Global lung health: the dangers of mild lung function impairment

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The relationship between low lung function and increased mortality risk, especially in the context of ageing and exposure to noxious particles and gases, was established several decades ago.[1–3] However, it was not until recently that low peak lung function in early adulthood (and thus the vital lung function trajectory that followed, independently of the ageing process) was associated with an increased prevalence, and about a decade earlier incidence, of respiratory and cardiovascular abnormalities, as well as premature death.[4,5]

In *The Lancet Global Health*, MyLinh Duong and colleagues[6] provide further evidence supporting a relationship between impaired lung function and respiratory and cardiovascular abnormalities and death, with data from the prospective urban rural epidemiology (PURE) study—an international study involving 126 359 adults from 628 urban and rural communities located in high-income, middle-income, and low-income countries, thus representing a large and genetically diverse population exposed to a wide variety of environmental risk factors. Participants (aged 35–70 years at enrolment) were followed up for a median period of 7·8 years (IQR 5·6–9·5) to record cardiovascular and respiratory disease events and deaths. Reduced lung function (measured as country-standardised forced expiratory volume in 1 s [FEV_1] values) was associated with increased mortality, incident cardiovascular disease, and respiratory hospitalisations. This relationship was present across all levels of impairment of FEV_1 (hazard ratio for mortality 1·27 [95% CI 1·18–1·36] for mild, 1·74 [1·60–1·90] for moderate, and 2·54 [2·26–2·86] for severe impairment *vs* no impairment). Notably, the population-attributable risks for death or cardiovascular disease from mildly to moderately impaired FEV_1 (0–2 SDs below the population mean; clinically normal) were greater than those of severe FEV_1 impairment (more than 2 SDs below the population mean), contributing substantially more than tobacco use or previous cardiovascular disease to risk. Importantly, this effect was reproduced across different country-income levels, rural and urban communities, and different intercountry risk exposures,[6] which include tobacco smoke and solid-fuel cooking. On the basis of these observations, Duong and colleagues concluded that impaired lung function (in terms of reduced FEV_1) is a strong, independent, and generalisable predictor of mortality, cardiovascular disease, and respiratory hospitalisation events.[6] These observations raise a number of questions.

The first question regards the mechanisms underlying the association between reduced lung function and adverse health outcomes. As noted in our previously published paper,[7] there are different lung function trajectories through life, and we propose that these trajectories are determined by a dynamic and probably cumulative set of gene–environment interactions acting across the lifespan of an individual, which are still poorly defined mechanistically. Within this context, these different trajectories have important health consequences, including an earlier prevalence and incidence of cardiovascular morbidities and premature death;[7] therefore, the genetic (or genomic) factors that govern the abnormal development of the lung might also be associated with the abnormal development or malfunction of other systemic organs. Accordingly, Horikoshi and colleagues[8] reported that the genetic loci associated with birthweight were also associated with the development of adult cardiovascular and metabolic disease.

Further questions, with important health-care implications, arise from the finding that much of the effect on mortality and cardiovascular disease is from FEV_1 within the currently accepted normal clinical levels. Should we still consider mild impairment of FEV_1 to be within the normal range? Should lung function be routinely tested in early adulthood to identify individuals who are at increased risk and offer them targeted health care; and, if so, how will we be able to promote lung health in these apparently healthy individuals? Finally, how should these findings be translated into practice for public health or clinical practice?

We suggest that spirometry—an easy, cheap, and reproducible test—should be used much more often and earlier in order to identify this group of high-risk individuals. In this context, impaired lung function,

particularly in early adulthood, should be considered a canary in a coal mine, used to raise the alert for potential future risks.[9]

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We declare no competing interests.

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