TORONTO

STAFF REPORT
ACTION REQUIRED

Path to Healthier Air: Toronto Air Pollution Burden of Illness Update

Date:	April 11, 2014
To:	Board of Health
From:	Medical Officer of Health
Wards:	All
Reference Number:	

SUMMARY

Toronto is on a path to healthier air. Policies and programs implemented at all levels of government over the past decade to reduce emissions have led to downward trends in pollutant emissions, ambient air pollution levels, and related health impacts. However, air pollution still poses a significant burden of illness in Toronto, and there is still much work to be done to reduce emissions that are harmful to health.

In 2004, Toronto Public Health (TPH) reported that air pollution contributed to an estimated 1,700 premature deaths and 6,000 hospitalizations each year in Toronto. Ten years later, air pollution still has a serious impact on health in Toronto, despite improvements in air quality. Air pollution is currently estimated to give rise to 1,300 premature deaths and 3,550 hospitalizations each year in the City.

Over half of Toronto's air pollution is emitted within the City's boundaries, with the biggest local source being motor vehicle traffic, including all types of personal and freight vehicles. On average, these sources account for about 280 deaths and 1,090 hospitalizations in the City each year, or about 42% of premature deaths and 55% of hospitalizations due to air pollution emitted in Toronto.

A renewed focus on reducing emissions from traffic is required to achieve continued improvements to air quality for the City. Such emissions reductions may be attained by achieving mode shift to healthier alternatives, ensuring that potential impacts of major transportation corridors are mitigated, and improving efficiency of goods movement in the City. Ongoing efforts to reduce industrial and small business emissions and reduce natural gas consumption through energy conservation efforts also remain key pillars of an approach to achieve cleaner air in Toronto. Supporting collection of data through air

quality modelling and monitoring will further aid the City and local communities and organizations in identifying additional pollution prevention strategies.

RECOMMENDATIONS

The Medical Officer of Health recommends that:

1. City Council request the Premier of Ontario to urgently allocate funding to support further investment in municipal transit and active transportation infrastructure to reduce air pollution emissions in Toronto and the GTHA;

2. City Council request Metrolinx to ensure that active transportation considerations be included at the initial planning stage for any Big Move infrastructure project;

3. City Council request the Chief Planner and Executive Director of City Planning, in collaboration with the Medical Officer of Health, Director of the Environment and Energy Division, and General Manager of Transportation Services, to examine design alternatives and guidelines for buildings with residential and other sensitive uses near highways so as to minimize the health impacts of air pollution on people in the vicinity;

4. City Council request the Director of the Environment and Energy Division, in collaboration with the Chief Planner and Executive Director of City Planning, the General Manager of Transportation Services, and the Medical Officer of Health, and working with external transportation and environmental experts, to co-ordinate exploration of options to improve efficiency and co-ordination of goods delivered by heavy-duty vehicles across Toronto, including an urban freight strategy;

5. City Council request the Ontario Ministry of the Environment and Ministry of Health and Long-Term Care, in collaboration with Public Health Ontario and Ontario municipalities and local public health agencies, to explore options to share costs and use of mobile air monitoring equipment with advanced capabilities;

6. The Board of Health forward this report to the Canadian Association of Physicians for the Environment, the Canadian Public Health Association, the Canadian Urban Institute, the Centre for Research on Inner City Health at St. Michael's Hospital, the Chief Medical Officer of Health of Ontario, Civic Action, the Clean Air Partnership, the Council of Ontario Medical Officers of Health, Green Communities Canada, the Heart and Stroke Foundation, the Ontario Ministers of Transportation, and Health and Long Term Care, the Ontario College of Family Physicians, the Ontario Medical Association, the Ontario Professional Planners Institute, the Ontario Public Health Association, the Ontario Trucking Association, the Pembina Institute, the Premier of Ontario, the Toronto Board of Trade, the Toronto Cancer Prevention Coalition - Occupational and Environmental

Health Working Group, the Toronto Transit Commission, and the Urban Public Health Network.

Financial Impact
There are no financial implications arising from the adoption of this report.

DECISION HISTORY
In 2004, Toronto Public Health (TPH) reported that air pollution contributed to 1,700 premature deaths and 6,000 hospitalizations in Toronto each year (http://www1.toronto.ca/City%20Of%20Toronto/Toronto%20Public%20Health/Healthy%20Public%20Policy/PDF%20Reports%20Repository/air_and_health_summary.pdf).

This report provides updated estimates of the health impacts of air pollution in the City, using the most recently available air quality and health information. Additional details are contained in a technical report "Path to Healthier Air: Air Pollution Burden of Illness Update", which is available at www.toronto.ca/health/reports.

