DETERMINING THE INFLUENCE OF THE LOCAL FOOD ENVIRONMENT ON THE DIETARY COMPLIANCE AND DIET QUALITY OF TYPE 2 DIABETES MELLITUS PATIENTS ENROLLED IN THE CARDIO-VASCULAR DISEASE (CVD) PROGRAM IN DAVAO CITY, PHILIPPINES

Miss Ma. Esmeralda Silva

A Dissertation Submitted in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy Program in Public Health
College of Public Health Sciences
Chulalongkorn University
Academic Year 2013

การประเมินผลกระทบของแหล่งอาหารในท้องถิ่น ต่อการปฏิบัติตามหลักการรับประทานอาหารคุณภาพ ของผู้ป่วยโรคเบาหวานชนิดที่สอง ที่ร่วมโครงการบูรณาการเพื่อป้องกันโรคหลอดเลือดและหัวใจ ในเมืองดาเวา ประเทศฟิลิปปินส์

นางสาวมา เอมเมอราลดา ซิลวา

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรดุษฎีบัณฑิต
สาขาวิชาสาธารณสุขศาสตร์
วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2556

Thesis Title	DETERMINING THE INFLUENCE OF THE LOCAL FOOD ENVIRONMENT ON THE DIETARY COMPLIANCE AND DIET QUALITY OF TYPE 2 DIABETES MELLITUS PATIENTS ENROLLED IN THE CARDIO-VASCULAR DISEASE (CVD) PROGRAM IN DAVAO CITY, PHILIPPINES
By	Miss Ma. Esmeralda Silva
Field of Study	Public Health
Thesis Advisor	Associate ProfessorSathirakorn Pongpanich
Thesis Co-Advisor	Assistant Professor Warapone Satheannoppakao, Ph.D.

Accepted by the Faculty of College of Public Health Sciences, Chulalongkorn University in Partial Fulfillment of the Requirements for the Doctoral Degree

.....Dean of the College of Public Health Sciences

(ProfessorSurasak Taneepanichskul, M.D.)

THESIS COMMITTEE

.....Chairman

(ProfessorSurasak Taneepanichskul, M.D.)

.....Thesis Advisor

(Associate ProfessorSathirakorn Pongpanich)

.....Thesis Co-Advisor

(Assistant Professor Warapone Satheannoppakao, Ph.D.)

.....Examiner

(Assistant ProfessorWattasit Siriwong, Ph.D.)

.....Examiner

(Robert Sedgwick Chapman, M.D.)

.....External Examiner

(Josephine Jasmin Villafuerte, M.D.)

.....External Examiner

(ProfessorMark G. Robson, Ph.D.)

มา เอมเมอราลดา ชิลวา : การประเมินผลกระทบของแหล่งอาหารในท้องถิ่น ต่อการปฏิบัติตามหลักการรับประทานอาหารคุณภาพ ของผู้ป่วยโรคเบาหวานชนิดที่สอง ที่ร่วมโครงการบูรณาการเพื่อป้องกันโรคหลอดเลือดและหัวใจ ในเมืองดาเวา ประเทศฟิลิปปินส์. (DETERMINING THE INFLUENCE OF THE LOCAL FOOD ENVIRONMENT ON THE DIETARY COMPLIANCE AND DIET QUALITY OF TYPE 2 DIABETES MELLITUS PATIENTS ENROLLED IN THE CARDIO-VASCULAR DISEASE (CVD) PROGRAM IN DAVAO CITY, PHILIPPINES) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: รศ. ดร.สถิรกร พงศ์พานิช, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: ผศ. ดร.วราภรณ์ เสถียรนพเก้า, , หน้า.

บทคัดย่อ

ความเป็นมา โรคเบาหวานเป็นหนึ่งในโรคไม่ติดต่อที่เป็นภาระด้านสาธารณสุขมากที่สุดทั่วโลก ในปี ค.ศ. 2008 ความชุกของโรคเบาหวานโดยการประมาณอย่างเป็นทางการ คิดเป็นร้อยละ 4.8 ในเมืองดาเวา การให้บริการโภชนบำบัดทางการแพทย์ในรูปแบบของการให้คำปรึกษารายบุคคลจัดให้สำหรับผู้ป่วยเบาหวานที่อยู่ในโปรแกรมโรคหัวใจและหลอดเลือด การศึกษานี้ได้รับการออกแบบเพื่อประเมินผลกระทบของสภาพแวดล้อมด้านอาหารท้องถิ่นที่มีต่อการปฏิบัติตามแนวทางอาหารและคุณภาพอาหารของผู้ป่วยเบาหวานชนิดที่ 2 ในโปรแกรมดังกล่าว รูปแบบการศึกษา การศึกษานี้เป็นการศึกษาที่แบ่งออกเป็น 3 ระยะ ดำเนินการในหมู่บ้านที่ถูกเลือกในเมืองดาเวา ระยะที่หนึ่งเป็นการศึกษาแบบภาคตัดขวางที่ศึกษาถึงอิทธิพลของสภาพแวดล้อมด้านอาหารท้องถิ่นที่มีต่อผลลัพท์ด้านอาหาร รวมทั้งความเต็มใจของร้านขายอาหารรายย่อยที่จะขาย และความเต็มใจของผู้ป่วยที่จะซื้ออาหารสุขภาพทางเลือกสำหรับเบาหวาน ระยะที่สองเน้นกา รประเมินสภาพแวดล้อมเชิงนโยบายระดับชาติและระดับท้องถิ่นด้วยวิธีการเชิงคุณภาพ ในระยะที่สาม การจัดโภชนบำบัดทางการแพทย์เชิงสร้างเสริมถูกออกแบบ ดำเนินการ และประเมินโดยใช้การวิจัยกึ่งทดลอง วิธีการ ผลลัพธ์ที่สำคัญของการศึกษาคือการปฏิบัติตามแนวทางอาหารและคุณภาพอาหาร สำหรับระยะที่ 1 ผู้ป่วยที่ได้รับการวินิจฉัยว่าเป็นโรคเบาหวานรายใหม่จำนวน 21 ราย ได้รับคัดเลือกจาก 6 หมู่บ้าน ผู้ป่วยถูกขอร้องให้จดบันทึกรายการอาหาร 7 วันเพื่อประเมินการบริโภคอาหาร แบบสัมภาษณ์ถูกพัฒนาเพื่อรวบรวมข้อมูลเกี่ยวกับการรับประทานอาหารและรูปแบบการซื้ออาหารของผู้ป่วย รวมทั้งการมีอยู่ของอาหารและความเต็มใจที่จะซื้ออาหารสุขภาพทางเลือกสำหรับเบาหวาน แบบสำรวจใช้เพื่อประเมินการมีอยู่ของอาหารสุขภาพทางเลือกสำหรับเบาหวานภายในร้านค้าและความเต็มใจของเจ้าของร้านที่จะขาย ระหว่างระยะที่ 2 การสัมภาษณ์ผู้ให้ข้อมูลสำคัญดำเนินการในเจ้าหน้าที่ท้องถิ่นที่มีความสำคัญเกี่ยวข้องโปรแกรมและนโยบายของเมืองดาเวาในด้านการมีอยู่และการเข้าถึงอาหาร เพื่อพัฒนาการจัดโภชนบำบัดทางการแพทย์ การประชุมเชิงปฏิบัติการในกลุ่มนักโภชนาการของโปรแกรมได้ถูกจัดขึ้น 2 ครั้ง หมู่บ้านจำนวน 2 หมู่บ้านถูกเลือกแบบเฉพาะเจาะจงและกำหนดให้เป็นหมู่บ้านที่ดำเนินการทดลองและหมู่บ้านควบคุม การจัดโภชนบำบัดทางการแพทย์ 4 ส่วนถูกดำเนินการในกลุ่มทดลอง โดยกลุ่มทดลองมีผู้ป่วยเบาหวานจำนวน 24 ราย และกลุ่มควบคุมจำนวน 21 ราย สถิติเชิงพรรณนาใช้สำหรับอธิบาย การมีอยู่ของร้านค้าอาหาร การมีอยู่ของอาหารสุขภาพทางเลือกสำหรับเบาหวานภายในร้านค้าและความเต็มใจที่จะขายอาหารสุขภาพทางเลือกสำหรับเบาหวาน ในร้านค้าจำนวน 2,315 ร้าน รวมทั้งข้อมูลด้านเศรษฐกิจ-สังคมและประชากรของผู้ป่วย รูปแบบการซื้ออาหารและการรับประทาน และความเต็มใจที่จะซื้ออาหารสุขภาพทางเลือกสำหรับเบาหวาน สำหรับค่าเฉลี่ยการได้รับพลังงาน สารอาหาร หลักและสารอาหารรองประจำวันคำนวณโดยใช้ซอฟท์แวร์ Menu-Eval และโปรแกรมรายการอาหารแลกเปลี่ยน ระดับของการปฏิบัติตามแนวทางอาหารและคะแนนดัชนีคุณภาพอาหาร-นานาชาติ (Diet Quality Index-International) ที่ปรับปรุงได้จากการประเมินสารอาหาร ดำเนินการการวิเคราะห์เนื้อหาจากการสัมภาษณ์ผู้ให้ข้อมูลสำคัญ และใช้การวิเคราะห์ทางสถิติแบบไม่ใช้พารามิเตอร์เพื่อประเมินประสิทธิภาพของการจัดโภชนบำบัดทางการแพทย์ ระหว่างกลุ่มทดลองและกลุ่มควบคุม ผลการศึกษา ถึงแม้ว่าจะมีแนวทางและโปรแกรมระดับชาติที่มุ่งแก้ไขปัญหาการเข้าถึงและการมีอยู่ของอาหาร โปรแกรมเหล่านี้เน้นผลิตภัณฑ์จากข้าวขาวมากกว่าและยังไม่การส่งเสริมการเข้าถึงและการมีอยู่ของอาหาร ในระดับท้องถิ่น ไม่มีกลไกทางระบบสถาบันที่ยั่งยืนในการสร้างความเข้มแข็งอย่างเป็นระบบในเรื่องการเข้าถึงและการมีอยู่ของอาหาร สภาพแวดล้อมด้านอาหารท้องถิ่นได้รับอิทธิพลจากร้านขายอาหารที่มีขนาดเล็กกว่า เช่น ร้านซาริ-ซาริ (sari-sari) การินเดอเรียส (karinderias) และรถเข็นขายอาหาร ทำให้การมีอยู่ในร้านค้าสำหรับอาหารสุขภาพทางเลือกสำหรับเบาหวานที่จำหน่ายออกอย่างรวดเร็วและไม่เน่าเสียง่ายเพิ่มขึ้น ในขณะที่อาหารสุขภาพทางเลือกสำหรับเบาหวานที่สดและอาหารไขมันต่ำและเค็มน้อยหาได้ยาก ค่าเฉลี่ยการได้รับพลังงานและสารอาหารหลักประจำวันของผู้ป่วยต่ำกว่าระดับเฉลี่ยที่แนะนำต่อวัน การปฏิบัติตามแนวทางอาหารสำหรับพลังงานและสารอาหารหลักอยู่ในระดับต่ำ และคุณภาพอาหารไม่ดี การปฏิบัติตามด้านพลังงานมีความสัมพันธ์อย่างมีนัยสำคัญกับการมีอยู่ของร้านขายอาหารในระยะ 500 เมตร ห่างจากที่พักอาศัยของผู้ป่วย แม้ว่าจะไม่พบความสัมพันธ์อย่างมีนัยสำคัญระหว่างความสามารถในการเข้าถึงทางกายภาพและคุณภาพอาหาร โภชนบำบัดทางการแพทย์เชิงสร้างเสริมมีประสิทธิผลในการเพิ่มความรู้ด้านโภชนาการแต่ไม่มีผลต่อการได้รับพลังงานและสารอาหารหลัก การปฏิบัติตามแนวทางอาหารและคุณภาพอาหาร สรุปและข้อเสนอแนะ สภาพแวดล้อมด้านอาหารท้องถิ่นตกอยู่ใต้อิทธิพลของร้านขายอาหารที่มีขนาดเล็ก ซึ่งทำให้เพิ่มการมีอยู่ของอาหารสุขภาพทางเลือกสำหรับเบาหวานที่จำหน่ายออกอย่างรวดเร็ว และลดการมีอยู่ของอาหารที่สดการปฏิบัติตามแนวทางอาหารและคุณภาพอาหารของผู้ป่วยอยู่ในระดับต่ำ การจัดโภชนบำบัดทางการแพทย์มีประสิทธิผลในการเพิ่มความรู้ด้านโภชนาการแต่ไม่ส่งผลต่อผลลัพธ์ด้านอาหารอื่นๆ จากการมีร้านขายอาหารจำนวนมากในระดับชุมชน จึงควรมีการส่งเสริมการเข้าถึงและการมีอยู่ของอาหารด้วยนโยบายและโปรแกรมในระดับท้องถิ่นที่เชื่อมโยงจุดเข้าถึงที่สำคัญเหล่านี้ไปสู่ห่วงโซ่อุปทาน ร่วมด้วยการตรวจสอบด้านนโยบายงบประมาณท้องถิ่นที่ช่วยกระตุ้นการจัดให้มีอาหารสุขภาพทางเลือกที่สดสำหรับเบาหวานเพื่อสนับสนุนการแก้ไขปัญหาดังกล่าว

สาขาวิชา สาธารณสุขศาสตร์ ลายมือชื่อนิสิต .....

ปีการศึกษา 2556 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก .....

ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์ร่วม .....

5379215453 : MAJOR PUBLIC HEALTH
KEYWORDS: TYPE 2 / FOOD ENVIRONMENT / DIET QUALITY / DIETARY COMPLIANCE / PHILIPPINES / DIETARY INTAKE

MA. ESMERALDA SILVA: DETERMINING THE INFLUENCE OF THE LOCAL FOOD ENVIRONMENT ON THE DIETARY COMPLIANCE AND DIET QUALITY OF TYPE 2 DIABETES MELLITUS PATIENTS ENROLLED IN THE CARDIO-VASCULAR DISEASE (CVD) PROGRAM IN DAVAO CITY, PHILIPPINES. ADVISOR: ASSOC. PROF.SATHIRAKORN PONGPANICH, Ph.D, CO-ADVISOR: ASST. PROF. WARAPONE SATHEANNOPPAKAO, Ph.D., pp.

Background. Diabetes mellitus has been identified as one of the non-communicable diseases that present the biggest public health burden globally. In 2008, the official estimated prevalence of diabetes mellitus was pegged at 4.8%. In Davao City, a medical nutrition therapy (MNT) service, a one-on-one nutrition counseling session, is being provided for diabetic patients enrolled in the Cardiovascular Disease (CVD) Program. This study was designed to assess the impact of the local food environment on dietary compliance and diet quality of Type 2 Diabetes Mellitus (T2DM) patients enrolled in the aforementioned program. Study design. This study was a three-phase study implemented in selected barangays (villages) in Davao City. The first phase was a cross-section study that looked into the influence of the local food environment on the dietary outcomes as well as the willingness of food retailers to sell and willingness of patients to purchase diabetic healthy food options (DHFOs). The second phase focused on assessing the national and local policy environment using qualitative methods. In the third phase, an enhanced medical nutrition therapy (MNT) intervention was designed, implemented and assessed using a quasi-experimental design. Methods. The main study outcomes were dietary compliance and diet quality. For Phase 1, 21 recently-diagnosed diabetic patients were recruited from 6 selected barangays. They were asked to make a 7-day food record to evaluate their dietary intake. An interview questionnaire was also developed to gather the patient's data related to eating and food shopping patterns as well as the home availability and willingness to purchase DHFOs. A survey questionnaire was used to assess the in-store availability of DHFOs and willingness to sell of food store owners. During Phase 2, a series of key informant interviews were conducted among key local officials regarding the city's programs and policies related to food availability and accessibility. To develop the enhanced MNT intervention, a 2-part workshop among program nutritionists was conducted. Inputs gathered from the workshop were integrated into the design of the intervention. Two barangays were purposively chosen and assigned as the intervention and control barangays. A 4-session enhanced MNT intervention was implemented in the intervention group. There were 24 diabetic patients in the intervention group and 21 in the control group. Descriptive statistics were computed to explain the food store availability and in-store availability of DHFOs and their willingness to sell DHFOs among 2,315 food stores as well as the patients' socio-economic, demographic profile, food shopping and eating patterns and their willingness to purchase DHFOs. Average daily energy, macronutrient and micronutrient intake were computed using the Menu-Eval software program and the Food Exchange List. Dietary compliance levels and modified Diet Quality Index-International scores were derived based on the nutrient assessment. Content analysis of the key informant interviews was done. Non-parametric statistical analysis was used to assess the effectiveness of the MNT intervention between the intervention and control groups. Results. Although there were national directives and programs that addressed food accessibility and availability, these programs have more focused on white-rice production and did not directly enhanced food accessibility and availability. At the local level, there were no sustainable institutional mechanisms that systematically strengthen food access and availability. The local food environment was dominated by smaller-sized food stores such as sari-sari stores, karinderias and food carts. This constrained the high in-store availability to fast-moving, non-perishable DHFOs, while fresh DHFOs and low-fat, low-salt dishes was less available. The average daily energy and macronutrient intake of the patients were found to be less than the average prescribed daily levels. The dietary compliance for energy and macronutrients ranges was low and diet quality was poor. Energy compliance was observed to be significantly associated with food store availability within 500 meters of the patient's residence, although no significant association was found between physical accessibility and diet quality. The enhanced MNT was effective in increasing nutrition knowledge but not energy and macronutrient intake, dietary compliance and diet quality. Conclusions and recommendations. The local food environment landscape was dominated by smaller-sized food stores. This drove the high availability of fast-moving DHFOs and the low availability of fresh food options. The dietary compliance and diet quality of the patients were found to be poor. The MNT intervention was effective in increasing nutrition knowledge, but did not affect other dietary outcomes. With the high presence of food stores at the community level, food accessibility and availability could be greatly enhanced with local policies and programs that link these potential access points to the supply chain. Local fiscal policies that incentivize the provision of fresh DHFOs could also be explored to compliment this initiative.

Field of Study: Public Health

Academic Year: 2013

Student's Signature .....

Advisor's Signature .....

Co-Advisor's Signature .....

ACKNOWLEDGEMENTS

It would not have been possible to write my dissertation paper without the help and support of those around me, to only some of whom it is possible to give particular mention here.

First and foremost, I'd like to thank God, the Almighty Father, for all of the blessings and opportunities that He has showered upon me. Everything in my life, both good and bad, has been a gift from Him that I may be the best person that He has dreamed for me.

I am profoundly grateful for the love and support of my family, my Dad and Mom and my sister, Pia. Their unending support and faith in me has been my bastion in times of hardship and moments of triumph.

I am thankful to all my Thai friends, especially Oui, Bo, Donna and Som. They have shown me that friendship transcends language and culture. You have made my 4-stay here in Thailand truly memorable and life changing. To my friends in the Philippines, I am grateful for all your encouragements and shout-outs as I move towards achieving one my life's goals.

This thesis would not have been possible without the help and support of my main adviser, Prof. Sathirakorn Pongpanich, and co-adviser, Prof. Warapone Satheannoppakao. Your patience and guidance in helping me navigate my research and pushing me to be the best that I could be is truly invaluable. I would like to thank my other advisers, Prof. Wattasit Siriwong, Dr. Mark Robson and Dr. Robert Chapman, whose insights have helped me refine my work into what it is today.

The benefaction given to me by Dr. Josephine Villafuerte, one of my dissertation advisers and the Davao City Health Officer, was without equal. Her support and those of Ms. Chona Dazon and Ms. Lovejoy Binobo have made my engagement with the CVD program a true learning experience. The aid given to me by Handicap International, through the efforts of Dr. Ivy Nolasco and Mr. Richard Erick Caballero, has gone a long way in helping me complete my work in Davao City.

I would like to thank the staff of the College of Public Health Sciences, under the leadership of Prof. Surasak Taneepanichskul, M.D., for their patience in helping me navigate the intricacies of the Chulalongkorn University bureaucracy. Your invaluable assistance to me has made my stay easy and enjoyable.

Last but not the least, I am grateful for the support and assistance that the University of the Philippines has provided me to enable me to pursue my doctoral studies at Chulalongkorn University. I would like to thank the Office of the Vice President for Academic Affairs and the Office of the Vice-Chancellor for Academic Affairs (Manila) for the financial and administrative support they have provided to me through the UP Doctoral Studies Fund. I would also like to thank Dr. Nina Gloriani, former Dean of the College of Public Health, Engr. Romeo Quizon, current Dean of the College of Public Health, Dr. Susan Mabunga, former Chair of the Department of Health Policy and Administration and Dr. Emerito Faraon, current Chair of the Department of Health Policy and Administration, for their unwavering faith in me.

CONTENTS

Page

Page

Chapter I

Introduction

1.1. Introduction

Diabetes mellitus (DM) has become a major public health problem. The prevalence and incidence of DM have increased considerably over the past 50 years. The International Diabetes Federation estimates showed that the number of adult diabetics globally is expected to be breach the 592 million adults in less than 25 years (International Diabetes Foundation, 2013). By 2030, it is estimated that there will be around half a billion diabetic patients globally (Shaw et al., 2010) . Global prevalence of diabetes among adults was pegged at 6.4% in 2010. Furthermore, this is expected to rise to 7.7% in 20 years resulting in a 54.1% increase in the number of adults aged 20 to 79 with diabetes (Shaw et al., 2009).

Diabetes is also evolving to be one of leading causes of mortality globally. It was estimated to have caused 4.6 million deaths in 2011. In 2002, it was ranked 11th among the 15 leading causes of death globally (Mathers and Loncar, 2006). By 2030, it is estimated that it will be the 7th leading cause of death globally, contributing 3.1% to the total deaths (Mathers and Loncar, 2005). Complications associated with this disease include metabolic and vascular complications that affect the eyes, kidneys and the heart. These are the major contributors to the excess morbidity and mortality associated with the disease (Bennett, 2011).

These trends in diabetes mortality and prevalence have not been limited to developed countries. Developing countries suffer from a disproportionately higher burden of diabetes where the number of diabetic adults is expected to surpass those in the developed world. By 2025, two out of three diabetes patients worldwide will be from developing countries, and one in three will be from India or China (Yajnik et al., 2011). By 2030, the prevalence of diabetes in the Western Pacific region, in which the Philippines belong to, is estimated to be 5.7% resulting to a 47% rise in the number of adults in the region with the disease (Shaw et al., 2009).

In developing countries, diabetes manifests at a younger age. Most of the adult patients were diagnosed diabetics between the ages of 45 to 64 years old compared to developed countries where diabetes tended to manifest in relatively older populations. Adults with diabetes in developing countries tended to have lower body mass index (BMI). However, their disease progressed faster compared to their European counterparts (Yajnik et al., 2011). With more diabetic adults belonging to the younger age groups in developing countries, he/she is expected to live with the disease over a relatively longer period imposing significant physical, economic and emotional burden on the patient, his/her family and society in general. To illustrate, increased morbidity from complications have vastly increased the direct and indirect medical costs associated with the disease (Bennett, 2011). .

Prevalence estimates in the Philippines have been varied. The 6th National Nutrition Survey in 2003 pegged the prevalence of diabetes in the country at 3.4% with the highest prevalence observed from the 50- to 59-year-old age group (Food and Nutrition Research Institution, 2010). In contrast, the Philippine Cardiovascular Outcomes Study (PhilCOS-DM) in 2009 estimated the prevalence of Type 2 Diabetes Mellitus to be 28% (Soria et al., 2009). Although the base years for the estimates are different, it would be unlikely for the prevalence estimates to have grown 9-fold in less than 5 years. The PhilCOS-DM estimates would be a more realistic estimate, since it included findings from the different diagnostic procedures.

The PhilCOS-DM study estimated the incidence rate from 1998 to 2007 at 16.3% which showed an alarming growth in diabetes and pre-diabetes stages in the country over a short period of time (Soria et al., 2009). This trend presents a significant public health challenge for developing countries like the Philippines, where local health systems are doubly burdened with nutritional deficiency and infectious diseases, while also tackling the rapidly increasing non-communicable diseases, which include diabetes mellitus (Yajnik et al., 2011). This is reflected in Figure 1.1 and 1.2, which show the leading causes of mortality and morbidity, respectively, in the Philippines for selected years. It can be seen that the leading causes of morbidity and death are still a mix of communicable and non-communicable diseases. Given the current trajectory in the growth in the number of diabetic patients in the population, it is expected that the local health systems will be in the frontline in providing prevention as well as early and late treatment programs. But the question is: will they be able to fully respond to the demands over the long-term?

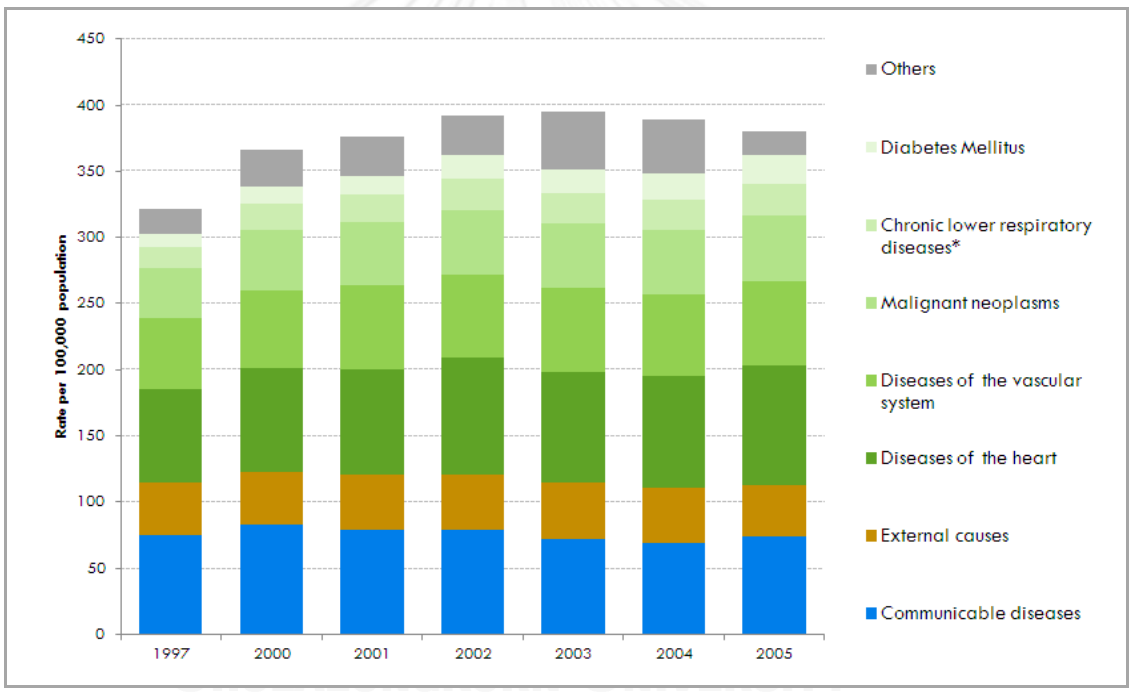


Figure 1.1: Leading causes of deaths in the Philippines, selected years. Data from the Department of Health, Philippines (2009).

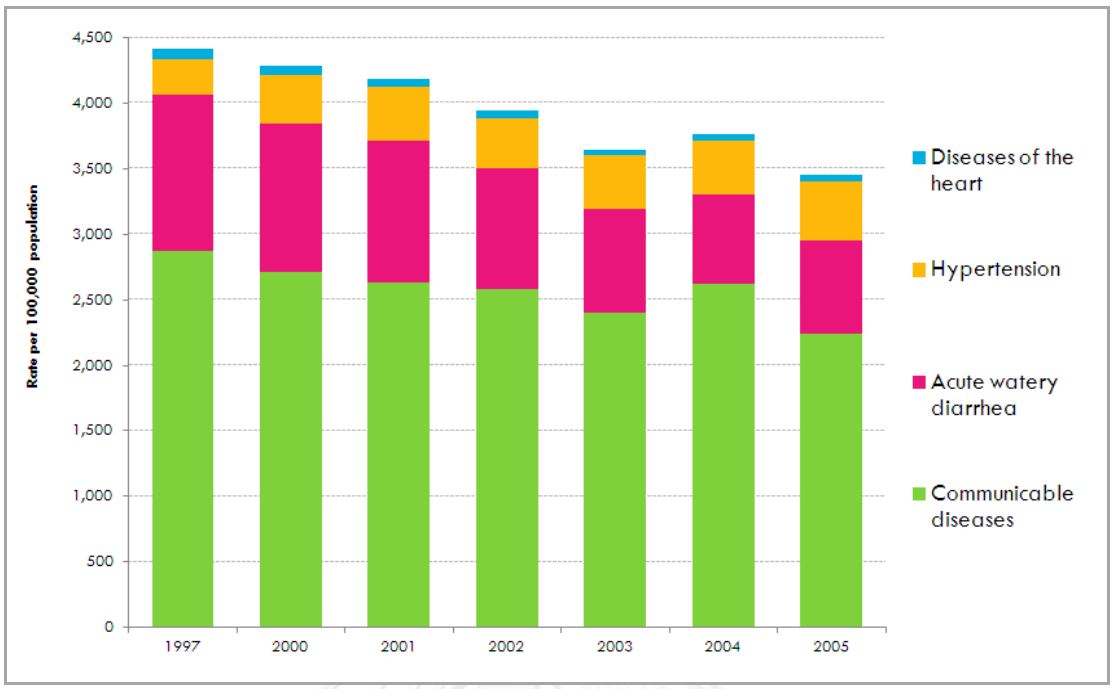


Figure 1.2: Leading causes of morbidity in the Philippines, selected years. Data from the Department of Health, Philippines (2009).

With a limited number of resources that can be used to help address a myriad of public health problems at the local level, local government units (LGUs) will have to prioritize and re-prioritize on what they consider as bigger and more immediate problems. It is a tough balancing act since local health systems will have to be able to respond to the disease management needs of patients with chronic diseases such as diabetes and, at the same time, move towards slowing it down through prevention. However, as Lorenzo et al. (2010) have found in their policy analysis of non-communicable disease (NCD) policies in the Philippines, there is a weak implementation of such policies at the local level despite having a Department of Health (DOH) directive. Most LGUs report having Healthy Lifestyle programs that consisted mainly of monitoring activities as well as sporadic screening activities, conduct of lectures, seminars and exercise programs, done usually once a year.

Therefore, it is imperative that both national and local policies and programs that directly address non-communicable diseases, especially diabetes mellitus which is currently considered as a gateway disease, be given priority. Chronic diseases, such as diabetes, are often undiagnosed until complications set in requiring the urgent need for prevention, control and management programs be fully integrated and implemented. Out-of-the-box and population-based approaches must also be explored early in order to come up with an integrated and holistic approach to this issue that will continue to affect Filipinos in the considerable future.

1.2. Rationale

Over the past few years, there has been a substantial focus on the physical or built environment, especially its effect on dietary choices and diet-related outcomes such as obesity. Types of food establishments within the immediate

vicinity of neighborhoods have been linked to diet quality and ultimately, changes in nutritional status. Several research studies have explored the relationship between the different types of food establishments, ranging from supermarkets to convenience stores to fast-food joints, with diet quality and nutritional status.

In a study by Powell et al. (2007a) on adolescent weight and availability of 4 categories of grocery food stores, they found that food store availability was significantly related with adolescent body mass index (BMI), where having more supermarket chains was linked to a decrease in BMI and a reduction in the prevalence of overweight. Similarly, Morland and Evenson (2009) found that the prevalence of obesity was lower in areas that had supermarkets but higher in areas with small grocery stores or fast-food restaurants. In a cross-sectional study involving participants in the Multi-Ethnic Study of Atherosclerosis, Moore et al. (2009) examined the association between fast-food consumption, neighborhood fast-food exposure and diet quality. They found that higher fast-food consumption and neighborhood fast-food exposure were associated with poorer diets.

Majority of these research studies have been conducted in more developed economies, although there has been work done in low-income communities in these countries. Nonetheless, it is important to realize that the physical or built environment in developed countries is very different from developing countries like the Philippines. Even though fast-food establishments such as McDonalds and Jollibee are proliferating, people eat in small *turo-turos* or *karinderias* and street vendors because these establishments are widely available and offer cheaper food. There are also significant contextual differences at the community level as to where households buy their food. This ranges from *sari-sari* stores to big groceries and even pharmacies. **Therefore, it is imperative to start building the evidence on the local food environment in the context of low and middle-income economies like the Philippines.** At present, there is a dearth of published work on the food environment, specifically looking at the physical/ built environments, in countries like the Philippines.

The food availability and accessibility in the food environment influences and shapes food choices. Although what is available is a direct function of demand, demand is still shaped by what was previously available. The food preferences of those living in the community are shaped by what they commonly see in their neighborhoods. Research findings indicate that there are differences in the healthy food options and its prices across different types of neighborhoods. In New York, a smaller number of the stores in the relatively poorer neighborhood (East Harlem) stocked diabetes-healthy food compared to its more affluent neighbor (Upper East Side) (Horowitz et al., 2004). Moreover, in New Zealand, Wang et al. (2010) found that healthy food was more available in urban areas compared to rural areas. While the healthy food basket was more expensive than the regular one, the price difference was more significant in urban areas. The abovementioned factors all have an impact on the food preferences and diet behavior of those living in these communities. If one is not exposed to healthier food options because it is not regularly available or not affordable, then there is less likelihood that an individual would consume a healthier diet or, much less, demand for healthier alternatives. This is particularly worrisome for diabetic patients, where diet and nutrition play a significant role in their self-care regimen. If diabetic patients do not find the food that they need or if these food options are priced out of their capacity, complying with their dietary regimen becomes more difficult and more expensive. **It is, therefore, critical that the local food environment be able accommodate the needs of diabetic patients in the community.**

The City of Davao is currently implementing a community-based integrated Cardio-Vascular Disease (CVD) Program in all 182 barangays. A critical component in this program is the nutrition counseling service for patients registered in the program at the barangay and district health centers. The counseling session is aimed at helping registered patients manage their diets. Having a healthy diet over the long-term is an important component in the self-care process. Like any kind of behavior change, diet shift is difficult and equally challenging to achieve and sustain over the long-term. At present, not enough time is being devoted to this component. Nutrition counseling is provided to patients only during the patient's initial visit in the program. The single session on nutrition counseling is an activity where *all* diabetes-related information is taught to patients. Based on anecdotal evidence and feedback from program implementers, this is insufficient. They are

inundated with so much information within a 45-minute contact. **It is imperative that the nutrition counseling service be structured in such a way that it is able to provide knowledge as well as teach skills necessary for patients to make better and healthier food choices. It must also be flexible enough to be responsive to the individual patient's dietary needs and preferences.**

It is essential to keep in mind that the intervention at the individual level is only a part of the self-care process, albeit it is the most critical piece. It is also essential to look at the environment where the diabetic patient live, eat, play, and work. **Even though nutrition counseling is successful in improving the patients' diet, accessibility and availability of the food that they need could constrain their success as well.**

The research focuses on the relationship between the local food environment, specifically covering the physical accessibility, food store availability and in-store availability of food diabetic-healthy food options, and the dietary compliance and diet quality of patients registered in the CVD program. Is the food that they need readily available and easily accessible? What are the opportunities in the local food environment for patients to enjoy healthier diets? What is the policy environment for the production and marketing of diabetic healthy food options? Answers to these questions will not automatically ensure that diabetic patients will start eating healthy and will be able to comply with their dietary requirements. An enhanced medical nutrition therapy program that is grounded on a clearer picture of the food environment helps create a more holistic approach to helping patients move towards better and healthier diets.

1.3. Research questions

This research sought to answer the following research questions:

1. How supportive was the local food environment in helping diabetic patients enrolled in Davao City's integrated CVD program meet their dietary needs and ensure that they have healthy diets?
    a. What was the availability of different types of food stores at the community level?
    b. How available were diabetic healthy food options in the community?
2. Compared to the average retail price, how much were the diabetic patients willing to pay for diabetic-healthy food in their local food environment?
3. Compared to the average retail price, how much were local food retailers willing to sell diabetic-healthy food?
4. What was the effect of an enhanced medical nutrition therapy (MNT) intervention on the dietary compliance, diet quality and diet and nutrition knowledge of the diabetic patients?
5. What was the policy environment surrounding the production, marketing and distribution of diabetic healthy food at the local and national level?

1.4. Research objectives

The main objective of this research was to assess the impact of food store availability, in-store availability and physical accessibility in the local food environment on the dietary compliance and diet quality of Type 2 Diabetes Mellitus (T2DM) patients enrolled in the Cardiovascular disease (CVD) program of Davao City. Specifically, the study sought to:

1. Explain the impact of physical accessibility, food store availability and in-store availability of diabetic healthy food options on the dietary compliance and diet quality of diabetic patients.

2. Describe the willingness to pay of patients to purchase diabetic-healthy food options as well as the willingness to sell of local merchants to provide diabetic-healthy food options.
3. Depict the national and local policy environment that influences food availability and accessibility in Davao City.
4. Implement an enhanced medical nutrition therapy intervention in a selected barangay.
5. Analyze the effectiveness of an enhanced medical nutrition therapy intervention on the diet and nutrition knowledge, dietary compliance and diet quality of patients in the CVD program. Specifically, it aimed to:
    a. Evaluate energy intake, dietary compliance, diet quality and diet and nutrition knowledge scores of each group between pre-intervention and post-intervention stages.
    b. Assess the change in energy intake, dietary compliance, diet quality and diet and nutrition knowledge scores between intervention and control groups.

1.5. Hypotheses

The study sought to test the following research hypotheses:

1. Comparison of study outcomes between pre-intervention and post-intervention stages
    a. H_a: There is a statistically significant difference between the energy intake of patients during pre-intervention and post-intervention stages for control and intervention groups.
    b. H_a: There is a statistically significant difference between the dietary compliance of patients during pre-intervention and post-intervention stages for control and intervention groups.
    c. H_a: There is a statistically significant difference between the modified DQI-I scores of patients during pre-intervention and post-intervention stages for control and intervention groups.
    d. H_a: There is a statistically significant difference between the knowledge scores of patients during pre-intervention and post-intervention stages for control and intervention groups.
    e. H_a: There is a statistically significant difference between the market game scores of patients during pre-intervention and post-intervention stages for control and intervention groups.
2. Comparison of changes in study outcomes between two groups
    a. H_a: The change in energy intake [$Energy_{post}$ - $Energy_{pre}$] for patients in the intervention group was statistically significant different from patients in the control group.
    b. H_a: The change in dietary compliance [# of days $compliant_{post}$ – # of days $compliant_{pre}$] for patients in the intervention group was statistically significant different from patients in the control group.
    c. H_a: The change in CPF compliance [CPF $Compliance_{post}$ – CPF $Compliance_{pre}$] for patients in the intervention group was statistically significant different from patients in the control group.
    d. H_a: The change in modified DQI-I scores [DQI-I $Score_{post}$ – DQI-I $Score_{pre}$] for patients in the intervention group was statistically significant different from patients in the control group.
    e. H_a: The change in knowledge test scores [Test $Score_{post}$ – Test $Score_{pre}$] for patients in the intervention group was statistically significant different from patients in the control group.
    f. H_a: The change in market game scores [MG $Score_{post}$ – MG $Score_{pre}$] for patients in the intervention group was statistically significant different from patients in the control group.

1.6. Theoretical framework

This study was based on the ecological framework presented by Story, et al. in 2008 (Figure 1.3).

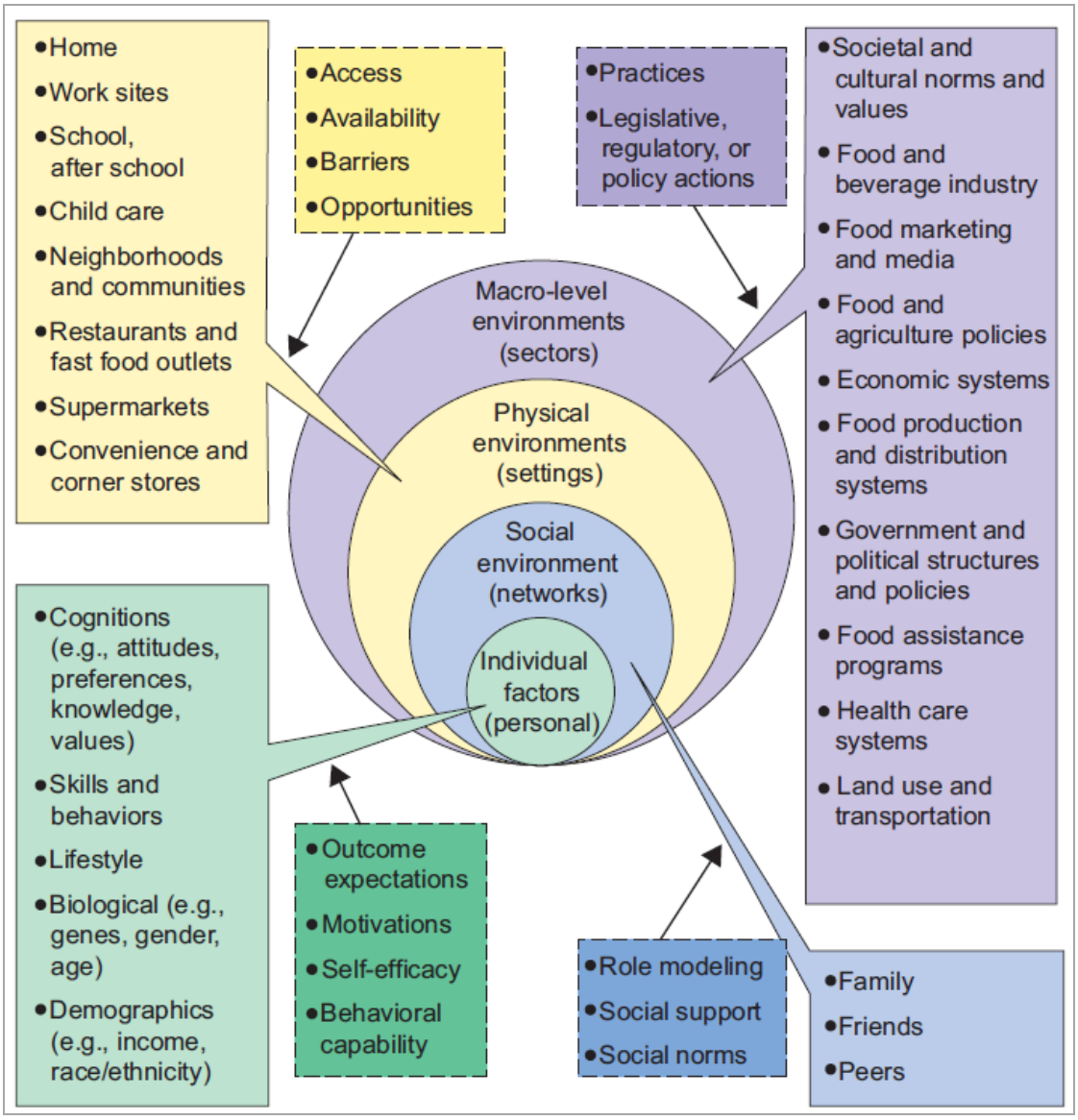


Figure 1.3. An ecological framework depicting the multiple influences on what people eat. Adapted from "Creating healthy food and eating environments: policy and environment approaches" by M. Story, K.M.Kaphingst, R. Robinson-O'Brien and K. Glanz, 2008, *Annual Review of Public Health, 29*, 253-272. 2008 by Annual Reviews

This framework presents the different levels of influence that shape food choices. One's health and risk for certain types of diseases is influenced by many factors, including diet and nutrition. However, it is also misleading to think that what one chooses to eat is a mere function of preference. Getting to the point of choosing between available options

is influenced by a multitude of factors from individual behavior and preferences all the way up to the macro-level environment or policy environment that shapes what is available, affordable and accessible in stores.

1.7. Conceptual framework

The conceptual framework for this study is shown in Figure 1.4.

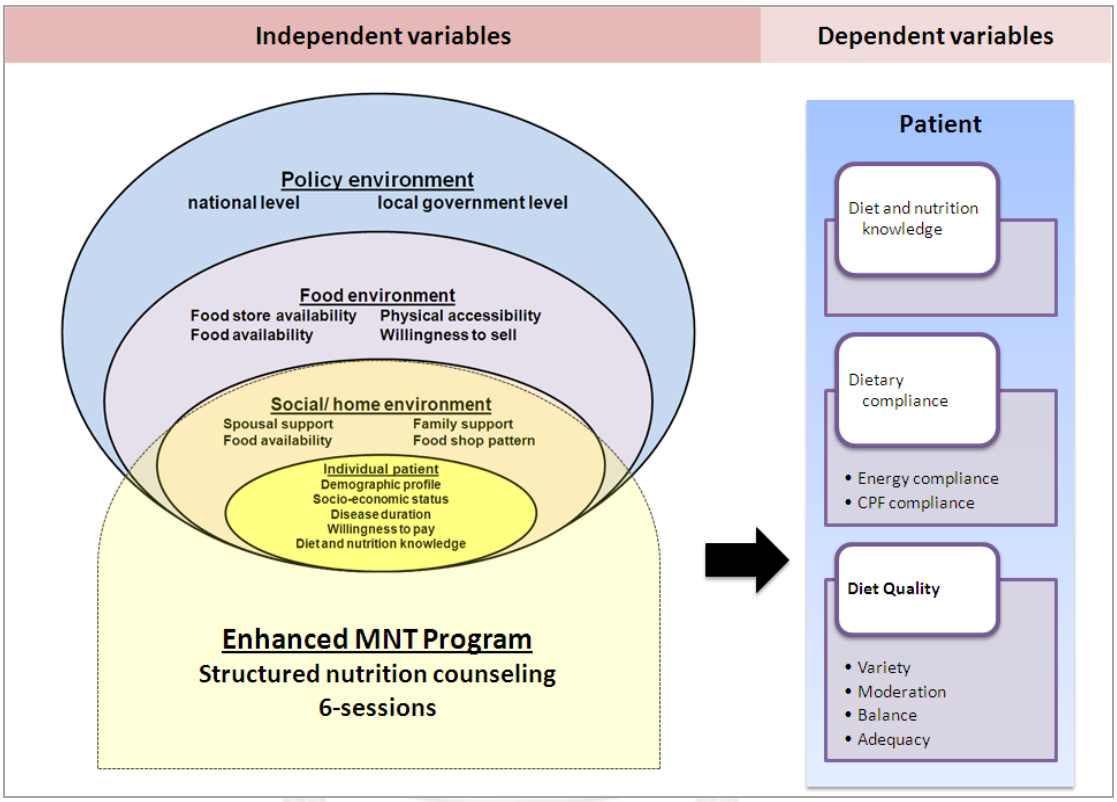


Figure 1.4: Conceptual framework

The main outcomes or dependent variables in the study are diet and nutrition knowledge, dietary compliance and diet quality. The study looked into the various levels of influences that can affect a patient's diet. These influences range from the individual level to the policy environment, which shapes the availability of goods and services. Over and above the demographic and socio-economic status of the patient, the study explored the patient's willingness to pay for diabetic healthy food options as well his/ her level of knowledge about diet and nutrition. These are important considerations when one seeks to intervene in the patient's dietary choices.

Since patients do not live in a vacuum, their social and home environments were also explored. Food purchases for the household usually try to strike a balance between the preferences of everybody in the household. This also shows the level of supportiveness of other members of the household to the dietary needs of the patients.

The food environment is the broader physical environment, where patients eat and buy food. The availability of certain food sources can influence the kinds of food items that are available. It also affects the level of physical access to these food options that patients have. It could also constrain or broaden the food choices that patients have.

The policy environment, on the other hand, indirectly influences the availability and affordability of food options. It shapes what is available, how available these items are and how affordable they are. In some ways, they shape the options that are available to the patients.

1.8. Operational definitions

Diet quality referred to the degree of "healthy-ness" of an individual's diet. The patient's diet quality was assessed using their 7-day food records. Diet quality score was computed based the nutrient values of their food intake. This was generated using a modified Diet Quality Index – International (DQI-I). The modified DQI-I is comprised of four sub-components: variety, adequacy, moderation and over-all balance. The total score is 78 points. The modified DQI-I score is further categorized into 4: very good (60-78 points), good (40-59 points), poor (20-39 points) and very poor (0-19 points).

Dietary compliance referred to the number of days in a week wherein the patients reached a pre-determined range of values based on the prescribed energy and carbohydrate-protein-fat (CPF) prescription made by the city nutritionist. For energy compliance, the energy compliance range was the total energy requirement ± 100 kcal while the carbohydrate, protein and fat compliance range was the macronutrient prescription ± 10 grams. The patient must be compliant for all three macronutrients in order to be considered CPF compliant.

Willingness to pay (WTP) referred to the preparedness of the diabetic patient to purchase a specific diabetic healthy food option at a given monetary value.

Willingness to sell (WTS) referred to the preparedness of a food seller (owners/ managers of food retail shops and food establishments) to offer diabetic-healthy options at a given monetary value.

Food shopping patterns referred to the eating and food shopping interactions of the patients and their caregivers with the local food environment. It specifically referred to the process of deciding when, what and where to eat, including their awareness of the food environment.

Effectiveness was defined as the positive change in the main study outcomes in the intervention group compared to the control group.

Local food environment referred to the food sources or places where people ate or bought food located within the administrative boundaries of the selected study sites. These food sources were classified under two categories which are further divided into four sub-categories:

1. Food retailers – stores where people bought raw/ uncooked & processed food items
    a. Mobile vendor - Mobile seller
    b. *Sari-sari* store - Had no cash register
    c. Grocery - Had 1-2 cash registers
    d. Supermarket - Had more than 2 cash registers
2. Food establishments - places where people can buy cooked food and beverages
    a. Mobile vendor – Seller without permanent stall
    b. Fast-food/ *karinderia*/ *turo-turo* – Served pre-cooked and short order food and had an eating area
    c. Food cart/ kiosk/ stall - Served pre-cooked and short order food and did not have an eating area
    d. Restaurant - Served food ala carte and had an eating area

Food retailers and establishments that were considered to be a part of the food environment were, but not limited to, those registered with the Business Bureau classified under Food Handlers (FH), Wholesale dealers and distributors (WDD) and Retailers.

The local food environment was assessed using three variables:

1. **Food store availability** was defined as the number and density of each type of food sources within the administrative boundaries of the study sites.
2. **Physical accessibility** referred to the number and density of each type of food sources within pre-defined distances from each of the patient participants' residence.
3. **In-store availability** was the presence or absence of diabetic-healthy food options among the different types of food sources in each barangay

Diabetic-healthy food options (DHFOs) were the set of basic staple food items that the city nutritionists of Davao City identified and recommended to households with diabetic patients. These selected food options were chosen based on their affordability and appropriateness to the Filipino food culture.

Recently-diagnosed diabetic patients were patients who have been diagnosed by a medical professional (physician) from January 2009 to April 2012.

Individual characteristics referred to the socio-economic, demographic and health characteristics of the diabetic patients which affects their ability to self-manage their disease. These included:

- Age at their last birthday
- Sex
- Marital status
- Occupational status
- Estimated household income
- Wealth estimate
- Disease duration or time since first diagnosis

Social network environment referred to filial and peer network that the patient interact with at home, in the office or in social gatherings. It includes spouses (for those who are married), other family members as well as peers/friends.

Chapter II

Review of Related Literature

2.1. Nutrition and health

"We don't eat nutrients, we eat foods." This statement can be amended to say that not only do we eat foods but we eat them in certain patterns. These patterns may be a consequence of our cultural and ethnic heritage and of many environmental factors, including the availability of foods, our ability to purchase and prepare foods, the numerous advertisements for foods, and, one hopes, the efforts of the government and the nutrition community to foster healthy diets. (Jacques and Tucker, 2001)

One's health is influenced by many factors, including what one chooses to eat in every time. What one chooses to eat goes beyond the mere act of choosing. Getting to the point of deciding what to eat and where to eat is influenced by a number of factors from the individual level up to the policy environment. Figure 1.3 is an ecological framework that captures the myriad of influences that shape one's eating behavior, including what s/he chooses to eat, where s/he eats and how much.

2.2. Determinants of food choices and eating behavior

2.2.1 Individual factors

Individual-level factors related to food choices and eating behaviors include cognitions, behaviors, and biological and demographic factors (Story et al., 2008). Food preference also plays a significant role in determining food choices. It has been found to be a strong determinant of healthy eating. Food preference also influences the frequency of consumption of the same foods (Drewnowski and Hann, 1999).

Food preferences are influenced by a number of different factors. In 2001, a cross-cultural study conducted in Japan, Taiwan, Malaysia and New Zealand looked into the personal motivations behind respondents' food choices. Respondents were asked to assess the relative importance of nine factors thought to be important motivations in food choice: Health, Mood, Convenience, Sensory Appeal, Natural Content, Price, Weight Control, Familiarity, and Ethical Concern (Prescott et al., 2002). They found that Taiwanese and Malaysian consumers valued the most were *Health*, *Natural Content*, *Weight Control* and *Convenience*. In contrast, *Price* was most important for Japanese consumers while *Sensory Appeal* was a crucial factor for New Zealand consumers in food choice (Prescott et al., 2002).

There are different motivations behind food preferences. Pettinger et al. (2003) investigated the nature of attitudes towards diet and health in northern and southern European countries. They found marked differences between the motivations between French and English respondents. The French respondents prioritized the pleasurable and social aspects of eating, certain food quality issues and health. On the other hand, English respondents reported that organic and ethical issues and convenience were important factors influencing their food choices (Pettinger et al., 2003).

2.2.2 Social environments

The family and home environment is an important determinant in shaping one's food choices and dietary behavior. The social environment includes interactions with family, friends, peers, and other people in the community, and may impact food choices through mechanisms such as role modeling, social support, and social norms (Story et al., 2008).

2.2.3 Physical environment

The physical environment includes the multiple settings where people eat or procure foods such as the homes, work sites, schools, restaurants, and supermarkets (Story et al., 2008). People live in different physical settings which could either expand or limit the options that are available to them to choose from.

What is physically available in the physical space poses constraint when making food choices. The physical settings within the community influence which food are available to eat and impact barriers and opportunities that facilitate or hinder healthy eating (Story et al., 2008). For example, Powell and Han (2011) found that food store outlet availability was found to have very small significant associations with some food consumption levels, but no significant associations were found for restaurant outlets.

Issues of accessibility and availability also come into play. Brown et al. (2008) found that both greater accessibility to and shopping in large chain supermarkets were associated with better self-rated health and trends toward lower BMI. Interestingly, study participants with a chronic condition appeared to benefit less from living in an area with a high concentration of supermarkets, and were more adversely affected when they lived in areas with a high concentration of convenience stores. The authors attributed this to a number of factors. The presence of a supermarket may not offer a broader range of selections and services compared to chain supermarkets. It may also translate to more visits to chain stores compared to supermarkets.

Neighborhood characteristics, such as socio-economic status, racial mix, etc., are also strong determinants of what would be available in a particular setting. Access to supermarkets is poorer in low-income neighborhoods, with fewer supermarkets and more small independent grocery stores available to local residents. In Edmonton, Canada, Smoyer-Tomic et al. (2006) found that low wealth, renter-occupied and lone parent neighborhoods had greater exposure to fast-food outlets, which was not offset by better access to supermarkets. The odds of exposure to fast-food outlets were greater in low-incomes areas compared to those in higher median income and dwelling value communities. This is consistent with a 2009 study on healthy food and physical activity opportunities in two contrasting Alabama cities. Bovell-Benjamin et al. (2009) found that healthy food options were less available in Tuskegee, compared to more affluent Auburn. This was due to the proliferation of convenience stores which offered less healthy food options. In contrast, Auburn had more supermarkets, which had more options. This is consistent with the findings of the study done in New Zealand by Wang, et al. in 2009 where they analyzed the availability and accessibility of healthy food in two contrasting areas based on their level of urbanization. They found that, compared to "regular" food, healthy food were generally more available and more expensive in urban areas. Even the price differences between regular and healthy food were greater in urban areas compared to rural areas. This has significant implications on the range of food choices that families living in these communities have.

In the Philippines, there is very limited evidence that explores the relationship between neighborhood characteristics and diet. Using data from the Cebu Longitudinal Health and Nutrition Study, Kelles and Adair (2009) sought to explore the differential effects of changing income, assets, maternal education, and urbanicity on dietary behaviors of mothers and their offsprings that may affect overweight risk. They found that mothers were consuming more obesogenic diets (more energy, higher % of fat and lower % of carbohydrate) with increasing socioeconomic status and urbanicity. Their offsprings, on the other hand, had more obesogenic diets compared to their mothers. These are troubling findings

considering the rapid urbanization that the country is going through. Since diet is intricately linked with NCDs, this had implications on the growth projections for the NCDs in the country.

Another factor that affects access is geographic distance and vehicle availability. For almost 20% of all rural residents in Texas, their neighborhoods were at least 17.7 km from the nearest supermarket or full-line grocery or 7.6 km from the nearest convenience store (Sharkey and Horel, 2008). This makes food shopping a challenge especially in areas where there is limited public transportation or has poor vehicular access.

2.2.4 Macro-level environment

Macro level environmental factors play a more distal and indirect role, but have a substantial and powerful effect on what people eat (Story et al., 2008). Macro-level factors include food marketing policies, social norms, food production and distribution systems, agriculture policies, and economic price structures.

Availability and accessibility to nutrition information are influenced by policy. This is seen in nutrition labeling and healthy food labeling initiatives. There is increasing evidence that supports the importance of nutrition labeling in helping people make healthier food choices such as the study of Barreiro-Hurlé et al. (2010) on the link between nutrition labels and consumers' food choices.

Another macro-level factor is the effect of social norms or societal pressures on healthy versus unhealthy eating. In 2009, Croker et al. conducted an experimental study that looked into the influence of social norms on intended fruit and vegetable intake. They found that societal norms were perceived to be of less importance compared to perceived importance of health and cost when deciding (Croker et al., 2009). Nevertheless, their experimental results indicated that men were positively influenced by normative information. These findings demonstrate that social norms or perceptions of what society perceives to be good also has an influence on food choices.

A broader and important set of policy instruments focuses on food. Blaylock et al. (1999) identified economic factors that influence food choices of consumer and, consequently, their nutritional outcomes. Food prices directly constrain food choices. Consumers are price-sensitive when it comes to their food choices. For instance, lower income and lower educated young adults as well as those with lower educated mothers and middle-income parents were found to be the most price-sensitive, when it came to fruit and vegetable consumption (Powell et al., 2009).

Differences in prices between different types of food (health versus non-healthy food items) also impact the food choice. A number of studies have explored the trend in prices and its relationship with consumption and diet quality. Monsivais and Drewnowski (2009) found that diets that were more costly in terms of dollars per 2000 kcal were also healthier (lower in energy density and contained higher levels of nutrients). For each 2000 kcal of dietary energy, men spent US$7.43 compared to US$8.12 spent by women after adjusting for energy (Monsivais and Drewnowski, 2009). The cost of dietary energy was negatively and significantly associated with dietary energy density in the sample of women. In contrast, Katz et al. (2011) found that, on the average, the prices of more nutritious foods were not significantly different from those of less nutrition foods. For example, more nutritious breads cost US$ 0.80 more than the less nutritious counterparts while more nutritious cereals and cookies cost less (US$ 1.04 and US$ 0.64, respectively). They posit that it is possible to have a healthier diet without having to spend more.

Places where food is sold also affect the amount of cost-saving generated. Cassady, Jetter and Culp in 2007 compared the prices of two market baskets, namely, the 2005 Dietary Guideline market basket and the Thrifty Food Plan market basket, which were considered as healthy. They found that the market basket following the 2005 Dietary Guidelines was 4% (US$68.78) cheaper than the Thrifty Food Plan, which was the optimal meal plan recommended for poorer households (Cassady et al., 2007). The guaranteed cost savings was only realized when one carefully selected where one

bought these food items because there was a great variation in prices across stores in these areas. It was less expensive in low-income areas ($65 less) and in bulk supermarkets (US$59 less) (Cassady et al., 2007).

Making unhealthy diets more expensive could also result to improving diet quality. Beydoun et al. (2008) found that higher fast-food price indeces (FFPIs) and higher fruits and vegetable price indeces (FVPIs) were related to better overall diet quality. By increasing FFPI by $1, percentage of saturated fat from total energy intake dropped by 1.1 percentage points and fiber intake increased by 2.8 g/day resulting in an overall improvement in the diet quality score. Their findings indicated that making certain kinds of food, such as fast-food, more economically inaccessible could improve diet quality.

Blaylock et al. (1999) also identified income as another constraint to food choices. Similarly, Cassady et al. (2007) found that households spent at least 40% of their household budget on food and posited that the food budget for consumers must also be expanded. By increasing income, consumers can expand their options. However, this does not necessarily translate to better diets. Earning more comes with a price. When more time is spent working, there is also an increased demand for take-away food. Time constraints, when it comes to acquiring nutrition information, also come into play. It would take a substantial amount of time to become nutrition savvy. But, at times, becoming nutrition savvy is just not worth time and effort.

Another economic factor that influences food choices is time. It takes a long period of time for health outcomes that result from eating habits to manifest. The delayed impact, coupled with the uncertainty of the future, is oftentimes overridden by taste considerations. Immediate gratification brought about by food choices often trumps health concerns in the future which may or may not happen. Taken together, these four economic factors are policy levers that can be manipulated through nutrition, agricultural and health policies.

2.3. Diet quality and diet quality indices

Diet quality indices are “pre-defined summary measures of overall diet quality and can be used as a simple and quick assessment of diet quality to evaluate the adherence to dietary guidelines and to monitor overall dietary changes” (Fransen and Ocke, 2008). A number of diet quality indices has been developed and reported in literature over the years. However, these indices vary in its definition of a high quality diet. Haines et al. (1999) identified three major constructs which form the Dietary Guidelines in the United States and was reflected in the assessment of diet quality. One construct was moderation where the intake of certain food groups was limited. Proportionality, on the other hand, focused on the recommendation to eat more servings of certain food groups and less of others (Haines et al., 1999). The last construct was variety which reflected the advantages of consuming a broad selection of food across different food groups to increase their intake of a wider range of nutritive and other food components (Haines et al., 1999).

Diet assessment can be done using three approaches. By comparing with existing nutritional standard, diet quality assessments could look into either nutrients and food components or the intake of food or food groups or both (Kant, 1996). Two current indices, the Healthy Eating Index (HEI) and the Diet Quality Index (DQI), assess diets by looking into both nutrient and food components as well as ingestion of foods and food groups.

The HEI, an instrument developed by the US Department of Agriculture, is a single summary measure of diet quality that can be used to monitor changes in consumption patterns and serve as a useful tool for nutrition education and health promotion (Kennedy et al., 1995). It is composed of 10 components, where the score for each component ranges from 0 to 10. Components 1 to 5 measure the level of compliance to the current dietary guidelines. Component 6 focus on overall fat consumption while component 7 look at saturated fat consumption. Component 8 is based on cholesterol intake while component 9 on sodium intake. Lastly, component 10 assess the level of variety in the diet. When it was

originally formulated, these 5 components were assessed against the USDA Food Guide Pyramid. The standards used, however, changed to the Dietary Guidelines for Americans, when the HEI was revised in 2005. The current version is an expansion of the different components of the original HEI to capture the important changes in the Dietary Guidelines. At present, this is the only index that is computed regularly to gauge the overall diet quality of Americans(Lee and Nieman, 2010).

The Diet Quality Index (DQI), in contrast, is an instrument used to assess the overall diet quality of a group and to evaluate risk for chronic disease related to dietary pattern (Haines et al., 1999). Since its inception, there have been changes in the dietary standards. The revised index, Diet Quality Index Revised, scored diet on the basis of 10 indicators of diet quality. Like the HEI, it has 10 components where each component contributes a maximum of 10 points to the final score. The first 3 components focus on macro-nutrient consumption, while the next 3 look into fruit, vegetable and grain consumption. The next two components are based on the iron and calcium recommendations. Lastly, the remaining components look into the variety and moderation elements of the diet.

Modifications to these indeces to capture the dietary patterns of specific groups such as children and adolescents (Feskanich et al., 2004), pregnant women (Bodnar and Siega-Riz, 2002) have been explored. One such modification is the development of the Diet Quality Index-International (DQI-I). One of the limitations in the use of the DQI Revised in its current form is that it is based on the United States' dietary guidelines. In 2003, Kim, et al. looked into developing a variation to the DQI Revised that would allow for cross-national comparison. Their instrument, the DQI-I, has four major categories: variety, adequacy, moderation and overall balance. In their analysis of diet quality between China and the United States using the DQI-I, they found that this instrument was able to capture variability in the dietary patterns in these two countries (Kim et al., 2003). The DQI-I provided an avenue for cross-national comparative work towards the global understanding of diet quality. The development of the DQI-I has led to a number of research studies using the DQI-I modified to a specific country's dietary guidelines such as the study of Tessier, et al. (2008) in Greater Tunis that evaluated the impact of regular supermarket use on diet quality as well as the evaluation of the Mediterranean diet using the DQI-I (Tur et al., 2005).

Other than these two indices, researchers have studied and compared these with other existing indices. Kant (1996) seminal paper focused on reviewing existing overall diet quality indeces and its relationship with health outcomes. Dubois et al. (2000), on the other hand, compared the 3 measures: the Diet Quality Index, Heathy Eating Index and the Health Diet Indicator. After adjusting to the 1990 Canadian nutrition recommendations, these measures were applied to the 1990 Quebec Nutrition Survey. The most recent review of diet quality indices was conducted by (Fransen and Ocke, 2008). They presented a summary of similar systematic reviews done immediately preceding their work such those by Waijers et al. (2007) and Kourlaba and Panagiotakos (2009) as well as updated literature since then.

2.4. Diet quality and the food environment

Types of food establishments in neighborhoods have been linked to diet quality and ultimately, changes in nutritional status. Several research studies have explored the relation of the types of food stores, ranging from supermarkets to convenience stores to fast-food joints, with diet quality and nutritional status. The findings, however, have been inconsistent so far.

The Multi-Ethnic Study of Atherosclerosis (MESA) found that participants who had no supermarkets near their homes were 25–46% less likely to have a healthy diet than those with the most stores, after adjusting for age, sex, race/ethnicity, and socio-economic indicators (Moore et al., 2008). They also found that perceptions about availability of

healthy food options were linked to the quality of diet. People living in worst-ranked neighborhoods, as perceived by themselves or other communities, were 22% to 35% less likely to have a healthier diet.

Moore et al. (2009) examined the association between fast-food consumption, neighborhood fast-food exposure and diet quality in another published study on the MESA. They found that fast-food consumption and neighborhood fast-food exposure were associated with poorer diets. Their analysis showed that those who never ate fast-food had 2 to 3 times higher odds of having a healthy diet compared to those who ate at least once a week. With respect to fast-food exposure, the chances of consuming fast-food near one's home increased by 11% to 16% while the probability of having a healthy diet decreased by 3% to 17% with a 1-standard deviation point increase in fast-food exposure.

