

1 Whereas, Household air pollution is a major health problem and, worldwide, is
2 responsible for more than 3 million deaths a year³; indoor air pollution is strongly linked
3 to asthma⁴; and
4

5 Whereas, Household and outdoor air pollution are social determinants of health and
6 associated with an increased risk of asthma^{5,6}; and air pollution contributes to health
7 disparities in asthma⁷; and
8

9 Whereas, according to the United States Environmental Protection Agency (EPA), a
10 growing body of scientific evidence indicates that, even in large cities, indoor air can be
11 more polluted than the outdoor air⁸; and
12

13 Whereas, Burning natural gas creates nitrogen dioxide (NO₂), particulate matter (PM_{2.5}),
14 carbon monoxide (CO), and other byproducts that contribute to air pollution⁹; and
15

16 Whereas, Nitrogen dioxide levels are significantly higher in homes with gas stoves than
17 homes with electric stoves^{10,11}; and
18

19 Whereas, In a simulation of homes where gas cooking stoves are used without exhaust
20 ventilation hoods, indoor NO₂ levels exceed outdoor air quality standards in 41%-70% of
21 homes¹²; and
22

23 Whereas, The burning of natural gas in stoves releases nitrogen oxides (NO_x) into
24 indoor air and is an important source of household air pollution in the United States¹³;
25 and
26

27 Whereas, According to the EPA, "Breathing air with a high concentration of NO₂ can
28 irritate airways in the human respiratory system. Such exposures over short periods can

³ The World Health Organization. Household air pollution and health. Published May 8, 2018.
<https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health> Accessed
October 5, 2019.

⁴ Breyse PN, Diette GB, Matsui EC, Butz AM, Hansel NN, McCormack MC. Indoor air pollution
and asthma in children. *Proc Am Thorac Soc*. 2010;7(2):102–106. doi:10.1513/pats.200908-
083RM

⁵ Sharma H, Hansel N, Matsui E, Diette G, Eggleston P, Breyse P. Indoor environmental
influences on children's asthma. *Pediatr Clin North Am*. 2007;54:103–120.
<https://doi.org/10.1016/j.pcl.2006.11.007>

⁶ Guarnieri M, Balmes JR. Outdoor air pollution and asthma. *Lancet*. 2014;383(9928):1581-92.

⁷ Forno E, Celedón JC. Health disparities in asthma. *Am J Respir Crit Care Med*.
2012;185(10):1033–1035. doi:10.1164/rccm.201202-0350ED

⁸ Environmental Protection Agency. The Inside Story: A Guide to Indoor Air
Quality. <https://www.epa.gov/indoor-air-quality-iaq/inside-story-guide-indoor-air-quality> Accessed
April 8, 2019.

⁹ Environmental Protection Agency. Natural gas combustion.
www3.epa.gov/ttn/chief/ap42/ch01/final/c01s04.pdf Accessed 2/14/19.

¹⁰ Belanger K, Gent JF, Triche EW, Bracken MB, Leaderer BP. Association of indoor nitrogen
dioxide exposure with respiratory symptoms in children with asthma. *Am J Respir Crit Care Med*.
2006;173(3):297–303. doi:10.1164/rccm.200408-1123OC

¹¹ Mullen NA, Li J, Russell, ML, Spears, M, Less, BD, Singer BC. Results of the California Health
Homes Indoor Air Quality Study of 2011-2013: impact of natural gas appliances on air pollutant
concentrations. *Indoor Air*. 2016;26: 231–245. <https://doi.org/10.1111/ina.12190>

¹² Logue JM, Klepeis NE, Lobscheid AB, Singer BC. 2014. Pollutant exposures from natural gas
cooking burners: a simulation-based assessment for Southern California. *Environ Health
Perspect* 122:43–50; <http://dx.doi.org/10.1289/ehp.1306673>

¹³ Environmental Protection Agency. Nitrogen Dioxide's Impact on Indoor Air Quality.
<https://www.epa.gov/indoor-air-quality-iaq/nitrogen-dioxides-impact-indoor-air-quality> Accessed
October 12, 2019.

1 aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms
2 (such as coughing, wheezing or difficulty breathing), hospital admissions and visits to
3 emergency rooms. Longer exposures to elevated concentrations of NO₂ may contribute
4 to the development of asthma and potentially increase susceptibility to respiratory
5 infections. People with asthma, as well as children and the elderly are generally at
6 greater risk for the health effects of NO₂¹⁴; and

7
8 Whereas, The World Health Organization recognized the associations between cooking
9 with gas stoves, indoor NO₂ levels, and asthma in their 2010 guidelines for indoor air
10 quality¹⁵; and

11
12 Whereas, Children living in a home with a gas cooking stove have a 42% increased risk
13 of current asthma and a 24% increased lifetime risk of asthma according to a meta-
14 analysis¹⁶; and

