

## Report 1: Air Quality, Health & Wood Burning

April 2017

### Summary

- The 2016 Oxford Health Matters Survey (OHMS) was conducted for Oxford County Public Health (Public Health) to inform public health program development in new and emerging areas based on the needs and concerns of the community, including topics such as air quality.
- Poor indoor and outdoor air quality can affect breathing and make lung conditions like asthma worse, cause throat irritation, affect heart conditions and increase an individual's risk of stroke.<sup>1,2</sup>
- Children and the elderly, as well as people with pre-existing lung and heart conditions, are most at risk for air pollution-associated health effects.<sup>2</sup>
- One way to judge air quality is using a health protection tool developed to assist people in understanding the effects of air quality on health, the Air Quality Health Index (AQHI).<sup>3</sup>
- Both indoor wood burning and outdoor open-air burning contribute to poor air quality inside and out and can affect health.<sup>2,4</sup>
- Nearly all Oxford County residents (93.8%) felt that local air quality was very good or good.
- One-third of residents (33.9%) were unfamiliar with the AQHI.
- Just over two-thirds (68.6%) of residents never check the AQHI. When those residents with children 12 years and under were asked whether they checked the AQHI before planning their children's activities, 46.4% said they never checked it.
- In the winter, the vast majority of residents (89.3%) did not burn wood indoors.
- In the summer, just over a third of residents (34.5%) burned wood outdoors.
- A significantly higher per cent of rural residents (22.2%) compared with urban residents (5.8%) burn wood indoors. Also, a significantly higher per cent of rural residents (54.5%) compared with urban residents (25.8%) burned wood outdoors.
- Residents were asked only about open-air wood burning, and not burning other materials, such as garbage, which can produce toxic fumes and smoke<sup>5</sup>.

## Background

The 2016 Oxford Health Matters Survey (OHMS) was conducted for Oxford County Public Health by the Institute for Social Research (ISR) at York University. The purpose of the survey was to collect data to help shape public health programs in new and emerging areas based on the needs and concerns of the community. This is the first in a series of reports using data from the OHMS.

As part of Public Health's ongoing commitment to address air quality issues within Oxford County, a series of questions related to air quality, health and wood burning were included in the 2016 OHMS. Public Health is mandated to increase public awareness of health risk factors due to health hazards such as indoor and outdoor air pollutants and, where possible, implement control measures to prevent or reduce exposure to these hazards.<sup>6</sup>

Poor indoor and outdoor air quality can affect breathing and make lung conditions like asthma worse, cause throat irritation, affect heart conditions and increase an individual's risk of stroke.<sup>1,2</sup> Certain groups, such as children and the elderly, are more likely to be affected by poor air quality. For example, children are at higher risk because they have less developed respiratory systems, inhale comparatively more pollution for their size and are more likely to be physically active outdoors.<sup>2</sup>

There are a variety of contributors to poor indoor and outdoor air quality, some of which individuals have control over, and others that can't be changed. Some things that contribute to poor indoor air quality include heating or cooking with a wood burning stove, smoking, or idling a car in an attached garage.<sup>4</sup> Some things that contribute to poor outdoor air quality include vehicle traffic, industrial processes and open-air burning, particularly open-air burning of materials such as garbage, which may produce toxic fumes and smoke.<sup>2,5</sup>

The survey questions included in this report assess:

- Impressions of local air quality and impact of poor air quality on health, e.g., whether poor air quality affects health conditions.
- Familiarity with and frequency of checking the The Air Quality Health Index (AQHI). The AQHI is a health protection tool developed to assist people in understanding the effects of air quality on health<sup>3</sup> (See definitions in the Data Notes for more information on the AQHI).
- Residents' change in their or their children's activities when AQHI is high.
- Residents' frequency of burning wood indoors in winter and outdoors in summer.