In 2008, a study was conducted among young Japanese women in 2008 for the Japan Dietetic Students' Study for Nutrition and Biomarkers Group. The cross-sectional study was aimed at examining the association between neighborhood food-store availability and individual food intake among 990 Japanese women aged 18 to 22 years old. Murakami et al. (2009) found that the availability of neighborhood stores selling confectionaries and bread were significantly positively associated with the intake of these food products. However no significant associations were found between the availability of neighborhood stores selling meat, fish, fruits and vegatables and rice and the intake of these food products.

2.5. Nutrition situation in the Philippines

Although undernutrition is still the predominant nutritional problem in the Philippines, the Filipino diet is changing. Figure 2.1 shows the per capita energy consumption from 1978 to 2003 as reported in the National Nutrition surveys conducted during this period.

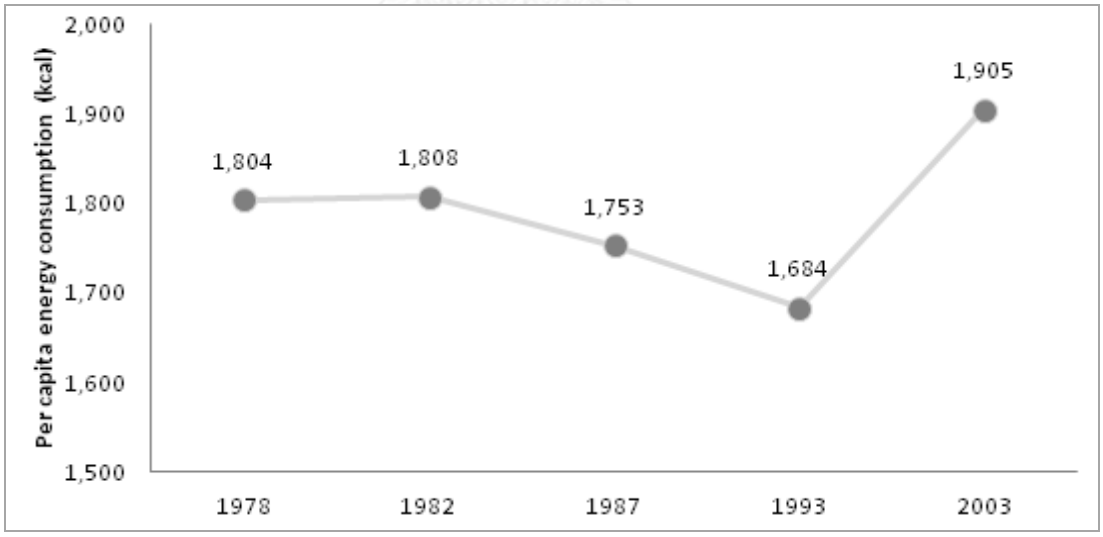


Figure 2.1. Total per capita energy intake per day (kcal/day) from 1978-2003. Data from the Food and Nutrition Research Institute, Philippines, 2011

From 1978 to 1993, energy consumption or the average number of calories consumed by a person had been declining. But for the succeeding decade, there was a 13% rise. Pedro et al. (2006) attributed this trend to fluctuations in

the Philippine economy over this 15-year period. The decreasing food intakes from 1982 to 1987 and from 1987 to 1993 may be related to the negative growth of the Philippine economy that was seen in 1986 and then from 1988 to 1991, the modest progress in reducing poverty, and lingering income inequality (Pedro et al., 2006). During the 1990s onwards, the Philippines experienced positive economic growth, which was reflected in the increasing food intake over the same period.

The composition of the Filipino diet over the years has been slowly shifting as well. The Filipino diet is still dominated by the consumption of cereal and cereal products, specifically rice, but the proportion of cereals and cereal products (i.e. rice) has been declining from 1978 to 2003 (Table 2.1). However, the proportion of animal-source foods has increased by 4.5% within the same period. Although the change has been minimal, the consumption of fat and oil, sugars, coffee and alcoholic beverages have also increased. In total, 92% of the Filipino diet is made up of these food groups which are considered to be high energy foods. Based on these nutritional trends, Filipinos are consuming calories that are not necessarily healthy ones.

Table 2.1. Proportion of per capita energy consumption to the total per capita energy consumption by food group in 1978-2003

	Proportion to total energy consumption				
Food group	**1978**	**1982**	**1987**	**1993**	**2003**
Cereals and cereal products	69.7%	69.8%	69.2%	71.0%	67.5%
Fish, meat and poultry	7.5%	8.6%	9.5%	9.5%	12.0%
Fats and oils	4.9%	6.2%	6.3%	5.9%	5.9%
Sugars and syrups	3.7%	4.5%	4.8%	4.2%	4.4%
Miscellaneous	0.6%	1.0%	1.0%	1.1%	2.2%
Vegetables	1.9%	1.6%	0.0%	1.5%	1.7%
Fruits	2.5%	2.3%	0.0%	2.1%	1.6%
Milk and milk products	5.2%	1.5%	1.3%	1.4%	1.4%
Starchy roots and tubers	2.2%	2.3%	1.3%	1.0%	1.2%
Dried beans, nuts and seeds3	1.1%	1.3%	1.3%	1.3%	1.1%
Eggs	0.6%	0.7%	0.8%	1.0%	1.0%
Total (kcal)	**1,804**	**1,808**	**1,753**	**1,684**	**1,905**

2.6. Diabetes mellitus

2.6.1 Definition and classification

Diabetes Mellitus (DM) is a chronic illness that requires continuing medical care and ongoing patient self-management education and support to prevent acute complications and to reduce the risk of long-term complications (American Diabetes Association, 2011). It is a condition primarily defined by the level of hyperglycaemia giving rise to risk of microvascular damage (retinopathy, nephropathy and neuropathy) (World Health Organization and International Diabetes Foundation, 2006). Diabetes mellitus is associated with a number of metabolic and vascular complications primarily affecting the eyes, kidneys, peripheral veins and heart that affects quality of life over the long-term. It also leads to an increased risk for macro-vascular complications such as ischaemic heart disease, stroke and peripheral vascular disease (World Health Organization and International Diabetes Foundation, 2006).

There are 4 recognized DM clinical classes (Table 2.2). These clinical phases were the first set of recommendations by ADA in 1997 and the WHO in 1998-1999. This has come to be the standard etiological classification of DM.

Table 2.2: DM classification and definition. Data from "National diabetes fact sheet" by the Center for Disease Control and Prevention (CDC), 2011, Online.

Classification	Definition*
Type 1 diabetes mellitus	• It develops when the body's immune system destroys pancreatic beta (β) cells, the only cells in the body that make the hormone insulin that regulates blood glucose. • This form of diabetes usually strikes children and young adults, although disease onset can occur at any age.
Type 2 diabetes mellitus (T2DM)	• It usually begins as insulin resistance, a disorder in which the cells do not use insulin properly. As the need for insulin rises, the pancreas gradually loses its ability to produce insulin. • It is associated with older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose metabolism, physical inactivity, and race/ethnicity.
Gestational diabetes mellitus (GDM)	• A form of glucose intolerance diagnosed in some women during pregnancy. • It is more common among obese women and women with a family history of diabetes.
Other specific types of diabetes due to other causes	• Genetic defects in β-cell function, genetic defects in insulin • Insulin action, diseases of the exocrine pancreas (such as cystic fibrosis), and drug or chemical-induced (such as in the treatment of HIV/AIDS or after organ transplantation)

2.6.2 Risk factors for Type 2 Diabetes Mellitus (T2DM)

Modifiable and non-modifiable risk factors for T2DM are enumerated in Table 2.3. People from certain ethnic groups, including African Americans, Hispanic Americans, Asian Americans, and Native Americans, have a higher risk for diabetes.

Table 2.3. Modifiable and non-modifiable risk factors for T2DM. Data from "Engaging and empowering patients to manage their Type 2 Diabetes, part 1: a knowledge, attitude and practice gap?" by M. Serrano-Gil and S. Jacob, 2010, *Advance Therapy, 27*(6), 321-333; "National diabetes fact sheet" by the Center for Disease Control and Prevention, 2011, Online.

Modifiable risk factors	• Overweight and obesity (central adiposity and total)
	• Physical inactivity
	• Diet
	• Previously diagnosed glucose intolerance
	• Metabolic syndrome
	  ○ Hypertension
	  ○ Decreased HDL cholesterol
	  ○ Increased triglycerides
	• Intrauterine environment
	• Inflammation

Non-modifiable risk factors	• Age (older than 45 years) • Sex • Family history of diabetes • Race/ethnicity • Prior history of gestational diabetes • Given birth to a baby weighing more than 9 pounds • Polycystic ovary syndrome

2.6.3 Screening and diagnosis

Over the years, the diagnostic criteria for diabetes have been constantly evolving based on the current evidence available at that time. Table 2.4 shows the recommended criteria from the WHO for the diagnosis of diabetes mellitus and other categories of glycemia.

Table 2.4: WHO criteria for the diagnosis of DM and other categories of glycemia

		2h Plasma glucose in mmol/L (mg/dl)		
		<7.8 (<140)	7.8-11 (140-199)	≥11.1 (≥200)
Fasting plasma glucose (mmol/L)	≥7.0 (≥126)		Diabetes	
	6.1-6.9 (110-125)	IFG*	IGT**	Diabetes
	≤6.0 (≤109)	Normo-glycemia		

*impaired fasting glucose **impaired glucose tolerance

These recommendations are based on the use of 2 screening tests, fasting plasma glucose (FPG) test or the 2-h value in the 75-g oral glucose tolerance test (OGTT). In 2009, an International Expert Committee composed of the ADA, the IDF and the European Association for the Study of Diabetes was constituted and it recommended the use of HbA1C (A1C) test in diagnosing diabetes with a threshold of 6.5% (American Diabetes Association, 2011). These recommendations were supported by a recent WHO report that endorsed the use of A1C as a diagnostic tool for diabetes and the recommended criterion (A1C ≥ 6.5%).

2.6.4 Mortality and DALYs trends

Diet and nutrition are important factors in the promotion and maintenance of good health throughout the life course. At the same time, their effect on chronic NCDs including diabetes is well established (World Health Organization and Food and Agriculture Organization, 2003). In its 2003 technical report on NCDs, the WHO identified diabetes, together with other NCDs such as obesity, CVD, cancer and osteoporosis, as one of the diseases which present the greatest public health burden both for developed and developing countries (World Health Organization and Food and Agriculture Organization, 2003).

Diabetes was estimated to have caused 4.6 million deaths in 2011. In 2002, diabetes was ranked #11 among the 15 leading causes of death globally (Mathers and Loncar, 2006). By 2030, it is estimated that it will be the 7th leading cause of death globally contributing 3.1% to the total deaths (Mathers and Loncar, 2005).

Deaths attributed to diabetes are often underestimated because most diabetic patients die from cardiovascular and renal conditions rather from causes uniquely related to DM. In 2005, Roglic, et al. came out with estimates on the excess mortality or deaths that attributable to diabetes globally and in the different WHO regions for the year 2000. Global excess mortality attributable to DM was estimated to be 5.2% of the global all-cause mortality or 2.9 million deaths globally (Roglic et al., 2005). They also estimated that, for those aged 35 years old and younger, 3 out of 4 deaths can be attributed to DM while almost 60% of deaths among 35 to 64 year old adults were attributable to DM. As for the elderly, almost one-third of deaths among those aged 65 years and older were attributable to DM. This pattern shows that a large proportion of premature mortality is driven by DM. Mortality among the older population is as expected since this population would suffer from different afflictions, other than DM.

When the all-cause mortality between developed and developing nations was compared, Roglic, et al. (2005) found that the number of deaths attributable to DM in developing countries was twice compared to those in developed countries (1.9 million versus 1 million deaths). It disputes the common notion that DM (and other NCDs) is a “disease of affluence”.

In terms of disability adjusted life years (DALYs), (Mathers and Loncar, 2006) project that diabetes mellitus will rise in rank as a leading cause of DALYs in 2030. In 2002, they estimated that it was ranked #20. By 2030, it is expected to

rise in rank by 9 places (#11). When looking at its contribution to DALYs in countries by income group, Mathers and Loncar estimated that it was one of the top 10 leading causes of DALYs in high and middle income countries. Anyhow, when looking at trends in low income countries, communicable diseases still drive the DALYs trend. These diseases are attributable to diseases that often strike chilren and babies.

2.6.5 Morbidity and prevalence of DM

The prevalence and incidence of diabetes mellitus have increased considerably over the past 50 years. Global prevalence of diabetes among adults was estimated to be 6.4% or 246 million diabetics in 2010 (Shaw et al., 2009). This is expected to rise to 7.7% by 2030 resulting in a 54.1% increase in the number of adults aged 20 to 79 years old with diabetes (Shaw et al., 2009). This is a higher estimate compared to the 2030 projections made by Wild et al. (2004) where they estimated that the global prevalence to be 4.4% from 2.2% prevalence in 2000. Despite this difference, this still translates to the large number of population suffering from DM (close to 0.4 billion diabetic patients). At present, global estimates do not make a distinction between Type 1 and Type 2 DM because of data limitations.

Developing countries have a disproportionately high burden of diabetes where the number of adult diabetic patients is expected to surpass those in the developed world. The estimated number of people with diabetes in developing and developed regions by Wild et al. (2004) and Shaw et al. (2010) supported the projected trends in the prevalence of diabetes between these regions.

Although the authors used different age group cut-offs, there were three points that these authors highlighted. First, the number of people with DM in developing countries is significantly higher compared to their more developed counterparts across all age groups. Second, the distribution across age groups is different between developing and developed countries. In developing countries, a larger proportion of the diabetic population tends to belong to a younger age group compared to those in developed countries. Lastly, the authors project that this pattern will carry through to 2030 which is equally troubling.

In a separate projection estimate by Yajnik et al. (2011), they predicted that 2 out of 3 diabetic patients worldwide will be from developing countries, and 1 in 3 will come from India or China by 2025 which is consistent with the earlier predictions. However, this is alarming because health systems in these developing countries are already overburdened and underfunded. Faced with the specter of chronic diseases such as DM where the burden will be felt over a significantly long time, it is likely that these health systems would not be able to fully respond to the physical, financial, emotional needs of the patients. With younger diabetic patients, this burden will be felt over a longer period of time as compared to having older diabetic patients.

2.6.6 Geographic variations in prevalence and incidence

Another dimension to exploring the distribution of disease is its spatial or geographic distribution. Analysis of small geographic areas can provide a roadmap for government to prioritize particular areas that are at higher risk. An example of this is the analysis undertaken by Ford et al. (2005) that looked at the geographic variability of diabetes prevalence between different Metropolitan Statistical Areas (MSAs) in the United States.

The analysis of geographic variability can also be expanded to include the exploration of the relationship of the disease with different elements present in this space. In 2003, Green, et al. did a geographic analysis of diabetes prevalence in an urban area, the city of Winnipeg, Manitoba specifically. They looked at the socio-demographic, environmental and lifestyle factors associated with the geographic variability of DM. A visual inspection of their chloropleth maps indicated that there was a cluster of DM prevalence in areas with a larger Aboriginal population, low education, low family income,

lone parent families, high unemployment, poor housing stock, high crime rates and high rates of smoking (Green et al., 2003).

2.7. Economic costs of diabetes

Increased morbidity from complications vastly increase the direct and indirect medical costs associated with the disease (Bennett, 2011). It is estimated that the disease caused at least US$ 465 billion in healthcare expenditures or 11% of total healthcare expenditures in adults aged 20 to 79 years old. In Taiwan, it was estimated that the economic cost shouldered by each diabetic patient was US$ 3065.7 per year (Chang, 2010). This is roughly equivalent to US$ 2.96 billion or 0.8% of the Gross Domestic Product (GDP) that is shouldered by society as a whole. In Australia, the total annual direct diabetes-attributable health-care costs in 2000 for people aged 25 years and older with T2DM were estimated at Aus$ 636 million (Davis et al., 2006). There are two significant factors that are projected to drive the future trends in health care costs: ageing and growth in the prevalence of risk factors. The number of people with T2DM will double between 2000 and 2051 as a result of ageing. This leads to a 2.5-fold increase in diabetes-attributable health-care costs. But if obesity and inactivity prevalence rates continue to rise, prevalence rates of T2DM will further increase three-fold the number of T2DM by 2051 from 2000 levels. The financial burden of treating T2DM could quadruple by 2051 when this happens (Davis et al., 2006).

In a 2002 cross-country analysis of costs associated with diabetes care, hospitalization accounted for the biggest proportion of costs (ranging from 30-65%) (Jonsson, 2002). On the other hand, CVD and lipid-lowering drugs occupied the largest proportion of medication costs (42%), while anti-diabetic and insulin drugs accounted for 24% of medication costs and only 7% of total health care costs. These figures show that the management of complications contributes a significant cost to the management of diabetes, particularly when it comes to medication.

In addition, for diabetic patients and their caregivers, the costs associated with the disease are not merely reflected in the direct health care costs. Opportunity costs are quite substantial as well. Type 2 Diabetes: Accounting for a Major Resource Demand in Society (T2ARDIS) was a study conducted to determine the full cost of care for a sample of people with T2DM in the United Kingdom. In an analysis by Holmes et al. (2003), they found that the patients and their caregivers lost earnings as a result of their condition. They estimate that the mean earnings lost per patient was £869 (S.D. £4,109) per year and £1,300 (S.D. £4,093) per caregiver per year. For those who actually lost earnings, the mean levels were far higher. A patient lost £13,841 (S.D. £9,551) in earning on the average per year while a caregiver lost £10,960 (S.D. £6,002) on the average per year. These hefty losses on the part of the patients can be attributed to the personal care expenses, especially when they have more complications (Holmes et al., 2003). On the part of caregivers, the losses can be attributed to the burden of care especially for those who provide a significant number of hours per week providing care. These findings reinforce the economic burden that the disease imposes on the patients themselves as well as on their immediate support system. This does not, in any way, capture the other intangible costs.

In the Philippines, the societal costs of early prevention of complications estimated to be PhP1.31 billion per year while societal costs of early treatment increase fourfold (approximately Php 6.98 billion per year) (Lorenzo et al., 2010). Actual societal costs double for late treatment (approximately Php 12.14 billion per year). Based on average cost per capita estimates, early treatment is cheaper on a per capita basis compared to health promotion and prevention. This can be quite misleading because the early treatment stage does not capture costs incurred in relation to self-care activities that are done to delay disease progression. Instead, these activities are captured in the health promotion and prevention stage. Thus when the average costs for these two stages are added up, the average cost per capita for early treatment increase and is more realistic.

2.8. Self-care and dietary adherence

There is a strong theoretical base on how T2DM should be managed. A critical component in the management of T2DM is the patient themselves. Self- care is an essential determinant of diabetic and overall health outcomes. In health, self-care is defined as "the activities individuals, families and communities undertake with the intention of enhancing health, preventing disease, limiting illness, and restoring health. These activities are derived from knowledge and skills from the pool of professional and lay experience. They are undertaken by lay people on their own behalf, either separately or in participative collaboration with professionals" (World Health Organization, 1984) Although this WHO material is a bit outdated, it is still relevant to the times.

2.8.1 Individual-level factors that influence self-care

A significant number of patients still struggle to achieve the internationally recommended targets for the modifiable risk factors that optimize the healthy outcomes. For diabetic patients, activities such as regular doctor visits, eating healthy, exercising and taking their medicine are some of the self-care activities that they need to do on a daily basis in order to control their diabetes and, hopefully, improve their health outcomes. Because of the chronic nature of T2DM, adhering to a self-care regimen can be extremely challenging over the long-term.

Figure 2.2 shows a general model on behavior change. It incorporates three well-known models: the Health Belief model, Social Cognitive theory and the Theory of Reasoned Action (Sevick et al., 2007). It identifies the common determinants of behavior change, particularly in relation to self-care. Sevick, et al. (2007) used it as the basis for analyzing a patient with a complex chronic disease. The authors infer that complex chronic diseases, such as diabetes, require changing and managing different behaviors over the long term. This make the behavior change process more complex and difficult. If the support system around patients such as health professionals do not fully understand the challenges that diabetic patients face, then the behavior change process can actually lead to negative behavior. An example of this when diabetic patients feel that their doctors are scolding them when they do not meet their clinical targets.

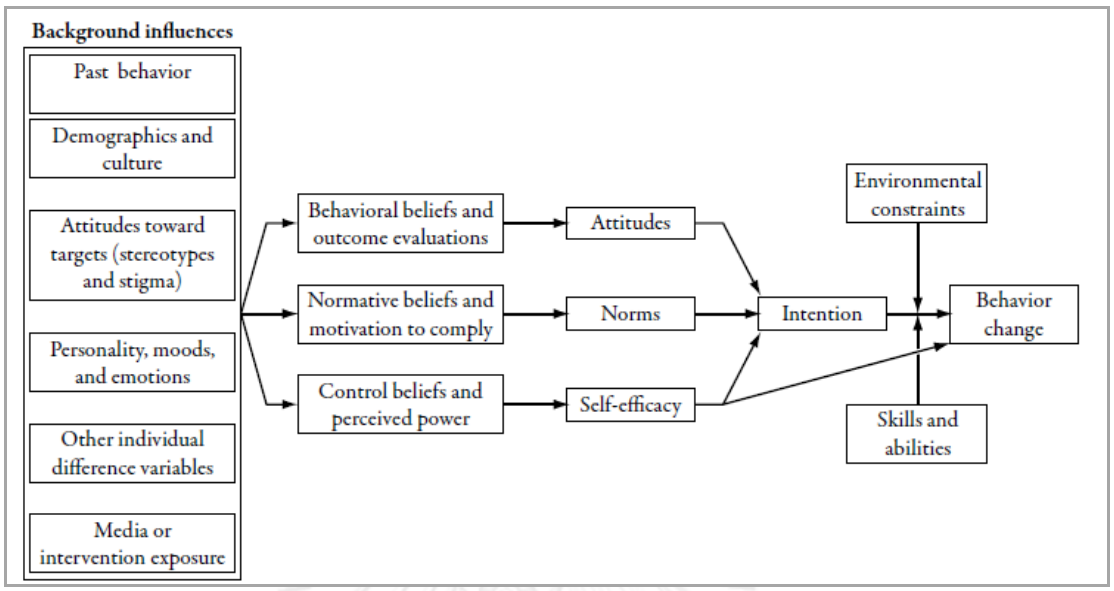


Figure 2.2: General model of behavior change. Adapted from "Patients with complex chronic diseases: perspective on supporting self-management" by M.A. Sevick, J.M.Trauth, B.S. Ling, R.T. Anderson, G.A. Platt, A.M. Kilbourne and R.M. Goodman, 2007, *Journal of general internal medicine, 22*(Supplement 3), 438-444.

There has been a number of studies done to examine the different factors that affect self-care and diet adherence in relation to T2DM. In 2001, Savoca and Miller conducted a series of interviews to capture a diabetic patient's viewpoint about elements affecting their dietary self-management behaviors. They found that the challenges that diabetic patients encountered when applying nutrition recommendations were related to their "old" eating practices. Dietary self-efficacy, social support, and time management were identified as mediating variables that can influence dietary behaviors (Savoca and Miller, 2001). They presented a graphical representation of the elements that influenced food selection and eating patterns among T2DM patients (Figure 2.3). The five central components offered a succinct representation of how past behavior links to current eating behavior as well as the mediating factors that can either constrain their efforts to maintain new dietary practices or facilitate the adoption of healthful eating habits.

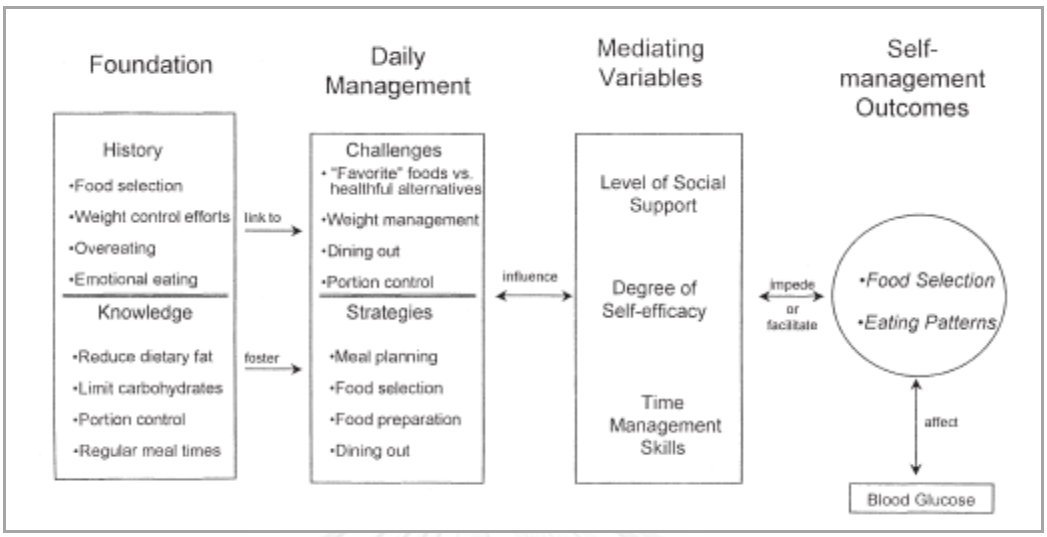


Figure 2.3: Elements that influence the food selection and eating patterns of T2DM patients. Adapted from "Food selection and eating patterns: themes found among people with type 2 diabetes mellitus" by M. Savoca and C. Miller, 2001, *Journal of nutrition education*(33), 224-233.

Using concepts from Transtheoretical Model of Change (TTM), Kavookjian, et al. (2005) found that most diabetic participants were in the action or maintenance stage in the 5-stage TTM. Patients in the earlier stages of behavior change were more influenced by the downside (or negative side) of diet adherence, particularly planning and preparing food in advance. Patients who decided to adhere to their diet were most influenced by their desire to prevent their diabetes from getting worse (Kavookjian et al., 2005). Their findings related to self-efficacy indicate that patients were able to see improvements in their blood sugar as a result of sticking to their diet, especially when faced with "tempting situations".

In contrast, a 2008 multi-ethnic study by Schoenberg, et al. on self-care patterns among the elderly diabetic patients of different ethnicities found that most of their respondents reported close adherence to the recommended medication use, optimal diet and foot care. However, physical activitiy was found to challenging for the respondents. The level of adherance to these recommendations was largely driven by the perceived importance of following the recommendations. The authors brought to light an interesting insight on why this was happening. Patients placed more emphasis on medication adherence because physicians prescribe this while recommending only the other self-care activities. This indicates the difference in emphasis that is given to some, but not all self-care activities which could lead to strict adherence in some and lenient adherence in others.

There are also non-behavioral barriers that make self-care and diet adherence challenging. A study by van de Laar et al. (2006) looked into the relationship between the type of eating behavior and the changes in fat and energy among newly-diagnosed diabetic patients. They found that newly diagnosed diabetic patients had similar eating behaviors compared to the general population. However, they found that emotional and external eating behaviors were positively related to energy intake. Emotional eating behavior is when a person's response to emotional distress is physiological (i.e. hunger) while the external eating behavior is when the external food environment is a determinant of eating behavior (van de Laar et al., 2006). Although these 2 concepts are correlated, van de Laar, et al. found that external eating behavior predicated a decrease in energy intake among women. They concluded that those who scored high on external eating behavior were more susceptible to initial dietary changes compared to those who scored high in emotional eating. These

findings imply that those whose eating behavior is more influenced by the external environment are more easily influenced to change their diets. In a recent study by Marcy et al. (2011), they found that the cost of healthy food, stress-driven inappropriate eating, and the temptation to eat unhealthy food were the most frequently reported barriers to healthy eating among low-income, urban, predominantly African American and Caucasian diabetic population.

2.8.2 Social environment and self-care

Individuals engage in self-management behavior for diabetes care in the context of their social environment that includes their family, friends and neighbors. Although interventions are directed towards patients, decisions related to behavior change do not occur in a vacuum. Multiple family members tend to share similar habits related to diet and physical activity. Individuals in a patient's support network can influence their behavioral response to illness (Searle et al., 2007). Most diabetic patients live with family members who may facilitate or inhibit self-management tasks or skills (Scollan-Kolipoulos, 2004). Families are considered as the primary social context in which diabetic patients manage their disease (Cole and Chesla, 2006). This social setting can either support or impede self-management. Family factors such as stress, interpersonal relationships, belief system have been all been found to have a profound effect on a patient's ability to manage his/her disease over the long-term.

Two themes have emerged in literature related to social support systems for diabetic patients. These are "social support" and "social control". These factors have been investigated in qualitative studies which provided a deeper understanding of the dynamics that occur in the relationships of diabetic patients with their families, friends and support groups.

Having a positive supportive environment has led to better self-management among diabetic patients. Family plays a fundamental role in decision involving diabetic patients (Albarran et al., 2006). This is particularly true in the context of marriage where coping with diabetes was not a solitary event, and coping with the disease could be enhanced or limited by the support of the spouse (Beverly et al., 2008). Searle et al. (2007) assessed the illness representation of diabetic patients and their partners and determined the level of agreement between them. Their findings suggested that the perceptions of patients and their partners can influence the self-management regimen of patients. They found that both patients and their partners had a good understanding of their condition, its consequences and treatment. This is consistent with the findings of Beverly et al. (2008) on the spousal relationship and behavior change among diabetic patients. They found that couples often sought information on the diabetes. Spousal dietary competence is considered to be a critical element when encouraging PWDs (people with diabetes) to adopt and maintain a healthful diet (Beverly et al., 2008).

Research evidence, however, also show that family interactions may also work against self-care behaviors, particularly physical activity and diet, exists. Often, the spouse was the most frequent source of social control. For unmarried women, their children were identified as the sources of social control while it was their family and friends for unmarried men (August and Sorkin, 2010). In comparing the frequency of social control, August and Sorkin found that married men reported receiving social control most often, whereas unmarried men reported receiving social control least often. They attributed this to the frequency of contact between the patients and their source of social control. For married men, their wives had greater participation in food planning and preparation and often ate together while for unmarried men, there was less frequent contact with their social support which led to fewer opportunities to exert social control.

Searle, et al. (2007) observed that, although patients had poorer understanding of their condition compared to their partners, they perceived that they had greater personal control over it as compared to the perceptions of their partners. This shows there is a "misalignment" of perceptions as to how much control does a diabetic patient have over his condition which could possibly affect how the diabetic and non-diabetic spouse interact.

Interviews conducted by Beverly et al (2008) indicated that control over food-related decisions, a perception of power, was a prominent topic among those with diabetes and their spouses. Spousal control and support over food preparation were found to be an important barrier to dietary change. Husbands, who often relied on their wives for food preparation, perceived the lack of control over making dietary changes. Wives, on the other hand, perceived a lack of support from their husbands. For some of the respondents, the lack of support led to negative health behaviors such as eating less healthy diets. Another important issue tackled in the study was spousal communication wherein most of the respondents agreed that open communication was an important factor in improving marital quality. This is consistent with the findings of August and Sorking (2010) where persuasion appeared to be effective in promoting dietary behavior change. Emotional responses to social control attempts were complex. Social control strategies evoked both appreciation and hostility in patients.

A study done by Miller and Brown in 2005 on the evolution of marital interactions within the first two years of diagnosis provide an interesting insights on the adaption processes that couples underwent. Two sets of interviews were conducted. The first one was at the time of diagnosis while the second was done two years after. Most couples at the second interview were found to be "disengaged" wherein the diabetic spouse was independently responsible for his/her diet. This kind of interaction was marked by poor communication and limited ability to negotiate, set and follow rules or alter roles (Miller and Brown, 2005). Two factors were found to be important to ensure successful adaption to the diabetic diet. These were: (1) spousal flexibility or the degree of flexibility when it came to food choices, rules and roles either by the diabetic spouse or the non-diabetic spouse and, (2) the communication skills of the couple.

The work of Albarran et al. (2006) provided insights on a culture that was very similar to the Philippine family culture. They observed that family dietary behavior in a Mexican cultural context was a challenge for diabetic patients. This was due to the fact that food selection and preparation responded fundamentally to dietary preferences derived from the family and not solely from the individual diabetic patient (Albarran et al., 2006). Family dietary behavior was a challenge for patients primarily due to the differences in dietary preferences and food preparation of the other members of the family. There was a reluctance to adjust from within the family, since these were considered to be only for diabetic concern.

Another important component of the social environment is the support group for diabetic patients. Albarran et al. (2006) found that diabetic patients valued support group meetings because this was a source of emotional support over and above the knowledge and skill they could gain for disease control.

2.8.3 Physical environment and self-care

One of the themes that emerged from the multi-ethnic study of Schoenberg et al. (2008) was the effect of resources on self-care. An interesting narrative presented in the study was one by a 60-year old Mexican-American woman who had to struggle with three jobs, cooking meals for her children and resting. The stress of balancing these activities was leading her to be lax when it came her self-care regimen, particularly her diet. Another respondent cited the presence of crime in his neighborhood as a factor that added stress to his life. This is consistent with the findings of Albarran et al. (2006) where they found these factors as barriers to behavioral change among diabetic Mexicans and their family.

2.8.4 Diabetes self-management education (DMSE)

Corollary to the success or failure of self-care is the effectiveness of the DMSE. DMSE is an important support mechanism to self-care. The American Diabetes Association (2011) has consistently recommended the need for DMSE as a support mechanism for self-care. It is the ongoing process of facilitating the knowledge, skill and ability necessary for diabetes self-care. It assists diabetic patients from the time that they are first diagnosed through their lifetime to help them cope with new challenges and treatment advances. According to the ADA's Standards of Care, current best practice is one

that incorporates a skills-based approach by helping those with diabetes to make informed self-management choices. It has changed to more theoretically based empowerment models that focus on helping those with diabetes make informed self-management decisions from an approach that merely provides information. In a way, it is more patient-centered, where the diabetic patient and his support group are at the core of the care process.

In a 2001 study by Nthangeni, et al. among black diabetic women in Africa, they found that barriers to dietary compliance were related the types of food allowed and the patients' understanding of portion sizes. The patients in the study received inaccurate dietary counseling in which most of the foods that were recommended to them were not culturally sensitive and scientifically sound. For example, they were told to eat sorghum instead of maize which is the traditional food staple and widely available.

A study in Ontario, Canada looked at the reasons behind a diabetic patient's decision to continue or discontinue attending self-care training in University Health Network Toronto Western Hospital in Ontario. Almost half of the new patients withdrew prematurely from recommended DSME services over the 1-year study period and only a third attended group education. Gucciardi et al. (2007) found that age (older than 65 years old), English-speaking, or working full- or part-time were associated with attrition from the training as well as the non-use of group education.

In conjunction to this, Serrano-Gil and Jacob suggested that a knowledge, attitude and practice gap drove the difficulties faced by patients in a 2010 two-part review article on self-care among diabetic patients. It was found that it was not merely a lack of information on the disease, its treatment and management but also the misalignment of the communication objectives of the health providers and information needs of the patients (Serrano-Gil and Jacob, 2010). An important issue that the authors raised was the disjoint between what health practitioners see as important markers of effective self-care and what was meaningful to patients. Effective management is often assessed using clinical measures, such as HbA1C. This is an objective assessment of the patient's condition. However it does not fully capture other aspects of living that is meaningful to patients such as quality of life. The authors pointed out that, in their daily lives, people with diabetes have many other priorities besides their medical condition and face many associated psychological, emotional, and practical difficulties.

2.8.5 Medical Nutrition Therapy (MNT)

In 2013, the American Diabetes Association (ADA) came out with a position statement on the importance of MNT and its role in preventing diabetes, managing it and preventing or slowing the development of complications, including specific evidence-based nutrition recommendations for diabetes MNT. This was likewise reflected in its 2013 standards of medical care. This is the latest set of nutrition recommendations released by the ADA regarding MNT. Numerous research studies have shown the effectiveness of MNT in helping patients reach their treatment goals for glycemia, lipids and blood pressure. These studies, ranging from randomized controlled trials to observational studies, are well-documented in review and commentary articles such as those done Franz et al. (2002), Franz et al. (2008) and Franz et al. (2010) Franz, et al. (2010).

2.9. Food environment, diet and diabetes mellitus

One of the key associations between diabetes and the built environment is through food choices and diet (Li et al., 2010). This is because the different elements in the built environment shape these choices and eventually lead to the development of NCDs such as diabetes mellitus. Elements in the built environment do not merely cover the physical elements such as supermarkets, roads and fast food chains but would also include less tangible elements that influence

the built environment such as socio-economic conditions in the community, racial/ ethnicity mix, low income challenges, and security.

2.9.1 Food accessibility and availability

As previously discussed, elements in the food environment and neighborhood characteristics shape food choices and dietary behavior. This section further explores this relationship with chronic diseases, diabetes mellitus in particular.

Using the data in the MESA, Auchincloss, et al. (2009) found that those who lived in neighborhoods with better resources for physical activity and healthy foods were associated with a 38% lower incidence of type 2 diabetes. This shows that access to better resources at the community level influences the growth of diabetes mellitus in the community.

This is consistent with the authors' earlier analysis that linked the homeostasis model assessment (HOMA) index, a measure of insulin resistance, of MESA respondents with area characteristics. Distance to a wealthy area was associated with HOMA independent of local poverty and person-level co-variates(Auchincloss et al., 2007). They also found that local neighborhood poverty was also positively, albeit weaker associated with insulin resistance. These results suggested that proximity to resources in high income areas may be related to better health, since area affluence was more spatially concentrated than poverty(Auchincloss et al., 2007).

Stewart, et al. (2011) found that, among adult African American Medicaid recipients, persistent poverty and unemployment were positively associated with diabetes prevalence. They also found that rurality was positively associated with diabetes prevalence. This is significant because of the increased focus of diabetes prevention interventions in urbanized areas. Rural areas are particularly vulnerable because of the low availability of establishments where they can access healthy food and limited transportation options which other studies have shown (Stewart et al., 2011). This is consistent with the findings of studies such as the study of Al-Moosa, et al. (2006) where they found that urban residence was significantly associated with diabetes among Omanis.

When it comes to access to diabetic healthy food, Horowitz, et al. (2004) compared the availability and accessibility of diabetic healthy food in two contrasting areas in New York City: the Upper East Side (affluent) and the East Harlem (less affluent). They found significant differences in the availability and accessibility of diabetic healthy food in these two areas. Upper East Side stores were 3.2 times more likely than East Harlem stores to be desirable and to stock all recommended food items, despite the fact that Upper East Side residents had fewer stores overall. When it came to the availability of desirable stores, Upper East Side *bodegas* were more than 5 times more likely than East Harlem *bodegas* to be desirable and to carry all 5 recommended foods (48% vs 9%; RR=5.3)(Horowitz et al., 2004). The 2 neighborhoods also differed when it came to the availability of specific food items. Upper East Side stores were significantly more likely than East Harlem stores to carry diabetic healthy food studied, with the exception of diet soda. When looking at this in the context of a diabetic's self-care and diet adherence, the difference in availability and accessibility of diabetic heatlhy food between affluent communities and their less affluent counterparts drives home the point about the difficulties that diabetic patients face when trying to adhere to their dietary requirements. If the food that they need are not available in their areas, then physical and economic access becomes constrained especially for those who are poor.

These studies suggest that the accessibility and availability of food, particularly diabetic healthy food, are influenced by multiple aspects of the built environment, including number and type of food stores and differences in neighborhood access to healthy foods often reflect other demographic features (i.e. race, socioeconomic status)(Li et al., 2010).

2.9.2 Food environment and economic access

Elements in the food environment can also influence economic access. Jetter and Cassady (2006) found that those who lived in higher-income neighborhoods enjoyed greater access to the healthier substitutes recommended for a healthy diet largely due to their easier access to supermarkets which often stock a variety of the recommended substitutes. On the other hand, higher-fiber breads and whole grains, or ground beef with less than 10% fat may never be available or would have limited availability in small independent grocery stores that are usually found in low-income communities. This problem was compounded by the lack of transportation options limiting consistent access to healthier foods. In contrast, a 2007 analysis by Cassady, Jetter and Culp found that the average price of fruits and vegetables was significantly less expensive in very low- and low-income neighborhoods and in bulk supermarkets. Since bulk supermarkets were exclusively located in low- and very-low income neighborhoods, cheaper fruits and vegetables were physically and economically more accessible to low-income consumers. When looking at diabetic health food options, Horowitz, et al. (2004) found that the median prices of all diabetic-healthy food items were significantly higher in Upper East Side stores than in East Harlem stores when prices were compared between *bodegas* and large stores in these two neighborhoods.

At the macro-level, Unwin, Whiting and Roglic, in a 2010 commentary, suggested that obesogenic environments that facilitated low levels of physical activity and access to energy rich diets were the most important determinants driving the alarming trends in T2DM worldwide. The structure and content of these environments are strongly influenced by globalization where foreign direct investments in food processing, for instance, drives the investment portfolio of transnational corporations in low and middle income countries. When manufacturing is brough closer to the market, cheaper energy-dense food is more accessible and availables.

2.10. Food environment interventions

Environment and macro-level interventions are primarily focused on population-based approaches. An example of a food environment intervention is the establishment of a farmers market in Old East, a "food desert" area where Larsen and Gilliland (2009) assessed how access to healthy food changed in the area. They found that availability and economic access to food improved three years after the farmers market was established. Although the healthy food basket was still relatively expensive compared to supermarkets in London, the price difference shrunk (from $54.42 to $11.69 price difference). In 2008, the price of the healthy food basket was $205.08, which was 12.2% lower than the price three years ealier. There were also more fresh produce options available in 2008 compared to 2005. This shows that an intervention at the food environment level can be effective in making healthier options more accessible and available.

In a review by Glanz and Yaroch (2004), they identified 4 key types of grocery-store-based interventions. They included (1) point-of-purchase (POP) information, (2) reduced prices and coupons, (3) increased availability, variety, and convenience, and (4) promotion and advertising. In a separate review article, Glanz and Hoelscher (2004) identified 6 separate types of restaurant-based interventions: (1) increased availability, (2) increased access, (3) reduced prices and coupons, (4) catering policies, (5) point-of-purchase (POP) information, and (6) promotion and communication. Evaluation data on these interventions looked promising. There have been few updated systematic reviews of food environment interventions.

At the macro-level, there have been studies done to analyze the policies related to pricing and fiscal instruments. A qualitative analysis conducted by Waterlander, et al. (2010) revealed that price was a "core factor" in food choice. Respondents shared that pricing strategies that encourage healthy eating were more helpful rather than those that focused on discouraging unhealthy eating. Suggested high reward strategies included reducing the price of healthier options of comparable products, providing a healthy food discount card for low-income groups, and combining price discounts on

healthier foods with other marketing techniques such as displaying cheap and healthy foods at the cash desk(Waterlander et al., 2010). These insights were also agreed upon by experts in a Delphi study conducted by the researchers.

Snowdon, et al. (2011) undertook a series of analysis to identify effective and cost-effective policy interventions that would support healthy eating in Fiji and Tonga. Their findings revealed that five most cost-effective policies in Fiji were all fiscal policies, affecting import duty and value-added-tax, which had low implementation costs. On the other hand, Tonga's most cost-effective policies were more of a mix of instruments, affecting prices of foods and availability of unhealthy food options. Their analysis brings to fore the myriad of policy options which could be implemented. Nonetheless, these policy instruments are not necessarily effective or cost-effective. Therefore it is important that policy interventions must also be modeled to capture whether it is worth implementing.

Unfortunately, there are not a lot of research studies done on food environment policies specific for diabetic patients. As previously discussed, the influence of the food environment on diabetes is expressed through their dietary choices. Providing nutrition information to diabetic patients is through nutrition labeling policies. One such research is conducted by Post, et al. (2010) which looked at the behavior of people with chronic diseases, including diabetes, when it came to reading food labels. They found that patients, upon the advice of their doctor or another health professional to reduce calories or weight, are 1.5 times more likely to read food labels compared to those did not receive such advice. Those who read food labels consumed less energy, saturated fat, carbohydrate, and sugar, and more fiber than those who did not.

2.11. Diabetes mellitus in the Philippines

2.11.1 Prevalence of diabetes in the Philippines

The latest estimates from the 7th National Nutrition Survey in 2008 pegged the prevalence of diabetes among adults at 4.8% which was a sharp rise from the 1998 estimate (3.8%) and 2003 estimates (3.4%). In contrast, the PhilCOS-DM study estimated that the prevalence of T2DM was 28%(Soria et al., 2009). This prevalence figure is almost 6 times higher than the FNRI estimates. This could be attributed to the difference in the type of diagnostic procedure that was used as basis for coming out with the diagnosis. The PhilCOS-DM study used diagnosis generated from 1 out of 3 diagnostic procedures.

The incidence rate for diabetes from 1998 to 2007 was pegged at 16.3% which shows an alarming growth in diabetes and pre-diabetes stages in the country over a short period of time(Soria et al., 2009). This presents a significant public health challenge for developing countries like the Philippines where local health systems are doubly burdened with nutritional deficiency and infectious diseases, while, at the same time, tackling the rapidly increasing non-communicable diseases, including diabetes mellitus(Yajnik et al., 2011). Over and above addressing communicable diseases which still dominate the causes of morbidity and mortality in the Philippines, the local health systems will have to look into the control and management services for patients with chronic conditions, including diabetic patient. At the same time, it should also provide prevention programs focused on established risk factors.

2.11.2 Mortality and morbidity in the Philippines

Figure 2.4 and 2.5 shows the leading causes of mortality and morbidity, respectively, in the Philippines for selected years. The leading causes of morbidity and death were a mix of communicable and non-communicable diseases. This presents a challenge to LGUs as to where should limited resources could be better invested in. Dealing with non-communicable diseases entails significant investments over a longer time period compared to communicable diseases.

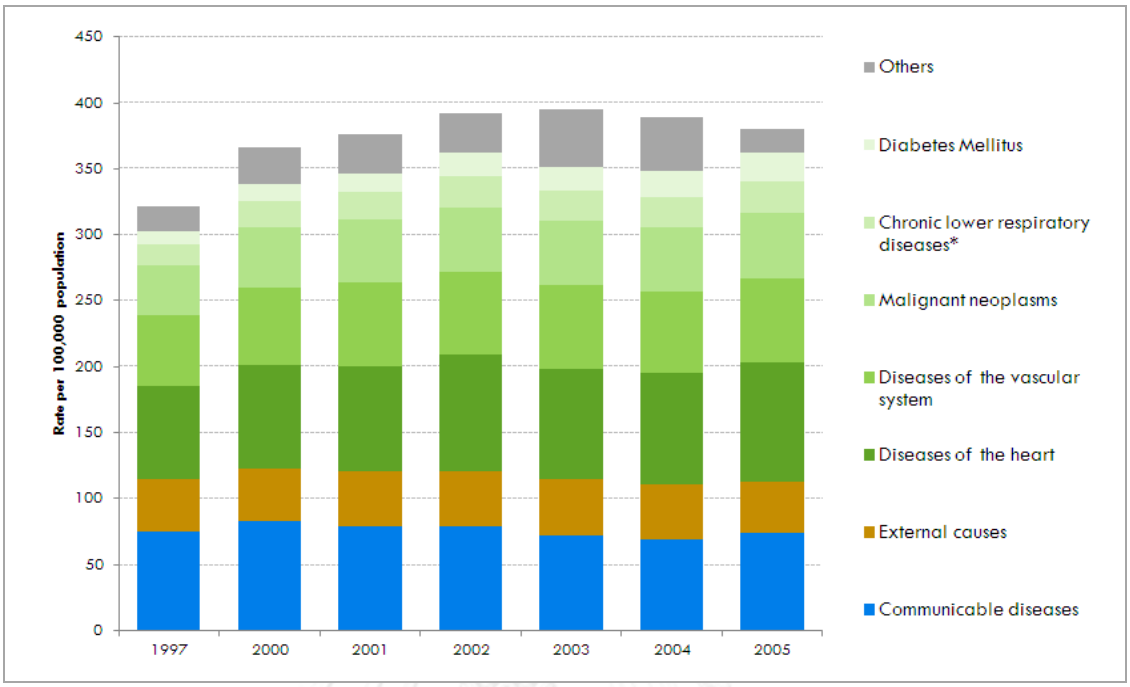


Figure 2.4: Leading causes of deaths in the Philippines in selected years. Data from the Department of Health, Philippines, 2009.

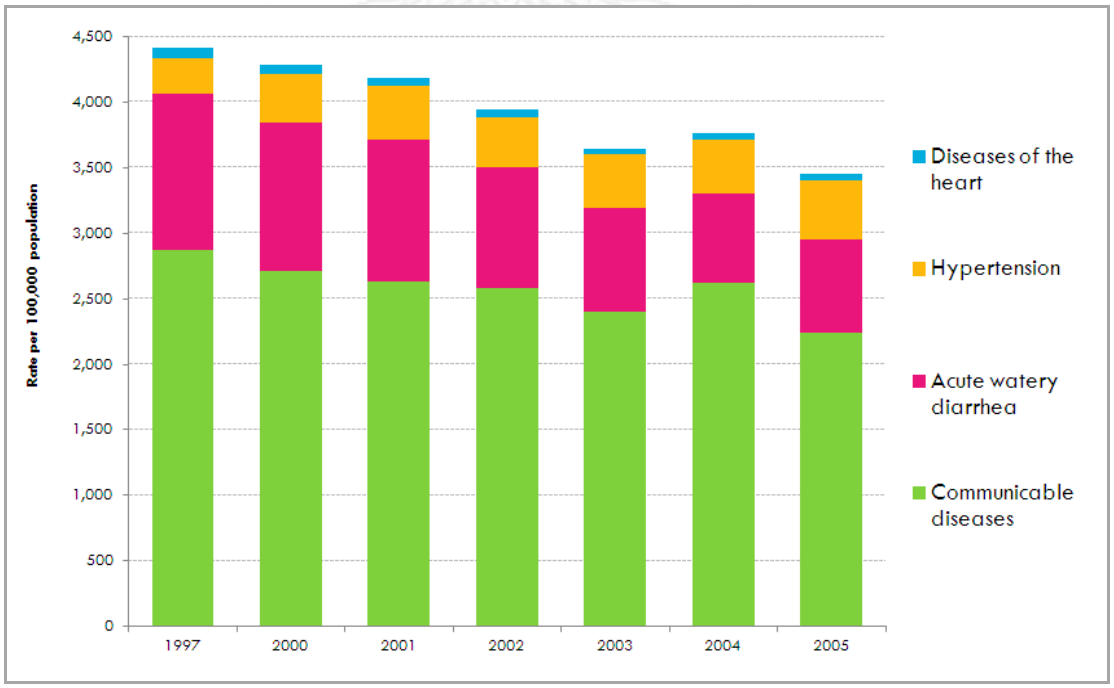


Figure 2.5: Leading causes of morbidity in the Philippines in selected years. Data from the Department of Health, Philippines, 2009.

Diabetes mellitus is reported as one of the top 10 leading causes of death but it is not reflected as such in the leading causes of morbidity. A similar pattern can be seen down to the local levels. Figure 2.6 and 2.7 show the recent estimates of the leading causes of mortality and morbidity in Davao city, respectively. It can be seen that the local health system is able to find *dead diabetic patients* but not *sick diabetic patients*.

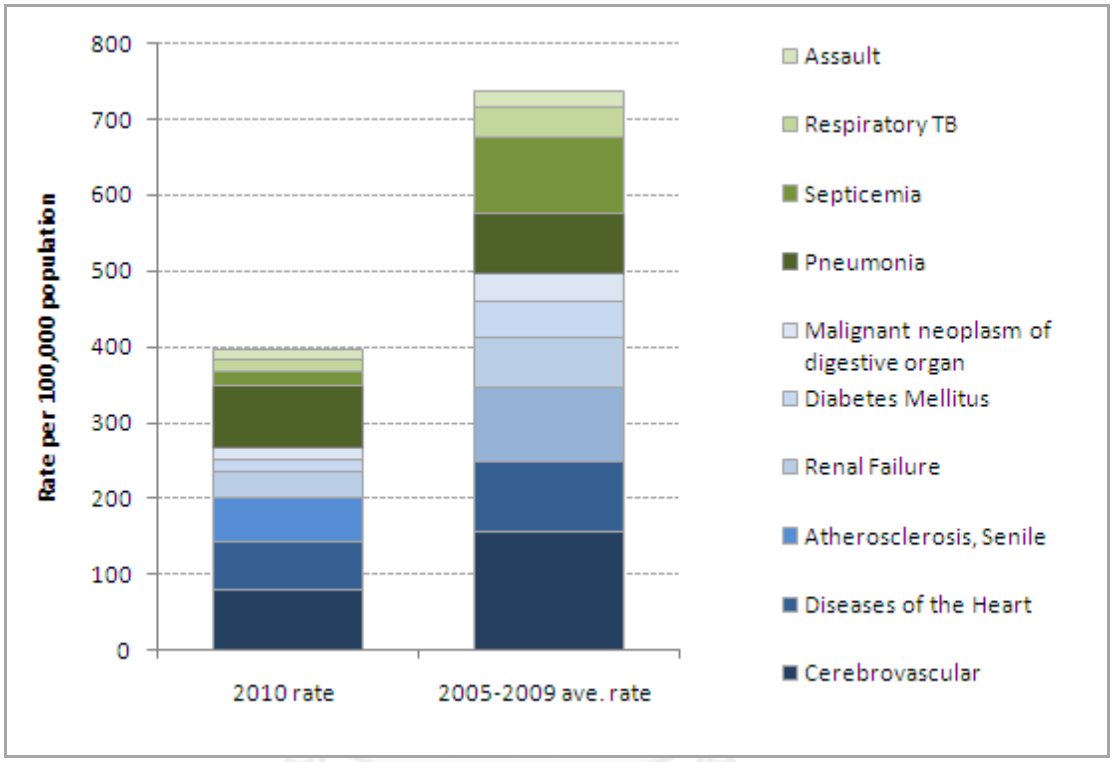


Figure 2.6: Leading causes of mortality in the Davao City for 2010 and 2005-2009 average. Data from City Health Office, Davao City, 2011.

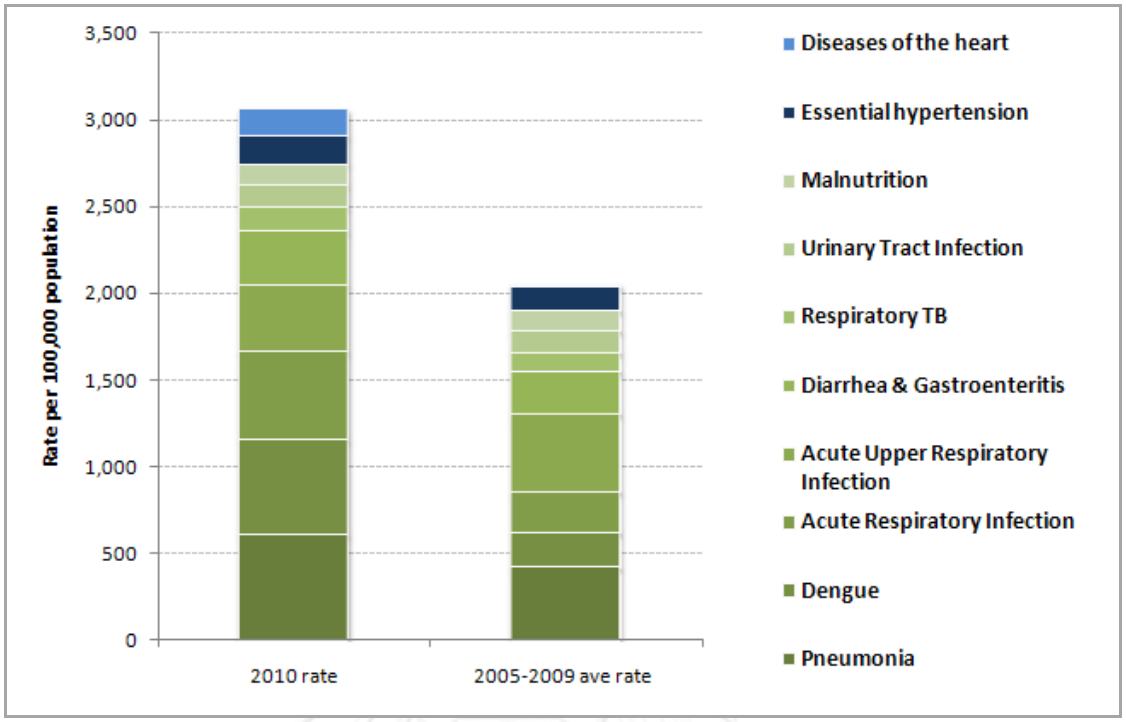


Figure 2.7: Leading causes of morbidity in the Davao City, 2010 and 2005-2009 average. Data from the City Health Office, Davao City, 2011.

According to the latest Burden of Disease estimates in 2010 by Lorenzo, et al., there was no apparent sex differential in mortality rates among the younger age groups. However, the elderly females were projected to have higher diabetes mortality rates compared to males. With regards to DALYs, they found that the females were disproportionately affected by higher DALYs compared to males. Out of the total DALYs (591,308), approximately 57% were contributed by females.

Given the current trajectory in the growth in the number of diabetic patients in the population, it is expected that the local health systems will be in the frontline of providing prevention, early and late treatment programs. But if it is not able to find "sick diabetic patients", it becomes doubtful whether the local health system would be able to respond fully to the need of diabetic patients. These patients will just become another statistic when they pass away.

2.12. Policy frameworks

2.12.1 Approach to care beyond the individual

Theoretically, the self-care regiment done correctly in a sustained manner ensures a greater chance of enjoying better health outcomes and delaying complications. But a diabetic patient does not exist in a vacuum. He interacts with an environment that can impact his self-care practice.

In 2002, the World Health Organization put forth the Improved Care for Chronic Conditions (ICCC) framework to identify the different levels of support that people with chronic conditions, including diabetic patients, need (Figure 2.7). Advocated by the IDF, it provided a scheme that encapsulated the macro- (policy and financing), meso- (health care organization and community), and micro- (patient and family) levels of support necessary for better outcomes for patients with all types of diabetes(Jacob and Serrano-Gil, 2010).

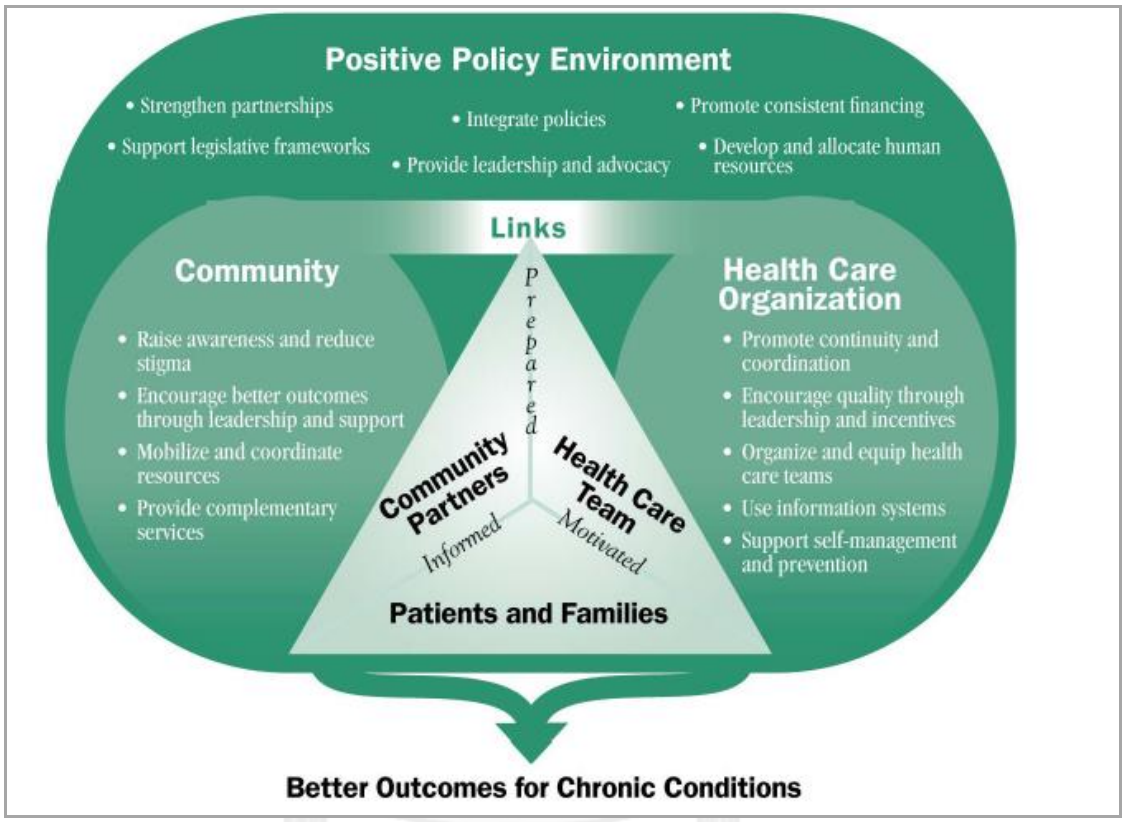


Figure 2.7: Improving Care for Chronic Conditions framework. Adapted from "Innovative care for chronic conditions: building blocks for action" by the World Health Organization, 2002. 2002 by World Health Organization.

It is critical that change occur at the different levels. Behavioral change at the micro-levels (patient and family) is important when it comes to the effective management of diabetes. The patient is central to this. But this change also needs to occur at the meso-level or the health system level. At present, health systems, especially those in the developing world, are not configured to handle chronic diseases. Epping-Jordan (2004) referred to this as "radar logic" to care where patients appeared on the "radar", found, treated and discharged. This kind of care may work for acute communicable illnesses but not work for chronic diseases where there is a need to provide the continuous support to the patient over the long-term is required.

Macro-level initiatives are designed to encourage a coordinated and supportive policy and financial environment for system changes to prevent disease and care for those affected (Serrano-Gil and Jacob, 2010). Changes in levels outside of the individual must occur for management and treatment of chronic diseases, including diabetes, to be successful.

2.12.2 Global directives

In 2006, the World Health Organization unveiled its global strategy on diet, physical activity and health. This document contained the most current recommendations of the WHO on promoting healthier diets and physical activity where the national governments play a pivotal role in pushing policies and programs that directly address these issues. The global strategy called for the creation of national guidelines and strategies from which specific policies will be anchored on. With regards to diet, the WHO recommended that, over and above IEC and adult literacy programs, they identified different actions that could directly impact healthy diets such as ensuring that accurate and balanced nutritional and dietary information are provided through mechanisms like appropriate nutrition labelling and regulating food marketing and advertising to children. National food and agricultural policies should also be consistent with the protection and promotion of public health such as the promotion of food products consistent with healthier diets and the implementation of fiscal policies that influence food prices. Unfortunately, there are no specific recommendations that directly target the built environment in relation to the food environment.

In its latest report on NCDs, the WHO in 2010 identified "best buys" or actions that should be undertaken immediately to produce accelerated results in terms of lives saved, diseases prevented and heavy costs avoided. Three out of 10 best buys are nutrition-related and directly linked to diet modification. Among other cost-effective and low-cost population wide interventions, it also recommended food marketing restrictions and the implementation of food taxes and subsidies to promote healthy eating.

2.12.3 National policies

Republic Act 8191 or the National Diabetes Act of 1996 was promulgated in June 1996. Section 4 of the law helped create the National Commission on Diabetes which was tasked to:

a) Assess the social and economic impact of diabetes mellitus on individuals, families, households, communities and the nation;
b) Evaluate the adequacy of national resources devoted to the prevention, diagnosis, and treatment of diabetes mellitus; and
c) Formulate, in accordance with Section 7 of this Act, the National Diabetes Prevention and Control Plan.

At present, the Diabetes Mellitus Prevention and Control Program is lodged under the National Cardiovascular Disease Prevention and Control Program (NCDPC) of the Department of Health. The aim of the program is to reduce morbidity and mortality from diabetes and its complications as well as utilizes all levels of preventive care in the community and hospital settings (Department of Health, 2011). It has five principal components: health promotion and education, manpower development and capabilities strengthening, service delivery, monitoring/evaluation, and research.

Given the current devolved set-up of the health system in the Philippines, implementation at the local government level is critical. As Lorenzo, et al. (2010) have found in their policy analysis of NCD policies in the Philippines, there was a weak implementation of such policies at the local level despite having a DOH directive. There is a high probability that this is true even for the implementation of diabetes mellitus-related programs at the local government level. Most local governments report having Healthy Lifestyle programs that consisted mainly of monitoring activities as well as sporadic screening activities, conduct of lectures, seminars and exercise programs, usually once a year.

The 2005-2010 Medium-Term Philippine Plan of Action for Nutrition (MTPPAN), created under the auspices of the National Nutrition Council, currently served as the previous administration's blueprint outlining the government's action plan in addressing the nutritional challenges of the country. It is specifically aimed at reducing underweight among children

0 to 5 years old in order to meet the country's Millenium Development Goal (MDG) goals in 2015. It also identifies 20 targets to be achieved by 2010 (Table 2.6). Out of these, 13 directly address undernutrition among at-risk population groups such as children, pregnant and lactating mothers. The rest are directly linked to non-communicable chronic diseases and their risk factors such as cholesterol and central obesity. Only one is linked to "healthy" diet which is vegetable intake where the target set for 2010 is a reduction in intake which is illogical.

Table 2.6. MTPPAN Targets for 2005-2010. Data from the National Nutrition Council, Philippines, 2011.

Targets (% per 100,000 population)	2005	2010
Prevalence of underweight among children 0-5 years old	25.88	21.58
Prevalence of underweight among children 10 years old	25.54	22.40
Prevalence of stunting among children 0 5 years old	28.90	25.30
Prevalence of stunting among children 10 years old	34.78	30.48
Prevalence of chronic energy deficiency among pregnant women	24.90	20.80
Prevalence of IDA among infants	59.20	41.70
Prevalence of IDA among children 1-5 years old	25.10	15.10
Prevalence of IDA among children 12 years old	34.00	25.50
Prevalence of IDA among pregnant women	43.30	42.10
Prevalence of VAD among children 0 months to 5 years old	32.90	15.00
Prevalence of VAD among pregnant women	15.20	10.92
Prevalence of VAD among lactating women	18.40	15.00
Prevalence of iodine deficiency among lactating women	22.40	20.00
Prevalence of current smoking among adult males	49.50	34.70
Prevalence of current smoking among adolescent females	10.00	7.50
Per capita total vegetable intake (g/day)	123.20	102.00
Prevalence of hypertension among adult males	19.80	13.90
Prevalence of adults with high FG	30.00	21.00
Prevalence of central obesity (WHR) among females	48.20	33.80
Prevalence of high total serum cholesterol among adult males	7.5	5.2

Due to the devolved set-up for health in the Philippines, the funding and implementation of nutrition programs on the ground are done by local government units (LGUs) with the Department of Health providing technical assistance. It is left to the LGUs to decide the focus and breadth of their implementation. This then directly affects the types of nutrition programs that get the funding as well as who gets to benefit from the programs. Since the national health agenda focuses on undernutrition, LGUs are more likely to focus on this. Oftentimes, there are not a lot of resources left to address other nutrition problems.

