



Increasing Awareness about the Association between Particulate Matter and the Impact of Cardiovascular Health among Disparately-Affected Populations in Michigan



Macey Ladisky, BS; Karen Fuller, MPH; Kristina Dawkins, MPH; Krystal Quartermus, MS, RD; Teri ScorciaWilson, PhD, MPH
Michigan Department of Health and Human Services

INTRODUCTION

Using a collaborative approach, the Michigan Department of Health and Human Services (MDHHS) Cardiovascular Health Nutrition and Physical Activity Section's Heart Disease and Stroke Prevention Unit (HDSP), is working to reduce heart disease and stroke across Michigan by aligning strategies with the national Million Hearts® Initiative. Million Hearts® 2022 has an emphasis on the importance of improving health outcomes for priority populations. One major strategy for those who have had a heart attack or stroke is increasing referral to, and participation in, cardiac rehab facilities and avoiding exposure to particulate matter 2.5 (PM_{2.5}).

METHODS

- Systematic review of literature was conducted.
- PubMed and The Cumulative Index to Nursing and Allied Health Literature (CINAL).
- Search terms: "particulate matter 2.5" "cardiovascular" and "heart".
- Inclusion criteria: English-language articles.
- Exclusion criteria: Non-full-text publications, duplicates, and non relevant articles were excluded.
- The response of PM_{2.5} and cardiovascular health was analyzed.

FINDINGS

- As of 2015, exposure to ambient PM_{2.5} was ranked fifth as the leading global risk factor for morbidity and mortality, closely following hypertension, smoking, high glucose, and high cholesterol.³
- PM_{2.5} contributes to many illnesses, including cancer and lung disease.³ Yet, the greatest measure of death and disability is from cardiovascular events.²
- PM_{2.5} causes worsening respiratory symptoms, more frequent medication use, diminished lung function, recurrent healthcare utilization and increased mortality.¹
- Long-term exposure to PM_{2.5} has been linked to the chronic progression of atherosclerosis as well as the increased incidence of hypertension and diabetes mellitus.⁶
- Short-term acute exposures subtly increase the rate of cardiovascular events within days of a pollution spike.¹