ISSUE BACKGROUND
In 2004, TPH reported that air pollution contributed to an estimated 1,700 premature deaths and 6,000 hospitalizations in Toronto each year. Since then, evidence has continued to accumulate that common air pollutants including sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), fine particulate matter ($PM_{2.5}$), and ozone (O_3) are associated with adverse health impacts. While most of this evidence focuses on the cardiovascular and respiratory health impacts of exposure to these substances, there is also research linking them to adverse birth outcomes, neurodevelopment, cognitive function, and chronic disease conditions such as diabetes.

This ten year update examines how the burden of illness has shifted over time and establishes which pollutants and sources contribute the most to current health impacts. In the ten years since the last burden of illness report was completed, actions have been taken at all levels of government to improve air quality. Recalculating the burden of illness with new information is an opportunity to reassess policy and program needs in light of today's circumstances.

This report was prepared in consultation with City Planning, the Environment and Energy Division, and Transportation Services.

COMMENTS
Based on the most current information available, TPH estimates that air pollution in Toronto from all sources currently gives rise to 1,300 premature deaths and 3,550 hospitalizations annually (see Table 1). These estimates include the impact of pollution originating in other parts of Ontario and the United States and represent a decrease of 23% in premature deaths and 41% in hospitalizations as compared with 2004 estimates.

Air pollution in Toronto comes mainly from traffic, industrial sources, residential and commercial sources, and off-road mobile sources such as rail, air, and marine sources. Of

these sources, traffic has the greatest impact on health, contributing to about 280 premature deaths and 1,090 hospitalizations each year, or about 20% of all premature deaths and 30% of all hospitalizations due to air pollution. When only pollutants emitted within Toronto's boundaries are considered, the proportions of premature deaths and hospitalizations attributable to traffic are 42% and 55%, respectively.

While these values represent decreases when compared to 2007 estimates (about 440 deaths and 1,700 hospitalizations each year) they still represent an important health impact (see Table 1).

Table 1: Burden of illness attributable to air pollution from sources inside and outside Toronto

Air Pollution Source		Health Outcome	
		Premature Deaths	Hospitalizations
All Sources Combined[1]		***1,300***	***3,550***
Sources in Toronto	Traffic (Cars and trucks)	280	1090
	Mobile off-road (eg.,rail, air, marine sources)	80	280
	Industrial	120	200
	Residential/Commercial	190	400
Sources outside Toronto	Transboundary from United States	390	870
	Transboundary from Ontario	270	740

[1] Totals may not appear to sum correctly as a result of rounding.

The burden of illness findings focus on the premature deaths and hospitalizations identified above. However, the impacts of air pollution on health also include less severe effects such as chronic bronchitis and asthma symptom days, visits to physicians, and school and work absences.

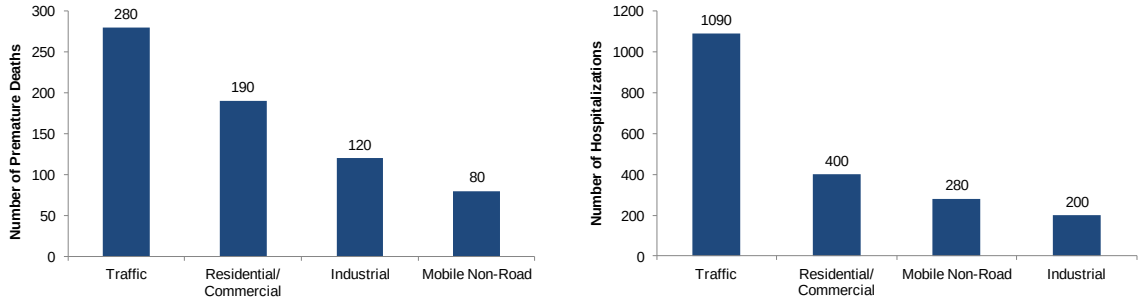
While this study did not directly calculate the number of health outcomes for these more common health outcomes, a sense of their relative magnitude can be obtained for the traffic-related health outcomes. Using the updated estimates for premature death and hospitalization numbers for traffic, the other health outcomes can be scaled from a 2007 report on traffic-related pollution in Toronto that considered all outcomes including premature deaths and hospitalizations. The result is that air pollution in Toronto from traffic sources may contribute to 800 episodes of acute bronchitis among children, 42,900 asthma symptom days (also mostly among children), 43,500 days where respiratory symptoms such as chest discomfort, wheeze, or sore throat would be reported, and 128,000 days when people would stay in bed or otherwise cut back on normal activities as a result of air pollution.