2.12.4 CVD Program in Davao City

The CVD program of Davao City is a community-based integrated program designed to implement an integrated CVD risk management approach, with diabetes and hypertension as entry-points as well as increase the accessibility of health services at the community health centers in barangays and health districts. It is a partnership between the City Government of Davao through the City Health Office, Handicap-International, Southern Philippines Medical Center and the Department of Health- Center for Health Development Davao Region. The program builds on the lessons from the program's pilot implementation in 2006-2009. It is set for full implementation in 2011 with a number of capacity building trainings for health providers. At present, all 182 barangays in Davao City are implementing the program albeit at its beginning stages.

The program is composed of two principal components: (1) screening and diagnosis, and (2) monitoring of self-management and care through pharmacological management, diet and nutrition counseling, physical activity and foot, wound and stump care. A complimentary function of the program is to improve the delivery of basic health services through capacity building and equipment upgrades.

The delivery of services under the CVD program is centralized at the barangay and district health centers where the monitoring and counseling services will be based. There will be a designated CVD day each week where registered patients can come in the health centers for monitoring, although they can visit the health centers anytime during the week.

Chapter III

Research methodology

3.1. Research design

The research was comprised of three phases. Each phase employed a different methodology. Phase 1 was a situational analysis that employed a cross-sectional research design. Its objectives were to:

1. Characterize the physical accessibility, food store availability and in-store availability of diabetic healthy food options in the study areas
2. Describe the food shopping behavior of the participants
3. Assess the dietary compliance and diet quality of diabetic patients enrolled in the CVD program
4. Explain the impact of the physical accessibility, availability and opportunities to purchase healthy food on the diet quality and dietary compliance of the patients
5. Describe the willingness to pay of the patients for diabetic healthy food options and the willingness to sell of sellers to provide diabetic healthy food options

Phase 2 was designed to study the current policy environment that influenced the production and marketing of diabetic healthy food options. This phase used a qualitative research approach. It was designed to:

1. Describe the local and national policy environment related to the production and marketing of diabetic healthy food options
2. Identify policy gaps
3. Formulate the policy directions that would help create a more supportive food environment for diabetic patients.

Phases 3 focused on the formulation, implementation and evaluation of an enhanced medical nutrition therapy (MNT) intervention. A prospective quasi-experimental research design was used. Specifically, these phases aimed to:

1. Formulate an enhanced MNT intervention through a participatory process
2. Implement the intervention in the identified intervention area
3. Determine the effectiveness of an intervention on the diet and nutrition knowledge, diet quality and dietary compliance of the patients in the intervention area by specifically:
    a. Assessing the change in diet and nutrition knowledge, diet quality and dietary compliance between patients in the intervention and control
    b. Evaluating the change in diet and nutrition knowledge, diet quality and dietary compliance before and after the intervention in the two groups

3.2. Study areas

The research study was conducted in Davao City, Philippines. It was chosen as the study site because it was the only city in the Philippines where an integrated community-based CVD program was being implemented.

Davao City is a highly-urbanized city in the Philippines with a population of 1.36 million in 2007. It lies in the southernmost tip of Mindanao with a total land area of 2,443.61 square kilometers, making it the biggest city by land area in the whole world. Based on its income class, Davao City is classified as a 1st class city. It has a total of 182 *barangay*s (villages).

In choosing the study areas, a modified urbanicity index was adopted for this study. This index, originally developed by Dahly & Adair (2007), was found to be valid and internally consistent (Cronbach's α = 0.8707 to 0.8915) when applied to the Cebu Longitudinal Health and Nutrition Study (CLHNS). The urban-rural classification of the National Statistics Office (NSO) was not used for this study because it did not consider factors such as transportation, intensity of economic activities and education options as important which are essential factors being considered in this study. It was also not sensitive enough to capture the differences in levels of urbanizations between barangays, as found by Dahly & Adair (2007) when they compared the urbanization index and the NSO classification.

For each *barangay*, the presence of different communication options, transportation services available, educational institutions, health facilities available and retail shops such as groceries and *sari-sari* stores were assigned points. Adjustments were made on two indicators, namely, educational institutions and paved road density, to accommodate the availability of data at the barangay level. A maximum of 62 points can be given to a *barangay* using the modified urbanicity index. The modified urbanicity index and its scoring guide can be found in Appendix A and B, respectively. Data was collected from the city's Business Bureau and City Health Office. A short *barangay* survey was also conducted to obtain data on the transportation and communication profile of each *barangay* since this was not readily available with the City Planning and Development Office (Appendix C). The *barangay* midwife or a *barangay* official answered the survey.

Using the median score of 27 as the cut-off score, the more urbanized half of the city was identified. This ensured that these barangays were comparable when it came to the level of economic development and socio-political structures. These areas were more likely to be considered as the "poblacion" *barangay*s or *barangay*s that are the centers of population, economic activities and education. There might be features in the local food environment in *barangay*s with lower urbanization scores (more rural *barangay*s) that made comparability with *barangay*s with higher scores more difficult.

Ninety-two (92) *barangay*s were shortlisted based on the cut-off range. These *barangay*s were contained in 6 health districts. Table 3.1 shows the total number of registered patients in the CVD program by health district.

Table 3.1: Number of patients registered in the CVD program in the shortlisted health districts. Data from the City Health Office, Davao City, 2011.

District Code	Health District	Number of patients registered in CVD program (as of October 2011)
4	D	281
5	Agdao	467
7	Buhangin	42
13	Talomo North	318
14	Talomo South	506
16	Tugbok	336

Based on this shortlist of health districts, 2 health districts were chosen as study areas for Phase 1. Talomo North and Talomo South health districts were purposively chosen based on the recommendations of the city health officials. The shortlisted health districts were assessed based on the following conditions: (1) the level of involvement of the district and barangay health officers in the implementation of the CVD program, (2) the support of the *barangay*s within the health district to the program, and (3) the physical comparability of the *barangay*s in the health district. The first two conditions were very important considerations since it had a direct effect on the implementation at the *barangay* level. The last condition was the subjective perception on the physical conditions in the *barangay* that was not captured in the urbanicity scores.

Three *barangay*s from each health district were then purposively chosen. Table 3.2 lists the *barangay*s chosen as study areas. These *barangay*s were chosen based on the following criteria: (1) proximity to the other *barangay*s, (2) the number of patients listed in the CVD registry, (3) the level of engagement of the *barangay* midwife and volunteer *barangay* health workers (BHWs) in the City Health Office's programs, including the CVD program, and (4) the support of the *barangay* captain. The last criterion was an important consideration, since the relationship between the *barangay* officials and the city government is highly politicized where the level of support is sometimes determined by political affiliations.

Table 3.2. *Barangay*s chosen as study areas for Phase 1.

Health district	Barangay
Talomo North	Matina Aplaya
	Matina Pangi
	Matina Crossing
Talomo South	Talomo Proper (Poblacion)
	Dumoy
	Bago Aplaya

A formal letter was sent to the *barangay* captain of each selected *barangay*. The primary purpose of the letter was to get the approval and support of the *barangay* captain on the research activities. It provided a brief background on the project as well as the specific activities and its timeline. A meeting with the *purok* (sub-village) leaders was also arranged in some of the *barangay*s. A copy of the endorsement letter from the *barangay* was included in the survey form and interview questionnaires.

For Phase 3, two (2) out of the six (6) *barangay*s were purposively chosen. These *barangay*s were Dumoy (control area) and Bago Aplaya (intervention area). These *barangays* were chosen based on (1) the level of support the *barangay* officials, *barangay* midwife and *barangay* health workers given during Phase 1 data collection, (2) the relationship between the research team and the *barangay* health officials, and (3) the observed interpersonal dynamics between the nurse, *barangay* midwife and BHWs. The intervention status was also purposively assigned between the 2 *barangay*s based on the observed interpersonal relationship between the midwife and BHWs. Interpersonal relationships or dynamics refer to the level of trust, power and control between the *barangay* midwife and BWHs. The *barangay* midwife is the communication link between the research team, the nutritionist providing the nutrition counseling and the BHW. For the intervention to run, it is important that the relationship between the midwife and BHWs be strong and positive since the intervention entails an appointment-keeping mechanism where the BHWs assigned to the patient is the go-to person to ensure that the patients go the *barangay* health center.

Before the study areas were finalized, the *barangay* midwives were consulted to check for the possibility of contamination between the two areas. They indicated that this was highly unlikely. Despite the fact that these two areas

are beside each other, patients do not go to another *barangay*'s health center for services. The only adjustment made was to re-assign one of the patients from the control group to the intervention group since she was going to be indirectly exposed to the intervention as the *barangay* midwife in the *barangay*.

3.3. Study population

The study population for this study was patients diagnosed with T2DM. These patients were also registered in the CVD Program of Davao City.

3.3.1 Inclusion and exclusion criteria of diabetic patients

The study population for this research was patients diagnosed with T2DM aged 18 years old and older. Diabetic patients who had been residing in the study sites for at least 6 months were eligible to participate in the study. Participants conversant in the Visayan dialect or Tagalog dialect were qualified to participant.

Qualified patients were those who were diagnosed by a medical doctor from January 2009 to April 2012. Literature has shown that patients who have been living with diabetes longer were less likely to adhere to the needed self-care regimen. By limiting the time since the initial diagnosis, the patients recruited into the study could still be influenced to adhere to the proposed intervention.

Eligible patients were those who were non-insulin dependent and had no complications or, at most, one reported complication at the time of recruitment. When this status changed during the course of the research, the patient was not dropped from the study.

Eligible patients were limited to those registered with the city's CVD program and were shown as such in the health center's patient registry. Only patients registered in health centers located in the study sites were eligible to participate in the study. They must also have attended the nutrition counseling session with the program nutritionist at the time of recruitment.

Patients who were physically and mentally differently-abled were excluded from the study.

3.3.2 Inclusion criteria for food stores

All open food sources at the time that the survey was being conducted in the sub-village were eligible to participate in the study. Food sources being manned by minors or owner/managers who refused to have a picture of the store taken or its geographic location noted were excluded.

3.3.3 Inclusion criteria for interviews

Representatives from different national and local agencies or offices that were involved in the formulation and implementation of local programs related to food availability and accessibility were interviewed. The agencies or offices that were shortlisted were the City Agriculture Office, City Health Office, National Nutrition Council representative and two *barangay* captains.

3.4. Sample & sample size

The sample size for food sources was not computed because all open food sources in the study areas were to be included in the study.

Lehr's Equation was used to compute for the *initial* sample size requirement (Equation 1). The outcome measure used in the computation was the number of days that a diabetic patient was compliant. The assumptions for standard deviation and the desired difference between control and intervention groups used in the equation were based on the findings of Tang, Funnell, Brown and Kurlander (2010) who evaluted the effect of a nutrition intervention between two groups. The desired difference in the number of compliant days between intervention and control groups was adjusted up to 1 day, instead of 0.5 day as found by Tang, et al. A 1-day difference between the intervention and control groups would be more meaningful and intuitive since this would refer to the eating regimen of a patient for a full day. The standard deviation of 3.4 days is the SD value for the difference in the change in the number of compliant days between intervention and control groups. The initial total sample size needed for this study was at least 228 T2DM patients should have been recruited to participate in the study. This includes a 20% attrition rate to account for possible drop-outs in Phase 3.

$$n = \frac{\left(z_{\frac{1-\alpha}{2}} + z_{1-\beta} \right)^2 \sigma^2}{\delta^2} * 2$$

Equation 1

Where:

α = 0.05 (for 95% CI)

β = 80% (power)

δ = 1 day per week (desired difference in the change in the number of days compliant between intervention and control groups)

σ = 3.4 days per week (standard deviation)

Unfortunately, due to difficulties in recruiting patients, a total of 21 patients participated in Phase 1 of the study. During the patient recruitment process in Phase 1, several problems were encountered that severely constrained the whole recruitment process. There were errors in the CVD patient registry such as double-entry of patients, inclusion of non-diagnosed patients, and inclusion of non-residents. There were also a significant number of patients listed in the registry who did not received nutrition counseling. This led to an overestimated number of qualified patients that could be recruited.

These factors, combined with expected limitations in the absorptive capacity of the nutritionist involved in the nutrition counseling, led to the decision to adjust the sample size down to 30 patients per group for Phase 4. After the recruitment for Phase 3, there were 24 patients in the intervention group and 27 patients in the control group.

The absorptive capacity of the nutritionist was an important consideration in the adjustment done on the number of patients. The city nutritionists are assigned at the district health center where they are responsible for the implementation of nutrition-related programs in whole health district. For the city's CVD program, they are tasked to provide diabetes education and nutrition counseling to registered patients. This study's nutrition counseling component was going to be added to her existing workload since it required her presence in the health center once a week for four (4)

months. It was important that the nutritionist be not overtaxed during nutrition counseling sessions. Hence, the number of patients scheduled per week was limited to a maximum of 7 patients per day.

3.5. Sampling technique

3.5.1 Participant recruitment and selection in Phase 1

From the *barangay* health center's CVD patient registry, a shortlist of eligible patients was generated based on the identified inclusion and exclusion criteria. The list included the name, their registry number and address of the eligible patients. The research team then visited each eligible patient to give them a short orientation about the research as well as get their informed consent to participate in the study.

It was during the patient recruitment in the third *barangay* that problems related to the CVD patient registry became apparent. There were errors in the CVD patient registry such as double-entry of patients, inclusion of undiagnosed patients, encoding errors (i.e. wrong disease diagnosis) and inclusion of non-residents. Except for one *barangay*, a majority of the shortlisted eligible patients in the study areas had not received nutrition counseling. These factors severely constricted the whole recruitment process. It whittled down considerably the number of eligible patients since being registered in the CVD program and receiving nutrition counseling were important eligibility criteria.

Instead of using the shortlist of eligible patients for recruitment, the first visit of the research team became an activity that focused on validating the patient registry entries. Eligible patients, who had not received nutrition counseling were identified and further shortlisted. A special nutrition counseling session for these eligible patients was in the Talomo South and Talomo North district health offices. After receiving nutrition counseling, a member of the research team talked with eligible patients to introduce the research and recruit them to participate in the study.

A unique numeric identifier for each participant was generated (Figure 3.1). This code was used in all patient records during the course of the research. This was done to ensure the confidentiality of their records and link their records across the different phases.

DD-BBB-XXX-YYY

Where:

- DD 2-digit health district code
- BBB 3-digit NSCB geographic code for the barangay
- XXX last 3-digits of the patient number on registry
- YYY 3-digit shortlist number

Figure 3.1: Respondent code format

3.5.2 Food establishment selection in Phase 1

All food sources within the administrative boundaries of the study areas were included in the research. For *barangay*, *puroks* were clustered to systematically cover the *barangay* and to facilitate coordination between the survey enumerators, *purok* leaders and/or BHWs. It was important that there was a *barangay* or *purok* leader present during data collection to help facilitate the initial contact between the food source owner/ manager and the research enumerator. This also gave an "official" stamp on the data collection activity.

A unique alpha-numeric code was generated. Figure 3.2 shows the format of the food source code. No distinctions were made between registered and unregistered food sources.

FF-DD-BBB-XXX-YYYY

Where:

- FF 2-digit Food source category
- DD 2-digit health district code
- BBB 3-digit NSCB geographic code for the barangay
- XXX 3 letters in the business line code of the dominant business
- YYYY 4-digit list number (chronological

Figure 3.2: Food source code format

3.5.3 Key informant interviewee identification in Phase 2

Representatives of various regional and local offices that were involved in implementing policies and programs related to the production and marketing of healthy food were identified and interviewed. *Barangay* officials from selected study areas were also interviewed since they are the direct implementers and recipients of the national and city programs.

3.5.4 Participant recruitment in Phase 3

Patients from *Barangay*s Bago Aplaya and Dumoy who participated in Phase 1 took part in the 3rd phase of the study. Another round of recruitment was conducted in these *barangay*s in order to reach needed sample size per group. The *barangay* midwife, city nutritionist and the research team went to a pre-identified *purok* in the *barangay* once a week. Prior arrangements were made with the BHWs assigned in the *purok* and the *purok*s surrounding it to gather diagnosed T2DM patients for nutrition counseling and recruitment. This recruitment activity was conducted over a two-and-a-half month period. Despite these efforts, the actual number of patients recruited fell short of the needed sample size per group. The researcher decided to stop the recruitment because the BHWs were not able to identify additional qualified diabetic patients in the community.

3.6. Intervention development

A participatory approach was adopted in developing the intervention. A two-day workshop was conducted among selected city nutritionists, City Health and Handicap International (HI) officials to gather feedback on the current MNT

service being provided under the program and to design the enhanced MNT intervention. The strengths, weaknesses and challenges faced by the current MNT service were gathered. Based on these feedbacks, the objectives, expected outputs and outcomes of the enhanced MNT intervention were identified. The topics to be included in the intervention were also identified and developed.

All information, education and communication (IEC) materials developed for the intervention were validated and approved by city nutritionists, officials of the City Health Office and Handicap International. The materials were distributed to the city nutritionists, who attended the workshop for content validity.

The session guides were developed in English and translated to the Visayan dialect. Once the content had been validated, the translated version was distributed to staff members of Handicap International and the Technical Officers of the City Health Office for another round of validation. It was important that the session guides were easily understood by the patients so the word used should be familiar and common.

3.7. Identification of the diabetic healthy food options (DHFOs)

An integral part to the study is the basket of goods or food staples that were considered to be diabetic-healthy. At present, there is no such food basket that has been identified for the Philippines. A workshop was conducted to build consensus among city nutritionists who were certified diabetes educators as well. These nutritionists were also responsible for conducting the nutrition counseling of the CVD program. The aim of the workshop was to come up with the recommended basket of diabetic-healthy food options that a household with a diabetic patient should have. These food items should be commonly recommended during nutrition counseling and both affordable and readily available. These criteria were important to keep in mind because there would be instances wherein the ideal recommendations would not be physically or economically accessible or available to the patients or households. The challenge to the nutritionists during the workshop was to ground their recommendations on realistic expectations rather than what was ideal.

The food options and their substitutes (in parenthesis) that were identified as diabetic-healthy and included in the survey were:

1. White rice (rice corn, sweet potatos)
2. Fish - round scad (small tuna)
3. Vegetables - Morning glory, Moringa, sweet potato tops, taro tops
4. Bananas (papaya, pineapple)
5. Low-fat/Non-fat milk
6. Coconut oil
7. Pure black coffee (Sugar-free 3-in-1 coffee)
8. Monggo (mung bean)
9. Soda crackers (pan de sal)
10. Eggs
11. Brown sugar (Sugar alternatives)

Three food options included in the list were not ideally recommended for diabetics. In its 2008 nutrition recommendation, the American Diabetes Association recommends “a dietary pattern that includes carbohydrate from fruits, vegetables, *whole grains*…” Although the consumption of white rice is not ideally encouraged for diabetic patients, whole grains like unpolished rice are expensive and not readily available in the community. Based on the responses during the workshop, white rice consumption, while not ideal, should be consumed in moderation (1/3 cup per meal).

Black coffee is another case in point. Ideally, diabetic patients are not encouraged to drink coffee. Nutritionists were asked to give their nutrition recommendation given the fact that diabetic patients still persists in drinking coffee. Consensus was reached on recommending black coffee instead of sugar-free 3-in-1 coffee.

Lastly, the inclusion of coconut oil was discussed. The evidence to support the health benefits of coconut oil has been inconclusive. A number of organizations, such as the American Diabetes Association (2008), Food and Agriculture Organization (2010), and the World Health Organization (2006), recommended the shift to "healthier" polyunsaturated fat and limited consumption of saturated fat, including cooking oils such as coconut oil and palm oil. However, coconut and palm oil are the options that are cheap and readily-available in the community. Consensus was reached to recommend coconut oil but in limited quantities.

3.8. Measurement tools

3.8.1 Food environment measurements

A Food Environment and willingness-to-sell survey questionnaire (Appendix D) was administered to collect information about the different food sources found in the study sites. The respondents for the survey questionnaire were the owner, manager or caretakers of the establishment. If the owner was not available on site during the first visit, the enumerator contacted him/her separately to get his/her response to the Willingness-to-Pay (WTP) questions.

This survey had three sections. The first section collected basic information about the store, including its longitude and latitude coordinates. The second section was an observation checklist containing the DHFOs identified by city nutritionists. The checklist included diabetic-health food staples (for food retailers) and dish options (for food establishments) generated in a consensus building workshop with city nutrionists. The last section covered questions on the owner's willingness to sell basic diabetic-healthy food staples or offer diabetic-friendly dishes.

3.8.2 Nutritional assessment

Food record method was used to assess the patients' dietary intake. The patient participants were given food diaries as part of their participation in the CVD program. The format of the food diary followed the Idaho plate method. Since patients were already familiar with this tool, the food diary form used in the study adopted the same format (Appendix E). During the collection of the food diaries, the enumerators used the Food Diary intake form (Appendix F) for cases where patients did not use the food diary form to record their intake.

Patients were asked to record their dietary intake for 7 days. For Phase 1, patients were asked to record their intake from June 12 to 18 June 2012. Patients who participated in Phase 4 recorded their dietary intake prior to the start of the intervention (January 21 to 27, 2013) and the week after the end of the intervention (May 27 to June 2, 2013).

3.8.3 Diet and nutrition knowledge

A 12-point knowledge test (Appendix G) and a Market Game (Appendix H) were administered in Phase 3 of the study to assess change in knowledge and purchase intention. The researcher-administered knowledge test was developed based on the content of the enhanced MNT sessions. The first section of the test was composed of true-or-false questions while the second part was made up of multiple-choice questions. The test was administered in the Visayan dialect. The Cronbach α value was 0.364.

The Market Game (MG) was a modified version of the market game included in the Play and Learn (*Pabasa sa Nutrisyon*) kit rolled by the National Nutrition Council to compliment the mother's classes currently being conducted by the local health offices. The original intent of the game was to teach mother's how to plan healthier meals for their children. For the study, the modified Market Game was re-designed to assess the intention to purchase of the patient, when confronted with selecting among healthy, un-healthy and "somewhat healthy" choices. More cards were added to the ones used in the original market game in order to expand the items to choose from. Identified healthy food items were given +1 point while unhealthy food items were given -1 point. Thirteen (13) food items from the list of healthy food items were identified as "weighted food items" most of which are carbohydrate-rich. Although these food items were considered healthy, consuming too many of them is considered unhealthy. If the patient chose two items from this group, an additional -1 point is given. An additional 1 point is deducted for every choice made after 2 choices. Appendix I shows the list of food items included in the game and the scoring sheet.

3.8.4 Eating and food shopping pattern measurement

In Phase 1, a researcher-administered Food Shopping interview questionnaire (Appendix J) was used. The primary respondents for the questionnaire were the patients. Answers from their primary caregiver were also solicited, especially when it came to questions pertaining to food preparation at home.

The survey questionnaire was divided into four parts. Part 1 of the survey collected the socio-economic and demographic profile as well as the geographic location of the respondents' residence. The second part of the questionnaire contained questions regarding the supportiveness of their home environment vis-à-vis their dietary regimen. Although the questions were open-ended, pre-identified pool of possible responses were already collected during the pre-test phase and were included in the questionnaire to facilitate the recording of their responses. The third part contained questions pertaining to the patient's interaction with the food environment for the past month which included the places where they usually bought food and their considerations when buying food staples or eat. The last section of the survey focused on their willingness to pay for diabetic-healthy food staples.

For Phase 3, a shorter Food Shopping interview questionnaire was used (Appendix K) which concentrated on the food shopping habits of the patient, focusing mainly on his/her most frequent food source for the past month. Two separate questionnaires were administered during the post-intervention stage (Appendix L and M). An additional section on intervention feedback was added for those in the intervention group.

3.8.5 Willingness-to-pay (WTP) and Willingness-to-sell (WTS) measurement

Questions pertaining to the respondents' WTP or the food sources' WTS were integrated into the food shopping and food environment questionnaires, respectively. The respondents were asked if he/she were willing to pay or sell DHFOs that were not available in the household or food store at the time of the survey. For those who were willing, they were asked whether they were willing to pay or sell at a price greater than, equal or less than the average retail price. The average retail price used in the study was based on the average retail price for February 2012, which was the latest complete price list collected and published by the Department of Agriculture and the Department of Trade and Industry. The average retail prices used in the study are in Table 3.3.

Table 3.3. Average retail prices for DHFO as of February 2012

Diabetic healthy food options	Average retail price (ARP), PhP	Unit
White rice	33.00	1 kilogram
Fish (round scad)	114.56	1 kilogram
Monggo (mung bean)	82.26	1 kilogram
Vegetables (Morning glory)	13.00	1 Medium sized bundle
Eggs	5.02	1 Piece
Coconut oil	113.61	1 Liter
Low-fat/Non-fat milk	23.60	1 Smallest tetra pack
Pure black coffee	17.75	25 gram pack
Brown sugar	44.50	1 kilogram
Bananas	1.60	1 piece
Soda crackers	40.63	10-piece pack

3.8.6 Policy stakeholder interview

A key informant interview schedule was developed to guide the interview process with identified representatives of national and local government offices (Appendices N to Q). An interview schedule was also prepared for *barangay* captains in selected study areas.

3.9. Validity and reliability tests

The Dietary Behavior survey questionnaires were distributed to nutrition experts in Manila as well as those in the CVD program for content validity. The willingness-to-pay and willingness-to-sell questions were also assessed by economic analysis experts in Davao City for content validity.

All of the data collection forms used for Phase 1 were pre-tested and re-tested in *Barangay* Agdao which was geographically far from the study areas. Thirty (30) food stores were included in the pre-test/ re-test process. Five (5) diabetic patients were also interviewed. A time-and-motion assessment of the different measurement tools, especially the survey and observation forms, was also done to determine how long each instrument would be administered. Common answers collected during this phase were incorporated as possible choices into the questionnaire to facilitate ease of administration. Corrections were incorporated into the tools after each re-test iteration.

During Phase 3, the knowledge test and market game were pre-tested among diabetic patients in *Barangay* Buhangin. Fifteen (15) patients participated in this activity. The *barangay* health center was unable to recruit more patients to participate in the pre-test because the health workers had to work in the evacuation sites for those displaced by a flash flood in one of the communities near the *barangay*.

The test questions were translated to the Visayan dialect. The pre-testing in Buhangin was conducted in the Visayan dialect as well. These were then circulated among selected city nutritionists and staff members of the Technical Office of the City Health Office for further refinement. This was to ensure that the translation was easily understood.

Two (2) training sessions were conducted for food environment enumerators. The reason behind this was that the first set of enumerators had to go back to school and a new team had to be organized and trained to finish the last half

of the survey. The enumerators were briefed on the forms that were to be used for the survey. They were also tasked to conduct the pre-test/ re-test in Barangay Agdao as part of their return-demonstration to evaluate their competency.

Three (3) training sessions for the nutrition enumerators were also implemented. Due to the long interval between the scheduled data collection, a new team of enumerators had to be recruited and trained. Licensed nutritionists from the Central Mindanao University were tapped to be the enumerators and encoders to ensure that the basic technical knowledge on nutrition was present. The enumerators were oriented on the forms, electronic files and software that were to be used for the survey. The last half of the training was devoted to hands-on exercises using the electronic files and software.

All of the survey questionnaires were developed in English and translated to the Visayan dialect. Since the tools were all enumerator-administered, the initial translation was made by the enumerators. This was done to make the enumerators more comfortable and familiar with the questionnaires as well as make the administration process consistent since all of the enumerators selected the appropriate terminologies for the questions to be easily understood. It was circulated among selected city nutritionists and staff members of Handicap International for validation.

3.10. Data collection

3.10.1 Pre-data collection

Before the data collection for Phase 1 commenced, a series of short orientation sessions on the research project were conducted among *barangay* and *purok* officials, district health officials as well as *barangay* health officials and workers. This was conducted to brief them about the activities of the research team in the area and garner their support for these activities. In situations where the enumerators had to visit households, it was important that a representative from the *barangay*, such as the *barangay* health worker or *purok* leader, accompanied them. This helped allay the hesitation of the participants and other members of the household if they saw somebody from the *barangay* with the enumerators. It also ensured the safety of the enumerators as they moved around the community.

3.10.2 Phase 1

3.10.2.1 Nutritional assessment, eating and food shopping patterns and WTS interview

Once the patients gave their consent to participate in the study, the nutrition enumerators reviewed how to make their 7-day food record using the study form. They were informed about the recording period (12-18 June 2012). To remind them of the schedules, they received 1 SMS message per day prior to and during the recording period. For those without mobile phones, a member of the research team called them through the landline (if they had one) or sent a reminder SMS message to the assigned BHWs.

The second visit was devoted to the collection and validation of the 7-day food record as well as administration of the Eating and food shopping patterns and WTP questionnaire which was conducted in the week after the recording period. The nutritionist reviewed all food and beverage entries in the food record by asking the specific type of ingredient used and the portion size of what they ate using the food models and measuring cups and spoons in the CVD MNT kit as reference. For example, if the patient ate fried fish, he/she was asked the kind of fish that he ate and the size of the fish relative to the food model. This information was noted down on the food record form. After validating the food record, the Food Shopping and WTS survey questionnaire were administered. Additionally, the GPS coordinates of the residence was also collected to obtain the geographic location.

3.10.2.2 Food environment and WTS survey

The food environment enumerators went to all open food sources in the *purok*. An introductory letter from the principal investigator as well as a copy of the endorsement letter from the *barangay*, the City Health Office and the City Mayor's Office were given to the person manning the food source. Once the purpose of the visit was explained, the enumerator tried to obtain their consent to participate in the research. Once consent was been given, observational survey and interview questionnaire were administered. For food stores that sold dry, processed food and cooked dishes, they were categorized according to the more dominant business determined by the relative floor space allocated for each type. Geographic coordinates of the establishment were taken using a GPS receiver attached to a laptop as well as photos of its exterior and interior structures using a digital camera. Survey responses were encoded using Epi Info™ 7.0 (Center for Disease Control, Atlanta, Georgia, USA).

3.10.3 Phase 2

An appointment for the interview was set with each of the representatives of the national and local health and agriculture offices as well as *barangay* captains in the study areas. At the start of each interview, the researcher asked for his/her consent to record the interview.

3.10.4 Phase 3

3.10.4.1 Nutritional assessment

The nutrition enumerators visited the patients a week prior to the recording period at the pre-intervention (January 21 to 27, 2013) and post-intervention (May 27 to June 2, 2013) stages. To remind them of the schedules, a member of the research team sent 1 SMS message per day prior and during the recording period. For patients without mobile phones, a member of the research team contacted them through the landline or sent a reminder SMS message to the assigned BHWs. The collection and validation processes for the patients' food records were the same as was done during Phase 1.

3.10.4.2 Dietary behavior and diet and nutrition knowledge assessment

For the patients in the control group, the dietary behavior interview and diet and nutrition tests were conducted when the food records were collected when home visits were made during the pre-intervention and post-intervention stages. For the intervention group however, the pre-intervention interview and tests were done during their first nutrition counseling appointment at the health center. For those who missed their first appointment, the enumerators visited them in their homes to conduct the interview and tests. The post-intervention assessment was administered when the food records were collected during the home visits.

3.11. Data analysis

3.11.1 Nutritional assessment

Dietary prescription for each patient participant was computed by the city nutritionist during nutrition counseling. The patient's desired body weight (DBW) in kilograms was computed and converted to their total energy requirement (TER) in kilocalories (kcal) based on the level of their physical activity and body frame. The TER was then divided and converted to the number of grams of carbohydrate, fat and protein that the patient must consume on a daily basis. This was a two-step process where the TER is divided between these three nutrients based on the following proportion: 55%

carbohydrate, 20% protein and 25% fat. These three values are standard proportions used in the CVD program. The recommended number of kilocalories of carbohydrate, fat and protein to be consumed was then computed. To convert kilocalorie to grams, the following constants were used: 4 for carbohydrate, 4 for protein and 9 for fat. The TER (in kcal), carbohydrate (in grams), protein (in grams) and fat (in grams) values generated were the dietary prescription that the patients were evaluated against.

The entries in the 7-day food record were encoded using Microsoft Excel (Microsoft Corporation, Redmond, Washington, USA). The patients' food intake in household measures were converted to edible portions (EP) in grams using an EP factor from a standardized transformation table from the Department of Nutrition, College of Public Health of the University of the Philippines Manila. Since this table contained the common food found in Filipino households, there were many occasions wherein the food that patients ate was not found in the list. For example, "*moro-moro*", which a commonly eaten fish in Davao, is not found in the list. Instead, the team substituted this with "medium-sized *matambaka*". The substitution was standardized to ensure that the EP factor used was consistent across the different enumerators.

Once the EPs have been generated, the food intake for one day was encoded and analyzed using FCT+Menu-Eval (FNRI, Taguig, Philippines) to generate the daily energy, protein and micronutrient intake of each patient. FCT+Menu-Eval is a software developed by the FNRI to "provide the nutrient composition of raw and processed food, speed-up menu formulation and evaluation, and compute the cost of the menu (software insert)." The nutrient composition of 1,541 food items included in the software was based on the 1997 Food Composition Table (FCT), the latest available version. Table 3.4 shows the proportion of the food items in the FCT where their energy, macronutrient and micronutrient content were specified. All outputs generated were included in the patient's worksheet.

Table 3.4. FCT database of energy, macronutrients and selected micronutrients in FCT+MENU-EVAL software

Food Component	% of food items in the FCT database
Energy	100.0
Carbohydrate	100.0
Protein	100.0
Fat	100.0
Fiber	97.5
Vitamin C	99.6
Calcium	99.5
Iron	99.9

The Food Exchange List of the Philippine Association of Diabetes Educators – Association of Diabetes Nurse Educators of the Philippines (PADE/ ADNEP) was used to estimate serving sizes. The estimated serving sizes were then used to compute for the daily carbohydrate, protein and fat (CPF) content in grams. The processed, canned or pre-packaged product's nutrition label was used as basis for the EP and serving size estimates.

Other than the macronutrient and micronutrient intake assessment, the patients' daily intake were evaluated for the number of food groups, number of protein sources and number of servings of vegetable, grains and fruit.

3.11.2 Diet Quality

The diet quality of the participants will be computed using the modified Diet Quality Index-International (DQI-I). The original DQI-I is a food-based diet quality index that looks at the participant's level of compliance with existing dietary guidelines. It also assesses the variety, adequacy, moderation and over-all balance of the diet. Table 3.5 shows the components of the original DQI-I.

Table 3.5: Components of the Diet Quality Index – International (DQI-I)

Component		Score
Variety	**0–20 points**	
• Overall food group variety (meat/poultry/fish/eggs; dairy/beans; grain; fruit; vegetable)	0–15 points	≥1 serving from each food group/d = 15 Any 1 food group missing/d = 12 Any 2 food groups missing/d = 9 Any 3 food groups missing/d = 6 ≥4 food groups missing/d = 3 None from any food groups = 0
• Within-group variety for protein source (meat, poultry, fish, dairy, beans, eggs)	0–5 points	≥3 different sources/d = 5 2 different sources/d = 3 From 1 source/d = 1 None = 0
Adequacy	**0–40 points**	
• Vegetable group [3,4]	0–5 points	≥3–5 servings/d = 5, 0 servings/d = 0
• Fruit group [3,4]	0–5 points	≥2–4 servings/d = 5, 0 servings/d = 0
• Grain group [3,4]	0–5 points	³6–11 servings/d = 5, 0 servings/d = 0
• Fiber [3,4]	0–5 points	≥20–30 g/d = 5, 0 g/d = 0
• Protein [3]	0–5 points	³10% of energy/d = 5, 0% of energy/d = 0
• Iron [3,5]	0–5 points	≥100% RDA (AI)/d = 5, 0% RDA (AI)/d = 0
• Calcium [3]	0–5 points	≥100% AI/d = 5, 0% AI/d = 0
• Vitamin C [3,6]	0–5 points	≥100% RDA (RNI)/d = 5, 0% RDA (RNI)/d = 0
Moderation	**0–30 points**	
• Total fat	0–6 points	≤20% of total energy/d = 6 >20–30% of total energy/d = 3 >30% of total energy/d = 0
• Saturated fat	0–6 points	≤7% of total energy/d = 6 >7–10% of total energy/d = 3 >10% of total energy/d = 0
• Cholesterol	0–6 points	≤300 mg/d = 6 >300–400 mg/d = 3 >400 mg/d = 0

Table 3.5: Components of the Diet Quality Index – International (DQI-I) (*continuation*)

Component		Score
• Sodium	0–6 points	≤2400 mg/d = 6 >2400–3400 mg/d = 3 >3400 mg/d = 0
• Empty calorie foods	0–6 points	≤3% of total energy/d = 6 >3–10% of total energy/d = 3 >10% of total energy/d = 0
Overall balance	**0–10 points**	
• Macronutrient ratio (carbohydrate:protein:fat) [7]	0–6 points	55 to 65 : 10 to 15 : 15 to 25 = 6 52 to 68 : 9 to 16 : 13 to 27 = 4 50 to 70 : 8 to 17 : 12 to 30 = 2 Otherwise = 0
• Fatty acid ratio (PUFA:MUFA:SFA)	0–4 points	P/S = 1 to 1.5 and M/S = 1 to 1.5 = 4 Else if: P/S = 0.8 to 1.7 and M/S = 0.8 to 1.7 = 2 Otherwise = 0

1. Abbreviations:
   - RDA : Recommended Dietary Allowance
   - AI : Adequate Intakes
   - RNI : Recommended Nutrient Intake
   - MUFA : monounsaturated fatty acids
   - SFA : saturated fatty acids
   - P/S : ratio of PUFA to SFA intake
   - M/S : ratio of MUFA to SFA intake
2. Used as a continuous variable.
3. Based on 7118 kJ (1700 kcal)/9211 kJ (2200 kcal)/11304 kJ (2700 kcal) diet; 1 kcal _ 4.1868 kJ.
4. Scoring system based on the AI value for China and RDA value for the United States.
5. Scoring system based on the RNI value for China and RDA value for the United States.
6. Ratio of energy from carbohydrate to protein to fat.

Some line items in the original DQI-I were dropped because these were not currently included in the Menu-Eval module and the Food Exchange List (Table 3.6). The total score in the modified DQI-I is 78. The scores were further divided into 4 score ranges each having a corresponding category (Table 3.7). Sensitivity analysis was done by adjusting the scoring system of the modified DQI-I.

Table 3.6. Components of the modified DQI-I.

Component		Score
Variety	**0–20 points**	
● Overall food group variety (meat/ poultry/ fish/ eggs; dairy/ beans; grain; fruit; vegetable)	0–15 points	≥1 serving from each food group/d = 15 Any 1 food group missing/d = 12 Any 2 food groups missing/d = 9 Any 3 food groups missing/d = 6 ≥4 food groups missing/d = 3 None from any food groups = 0
● Within-group variety for protein source (meat, poultry, fish, dairy, beans, eggs)	0–5 points	≥3 different sources/d = 5 2 different sources/d = 3 From 1 source/d = 1 None = 0
Adequacy	**0–40 points**	
● Vegetable group	0–5 points	≥3–5 servings/d = 5, 0 servings/d = 0
● Fruit group	0–5 points	≥2–4 servings/d = 5, 0 servings/d = 0
● Grain group	0–5 points	6–11 servings/d = 5, 0 servings/d = 0
● Fiber	0–5 points	≥20–30 g/d = 5, 0 g/d = 0
● Protein	0–5 points	10% of energy/d = 5, 0% of energy/d = 0
● Iron	0–5 points	≥100% RENI[1]/d = 5, 0% RENI/d = 0
● Calcium	0–5 points	≥100% RENI[1]/d = 5, 0% RENI/d = 0
● Vitamin C	0–5 points	≥100% RENI[1]/d = 5, 0% RENI/d = 0
Moderation	**0–12 points**	
● Total fat	0–6 points	≤20% of total energy/d = 6 >20–30% of total energy/d = 3 >30% of total energy/d = 0
● Empty calorie foods	0–6 points	≤3% of total energy/d = 6 >3–10% of total energy/d = 3 >10% of total energy/d = 0
Overall balance	**0–6 points**	
● Macronutrient ratio[2] (carbohydrate:protein:fat)	0–6 points	55 to 65 : 10 to 15 : 15 to 25 = 6 52 to 68 : 9 to 16 : 13 to 27 = 4 50 to 70 : 8 to 17 : 12 to 30 = 2 Otherwise = 0

1. RENI: Recommended Energy and Nutrient Intake
2. Ratio of energy from carbohydrate to protein to fat.

Table 3.7: Modified DQI-I categories

Modified DQI-I score range	DQI-I Category
0-19	Very poor
10-39	Poor
40-59	Good
60-78	Very good

3.11.3 Dietary compliance

Dietary compliance was the number of days that the patient's average daily energy and macronutrient intake fell within a pre-determined compliance range. The constant used to compute for the energy compliance range was based on a study by Metz et al. (1997) where they assessed dietary compliance and cardiovascular risk reduction. The computation for the compliance range for energy and macronutrients are shown in Equations 1 and 2. All macronutrient intakes should be within the compliance range in order to be considered as compliant.

Total energy requirement (kcal) + 100 = upper limit of energy compliance range
Total energy requirement (kcal) – 100 = lower limit of energy compliance range Equation 3.1

Macronutrient requirement (grams) + 10 = upper limit of macronutrient compliance range
Macronutrient requirement (grams) - 10 = lower limit of macronutrient compliance range Equation 3.2

Sensitivity analysis was also completed. The analysis used a narrower range which is consistent with the nutritionists' criteria for compliance or the technical criteria of compliance. Nutritionists consider a patient's intake to be compliant when it is within the following range for energy and macronutrient intake: ± 5 grams of CPF prescription and ± 50 kcal of total energy requirement.

3.11.4 Diet and nutrition knowledge test and Market Game scores

After the tests were administered, the scores were encoded. Pre-intervention and post-intervention analyses were done only for patients who had both pre-intervention and post-intervention food records.

3.11.5 Eating and food shopping patterns

The eating and food shopping behavior patterns of the patients were collected to determine the changes in their diets since their diagnosis. In Phase 1, the analysis focused on all of the places where they shopped and ate in the previous month and their reasons for doing so. In contrast, the analysis in Phase 4 looked only into the most frequent place where they shopped for food in the previous month.

3.11.6 Food environment analysis

The coordinates of the food sources and patient's residence in degrees, minutes, seconds (DMS) gathered during the survey were converted to decimal degrees using Equation 3.3. These were then plotted using ArcGIS 9.0 (ESRI,

Redlands, California, USA). A series of chloropleth maps were generated to display the food environment in the selected study areas.

$$\text{Degrees} + \left(\frac{\text{Minutes}}{60}\right) + \left(\frac{\text{Seconds}}{3{,}600}\right) = \text{Decimal degrees} \quad \text{Equation 3.3}$$

Population and geographic density of each type of food source was computed. The following equations were used (Equation 3.4 and 3.5).

$$\left(\frac{\text{Number of food source type}}{\text{barangay population}}\right) \times 1{,}000 = \text{Population density} \quad \text{Equation 3.4}$$

$$\left(\frac{\text{Number of food source type}}{\text{barangay ares (in km}^2\text{)}}\right) = \text{Geographic density} \quad \text{Equation 3.5}$$

3.11.7 Content analysis of interviews

Interviews, of which detailed notes were made, were recorded and electronically stored. To ensure consistency, all notes taken were cross-checked with the electronic recordings.

3.11.8 Statistical analysis

The main outcome variables for the study were diet quality and dietary compliance. These were evaluated using the following variables: (1) total energy consumed, (2) modified DQI-I score, (3) number of days that the patients were compliant with their energy requirement, and (4) number of days that the patients were compliant with CPF prescription. For Phase 4, additional variables measured included knowledge test score and market game score.

Daily food records, where the total energy consumed was greater than 5,000 kcal/day or less than 500 kcal/day, were dropped from the analysis (Willett, 1998). All nutrition-related analyses were aggregated to the patient level. The means of the daily macronutrient and micronutrient intake as well as the modified DQI-I score were computed. To obtain the average macronutrient and micronutrient intake as well as the modified DQI-I score of the patient.

Summary statistics on the different outcomes variables were generated using and SPSS Statistics 17.0 (IBM Corporation, New York, USA). Non-parametric Student's t-test and Chi-square analysis were done to determine whether the independent and dependent variable were statistically different between groups. Non-parametric Paired t-test analysis was ran to assess the change in the outcome variables within and between intervention and control groups. Linear and binary logistic regression was done to determine the magnitude and direction of the association between the modified DQI-I score and energy compliance of patients with food store availability within 300 meters and 500 meters of the patients' residence. Energy compliance was a dichotomous variable where patients who were able to meet their energy compliance range were given a score of "1" otherwise, "0" was given. Table 3.7 outlines the statistical analysis matrix done for the study.

Table 3.7. Statistical analysis matrix

Statistical analysis		Variable	Type of measurement
Summary statistics	Outcome variables	• Energy consumed	• Continuous
		• Modified DQI-I score	• Continuous
		• Number of compliant days	• Categorical
		• Knowledge score	• Continuous
		• MG score	• Continuous
	Individual –level independent variables	• Age	• Continuous
		• Sex	• Categorical
		• Family income	• Categorical
		• Wealth score	• Categorical
		• Educational assessment	• Categorical
		• Marital status	• Categorical
		• Year diagnosed	• Continuous
	Food environment	• Food store availability by barangay	• Continuous
		• In-store availability by barangay	
		• In-store availability by food store type	• Continuous • Continuous
	Dietary intake	• Macronutrient intake	• Continuous
		• Micronutrient intake	• Continuous
		• Modified DQI-I score	• Continuous
		• DQI-I sub-component score	• Continuous
	WTP/ WTS analysis	• Willingness to sell DHFOs	• Categorical
		• Willingness to pay DHFOs	

Table 3.7. Statistical analysis matrix (continued)

Statistical analysis	Variable		Type of measurement
Non-parametric ● Student's t-test ● Mann-Whitney test ● Wilcoxon signed rank test	Outcome variables ● Pre-intervention ● Post-intervention	● Energy consumed	● Continuous
		● Modified DQI-I score	● Continuous
		● Number of days compliant	● Categorical
		● Knowledge score	● Continuous
		● MG score	● Continuous
Bivariate linear regression	Independent variable	● Food store availability with 300 meters of patients' residence	● Continuous
		● Food store availability with 500 meters of patients' residence	● Continuous
	Dependent variable	● Modified DQI-I score	● Continuous
Binary logistic regression	Independent variable	● Food store availability with 300 meters of patients' residence	● Continuous
		● Food store availability with 500 meters of patients' residence	● Continuous
	Dependent variable	● Energy compliance	● Dichotomous

3.12. Ethical consideration

The research was submitted for ethical approval to Chulalongkorn University's Ethics Review Board as well as the University of the Philippines Manila Research Ethics Board (UPMREB). The Chulalongkorn University Ethics Review Board approved the research protocol last May 2012 while UPMREB approved it last February 2013 (UPMREB-2012-0327-P1). An official endorsement from the Office of the Mayor of Davao City was given in April 2013.

Signed informed consent forms were secured from all study participants, including the patients and food source respondents prior to their participation in the study. All respondents were assigned a unique alpha-numeric code to which all of their records were linked. Personally identifiable data, including links to specific geographic locations, were not shared or disclosed to other parties.

Chapter IV

Results

The present research studied the impact of physical accessibility, food store availability and in-store availability in the local food environment on the dietary compliance and diet quality of Type 2 Diabetes Mellitus (T2DM) patients enrolled in the CVD program of Davao City. It also sought to describe the willingness to pay of patients as well as the willingness to sell of local merchants to provide diabetic healthy food options. An enhanced medical nutrition therapy intervention was designed, implemented and assessed.

4.1. Phase 1

4.1.1 Patients' demographic and socio-economic profile

A total of twenty-one (21) recently-diagnosed T2DM patients participated in the Phase 1 of the study. Roughly half of the patients were newly-diagnosed (less than 1 year since diagnosis) whose average age was 55 years old (Table 4.1). Most of the patients were male, married, employed and finished high school. The average household monthly income of most patients was PhP10,000.00 and below. Patients were asked about whether they owned any of six household appliances (television set, washing machine, motorcycle, air-conditioning unit, computer and refrigerator) that were non-monetary proxy indicators of wealth. On the average, patients owned 3 to 4 items.

Table 4.1. Socio-economic and demographic profile of patients (n=21)

Socio-economic and demographic variables	Number	Percentage
Age (years) Mean (SD)	55.43 (8.55)	
Sex (n=21)		
Male	17	81.0
Female	4	19.0
Marital Status (n=21)		
Married	13	61.9
Separated	1	4.8
Single	4	19.0
Widow/widower	3	14.3
Employment Status (n=21)		
Employed	8	38.1
Homemaker	5	23.8
Not working	3	14.3
Self-employed	5	23.8
Educational Attainment (n=21)		
Attended elementary school	3	14.3
Graduated Grade 6	2	9.5
Attended high school	2	9.5
Graduated high school	6	28.6
Attended college/ vocational school	3	14.3
Graduated college	4	19.0
Attended/ graduated masters/ doctorate	1	4.8
Average Household Monthly Income (n=21)		
10,000 pesos and below	16	76.2
10,001 to 20,000 pesos	1	4.8
20,001 to 30,000 pesos	2	9.5
30,001 to 40,000 pesos	0	0.0
40,001 to 50,000 pesos	0	0.0
Higher than 50,000 pesos	2	9.5

Table 4.1. Socio-economic and demographic profile of patients (n=21) [continued]

Socio-economic and demographic variables	Number	Percentage
Wealth Index (n=21)		
0	1	4.8
1	1	4.8
2	4	19.0
3	5	23.8
4	6	28.6
5	2	9.5
6	2	9.5
Year Diagnosed (n=21)		
2009	1	4.8
2010	4	19.0
2011	6	28.6
2012	10	47.6

4.1.2 Patients' eating and shopping pattern

4.1.2.1 Changes in diet post-diagnosis

Patients were asked about their eating and shopping pattern. Figure 4.1 shows the proportion of patients who indicated that their diet changed post-diagnosis. Two out of three patients changed their diets mostly through portion control. The rest indicated that they ate more of vegetables and rice corn. Among the patients whose diets have changed after being diagnosed, four out of five still ate the same meal as the family members did (Figure 4.2). The primary reasons given for this were the budgetary constraint and the additional work related to preparing separate meals.

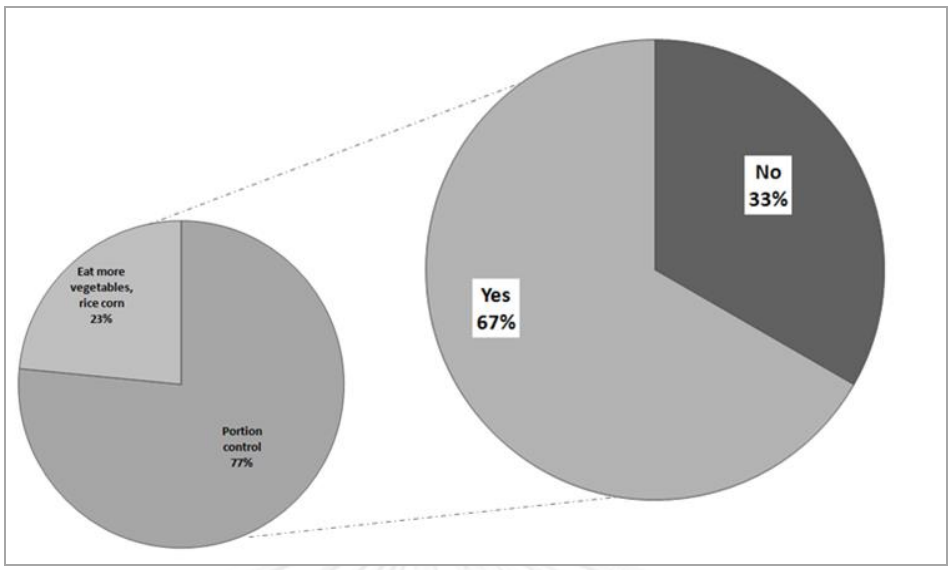


Figure 4.1. Percentage of patients whose diet had been changed after diagnosis

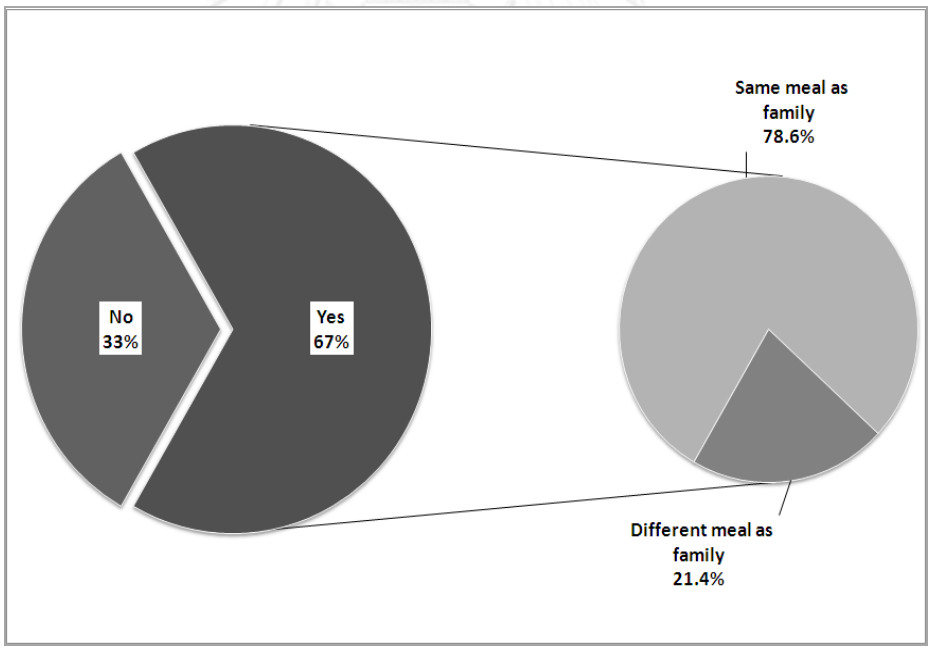


Figure 4.2. Percentage of patients whose diet had been changed after diagnosis and status of meal-sharing with other family members.

When it came to meal planning and preparation, most patients planned and cooked their own meals (Figure 4.3). Other than the patients themselves, it was their spouses who planned and cooked their meals.

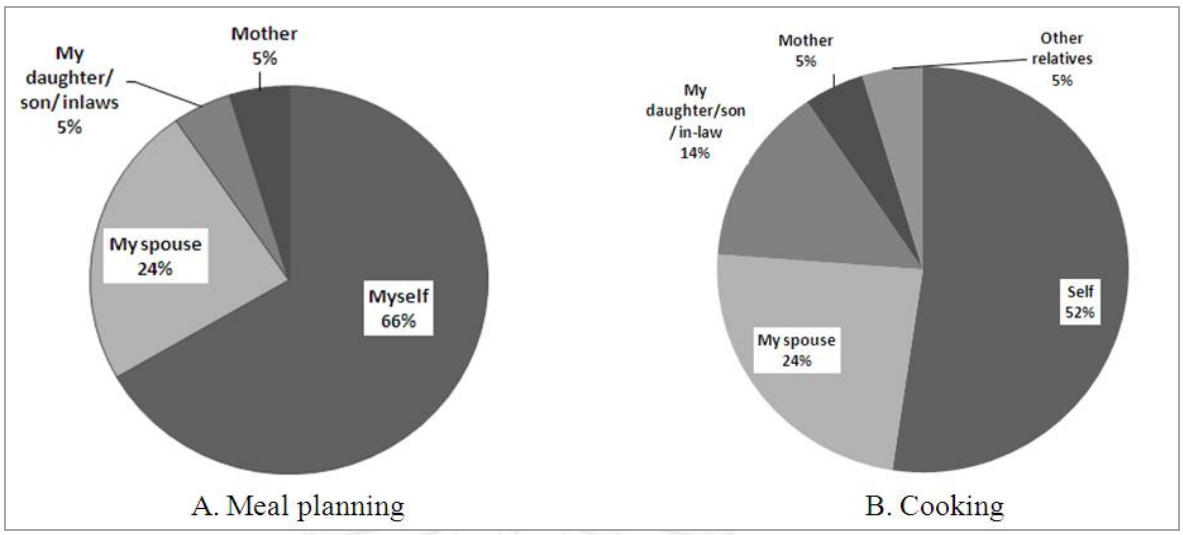


Figure 4.3. Percentage of people involved in meal planning and cooking

4.1.2.2 Frequency of meals and location of meals-taking

All of the patients ate three (3) times a day. Most often, they ate at home (Table 4.2), the reason for which was because meals were clean and cheaper. Although there were not a lot of patients who ate out, the most common reason cited for eating out was that they were familiar with the people in the restaurant. During nutrition counseling, patients were encouraged to eat more frequently thus, they were asked about their snacking habits. Out of four patients, three ate snacks. Almost all of the patients (93.7%) snacked in the mid-afternoon, while 56% took their snacks mid-morning (Table 4.3). When it came to their reasons for snacking at home or not, the commonly cited reason was that they were used to doing this at home. For those who snacked outside the home, they cited the nearness of the place as the reason for doing so.

Table 4.2. Frequency and reasons of patients (n=21) for eating home and outside the home in the past month, by place of eating breakfast, lunch and dinner.

	Place to eat	At home						Outside of home					
	Meals	Breakfast		Lunch		Dinner		Breakfast		Lunch		Dinner	
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
	N	*20*	*95.2*	*17*	*81.0*	*21*	*100.0*	*1*	*4.8*	*4*	*19.0*	*0*	*0.0*
Frequency of eating at home	4	1	5.0	1	5.9	1	4.8						
	5	1	5.0	1	5.9	1	4.8						
	6	0	0.0	0	0.0	0	0.0						
	7	18	90.0	15	88.2	19	90.5						
Reasons for eating at home*	Clean	3	15.0	4	23.5	3	14.3						
	Cost-saving	4	20.0	3	17.6	4	19.0						
	Safe	3	15.0	3	17.6	3	14.3						
	Used to it	4	20.0	3	17.6	4	19.0						
	Comfortable	1	5.0	1	5.9	1	4.8						
	No time	0	0.0	0	0.0	1	4.8						
	No response	5	25.0	3	17.6	5	23.8						
Reasons for eating outside of home**	Good food							0	0.0	0	0.0	0	0.0
	Good service							0	0.0	1	25.0	0	0.0
	Near							0	0.0	0	0.0	0	0.0
	Cheap							1	100.0	0	0.0	0	0.0
	Delicious							0	0.0	0	0.0	0	0.0
	Know somebody							1	100.0	1	25.0	0	0.0
	No response							0	0.0	3	75.0	0	0.0

*Single response

**Multiple responses

Note: Freq stands for Frequency

Table 4.3. Frequency and reasons of patients (n=16) for eating at home and outside the home in the past month, by place of eating snacks.

Patients who ate snacks		Frequency	%
Snacking time **	AM snack	9	56.2
	PM snack	15	93.7
	Midnight snack	3	18.7
Places where patients snacked	At home	10	62.5
	Outside of home	6	37.5
Reasons for snacking at home (n=10)*	Clean	2	12.5
	Safe	1	6.2
	Used to it	5	31.2
	Comfortable	1	6.2
	Near	1	6.2
	No response	6	37.5
Reasons for snacking outside the home (n=6)**	Near	4	66.7
	Delicious	2	33.3
	Cheap	1	16.7
	Good food	0	0
	Good service	0	0
	Know somebody	0	0
	No response	2	33.3

*Single response
**Multiple responses

4.1.2.2 Food shopping patterns

Other than determining when and where patients ate, it was equally important to ascertain the food shopping patterns of the patients. Table 4.4 shows the food shopping patterns of the patients in the past month. Most of the patients bought their food from grocery stores and wet markets. Grocery stores, in this study, have been defined as food retailers with 1 to 2 cash registers. The top 3 commonly cited reasons for shopping were: (1) more accessible, (2) cheaper, and (3) more products sold. In contrast, there were no patients who cited the presence of more DHFO as a reason for shopping in these stores.

Table 4.4. Frequency and percentage of patients' (n=21) food purchasing patterns as well as rank of reasons for food purchase pattern in the past month, by type of food retailer.

Type of food store	Supermarket			Grocery			Sari-sari store			Wet market		
	Freq	%	Rank	Freq	%	Rank	Freq	%	Rank	Freq	%	Rank
Shopped for food in this food store in the past month	7	33.3		14	66.7		6	28.6		13	61.9	
Reasons for shopping in this food store*												
1. More products	5	85.7	1	3	21.4	4	1	15.7	2	5	38.5	3
2. Accessible	5	71.4	2	1	50.0	2	6	100.0	1	11	84.6	1
3. More choices	2	28.6	3	4	28.6	3	0	0.0		5	38.5	3
4. Cheaper	2	28.6	3	10	71.4	1	0	0.0		6	46.2	2
5. Better service	0	0.0		2	14.3	5	0	0.0		0	0.0	
6. More DHFO available	0	0.0		0	0.0		0	0.0		0	0.0	

*Multiple responses
Note: Freq stands for Frequency

Table 4.5. Frequency and percentage of patients' (n=21) cooked food purchasing patterns as well as reasons for cooked food purchases in the past month, by type of food establishment.

Type of food store	Restaurant			Karinderia		
	Freq	%	Rank	Freq	%	Rank
Shopped for food in this food store in the past month	3	14.3		8	38.1	
Reasons for eating/ buying food in this food store*						
1. Delicious	3	100.0	1	6	75.0	1
2. Fast	2	66.7	2	1	12.5	4
3. Convenient	0	0.0		2	25	2
4. Affordable	0	0.0		2	25	2
5. Serve diabetic healthy food options	0	0.0		0	0.0	
6. Clean	0	0.0		0	0.0	

*Multiple responses
Note: Freq stands for Frequency

As for cooked food, patients ate or bought cooked food from two types of food stores: restaurants and *karinderia*s (or "*turo-turo*"). The most common cited reasons for this were that the food was delicious and service was fast in these places (Table 4.5).

4.1.2.3 DHFO availability at home

Table 4.6 shows the DHFO availability in the patients' households. The most available food options were white rice, bananas and fish while the least available were coconut oil and low-fat or non-fat milk. When it came to coconut oil,

patients were unaware if the oil that they bought was coconut oil or not. This was because the oil that they bought was often re-packed and unlabeled.

Table 4.6. Availability of DHFOs in the households at the time of the survey

DHFO	Present at home		Not present at home		Total	
	Freq	%	Freq	%	Freq	%
White rice	21	100.0	0	0.0	21	100.0
Bananas	21	100.0	0	0.0	21	100.0
Fish (round scad, small tuna)	21	100.0	0	0.0	21	100.0
Vegetables (Morning glory, moringa, sweet potato tops, taro tops)	19	90.5	2	9.5	19	90.5
Brown sugar	18	85.7	3	14.3	18	85.7
Eggs	16	76.2	5	23.8	16	76.2
Saltine crackers	15	71.4	6	28.6	15	71.4
Monggo	10	47.6	11	52.4	11	52.4
Pure black coffee	5	23.8	16	76.2	16	76.2
Coconut oil	2	9.5	19	90.5	19	90.5
Low-fat/Non-fat milk	0	0.0	21	100.0	21	100.0
Total	21	100	21	100	21	100

Note: Freq stands for Frequency

Patients were asked about the places where they bought the DHFO that were present in their homes. The results are tabulated in Table 4.7. White rice was often bought from the wet market. Fresh DHFOs like fish, bananas and vegetables were often bought from the wet market though some patients grew their own vegetables. When it came to products with a longer shelf-life, these were bought from grocery stores. Interestingly, products that could be bought by piece (eggs and saltine crackers) were purchased from *sari-sari* stores. These items were often bought as needed and can only be bought from small or *sari-sari* stores.

Table 4.7. Frequency of places where patients purchased the DHFOs in their homes at the time of the survey

DHFOs	Place purchased								
	Super-market	Grocery	Sari-sari store	Wet market	Mobile vendor	Own backyard	Family/ neighbors	Others (i.e. specialty store)	Total
White Rice	0	1	5	11	0	0	0	4	21
Fish (round scad, small tuna)	1	0	0	17	2	0	1	0	21
Bananas	0	0	1	17	0	2	1	0	21
Vegetables (Morning glory, moringa, sweet potato tops, taro tops)	0	0	1	7	0	11	0	0	19
Brown sugar	4	8	5	1	0	0	0	0	18
Eggs	2	4	7	3	0	0	0	0	16
Saltine crackers	4	3	8	0	0	0	0	0	15
Monggo	0	1	2	0	0	0	0	7	10
Pure black offee	0	3	1	1	0	0	0	0	5
Coconut oil	0	1	0	1	0	0	0	0	2
Low-fat/ Non-fat milk	0	0	0	0	0	0	0	0	0

Regarding the reason for not purchasing the DHFOs, the most common reason was driven by personal preferences, specifically because they did not like to eat it (Table 4.8). Ranking second was the lack of awareness. This was especially true in foods like low-fat/ non-fat milk and coconut oil.

Table 4.8. Frequency of reasons given by patients for non-purchase of DHFOs

DHFOs	Reason for non-purchase					
	Not personal preference	Expen-sive	Not aware	Brand preference	No response	Total
Low-fat/Non-fat milk	13	3	4	1	0	21
Coconut oil	5	1	9	4	0	19
Pure black coffee	13	0	0	0	3	16
Monggo	11	0	0	0	0	11
Crackers	2	0	0	3	1	6
Eggs	4	1	0	0	0	5
Brown sugar	2	0	0	1	0	3
Vegetables	2	0	0	0	0	2
White rice	0	0	0	0	0	0
Fish	0	0	0	0	0	0
Bananas	0	0	0	0	0	0

4.1.3 Nutritional assessment of the patients

Seven-day food records were collected from patients participating in Phase 1 of the study and were validated by the enumerators during data collection. All food and beverage intakes of each patient were then encoded and analyzed to determine the average daily energy, carbohydrate-protein-fat (CPF) and selected micronutrient intake, diet quality and dietary compliance.

