Air Quality and Outdoor Exercise

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Problem Statement

Physical inactivity and exposure to air pollution are important risk factors for death and disease globally (1) (Figure 1). The Environmental Protection Agency (EPA) has developed an Air Quality Index (AQI) and public health advisories associated with increasing pollution levels (2). Measurable reductions of outdoor activity have been documented based on media alerts from EPA health advisories (3). Reduced levels of physical activity have been associated with increased risk of obesity (4), depression (4), and reduced life expectancy (2). Health care providers and their patients could benefit from an analysis of air pollution risks versus reduced health benefits associated with physical inactivity.

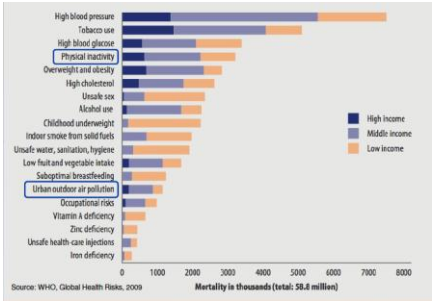

Figure 1: WHO http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_part2.pdf?ua=1

Methods

A focused literature review was undertaken between April 2014 and June 2014 to evaluate the current body of knowledge regarding air pollution and outdoor exercise. PubMed, Google Scholar, and Google search engine were used to identify relevant research.

Air Quality Index (AQI)	PM 2.5	Ozone
Good	0 - 12.0 μg/m^3	0 - 0.059 ppm
Moderate	12.1 - 35.4 μg/m^3	0.06 - 0.075 ppm
Unhealthy for Sensitive Groups	35.5 - 55.4 μg/m^3	0.076 - 0.095 ppm
Unhealthy	55.5 - 150.4 μg/m^3	0.096 - 0.115 ppm
Very Unhealthy	150.5 - 210.4 μg/m^3	0.116 - 0.374 ppm
Hazardous	Above 210.5 μg/m^3	Above 0.375 ppm
	Based on a 24-hour average.	Based on an 8-hour average.

http://www.airquality.utah.gov/aqp/currentconditions.php

Findings

Air quality is measured under the direction of the EPA (5). While many pollutants can be present in air, two common pollutants of concern are PM 2.5 and Ozone. PM 2.5 is made up of solid or liquid particles that may include dust, dirt, soot, and smoke (6). Ozone is produced by nitrogen and organic compounds in the presence of sunlight (7).

There is a small, but identifiable risk to population level exposure to air pollution. Bell et al., 2004 showed that a 10 ppb increase in ozone resulted in a 0.52% increase in daily mortality (8). Bell et al., 2013 also found increased mortality rate of 0.34% (in younger people) and 0.64% (in older people) with each 10 μg/m^3 increase in particulate matter with an aerodynamic diameter ≤ 10 μm (9).

Regular exercise may result in a 30% reduction in all cause mortality with a 35% reduction in cardiovascular disease, coronary heart disease, and stroke (10). Kokkinos et al. showed that the risk of death was 13% lower for every 1 MET increase in activity level (2). In general, the more vigorous the activity, the more METs will be expended (11).

METs for Common Activities

Walking the Dog = 3.5 METS
General Golf = 4.0 METS
Skateboarding = 5.0 METS
General Jogging = 7.0 METS
General Tennis = 7.0 METS
Snowshoeing = 8.0 METS
Mountain Biking = 8.5 METS
Rock Climbing, ascending = 11.0 METS (8)

Conclusions

Although there is a recognized and quantifiable risk of negative health outcome associated with exposure to air pollution, the positive health effects of physical activity outweigh those risks. Based on review of current medical literature, for otherwise healthy people, the large benefit of physical activity outweighs the small risk of exposure to air pollution, even on days with higher levels of pollution. A number of electronic resources, such as Utah's myAir Health App, may help individuals with pre-existing medical conditions make informed choices regarding outdoor physical activity and their unique health profiles.

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