Pollutants and Sectors that Contribute to the Burden of Illness

Five air pollutants were considered in the calculation of the burden of illness from air pollution in Toronto. When the proportion of the burden attributable to each individual pollutant is considered, NO_2, $PM_{2.5}$, and O_3 contribute the most to cardiovascular and respiratory ill health. They account for about 13%, 69%, and 14% of premature mortality and about 35%, 33%, and 29% of hospitalizations, respectively.

Figure 1 shows the distribution of premature deaths and hospitalizations arising from air pollution emitted within the City's boundaries by source. The biggest local source is traffic, which accounts for about 280 premature deaths and 1090 hospitalizations each year in Toronto, which translates to 42% of deaths and 55% of hospitalizations arising from air pollution emitted within Toronto's boundaries. Traffic sources include all types of on-road vehicles such as personal vehicles and freight trucks. Residential and commercial sectors are the next most important local contributors to health impacts from air pollution, accounting for about 190 premature deaths and 400 hospitalizations (or 28% of deaths and 20% of hospitalizations arising from pollution emitted in Toronto). The main source of emissions from residential and commercial properties is combustion of natural gas to heat homes and buildings, as well as heating water.

Figure 1: Estimated Number of Premature Deaths and Hospitalizations Attributable to Air Pollution Emitted in Toronto by Source, Toronto, 2009



Prepared by: Toronto Public Health

Based on emissions reported to the National Pollutant Release Inventory (NPRI), industrial sources account for about 120 premature deaths and 200 hospitalizations (or 18% of deaths and 10% of hospitalizations arising from pollution emitted in Toronto). Finally, mobile non-road sources such as emissions arising from rail and air traffic contribute about 80 premature deaths and 280 hospitalizations (or 12% of deaths and 14% of hospitalizations due to pollution emitted in Toronto).

Next Steps to Achieve Healthier Air

The transportation sector remains a key contributor to emissions that cause harmful health impacts. Reducing emissions from this sector means tackling issues such as vehicle dependence, the impacts of highways and truck traffic, and vehicle performance.

Mode shift

Emissions from traffic will decrease if people have viable options to use less polluting modes of transportation, including walking, cycling, and taking transit. Encouraging more walking and cycling depends on investing in safe, connected infrastructure such as sidewalks, bike lanes, and pedestrian and bike paths that enable pedestrians and cyclists to be adequately separated from traffic. It can also include strategies to achieve speed reduction, traffic signal retiming to improve flow of all modes, and designing intersections with pedestrians and cyclists in mind. City Planning and Transportation Services are jointly developing "Complete Streets Guidelines" for the City of Toronto, which will help ensure that all users are considered when roads are newly built or reconstructed.

Efforts must also be made to improve transit, so that those making longer trips have a viable alternative to driving. Metrolinx, an agency of the provincial government, has a mandate to implement "The Big Move", a regional transportation plan for the Greater Toronto and Hamilton area. The plan calls for $50 billion in investment over 25 years. Sixteen billion of this is currently funded through senior government commitments, while the remaining $34 billion in transportation improvements remains unfunded at the time of preparation of this report.

With sufficient and appropriately directed funding, The Big Move could offer opportunities to re-engineer the way people travel around the region, encouraging not only transit use, but also active transportation. Currently, 25% of the funding is set aside for local transportation initiatives including transit and road improvements. To ensure that active transportation is adequately funded, a significant portion of this local funding should be dedicated to walking and cycling projects. As well, active transportation considerations should be integrated into all aspects of planning, funding, and design for each of the Big Move projects.