4.1.3.1 Energy, CPF and micronutrient intakes of the patients

Table 4.9 shows the amount of energy, CPF and micronutrient intakes per day of the patients. The median daily energy intake of the patients was 1,118.0 kcal/day which was lower than the average prescribed energy intake of 1,776.2 kcal/day. Median CPF intake was 183.0 grams/day of carbohydrate, 41.8 grams/day of protein and 23.4 grams/day of fat. These were also below the average prescribed levels of 243.6 grams/day of carbohydrate, 87.6 grams/days of protein and 49.8 grams of fat.

Table 4.9. Quantity of daily energy and CPF intake consumed by the patients. (n=21)

Total intake	Median	Inter-quartile range (IQR)	Minimum intake	Maximum intake
Energy intake (kcal/day)	1,188.0	710.0	819.0	2,528.0
Carbohydrate intake (g/day)	183.0	62.0	117.0	297.0
Protein intake (g/day)	41.8	33.0	27.0	94.0
Fat intake (g/day)	23.4	14.0	9.0	81.0

The distribution of the daily energy and CPF intake was not normally distributed. Given the IQR values, the daily energy and CPF intake of 50% of the patients tended to be concentrated below and around the average prescribed values for energy and CPF suggesting that the patients had a tendency to under-consume.

The percentage of total energy from carbohydrate was 67.6% (±19.3), 14.2% (±2.9%) from protein and 18.2% (±7.6%) from fat (Table 4.10). This is substantially different from the prescribed carbohydrate:protein:fat ratio (55:20:25) used by the city nutritionists to compute for the dietary prescription of patients. The proportion of total energy from protein and fat tended to be low, while that from carbohydrate tended to be concentrated above the prescribed ratio for carbohydrate.

Table 4.10. Percentage of energy from macronutrients, carbohydrate (C), protein (P) and fat (F) per day (n=21)

Variable	Mean	Standard deviation	Minimum value	Maximum value
Energy from carbohydrate (%)	67.6	19.3	31.0	91.0
Energy from protein (%)	14.2	2.9	11.0	23.0
Energy from fat (%)	18.2	7.6	6.0	35.0

4.1.3.2 Micronutrient intake of the patients

When it came to the micronutrient intake, their daily intake was compared to the daily Recommended Energy and Nutrient Intake (RENI) values which are age- and sex-specific recommendations for daily energy, CPF and micronutrient intake for the general population. Table 4.11 shows the non-parametric statistics for the % RENI met for Vitamin C, Calcium and Iron. The values for % RENI for Vitamin C met was concentrated around the 70% mark. On the other hand, the % RENI for calcium and iron met was concentrated below the 50% of the recommended values.

Table 4.11. Percentage RENI met for selected micronutrients (n=21)

Micronutrient	Median	IQR	Minimum intake	Maximum intake
Vitamin C (% RENI)	70.2%	38.0%	20.0%	164.0%
Calcium (% RENI)	41.9%	30.0%	21.0%	147.0%
Iron (% RENI)	25.4%	21.0%	16.0%	76.0%

4.1.4 Patients' Dietary compliance

Dietary compliance was defined as the number of days the patient met his/her dietary compliance range within the 7-day recording period. A patient was considered "compliant" when his/her daily energy and CPF intake fell within the compliance range (total energy requirement ± 100 kcal; macronutrient prescription ± 10 grams).

Three out of five of patients did not meet their energy compliance range on any day of the week (Table 4.12) while only one patient was able to meet the compliance range in 3 out of 7 days. With regards to CPF compliance (Table 4.13), none of the intake of the diabetic patients fell within the CPF compliance range. However, if the macronutrients were analyzed separately, more patients were able to meet their carbohydrate compliance range at least once a week compared to that of protein and fat.

Table 4.12. Frequency and percentage of patients (n=21) whose energy intake fell within their energy compliance range, by the number of days compliant

Number of days	Frequency	%
0	14	66.7
1	4	19.0
2	2	9.5
3	1	4.8
Total	21	100.0

Table 4.13. Number of patients (n=21) whose CPF intake fell within their carbohydrate, protein, fat and CPF compliance range, by number of days

Macronutrient	Number of days		
	None	1 day	2 days
Carbohydrate	15	5	1
Protein	0	0	0
Fat	0	1	0
Carbohydrate-Protein-Fat	21	0	0

A sensitivity analysis was done to assess the level of compliance of the patients using a narrower compliance standard. Intake that fell within ±5 grams of the carbohydrate, protein and fat prescription and energy intake within ±50 kcal of the total energy requirement were considered compliant. Using this standard, only 7 patients (33.3%) were considered to be compliant with their energy recommendation while no patient was compliant with their CPF prescription using this standard (Table 4.14) which was not different when a broader range was used.

Table 4.14. Frequency and percentage of patients (n=21) whose energy and CPF intake fell within the narrower compliance range, by number of days compliant

# of days compliant		Frequency	%
Energy	0	14	66.7
	1	6	28.6
	2	1	4.8
CPF	0	21	100.0

4.1.5 Patients' Modified DQI-I scores

The total number of points that can be obtained from the modified DQI-I is 78. When the average modified DQI-I scores of the patients was computed, a value of 35 (±4.26) (Table 4.15) where most were concentrated below the halfway mark (39 out of 78 points). Looking at the score distribution among the different subcomponents, patients scored the highest in the variety sub-component [mean (SD) = 15(±1.8)] and lowest in the balance sub-component [mean (SD) = 0.29(±0.4)]. This was largely due to the low scores in the adequacy sub-component since the majority of the patients had less than adequate levels (<100% of RENI) of selected micronutrients. When the modified DQI-I scores were transformed to 4 diet quality categories, the diet quality of the patients was categorized to be poor (Figure 4.6).

Table 4.15. Modified DQI-I scores of patients (n=21)

Variable	Total score	Mean	Standard Deviation	Percentiles		
				25th	50th	75th
Mod DQI-I score	78	34.93	4.26	31.86	35.71	37.71
Sub-components						
1. Variety	20	15.38	1.77	14.14	15.29	16.43
2. Adequacy	40	12.18	2.37	11.07	12.14	13.57
3. Moderation	12	7.08	2.57	4.93	6.86	9.21
4. Balance	6	0.29	0.39	0.00	0.00	0.57

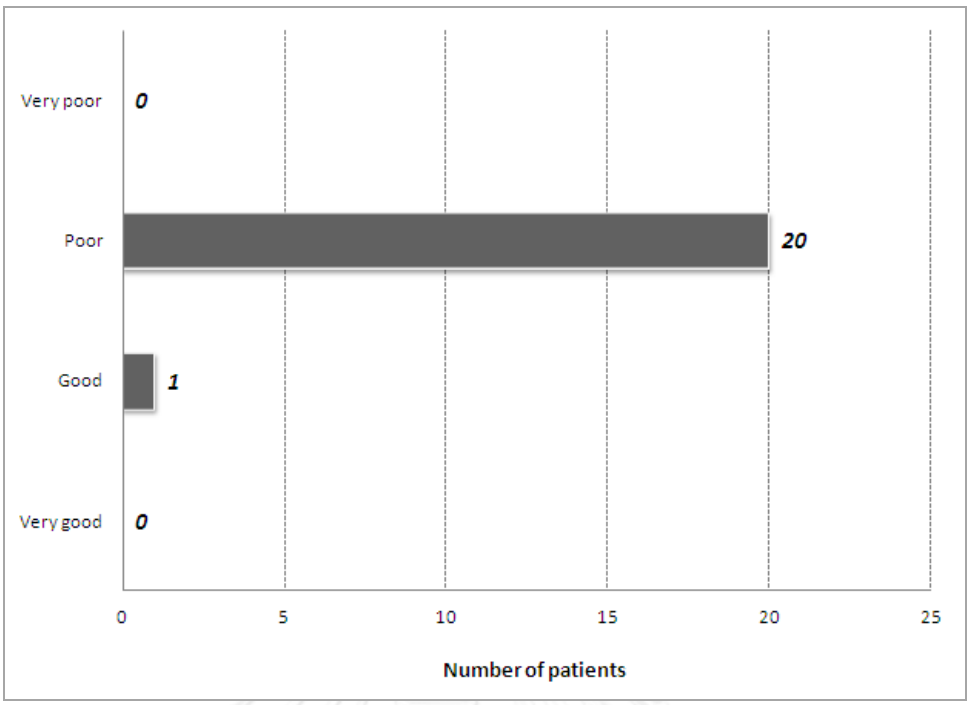


Figure 4.6. Number of patients (n=21) distributed by 4 diet quality categories

A sensitivity analysis was done wherein the cut-off points were modified. The cut-off points of some of the sub-categories were adjusted to Philippine standards while the cut-off for the proportion of selected micronutrients to RENI was adjusted to 80% from 100%. This cut-off for % adequacy was recommended by Pedro, Candelaria, Velasco, & Barba (2004) and was included in 2008 NNS analysis. The adjusted cut-off for the proportion of energy from protein and fat were 20% and 25%, respectively. This is part of the FNRI recommendations for protein and fat.

The sensitivity analysis shows that the adequacy scores adjusted down while the moderation scores adjusted up (Table 4.16). However, there were no changes observed in the over-all scores.

Table 4.16. The sensitivity analysis on the modified DQI-I scores of patients (n=21)

Variable	Total score	Mean	Standard Deviation	Percentiles		
				25%	50%	75%
Mod DQI-I score	78	34.84	4.15	31.86	35.71	37.71
Sub-components						
1. Variety	20	15.38	1.77	14.14	15.29	16.43
2. Adequacy	40	9.52	2.63	8.21	9.29	11.43
3. Moderation	12	7.65	2.36	5.79	7.29	9.86
4. Balance	6	0.29	0.39	0.00	0.00	0.57

4.1.6 Food environment

4.1.6.1 Food store availability

According to the 2007 census estimates, the total population of the study areas was 164,616 spread over 28.26 square kilometers. Figure 4.7 illustrates the population density of the study areas where the darker colored *barangay*s have wider land areas. The varying concentrations of the light-colored dots represent the population density of these *barangay*s. Talomo Proper, Matina Crossing and Matina Aplaya, were the densest as well as the highly urbanized *barangay*s located in the northern half of the study area. These areas were also traversed by a network of national highways (heavy broken line). The largest *barangay*, Talomo Proper, was also one of the densest *barangay*s. In contrast, the second largest *barangay* in terms of land area, Matina Pangi, was the least dense *barangay*s. Geographically, it was the farthest from the city center and the national highway.

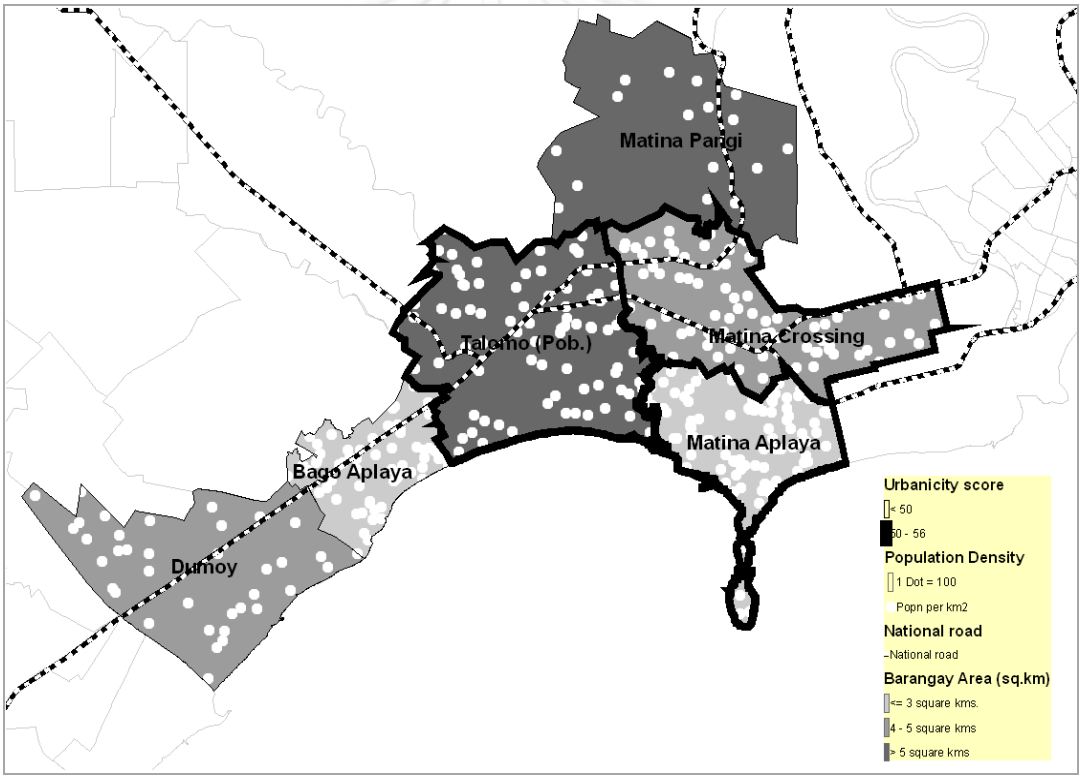


Figure 4.7. Land area (in km^2) and Population density (population per km^2) of the study areas. Data from the National Statistics Office, Philippines, 2007.

A total of 2,315 food stores participated in the study (Table 4.17). The food environment survey only included the food stores that were open during the time the survey was conducted in the area.

Table 4.17. Frequency and percentage of food stores by type of food stores

FOOD STORE TYPE (n=2,315)	Frequency	%
Food retailers	**1,820**	**78.6**
Sari-sari store (no cash register)	1791	98.4
Grocery (1-2 cash register)	18	1.0
Supermarket (more than 2 cash register)	2	0.1
Mobile vendor	9	0.5
Food establishments	**495**	**21.4**
Fast food, karinderia, turo-turo	253	51.1
Food cart, kiosk, stall	222	44.8
Restaurant	10	2.0
Mobile vendor	10	2.0
TOTAL	**2,315**	**100.0**

Four out of five stores surveyed were food retailers or food stores that sold dry or processed goods. Almost all food retailers surveyed were *sari-sari* stores that were usually small and family-owned. Grocery stores and supermarkets comprised only a small proportion of food retailers in the community. The least available food retailer within the study area was supermarkets that accounted for only 0.1% of all food retailers.

Nine out of ten participating food establishments were small-scale food stores. The fast-food/ *karinderia*/ *turo-turo* stores were defined as food establishments that have a small eating area and offered pre-cooked dishes. Although food carts/ kiosks/stalls also offer pre-cooked dishes, these did not have a distinct eating area. The least available food establishments were restaurants and mobile vendors.

There were 407 food stores that refused to participate in the food environment survey (Table 4.16). The frequency of refusals was uneven across the different *barangay*s. Based in enumerators' feedback, more food stores refused to participate in more urbanized barangays as well as in subdivisions. This was attributed to several factors some of which distrust (unknown person) and "fear" of being monitored by the city. Interestingly, it was in the *barangay*s where the BHWs and/or purok leaders joined the enumerators where there was less frequency of refusals.

Table 4.16. Number of refusals to participate in food environment survey by *barangay*

Name of *barangay*	Number of refusals
Dumoy	44
Bago Aplaya	47
Talomo Proper	123
Matina Crossing	96
Matina Aplaya	76
Matina Pangi	21
Total	**407**

Table 4.17 shows distribution of food stores across the six *barangay*s. The distribution of food stores followed that of population size wherein the more populous the *barangay* is, the more food stores can be found. Food retailers, specifically *sari-sari* stores, were the most common food stores that can be found in the community. This observation was consistent across the 6 *barangay*s. The supermarkets in the study area were located in only one *barangay*, Matina Crossing. A grocery store, which is a smaller-sized food retailer, was more available compared to the supermarkets.

Related to food establishments, smaller-sized stores such as *karinderia*s and food carts were more commonly found across the different *barangay*s. Compared to other *barangay*s, more of these food establishments were found in Matina Crossing due to the presence of malls. Additionally, restaurants also were concentrated in this *barangay*.

Table 4.17. Frequency and percentage of food stores by type of food store by *barangay*

Type of food store (n= 2,315)	Talomo Proper		Matina Crossing		Matina Aplaya		Dumoy		Bago Aplaya		Matina Pangi	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Barangay population	*53,212*		*36,642*		*31,641*		*19,389*		*13,532*		*10,200*	
Food retailers	**665**	**100.0**	**427**	**100.0**	**241**	**100.0**	**233**	**100.0**	**150**	**100.0**	**104**	**100.0**
Sari-sari store (no cash register)	654	98.3	420	98.4	236	97.9	230	98.7	147	98.0	104	100.0
Grocery (1-2 cash register)	6	0.9	3	0.7	4	1.7	2	0.9	3	2.0	0	0.0
Supermarket (> 2 cash register)	0	0.0	2	0.5	0	0.0	0	0.0	0	0.0	0	0.0
Mobile vendor	5	0.8	2	0.5	1	0.4	1	0.4	0	0.0	0	0.0
Food establishment	**145**	**100.0**	**237**	**100.0**	**59**	**100.0**	**22**	**100.0**	**24**	**100.0**	**8**	**100.0**
Fast food, karinderia, turo-turo	88	60.7	104	43.9	35	59.3	12	54.5	10	41.7	4	50.0
Food cart, kiosk, stall	54	37.2	122	51.5	21	35.6	9	40.9	12	50.0	4	50.0
Mobile vendor	3	2.1	1	0.4	3	5.1	1	4.5	2	8.3	0	0.0
Restaurant	0	0.0	10	4.2	0	0.0	0	0.0	0	0.0	0	0.0

Note: Freq stands for Frequency

Figures 4.8 and 4.9 show the geo-location of the food stores by classification. The concentration of food stores was found on the side where residential areas were located. This was evident particularly in the least populous *barangay*s. In Matina Pangi (Figure 4.9), the food store locations were located away from the national highway that bisects the *barangay* primarily because there was little real estate activity near the highway. In contrast, food store locations in Dumoy and Bago Aplaya (Figure 4.8) were largely concentrated on one side of the road where more residential activity was present.

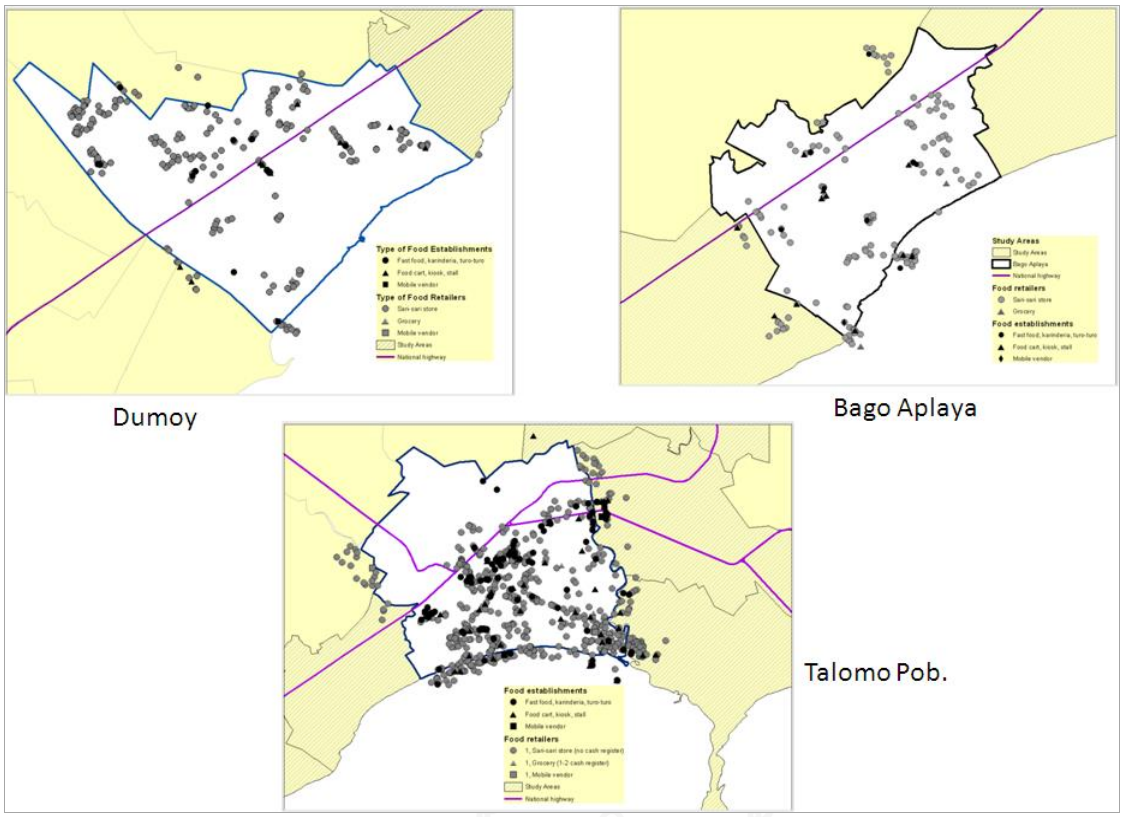


Figure 4.8. Barangay maps showing the location of food stores by category in Talomo South district

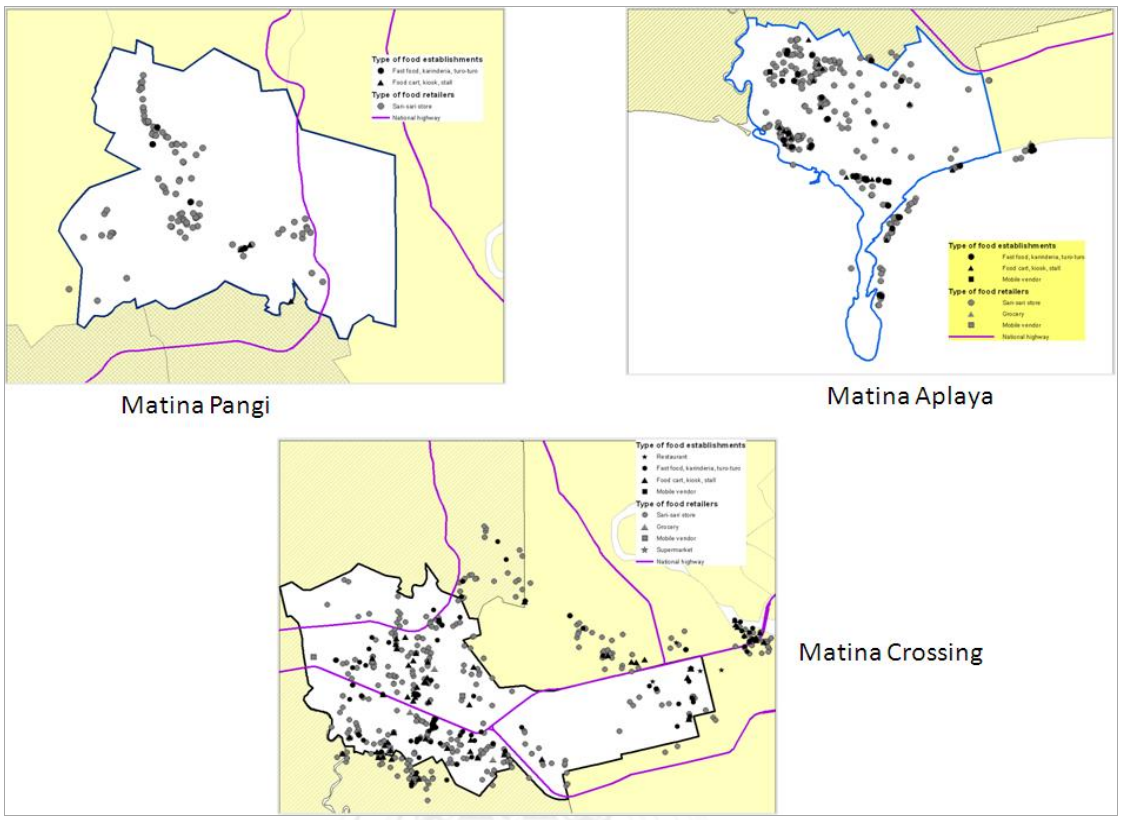


Figure 4.9. Barangay maps showing the location of food stores by category

in Talomo North District

In Talomo Poblacion, Matina Aplaya and Matina Crossing, the geographic distribution of the food stores tended to be concentrated along the national highway and along the coast line. However, there were some food stores located outside the geographic border as rendered in the maps of Matina Crossing and Talomo Poblacion as a result of administrative boundary disputes in the case Talomo Poblacion and division of economic jurisdiction over these stores in the case of Matina Crossing.

The geo-location of patients and food stores were plotted (Figures 4.10 and 4.11). A 300-meter and 500-meter buffer zone was created around their locations to determine the level of food store availability to patients.

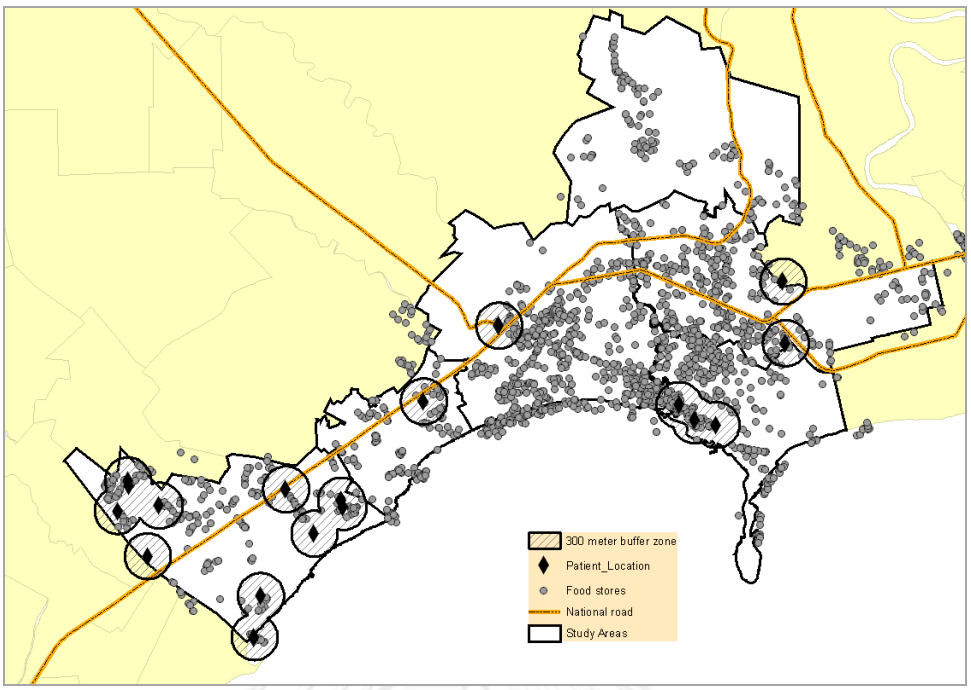


Figure 4.10. Patient locations and a 300-meter radius around their location

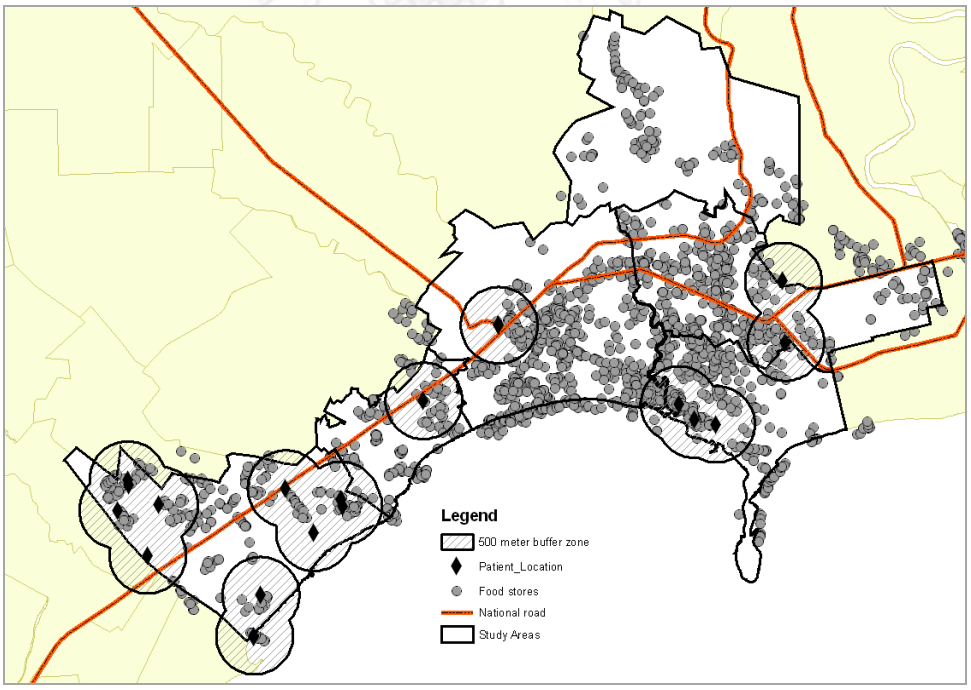


Figure 4.11. Patient locations and a 500-meter radius around their location

Tables 4.20 and 4.21 show the number of food stores that are located within 300 and 500 meters of patients' residence. Food retailers were found to be the most available food store within close proximity to the patient's residence.

Four out five food stores within a 300-meter and 500-meter radius were food retailers of which almost all were of the *sari-sari* store type.

Table 4.20. Number of food stores located within 300 meters of patients' residence, by type of food store

	within 300 meters	
	Frequency	%
Food stores	**431**	**100.0**
Food retailer	**386**	**89.6**
Mobile vendor	1	0.3
Sari-sari store	380	98.4
Grocery	5	1.3
Food establishment	**44**	**10.4**
Mobile vendor	1	2.3
Karinderia	21	47.7
Food cart	22	50.0

Table 4.21. Frequency and percentage of food stores located within 500 meters of patients' residence, by type of food store (n=674)

	within 500 meters	
	Frequency	%
Food stores	**674**	**100.0**
Food retailer	**581**	**86.2**
Mobile vendor	4	0.7
Sari-sari store	570	98.1
Grocery	7	1.2
Food establishment	**92**	**13.6**
Mobile vendor	4	4.3
Karinderia	48	52.2
Food cart	40	43.5

4.1.6.2 Food store density

Two density measures, the geographic store density and the population store density, were used for this study. These were computed to provide a more complete picture of the availability and distribution of food stores in the *barangay* level. If each was used alone, a geographic store density estimate would not capture the people and settlement elements within a specific geographic space, while a population store density estimate would not adequately portray the spread within that geographic space.

Computing for the density estimates, there were 81.9 food stores per square kilometer in the study area and 14.1 food stores per 1,000 population based on the number of smaller food stores located within the study area. In Table 4.22, small food stores such as *sari-sari* stores, *karinderia*s and fast-food were more densely located within a 1-square kilometer radius compared to the bigger stores (supermarkets and restaurants). The same pattern was observed for the population store density. There were 10 times more *sari-sari* stores per 1,000 people compared to the number of groceries and supermarkets combined. For mobile vendors and restaurants however, the population density was almost negligible compared to those of smaller food establishments (*karinderia*s and food carts). This pattern was consistent when estimated across the other different *barangay*s.

*Barangay*s with a bigger population had a relatively higher geographic store density (Table 4.23). These *barangay*s, like Matina Crossing and Matina Aplaya, which did not have a large land area, were more densely populated compared to the other *barangay*s. However, this pattern was not consistent when the population store density for these barangays were determined. For example, in Matina Aplaya, which had a high population count concentrated within a small land area (3.16 km^2), one would expect that the population store density would be also higher. However, of the 6 barangays, it had lowest population store density. Matina Crossing, on the other hand, had a high population count spread over a small land area with comparatively high geographic and population store densities. In Bago Aplaya, the geographic store density was close to those of larger barangays despite being the least populated barangay.

Table 4.22. Geographic and Population food store density by type of food store

FOOD STORE TYPE	Number of food stores	Geographic store density*	Population store density**
Food retailers	**1,820**	**64.4**	**11.1**
Sari-sari store (no cash register)	1,791	63.4	10.9
Grocery (1-2 cash register)	18	0.6	0.1
Supermarket (< 2 cash register)	2	0.1	0.0
Mobile vendor	9	0.3	0.1
Food establishments	**495**	**17.5**	**3.0**
Fast food, *karinderia*, *turo-turo*	253	9.0	1.5
Food cart, kiosk, stall	222	7.9	1.4
Restaurant	10	0.4	0.1
Mobile vendor	10	0.4	0.1
Total	**2,325**	**81.9**	**14.10**

*Geographic store density: Number of food stores by km^2

**Population store density: Number of food stores by 1,000 population

Table 4.23. Geographic and Population food store density by barangay by type of food store

Barangay	Land Area (Km^2)^	Population^	Number of food stores	Geographic Density*			Population Density**		
				Food stores	Food retailers	Food establishments	Food stores	Food retailers	Food establishments
Talomo Proper	6.50	53,212	809	124.5	102.2	22.3	15.2	12.5	2.7
Matina Crossing	4.92	36,642	665	135.2	86.8	48.4	18.1	11.7	6.5
Matina Aplaya	3.16	31,641	300	95.1	76.4	18.7	9.5	7.6	1.9
Dumoy	5.31	19,389	252	47.5	43.5	4.0	13.0	11.9	1.1
Bago Aplaya	2.20	13,532	177	80.4	69.0	11.4	13.1	11.2	1.9
Matina Pangi	6.18	10,200	112	18.1	17.0	1.1	11.0	10.3	0.7
Total	**28.26**	**164,616**	**2,315**	**81.9**	**64.4**	**17.5**	**14.1**	**11.1**	**3.0**

^Source of data: National Statistics Office, 2007

*Geographic store density: Number of food stores by km^2

**Population store density: Number of food stores by 1,000 population

4.1.6.2 In-store availability

Pure black coffee, brown sugar, eggs and bread were the most available DHFO across the different types of food retailers (Table 4.24). On the other hand, the least available were vegetables, meat and low-fat/ non-fat milk. When looking at the availability across the different types of food retailers, all DHFOs were available in the supermarkets.

Among food establishments, the most available dishes were chicken, vegetable and pork dishes (Table 4.25). Except for the vegetable dishes, there was the possibility that these dishes may or may not be healthy without properly assessing their nutritious values. Negative responses were elicited from food establishment owners when asked whether they served low-fat, low-salt alternatives.

Table 4.24. Frequency and percentage of food retailers who sold DHFOs, by type of food retailer

DHFOs	Frequency (%)				
	Sari-sari store (n=1,791)	Grocery (n=18)	Supermarket (n=2)	Mobile vendor (n=9)	Total (N=1,820)
Pure black coffee	1,556 (86.9)	15 (83.3)	2 (100.0)	2 (22.2)	1,575 (86.5)
Brown sugar	1,525 (85.1)	18 (100.0)	2 (100.0)	1 (11.1)	1,546 (84.9)
Eggs	1,519 (84.8)	17 (94.4)	2 (100.0)	2 (22.2)	1,540 (84.6)
Bread, saltine crackers	1,506 (84.1)	18 (100.0)	2 (100.0)	4 (44.4)	1,530 (84.1)
Coconut Oil	1,040 (58.1)	13 (72.2)	2 (100.0)	1 (11.1)	1,056 (58)
Mongo/ mung bean	751 (41.9)	7 (38.9)	2 (100.0)	1 (11.1)	761 (41.8)
White rice, rice corn, sweet potatos	676 (37.7)	14 (77.8)	2 (100.0)	0 (0.0)	692 (38.0)
Fruits (papaya, banana, pineapple)	241 (13.5)	0 (0.0)	2 (100.0)	2 (22.2)	245 (13.5)
Vegetables (morning glory, moringa, taro tops)	201 (11.2)	1 (5.6)	2 (100.0)	1 (11.1)	205 (11.3)
Meat (lean pork, fish, chicken)	127 (7.1)	0 (0.0)	2 (100.0)	5 (55.6)	134 (7.4)
Low-fat, non-fat Milk	25 (1.4)	9 (50.0)	2 (100.0)	0 (0.0)	36 (2.0)

Table 4.25. Frequency and percentage of food establishments who sold cooked dishes, by type of food establishment

Cooked dishes	Frequency (%)				
	Fast food, karinderia, turo-turo (n=253)	Food cart, kiosk, stall (n=222)	Mobile vendor (n=10)	Restaurant (n=10)	Grand Total (n=495)
Chicken dishes	216 (85.4)	71 (32)	0 (0.0)	10 (100.0)	297 (60.0)
Vegetable dishes	207 (81.8)	67 (30.2)	0 (0.0)	9 (90.0)	283 (57.2)
Pork dishes	202 (79.8)	68 (30.6)	0 (0.0)	10 (100.0)	280 (56.6)
Fish dishes	205 (81)	62 (27.9)	0 (0.0)	9 (90.0)	276 (55.8)
Steamed rice	198 (78.3)	37 (16.7)	0 (0.0)	10 (100.0)	245 (49.5)
Pasta or *pancit* dishes	70 (27.7)	41 (18.5)	0 (0.0)	6 (60.0)	117 (23.6)
Fresh fruits	73 (28.9)	37 (16.7)	2 (20.0)	4 (40.0)	116 (23.4)
Diet/ low sugar drinks	6 (2.4)	19 (8.6)	0 (0.0)	4 (40.0)	29 (5.9)
Low Fat alternatives	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Low salt alternatives	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

4.1.7 Willingness-to-sell and willingness-to-pay

In patient households where some DHFO were not available, patients were not willing to purchase these products. Their reasons for doing so are contained in Table 4.8. Food retailers who were not selling some DHFO were asked whether they were willing to sell these products in the future. Table 4.26 shows their willingness-to-sell responses of these food stores.

Majority of the food retailers across the 6 barangays were willing to sell white rice, monggo, eggs, coconut oil and saltine crackers. Most of them were also willing to sell these at prices higher than the prevailing average retail price (Table 4.27).

However, food retailers were not willing to sell fish, vegetables, bananas and low-fat/non-fat milk. This was consistent across all barangays. The most common reason behind this was that they were not interested or they did not prefer to sell it (Table 4.28). They said that it was difficult to sell them because they were perishable. It would also require more work and additional manpower to buy it fresh from the market. For the low-fat/ non-fat milk, there were 3 out of 4 who were unwilling to sell because of the weak saleability of the product.

Table 4.26. Number and percentage of food retailers willing to sell DHFOs by *barangay*

DHFOs	Willingness to sell	Bago Aplaya		Dumoy		Matina Aplaya		Matina Crossing		Matina Pangi		Talomo Proper		Total	
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
White rice	Yes	42	45.7	71	51.8	83	58.5	111	41.7	41	65.1	162	37.9	510	45.3
	No	23	25.0	51	37.2	49	34.5	149	56.0	18	28.6	248	58.1	538	47.7
	No response	27	29.4	15	11.0	10	7.0	6	2.3	4	6.4	17	4.0	79	7.0
Fish (round scad, small tuna)	Yes	29	22.7	54	25.7	41	18.9	41	10.1	29	31.9	87	13.7	281	16.7
	No	90	70.3	148	70.5	151	69.6	362	89.4	58	63.7	520	81.9	1329	78.8
	No response	9	7.0	8	3.8	25	11.5	2	0.5	4	4.4	28	4.4	76	4.5
Monggo/ mung bean	Yes	29	44.6	49	41.5	71	47.7	123	45.7	27	62.8	169	40.8	468	44.2
	No	22	33.9	43	36.4	64	43.0	131	48.7	11	25.6	200	48.3	471	44.5
	No response	14	21.5	26	22.0	14	9.4	15	5.6	5	11.6	45	10.9	119	11.3
Vegetables (Morning glory, moringa, sweet potato tops, taro tops)	Yes	39	28.9	62	30.0	58	27.6	104	26.5	25	28.4	143	24.5	431	26.7
	No	88	65.2	133	64.3	144	68.6	279	71.2	57	64.8	407	69.8	1108	68.6
	No response	8	5.9	12	5.8	8	3.8	9	2.3	6	6.8	33	5.7	76	4.7
Eggs	Yes	7	58.3	12	40.0	16	61.5	25	53.2	6	75.0	77	49.4	143	51.3
	No	1	8.3	12	40.0	6	23.1	19	40.4	1	12.5	61	39.1	100	35.8
	No response	4	33.3	6	20.0	4	15.4	3	6.4	1	12.5	18	11.5	36	12.9
Coconut oil	Yes	25	44.6	27	34.2	50	45.1	95	55.6	26	51.0	132	44.6	355	46.5
	No	16	28.6	44	55.7	53	47.8	63	36.8	22	43.1	136	46.0	334	43.7
	No response	15	26.8	8	10.1	8	7.2	13	7.6	3	5.9	28	9.5	75	9.8

Note: Freq stands for Frequency

Table 4.26. Number and percentage of food retailers willing to sell DHFOs by *barangay* [continued]

DHFOs	Willingness to sell	Bago Aplaya		Dumoy		Matina Aplaya		Matina Crossing		Matina Pangi		Talomo Proper		Total	
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Low fat/ non-fat milk	Yes	36	24.5	62	27.9	73	31.3	94	22.5	25	23.8	142	21.7	432	24.3
	No	108	73.5	156	70.3	157	67.4	319	76.3	78	74.3	483	73.9	1301	73.1
	No response	3	2.0	4	1.8	3	1.3	5	1.2	2	1.9	29	4.4	46	2.6
Pure coffee	Yes	4	10.0	12	6.0	6	10.0	15	21.7	4	100.0	46	14.2	87	12.5
	No	1	0.0	12	0.0	5	0.0	17	0.0	2	0.0	53	0.0	90	0.0
	No response	4	90.0	21	94.0	6	90.0	6	78.3	0	0.0	31	85.9	68	87.6
Brown sugar	Yes	6	10.0	6	6.9	8	18.2	15	14.3	4	12.9	47	9.1	86	10.2
	No	2	0.0	12	0.0	5	0.0	17	0.0	1	0.0	67	0.0	104	0.0
	No response	6	90.0	9	93.1	4	81.8	10	85.7	3	87.1	52	90.9	84	89.8
Bananas	Yes	59	45.4	88	43.8	89	44.3	160	41.7	49	58.3	221	38.4	666	42.3
	No	65	50.0	102	50.8	106	52.7	216	56.3	34	40.5	342	59.5	865	54.9
	No response	6	4.6	11	5.5	6	3.0	8	2.1	1	1.2	12	2.1	44	2.8
Saltine crackers	Yes	10	58.8	15	41.7	18	58.1	25	38.5	11	68.8	38	30.4	117	40.3
	No	1	5.9	14	38.9	6	19.4	28	43.1	3	18.8	61	48.8	113	39.0
	No response	6	35.3	7	19.4	7	22.6	12	18.5	2	12.5	26	20.8	60	20.7

Note: Freq stands for Frequency

Table 4.27. Price levels that food retailers were willing to sell, by DFHOs

DHFOs	Price levels stores were willing to sell	Types of food retailer, Frequency (%)		
		Grocery (1-2 cash register)	Sari-sari store (no cash register)	Total
White rice	*# of stores willing to sell*	*1 (0.0)*	*509 (100.0)*	*510 (100.0)*
	Equal to ARP	0 (0.0)	93 (18.3)	93 (18.6)
	Less than ARP	0 (0.0)	5 (1.0)	5 (1.0)
	More than ARP	1 (100.0)	408 (80.2)	409 (81.6)
	No response	0 (0.0)	3 (0.6)	3 (0.6)
Fish (round scad)	*# of stores willing to sell*	*2 (100.0)*	*279 (100.0)*	*281 (100.0)*
	Equal to ARP	0 (0.0)	86 (30.8)	86 (30.6)
	Less than ARP	1 (50.0)	30 (10.8)	31 (11.0)
	More than ARP	1 (50.0)	156 (55.9)	157 (55.9)
	No response	0 (0.0)	7 (2.5)	7 (2.5)
Monggo/ mung bean	*# of stores willing to sell*	*6 (100.0)*	*462 (100.0)*	*468 (100.0)*
	Equal to ARP	2 (33.3)	99 (21.4)	101 (21.6)
	Less than ARP	2 (33.3)	157 (34.0)	159 (34.0)
	More than ARP	2 (33.3)	199 (43.1)	201 (42.9)
	Repack	0 (0.0)	2 (0.4)	2 (0.4)
	No response	0 (0.0)	5 (1.1)	5 (1.1)
Vegetables (Morning glory, moringa, sweet potato tops, taro tops)	*# of stores willing to sell*	*3 (100.0)*	*428 (100.0)*	*431 (100.0)*
	Equal to ARP	1 (33.3)	129 (30.1)	130 (30.2)
	Less than ARP	1 (33.3)	90 (21.0)	91 (21.1)
	More than ARP	1 (33.3)	209 (48.8)	210 (48.7)

Table 4.27. Price levels that food retailers were willing to sell, by DFHOs [continued]

DFHOs	Price levels stores were willing to sell	Types of food retailer, Frequency (%)		
		Grocery (1-2 cash register)	Sari-sari store (no cash register)	Total
Eggs	*# of stores willing to sell*	*0 (100.0)*	*143 (100.0)*	*143 (100.0)*
	Equal to ARP	0 (0.0)	18 (12.6)	18 (12.6)
	Less than ARP	0 (0.0)	6 (4.2)	6 (4.2)
	More than ARP	0 (0.0)	118 (82.5)	118 (82.5)
	No response	0 (0.0)	1 (0.7)	1 (0.7)
Coconut oil	*# of stores willing to sell*	*2 (100.0)*	*353 (100.0)*	*355 (100.0)*
	Equal to ARP	0 (0.0)	85 (24.1)	85 (23.9)
	Less than ARP	0 (0.0)	115 (32.6)	115 (32.4)
	More than ARP	2 (100.0)	149 (42.2)	151 (42.5)
	No response	0 (0.0)	4 (1.1)	4 (1.1)
Low-fat/Non-fat milk	*# of stores willing to sell*	*5 (100.0)*	*428 (100.0)*	*433 (100.0)*
	Equal to ARP	0 (0.0)	117 (27.3)	117 (27.0)
	Less than ARP	0 (0.0)	21 (4.9)	21 (4.8)
	More than ARP	5 (100.0)	290 (67.8)	295 (68.1)
Black coffee	*# of stores willing to sell*	*0 (100.0)*	*87 (100.0)*	*87 (100.0)*
	Equal to ARP	0 (0.0)	29 (33.3)	29 (33.3)
	Less than ARP	0 (0.0)	15 (17.2)	15 (17.2)
	More than ARP	0 (0.0)	43 (49.4)	43 (49.4)

Table 4.27. Price levels that food retailers were willing to sell, by DFHOs [continued]

DFHOs	Price levels stores were willing to sell	Types of food retailer, Frequency (%)		
		Grocery (1-2 cash register)	Sari-sari store (no cash register)	Total
Brown sugar	*# of stores willing to sell*	*0 (100.0)*	*87 (100.0)*	*87 (100.0)*
	Equal to ARP	0 (0.0)	19 (21.8)	19 (21.8)
	Less than ARP	0 (0.0)	16 (18.4)	16 (18.4)
	More than ARP	0 (0.0)	51 (58.6)	51 (58.6)
Bananas	*# of stores willing to sell*	*4 (100.0)*	*662 (100.0)*	*666 (100.0)*
	Equal to ARP	1 (25.0)	200 (30.2)	201 (30.2)
	Less than ARP	1 (25.0)	114 (17.2)	115 (17.3)
	More than ARP	2 (50.0)	348 (52.6)	350 (52.6)
	Php10.00/kilo (*candaba*)	0 (0.0)	2 (0.3)	2 (0.3)
Saltine crackers	*# of stores willing to sell*	*0 (100.0)*	*117 (100.0)*	*117 (100.0)*
	Equal to ARP	0 (0.0)	28 (23.9)	28 (23.9)
	Less than ARP	0 (0.0)	12 (10.3)	12 (10.3)
	More than ARP	0 (0.0)	77 (65.8)	77 (65.8)

Table 4.28. Reasons for unwillingness to sell by food retailers who were not willing to sell

DHFOs	Reasons*	Types of food retailer, Frequency (%)			
		Grocery (1-2 cash register)	Sari-sari store (no cash register)	Mobile vendor	Total
White rice	*# of stores unwilling to sell*	*1 (100.0)*	*530 (100.0)*	*8 (100.0)*	*539 (100.0)*
	Financial constraints, low profitability	0 (0.0)	304 (57.4)	2 (25.0)	306 (56.8)
	Not interested; personal preference	0 (0.0)	107 (20.2)	2 (25.0)	109 (20.2)
	Competition, weak saleability of product	0 (0.0)	61 (11.5)	1 (12.5)	62 (11.5)
	Limitations in space, need additional permits/ license	1 (100.0)	60 (11.3)	6 (75.0)	63 (11.7)
	Other reasons	0 (0.0)	11 (2.1)	0 (0.0)	11 (2.0)
	No response	0 (0.0)	3 (0.6)	0 (0.0)	3 (0.6)
Fish (round scad)	*# of stores unwilling to sell*	*16 (100.0)*	*1,310 (100.0)*	*4 (100.0)*	*1,330 (100.0)*
	Financial constraints, low profitability	0 (0.0)	263 (20.1)	0 (0.0)	263 (19.8)
	Not interested; personal preference	4 (25.0)	543 (41.5)	0 (0.0)	547 (41.1)
	Competition, weak saleability of product	4 (25.0)	333 (25.4)	2 (50.0)	339 (25.5)
	Limitations in space	7 (43.8)	226 (17.3)	2 (50.0)	235 (17.7)
	Other reasons	1 (6.3)	10 (0.8)	0 (0.0)	11 (0.8)
	No response	0 (0.0)	8 (0.6)	0 (0.0)	8 (0.6)

Note: Freq stands for Frequency

*multiple responses

Table 4.28. Reasons for unwillingness to sell by food retailers who were not willing to sell [continued]

DHFOs	Reasons*	Types of food retailer, Frequency (%)			
		Grocery (1-2 cash register)	Sari-sari store (no cash register)	Mobile vendor	Total
Monggo (mung bean)	*# of stores unwilling to sell*	*4 (100.0)*	*460 (100.0)*	*7 (100.0)*	*471 (100.0)*
	Financial constraints, low profitability	0 (0.0)	102 (22.2)	1 (14.3)	103 (21.9)
	Not interested; personal preference	0 (0.0)	171 (37.2)	0 (0.0)	171 (36.3)
	Competition, weak saleability of product	2 (50.0)	145 (31.5)	2 (28.6)	149 (31.6)
	Limitations in space	1 (25.0)	36 (7.8)	4 (57.1)	41 (8.7)
	Other reasons	1 (25.0)	8 (1.7)	0 (0.0)	9 (1.9)
	No response	0 (0.0)	7 (1.5)	0 (0.0)	0 (0.0)
Vegetables (Morning glory, moringa, sweet potato tops, taro tops)	*# of stores unwilling to sell*	*14 (100.0)*	*1,086 (100.0)*	*8 (100.0)*	*1,108 (100.0)*
	Financial constraints, low profitability	0 (0.0)	67 (6.2)	1 (12.5)	68 (6.1)
	Not interested; personal preference	3 (21.4)	634 (58.4)	1 (12.5)	638 (57.6)
	Competition, weak saleability of product	5 (35.7)	312 (28.7)	2 (25.0)	319 (28.8)
	Limitations in space	6 (42.9)	88 (8.1)	4 (50.0)	98 (8.8)
	Other reasons	1 (7.1)	17 (1.6)	0 (0.0)	18 (1.6)
	No response	0 (0.0)	1 (0.1)	0 (0.0)	0 (0.0)
Eggs	*# of stores unwilling to sell*	*1 (100.0)*	*92 (100.0)*	*7 (100.0)*	*100.0 (100.0)*
	Financial constraints, low profitability	0 (0.0)	26 (28.3)	1 (14.3)	27 (27.0)
	Not interested; personal preference	0 (0.0)	21 (22.8)	0 (0.0)	21 (21.0)
	Competition, weak saleability of product	0 (0.0)	18 (19.6)	2 (28.6)	20 (20.0)
	Limitations in space	1 (100.0)	23 (25.0)	4 (57.1)	28 (28.0)
	Other reasons	0 (0.0)	5 (5.4)	0 (0.0)	5 (5.0)
	No response	0 (0.0)	1 (1.1)	0 (0.0)	0 (0.0)

Note: Freq stands for Frequency

*multiple responses

Table 4.28. Reasons for unwillingness to sell by food retailers who were not willing to sell [continued]

DHFOs	Reasons*	Types of food retailer, Frequency (%)			
		Grocery (1-2 cash register)	Sari-sari store (no cash register)	Mobile vendor	Total
Coconut oil	*# of stores unwilling to sell*	*3 (100.0)*	*323 (100.0)*	*8 (100.0)*	*334 (100.0)*
	Financial constraints, low profitability	0 (0.0)	37 (11.5)	1 (12.5)	38 (11.4)
	Not interested; personal preference	0 (0.0)	71 (22)	0 (0.0)	71 (21.3)
	Competition, weak saleability of product	1 (33.3)	189 (58.5)	2 (25.0)	192 (57.5)
	Limitations in space	0 (0.0)	25 (7.7)	4 (50.0)	29 (8.7)
	Other reasons	2 (66.7)	6 (1.9)	1 (12.5)	9 (2.7)
	No response	0 (0.0)	2 (0.6)	0 (0.0)	2 (0.6)
Low-fat/Non-fat milk	*# of stores unwilling to sell*	*4 (100.0)*	*1,289 (100.0)*	*8 (100.0)*	*1,301 (100.0)*
	Financial constraints, low profitability	1 (25.0)	168 (13)	1 (12.5)	170 (13.1)
	Not interested; personal preference	0 (0.0)	127 (9.9)	1 (12.5)	128 (9.8)
	Competition, weak saleability of product	3 (75.0)	928 (72.0)	3 (37.5)	934 (71.8)
	Limitations in space	0 (0.0)	79 (6.1)	3 (37.5)	82 (6.3)
	Other reasons	0 (0.0)	9 (0.7)	0 (0.0)	9 (0.7)
	No response	0 (0.0)	4 (0.3)	0 (0.0)	4 (0.3)

Note: Freq stands for Frequency

*multiple responses

Table 4.28. Reasons for unwillingness to sell by food retailers who were not willing to sell [continued]

DHFOs	Reasons*	Types of food retailer, Frequency (%)			
		Grocery (1-2 cash register)	Sari-sari store (no cash register)	Mobile vendor	Total
Black coffee	*# of stores unwilling to sell*	*0 (0.0)*	*84 (100.0)*	*6 (100.0)*	*90 (100.0)*
	Financial constraints, low profitability	0 (0.0)	32 (38.1)	1 (16.7)	33 (36.7)
	Not interested; personal preference	0 (0.0)	10 (11.9)	1 (16.7)	11 (12.2)
	Competition, weak saleability of product	0 (0.0)	12 (14.3)	1 (16.7)	13 (14.4)
	Limitations in space	0 (0.0)	26 (31.0)	3 (50.0)	29 (32.2)
	Other reasons	0 (0.0)	3 (3.6)	0 (0.0)	3 (3.3)
	No response	0 (0.0)	1 (1.2)	0 (0.0)	1 (1.1)
Brown sugar	*# of stores unwilling to sell*	*0 (0.0)*	*97 (100.0)*	*7 (100.0)*	*104 (100.0)*
	Financial constraints, low profitability	0 (0.0)	33 (34.0)	1 (14.3)	34 (32.7)
	Not interested; personal preference	0 (0.0)	19 (19.6)	0 (0.0)	19 (18.3)
	Competition, weak saleability of product	0 (0.0)	13 (13.4)	3 (42.9)	16 (15.4)
	Limitations in space	0 (0.0)	30 (30.9)	3 (42.9)	33 (31.7)
	Other reasons	0 (0.0)	2 (2.1)	0 (0.0)	2 (1.9)
	No response	0 (0.0)	2 (2.1)	0 (0.0)	2 (1.9)

Note: Freq stands for Frequency

*multiple responses

Table 4.28. Reasons for unwillingness to sell by food retailers who were not willing to sell [continued]

DHFOs	Reasons*	Types of food retailer, Frequency (%)			
		Grocery (1-2 cash register)	Sari-sari store (no cash register)	Mobile vendor	Total
Bananas	*# of stores unwilling to sell*	*13 (100.0)*	*845 (100.0)*	*7 (100.0)*	*865 (831.7)*
	Financial constraints, low profitability	0 (0.0)	44 (5.2)	0 (0.0)	44 (42.3)
	Not interested; personal preference	2 (15.4)	459 (54.3)	0 (0.0)	461 (443.3)
	Competition, weak saleability of product	5 (38.5)	294 (34.8)	4 (57.1)	303 (291.3)
	Limitations in space	4 (30.8)	57 (6.7)	3 (42.9)	64 (61.5)
	Other reasons	2 (15.4)	11 (1.3)	0 (0.0)	13 (12.5)
	No response	0 (0.0)	1 (0.1)	0 (0.0)	1 (1.0)
Saltine crackers	*# of stores unwilling to sell*	*0 (0.0)*	*108 (100.0)*	*5 (100.0)*	*113 (100.0)*
	Financial constraints, low profitability	0 (0.0)	38 (35.2)	1 (20.0)	39 (34.5)
	Not interested; personal preference	0 (0.0)	34 (31.5)	0 (0.0)	34 (30.1)
	Competition, weak saleability of product	0 (0.0)	13 (12.0)	1 (20.0)	14 (12.4)
	Limitations in space	0 (0.0)	22 (20.4)	3 (60.0)	25 (22.1)
	Other reasons	0 (0.0)	1 (0.9)	0 (0.0)	1 (0.9)

Note: Freq stands for Frequency

*multiple responses

Three out of five food establishments were willing to sell diabetic healthy dishes (Table 4.29). Among these food establishments willing to sell diabetic healthy dishes, 75% (3 out of 4) were willing to sell at prices equal to regular dishes.

Table 4.29. Frequency and percentage of food establishments who were willing to sell diabetic healthy dishes and the prices levels they were willing to sell low-fat/ low salt dishes

	Response	Frequency	%
Willingness to sell (n=323)	Yes	190	58.8
	No	131	40.6
	No response	2	0.6
Price levels stores are willing to sell (n=190)	Equal to the regular dish/ item	138	72.6
	Less than the regular dish/ item	35	18.4
	More than the regular dish/ item	15	7.9
	No response	2	1.0

4.2. Phase 2

This phase of the study sought to present the national and local policies that addressed availability and accessibility of food in general and the diabetic healthy food options covered in the research in particular. A series of key informant interviews were conducted among regional representatives of national agencies, city officials and barangay representatives.

4.2.1 National policies

At the start of each presidency, the administration's priority goals and objectives moving forward were encapsulated in the Philippine Development Plan. Under the Arroyo presidency, the country's development plan was articulated in the Medium Term Development Plan (MTDP) 2004-2011. Under the MTDP 2004, all agriculture-related policies and programs were subsumed under the agribusiness category. This showed the administration's plans for the agricultural sector, which was essentially centered on enterprise building and strengthening the supply chain mechanisms. In the MTDP 2004, there were two agribusiness goals. The first one was to "develop at least 2 million hectares of new land for agribusiness in order to contribute 2 million out of the 10 million jobs targeted as a legacy by 2010" and the other was to ensure the availability of "wage" goods (i.e. rice, sugar, vegetables) and other "non-wage" goods (i.e. corn). Included in the second goal was the need to be self-sufficient and efficient in rice production. When it came to nutrition-related goals, the MTDP 2004 focused on child undernutrition and priority programs focusing on micronutrient supplementation and community-level feeding programs.

When the current Aquino administration assumed power in 2010, the Philippines Development Plan 2011 to 2016 (PDP 2011) was crafted. It outlined the Aquino administration's 10 priority areas. These were as follows:

1. In pursuit of inclusive growth
2. Macroeconomic policy
3. Competitive industry and service sectors
4. Competitive and sustainable agriculture and fisheries sector
5. Accelerating infrastructure development

6. Towards a resilient and inclusive financial sector
7. Good governance and the rule of law
8. Social development
9. Peace and security
10. Conservation, protection and rehabilitation of the environment and natural resources.

The two priority areas that were linked to food accessibility and availability were: (1) the competitiveness of the agro-fishery sector and, (2) the social development initiatives. Under the PDP 2011, the social development initiatives focused on five areas, namely, health, education, housing, social protection and asset reform. As outlined in the strategic framework for health, the goal was to "universalize" health to assure better health outcomes that can be achieved under the Universal Health Care umbrella. In this case, better health outcomes were linked to the achievement of the Millennium Development Goals, not lifestyle-related diseases. Other targets identified under the strategic framework were linked to health insurance and nutrition. Figure 4.12 shows the health targets as outlined in the PDP 2011.

Indicators	Baseline	2011	2012	2013	2014	2015	2016
MDG Indicators							
Prevalence of underweight children under five years of age (in %)	20.6 (2008)	17.6	16.6	15.6	14.6	13.7	12.7
Proportion of households with per capita intake below 100% dietary energy requirement (in %)	66.9 (2008)	54.1	49.9	45.6	41.4	37.1	32.8
Under 5 mortality rate (per 1,000 live births)	34 (2008)	31.6	30.4	29.2	28	26.7	25.5
Infant mortality rate (per 1,000 live births)	25 (2008)	23	22	21	20	19.0	17
Maternal mortality ratio (per 100,000 live births)	95-163 (2010, NSCB)	97	84	70	61	52	50
Contraceptive Prevalence Rate (all methods)	51 (2008)	56.2	57.9	59.7	61.4	63	
Proportion of births attended by a health professional (in %)	62 (2008)	69	72	75	80	85	90
Proportion of births delivered in health facilities (in %)	44 (2008)	69	72	75	80	85	90
HIV Prevalence*	Less than 1% (2009)	<1%	<1%	<1%	<1%	<1%	<1%
Malaria morbidity rate per 100,000	22 (2009)	16.9	14.3	11.8	9.2	6.6	4
Malaria mortality rate	0.03 (2009)	<.03	<.03	<.03	<.03	<.03	<.03
TB prevalence rate per 100,000	486 (2008)	446	434	422	410	398	387
TB mortality rate per 100,000	41 (2007)	36	35	35	34	33	33
TB case detection rate	73 (2008)	79	81	83	84	85	85
TB cure rate	79 (2008)	82	83	83	84	85	85
Proportion of population with access to safe water (households) (in %)	82.3 (FHSIS 2008)	83	84	85	86	86.9	88
Proportion of population with access to sanitary toilet facilities (households) (in %)	76.8 (FHSIS 2008)	79	81	83	84	85.9	88
Population with access to affordable essential drugs (in %)	73 (2009)	75	78	82	84	85	95
Other Indicators							
Population Growth Rate	2.04 (2000-2007)					1.48-1.82	
Total Fertility Rate	3.3 (2008)					2.4-2.96	
Percentage of out of pocket payment from total health care expenditure	54.3 (2007)			41			35
Benefit Delivery Rate (NHIP)	7.7 (2008)			15			30
National Health Insurance Program (NHIP) Coverage	53 (2008)	70	85	100	100	100	100
NHIP Enrollment rate	74 (2010)	85	90	100	100	100	100
Ratio of accredited health facilities to total number of licensed health facilities	90 (2010)	95	95	95	95	95	95
Mortality rate from lifestyle related and non communicable diseases (in %)		2% ann. reduction	2% ann. reduction	2% ann. reduction	2% ann. reduction	2% ann. reduction	2% ann. reduction
Prevalence (in %) of stunted under-five children	32.2 (2008)	28.0	26.6	25.2	23.8	22.3	20.9
Prevalence (in %) of wasted under-five children	7.5 (2008)	6.5	6.2	5.9	5.6	5.2	<5
Prevalence (in %) of thin children 6-10 years old	8.1 (2008)	6.9	6.5	6.1	5.7	5.3	<5
Percent of pregnant women who are nutritionally-at-risk	26.3 (2008)	24.8	24.3	23.9	23.4	22.9	22.4

Sources: DOH, NNC, POPCOM and NSCB
**For the specific annual targets, please refer to the 5th AIDS Medium Term Plan (AMTP). The 5th AMTP goal states that by 2016, the country will maintain the prevalence of less than 66 HIV cases per 100,000 population.*

Figure 4.12. Health, nutrition and population targets identified in the Philippine Development Plan 2011-2016. Adapted from the Philippine Development Plan 2011-2014 by the National Economic Development Agency (NEDA), 2011

The nutrition targets primarily focused on the population groups who were considered to be at-risk such as children and pregnant women. As the PDP 2011 drills down to specific sector policies and strategies, more details were provided on how these targets were to be achieved. Among the 7-point strategies presented, only one was explicitly linked to the agri-fishery sector and related to the supply of food. One sectoral strategy identified was to increase the food supply "through food production programs and development and the maintenance of facilities to allow efficient distribution of food." Although this strategy was specifically identified to address malnutrition in the vulnerable population, this could also be tapped to address diet and nutrition among diabetic patients.

The identified sector strategies in the PDP 2011 were directly linked and translated to more specific strategies and actions of 3 national agencies: the Department of Health, the National Nutrition Council and the Department of Agriculture. The National Objectives for Health 2011-2016 (NOH 2011) outlined the DOH's strategies to compliment the sectoral strategies laid out in the PDP 2011. The NOH 2011 did not explicitly flesh out the PDP strategies. Instead, the DOH presented its strategies according to disease or program. Interestingly, there were no explicit strategies in the NOH 2011 that looked into malnutrition. Hence, the goals and strategies linked to food accessibility and food availability were under lifestyle-related non-communicable diseases.

The NOH 2011 identified the Integrated Non-communicable Lifestyle-related Disease Prevention and Control Program as its centerpiece program to address the prevention and control of lifestyle-related non-communicable diseases. The program had two primary objectives which were: (1) to "*reduce the exposure of population to risks related to lifestyle-related non-communicable diseases*" and (2) to "*increase the proportion of lifestyle-related non-communicable diseases cases given appropriate treatment and care*". These were broken down to 4 strategic objectives, one of which was to reduce risk factors associated with lifestyle-related diseases. Out of the 6 key indicators, only 2 were diet-related, namely, (1) decrease salt intake per day, and (2) increase mean one-day per capita intake of fruits and vegetables. The anticipated increase in fruit and vegetable intake was 400% to 700% of current consumption levels. Strategies that were identified under the NOH 2011 are presented in Figure 4.13. Among the six strategies enumerated, the fifth strategy was the only one that contained specifics explicitly related to diet and nutrition. The reference made to diet and nutrition in the rest of the strategies, including the one related to the Healthy Lifestyle promotion program, was more implicit and vague.