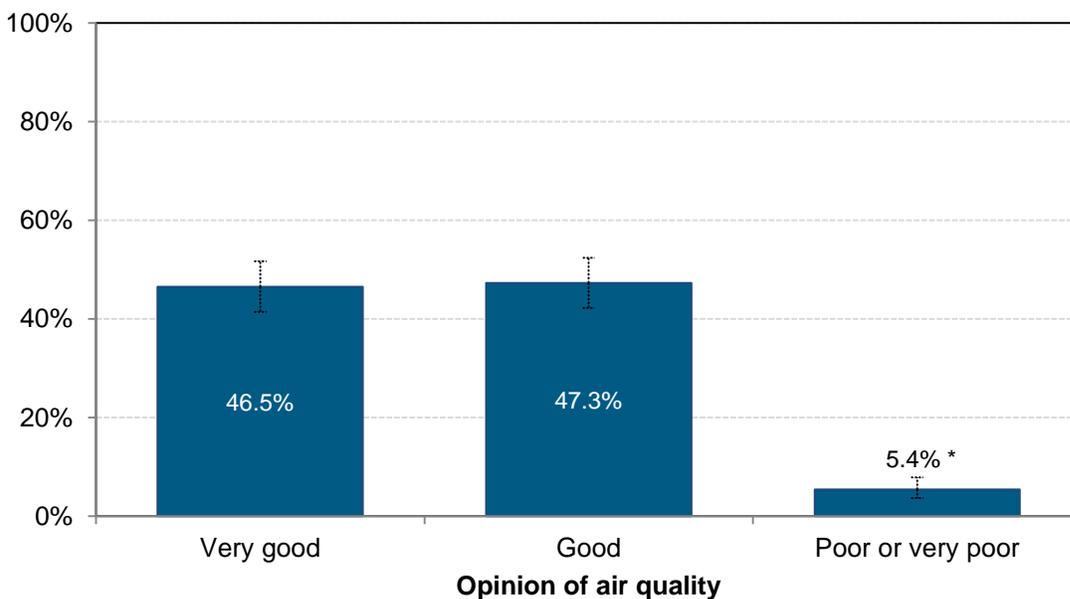
Where possible, results are presented by rural or urban place of residence to explore if behaviours are different by place of residence. Please see Data Notes for for more information about definitions and methods of the survey, sample size, and how the numbers are calculated and displayed.

## Results

### Air Quality and Health

Overall, nearly all residents surveyed (93.8%) classified the air quality in Oxford County as very good (46.5%) or good (47.3%) (Figure 1). Only 5.4% felt that it was poor or very poor. There were no statistically significant differences in answers between rural and urban residents (Appendix, Table 1).

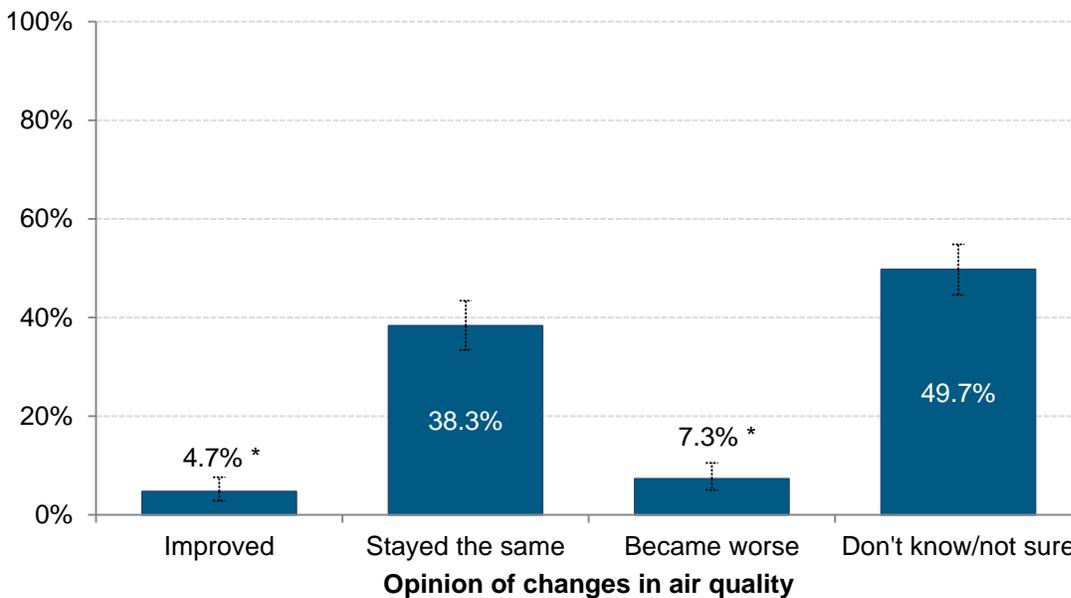
**Figure 1. Residents' opinion of air quality, Oxford County, 2016**



