

## Journal Articles

in order presented herein

1. Steinemann A. 2020. The Fragranced Products Phenomenon: Air Quality and Health, Science and Policy. *Air Quality, Atmosphere, and Health* (19 Sep).\*

A synthesis of more than a decade of research, this article investigates the science, health, and policy pieces of the fragranced consumer products puzzle. Using data from international studies, the article presents findings on product use and exposure, associated health problems, effects on vulnerable individuals, disability access, societal and economic costs, product emissions and potentially hazardous pollutants, air quality implications, ingredients and disclosure, and preferences for fragrance-free environments.

2. Steinemann A. 2019. Ten questions concerning fragrance-free policies and indoor environments. *Building and Environment* 159:1-8.\*

This article defines and investigates the "fragrance problem," the need for and benefits of fragrance-free policies, and how and why such policies are implemented. In addition, national surveys across the United States (US), Australia (AU), United Kingdom (UK), and Sweden (SE) found that a majority of the general population would prefer fragrance-free rather than fragranced environments, such as workplaces, health care facilities, hotels, and airplanes.

3. Steinemann A. 2017. Ten questions concerning air fresheners and indoor built environments. *Building and Environment* 111:279-284.\*

Air fresheners emit a range of volatile organic compounds, including hazardous air pollutants, but fewer than 10% of ingredients are typically disclosed. Emissions of hazardous pollutants from green or organic air fresheners are not significantly different from regular air fresheners. Across the US, 20.4% of the general population report health problems, such as migraine headaches and asthma attacks, when exposed to air fresheners and deodorizers.

4. Steinemann A. 2019. International prevalence of fragrance sensitivity. *Air Quality, Atmosphere and Health* 12(8):891-897.\*

Across four countries (US, AU, UK, SE), 32.2% of the general population report adverse health effects, such as respiratory difficulties and headaches, from exposure to fragranced consumer products, such as air fresheners and cleaning supplies. In addition, 9.0% of the population have lost workdays or lost a job, in the past year, due to illness from fragranced product exposure in the workplace. Personal estimated costs due to these lost workdays and lost jobs exceed \$146 billion (US) in one year.

5. Steinemann A. 2019. International prevalence of chemical sensitivity, co-prevalences with asthma and autism, and effects from fragranced consumer products. *Air Quality, Atmosphere and Health* 12(5):519-527.\*

Across four countries (US, AU, UK, SE), 19.9% of the general population report chemical sensitivity, 7.4% report medically diagnosed multiple chemical sensitivities (MCS), and 32.2% report fragrance sensitivity. Among individuals with asthma/asthma-like conditions, 42.6% report chemical sensitivity and 57.8% fragrance sensitivity. Among individuals with autism/ASDs, 60.6% report chemical sensitivity and 75.8% fragrance sensitivity. (See Table 1 of

the paper.) For 44.1% of individuals with chemical sensitivity, the severity of health effects from fragranced products can be disabling. Chemical sensitivity is widespread across the four countries, affecting more than 61 million people.

6. Steinemann A. 2016. Fragranced consumer products: exposures and effects from emissions. *Air Quality, Atmosphere and Health* 9(8):861-866.\*

Across the US population, 34.7% report health problems when exposed to fragranced consumer products. Further, 15.1% have lost workdays or a job due to fragranced product exposure in the workplace. Also, 20.2% would enter a business but then leave as quickly as possible if they smell air fresheners or some fragranced product. More than 50% of the population would prefer that workplaces, health care facilities and professionals, hotels, and airplanes were fragrance-free.

7. Steinemann A. 2017. Health and societal effects from exposure to fragranced consumer products. *Preventive Medicine Reports* 5:45-47.\*

Across the AU population, 33.0% report health problems when exposed to fragranced consumer products.

8. Steinemann A. 2018. Fragranced consumer products: sources of emissions, exposures, and health effects in the UK. *Air Quality, Atmosphere and Health* 11(3):253-258.\*

Across the UK population, 27.8% report health problems when exposed to fragranced consumer products.