STRATEGIES FOR 2011-2016

- Implement sound, long-term and sustained Healthy Lifestyle promotion programs using community-based approaches, with DOH supplementing local campaigns with regular mass media campaigns and CHED improving medical and paramedical curricula in the area of healthy lifestyle and behavior modification.
  - Promote information, education and advocacy campaigns in the reduction of risk factors, early detection and management, and improvement in the quality of life of people with lifestyle-related diseases.
  - Expand the capacity of primary health care facilities on health promotion, screening, early diagnosis and early management of LRDs.
- Translate and implement provisions of the tobacco laws as local ordinances and develop community infrastructure supportive of healthy lifestyle (sports centers, green parks, smoking cessation clinics, etc.).
- Pursue training of clinicians and other frontline health care providers in health promotion, screening, early diagnosis, treatment, rehabilitation and palliative care.
- Support and implement financial risk protection measures for persons with lifestyle-related diseases by lowering the cost of essential drugs and provision of better social health insurance benefit packages.
- Other strategies:
  - Manage risk behaviors and risk factors by establishing more smoking cessation clinics, finding and treating more patients with rheumatic heart disease, providing more training opportunities for diet counseling and smoking cessation programs, and organizing and counseling for healthful physical activities.
  - Strengthen networking and collaboration among GOs, NGOs and various stakeholders to ensure sharing of technologies, resources and expertise and to maximize efforts towards the prevention and control of lifestyle-related diseases.

Figure 4.13. NOH 2011 strategies for lifestyle-related non-communicable diseases. Adapted from the National Objectives for Health 2011-2016, Department of Health, Philippines, 2011

Another agency that had a major role in the sectoral strategies of the PDP 2011 is the Department of Agriculture. It is the lead agency working on issues related to food supply and the agri-fishery sector. The PDP 2011 identified the competitiveness and sustainability of the agri-fishery sector as one of its priority areas. The PDP's vision of a competitive and sustainable sector was driven by a productive agri-fishery industry and supported by an efficient value chain that moves their products to both domestic and foreign markets. One of the three goals identified under the strategic framework was the improvement in food security and the increase in income. This was where the strategies related to food supply were lodged. The two specific measures related food availability and affordability were identified. These were: (1) to "ensure the availability of food staples (rice, white corn, and other starchy food) at reasonable prices at all times and, (2) the "management of consumption and diversification of staples." Essentially, these measures focused only on food staples like white rice and its substitutes (e.g. white corn, root crops and *saba* banana).

The food security goals identified in the PDP 2011 were fleshed out in the Food Self-Sufficiency Roadmap (FSSR). The PPAN 2011 also alluded to the FSSR in its strategies. The roadmap has identified self-sufficiency in the domestic market of food staples, or when domestic production is able to meet domestic requirements for food, seeds, processing, feeds and adequate buffer stock for these products, as its main goal. The FSSR identified three strategies and the corresponding interventions to achieve this. These strategies were:

1. "Increase and sustain the gains in production through production interventions and enabling mechanisms—specifically by producing more than 21.11 and 22.49 million tons of palay by the end of 2013 and 2016, respectively.

2. Farm mechanization and reduction of post-harvest losses reduction, which accounts for 16.47% of loss in production.
3. Manage consumption by maintaining per capita rice consumption at 120 kg/year."

The Department of Agriculture's Food Self-Sustainability Program (FSSP) is the umbrella program under which the FSSR strategies and interventions would come to fruition. The vision of the FSSP is "Food for All." The program was formulated to strengthen the food production mandate of the DA.

It has 3 major components. The program was put together to: (1) improve all aspects of (white) rice production from seeds to post-harvest processing, (2) enhance the enabling mechanisms for farmers, and (3) manage demand for food staples in order to achieve self-sufficiency by 2013. The first two components were related to the supply of white rice while the last component was concerned with the demand side. The program focused mainly on increasing and stabilizing availability of white rice.

To expand consumer choice related to food staples, the FSSP identified 3 strategies. The first one was to expand food staple consumption by increasing consumption of other food staples such as rice corn, cassava (tapioca) and sweet potatoes. The interventions presented under this strategy were more focused on increasing planting and consumption of these non-rice staples at the household level. Other interventions directed at improving the supply of these food staples were too basic that these would not make a dent in adequately providing enough to meet "enhanced demand" which was the goal of this strategy. The second strategy was focused on promoting the consumption of unpolished or brown rice. There were no identified interventions under this strategy. The third and the last strategy was to decrease food wastage. Similar to the second strategy, there were no interventions identified under this strategy. This supports the previous assertion that the FSSP was more focused on enhancing food availability of white rice.

In contrast, the Philippine Plan of Action for Nutrition 2011-2016 (PPAN 2011) of the NNC was more multi-sectoral in its approach. The PPAN 2011 identified priority nutrition initiatives from the national down to the local levels to address the needs of those who belong to the vulnerable population groups, such mothers and infants. It was clearer in identifying nutrition-related strategies, including those on food availability and accessibility. Since malnutrition is a multi-factorial issue, the PPAN also identified strategies that covered different sectors like agriculture, governance, trade and even energy.

One of the objectives identified under the PPAN was to ensure the availability of food, specifically ensuring both physical and economic access. The PPAN 2011 outlined 5 major strategies that would address physical and economic access of Filipino families. The strategies and specific action plans were found to transcend different sectors and industries. The action plan outlined a series of actions that included multi-sectoral measures such as increasing the availability of food staples, raising and diversifying production and even stabilizing non-food commodities like fuel. It laid out "farm to table" measures meant to enhance food production such as access to knowledge and innovation, land and water assets, credit and financing for farmers. When it came to expanding economic access to food, the PPAN focused on job generation strategies particularly among low-income families. The other 3 major strategies zeroed in on the health and food safety nets such as health insurance and direct food subsidies.

The PPAN 2011 was a more all-encompassing plan compared to the NOH 2011 and the FSSP. It was able to include both demand and supply side strategies and interventions when it came to food availability and accessibility. This could be attributed to the nature and mandate of the National Nutrition Council compared to the Departments of Agriculture and Health. The National Nutrition Council is the highest policy-making and coordinating body that is focused on nutrition. Its policy-making arm is a governing board composed of the Department Secretary of Health, Agriculture, Interior and Local Government, Budget and Management, Education, Labor and Employment, Science and Technology, Social Welfare and Development, Trade and Industry and the National Economic and Development Authority. The NNC is lodged within the DOH since the Secretary of Health serves as the Chairperson while the Secretaries of Agriculture and the Interior

and Local Government serve as Vice-Chairpersons. This structure is replicated in the local nutrition committees at the provincial, city, municipal and barangay levels with the governor, mayor and barangay captain serving as the chairperson. The multi-agency involvement is reflected in the breadth and width of the strategies in the PPAN 2011.

Despite this structure, the National Nutrition Council has relatively little administrative control over nutrition-related programs and functions of the other agencies. Although the FSSP has clear nutrition-related goals and strategies, it is the Department of Agriculture that is tasked to implement the said program. The National Nutrition Council does not have any administrative power over the Department of Agriculture and, to a large extent, does not have any say in the implementation of the FSSP. The governing board of the National Nutrition Council is just a coordinating body without the administrative power to push the involved departments to reach the nutrition goals. The level of coordination between agencies in the NNC governing board is an inter-play between department interests and inter-personal relationships between the Department Secretaries.

4.2.2 City policies

In Davao City, the City Agriculture Office (CAO) leads all agri-fisheries initiatives of the city. It is also the local partner of the regional office of the Department of Agriculture, when it comes to the implementation of its programs in the city. Two interviews were conducted with representatives of the CAO. The CAO was currently in transition to a new chief at the time of the interviews.

The existing programs of the CAO that were identified by the respondents to be related to food availability and accessibility were the *Gulayan sa Barangay* (GSB) or Vegetable Gardening in the Barangay project and organic agriculture. The GSB project is an annual inter-*barangay* gardening competition which was initially launched to push for higher vegetable consumption among Dabawenyos. The current objectives of the GSB were to:

> "...recognize and give awards to the deserving barangays which actively participated in the Gulayan sa Barangay project of the City Agriculturist Office and likewise to maximize production of vegetables per unit area, not only to address malnutrition as a national and local concern, but also to help farmers to become profitable entrepreneurs. Lastly, this project also aims to generate jobs in the farm and aid in the distribution chain in urban and rural areas."

Participation in the GSB is voluntary on the part of the *barangay* and is classified into rural and urban categories. Monitoring and evaluation of the gardening projects were done by district evaluators from February to August. The gardening projects were assessed based on 5 criteria. The first criterion was the kinds of vegetables grown, such as the number of leafy, fruit, root and other crops. The second was sustainability wherein *barangay*s were evaluated on their use of organic materials as well as the cropping pattern. The record of operation was the third criterion. Fourth was the level of community involvement was assessed and lastly, creativity where the aesthetic value and amenities were evaluated. The number of participating sectors and the number of adoptors were evaluated under this criterion. The criteria for judging were the same for both categories. Awarding of outstanding *barangay*s was done towards the end of each year.

Figure 4.14 shows the trend in the number of *barangay* participation in the competition. Since its inception, the number of participating *barangay*s has increased three-fold from 23 *barangay*s in 2004 to 90 *barangay*s in 2010. After peaking in 2005, the percentage change in participation has been declining with the participation rates plateauing in the past few years.

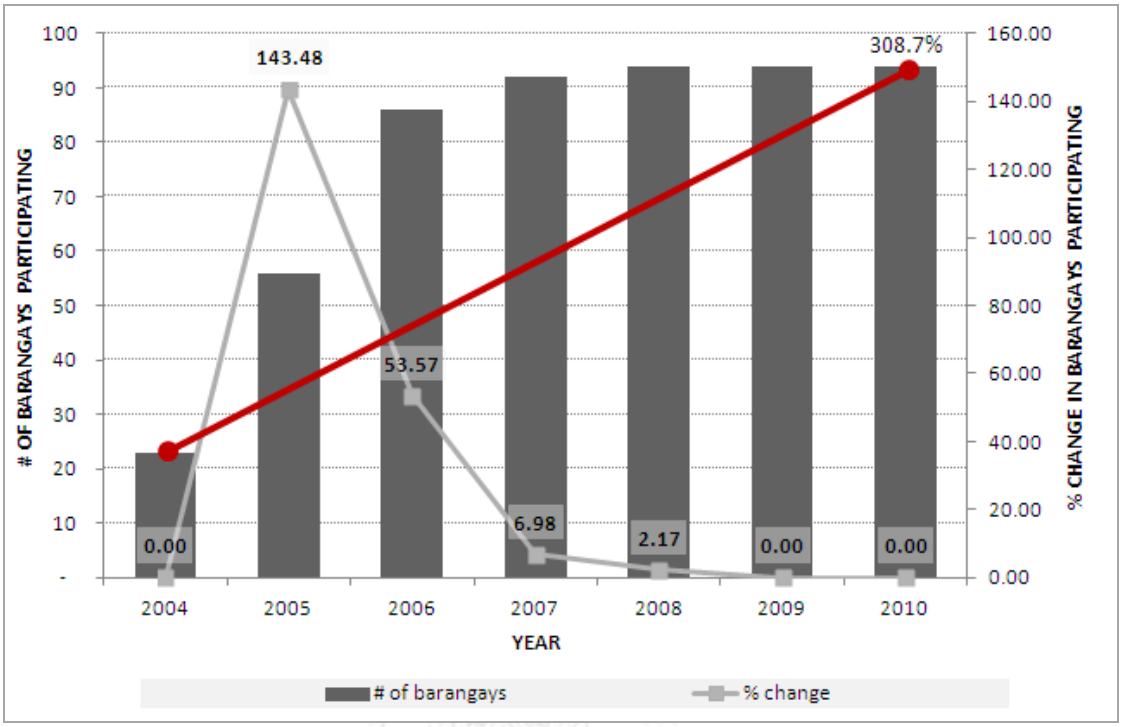


Figure 4.15. Number of participating barangays in the GSB competition and the percentage change in participation

A GSB briefing document was given to the researcher. The document outlined the positive results and impact of the project. It has identified the integration of the produce from the GSB projects into LGU-sponsored initiatives such as the regular feeding program and school feeding programs. In some *barangay*s, the proceeds from the GSB has also benefited members of the community through scholarship programs or has supplemented the barangay's funds. Other than the briefing document, the CAO could not provide the researcher with data on the volume of vegetables produced since 2004.

The GSB project was initially given a PhP225,000 allotment in 2004 (Figure 4.15). It has risen to PhP388,000 in 2010 or a 255% increase from the 2004 level which has been the budgetary allotment for the GSB project from 2008 to 2010.

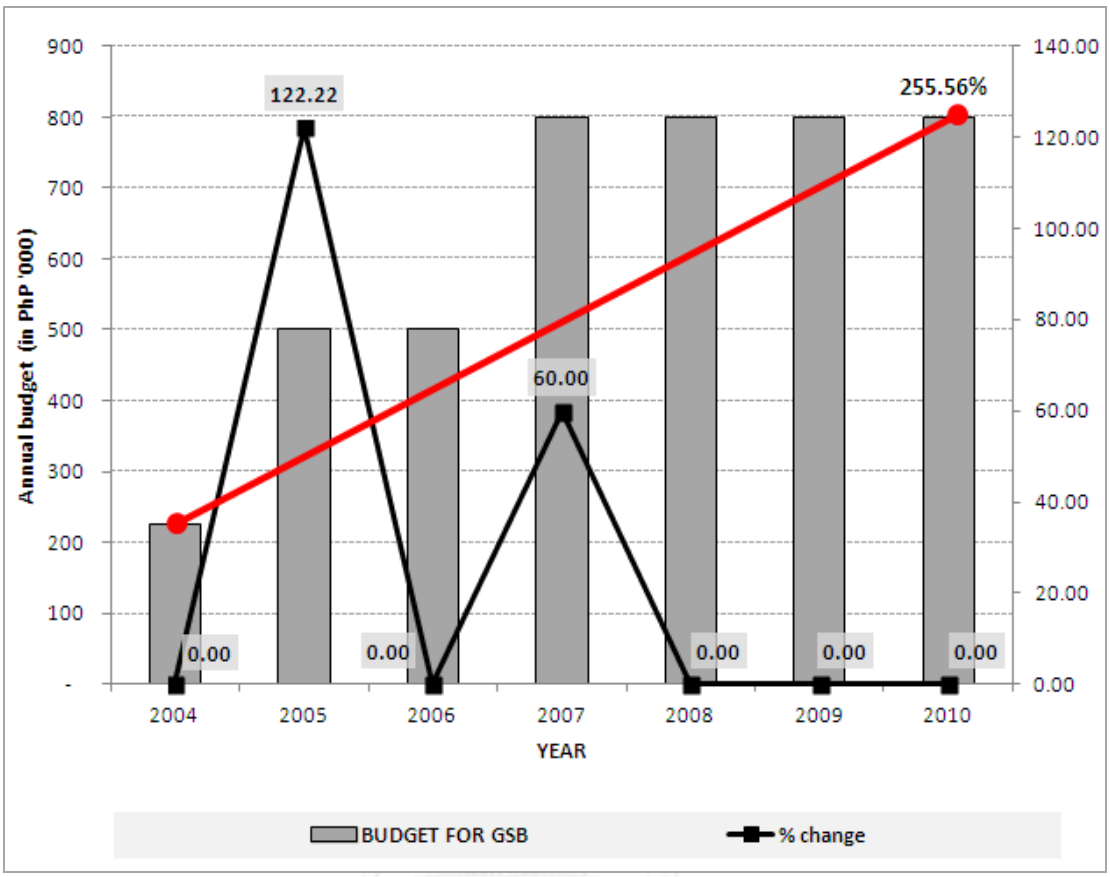


Figure 4.15. Annual budget for the GSB competition and the percentage change in budgetary allotment

Although the budget for this project has increased tremendously from 2004 to 2010, it is important to put this in the perspective of the total budget of the office. Among the 3 major expenditure items in the annual budget, this accounted for the biggest share of the maintenance and other operating expenses (MOOE) allocation of CAO, which was only 7% to 9% of the annual CAO budget. In terms of its proportion to the MOOE budget for 2008 to 2010, the GSB project budget took 17% to 19% of the total annual budget. It was receiving a relatively large proportion of the MOOE budget. However, this was only 1% of the total annual CAO budget for these years. The bulk of the annual budget was allotted for the salaries and wages of the CAO personnel.

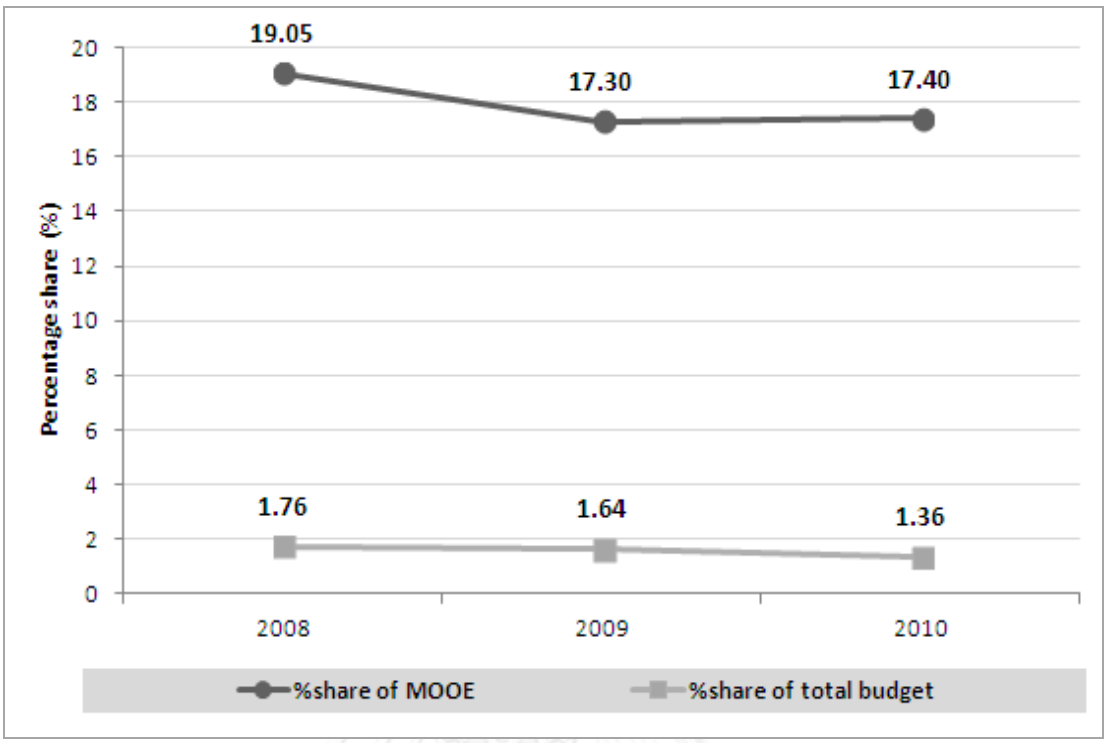


Figure 4.16. Percentage of GSB budget to the total MOOE allocation and total budget of CAO for fiscal year 2008 to 2010.

Other than the GSB project, both respondents identified the implementation of the organic agriculture ordinance as one of the priority programs of the CAO. The Organic Agriculture Ordinance of Davao City of 2009 (Ordinance Number 0384-10 Series of 2010) was promulgated on April 28, 2010. It laid out the principles, strategies and implementation mechanisms for the city to comply with the Republic Act 10068 or the "Organic Agriculture Act of 2010" which was signed into law on April 6, 2010.

Seven (7) strategies were identified to promote organic agriculture in the city. These included the following:

1. Identify organic agriculture zones;
2. Establish organic centers that would promote, market and develop organic agriculture;
3. Put in place measures that would conserve indigenous farm practices;
4. Establish an organic gene/ seed bank;
5. Provide support services to organic famers;
6. Ensure access to credit facilities and financial services by small and organic farmers; and
7. Practice biological and botanical control with support from the Research Division of the City Agriculturist's Office.

The ordinance and its Implementing Rules and Regulations (IRR) also identified a number of implementation mechanisms. Pursuant to the IRR of the Organic Agriculture Ordinance, Executive Order Number 05 was issued on March 2012 to convene an Organic Agriculture Management Council (OAMC) chaired by the City Mayor, represented by the City Agriculturist Officer, and co-chaired by the Chairperson of the City Council Committee on Agriculture. The members of the council were to be a mix of city officials, representatives from the academe and chamber of commerce as well as heads of various non-government and people's organizations. The main functions of this council, as enumerated in the IRR, revolved

around the standards setting for organic agriculture systems, putting in place an incentive system for farmers involved in organic agriculture as well as identifying the organic agriculture zones in the city.

Other than the creation of the OAMC, the ordinance and its IRR identified the provision of incentives, awards and financial support for individuals, institutions and *barangay*s to pursue, promote and practice organic farming. More importantly, the ordinance paved the way for the earmarking of the budget for two mechanisms. At least 10% of the budget was to be set aside for capacity-building and another 10% for research and development. The ordinance was not clear about the source of this fund, whether it was going to be taken from the CAO budget or from the city budget. The ordinance also contained a section that compels the City Government to set aside "appropriate substantial budget" for the implementation of the organic agriculture ordinance.

Despite these strategies and mechanisms, the ordinance fell short in identifying strategies that would address one of its guiding principles – that it contributes to the "attainment of food security…" (Section 3.e). At the time of the interview, the CAO was preparing to hold its first organic market to which was aligned with one of the provisions of the ordinance regarding the establishment of organic centers that will promote, market and develop organic agriculture.

One of the respondents from CAO identified two major challenges to the implementation of organic agriculture in the city. One challenge identified was the time needed by farmers to transition to organic agricultural production. It was estimated that it would take 4 to 5 years for a farmer to produce organic products. Although production costs are low, there will be an expected to dip during the transition period. This dip creates a disincentive for farmers to join the organic bandwagon. Another identified challenge was the pervading perception that organic products are expensive and "*pang-mayaman*" (for the affluent). This negatively affects the demand for organic products thus becoming another deterrent for farmers to invest in organic agriculture.

Beyond the obstacles faced by these programs, the respondents identified challenges within CAO. The respondents said that the highly-politicized nature of the leadership in the CAO has contributed to the changing agenda and inconsistent implementation of programs. At the time of the interview, the respondent expressed uncertainty about the progression of the programs discussed during the interview because the CAO was in the process of ushering a new director who would again have his own set of priorities and programs.

When the respondents were asked about the policies and mechanisms which should be in place to enhance food availability and accessibility, they identified the need to stimulate entrepreneurship and put in more incentives, such as subsidies and price control measures, to promote organic agriculture. Another identified policy needed was one that would help create and implement mechanisms to stimulate a demand for organic products.

A representative from the City Health Office was interviewed regarding the city's programs or initiatives that addressed food availability and food accessibility. The programs the respondent identified were the programs under the umbrella of the City Nutrition Council. Other than the GSB program, the "Food on the Table" (FAITH) program was identified as another program. This was seconded by the NNC regional representative. However, this program was not identified by the CAO representatives. The FAITH program is a backyard gardening initiative among households and schools wherein the produce from this program were usually sold commercially and were seldom used for home consumption. If the vegetable farmer profits from the sale of his/her produce, he/she uses it to buy food, which usually includes *bulad* or dried salted fish, for the family. Although these farming families have access to vegetables, they still prefer to sell it rather than eat it. Another problem that was pointed out by the respondent was the lack of variety in the vegetables being grown.

The NNC regional representative, who identified the problems related to food availability and accessibility, was interviewed for the study as well. One problem was the lack of post-harvest facilities, farm-to-market roads and fully-

equipped markets. In far-flung areas, there were no such facilities present. In reference to the initiative to push for brown rice and other food staples (referring to the FSSP initiatives), the NNC representative indicated that brown rice was not very available and affordable. In scale of "1" (lowest) to "4" (highest), this initiative was rated "3" in terms of its performance.

4.2.3 Barangay policies

Two *barangay* captains from the selected study areas were interviewed for this study. According to the *barangay* captain of Bago Aplaya, the *barangay* was implementing 3 projects and have consistently won. It has been participating in the GSB project for the past 5 to 6 years. It's garden was located in Gulfview Village planted to Filipino bokchoy, Chinese cabbage, Moringa, Malabar nightshade, okra, green beans and squash. However, the area (150 square meters) was small thus limiting the production level. There were ongoing plans to transfer the garden to a bigger area near the *barangay* hall. He credited the success of the GSB to the high participation of members of the *barangay*. Another project was backyard gardening that was being promoted at the household level. According to him, the adoption of the project was weak. He estimated that only 5% of the households started their backyard gardens where majority was planted ornamental plants instead of vegetable crops. He said that households still preferred to buy their food rather than plant. A "*kakanin*" (native snacks) production project was also launched in the *barangay* geared to a livelihood program of the *barangay*. At the time of the interview, this project was just recently started. Lastly, the *barangay* was in the process of developing a school-based juicing project.

Barangay Dumoy, the other *barangay*, is another GSB Hall of Fame awardee. It has successfully been implementing this project for the past 7 years. Although the *barangay*'s garden was located near the *barangay* hall, there were satellite gardens in 2 other *puroks*. These satellite gardens had a livelihood component that benefited those living near the gardens. They were planted to Filipino bokchoy, morning glory, white squash and sweet potato tops. Similar to *Barangay* Bago Aplaya, the *barangay* also had a backyard farming project that was linked to the GSB project. Seeds and seedlings were given to vegetable farmers to support the project. A quarterly meeting is usually held to to discuss additional support that may possibly be given to the farmers. In a scale of "1" (lowest) to "4" (highest), the *barangay* captain rated the performance of the projects at "3". Future plans of the *barangay* included strategies to enhance the local patronage of the vegetables produced through IEC campaigns. The *barangay* also expressed interest in gaining access to the supply chain so that the produce could also be sold commercially.

4.3. Phase 3

4.3.1 Enhanced MNT Intervention

4.3.1.1 Background and Rationale

Nutrition counseling is one of the critical components of Davao City's CVD Program. It is provided to diabetic patients once they enroll in the CVD Program. This service is conducted by city nutritionists at the district health offices every Friday, in conjunction with the diabetes education done by other diabetes educators (DEs) in the health office.

At present, the nutrition counseling is done only once which is ideally at the time of enrolment. This was referred to as *Session 0*. Based on the personal observations of the researcher and confirmed by selected City Nutrition Officers (CNOs), this session usually lasts from 30 minutes to 1 hour, depending on the patient as well as the number of patients in the queue for the day. During this session, the city nutritionist did the following activities. These were:

1. Compute the dietary prescription
2. Elicit and record the patient's food preferences
3. Teach meal planning, including the Idaho Plate Method
4. Make a sample one-day menu for the patient

If the CNO was a Diabetes Educator (DE) as well, diabetes education was also integrated into the session. This further ate up time that was meant solely for nutrition counseling.

To fully grasp the challenges of Session 0, a participative workshop was conducted among selected city nutritionists and program officers of the CVD program. This workshop was designed to collect feedback from the participants regarding the current implementation of Session 0 and work toward formulating the nutrition counseling intervention. Based on feedbacks received during the workshop and the personal observations of the researcher, Session 0 was not patient-friendly. Although ample time was provided to cover all the activities included in the counseling intervention, it was not sufficient for patients to fully grasp and understand all topics discussed during the session. It was important to note that most of these patients were oftentimes elderly. The time since they last were in school and the need to re-orient them to the "teaching environment" was an adjustment that needed to be considered. These patients also visited the health center alone and thus did not have anybody who would be able to listen and understand the lecture with them.

The activities undertaken during Session 0 was also challenging for city nutritionists. Workshop participants shared that the burden of doing diabetes education often fell on them, even if there were other Des, like nurses, in the district health office. This infringed on the time they need to effectively conduct nutrition counseling. It was also physically taxing for them, since they were the only ones who could do both diabetes education and nutrition counseling. Since this was done all in one session, there was pressure to squeeze in all diabetes- and nutrition-related information within the session. There were no mechanisms or provisions within the CVD program that would require patients to return to the health center, either at the barangay or district level, for additional nutritional inputs.

4.3.1.2 Intervention description

Building on the feedback from the current structure of the nutrition counseling service, an Enhanced MNT intervention was developed. The intervention, a barangay health center-based intervention, was comprised of four sessions with each session running for a maximum of 45 minutes. A city nutritionist was assigned by the City Health Office to implement the intervention in the intervention area.

The sessions were designed to be given after the initial nutrition counseling session (Session 0). An innovation that was tested in this intervention was the integration of the patient's caregiver in the nutrition counseling process. The patient's caregiver was tasked to be his/her "treatment partner". It was critical that the caregiver received the necessary nutrition knowledge and skills as well because they were oftentimes involved in planning and preparing the meals in the household.

Intervention objectives were linked to the program's monitoring and evaluation indicators. It was imperative that the intervention helped city nutritionists reach their deliverables. Support and adoption for the intervention would significantly slow down if it was going to be monitored and evaluated differently from the existing nutrition counseling service.

The intervention aimed to assist patients and their caregivers modify their diets by making better and healthier dietary decisions. Specifically, it was designed to:

1. Provide patients and their caregivers a deeper understanding on the relationship between diet, nutrition and Type 2 Diabetes Mellitus.
2. Build the nutrition knowledge of the patients and their caregivers on meal planning, healthier food choice and food preparation.
3. Strengthen the skills of the patients and their caregivers on measuring portions, reading nutrition labels and food preparation.
4. Help create a more supportive social (home) environment for the patient.
5. Increase their awareness about the local food environment and the availability of diabetic healthy food options.
6. Help patients and their caregivers to customize their diets

Specific knowledge and skills were also identified. At the end of the intervention, the patient and his/her treatment partner were expected to know the following:

a. Explain the link between food intake and T2DM and the need for diet modification
b. Enumerate his/her dietary prescription and recommended food
c. Identify food substitutes of common food items and measurements
d. Identify the WHO-CVD recommendations for diet
e. Be more aware about the local food environment and food options that are available

The patient and his/ her treatment partner were expected to able to:

a. Choose healthier selections
b. Determine portion size using common household measures and hand skills
c. Count carbohydrate content of food intake
d. Assess the glycemic index of common food items
e. Explain the contents of the nutrition facts labels
f. Use the CVD Food Dictionary

All sessions were structured. A session guide, composed of 2 parts, was developed for each session. One was a slide presentation in the Visayan dialect to be shown to the patient during the session. A corresponding guide in English that contained a copy of the slide and a script was developed for the nutritionist. The script provided the minimum talking points that needed to be covered per slide. This removed the burden on the nutritionist to think about how to effectively communicate the concept/s to the patient. It also standardized the information to be communicated to the patient. Since the guide only provided the minimum talking points, the nutritionist could adjust or build on the script as long as the talking points were covered.

The topics included in the enhanced MNT intervention were identified during the workshop with selected CNOs. They were asked about the minimum diet and nutrition knowledge and skills that a diabetic patient should have. The identified topics were (1) hand and common household measures, (2) carbohydrate counting, (3) reading nutrition labels, and (4) understanding glycemic index. The session objectives, activities and key messages for the sessions are in Appendix T. Each session was limited to only one topic to ensure that the patients were not inundated with too much information. This also gave some room for the nutritionist to adjust the pace of each session.

Each patient was instructed to do a 3-day food record prior to their session. If the patient was unable to comply, a 24-hour food recall was conducted by the nutritionist. A quick energy and CPF assessment would then be done.

Embedded in the session guide was an opportunity to test the patient's knowledge and food intake. Knowledge test questions pertaining to the previous session were included in the guide. The CNO would randomly choose 3 to 5 questions from a longer list designed to be asked in conjunction with the food record or food recall output. This made it easy for the patient to relate to the question. It also lessened the burden on the nutritionist to come up with test questions every time the session was conducted.

Each session was organized in the same manner. After establishing rapport with the patient, a quick review of the previous session's topic will be initially done. This was followed by the validation of the 3-day food record or getting the 24-hour food recall. The short knowledge test will then administered followed by the session proper. The session ended with a recap of the WHO recommendations for a healthy diet. The patient was then reminded of the assignment for next session, the 3-day food record. This structure was followed in every session. The graphics used in the common lecture points were the same to improve recall.

For the intervention, a Food Dictionary was developed. This booklet included information about the carbohydrate content of 1 serving of selected food items commonly consumed by Dabawenyos. The carbohydrate values used for the food items were from the Food Exchange List used by the program and the Food and Nutrition Research Institute. It contained information about the glycemic index (GI) values for these products. Since the glycemic index numerical value would be difficult for patients to understand, these were divided into 3 categories (low, medium, high) and then presented using the colors commonly found in the traffic stoplight. This was done to provide a more visual representation of the glycemic index values in a form that could be easily understood by the patients. For the meats and oils, these were separated into 3 categories as well: low-fat, medium-fat and high-fat. All of the nutrition information included in the food dictionary were gathered and validated by the CNOs.

Recording forms were developed for the intervention. These forms were designed to be consistent with existing CVD forms and were to be used by the nutritionist to record and track the nutritional assessment of the patient's intake, recommendations given at the end of the session as well as the scores.

4.3.1.3 Intervention implementation

The intervention area in the study was Barangay Bago Aplaya. The intervention was implemented at the *barangay* health center located near the *barangay* hall.

Sessions were held every Thursday of the month. This was chosen and agreed upon by the researcher and the nutritionist assigned to help in the intervention. Each patient was assigned a Thursday of the month (1st/ 2nd/ 3rd/ 4th Thursday) as well as an appointment time. The appointment keeping mechanism was set up this way to help patients easily keep track of their appointments as well as to facilitate the coordination between the research team, the barangay midwife and the barangay health worker assigned in the area of the patient. Patients were given a flash card that contained their appointment dates and time. SMS messages were also sent to them and/or their *barangay* health worker to remind them of their next appointment.

An appointment tracking form was updated every week. This was in the safekeeping of the *barangay* midwife so she could remind the assigned BHWs about patients scheduled for the coming Thursday. For patients who missed their appointments, they were reminded to go to the health center the following Thursday. Their BHWs were reminded as well.

When each patient and his/her caregiver arrived at the health center, he/she was weighed and their blood pressure taken. This was recorded in the patient's CVD folder at the health center. At the end of their session, the patient was reminded of his/her next appointment by both the CNO and the researcher.

4.3.1.4 Attendance rates

Twenty-five patients participated in the intervention. Table 4.31 shows the attendance of the patients until May 2013. Almost all of the patients (72%) completed 3 to 4 sessions.

Table 4.31. Number and percentage of patients (n=25) who attended the intervention sessions, by number of sessions attended

Number of sessions attended	Frequency	**%**
Never attended	3	12.0
1	2	8.0
2	2	8.0
3	7	28.0
4	11	44.0
Total	25	100.0

Among the 22 patients who were able to attend at least one session, majority of the patients were able to attend their appointments on time (Table 4.32). On the other hand, 37% of the patients were delayed in attending one out of four sessions.

Table 4.32. Number and percentage of patients (n=22) who were delayed in attending the intervention sessions, by number of sessions delayed

Number of sessions delayed in attending	**Frequency**	**%**
0	10	39.4
1	7	36.6
2	4	18.3
3	1	5.6
Total	22	100.0

Majority of the patients (59.1%) did not bring their treatment partners to the nutrition counseling sessions (Table 4.33). For patients who attended the sessions with their partners, only 2 patients completed the 4 sessions with their treatment partner.

Table 4.33. Number and percentage of patients who attended with their treatment partner, by number of sessions attended (n=22)

Number of sessions attended	Frequency	%
0	13	59.1
1	3	13.6
2	4	18.1
4	2	9.1
Total	**22**	**100.0**

During the post-intervention assessment, patients were asked about their reasons behind their attendance pattern as well as their level of satisfaction with the intervention. Among the patients who were able to complete the 4 sessions, 3 out of 4 patients did so because they needed to know how to better manage their disease (Table 4.34). Most found that the sessions were interesting.

Table 4.34. Reasons for complete attendance (n=11)

Reasons*	Frequency	%
Need to know how to better manage my diabetes	8	72.7
Interesting	7	63.6
Learning from the sessions	6	54.5
Free meds	1	9.1
Received a reminder text	1	9.1

*Multiple responses

For patients who missed 1 to 3 sessions, the most common reason reported was that they were not physically able to go the health center for the nutrition counseling session (Table 4.35).

Table 4.35. Reasons for missing 1-3 sessions (n=11)

Reasons for not attending 1-3 sessions	Frequency	%
Physical incapacity	4	36.4
Couldn't leave house/ work	3	27.3
Forgot	2	18.2
Not around that time	1	9.1
Economic constraints	1	9.1
Total	11	100.0

The patients who missed 1to 3 sessions were then asked what could be done to get them to finish the intervention. Their responses are tabulated in Table 4.36 where the most common response was through home visits (36.4%) followed by providing transportation fare or fetching them at home.

Table 4.36. Ways for patients (n=11) who missed 1-3 sessions to finish the intervention

Ways to make them attend the other sessions	Frequency	%
Home visits	4	36.4
Provide fare; Fetch at home	2	18.2
Contact through telephone numbers	1	9.1
Depend upon the situation	1	9.1
Be notified earlier	1	9.1
Remind the other family members	1	9.1
No response	1	9.1
Total	11	100.0

Two out of the three patients who were unable to attend any of the sessions were interviewed. One patient was unable to attend because she could not leave the house. Another patient, on the other hand, did not have time to go to the health center during his appointment because he had sub-contracted work during those times. The third patient refused to attend because there was no free medicine that was being given away, as reported by the BHW assigned in the area.

4.3.1.5 Satisfaction rates

Patients who attended at least one (1) session were asked to rate their satisfaction with the nutrition counseling sessions. The satisfaction rating was from 1 to 5, with 1 as the least satisfactory rating. Most of those who attended the nutrition counseling rated the sessions "4" (Figure 4.17).

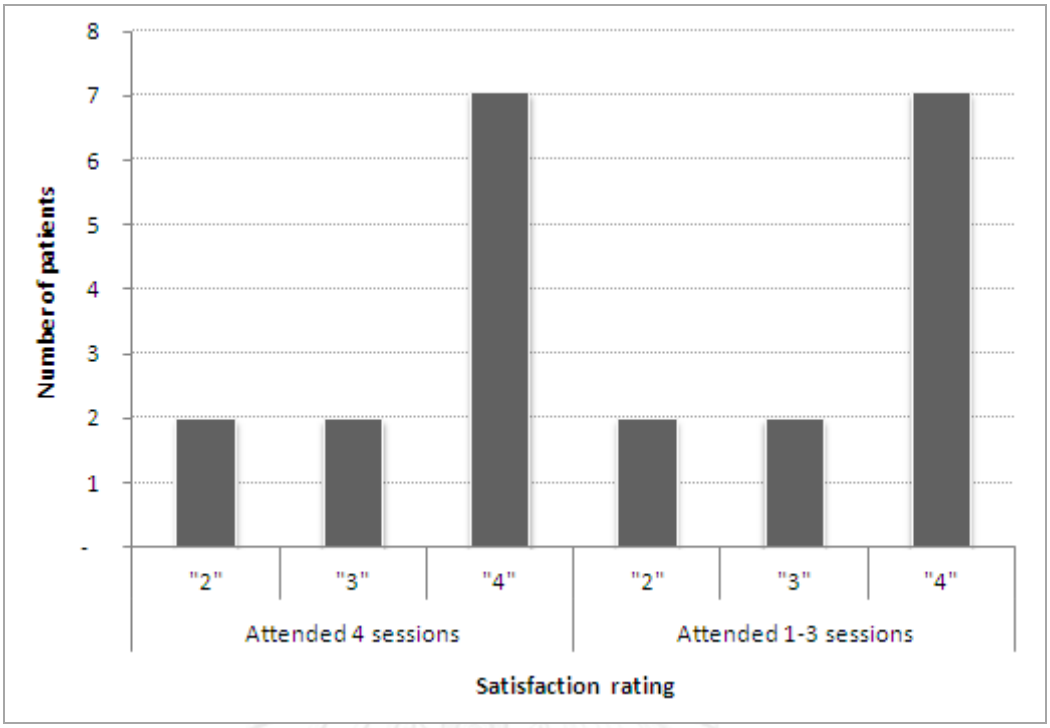


Figure 4.17. Satisfaction rating of patients who attended the sessions

4.3.2 Intervention assessment

This phase of the study focused on assessing the effectiveness of the first four sessions of the intervention. A quasi-experimental design was used where Barangay Dumoy was chosen to be the control area while Bago Aplaya was chosen as the intervention area. A total of 52 patients participated in the study where 27 belonged to the control group while 25 patients belonged to the intervention group.

4.3.2.1 Patients' demographic and socio-economic profile

The demographic and socio-economic profile of only 51 patients (one patient from the intervention group refused to be interviewed prior to the intervention) is presented in Table 4.32. The median age of the patients was 56.5 years old for the control group and 56.4 years old for the intervention group. Most of the patients from both groups were female. Approximately 60% of the patients were married. More than a third of the patients in the control group were self-employed, while approximately 30% of those in the intervention group were homemakers. A little over one-third of the patients in the control and intervention groups had some elementary education or finished grade school. The average household monthly income of around 60% of the patients from both groups was PhP10,000 or less. When it came to ownership of indicators of wealth, approximately half of the patients in both groups owned 3 or less of these items. The difference in the socio-economic and demographic profile between these two groups was found to be not statistically significant.

Table 4.37. Socio-economic & demographic profile of patients, by intervention status

Variables	Control group (n=27)		Intervention group (n=24)		p-value*
	Frequency	%	Frequency	%	
Age (Median, IQR)	58.0, 15		57.5, 20		0.954
Sex					
Male	5	18.5	6	25.0	0.736
Female	22	81.5	18	75.0	
Marital status					
Single	4	14.8	1	4.2	
Married	16	59.3	14	58.3	0.591
Widow/ widower	5	18.5	7	29.2	
Separated	2	7.4	2	8.3	
Employment status					
Homemaker	5	18.6	7	29.2	
Employed	6	22.2	5	20.8	0.771
Self-employed	10	37.0	6	25.0	
Not working/ retired	6	22.2	6	25.0	
Educational attainment					
Grade school	10	37.0	8	36.4	
High school	8	29.7	7	31.8	1.000
College and higher	9	33.3	7	31.8	
Average household monthly income					
<=P10,000	16	59.3	15	62.5	
P10,001- P20,000	9	33.3	8	33.3	1.000
P20,001- P30,000	2	7.4	1	4.2	
Wealth index					
Do not own any	2	7.4	1	4.0	
3 or less items	15	55.6	13	52.0	0.911
4 or more items	10	37.0	11	44.0	

*Significant level determined at p-value < α (0.05)

4.3.2.2 Nutritional assessment of the patients in control and intervention groups

A seven-day food record method was used to collect dietary information from patients in the control and intervention groups. This was collected prior to the intervention (pre-intervention stage) in January 2013 and four months after the start of the intervention (post-intervention stage). These food records were validated by the enumerators during data collection, encoded and analyzed to determine the daily energy, CPF and micronutrient intakes, diet quality and dietary compliance. The individual energy, CPF and micronutrient intakes were computed for each patient.

Four daily food records collected during pre-intervention were excluded from the analysis because their daily energy intake were either less than 500 kcal/ day or greater than 6,000 kcal/day. Similarly, 4 daily food records were also removed from the analysis during post-intervention for the same reason.

A total of 52 patients participated in the pre-intervention stage. All 27 patients in the control group and 25 patients in the intervention group gave food records. However, in the post-intervention stage, only 45 patients (21 from control group and 24 from intervention group) participated. The succeeding analyses include only patients who participated in both stages.

4.3.3.2.1 Energy and CPF intake of the patients

Table 4.38 shows the daily energy and CPF intake of the patients in the intervention and control groups during the pre-intervention and post-intervention stages. In the pre-intervention stage, the median daily energy intake of the patients in the control group was 1,396.4 kcal/day and 1,346.0 kcal/day for those in the intervention group. These were less than the prescribed energy intake for each group (control group = 1,830 kcal/day; intervention group = 2,002 kcal/day). The average daily energy intake of half of the patients in both groups was below the prescribed energy intake. After four months, the median daily energy intake of the control group was higher than the pre-intervention intake of 1,448.7 kcal/day. For the intervention group, however, the median daily energy intake was lower compared to the pre-intervention intake which was 1,290.1 kcal/day. But, despite this, the daily energy intake of the patients was still concentrated below the prescribed energy intake for both groups. The difference between the two groups at each stage was found to be not statistically significant at α=0.05.

Table 4.38. Median and IQR of energy and CPF intakes of patients in intervention and control groups during pre-intervention and post-intervention stages and change in intake between the two stages.

Variable	Pre-intervention			Post-intervention			Post-Pre			p-value
	n	Median	IQR	n	Median	IQR	n	Median	IQR	***
Energy intake (kcal/day)										
Control group	21	1,396.4	548	21	1,488.7	9.7	21	-68.4	695	0.517
Intervention group	24	1,345.7	39	24	1,290.1	435	24	-29.1	410	0.228
Z; p-value*		0.842; 0.41			-0.956; 0.349			-0.023; 0.991		
Carbohydrate intake (g/day)										
Control group	21	227.3	75	21	231.6	92	21	0.5	62.7	0.946
Intervention group	24	220.3	92	24	208.5	83	24	-18.3	64.8	0.128
Z; p-value*		-0.842; 0.410			-0.751; 0.463			-1.092; 0.283		
Protein intake (g/day)										
Control group	21	45.8	21	21	48.8	28	21	-2.6	25.6	0.946
Intervention group	24	44.0	51	24	43.4	11	24	3.3	14.2	0.107
Z; p-value*		-1.126; 0.265			-0.751; 0.463			-0.956; 0.349		
Fat intake (g/day)										
Control group	21	26.4	11	21	32.7	20	21	6.1	1.6	0.103
Intervention group	24	25.0	15	24	29.5	15	24	16.8	19.0	0.565
Z; p-value*		-0.273; 0.796			-0.599; 0.565			-0.819; 0.423		

*Mann Whitney test

**Significant level determined at p-value < α (0.05)

***Wilcoxon signed rank test

The changes in pre-intervention and post-intervention were assessed as well. Half of the patients in both groups experienced a drop in energy intake as seen in the median change in daily energy intake for the control group (-66.43 kcal/day) and intervention group (-29.07 kcal/day). The difference in the change in daily energy intake was not found to be statistically significant across the two groups. Similarly, the change in energy intake between pre-intervention and post-intervention stages for both groups was also not statistically significant at α=0.05.

Computing for the median daily CPF intake, the control group's values were 272.2 g/day of carbohydrate, 45.8 g/day of protein and 26.4 g/day of fat while that for the intervention group, was 220.4 g/day of carbohydrate, 44.0 g/day of protein and 25.0 g/day of fat. Except for carbohydrate intake, patients in both group consumed less protein and fat when compared to the average prescribed values for these macronutrients.

The median daily CPF intake was observed to be higher in the post-intervention stage compared to the pre-intervention assessment. For the control group, the median daily CPF intake was 231.6 g/day of carbohydrate, 48.8 g/day of protein and 32.6 g/day of fat while it was 208.5 g/day of carbohydrate, 43.4 g/day of protein and 29.5 g/day of fat for the intervention group. Comparing the daily CPF intake between both groups at the pre-intervention and post-intervention stages, the difference between the two groups at each stage was not statistically significant (p-value $\geq$ 0.05).

It was only in the daily carbohydrate intake of patients in the intervention group and the daily protein intake of patients in the control group was there an observed drop in the post-intervention daily intake. The difference in the change in daily CPF intake between the two groups was not found to be statistically significant.

4.3.2.2.2 Proportion of CPF intake to energy of the patients

During the pre-intervention stage, the proportion of energy from macronutrients were 71.4% from carbohydrate, 12.7% from protein and 15.9 % fat for patients in the control group (Table 4.39). The same distribution across the different macronutrients was found to be the same for those in the intervention group. The proportion of energy from carbohydrate, protein and fat among half of the patients in each group was found to be concentrated within a very narrow range that did not even reach the prescribed CPF ratio (55:25:20). Between the control and intervention groups, the difference was not statistically significant (p-value $\geq$ 0.05).

The median proportion of energy from carbohydrate, protein and fat in the post-intervention stage was similar to the percentages in the pre-intervention stage. The proportion of energy from protein of patients in the intervention group increased and was found to be statistically significant (p-value=0.009). The proportion of energy from fat in the control group rose and was also determined to be statistically significant (p-value = 0.026).

Table 4.39. Median proportion of energy from carbohydrate (C), protein (P) and fat (F) of patients in intervention and control groups during pre-intervention and post-intervention stages and change in intake between the two stages.

Variable	Pre-intervention			Post-intervention			Post-Pre			p-value
	n	Median	IQR	n	Median	IQR	n	Median	IQR	***
Energy from carbohydrate (%)										
Control group	21	71.4	18	21	68.3	26	21	1.9	34.6	0.95
Intervention group	24	71.8	22	24	71.6	11	24	-2.2	21.1	0.51
Z; p-value*		-0.501; 0.628			-0.068; 0.955			-0.319; 0.761		
Energy from protein (%)										
Control group	21	12.7	2	21	13.0	2	21	0.7	2.4	0.18
Intervention group	24	12.8	3	24	14.9	4	24	1.6	3.2	0.009**
Z; p-value*		-0.159; 0.884			-1.633; 0.104			-1.456; 0.150		
Energy from fat (%)										
Control group	21	15.9	6	21	18.7	9	21	5.0	9.6	0.026**
Intervention group	24	15.5	10	24	13.5	8	24	3.2	8.2	0.15
Z; p-value*		-1.115; 0.273			-0.660; 0.520			-0.751; 0.463		

*Mann Whitney test

**Significant level determined at p-value < α (0.05)

***Wilcoxon signed rank test

In general, the median change in proportion from the pre-intervention to the post-intervention stage was positive. This is indicative that most of the post-intervention proportions were bigger than pre-intervention estimates. Nonetheless, these changes were less than 5%. The changes in energy distribution from macronutrients between post- and pre-intervention stages between groups were not statistically significant (p-value $\geq$ 0.05).

4.3.2.2.3 Micronutrient intake of the patients in control and intervention groups

The median daily Vitamin C, calcium and iron intake of patients in the control group during the pre-intervention stage was 44.9 mg/day, 332.7 mg/day and 8.2 mg/day, respectively (Table 4.40). The median daily intake of these micronutrients was similar to those by patients in the intervention group. The difference in the daily micronutrient intake of patients between the 2 group was determined to be not statistically significant (p-value $\geq$ 0.05). In both groups, the median daily intake of these micronutrients likely increased during the post-intervention stage. However, when the difference in the selected micronutrient intakes between the two groups was examined, no statistical significance was found.

The change in daily intake, regardless of direction, was minimal for both groups, except for calcium intake in the intervention group. Nevertheless, this difference in the changes in the daily micronutrient intake was not statistically significant.

Table 4.40. Median and IQR of selected micronutrient intake of patients in intervention and control groups during pre-intervention and post-intervention stages and change in intake between the two stages.

Selected micronutrients (mg/day)	Pre-intervention			Post-intervention			Post-Pre			p-value
	n	Median	IQR	n	Median	IQR	n	Median	IQR	***
Vitamin C (mg/day)										
Control group	21	44.9	49	21	52.1	42	21	-2.7	64.9	0.702
Intervention group	24	45.6	67	24	46.2	73	24	-0.6	68.0	0.684
Z; p-value*		-0.705; 0.488			-0.262; 0.800			-0.159; 0.879		
Calcium consumed (mg/day)										
Control group	21	332.7	356	21	463.0	368	21	6.7	328.2	0.338
Intervention group	24	385.3	250	24	389.4	250	24	43.8	203.2	0.473
Z; p-value*		-0.228; 0.831			-1.035; 0.307			-0.091; 0.937		
Iron consumed (mg/day)										
Control group	21	8.2	6	21	8.5	5	21	-0.9	5.6	0.432
Intervention group	24	8.1	4	24	8.6	4	24	0.7	3.7	0.473
Z; p-value*		-0.933; 0.357			-0.159; 0.884			-0.956; 0.349		

*Mann Whitney test

**Significant level determined at p-value < α (0.05)

***Wilcoxon signed rank test

Table 4.41. Percentage of Vitamin C, Calcium and Iron RENI met by patients in intervention and control groups during pre-intervention and post-intervention stages and change in intake between the two stages.

Variable	Pre-intervention			Post-intervention			Post-Pre			p-value
	n	Median	IQR	n	Median	IQR	n	Median	IQR	***
% RENI of vitamin C										
Control group	21	64.1	69	21	74.5	61	21	-3.9	92.7	0.288
Intervention group	24	63.0	94	24	66.0	105	24	-0.9	96.4	0.747
Z; p-value*		-0.660; 0.517			-0.273; 0.796			-0.159; 0.879		
% RENI of calcium										
Control group	21	43.1	44	21	57.9	47	21	0.8	42.5	0.727
Intervention group	24	48.2	39	24	49.3	33	24	5.6	26.8	0.705
Z; p-value*		-0.068; 0.955			-1.047; 0.304			-0.319; 0.761		
% RENI of iron										
Control group	21	47.4	25	21	37.0	24	21	-3.3	25.2	0.517
Intervention group	24	37.4	31	24	38.0	26	24	1.6	25.2	0.643
Z; p-value*		-0.421; 0.681			-0.068; 0.955			-0.887; 0.385		

*Mann Whitney test

**Significant level determined at p-value < α (0.05)

***Wilcoxon signed rank test

When comparing these daily micronutrient intakes against the RENI values, the median daily micronutrient intake was not even close to 100% of the RENI for both pre-intervention and post-intervention stages (Table 4.41). For example, the median percentages of RENI from iron and calcium in both stages were only about 50%. The same pattern can be seen for both pre-intervention and post-intervention stages. The difference in the proportions of the daily micronutrient intake to the RENI between the two group was not statistically significant (p-value $\geq$ 0.05). The proportion of the daily micronutrient intake to RENI between pre-intervention and post-intervention stages for each group of patients was also not statistically different from each other.

The median change in the proportion of daily micronutrient intake to RENI within 4-month period was minimal. Interestingly, the change in the proportion of daily Vitamin C intake to RENI was concentrated in the negative changes, which indicates that the post-intervention proportion of daily Vitamin C intake to RENI was less than the pre-intervention proportion.

4.3.2.3 Dietary compliance of patients in control and intervention groups

During the pre-intervention stage, majority of the patients did not meet their energy compliance range within the 7-day period (total energy requirement ± 100kcal) (Table 4.42). A greater proportion of patients in the intervention group were not able to meet their energy compliance range compared to patients in the control. However, relatively more patients in the intervention group were able to meet their energy compliance range at the post-intervention stage (Table 4.43). As a whole, majority of the patients from both groups were able to meet their energy compliance range at least once a week.

Table 4.42. Number of days patients met their energy compliance range during pre-intervention, by intervention status

Number of days compliant	Control group (n=21)		Intervention group (n=24)		Total	
	Freq	%	Freq	%	Freq	%
0	16	76.2	23	95.8	39	86.7
1	5	23.8	0	0.0	5	11.1
2	0	0.0	1	4.2	1	2.2
Total	21	100.0	24	100.0	45	100.0

Note: Freq stands for Frequency

Table 4.43. Number of days patients met their energy compliance range during post-intervention, by intervention status

Number of days compliant	Control group (n=21)		Intervention group (n=24)		Total	
	Freq	%	Freq	%	Freq	%
0	12	57.1	15	62.5	27	60.0
1	6	28.2	8	33.3	14	31.1
2	3	14.3	1	4.2	4	8. 9
Total	21	100.0	24	100.0	45	100.0

Note: Freq stands for Frequency

When it comes to CPF compliance, there were no patients in both groups who were able to meet their carbohydrate, protein and fat compliance ranges simultaneously within a day during the pre-intervention and post-intervention stages (Table 4.44 and 4.45). However, there were patients in both groups who were able to meet the compliance range for carbohydrate, protein or fat at least once a week. There were also more patients who met their carbohydrate compliance range at least once a week compared to the other macronutrients.

Table 4.44. Number of days patients who met their carbohydrate, protein, fat and CPF compliance range during pre-intervention stage, by intervention status

Macro-nutrient	Number of days compliant	Control group (n=21)		Intervention group (n=24)		Total	
		Freq	%	Freq	%	Freq	%
Carbohydrate	0	13	61.9	18	75.0	31	68.9
	1	8	38.1	3	12.5	11	24.4
	2	0	0.0	3	12.5	3	6.7
Protein	0	21	100.0	24	100.0	45	100.0
Fat	0	20	95.2	22	91.7	42	93.3
	1	0	0.0	2	8.3	2	4.4
	2	1	4.8	0	0.0	1	2.2
CPF	0	21	100.0	24	100.0	45	100.0

Note: Freq stands for Frequency

Table 4.45. Number of days patients who met their carbohydrate, protein, fat and CPF compliance range during post-intervention stage, by intervention status

Macro-nutrient	Number of days compliant	Control group (n=21)		Intervention group (n=24)		Total	
		Freq	%	Freq	%	Freq	%
Carbohydrate	0	5	23.8	17	70.8	22	48.9
	1	11	52.4	3	12.5	14	31.1
	2	4	19.6	4	16.7	8	17.8
	3	1	4.8	0	0.0	1	2.2
Protein	0	21	100.0	24	100.0	45	100.0
Fat	0	18	85.7	21	87.5	39	86.7
	1	3	14.3	2	8.3	5	11.1
	2	0	0.0	1	4.2	1	2.2
CPF	0	21	100.0	24	100.0	45	100.0

Note: Freq stands for Frequency

These results are consistent with the summary statistics computations where the median number of days patients in both groups were energy and CPF compliant was zero (Table 4.46). This was found to be true for the pre-intervention and post-intervention stages. However, only the change in energy compliance between the post-intervention and pre-intervention stages for the intervention group was found to be statistically significant (p-value= 0.035). On the other hand, the median change in the number of days compliant with the CPF compliance range was also zero for both groups. The change in compliance levels between the two groups was not statistically significant.

Table 4.46. Median and IQR of the number of days patient met their energy and CPF compliance range and the modified DQI-I scores of patients in intervention and control groups during pre-intervention and post-intervention stages and change in compliance and modified DQI-I scores between the two stages.

Variable	Pre-intervention			Post-intervention			Post-Pre			p-value
	n	Median	IQR	n	Median	IQR	n	Median	IQR	***
Energy compliance										
Control group	21	0	0	21	0	1	21	0	1	0.094
Intervention group	24	0	0	24	0	1	24	0	1	0.035**
Z; p-value*		-1.813; 0.083			-0.590; 0.597			-1.485; 0.140		
CPF compliance										
Control group	21	0	0	21	0	0	21	0	0	1.000
Intervention group	24	0	0	24	0	0	24	0	0	1.000
Z; p-value*		0.000; 1.000			0.000; 1.000			0.000; 1.000		
Mod DQI-I score										
Control group	21	33.57	9	21	34.00	10	21	0.98	10	0.622
Intervention group	24	34.29	5	24	34.43	9	24	0.43	6	0.649
Z; p-value*		-0.262; 0.800			-0.353; 0.731			-0.876; 0.388		

*Mann Whitney test

**Significant level determined at p-value < α (0.05)

***Wilcoxon signed rank test

4.3.2.4 Modified DQI-I scores

The patients in both groups did not perform well when their diet quality was assessed (Table 4.46). During the pre-intervention stage, the median modified DQI-I score of patients in the control group was 33.57 points and 34.29 points for the intervention group which did not reach the halfway mark of 39 points. The DQI-I scores of 50% of the patients in both groups were just below or near the halfway mark. The difference in scores between the two groups was also not statistically significant. Four months after, the median scores for both groups still did not improve. Although the interquartile range expanded, the DQI-I scores were still concentrated below the halfway mark. The difference in scores between the two groups was not statistically significant. When the pre-intervention and post-intervention DQI-I scores are plotted together, it can be seen that the dots are clustered below the halfway mark (Figure 4.18).

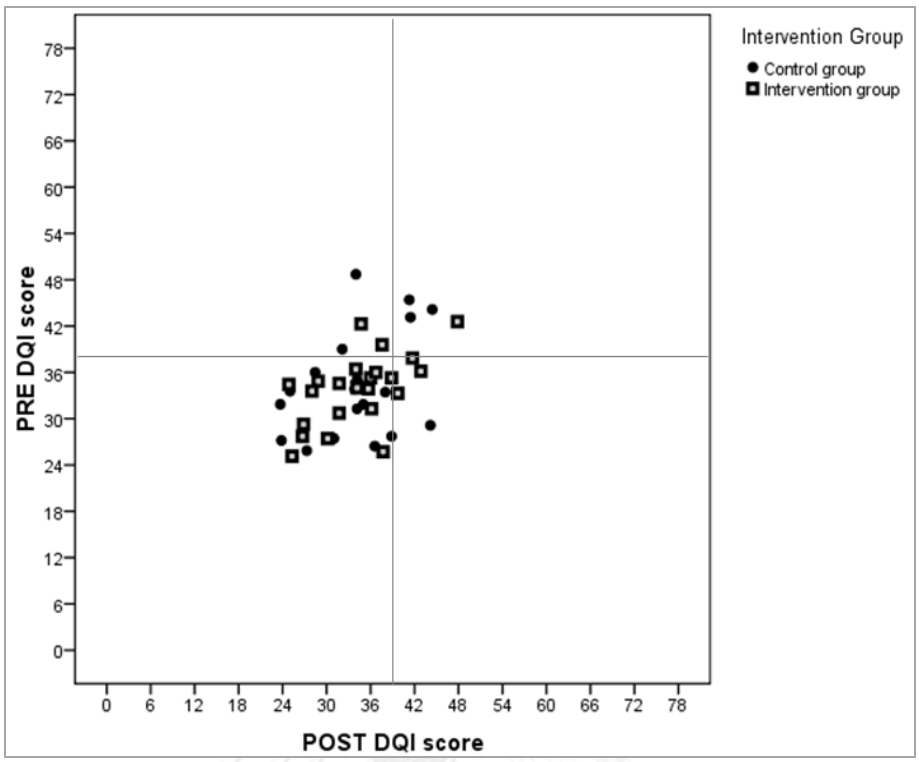


Figure 4.18. Scatterplot of the pre-intervention and post-intervention modified DQI-I scores of patients in the control and intervention groups

The median change in DQI-I score for both groups was less than 1 point. This difference in the change in DQI-I scores between the two groups was not found to be statistically significant. The change in scores from the pre-intervention stage to the post-intervention for each group was also not statistically significant.

When the modified DQI-I scores were classified under 4 categories, most of the diet quality of the patients from both groups were classified as "poor" at the pre-intervention stage (Table 4.47). In the post-intervention stage, the diet quality of these patients was still categorized as poor. There was only one patient from the control group and two patients from the intervention group whose diet quality improved from poor to good.

Table 4.47. Number of patients distributed by diet quality categories at pre-intervention and post-intervention stages, by intervention status.

		Pre-intervention				Total
		Control group		Intervention group		
Post-intervention		Poor	Good	Poor	Good	
Control group	Poor	16	1			17
	Good	1	3			4
Intervention group	Poor			18	2	20
	Good			3	1	4
Total		17	4	21	3	45

4.3.2.5 Knowledge test and market game scores

The knowledge test was a 12-point researcher-administered test. Questions contained in the knowledge test were based on the topics covered in the first 4 sessions of the enhanced MNT intervention. The Market Game, on the other hand, was a market simulation game/exercise. Patients chose from a set of cards containing names of healthy, unhealthy and "kind-of" healthy food items. Healthier choices were equivalent to +1 point while unhealthy choices were equal to -1 point. The patient was penalized when he/she chose more than two food items from a sub-group of healthier food items.

The median test scores and market game scores for patients in both groups are shown in Table 4.48. During the pre-intervention stage, the median score for patients in both the control and intervention groups was 7 points. The knowledge score of the two groups was determined to be not statistically different from each other. The market game scores of the patients were 13.5 points for the control group and 16.5 points for the intervention group.

In the post-intervention stage, the median knowledge test score for the patients in the control group was lower compared to the median scores in the pre-intervention stage. In contrast, the knowledge test score for patients in the intervention group rose. The difference in the knowledge test scores between the two groups was found to be statistically significant (p-value = 0.027). When it came to the market game scores, the median scores of the patients was higher in the post-intervention stage. The difference between the groups was also not statistically significant.

Table 4.48. Median and IQR of the knowledge test and market game scores of patients in intervention and control groups during pre-intervention and post-intervention stages and change in compliance between the two stages.

Variable	Pre-intervention			Post-intervention			Post-Pre			p-value
	n	Median	IQR	n	Median	IQR	n	Median	IQR	***
Knowledge score										
Control group	20	7.0	2	20	6.5	4	20	-1.00	3	0.038**
Intervention group	24	7.0	4	24	8.0	4	24	1.00	2	0.078
Z; p-value*		-1.300; 0.198			-2.199; 0.027**			-2.954; 0.003**		
Market game score										
Control group	20	13.5	12	20	15.5	12	20	2	12	0.279
Intervention group	24	16.5	9	24	19.5	11	24	4.04	11	0.012**
Z; p-value*		-1.264; 0.211			-1.535; 0.127			-0.908; 0.371		

*Mann Whitney test

**Significant level determined at p-value < α = 0.05

***Wilcoxon signed rank test

When it came to assessing the change in knowledge test scores, findings show that the median change in the test results for the control group was -1 point. With regard to the change in the scores of 50% of the patients in the control group which were distributed within a 3-point range around the median value, this shows that the scores of patients in this group were either the same or dropped from the pre-intervention levels. This drop in knowledge test scores was found to be statistically significant (p-value = 0.038) for the control group.

In contrast, the median value of the change in knowledge scores among patients in the intervention group was +1 point. Although the pre-intervention score was not statistically significant from the post-intervention score, the difference in the change in knowledge scores between the two groups was statistically significant (p-value = 0.003)

For the change in market game scores, the median change in market game scores for the control group was 2 points and 4.04 points for the intervention group. The difference in post-intervention and pre-intervention scores was statistically significant for the intervention group (p-value = 0.012) but not for the control group.

4.3.2.6 Net effects of the main study outcomes

Among the 6 main outcomes measured in the study, 2 outcomes were proximal outcomes. Figures 4.19 and 4.20 show the magnitude and direction of change in the knowledge test and market game scores within the 4-month period. The net benefits from both tests boded well for the intervention. The net change in knowledge seen after 4 months was positive. The decrease in knowledge test scores in the control group was found to be statistically significant. For the market game score, the rise in the scores of patients from the intervention group was statistically significant as well. Although the change in the test scores in the other group was not significant, the change would have moved in the direction seen among the current patients with a higher sample size.

