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APPENDICES

APPENDIX A

Respiratory Questionnaire

Epidemiology Standardization Project

ATS-DLD-78-C

Thank you for your willingness to participate. You were selected by a scientific sampling procedure, and your cooperation is very important to the success of the study.

This is a questionnaire you are asked to fill out. Please answer the questions as frankly and accurately as possible. All information obtained in the study will be kept confidential and used for medical research only. Your personal physician will be informed about the test results if you desire.

The questions can be answered by checking the best answer or by filling in a blank with a number or word.

Example: Do you live in the United States 1. Yes...✓...
2. No.........

If you desire help in answering a question, please put a check (✓) in *front* of the question number. You will be helped with these questions at the time of your appointment.

Identification Number 1-5 □□□□□

Card Number 1
6

Name..

Address..

.... 7-11 □□□□□

(Zip code)

Telephone number..

Interviewer.. 12 □

Date.. 13-17 □□□□□

MO DAY YR

For Office Use

1. Sex of child?	1. Male........2. Female..........	18	☐
2. What is the racial-ethnic group of this child?		19	☐
	1. White............................		
	2. Black............................		
	3. Oriental.........................		
	4. American Indian..............		
	5. Mexican-American............		
	6. Other................Specify..............		
3. Date of birth..		20-23	☐☐☐☐
	(Month) (Day) (Year)		
4. In what city or town was this child's mother living when this child was born?		24-26	☐☐☐
Please Specify...			
5. Please list all places where he or she lived for 6 months or longer, from birth to the present (and the number of years at current address)			
Birth year (....)	....		
	....		
	....		
	....		
Current Year	....		
Number of years at current address..		27-28	☐☐

For Office Use

6A. What type of his/her school? 29 ☐

1. No attend class.....................................
2. Day care or nursery school.........................
3. Regular school....................................

If *Yes* To day care or nursery school:

B. How many children are in his/her class? 30-31 ☐☐

....

Number of children

If *Yes* To regular school:

C. What grade is he/she in? 32 ☐

1. Kindergarten school...............................
2. Elementary school.................................
3. Junior high school................................

7. How old of youngest children in your house? 33 ☐

0. < 6 month...
1. 6-17 month..
2. 18-29 month.......................................
3. 30 month < 5 year................................
4. 5-9 year..
5. > 10 year..
6. No youngest children............................

8A. How many people sleep with children in his/her bedroom? 34 ☐

1. No person...
2. 1 person ....
3. 2 persons...
4. ≥ 3 persons.......................................

If *Yes* To people sleep with children:

B. Does people sleep with children smoke?

1. Yes___ 2. No___ 35 ☐

หอสมุดกลาง ศูนย์วิทยทรัพยากร จุฬาลงกรณ์มหาวิทยาลัย

For Office Use

C. Have children his/her personal mattress? 36 ☐

1. Yes___ 2. No___

If *No* To 8C:

D. How many people use mattress with children? 37 ☐

1. 1 person..
2. 2 persons..
3. ≥ 3 persons...

9A. How many rooms (not counting bathrooms) are there in your house/ apartment? .... 38-39 ☐☐

Number of rooms

9B. How many people live in your home? 40-41 ☐☐

....

Number of people

10. How is your home heated? 42 ☐

1. Steam or hot water................................
2. Warm air furnace.................................
3. Floor, wall, or pipeless furnace.................
4. Built-in electric units..............................
5. Other means-with flue............................
6. Other means-without flue........................
7. Not heated...

11. What fuel is used most for cooking in your home? 43 ☐

1. Coal or coke.......................................
2. Wood...
3. Utility gas...
4. Bottled, tank or LP gas...........................
5. Electricity...
6. Fuel oil, kerosene.................................

For Office Use

12. Do you have any air conditioner(s), humidifier(s), or air filter(s) in your home? 44 ☐

0. None………………………………………
1. Air conditioner(s)……………………………
2. Humidifier(s)………………………………..
3. Air filter(s)…………………………………..
4. Air conditioner(s) + humidifier(s)…………..
5. Air conditioner(s) + air filter(s)……………..
6. Humidifier(s) + air filter(s)…………………
7. Air conditioner(s) + humidifier(s) + air filter(s)

13. Do you have a cat, dog, or bird living in your home? 45 ☐

0. No…………………………………………
1. Cat…………………………………………
2. Dog………………………………………..
3. Bird………………………………………..
4. Cat + dog……………………………………
5. Cat + bird……………………………………
6. Dog + bird……………………………………
7. Cat + dog + bird………………………………

For Office Use

These questions pertain mainly to your child's chest. Please answer *yes* or *no* if possible. If a question does not appear to be applicable to your child, check the *does not apply* space.

COUGH

14A. Does he/she usually have a cough with colds? 1. Yes___ 2. No___ 46 ☐

B. Does he/she usually have a cough apart from colds? 1. Yes___ 2. No___ 47 ☐

If *Yes* To 14A OR 14B:

C. Does he/she cough on most days (4 or more days per week) for as much as 3 months of the year? 1. Yes___ 2. No___ 8. Does not apply___ 48 ☐

D. For how many years has he/she had this cough? ________________ Number of years 8. Does not apply___ 49 ☐

CONGESTION AND/OR PHLEGM

15A. Does this child usually seem congested in the chest or bring up phlegm with colds? 1. Yes___ 2. No___ 50 ☐

B. Does this child usually seem congested in the chest or bring up phlegm apart from colds? 1. Yes___ 2. No___ 51 ☐

If *Yes* To 15A OR 15B:

C. Does this child usually seem congested or bring up phlegm, sputum, or mucus from his/her chest on most days (4 or more days per week) for as much as 3 months a year? 1. Yes___ 2. No___ 8. Does not apply___ 52 ☐

D. For how many years has he/she seemed congested or raised phlegm, sputum, or mucus from his/her chest? ________________ Number of years 8. Does not apply___ 53 ☐

For Office Use

16A. Does this child get attacks of (increased) cough, chest congestion, or phlegm lasting for 1 week or more each year? 1. Yes___ 2. No___ 54 ☐

____If *Yes* To 16A:

B. For how many years? ____ Number of years 55 ☐
8. Does not apply___

C. On average, how many chest colds per year does he/she get? ____Average number of year 56 ☐
8. Does not apply___

WHEEZING

17. Does this child's chest ever sound wheezy or whistling:

A. When (he/she) has a cold? 1. Yes___ 2. No___ 57 ☐

B. Occasionally apart from colds? 1. Yes___ 2. No___ 58 ☐

C. Most days or nights? 1. Yes___ 2. No___ 59 ☐

____If *Yes* To 17B OR 17C:

D. For how many years has wheezing or whistling in the chest been present? ____ Number of years 60 ☐
8. Does not apply___

18A. Has the child ever had an attack of wheezing that has caused him/her to be short of breath? 1. Yes___ 2. No___ 61 ☐

If *Yes* To 18A:

B. Has he/she had 2 or more such episodes? 1. Yes___ 2. No___ 62 ☐

C. Has he/she ever required medicine or treatment for the(se) attack(s)? 1. Yes___ 2. No___ 63 ☐

D. How old was this child when he/she had his/her first such attack? ____Age in years 64-65 ☐☐
8. Does not apply___

E. Is or was his/her breathing completely normal between attacks? 1. Yes___ 2. No___ 66 ☐
8. Does not apply___

For Office Use

19. Does this child ever get attacks of wheezing after he/she has been playing hard or exercising? 1. Yes___ 2. No___ 67 ☐

CHEST ILLNESS

20A. During the past 3 years has this child had any chest illness that has kept him/her from his/her usual activities for as much as 3 days? 1. Yes___ 2. No___ 68 ☐

If *Yes* To 20A:

B. Did he/she bring up more phlegm or seem more congested than usual with any of these illnesses? 1. Yes___ 2. No___ 8. Does not apply___ 69 ☐

C. How many illnesses like this has he/she had in the past 3 years?

1. Less than 1 illness per year ____
2. 1 illness per year ____ 70 ☐
3. 2-5 illnesses per year ____
4. More than 5 illnesses per year ____
8. Does not apply ____

D. How many of these illnesses have lasted for as long as 7 days? ____Number of illnesses 8. Does not apply___ 71 ☐

21. Was he/she ever hospitalized for a severe chest illness or chest cold before the age of 2 years?

1. Yes, only once ____
2. Yes, 2 times ____ 72 ☐
3. Yes, 3 or more times ____
4. No ____

22. Did this child have any other severe chest illness or chest cold before the age of 2 years? 1. Yes___ 2. No___ 73 ☐

For Office Use

OTHER ILLNESSES

23. Has this child had any of the following illnesses, and if *yes*, at what age?

		First Diagnosed		
A. Measles (Not German)	Yes___ No___	At age___	74-75	☐☐
B. Sinus trouble	Yes___ No___	At age___	76-77	☐☐
C. Bronchiolitis	Yes___ No___	At age___	78-79	☐☐
			ID Dup 1-5 2	
			6	
D. Bronchitis	Yes___ No___	At age___	7-8	☐☐
E. Asthmatic bronchitis	Yes___ No___	At age___	9-10	☐☐
F. Pneumonia	Yes___ No___	At age___	11-12	☐☐
G. Whooping cough	Yes___ No___	At age___	13-14	☐☐
H. Croup	Yes___ No___	At age___	15-16	☐☐
I. Cystic fibrosis	Yes___ No___	At age___	17-18	☐☐

24. Did the doctor ever say that this child had eczema before the age of 2 years?	1. Yes___ 2. No___	19	☐
25. Does or did this child have external ear (ear canal) infections (swimmer's ear)	1. Yes___ 2. No___	20	☐
26. Does or did this child have frequent ear infections (middle ear):			
A. Between the age of 0 and 2?	1. Yes___ 2. No___	21	☐
B. Between the age of 2 and 5?	1. Yes___ 2. No___	22	☐
C. Over age 5?	1. Yes___ 2. No___	23	☐
27. Did this child ever require tubes to be placed in his/her ears to drain them?	1. Yes___ 2. No___	24	☐
28. Did this child ever have an operation on his/her tonsils or adenoids?	1. Yes___ 2. No___	25	☐

For Office Use

29. A. Has a doctor ever said that this child had asthma? 1. Yes___ 2. No___ 26 ☐

If *Yes* To 29A:

B. At what age did his/her asthma begin? ____Age in years 27-28 ☐☐

C. Does he/she still have asthma? 1. Yes___ 2. No___ 29 ☐

D. Does he/she currently take medicine or treatment for asthma? 1. Yes___ 2. No___ 30 ☐

If *no* to 29C:

E. At what age did his/her asthma stop? ____Age in years 31-32 ☐☐

30. Has this child ever had an operation on his/her chest? 1. Yes___ 2. No___ 33 ☐

If *yes*, specify: ______________________________

31. Has a doctor ever said that this child ever had heart disease? 1. Yes___ 2. No___ 34 ☐

If *yes*, what did the doctor say it was: ____________________

32. When this child was born was he/she kept in the hospital after the mother went home? 1. Yes___ 2. No___ 35 ☐

If *yes*, specify reason: ______________________________

ALLERGY

33A. Has a doctor ever said that this child had an allergic reaction to food or medicine?

1. Yes, food only____ 2. Yes, medicine only____ 36 ☐

3. Yes, both food and medicine____ 4. No____

B. Has a doctor ever said that this child had an allergic reaction to pollen or dust? 1. Yes___ 2. No___ 37 ☐

C. Has a doctor ever said that this child had an allergic skin reaction to detergents or other chemicals? (Do not include poison oak or poison ivy.) 1. Yes___ 2. No___ 38 ☐

D. Did this child ever receive allergy shots? 1. Yes___ 2. No___ 39 ☐

For Office Use

FAMILY HISTORY

We would like to obtain some information about the parents or guardians living with the child. (In single parent family, complete only A or B as appropriate.) Section C should be completed by all families.

A. MALE PARENT OR QUARDIAN

34. Please indicate whether the male adult is: 1. Natural father ____ 40 ☐
2. Stepfather ____
3. Other ____

35. What is the highest grade of school he completed? ____Total years 41-42 ☐☐

36. What is his parent job (title)/industry? ______________________________ 43-44 ☐☐

37. Does he now smoke regularly (at least 1 cigarette per day or 1 oz tobacco per month)?

1. No___

If *yes*: 2. Cigarettes ___ 45 ☐
3. Cigars ___
4. Pipe ___
5. Cigarettes plus pipe and/or cigars ___
6. Pipe and cigar ___
7. Don't know ___

38. Has he ever smoked regularly (at least 20 packs of cigarettes while living in the home with this child)?

1. No___

If *yes*: 2. Cigarettes ___ 46 ☐
3. Cigars ___
4. Pipe ___
5. Cigarettes plus pipe and/or cigars ___
6. Pipe and cigar ___
7. Don't know ___

For Office Use

39. Has a doctor ever said he had:

A. Bronchitis?	1. Yes___	2. No___	3. Don't know	47	☐
B. Emphysema?	1. Yes___	2. No___	3. Don't know	48	☐
C. Asthma?	1. Yes___	2. No___	3. Don't know	49	☐
D. Hay fever?	1. Yes___	2. No___	3. Don't know	50	☐
E. Other respiratory conditions?					
Please specify: ________________________________				51	☐

B. <u>FEMALE PARENT OR QUARDIAN</u>

40. Please indicate whether the female adult is: 1. Natural father ____ 52 ☐

2. Stepfather ____

3. Other ____

41. What is the highest grade of school he completed? ____Total years 53-54 ☐☐

42. What is her parent job (title)/industry? ____________________________ 55-56 ☐☐

43. Does she now smoke regularly (at least 1 cigarette per day)?

1. No___

If *yes*: 2. Cigarettes ___ 57 ☐

3. Cigars ___

4. Pipe ___

5. Cigarettes plus pipe and/or cigars ___

6. Pipe and cigar ___

7. Don't know ___

For Office Use

44. Has she ever smoked regularly (at least 20 packs of cigarettes while living in the home with this child)?

1. No___

If *yes*: 2. Cigarettes ___ 58 ☐

3. Cigars ___

4. Pipe ___

5. Cigarettes plus pipe and/or cigars ___

6. Pipe and cigar ___

7. Don't know ___

45. Has a doctor ever said she had:

A. Bronchitis? 1. Yes___ 2. No___ 3. Don't know 59 ☐

B. Emphysema? 1. Yes___ 2. No___ 3. Don't know 60 ☐

C. Asthma? 1. Yes___ 2. No___ 3. Don't know 61 ☐

D. Hay fever? 1. Yes___ 2. No___ 3. Don't know 62 ☐

E. Other respiratory conditions?

Please specify: ______________________________ 63 ☐

C. <u>OTHER HOUSEHOLD MEMBERS</u>

46. Are there other members of the household who currently smoke regularly (not counting persons mentioned above)? 1. Yes___ 2. No___ 64 ☐

If *yes*, specify number ____ 65 ☐

เลขที่ ☐☐☐☐☐☐

1-6

แบบสอบถามเกี่ยวกับระบบทางเดินหายใจของเด็ก (อายุ 10-15 ปี)

ขอให้ท่านกรุณากรอกแบบสอบถามนี้สำหรับบุตร (หรือเด็ก) ที่อยู่ในความดูแลของท่าน โดยตอบคำถามที่เกี่ยวกับเด็กอย่างถูกต้องชัดเจนและเป็นไปได้มากที่สุด ข้อมูลที่ได้ทั้งหมดจากการศึกษานี้จะถือเป็นความลับและนำมาใช้เพื่อประโยชน์ทางการวิจัยเท่านั้น (แพทย์ประจำตัวของเด็ก จะได้ทราบผลด้วยหากท่านต้องการ)

กำลังศึกษาในระดับชั้น.....................โรงเรียน.................................จังหวัด...............................

วันที่ทำแบบสอบถาม........... ....

(วัน เดือน ปี)

โปรดทำเครื่องหมาย (✓) หรือเติมข้อความสั้นๆ ลงในช่องว่างหน้าข้อความที่ท่านเห็นว่าเหมาะสมและตรงกับสภาพความเป็นจริงมากที่สุด

สำหรับเจ้าหน้าที่กรอก

ผู้ทำการกรอกแบบสอบถามมีความสัมพันธ์กับเด็ก คือเป็น 7 ☐

1. ( ) มารดา

2. ( ) บิดา

3. ( ) ผู้ดูแลหญิง เช่น ย่า ยาย ป้า ฯลฯ

4. ( ) ผู้ดูแลชาย เช่น ปู่ ตา ลุง ฯลฯ

5. ( ) พี่สาว

6. ( ) พี่ชาย

<u>ส่วนที่ 1</u> ข้อมูลทั่วไป

1. เพศของเด็ก	1) ชาย....... 2) หญิง........	8	□
2. วันเกิด		9-14	□□□□□□
	(วัน เดือน ปี)		
3. อายุ..................... ปี		15-16	□□
4. หลังจากเด็กถือกำเนิดแล้วมารดาของเด็กอยู่ที่		17	□

1. ( ) กรุงเทพมหานคร
2. ( ) ต่างจังหวัด จังหวัด........................
3. ( ) อื่นๆ โปรดระบุ...................................

5. หลังจากเด็กถือกำเนิดแล้ว มารดาของเด็กอาศัยอยู่ที่ใดบ้าง	18	□

เป็นเวลานานกว่า 6 เดือน นับตั้งแต่ปีที่เกิด โปรดระบุ (........)

....

....

....

....

ที่อยู่ปัจจุบัน	19	□
อาศัยที่อยู่ในปัจจุบันเป็นเวลา .... ปี	20-21	□□
6. A. เด็กเข้าเรียนอยู่ในสถานศึกษาประเภทใด	22	□

1. ( ) ไม่ได้เข้าเรียน
2. ( ) โรงเรียนประจำ
3. ( ) โรงเรียนธรรมดา (เช้าไป เย็นกลับ)

ถ้าเด็กไม่ได้เข้าเรียน ให้ตอบข้อ 7

B. ถ้าเด็กเข้าโรงเรียนอยู่โรงเรียนธรรมดา (เช้าไป เย็นกลับ)

ในชั้นเรียนของเด็กมีนักเรียนกี่คน .... คน 23-24 □□

C. ถ้าเรียนในโรงเรียนธรรมดา เด็กเรียนอยู่ชั้นศึกษาใด 25 □

1) โรงเรียนอนุบาล........

2) โรงเรียนประถม........

3) โรงเรียนมัธยม..........

7. ในบ้านของท่าน เด็กที่มีอายุน้อยที่สุดมีอายุเท่าใด 26 □

0. ( ) อายุน้อยกว่า 6 เดือน

1. ( ) 6-17 เดือน

2. ( ) 18-29 เดือน

3. ( ) 30 เดือน < 5 ปี

4. ( ) 5-9 ปี

5. ( ) มากกว่า 10 ปี

6. ( ) ไม่มีเด็กอายุน้อย

8. A. ห้องนอนของเด็กมีผู้อื่นใช้ร่วมด้วยหรือไม่? 27 □

1. ( ) ไม่มี

2. ( ) มี 1 คน

3. ( ) มี 2 คน

4. ( ) มี 3 คน หรือมากกว่า

ถ้ามีคนนอนกับเด็กกรุณาตอบคำถามต่อไปนี้

B. คนที่นอนกับเด็กสูบบุหรี่หรือไม่ 1) สูบ .... 2) ไม่สูบ .... 28 ☐

C. เด็กมีที่นอนส่วนตัวหรือไม่ 29 ☐

1. ( ) มี

2. ( ) ไม่มี มีคนใช้ด้วย 1 คน

3. ( ) ไม่มี มีคนใช้ด้วย 2 คน

4. ( ) ไม่มี มีคนใช้ด้วย 3 คน หรือมากกว่า

9. A. ในบ้านของท่านมีห้องทั้งหมด .... ห้อง (ไม่รวมห้องน้ำ) 30-31 ☐☐

B. ในบ้านของท่านมีสมาชิกอาศัยอยู่ทั้งหมด .... คน (จำนวนคน) 32-33 ☐☐

10. ที่บ้านของท่านมีเครื่องทำความร้อน 1) ใช่ .... 2) ไม่ใช่ ...... 34 ☐

11. ในบ้านของเด็กใช้เตาประกอบอาหารประเภทใด 35 ☐

1. ( ) แก๊ส 3. ( ) ถ่าน

2. ( ) ไฟฟ้า 4. ( ) อื่นๆ ระบุ.................