\* High variability results, interpret with caution.

Nearly half of residents (49.7%) said they were not sure or didn't know when asked whether air quality has changed in the past five years (Figure 2). An additional 38.3% said air quality has stayed the same. Only 4.7% of residents felt that air quality had improved and 7.3% felt that it had become worse. When compared by rural or urban place of residence, the results were not statistically significant (Appendix, Table 1).

**Figure 2. Residents' opinions of changes in air quality over past five years, Oxford County, 2016**



\* High variability results, interpret with caution.

Of the residents that answered that air quality was poor or very poor (n=42), 47.6% said that air quality has not affected their or their family's health, while 35.7% said that air quality has affected their or their family's health. Of those who said that poor air quality has affected their or their family's health, some noted that they got asthma or their asthma became worse. Others mentioned that they had difficulty breathing, and several more mentioned other issues, such as chronic obstructive pulmonary disease (COPD), coughing, burning eyes and migraines.

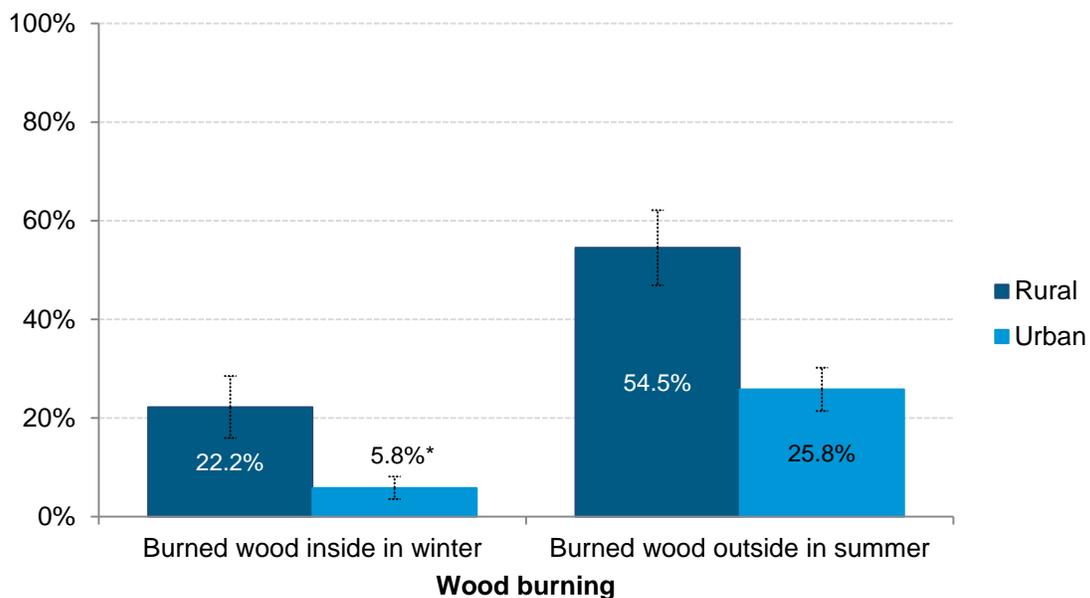
### Air Quality Health Index (AQHI)

Overall, about one third (33.9%) of residents were not at all familiar with the AQHI. Knowledge and behaviour surrounding the AQHI did not differ significantly between rural and urban residents (Appendix, Table 2). Of the residents that stated they were familiar with the AQHI, over two-thirds (68.6%) answered that they never check the AQHI in the summer. Similarly, of those residents with children 12 years and under (n=91), 46.4% never checked the AQHI before planning their children's activities, whereas 20.0% said they checked it always or most of the time. Finally, of those residents who check the AQHI in the summer, 33.0% never or almost never change their outdoor activities, while 27.1% change their activities most of the time (Appendix, Table 2).