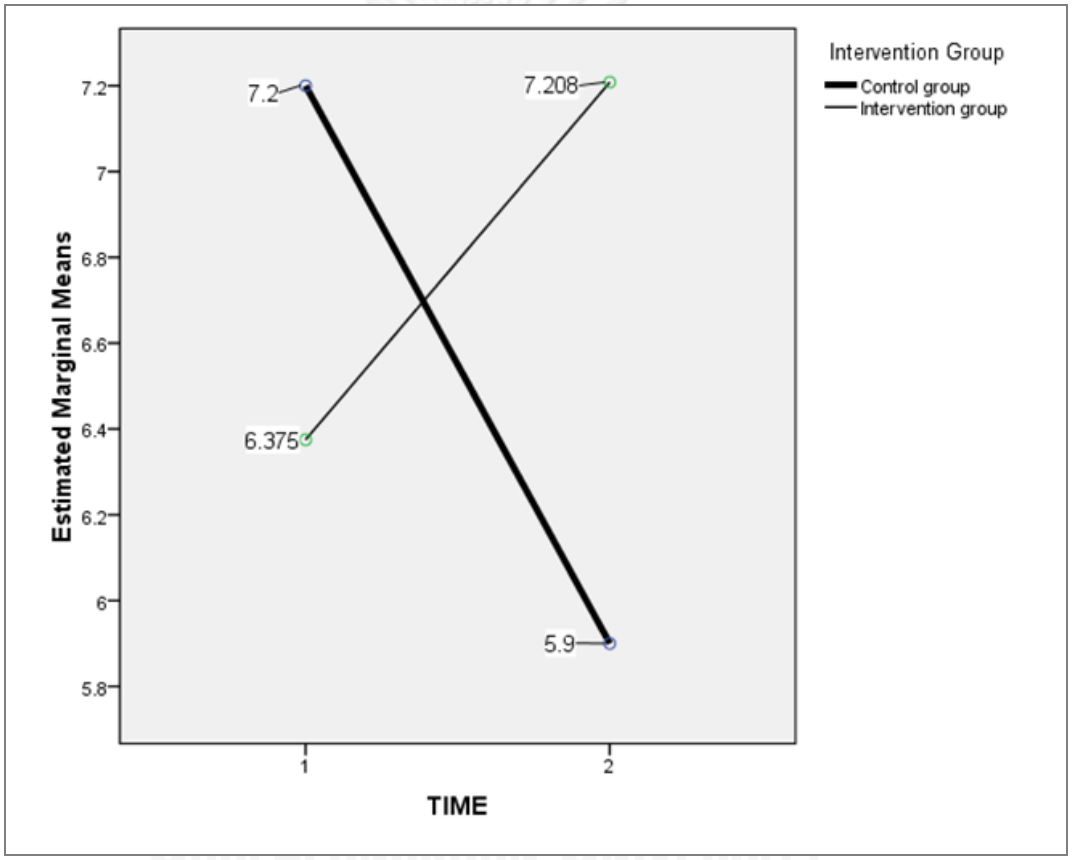


Figure 4.19. Net change in knowledge test scores of patients in control and intervention groups from pre-intervention to post-intervention stages.

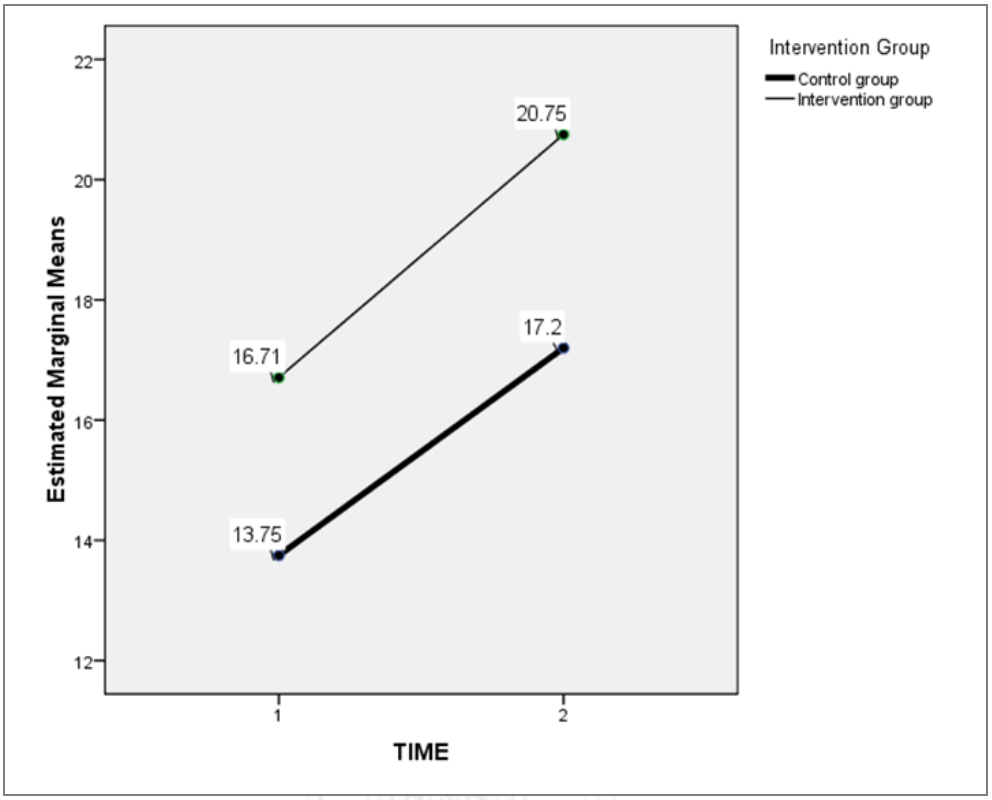


Figure 4.20.Net change in market game scores of patients in control and intervention groups from pre-intervention to post-intervention stages.

The 4 distal outcomes measured in this study were: (1) total energy consumed, (2) energy compliance, (3) CPF compliance and, (4) the modified DQI-I scores. There was a decrease in the daily energy consumed in the control and intervention groups (Figure 4.21). This resulted in a positive net change in energy consumption of 3.85 kcal/day. This would be an optimistic outcome except that, as shown in other parts of this chapter, the trends in the energy consumed of patients tended to be low compared to the prescribed levels. Therefore, this downward movement was not beneficial since patients should still increase their intake but not too much.

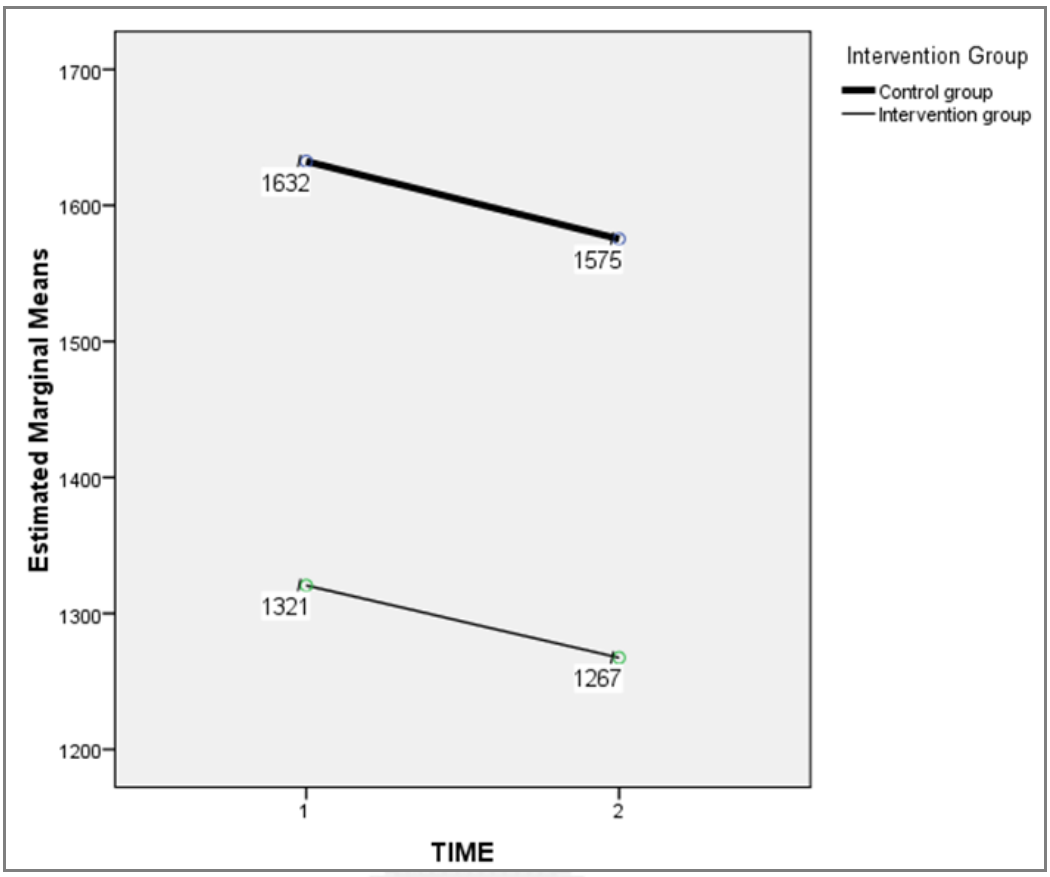


Figure 4.21. Net change in average daily energy consumed (kcal/day) for patients in control and intervention groups from pre-intervention to post-intervention stages.

On the other hand, the number of days that patients were able to meet their energy compliance range moved in the same direction for each group (Figure 4.22). The net change in energy compliance was 0.667 day.

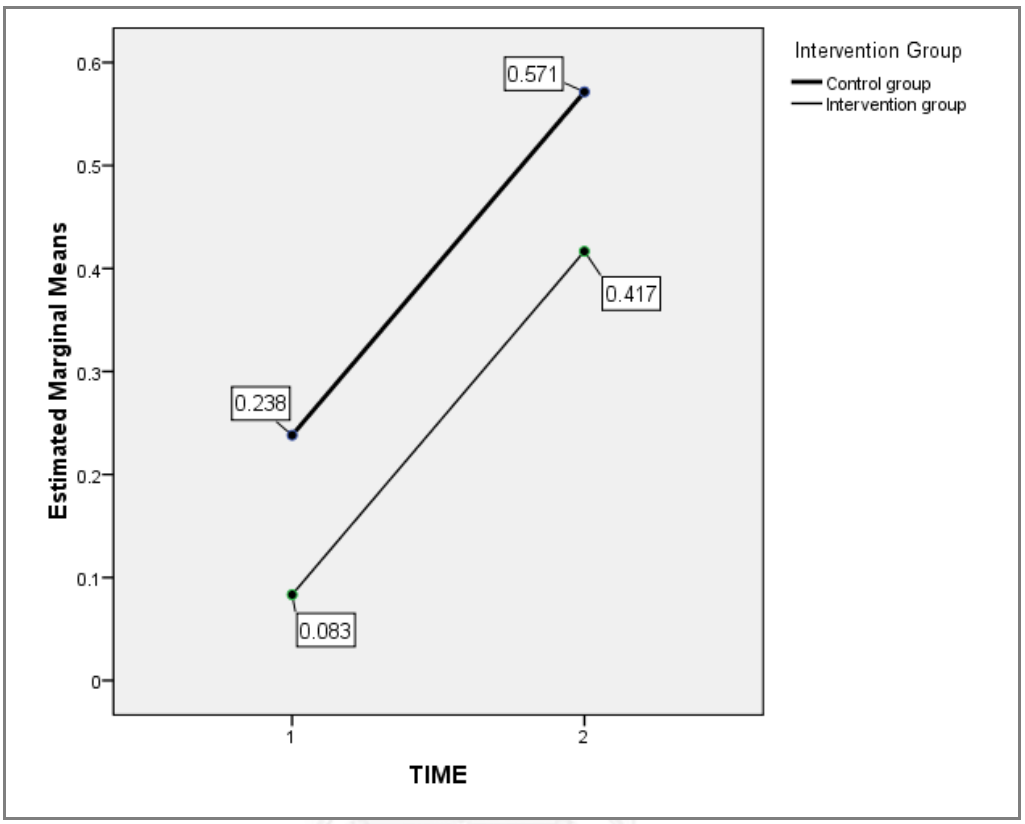


Figure 4.22. Net change in the number of days a patient met his/her energy compliance range for patients in control and intervention groups from pre-intervention to post-intervention stages.

In contrast, the number of days that patients were able to meet their CPF compliance range was dismal (Figure 4.23). There was no change in CPF compliance after 4 months.

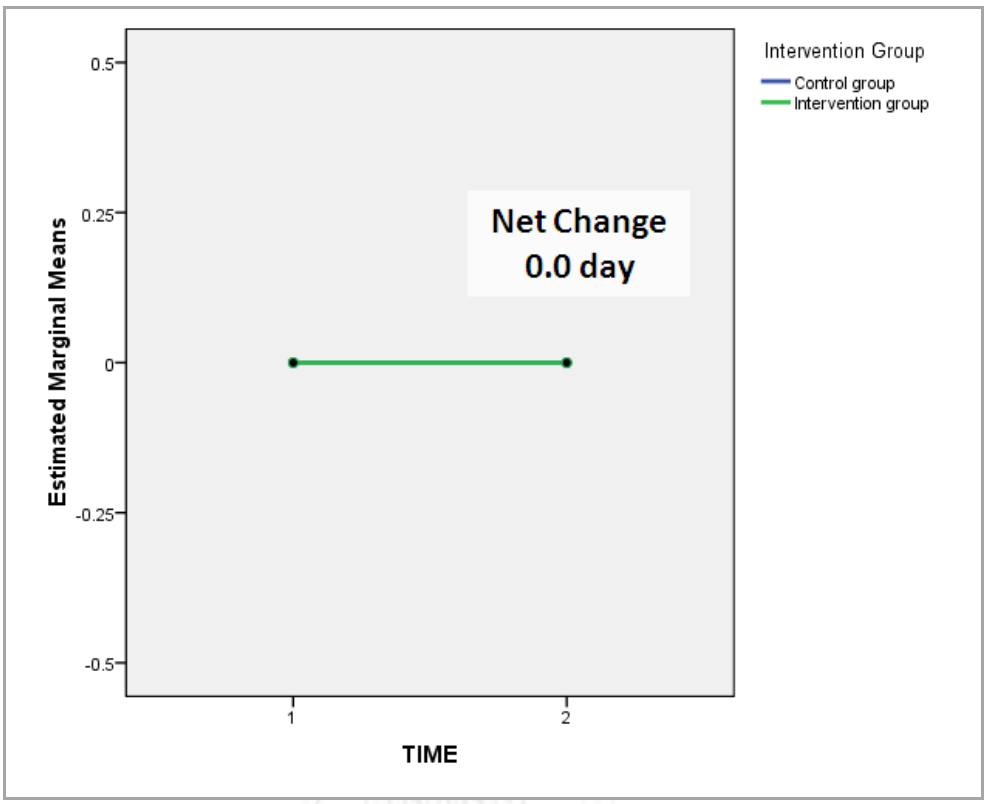


Figure 4.23. Net change in the number of days a patient met his/her CPF compliance range for patients in control and intervention groups from pre-intervention to post-intervention stages.

Figure 4.24 shows the magnitude and direction of the change in the modified DQI-I scores of the patients in the intervention and control groups. In the intervention group, the modified DQI-I score of the patients increased by 0.3 points while it decreased for those in the control group. The over-all net change was positive.

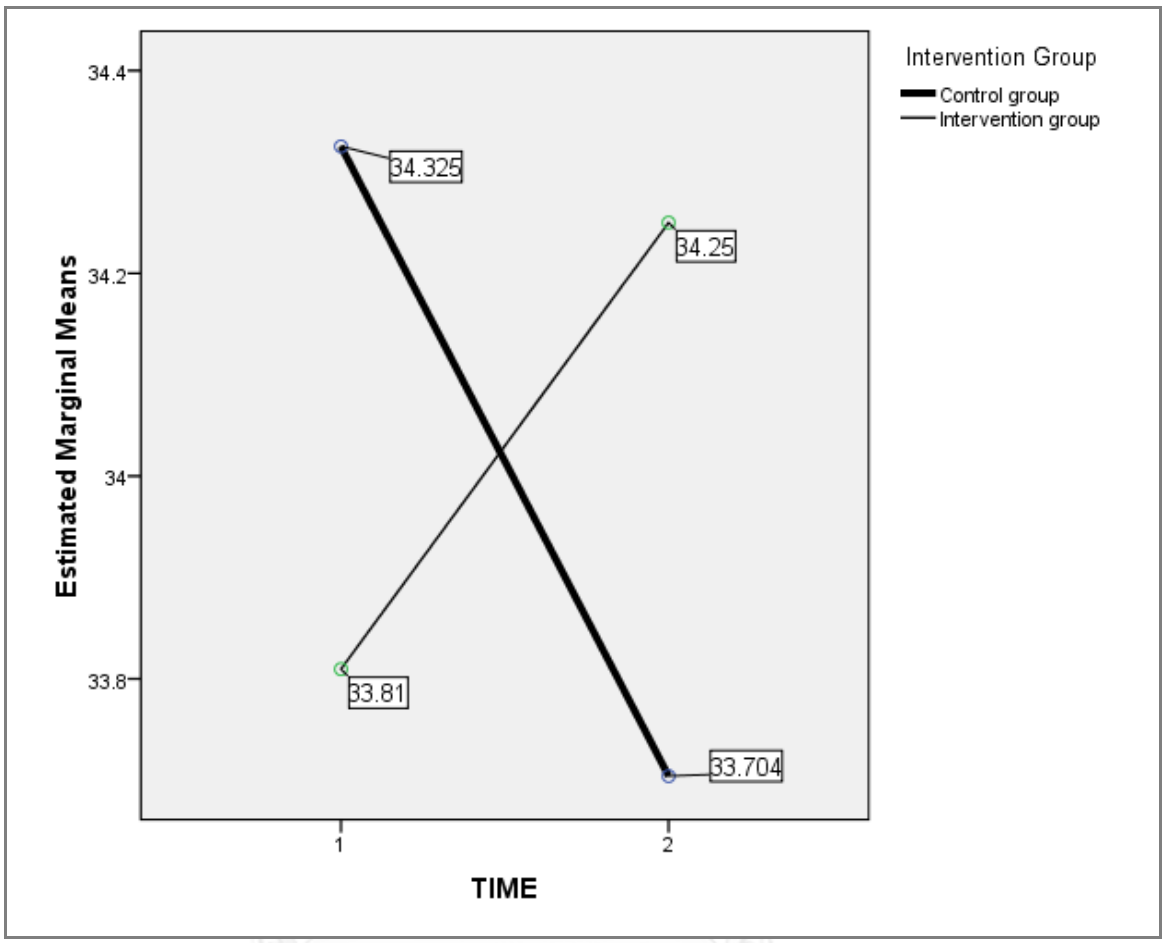


Figure 4.24. Net change in the modified DQI-I score of patients in control and intervention groups from pre-intervention to post-intervention stages.

Chapter V

Discussion

The research sought to investigate the impact of physical accessibility, food store availability and in-store availability of diabetic healthy food options in the local food environment on the dietary compliance and diet quality of Type 2 Diabetes Mellitus patients enrolled in the CVD program of Davao City. It also aimed to describe the patients' willingness to purchase and the local merchants' willingness to sell DHFOs. An enhanced medical nutrition therapy intervention was designed, implemented and assessed. The current national and local policies and programs that had bearing on the accessibility and availability of food at the community level were also analyzed.

5.1. Influence of physical accessibility, food store availability and in-store availability of diabetic healthy food options on the dietary compliance and diet quality of diabetic patients.

5.1.1 Food environment

5.1.1.1 Food store availability

A total of 2,315 food stores participated in the food environment survey. Four out of five food stores were food retailers or those that sold dry, processed food and the rest were food establishments. When rendered in a map, food stores tended to be located near major highways as well as residential developments including informal settlements. This is an expected trend since there would be heavier foot and vehicle traffic in these areas.

Almost all of the food stores found in the community were smaller-sized food stores such as *sari-sari* stores and *karinderias*. Big food stores such as supermarkets and restaurants were lesser in number and tended to be located in more populous barangays. The high presence of smaller-sized food stores is not surprising, since this requires minimal investments on the part of the owner. This is consistent with the findings of other studies that have inventoried food stores at the community level such as the studies by Cannuscio et al. (2013), Bovell-Benjamin et al. (2009) and Liese et al. (2007). *Sari-sari* stores and *karinderias* are easier to put up and sustain since they requires only a small financial and logistic investment. There is no need for it to offer a wide variety of products or food dishes. These stores still manages to thrive even if it sells coffee, biscuits and some junk food or offers only 2-3 dish viands. It is not an uncommon sight in the Philippines to have these stores in lining up along one street. Households often put up these small stores to augment their family income or to give those who stay at home, particularly the older members of the household, something to do.

When it came to store density rate, the results were mixed. More populous barangays had more food sources per square kilometer. However, this pattern did not hold true for the population-based store density. This inconsistency between the two measures of store density could be attributed to other neighborhood-level factors that can influence the feasibility and sustainability of running a food store, other than area and population size. Neighborhood-level factors could include ethnic/race, types of dwellings in the community (i.e. rental properties) and socioeconomic status of residents. In the United States, Moore and Diez Roux (2006) found that the type and location of food stores varied along racial/ ethnic and socio-economic lines. They found that lower-income neighborhoods tended to have more grocery stores and liquor stores but fewer fresh markets and natural food stores. This was consistent with the earlier findings of Morland et al. (2002) and Powell et al. (2007b). In a multi-site study by Krukowski et al. (2010), they found that median household income was significantly associated with the Nutrition Environment Measures Study (NEMS) healthy food availability score.

In a developing country like the Philippines, other neighborhood-level factors could include urbanicity level and the types of economic activities in the community. Urbanization as well as the increasingly diversified economic activities brings about a more robust local economy. This attracts more residential development and more investments, including investments in different types and scale of food stores. With a more robust local economy, residents in these barangays are more likely to have a higher purchasing power. In the recent study of Bower et al. (2014), they found that the patterns of supermarket availability differed between urban and rural settings. Their analysis indicated that neighborhood poverty or racial/ethnic composition predicted supermarket availability.

The level and type of food store availability at the community level presents a potential conduit through which healthier food options could be made available at the community level. At present, popular healthier food options like brown rice are sold in supermarkets and big wet markets. If the local government chooses to create a policy or program that pushes healthier food options further along the supply chain, then these food stores is a ready option in increasing physical access to these products.

With regards to physical accessibility, results indicate a significant number of food stores within a walking distance of the patient's residence. Almost all of the food stores located near the patients' residences was *sari-sari* stores and *karinderias*. However, the in-store availability of DHFOs in these types of stores are limited to non-perishable processed DHFOs and the absence of low-fat, low-salt dishes. They would have less access to the fresh DHFOs because it is unlikely that it is sold in the stores near their houses.

5.1.1.2 In-store availability

The picture of in-store availability of diabetic healthy food options was not optimistic as expected. Although most of DHFOs were available among food retailers, the most available ones were the fast-moving and non-perishable food options. These items were often consumed for breakfast or snacks. In contrast, highly-perishable food options were more available in larger stores, such as supermarkets. Unfortunately, there were only two supermarkets found within the study area and were located in one barangay. Patients will have to travel far to get to a supermarket to buy DHFOs that are not being sold in their local food store such as low-fat milk and fresh produce. This creates an added economic, logistic and time burden on patients and their caregivers when it comes to adhering to their diet.

The DHFOs included in this study were available in supermarkets while 4 out 5 *sari-sari* stores carried the top 5 most available DHFO. The top 5 most available DHFO were pure black coffee, brown sugar, eggs, bread/ saltine crackers and coconut oil. Except for eggs, these are fast-moving, processed food products with long shelf-lives. Fresh food options were available in supermarkets but were rarely available in smaller-sized food retailers such as *sari-sari* stores. This is consistent with the findings of Bovell-Benjamin, Hathorn, Ibrahim, Gichuchi, & Bromfield (2009), who found that healthy food options such as yellow and dark green vegetables as well as low-fat dairy products were not available among convenience stores in Tuskagee. Other studies have also shown a limited availability of healthy food options, particularly fresh fruits and vegetables, low-fat dairy products and fresh meats in convenience stores (Liese et al., 2007), single-aisle (Laska et al., 2009) and small independent stores (Jetter and Cassady, 2006) compared to larger food stores such as supermarkets. Bustillos et al. (2009) looked into in-store availability and variety of healthful food options among tradition, non-traditional and convenience food stores in Brazos Valley. They observed that, among convenience and nontraditional food stores, "dollar stores" offered the best variety of more healthful options such as canned fruits and vegetables, whole-wheat bread and whole-grain cereal while traditional food stores such as grocery stores and supermarkets offered the greater availability of more healthful food options. In a comprehensive food store survey in the Lower Mississippi Delta, Connell et al. (2007) found that supermarkets carried 96% of the food items that compose the Thrift Food Plan (TFP) while small/medium stores carried half of the food items listed. Only 28% of the TFP food items were available in convenience stores. Although

almost all of the food items in the TFP could be found in supermarkets, the number of supermarkets is limited. There are also logistical constraints in the part of community residents that limits their ability to access the supermarkets.

This trend in in-store availability can be driven by a number of factors. The high availability of dry processed food products could be attributed to the minimal investment needed in order to sell them. These products are often available in sachets or repacked to smaller packaging requiring smaller shelf space such as shelves. These are often fast-moving products so the return on investment is faster. They also have longer shelf-lives, so that the store owner does not need to worry about them going stale. Lastly, the high availability of fast-moving DHFOs could also be driven by relatively high demand for them.

The in-store availability trend could also be influenced by competition among food retailers. Responses from food retailers indicate that their reluctance to sell some DHFOs is due to the fact that other food retailers in the area were selling the same products. Personal preferences of food store owners were also a big factor in their reluctance to sell certain DHFOs, particularly fresher DHFOs. Fresh and highly-perishable produce would need for more investments in terms of space, storage equipment, additional manpower and time to buy fresh produce on a daily basis. Time and additional manpower is needed to ensure that the stock of fresh products is replenished regularly. Cooling equipment such as a refrigerator or cooler is needed to store fresh meats which will take up store space.

Another possible factor is the dynamics of supply and demand. Consumer preferences can be shaped by what is readily-available to them. Consumers will not demand for products that they know are not available in certain types of stores. For example, they will not look for fresh meats in their *sari-sari* store if they know that it is not being sold there. On the other hand, in-store availability can be influenced as well by the demand for certain products. Food store owners will not sell certain products when they know that it will not be move fast. Their investment would just be sleeping if the items in their stores are not sold fast enough. This situation can be viewed as a "chicken-and-egg" problem.

The in-store availability of diabetic healthy dishes among food establishment presented a more dismal picture. Low-salt and low-fat dishes were not available among food establishments. For patients who prefer buying cooked food for their meals, they could end up eating food that is not necessarily good for them. This is not surprising since there is not enough demand for food establishments to serve low-salt and low-fat dishes. Oftentimes, patients would have to make do with what is available in their areas which are not necessarily good for them (Laska et al., 2009). This has implications on the patients' ability to maintain their diet. The fresh produce need for cooking, i.e. meats and vegetables, is not readily available. At the same time, they are less likely to find low-salt and low-fat dishes. Bovell-Benjamin et al. (2009) made a similar observation on the impact of the limited availability of healthier food options among small food stores which are commonly located at the community level.

5.1.2 Patients' eating and shopping patterns and nutritional assessment

5.1.2.1 Eating patterns

Most of the patients changed their diet since their diagnosis through portion control and changing the kinds of food that they ate (i.e. eating rice corn instead of white rice). Through portion control, they are able to stick to their diet without further burdening the family and the household budget. When it came to meal planning and preparation, the patient and their spouse still played a central role in the process. However this does not necessarily translate to support. During food record validation interviews, patients shared stories about their diet in the context of their household situation. There were patient who regularly received cooked food from their children. So, they had to make do with what was given to them regardless of the fact that these dishes might not be good for them. Most patients also often shared their meals

with other members of their families, especially with the younger children and grandchildren. If the kids wanted to eat fried chicken, this was what got served at meal time. Since the patients live with their nuclear and extended families, there had to be balance between the dietary requirements of the patients and the preferences of the other members of the household. Rice corn consumption is an example. Although eating rice corn is part of the food culture of Davao City, it is still an acquired taste. There are still people who prefer to eat white rice over rice corn. Hence, doing portion control or eating more vegetables would be a more reasonable adjustment for diabetic patients. This way there is no need to prepare separate dishes and would not further tax the household budget. A review of 29 empirical studies on social support and chronic illness by Gallant (2003) found a modest positive relationship between social support and chronic illness self-management, especially for diabetes. There is evidence suggesting that diabetic patients found it particularly difficult to maintain their diets when other family member were inflexible about their own dietary preferences. Albarran et al. (2006) found that the family dietary behavior was a challenge for diabetic patients largely due to the differences in dietary preferences and food preparation of the other members of the family. This was due to the fact that food selection and preparation respond fundamentally to dietary preferences derived from the family and not solely from the individual diabetic (Albarran et al., 2006). This was also consistent with the findings of a recent 2012 study among diabetic patients in Davao City on the social support given to diabetic patients. Dazon (2012) observed that there was little support given to diabetic patients when it comes to their diets. Support given by family members was more focused on "watching over the patients." However, they were less demonstrative when it came to "more interactive" aspects of support such as reminding patients about their diet, providing negative or positive feedback, monitoring the patient's meals and buying food that the patients could eat.

The study results brought to light the need to include their non-diabetic spouses and/or caregivers in program interventions. This was an important consideration in designing the enhanced MNT intervention where the patient's caregiver was made his/her treatment partner during the intervention. As his/her treatment partner, he/she participated in the nutrition counseling process to help create a more supportive household environment in reaching the patient's diet and nutrition needs. However, this turned out to difficult to achieve as evidenced by the low attendance of the treatment partners during the course of the intervention. Appropriate behavioral theories should be integrated into future MNT interventions.

All of the patients ate 3 times a day and often ate at home. This is an important piece of information when it came to the nutrition counseling process. At the same time, it also reflects the food culture of Dabawenyos where people still prefer to eat at home most of the time. Since results of the food environment survey showed that there were no food establishments that served low-salt, low-fat dishes, the fact that patients still prefer to eat at home is a good sign.

However, it is important to keep in mind the challenges in maintaining a healthier diet when eating at home. As mentioned earlier, a big challenge for patients who share their meals with other members of the household is the need to balance everybody's food preferences and requirements. An example would be choosing between the food preferences of the children and those of the older members of the household. Often, the food preferences of the younger members of household are catered to and prioritized since it is more important to make sure that they are adequately fed to stay healthy. Although this choice is a perfectly valid one, patients would have to learn to cope with this situation. This was apparent in their responses to questions regarding the changes that they have made in their diets. These changes include eating more vegetables and rice corn as well as portion control.

Based on the responses of the patients, the eat-at-home pattern was largely driven by budgetary constraints and food safety concerns. It is cheaper for patients to eat at home compared to going out to eat since they can stretch their available budget by buying smaller packages, haggling with food sellers and the like. They are also able to make larger portions and eat as much as they can. Transaction costs are also minimized. If the family were to eat out, the transaction

cost is multiplied by the number of people travelling. In contrast, eating at home pushes down the transaction costs to the cost of going to and from the market. The downside to this has been discussed previously.

The budget also influences the choices that the household would have if they decide to eat out. If their budget is constrained, then they would have to eat in the cheaper places such as *karinderias* and *turo-turos* where food safety can be a problem. Patients and their family are not assured that the food being served in these food stores are safe and clean. So, for the patients, it would be better for them to prepare the food themselves since they know that the food they are eating is prepared properly.

When it came to snacking, majority of the patients ate snacks. Most of them snacked in the afternoon although it is highly probable that most of them ate snacks more than once a day. This is a behavior that is consistent with nutrition advice given to the patients where they are encouraged to eat frequently (up to 6 meals a day).

When it comes to DHFO availability at home, the most available were white rice, fish and bananas. This was consistent with the food records of the patients. The marked absence of low-fat/ non-fat milk in the house is consistent with the dietary intake of the patients. There were few patients who drank milk regularly but not low-fat/ non-fat milk.

The apparent absence of coconut oil in the household can be attributed to the patients' feedback indicating that they did not know what kind of oil they bought. In the Philippines, cooking oil is stored in big vats, repacked into small plastic cases and sold in the *sari-sari* stores. These are often not labeled as well. Oftentimes, residents prefer to buy the repacked oil because it is cheaper and widely available. Since these packs are unlabeled, the patients do not what kind of cooking oil they are purchasing. Similarly, responses from the food store owners also revealed that they did not know the kind of cooking oil they were selling.

5.1.2.2 Food shopping patterns

The food shopping patterns of the patients showed that they preferred to shop in larger stores where more products were offered at cheaper prices and were accessible to them. Ideally, a supermarket would be the best option for this. This is in line with the recent observations of Cannuscio et al. (2013) in study conducted in West and Southwest Philadelphia. Using the validated Nutrition Environment Measures Survey in Stores (NEMS-S) survey, they found that most of the survey participants did their primary food shopping in supermarkets that offered more diverse and healthful food inventories. Using multivariate analysis, participants were more likely to go to supermarkets closest to home that had a more extensive inventory of healthier food options. Similarly, a comprehensive food store survey in Lower Mississippi Delta revealed that 96% of items in the Thrifty Food Plan were available in supermarkets (Connell et al., 2007). By looking into the combined findings of 5 independently conducted studies on the daily food practices of low-income communities in California and Chicago, Alkon et al. (2013) also found that low-income families generally shop in large chain supermarkets while only a small proportion shopped in small neighborhood markets or corner store.

Unfortunately, there were only 2 supermarkets in the study area. Groceries and wet markets are the better alternatives. Groceries are not as big as supermarkets but offer more products compared to the *sari-sari* store. The food environment survey results reveal that this type of food store is more available at the community level. This could be attributed to the fact that grocery stores require less financial and logistic investments compared to a supermarket. Wet markets, on the other hand, are local markets that sell both dry goods and fresh produce (meats, vegetables and fruits). It can be likened to a supermarket but with many individual retailers. Wet markets are composed of many retailers and are often divided into different zones. It is also a one-stop shop where customers could buy everything could possibly need such as fresh and dry food items, household items, school uniforms, medicine, etc. People are also able to get more value for their money since they can haggle over prices which they cannot do in groceries and supermarkets.

The food purchasing patterns of the patients showed that the fresh meats were often bought from the wet market while the non-perishables were bought from the grocery store and *sari-sari* stores. This is reflective of the in-store availability of fresher produce among food stores at the community level. The purchasing decisions of where to buy what food item is largely driven by the in-store availability in specific types of food stores. There is no incentive for food stores to sell food items that there is no demand for. *Sari-sari* stores, for instance, has no incentive to sell fresh vegetables because people do not buy them. Conversely, people will not look for and buy food items in stores that they know these are not available. Given the reluctance of *sari-sari* store owners to sell fresh meats, buyers buy these from the wet markets. This in turn lessens the incentive for *sari-sari* store owners to sell fresh meats.

Patients were asked about their considerations when they shopped for food. The most common reasons for shopping for food in specific types of food stores were accessibility and lower prices. The insights drawn from different food pathways studies in Chicago and California provide a contrast to this finding. Alkon et al. (2013) found that the cost of food were the main drivers behind the respondents' decision on where to shop. There were respondents who were willing to travel farther just to save on costs. People shopped in multiple stores, rather than the nearest store, if it would generate the most savings. This is consistent with the findings of Galasso et al. (2005) among black diabetic women. Their findings showed that, among lower-income diabetic patients, the cost of the food was one of the factors that constricted their shopping and food preparation efforts. This, in turn, hindered their ability to comply with their dietary needs.

Interestingly, all of the patients did not consider the availability of more DHFOs as a factor when food shopping. The DHFOs used in this study were common and familiar food items. However, these food items are not commonly associated with diabetes. It is likely that the patients were thinking of products that are specifically formulated for diabetics such as milk "specifically formulated for diabetics." Furthermore, if patients and their treatment partners associate DHFOs with products/ items that are specifically formulated for diabetics, they will not consider the availability of DHFOs when food shopping since these products are generally expensive and unaffordable to patients on a tight budget.

The lack of consideration given to the availability of DHFOs when food shopping could also be attributed to the possibility that patients were not able to connect and integrate what they have learned during nutrition counseling sessions to their food shopping considerations. The nutrition counseling session does not espouse going on a "diabetic diet" but rather encourages patients to eat healthier such as eating more vegetables and leaner meats, doing portion control, eating in moderation. Patients should be able to associate these DHFOs as "diabetic healthy".

When it came to buying cooked food, purchases have been limited to restaurants and *karinderias*. The reason for eating in these places is due to the taste of the meals ("delicious"). Nonetheless, they do not consider the availability of diabetic healthy dishes as a reason for choosing the places where they eat out. Given the unavailability of low-salt, low-fat dishes among food establishments, patients do not consider looking for such options.

5.1.3 Patients' nutritional assessment

Patients were given their personalized dietary prescription when they underwent nutrition counseling. This included their total energy requirement (in kcal/day) as well as their carbohydrate, protein and fat requirements (in g/day). The dietary prescription is computed to find the appropriate energy and CPF levels for each patient by taking into account their body mass index, body frame, level of physical activity and dietary goal (weight loss or weight gain). The daily intake of the patients were assessed and compared against their prescribed levels.

Results indicate that the daily energy and macronutrient intake of the patients did not meet their prescribed levels which indicate that patients were not eating optimally. The proportion of energy from protein and fat were below

prescribed 25% and 20% levels, respectively, while the percentage of energy from carbohydrate tended to be above the prescribed level of 55%. These findings were consistent with the results of the 7th National Nutrition Survey (NNS) conducted in 2008. The proportion of energy from carbohydrate, protein and fat of the average Filipino was estimated to be 70.5%, 12.1% and 17.4 respectively (Food and Nutrition Research Institution, 2010). This was also consistent with the 2009 findings in a cross sectional study conducted among older adults in a rural community in the Philippines. Risonar et al. (2009) found that the carbohydrate, protein and fat provided around 78%, 11% and 11% of total energy intake, respectively, raising the need for a "timely nutritional assessment and appropriate nutrition counseling" for this target population. In a study among African diabetic adults, Nthangeni et al. (2001) observed a similar pattern of energy distribution.

With respect to the micronutrient intake, the patients did not fare better. Micronutrient intake of the patients was also found to be less than the recommended levels for their sex and age group. This was evident in the %RENI pattern observed among the patients where they were not able to meet the recommended levels considered to be adequate. The proportion of vitamin C, calcium and iron to recommended values were low but this is consistent with the research findings for the patients' age group. Community living elderly in the Philippines suffered from the lack of micronutrient intake when compared to dietary recommendations (Risonar et al., 2009). The results of the 7th National Nutrition Survey also indicated that less than 20% of the households surveryed were able to meet the recommended levels for iron and calcium, among other essential nutrients while only 30% of the household were able to meet the recommended levels for ascorbic acid.

There have been a number of research studies among the elderly showing that older people tend to consume food in small amounts and eat less frequently compared to their younger counterparts, such as the findings of Shahar et al. (2007) and Risonar et al. (2009). Similar patterns were observed in studies among the elderly in South Africa (Oldewage-Theron and Kruger, 2008), Portugal (Velho et al., 2008), Finland (Vikstedt et al., 2011), Brazil (Sarti et al., 2013) and the United States (Deierlein et al., 2014). In a recent cross-sectional study among older urban adults aged 60 to 99 years old, Deierlein et al. (2014) observed that energy, fiber, and the majority of micronutrient intakes were less than recommendations the recommended levels.

This consumption pattern could be attributed to a number of factors. The more obvious reason is the budgetary constraint that patients live under. Since most of the patients live in households where the average monthly household income is PhP 10,000 and below, there is not much go around especially if they live with their extended families. Due to their low income, household members are generally eating less.

This behavior could also be seen as their way of adapting to their dietary prescriptions. The common complaint by black diabetic women participating in a diabetes education program was the inability of the health professionals to tell them "how to do" the necessary lifestyle changes (Galasso et al., 2005). This sentiment could be at play in this situation. Since the patients only underwent one nutrition counseling session, the patients did not have an idea about how their dietary prescriptions translate to actual food on their plates. Patients were given a sample meal at the end of their counseling session. Theoretically, this serves as their "template" when planning their meals. Since there were no follow-up visits, the patients were unable to get feedback on how they should be adjusting their dietary intake in light of the dietary prescription. It is then possible that patients erred too much on the side of caution and end up eating less than what is optimal for them.

Another possible reason is the "fear" of eating too much. During the course of the study, the researcher came across some of the myths and misinformation about the disease and its management, particularly on diet, from the patients and their caregivers. Even the barangay health workers and other health personnel were not immune from this. Also, patients are often confronted with people saying "you CANNOT eat such and such food". Since the patients have only been recently diagnosed at the time of the study, it is possible that they feared eating too much and cut their dietary intake

too much instead. Mannucci et al. (2008) analyzed the total energy and macronutrient intake of 1,242 predominantly elderly subjects enrolled in the InCHIANTI study using the EPIC self-reported questionnaire. They found that patients with known diabetes reported statistically significant lower total energy and soluble carbohydrate intakes compared to other subjects without known diabetes. Their findings posit that the diabetes diagnosis could induce some changes in dietary intake. However, they also suggest that these adjustments might not be consistent with current guidelines and recommendations.

The limited availability of fresh produce in their immediate vicinity could be another contributing factor. Even if there were a significant number of stores available within a 300 to 500 meter radius around their residence, these food stores were *sari-sari* stores. These stores, as seen in the food environment survey, often do not sell fresh produce. Given this constraint, patients will have to make do with what is readily available. There were also mobile vendors who go around the community selling fresh fish and vegetables, but these were often more expensive. If the patients and their family wanted to buy these items at a lower price, they have to go to the few wet markets located in the study areas.

The "under-consumption" pattern highlights some of the weaknesses to the nutrition counseling service of the CVD program. The nutrition counseling service was only done once – when the patient registers to the program. During this one-time session, program nutritionists educate patients about diabetes, conduct a 24-hour food recall interview, determine the patient's food preferences, teach the Idaho Plate method and explain the sample meal plan within 45 minutes or less. The session is packed with information that there is not enough time for nutritionists and patients discuss diet and nutrition information. Based on observations during the nutrition counseling sessions, the nutritionist often quickly skims through all of the topics that needed to be covered because of the time constraint. As a result, patients can be overloaded with information that they do not have time to ask questions or seek clarification about their diet. It is possible that they fall back on the advice that they hear from well-meaning family members, friends, neighbors and even strangers. Unfortunately, this is often riddled with misinformation and myths. They might make adjustments to their dietary intake that could lead to under-consumption.

Consequently, the time constraint also lessens the chance to quickly and efficiently identify and address the patients' dietary intake (under-consumption or over-consumption). Since it is a one-time session only, there are no other opportunities to do a nutritional assessment to identify and evaluate this issue. The absence of follow-up sessions also hinders the ability of nutritionists to continuously assess the food intake of the patients and teach them how to plan and prepare their meals better so that they are able to meet their dietary prescriptions. Given the observed dietary patterns among the patients, the nutritionists would have to think of ways to encourage patients to eat more while still maintaining a healthy diet.

These dietary intake patterns pose a big challenge to the program nutritionists as well. The community-based nutrition counseling service of the CVD program is the first of its kind in the Philippines. This is also the first time that the city's nutritionists are involved in a more systematic and structured delivery of this service. Even though they are registered dietitians and nutritionists, it is most likely that they have not been actively involved in providing nutrition counseling to diabetic patients for a number of years. Hence, the nutritionists are essentially re-tooling their skills set to match the requirements of the service. And being able to do quick nutrition assessment and customize their nutrition advice would take time to re-learn.

5.1.4 Dietary compliance

Results of the basic analysis as well as the sensitivity analysis showed that majority of the patients were not able to meet their energy compliance range at least once a week. Although the sensitivity analysis used a narrower range of

values around the prescribed levels, the number of days patients were energy compliant did not change. When it came to macronutrient intake, none of the patients were CPF compliant during the week. The basic analysis indicated that more patients were able to meet the compliance range for carbohydrate but not for protein and fat. This pattern is consistent with the results of the macronutrient intake assessment when the proportion of energy from carbohydrate was high while the proportion of energy from protein and fat were low. The compliance levels for macronutrient intake established in the basic analysis disappeared when a narrower compliance range was used in the sensitivity analysis.

The most common dietary outcome measure used in food environment-diet studies have focused on compliance with the recommended number of servings of particular food groups such as grains, meats, fruits and vegetables. A cross-sectional study in Switzerland involving 4,371 adults showed that there was low compliance with the Swiss dietary recommendations per week for fruit, vegetables, meat, fish and dairy products (de Abreu et al., 2013).

There have been several studies that have explored the barriers to dietary adherence among diabetic patients. Cost of healthy food, stress-related inappropriate eating, small portion sizes and temptation of eating unhealthy food has been identified as barriers at the individual level in studies such as those by Vijan et al. (2005) and Marcy et al. (2011). Vijan et al. (2005) observed that the most commonly cited challenge to sticking to the diet prescribed to diabetics was the high cost of healthy food. The findings of a study seeking to determine whether price was a barrier to fruit and vegetable consumption among low-income families in the US showed that these families would have to spend 43% to 70% of their household income to fruits and vegetables in quantities that met the 2005 US Dietary Guidelines (Cassady et al., 2007).

Social support, including the home environment, can enhance or impeded dietary adherence. A number of studies have sought to provide evidence on this. Insights garnered from discussions among Mexican diabetic patients revealed that there was reluctance among family members to follow dietary change recommendations because these changes were viewed to be a diabetic's concern (Albarran et al., 2006). Discussion groups among diabetic patients in Michigan have also identified the lack of family support as one of the major factors that made dietary adherence difficult for patients (Vijan et al., 2005). Beverly et al. (2008) conducted a qualitative study that delved into spousal support and its influences on dietary changes among 30 middle-aged and older diabetic patients and their spouses. Using social cognitive theory, their findings revealed that the core themes related to dietary adherence were linked to reinforcement and self-efficacy constructs. They posit that the spouse places a critical role in providing support and reinforcement to the diabetic patient as he/she copes with the disease. Similarly, the spouse also helps build the patient's self-efficacy or his/her perceived ability to follow a healthful diet. This perceived competence can be influenced by internal and external control over food within the marital relationship as well as knowledge on self-care management.

The use of dietary compliance as a metric is helpful in comparing food intake against their dietary prescription. It is quick way of measuring how patients are doing when it comes to meeting their dietary prescription. It can be a form of feedback to patients in tracking their progress when it to their diet.

However, the standards used in this analysis needs to be constructive for the patients as well as handy as a performance metric. A compliance range was used for this analysis to ensure that the standards used reflected the acceptable limits around the prescribed energy, carbohydrate, protein and fat intake levels. In contrast, a static standard, such as the dietary prescription, would be too strict and difficult to reach. Using the dietary prescription in its current form (in grams and kcal) is a good tool to help patients have a specific dietary goal. However, it is not helpful as a performance measure. If patients missed the prescribed value by 1 gram or 1 kcal, they are deemed non-compliant. On the other hand, the standard used in the sensitivity analysis was too stringent such that it was also difficult for patients to be considered compliant. In essence, when patients feel that the process towards compliance becomes too difficult, they might give up because they feel frustrated.

Other than providing useful feedback to the patients, this outcome variable is also be helpful in evaluating the performance of the nutritionist. This could serve as a quick feedback to the nutritionist if his/her nutrition counseling advice is making an impact on the patient's dietary intake. At the same time, it also serves as a performance metric that allows the CVD program managers to assess the nutrition counseling service and, at the same time, monitor the performance of the nutritionists. The only drawback with the use of this metric is that it is time consuming to do. Although it is possible for nutritionists to quickly assess the energy and macronutrient intake of the patient, it would still require some down time to do the computations. This might be something that some of the nutritionists would be reluctant to do given the time constraints and load of work that needs to be accomplished during the nutrition counseling session.

5.1.5 Diet quality

The diet quality of their daily intake was found to be poor. The patients' average modified DQI-I scores did not reach the halfway mark. The distribution of the scores was concentrated below 39 points. Most of them scored high in the variety component but did not fare well in the adequacy and moderation components. The low scores in these components are consistent with macronutrient and micronutrient assessment results discussed earlier. However, this was inconsistent with the recent findings of Kim et al. (2013) among Korean diabetics. Using the original validated DQI-I, their analysis of the 1-day dietary intake of 110 diabetic patients revealed that their diet quality was good wherein the mean DQI-I scores of the diabetic patients was 68.9 (SD 8.2) points out of 100 points. Patient scored lowest on over-all balance and highest in the variety sub-component.

The poor diet quality of patients can be linked to a number of factors. At the individual level, a factor that could influence diet quality is the socio-economic status of the patient. Multivariate analysis of the dietary intake of 4,356 American adults showed that better socio-economic status, specifically education and income, independently improved the likelihood of eating more fruit and vegetables and improving diet quality (Beydoun and Wang, 2008).

This could also be attributed to the lack of nutrition knowledge and skills. Even if the patient underwent nutrition counseling, it is possible that the patient did not fully understand what was discussed during the counseling session. In the analysis of Beydoun and Wang (2008) that focused the relationship between SES, fruit and vegetable intake and diet quality, they found that nutrition knowledge and beliefs were effect modifiers in the relationship between socio-economic status and over-all fruit and vegetable intake and diet quality.

At the household level, a factor that could influence this is the budgetary constraint. Most of the patients involved in the study were living in lower-income households. With a reported household income of PhP 10,000 or less, there is not much to go around. They are also most likely to be living with their extended families so the household budget has to be stretched to support more people. The recent 2012 Family Income and Expenditure survey shows that, on the average, Filipino families spend 44.4% of their income on food. For families in the bottom 30 percent per capita income group, two-thirds of their expenditure was on food (National Statistics Office, 2013). Although this seems like big chunk, it translates to a small amount in monetary terms. If patients were living with their extended families, then the food budget has to be stretched more. This translates to smaller dietary intake. Hence, they are likely to have poorer diet quality.

Another possible factor is the food environment itself. As seen in the food environment findings, the in-store availability of the fresh perishable DHFO was lower in the small-sized stores. These were also the most available food stores that the patients had the most access to. Patients have to travel far and spend more to gain access to a supermarket, grocery or wet market where the DHFOs are most available in one place. There has been limited published analysis that has focused on the relationship of food store and in-store availability on diet quality. So far, findings from

these studies have been inconsistent. Laraia et al. (2004) found that diet quality among pregnant women were more likely to be poor when they lived in close proximity to supermarket (less than 4 miles to the nearest supermarket). Turkish shoppers who chose supermarkets as their first shopping choice had better diet quality compared to those who shopped elsewhere (Tessier et al., 2008). Using baseline data derived from Multi-Ethnic Study of Atherosclerosis (MESA) among American adults aged 45–84 years, Moore et al. (2008) found that participants who living with no supermarkets within 1 mile of their homes were 25–46% less likely to have a healthy diet (higher Healthy Eating Index score) compared to those with the most stores. In a separate analysis of the MESA data, Moore et al. (2009) found that a 1-standard deviation increase in fast food exposure decreases the odds of having a healthy diet by 3% to 17%. In contrast, an recent analysis of 15 years of longitudinal data from the Coronary Artery Risk Development in Young Adults (CARDIA) study, a cohort study of young American adults, revealed no significant associations between greater supermarket availability and diet quality (Boone-Heinonen et al., 2011). When it came to in-store availability and diet quality, Franco et al. (2009) studied the association between healthy food availability and dietary patterns. They found that lower availability of healthy food was associated with the consumption of a poorer-quality diet. Similarly, a study in a low-income community in Baltimore City revealed a significant association between the high availability of corner stores with the consumption of unhealthy food (D'Angelo et al., 2011)

Assessing the diet quality of the diet consumed by patients is a key aspect in assessing dietary intake, especially among diabetic patients. Dietary compliance or meeting the dietary prescription is an important first step since this metric evaluates the patient's dietary intake against the patient's specific dietary goal. Over and above compliance, the healthy-ness of a patient's diet must be established as well. A dietary guideline index, such as the DQI-I, provides a comprehensive snapshot of important aspects of the patient's dietary intake including variety, balance, moderation and adequacy. It gathers the different outputs of the nutritional assessment process (i.e. number of food groups, number of servings of vegetables, %RENI) into a single metric that can be transformed and communicated to a patient (i.e. "very poor", "poor", "good", "very good" categories). A metric such as this could be used to guide the patient during nutrition counseling. At the same time, it can also be a monitoring and evaluation measurement for the nutrition counseling service.

Despite the dismal results, it is important to be cautious about these findings. The low-scoring pattern could also be a result of the way the modified DQI-I is structured when it comes to assigning points. In the adequacy sub-component, there is an "all-or-nothing" approach to scoring. When patients do not reach the recommended levels (100% of recommended levels), they do not get any points. Even if they are able to consume some micronutrients, they do not get credit for it when the intake does not reach the recommended levels. It unduly "penalizes" patients because the cut-offs are too high, especially for the older population. This approach can be misleading since the actual assessed levels tend to be low and would lead one to think that their diets are not good when it is entirely possible that their diets are not as bad.

Furthermore when a sensitivity analysis was done using Philippine standards, there were little to no changes in the scores. This highlights the need to develop a DQI-I scoring system that is country-specific and appropriate for certain age groups and sex.

5.1.6 Association between physical accessibility and energy compliance and diet quality

A significant association was observed between energy compliance and food store availability within 500 meters of the patients' residence. Patients were less likely to meet their energy compliance range with the presence of one additional food store within this distance. This association held true for *sari-sari* stores as well. On the other hand, there was no significant association observed between the food store availability and diet quality despite the proliferation of food stores within 300 meters and 500 meters of the patients' residence.

The direction and magnitude of the association was unexpected. Patients were less likely to meet their energy compliance range with the presence of an additional food store within 300 and 500 meters of the patient's residence. These results are consistent with findings of some studies that have looked into physical accessibility and fruit and vegetable intake. Gustafson et al. (2011) found that low-income women in North Carolina who lived in a census tract with a supercenter and a convenience store consumed fewer servings of fruits and vegetables. They posit that this may reflect influence of the residents' perception about the quality of food options available in nearby food stores. The same relationship was observed between the fruit and vegetable intake among Australian children and availability of convenience stores and fast food outlets within 800 meters of the child's home (Timperio et al., 2008). In a cross-sectional study of male adolescents, Jago et al. (2007) observed the increased distance from distance to a small food store was associated with increase fruit and juice consumption. However, their analysis also showed that residing near a fast food restaurant was also significantly associated with increased fruit and juice consumption. A longitudinal analysis of a large cross-sectional study of US young adults revealed mixed results as well (Boone-Heinonen et al., 2011). Among low-income male respondent, fast food consumption was related to fast food availability within 1.0 to 2.9 kilometers of their homes. However, greater supermarket availability was not associated with greater adherence to dietary recommendations and diet quality.

In contrast, there has also been a significant number of studies over the past few years that have shown that the close proximity of food stores was significantly and positively associated with fruit and vegetable intake. Using the participant's census tract to identify food stores that were near the participant's home, Morland et al. (2002) found that fruit and vegetables intake of black and white Americans in Maryland, North Carolina, Mississippi and Minnesota increased by 32% and 11%, respectively, with the presence of an additional supermarket within the census tract. A cross-sectional analysis of rural seniors Brazos Valley county in Texas, USA revealed that increased distance to the nearest supermarket, nearest food store with a good variety of fresh and processed fruits or those with a good section of fresh and processed vegetables were significantly associated with lower fruit and vegetable intake (Sharkey et al., 2010). Similarly, respondents who had a small food store within 100 meters of their homes had a higher mean intake of fruit and vegetables (Bodor et al., 2008). Their analysis has shown that the presence of a small food store within 100 meters was a marginally significant positive predictor of fruit consumption but not for vegetable consumption.

To date, there has been no similar research conducted at the time of this writing that used the dietary outcomes used in this study. In measuring compliance, the most common standard used is the dietary guidelines for the general population where the recommended number of servings of certain food groups is outlined.

5.2. National and local policy environment that influences food availability and accessibility in Davao City.

The start of a new national and local administration signals the commencement of new policy initiatives and programs while building on existing ones. The vision and goals for the country over the medium term are encapsulated in the current administration's development plan. Enshrined within these development plans are the administration's priority areas and goals. In the past administrations, agricultural policy has always been priority area of the Philippines' development plan. This can be attributed to the fact that the Philippines is still considered an agricultural economy. It is also seen as a tool for economic development and poverty alleviation particularly in the rural areas.

The agriculture and nutrition goals and strategies articulated in the PDP 2011 were similar to previous country-level development plans including the MTDP 2004. Self-sufficiency in rice is a case in point. This goal was a priority area in the PDP 2011 but was also previously included in the MTDP 2004. The strategies outlined in the MTDP 2004 for rice self-sufficiency were similar to those included in PDP 2011. Although there were slight differences in the specific programs and

processes, the strategies essentially stayed the same. This can be interpreted in 2 ways. On a positive note, this shows that there will be continuity when it comes to the agricultural policies and programs as one administration transitions to the next. This is indicative that the programs in place will more or less continue moving forward. On the other hand, this can also be construed that the previous administration was not entirely successful in meeting its development goals. Since this type of reforms has been a recurring theme over the past decades, the lack of success of the national government in bringing about meaningful and sustained development in the agriculture sector is brought to light.

The same can be said for nutrition-related goals and strategies. Malnutrition, specifically undernutrition, has always been a part of the Philippines' policy agenda. The two most recent development plans reflect this although the PDP 2011 provided more details on its nutrition-related goals and strategies and how it links up to other sectors. Despite the inclusion of malnutrition, specifically undernutrition, in the MTPD 2004 and PDP 2011, the strategies and programs were a mere repetition of existing programs such as micronutrient fortification and feeding programs. As previously mentioned, this ensures that the implementation of these programs would still continue. But at the same time, it also highlights the lack of significant success making headway in addressing malnutrition.

At present, it is the PDP 2011 that drives the policy agenda of the (current) Aquino administration. As set in the MTDP 2004, the PDP 2011 also identified food self-sufficiency, white rice in particular, as its primary goal in the agricultural sector. This is further reflected in the FSSP program of the DA. Program documents show that the breadth and width of the work that the Aquino administration is willing to do to improve the agriculture sector. However, a close examination of the documents showed that these efforts are focused on white rice as a food staple. Despite the inclusion of shifting consumption to other food staples and increasing demand for brown rice in the FSSP, there were little to no detailed strategies and actions provided in the document. In a 70-page document, the strategies and actions related to these two issues were confined to a one-page write-up. This further supports the increased focus on the production, distribution and consumption of white rice.

This situation is not by any means different from previous administrations. On one hand, this is not necessarily bad since the agriculture sector is still focused on white rice production. Still, this does not provide flexibility when it comes to other food staples or wage goods, as the MTDP 2004 refers to these food items. Most investments in infrastructure, research and development, social safety nets will be directed towards white rice farmers while little investment headway would be made on other food options like vegetables and animal meats.

This "white rice-centric" policy environment will impact the production, distribution and consumption of other food produce such as other food staples, vegetables, fruits and animal meats. Although these food items benefit from infrastructure investments in white rice production such as farm to market roads, other post-harvest investments are needed to be made as well. Investments in building the appropriate supply chain infrastructure will be needed to ensure the freshness of these products. Similar investments in building sufficient demand for these food products needs to be made as well. Unfortunately, with a "white-rice centric" policy environment in place, this will not be a priority for the national government at present.

Interviews with key local officials revealed that city-level policies and programs revolved around organic agriculture and the Gulayan sa Barangay (GSB) program. When respondents at the city and barangay levels were asked about local initiatives related to food accessibility and accessibility, these were the two most cited programs/ policies. The organic agriculture ordinance promulgated by the city is a local adoption of the national policy on organic agriculture. On the other hand, the GSB is a city-initiated program that has been in place before the institution of the FSSP.

It would appear that the city does not have a specific program that links up to the FSSP. Given that the FSSP is essentially a continuation of an existing national program under a different name, existing local agricultural programs remain

unchanged. Interestingly, when asked about the local implementation of the FSSP, both the regional office of the DA and the City Agriculture Office were pointing at the other office to provide more details about the FSSP.

The provisions of the ordinance reflected the need to establish and build organic agriculture in the city. The provisions were mainly focused on setting the foundations for organic agricultural production such as standards setting, establishing a gene bank, etc. There was little mention of how the growth in this sector will be stimulated over the long-term, including investments in infrastructure and sustainability issues. There were no provisions that focused on building the demand for organic produce. Supply and demand for organic produce are two sides of one coin that are critical elements in building and sustaining organic agriculture in the city. The way the ordinance is crafted shows a more short-sighted vision that focuses on establishing organic agriculture.

The local ordinance contained provisions that earmark part of the local budget for organic agriculture. Unfortunately, the way the provision is written comes across as ambiguous and subjective. What may be "appropriate and substantial" for one administration may not be true for another. This opens up the possibility of the budgetary allocation to fluctuate depending on the importance being given to organic agriculture.

If the CAO is looking at organic agriculture as an initiative to enhance food accessibility and availability, it is going to take a while before this will be realized. At present, organic agriculture is still in the infancy stage. The IRR of the local ordinance was just passed in 2012. The organization of the organic agriculture technical committee was also completed during the same year. Ideally, the ball should start rolling by 2013 with budgetary support in place by the 2014 budget. However, given the highly politicized nature of the city agriculture office as well as the change in political leadership in the city, there is big chance that this policy will be sidelined because it might not be a priority of the current CAO leadership.

On the other hand, there seemed to be a collective agreement that the GSB program is the city's centerpiece program that addresses food accessibility and availability at the community level. A major strength of this program is that it has been implemented by the city for a number of years. It enjoys a substantial and steady budgetary support from the city.

However, it has a number of weaknesses that jeopardizes the city's ability to address food accessibility and availability issues at the barangay level. One major drawback with the GSB program is that it is an annual competition. The fact that it is a competition has several implications on the possible impact of the program on food accessibility and availability. One, the competitive nature of the GSB does not allow for a more prescriptive or "de kahon" approach. Thus, there is no minimum set of deliverables that implementers need to accomplish. Barangays were essentially given a free hand on how they design their community garden to be, although the district agriculturists were on hand to provide technical support. The absence of a prescriptive approach also leads to variability in how the barangay sets up and manages the garden. Therefore, there is no assurance that the vegetables produced would redound to increasing food access and availability within the barangay.

There is also no incentive for barangays to make their community gardens be more than the criteria set for the competition. The way the point system is structured gives an insight the priorities of the program. The manner by which points are assigned shows the incentives/ disincentives in place. Out of the 5 criteria items, the kinds of vegetables that are planted in the barangay's garden merits the most number of points (40 points). Participants get less than 5 points if they plant less than 4-5 kinds per type of vegetable but, if they plant more than 5 kinds per type of vegetable, they are not given more points. There is no incentive to have a big multi-crop garden. Similarly, the same pattern could be seen with the community involvement criteria. If the school (Gulayan sa Paaralan) built a community garden or 40 households adopted the program, the barangay automatically gets 10 points. However, the barangay does not get more points if more than 40 households adopt the program thereby creating a disincentive to recruit more households to participate in the

community garden initiative. Although sustainability is one of the criteria but it is more agriculture-related wherein soil fertility is assured. This shows that economic sustainability of community garden is a priority.

Due to the competitive nature of the program, emphasis is placed on winning the competition. Although it is referred to as a "program," this initiative does not push a city-wide effort to make vegetables more available and accessible. Since the criteria at present does not indicate the need to create access for those living in the community, including patients, to the garden, then there is no incentive for them to do so. Although there are some barangays who sell their vegetable produce to the residents, there is no incentive for the other barangays to do so. This was evident in the responses of the barangay respondents where they shared that the produce was already contracted to a market supplier and could not be sold retail to the members of the barangay.

Another drawback to the current set-up of the GSB program is that its "implementation" of the GSB program is uneven largely because participation is voluntary. At present, approximately 50% of the city's barangays are participation in the program that residents of non-participating barangays without the opportunity to access the produce of the community garden. And since a participating barangay can opt-out of the competition, this also cuts potential access to the community garden.

Lastly, there are no sustainability mechanisms in place at the city and barangay levels. The voluntary nature of participation makes it easy for barangays to opt-out of the program which makes the existing community garden obsolete. For barangays to participate regularly, the year-to-year growth of their community gardens are not taken into consideration in the criteria. Hence, there is no incentive to make the barangay gardens flourish over the long run. Despite the fact that the GSB is referred to as a program, it is not an institutionalized initiative that all barangays have to participate in. As stated earlier, there are no pre-defined deliverables over and above setting up a community garden. Essentially, the CAO oversees and manages the running of the competition. These do not ensure the sustainability of the community gardens.

As a whole, the national and city policies and programs do not translate to mechanisms that enhance food availability and accessibility at the community level. There is a national directive that specifically addresses this issue. However, implementation is done by different national agencies. There is no mechanism that synchronizes the different initiatives in order to achieve nutritional goals. At the city level, the prominent initiative that is linked to food accessibility and availability fails to achieve this because it is bogged down by sustainability issues.

5.3. Effectiveness of an enhanced medical nutrition therapy intervention on the diet and nutrition knowledge, dietary compliance and diet quality of patients in the CVD program.

5.3.1 Energy, macronutrient and micronutrient intake

The average daily energy and macronutrient intake of patients in both groups were less than the average prescribed levels at pre-intervention or post-intervention stages. Consistent with the baseline findings, dietary intake of patients in both groups at the start and end of the intervention was high in carbohydrates and marginal in fat and protein. The same trend was observed in the micronutrient intake of the patients in both groups. When it came to the percentage of the patients' daily intake of selected micronutrients to the recommended values, their daily intake was still below the adequate levels. Furthermore, there were no significant changes in these dietary outcomes for both groups from pre-intervention to post-intervention stages. Other similar nutrition interventions showed different results. Using a randomized control trial design, a 1997 intensive diabetes education intervention resulted in significant decreases in total energy intake as well as the proportion of energy from fat and carbohydrate was found among diabetic patients in the intervention group

(Agurs-Collins et al., 1997). A workplace-based nutrition intervention was implemented in a university campus in 2003. Based on the Health Belief Model, the intervention aimed at changing dietary behavior by systematically modifying specific health beliefs, particularly benefits and barriers related to dietary changes and, at the same time, increase nutrition knowledge related to CVD. The assessment of the intervention revealed significant reduction in total energy and fat, among other nutrients, in the treatment group (Abood et al., 2003). In a more recent intervention study in South Korea, nutrient analysis of diabetic patients who participated in the study revealed significant changes in carbohydrate and selected micronutrient intake (Lim et al., 2009).

Despite the enhanced MNT intervention, the under-consumption trend was still evident at the post-intervention stage. This could be attributed to the fact that the intervention itself does not directly address this issue. However, this highlights the need to integrate a mechanism to find and address this pattern among patients who will be undergoing nutrition counseling.

5.3.2 Dietary compliance

The trend in the level of dietary compliance of the patients in both groups is not encouraging. Most of the patients in both groups did not meet their energy and CPF compliance ranges at any time during the week. After the intervention, the same pattern was evident. Nutrition intervention studies that looked into dietary compliance are far and between. Results of a nutrition education intervention in Seoul, South Korea revealed significant changes in compliance to a dietary prescription following a single individual-based nutrition counseling session plus a telephone follow-up (Lim et al., 2009). In a study by Tang et al. (2010), similar results were observed among African-American diabetic patients. Significant improvements in the intake of healthier diets were found among patients in the intervention group after receiving a 6-month intervention focused on empowering patients as they learned to cope with diabetes.