PM 2.5 Emissions in 2014

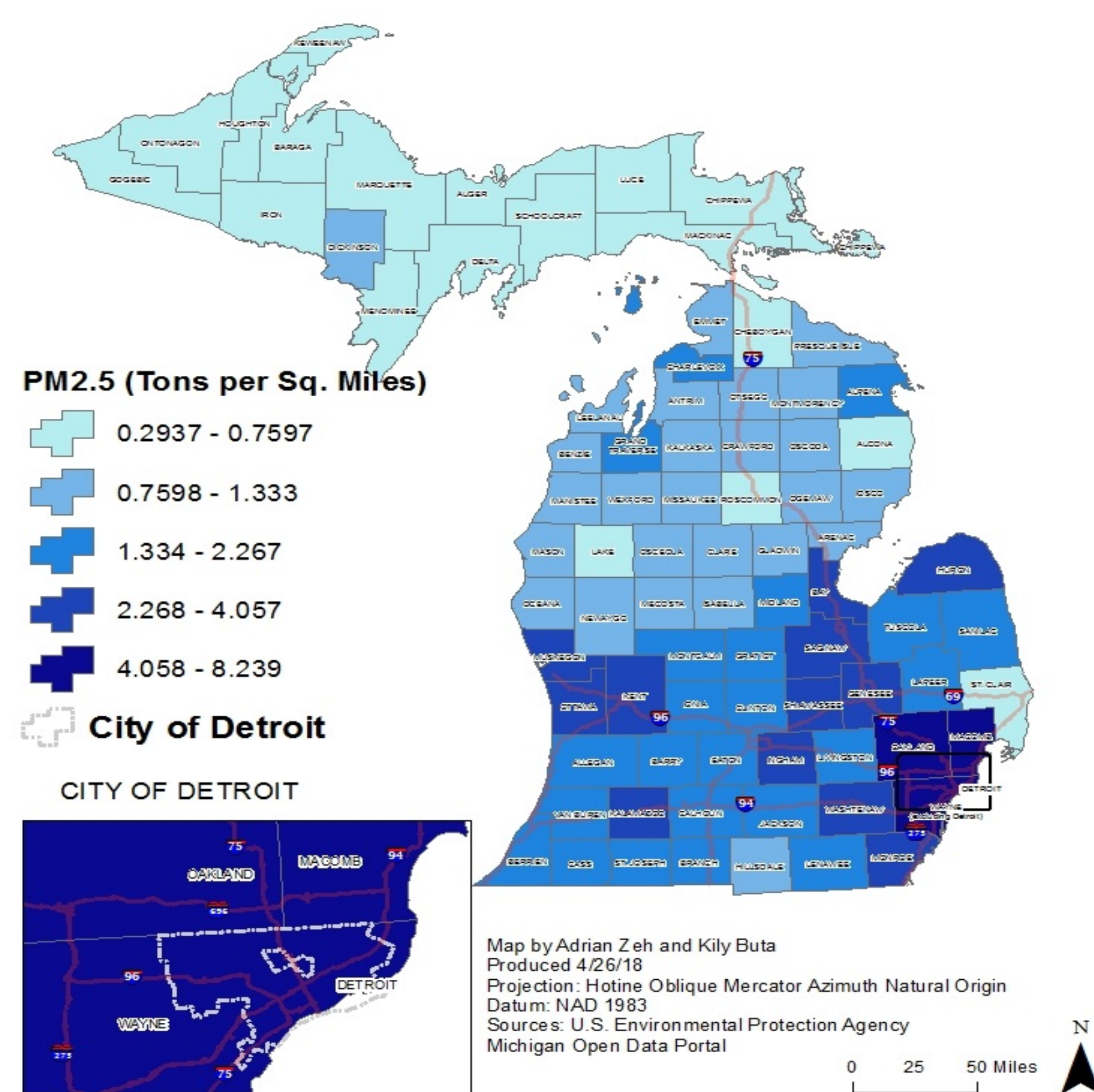


Figure 1: Map of 2014 PM_{2.5} Emissions in Michigan

PM_{2.5} Emissions by Source Sector in Michigan (NEI 2014 v1)