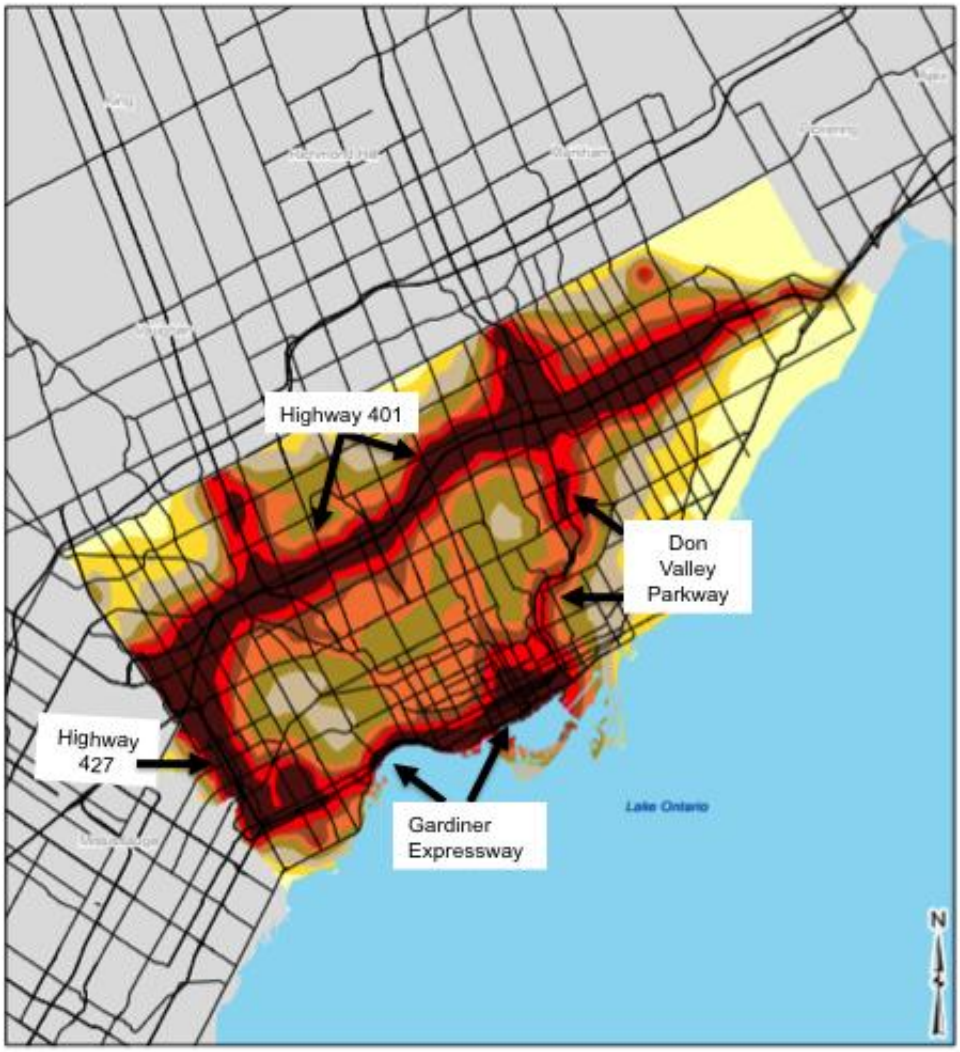
Highways

Some of the highest levels of air pollution in the City of Toronto occur along the major highways. Figure 3 shows the relatively high concentrations of NO_x estimated to occur along the City's major highways including Highway 427, Highway 401, Highway 400, the Don Valley Parkway, and the Gardiner Expressway. In this figure, the darker colours represent higher concentrations of NO_x. While the figure is based on older (2006) data, the overall patterns in emissions are expected to be the same today. Recent studies conducted in two Toronto neighbourhoods examining both ambient air pollution and related health risks arising from local levels of air pollution found both to be highest near major highways.

In some jurisdictions, efforts have been made to encourage mitigation measures for new developments near highways. For example, in Halton, draft land use compatibility guidelines require that an assessment be completed if a sensitive use falls within 150 metres of a major highway or within 30 metres of a major arterial, and development proponents must demonstrate mitigation measures to address such land use compatibility issues.

In Toronto, efforts to increase density and accommodate new residents may mean that even more buildings will be planned for areas near busy highways. There is some evidence that strategies exist to mitigate impacts of air pollution from busy highways in dense urban areas. These may include building design and placement that ensures adequate airflow around tall buildings, locating the most sensitive uses in mixed-use developments away from the roadside, and ensuring that the closest buildings to the highways "face" away from highways. As new developments are planned for Toronto, it is useful to explore opportunities to implement design alternatives that could minimize the impacts of air pollution from highways on the people who use nearby buildings.

Figure 3: NO_x levels across the City of Toronto, 2006



Source: Adapted from Golder Associates, 2011

Vehicle Performance

While Canada has historically aligned its vehicle emissions standards with those of the United States, TPH has previously advocated for more stringent standards to achieve meaningful reduction in emissions. Additional gains may also be achieved from clean

vehicle technologies such as hybrids and electric vehicles. Such advocacy may be more effective if undertaken in partnership with other major urban centres and stakeholders across North America. TPH supports a March 2014 recommendation to Toronto's Parks and Environment Committee that Toronto should advocate for significant and timely improvements in standards for vehicle fuels and engines.

Heavy Trucks

A large part of highway traffic is truck traffic, and heavy trucks have a disproportionate impact on air quality. In 2009, heavy vehicles made up just 1.5% of Canada's vehicle fleet, but according to data from Environment Canada, they were responsible for almost 80% of $PM_{2.5}$ emissions and over half of NO_x emissions from vehicles in Ontario. Additional measures are required for heavy vehicles, which have long lifetimes, meaning that vehicles with older, polluting technologies remain on the road even as improved standards are phased in for newer vehicles.