12. ในบ้านท่านมีเครื่องปรับอากาศ เครื่องดูดความชื้นหรือเครื่องฟอกอากาศหรือไม่ 36 ☐

(ถ้ามี โปรดระบุ)

0. ( ) ไม่มีเลย

1. ( ) เครื่องปรับอากาศ

2. ( ) เครื่องดูดความชื้น

3. ( ) เครื่องฟอกอากาศ

4. ( ) เครื่องปรับอากาศ + เครื่องดูดความชื้น

5. ( ) เครื่องปรับอากาศ + เครื่องฟอกอากาศ

6. ( ) เครื่องดูดความชื้น + เครื่องฟอกอากาศ

7. ( ) เครื่องปรับอากาศ + เครื่องดูดความชื้น + เครื่องฟอกอากาศ

13. ท่านมีสัตว์เลี้ยงไว้ในบ้านของท่านหรือไม่ (ถ้ามี โปรดระบุ) 37 ☐

0. ( ) ไม่มี

1. ( ) แมว

2. ( ) สุนัข

3. ( ) นก

4. ( ) แมว + สุนัข

5. ( ) แมว + นก

6. ( ) สุนัข +นก

7. ( ) แมว + สุนัข +นก

<u>ส่วนที่ 2</u> คำถามต่อไปนี้ส่วนใหญ่เกี่ยวกับระบบทางเดินหายใจของเด็ก กรุณาตอบใช่หรือไม่ใช่

<u>อาการไอ</u>

14. A. เด็กมักจะมีอาการไอเมื่อเป็นหวัด 1) ใช่... ....2) ไม่ใช่ .... 38 ☐

B. เด็กมีอาการไอเนื่องจากสาเหตุอื่น ที่ไม่ใช่หวัด 1) ใช่... ... 2) ไม่ใช่ .... 39 ☐

<u>ถ้าตอบใช่ในข้อ 14 A หรือ 14 B</u>

C. เด็กมีอาการไอเป็นเวลานาน 1) ใช่... ... 2) ไม่ใช่ .... 40 ☐

(มากกว่า 4 วันต่อสัปดาห์) หรือไอเป็นเวลา

มากกว่า 3 เดือนต่อปี

D. เด็กมีอาการไอเป็นเวลา ....ปี 41-42 ☐

<u>อาการมีเสมหะ</u>

15. A เด็กมักจะมีอาการแน่นหน้าอกหรือ มีเสมหะเนื่องจากหวัด 1) ใช่… … 2) ไม่ใช่ ……….. 43 ☐

B. เด็กมักจะมีอาการแน่นหน้าอกหรือมีเสมหะ เนื่องจากสาเหตุอื่นที่ไม่ใช่หวัด 1) ใช่… … 2) ไม่ใช่ ……….. 44 ☐

<u>ถ้าตอบใช่ในข้อ 15 A หรือ 15 B</u>

C. เด็กมีอาการอึดอัด มีเสมหะ มีเสลด คัดจมูกจากอาการแน่นหน้าอกหลายวัน (มากกว่า 4 วันต่อสัปดาห์) นานกว่า 3 เดือนต่อปี 1) ใช่… … 2) ไม่ใช่ ……….. 45 ☐

D. เด็กมีอาการอึดอัดหรือเริ่มมีเสมหะ มีเสลดหรือมี……………… …. ……..ปี 46-47 ☐☐
อาการคัดจมูกซึ่งมาจากอาการแน่นหน้าอกเป็นเวลา

16. A. เด็กมีอาการไอหรือแน่นหน้าอกหรือมีเสมหะ ครั้งสุดท้ายเป็นเวลานานกว่า 1 สัปดาห์ 1) ใช่… … …2) ไม่ใช่ ………. 48 ☐

<u>ถ้าตอบใช่ในข้อ 16 A</u>

B. เด็กมีอาการเหล่านี้เป็นเวลา …………………….. ………..ปี 49-50 ☐☐

C. เด็กมีอาการแน่นหน้าอกเนื่องจากเป็นหวัดโดยเฉลี่ย……………..ครั้ง/ ปี 51-52 ☐☐

<u>อาการหายใจมีเสียง</u>

17. เด็กมีอาการหายใจมีเสียงในเวลาใด

A. ขณะเป็นหวัด 1) ใช่… … 2) ไม่ใช่ ………. 53 ☐

B. เป็นบางครั้งและไม่ได้มาจากการเป็นหวัด1) ใช่… … 2) ไม่ใช่ ……….. 54 ☐

C. ตลอดทั้งวันทั้งคืน	1) ใช่… … 2) ไม่ใช่ ……….	55	☐
ถ้าตอบใช่ในข้อ 17B หรือ 17C			
D. เด็กมีอาการหายใจมีเสียงเป็นเวลา	…………………….. ……..ปี	56-57	☐☐
18.A. เด็กมีอาการหายใจมีเสียง ซึ่งเป็นสาเหตุให้เกิดอาการหายใจช่วงสั้นๆ	1) ใช่… … 2) ไม่ใช่ ……….	58	☐
ถ้าตอบใช่ในข้อ 18A			
B. เด็กมีอาการคราวละ 2 ครั้งหรือมากกว่า	1) ใช่… … 2) ไม่ใช่ ……….	59	☐
C. เด็กต้องการยาหรือการบำบัดอาการนี้	1) ใช่… … 2) ไม่ใช่ ……….	60	☐
D. เด็กมีอาการนี้ครั้งแรกเมื่ออายุ	…………………….. ……..ปี	61-62	☐☐
E. ในระหว่างการหายใจเป็นปกติมีอาการหายใจ มีเสียงเกิดขึ้น	1) ใช่… … 2) ไม่ใช่ ……….	63	☐
19. เด็กเคยเกิดอาการหายใจมีเสียงหลังจากที่ ออกกำลังกายมากๆ	1) ใช่… …… 2) ไม่ใช่ ……….	64	☐
อาการแน่นหน้าอก - -			
20. A. ในช่วงระยะเวลา3 ปีที่ผ่านมา เด็กเคย มีอาการแน่นหน้าอกจนเป็นสาเหตุให้ต้อง หยุดพักถึง 3วัน	1) ใช่… …… 2) ไม่ใช่ ……….	65	☐
ถ้าตอบใช่ในข้อ 20A			
B. เด็กมีเสมหะร่วมกับอาการเจ็บหน้าอก	1) ใช่… …… 2) ไม่ใช่ ……….	66	☐

C. เด็กมีอาการเจ็บป่วยข้างต้นกี่ครั้งในช่วง 3 ปีที่ผ่านมา 67 ☐

1. ( ) น้อยกว่า 1 ครั้งต่อปี

2. ( ) 1 ครั้งต่อปี

3. ( ) 2-5 ครั้งต่อปี

4. ( ) มากกว่า 5 ครั้งต่อปี

D. ความเจ็บป่วยเหล่านี้เกิดขึ้นกี่ครั้งที่มีเวลา จำนวน ....ครั้ง 68 ☐

นานกว่า 7 วัน

21. เด็กเคยมีประวัติการป่วยทางทรวงอกก่อนอายุ 2 ปีหรือไม่ 69 ☐

1. ( ) ใช่ 1 ครั้ง 3. ( ) ใช่ 3 ครั้งหรือมากกว่า

2. ( ) ใช่ 2 ครั้ง 4. ( ) ไม่เคยเลย

22. เด็กเคยมีปัญหาความเจ็บป่วย 1) ใช่... ...... 2) ไม่ใช่ .... 70 ☐

ทางทรวงอกอื่นๆ ก่อนอายุ 2 ปี

<u>ความเจ็บป่วยอื่นๆ</u>

23. เด็กเคยเจ็บป่วยด้วยโรคต่างๆ ดังต่อไปนี้หรือไม่ ถ้าเคยเกิดขึ้นเมื่ออายุ

การวินิจฉัยโรคครั้งแรกจากแพทย์

A. หัด (ยกเว้นหัดเยอรมัน) 1)ใช่ .... 2) ไม่ใช่ ...... เมื่ออายุ .... 71 ☐

B. ปัญหาไซนัส 1)ใช่ .... 2)ไม่ใช่ ...... เมื่ออายุ .... 72 ☐

C. หลอดลมอักเสบ 1)ใช่ .... 2)ไม่ใช่ ...... เมื่ออายุ .... 73 ☐

D. หลอดลมเล็กอักเสบ 1)ใช่ .... 2)ไม่ใช่ ...... เมื่ออายุ .... 74 ☐

E. หอบหืด 1)ใช่ .... 2)ไม่ใช่ ...... เมื่ออายุ .... 75 ☐

F. ปอดอักเสบ 1)ใช่ .... 2)ไม่ใช่ ...... เมื่ออายุ .... 76 ☐

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G. ไอกรน	1)ใช่ .... 2)ไม่ใช่ ...... เมื่ออายุ	77	☐
H. โรคซาง (แพ้ฝุ่นเกสรดอกไม้)	1)ใช่ .... 2)ไม่ใช่ ...... เมื่ออายุ	78	☐
I. โรคระบบทางเดินหายใจอื่นๆ	1)ใช่ .... 2)ไม่ใช่ ...... เมื่ออายุ	79	☐
24. แพทย์เคยวินิจฉัยว่าเด็กเป็นโรคผิวหนังอักเสบก่อนอายุ 2 ปี	1)ใช่ .... 2)ไม่ใช่	80	☐
25. เด็กเคยมีปัญหาในเรื่องหูชั้นนอกอักเสบ	1)ใช่ .... 2)ไม่ใช่	81	☐
26. เด็กเคยมีปัญหาในเรื่องหูชั้นกลางอักเสบ			
A. ระหว่างอายุ 0-2 ปี	1)ใช่ .... 2)ไม่ใช่	82	☐
B. ระหว่างอายุ 2-5 ปี	1)ใช่ .... 2)ไม่ใช่	83	☐
C. อายุมากกว่า 5 ปี	1)ใช่ .... 2)ไม่ใช่	84	☐
27. เด็กเคยได้รับการรักษาทางหู	1)ใช่ .... 2)ไม่ใช่	85	☐
28. เด็กเคยได้รับการผ่าตัดทอนซิล	1)ใช่ .... 2)ไม่ใช่	86	☐
29. A. เด็กเคยได้รับการวินิจฉัยจากแพทย์ว่าเป็นหอบหืด	1)ใช่ .... 2)ไม่ใช่	87	☐
<u>ถ้าตอบใช่ในข้อ 29 A.</u>			
B. เด็กเริ่มเป็นหอบหืดเมื่ออายุ	.... ปี	88-89	☐☐
C. ในปัจจุบันเด็กยังคงเป็นหอบหืด	1)ใช่ .... 2)ไม่ใช่	90	☐
D. เด็กยังคงรับการรักษาเรื่องหอบหืด	1)ใช่ .... 2)ไม่ใช่	91	☐
<u>ถ้าตอบใช่ในข้อ 29 C.</u>			
E. เด็กหายจากหอบหืดเมื่ออายุ	.... ปี	92	☐
30. เด็กเคยได้รับการผ่าตัดทรวงอกหรือไม่	1)ใช่ .... 2)ไม่ใช่	93	☐

ถ้าเคย โปรดระบุประเภทการผ่าตัด ....

31. เด็กเคยได้รับการวินิจฉัยจากแพทย์ว่าเป็น โรคหัวใจหรือไม่ ถ้าใช่โปรดระบุ	1)ใช่ .... 2)ไม่ใช่	94	☐
32. เด็กหลังคลอดต้องอยู่โรงพยาบาลต่อภายหลัง จากมารดากลับบ้านแล้วใช่หรือไม่	1)ใช่ .... 2)ไม่ใช่	95	☐
ถ้าใช่ แพทย์บอกว่าเด็กเป็น		96	☐

<u>ภูมิแพ้</u>

33. A. เด็กเคยได้รับการตรวจจากแพทย์และบอกว่าเด็กเป็นโรคภูมิแพ้ 97 ☐

1. ( ) ใช่ แพ้อาหาร 2. ( ) ใช่ แพ้ยา

3. ( ) ใช่ แพ้ทั้งอาหารและยา 4. ( ) ไม่ใช่

B. แพทย์เคยบอกว่าเด็กแพ้ฝุ่นละออง	1)ใช่ .... 2)ไม่ใช่	98	☐
C. แพทย์เคยบอกว่าเด็กแพ้สารเคมี	1)ใช่ .... 2)ไม่ใช่	99	☐
D. เด็กเคยได้รับการทดสอบภูมิแพ้	1)ใช่ .... 2)ไม่ใช่	100	☐

<u>ส่วนที่ 3</u> ประวัติครอบครัว

จากการศึกษาครั้งนี้ต้องการทราบข้อมูลจากผู้ที่อาศัยอยู่กับเด็ก (ในครอบครัวเดียวกันกรุณาเลือกตอบในข้อ A หรือ B ตามความเหมาะสม) ในส่วนของข้อ C นั้นให้ตอบทุกครอบครัว

A. <u>ผู้ปกครองหรือผู้ที่ใกล้ชิดเป็นเพศชาย</u>

34. โปรดระบุความสัมพันธ์กับเด็ก	1. ( ) บิดา	101	☐
	2. ( ) บิดาบุญธรรม		
	3. ( ) อื่นๆ ระบุ		

35. ระดับการศึกษาสูงสุดของท่าน .... 102 ☐

36. ท่านประกอบอาชีพ .... 103 ☐

37. ท่านสูบบุหรี่หรือไม่ 1. ( ) ไม่สูบ 104 ☐

2. ( ) สูบ

38. ท่านเคยสูบบุหรี่ในบ้านขณะเด็กอยู่หรือไม่ 1. ( ) ไม่สูบ 105 ☐

2. ( ) สูบ

39. แพทย์เคยวินิจฉัยว่าท่านเป็น

A. หลอดลมอักเสบ 1)ใช่ .... 2)ไม่ใช่ ...... 3) ไม่ทราบ ....106 ☐

B. ถุงลมโป่งพอง 1)ใช่ .... 2)ไม่ใช่ ...... 3) ไม่ทราบ ....107 ☐

C. หอบหืด 1)ใช่ .... 2)ไม่ใช่ ...... 3) ไม่ทราบ ....108 ☐

D. แพ้ฝุ่นละอองเกสรดอกไม้ 1)ใช่ .... 2)ไม่ใช่ ...... 3) ไม่ทราบ ....109 ☐

E. โรคระบบทางเดินหายใจอื่นๆ 1)ใช่ .... 2)ไม่ใช่ ...... 110 ☐

ถ้าใช่ โปรดระบุ ....

B. <u>ผู้ปกครองหรือผู้ที่ใกล้ชิดเป็นเพศหญิง</u>

40. โปรดระบุความสัมพันธ์กับเด็ก 1. ( ) มารดา 111 ☐

2. ( ) มารดาบุญธรรม

3. ( ) อื่นๆ ระบุ ....

41. ระดับการศึกษาสูงสุดของท่าน .... 112 ☐

42. ท่านประกอบอาชีพ .... 113 ☐

43. ท่านสูบบุหรี่หรือไม่	1. ( ) ไม่สูบ	114	☐
	2. ( ) สูบ		
44. ท่านเคยสูบบุหรี่ในบ้านขณะเด็กอยู่หรือไม่	1. ( ) ไม่สูบ	115	☐
	2. ( ) สูบ		

45. แพทย์เคยวินิจฉัยว่าท่านเป็น

A. หลอดลมอักเสบ	1)ใช่ .... 2)ไม่ใช่ ...... 3) ไม่ทราบ	116	☐
B. ถุงลมโป่งพอง	1)ใช่ .... 2)ไม่ใช่ ...... 3) ไม่ทราบ	117	☐
C. หอบหืด	1)ใช่ .... 2)ไม่ใช่ ...... 3) ไม่ทราบ	118	☐
D. แพ้ฝุ่นละอองเกสรดอกไม้	1)ใช่ .... 2)ไม่ใช่ ...... 3) ไม่ทราบ	119	☐
E. โรคระบบทางเดินหายใจอื่นๆ	1)ใช่ .... 2)ไม่ใช่	120	☐

ถ้าใช่ โปรดระบุ ....

C. สมาชิกหรือบุคคลอื่นๆ

46. มีบุคคลในบ้านที่สูบบุหรี่หรือไม่	1. ( ) มี	121	☐
(ไม่นับรวม ผู้ตอบข้อบน)	2. ( ) ไม่มี		
ถ้ามี มีจำนวน .... คน		122-123	☐☐