However, it is important to note the difference in how dietary compliance was measured in these studies compared to the current study. Although patients who took part in the Korean study answered a food frequency questionnaire, their intake were not compared against a dietary prescription. Their intake were compared to the dietary guideline. On the other hand, the study of Tang et al. (2010) utilized self-reported responses to questions related adherence to dietary recommendations (i.e. adhering to a low-fat diet"). The dietary compliance metric used for this study evaluates daily intake against a dietary prescription that is unique to the patient.

5.3.3 Diet quality

The diet quality of the dietary intake of the patients in both groups was poor. This did not improve after undergoing the enhanced MNT intervention, as seen in the median change in the modified DQI-I score. This was consistent with the findings on the proportion of the recommended values for selected micronutrients that was met by patients as well as the proportion of energy from carbohydrate, protein and fat. At the time of this writing, there has been no published article on the effect of a nutrition education intervention on diet quality.

Consistent with the findings in Phase 1, the patients got low scores in the adequacy and moderation components. The dietary intake of the patients was assessed as "inadequate" and, thus, did not get any points. However, as was raised in an earlier discussion, the "all-or-nothing" approach to the scoring system of the DQI-I can be a big factor behind the low scores of the patients both prior to and after the intervention. Should the CVD program adopt the DQI-I as a monitoring and evaluation metric, the DQI-I needs to be further modified to be more sensitive to the normal eating patterns of Filipinos across different sex and age groups.

The trends in energy and macronutrient intake, dietary compliance and diet quality were found to be consistent across these different outcomes. The patterns indicate a tendency towards under-consumption that contributed to low compliance and poor diet quality. These trends can be attributed to a number of factors. A contributing factor is the short time interval between the end of the intervention and the post-intervention assessment which was done immediately after the end of the intervention. Patients did not have enough time to modify their diets. It is going to be a struggle to mesh what they have learned in the nutrition counseling sessions with their food preferences. For a patient does not like to eat vegetables, it would take some time for him/ her to slowly integrate vegetables into his/her daily intake. The most common complaint shared during a series of focus group discussions among African American diabetics was portion sizes. Patients would often go hungry because of the small portion size (Vijan et al., 2005).

Changing their dietary intake would also take more time since patients would have to make these adjustments within the home environment. The necessary shift in dietary intake, i.e. eating more vegetables or less fried dishes, would have to be "negotiated" with other members of the household. Other non-diabetic members of the household may support or resist this change. Other than the supportiveness of other household members, economic constraints could facilitate or hinder this change. Nevertheless, it would take time before any meaningful changes could be made.

These trends also reflect the shortcomings of the intervention itself. The intervention, in its current form, was not specifically designed to address under-consumption. The intervention was aimed at improving nutrition knowledge and skills to help patients make better dietary choices. It would take much more than the current structure of the intervention to fully capacitate the diabetic patients in adhering to their dietary prescription.

The food environment is another factor that could influence these trends. The low availability of fresh, highly-perishable DHFO in food stores near the patients' residence limits the options that patients can choose from. Should they want to buy fresher options, they would have to go to the supermarket or wet market. This would entail transaction and opportunity costs on their part. Given that they are most likely a low-income household, this option might not be available to them. Therefore, they would have to make do with what is available.

5.3.4 Knowledge and market game scores

Patients took 2 types of tests at the beginning and end of the intervention. One was the 12-point knowledge test and the Market Game test. The questions in the knowledge test were based on the content of the nutrition counseling sessions while the Market Game was a simulation game to test the patients' knowledge and intent to purchase. The change in knowledge test scores of patients in the control group and the change in market game scores of patients in the intervention group were found to be statistically significant. These trends are promising signs that the intervention has an impact on the knowledge levels of the patients. However, these results should also be considered cautiously given the small sample size of diabetic patients that participated in the study. An implementation of the intervention at a larger scale (larger sample size) at the same level of intensity increases the confidence that the intervention has significantly affected nutrition knowledge.

A number of nutrition interventions have been conducted that looked into the effect of these interventions on nutrition knowledge. These interventions have shown promising results as well. The Dining with Diabetes program of the Illinois Extension Services was a community-based diabetes education program designed to increase knowledge of healthful food choices. It was composed of 3 monthly sessions focusing on meal planning. Knowledge questions focused on the identification of carbohydrates, artificial sweeteners, the Food Guide Pyramid, the Nutrition Facts label, types and sources of fats, and the importance of fiber in the diet (Chapman-Novakofski and Karduck, 2005). Participants of the program showed significant increases in knowledge after the intervention. Similar gains were seen in a nutrition education intervention was

implemented in a diabetes clinic in Seoul, South Korea. The 1-2 hour session was structured to provide information about meal planing and the dietary recommendations. Based on the results of their food frequency questionnaires, each participant in the intervention group was provided customized dietary advise. Food exchange knowledge was assessed to determine nutrition knowledge. The intervention assessment by Lim et al. (2009) revealed a significant increase in food exchange knowledge in the intervention group but none in the control group.

Dietary management is one of the cornerstones of self-management that diabetic patients must engage in. Although knowledge gain does not necessarily translate to changes in dietary behavior, nutrition knowledge is one of the major factors that influences food consumption (Variyam and Blaylock, 1998). The lack of nutrition knowledge has been cited as a barrier to dietary adherence (Galasso et al., 2005). It has also been linked to better diet quality scores (Variyam and Blaylock, 1998). The enhanced MNT intervention implemented and assessed in this study is an important first step in capacitating diabetic patients in making bettern dietary choices by providing them with nutrition knowledge and skills in a series of structured sessions.

Despite these promising results, there are a number of points that need to be raised when the intervention is rolled out to other barangays. The study areas chosen for Phase 3 were purposively chosen in order to control for the possible effect of the "health center dynamics" on the success or failure of the intervention. An important consideration was the positive working relationship between the barangay midwife and the barangay health workers. This was especially true when it came to choosing the intervention area since the intervention relies heavily on making sure that patients keeping their next appointment. The relationship between the barangay midwife and the barangay health workers plays a critical role in this mechanism because these two entities would be closely coordinating patient recruitment and appointment keeping of the patients.

The presence of the researcher during the time of the intervention could have also influenced the implementation of the intervention. During the post-intervention interview, some of the patients cited the presence and engagement of the research team as a factor for their attendance. Reminder SMS messages were also sent by the researcher or a member of the research team to patients scheduled for a session while a member of the research team was always present during the nutrition counseling sessions every Thursday. When the intervention is rolled out to the rest of the city, the implementation would be relying on the barangay midwife and the barangay health workers in ensuring that patients keep track of their appointments and actually go to the health center to attend the sessions. This could be quite problemmatic because these health personnel would be reluctant to spend their own money or spend more time ensuring that their patients actually go to the health center.

Lastly, the nutritionist is critical to the sustained implementation of the intervention. To ensure that the nutrition counseling session went on as scheduled during the intervention period, a formal endorsement from the City Health Office was sought. Formal requests to the City Nutrition Office and the District Health Office were also given to ensure that the nutritionist was officially assigned to help in the intervention and could not be recalled to do other functions during the scheduled days. These measures were done to ensure that a nutritionist was on-site and available during the scheduled appointments. One of the major challenges facing the intervention roll-out is the never-ending demands on the time of the nutritionists. City nutritionists are assigned at the health district level where they oversee nutrition-related programs, including the CVD program, within the health district. They are also called to attend trainings on behalf of the city or serve as resource persons during workshops and trainings. It would be very easy for their commitment to the intervention to be set aside in the face of more urgent needs.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

6.1.1 The influence of physical accessibility, food store availability and in-store availability of diabetic healthy food options on the dietary compliance and diet quality of diabetic patients.

There was high food store availability at the community-level with a substantial number of food retailers and food establishments in the barangays. Smaller-sized food stores, particularly *sari-sari* stores, have a dominating presence at the community level. However, access to DHFOs is constrained by the type of food stores that proliferate at the community level. Based on in-store availability results, fast-moving non-perishable food products were the most available DHFO in these types of stores while fresh highly-perishable food items were the least available. Fresh highly-perishable options were available in larger food retailers, supermarkets in particular. When it came to cooked food, low-fat, low-salt options were not available in food establishments.

The substantial number of food stores at the barangay is points of potential access for DHFO by diabetic patients. Given the large presence of food stores that are physically accessible from the patients' residence, there is cause for optimism. However, the reluctance of food retailers to sell fresh highly-perishable DHFO needs to be addressed. Most food retailers were not willing to sell these food options because of logistical and "saleability" concerns.

The dietary intake patterns, diet quality and dietary compliance of patients were found to be poor among the diabetic patients who participated in the study. The energy, macronutrient and micronutrient intake of the patients did not reach prescribed and/or recommended levels. Consequently, most patients did not reach the energy and CPF compliance ranges while the diet quality of the patients was found to be poor. These trends highlight the need to address the dietary intake of the patients. It brings to light the issues that the nutrition counseling service does not fully address.

Despite the high availability of food stores, energy compliance was significantly associated with the availability of food stores, *sari-sari* stores in particular, within 500 meters of the patient's residence to the his/her ability to meet his/her energy compliance range at least once a week. No significant associations were found to diet quality and food store availability within 300 and 500 meters of the patient's residence.

6.1.2 The policy framework at the national and local level on food availability and accessibility

There have not been substantial changes in the national policy framework when it came to food availability and accessibility. Although the Philippine Development Plan 2011-2016 identified food self-sufficiency is a national priority, the strategies and programs created to implement these strategies were still essentially that same as programs of previous administration. The strategies outlined in the PDP 2011 are embodied in the Food Self Sufficiency Program of the Department of Agriculture, the lead agency tasked to oversee the implementation of these strategies. However, a closer scrutiny of the program documents revealed that the food self-sufficiency efforts will be on white rice production.

These self-sufficiency strategies were also found to be included in the Philippine Action Plan for Nutrition 2011-2016 of the National Nutrition Council, a multi-sector agency that oversees nutrition-related programs. Yet, the council has little administrative power over implementing agencies such as the Department of Agriculture and the Department Health.

Therefore, the need to realize nutritional targets is not assured because of the disparate implementation of the different programs.

Local food accessibility and availability efforts have been centered on the establishment of organic agriculture in the city and the Gulayan sa Barangay program. Given that the organic agriculture ordinance has only been recently promulgated, it would take few more years before its effect on food accessibility and availability will be felt. The ordinance's language and content indicate its focal point would be the creation and establishment of organic agriculture. There were no provisions that focused on issues such as demand stimulation, sustainability of the industry and the like.

The Gulayan sa Barangay program is an annual competition conducted among participating barangays. The competition has grown such that 50% of the city's barangays are currently participating in the competition. However, the fact that it is a competition has significant impacts on the program's sustainability. Participating barangays do not have any incentive to create a mechanism that links their community gardens to increasing food accessibility and availability. This program falls short of addressing food accessibility and availability within the barangay.

6.1.3 Effectiveness of the enhanced medical nutrition therapy (MNT) intervention on energy intake, diet quality, dietary compliance and nutrition knowledge

The enhanced MNT intervention appears to be effective in improving nutrition knowledge. Results after the implementation of the intervention showed that there was a significant difference in the knowledge levels of the patients in the intervention group compared to those in the control group after the intervention. There was also a significant difference between the changes in knowledge scores between the 2 groups. Significant difference in the knowledge scores of patients between patients in the intervention and control groups was also observed.

In contrast, the intervention was not effective in influencing change in the dietary intake, dietary compliance and diet quality of among the patients in the intervention group. At the pre-intervention stage, there were no significant differences in energy intake, energy and CPF compliance, modified DQI-I scores, knowledge and market game scores between patients in the 2 groups. Nevertheless, there were no significant changes found in the energy intake, dietary compliance and diet quality in the 2 groups after the implementation of the intervention.

These results indicate that the intervention is effective in improving nutrition knowledge but not dietary intake, dietary compliance and diet quality. This could be influenced by a number of factors. It will take time before dietary modifications can take place. Individual, social and physical environment factors play a big role in this process. The post-intervention assessment was done immediately after the end of the intervention. There was not enough time for the patients to modify their dietary intake in a more sustained manner. The intervention structure could also be insufficient or inappropriate in addressing these outcomes.

6.2. Strengths and limitations to the study

The food environment assessment is one of the major contributions of this research. This type of assessment is the first of its kind conducted in the Philippines. The amount and type of data collected for the food environment assessment, including the geo-coding of food store locations, has enabled the researcher to generate a comprehensive picture of the food environment at the barangay-level. Even though the survey was conducted in 6 barangays, the survey instrument could easily be replicated. Even though the observation checklist included DHFOs, the checklist could be revised to include the Filipino food basket.

The dietary outcomes included in this study have not been the focus of published nutrition studies in the Philippines. In assessing dietary compliance, the use of a patient's dietary prescription as a standard is an innovation. To date, there are no published studies that have focused on assessing dietary intake against a standard such as a personalized dietary prescription. Most literature on dietary adherence have centered on compliance with national dietary guidelines that outline the recommended number of servings of particular food groups or following dietary recommendations such as "eating a low-fat, low-salt diet". Similarly, there are no published studies on diet quality among diabetic patients in the Philippines.

A major strength of this research is the integration of the various processes, tools, standards and references used by the CVD program into the data processing and analysis process. These included the Food Exchange List (FEL) used by the nutritionists as well as the patient interview form used in nutrition counseling. These were important considerations to ensure the replicability of the analysis done should the program leaders decide to integrate the nutrition assessment process into the program. The researcher was also careful to follow the internal processes and procedures of the program. This was particularly true during patient recruitment and the implementation of the intervention. This was done to ensure that the needs of the research did not supersede the standard operating procedures of the program.

Another contribution of the research study was the use of a market game, a food shopping simulation exercise, to assess nutrition knowledge. Other than using a knowledge test questionnaire, the study used the revised "Market Game" cards included in the Play and Learn kits developed by the Nutrition Council of the Philippines. These kits were distributed to all local government units to compliment the Mothers Nutrition classes being conducted by the local health units. The standard "Market Game" cards comprised of healthy food items. For the purposes of the study, additional food cards depicting unhealthy and "kind of" healthy food items were generated. In essence, the study took an existing tool and built on it to be used for other purposes.

There are a number of limitations to this study that must be taken into account. The nutritional assessment relies heavily on the use of food records made by the patients themselves. The time when recorded their dietary intake as well as the level of honesty of the patients when recording has an impact on the completeness and accuracy of the food records. It is likely that the patients were not fully honest when they were writing their food records. They could underestimate their food intake or not record all of the food that they ate in order to appear to be eating healthy. The only patient that dropped out in Phase 1 left the research because she did not want to do the food record. Based on the exit interview, she was embarrassed that she was not able to control her food intake and comply with her dietary prescription. Food records were validated by enumerators one week after the recording period. During this process, recall bias plays a factor since patients will have to validate what they ate and remember portion size a week after they recorded it.

The use of food records could also have an unintended effect on the food intake of the patients. It is also possible that patients adjusted their food intake during the recording period because they become more aware of what they are eating. This effect could also be compounded by the fact that the research team sent them SMS messages during the course of the recording period. Although these messages were limited to reminders to record their intake, this could also serve as an unintended prompt for them to eat healthy.

The small sample sizes in Phases 1 and 3 limits the power of the study to confidently illustrate the relationship between the food environment and the dietary outcomes as well as the ability to infer the effect of the intervention on the dietary and knowledge outcomes of patients in both groups. A study with a larger sample size would be beneficial in detect these associations.

The food environment results of the study are not generalizable to other barangays in Davao City. The study areas in Phase 1 were urbanized barangays that were located farther from the city center. Although the same type of food

stores are likely to be found in other barangays, the density and spatial distribution would be different. Physical accessibility would also be markedly different between barangays, even among urbanized barangays. Patients living in barangays located in the city center would have access to more food stores whether they walk or take public transport. In the study areas, patients would take on more transportation costs in order to expand their food store choices.

The study results are also not generalizable to all diabetic patients in Davao City. The patients that participated in the study belong to a lower socio-economic stratum that influences the type and quality of health care that they have access to. The patients are more or less still reliant on the services offered by the city health office. Their health seeking behavior could also be different. Their food shopping and eating patterns as well as the willingness to sell/ purchase responses might vary compared to patients living in other barangays. The barriers to access that these diabetic patients face might also be different. These barriers could include differences in transportation options, the geographic characteristics of their barangay.

6.3. Recommendations and future research

Efforts should be made to include the enhanced MNT intervention into the roster of services that the CVD program provides to its clients, particularly diabetic patients. The intervention shows that a service such as this could be easily implemented with minimal changes in how the CVD program is currently being implemented at the barangay and district levels. The inclusion of the intervention as a regular service under the program would enhance the dietary outcomes of the patients who will be participating in the enhanced MNT service. It will also create an opportunity for the program implementers to monitor and engage its clients on other services that self-management practices such as physical activity. By offering the enhanced MNT service, the program will be able to address issues related to the low dietary compliance and poor diet quality of the patients.

In doing this, appropriate and sensitive metrics should be developed and tested by the program. This study used two such metrics to evaluate the energy and macronutrient intake of the patients. However, these metrics needs to be adjusted so that they are suitable for the kind of feedback needed. As pointed in previous sections, the metrics to be used should be useful for patients. In a way, it should make sense to them. For nutritionists, it should provide suitable and appropriate feedback on the dietary intake of the patient. It should be sensitive enough to identify strengths and weaknesses to the patient's dietary intake.

Similarly, the diet quality index needs to be adjusted as well. It is a very good tool for nutritionists and patients to see another way their food intake is assessed, not just in terms of meeting their dietary prescription. However, the current form of the modified DQI-I is still not fully appropriate. As previously pointed out, the cut-offs in the scoring system is too high. It needs to be adjusted to levels that are appropriate for the age group and sex. For example, research studies have shown that the elderly population eats less. So it is unrealistic to expect them to reach the recommended adequacy levels for the general population. At the same time, macronutrient and micronutrient adequacy levels are different from those used in the modified DQI-I cut-offs. The cut-off scores should also be appropriate for diabetic patients as well.

When developing these metrics, it is also important to keep in mind that these metrics serve several purposes. It could be used to monitor the progress of diabetic patients as they go through the nutrition counseling services. It is also a tool that could be used to assess the effectiveness of the service itself in helping patients reach their dietary and treatment goals. At the same time, these metrics can also be used to evaluate the performance of the nutritionists. Similarly, it can also be feedback to patients on their food intake vis-à-vis their dietary prescription.

Despite the presence of a national initiative that addresses food availability and accessibility, the policy actions at the local level is a critical piece in ensuring this. All of the local policies (i.e. organic agriculture policy) and programs (i.e. food self-sufficiency implementation and the Gulayan sa Barangay competition) needs to come together under a cohesive framework. The integration of the various policies and program needs to go beyond what it is right now. By integrating these initiatives in one framework, the interrelated elements of these programs and policies would synchronize.

The city should explore institutionalizing the program at the barangay level. Given the track record of the Gulayan sa Barangay program of the city, it is ripe for implementation in all barangays. The best and worst practices that the program implementers have seen through the years will help guide the city agriculture office in institutionalizing this program. It is also going to be an opportunity to directly intervene in food accessibility and availability issues and influence nutrition-related outcomes at the barangay level.

Future research could focus on developing and validating a standardized food environment assessment tool very similar to the Nutrition Environment Measurement Survey (NEMS) tools from the United States. This standardized tool will allow for comparability between future food environment researches.

Food environment research in different settings and context should also be actively pursued. The current study looked into the food environment within residential communities. However, most people work, play and socialize in other setting such as workplaces, schools, churches, etc. These research studies will greatly inform non-communicable disease (NCD) prevention programs in the future.

REFERENCES

ABOOD, D. A., BLACK, D. R. & FERAL, D. 2003. Nutrition education worksite intervention for university staff: application of the health belief model. *J Nutr Educ Behav,* 35**,** 260-7.

AGURS-COLLINS, T. D., KUMANYIKA, S. K., TEN HAVE, T. R. & ADAMS-CAMPBELL, L. L. 1997. A randomized controlled trial of weight reduction and exercise for diabetes management in older African-American subjects. *Diabetes Care,* 20**,** 1503-11.

ALBARRAN, N. B., BALLESTEROS, M. N., MORALES, G. G. & ORTEGA, M. I. 2006. Dietary behavior and type 2 diabetes care. *Patient Educ Couns,* 61**,** 191-9.

ALKON, A. H., BLOCK, D., MOORE, K., GILLIS, C., DINUCCIO, N. & CHAVEZ, N. 2013. Foodways of the urban poor. *Geoforum,* 48**,** 126-135.

AMERICAN DIABETES ASSOCIATION 2008. Nutrition recommendations and interventions for diabetes: a position statement of the American Diabetes Association. *Diabetes Care,* 31 Suppl 1**,** S61-78.

AMERICAN DIABETES ASSOCIATION 2011. Standards of medical care in diabetes--2011. *Diabetes Care,* 34 Suppl 1**,** S11-61.

AUCHINCLOSS, A. H., DIEZ ROUX, A. V., BROWN, D. G., O'MEARA, E. S. & RAGHUNATHAN, T. E. 2007. Association of insulin resistance with distance to wealthy areas: the Multi-Ethinic Study of Atherosclerosis. *American journal of epidemiology,* 165**,** 389-397.

AUGUST, K. J. & SORKIN, D. H. 2010. Marital status and gender differences in managing a chronic illness: the function of health-related social control. *Social science and medicine***,** 1831-1838.

BARREIRO-HURLÉ, J., GRACIA, A. & DE-MAGISTRIS, T. 2010. Does nutrition information on food products lead to healthier food choices? *Food Policy,* 35**,** 221-229.

BENNETT, P. H. 2011. Evolution of classification and diagnostic criteria for diabetes and other forms of hyperglycemia. *In:* NARAYAN, K. M. V., WILLIAMS, D., GREGG, E. W. & COWIE, C. C. (eds.) *Diabetes public health.* New York, New York, USA: Oxford University Press.

BEVERLY, E. A., MILLER, C. K. & WRAY, L. A. 2008. Spousal support and food-related behavior change in middle-aged and older adults living with type 2 diabetes. *Health Educ Behav,* 35**,** 707-20.

BEYDOUN, M. A., POWELL, L. M. & WANG, Y. 2008. The association of fast food, fruit and vegetable prices with dietary intakes among US adults: is there modification by family income? *Soc Sci Med,* 66**,** 2218-29.

BEYDOUN, M. A. & WANG, Y. 2008. Do nutrition knowledge and beliefs modify the association of socio-economic factors and diet quality among US adults? *Prev Med,* 46**,** 145-53.

BLAYLOCK, J., SMALLWOOD, D., KASSEL, K., VARIYAM, J. & ALDRICH, L. 1999. Economics, food choices, and nutrition. *Food Policy,* 24**,** 269-286.

BODNAR, L. M. & SIEGA-RIZ, A. M. 2002. A diet quality index for pregnancy detects variation in diet and different by sociodemographic factors. *Public Health Nutrition,* 5**,** 801-809.

BODOR, J. N., ROSE, D., FARLEY, T. A., SWALM, C. & SCOTT, S. K. 2008. Neighbourhood fruit and vegetable availability and consumption: the role of small food stores in an urban environment. *Public Health Nutr,* 11**,** 413-20.

BOONE-HEINONEN, J., GORDON-LARSEN, P., KIEFE, C. I., SHIKANY, J. M., LEWIS, C. E. & POPKIN, B. M. 2011. Fast food restaurants and food stores: longitudinal associations with diet in young to middle-aged adults: the CARDIA study. *Arch Intern Med,* 171**,** 1162-70.

BOVELL-BENJAMIN, A. C., HATHORN, C. S., IBRAHIM, S., GICHUHI, P. N. & BROMFIELD, E. M. 2009. Healthy food choices and physical activity opportunities in two contrasting Alabama cities. *Health Place,* 15**,** 429-38.

BOWER, K. M., THORPE, R. J., JR., ROHDE, C. & GASKIN, D. J. 2014. The intersection of neighborhood racial segregation, poverty, and urbanicity and its impact on food store availability in the United States. *Prev Med,* 58**,** 33-9.

BROWN, A. F., VARGAS, R. B., ANG, A. & PEBLEY, A. R. 2008. The neighborhood food resource environment and the health of residents with chronic conditions: the food resource environment and the health of residents. *J Gen Intern Med,* 23**,** 1137-44.

BUSTILLOS, B., SHARKEY, J. R., ANDING, J. & MCINTOSH, A. 2009. Availability of more healthful food alternatives in traditional, convenience, and nontraditional types of food stores in two rural Texas counties. *J Am Diet Assoc,* 109**,** 883-9.

CANNUSCIO, C. C., TAPPE, K., HILLIER, A., BUTTENHEIM, A., KARPYN, A. & GLANZ, K. 2013. Urban food environments and residents' shopping behaviors. *Am J Prev Med,* 45**,** 606-14.

CASSADY, D., JETTER, K. M. & CULP, J. 2007. Is price a barrier to eating more fruits and vegetables for low-income families? *J Am Diet Assoc,* 107**,** 1909-15.

CHANG, K. 2010. Comorbidities, quality of life and patients' willingness to pay for a cure of type 2 diabetes in Taiwan. *Public health,* 124**,** 284-294.

CHAPMAN-NOVAKOFSKI, K. & KARDUCK, J. 2005. Improvement in knowledge, social cognitive theory variables, and movement through stages of change after a community-based diabetes education program. *J Am Diet Assoc,* 105**,** 1613-6.

COLE, I. & CHESLA, C. 2006. Interventions for the family with diabetes. *Nursing Clinics of North America,* 41**,** 625-639.

CONNELL, C. L., YADRICK, M. K., SIMPSON, P., GOSSETT, J., MCGEE, B. B. & BOGLE, M. L. 2007. Food supply adequacy in the Lower Mississippi Delta. *J Nutr Educ Behav,* 39**,** 77-83.

CROKER, H., WHITAKER, K. L., COOKE, L. & WARDLE, J. 2009. Do social norms affect intended food choice? *Prev Med,* 49**,** 190-3.

D'ANGELO, H., SURATKAR, S., SONG, H. J., STAUFFER, E. & GITTELSOHN, J. 2011. Access to food source and food source use are associated with healthy and unhealthy food-purchasing behaviours among low-income African-American adults in Baltimore City. *Public Health Nutr,* 14**,** 1632-9.

DAVIS, W. A., KNUIMAN, M. W., HENDRIE, D. & DAVIS, T. M. E. 2006. The obesity-driven rising costs of type 2 diabetes in Australia: projections from the Fremantle Diabetes Study. *Internal medicine journal,* 36**,** 155-161.

DAZON, C. G. 2012. *Diabetes social support and quality of life of patients in Davao City.* Masters of Public Health, University of the Visayas.

DE ABREU, D., GUESSOUS, I., VAUCHER, J., PREISIG, M., WAEBER, G., VOLLENWEIDER, P. & MARQUES-VIDAL, P. 2013. Low compliance with dietary recommendations for food intake among adults. *Clin Nutr,* 32**,** 783-8.

DEIERLEIN, A. L., MORLAND, K. B., SCANLIN, K., WONG, S. & SPARK, A. 2014. Diet quality of urban older adults age 60 to 99 years: the Cardiovascular Health of Seniors and Built Environment Study. *J Acad Nutr Diet,* 114**,** 279-87.

DEPARTMENT OF HEALTH 2011. Diabetes mellitus prevention and control program.

DREWNOWSKI, A. & HANN, C. 1999. Food preferences and reported frequencies of food consumption as predictors of current diet in young women. *American Journal of Clinical Nutrition,* 70**,** 28-36.

DUBOIS, L., GIRARD, M. & BERGERON, N. 2000. The choice of a diet quality indicator to evaluate the nutritional health of populations. *Public Health Nutr,* 3**,** 357-65.

FESKANICH, D., ROCKETT, H. R. H. & COLDITZ, G. A. 2004. Modifying the Healthy Eating Index to assess diet quality in children and adolescents. *Journal of American Dietetic Association,* 104**,** 1375-1383.

FOOD AND AGRICULTURE ORGANIZATION 2010. *Fats and fatty acids in human nutrition: report of an expert consultation,* Rome, Food and Agriculture Organization.

FOOD AND NUTRITION RESEARCH INSTITUTION 2010. *Philippine Nutrition: Facts and Figures,* Metro Manila, Food and Nutrition Research Institute.

FORD, E. S., MOKDAD, A. H., GILES, W. H., GALUSKA, D. A. & SERDULA, M. K. 2005. Geographic Variation in the Prevalence of Obesity, Diabetes and Obesity-Related Behaviors. *OBESITY RESEARCH,* 13**,** 118-122.

FRANCO, M., DIEZ-ROUX, A. V., NETTLETON, J. A., LAZO, M., BRANCATI, F., CABALLERO, B., GLASS, T. & MOORE, L. V. 2009. Availability of healthy foods and dietary patterns: the Multi-Ethnic Study of Atherosclerosis. *Am J Clin Nutr,* 89**,** 897-904.

FRANSEN, H. P. & OCKE, M. C. 2008. Indices of diet quality. *Curr Opin Clin Nutr Metab Care,* 11**,** 559-65.

FRANZ, M. J., BANTLE, J. P., BEEBE, C. A., BRUNZELL, J. D., CHIASSON, J.-L., GARG, A., HOLZMEISTER, L. A., HOOGWERF, B., MAYER-DAVIS, E., MOORADIAN, A. D., PURNELL, J. Q. & WHEELER, M. 2002. Evidence-Based Nutrition Principles and Recommendations for the Treatment and Prevention of Diabetes and Related Complications. *Diabetes Care,* 25**,** 148-198.

FRANZ, M. J., BOUCHER, J. L., GREEN-PASTORS, J. & POWERS, M. A. 2008. Evidence-based nutrition practice guidelines for diabetes and scope and standards of practice. *J Am Diet Assoc,* 108**,** S52-8.

FRANZ, M. J., POWERS, M. A., LEONTOS, C., HOLZMEISTER, L. A., KULKARNI, K., MONK, A., WEDEL, N. & GRADWELL, E. 2010. The evidence for medical nutrition therapy for type 1 and type 2 diabetes in adults. *J Am Diet Assoc,* 110**,** 1852-89.

GALASSO, P., AMEND, A., MELKUS, G. D. & NELSON, G. T. 2005. Barriers to medical nutrition therapy in black women with type 2 diabetes mellitus. *Diabetes Educ,* 31**,** 719-25.

GALLANT, M. P. 2003. The influence of social support on chronic illness self-management: a review and directions for research. *Health Educ Behav,* 30**,** 170-95.

GREEN, C., HOPPA, R. D., YOUNG, T. K. & BLANCHARD, J. F. 2003. Geographic analysis of diabetes prevalence in an urban area. *Social science and medicine***,** 551-560.

GUCCIARDI, E., DEMELO, M., OFFENHEIM, A., GRACE, S. L. & STEWART, D. E. 2007. Patient factors associated with attrition from a self-management education programme. *J Eval Clin Pract,* 13**,** 913-9.

GUSTAFSON, A. A., SHARKEY, J., SAMUEL-HODGE, C. D., JONES-SMITH, J., FOLDS, M. C., CAI, J. & AMMERMAN, A. S. 2011. Perceived and objective measures of the food store environment and the association with weight and diet among low-income women in North Carolina. *Public Health Nutr,* 14**,** 1032-8.

HAINES, P. S., SIEGA-RIZ, A. M. & POPKIN, B. M. 1999. The Diet Quality Index revised: a measurement instrument for populations. *J Am Diet Assoc,* 99**,** 697-704.

HOLMES, J., GEAR, E., BOTTOMLEY, J., GILLAM, S., MURPHY, M. & WILLIAMS, R. 2003. Do people with type 2 diabetes and their carers lose income? (T2ARDIS-4). *Health Policy,* 64**,** 291-296.

HOROWITZ, C. R., COLSON, K. A., HEBERT, P. L. & LANCASTER, K. 2004. Barriers to buying healthy foods for people with diabetes: Evidence of environmental disparities. *American Journal of Public Health,* 94**,** 1549-1554.

INTERNATIONAL DIABETES FOUNDATION 2013. *IDF Diabetes Atlas,* Brussels, Belgium, International Diabetes Foundation.

JACOB, S. & SERRANO-GIL, M. 2010. Engaging and empowering patients to manage their Type 2 Diabetes, Part II: Initiatives for Success. *Advance therapy,* 27**,** 665-680.

JACQUES, P. F. & TUCKER, K. L. 2001. Are dietary patterns useful for understanding the role of diet in chronic disease? *American Journal of Clinical Nutrition***,** 1-2.

JAGO, R., BARANOWSKI, T., BARANOWSKI, J. C., CULLEN, K. W. & THOMPSON, D. 2007. Distance to food stores & adolescent male fruit and vegetable consumption: mediation effects. *International Journal of Behavioral Nutrition and Physical Activity,* 4.

JETTER, L. M. & CASSADY, D. L. 2006. The availability and cost of healthier food alternatives. *American journal of preventive medicine,* 30**,** 38-44.

JONSSON, B. 2002. Revealing the cost of type 2 diabetes in Europe. *Diabetologia,* 45**,** S5-S12.

KANT, A. K. 1996. Indexes of overall diet quality: A review. *Journal of the American Dietetic Association,* 96**,** 785-791.

KATZ, D. L., DOUGHTY, K., NJIKE, V., TREU, J. A., REYNOLDS, J., WALKER, J., SMITH, E. & KATZ, C. 2011. A cost comparison of more and less nutritious food choices in US supermarkets. *Public Health Nutr,* 14**,** 1693-9.

KAVOOKJIAN, J., BERGER, B. A., GRIMLEY, D. M., VILLAUME, W. A., ANDERSON, H. M. & BARKER, K. N. 2005. Patient decision making: strategies for diabetes diet adherence intervention. *Research in social and administrative pharmacy*, 389-407.

KELLES, A. & ADAIR, L. 2009. Offspring consume a more obesogenic diet than mothers in response to changing socioeconomic status and urbanization in Cebu, Philippines. *Int J Behav Nutr Phys Act,* 6, 47.

KENNEDY, E. T., OHLS, J., CARLSON, S. & FLEMING, K. 1995. The Healthy Eating Index: Design and application. *Journal of American Dietetic Association,* 95, 1103-1108.

KIM, J., CHO, Y., PARK, Y., SOHN, C., RHA, M., LEE, M. K. & JANG, H. C. 2013. Association of dietary quality indices with glycemic status in korean patients with type 2 diabetes. *Clin Nutr Res,* 2, 100-6.

KIM, S., HAINES, P. S., SIEGA-RIZ, A. M. & POPKIN, B. M. 2003. The Diet Quality Index-International (DQI-I) provides an effective tool for cross-national comparison of diet quality as illustrated by China and the United States. *Journal of Nutrition,* 133, 3476-3484.

KOURLABA, G. & PANAGIOTAKOS, D. B. 2009. Dietary quality indices and human health: a review. *Maturitas,* 62, 1-8.

KRUKOWSKI, R. A., WEST, D. S., HARVEY-BERINO, J. & ELAINE PREWITT, T. 2010. Neighborhood impact on healthy food availability and pricing in food stores. *J Community Health,* 35, 315-20.

LARAIA, B. A., SIEGA-RIZ, A. M., KAUFMAN, J. S. & JONES, S. J. 2004. Proximity of supermarkets is positively associated with diet quality index for pregnancy. *Prev Med,* 39, 869-75.

LASKA, M. N., BORRADAILE, K. E., TESTER, J., FOSTER, G. D. & GITTELSOHN, J. 2009. Healthy food availability in small urban food stores: a comparison of four US cities. *Public Health Nutrition,* 13, 1031-1035.

LEE, R. D. & NIEMAN, D. C. 2010. *Nutritional Assessment,* New York, McGraw Hill.

LI, A., KIM, A. & FARLEY, E. 2010. Diabetes and the built environment: contributions from an emerging interdisciplinary research programme. *University of Western Ontario medical journal,* 1, 20-22.

LIESE, A. D., WEIS, K. E., PLUTO, D., SMITH, E. & LAWSON, A. 2007. Food store types, availability, and cost of foods in a rural environment. *J Am Diet Assoc,* 107, 1916-23.

LIM, H. M., PARK, J. E., CHOI, Y. J., HUH, K. B. & KIM, W. Y. 2009. Individualized diabetes nutrition education improves compliance with diet prescription. *Nutr Res Pract,* 3, 315-22.

LORENZO, F. M. E., BORJA, M. P., DELA ROSA, J. F. E., GEPTE, A. T. D., GARCIA, F. P., MERCADO, R. A., PERALTA, C. R. & SILVA, M. E. C. 2010. Burden of Illness and Economic Evaluation of Cardiovascular Diseases and Diabetes Mellitus in the Philippines. Philippines.

MANNUCCI, E., BARTALI, B., MOLINO LOVA, R., PAPUCCI, M., LAURETANI, F., LUISI, M. L., PIETROBELLI, A. & MACCHI, C. 2008. Eating habits in elderly diabetic subjects: assessment in the InCHIANTI Study. *Nutr Metab Cardiovasc Dis,* 18, 278-82.

MARCY, T. R., BRITTON, M. L. & HARRISON, D. 2011. Identification of barriers to appropriate dietary behavior in low-income patients with type 2 diabetes mellitus. *Diabetes Ther,* 2, 9-19.

MATHERS, C. D. & LONCAR, D. 2005. Updated projections of global mortality and burden of disease, 2002-2030: data sources, methods and results. World Health Organization.

MATHERS, C. D. & LONCAR, D. 2006. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med,* 3, e442.

METZ, J. A., KRIS-ETHERTON, P. M., MORRIS, C. D., MUSTAD, V. A., STERN, J. S., OPARIL, S., CHAIT, A., HAYNES, R. B., RESNICK, L. M., CLARK, S., HATTON, D. C., MCMAHON, M., HOLCOMB, S., SNYDER, G. W., PI-SUNYER, F. X. & MCCARRON, D. A. 1997. Dietary compliance and cardiovascular risk reduction with a prepared meal plan compared with a self-selected diet. *Am J Clin Nutr,* 66, 373-85.

MILLER, D. & BROWN, J. L. 2005. Marital interactions in the process of dietary change for type 2 diabetes. *Journal of nutrition education and behavior*, 226-234.

MONSIVAIS, P. & DREWNOWSKI, A. 2009. Lower-energy-density diets are associated with higher monetary costs per kilocalorie and are consumed by women of higher socioeconomic status. *J Am Diet Assoc,* 109, 814-22.

MOORE, L. V. & DIEZ ROUX, A. V. 2006. Associations of neighborhood characteristics with the location and type of food stores. *Am J Public Health,* 96**,** 325-31.

MOORE, L. V., DIEZ ROUX, A. V., NETTLETON, J. A., JACOBS, D. R. & FRANCO, M. 2009. Fast-food consumption, diet quality, and neighborhood exposure to fast food: the multi-ethnic study of atherosclerosis. *Am J Epidemiol,* 170**,** 29-36.

MOORE, L. V., DIEZ ROUX, A. V., NETTLETON, J. A. & JACOBS, D. R., JR. 2008. Associations of the local food environment with diet quality--a comparison of assessments based on surveys and geographic information systems: the multi-ethnic study of atherosclerosis. *Am J Epidemiol,* 167**,** 917-24.

MORLAND, K., WING, S. & DIEZ ROUX, A. 2002. The contextual effect of the local food environment on residents' diets: the atherosclerosis risk in communities study. *Am J Public Health,* 92**,** 1761-7.

MORLAND, K. B. & EVENSON, K. R. 2009. Obesity prevalence and the local food environment. *Health Place,* 15**,** 491-5.

MURAKAMI, K., SASAKI, S., TAKAHASHI, Y., UENISHI, K., JAPAN DIETETIC STUDENTS' STUDY FOR, N. & BIOMARKERS, G. 2009. Neighborhood food store availability in relation to food intake in young Japanese women. *Nutrition,* 25**,** 640-6.

NATIONAL STATISTICS OFFICE 2013. Income and Expenditure. *National Statistics Office.*

NTHANGENI, G., STEYN, N. P., ALBERTS, M., STEYN, K., LEVITT, N. S., LAUBSCHER, R., BOURNE, L., DICK, J. & TEMPLE, N. 2001. Dietary intake and barriers to dietary compliance in black type 2 diabetic patients attending primary health care services. *Public Health Nutrition,* 5**,** 329-338.

OLDEWAGE-THERON, W. H. & KRUGER, R. 2008. Food variety and dietary diversity as indicators of the dietary adequacy and health status of an elderly population in Sharpeville, South Africa. *J Nutr Elder,* 27**,** 101-33.

PEDRO, M., BENAVIDES, R. & BARBA, C. 2006. Dietary changes and their health implications in the Philippines. *The double burden of malnutrition: Case studies from 6 developing countries.* Rome: Food and Agriculture Organization.

PETTINGER, C., HOKLSWORTH, M. & GERBER, M. 2003. Psycho-social influences on food choices in Southern France and Central England. *Appetite***,** 307-316.

POWELL, L. M., AULD, M. C., CHALOUPKA, F. J., O'MALLEY, P. M. & JOHNSTON, L. D. 2007a. Associations between access to food stores and adolescent body mass index. *Am J Prev Med,* 33**,** S301-7.

POWELL, L. M. & HAN, E. 2011. The costs of food at home and away from home and consumption patterns among U.S. adolescents. *J Adolesc Health,* 48**,** 20-6.

POWELL, L. M., SLATER, S., MIRTCHEVA, D., BAO, Y. & CHALOUPKA, F. J. 2007b. Food store availability and neighborhood characteristics in the United States. *Prev Med,* 44**,** 189-95.

POWELL, L. M., ZHAO, Z. & WANG, Y. 2009. Food prices and fruit and vegetable consumption among young American adults. *Health and Place,* 15**,** 1064-1070.

PRESCOTT, J., YOUNG, O., O'NEILL, L., YAU, N. J. N. & STEVENS, R. 2002. Motives for food choice: a comparison of consumers from Japan, Taiwan, Malaysia and New Zealand. *Food Quality and Preference***,** 489-495.

RISONAR, M. G., RAYCO-SOLON, P., RIBAYA-MERCADO, J. D., SOLON, J. A., CABALDA, A. B., TENGCO, L. W. & SOLON, F. S. 2009. Physical activity, energy requirements, and adequacy of dietary intakes of older persons in a rural Filipino community. *Nutr J,* 8**,** 19.

ROGLIC, G., UNWIN, N., BENNETT, P. H., MATHERS, C., TUOMILEHTO, J., NAG, S., CONNOLLY, V. & KING, H. 2005. The burden of mortality attritutable to diabetes: realistic estimates for year 2000. *Diabetes care,* 28**,** 2130-2135.

SARTI, S., RUGGIERO, E., COIN, A., TOFFANELLO, E. D., PERISSINOTTO, E., MIOTTO, F., PINTORE, G., INELMEN, E. M., MANZATO, E. & SERGI, G. 2013. Dietary intake and physical performance in healthy elderly women: a 3-year follow-up. *Exp Gerontol,* 48**,** 250-4.

SAVOCA, M. & MILLER, C. 2001. Food selection and eating patterns: themes found among people with type 2 diabetes mellitus. *Journal of nutrition education***,** 224-233.

SCHOENBERG, N. E., TRAYWICK, L. S., JACOBS-LAWSON, J. & KART, C. S. 2008. Diabetes self-care among a multiethnic sample of older adults. *J Cross Cult Gerontol,* 23**,** 361-76.

SCOLLAN-KOLIPOULOS, M. 2004. Consideration for legacies about diabetes and self-care for the family with a multigenerational occurance of type 2 diabetes. *Nursing and health sciences***,** 223-227.

SEARLE, A., NORMAN, P., THOMPSON, R. & VEDHARA, K. 2007. Illness representations among patients with type 2 diabetes and their partners: relationships with self-management behaviors. *J Psychosom Res,* 63**,** 175-84.

SERRANO-GIL, M. & JACOB, S. 2010. Engaging and empowering patients to manage their type 2 diabetes, Part I: a knowledge, attitude, and practice gap? *Adv Ther,* 27**,** 321-33.

SEVICK, M. A., TRAUTH, J. M., LING, B. S., ANDERSON, R. T., PLATT, G. A., KILBOURNE, A. M. & GOODMAN, R. M. 2007. Patients with complex chronic diseases: perspective on supporting self-management. *Journal of general internal medicine,* 22**,** 438-444.

SHAHAR, S., IBRAHIM, Z., FATAH, A. R., RAHMAN, S. A., YUSOFF, N. A., ARSHAD, F., YASSIN, Z. & ADZNAM, S. N. 2007. A multidimensional assessment of nutritional and health status of rural elderly Malays. *Asia Pac J Clin Nutr,* 16**,** 346-53.

SHARKEY, J. R. & HOREL, S. 2008. Neighborhood socioeconomic deprivation and minority composition are associated with better potential spatial access to the ground-truthed food environment in a large rural area. *J Nutr,* 138**,** 620-7.

SHARKEY, J. R., JOHNSON, C. M. & DEAN, W. R. 2010. Food access and perceptions of the community and household food environment as correlates of fruit and vegetable intake among rural seniors. *BMC Geriatr,* 10**,** 32.

SHAW, J. E., SICREE, R. A. & ZIMMET, P. Z. 2009. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes research and clinical practice***,** 4-14.

SHAW, J. E., SICREE, R. A. & ZIMMET, P. Z. 2010. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res Clin Pract,* 87**,** 4-14.

SMOYER-TOMIC, K. E., SPENCE, J. C. & AMRHEIN, C. 2006. Food Deserts in the Prairies? Supermarket Accessibility and Neighborhood Need in Edmonton, Canada*. *The Professional Geographer,* 58**,** 307-326.

SORIA, M. L. B., SY, R. G., VEGA, B. S., TY-WILLING, T., ABENIR-GALLARDO, A., VELANDRIA, F. & PUNZALAN, F. E. 2009. The incidence of type 2 diabetes mellitus in the Philippine: a 9-year cohort study. *Diabetes Research and Clinical Practice***,** 130-133.

STEWART, J. E., BATTERSBY, S. E., LOPEZ-DE FEDE, A., REMINGTON, K. C., HARDIN, J. W. & MAYFIELD-SMITH, K. 2011. Diabetes and socioeconomic and built environment: geovisualization of disease prevalence and potential contextual associations using ring maps. *International journal of health geographics***,** 10:18.

STORY, M., KAPHINGST, K. M., ROBINSON-O'BRIEN, R. & GLANZ, K. 2008. Creating healthy food and eating environments: policy and environment approaches. *Annual Review of Public Health,* 29**,** 253-272.

TANG, T. S., FUNNELL, M. M., BROWN, M. B. & KURLANDER, J. E. 2010. Self-management support in "real-world" settings: an empowerment-based intervention. *Patient Educ Couns,* 79**,** 178-84.

TESSIER, S., TRAISSAC, P., MAIRE, B., BRICAS, N., EYMARD-DUVERNAY, S., ATI, J. E. & DELPEUCH, F. 2008. Regular Users of Supermarkets in Greater Tunis Have a Slightly Improved Diet Quality. *J Nutr,* 138**,** 768-774.

TIMPERIO, A., BALL, K., ROBERTS, R., CAMPBELL, K., ANDRIANOPOULOS, N. & CRAWFORD, D. 2008. Children's fruit and vegetable intake: associations with the neighbourhood food environment. *Prev Med,* 46**,** 331-5.

TUR, J. A., ROMAGUERA, D. & PONS, A. 2005. The Diet Quality Index-International (DQI-I): is it a useful tool to evaluate the quality of the Mediterranean diet? *British Journal of Nutrition,* 93**,** 369-376.

VAN DE LAAR, F. A., VAN DE LISDONK, E. H., LUCASSEN, P. L., STAFLEU, A., MULDER, J., VAN DEN HOOGEN, H. J., RUTTEN, G. E. & VAN WEEL, C. 2006. Eating behaviour and adherence to diet in patients with Type 2 diabetes mellitus. *Diabet Med,* 23**,** 788-94.

VARIYAM, J. N. & BLAYLOCK, J. 1998. Unlocking the Mystery Between Nutrition Knowledge and Diet Quality. *Food Review*.

VELHO, S., MARQUES-VIDAL, P., BAPTISTA, F. & CAMILO, M. E. 2008. Dietary intake adequacy and cognitive function in free-living active elderly: a cross-sectional and short-term prospective study. *Clin Nutr,* 27**,** 77-86.

VIJAN, S., STUART, N. S., FITZGERALD, J. T., RONIS, D. L., HAYWARD, R. A., SLATER, S. & HOFER, T. P. 2005. Barriers to following dietary recommendations in Type 2 diabetes. *Diabet Med,* 22**,** 32-8.

VIKSTEDT, T., SUOMINEN, M. H., JOKI, A., MUURINEN, S., SOINI, H. & PITKALA, K. H. 2011. Nutritional status, energy, protein, and micronutrient intake of older service house residents. *J Am Med Dir Assoc,* 12**,** 302-7.

WAIJERS, P. M., FESKENS, E. J. & OCKE, M. C. 2007. A critical review of predefined diet quality scores. *Br J Nutr,* 97**,** 219-31.

WANG, J., WILLIAMS, M., RUSH, E., CROOK, N., FOROUHI, N. G. & SIMMONS, D. 2010. Mapping the availability and accessibility of healthy food in rural and urban New Zealand--Te Wai o Rona: Diabetes Prevention Strategy. *Public Health Nutr,* 13**,** 1049-55.

WATERLANDER, W. E., DE MUL, A., SCHUIT, A., SEIDELL, J. C. & STEENHUIS, I. H. 2010. Perceptions on the use of pricing strategies to stimulate healthy eating among residents of deprived neighborhoods: a focus group study. *International journal of behavioral nutrition and physical activity,* 7**,** http://www.ijbnpa.org/content/7/1/44.

WILD, S., ROGLIC, G., GREEN, A., SICREE, R. & KING, H. 2004. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care,* 27**,** 1047-53.

WILLETT, W. 1998. *Nutritional epidemiology,* New York, Oxford University.

WORLD HEALTH ORGANIZATION 1984. Health education in self-care: possibilities and limitations. Geneva: World Health Organization.

WORLD HEALTH ORGANIZATION 2006. *Global strategy on diet, physical activity and health,* Geneva, World Health Organization.

WORLD HEALTH ORGANIZATION & FOOD AND AGRICULTURE ORGANIZATION 2003. Diet, nutrition and the prevention of chronic diseases. Geneva: World Health Organization.

WORLD HEALTH ORGANIZATION & INTERNATIONAL DIABETES FOUNDATION 2006. Definition and diagnosis of Diabetes Mellitus and intermediate hyperglycemia. Geneva: World Health Organization.

YAJNIK, C. S., FORRESTER, T., RAMAIYA, K., TANDON, N., KALE, S. & TULLOCH-REID, M. 2011. Prevalence/ incidence, risk factors, and future burden of Type 1, Type 2 and Gestational Diabetes in developing countries. *In:* NARAYAN, K. M. V., WILLIAMS, D., GREGG, E. W. & COWIE, C. C. (eds.) *Diabetes public health.* New York, New York, USA: Oxford University Press.

APPENDICES

APPENDIX A:

Modified urbanicity index

Total population and Population Density

Communication profile

- Presence/ absence of mail service
- Presence/ absence of newspaper service
- Presence/ absence of telephone service
- Presence/ absence of cellphone service
- Presence/ absence of Internet service
- Presence/ absence of cable service

Transportation profile

- Presence/ absence of bus, taxi and jeepney services
- Frequency of service (continuous, daily, less than daily, no service)
- Estimate paved road

Educational facilities

- Presence/ absence of schools

Health services

- Number of:
    - Hospitals
    - Medical clinics (stand alone)
    - Pharmacies
    - Maternal health clinics (such as family planning clinics, birthing centers)
    - Barangay health center

Market

- Number of:
    - Grocery stores
    - Gas stations
    - Sari–sari stores

APPENDIX B:

Modified urbanicity index scoring guide

POPULATION SIZE		
Minimum	Maximum	Points
1	500	1
501	1,000	2
1,001	2,000	3
2,001	4,000	4
4,001	6,000	5
6,001	8,000	6
8,001	10,000	7
10,001	15,000	8
15,001	20,000	9
20,001	200,000	10

POPULATION DENSITY		
Minimum	Maximum	Points
1	500	1
501	1,000	2
1001	2,500	3
2501	5,000	4
5001	7,500	5
7501	10,000	6
10000	15,000	7
15001	30,000	8
30001	50,000	9
50001	200,000	10

COMMUNICATION	Answer	Points
mail service	Yes/ No	YES = 1
newspaper	Yes/ No	YES = 1
telephone	Yes/ No	YES = 1
cellphone	Yes/ No	YES = 1
internet	Yes/ No	YES = 1
cable	Yes/ No	YES = 1

TRANSPORTATION	Answer	Points
Bus	3 (continuous)	3
	2 (daily)	2
	1 (less than daily)	1
	0 (none)	0
Jeep	3 (continuous)	3
	2 (daily)	2
	1 (less than daily)	1
	0 (none)	0
Taxi	3 (continuous)	3
	2 (daily)	2
	1 (less than daily)	1
	0 (none)	0

ESTIMATED PAVED ROAD	
Answer	Points
0 km	0.00
partly, some	1.00
100%	2.00

HEALTH SERVICE	Answer	Points
Hospital	Yes/ No	YES = 1
Medical clinics	Yes/ No	YES = 1
Pharmacies	Yes/ No	YES = 1
BHCs	Yes/ No	YES = 1
Maternal clinics	Yes/ No	YES = 1

SCHOOLS	Answer	Points
>=1 schools	1	2
no school	0	2

SARI-SARI STORES		
Minimum	Maximum	Points
0	0	0
1	20	1
21	50	2
51	100	3
101	200	4
201	1000	5

MARKETS	Answer	Points
Grocery	Yes/ No	YES =2
Gas station	Yes/ No	YES=2
Drug Stores	Yes/ No	YES=1

APPENDIX C:
Communication and transportation survey form

NAME OF BARANGAY: _____

Communication profile

1. **Naga deliver ba ang POST OFFICE sa inyong barangay?**	[ ] OO (yes)	[ ] DILI (no)
2. **Naga deliver ba ug DYARYO (newspaper) sa inyong barangay?**	[ ] OO (yes)	[ ] DILI (no)
3. **Aduna bay TELEPHONE SERVICE (landline) sa inyong barangay?**	[ ] OO (yes)	[ ] WALA (no)
4. **Aduna bay CELLPHONE SERVICE sa inyong barangay?**	[ ] OO (yes)	[ ] WALA (no)
5. **Aduna bay INTERNET SERVICE sa inyong barangay?**	[ ] OO (yes)	[ ] WALA (no)
6. **Aduna bay CABLE TV SERVICE sa inyong barangay?**	[ ] OO (yes)	[ ] WALA (no)

Transportation profile

Naga-agi ba ang BUS sa inyong barangay? **[ ] OO (yes)** **[ ] DILI (no)**
- Kapila naga-agi ang bus?
  - ☐ Tibuok adlaw, kada-adlaw (Continuous)
  - ☐ 1-3 beses kada-adlaw (Daily)
  - ☐ Dili kada-adlaw (Less than daily)

Naga-agi ba ang TAXI sa inyong barangay? **[ ] OO (yes)** **[ ] DILI (no)**
- Kapila naga-agi ang taxi?
  - ☐ Tibuok adlaw, kada-adlaw (Continuous)
  - ☐ 1-3 beses kada-adlaw (Daily)
  - ☐ Dili kada-adlaw (Less than daily)

Naga-agi ba ang JEEP sa inyong barangay? **[ ] OO (yes)** **[ ] DILI (no)**
- Kapila naga-agi ang jeep?
  - ☐ Tibuok adlaw, kada-adlaw (Continuous)
  - ☐ 1-3 beses kada-adlaw (Daily)
  - ☐ Dili kada-adlaw (Less than daily)

Length of paved road in kilometers

APPENDIX D

FORM 2: Food environment and willingness to sell survey questionnaire

Name of establishment: _____

Barangay: _____

Name of Proprietor/ owner: _____

Longitude: _____ Latitude: _____

Pictures taken:

- ☐ Exterior with store signage
- ☐ Interior photos

Business line code (choose all that apply)

Business line code	Description
☐ FH-001	Cafes, cafeterias, carenderias, eateries/ fast food, coffee shop
☐ FH-002	Food caterer
☐ FH-003	Restaurants
☐ FH-004	Ice cream and refreshment parlors, soda fountain bars
☐ FH-999	Other food handlers business
☐ WDD-002	Agricultural products, marine and fresh water products
☐ WDD-004	Cooking oil and cooking gas
☐ WDD-005	Dairy products
☐ WDD-007	Liquor, distilled spirits, wines
☐ WDD-012	Processed or preserve foods (locally made)
☐ WDD-013	Rice and corn
☐ WDD-016	Wheat or cassava flour
☐ WDD-999	Others (includes groceries, sari-sari stores)
☐ RET-002	Agricultural products, marine and fresh water products
☐ RET-004	Cooking oil and cooking gas
☐ RET-005	Dairy products
☐ RET-007	Liquor, distilled spirits and wines (fermented – beer, tuba; domestic – tanduay; imported – red label)
☐ RET-012	Processed or preserved foods (locally made)
☐ RET-013	Rice and corn
☐ RET-016	Wheat or cassava flour
☐ RET-999	Other – sari sari stores
☐ PEDDLERS	Mobile vendors (taho, mani, maglalako)

Type of food source (check one)

☐ Food Retailer (dry goods)	☐ Food Establishment (cooked food)
○ Supermarket	○ Restaurant
○ Grocery	○ Fast food store
○ Sari-sari store	○ Food kiosk/ stall/ Food cart
○ Mobile vendor	○ Mobile food vendor

A. <u>If food source is classified as "Food Retailer"</u>

Part A1. Options available (check all that apply)

Products sold Food stores	
☐ Grains	☐ Coconut oil*
○ Rice*	☐ Soda crackers*
○ Camote*	☐ Coffee
○ Rice corn*	○ Sugar-free*
☐ Bread	○ Black*
○ Pandesal*	○ Others
☐ Pork	☐ Milk
○ Lean*	○ Regular
☐ Fish	○ Low-fat*
○ Galunggong*	○ Non-fat*
○ Barilison*	☐ Sugar
☐ Chicken*	○ White
☐ Dried fish	○ Brown*
☐ Noodles	○ Sugar alternatives*
☐ Mungo beans*	☐ Fruits
☐ Condiments	○ Papaya*
☐ Egg*	○ Banana*
☐ Green leafy vegetables	○ Pineapple*
○ Kangkong*	○ Others _____
○ Malunggay*	
○ Kamote tops*	
○ Gabi leaves*	

Part A2. Willingness to sell

Does your establishment offer products that are diabetic-healthy (low-fat, low sugar, high protein, complex carbohydrate food)?

☐Yes ☐No

- If no,

Diabetic health food option	Are you willing to sell diabetic-healthy food options?			
	☐ YES			☐ NO
	Package size	How much are willing to sell for these products?		Why?
		Choose 1	*Average price*	
☐ Rice	☐ 500 grams ☐ 1 kilo	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**33.00 per kilo**	
☐ Fish	☐ 500 grams ☐ 1 kilo	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**114.56 per kilo**	
☐ Mongo beans, green	☐ 250 grams ☐ 500 grams	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**82.26 per kilo**	
☐ Eggs	☐ Piece ☐ Half dozen ☐ 1 dozen	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**5.02 per piece**	
☐ Green leafy vegetables (malunggay, kangkong, camote tops)	☐ 1 bundle ☐ 500 grams ☐ 1 kilo	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**12.99 per kilo**	
☐ Coconut oil	☐ 200 grams ☐ 500 grams ☐ 1 kilo	☐ Less than (<) ☐ Equal to (=)	**113.61 per 1 liter**	

Diabetic health food option	Are you willing to sell diabetic-healthy food options?			
	☐ YES			☐ NO
	Package size	How much are willing to sell for these products?		Why?
		Choose 1	*Average price*	
		☐ More than (>)		
☐ Non-fat milk*	☐ 1 liter	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**23.60 per 80 grams pack**	
☐ Black coffee	☐ 25 grams ☐ 50 grams ☐ 250 grams ☐ 500 grams	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**17.75 per 25gram pack**	
☐ Brown sugar**	☐ 250 grams ☐ 500 grams ☐ 1 kilo	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**44.50 per kilo**	
☐ Banana	☐ Piece ☐ Hand ☐ 1 kilo	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**1.60 per piece**	
☐ Soda crackers	☐ Piece or sachet ☐ 1 pack (10 sachets, 1can)	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**40.63 per 10-piece pack**	

** use regular powdered milk as the regular alternative*

***use refined white sugar as the regular alternative*

B. <u>If food source is classified as "Food establishment"</u>

Part B1. Options available (check all that apply)

Food/ dishes sold in food establishments	
☐ Short order	☐ Beverages
☐ Hamburgers	☐ Regular soda, hot/ cold coffee, iced tea
☐ Pizza	☐ Diet soda, Unsweetened, low sugar drinks
☐ Pasta and noodles (mami, batchoy, pancit)	☐ Snacks, desserts
☐ French fries	☐ Kakanin (puto, bibingka)
☐ Rice	☐ Baked products (cakes, cookies)
☐ Steamed rice	☐ Street food
☐ Fried rice	☐ Fresh fruits
☐ Viands	☐ Offer healthier alternatives
☐ Fish dishes	☐ Low-fat alternatives
☐ Pork dishes	☐ Low-salt alternatives
☐ Chicken dishes	
☐ Vegetables dishes	

Part B2. Willingness to sell

Does your establishment offer food that is low-fat, low-salt, high protein dishes?

☐Yes ☐No

- Why?

- If no, are you willing to provide low-fat, low-salt, high protein dishes? ☐ Yes ☐ No

- At what price are willing to provide it?
  - ☐ Cheaper than the regular dish/ item (By how much? PhP_____)
  - ☐ Same price as the regular dish/ item
  - ☐ More expensive than the regular dish/ item (By how much? PhP_____)

-Thank you-

APPENDIX E

Form 1D: Food record using Idaho Plate method

_____ TO _____ JUNE 2012

NAME: _____

RESPONDENT #: _____

REMINDERS

- Record all of your meals, including snacks.
- Include the brand of the food if applicable

NEXT APPOINTMENT:_____

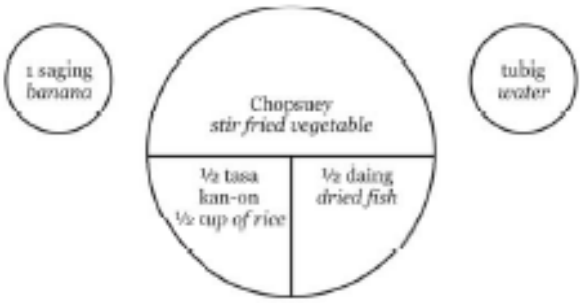
Talaan sa Akong Ginakaon *My Food Diary*

BASAHA SA KINI: Kining bahina alang sa mga tawong gitambagan sa Nutritionist - Dietitian nga hugot bantayan ang ilang ginakaon.

This section is for persons advised by their Nutritionist - Dietitian to strictly monitor their food intake.

Pananglitan:

Paniudto



Snack: suman *rice roll*

30

Petsa Date: PRACTICE

Pamahaw

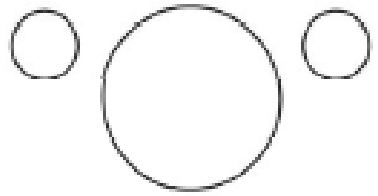
Snack:

Panihapon

Snack:

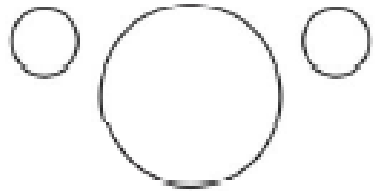
Petsa Date: June --, 2012

Pamahaw



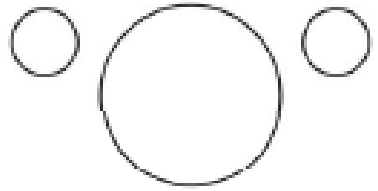
Snack:

Paniudto



Snack:

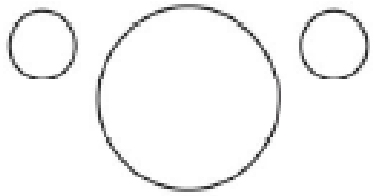
Panhapon



Snack:

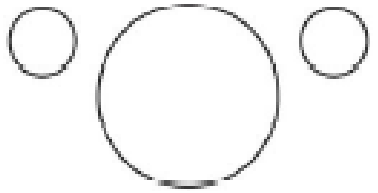
Petsa Date: June --, 2012

Pamahaw



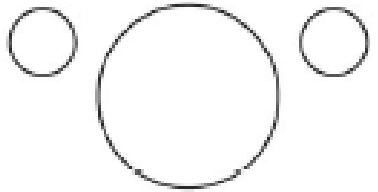
Snack:

Paniudto



Snack:

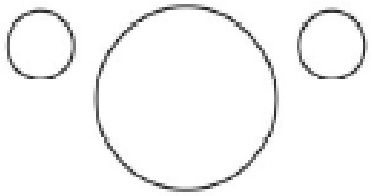
Panhapon



Snack:

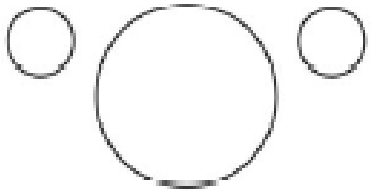
Petsa Date: June --, 2012

Pamahaw



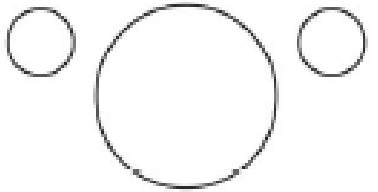
Snack:

Paniudto



Snack:

Panhapon



Snack:

APPENDIX F

FORM 1C: Food record supplementary form

Directions:

1. This is based on the food record entries of the patient participant.
2. Record only one food item per line
3. **Be as specific as possible when describing the food item eaten:**
    a. **The way it was cooked**
    b. **The amount that was eaten**
    c. **The place where they ate**
    d. **For mixed dishes, get the ingredients and estimated portion**
4. Include brand names whenever possible
5. Report only the food portion that was actually eaten
6. Record amounts in household measures:
    a. Tablespoon
    b. Cups
    c. Slices (i.e. 2 slices of white bread)
    d. Units (i.e. 1 piece of raw apple)
7. Indicate the place where you ate:
    a. Home
    b. Specific food establishment name and general location
8. Include method that was used to prepare the food item
    a. Boiled
    b. Fried
    c. Raw
    d. Sauteed
9. Remember to record the amounts of visible fats (oils, butter, salad dressings, margarine, etc) you eat or use in cooking.
10. For canned foods, include the liquid in which it was canned (i.e. tuna in brine, fruit cocktail in light syrup)
11. Food items listed without specific amounts eaten will be analyzed using portion sizes
12. Include beverages and seasonings used in preparation

- **This form will be used for mixed dishes and additional details to the entries in Form 1D.**

Meal - Date	DISH	FOOD ITEM/ INGREDIENTS	BRAND, if applicable	METHOD OF PREPARATION *[Boil | Fry | Raw | Sautee]*	AMOUNT EATEN *(in HH measures)*	PLACE/ ESTABLISHMENT *[Home | Specify place]*
B – June 12	Fried rice	Rice	Jollibee	Fried	1 cup	Jollibee Centerpoint

APPENDIX G

FORM 3C: Knowledge Text Questionnaire and Answer key (Pre/ Post Test)

Name of patient:_____ **Barangay:**_____

Instruction. This is a nutritionist-administered test. Each question is equivalent to one (1) point.