## Wood Burning

Overall, 89.3% of residents stated that they did not burn wood inside in the winter; however, 34.5% of residents stated that they did burn wood outside in summer. When further analyzed by rural and urban residence, a significantly higher per cent of rural residents (22.2%) burned wood inside in winter than urban residents (5.8%) (Figure 3). Also, a significantly higher per cent of rural residents (54.5%) stated that they burned wood outside in the summer compared with urban residents (25.8%).

**Figure 3. Residents that burned wood inside or outside, by rural or urban residence, Oxford County, 2016**



\* High variability results, interpret with caution

When those that said yes to indoor wood burning were asked about their frequency of wood burning, 44.1% said they burned wood daily, while the remainder said they either burned wood once a week, or once a month or less. Conversely, when those that said yes to outdoor wood burning were asked about wood burning frequency, 41.2% said they burned wood about once a month, while 39.6% said they burned wood less than once a month.

Significantly more urban (46.9%) than rural (21.5%) residents burn wood less than once a month outside in summer (Appendix, Table 3).

## Considerations

Overall, nearly all residents feel that air quality in Oxford County is very good or good. While this may be positive, it may also explain why only one-third of residents are familiar with the AQHI, and few check the AQHI or change their outdoor activities if the AQHI is high. Almost half of parents of children under 12 do not check the AQHI when planning their children's activities. Given that many residents do not use the AQHI, and that children are more vulnerable to the effects of poor air quality, education and promotion of the AQHI and how to use it could benefit the general public, especially parents.

The majority of residents do not burn wood indoors in winter, and just over a third burn wood outdoors in summer, which can contribute to poor air quality. There are some differences between rural and urban residents, with more rural residents doing more wood burning both indoors and outdoors than their urban counterparts, which may be due to local differences in heating requirements and open-air burning by-laws. One limitation of the survey was that it only asked about wood burning, and not other types of open-air burning (such as burning garbage), which can create an additional health hazard by producing toxic fumes and smoke. Public Health has a role in educating residents and promoting responsible indoor and open-air burning practices.

## Appendix: Tables

**Table 1. Residents' opinions of air quality, by overall sample, rural or urban residence, Oxford County, 2016**

Indicator	Responses	Per cent of residents (95% CI)		
		Overall	Rural	Urban
Opinion of Oxford County air quality	Very good	46.5% (41.4%-51.7%)	54.7% (45.4%-63.6%)	42.2% (36.3%-48.3%)
	Good	47.3% (42.2%-52.4%)	39.9% (31.4%-49.0%)	51.2% (45.1%-57.2%)
	Poor or very poor	5.4% * (3.7%-7.9%)	5.4% * (2.8%-10.2%)	5.4% * (3.3%-8.6%)
Opinion of changes in air quality in the past five years	Improved	4.7% * (2.8%-7.6%)	**	**
	Stayed the same	38.3% (33.5%-43.4%)	41.1% (32.4%-50.4%)	36.9% (31.3%-42.9%)
	Become worse	7.3% * (5.0%-10.5%)	**	**
	Not sure/don't know	49.7% (44.6%-54.8%)	42.2% (33.3%-51.7%)	53.6% (47.5%-59.5%)

\* High variability results, interpret with caution.

\*\* Extremely high variability results, data suppressed.