APPENDIX B

Spirometry Parameters

Spirometry 19/5/2004 Piboon Prachasan

Subject ID	Predictive spirometric values					Interpretation	Degree
	FVC	FEV1	FEV1/FVC	FEF25-75%	PEF		
14303	1.56	1.17	87.4	1.48	2.79	Normal	
14305	1.25	0.819	86.1	0.904	2.01	Normal	
14309	1.72	1.35	88	1.77	3.19	Normal	
14311	2.52	2.19	90.1	2.99	5.02	Normal	
14313	1.99	1.65	88.8	2.22	3.84	Normal	
14315	1.88	1.53	88.5	2.04	3.58	Normal	
14317	1.87	1.72	91.7	2.48	4.06	Normal	
14319	1.87	1.72	91.7	2.48	4.06	Normal	
14321	1.46	1.26	97.3	1.85	3.08	Normal	
14323	1.41	1.21	91.3	1.76	2.95	Normal	
14325	1.41	1.21	91.3	1.76	2.95	Normal	
14327	1.87	1.72	91.7	2.48	4.06	Small airway obstruction	
14331	1.36	1.15	91.3	1.68	2.82	Normal	
Total=13 (N=12, Sao=1)							
14401	2.45	2.1	89.7	2.86	5.01	Obstruction or mixed pattern	
14403	2.42	2.09	89.8	2.84	4.89	Normal	
14405	2.34	2.01	89.7	2.74	4.63	Restrictive	Mild
14407	1.77	1.41	88.2	1.86	3.32	Normal	
14411	2.05	1.71	89	2.31	3.97	Restrictive	Mild
14413	1.35	0.938	86.6	1.1	2.27	Normal	
14415	1.77	1.41	88.2	1.86	3.32	Normal	
14417	1.61	1.23	87.6	1.58	2.93	Normal	
14419	2.11	1.77	89.2	2.4	4.1	Normal	
14421	1.82	1.66	91.6	2.41	3.95	Restrictive	Mild
14423	1.93	1.77	91.5	2.55	4.22	Normal	
14425	1.97	1.82	91.8	2.62	4.29	Normal	
14427	1.92	1.77	91.7	2.55	4.18	Restrictive	Mild
14429	2.28	2.14	92	3.02	4.91	Normal	
14431	1.66	1.49	91.5	2.17	3.59	Normal	
14433	2.28	2.14	92	3.02	4.91	Small airway obstruction	
Total=16 (N=10, Sao=1, O=1, RM=4)							
15101	1.66	1.29	87.8	1.67	3.06	Normal	
15103	2.42	2.09	89.8	2.84	4.89	Obstruction	Mild
15105	2.83	2.49	90.7	3.39	5.68	Normal	
15107	2.48	2.15	89.9	2.93	5.02	Normal	
15109	1.61	1.23	87.6	1.58	2.93	Restrictive	Mild
15111	2.48	2.15	89.9	2.93	5.02	Normal	
15113	2.6	2.27	90.1	3.09	5.28	Restrictive	Mild
15115	1.56	1.17	87.4	1.48	2.79	Normal	
15117	2.48	2.15	89.9	2.93	5.02	Restrictive	Mild
15119	2.43	2.29	92.2	3.2	5.2	Normal	
15121	1.51	1.32	91.4	1.93	3.21	Restrictive	Mild
15123	2.02	1.88	91.8	2.69	4.4	Normal	
15125	1.36	1.15	91.3	1.68	2.82	Normal	
15127	1.51	1.32	91.4	1.93	3.21	Normal	
15129	2.02	1.88	91.8	2.69	4.4	Normal	
15131	2.23	2.09	91.8	2.95	4.86	Normal	
15133	2.8	2.61	91.7	3.51	5.9	Normal	
Total=17 (N=12, RM=4, OM=1)							
15403	1.72	1.35	88	1.77	3.19	Normal	
15407	2.73	2.39	90.3	3.25	5.54	Restrictive	Moderate
15409	1.99	1.65	88.8	2.22	3.34	Normal	
15411	3.07	2.7	90.5	3.64	6.41	Normal	
15413	2.05	1.71	89	2.31	3.97	Normal	
15417	2.64	2.31	90.3	3.15	5.28	Restrictive	Severe
15419	2.48	2.34	92.2	3.26	5.29	Small airway obstruction	
15421	1.92	1.77	91.7	2.55	4.18	Normal	
15423	2.74	2.57	92.2	3.51	5.76	Restrictive	Mild
15425	2.48	2.34	92.2	3.26	5.29	Normal	
15427	1.97	1.82	91.8	2.62	4.29	Normal	
15429	1.92	1.77	91.7	2.55	4.18	Restrictive	Mild
Total=12 (N=7, Sao=1, RM=2, RMod=1, RS=1)							
15501	4.05	3.57	91.3	4.65	8.23	Restrictive	Severe
15503	2.28	1.95	89.6	2.66	4.5	Normal	
15505	2.46	2.13	90	2.91	4.89	Normal	
15507	2.58	2.25	90.2	3.07	5.15	Restrictive	Mild
15509	1.77	1.41	88.2	1.86	3.32	Normal	
15511	2.34	2.01	89.7	2.74	4.63	Normal	
15513	1.94	1.59	88.7	2.13	3.71	Normal	
15515	2.11	1.77	89.2	2.4	4.1	Normal	
15517	1.92	1.77	91.7	2.55	4.18	Normal	
15519	1.82	1.66	91.6	2.41	3.95	Normal	
15521	1.82	1.66	91.6	2.41	3.95	Normal	
15523	2.02	1.88	91.8	2.69	4.4	Normal	
15525	2.03	1.88	91.6	2.69	4.44	Normal	
15527	2.17	2.03	92	2.89	4.71	Normal	
15529	1.36	1.15	91.3	1.68	2.82	Normal	
15531	2.33	2.19	92.1	3.08	5.01	Normal	
Total=16 (N=14, RM=1, RS=1)							
16101	2.97	2.62	90.7	3.55	6.06	Small airway obstruction	
16103	2.25	1.91	89.4	2.59	4.5	Restrictive	Mild
16105	2.91	2.56	90.6	3.48	5.93	Normal	
16107	2.54	2.21	90	3.01	5.15	Restrictive	Mild
16109	2.13	1.79	89.1	2.42	4.24	Normal	
16111	3.78	3.34	91.2	4.39	7.72	Obstruction	Mild
16113	2.45	2.1	89.7	2.86	5.01	Normal	
16115	2.19	1.85	89.2	2.51	4.37	Obstruction	Mild
16119	1.53	1.33	91.2	1.93	3.26	Normal	
16121	2.24	2.09	91.5	2.94	4.9	Restrictive	Mild
16123	2.28	2.14	91.8	3.01	4.96	Normal	
16125	2.74	2.57	92.2	3.51	5.76	Normal	
16127	2.04	1.88	91.4	2.68	4.48	Normal	
16129	2.49	2.33	91.7	3.23	5.37	Restrictive	Mild
16131	2.34	2.19	91.8	3.07	5.05	Normal	
16133	2.79	2.62	91.9	3.53	5.87	Restrictive	Mild
Total=16 (N=8, Sao=1, RM=5, OM=2)							
16501	2.99	2.63	90.6	3.56	6.17	Restrictive	Mild
16503	2.08	1.73	88.9	2.34	4.11	Small airway obstruction	
16505	2.45	2.1	89.7	2.86	5.01	Normal	
16509	2.13	1.79	89.1	2.42	4.24	Normal	
16511	2.6	2.27	90.1	3.09	5.28	Normal	
16513	2.48	2.15	89.9	2.93	5.02	Restrictive	Mild
16515	2.25	1.91	89.4	2.59	4.5	Restrictive	Mild
16517	2.05	1.69	88.7	2.28	4.1	Normal	
16519	1.7	1.32	87.7	1.71	3.2	Normal	
16523	2.59	2.43	92.1	3.35	5.51	Restrictive	Mild
16525	1.94	1.78	91.3	2.54	4.27	Normal	
16527	2.39	2.24	91.9	3.13	5.15	Normal	
16531	2.84	2.66	92	3.58	5.94	Normal	
Total=13 (N=8, Sao=1, RM=4)							
11201	2.89	2.52	90.3	3.42	6.02	Normal	
11203	2.77	2.41	90.1	3.27	5.77	Small airway obstruction	
11205	2.69	2.34	90.1	3.18	5.52	Normal	
11207	2.51	2.16	89.8	2.94	5.14	Normal	
11209	3.78	3.34	91.2	4.39	7.72	Normal	
11211	2.69	2.34	90.1	3.18	5.52	Normal	
11213	3.18	2.81	90.8	3.78	6.56	Restrictive	Mild
11215	2.75	2.56	91.7	3.47	5.82	Normal	
11217	2.8	2.61	91.7	3.51	5.9	Restrictive	Mild

11219	2.5	2.33	91.5	3.21	5.4	Restrictive	Mild
11221	2.4	2.24	91.4	3.1	5.22	Normal	
11223	3.24	3.02	92.6	3.92	6.46	Restrictive	Mild
11227	2.69	2.52	91.9	3.44	5.71	Normal	
11229	2.3	2.14	91.4	2.99	5.03	Restrictive	Mild
11231	3.14	2.92	92.2	3.83	6.36	Normal	
11233	2.4	2.24	91.4	3.1	5.22	Normal	
11237	2.14	1.99	91.5	2.81	4.69	Normal	
11239	2.89	2.71	92	3.62	6.02	Normal	
11241	2.87	2.52	90.4	3.41	5.91	Restrictive	Mild
11243	2.95	2.74	91.8	3.64	6.12	Restrictive	Mild
11245	2.89	2.71	92	3.62	6.02	Restrictive	Mild
Total=21 (N=12, Sao=1, RM=8)							
12101	4.14	3.62	90.9	4.68	8.54	Normal	
12103	3.26	2.87	90.7	3.86	6.79	Restrictive	Mild
12105	3.03	2.65	90.3	3.58	6.39	Restrictive	Mild
12107	3.66	3.22	90.8	4.25	7.66	Restrictive	Mild
12109	3.21	2.82	90.5	3.79	6.77	Normal	
12111	3.8	3.33	90.9	4.38	7.91	Restrictive	Mild
12113	2.65	2.29	89.9	3.12	5.51	Restrictive	Mild
12115	4.21	3.68	90.9	4.74	8.67	Normal	
12119	2.97	2.59	90.2	3.51	6.26	Restrictive	Mild
12123	2.95	2.74	91.8	3.64	6.12	Restrictive	Mild
12125	3.09	2.88	92.2	3.79	6.3	Normal	
12127	2.65	2.47	91.3	3.35	5.69	Normal	
12129	3	2.78	91.5	3.66	6.21	Normal	
12131	3	2.78	91.5	3.66	6.21	Obstruction	Mild
12135	3.05	2.81	91.3	3.67	6.3	Normal	
12137	2.65	2.47	91.6	3.37	5.66	Normal	
12139	2.35	2.19	91.4	3.05	5.13	Restrictive	Mild
12141	3.46	3.05	90.9	4.06	7.17	Restrictive	Mild
Total=18 (N=8, RM=9, OM=1)							
12203	3.4	2.99	90.7	3.99	7.15	Restrictive	Moderate
12205	3.86	3.39	90.9	4.44	8.04	Normal	
12207	3.03	2.65	90.3	3.58	6.39	Restrictive	Mild
12211	3.86	3.39	90.9	4.44	8.04	Normal	
12213	4.06	3.57	91.1	4.64	8.33	Restrictive	Mild
12215	4.15	3.61	90.5	4.65	8.71	Normal	
12217	2.95	2.58	90.4	3.5	6.15	Normal	
12221	2.95	2.74	91.8	3.64	6.12	Restrictive	Mild
12223	2.85	2.65	91.5	3.54	6	Restrictive	Mild
12225	2.85	2.65	91.5	3.54	6	Normal	
12227	2.45	2.28	91.5	3.16	5.31	Restrictive	Mild
12231	2.7	2.52	91.6	3.42	5.74	Restrictive	Mild
12233	2.6	2.43	91.6	3.32	5.58	Restrictive	Mild
12235	3	2.78	91.5	3.66	6.21	Restrictive	Mild
12237	3.39	3.1	91.8	3.93	6.7	Normal	
12239	3.09	2.87	91.9	3.76	6.32	Restrictive	Mild
12241	2.9	2.88	91.2	3.56	6.1	Normal	
Total=17 (N=7, RM=9, RMod=1)							
12401	3.43	3	90.4	3.99	7.34	Restrictive	Mild
12403	3.46	3.05	90.9	4.06	7.17	Normal	
12405	3.26	2.87	90.7	3.86	6.79	Restrictive	Mild
12407	3.59	3.16	91	4.19	7.43	Restrictive	Mild
12409	4.56	3.97	91	5.04	9.22	Normal	
12411	3.86	3.39	91.1	4.45	7.94	Restrictive	Mild
12413	3.2	2.81	90.7	3.79	6.66	Normal	
12417	3.4	2.99	90.7	3.99	7.15	Normal	
12419	2.36	2	89.3	2.72	4.87	Restrictive	Mild
12421	2.65	2.29	89.9	3.12	5.51	Normal	
12423	2.7	2.52	91.6	3.42	5.74	Restrictive	Mild
12425	2.8	2.61	91.7	3.51	5.9	Small airway obstruction	
12427	3.19	2.95	92	3.83	6.45	Normal	
12431	2.7	2.52	91.6	3.42	5.74	Normal	
12433	2.7	2.51	91.4	3.4	5.77	Restrictive	Mild
12435	2.9	2.69	91.5	3.58	6.07	Normal	
12437	3.39	3.12	92.1	3.96	6.68	Normal	
12439	2.85	2.65	91.7	3.56	5.97	Obstruction or mixed pattern	
Total= 18 (N=9, Sao=1, RM=7, O=1)							
13101	3.54	3.11	90.6	4.12	7.5	Restrictive	Mild
13105	4	3.51	90.9	4.56	8.29	Normal	
13107	3.86	3.39	90.9	4.44	8.04	Normal	
13109	3.86	3.39	90.9	4.44	8.04	Restrictive	Mild
13111	4.21	3.67	90.7	4.73	8.76	Restrictive	Mild
13113	3.74	3.28	90.7	4.31	7.87	Normal	
13115	2.75	2.56	91.4	3.45	5.85	Normal	
13117	2.9	2.69	91.5	3.58	6.07	Normal	
13119	3.24	2.98	91.7	3.84	6.53	Restrictive	Mild
13121	2.8	2.6	91.4	3.49	5.93	Restrictive	Mild
13123	2.85	2.64	91.2	3.51	6.03	Normal	
13127	2.9	2.68	91.2	3.56	6.1	Normal	
13131	2.86	2.46	91.1	3.33	5.72	Restrictive	Mild
13133	2.95	2.73	91.5	3.62	6.15	Restrictive	Moderate
13135	2.51	2.33	91	3.18	5.47	Normal	
Total=15 (N=8, RM=6, RMod=1)							
13301	4.01	3.5	90.7	4.55	8.38	Restrictive	Mild
13303	3.66	3.22	90.8	4.25	7.66	Normal	
13305	3.8	3.33	90.9	4.38	7.91	Restrictive	Mild
13307	4.35	3.78	90.6	4.84	9.01	Normal	
13309	3.8	3.33	90.9	4.38	7.91	Restrictive	Mild
13311	4.35	3.79	90.8	4.85	8.93	Obstruction	Mild
13313	3.28	2.88	90.6	3.86	6.89	Normal	
13315	2.91	2.53	90.2	3.43	6.13	Restrictive	Moderate
13317	4.01	3.5	90.7	4.55	8.38	Restrictive	Mild
13321	3.8	3.33	90.9	4.38	7.91	Restrictive	Mild
13323	3.93	3.45	90.9	4.5	8.16	Restrictive	Mild
13325	3.39	3.1	91.8	3.93	6.7	Normal	
13327	2.9	2.69	91.5	3.58	6.07	Restrictive	Mild
13329	3.09	2.86	91.6	3.74	6.35	Normal	
13331	3.28	2.97	90.6	3.75	6.66	Restrictive	Severe
13333	2.8	2.6	91.2	3.47	5.95	Restrictive	Mild
13335	3	2.77	91.3	3.64	6.24	Normal	
13337	3.24	2.97	91.4	3.81	6.55	Normal	
13339	2.65	2.47	91.3	3.35	5.69	Restrictive	Mild
Total=19 (N=7, RM=9, RMod=1, RS=1, OM=1)							

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Subject ID	Predictive spirometric values					Interpretation	Degree
	FVC	FEV1	FEV1/FVC	FEF25-75%	PEF		
34101	1.56	1.17	87.4	1.48	2.79	Normal	
34103	1.5	1.11	87.2	1.39	2.66	Normal	
34105	1.99	1.65	88.8	2.22	3.84	Normal	
34107	1.77	1.41	88.2	1.86	3.32	Normal	
34109	1.97	1.62	88.6	2.16	3.85	Normal	
34111	1.5	1.11	87.2	1.39	2.66	Normal	
34113	1.77	1.41	88.2	1.86	3.32	Normal	
34115	1.83	1.47	88.3	1.95	3.45	Normal	
34119	1.72	1.35	88	1.77	3.19	Normal	
34121	1.56	1.38	91.4	2.01	3.34	Normal	
34123	2.33	2.19	92.1	3.08	5.01	Restrictive	Moderate
34125	2.07	1.93	91.9	2.76	4.5	Restrictive	Mild
34127	1.92	1.77	91.7	2.55	4.18	Obstruction or mixed pattern	
34129	1.92	1.77	91.7	2.55	4.18	Normal	
34131	1.82	1.66	91.6	2.41	3.95	Normal	

34133	1.82	1.66	91.6	2.41	3.95	Restrictive	Mild
34135	1.77	1.61	91.6	2.33	3.83	Normal	
34137	1.82	1.66	91.6	2.41	3.95	Normal	
34139	1.87	1.72	91.7	2.48	4.06	Restrictive	Mild
Total=19 (N=14, RM=3, RMod=1, O=1)							
34201	2.16	1.83	89.3	2.48	4.23	Normal	
34203	2.4	2.07	89.9	2.82	4.76	Normal	
34205	2.22	1.89	89.5	2.57	4.37	Normal	
34207	2.34	2.01	89.7	2.74	4.63	Normal	
34209	2.16	1.83	89.3	2.48	4.23	Restrictive	Mild
34211	1.61	1.23	87.6	1.58	2.93	Normal	
34213	1.72	1.35	88	1.77	3.19	Normal	
34215	1.77	1.41	88.2	1.86	3.32	Normal	
34217	1.77	1.41	88.2	1.86	3.32	Normal	
34219	1.94	1.59	88.7	2.13	3.71	Normal	
34221	1.1	0.852	91	1.22	2.12	Normal	
34223	1.82	1.66	91.6	2.41	3.95	Obstruction	Mild
34225	1.71	1.55	91.6	2.25	3.71	Normal	
34227	1.97	1.82	91.8	2.62	4.29	Restrictive	Mild
34229	1.71	1.55	91.6	2.25	3.71	Restrictive	Mild
34231	1.82	1.66	91.6	2.41	3.95	Restrictive	Mild
34233	1.46	1.26	91.3	1.85	3.08	Normal	
34235	2.02	1.88	91.8	2.69	4.4	Normal	
34237	1.66	1.49	91.5	2.17	3.59	Restrictive	Mild
34239	1.97	1.82	91.8	2.62	4.29	Restrictive	Mild
Total=20 (N=13, RM=6, OM=1)							
34301	1.4	0.998	86.8	1.2	2.4	Normal	
34303	1.61	1.23	87.6	1.58	2.93	Normal	
34305	2.05	1.71	89	2.31	3.97	Normal	
34307	1.66	1.29	87.8	1.67	3.06	Normal	
34309	1.45	1.05	87	1.29	2.53	Normal	

34311	1.5	1.11	87.2	1.39	2.66	Normal	
34313	1.66	1.29	87.8	1.67	3.06	Normal	
34317	1.72	1.35	88	1.77	3.19	Normal	
34319	1.4	0.998	86.8	1.2	2.4	Normal	
34321	1.99	1.65	88.8	2.22	3.84	Normal	
34323	1.71	1.55	91.6	2.25	3.71	Normal	
34325	1.41	1.21	91.3	1.76	2.95	Normal	
34327	1.61	1.44	91.5	2.1	3.46	Restrictive	Mild
34329	1.77	1.61	91.6	2.33	3.83	Normal	
34331	1.36	1.15	91.3	1.68	2.82	Normal	
34333	1.2	0.973	91.1	1.41	2.41	Normal	
34335	1.41	1.21	91.3	1.76	2.95	Normal	
34337	2.48	2.34	92.2	3.26	5.29	Restrictive	Moderate
34339	1.82	1.66	91.6	2.41	3.95	Normal	
Total=19 (N=17, RM=1, RMod=1)							
35201	1.94	1.59	88.7	2.13	3.71	Normal	
35203	1.91	1.56	88.4	2.07	3.72	Normal	
35205	2.79	2.45	90.4	3.32	5.67	Normal	
35209	1.75	1.38	87.9	1.8	3.33	Normal	
35211	2.28	1.95	89.6	2.66	4.5	Restrictive	Mild
35213	1.72	1.35	88	1.77	3.19	Normal	
35215	2.05	1.71	89	2.31	3.97	Normal	
35217	1.83	1.47	88.3	1.95	3.45	Normal	
35219	1.7	1.32	87.7	1.71	3.2	Normal	
35221	2.48	2.34	92.2	3.26	5.29	Normal	
35223	1.58	1.39	91.2	2.01	3.39	Normal	
35225	2.18	2.04	91.7	2.88	4.76	Restrictive	Moderate
35227	1.77	1.61	91.6	2.33	3.83	Normal	
35229	2.79	2.62	92.2	3.55	5.84	Restrictive	Mild
35231	1.58	1.39	91.2	2.01	3.39	Normal	
35235	2.44	2.29	91.9	3.19	5.24	Restrictive	Mild

35237	1.58	1.39	91.2	2.01	3.039	Normal	
Total=17 (N=13, RM=3, RMod=1)							
35301	2.11	1.77	89.2	2.4	4.1	Restrictive	Mild
35303	1.49	1.08	87	1.33	2.68	Obstruction	Mild
35305	1.78	1.4	87.9	1.84	3.46	Normal	
35309	2.66	2.33	90.2	3.17	5.41	Normal	
35311	2.25	1.91	89.4	2.59	4.5	Normal	
35313	3.1	2.74	90.9	3.7	6.32	Restrictive	Mild
35315	2.16	1.83	89.3	2.48	4.23	Restrictive	Mild
35317	1.83	1.47	88.3	1.95	3.45	Normal	
35319	3.18	2.81	90.8	3.78	6.56	Normal	
35321	2.28	2.14	91.8	3.01	4.96	Restrictive	Mild
35323	2.54	2.38	92	3.3	5.42	Small airway obstruction	
35325	2.54	2.38	92	3.3	5.42	Normal	
35327	1.36	1.15	91.3	1.68	2.82	Normal	
35329	1.98	1.83	91.6	2.62	4.33	Normal	
35331	2.49	2.34	92	3.24	5.33	Normal	
35333	2.17	2.03	92	2.89	4.71	Normal	
35335	2.39	2.24	91.9	3.13	5.15	Restrictive	Mild
Total=17 (N=10, RM=5, OM=1, Sao=1)							
36101	2.25	1.91	89.4	2.59	4.5	Normal	
36103	2.19	1.85	89.2	2.51	4.37	Normal	
36105	2.63	2.28	90	3.1	5.39	Normal	
36107	2.27	1.93	89.3	2.62	4.62	Normal	
36109	2.45	2.1	89.7	2.86	5.01	Normal	
36111	1.97	1.62	88.6	2.16	3.85	Normal	
36113	2.75	2.4	90.2	3.26	5.65	Restrictive	Mild
36115	2.87	2.52	90.4	3.41	5.91	Restrictive	Mild
36117	2.75	2.4	90.2	3.26	5.65	Normal	
36119	2.02	1.67	88.8	2.25	3.98	Normal	
36121	2.48	2.15	89.9	2.93	5.02	Restrictive	Mild