9. Steinemann A. 2018. Exposures and effects from fragranced consumer products in Sweden. *Air Quality, Atmosphere and Health* 11(5):485-49.\*

Across the SE population, 33.1% report health problems when exposed to fragranced consumer products.

10. Steinemann A. 2018. National prevalence and effects of multiple chemical sensitivities. *Journal of Occupational and Environmental Medicine* 60(3):e152-e156.\*

Across the US population, 25.9% report chemical sensitivity, and 12.8% medically diagnosed MCS. Prevalence of chemical sensitivity has increased more than 200%, and diagnosed MCS has increased more than 300%, in the past decade.

11. Steinemann A. 2018. Prevalence and effects of multiple chemical sensitivities in Australia. *Preventive Medicine Reports* 10:191-194.\*

Across the AU population, 18.9% report chemical sensitivity, and 6.5% medically diagnosed MCS.

12. Steinemann A. 2019. Chemical sensitivity, asthma, and effects from fragranced consumer products: National Population Study in the United Kingdom. *Air Quality, Atmosphere and Health* 12(4):371-377.\*

Across the UK population, 16.3% report chemical sensitivity, and 6.6% medically diagnosed MCS.

13. Steinemann A. 2019 Chemical sensitivity, asthma, and effects from fragranced consumer products: national population study in Sweden. *Air Quality, Atmosphere and Health* 12(2):129-136.<sup>+</sup>

Across the SE population, 18.5% report chemical sensitivity, and 3.6% medically diagnosed MCS.

14. Steinemann A. 2018. Fragranced consumer products: effects on asthmatics. *Air Quality, Atmosphere and Health* 11(1):3-9.\*

Among asthmatics in the US, 64.3% report health problems when exposed to fragranced consumer products. In particular, 41.0% of asthmatics report health problems from air fresheners or deodorizers, 28.9% from the scent of laundry products coming from a dryer vent, and 42.3% from being in a room cleaned with scented products. In addition, 35.4% of asthmatics have lost workdays or a job, in the past year, due to fragranced product exposure in the workplace.

15. Steinemann A. 2018. Fragranced consumer products: effects on autistic adults in the United States, Australia, and United Kingdom. *Air Quality, Atmosphere and Health* 11(10):1137-1142.<sup>+</sup>

Among individuals with autism/ASDs in three countries (US, AU, UK), 83.7% report health problems when exposed to fragranced consumer products. In particular, 62.9% of individuals with autism/ASDs report health problems from air fresheners or deodorizers, 57.5% from the scent of laundry products coming from a dryer vent, and 65.9% from being in a room cleaned with scented products. In addition, 59.4% of individuals with autism/ASDs have lost workdays or lost a job, in the past year, due to fragranced product exposure in the workplace.

16. Steinemann A. 2015. Volatile emissions from common consumer products. *Air Quality, Atmosphere and Health* 8(3):273-281.<sup>+</sup>

Analyses of emissions of 37 consumer products found 556 volatile organic compounds (VOCs), with 230 VOCs classified as toxic or hazardous. Emissions of hazardous air pollutants from products with claims of green, organic, or essential oils were not significantly different from regular fragranced products. All fragranced products emitted terpenes, such as limonene, which were not in fragrance-free versions. More than 97% of all VOCs, and more than 94% of potentially hazardous VOCs, were undisclosed.

17. Steinemann AC. 2009. Fragranced consumer products and undisclosed ingredients. *Environmental Impact Assessment Review* 29(1):32-38.<sup>+</sup>

No law in the US requires disclosure of all chemical ingredients in common consumer products or in fragrance mixtures in those products. Analyses of organic air fresheners and fragranced laundry products found fewer than 2% of VOCs were disclosed to the public on any product labels or safety data sheets. None of the hazardous air pollutants were disclosed, even though they have no safe exposure level.

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