In their 2014 report *Greening the Goods*, the Pembina Institute released[2] a set of recommendations aimed at moving goods more efficiently and with less pollution in the City of Toronto. The report outlines that efficiency in goods movement is diminished by traffic congestion in the City and a lack of co-ordination across clients receiving goods that results in multiple, overlapping deliveries within the same neighbourhood. Efficiency is also limited by lack of collaboration among truck operators. Pembina reports that empty trucks represented a full 37% of trips surveyed.

Pembina recommends several strategies to improve the efficiency of goods movement in Toronto and reduce emissions of both air pollutants and greenhouse gases. For example, an urban freight strategy could improve the efficiency of deliveries in the city. Such a strategy could consider ideas such as off-peak deliveries, better on-street parking for truck loading, and use of advanced technologies that combine on-road data with mapping systems to improve delivery efficiency. Pembina also describes how neighbourhood freight forums may bring together fragmented and independent businesses and clients to review and potentially co-ordinate their transportation practices. This may be especially useful for planning consolidated and off-peak deliveries in areas where congestion, road space management, and air quality issues are of concern. Finally, Pembina outlines additional research needed to help build the case for clean vehicle incentive programs and emissions fees policies.

These ideas warrant further exploration. If supported by appropriate partnership between the City of Toronto and other agencies, they have the potential for multiple benefits including healthier air, fewer greenhouse gas emissions, and less congestion in the City.

Industrial Sources

While emissions of SO_2 and NO_2 reported to the NPRI have decreased by 30% and 17% respectively across Canada between 2008 and 2012, air pollution from large industries still contributes to 18% of premature deaths and 10% of hospitalizations from air

[2] *Greening the Goods* is in press at the time of writing and expected to be public before this report's release.

pollution emitted in Toronto. These are likely improvements compared with a decade ago. NPRI reports that significant reductions in emissions have been achieved from a number of sources including base metal smelters, manufacturing facilities, and coal-fired electricity generating stations. The reasons include process efficiencies, facility closures and production decreases.

The NPRI collects information from large emitters across Canada, such as factories, electricity generation facilities and wastewater treatment plants. Small and medium-sized facilities, which represent the majority of facilities in Toronto, are not required to report to the NPRI. From this perspective, the proportion of the burden of illness attributed to industrial processes may currently be underestimated.

ChemTRAC is a City of Toronto program that requires local businesses to track and report on the manufacture, process, use and release of 25 priority substances. As of 2013, data collection is fully phased in and provides information that will support emissions reduction from smaller businesses across the City.

ChemTRAC is helping to identify substances of concern as well as the location of sources, which can in turn inform and support pollution prevention programs for specific substances, geographic areas, source types or industrial processes. The program also provides new data on industrial and commercial sources of pollutants and will be used to support future local air quality modelling studies.

Finally, tracking and reporting to the ChemTRAC program helps businesses identify the major sources of chemicals in their facility. With the major sources identified, businesses can develop plans to reduce the use and release of these substances in their facilities. TPH is assisting businesses on this by providing them with supports to green their operations through pollution prevention and innovation.

Commercial and Residential Sources

Emissions attributed to the residential and commercial sectors arise almost entirely from combustion of natural gas. Energy conservation is a primary method for reducing natural gas use. There is evidence that efforts to reduce natural gas use are having a positive impact. The Environmental Commissioner of Ontario (ECO) concluded that Enbridge Gas and Union Gas achieved commendable natural gas savings in 2012 (ECO, 2013) and the City of Toronto reported a 3.5% decrease in natural gas consumption in 2011 compared with 1990 levels.

However, these reductions may not be translating directly into air quality improvements in more recent years. The City also reported that NO_x emissions attributable to natural gas have remained relatively stable between 2004 and 2011 (City of Toronto, 2013). The report suggests that this may be a result of increased reliance on natural gas as an energy source since the closure of Ontario's coal-fired power plants.

Energy conservation efforts have been ongoing in the City over the past decade through programs and activities that target various building types and energy users. The Toronto

Green Standard applies higher energy efficiency requirements for new construction beyond the Ontario Building Code. Other City programs that target building energy conservation and provide financial assistance include: Tower Renewal efforts, Home Energy Assistance Toronto, the Better Building Partnership, Eco-Roof promotion, Enwave Energy Corporation's Deep Lake Water Cooling, Toronto Solar Neighbourhoods, Live Green Toronto, and a number of Toronto Hydro energy efficiency programs and projects supported by the Toronto Atmospheric Fund.