True or False

1.	Diabetics should follow the Diabetic Diet.	True	False
2.	Eating fish 3 times a week is not healthy.	True	False
3.	Diabetics can still continue drinking alcohol but in moderation.	True	False
4.	When counting carbohydrate content, 1 carbohydrate serving is equal to 10 grams	True	False
5.	Persons with diabetes need to eat 10x a day.	True	False
6.	Using hand measurements, 1 fist is equal to ½ cup.	True	False
7.	Food with higher the glycemic index is better than those with lower glycemic index	True	False
8.	Broiling is a healthier way of cooking compared to frying.	True	False

Multiple choice. Choose the best answer.

1. _____ is like a key that open the body cells so that glucose can be used as energy by the body
   a. Insulin
   b. Fat
   c. Protein
2. How many servings of fruit do you need to eat in a day?
   a. 3 servings
   b. 5 servings
   c. 1 serving
3. In "Idaho Plate Method", which portion must be larger?
   a. Rice
   b. Meat or fish
   c. Vegetables
   d. Fruits
4. What is the most important nutrition information to consider in a food label?
   a. Total calories
   b. Total fat
   c. Total sodium

APPENDIX H

FORM 3B. Modified Market Game Scoring Sheet (Pre/ Post Test)

Name: _____ **Respondent Number:** _____

Date (Month/ Day/ Year)**:**_____ **Time: Started**_____ **Ended** _____

Instructions to the test administrator (researcher):

Before the patient and his/her caregiver arrives:

1. Sort and group the food cards according to their food group (i.e. cereals, meats, vegetables, fruits, etc).
2. Remove the condiment cards.
3. Remove similar cards.
4. Spread the cards on a flat surface with food cards belonging to the same food group placed next to each other. [Note: Make sure that there are no visual demarcations that indicate the groupings]
5. Cover the cards with paper or newspaper.

Test proper:

1. Ask the patient-participant and his/her caregiver to sit facing the cards.
2. Introduce the game.
3. Instruct them on how the game will be conducted.
4. At the end of the time limit, gather the cards they have picked.
5. Check the cards they picked in the list below. Encircle the corresponding point score.

After the test proper:

1. Ask them why they chose the food card/s.
2. Process the cards individually or as a group depending on how they answer the question.

Instructions to be given to the patient and his/her caregiver (script):

Introduction	*The game that we will be doing today is a simulated community store. It contains common food items and dishes that you would find in the grocery. Through this game, we would like to know what you would buy in a store.*
Instruction	*If you were to go to the grocery and "buy" the food items represented in each card, what food item would you buy?* *There is no budgetary limit.* *You have 15 minutes to choose.*
Process question	*Why did you choose theses cards?*

SCORE COMPUTATION

(+) POINTS	*(A)*	
(-) POINT	*(B)*	
Sub-total		
WEIGHT	(C)	
GRAND TOTAL		

PLUS (+) 1 POINT

+	Food Item
☐	Alugbati
☐	Arroz caldo
☐	Ampalaya
☐	Apple
☐	Atay
☐	Avocado
☐	Bayabas
☐	Bibingka
☐	Bigas
☐	Biko
☐	Brown rice
☐	Corn oil
☐	Dahon ng gabi
☐	Dalanghita
☐	Fresh lumpia
☐	Gabi
☐	Gatas
☐	Hipon
☐	Isda
☐	Itlog
☐	Kadyos
☐	Kalabasa
☐	Kalamansi
☐	Kamatis
☐	Kamote
☐	Kamoteng kahoy
☐	Kangkong
☐	Karne
☐	Karot

+	Food Item
☐	Keso
☐	Kuhol
☐	Kutsinta
☐	Lechon manok
☐	Mais
☐	Malunggay
☐	Mangga
☐	Mani
☐	Manok
☐	Milon
☐	Munggo
☐	Niyog
☐	Okra
☐	Pancit
☐	Papaya
☐	Pandesal
☐	Patani
☐	Patatas
☐	Petsay
☐	Pinakbet
☐	Pusit
☐	Puto
☐	Rice corn
☐	Saging
☐	Sapin sapin
☐	Sitaw
☐	Spaghetti
☐	Suman
☐	Tahong
☐	Talbos ng kamote
☐	Tinapay
☐	Tokwa
☐	Ubas
+ ____	(A)TOTAL POINTS

MINUS (-) 1 POINT

-	Food Item
☐	Alimasag
☐	Bicol express
☐	Bulalo
☐	Balut
☐	Chicharon
☐	Chorizo
☐	Coke
☐	Crispy pata
☐	Daing
☐	Dilis
☐	Ensaymada
☐	French fries
☐	Hamburger
☐	Halo halo
☐	Humba
☐	Kare-kare
☐	Lard
☐	Lechon
☐	Longganisa
☐	Mantekilya/ lard
☐	Mantika
☐	Margarine
☐	Pizza
☐	Pork BBQ
☐	Sisig
☐	Tuyo
☐	White sugar
- ____	(B)TOTAL POINTS

WEIGHTED FOOD ITEMS

- If 2 checks, add (-1) point
- If more than 2 checks, add (-1) point and (-1) point for every additional choice. Example:
  - 3 checks=(-1) + (-1)
  - 4 checks=(-1) + (-1) +(-1)

	Food Item
☐	Arroz caldo
☐	Bibingka
☐	Biko
☐	Hipon
☐	Itlog
☐	Keso
☐	Kutsinta
☐	Pan de sal
☐	Puto
☐	Sapin sapin
☐	Spaghetti
☐	Suman
☐	Tinapay
- ____	(C)TOTAL POINTS

APPENDIX I

List of food items used in the Modified Market Game

Alimasag
Alugbati
Ampalaya
Apple
Arroz caldo
Arroz caldo
Atay
Avocado
Balut
Bayabas
Bibingka
Bibingka
Bicol express
Bigas
Biko
Biko
Brown rice
Bulalo
Chicharon
Chorizo
Coke
Corn oil
Crispy pata
Dahon ng gabi
Daing
Dalanghita
Dilis
Ensaymada
French fries
Fresh lumpia
Gabi
Gatas
Halo halo
Hamburger
Hipon
Hipon
Humba
Isda
Itlog
Itlog
Itlog
Kadyos
Kalabasa
Kalamansi
Kamatis
Kamote
Kamoteng kahoy
Kangkong
Kare-kare
Karne
Karot
Keso
Keso
Kuhol
Kutsinta
Kutsinta
Lard
Lechon
Lechon manok
Longganisa
Mais
Malunggay
Mangga
Mani
Manok
Mantekilya/ lard
Mantika
Margarine
Milon
Munggo
Niyog
Okra
Pan de sal
Pancit
Pandesal
Papaya
Patani
Patatas
Petsay
Pinakbet
Pizza
Pork BBQ
Pusit
Puto
Puto
Rice corn
Saging
Sapin sapin
Sapin sapin
Sisig
Sitaw
Spaghetti
Spaghetti
Suman
Suman
Tahong
Talbos ng kamote
Tinapay
Tinapay
Tokwa
Tuyo
Ubas
White sugar

APPENDIX J

FORM 1A: Individual profile and food preparation

ENTRY DATE: _____

Month/ Day/ Year

Part 1. Individual Profile

Health District
- ☐ Talomo North
- ☐ Talomo South

Barangay
- ☐ Bago Aplaya
- ☐ Talomo Proper
- ☐ Dumoy
- ☐ Matina Crossing
- ☐ Matina Aplaya
- ☐ Matina Pangi

Registry #:_____ **Shortlist #:**_____

Name: _____ **Contact #:**_____

Coordinates: Longitude_____ Latitude:_____

Sex: ☐ Male ☐ Female **Date of Birth**: _____

Month/ Day/ Year

Marital status
- ☐ Single
- ☐ Married
- ☐ Separated
- ☐ Widow/ widower
- ☐ Divorced

Occupation status
- ☐ Employed
- ☐ Self-employed
- ☐ Not working
- ☐ Homemaker
- ☐ Retired

Estimated average monthly household income:
- ☐ 10,000 Pesos and below
- ☐ 10,001 to 20,000 Pesos
- ☐ 20,001 to 30,000 Pesos
- ☐ 30,001 to 40,000 Pesos
- ☐ 40,001 to 50,000 Pesos
- ☐ Higher than 50,000 Pesos

Highest educational attainment:
- ☐ Attended elementary school
- ☐ Graduated Grade 6
- ☐ Attended high school
- ☐ Graduated high school
- ☐ Attended college/ vocational school
- ☐ Graduated college
- ☐ Attended/ graduated post-baccalaureate (masters, doctorate)

Do you own any of the following appliances?
- ☐ Ref
- ☐ Computer
- ☐ TV
- ☐ Motorized vehicle
- ☐ Washing machine
- ☐ Aircon

Part 2. Food preparation

When were you diagnosed as a diabetic? (Year diagnosed) _____

Has your diet changed since you've been diagnosed? ☐ Yes ☐ No

- If yes, how?
- If no, why?

In the past 6 months, were your meals different from the rest of the family? ☐ Yes ☐ No

- If yes, how is it different?
    - What has been the rest of the family's reaction to this?
- If no, why?

In the past 6 months, who usually plans your meals at home?

☐ Myself
☐ My wife/husband
☐ My daughter/ son/ in-laws
☐ Our helper/ maid/ kasambahay

In the past 6 months, who usually cooks your meals at home?

☐ Myself
☐ My wife/husband
☐ My daughter/ son/ in-laws
☐ Our helper/ maid/ kasambahay

-- THANK YOU VERY MUCH--

You need to make a 7-day food record on – to -- JUNE 2012. We will be coming back to visit you after – JUNE 2012 to get the food record and ask you some more questions.

FORM 1B:

Dietary behavior 1 and willingness to pay survey questionnaire

Part 1. Dietary choices

This questionnaire will give us information about your eating habits. There is no "right" or "wrong" answers. Recall the times during the day when you ate and what you had. Use the **past six (6) months** as your standard for how you eat.

	In the past 6 months, did you regularly eat these meals? (at least 4x a week)	
	☐ **YES**	☐ **NO**
Breakfast	If yes, where do you usually eat? ☐ My residence ☐ Outside of my residence If respondent eats at home, do you usually… (choose 1) ☐ Eat by yourself (how many times a week?_____) ☐ Eat with family (how many times a week?_____) • Why do you eat at home? If respondent eats out, do you usually… (choose 1) ☐ Eat by yourself (how many times a week?_____) ☐ Eat with family (how many times a week?_____) ☐ Eat with officemates (how many times a week? _____) ☐ Eat with friends (how many times a week?_____) • Where do you frequently eat? (choose 1) ○ Restaurant ○ Karinderias ○ Office canteen ○ Fast food _____ ○ Baon (packed food from home) ○ Others _____ • Why do you eat in these places? Check all that apply. ☐ Serve dishes that are good for diabetics ☐ Convenient ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Fast service ☐ Know somebody in the place ☐ Others _____ ○ Is the fact that you're diabetic factor in this process?	Why?

	In the past 6 months, did you regularly eat these meals? (at least 4x a week)	
	☐ YES	☐ NO
	☐ Yes ☐ No • If no, why? ○ What do you do when they don't have food that is good for diabetics?	
Lunch:	If yes, where do you usually eat? ☐ My residence ☐ Outside of my residence If respondent eats at home, do you usually… (choose 1) ☐ Eat by yourself (how many times a week?_____) ☐ Eat with family (how many times a week?_____) • Why do you eat at home? If respondent eats out, do you usually… (choose 1) ☐ Eat by yourself (how many times a week?_____) ☐ Eat with family (how many times a week?_____) ☐ Eat with officemates (how many times a week? _____) ☐ Eat with friends (how many times a week?_____) • Where do you frequently eat? (choose 1) ○ Restaurant ○ Karinderias ○ Office canteen ○ Fast food _____ ○ Baon (packed food from home) ○ Others _____ • Why do you eat in these places? Check all that apply. ☐ Serve dishes that are good for diabetics ☐ Convenient ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Fast service ☐ Know somebody in the place ☐ Others _____ ○ Is the fact that you're diabetic factor in this process? ☐ Yes ☐ No	Why?

	In the past 6 months, did you regularly eat these meals? (at least 4x a week)	
	☐ YES	☐ NO
	• If no, why? ○ What do you do when they don't have food that is good for diabetics?	
Dinner:	If yes, where do you usually eat? ☐ My residence ☐ Outside of my residence If respondent eats at home, do you usually… (choose 1) ☐ Eat by yourself (how many times a week?_____) ☐ Eat with family (how many times a week?_____) • Why do you eat at home? If respondent eats out, do you usually… (choose 1) ☐ Eat by yourself (how many times a week?_____) ☐ Eat with family (how many times a week?_____) ☐ Eat with officemates (how many times a week? _____) ☐ Eat with friends (how many times a week?_____) • Where do you frequently eat? (choose 1) ○ Restaurant ○ Karinderias ○ Office canteen ○ Fast food _____ ○ Baon (packed food from home) ○ Others _____ • Why do you eat in these places? Check all that apply. ☐ Serve dishes that are good for diabetics ☐ Convenient ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Fast service ☐ Know somebody in the place ☐ Others _____ ○ Is the fact that you're diabetic factor in this process? ☐ Yes ☐ No • If no, why?	Why?

	In the past 6 months, did you regularly eat these meals? (at least 4x a week)	
	☐ YES	☐ NO
	○ What do you do when they don't have food that is good for diabetics?	

	In the past 6 months, did you regularly eat these meals? (at least 4x a week)	
	☐ YES	☐ NO
SNACKS	How often do you eat snacks in a day? • Morning: ☐ None ☐ Once ☐ More than once • Afternoon: ☐ None ☐ Once ☐ More than once • Evening: ☐ None ☐ Once ☐ More than once Where do you usually eat? ☐ My residence ☐ Outside of my residence If respondent eats at home, do you usually… ☐ Eat by yourself (how many times a week?_____) ☐ Eat with family (how many times a week?_____) • Why do you eat at home? If respondent eats out, do you usually… (choose 1) ☐ Eat by yourself (how many times a week?_____) ☐ Eat with family (how many times a week?_____) ☐ Eat with officemates (how many times a week?_____) ☐ Eat with friends (how many times a week?_____) • Where do you frequently eat? (choose 1) ○ Restaurant ○ Karinderias ○ Office canteen ○ Fast food _____ ○ Baon (packed food from home) ○ Others _____ • Why do you eat in these places? Check all that apply. ☐ Serve dishes that are good for diabetics ☐ Convenient ☐ Delicious cooking ☐ Cheap/ affordable food	Why?

	In the past 6 months, did you regularly eat these meals? (at least 4x a week)	
	☐ YES	☐ NO
	☐ Fast service ☐ Know somebody in the place ☐ Others _____ _____ ○ Is the fact that you're diabetic factor in this process? ☐ Yes ☐ No ● If no, why? ○ What do you do when they don't have food that is good for diabetics?	

Part 2. Food environment

Where do you/ your family frequently buy your groceries? Check all that apply. Why do you go these specific places? Specify names of usual places (i.e. grocery in NCCC, Agdao public market)

Food source	Specific name	Why do you go to these places? Choose all the apply
☐ Supermarket		☐ Physically accessible (near home, office, church, etc) ☐ Can buy more in one visit (Offers more products) ☐ Cheaper prices ☐ More choices (# of brands per product) ☐ Have products for diabetics ☐ Better service (senior citizens, etc) ☐ Have grocery items that are good for diabetics
☐ Grocery		☐ Physically accessible (near home, office, church, etc) ☐ Can buy more in one visit (Offers more products) ☐ Cheaper prices ☐ More choices (# of brands per product) ☐ Have products for diabetics ☐ Better service (senior citizens, etc) ☐ Have grocery items that are good for diabetics
☐ Sari-sari store		☐ Physically accessible (near home, office, church, etc) ☐ Can buy more in one visit (Offers more products) ☐ Cheaper prices ☐ More choices (# of brands per product) ☐ Have products for diabetics ☐ Better service (senior citizens, etc) ☐ Have grocery items that are good for diabetics

Food source	Specific name	Why do you go to these places? Choose all the apply
☐ Stall in the wet market (palengke, talipapa)		☐ Physically accessible (near home, office, church, etc) ☐ Can buy more in one visit (Offers more products) ☐ Cheaper prices ☐ More choices (# of brands per product) ☐ Have products for diabetics ☐ Better service (senior citizens, etc) ☐ Have grocery items that are good for diabetics
☐ Others		☐ Physically accessible (near home, office, church, etc) ☐ Can buy more in one visit (Offers more products) ☐ Cheaper prices ☐ More choices (# of brands per product) ☐ Have products for diabetics ☐ Better service (senior citizens, etc) ☐ Have grocery items that are good for diabetics

Do you know of any place in your community where you can buy grocery items (food staples) that is good for diabetics?

☐ Yes ☐ No

- Do you buy there? ☐ Yes ☐ No
- If no, why not?

Where do you/ your family frequently **eat out** or buy your cooked food? Check all that apply. Why do you go these specific places? Specify names of usual places (i.e. grocery in NCCC, Agdao public market)

Food source	Specific name	Why do you go to these places? Choose all the apply
☐ Restaurant		☐ Serve dishes that are good for diabetics ☐ Convenient (near home, office, church, etc) ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Readily available
☐ Fast food		☐ Serve dishes that are good for diabetics ☐ Convenient (near home, office, church, etc) ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Readily available
☐ Karinderia		☐ Serve dishes that are good for diabetics ☐ Convenient (near home, office, church, etc) ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Readily available

Food source	Specific name	Why do you go to these places? Choose all the apply
☐ Mobile vendor		☐ Serve dishes that are good for diabetics ☐ Convenient (near home, office, church, etc) ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Readily available
☐ Supermarket		☐ Serve dishes that are good for diabetics ☐ Convenient (near home, office, church, etc) ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Readily available ☐ Buy food whenever I go here to shop
☐ Grocery		☐ Serve dishes that are good for diabetics ☐ Convenient (near home, office, church, etc) ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Readily available ☐ Buy food whenever I go here to shop
☐ Sari-sari store		☐ Serve dishes that are good for diabetics ☐ Convenient (near home, office, church, etc) ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Readily available ☐ Buy food whenever I go here to shop
☐ Stall in the wet market (palengke, talipapa)		☐ Serve dishes that are good for diabetics ☐ Convenient (near home, office, church, etc) ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Readily available ☐ Buy food whenever I go here to shop
☐ Others		☐ Serve dishes that are good for diabetics ☐ Convenient (near home, office, church, etc) ☐ Delicious cooking ☐ Cheap/ affordable food ☐ Readily available

Do you know of any place in your community where you can buy cooked food that is good for diabetics or eat out?

☐ Yes ☐ No

- Do you buy there? ☐ Yes ☐ No
- If no, why not?

Part 3. Willingness to Pay

Check all food items applicable to your household.

Diabetic healthy food*	In the past month, did you have any of the food items in your household?						
	YES			NO			
				WHY?	If respondent cites **availability,** would you buy these products if you could buy them in the barangay?	If respondent cites **expensive price,** How much are willing to pay for these products (underlined in column 1)?	
	If yes, purchase price (PhP)	**Package size**	**Where did you buy it? Choose one.**			*Choose 1*	*Average price*
☐ Cereal ☐ Rice ☐ Camote ☐ Rice corn	PHP	☐ 500 grams ☐ 1 kilo	☐ Supermarket ☐ Grocery ☐ Sari-sari store ☐ Convenience store ☐ Stall in the wet market ☐ Others Name of store:	☐ Expensive, not affordable ☐ It is not available ☐ The brand I like is not available ☐ I do not eat them (not my preference)	☐ YES, will buy if available ☐ NO, will not buy	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**33.00 per kilo**
☐ Meat ☐ Lean Meat ☐ Fish ☐ Chicken (no skin)	PHP	☐ 500 grams ☐ 1 kilo	☐ Supermarket ☐ Grocery ☐ Sari-sari store ☐ Convenience store ☐ Stall in the wet market ☐ Others Name of store:	☐ Expensive, not affordable ☐ It is not available ☐ The brand I like is not available ☐ I do not eat them (not my preference)	☐ YES, will buy if available ☐ NO, will not buy	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**114.56 per kilo**

Diabetic healthy food*	In the past month, did you have any of the food items in your household?		
	YES	NO	
		WHY?	If respondent cites **availability,** would you buy	If respondent cites **expensive price,** How much are willing to pay for these products (underlined in column 1)?

	If yes, purchase price (PhP)	Package size	Where did you buy it? Choose one.		these products if you could buy them in the barangay?	*Choose 1*	*Average price*
☐ Mongo beans (green)	PHP	☐ 250 grams ☐ 500 grams ☐ 1 serving	☐ Supermarket ☐ Grocery ☐ Sari-sari store ☐ Convenience store ☐ Stall in the wet market ☐ Cooked outside ☐ Others Name of store:	☐ Expensive, not affordable ☐ It is not available ☐ The brand I like is not available ☐ I do not eat them (not my preference)	☐ YES, will buy if available ☐ NO, will not buy	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**82.26 per kilo**
☐ Eggs	PHP	☐ Piece ☐ Half dozen ☐ 1 dozen	☐ Supermarket ☐ Grocery ☐ Sari-sari store ☐ Convenience store ☐ Stall in the wet market ☐ Others Name of store:	☐ Expensive, not affordable ☐ It is not available ☐ The brand I like is not available ☐ I do not eat them (not my preference)	☐ YES, will buy if available ☐ NO, will not buy	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**5.02 per piece**

Diabetic healthy food*	In the past month, did you have any of the food items in your household?						
	YES			NO			
				WHY?	If respondent cites <u>availability</u>, would you buy these products if you could buy them in the barangay?	If respondent cites <u>expensive price</u>, How much are willing to pay for these products (<u>underlined in column 1</u>)?	
	If yes, purchase price (PhP)	Package size	Where did you buy it? Choose one.			*Choose 1*	*Average price*
☐ Green leafy vegetables (malunggay, <u>kangkong</u>,	PHP	☐ 1 bundle ☐ 500 grams	☐ Supermarket ☐ Grocery ☐ Sari-sari store ☐ Convenience store ☐ Stall in the	☐ Expensive, not affordable ☐ It is not available ☐ The brand I	☐ YES, will buy if available ☐ NO, will not buy	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**12.99 per kilo**

Diabetic healthy food*	In the past month, did you have any of the food items in your household?						
	YES			NO			
				WHY?	**If respondent cites <u>availability</u>,** would you buy these products if you could buy them in the barangay?	**If respondent cites <u>expensive price</u>,** How much are willing to pay for these products (<u>underlined in column 1</u>)?	
	If yes, purchase price (PhP)	**Package size**	**Where did you buy it? Choose one.**			*Choose 1*	*Average price*
camote tops)		☐ 1 kilo	wet market ☐ Backyard ☐ Others Name of store:	like is not available ☐ I do not eat them (not my preference)			
☐ Coconut oil	PHP	☐ 200 grams ☐ 375 ml (lapad) ☐ 500 grams ☐ 1 kilo	☐ Supermarket ☐ Grocery ☐ Sari-sari store ☐ Convenience store ☐ Stall in the wet market ☐ Others Name of store:	☐ Expensive, not affordable ☐ It is not available ☐ The brand I like is not available ☐ I do not eat them (not my preference)	☐ YES, will buy if available ☐ NO, will not buy	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**113.61 per 1 liter**

Diabetic healthy food*	In the past month, did you have any of the food items in your household?						
	YES			NO			
				WHY?	**If respondent cites <u>availability</u>,** would you buy these products if you could buy them in the barangay?	**If respondent cites <u>expensive price</u>,** How much are willing to pay for these products (<u>underlined in column 1</u>)?	
	If yes, purchase price (PhP)	**Package size**	**Where did you buy it? Choose one.**			*Choose 1*	*Average price*
☐ Milk (choose 1) ☐ <u>non-fat</u> ☐ low fat	PHP	☐ 1 liter	☐ Supermarket ☐ Grocery ☐ Sari-sari store ☐ Convenience store ☐ Stall in the wet market ☐ Others Name of store:	☐ Expensive, not affordable ☐ It is not available ☐ The brand I like is not available ☐ I do not eat them (not my preference)	☐ YES, will buy if available ☐ NO, will not buy	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**23.60 per 80 grams**
☐ Coffee (choose 1) ☐ Sugar free ☐ <u>Black</u>	PHP	☐ 25 grams ☐ 50 grams ☐ 250 grams ☐ 500 grams	☐ Supermarket ☐ Grocery ☐ Sari-sari store ☐ Convenience store ☐ Stall in the wet market ☐ Others Name of store:	☐ Expensive, not affordable ☐ It is not available ☐ The brand I like is not available ☐ I do not eat them (not my preference)	☐ YES, will buy if available ☐ NO, will not buy	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**17.75 per 25gram pack**

Diabetic healthy food*	In the past month, did you have any of the food items in your household?						
	YES			NO			
				WHY?	If respondent cites **availability,** would you buy these products if you could buy them in the barangay?	If respondent cites **expensive price,** How much are willing to pay for these products (underlined in column 1)?	
	If yes, purchase price (PhP)	**Package size**	**Where did you buy it? Choose one.**			*Choose 1*	*Average price*
☐ Brown sugar	PHP	☐ 250 grams ☐ 500 grams ☐ 1 kilo	☐ Supermarket ☐ Grocery ☐ Sari-sari store ☐ Convenience store ☐ Stall in the wet market ☐ Others Name of store:	☐ Expensive, not affordable ☐ It is not available ☐ The brand I like is not available ☐ I do not eat them (not my preference)	☐	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**44.50 per kilo**
☐ Fruits ☐ Papaya ☐ Banana (latundan) ☐ Pineapple	PHP	☐ Piece ☐ Sipi/hand (for bananas) ☐ 1 kilo	☐ Supermarket ☐ Grocery ☐ Sari-sari store ☐ Convenience store ☐ Stall in the wet market ☐ Others Name of store:	☐ Expensive, not affordable ☐ It is not available ☐ The brand I like is not available ☐ I do not eat them (not my preference)	☐ YES, will buy if available ☐ NO, will not buy	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**1.60 per piece**

Diabetic healthy food*	In the past month, did you have any of the food items in your household?						
	YES			NO			
				WHY?	If respondent cites **availability,** would you buy these products if you could buy them in the barangay?	If respondent cites **expensive price,** How much are willing to pay for these products (underlined in column 1)?	
	If yes, purchase price (PhP)	**Package size**	**Where did you buy it? Choose one.**			*Choose 1*	*Average price*

Diabetic healthy food*	In the past month, did you have any of the food items in your household?						
	YES			NO			
	If yes, purchase price (PhP)	Package size	Where did you buy it? Choose one.	WHY?	If respondent cites **availability,** would you buy these products if you could buy them in the barangay?	If respondent cites **expensive price,** How much are willing to pay for these products (underlined in column 1)?	
						Choose 1	*Average price*
☐ Snacks (choose 1): ☐ Soda crackers ☐ Pandesal	PHP	☐ Piece or sachet ☐ 1 pack (10 sachets, 1can)	☐ Supermarket ☐ Grocery ☐ Sari-sari store ☐ Convenience store ☐ Stall in the wet market ☐ Others Name of store:	☐ Expensive, not affordable ☐ It is not available ☐ The brand I like is not available ☐ I do not eat them (not my preference)	☐ YES, will buy if available ☐ NO, will not buy	☐ Less than (<) ☐ Equal to (=) ☐ More than (>)	**40.63 per 10- piece pack**

***use vegetable oil as the regular alternative*

**** use fresh milk as the regular alternative*

*****use refined white sugar as the regular alternative*

--Thank You--

APPENDIX K

FORM 3A: Patient Participant and Caregiver Questionnaire

ENTRY DATE: _____

Month/ Day/ Year

Part 1. Individual Profile

Health District ☐ Talomo South

Barangay ☐ Bago Aplaya ☐ Dumoy

Name: _____ **Contact #:** _____

Respondent Number: _____

Coordinates: Longitude_____ Latitude:_____

Sex: ☐ Male ☐ Female **Date of Birth**: _____ **Age**:_____

Month/ Day/ Year

Marital status

☐ Single ☐ Widow/ widower
☐ Married ☐ Divorced
☐ Separated

Occupation status

☐ Employed ☐ Homemaker
☐ Self-employed ☐ Retired
☐ Not working

Estimated average monthly household income:

☐ 10,000 Pesos and below ☐ 30,001 to 40,000 Pesos
☐ 10,001 to 20,000 Pesos ☐ 40,001 to 50,000 Pesos
☐ 20,001 to 30,000 Pesos ☐ Higher than 50,000 Pesos

Highest educational attainment:

☐ Attended elementary school ☐ Attended college/ vocational school
☐ Graduated Grade 6 ☐ Graduated college
☐ Attended high school ☐ Attended/ graduated post-baccalaureate (masters, doctorate)
☐ Graduated high school

In your household, do you own any of the following appliances?

☐ Ref ☐ Motorized vehicle
☐ Computer ☐ Washing machine
☐ TV ☐ Aircon

Part 2A. Food preparation (only for recently recruited patients)

When were you diagnosed as a diabetic? (Year diagnosed) _____

Has your diet changed since you've been diagnosed? ☐ Yes ☐ No

- If yes, how?

- If no, why?

In the past 6 months, were your meals different from the rest of the family? ☐ Yes ☐ No

- If yes, how is it different?
    - What has been the rest of the family's reaction to this?

- If no, why?

In the past 6 months, who usually plans your meals at home?

☐ Myself
☐ My wife/husband
☐ My daughter/ son/ in-laws
☐ Our helper/ maid/ kasambahay

In the past 6 months, who usually cooks your meals at home?

☐ Myself
☐ My wife/husband
☐ My daughter/ son/ in-laws
☐ Our helper/ maid/ kasambahay

Part 2B. Caregiver profile

Name: _____ **Contact #:**_____

Respondent Number: _____

Sex: ☐ Male ☐ Female **Date of Birth:** _____ **Age:**_____
Month/ Day/ Year

Marital status

- ☐ Single
- ☐ Married
- ☐ Separated
- ☐ Widow/ widower
- ☐ Divorced

Occupation status

- ☐ Employed
- ☐ Self-employed
- ☐ Not working
- ☐ Homemaker
- ☐ Retired

Highest educational attainment:

- ☐ Attended elementary school
- ☐ Graduated Grade 6
- ☐ Attended high school
- ☐ Graduated high school
- ☐ Attended college/ vocational school
- ☐ Graduated college
- ☐ Attended/ graduated post-baccalaureate (masters, doctorate)

The succeeding parts should be answered by the patient and the caregiver together.

Part 3. Primary shopping store

Where did you/ your family most frequently buy your groceries in the past 30 days (more 4x in the past 30 days or at least once a week every week)? Choose 1. Why do you go this specific place? Specify the name of the establishment (i.e. grocery in NCCC, Agdao public market)

Food source	Specific name	Why do you go to these places? Choose all the apply
☐ Supermarket		☐ Physically accessible (near home, office, church, etc) ☐ Can buy more in one visit (Offers more products) ☐ Cheaper prices ☐ More choices (# of brands per product) ☐ Have products for diabetics ☐ Better service (senior citizens, etc) ☐ Have grocery items that are good for diabetics
☐ Grocery		☐ Physically accessible (near home, office, church, etc) ☐ Can buy more in one visit (Offers more products) ☐ Cheaper prices ☐ More choices (# of brands per product) ☐ Have products for diabetics ☐ Better service (senior citizens, etc) ☐ Have grocery items that are good for diabetics
☐ Sari-sari store		☐ Physically accessible (near home, office, church, etc) ☐ Can buy more in one visit (Offers more products) ☐ Cheaper prices ☐ More choices (# of brands per product) ☐ Have products for diabetics ☐ Better service (senior citizens, etc) ☐ Have grocery items that are good for diabetics

Food source	Specific name	Why do you go to these places? Choose all the apply
☐ Stall in the wet market (palengke, talipapa)		☐ Physically accessible (near home, office, church, etc) ☐ Can buy more in one visit (Offers more products) ☐ Cheaper prices ☐ More choices (# of brands per product) ☐ Have products for diabetics ☐ Better service (senior citizens, etc) ☐ Have grocery items that are good for diabetics
☐ Others		☐ Physically accessible (near home, office, church, etc) ☐ Can buy more in one visit (Offers more products) ☐ Cheaper prices ☐ More choices (# of brands per product) ☐ Have products for diabetics ☐ Better service (senior citizens, etc) ☐ Have grocery items that are good for diabetics

What diabetic healthy food options did you buy in this store? Enumerate as much as you can remember.

Part 4. Awareness about the food environment

Do you know of any place in your barangay where you can buy food items that are good for diabetics?

☐ Yes ☐ No

- If yes, in your estimate, how many do you think there are?
  - ○ Less than 5 ☐ 6-10 stores ☐ More than 10
- How did you know that these stores sold food items that are good for diabetics?
  - ☐ I am a favored customer ("Suki")
  - ☐ From other diabetics
  - ☐ From neighbors
  - ☐ From other family members/ relatives

- If no, why do you think there are no such stores in your barangay?

APPENDIX L

Patient Participant and Caregiver Questionnaire for intervention area (Bago Aplaya)

ENTRY DATE: _____

Month/ Day/ Year

Part 1. Individual Profile

Barangay ☐ Bago Aplaya

Name: _____ **Contact #:**_____

Part 1. Life changes

Were you hospitalized since last January 2013? [ ] Yes [ ] No

- If yes
  - How many times? _____
  - Inclusive dates of hospitalization and reason for hospitalization
    1. From _____ TO _____
       - Reason: _____
    2. From _____ TO _____
       - Reason: _____
    3. From _____ TO _____
       - Reason: _____
    4. From _____ TO _____
       - Reason: _____
  - Were there any changes to your current diagnosis? [ ] Yes [ ] No
    1. What were these additional diagnosis?

_____

_____

_____

_____

In the past 6 months, were there any significant changes in your personal life that has affected your everyday living?

- ☐ Marriage
- ☐ Retirement
- ☐ Death of a family member or relative or close friends
- ☐ Took over the care of family members (i.e. watch over grand children)

In the past 6 months, were there any significant changes in your work life that has affected your everyday living?

- ☐ New job/ promotion
- ☐ New business
- ☐ Closed an existing business
- ☐ Retirement

Part 2. MNT package participation and satisfaction

For those who did not attend at least 1 MNT session:	For those who attended 1-3 MNT sessions:	For those who attended all MNT sessions:
• Why did you not go to at least 1 MNT session? ☐ No time ☐ Was at work ☐ Could not leave the house or business ☐ The appointment coincided with other duties ☐ No other services offered (i.e. medicine, FBS testing) ☐ Physical ailment (physically weak, hospitalized, dysmenorrhea) • **What do you think should be done to enable you attend the MNT session?** ☐ Home visits ☐ Appointments should be done after office hours ☐ Provide medicine and other services ☐ Others _____ _____ _____	• Why were you not able to complete the 4 MNT sessions? ☐ No time ☐ Was at work ☐ Could not leave the house or business ☐ The appointment coincided with other duties ☐ No other services offered (i.e. medicine, FBS testing) ☐ Physical incapacity (physically weak, hospitalized, dysmenorrhea) • **What do you think should be done to enable you attend the MNT session?** ☐ Home visits ☐ Appointments should be done after office hours ☐ Provide medicine and other services ☐ Others _____ _____ _____	• Why did you attend all of the MNT sessions? ☐ Interesting topics ☐ Need to it better manage my diabetes ☐ I was learning a lot from the sessions ☐ I was told by BHW/midwife/Ms. Silva to attend ☐ I received text messages that I should attend • **In a scale of 1-4, with 1 as the lowest, how satisfied are you with the nutrition counseling services?** 1 2 3 4 *Lowest* *Highest* • **What do you think should be done to make you continue attending similar activities?** • What other topics/ subjects would you like to learn more of?

	• **In a scale of 1-4, with 1 as the lowest, how satisfied are you with the nutrition counseling services?** 1 | 2 | 3 | 4 *Lowest* *Highest* • Would you still continue attending the nutrition counseling session and complete the 6 sessions? ☐ YES [ ] NO. Why?	

Part 3. Treatment partner profile and participation

Do you have a treatment partner/ caregiver? [ ]Yes [ ]No

- **If yes:**

Name: _____ Contact #: _____

Respondent Number: _____

Relationship to the patient:

- ☐ Mother
- ☐ Father
- ☐ Uncle/Aunt
- ☐ Distant relative
- ☐ Employer

Sex: ☐ Male ☐ Female

Date of Birth: _____ Age: _____
Month/ Day/ Year

Marital status

- ☐ Single
- ☐ Married
- ☐ Separated
- ☐ Widow/ widower
- ☐ Divorced

Occupation status

- ☐ Employed
- ☐ Self-employed
- ☐ Not working
- ☐ Homemaker
- ☐ Retired

Highest educational attainment:

- ☐ Attended elementary school
- ☐ Graduated Grade 6
- ☐ Attended high school
- ☐ Attended college/ vocational school
- ☐ Graduated college
- ☐ Attended/ graduated post-baccalaureate

☐ Graduated high school (masters, doctorate)

For those whose TP did not attend at least one (1) MNT counseling sessions:	For those whose TP attended 1-3 MNT counseling sessions:	For those whose TP attended all MNT counseling sessions:
• Why was your TP not able to accompany you during your counseling sessions? ☐ Busy with work/ business ☐ Nobody would be left at home to take care of the children/ grandchildren ☐ Emergency ☐ Others _____ _____ _____ • What do you think could be done to ensure that your TP is able to join you?	• Why was your TP not able to accompany you in ALL of your counseling sessions? ☐ Busy with work/ business ☐ Nobody would be left at home to take care of the children/ grandchildren ☐ Emergency ☐ Others _____ _____ _____ • What do you think could be done to ensure that your TP is able to join you? [FOR THE TP] ○ Was the nutrition counseling helpful to you and your patient? [ ] Yes [ ] No ○ What changes did you make after attending the sessions? ☐ Changed his/her food intake. Example_____ _____ ____ ☐ Ate more frequently ☐ Cooked healthier dishes. Example_____ _____ ____ ○ Are you still willing to accompany the patient to other similar	• What challenges did you and your TP face whenever you had to go to the health center to attend the counseling session? • What did you do to overcome these challenges? [FOR THE TP] • Was the nutrition counseling helpful to you and your patient? [ ] Yes [ ] No • What changes did you make after attending the sessions? ○ Changed his/her food intake. Example__ _____ _____ ○ Ate more frequently ○ Cooked healthier dishes. Example

	activities? [ ]Yes [ ]No	_____ _____ • Are you still willing to accompany the patient to other similar activities? []Yes []No

Part 5. Awareness about the food environment

Do you know of any place in your barangay where you can buy food items that are good for diabetics?

☐ Yes ☐ No

- If yes, in your estimate, how many do you think there are?
  - Less than 5 ☐ 6-10 stores ☐ More than 10
- How did you know that these stores sold food items that are good for diabetics?
  - ☐ I am a favored customer ("Suki")
  - ☐ From other diabetics
  - ☐ From neighbors
  - ☐ From other family members/ relatives

- If no, why do you think there are no such stores in your barangay?

APPENDIX M

FORM 4A.2: Patient Participant and Caregiver Questionnaire for control area (Dumoy)

ENTRY DATE: _____

Month/ Day/ Year

Part 1. Individual Profile

Barangay ☐ Dumoy

Name: _____ **Contact #:** _____

Part 1. Life changes

Were you hospitalized since last January 2013? [ ] Yes [ ] No

- If yes
  - How many times? _____
  - Inclusive dates of hospitalization and reason for hospitalization
    1. From _____ TO _____
       - Reason: _____
    2. From _____ TO _____
       - Reason: _____
    3. From _____ TO _____
       - Reason: _____
    4. From _____ TO _____
       - Reason: _____
  - Were there any changes to your current diagnosis? [ ] Yes [ ] No
    1. What were these additional diagnosis?

_____

_____

_____

_____

In the past 6 months, were there any significant changes in your personal life that has affected your everyday living?

- ☐ Marriage
- ☐ Retirement
- ☐ Death of a family member or relative or close friends
- ☐ Took over the care of family members (i.e. watch over grand children)

In the past 6 months, were there any significant changes in your work life that has affected your everyday living?

- ☐ New job/ promotion
- ☐ New business
- ☐ Closed an existing business
- ☐ Retirement

Part 2. Treatment partner profile

Do you have a treatment partner/ caregiver? [ ]Yes [ ]No

- **If yes:**

Name: _____ Contact #: _____

Respondent Number: _____

Relationship to the patient:

- ☐ Mother
- ☐ Father
- ☐ Uncle/Aunt
- ☐ Distant relative
- ☐ Employer

Part 3. Awareness about the food environment

Do you know of any place in your barangay where you can buy food items that are good for diabetics?

☐ Yes ☐ No

- If yes, in your estimate, how many do you think there are?
  - ○ Less than 5 ☐ 6-10 stores ☐ More than 10
- How did you know that these stores sold food items that are good for diabetics?
  - ☐ I am a favored customer ("Suki")
  - ☐ From other diabetics
  - ☐ From neighbors
  - ☐ From other family members/ relatives

- If no, why do you think there are no such stores in your barangay?

APPENDIX N

City Agriculture Office Interview schedule

Date: _____ Time: _____

Respondents: _____

Instructions for interviewer:

1. Introduce yourself.
2. Give a brief background on the research study and the purpose of the interview.
3. Ask for permission to record the interview.

A. What are the existing programs of your office that directly addresses the enhancement of availability and/or accessibility of food at the community level?

1. Program #1 _____

a. Can you describe the program? How does is this program being implemented?

i. Is this under the FSSP of the Dept of Agriculture? _____

ii. What products are produced under this program?

b. Who do you work with (i.e. barangay captain, NGOs, etc) under this program? Who implements it? What is the role of the city agriculture office?

c. To date, how many barangays are implementing this program? _____

i. What do you think are the factors that influenced the adoption of this program by these barangays?

ii. For the barangays not implementing the program, what were the reasons behind non-adoption?

d. How would rate the performance of the city when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

2. Program #2 _____

a. Can you describe the program? How does is this program being implemented?

i. Is this under the FSSP of the Dept of Agriculture? _____

ii. What products are produced under this program?

b. Who do you work with (i.e. barangay captain, NGOs, etc) under this program? Who implements it? What is the role of the city agriculture office?

c. To date, how many barangays are implementing this program? _____

i. What do you think are the factors that influenced the adoption of this program by these barangays?

ii. For the barangays not implementing the program, what were the reasons behind non-adoption?

d. How would rate the performance of the city when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

3. Program #3 _____

a. Can you describe the program? How does is this program being implemented?

i. Is this under the FSSP of the Dept of Agriculture? _____

ii. What products are produced under this program?

b. Who do you work with (i.e. barangay captain, NGOs, etc) under this program? Who implements it? What is the role of the city agriculture office?

c. To date, how many barangays are implementing this program? _____

i. What do you think are the factors that influenced the adoption of this program by these barangays?

ii. For the barangays not implementing the program, what were the reasons behind non-adoption?

d. How would rate the performance of the city when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

B. What do you think the City Agriculture Office could do to further enhance the food availability and accessibility of diabetic healthy food options?

C. What are the plans of the City Agriculture Office for the next 5 years when it comes to these programs?

- Discuss program enhancements. Probe on mechanisms that they are looking at. Look at how these could be linked to DHFO

APPENDIX O

National Nutrition Council Interview schedule

Date: _____ Time: _____

Respondents: _____

Instructions for interviewer:

1. Introduce yourself.
2. Give a brief background on the research study and the purpose of the interview.
3. Ask for permission to record the interview.

A. What are the existing programs of the NNC that directly addresses the enhancement of availability and/or accessibility of food at the community level?

1. Program #1 _____

a. Can you describe the program? How does is this program being implemented?

i. What products are produced under this program?

b. Who do you work with (i.e. barangay captain, NGOs, etc) under this program? Who implements it? What is the role of the city health office?

c. To date, how many barangays are implementing this program? _____

i. What do you think are the factors that influenced the adoption of this program by these barangays?

ii. For the barangays not implementing the program, what were the reasons behind non-adoption?

d. How would rate the performance of the city when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

2. Program #2 _____

a. Can you describe the program? How does is this program being implemented?

i. What products are produced under this program?

b. Who do you work with (i.e. barangay captain, NGOs, etc) under this program? Who implements it? What is the role of the city health office?

c. To date, how many barangays are implementing this program? _____

ii. What do you think are the factors that influenced the adoption of this program by these barangays?

iii. For the barangays not implementing the program, what were the reasons behind non-adoption?

d. How would rate the performance of the city when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

3. Program #3 _____

a. Can you describe the program? How does is this program being implemented?

i. What products are produced under this program?

b. Who do you work with (i.e. barangay captain, NGOs, etc) under this program? Who implements it? What is the role of the city health office?

c. To date, how many barangays are implementing this program? _____

i. What do you think are the factors that influenced the adoption of this program by these barangays?

ii. For the barangays not implementing the program, what were the reasons behind non-adoption?

d. How would rate the performance of the city when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

B. What do you think the NNC could do to further enhance the availability and accessibility of diabetic healthy food options?

C. What are the plans of the NNC for the next 5 years when it comes to these programs?

a. Discuss program enhancements. Probe on mechanisms that they are looking at. Look at how these could be linked to DHFO

APPENDIX P

City Health Office Interview schedule

Date: _____ Time: _____

Respondents: _____

Instructions for interviewer:

1. Introduce yourself.
2. Give a brief background on the research study and the purpose of the interview.
3. Ask for permission to record the interview.

A. What are the existing programs of the City Health Office that directly addresses the enhancement of availability and/or accessibility of food at the community level?

1. Program #1 _____

a. Can you describe the program? How does is this program being implemented?

i. What products are produced under this program?

b. Who do you work with (i.e. barangay captain, NGOs, etc) under this program? Who implements it? What is the role of the city health office?

c. To date, how many barangays are implementing this program? _____

i. What do you think are the factors that influenced the adoption of this program by these barangays?

ii. For the barangays not implementing the program, what were the reasons behind non-adoption?

d. How would rate the performance of the city when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

2. Program #2 _____

a. Can you describe the program? How does is this program being implemented?

iv. What products are produced under this program?

b. Who do you work with (i.e. barangay captain, NGOs, etc) under this program? Who implements it? What is the role of the city health office?

c. To date, how many barangays are implementing this program? _____

i. What do you think are the factors that influenced the adoption of this program by these barangays?

ii. For the barangays not implementing the program, what were the reasons behind non-adoption?

d. How would rate the performance of the city when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

3. Program #3 _____

a. Can you describe the program? How does is this program being implemented?

i. What products are produced under this program?

b. Who do you work with (i.e. barangay captain, NGOs, etc) under this program? Who implements it? What is the role of the city health office?

c. To date, how many barangays are implementing this program? _

i. What do you think are the factors that influenced the adoption of this program by these barangays?

ii. For the barangays not implementing the program, what were the reasons behind non-adoption?

d. How would rate the performance of the city when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

B. What do you think the City Health Office could do to further enhance the availability and accessibility of diabetic healthy food options?

C. What are the plans of the City Health Office for the next 5 years when it comes to these programs?

- Discuss program enhancements. Probe on mechanisms that they are looking at. Look at how these could be linked to DHFO

APPENDIX Q

Barangay Interview schedule

Date: _____ Time: _____

Respondents: _____

Instructions for interviewer:

1. Introduce yourself.
2. Give a brief background on the research study and the purpose of the interview.
3. Ask for permission to record the interview.

A. What are the existing programs in the barangay that directly addresses the of availability and/or accessibility of food at the community level?

1. Do you have a Gulayan sa Barangay?

a. Can you describe the Gulayan? Who is directly implementing this? What role does the barangay play in this project (i.e. funding, personnel, marketing assistance)?

i. What products are produced under this program?

b. How long have you been implementing this program? _____

c. How much is the production level of your program?

d. Who are the recipients or end-users of the produce?

e. How would rate the performance of the barangay when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

i. What do you think are the factors made it successful?

ii. What are its challenges?

f. How much is the production level of your Gulayan?

2. Program #2 _____

a. Can you describe the program? Who is directly implementing this? What role does the barangay play in this program(i.e. funding, personnel, marketing assistance)?

i. What products are produced under this program?

b. How long have you been implementing this program?_____

c. How much is the production level of your program?

d. Who are the recipients or end-users of the produce?

e. How would rate the performance of the barangay when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

i. What do you think are the factors made it successful?

ii. What are its challenges?

3. Program #3 _____

a. Can you describe the program? Who is directly implementing this? What role does the barangay play in this program(i.e. funding, personnel, marketing assistance)?

i. What products are produced under this program?

b. How long have you been implementing this program?_____

c. How much is the production level of your program?

d. Who are the recipients or end-users of the produce?

e. How would rate the performance of the barangay when it comes to the implementation of this program? Why?

1	2	3	4
Lowest			Highest

i. What do you think are the factors made it successful?

ii. What are its challenges?

B. What do you think the barangay could do to further enhance the availability and accessibility of diabetic healthy food options?

C. What are the plans of the barangay for the next 5 years when it comes to these programs?

- Discuss program enhancements. Probe on mechanisms that they are looking at. Look at how these could be linked to DHFO

APPENDIX R

Information sheet and informed consent form for patient participants

Title of research Determining the influence of the local food environment on the dietary compliance and diet quality of Type 2 Diabetes Mellitus enrolled in the CVD program in Davao City, Philippines

Investigator **Ms. Ma. Esmeralda Silva**

Contact Number: 0921-201-8235 [Smart] || 0923-396-4200 [Sun]

You are being invited to take part in a research project. Before you decide to participate it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and do not hesitate to ask if anything is unclear or if you would like more information. This consent form may contain words that you may not understand. Please ask the person talking to you about this form to explain any words or information that you do not clearly understand. You may keep an unsigned copy of this consent form to think about or discuss with your family or friends before making your decision.

Nature and purpose of this study

You have been pre-selected to participate in a nutrition and diabetes study in selected health districts in Davao City. You are one of the pre-selected diabetics enrolled in Davao City's CVD program from your health district to participate in the study. Your participation to the study is voluntary.

The purpose of this study is to determine the impact of the influence of the local food environment in ensuring the dietary compliance and diet quality among diabetic patients enrolled in the integrated CVD program of Davao City, Philippines.

The study is expected to last for one year. You will need to participate three (3) times during the whole duration of the study. For each time, your participation will take one week (7 days). The first time you will participate will be during Phase 1 of the study which is the situational analysis phase. The two remaining instances would be at the start and end of Phase 4 or the evaluation phase.

Phase 1 is to study the effect of the local food environment on the diet quality and dietary compliance of diabetic patients enrolled in the city's CVD program. In this phase, you will be required to record what you ate for seven consecutive (7) days in the food diary provided by the CVD program. The researcher will inform you the dates when you will record what you ate in your food diary. The food diary must be completed daily, preferably during or right after your meal. The researcher will visit you after the last day of entry to collect your food diary. During this visit, the researcher will collect the entries in your food diary. You will also be asked to answer a survey questionnaire regarding your eating habits both at home and away from home as well as your willingness to pay for basic diabetic-healthy food options. The survey will take 15 minutes. The activities for Phase 1 are as follows:

Visit #1	• Review Idaho Plate method taught during the nutrition counseling session with the community nutritionist • Inform you about the dates for the food diary intake
Visit #2	• Collect food diary entries • Administer dietary behavior and willingness to pay survey

Phase 4 will evaluate a small project of the research. For this phase, you will be required to record your food intake for 7 consecutive days in a food diary. The researcher will be visiting you four times during an eight-month period. The first 2 visits will be for the baseline stage of Phase 4 which will be done a few weeks before the project starts. The last 2 will be for the post-intervention stage which is going to be after sixth month of implementing the project. The activities for this phase are as follows:

Visit #1	• Confirm continued participation in Phase 4 • Review Idaho Plate method • Inform you about the dates for the food diary intake
Visit #2	• Collect food diary entries • Quick interview
Visit #3	• Review Idaho Plate method • Inform you about the dates for the food diary intake
Visit #4	• Collect food diary entries • Quick interview

Reminder: The food diary must be completed daily, preferably during or right after your meal.

You may not receive direct benefit from your participation in this study. Your participation in this study can provide knowledge that will benefit your community and the health leadership in the city. This study hopes to provide the health officials in Davao City, specifically those involved in the CVD program that is being implemented in your barangay, a picture of the challenges that diabetic patients such as yourself when it comes to accessing and availing of food that you need.

Should you wish to decline participating in this study, your status in the CVD Program and other future government programs will not be affected.

There will be no cost to you for the supplies related to this study. The supplies you need to complete this study will be provided to you.

Any information you provide the researcher during the course of the study will be kept private and confidential. Your information will be coded under your respondent number. Any personally identifiable information cannot be directly linked to you. You will not be identified by name in any publication or presentation.

Questions

If you have any questions regarding your participation in this study, including the keeping of food diaries, you can send a text message to:

Ma. Esmeralda Silva (Myra)
0921-201-8235 [Smart] || 0923-396-4200 [Sun]

If researcher does not perform the procedure as stated above, the participants can report the incident to:

Ethics Review Committee for Research Involving Human Research Subjects
Health Sciences Group, Chulalongkorn University (ECCU).
Institute Building 2, 4th Floor, Soi Chulalongkorn 62,
Phyathai Rd., Bangkok 10330, Thailand,
Tel: 0-2218-8147 Fax: 0-2218-8147 E-mail: eccu@chula.ac.th.

Informed Consent form for patient participants

I voluntarily agree to participate in this research project:

Title of research	*Determining the influence of the local food environment on the dietary compliance and diet quality of Type 2 Diabetes Mellitus enrolled in the CVD program in Davao City, Philippines*
Investigator	*Ma. Esmeralda Silva*
Contact address:	*Tulip Lane, Woodridge Park Homes, Ma-a, Davao City*
Contact Number:	*0921-201-8235 [Smart] || 0923-396-4200 [Sun]*

I have read and I understand the information about the study and the scope of my participation. All my questions regarding the study and my participation in it have been answered to my satisfaction. I have been informed of the risks involved and my rights as a research subject.

I willingly agree to participate in the study and give my consent to do the following:

- **Keep 7-day food record once during Phase 1**
- **Answer the dietary behavior and willingness to pay survey for Phase 1**
- **Allow the collection of the longitude and latitude coordinates of my house**
- **Keep 7-day food record twice during Phase 4**
- **Answer a survey questionnaire during Phase 4.**

I have the right to withdraw from this research project at any time as I wish with no need to give any reason. This withdrawal will not have any negative impact upon me.

Researcher has guaranteed that procedure(s) acted upon me would be exactly the same as indicated in the information. Any of my personal information will be kept confidential. Results of the study will be reported as total picture. Any of personal information which could be able to identify me will not appear in the report.

If I am not treated as indicated in the information sheet, I can report to the Ethics Review Committee for Research Involving Human Research Subjects, Health Sciences Group, Chulalongkorn University (ECCU). Institute Building 2, 4 Floor, Soi Chulalongkorn 62, Phyat hai Rd., Bangkok 10330, Thailand, Tel: 0-2218-8147 Fax: 0-2218-8147 E-mail: eccu@chula.ac.th,

I understand that I will receive a signed and dated copy of this consent form. By signing this consent form, I have not waived any of the legal rights which I otherwise would have as a subject in a research study.

Printed name of participant	*Participant's signature*
Date	*Respondent Number*

Witness: *Printed name* *Signature*

Date

The above-named subject has been fully informed of the study.

Signature of person conducting informed consent discussion	*Date*
Investigator's signature (if different from above)	*Date*

APPENDIX S

Information form and informed consent form for food source respondents

Title of research Determining the influence of the local food environment on the dietary compliance and diet quality of Type 2 Diabetes Mellitus enrolled in the CVD program in Davao City, Philippines

Investigator **Ms. Ma. Esmeralda Silva**

Contact Number: 0921-201-8235 [Smart] || 0923-396-4200 [Sun]

You are being invited to take part in a research project. Before you decide to participate it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and do not hesitate to ask if anything is unclear or if you would like more information. This consent form may contain words that you may not understand. Please ask the person talking to you about this form to explain any words or information that you do not clearly understand. You may keep an unsigned copy of this consent form to think about or discuss with your family or friends before making your decision.

Nature and purpose of this study

You have been selected to participate in a nutrition and diabetes study in selected health districts in Davao City. Your participation to the study is voluntary.

The purpose of this study is to determine the influence of the local food environment on the dietary compliance and diet quality among diabetic patients enrolled in the integrated CVD program of Davao City, Philippines. An important component to the study is to provide a picture of the local food environment. The study is expected to last for one year.

As a food source in the barangay, your establishment was chosen to participate in the study. All sources of food in your barangay are included in the study.

You will only participate once during Phase 1 of the study. This phase is aimed at studying the relationship between the local food environment and the diet quality and dietary compliance of diabetic patients enrolled in the city's CVD program.

During this phase, you will be required to allow access to the researcher to observe your food offerings in your store/ establishment as well as answer a survey questionnaire regarding your willingness to sell diabetic-healthy food. The researcher would also need to get the longitude and latitude coordinates of your establishment to be able to map it as well as take pictures. The survey is expected to last from 15 to 30 minutes.

You may not receive direct benefit from your participation in this study. Your participation in this study can provide knowledge that will benefit your community and the health leadership in the city. This study hopes to provide the health officials in Davao City, specifically those involved in the CVD program that is being implemented in your barangay, a picture of the accessibility and availability of food in the community, particularly those needed by diabetics.

Any information you provide the researcher during the course of the study will be kept private and confidential. Your business-related information will be coded a unique alpha-numeric code. Any personally identifiable information cannot be directly linked to you. Efforts will be made to mask the specific location of your business. Your business will not be identified by name in any publication or presentation.

Questions

If you have any questions regarding your participation in this study, you can send a text message to:

Ma. Esmeralda Silva (Myra)
0921-201-8235 [Smart] || 0923-396-4200 [Sun]

If researcher does not perform the procedure as stated above, the participants can report the incident to:

Ethics Review Committee for Research Involving Human Research Subjects
Health Sciences Group, Chulalongkorn University (ECCU)
Institute Building 2, 4th Floor, Soi Chulalongkorn 62
Phyathai Rd., Bangkok 10330, Thailand,
Tel: 0-2218-8147 Fax: 0-2218-8147 E-mail: eccu@chula.ac.th.

Informed Consent form for food source respondents

I voluntarily agree to participate in this research project:

Title of research	*Determining the influence of the local food environment on the dietary compliance and diet quality of Type 2 Diabetes Mellitus enrolled in the CVD program in Davao City, Philippines*
Investigator	*Ma. Esmeralda Silva*
Contact Number:	*0921-201-8235 [Smart] || 0923-396-4200 [Sun]*

I have read and I understand the information about the study and the scope of my participation. All my questions regarding the study and my participation in it have been answered to my satisfaction. I have been informed of the risks involved and my rights as a research subject.

I willingly agree to participate in the study and give my consent for the researcher to the following:

- **Observe the food items/ offerings in my establishment**
- **Collect the longitude and latitude coordinates of my establishment**
- **Take pictures of my establishment and will be destroyed after the completion of the study**
- **Answer a survey on willingness to sell questions.**

I have the right to withdraw from this research project at any time as I wish with no need to give any reason. This withdrawal will not have any negative impact upon me.

Researcher has guaranteed that procedure(s) acted upon me would be exactly the same as indicated in the information. Any of my personal information will be kept confidential. Results of the study will be reported as total picture. Any of personal information which could be able to identify me will not appear in the report.

If I am not treated as indicated in the information sheet, I can report to the Ethics Review Committee for Research Involving Human Research Subjects, Health Sciences Group, Chulalongkorn University (ECCU). Institute Building 2, 4 Floor, Soi Chulalongkorn 62, Phyat hai Rd., Bangkok 10330, Thailand, Tel: 0-2218-8147 Fax: 0-2218-8147 E-mail: eccu@chula.ac.th,

I understand that I will receive a signed and dated copy of this consent form. By signing this consent form, I have not waived any of the legal rights which I otherwise would have as a subject in a research study.

Printed name of participant *Participant's signature*

Date *Food source code*

Witness: *Printed name* *Signature*

Date

The above-named subject has been fully informed of the study.

Signature of person conducting informed consent discussion *Date*

Investigator's signature (if different from above) *Date*

APPENDIX S

Enhanced MNT Session Structure

Session 0:	
OBJECTIVES	• At the end of the session, the patient should 1. Enumerate his/her TER and CPF prescription 2. Explain the basics of meal planning, based on his/her CPF prescription 3. Demonstrate the IDAHO plate method
ACTIVITIES	• Compute for TER and CPF (page 1 and upper portion of page 2 of the Cardex form) • Overview on MNT (complete lecture) 1. Assessing food preferences 2. Explaining the daily energy requirement and the CPF prescription 3. Basics of Meal Planning using the food model 4. Idaho plate method • Assignment 1. 3-day food diary 2. Bring treatment partner (naga-prepare ng food) in the next session • Set appointment for the next session
KEY MESSAGE	• There is NO such thing as a diabetic diet • Walang bawal na pagkain sa diabetics
TOOLS	• CVD diary • DE flipchart • Cardex form (peach/pink form)

Session 1:	
OBJECTIVES	• At the end of the session, the patient and his/her treatment partner should be able to: 1. Explain the link between diet, nutrition and T2DM and the reasons for diet modification 2. Say his/ her dietary prescription and recommended food 3. Demonstrate household measurements and hand skills 4. Identify parts of his/her 3 day food record that could be improved
ACTIVITIES	• Administer the intervention pre-test • Re -assess the dietary prescription using the 3-day food diary 1. TER 2. CPF • Review 1. Diet, nutrition and T2DM “link” • Teach 1. Household measures and hand skills 2. Return demonstration of HH measures and hand skills • Provide nutrition advice 1. Focus question: Using the 3-day food diary, how his diet his/her can be improved?

Session 1:	
	• Assignment: 1. 3-day food diary • Set next appointment
KEY MESSAGE	• Measure what you eat
TOOLS	• Intervention pre-test • DE flipchart (page 2) • CVD Diary • Food models • Common household measurements example 1. Takal (star margarine small) 2. Baso 3. Cup 4. Mug

Session 2:	
OBJECTIVES	• At the end of the session, the patient should be able to: 1. Count carbohydrate content
ACTIVITIES	• Test guide/ questionnaire #2 • Review: 1. Hand skills 2. Use of food dictionary (looking for equivalent but better alternatives) • Teach: 1. Carb counting 2. GI assessment (as low as possible) • Re -assess using 3-day food diary [dietary analysis] • Provide nutrition advice 1. Link CHO consumption in the diary with carb counting 2. Link food diary contents with GI assessment 3. Identifying equivalent but healthier alternatives using the food dictionary • Assignment 1. 3-day food diary
KEY MESSAGE	• Count your carbs
TOOLS	• Test questionnaire/ guide (#2) • Patient's CVD diary • Food dictionary

Session 3:	
OBJECTIVES	• At the end of the session, the patient should be able to: 1. Assess food intake 2. Identify alternative sources of diabetic healthy food options in the local food environment 3. Explain nutrition labels 4. Provide nutrition advice
ACTIVITIES	• Administer the test using the food diary 1. Carb counting, GI assessment • Interview 1. Where do they usually buy their food? Why? 2. What other places in the community could they buy food? 3. What are the selections being offered in these places? • Teach: 1. Read nutrition label • Re -assess using 3-day food diary [dietary analysis] • Provide nutrition advice 1. Stimulate greater awareness about the food availability in the local food environment • Assignment 1. 3-day food diary
KEY MESSAGE	• Look at: 1. Carbohydrates 2. Sodium • Avoid hydrogenated vegetable oil, satured fat, trans fat.
TOOLS	• Test questionnaire/ guide (#3) • Nutrition labels for common grocery items in flash cards: 1. Skyflakes 2. Bear brand SWAK 3. Lucky me noodles 4. Sardinas 5. Iced tea 6. 3 in 1 Coffee

Session 4:	
OBJECTIVES	• At the end of intervention, the patient should be able to: 1. Identify commonly available diabetic healthy food options in their community 2. Explain the carbohydrate-GI link and its implication on T2DM 3. Navigate the CVD food dictionary 4. Identify common equivalent alternatives to what they usually eat
ACTIVITIES	• Test questionnaire/ guide #1 • Teach: 1. Carb-GI link and disease implications 2. Learning to look for equivalent but healthier alternatives using the CVD Food dictionary • Re -assess using 3-day food diary [dietary analysis] • Provide nutrition advice 1. Identifying equivalent alternatives 2. Food availability of diabetic healthy food options in the community • Where to buy • Deciding how to buy • SCRIPT → If you notice they always eat law-oy, you could suggest that they could eat other veggie dishes. Prompt: what other veggies are available in your community? What other meats can you buy near your place? Integrate hand skills prompts to remind them how to use it when assessing how much to buy. Suggest quick easy way to cook. • Assignment 1. 3-day food diary
KEY MESSAGE	• Use the CVD Food dictionary • FIRE (high GI), WATER (free food – fruits, vegetables), COAL (low GI – proteins, meat • Eat more high fiber slow release carb food
TOOLS	• Test questionnaire/ guide (#1) • CVD food dictionary • Patient's CVD diary • Food model and HH measure samples

VITA

I am a faculty member of the Department of Health Policy and Administration at the College of Public Health, University of the Philippines Manila. My area of specialization is in health policy and analysis. My field of study is in obesogenic environments, specifically food and physical environment activities. I completed my doctorate in Public Health at Chulalongkorn University. I finished my Masters in Public Affairs from the University of the Philippines Los Banos where I specialized in Strategic Planning and Policy Studies. In 2006, I completed my MS in Public Policy and Management degree, majority in Policy Analysis, from Carnegie Mellon University.