36123	2.08	1.73	88.9	2.34	4.11	Restrictive	Mild
36125	3.51	3.1	91.1	4.13	7.2	Normal	
36127	2.24	2.09	91.5	2.94	4.9	Restrictive	Mild
36129	2.64	2.48	92.1	3.41	5.59	Restrictive	Mild
36131	2.59	2.43	92.1	3.35	5.51	Restrictive	Mild
36133	2.345	2.19	91.8	3.07	5.05	Normal	
36135	2.74	2.57	91.9	3.49	5.79	Small airway obstruction	
36137	2.09	1.93	91.4	2.74	4.59	Restrictive	Mild
36139	3.19	2.97	92.2	3.86	6.42	Normal	
36141	2.79	2.62	91.9	3.53	5.87	Restrictive	Mild
Total=21 (N=11, RM=9, Sao=1)							

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Subject ID	Predictive spirometric values					Interpretation	Degree
	FVC	FEV1	FEV1/FVC	FEF25-75%	PEF		
21201	4.05	3.57	91.3	4.65	8.23	Restrictive	Mild
21203	3.12	2.75	90.7	3.71	6.43	Normal	
21205	3.2	2.81	90.7	3.79	6.66	Normal	
21207	3.06	2.69	90.7	3.64	6.3	Restrictive	Mild
21209	3.44	3.04	91	4.06	7.07	Normal	
21211	3.72	3.28	91	4.32	7.69	Restrictive	Moderate
21213	3.52	3.1	90.9	4.13	7.3	Restrictive	Mild
21215	3.65	3.22	91	4.26	7.56	Restrictive	Mild
21217	3.51	3.1	91.1	4.13	7.2	Restrictive	Mild
21219	3.91	3.45	91.3	4.52	7.97	Normal	
21221	2.57	2.22	89.9	3.02	5.27	Normal	
21223	3.91	3.45	91.3	4.52	7.97	Normal	
21225	2.79	2.62	91.9	3.53	5.87	Normal	
21227	2.29	2.14	91.6	3	4.91	Normal	
21229	2.75	2.56	91.7	3.47	5.82	Restrictive	Mild
21231	2.85	2.65	91.7	3.56	5.97	Normal	
21233	2.99	2.79	92.1	3.71	6.16	Normal	

21235	3.04	2.83	91.9	3.72	6.26	Restrictive	Mild
21237	2.39	2.24	91.7	3.12	5.18	Restrictive	Mild
21239	2.4	2.24	91.4	3.1	5.22	Normal	
21241	2.89	2.71	92	3.62	6.02	Restrictive	Mild
21243	2.74	2.57	91.9	3.49	5.79	Normal	
21245	2.49	2.33	91.7	3.23	5.37	Normal	
21247	3.24	3.01	92.3	3.9	6.48	Normal	
21249	2.44	2.29	91.7	3.17	5.28	Normal	
21251	2.79	2.62	91.9	3.53	5.87	Normal	
Total=26 (N=16, RM=9, RMod=1)							
21301	3.58	3.16	91.1	4.2	7.33	Restrictive	Mild
21303	4.41	3.86	91	4.93	8.97	Normal	
21305	3.12	2.75	90.7	3.71	6.43	Normal	
21307	3.38	2.98	91	3.99	6.94	Restrictive	Mild
21309	3.39	2.99	90.8	3.99	7.05	Normal	
21311	2.27	1.93	89.3	2.62	4.62	Normal	
21313	3.12	2.75	90.7	3.71	6.43	Restrictive	Mild
21315	2.81	2.46	90.3	3.34	5.78	Restrictive	Mild
21317	3.78	3.34	91.2	4.39	7.72	Obstruction	Mild
21319	2.81	2.46	90.3	3.34	5.78	Normal	
21321	2.16	1.81	89	2.45	4.36	Normal	
21323	3.65	3.22	91	4.26	7.56	Normal	
21325	3.21	2.82	90.5	3.79	6.77	Normal	
21327	2.65	2.29	89.9	3.12	5.51	Normal	
21329	3.01	2.64	90.4	3.57	6.28	Normal	
21331	3.19	2.95	92	3.83	6.45	Normal	
21333	2.9	2.7	91.8	3.6	6.05	Normal	
21335	2.1	1.94	91.2	2.74	4.63	Normal	
21337	2.7	2.52	91.6	3.42	5.74	Restrictive	Mild
21339	3.09	2.88	92.2	3.79	6.3	Normal	
21341	2.79	2.62	91.9	3.53	5.87	Restrictive	Mild

21343	2.95	2.74	91.8	3.64	6.12	Normal	
21345	2.74	2.57	91.9	3.49	5.79	Normal	
21347	2.69	2.52	91.9	3.44	5.71	Restrictive	Mild
21349	2.84	2.66	92	3.58	5.94	Restrictive	Mild
Total=25 (N=16, RM=8, OM=1)							
22405	2.91	2.53	90.2	3.43	6.13	Restrictive	Mild
22407	3.92	3.45	91.1	4.51	8.07	Normal	
22411	3.44	3.04	91	4.06	7.07	Restrictive	Mild
22415	3.53	3.11	90.7	4.13	7.4	Normal	
22417	3.66	3.22	90.8	4.25	7.66	Normal	
22419	3.34	2.93	90.6	3.93	7.02	Normal	
22421	3.52	3.1	90.9	4.13	7.3	Restrictive	Mild
22423	2.77	2.41	90.1	3.27	5.77	Normal	
22425	3.46	3.05	90.9	4.06	7.17	Normal	
22427	3.2	2.81	90.7	3.79	6.66	Normal	
22429	2.83	2.47	90.2	3.35	5.89	Restrictive	Mild
22431	3.52	3.1	90.9	4.13	7.3	Normal	
22433	4.21	3.68	90.9	4.74	8.67	Obstruction	Mild
22435	2.7	2.52	91.6	3.42	5.74	Normal	
22437	2.85	2.65	91.7	3.56	5.97	Normal	
22439	2.8	2.61	91.7	3.51	5.9	Normal	
22441	2.8	2.61	91.7	3.51	5.9	Normal	
22443	2.8	2.6	91.4	3.49	5.93	Normal	
22445	2.8	2.6	91.4	3.49	5.93	Normal	
22447	2.65	2.47	91.6	3.37	5.66	Restrictive	Mild
Total=20 (N=14, RM=5, OM=1)							
23501	4.14	3.62	90.9	4.68	8.54	Restrictive	Moderate
23503	4.21	3.67	90.7	4.73	8.76	Normal	
23505	4.93	4.25	90.5	5.28	9.94	Normal	
23507	4.14	3.62	90.9	4.68	8.54	Normal	
23509	4	3.51	90.9	4.56	8.29	Normal	

23511	3.73	3.28	90.8	4.32	7.78	Normal	
23513	3.09	2.7	90.4	3.65	6.51	Restrictive	Mild
23515	4.21	3.68	90.9	4.74	8.67	Restrictive	Mild
23517	3.61	3.16	90.6	4.19	7.62	Normal	
23519	3.67	3.22	90.6	4.25	7.75	Normal	
23521	3.6	3.16	90.8	4.19	7.53	Restrictive	Mild
23523	4.21	3.68	90.9	4.74	8.67	Restrictive	Mild
23525	3.47	3.05	90.7	4.06	7.27	Normal	
23527	3.47	3.05	90.7	4.06	7.27	Normal	
23529	2.85	2.64	91.2	3.51	6.03	Normal	
23531	3.49	3.18	91.8	3.98	6.8	Normal	
23533	3.24	2.98	91.7	3.84	6.53	Normal	
23537	3.09	2.86	91.6	3.74	6.35	Restrictive	Mild
23539	2.95	2.73	91.5	3.62	6.15	Obstruction	Mild
23541	3.44	3.14	91.8	3.96	6.75	Small airway obstruction	
23543	2.51	2.33	91.3	3.2	5.43	Normal	
23545	3.43	3.13	91.5	3.93	6.76	Restrictive	Mild
23547	2.95	2.73	91.3	3.6	6.17	Normal	
Total=23 (N=14, RM=6, RMod=1, OM=1, Sao=1)							
231001	3.62	3.16	90.4	4.18	7.71	Normal	
231003	4.42	3.83	90.4	4.87	9.21	Normal	
231005	3.93	3.45	90.9	4.5	8.16	Normal	
231007	4.07	3.56	90.9	4.62	8.42	Restrictive	Mild
231011	3.09	2.7	90.4	3.65	6.51	Normal	
231015	3.8	3.53	90.9	4.38	7.91	Small airway obstruction	
231019	3.93	3.45	90.9	4.5	8.16	Normal	
231023	3.66	3.22	90.8	4.25	7.66	Restrictive	Mild
231027	3.8	3.33	90.9	4.38	7.91	Normal	
231029	4.28	3.73	90.9	4.8	8.8	Restrictive	Mild
231031	4.21	3.68	90.9	4.74	8.67	Obstruction or mixed pattern	
231033	3.8	3.33	90.9	4.38	7.91	Normal	

231035	3	2.78	91.5	3.66	6.21	Normal	
231037	3.34	3.05	91.5	3.87	6.66	Obstruction	Mild
231039	2.9	2.69	91.5	3.58	6.07	Normal	
231041	2.95	2.73	91.5	3.62	6.15	Normal	
231043	3.19	2.94	91.7	3.81	6.47	Restrictive	Mild
231047	2.95	2.73	91.5	3.62	6.15	Normal	
Total=18 (N=11, RM=4, OM=1, O=1, Sao=1)							
Spirometry	23/7/2004	Wat Verurachin					
Subject ID	Predictive spirometric values					Interpretation	Degree
	FVC	FEV1	FEV1/FVC	FEF25-75%	PEF		
54105	1.56	1.17	87.4	1.48	2.79	Normal	
54107	1.61	1.44	91.5	2.1	3.46	Normal	
54109	1.77	1.41	88.2	1.86	3.32	Normal	
54111	1.15	0.699	85.7	0.703	1.75	Normal	
54115	1.92	1.77	91.7	2.55	4.18	Normal	
54117	1.46	1.26	91.3	1.85	3.08	Normal	
54119	1.71	1.55	91.6	2.25	3.71	Normal	
54121	2.53	2.39	92.3	3.32	5.38	Restrictive	Mild
54125	2.31	1.97	89.5	2.68	4.63	Normal	
54127	1.72	1.35	88	1.77	3.19	Normal	
54129	1.56	1.38	91.4	2.01	3.34	Normal	
54131	1.72	1.35	88	1.77	3.19	Normal	
54135	2.07	1.93	91.9	2.76	4.5	Normal	
54137	1.56	1.17	87.4	1.48	2.79	Normal	
Total=14 (N=13, RM=1)							
54205	1.77	1.61	91.6	2.33	3.83	Restrictive	Mild
54207	1.88	1.53	88.5	2.04	3.58	Normal	
54209	1.92	1.77	91.7	2.55	4.18	Restrictive	Moderate
54211	2.22	1.89	89.5	2.57	4.37	Normal	
54213	1.77	1.41	88.2	1.86	3.32	Normal	
54215	2.02	1.88	91.8	2.69	4.4	Restrictive	Mild

54217	2.31	1.97	89.5	2.68	4.63	Normal	
54219	1.46	1.26	91.3	1.85	3.08	Normal	
54221	1.83	1.47	88.3	1.95	3.45	Restrictive	Mild
54223	2.42	2.09	89.8	2.84	4.89	Obstruction or mixed pattern	
54227	1.45	1.05	87	1.29	2.53	Normal	
54229	1.41	1.21	91.3	1.76	2.95	Normal	
54231	2.73	2.58	92.4	3.53	5.72	Normal	
54233	1.36	1.15	91.3	1.68	2.82	Normal	
Total=14 (N=9, RM=3, RMod=1, O=1)							
55105	2.23	2.09	91.8	2.95	4.86	Normal	
55107	1.78	1.61	91.4	2.33	3.88	Normal	
55109	2.49	2.34	92	3.24	5.33	Restrictive	Mild
55111	1.88	1.72	91.5	2.47	4.11	Normal	
55113	1.36	1.15	91.3	1.68	2.82	Normal	
55115	1.54	1.14	87.2	1.43	2.81	Normal	
55117	1.46	1.26	91.3	1.85	3.08	Normal	
55121	2.08	1.73	88.9	2.34	4.11	Restrictive	Mild
55123	2.22	2.09	92	2.96	4.81	Small airway obstruction	
55125	2.23	2.09	91.8	2.95	4.86	Normal	
55127	3.58	3.16	91.1	4.2	7.33	Normal	
55129	2.25	1.91	89.4	2.59	4.5	Normal	
55131	2.28	2.14	92	3.02	4.91	Small airway obstruction	
Total=13 (N=9, RM=2, Sao=2)							
55205	1.94	1.59	88.7	2.13	3.71	Normal	
55207	2.22	2.09	92	2.96	4.81	Normal	
55209	2.25	1.91	89.4	2.59	4.5	Normal	
55211	2.58	2.44	92.3	3.37	5.47	Normal	
55213	2.16	1.83	89.3	2.48	4.23	Normal	
55215	2.17	2.03	92	2.89	4.71	Restrictive	Mild

55217	1.88	1.53	88.5	2.04	3.58	Normal	
55219	2.75	2.4	90.2	3.26	5.65	Normal	
55221	2.28	1.95	89.6	2.66	4.5	Normal	
55223	1.61	1.44	91.5	2.1	3.46	Normal	
55225	2.53	2.39	92.3	3.32	5.38	Obstruction or mixed pattern	
55227	1.61	1.44	91.5	2.1	3.46	Normal	
55229	1.97	1.82	91.8	2.62	4.29	Restrictive	Mild
55231	1.83	1.47	88.3	1.95	3.45	Normal	
Total=14 (N=11, RM=2, O=1)							
55303	2.49	2.34	92	3.24	5.33	Normal	
55305	1.29	0.849	86.1	0.95	2.16	Normal	
55307	2.39	2.24	91.9	3.13	5.15	Normal	
55309	2.4	2.07	89.9	2.82	4.76	Normal	
55311	2.31	1.97	89.5	2.68	4.63	Normal	
55313	2.34	2.01	89.7	2.74	4.63	Normal	
55315	2.4	2.07	89.9	2.82	4.76	Normal	
55317	1.61	1.44	91.5	2.1	3.46	Normal	
55321	1.92	1.77	91.7	2.55	4.18	Normal	
55323	2.57	2.22	89.9	3.02	5.27	Normal	
55325	2.58	2.25	90.2	3.07	5.15	Restrictive	Mild
55327	2.4	2.07	89.9	2.82	4.76	Normal	
Total=12 (N=11, RM=1)							
56103	2.28	2.14	92	3.02	4.91	Normal	
56105	2.63	2.28	90	3.1	5.39	Normal	
56107	2.97	2.62	90.7	3.55	6.06	Normal	
56109	2.34	2.19	91.8	3.07	5.05	Restrictive	Mild
56111	3.36	2.98	91.1	3.99	6.84	Restrictive	Mild
56113	2.08	1.93	91.6	2.75	4.55	Restrictive	Mild
56115	2.64	2.48	92.1	3.41	5.59	Restrictive	Mild
56117	2.63	2.28	90	3.1	5.39	Normal	
56119	2.74	2.57	92.2	3.51	5.76	Restrictive	Mild

56121	2.99	2.63	90.6	3.56	6.17	Restrictive	Mild
56123	2.13	1.98	91.7	2.82	4.65	Restrictive	Mild
56125	1.98	1.83	91.6	2.62	4.33	Normal	
Total=12 (N=5, RM=7)							
56203	2.22	1.87	89.1	2.53	4.49	Normal	
56205	2.49	2.34	92	3.24	5.33	Normal	
56207	2.59	2.43	91.8	3.34	5.54	Normal	
56209	3.2	2.81	90.7	3.79	6.66	Obstruction or mixed pattern	
56211	2.65	2.29	89.9	3.12	5.51	Normal	
56213	2.69	2.34	90.1	3.18	5.52	Normal	
56215	2.19	2.04	91.5	2.87	4.8	Normal	
56221	1.99	1.83	91.4	2.61	4.38	Restrictive	Mild
56223	3.09	2.87	91.9	3.76	6.32	Restrictive	Mild
56225	2.49	2.33	91.7	3.23	5.37	Normal	
56229	2.57	2.22	89.9	3.02	5.27	Normal	
56231	2.74	2.57	91.9	3.49	5.79	Normal	
Total=12 (N=9, RM=2, O=1)							
56303	2.57	2.22	89.9	3.02	5.27	Normal	
56305	2.53	2.18	89.7	2.96	5.25	Restrictive	Mild
56307	2.16	1.81	89	2.45	4.36	Normal	
56309	2.63	2.28	90	3.1	5.39	Restrictive	Mild
56311	2.93	2.57	90.5	3.49	6.04	Normal	
56313	2.29	2.14	91.6	3	4.99	Normal	
56315	2.44	2.29	91.9	3.19	5.24	Restrictive	Mild
56321	2.57	2.22	89.9	3.02	5.27	Normal	
56323	2.31	1.97	89.5	2.68	4.36	Normal	
56325	1.68	1.5	91.3	2.17	3.64	Normal	
56327	2.39	2.24	91.7	3.12	5.18	Restrictive	Mild
56329	2.18	2.04	91.7	2.88	4.76	Normal	
56331	2.85	2.65	91.7	3.56	5.97	Normal	
Total=13 (N=9, RM=4)							

Spirometry 23/7/2004 Ritthinarongron

Subject ID	Predictive spirometric values					Interpretation	Degree
	FVC	FEV1	FEV1/FVC	FEF25-75%	PEF		
41201	2.02	1.67	88.8	2.25	3.98	Normal	
41203	3.01	2.64	90.4	3.57	6.28	Normal	
41205	3.01	2.64	90.4	3.57	6.28	Normal	
41207	3.51	3.1	91.1	4.13	7.2	Normal	
41209	3.12	2.75	90.7	3.71	6.43	Restrictive	Mild
41211	3.58	3.16	91.1	4.2	7.33	Normal	
41213	3.79	3.34	91	4.39	7.81	Normal	
41217	2.47	2.12	89.6	2.88	5.13	Normal	
41219	2.27	1.93	89.3	2.62	4.62	Restrictive	Mild
41221	2.74	2.57	91.9	3.49	5.79	Normal	
41223	2.94	2.75	92.1	3.67	6.09	Normal	
41225	2.44	2.29	91.7	3.17	5.28	Normal	
41227	2.74	2.57	91.9	3.49	5.79	Normal	
41229	2.39	2.24	91.7	3.12	5.18	Restrictive	Mild
41231	2.4	2.24	91.4	3.1	5.22	Restrictive	Mild
41233	2.8	2.61	91.7	3.51	5.9	Restrictive	Mild
41235	2.64	2.48	91.8	3.39	5.63	Restrictive	Mild
41237	2.39	2.24	91.7	3.12	5.18	Restrictive	Mild
41239	2.85	2.65	91.7	3.56	5.97	Restrictive	Mild
41241	2.8	2.61	91.7	3.51	5.9	Restrictive	Mild
41243	2.65	2.47	91.6	3.37	5.66	Normal	
Total=21 (N=12, RM=9)							
41601	3.12	2.75	90.7	3.71	6.43	Restrictive	Mild
41603	2.81	2.46	90.3	3.34	5.78	Obstruction	Mild
41605	2.95	2.58	90.4	3.5	6.15	Normal	
41607	2.71	2.35	90	3.2	5.64	Normal	
41609	2.89	2.52	90.3	3.42	6.02	Restrictive	Mild
41611	2.3	1.95	89.2	2.64	4.74	Normal	

41613	2.79	2.45	90.4	3.32	5.67	Normal	
41615	3.04	2.68	90.8	3.63	6.19	Normal	
41617	2.16	1.81	89	2.45	4.36	Normal	
41619	2.81	2.46	90.3	3.34	5.78	Restrictive	Mild
41621	3.71	3.28	91.2	4.33	7.59	Restrictive	Mild
41623	3.46	3.05	90.9	4.06	7.17	Restrictive	Mild
41625	2.64	2.48	91.8	3.39	5.63	Restrictive	Mild
41627	2.5	2.33	91.5	3.21	5.4	Normal	
41629	2.64	2.48	91.8	3.39	5.63	Restrictive	Mild
41633	2.95	2.74	91.8	3.64	6.12	Normal	
41635	2.34	2.19	91.6	3.06	5.09	Normal	
41637	2.75	2.56	91.7	3.47	5.82	Normal	
41639						ไม่แปลผล	
41641	2.34	2.19	91.6	3.06	5.09	Restrictive	Mild
41643	2.04	1.88	91.4	2.68	4.48	Normal	

Total=21 (N=11, RM=8, OM=1, ไม่เป่า=1)

