

Air pollution and diabetes: it's time to get active!



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Cardiovascular disease, diabetes, chronic obstructive pulmonary disease, cancers, and other non-communicable diseases are among the leading causes of morbidity and mortality in low-income, middle-income, and high-income countries, and *The Lancet* Taskforce¹ recently made the case for investing in non-communicable disease prevention. Now, in *The Lancet Planetary Health*, Benjamin Bowe and colleagues² report that exposure to PM_{2.5} air pollution is indeed a risk factor for diabetes. In their adjusted models, a 10 µg/m³ increase in PM_{2.5} was associated with increased risk of diabetes (HR 1.15, 95% CI 1.08–1.22). There is the possibility of spurious associations in observational studies, but one of the strengths of Bowe and colleagues' study is the use of negative controls. Physical activity is a risk factor for diabetes, and one of the limitations of Bowe and colleagues' study is the absence of adjustment for physical activity. Whatever the strengths and limitations, Bowe and colleagues' study is another call for action. Liveable cities have been identified as a means of increasing physical activity and decreasing air pollution to help meet the Sustainable Development Goal of reducing premature mortality from non-communicable diseases by a third by 2030.¹ Hereafter, we describe some of the policies and interventions that might actually increase physical activity and decrease air pollution.

The prevailing wisdom in high-income countries is that there are no successful community-wide physical activity interventions.^{3,4} However, one need only look to Latin America to know that this belief is mistaken.⁵ In Colombia, for example, the right to sport and exercise is enshrined in the constitution. The Ciclovía is the flagship programme, where roads are closed to motor vehicles on Sunday mornings and public holidays and are open to individuals for physical activities (figure). The Ciclovía in the city of Bogotá, Colombia, started in 1974 and progressively grew to a weekly programme. An average of more than 1 million people from all walks of life participate in each Ciclovía in Bogotá and the reasons given for taking part include for health, for fun, and to protect the environment.⁵ More than 40% of adult participants report more than 3 h of moderate to vigorous physical activity during a Ciclovía and most participants say they would not exercise if it were not

for the Ciclovía.⁶ The cost of the Ciclovía in Bogotá is mainly covered by the municipality⁵ and the benefits to these “weekend warriors” include a 30% reduction in all-cause mortality risk.⁷ Medellín, Bogotá, São Paulo, and many other cities in Latin America have bicycle sharing schemes and the potential benefits of cycling to and from work include a 40% reduction in all-cause mortality risk,⁸ however, more needs to be done to separate cyclists from other road users and to reduce road traffic deaths in the region.⁹

It is alarming that Bowe and colleagues² found that diabetes risk increased with PM_{2.5} concentrations much lower than those recommended by the WHO air quality guideline value of 10 µg/m³. Motor vehicles are one of the principal sources of PM_{2.5} air pollution and the transition to electric vehicles is urgently needed. This transition is challenging and the improvement of fuel quality is important in the short term. There is some evidence that the greatest reduction in emissions is achieved by reducing sulphur content in fuels.¹⁰ The introduction of policies that guarantee the supply of ultra-low sulphur fuels would also complement the implementation of exhaust particle filters across heavy vehicle fleets because the effectiveness of filters is a function of the average sulphur concentration.¹¹ Polices



Figure: A Ciclovía in Medellín, Colombia, where roads are closed to motor vehicles on Tuesday evenings, Thursday evenings, Sunday mornings, and public holidays

Data from the Institute of Sport and Recreation (INDER) in Medellín, Colombia, suggest that 50 000–90 000 people from all socioeconomic groups take part in the Ciclovías in Medellín every month. There are more than 900 public sport and exercise facilities in Medellín, and INDER estimates that up to 850 000 (34%) of 2.5 million residents use these facilities free of charge every month.

directed at limiting the use of vehicles must also be considered. Pico y placa (ie, rush hour and number plate) in Latin America, the ultra-low emission zone in London, UK, and other rotating driving prohibition schemes could contribute towards the reduction in air pollution, if only in the short term.¹²

More research is required to determine the independent associations of physical activity and air pollution with diabetes and other non-communicable diseases;^{2,13} nonetheless, there is more than enough evidence to justify the implementation of policies and interventions that might actually increase physical activity and decrease air pollution, such as Ciclovías, free sport and exercise facilities, bicycle sharing schemes, electric vehicles, low sulphur fuels, exhaust filters, and driving prohibition schemes.

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1 Nugent R, Bertram MY, Jan S, et al. Investing in non-communicable disease prevention and management to advance the Sustainable Development Goals. *Lancet* 2018; **391**: 2029–35.

2 Bowe B, Xie Y, Li T, Yan Y, Xian H, Al-Aly Z. The 2016 global and national burden of diabetes mellitus attributable to PM2.5 air pollution: a longitudinal cohort study using the Global Burden of Disease 2016 data and methodologies. *Lancet Planet Health* 2018; **7**: e301–12.

3 Baker PR, Francis DP, Soares J, Weightman AL, Foster C. Community wide interventions for increasing physical activity. *Cochrane Database Syst Rev* 2015; **1**: CD008366.

4 Bennie J, Crane O, Cullum A, et al. Physical activity and the environment update. Effectiveness and cost-effectiveness evidence review 2: 'Ciclovía' and street closures, trails and safe routes to schools. 2017. <https://www.nice.org.uk/guidance/gid-phg97/documents/evidence-review-2> (accessed Feb 7, 2018).

5 Sarmiento OL, Diaz Del Castillo A, Triana CA, Acevedo MJ, Gonzalez SA, Pratt M. Reclaiming the streets for people: insights from Ciclovias Recreativas in Latin America. *Prev Med* 2017; **103S**: S34–40.

6 Montes F, Sarmiento OL, Zarama R, et al. Do health benefits outweigh the costs of mass recreational programs? An economic analysis of four Ciclovía programs. *J Urban Health* 2012; **89**: 153–70.

7 O'Donovan G, Lee IM, Hamer M, Stamatakis E. Association of "weekend warrior" and other leisure time physical activity patterns with risks for all-cause, cardiovascular disease, and cancer mortality. *JAMA Intern Med* 2017; **177**: 335–42.

8 Celis-Morales CA, Lyall DM, Welsh P, et al. Association between active commuting and incident cardiovascular disease, cancer, and mortality: prospective cohort study. *BMJ* 2017; **357**: j1456.

9 WHO. Global status report on road safety 2015. Geneva: World Health Organization, 2015. http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/ (accessed June 5, 2018).

10 Cooper E, Arioli M, Carrigan A, Jain U. Meta-analysis of transit bus exhaust emissions. *Transp Res Rec* 2013; **2340**: 20–28.

11 Partnership for Clean Fuels and Vehicles. Opening the door to cleaner vehicles in developing and transition countries: the role of lower sulphur fuels. http://wedocs.unep.org/bitstream/handle/20.500.11822/21551/opening_door_cleaner_vehicles_Summary.pdf?sequence=1&isAllowed=y (accessed June 5, 2018).

12 Cantillo V, Ortúzar J. Restricting the use of cars by license plate numbers: a misguided urban transport policy. *DYNA* 2014; **81**: 75–82.

13 Cepeda M, Schoufour J, Freak-Poli R, et al. Levels of ambient air pollution according to mode of transport: a systematic review. *Lancet Public Health* 2017; **2**: e23–34.