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'TURN IT OFF'
ANTI-IDLING CAMPAIGN REPORT

Simcoe Muskoka District Health Unit

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EXECUTIVE SUMMARY

Beginning in the fall of 2007, the Simcoe Muskoka District Health Unit (SMDHU) piloted an anti-idling campaign in select communities within Simcoe Muskoka over an eight-month period. The health unit received funding from the Enbridge 'Awaire' Fund to pilot the school and community based social marketing campaign to raise awareness about vehicle idling and to support changes in idling behaviour.

The campaign, "Turn It Off", was expanded to include a research component which would measure the impacts of interventions in influencing behaviour change related to idling. In both phases, to fulfill the research component of the project, two schools were selected, one as an Intervention School and one as a Control School. The inclusion of idling behaviour measurements at a control site was a component of the pilot which made it unique from other similar anti-idling projects. Phase 1 of the project was completed in the District of Muskoka in September/October 2007. Phase 2 was completed in Simcoe County in April/May 2008. The campaign was implemented in 2 phases to meet resource and planning needs.

The campaign was completed in collaboration with the Trillium Lakelands District School Board, Simcoe County District School Board, Town of Gravenhurst and the City of Orillia. Municipal councils were approached to advise them of the campaign and to request their support. The school boards also provided valuable input, support and advice. The health unit would also like to acknowledge the assistance and support from Georgian College, and the students from the Georgian College Research Analyst program and the University Partnership Centre at Georgian College who volunteered to assist with the school observations and interventions.

An anti-idling project was selected as the focus of the campaign for a number of reasons. Many municipalities are considering implementing anti-idling policies. An important component of a by-law is increasing public awareness of the issue. Local information and research can enhance the relevancy of the research currently available. The campaign was also an opportunity to educate and engage students, parents, teachers and the public about the hazards of poor outdoor air quality. Idling frequency and duration can be quantified and evaluated. Many behavioural changes are needed to improve outdoor air quality. Turning off an engine is a clear and simple means of engaging people in air quality improvement behaviours.

In Ontario, transportation and energy generation are the leading contributors to poor air quality. An idling engine releases twice as many exhaust fumes as a vehicle in motion. This pollution is a significant contributor to environmental and health problems like climate change and smog[3]. Many schools have identified, through their principals and Parent Councils, that idling vehicles are a concern in relation to student's health and safety. In particular, idling vehicles release air pollutants in areas where students are waiting for buses, or entering or exiting the school building[1].

In order to meet the objectives of this campaign, the health unit employed a health promotion approach that utilized a social marketing campaign as its key strategy. Health promotion strategies are used to help produce specific outcomes in individuals or populations. These outcomes can include: increasing awareness and knowledge, changing attitudes and perceptions, improving and increasing personal skills, and changing behaviour.

A number of idle-free initiatives have been completed in Ontario, specifically, the GTA "Idle-Free" Campaign, Natural Resources Canada and the Clean Air Partnership "The Carrot, the Stick and the Combo – A Recipe for Reducing Vehicle Idling in Canadian Communities" and Earthcare Sudbury – Anti-Idling Campaign. These campaigns and their resultant reports provided valuable guidance.

In addition to the social marketing campaign, the project also included a research component. The research component was developed to measure idling behaviour, pre- and post-intervention, at the Intervention School. Idling behaviour observations were also conducted at a Control School, a school that did not receive the intervention. This allowed comparison of idling behaviours between individuals who received the intervention and individuals who did not. In addition, following Phase 2 of the project, implemented in Simcoe County in spring 2008, an intercept survey was conducted at several locations in the participating community to evaluate the impact of the social marketing campaign.

The intercept survey found that 55% of respondents were aware of the campaign in Simcoe County, and had heard the messages through the media (newspaper ads and radio spots). Thirty-nine per cent (39%) of respondents (18/47) indicated that the campaign had affected their idling behaviour. In addition, almost three quarters (73%) of all respondents reported that they would share the idling information with others and that they would urge them to change their idling behaviour. The survey results indicate wide-spread and strong public support in this community for anti-idling by-laws and community idle-free zones. This support, combined with a high level of knowledge of idling effects on health and the environment, suggests that respondents in this community may be ready for policy action.