42201	4.12	3.63	91.3	4.71	8.36	Restrictive	Mild
42203	3.33	2.93	90.8	3.92	6.92	Obstruction	Mild
42205	3.44	3.04	91	4.06	7.07	Normal	
42207	4.07	3.56	90.7	4.61	8.5	Normal	
42209	4.2	3.68	91.1	4.76	8.58	Normal	
42211	2.79	2.42	90	3.28	5.88	Small airway obstruction	
42213	3.52	3.1	90.9	4.13	7.3	Small airway obstruction	
42215	3.46	3.05	90.9	4.06	7.17	Obstruction	Mild
42217	2.77	2.41	90.1	3.27	5.77	Restrictive	Mild
42219	2.35	2.19	91.4	3.05	5.13	Normal	
42221	2.75	2.56	91.7	3.47	5.82	Normal	
42223	2.95	2.74	91.8	3.64	6.12	Normal	
42225	3.09	2.87	91.9	3.76	6.32	Normal	
42227	2.9	2.7	91.8	3.6	6.05	Normal	
42229	3	2.79	91.8	3.69	6.19	Restrictive	Mild
42231	2.5	2.33	91.5	3.21	5.4	Small airway obstruction	
42233	2.95	2.74	91.8	3.64	6.12	Normal	
42235						ไม่แปลผล	
42237	2.95	2.73	91.5	3.62	6.15	Normal	
42239	2.85	2.65	91.5	3.54	6	Restrictive	Mild
42241	2.85	2.65	91.7	3.56	5.97	Restrictive	Mild
42243	2.7	2.51	91.4	3.4	5.77	Normal	
42245	3	2.79	91.8	3.69	6.19	Normal	

Total=23 (N=12, RM=5, OM=2, Sao=3, ไม่เป่า=1)

42501	3.6	3.16	90.8	4.19	7.53	Normal	
42503	3.66	3.22	90.8	4.25	7.66	Restrictive	Mild
42505	3.28	2.88	90.6	3.86	6.89	Restrictive	Mild
42507	3.46	3.05	90.9	4.06	7.17	Normal	
42509	2.97	2.59	90.2	3.51	6.26	Restrictive	Mild
42511	3.14	2.76	90.6	3.71	6.53	Normal	
42513	2.95	2.58	90.4	3.5	6.15	Normal	
42515	3.92	3.45	91.1	4.51	8.07	Normal	
42517	4.34	3.8	91.1	4.87	8.84	Restrictive	Mild
42519	3.01	2.64	90.4	3.57	6.28	Normal	
42521	3.33	2.93	90.8	3.92	6.92	Normal	
42523	4.14	3.62	90.9	4.68	8.54	Restrictive	Mild
42525	2.49	2.13	89.5	2.9	5.24	Restrictive	Mild
42527	2.6	2.43	91.6	3.32	5.58	Normal	
42529	3	2.79	91.8	3.69	6.19	Restrictive	Mild
42531	3.24	2.98	91.7	3.84	6.53	Restrictive	Mild
42533	2.45	2.28	91.5	3.16	5.31	Normal	
42535	2.6	2.43	91.6	3.32	5.58	Normal	
42537	3.05	2.82	91.6	3.7	6.28	Normal	
42539	2.49	2.33	91.7	3.23	5.37	Restrictive	Mild
42541	2.75	2.56	91.7	3.47	5.82	Normal	
42543	2.65	2.47	91.6	3.37	5.66	Normal	

Total=22 (N=13, RM=9)

43101	4.07	3.56	90.9	4.62	8.42	Normal	
43103	3.03	2.65	90.3	3.58	6.39	Restrictive	Mild
43105	5	4.29	90.2	5.3	10.1	Normal	
43107						ไม่แปลผล	
43109	3.34	2.93	90.6	3.93	7.02	Normal	
43111	2.47	2.12	89.6	2.88	5.13	Restrictive	Mild
43113	4.07	3.56	90.7	4.61	8.5	Normal	
43115	2.9	2.69	91.5	3.58	6.07	Normal	
43117	3.09	2.86	91.6	3.74	6.35	Normal	
43119	3	2.77	91.3	3.64	6.24	Obstruction	Mild
43121	2.9	2.69	91.5	3.58	6.07	Normal	
43123	3.44	3.14	91.8	3.96	6.75	Normal	
43125	3.09	2.86	91.6	3.74	6.35	Normal	
43127	3.05	2.82	91.6	3.7	6.28	Restrictive	Mild
43131	2.56	2.38	91.3	3.25	5.52	Normal	
43133	2.71	2.51	91.1	3.38	5.8	Normal	
43135	2.9	2.69	91.5	3.58	6.07	Normal	
43139	2.7	2.51	91.4	3.4	5.77	Obstruction	Mild

Total=18 (N=12, RM=3, OM=2, *เป่าไม่ได้=1)

43401	3.33	2.93	90.8	3.92	6.92	Restrictive	Mild
43403	4.56	3.96	90.8	5.02	9.31	Normal	
43405	3.4	2.99	90.7	3.99	7.15	Normal	
43409	3.94	3.45	90.7	4.49	8.25	Restrictive	Mild
43411	3.8	3.33	90.9	4.38	7.91	Normal	
43413	3.67	3.22	90.6	4.25	7.75	Normal	
43415	3.09	2.7	90.4	3.65	6.51	Restrictive	Mild
43419	2.56	2.38	91.3	3.25	5.52	Normal	
43423	3.24	2.98	91.7	3.84	6.53	Normal	
43425	3.54	3.22	91.9	4.01	6.84	Restrictive	Mild
43427	2.8	2.6	91.2	3.47	5.95	Normal	
43429	2.46	2.28	91.2	3.14	5.35	Normal	
43431	2.7	2.51	91.4	3.4	5.77	Normal	
43433	2.95	2.73	91.5	3.62	6.15	Normal	
43435	2.9	2.68	91.2	3.56	6.1	Normal	
43437	2.95	2.73	91.3	3.6	6.17	Normal	
43439	3.14	2.9	91.6	3.77	6.41	Obstruction or mixed pattern	

Total=17 (N=12, RM=4, O=1)

Spirometry 11/6/2004 Pratom Banbangkapi

Subject ID	Predictive spirometric values					Interpretation	Degree
	FVC	FEV1	FEV1/FVC	FEF25-75%	PEF		
64101	1.61	1.23	87.6	1.58	2.93	Normal	
64103	1.83	1.47	88.3	1.95	3.45	Normal	
64105	1.99	1.65	88.8	2.22	3.84	Normal	
64107	2.64	2.31	90.3	3.15	5.28	Normal	
64109	1.88	1.53	88.5	2.04	3.58	Obstruction	Mild
64111	2.28	1.95	89.6	2.66	4.5	Restrictive	Mild
64113	2.64	2.31	90.3	3.15	5.28	Normal	
64115	1.83	1.47	88.3	1.95	3.45	Restrictive	Mild
64117	1.77	1.41	88.2	1.86	3.32	Restrictive	Mild
64119	1.87	1.72	91.7	2.48	4.06	Normal	
64121	1.51	1.32	91.4	1.93	3.21	Normal	
64123	1.87	1.72	91.7	2.48	4.06	Obstruction	Mild
64125	2.63	2.48	92.4	3.42	5.56	Normal	
64127	1.66	1.49	91.5	2.17	3.59	Normal	
64129	2.48	2.34	92.2	3.26	5.29	Small airway obstruction	
64131	1.66	1.49	91.5	2.17	3.59	Normal	
64133	2.17	2.03	92	2.89	4.71	Restrictive	Mild
64135	2.02	1.88	91.8	2.69	4.4	Restrictive	Mild
64137	2.02	1.88	91.8	2.69	4.4	Restrictive	Mild
64139	1.46	1.26	91.3	1.85	3.08	Normal	
64141	1.2	0.973	91.1	1.41	2.41	Normal	

64143	2.12	1.98	91.9	2.83	4.61	Normal	
64145	2.28	2.14	92	3.02	4.91	Restrictive	Moderate

Total=23 (N=13, RM=6, RMod=1, OM=2, Sao=1)

64701	1.35	0.938	86.6	1.1	2.27	Normal	
64703	2.16	1.83	89.3	2.48	4.23	Normal	
64705	2.11	1.77	89.2	2.4	4.1	Normal	
64707	1.88	1.53	88.5	2.04	3.58	Normal	
64709	2.58	2.25	90.2	3.07	5.15	Normal	
64711	2.22	1.89	89.5	2.57	4.37	Normal	
64713	1.88	1.53	88.5	2.04	3.58	Normal	
64715	1.66	1.29	87.8	1.67	3.06	Normal	
64717	1.77	1.41	88.2	1.86	3.32	Normal	
64719	1.61	1.23	87.6	1.58	2.93	Normal	
64721	2.12	1.98	91.9	2.83	4.61	Restrictive	Mild
64723	1.26	1.03	91.2	1.5	2.54	Normal	
64725	1.61	1.44	91.5	2.1	3.46	Normal	
64727	2.02	1.88	91.8	2.69	4.4	Normal	
64729	1.87	1.72	91.7	2.48	4.06	Small airway obstruction	
64731	1.87	1.72	91.7	2.48	4.06	Normal	
64733	1.71	1.55	91.6	2.25	3.71	Normal	
64735	2.12	1.98	91.9	2.83	4.61	Restrictive	Moderate
64737	1.77	1.61	91.6	2.33	3.83	Normal	
64739	1.61	1.44	91.5	2.1	3.46	Normal	
64743	2.11	1.77	89.2	2.4	4.1	Restrictive	Moderate
64745	1.31	1.09	91.2	1.59	2.68	Normal	
64747	1.61	1.44	91.5	2.1	3.46	Normal	

Total=23 (N=19, RM=1, RMod=2, Sao=1)

65401	3.59	3.16	91	4.19	7.43	Obstruction	Mild
65403	2.16	1.83	89.3	2.48	4.23	Restrictive	Mild
65405	2.83	2.49	90.7	3.39	5.68	Normal	
65407	2.11	1.77	89.2	2.4	4.1	Normal	
65409	1.61	1.23	87.6	1.58	2.93	Normal	
65411	3.3	2.92	91.1	3.92	6.71	Normal	
65413	2.37	2.03	89.6	2.76	4.76	Normal	
65415	1.83	1.47	88.3	1.95	3.45	Normal	
65417	1.75	1.38	87.9	1.8	3.33	Normal	
65419	2.52	2.19	90.1	2.99	5.02	Normal	
65421	2.34	2.01	89.7	2.74	4.63	Small airway obstruction	
65423	1.83	1.47	88.3	1.95	3.45	Normal	
65425	3.04	2.68	90.8	3.63	6.19	Normal	
65427	2.22	1.89	89.5	2.57	4.37	Normal	
65429	1.86	1.5	88.3	1.98	3.59	Normal	
65431	1.92	1.77	91.7	2.55	4.18	Normal	
65433	1.97	1.82	91.8	2.62	4.29	Normal	
65435	2.38	2.24	92.1	3.14	5.11	Normal	
65437	2.39	2.24	91.9	3.13	5.15	Restrictive	Mild
65439	1.92	1.77	91.7	2.55	4.18	Normal	
65441	2.28	2.14	92	3.02	4.91	Restrictive	Mild
65443	2.28	2.14	91.8	3.01	4.96	Restrictive	Mild

Total=22 (N=16, RM=4, OM=1, Sao=1)

661001	2.08	1.73	88.9	2.34	4.11	Normal	
661003	2.37	2.03	89.6	2.76	4.76	Normal	
661005	2.77	2.41	90.1	3.27	5.77	Normal	
661007	1.8	1.44	88.1	1.89	3.46	Normal	
661009	2.73	2.39	90.3	3.25	5.54	Restrictive	Mild
661011	2.63	2.28	90	3.1	5.39	Normal	
661013	2.48	2.15	89.9	2.93	5.02	Restrictive	Mild
661015	2.02	1.67	88.8	2.25	3.98	Restrictive	Mild
661017	2.79	2.45	90.4	3.32	5.67	Normal	
661019	2.79	2.45	90.4	3.32	5.67	Restrictive	Moderate
661021	2.54	2.38	91.8	3.28	5.46	Restrictive	Mild
661023	2.49	2.33	91.7	3.23	5.37	Obstruction or mixed pattern	
661025	2.59	2.43	92.1	3.35	5.51	Normal	
661027	2.49	2.34	92	3.24	5.33	Restrictive	Mild
661029	1.98	1.83	91.6	2.62	4.33	Restrictive	Mild
661031	2.49	2.34	92	3.24	5.33	Normal	
661033	2.64	2.48	92.1	3.41	5.59	Restrictive	Mild
661035	2.64	2.48	92.1	3.41	5.59	Normal	
661037	2.23	2.09	91.8	2.95	4.86	Normal	
661039	2.59	2.43	92.1	3.35	5.51	Normal	
661041	3.38	2.98	91	3.99	6.94	Restrictive	Mild
661043	2.39	2.05	89.5	2.78	4.88	Normal	

Total=22 (N=12, RM=8, RMod=1, O=1)

661101	2.54	2.21	90	3.01	5.15	Normal	
661103	3.04	2.68	90.8	3.63	6.19	Normal	
661105	3.17	2.8	90.9	3.78	6.45	Obstruction	Mild
661107	2.39	2.05	89.5	2.78	4.88	Restrictive	Mild
661109	2.45	2.1	89.7	2.86	5.01	Restrictive	Mild
661111	3.04	2.68	90.8	3.63	6.19	Normal	
661113	3.04	2.68	90.8	3.63	6.19	Normal	
661115	3.77	3.34	91.4	4.4	7.62	Obstruction	Mild
661117	2.57	2.22	89.9	3.02	5.27	Restrictive	Mild
661119	2.91	2.56	90.6	3.48	5.93	Normal	
661121	2.54	2.38	91.8	3.28	5.46	Normal	
661123	2.04	1.88	91.4	2.68	4.48	Restrictive	Mild
661125	2.18	2.04	91.7	2.88	4.76	Restrictive	Mild
661127	2.49	2.34	92	3.24	5.33	Normal	
661129	2.59	2.43	92.1	3.35	5.51	Normal	
661131	2.44	2.29	91.9	3.19	5.24	Restrictive	Mild
661133	2.84	2.67	92.3	3.6	5.91	Restrictive	Mild
661135	2.89	2.71	92.3	3.65	5.99	Restrictive	Mild
661137	2.79	2.62	92.2	3.55	5.84	Normal	
661139	2.07	1.93	91.9	2.76	4.5	Normal	
661143	2.37	2.03	89.6	2.76	4.76	Normal	

Total=21 (N=11, RM=8, OM=2)

Spirometry 11/6/2004 Matayom Banbangkapi

Subject ID	Predictive spirometric values					Interpretation	Degree
	FVC	FEV1	FEV1/FVC	FEF25-75%	PEF		
71101	4.2	3.68	91.1	4.76	8.58	Normal	
71103	2.05	1.69	88.7	2.28	4.1	Normal	
71105	2.87	2.52	90.4	3.41	5.91	Normal	
71107	3.06	2.69	90.7	3.64	6.3	Restrictive	Mild
71109	3.46	3.05	90.9	4.06	7.17	Normal	
71111	3.44	3.04	91	4.06	7.07	Obstruction	Mild
71113	3.2	2.81	90.7	3.79	6.66	Restrictive	Mild
71117	2.99	2.79	92.1	3.71	6.16	Normal	
71119	2.99	2.79	92.1	3.71	6.16	Restrictive	Mild
71123	3.34	3.08	92.1	3.93	6.62	Restrictive	Moderate
71125	3.14	2.91	91.9	3.8	6.39		
71127	2.89	2.71	92	3.62	6.02		
71129	2.84	2.66	92	3.58	5.94		
71131	2.84	2.66	92	3.58	5.94		
71133	2.44	2.29	91.7	3.17	5.28		
71135	2.79	2.62	91.9	3.53	5.87		
71137	2.44	2.29	91.7	3.17	5.28		

Total=17 (N=9, RM=6, RMod=1, OM=1)

71201	2.81	2.46	90.3	3.34	5.78	Restrictive	Mild
71203	2	1.64	88.5	2.19	3.98	Normal	
71205	3.86	3.39	90.9	4.44	8.04	Normal	
71207	2.24	1.89	89.1	2.56	4.61	Normal	
71209	2.51	2.16	89.8	2.94	5.14	Restrictive	Mild
71211	3.85	3.39	91.2	4.46	7.85	Normal	
71213	2	1.64	88.5	2.19	3.98	Normal	
71215	3.25	2.87	90.9	3.85	6.68	Normal	

71217	3.66	3.22	90.8	4.25	7.66	Restrictive	Mild
71219	3.07	2.7	90.5	3.64	6.41	Normal	
71221	3.39	2.99	90.8	3.99	7.05	Restrictive	Mild
71223	3.38	2.98	91	3.99	6.94	Normal	
71225	2.57	2.22	89.9	3.02	5.27	Restrictive	Mild
71227	3.09	2.86	91.6	3.74	6.35	Restrictive	Mild
71229	2.75	2.56	91.7	3.47	5.82	Normal	
71231	2.8	2.61	91.7	3.51	5.9	Restrictive	Mild
71233	2.34	2.19	91.6	3.06	5.09	Normal	
71235	2.74	2.57	91.9	3.49	5.79	Normal	
71237	3.09	2.88	92.2	3.79	6.3	Restrictive	Mild
71239	2.59	2.43	91.8	3.34	5.54	Normal	
71241	3.04	2.84	92.1	3.75	6.23	Normal	
Total=21 (N=13, RM=8)							
72101	3.46	3.05	90.9	4.06	7.17	Obstruction	Mild
72103	2.36	2	89.3	2.72	4.87	Small airway obstruction	
72105	3.25	2.87	90.9	3.85	6.68	Normal	
72107	3.53	3.11	90.7	4.13	7.4	Normal	
72109	3.85	3.39	91.2	4.46	7.85	Restrictive	Mild
72111	3.4	2.99	90.7	3.99	7.15	Small airway obstruction	
72113	4.35	3.79	90.8	4.85	8.93	Normal	
72115	3.33	2.93	90.8	3.92	6.92	Normal	
72117	3.52	3.1	90.9	4.13	7.3	Normal	
72119	3	2.79	91.8	3.69	6.19	Normal	
Total=10 (N=6, RM=1, OM=1, Sao=2)							
72201	3.26	2.87	90.7	3.86	6.79	Restrictive	Mild
72203	3.99	3.51	91.1	4.58	8.2	Restrictive	Mild
72205	3.21	2.82	90.5	3.79	6.77	Normal	
72207	3.09	2.7	90.4	3.65	6.51	Normal	
72209	3.46	3.05	90.9	4.06	7.17	Normal	
72211	3.52	3.1	90.9	4.13	7.3	Obstruction	Mild

72213	4.28	3.73	90.7	4.78	8.88	Normal	
72215	3.26	2.87	90.7	3.86	6.79	Normal	
72217	2.27	1.93	89.3	2.62	4.62	Normal	
72219	2.69	2.52	91.9	3.44	5.71	Restrictive	Mild
72221	2.84	2.66	92	3.58	5.94	Normal	
72223	2.85	2.65	91.7	3.56	5.97	Normal	
72225	2.8	2.6	91.4	3.49	5.93	Restrictive	Mild
72227	2.85	2.65	91.5	3.54	6	Normal	
72229	2.85	2.65	91.5	3.54	6	Normal	
72231	2.85	2.65	91.5	3.54	6	Restrictive	Mild
72233	2.36	2.19	91.2	3.03	5.16	Normal	
72235	2.7	2.51	91.4	3.4	5.77	Restrictive	Moderate
72237	2.95	2.74	91.8	3.64	6.12	Small airway obstruction	
72239	2.65	2.47	91.6	3.37	5.66	Normal	
72241	2.75	2.56	91.7	3.47	5.82	Normal	
Total=21 (N=13, RM=5, RMod=1, OM=1, Sao=1)							
73101	2.79	2.42	90	3.28	5.88	Normal	
73103	3.93	3.45	90.9	4.5	8.16	Normal	
73105	3.47	3.05	90.7	4.06	7.27	Restrictive	Mild
73107	4.49	3.91	91	4.98	9.09	Normal	
73111	2.8	2.6	91.2	3.47	5.95	Restrictive	Mild
73113	3	2.78	91.5	3.66	6.21	Restrictive	Moderate
73115	2.9	2.69	91.5	3.58	6.07	Normal	
73117	3.29	3.02	91.7	3.87	6.59	Normal	
73119	2.65	2.47	91.3	3.35	5.69	Normal	
73121	2.95	2.73	91.5	3.62	6.15	Normal	
73123	2.8	2.6	91.4	3.49	5.93	Normal	
73125	2.85	2.65	91.5	3.54	6	Restrictive	Mild
73127	2.95	2.73	91.5	3.62	6.15	Normal	
73129	3.24	2.98	91.7	3.84	6.53	Normal	
73131	2.8	2.6	91.4	3.49	5.93	Normal	