**Table 2. Residents' familiarity with and behaviour regarding AQHI, by overall sample, rural or urban residence, Oxford County, 2016 (continues on next page)**

Indicator	Responses	Per cent of residents (95% CI)		
		Overall	Rural	Urban
Familiarity with AQHI	Very familiar	11.3% (8.8%-14.4%)	12.8% * (8.5%-18.7%)	10.5% (7.6%-14.4%)
	Somewhat familiar	30.0% (25.5%-34.9%)	29.9% (22.1%-39.1%)	30.0% (24.8%-35.9%)
	Not very familiar	24.8% (20.6%-29.4%)	21.6% * (15.1%-29.8%)	26.5% (21.4%-32.3%)
	Not at all familiar	33.9% (29.0%-39.2%)	35.7% (26.8%-45.8%)	32.9% (27.3%-39.1%)
How often checks AQHI in the summer	Daily	13.5% (10.6%-16.9%)	13.1% * (8.8%-19.0%)	13.7% * (10.1%-18.2%)
	About once a week	10.5% (7.9%-13.8%)	11.6% * (6.9%-18.8%)	9.9% * (7.0%-13.7%)
	About once a month	3.9% * (2.4%-6.1%)	**	4.8% * (2.8%-7.9%)
	Less often than once a month	3.6% * (2.1%-6.3%)	**	2.4% * (1.3%-4.5%)
	Never check	68.6% (63.8%-73.0%)	67.3% (58.4%-75.1%)	69.3% (63.6%-74.4%)

\* High variability results, interpret with caution.

\*\* Extremely high variability results, data suppressed.

Indicator	Responses	Per cent of residents (95% CI)		
		<b>Overall</b>		
How often checks AQHI/smog advisories when planning children's outdoor activities <b>(Only asked of residents with children &lt;12 years, n=91) †</b>	Always or most of time	20.0% * (12.4%-30.7%)		
	Sometimes	14.5% * (8.7%-23.2%)		
	Rarely	19.1% * (12.0%-29.0%)		
	Never/ only if happen to hear of it	46.4% (35.2%-58.1%)		
		<b>Overall</b>	<b>Rural</b>	<b>Urban</b>
How often changed activities when AQHI was high enough to affect health	All of the time	11.3% * (7.3%-17.1%)	**	**
	Most of the time	27.1% (20.5%-34.8%)	22.6% * (13.7%-35.1%)	29.6% (21.2%-39.6%)
	About half of the time	16.6%* (11.8%-23.0%)	22.2% (13.0%-35.3%)	13.5% (8.5%-20.7%)
	Less than half of the time	12.0%* (6.8%-20.3%)	**	**
	Never or almost never	33.0% (25.3%-41.7%)	27.4% * (15.5%-43.9%)	36.1% (26.8%-46.7%)

\* High variability results, interpret with caution.

\*\* Extremely high variability results, data suppressed.

† Sample was not large enough to allow for rural/urban comparison for this indicator.

**Table 3. Residents wood burning behaviour, by overall sample, rural or urban residence, Oxford County, 2016, (continues on next page)**

Indicator	Responses	Per cent of residents (95% CI)		
		Overall	Rural	Urban
Burn wood inside in winter	Yes	10.7% (8.1%-13.3%)	22.2% ‡ (15.9%-28.5%)	5.8%* ‡ (3.5%-8.1%)
	No	89.3% (86.7%-91.9%)	77.8% ‡ (71.5%-84.1%)	94.2% ‡ (91.9%-96.5%)
Frequency of wood burning inside in winter	Daily	44.1% (31.4%-56.8%)	66.2% (51.0%-81.4%)	**
	About once a week	25.4% * (14.3%-36.5%)	**	36.4% * (16.3%-56.5%)
	About once a month or less	30.5% * (18.8%-42.2%)	**	50.0% (29.1%-70.9%)
Burn wood outside in summer	Yes	34.5% (30.5%-38.5%)	54.5% ‡ (46.9%-62.1%)	25.8% (21.4%-30.2%)
	No	65.5% (61.5%-69.5%)	45.5% ‡ (37.9%-53.1%)	74.2% (69.8%-78.6%)
Frequency of wood burning outside in summer	Daily to about once a week	19.3% (15.2%-23.4%)	20.2% * (11.9%-28.5%)	18.4% * (10.7%-26.1%)
	About once a month	41.2% (36.1%-46.3%)	48.3% (37.9%-58.7%)	34.7% (25.3%-44.1%)
	Less than once a month	39.6% (34.6%-44.6%)	21.5% * ‡ (13.0%-30.0%)	46.9% ‡ (37.0%-56.8%)

\* High variability results, interpret with caution.

