Appendix 1: additional details of methods and analysis [posted as supplied by author]

1. Healthy group and high-risk for COPD

Healthy group was defined as population who were neither at high-risk for COPD nor COPD. High-risk group referred to non-COPD subjects at high-risk for COPD who had symptoms (cough, expectoration and shortness of breathe), and/or a history of smoking, exposure to dusts/gases/fumes or childhood respiratory tract infection, or a family history of respiratory diseases or a low body mass index (BMI). Subjects with a post-bronchodilar FEV_1/FVC below 70 % were defined as COPD.

2. Questionnaires

The questionnaires include questions on demographics, awareness of the risk factors for COPD (i.e. smoking, occupational history of dusts/gases/fumes, respiratory infection during childhood), respiratory symptoms and previous disease diagnosis, quality of life (12-item short form) and safety for spirometry test. Awareness of COPD and smoking hazards was assessed in a survey among subjects selected from the two communities using systematic sampling strategy by asking their knowledge about COPD and smoking-related diseases (i.e. hypertension, cardiac diseases, lung cancer, and fetal abnormality).

3. Spirometry

Technique to perform spirometry test has been reported elsewhere [1]. Safety and medication were also assessed before spirometry test. All technicians who performed spirometry were well trained and certified before the study start. Micro spirometer (Micro Medical Ltd, Chatham, Kent, UK) that med the instrumentation standardization recommended by ATS-ERS [2-3] statements was used. Calibration check was performed each day prior to the test by applying a 3.000 L syringe, and the validation should be within 3% of full range or 90 ml to ensure the accuracy of spirometer. The subjects was instructed how to perform a correct maneuver. Nose clips or manual occlusion of the nares were used. The subjects were encourage to take breath in as deep as possible, and then exhale as fast as and as long as possible. Acceptable maneuver defined by ATS-ERS was applied [2-3], i.e. (1) free from artifacts (cough during the first second of exhalation, glottis closure that influences the measurement, early termination or cut-off, effort that is not maximal throughout, Leak or obstructed mouthpiece), (2) satisfactory good starts (extrapolated volume less than 5% of FVC or 0.15 L, whichever is greater, apart from visual flow-volume curve), and (3) good ends (a plateau in the volume–time curve or duration of expiratory time more than 6 s). 3 to 8 maneuvers were tested until at least 3 acceptable as well as 2 reproducible spirograms were taken. The largest and next largest values of FVC and FEV1 were within 0.150 L or 5%. The largest value of FVC and FEV1 were reported. In addition, in order to minimize the variation of the results, on each of the four testing days during the four-year-study (one day/per year), the spirometry was performed for each individual participant at approximately the

same time during the day. ATS recommendation for spirometry test was strictly followed; the usage of short and long acting bronchodilator was prohibited within 12 or 24 hours before the test, respectively. In case of common cold, COPD exacerbation or other sicknesses, test was suspended and would be performed within the following 6-8 weeks. If the participants still couldn't make it, their data were kept as empty or missing. Smoking was not allowed at least 1 hour before the test.

1 Zhong N, Wang C, Yao W, Chen P, Kang J, Huang S, et al. Prevalence of Chronic Obstructive Pulmonary Disease in China – A Large Population-based spirometry based Cross-sectional Survey. *Am J Respir Crit Care Med* 2007;176:753-60.

2 American Thoracic Society. Standardization of Spirometry 1994 Update. *Am J Respir Crit Care Med* 1995;152:1107-36.

3 Pellegrino R, Viegi G, Brusasco V, Crapo RO, Burgos F, Casaburi R, et al. Interpretative strategies for lung function tests. *Eur Respir J* 2005; 26: 948-68.

4. Quality control of the study

Considerable efforts were taken to ensure high-quality data in this study.

ATS recommendation for spirometry test was strictly followed. One senior professor was in charge of the quality control of the spirometry test. All technicians and physicians who performed spirometry and questionnaire were well trained and certified before the start of our study. Those technicians and physicians' inter-rater reliability were evaluated through measuring the same individuals, and very good reliability had been observed. Uniform instrument and procedures were used. Calibration check was performed a day before the test by applying a 3.000 L syringe, and the validation should be within 3% of full range or within 90 ml to ensure the accuracy of spirometer. In order to minimize the variation of the results, on each of the four testing days during the four-year-study (one day/per year), the spirometry was performed for each individual participant at approximately the same time during the day. The usage of short and long acting bronchodilator was prohibited within 12 or 24 hours before the test, respectively. In case of common cold, COPD exacerbation or other sicknesses, test was suspended and would be performed within the following 6-8 weeks. If the participants still couldn't make it, their data were kept as empty or missing. Smoking was not allowed at least 1 hour before the test.

To avoid information bias, each participant was assigned a sole number of researches; Registers, questionnaire investigators, technicians performing pulmonary function test, statistician and individuals who provided intervention were pre-divided into separated groups, and each individual group only performed their specific assigned tasks. At the phase of data collection, participants from both communities were invited to the same hospital, receiving questionnaires investigations and spirometry tests respectively. Thus the technicians only knew the number of subjects rather than their communities. Data analysis was completed by a statistician who was not involved in the delivery of interventions and was only told of the code of Communities (Community One and Community Two).

In addition, the randomization was conducted at the community level instead of at the level of health care units with regard to reduce potential contaminations due to the possibility of changing health care units within the same community. The

participants' smoking status was not only based on self-report, but also confirmed by their close family members who live together through telephone calls or interviews to ensure the accuracy of information. The participants were encouraged to comply with the whole process of the study through positive patient-physician communications.

5. Correlation of adjusted FEV1, FEV1/FVC with air pollutants

Further partial correlations analysis showed that year-specific and community-specific averaged FEV1 (both ml and %predicted values) and FEV1/FVC (%) adjusted for confounders and clustering effects was correlated with its averaged level of air pollutants during period from baseline to the spirometry testing, after controlling for community and years. The correlation coefficient ranged from an R of -0.732(P =0.0391) for SO_2 and adjusted FEV1(% predicted), to an R of -0.902(P =0.0020) for SO_2 and adjusted FEV1/FVC (%). Similar results were founded among subgroup analysis (see Table E in appendix 2).