PERSONAL STRATEGIES TO MINIMIZE EFFECTS OF AIR POLLUTION ON RESPIRATORY HEALTH: ADVICE FOR PROVIDERS, PATIENTS AND THE PUBLIC

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INTRODUCTION

The World Health Organization (WHO) recognizes air pollution and climate change as a global threat to human health. **Figure 1** summarizes the health burden of air pollution. There is a need to empower the public with strategies to minimize the effects of air pollution on respiratory health. It is recommended that healthcare professionals (HCPs) should help vulnerable patients protect themselves from the effects of air pollution by suggesting impact-reducing strategies that are backed by scientific evidence.

OBJECTIVE AND METHODOLOGY

To provide recommendations to assist providers and public health officials when advising patients and the public regarding personal-level strategies to mitigate risk imposed by air pollution.

A literature search was performed to identify peer-reviewed scientific evidence that addressed the effectiveness of personal-level interventions to reduce exposure to air pollution, as well as the role therein of Effect Modifiers such as diet and lifestyle.

SUGGESTED STRATEGIES TO MITIGATE THE IMPACT OF AIR POLLUTION

The key elements in mitigating air pollution exposure and protecting respiratory health are summarized in **figure 2**. The population at high risk which include susceptible individuals such as those with chronic pulmonary conditions, at extremes of age and pregnant women, may benefit more from the suggested mitigation strategies.

Figure 1: Health burden of air pollution

- **≈9 million** annual deaths from global air pollution
- **>99% of deaths** due to household air pollution
- **90% of deaths** due to ambient air pollution (low and middle-income contries)
- **25% of premature deaths** associated with air pollution are respiratory in nature

Figure 2: Key elements in mitigating exposure and protecting respiratory health

Mitigation strategies for Ambient exposure
- Face masks
- Active transport
- Low air pollution routes
- Vehicle settings
- Plan exercise
- Local air forecast

Mitigation strategies for Household exposure
- Clean fuel and stoves
- Ventilate homes
- Air cleaners

Effect modifiers: Interventions to modify individual risk factors
- Treat & manage respiratory conditions
- Reduce obesity, promote physical avtivity, smoking cessation and avoidance of second-hand smoke
- Healthy balanced diet

EVIDENCE-BASED* RECOMMENDATIONS TO MINIMIZE PERSONAL EXPOSURE TO AMBIENT AIR POLLUTION

Mitigation strategy	Recommendation and evidence
Use **facemasks** under appropriate circumstances(Evidence grade C)	• Evidence that N95 facemask use has an impact on cardiopulmonary health is limited. Close fitting N-95 masks (defined as filtering >95% of 0.3 µm particles under test conditions) are recommended when exposure to ambient air pollution exceeds recommended levels. • Manufacturers' guidance on correct mask usage, maintenance and fit, including a user seal check should be strictly followed. People with chronic respiratory, cardiac or other conditions that make breathing difficult should use an N95 facemask under strict medical supervision. • Cloth masks are far inferior to N-95 masks.
Shift **from motorized to active transport** (like cycling and walking) whenever possible (evidence grade C)	• The benefits of physical activity with active transport appears to outweigh the risks associated with the increased inhaled dose of air pollutants and a mortality benefit of physical activity even in high air pollution environments. • Infrastructure should be designed to prioritize active transportation and make age-appropriate accommodations.
Choose **travel routes that minimize near-road air pollution** exposure (evidence grade C)	**Provide information on how to minimize exposure to traffic-related air pollution (TRAP) by:** • Prioritizing low air pollution routes, integrated with cycling and walking plans, avoid major intersections, and higher-emission sides of a given road. • Mobile phone applications can help plan the travel routes.

Mitigation strategy	Recommendation and evidence
Optimize driving style and vehicle settings (evidence grade D)	• Maintain optimum vehicle filtration/ventilation and, when in conditions of high air pollution, drive with windows closed and keep the air on internal circulation (reduces in-vehicle particle concentrations by up to 75%).
Moderate outdoor physical activity when and where air pollution levels are high (evidence grade C)	• High risk individuals (those susceptible to cardiopulmonary disease) can reduce their exposure to air pollutants by staying indoors on high pollution days and limiting outdoor physical activity near sources of air pollution. Advise to decrease or stop exercising if concerning symptoms such as coughing, chest tightness or wheezing are noticed.
Monitor air pollution levels (evidence grade D)	• Conflicting data exists on efficacy of Air Quality Index alerts and wearable technology in increasing air pollution-protective behavior. • Patients, especially those with underlying susceptibility, should be aware of air quality alerts and learn to implement appropriate protective behavior on high air pollution days.

EVIDENCE-BASED* RECOMMENDATIONS TO MINIMIZE PERSONAL EXPOSURE TO HOUSEHOLD AIR POLLUTION

Mitigation strategy	Recommendation and evidence
Use clean fuels (evidence grade C), **optimize household ventilation** (evidence grade C) and **adopt efficient cookstoves** where possible (evidence grade D)	• Replacing biomass fuels with cleaner cooking fuels (LPG or electricity) combined with improved kitchen ventilation reduces the risk of acute respiratory infection, reduces respiratory symptoms and shortens the hospital stays versus persistent solid fuel users. • Improved ventilation in cooking areas with cross-ventilation (opening windows or doors), chimneys or exhaust fans significantly improves respiratory health.
Use portable air cleaners as an indoor environmental intervention (evidence grade C)	• Portable air cleaners in homes improve outcomes and HEPA (high-efficiency particulate air) filters also improve symptoms in patients with allergic rhinitis. • Air-cleaning technologies that may emit harmful byproducts should be avoided and air cleaners should be placed where the most vulnerable occupants spend most of their time.

EFFECT MODIFIER'S: INTERVENTIONS TO MODIFY INDIVIDUAL RISK FACTORS TO PROTECT RESPIRATORY HEALTH

Strategy	Recommendation and evidence
Treat and manage respiratory conditions (evidence grade D)	• Maximize control of airway disease through optimized care (e.g. symptom and airflow monitoring, medications, and vaccinations). • Promote primary, secondary and tertiary interventions to attenuate the burden of cardiopulmonary disease associated with air pollution exposure. • Includes reducing obesity, promoting physical activity, smoking cessation and avoidance of second-hand smoke.
Modify diet and supplement with antioxidants or anti-inflammatory agents (evidence grade D)	• A healthy, balanced diet (rich in antioxidants, fiber, protein and polyunsaturated fatty acids) is associated with reductions in the risk of chronic lung diseases known to be compounded by air pollution. • Do not recommend taking any dietary supplements as none has been shown convincingly to have such benefits.

SUMMARY

• The negative impact of air pollution on respiratory health is well documented.

• Mitigation strategies (as tabulated in the article) need to be tailored to the individual dependent on their levels of air pollution exposure, susceptibilities to air pollution exposure, health literacy, financial resources and support networks.

• Evidence-based, practical recommendations should serve as a useful reference for advising patients and the public on individual-level interventions to reduce exposure to air pollution and mitigate the associated respiratory health risks.