| PM$_{2.5}$ (Per 10 μg/m$^3$ increase) | Urban | Frailty index | Rural | Frailty index |
|-----------------------------------|-------|---------------|-------|---------------|
|                                   | β     | 95%CI         | β     | 95%CI         |
| Overall                           | 0.008 | [-0.011 - 0.027] | 0.026** | [0.013 - 0.039] |
| Country                           |       |               |       |               |
| China                             | -0.007 | [-0.014 - 0.001] | -0.003 | [-0.011 - 0.005] |
| Ghana                             | 0.033 | [-0.068 - 0.134] | 0.022 | [-0.053 - 0.097] |
| India                             | 0.002 | [-0.010 - 0.013] | -0.001 | [-0.009 - 0.006] |
| Mexico                            | 0.030 | [-0.026 - 0.087] | 0.075 | [-0.004 - 0.154] |
| Russian federation                | -0.033 | [-0.192 - 0.127] | -0.091 | [-0.312 - 0.130] |
| South Africa                      | 0.130** | [0.076 - 0.185] | 0.097** | [0.048 - 0.146] |
| Age group                         |       |               |       |               |
| 50-59                             | 0.015 | [-0.008 - 0.037] | 0.021** | [0.006 - 0.035] |
| 60-69                             | -0.003 | [-0.020 - 0.013] | 0.026** | [0.009 - 0.043] |
| 70-79                             | -0.009* | [-0.017 - -0.001] | 0.014 | [-0.003 - 0.030] |
| 80+                               | -0.007 | [-0.036 - 0.021] | 0.015 | [-0.030 - 0.059] |
| Gender                            |       |               |       |               |
| Men                                | -0.000 | [-0.014 - 0.014] | 0.021** | [0.007 - 0.035] |
| Women                              | 0.006 | [-0.017 - 0.029] | 0.027** | [0.012 - 0.042] |

1. We use a three-level hierarchical linear model to evaluate the association between long-term three-year PM$_{2.5}$ exposure and frailty index (continuous). Coefficients are adjusted for age, education, gender, wealth index, fruit and vegetable intake, tobacco use, physical activity level, cooking fuel use, temperature and humidity.

* p<0.05, ** p<0.01
eTable 2 Sensitivity analysis of the association between frailty and 5 years averaged PM$_{2.5}$ concentration.

| The average PM$_{2.5}$ concentrations | Frailty status$^1$ | Frailty Index$^2$ |
|--------------------------------------|--------------------|-------------------|
|                                      | Urban              | Rural             | Urban              | Rural             |
|                                      | OR 95%CI           | OR 95%CI          | $\beta$ 95%CI     | $\beta$ 95%CI     |
| 1 year                               | 1.015 [0.637 - 1.618] | 1.279** [1.164 - 1.406] | 0.006 [-0.020 - 0.032] | 0.021* [0.004 - 0.038] |
| 2 year                               | 0.966 [0.668 - 1.397] | 1.289** [1.173 - 1.417] | 0.005 [-0.016 - 0.025] | 0.024** [0.009 - 0.039] |
| 3 year                               | 1.03 [0.717 - 1.480]  | 1.297** [1.211 - 1.388] | 0.008 [-0.011 - 0.027] | 0.026** [0.013 - 0.039] |
| 4 year                               | 1.05 [0.679 - 1.623]  | 1.299** [1.203 - 1.403] | 0.009 [-0.014 - 0.032] | 0.027** [0.014 - 0.041] |
| 5 year                               | 1.043 [0.687 - 1.585] | 1.300** [1.207 - 1.401] | 0.008 [-0.014 - 0.031] | 0.028** [0.015 - 0.040] |

1. We use a three-level hierarchical linear model to evaluate the association between long-term three-year PM$_{2.5}$ exposure and frailty index (continuous). Coefficients are adjusted for age, education, gender, wealth index, fruit and vegetable intake, tobacco use, physical activity level, cooking fuel use, temperature and humidity.

2. We use a three-level hierarchical logistic model was used to evaluate the association between long-term three-year PM$_{2.5}$ exposure and frailty status (binary). Odds ratios are adjusted for age, education, gender, wealth index, fruit and vegetable intake, tobacco use, physical activity level, cooking fuel use, temperature and humidity.

* $p<0.05$, ** $p<0.01$
| Domain                        | Variables                                                                 |
|-------------------------------|---------------------------------------------------------------------------|
| General health               | Self-rated health                                                         |
| Medically diagnosed conditions| Arthritis; stroke; angina; diabetes; COPD; asthma; depression; hypertension; cataracts |
| Medical symptoms             | ...of bodily aches or pains did you have?                                 |
|                              | ...of a problem did you have with sleeping?                               |
|                              | ...difficulty did you have in seeing (person or object) across the road?   |
|                              | ...difficulty did you have in seeing an object at arm’s length?           |
| Functional activities assessment| ...sitting for long periods                                               |
|                              | ...walking 100 meters                                                     |
|                              | ...standing up from sitting down                                           |
|                              | ...standing for long periods                                              |
|                              | ...climbing one flight of stairs without resting                          |
|                              | ...stooping, kneeling or crouching                                         |
|                              | ...picking up things with fingers                                         |
|                              | ...extending arms above shoulders                                         |
|                              | ...concentrating for 10 minutes                                           |
|                              | ...walking long distance (1km)                                            |
|                              | ...carrying things                                                        |
|                              | ...getting out of home How much is respondent emotionally affected by health condition? |
| Activities of daily living (ADLs) | ...taking care of your household responsibilities                        |
|                              | ...joining community activities                                           |
|                              | ...bathing/washing                                                         |
|                              | ...dressing                                                               |
|                              | ...performing day to day work                                             |
|                              | ...moving around inside home                                              |
|                              | ...eating                                                                 |
|                              | ...getting up from lying down                                             |
|                              | ...getting to and using the toilet                                        |
|                              | ...getting where you want to go (using private or public transport, if needed) |
| Body mass index (BMI)         | BMI                                                                       |
| Grip strength                | Grip                                                                      |
| Gait speed                   | Time (sec) at normal/usual pace over 4 meters                             |