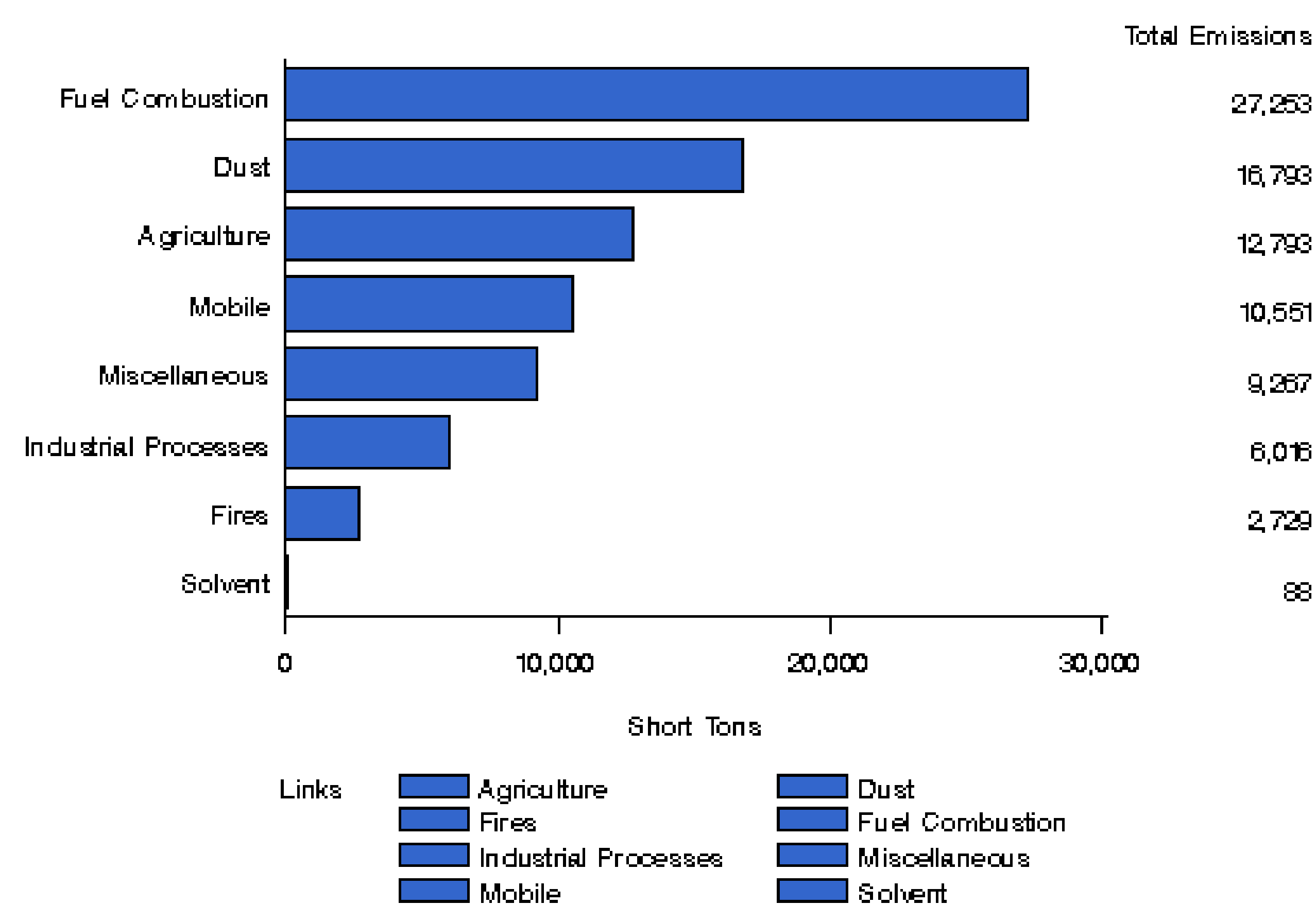


Figure 2: Bar Chart of PM_{2.5} Emission by Source Sector in Michigan

*Image courtesy of Environmental Protection Agency (EPA)

PUBLIC HEALTH IMPLICATIONS

- Reducing air pollution such as PM_{2.5} is considered an environmental justice problem because the worst air quality levels tend to be in areas where lower-income and minority individuals live.⁴
- While the increased daily risks from PM exposures are modest for any individual, the costs of the worldwide healthcare burden are staggering when applied to populations.¹
- Patient education and behavioral modification strategies may contribute to better overall health and a reduction in mortality.¹

CONCLUSION

HDSP is working on increasing education and awareness of PM_{2.5}, and identifying areas across Michigan with the highest readings of PM_{2.5}. HDSP is building partnerships with other sections across MDHHS for this purpose. Our beginning efforts include working with the Tobacco Section to share messages around the harmful effects of PM_{2.5} from tobacco and E-cigarettes, including the health impact on heart disease.

REFERENCES

1. Anderson, J., Thundiyil, J., & Stolbach, A. (2011). Clearing the Air: A Review of The Effects of Particulate Matter Air Pollution on Human Health. *Journal of Medicine Toxicology*, 8, 166-175.
2. Brook, R., & Rajagopalan, S. (2017). "Stressed" About Air Pollution. *131*, 628-631.
3. Cohen, A., Brauer, M., Burnett, R., Anderson, H., Frostad, J., Estep, K., Forouszanfar, M. (2017). Estimates and 25-year Trends of Global Burden of Disease Attributable to Ambient Air Pollution. *Lancet*, 389, 1907-1918.
4. Fair, D. (2016). Issues of The Environment: Addressing Michigan's Air Quality. *WEMU*. Retrieved from <http://wemu.org/post/issues-environment-addressing-michigans-air-quality>.
5. Libby, P. (2002). Inflammation in atherosclerosis. *Nature*, 420 (6917), 868-874.
6. Morishita, M., Thompson, K., & Brook, R. (2015). Understanding Air Pollution and Cardiovascular Diseases: Is it Preventable? *Curr Cardiovascular Risk Rep*, 9(6).