\*\* Extremely high variability results, data suppressed.

‡ Statistically significant difference between rural and urban groups based on a 95% confidence interval.

## Data Notes

### Definitions

**Air Quality Health Index (AQHI):** The AQHI is a health protection tool developed to assist people in understanding the effects of air quality on health. It consists of a scale from 1 to 10; the higher the number, the poorer the air quality and the greater the health risk. The AQHI represents the relative risk of a mix of three well-known air pollutants that are bad for health, including ground-level Ozone (O<sub>3</sub>), Nitrogen Dioxide (NO<sub>2</sub>) and fine particulate matter (PM<sub>2.5</sub>). People may want to change their outdoor activities, particularly the young, the elderly, or those with breathing problems when the AQHI is high.<sup>3</sup>

**Rural versus Urban Comparisons:** Results are presented for Oxford County as a whole, and where possible, reported by whether the resident lives in a 'rural' or 'urban' area within the County. Although there are a mixture of rural and (sub)urban areas even within the municipalities, for the purposes of this report, they were subdivided as follows:

1. **Rural:** Zorra, East Zorra-Tavistock, Blandford-Blenheim, Norwich and South-West Oxford.
2. **Urban:** Woodstock, Ingersoll and Tillsonburg.

### Methods

The 2016 Oxford Health Matters Survey (OHMS) was conducted for Oxford County Public Health by the Institute for Social Research (ISR) at York University. The purpose of the survey was to collect data to help shape public health programs in new and emerging areas based on the needs and concerns of the community. The survey interviewed by telephone a total of 550 randomly selected households from September to December 2016 with Oxford County residents aged 18 years or older. This resulted in an overall response rate of 44%, which is comparable to other recent Canadian health surveys. If the household included a person aged 18-30 years old, they were selected to answer the survey to increase the number of young people in the sample, as they are typically harder to reach with this type of survey. Otherwise, the person with the first birthday in the household was asked to complete the survey.

The number of responses for various questions may not total 550 due to survey skip patterns and differing amounts of non-response to each question. Responses to questions relevant to individuals are weighted by age and sex to adjust for fewer males and younger individuals completing the survey. This weighting allows the sample to more closely represent the population of Oxford County.

### **Confidence Intervals**

The per cents in brackets that follow each per cent estimate in the tables are the confidence intervals (CIs). Each estimate is based on the survey sample, and a CI is a range of values that describes the uncertainty surrounding an estimate.<sup>7</sup> The 95% CI shows a range of values that have a 95% chance of including the true estimate in the population if the survey was repeated. The larger a 95% CI, the more caution should be used when using the estimate. In graphs, the 95% CI is shown by an error bar. Error bars and CIs that don't overlap show statistically significant differences between groups (e.g., when comparing males and females). Statistically significant results indicate the finding is unlikely to be due to chance alone.

### **Variability**

Throughout the report, some numbers may be suppressed because they are unstable due to high variability, as measured by the coefficient of variation (CV). The CV indicates how precise an estimate is. Higher CVs indicate more variability, which often occurs when there is a small sample size. When the CV is between 16.6 and 33.3, the estimate should be interpreted with caution because of high variability. In tables and graphs, this is shown with an asterisk (\*). Estimates with a CV of 33.3 or more are not reportable and the estimates are replaced with double asterisks (\*\*). Estimates may also not be reportable if they are based on an unweighted denominator of less than 30 or a numerator of less than 5.

### **Missing Responses**

“Don't know” and “Refused” responses are usually removed from the analysis, unless they account for over 5% of the responses. Then they are included as a separate category. Responses are self-reported and may be subject to recall bias (trouble remembering) and social desirability bias (answering in the “expected” or socially acceptable way).

## References

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