73133	2.51	2.33	91.3	3.2	5.43	Normal	
73135	2.85	2.65	91.5	3.54	6	Restrictive	Mild
Total=17 (N=12, RM=4, RMod=1)							
73201	2.97	2.59	90.2	3.51	6.26	Restrictive	Mild
73203	4.01	3.5	90.5	4.54	8.46	Normal	
73205	4.01	3.5	90.7	4.55	8.38	Normal	
73209	3.53	3.11	90.7	4.13	7.4	Normal	
73211	3.99	3.51	91.1	4.58	8.2	Normal	
73213	3.03	2.65	90.3	3.58	6.39	Small airway obstruction	
73215	3.21	2.82	90.5	3.79	6.77	Restrictive	Mild
73217	3.66	3.22	90.8	4.25	7.66	Normal	
73219	4.14	3.62	90.9	4.68	8.54	Normal	
73221	2.95	2.73	91.5	3.62	6.15	Normal	
73223	2.9	2.69	91.5	3.58	6.07	Normal	
73225	3.39	3.1	91.8	3.93	6.7	Restrictive	Mild
73227	2.56	2.38	91.3	3.25	5.52	Normal	
73229	2.8	2.6	91.4	3.49	5.93	Normal	
73231	3.49	3.18	91.8	3.98	6.8	Normal	
73233	3.19	2.95	92	3.83	6.45	Normal	
73235	2.6	2.42	91.3	3.3	5.61	Normal	
73237	3.09	2.86	91.6	3.74	6.35	Normal	
Total=18 (N=14, RM=3, Sao=1)							
Spirometry	28/5/2004	Pratoochai					
Subject ID	Predictive spirometric values					Interpretation	Degree
	FVC	FEV1	FEV1/FVC	FEF25-75%	PEF		FVC
84401	2.52	2.19	90.1	2.99	5.02	Normal	
84403	1.61	1.23	87.6	1.58	2.93	Normal	
84405	1.94	1.59	88.7	2.13	3.71	Normal	
84407	1.2	0.759	85.9	0.804	1.88	Normal	
84409	2.83	2.49	90.7	3.39	5.68	Normal	
84411	2.58	2.25	90.2	3.07	5.15	Normal	

84413	1.77	1.41	88.2	1.86	3.32	Normal	
84415	1.77	1.41	88.2	1.86	3.32	Normal	
84417	1.94	1.59	88.7	2.13	3.71	Normal	
84419	2.05	1.71	89	2.31	3.97	Restrictive (3RMod)	Mild
84421	1.77	1.61	91.6	2.33	3.83	Normal	
84423	1.71	1.55	91.6	2.25	3.71	Normal	
84425	1.56	1.38	91.4	2.01	3.34	Normal	
84427	1.92	1.77	91.7	2.55	4.18	Normal	
84429	1.26	1.03	91.2	1.5	2.54	Normal	
84431	2.07	1.93	91.9	2.76	4.5	Obstruction or mixed pattern	
84433	1.31	1.09	91.2	1.59	2.68	Normal	
84435	1.77	1.61	91.6	2.33	3.83	Normal	
84437	2.53	2.39	92.3	3.32	5.38	Normal	
84439	1.51	1.32	91.4	1.93	3.21	Normal	
84441	1.41	1.21	91.3	1.76	2.95	Normal	
84443	1.46	1.26	91.3	1.85	3.08	Normal	
84445	1.71	1.55	91.6	2.25	3.71	Restrictive	Mild
Total=23 (N=20, RM=2, O=1)							
84601	2.45	2.1	89.7	2.86	5.01	Normal	
84603	1.83	1.47	88.3	1.95	3.45	Normal	
84605	1.72	1.35	88	1.77	3.19	Normal	
84607	1.72	1.35	88	1.77	3.19	Normal	
84609	1.66	1.29	87.8	1.67	3.06	Restrictive	Mild
84611	1.99	1.65	88.8	2.22	3.84	Normal	
84615	1.61	1.23	87.6	1.58	2.93	Normal	
84617	1.3	0.878	86.3	1	2.14	Normal	
84619	1.61	1.23	87.6	1.58	2.93	Normal	
84621	1.77	1.41	88.2	1.86	3.32	Normal	
84623	2.31	1.97	89.5	2.68	4.63	Normal	
84625	2.43	2.29	92.2	3.2	5.2	Normal	
84627	2.17	2.03	92	2.89	4.71	Normal	

84629	1.2	0.973	91.1	1.41	2.41	Normal	
84631	1.41	1.21	91.3	1.76	2.95	Normal	
84633	1.41	1.21	91.3	1.76	2.95	Normal	
84635	1.56	1.38	91.4	2.01	3.34	Normal	
84637	2.12	1.98	91.9	2.83	4.61	Normal	
84639	1.87	1.72	91.7	2.48	4.06	Normal	
84641	1.41	1.21	91.3	1.76	2.95	Normal	
84643	1.61	1.44	91.5	2.1	3.46	Normal	
84645	1.61	1.44	91.5	2.1	3.46	Normal	
Total=22 (N=21, RM=1)							
85601	1.94	1.59	88.7	2.13	3.71	Normal	
85603	2.11	1.77	89.2	2.4	4.1	Normal	
85605	2.58	2.25	90.2	3.07	5.15	Normal	
85607	2.11	1.77	89.2	2.4	4.1	Normal	
85609	1.66	1.29	87.8	1.67	3.06	Normal	
85611	3.15	2.79	91.1	3.77	6.33	Normal	
85613	1.88	1.53	88.5	2.04	3.58	Normal	
85615	1.77	1.41	88.2	1.86	3.32	Normal	
85617	1.83	1.47	88.3	1.95	3.45	Normal	
85619	2.79	2.45	90.4	3.32	5.67	Normal	
85621	2.33	2.19	92.1	3.08	5.01	Normal	
85623	2.68	2.53	92.4	3.47	5.64	Restrictive	Mild
85625	1.82	1.66	91.6	2.41	3.95	Small airway obstruction (2, 3RM)	
85627	1.46	1.26	91.3	1.85	3.08	Normal	
85629	2.02	1.88	91.8	2.69	4.4	Small airway obstruction	
85631	1.77	1.61	91.6	2.33	3.83	Normal	
85633	2.12	1.98	91.9	2.83	4.61	Normal	
85635	2.43	2.29	92.2	3.2	5.2	Normal	
85637	1.56	1.38	91.4	2.01	3.34	Normal	
85639	2.53	2.39	92.3	3.32	5.38	Normal	
85641	1.93	1.77	91.5	2.55	4.22	Restrictive	Mild

Total=21 (N=17, RM=2, Sao=2)							
85701	1.83	1.47	88.3	1.95	3.45	Normal	
85703	2.19	1.85	89.2	2.51	4.37	Normal	
85705	1.72	1.35	88	1.77	3.19	Restrictive	Mild
85707	2.28	1.95	89.6	2.66	4.5	Normal	
85709	2.28	1.95	89.6	2.66	4.5	Normal	
85711	2.34	2.01	89.7	2.74	4.63	Normal	
85713	2.34	2.01	89.7	2.74	4.63	Normal	
85715	2.16	1.83	89.3	2.48	4.23	Normal	
85717	1.66	1.29	87.8	1.67	3.06	Normal	
85723	2.23	2.09	91.8	2.95	4.86	Normal	
85725	1.97	1.82	91.8	2.62	4.29	Normal	
85727	2.17	2.03	92	2.89	4.71	Normal	
85729	1.98	1.83	91.6	2.62	4.33	Normal	
85731	2.33	2.19	92.1	3.08	5.01	Normal	
85733	1.82	1.66	91.6	2.41	3.95	Normal	
85737	2.43	2.29	92.2	3.2	5.2	Restrictive	Mild
85739	1.98	1.83	91.6	2.62	4.33	Normal	
85741	2.22	2.09	92	2.96	4.81	Normal	
Total=18 (N=16, RM=2)							
86301	2.25	1.91	89.4	2.59	4.5	Normal	
86303	2.25	1.91	89.4	2.59	4.5	Normal	
86305	2.73	2.39	90.3	3.25	5.54	Restrictive (3N)	Mild
86307	3.12	2.75	90.7	3.71	6.43	Small airway obstruction	
86309	2.05	1.69	88.7	2.28	4.1	Small airway obstruction (3RM)	
86311	2.08	1.73	88.9	2.34	4.11	Normal	
86313	1.78	1.4	87.9	1.84	3.46	Normal	
86315	2.73	2.39	90.3	3.25	5.54	Restrictive (3RMod)	Mild
86317	2.34	2.01	89.7	2.74	4.63	Normal	
86319	2.13	1.79	89.1	2.42	4.24	Normal	
86321	3.49	3.1	91.2	4.13	7.1	Obstruction	Mild

86323	2.45	2.1	89.7	2.86	5.01	Restrictive	Mild
86325	1.93	1.77	91.5	2.55	4.22	Normal	
86327	2.39	2.24	91.7	3.12	5.18	Restrictive	Mild
86329	2.94	2.76	92.3	3.69	6.06	Normal	
86331	2.44	2.29	91.9	3.19	5.24	Restrictive	Moderate
86333	1.93	1.77	91.5	2.55	4.22	Normal	
86335	1.88	1.72	91.5	2.47	4.11	Normal	
86337	2.89	2.71	92.3	3.65	5.99	Restrictive (Only1)	Mild
86339	2.54	2.38	92	3.3	5.42	Restrictive (2,3RMod)	Mild
86341	2.74	2.57	91.9	3.49	5.79	Normal	
86343	1.82	1.66	91.6	2.41	3.95	Normal	
86345	2.33	1.99	89.4	2.7	4.75	Restrictive	Mild
Total=23 (N=12, RM=7, RMod=1, OM=1, Sao=2)							

Spirometry 28/5/2004 Ayutthaya Witthayalai

Subject ID	Predictive spirometric values					Interpretation	Degree
	FVC	FEV1	FEV1/FVC	FEF25-75%	PEF		
91201	2.75	2.4	90.2	3.26	5.65	Normal	
91203	2.93	2.57	90.5	3.49	6.04	Restrictive	Mild
91205	3.07	2.7	90.5	3.64	6.41	Obstruction	Mild
91207	3.38	2.98	91	3.99	6.94	Obstruction	Mild
91209	3.31	2.93	90.9	3.92	6.81	Normal	
91211	3.06	2.69	90.7	3.64	6.3	Normal	
91213	2.33	1.99	89.4	2.7	4.75	Normal	
91215	3.14	2.76	90.6	3.71	6.53	Normal	
91217	2.89	2.52	90.3	3.42	6.02	Restrictive	Mild
91219	3.18	2.81	90.8	3.78	6.56	Normal (3RM)	
91221	3.58	3.16	91.1	4.2	7.33	Restrictive (3N)	Mild
91223	2.85	2.5	90.5	3.4	5.8	Restrictive (2RM)	Moderate
91225	3.64	3.22	91.2	4.26	7.46	Normal	
91227	3.06	2.69	90.7	3.64	6.3	Normal	
91229	3.01	2.64	90.4	3.57	6.28	Normal	
91231	3.59	3.16	91	4.19	7.43	Obstruction (Only1)	Mild
91233	3.71	3.28	91.2	4.33	7.59	Normal	
91235	3.06	2.69	90.7	3.64	6.3	Restrictive	Mild
91237	2.39	2.05	89.5	2.78	4.88	Normal	
91239	3.26	2.87	90.7	3.86	6.79	Normal	
91241	2.34	2.19	91.6	3.06	5.09	Normal	
91243	2.69	2.52	91.9	3.44	5.71	Normal	
91245	2.64	2.48	92.1	3.41	5.59	Normal	
91247	3.24	3	92	3.87	6.51	Restrictive	Mild
91249	2.94	2.75	92.1	3.67	6.09	Normal	
91251	3.19	2.97	92.2	3.86	6.42	Normal	
91253	2.04	1.88	91.4	2.68	4.48	Normal	
91255	3.49	3.21	92.5	4.05	6.76	Normal	
Total=28 (N=19, RM=5, RMod=1, OM=3)							
92301	3.71	3.28	91.2	4.33	7.59	Normal	
92303	4.13	3.62	91.1	4.7	8.45	Normal	
92305	3.86	3.39	90.9	4.44	8.04	Normal	
92307	3.64	3.22	91.2	4.26	7.46	Normal	
92309	3.33	2.93	90.8	3.92	6.92	Normal	
92311	3.79	3.34	91	4.39	7.81	Normal	
92313	4.35	3.79	90.8	4.85	8.93	Normal	
92315	3.99	3.51	91.1	4.58	8.2	Normal	
92317	4.07	3.56	90.9	4.62	8.42	Normal	
92319	3.07	2.7	90.5	3.64	6.41	Normal	
92321	4.13	3.62	91.1	4.7	8.45	Normal	
92323	4.07	3.56	90.9	4.62	8.42	Normal	
92325	3.33	2.93	90.8	3.92	6.92	Restrictive	Mild
92327	3.65	3.22	91	4.26	7.56	Normal	
92329	3.07	2.7	90.5	3.64	6.41	Restrictive	Mild
92331	3.46	3.05	90.9	4.06	7.17	Restrictive	Moderate
92333	3.39	2.99	90.8	3.99	7.05	Restrictive	Mild

92335	2.8	2.61	91.7	3.51	5.9	Normal	
92337	2.84	2.66	92	3.58	5.94	Normal	
92339	2.85	2.65	91.7	3.56	5.97	Normal	
92341	2.9	2.7	91.8	3.6	6.05	Normal	
92343	2.74	2.57	91.9	3.49	5.79	Normal	
92345	2.46	2.28	91.2	3.14	5.35	Normal	
92347	2.8	2.6	91.4	3.49	5.93	Normal	
92349	2.8	2.6	91.4	3.49	5.93	Normal	
92351	3.14	2.91	91.9	3.8	6.39	Restrictive	Mild
92353	2.64	2.48	91.8	3.39	5.63	Normal	
Total=27 (N=22, RM=4, RMod=1)							
321001	4.07	3.56	90.9	4.62	8.42	Normal	
921003	2.91	2.53	90.2	3.43	6.13	Restrictive	Mild
921005	3.39	2.99	90.8	3.99	7.05	Restrictive	Mild
921007	3.52	3.1	90.9	4.13	7.3	Normal	
921009	3.65	3.22	91	4.26	7.56	Restrictive	Mild
921013	3.72	3.28	91	4.32	7.69	Normal	
921015	3.79	3.34	91	4.39	7.81	Normal	
921017	2.65	2.29	89.9	3.12	5.51	Normal	
921019	2.89	2.52	90.3	3.42	6.02	Normal	
Total=9 (N=6, RM=3)							
93427	3.15	2.76	90.5	3.72	6.64	Normal	
93429	3.47	3.05	90.7	4.06	7.27	Restrictive	Mild
93431	4.14	3.62	90.9	4.68	8.54	Restrictive	Mild
93433	3.94	3.45	90.7	4.49	8.25	Normal	
93435	3.4	2.99	90.7	3.99	7.15	Normal	
93437	3.93	3.45	90.9	4.5	8.16	Normal	
93443	3.73	3.28	90.8	4.32	7.78	Normal	
93445	3.24	2.98	91.7	3.84	6.53	Normal	
93447	2.8	2.6	91.4	3.49	5.93	Normal	
93449	2.65	2.47	91.3	3.35	5.69	Normal	
93451	2.9	2.7	91.8	3.6	6.05	Normal	
Total=11 (N=9, RM=2)							
93501	3.73	3.28	90.8	4.32	7.78	Normal	
93503	3.86	3.39	90.9	4.44	8.04	Normal	
93505	4.63	4.01	90.5	5.05	9.51	Obstruction	Mild
93507	4.01	3.5	90.7	4.55	8.38	Normal	
93509	3.86	3.39	90.9	4.44	8.04	Normal	
93511	4.14	3.62	90.9	4.68	8.54	Normal	
93513	3.34	2.93	90.6	3.93	7.02	Restrictive	Moderate
93515	3.66	3.22	90.8	4.25	7.66	Normal	
93517	3.73	3.28	90.8	4.32	7.78	Restrictive (3O)	Mild
93519	2.98	2.6	90.1	3.51	6.36	Normal	
93521	3.65	3.22	91	4.26	7.56	Restrictive	Mild
93523	3.6	3.16	90.8	4.19	7.53	Restrictive	Mild
93525	4.49	3.9	90.6	4.94	9.26	Normal	
93527	4.63	4.02	90.7	5.07	9.43	Restrictive	Mild
93529	3.66	3.22	90.8	4.25	7.66	Normal	
93531	3.92	3.45	91.1	4.51	8.07	Normal	
93533	4.14	3.62	90.9	4.68	8.54	Restrictive (3RMod)	Mild
93535	3.66	3.22	90.8	4.25	7.66	Restrictive	Mild
93537	4.21	3.68	90.9	4.74	8.67	Restrictive	Mild
93539	4.28	3.73	90.9	4.8	8.8	Normal	
93541	3.66	3.22	90.8	4.25	7.66	Normal	
93543	4.21	3.68	90.9	4.74	8.67	Normal	
93545	2.9	2.69	91.5	3.58	6.07	Normal	
93547	3	2.78	91.5	3.66	6.21	Normal	
93549	3	2.78	91.5	3.66	6.21	Normal	
93551	3.34	3.06	91.8	3.9	6.64	Normal	
Total=26 (N=17, RM=7, RMod=1, OM=1)							

APPENDIX C

SPSS Output

SPSS Output

Oneway

Descriptives

Year 2004

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	354	65.031455	23.7930413	1.2645859	62.544385	67.518525	29.1250	185.0830
2	354	67.488703	26.8620865	1.4277038	64.680827	70.296578	29.9583	183.7920
3	361	52.209353	18.8412143	.9916429	50.259212	54.159493	23.5714	153.8750
4	366	47.025236	19.8783352	1.0390572	44.981945	49.068526	22.1905	130.5830
Total	1435	57.819476	24.0885915	.6358951	56.572092	59.066860	22.1905	185.0830

ANOVA

Year 2004

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	105516.0	3	35171.992	69.272	.000
Within Groups	726577.2	1431	507.741		
Total	832093.2	1434			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Year 2004

LSD

(I) Group 1=HR, 2=HG, 3=MR, 4=C	(J) Group 1=HR, 2=HG, 3=MR, 4=C	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-2.4572477	1.6936920	.147	-5.779633	.865138
	3	12.8221022*	1.6854616	.000	9.515862	16.128343
	4	18.0062193*	1.6797519	.000	14.711179	21.301259
2	1	2.4572477	1.6936920	.147	-.865138	5.779633
	3	15.2793499*	1.6854616	.000	11.973109	18.585590
	4	20.4634670*	1.6797519	.000	17.168427	23.758507
3	1	-12.822102*	1.6854616	.000	-16.128343	-9.515862
	2	-15.279350*	1.6854616	.000	-18.585590	-11.973109
	4	5.1841171*	1.6714528	.002	1.905357	8.462878
4	1	-18.006219*	1.6797519	.000	-21.301259	-14.711179
	2	-20.463467*	1.6797519	.000	-23.758507	-17.168427
	3	-5.1841171*	1.6714528	.002	-8.462878	-1.905357

*. The mean difference is significant at the .05 level.

Prevalence of respiratory symptoms and impaired lung function in schoolchildren, Thailand

Parameter[a]	Elememtary student (n=354)	Junior high school student (n=368)	Both of student (n=722)
	p-value[b]	*p*-value[b]	*p*-value[b]
1. Chronic bronchitis			
HR-C	0.772	0.992	0.607
HG-C	0.024	1.000	0.065
MR-C	1.000	1.000	1.000
2. Bronchial asthma			
HR-C	0.860	0.189	0.607
HG-C	1.000	1.000	0.965
MR-C	1.000	0.289	0.592
3. Dyspnea and wheezing			
HR-C	0.404	0.002	0.001
HG-C	1.000	0.000	0.000
MR-C	0.926	0.289	0.222
4. Persistent cough			
HR-C	0.195	0.220	0.042
HG-C	0.024	1.000	0.102
MR-C	1.000	0.578	0.373
5. Persistent phlegm			
HR-C	0.772	0.992	0.607
HG-C	0.014	1.000	0.041
MR-C	0.249	1.000	0.373

a: HR = High-polluted roadside area; HG = High-polluted general area; MR = Moderate-polluted roadside area; C = Control area.

b: *p*-value for the trend by Yates' Correction Chi-Square

Prevalence of respiratory symptoms and impaired lung function in schoolchildren, Thailand (cont.)