In addition, programs such as Leadership in Energy and Environmental Design (LEED) and ecoENERGY encourage the adoption of measures that decrease energy requirements in building and homes across Toronto. LEED is a green building rating system, administered by the Canada Green Building Council. In particular, the LEED program for existing buildings (called LEED EB:OM) enables buildings to identify ways to reduce energy use – and at the same time encourages adoption of sustainable modes of travel. In the past, Natural Resources Canada's ecoENERGY programs included guidance and funding to help homeowners reduce their energy consumption.

The ECO suggested that there may be some saturation of residential energy conservation initiatives. However, the report indicated that there is still potential to improve energy efficiency in larger commercial buildings where costs may be a key motivator to reduce consumption and there is room to improve the technical standards for the Ontario building code by restricting the use of trade-offs that reduce the level of energy performance of the building envelope.

Air Toxics

While the common air contaminants are the focus of this report, there is another class of air pollutants that may affect the health of Toronto residents: air toxics. These are substances for which exposure over a long time is associated with the development of cancer, reproductive effects or birth defects. Examples of air toxics include benzene, tetrachloroethylene, and lead.

Canada-wide, emissions of air toxics from large industrial emitters are decreasing over time. The total reported releases of toxics included in the NPRI decreased 23% between 2008-2012. In June 2014, TPH will release its annual ChemTRAC report. For the first time, the TPH report will include information from all sectors required to report.

While the focus of ChemTRAC is on air toxics, it also includes the common air contaminants. Like many measures to address air pollution, it is likely to have co-benefits for reducing both common air contaminants and air toxics.

Communicating About Health Risks from Air Pollution

The Air Quality Health Index (AQHI) helps people protect themselves from air pollution by telling them when it is safe to be active outdoors or when they should reduce or reschedule activities. The AQHI measures air quality in relation to health on a scale from 1 to 10. The higher the number, the greater the health risk associated with the air quality. Five categories are used to describe the level of health risk associated with the index

reading (e.g. Low (1-3), Moderate (4-6), High (7-10) and Very High (10+)). The AQHI provides a special set of messages for people most sensitive to air pollution (eg., people with heart and lung conditions) and provides readings every hour and maximum forecast values for the day, night and following day.

Although air quality may have improved since the AQHI was piloted in 2007, there are still days and times when pollution presents a significant risk. An analysis by Public Health Ontario found that across Ontario, on most days the AQHI was in the moderate risk category. In this category, excess daily mortality risk ranged from 2.6% to 6.8%, suggesting that excess deaths still occur even at these moderate AQHI values. Those with underlying cardiac or respiratory conditions are particularly at risk.

It is important that the AQHI continues to be promoted alongside messaging that reminds people of the potential health impacts of poor air quality. This enables all residents, and especially those at most risk to reduce exposure during times when health risks may be elevated.

Addressing Local Air Quality Health Concerns

Burden of illness estimates represent averages for the City as a whole. Because there is considerable local variation in air pollution concentrations across the city, tracking the emissions and concentrations of air pollution in neighbourhoods is important in helping to understand the health implications of local decisions and activities, and in setting priorities for pollution prevention. Ideally, this could be done through a combination of air quality modelling and monitoring.

Local air quality studies carried out by the Toronto Environment and Energy Division in collaboration with TPH are modelling studies that examine the spatial distribution of health risk. Each one supports identification of localized issues, and as more of them are completed, patterns in emissions or risk which emerge will also help shape Toronto's future air quality agenda. The two studies already completed suggest a consistent impact from high-volume highways. Community facilitators will help local residents, community groups, business, and industry in these areas tackle specific air quality concerns identified through these studies, and identify and undertake actions more generally to improve air quality and create a more sustainable community.

Air quality monitoring is useful because it provides information about actual concentrations in a specific location, and also allows investigation of trends in air quality over time. Monitoring equipment is expensive to purchase, and must be maintained regularly. Most air quality monitors measure air quality at only one location. In Toronto, there are four monitoring stations that measure the most common air pollutants. They cannot provide information about air pollution concentrations at other locations, or about where the air pollution is coming from.

Recent advances in air monitoring research suggest that an inexpensive air-quality monitor may be available within a few years. The technology is under development at the University of Toronto and would measure pollutants such as fine particulate, NO_x, VOCs

and CO. Once this technology becomes available, it will offer more opportunities to conduct monitoring to gather evidence in support of local health and environmental concerns. It would be useful for TPH to have access to such equipment, to help in investigating local concerns and complaints, track changes in air quality associated with various projects and pollution prevention efforts, and to validate modeled estimates such as those being produced by the local air quality studies, as well as any measurements that may be collected by the community.