The goal of the school intervention portion of the project was to influence idling behaviour among drivers picking up children after school. In the first phase, implemented in the District of Muskoka, idling incidence was found to decrease by 8% at the Intervention School following the intervention. It is important to note that during the same time period, idling incidence increased by over 10.0% at the Control School. As a result of idling behaviour change by drivers at the Intervention School, about 5 tonnes/year of CO_2 were not produced or were saved during the post-intervention period. In the second phase, in Simcoe County, idling incidence decreased by 32% at the Intervention School following the intervention, and by 13% at the Control School with no intervention. Overall, the CO_2 contribution at both schools decreased. However, the Intervention School achieved the largest reduction, decreasing calculated CO_2 emissions by approximately 7.5 tonnes.

Although a small pilot project, the "Turn It Off" Campaign demonstrates that this type of small initiative can successfully engage students, the community and local decision-

makers. The campaign was successful in both influencing individual behaviours, as demonstrated by the reduction in idling incidence at the intervention schools, and was found to build momentum in the participating communities related to institutional and municipal idling policy development. The “Turn It Off” Campaign reinforces the underlying principles of policy development, in particular the effectiveness of community education and awareness campaigns for building support for policies whether municipal or institutional.

1 INTRODUCTION

"Turn It Off" was a community based anti-idling campaign implemented in the District of Muskoka and the County of Simcoe in two phases, the first in fall of 2007 and the second in spring of 2008. The campaign was possible through partnerships with the Town of Gravenhurst, Trillium Lakelands School Board, Simcoe County District School Board, City of Orillia and the Simcoe Muskoka District Health Unit. The campaign was partially funded with support from Enbridge Gas through their 'Awaire' Fund.

An anti-idling project was selected as the focus of the campaign for a number of reasons. Many municipalities are considering implementing anti-idling policies. An important component of a by-law is increasing public awareness of the issue. Local information and research can enhance the relevancy of the research currently available. The campaign was also an opportunity to educate and engage students, parents, teachers and the public about the hazards of poor outdoor air quality. Idling frequency and duration can be quantified and evaluated. Many behavioural changes are needed to improve outdoor air quality. Turning off an engine is a clear and simple means of engaging people in air quality improvement behaviours.

The first phase of the project, implemented in the District of Muskoka in the fall of 2007 included school and community site interventions, a local media campaign, and public education to raise awareness related to idling behaviour. The second phase of the project, implemented in Simcoe County in spring 2008, consisted of a school intervention and media campaign similar to those used in phase 1 with the addition of a community intercept survey to evaluate community awareness of the campaign messages.

As a component of the school intervention, two schools were selected as research schools in the District of Muskoka (Phase 1) and the Simcoe County (Phase 2). One school was classified as the Intervention School and received an intervention related to air quality and anti-idling. The second school was classified as the Control School. This school did not receive the intervention during the research period. Observations of idling behaviour were completed at both schools before the intervention period. The two-week intervention then occurred at only the Intervention School. The intervention was followed by post intervention observations at the schools. A comparison of the idling behaviour between the schools was assessed to determine the possible impact of the intervention.

1.1 Background

The Ontario Medical Association (OMA) has developed a method of estimating the health impacts that air pollution has on the health of various communities. The OMA's software, Illness Costs of Air Pollution (ICAP) model estimated that in 2008, air pollution could contribute to up to 6,261 premature deaths in Ontario and 223 premature deaths in Simcoe Muskoka.

It is expected that air pollution-related illness and premature death will continue to increase. In Simcoe Muskoka the projected increases in premature mortality over the next 19 years show an increase from 223 deaths in 2008 to 364 deaths in 2026. The 18 to 65 age group will experience an 11 per cent increase in premature mortality as a result of air pollution. Premature mortality for those 65 years and over is expected to increase approximately 74 per cent. The primary factor used by the model in estimating projected health impact is the aging of the population.

In 2005, the Ministry of the Environment (MOE) issued smog advisory alerts that covered 40 days. There were 11 and 21 smog advisory days in 2006 and 2007 respectively. Local weather conditions contribute to large variability in air quality from year to year; typically more poor air days are experienced during hot, sunny weather conditions.

Air quality standards focus on criteria air pollutants – ozone, particulate matter, sulphur oxides, nitrogen oxides, carbon monoxide and lead. The public is also exposed to many other harmful substances through the air, such as mercury, benzene and other airborne toxins. It is important to note that some of the MOE air quality criteria are considered less protective to human health than national and international standards.