Parameter[a]	Elememtary student (n=354)	Junior high school student (n=368)	Both of student (n=722)
	p-value[b]	*p*-value[b]	*p*-value[b]
6. Both of PCP			
HR-C	-	0.388	0.395
HG-C	0.072	1.000	0.204
MR-C	-	1.000	1.000
7. Any one of the respiratory symptoms			
HR-C	0.217	0.007	0.003
HG-C	0.036	0.001	0.000
MR-C	0.582	0.133	0.071
8. Impaired lung function			
HR-C	0.414	0.028	0.382
HG-C	0.633	0.718	1.000
MR-C	0.378	0.826	0.805

a: HR = High-polluted roadside area; HG = High-polluted general area; MR = Moderate-polluted roadside area; C = Control area.

b: *p*-value for the trend by Yates' Correction Chi-Square

APPENDIX D

Pony Graphic User Manual

Pony Graphic User Manual

Intended Use

Pony graphic is an electrical medical device designed to perform pulmonary function tests. It is to be used by physicians or by trained personnel on a physician responsibility. This equipment has been conceived to be used as an auxiliary instrument in order to:

- Formulate lung pathology diagnosis;
- Perform studies concerning human physiology;
- Get information in sport medicine.

Technical Features

Features	Value
Flow meter	Digital bi-directional turbine
Flow range	0.30-20 l/s
Volume range	10 l
Accuracy F/V	± 3% or ± 50 ml
Dynamic res at 12 l/s	< 0.7 cm H_2O/l/s
Mouthpieces	∅ 31 and 22 mm
Graphic display	Back lighting LCD 70× 80 mm
Printer	Graphic, 24 char/lin, 2, 5 lines/s
Keyboard	12 multifunction keys
Serial cable	RS 232 bidirectional 4800 baud.
Power supply	Batteries Ni-Cd 5V, 1, 2 Ah
Battery autonomy	200 tests including prints out
Battery charge	12V dc – 1, 2 A
Dimensions	237 × 127 × 46 mm
Weight	1, 2 kg

Preparing the unit

Before using the Pony graphic it's necessary:

- Set up the turbine Flow Meter
- Check the paper in the printer
- Check the ribbon in the printer
- Make sure the batteries are charged

Calibration

The system is precisely calibrated by Cosmed and will remain so as long as it is used properly. If a proper maintenance is executed, it is possible to check the calibration of the Flow meter turbine even after long periods. Check the calibration by measuring a known volume (syringe) using the FVC and VC tests and comparing the results measured with the predicted one (the syringe one). If the discrepancy is more than 3% the system should be re calibrated. This standard calibrated syringe (3 Liters) is supplied by COSMED:

Calibration syringe: P/N 00600-01-11

APPENDIX E

Micro Medical Smoke Check Operating Manual

Micro Medical Smoke Check Operating Manual

Operation

For accurate results the Smoke Check should be used at room temperature. If the instrument has been stored in cool or hot conditions then allow time to reach room temperature prior to use. Install the PP3 battery by sliding open the battery cover, clipping the battery in place and replacing the cover. Insert the mouthpiece adapter into the Smoke Check meter and then insert a disposable cardboard mouthpiece into the adapter. If possible, the subject should rinse their mouth with clean water prior to performing a test. Do not use mouthwash, as the readings will be affected. To obtain an accurate reading from a sample of alveolar gas the patient should inspire and hold their breath for 20 seconds before expiring slowly and fully through the mouthpiece. As an aid to timing the breath-holding period, a buzzer will sound 20 seconds after the unit is turned on. However the instrument may be used any time after the first 12 seconds when the auto-zero has been performed. Turn the unit on by pushing the central slide switch up and the three colored lights will illuminate momentarily together with all the display legends:

BAT		
WAIT	7 – 10 PPM	20+ PPM
BLOW	0 – 6 PPM	11 – 20 PPM
GAS		

Ask the subject to inspire and hold their breath. The unit will auto-zero for twelve seconds during which time the following will be displayed:

WAIT

Important note: the unit must not be used during this period.

After twelve seconds the display will change to:

WAIT 0 – 6 PPM

The subject may now seal their lips around the mouthpiece and exhale slowly and fully if they cannot hold there breathe any longer. However, more accurate results will be obtained if they hold their breath until the buzzer sounds and the display changes to:

BLOW 0 – 6 PPM

The CO reading will rise to a plateau over the course of several seconds. The final value will be held until the unit is turned off and will be displayed in one of the four ranges:

0 – 6 ppm with green indicator

7 – 10 ppm with amber indicator

11 – 20 ppm with red indicator

20+ ppm with flashing red indicator and alarm

Important note

Before repeating a measurement the unit must be turned off, and the mouthpiece and adapter removed for at least 1 minute. This is to allow re-equilibration with ambient air and to dry the surface of the sensor. Visually inspect that all moisture has evaporated from the surface of the sensor before reuse. If the unit is switched on again too quickly after use there may be a response to residual expired carbon monoxide from the previous test.

Specifications

Sensor type	Electro-chemical fuel cell
Range	0 – 20 ppm
Detected levels:	Display:
0 to 6 ppm	0 – 6 ppm with green indicator
7 to 10 ppm	7 – 10 ppm with amber indicator
11 – 20 ppm	11 – 20 ppm with red indicator
> 20 ppm	20+ ppm with red indicator and alarm
Accuracy	+/– 5% of full scale or 1 ppm whichever is the greater
Sensitivity drift	0.5%/°C
Sensor life	2 to 5 years
Response time	< 15 sec (to 90% of reading)
Hydrogen cross sensitivity	< 15%
Operating temperature	15 – 25°C
Operating pressure	Atmospheric +/– 10%
Pressure coefficient	0.02% signal per mBar
Relative humidity (Non condensing)	15 – 90% continuous (0 – 99% intermittent)
Baseline drift	0 ppm (auto-zero)
Long term drift	< 2% signal loss per month
Power source	Single Alkaline 9 volt PP3
Battery life	> 8000 tests
Weight	130 g without battery
Dimensions	170 × 60 × 26 mm
Display	Custom LCD
Storage temperature	-20°C to +70°C
Storage humidity	30% to 75%

APPENDIX F

Publication

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Respiratory symptoms and lung function in Bangkok school children

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Background: Previous epidemiological studies have shown acute effects of ambient air pollutants in children with respiratory disorders. **Methods:** The chronic effects of air pollution in Bangkok children were investigated. Children aged 10–15 years were examined for lung functions using spirometry tests and for respiratory symptoms by the American Thoracic Society's Division of Lung Diseases (ATS-DLD-78-C) questionnaire during May–August 2004. Effects of residential area were estimated by multiple logistic regression analysis. Of the 878 children, 722 (82%) had completed lung function test and ATS-DLD questionnaire. **Results:** In children, who live in roadside (R) and general (G) areas with high (H) pollution, the prevalence of respiratory symptoms increased significantly [odds ratios (95% confidence interval) in HR and HG are 2.44 (1.21–4.93) and 2.60 (1.38–4.91), respectively]. Children with normal lung function were less observed in H- and M-polluted roadside and general area [HR, OR = 1.41 (95% CI 0.89–2.22); HG, 1.08 (0.71–1.64); and MR, 0.99 (0.63–1.57)]. Residential locations and family members were associated with the prevalence of respiratory symptoms, whereas factors such as the responder of ATS-DLD, gender, age, residential years, home size, parental smoking habits, use of air conditioners, and domestic pets were not associated. Age was associated with the impaired lung function, whereas others factors were not associated. **Conclusion:** The prevalence of respiratory symptoms and impaired lung function were higher among children living in areas with high pollution than those in areas with low pollution.

Keywords: air pollution, Bangkok, children, lung function, respiratory symptoms

Introduction

Epidemiological studies found relatively consistent associations between outdoor particulate matter concentrations and various adverse health effects, such as exacerbation of asthma, other respiratory tract diseases, and decrements in lung function.[1–12]

The high concentration of respirable particulate matter (PM_{10}) in ambient air is one of the serious environmental problems in Bangkok city, particularly in the traffic-congested areas. PM_{10} levels were monitored systematically at 32 Pollution Control Department (PCD) monitoring stations. In many areas, annual average PM_{10} concentrations were found to be higher than the National Ambient Air Quality Standard. In 2004, annual average concentrations of total suspended particulate matter (TSP) and PM_{10} at roadside monitoring stations were ~0.18 mg/m^3 and 78.50 μg/m^3, exceeding the standard[13] by ~8.3 and 8.4% days, respectively. There is a potential increase in the concentration of pollutants each year. Furthermore, PM_{10} in Bangkok has been associated with serious health effects, such as increased hospital admissions and mortality.[14] The associations were also reported between air pollution and respiratory health among traffic policemen[15–18] and their wives.[19] These studies have mainly been conducted in healthy adult groups. It is not clear to what extent such associations could be revealed in children, who might be more susceptible to air pollution than adults. A few researchers have reported that there is an increase in respiratory symptoms[20] and impaired lung function among asthmatic children near Maemoh Power Plant, Thailand.[21] However, chronic health effects for the children remain uncertain, particularly for Bangkok children. Therefore, with the help of a cross-sectional design, possible chronic effects of exposure to air pollution in Bangkok school children were investigated. The aim of this study was to evaluate the association between air pollution and respiratory symptoms, or lung function, by using the ATS-DLD-78-C respiratory questionnaires and spirometry tests among the school children in different air pollution levels.

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Methods

Study site and population

Bangkok has a population of about six million people with a very high density (4051 persons per square kilometre). To obtain a wide range of air pollution level, four different areas were selected based on the traffic volumes and population density. Based on the level of PM_{10} obtained from PCD monitoring stations, four areas (highly polluted roadside area: HR; highly polluted general area: HG; moderately polluted roadside area: MR; and less-polluted area as a control: C) with elementary and junior high schools were chosen. Figure 1 shows the location of the studied areas. Annual average PM_{10} level in 2004[13] at Din Daeng Housing Authority Station located in HR was 65 μg/m^3, and this level too exceeds the standard 50 μg/m^3. There were 12 out of 354 observations, representing 3.4% of the total observations, where concentrations exceed the standard 120 μg/m^3. The concentration level at Nonsi Withaya School Station located in HG was 67.5 μg/m^3. There were 20 out of 354 observations, representing 5.7% of the total observations, where concentrations exceed the standard. At Thonburi Substation Station located in MR, the level was 52.2 μg/m^3. There were 4 out of 361 observations, representing 1.1% of the total observations, where concentrations exceed the standard and at Khlong Chan Housing Community Station located in C, the level was 47 μg/m^3. There were 2 out of 366 observations, representing

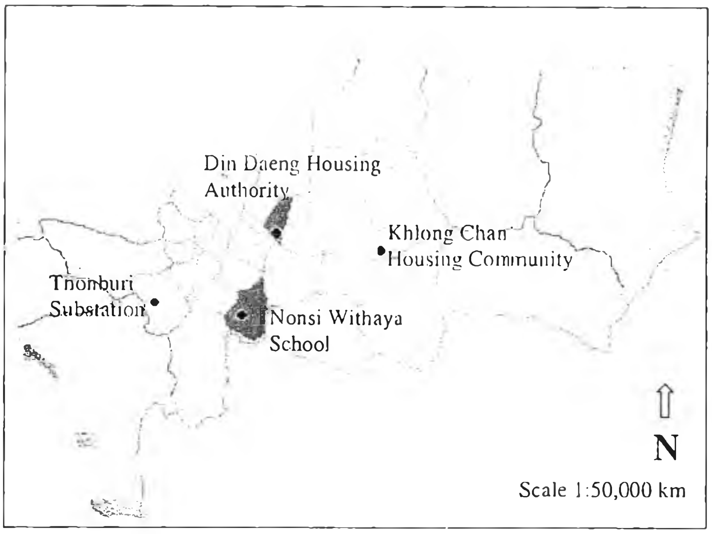

Figure 1 Location of air monitoring stations in the study areas. Dark shading represents highly polluted area (Adapted from http://www.pcd.go.th/AirQuality/Bangkok/Graph/createaqi1.cfm)

Table 1 Traffic volume, zone characteristic, and 24 h average concentration of PM_{10} in Bangkok, Thailand, 2004

Area[a]	Traffic volume (cars/h)	Characteristic	PM_{10} ($\mu g/m^3$)[b]			
			Range	Average	Frequency of exceeding standard	*P*
HR	4973 (Asok Din Daeng Rd)	Super block zone	29.1–185.1	65.0	12/354 (3.4%)	vs HG[NS]
						vs MR**
						vs C**
HG	3498 (Rama III Express way)	New economic zone	30.0–183.8	67.5	20/354 (5.7%)	vs MR**
						vs C**
MR	1364 (Therd Thai Rd)	Conservative zone	23.6–153.9	52.2	4/361 (1.1%)	vs C*
C	938 (Soi Happy Land)	Residence zone	22.2–130.6	47.0	2/366 (0.6%)	—

a: HR = highly polluted roadside area; HG = highly polluted general area; MR = moderately polluted roadside area; C = control area
b: PM = particulate matter diameter <10 μm
$^*P < 0.005$, $^{**}P < 0.001$, NS: non significant by one-way ANOVA compared mean of 24 h average concentration of PM_{10}

0.6% of the total observations, where concentrations exceed the standard (Table 1).

In 2004, school children aged 10–15 years were recruited for the study. Simple random sampling was used in the selection of one elementary school and one junior high school in each area that are close to or within 2 km of a PCD roadside and ambient air quality monitoring station. Total study subjects were 878 school children summed up to 10% of total children in each school. Systematic sampling in odd personal numbers of school students aged 10–12 and 13–15 years living in the four study areas were chosen. Exposure level of air pollution to each child was derived from the monitoring station nearest to his or her school in HR, HG, MR, and control areas. The overall participation rate was high (82%).

Respiratory questionnaires

The prevalence of chronic respiratory symptoms (non-specific respiratory disease: NSRD and persistent cough and phlegm: PCP) were assessed using Thai version of ATS-DLD-78-C.[22] Criteria for NSRD are (i) chronic bronchitis: phlegm production from the chest ≥two times/day for ≥4 days/week for ≥3 months/year for at least 3 years; (ii) bronchial asthma: doctor-diagnosed asthma and still have asthma; (iii) dyspnea and wheezing: wheezing or whistling in the chest apart from cold on most days or nights. Criteria for PCP are (i) persistent cough: cough apart from cold on most days more than 4 days/week for 3 months/year for at least 1 year; and (ii) persistent phlegm: congested in the chest or bring up phlegm, sputum, or mucus apart from cold on most days more than 4 days/week for 3 months/year for at least 1 year.

The questionnaire consists of general information, respiratory symptoms (cough, phlegm, wheeze, chest tightness), and family history. Either of the parents of children completed the respiratory questionnaire after the children were examined for their lung functions (HR = 152, HG = 207, MR = 150, and C = 213 cases).

Lung function test

Lung function was measured by automated spirometry (Pony Graphic 3.3, Cosmed, Italy) using Spiro Thai 2.0 Program, according to the predicted lung function parameters from reference values in the Thai population.[23] Spirometric measurements include forced expiratory volume in 1 s (FEV_1), forced vital capacity (FVC), FEV_1/FVC%, and forced expiratory flow between 25 and 75% expired volumes ($FEF_{25-75\%}$).

Three experienced lung function technicians, who received certifications from the Cardiopulmonary Thailand Association under American Thoracic Society (ATS)[24], performed the spirometry tests in each school after regular calibration of spirometers. Standing height and weight were measured using the standardized equipments and procedures in all schools. Lung function was measured during May–August 2004 (HR = 212, HG = 225, MR = 226, and C = 215 cases). All subjects were trained by technicians for their proper blowing as fast, hard, and long as possible, with at least three spirometry tests in the seated position. The best spirogram with the highest sum of FVC and FEV_1 was chosen for further analyses. Test acceptability was determined by examining the flow and volume time curve as recommended by ATS. FEV_1 and FVC [greater than] 80% predicted were used as the criteria for normal lung function.

Statistical analysis

Differences in the health-related parameters among the areas of HR, HG, MR, and control groups were compared using Yates' chi-squared test.[25] Logistic regression techniques were used to assess the dependency between prevalence of respiratory symptoms, lung function, and independent variables such as responder (mother = 1, father or others = 0), gender (male = 1, female = 0), age, residential years, home size, family members, parental smoking habits (mother or father or both smoke = 1, neither smoke = 0), use of air conditioners (yes = 1, no = 0), and having domestic pets (yes = 1, no = 0). The factor of residential areas as categorical covariate and the control area were used as a reference category. Three dummy or indicator variables denoting areas were included in this model (HR = 1, HG = 2, MR = 3, and C = 4). The regression models were tested using any of the respiratory symptoms and impaired lung function as dependent variables, and the area and others as independent variables listed above. The odds ratios (ORs) and 95% confidence intervals (CIs) were treated as the outcome variables and precision weighting was applied to estimate the degree of association in this study. The data were analysed by the statistical program SPSS version 13.0 (SPSS Inc., Chicago, IL, USA, 2001).

Results

Lung function was measured in 872 (99.3%) of the 878 children aged 10–15 years, as 2 (0.2%) children showed major signs of upper respiratory tract infections and 4 (0.4%) children refused to participate in the study. After evaluating the flow-volume curves applied to the criteria of ATS, data from 844 (96%) children were acceptable for further analyses. Among them 722 (82%) completed the respiratory questionnaire. Table 2 shows the demographic and risk factor characteristics of the 722 children in each study group. Sixty per cent of the ATS-DLD questionnaire was completed by mothers. There were 354 boys and 368 girls, and 37% of them have been living in their areas for more than 10 years. They lived in the same place for at least 6 months before the survey.

Table 3 shows the prevalence of respiratory symptoms and impaired lung function of children. The prevalence of respiratory symptoms was shown to be higher for chronic bronchitis, bronchial asthma, dyspnea and wheezing, persistent cough, and persistent phlegm in the HR, HG, and MR areas than in the C area (dyspnea and wheezing in junior high school students in HR and HG areas, $P < 0.01$). The prevalence of chronic bronchitis, persistent cough, and persistent phlegm were higher significantly in elementary students in HG area compared with those in C area ($P < 0.05$). A significant higher prevalence of any one of the respiratory symptoms was observed in junior high school students in HR and HG areas ($P < 0.01$) and in elementary students in HG area ($P < 0.05$) compared with those in C area. The percentage of impaired lung function in junior high school students, who live in HR, HG, and MR areas, was significantly higher than in the C area ($P < 0.01$). There was no significant difference in the bronchial asthma.

The results of the multiple logistic regression analyses were shown in Table 4. To evaluate the significant factors on any one of the respiratory symptoms or impaired lung function, independent variables such as the responder of ATS-DLD, gender, age, residential years, home size, family members, parental smoking habits, use of air conditioners, domestic pets, and residential areas were included in this model. In children who live in HR and HG areas, the prevalence of respiratory symptoms increased significantly compared with those living in the control area. Family members slightly increased the significance of the prevalence of respiratory symptoms and age slightly increased the significance of the risk of impaired lung functions. Restricted only to the children whose mother completed the ATS-DLD questionnaires ($n = 436$), family members significantly increased the prevalence of respiratory symptoms (OR = 1.20, 95% CI = 1.05–1.37) and age slightly increased the significance of the risk of impaired lung functions (OR = 1.19, 95% CI = 1.07–1.34). Residential areas and family members were associated with the prevalence of respiratory symptoms and age was associated with impaired lung function significantly, whereas factors such as the responder of ATS-DLD, gender, residential years, home size, parental smoking habits, use of air conditioners, and domestic pets were not associated.