There is considerable interest in access to monitoring equipment among jurisdictions in and around the GTHA, including TPH. Because monitoring can be expensive, and to extend the scope of pollutants that can be measured, it is useful to explore sharing costs and use of a more sophisticated mobile monitor among area local public health agencies, municipalities, Public Health Ontario, and the Ontario Ministry of the Environment.

On the Path to Healthier Air

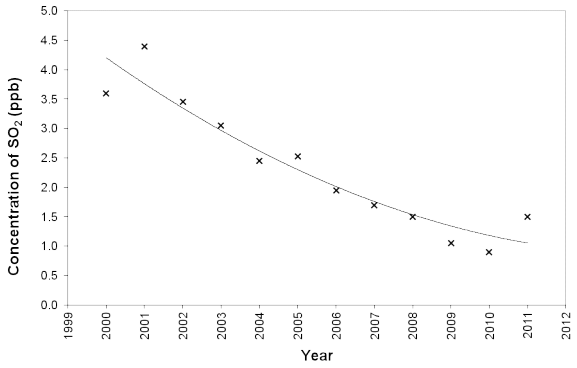
The updated estimates of 1,300 premature deaths and 3,550 hospitalizations attributable to air pollution in Toronto each year represent decreases of 23% and 41% compared to 2004 estimates. These decreases are directly related to improvements in air quality that have been achieved for key pollutants in Toronto since 2000. Average levels of four out of five pollutants have decreased substantially in Toronto (See Figure 4).

Between 2000 and 2011, ambient levels of SO_2 decreased by 79% and levels of NO_2 decreased by 36%. Between 2001 and 2011, levels of CO decreased by 78%, and between 2003 (the first year $PM_{2.5}$ was monitored) and 2011, ambient levels of $PM_{2.5}$ dropped by 30%. On the other hand, levels of O_3 increased by 10% between 2000 and 2011.

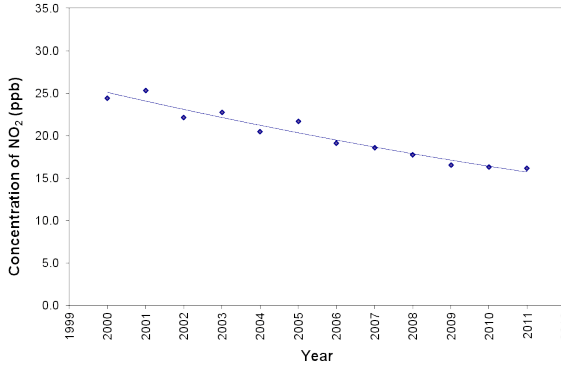
Recent trends in ambient levels of the five common air contaminants suggest that while significant gains have been achieved in air quality, especially for NO_x and CO, progress may now be slowing. For several of the pollutants including SO_2, $PM_{2.5}$, and CO, levels measured in 2010 and 2011 are suggestive of a possible flattening or upward trend.

Figure 4: Trends in ambient air pollution levels for five common air pollutants in Toronto.