15
16 Whereas, A year-long, prospective study of NO₂ exposure in 1,342 children with active
17 asthma in Massachusetts and Connecticut found a dose-response relationship between
18 the amount of NO₂ exposure and risk of asthma severity. Every 5-fold increase in NO₂
19 exposure above 6 parts per billion (ppb) was associated with a dose-dependent increase
20 in the risk of asthma severity, wheeze, and rescue medication use¹⁷; and

21
22 Whereas, About one-third of households in the United States cook with gas stoves¹⁸;
23 and

24
25 Whereas, In homes with gas cooking stoves, children whose parents reported never
26 using exhaust fans, or who did not have them available had lower lung function and
27 higher adjusted odds of asthma 1.56 (1.03, 2.32), wheeze, 1.66 (1.16, 2.38) and
28 bronchitis 1.66 (1.05-2.70) compared to children in homes where parents reported using
29 exhaust fans¹⁹; and

30
31 Whereas, A randomized study comparing replacing gas stoves with electric stoves,
32 using a free-standing High Efficiency Particulate Air (HEPA) air-filters, and installing
33 above-stove exhaust hoods found that stove replacement and HEPA filters were
34 effective in reducing NO₂ levels²⁰; and

35

¹⁴ Environmental Protection Agency. Nitrogen Dioxide (NO₂) Pollution. <https://www.epa.gov/no2-pollution/basic-information-about-no2> Accessed April 8, 2019.

¹⁵ Jarvis DJ, Adamkiewicz G, Heroux ME, et al. Nitrogen dioxide. In: WHO Guidelines for Indoor Air Quality: Selected Pollutants. Geneva: World Health Organization; 2010. 5. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK138707/>

¹⁶ Lin W, Brunekreef B, Gehring, U. Meta-analysis of the effects of indoor nitrogen dioxide and gas cooking on asthma and wheeze in children. *Int J Epidemiol.* 2013;42:1724–1737. doi:10.1093/ije/dyt150

¹⁷ Belanger K, Holford TR, Gent JF, Hill ME, Kezik JM, Leaderer BP. Household levels of nitrogen dioxide and pediatric asthma severity. *Epidemiology.* 2013;24(2):320-330. doi:10.1097/EDE.0b013e318280e2ac

¹⁸ US Department of Housing and Urban Development and US Census Bureau, American Housing Survey for the United States. Published 2009. www.census.gov/prod/2011pubs/h150-09.pdf Accessed February 13, 2019.

¹⁹ Kile ML, Coker ES, Smit E, Sudakin D, Molitor J, Harding AK. A cross-sectional study of the association between ventilation of gas stoves and chronic respiratory illness in U.S. children enrolled in NHANESIII. *Environ. Health.* 2014;13:71. doi:10.1186/1476-069X-13-71.

²⁰ Paulin LM, Diette GB, Scott M, McCormack MC, Matsui EC, Curtin-Brosnan J, Williams DL, Kidd-Taylor A, Shea M, Breyse P, Hanse NN. Home interventions are effective at decreasing indoor nitrogen dioxide concentrations. *Indoor Air.* 2014;24:416-424. doi:10.1111/ina.12085

1 Whereas, In Massachusetts, informal questioning found that many parents, health
2 professionals, local health departments, local boards of health, and others did not know
3 about the association between cooking with gas stoves and increased risk of asthma²¹;
4 and

5
6 Whereas, Parents, public health staff, building inspectors, teachers, and many others
7 should know about this association so that they can help protect children from household
8 air pollution produced by gas stoves and reduce the risk of asthma; therefore, be it
9

10 **1. RESOLVED, That the MMS reaffirms the United States Environmental**
11 **Protection Agency finding that increased levels of nitrogen dioxide irritate**
12 **the respiratory system, are associated with asthma aggravation, and, with**
13 **longer exposure, may contribute to the development of asthma; and, be it**
14 **further (HP)**

15
16 **2. RESOLVED, That the MMS recognizes the association between household**
17 **air pollution produced by cooking with a gas stove and the increased risk of**
18 **asthma and greater asthma severity among children living in such**
19 **households; and be it further (HP)**

20
21 **3. RESOLVED, That the MMS will inform its members and, to the extent**
22 **possible, health care providers, the public, and relevant Massachusetts**
23 **organizations that cooking with a gas stove increases household air**
24 **pollution and the risk of childhood asthma and asthma severity; and be it**
25 **further (D)**

26
27 **4. RESOLVED, That the MMS will inform its members and, to the extent**
28 **possible, health care providers, the public, and relevant Massachusetts**
29 **organizations that the risks of household air pollution and asthma**
30 **associated with gas cooking stoves can be mitigated by reducing the use of**
31 **the gas stove, using adequate ventilation, using a HEPA air filter, and**
32 **replacing the gas cooking stove with an electric stove. (D)**

33
34
35 Fiscal Note: No Significant Impact
36 (Estimated Expenses)

37
38 Estimated Staff Effort
39 to Complete Directive(s): No Significant Impact

²¹ Personal communication from T. Stephen Jones and Andee Krasner April 4, 2019.