Discussion

Children living in highly polluted areas would possibly indicate higher prevalence of respiratory symptoms and impaired lung function than those living in moderately and less-polluted areas. In this study, we categorized the children into eight groups based on area, school type, roadside and ambient monitoring stations and have found that children living in highly polluted areas suffered more frequently with respiratory symptoms and decreased lung functions compared to those children who live in less-polluted areas. Junior high school students in HR area have the greatest impaired lung functions. Both elementary and junior high school students in HR and HG areas illustrated the higher prevalence of respiratory symptoms compared to children in other groups. It is obvious that air pollution affects more on children who have been living for a long time in highly polluted areas of Bangkok than on children who live in less-polluted areas. There were differences in associations between pollutants and respiratory symptoms for elementary students and junior high school students. There may be junior high school students living for a longer period in their polluted areas more than the elementary students. There may be children of younger ages who are sensitive to these respiratory symptoms. These groups correspond with both biological development and the type of care for those families. In addition, we confirmed the observation after controlling other risk factors. There seems to be greater effects of air pollution on the respiratory symptoms and lung function in school children compared to adults as having shown in other cities.[1–12] Our studies also suggested that children who live in highly polluted areas were susceptible to adverse health effects.

Lung function tests for children were performed in the seated position and without nose clip. ATS guidelines[24] suggest that subjects can be tested either seated or standing and a report from school-age children who were tested with and without nose clips found no systematic effect on FEV_1 or FVC.[26] After the flow-volume curve examinations, we found high proportion of valid tests. Therefore, we believed that the lung function tests were performed satisfactorily. There may be an area difference in the proportion of time for the children spending outdoors. Outdoor pollutants may affect them more if they stayed outdoors longer. According to the population density, Bangkok Metropolitan Administration has divided the city into three zones, inner, middle, and outer zone, in accordance with the population density. Khlong Chan Housing Community Station as our control

Table 2 Demographic and risk factor characteristics of children included in analysis, Thailand, 2004 ($n = 722$)

Parameter	Children included in the analysis[a]							
	HR		HG		MR		C	
	Elementary student ($n = 79$)	Junior high school student ($n = 73$)	Elementary student ($n = 111$)	Junior high school student ($n = 96$)	Elementary student ($n = 60$)	Junior high school student ($n = 90$)	Elementary student ($n = 110$)	Junior high school student ($n = 103$)
Mother responder [n (%)]	44 (55.7)	39 (53.4)	60 (54.1)	65 (67.7)	29 (48.3)	65 (72.2)	68 (61.8)	66 (64.1)
Boys [n (%)]	39 (49.4)	27 (37)	59 (53.2)	55 (57.3)	27 (45)	39 (43.3)	57 (51.8)	51 (49.5)
Mean age ± SD[b] (years)	10.6 ± 0.9	13.7 ± 1	10.3 ± 0.9	13.4 ± 1	10.5 ± 0.9	13.5 ± 1	10.6 ± 1	13.6 ± 0.9
Born in Bangkok [n (%)]	68 (86.1)	53 (72.6)	92 (82.9)	89 (92.7)	46 (76.7)	76 (84.4)	98 (89.1)	87 (84.5)
Residential area [n (%)]								
Urban	77 (97.5)	70 (95.9)	111 (100)	95 (99)	58 (96.7)	90 (100)	108 (98.2)	102 (99)
Suburban	2 (2.5)	3 (4.1)	0	1 (1)	2 (3.3)	0	2 (1.8)	1 (1)
Rural	0	0	0	0	0	0	0	0
Residential years [n (%)]								
0–5	20 (25.3)	31 (42.5)	32 (28.8)	24 (25)	19 (31.7)	28 (31.1)	33 (30)	29 (28.2)
6–10	32 (40.5)	21 (28.8)	44 (39.6)	22 (22.9)	22 (36.7)	26 (28.9)	33 (30)	39 (37.9)
>10	27 (34.2)	21 (28.8)	35 (31.5)	50 (52.1)	19 (31.7)	36 (40)	44 (40)	35 (34)
Home size, room [n (%)]								
1	32 (40.5)	29 (39.7)	41 (36.9)	23 (24)	21 (35)	27 (30)	19 (17.3)	23 (22.3)
2–5	36 (45.5)	33 (45.2)	61 (54.9)	66 (68.8)	31 (51.8)	56 (62.1)	84 (76.4)	71 (69)
>5	1 (1.3)	8 (11)	4 (3.6)	5 (5.2)	1 (1.7)	2 (2.2)	6 (5.4)	4 (3.9)
Family members [n (%)]								
1–5	62 (78.4)	44 (60.3)	73 (65.7)	60 (62.4)	29 (48.4)	51 (56.7)	79 (71.8)	74 (71.8)
6–10	8 (10.2)	22 (30.2)	24 (21.6)	26 (27.1)	22 (36.7)	29 (32.1)	27 (24.4)	24 (23.3)
>10	4 (5.1)	6 (8.4)	10 (9)	7 (7.1)	3 (5)	4 (4.4)	3 (2.7)	2 (2)
Parental smoking habits [n (%)]								
Neither smoke	51 (64.6)	42 (57.5)	70 (63.1)	65 (67.7)	35 (58.3)	54 (60)	84 (76.4)	69 (67)
Father only smoke	23 (29.1)	26 (35.6)	33 (29.7)	28 (29.2)	16 (26.7)	33 (36.7)	25 (22.7)	29 (28.2)
Mother only smoke	3 (3.8)	2 (2.7)	5 (4.5)	1 (1)	1 (1.7)	3 (3.3)	0	2 (1.9)
Both smoke	2 (2.5)	3 (4.1)	3 (2.7)	2 (2.1)	8 (13.3)	0	1 (0.9)	3 (2.9)
Use of air conditioners [n (%)]	8 (10.1)	20 (27.4)	22 (19.8)	36 (37.5)	9 (15)	26 (28.9)	60 (54.5)	48 (46.6)
Domestic pets [n (%)]	20 (25.3)	25 (34.2)	42 (37.8)	34 (35.4)	18 (30)	33 (36.7)	33 (30)	35 (34)
History of allergic diseases [n (%)]	15 (19)	18 (24.7)	25 (22.5)	21 (21.9)	7 (11.7)	17 (18.9)	26 (23.6)	24 (23.3)

a: HR = highly polluted roadside area; HG = highly polluted general area; MR = moderately polluted roadside area; C = control area
b: Standard deviation

site, located in the middle zone and HR and HG areas located in the inner zone. The results revealed the association between site conditions and the health effects. The prevalence of respiratory symptoms was higher among children living in HR and HG areas than those children living in other groups. We assumed that children in control area, in the middle zone, low population density, have more chance to play outdoors than those living in busy streets in inner areas. Thus without considering the difference in playing outdoors, there may be even larger difference in the effect of air pollution among the areas. In addition, there may be other potential confounders such as unaccounted differences in socio-economic variables. Lenth *et al.*[17] showed that socio-economic status (SES) affected health conditions. However, most of the parents of the children in this study were considered to be of the middle class and the inclusion of variables such as air conditioners use, home size, family members, and respondents of the questionnaire in the multiple logistic analyses may adjust the remaining effect of SES. In

Table 3 Number and prevalence (%) of respiratory symptoms and impaired lung function in school children, Thailand ($n = 722$)

Area[a] (total number)	Impaired lung function[b]	NSRD[c]			PCP[d]			Any one of the respiratory symptoms[e]
		Chronic bronchitis	Bronchial asthma	Dyspnea and wheezing	Persistent cough	Persistent phlegm	Both of PCP	
HR								
E (79)	22 (28.9)	2 (2.5)	1 (1.3)	4 (5.1)	4 (5.1)	2 (2.5)	0	10 (13)
J (73)	37 (56.1)**	3 (4.1)	4 (5.5)	10 (13.7)**	6 (8.2)*	3 (4.1)	3 (4.1)	16 (22)**
HG								
E (111)	34 (31.5)	9 (8.1)*	4 (3.6)	3 (2.7)	9 (8.1)*	10 (9)*	5 (4.5)	18 (16)*
J (96)	35 (37.2)	3 (3.1)	1 (1)	17 (17.7)**	2 (2.1)	3 (3.1)	0	23 (24)**
MR								
E (60)	16 (27.6)	1 (1.7)	1 (1.7)	2 (3.3)	1 (1.7)	3 (5)	0	6 (10)
J (90)	32 (37.7)	2 (2.2)	4 (4.4)	4 (4.4)	5 (5.6)	3 (3.3)	1 (1.1)	13 (14)
C								
E (110)	38 (34.9)	1 (0.9)	3 (2.7)	2 (1.8)	1 (0.9)	1 (0.9)	0	7 (6.4)
J (103)	34 (34)	3 (2.9)	1 (1)	1 (0.9)	3 (2.9)	3 (2.9)	1 (1)	7 (6.8)

a: HR = highly polluted roadside area; HG = highly polluted general area; MR = moderately polluted roadside area; C = control area; E = elementary student; J = junior high school student
b: Results from spirometry test; obstructive ventilatory defect ($FEV_1 < 80\%$ predicted), restrictive ventilatory defect ($FVC < 80\%$ predicted), mixed obstruction and restriction (FEV_1 and $FVC < 80\%$ predicted), and small airway obstruction or restrictive ($MMEF < 65\%$ predicted)
c: Non-specific respiratory disease, results from the ATS-DLD questionnaire
d: Persistent cough and phlegm, results from the ATS-DLD questionnaire
e: Results from the ATS-DLD questionnaire
*$P < 0.05$, **$P < 0.01$ by chi-squared test compared with control

Table 4 Multiple logistic regression analyses for the association between independent variables, any of the respiratory symptoms, and impaired lung function among school children in Bangkok

Independent variables	Children ($n = 722$)	
	Any of respiratory symptoms OR (95% CI)[a]	Impaired lung function OR (95% CI)[a]
Responder of ATS-DLD	0.63 (0.39–1.01)	1.05 (0.77–1.44)
Gender	0.77 (0.49–1.21)	1.07 (0.78–1.46)
Age	1.06 (0.94–1.20)	1.18 (1.08–1.28)
Residential years	0.97 (0.92–1.02)	0.99 (0.96–1.02)
Home size	0.95 (0.78–1.16)	0.95 (0.83–1.10)
Family members	1.16 (1.04–1.29)	0.94 (0.86–1.03)
Parental smoking habits	0.96 (0.61–1.52)	0.92 (0.66–1.27)
Use of air conditioners	0.78 (0.47–1.28)	1.06 (0.74–1.51)
Domestic pets	0.85 (0.53–1.37)	1.14 (0.81–1.60)
Area[b]		
HR	2.44 (1.21–4.93)	1.41 (0.89–2.22)
HG	2.60 (1.38–4.91)	1.08 (0.71–1.64)
MR	1.57 (0.76–3.25)	0.99 (0.63–1.57)

a: OR: odds ratio, CI: confidence interval
b: HR = highly polluted roadside area; HG = highly polluted general area; MR = moderately polluted roadside areas

addition, the prevalence of some respiratory symptoms, such as chronic bronchitis, dyspnea and wheezing, persistent cough, and phlegm, may be associated with the residential area, which may in turn be associated with low-SES. This could lead to a confounding bias if children with low-SES were probably living in near busy streets. Therefore, if poorer families are unable to afford to live in cleaner areas and as a result their children's respiratory health suffers, this would suggest that PM_{10} is one of the potential mechanism by which SES affects health. Family members were associated significantly with the prevalence of respiratory symptoms. People with weakened immune systems can be especially susceptible to more severe complications, such as bronchial infections. There can be any family members who suffer from allergies, asthma, or other respiratory problems. In addition, they may have immune system problems or illness and smoke inside their houses. Overall, in more than half of the households (60.4%), mothers were the questionnaire respondents. Normally, mothers were more likely to report a symptom or illness than the other questionnaire respondents. However, this study found mother or father or other were not associated significantly with reporting the prevalence of any of the respiratory symptoms. Nature of Thai people likes to take care of their children and to be very familiar. Some children may live with father only or with family senior relatives, because their parents were very busy at work. It is possible that mother or father or the other be equal in raising their children and can give reliable symptoms details.

The percentage of the willingness to participate in our study was high and the children included in the analyses should be reasonably representative of all children of a similar age in Bangkok. In line with the results from previous studies, children with asthma, wheezing, or a positive provocation challenge have a greater variability in lung function than in healthy children.[2]

This work was in the beginning stage of health effect study in Bangkok children. Since, the cross-sectional study was applied, the causal association may not be determined. However, from the results, we could suggest that living in highly polluted areas in Bangkok will lead to the chronic effects on respiratory systems in addition to the acute health effects as reported by previous studies.

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Key Points

- This study was aimed to evaluate the association between air pollution and respiratory health among school children in Bangkok.
- The prevalence of respiratory symptoms and impaired lung function were higher among children living in areas with high pollution than in areas with low pollution.
- Bangkok populations are being adversely affected by air pollution to which they are regularly exposed.
- This has clear implication in public health and regulatory perspectives to protect the vulnerable populations.

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Health effects of respirable particulate matter in Bangkok schoolchildren

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Abstract. The chronic effects of air pollution to Bangkok children were investigated. The lung function and respiratory symptoms of 570 children aged 10 to 15 years were examined during May–August 2004. Three study areas based on the level of PM_{10} obtained from the Pollution Control Department (PCD) ambient monitoring stations were selected as High-polluted area (H), Moderate-polluted area (M) and low-polluted area as a Control (C). Effects of residential area were estimated by the multiple logistic regression analysis. The prevalence of respiratory symptoms increased significantly [odds ratios (95% CI) in H and M are: 3.92 (2.02–7.59) and 2.36 (1.12–5.01), respectively]. There was no significant difference between impaired lung function among H, M and C. Residential location of subjects was associated with the prevalence of respiratory symptoms statistically significant. The other factors such as ATS-DLD responder, gender, age, parental smoking habits, use of air conditioners and possession of domestic pets were not associated with the respiratory symptoms. The prevalence of respiratory symptoms was higher among children living in areas with high- and moderate-pollution than those in an area with low-pollution statistically significant. © 2006 Published by Elsevier B.V.

Keywords: Air pollution; Bangkok; Children; Lung function; Respiratory symptoms

1. Introduction

The high concentration of particulate matters in ambient air is one of the serious environmental problems in Bangkok, particularly in the traffic-congested area. In

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2004, the 24-h average concentrations of roadside total suspended particulate matter, TSP and particulate matter with diameter less than 10 μm, the PM_{10} were about 0.18 mg/m^3 and 78.5 μg/m^3, respectively. Frequently, the level of particulate matters exceeded the National Ambient Air Quality Standard by approximately 8%days. PM_{10} in Bangkok has been associated with serious health effects, such as the increase in hospital admission and mortality . There were some reports on the association of air pollution and respiratory health among traffic policemen and their wives in Bangkok . However, those studies have mainly been conducted in healthy adults groups. It is not clear to what extent such associations would be revealed in children who might be more susceptible to air pollution than adults. However, the chronic health effects in children remain uncertain, particularly in Bangkok children.

2. Material and methods

2.1. Study site and population

Based on the level of PM_{10} obtained from the ambient monitoring stations, site characteristic, traffic volume, season, and wind direction, three areas with elementary and junior high schools were chosen in Bangkok. The annual average of PM_{10} levels in 2003 at Nonsi Withaya School Station located in high-polluted area (H) was 62.5 μg/m^3, at Thonburi Substation Station located in moderate-polluted area (M) it was 53.9 μg/m^3, and at Khlong Chan Housing Community Station located in low-polluted area as a Control (C) it was 45.8 μg/m^3. Schoolchildren aged 10–12 years and 13–15 years from each area were recruited for the study. Total study subjects were 666 schoolchildren determined with 10% precision levels of sampling size .

2.2. Respiratory questionnaires

The prevalence of chronic respiratory symptoms (Non-Specific Respiratory Disease: NSRD, Persistent Cough and Phlegm: PCP) were assessed by ATS-DLD-78-C questionnaires (Thai version).

2.3. Lung function test

Lung function was measured by automated spirometer (Pony Graphic 3.3, Cosmed, Italy) using Spiro Thai 2.0 Program according to predicted lung function parameters from reference values in the Thai population . Lung function was measured during May–August 2004 (H=225, M=226, C=215 cases) according to the Standardization of Spirometry method .

2.4. Statistical analysis

Differences of the health-related parameters among the areas of H, M and C groups were compared using Yates' Chi-square test . Logistic regression techniques were used to assess the dependency between prevalence of respiratory symptoms, lung function and independent variables such as responder, gender, age, parental smoking habits, use of air conditioners and possession of domestic pets. We used the factor of residential areas as categorical covariate and the control area as reference category. The

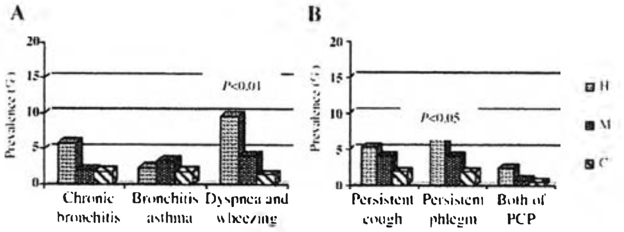

Fig. 1. Prevalence of respiratory symptoms among schoolchildren in Bangkok.

analysis was conducted using the computer program SPSS 13 (SPSS Inc., Chicago, USA, 2001).

3. Results

Lung function was measured in 661 (99.2%) of the 666 children aged 10–15 years. Two children (0.3%) showed major signs of upper respiratory tract infections and three (0.5%) children refused to participate in the study. They were excluded from the collecting of data. After evaluating the flow–volume curves applied to the criteria of ATS, data from 645 (97%) children were then acceptable for the further analysis. 570 subjects (86%) completed the respiratory questionnaire.

The prevalence of respiratory symptoms was shown higher in the H and M area than in the C area (dyspnea and wheezing in H area $p<0.01$, persistent phlegm in H area $p<0.05$) (A,B). The percentage of impaired lung function in children who live in H, M, and C area did not differ significantly. Significantly higher prevalence of any one of the respiratory symptoms was observed in children in the H area ($p<0.01$) compared with those in C area.

The results of the multiple logistic regression analyses were shown in . In children who live in H and M areas, the prevalence of respiratory symptoms increased significantly compared with those living in control area. The risk of impaired lung functions

Table 1
Association between independent variables, any of respiratory symptoms and impaired lung function among schoolchildren in Bangkok

Independent variables	Children ($n=570$)	
	Any of respiratory symptoms [OR (95% CI)][a]	Impaired lung function [OR (95% CI)]a
Responder of ATS-DLD	0.63 (0.36, 1.09)	1.05 (0.73, 1.50)
Gender	0.71 (0.42, 1.17)	1.31 (0.92, 1.86)
Age	1.05 (0.91, 1.21)	1.09 (0.99, 1.21)
Parental smoking habits	0.94 (0.55, 1.60)	0.99 (0.68, 1.43)
Use of air conditioners	0.64 (0.38, 1.09)	1.24 (0.85, 1.80)
Domestic pets	0.87 (0.51, 1.46)	1.35 (0.93, 1.95)
Area[b]		
H	3.92 (2.02, 7.59)	1.01 (0.67, 1.52)
M	2.36 (1.12, 5.01)	0.95 (0.60, 1.49)

[a] OR = odds ratio, CI = confidence interval.
[b] H = high-polluted area; M = moderate-polluted area.

did not differ significantly. Restricted only to the children whose mother completed the ATS-DLD questionnaires ($n=353$), the prevalence of respiratory symptoms increased significantly in the H area (OR=2.79, CI: 1.34–5.86), but not in the M area (OR=1.72, CI: 0.73–4.05). Residential areas were associated with prevalence of respiratory symptoms significantly, whereas those factors of responder of ATS-DLD, gender, age, parental smoking habits, use of air conditioners and possession domestic pets were not.

4. Discussion

The children who live in the high-polluted area frequently suffered from respiratory symptoms. It is possible that air pollution affects on children who live long terms in the high-polluted area of Bangkok more than in children who live in the low-polluted area. The observation was confirmed after the correction of other risk factors such as responder of ATS-DLD, gender, age, parental smoking habits, use of air conditioners, and possession of domestic pets. Because this was a cross-sectional study, we cannot determine the causal association but we may suggest that living in highly polluted areas in Bangkok have chronic effects on respiratory systems of children in addition to acute health effects reported by previous studies.

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We are deeply grateful to the parents and children who participated in our study. The Royal Golden Jubilee (RGJ) Ph.D. Program Thailand Research Fund and National Research Center–Environmental Hazardous Waste Management (NRC–EHWM), Thailand financially supported this research.

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