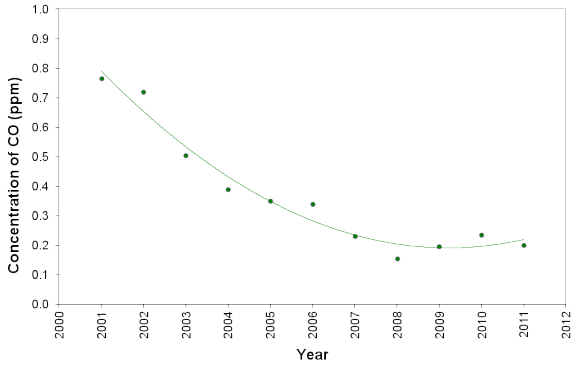
Annual Average SO_2



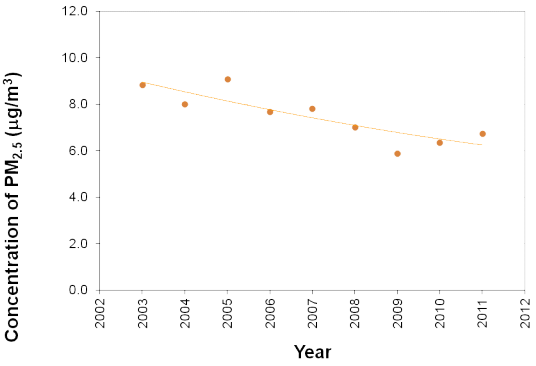
Annual average NO_2



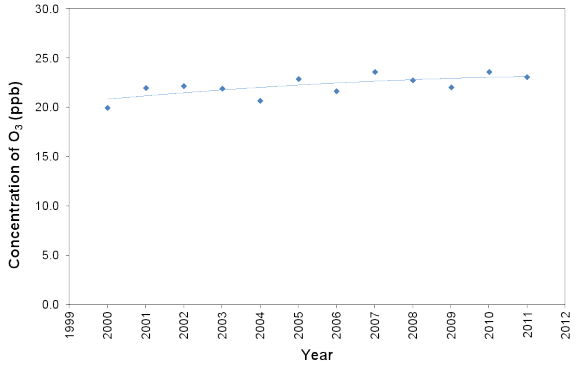
Annual average CO



Annual average $PM_{2.5}$



Annual average O_3



Source: Based on annual Air Quality in Ontario reports produced by the Ontario Ministry of the Environment.
Prepared by: Toronto Public Health

Achievements in Improving Air Quality

Key sources of common air contaminants in Toronto over the past decade include transportation sources, industrial sources, and energy use. The improvements in air quality are likely a result of a combination of policy and program successes achieved

across these source types over the past decade. Some of these successes are illustrated in Table 2 below.

Table 2: A selection of air quality improvement initiatives in Toronto

Date	Initiative
1999	City Council adopts the Environmentally Responsible Procurement Policy
1999	City of Toronto adopts low-sulphur fuel purchasing
1999	The Government of Ontario introduces the Drive Clean Program, a program that reduces nitrogen oxides and volatile organic compounds through emissions testing of vehicles and enforcement
2000	Federal Government signs the Canada-Wide Standards for $PM_{2.5}$ and Ozone. In 2013 standards become more stringent
2001	Toronto City Council adopts the Bike Plan
2002	Federal regulations come into force that reduce the limit for sulphur in gasoline fuels. In 2005 the limit becomes more stringent
2001	City of Toronto is a key partner in launching the Black Creek Regional Transportation Management Association. It was the first of its kind in Ontario and the precursor to Smart Commute, which now exists as a network of 13 Smart Commute programs across the GTHA
2003	City of Toronto Clean Roads to Clean Air program introduces new street sweepers that entrain less particulate matter
2004	City of Toronto implements Green Fleet Plan to choose more environmentally sustainable vehicles, fuels and practices for City vehicles and operations. In 2008 Phase II is implemented
2005	Closure of Lakeview coal-fired power plant
2005	Ontario Regulations are adopted to set air quality standards for toxic substances to protect local communities
2006	Federal regulations come into force that reduce the limit for sulphur in diesel fuels for on-road applications. In 2010, limits come into force for off-road applications, and in 2012, limits come into force for rail and marine applications
2006	Ontario Regulations establishing industry sector emission caps for NO_x and SO_x come into force, with milestones in 2007, 2011, 2015
2007	A new, health-based index called the Air Quality Health Index (AQHI) is promoted in Toronto
2007	Settlement announced in a lawsuit filed by USEPA against American Electric Power claiming the large utility had violated the requirements of the Clean Air Act. The settlement required major reductions in NO_x and SO_x emissions in coal-fired facilities. The City of Toronto was an intervenor.
2007	City Council Adopts a Climate Change Action Plan which includes actions and targets to reduce locally-generated air pollution emissions by 20%, from 2004 levels by 2012 for the Toronto urban area
2008	Toronto City Council Adopts the Toronto Walking Strategy
2009	Ontario's *Green Energy Act* was introduced into the Legislature
2010	The Chemtrac program comes into effect, requiring local facilities to annually track and report on the use and release of priority air pollutants
2010	Idling Control Bylaw updated, limiting idling to one minute
2010	The Toronto Green Standard is implemented, creating a two-tier set of performance measures with supporting guidelines related to sustainable site and building design for new private and public development. In 2014 Version 2.0 is in effect with increased energy performance targets
2013	Ontario has now shut down 17 of 19 coal-fired units, with all to be shut down by the end of 2014.

The various actions resulted in measurable decreases in emissions. Among emissions reported to the NPRI for the province of Ontario, for SO_x, the greatest drop is related to emissions from fuel combustion, while for NO_x and CO, the greatest improvements are from reductions in transportation-related emissions. For $PM_{2.5}$, the successes appear to arise mainly from reductions in industrial emissions.

Air quality in Toronto has improved over the past decade, and as a result, the adverse health impacts of air pollution have been reduced. However, with air pollution still contributing to an estimated 1,300 premature deaths and 3,550 hospitalizations, there is more work to do to achieve cleaner air and better health. The successes of the past 15 years show that with concerted action across emission sources, significant improvements can be achieved. The most important next steps will require continued efforts to reduce air pollution from transportation, but there are still opportunities to reduce emissions from residential, commercial, and industrial sources.

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