In Simcoe Muskoka, smog advisories result, most often, from exceedances of ground-level ozone. The Ontario Ambient Air Quality criteria for ozone are 80 ppb, while the Canada Wide Standard (CWS) is 65 ppb, and the World Health Organization (WHO) recommendation is 50ppb. This means that even at times when air quality does not exceed the Ontario Ambient Air Quality criteria, the same levels of air pollutants would trigger an advisory in those areas applying the CWS or the WHO recommendations. In the Barrie area in 2007, there were 7 ozone exceedances recorded, however application of the WHO recommendations would have resulted in 42 exceedances.

Ozone – the good and the bad

Stratospheric ozone, commonly referred to as the Ozone Layer, is found 20-30 kilometres above the earth's surface and is important in protecting us from the sun's UV rays. Tropospheric ozone, or ground-level ozone, damages human health and vegetation.[1]

Exposure to ozone in sensitive people can cause chest tightness, coughing and wheezing. Individuals with pre-existing respiratory disorders, such as asthma and chronic obstructive pulmonary disease are also at risk from ozone. It is important to note that there is no threshold concentration of ozone below which no health effects are found. Negative health effects will occur in some people even at very low levels, and the proportion of people impacted will rise as ozone levels rise.

A number of studies have examined the impact of air pollution on birth outcomes and reproduction. When a team of scientists reviewed the evidence, they concluded that infants exposed to higher outdoor levels of airborne particulate matter are at increased risk of death from respiratory ailments. They also concluded that air pollution can increase the risk of infants being born with low birth weights[2].

Children are particularly vulnerable to health impacts from air pollution due to their physical development – small lungs, narrow airways and rapid breathing mean that children inhale a greater amount of air than adults. Researchers have found that children who are active outdoors when ozone levels are elevated are particularly vulnerable, affecting normal development and growth of their lungs. It has been shown that these children are up to three times more likely to develop asthma than children in low ozone communities[2]. Poor childhood lung function is a good indicator for poor health later in life. Even healthy adults experience a decrease in lung function when exercising in elevated ozone conditions.

The senior population may have a weakened immune system that reduces the respiratory system's ability to fight infections and remove foreign materials. Exposure to air pollutants may exacerbate allergies or asthma symptoms. Seniors also have a greater incidence of cardio and respiratory illness, and a natural decline in lung function may be accelerated by poor air quality.

In Ontario, transportation and energy generation are the leading contributors to poor air quality. An idling engine releases twice as many exhaust fumes as a vehicle in motion. This pollution is a significant contributor to health and environmental problems like climate change and smog[3].

How is idling my vehicle harmful to my health?

Idling vehicles release harmful emissions that can:

- cause eye, nose and throat irritation
- coughing and wheezing
- breathing difficulty
- reduced lung capacity
- lowered resistance to infections
- increased heart and lung conditions

Source: Peel Public Health, 2008

1.2 "Turn It Off" Campaign

The 'Turn It Off' Campaign was designed to target idling at locations where one of the most vulnerable populations, children, are exposed. Many schools have identified, through their principals and Parent Councils, that idling vehicles are a concern in relation to students' health and safety. In particular, idling vehicles release air pollutants in areas where students are waiting for buses or entering or exiting the school building[1]. Turning off idling engines creates a healthier environment for children.

School buses and automobiles are sources of vehicle emissions at schools. There are a number of school bus companies who provide transportation to the participating schools. Some of the companies have policies that provide direction on the amount of time a school bus operator may idle the bus. Since the focus of this project was to influence behaviour change with the adults of waiting vehicles, results related to the school bus operators will be provided directly to the respective companies. The idling behaviour of drivers of personal automobiles including cars, vans and sport utility vehicles is included in this report.

1.3 Other Idle-Free Initiatives in Ontario

As more is known about the health impacts of poor air quality and the predictions related to climate change and increasingly poor air quality, it is important for children to understand their role, both in terms of influencing their parent's behaviour and also as contributors to pollution.

A number of idle-free initiatives have been completed and provided background information and generated ideas for the "Turn It Off" Campaign. Specifically, the GTA "Idle-Free" Campaign, Natural Resources Canada and the Clean Air Partnership "The Carrot, the Stick and the Combo – A Recipe for Reducing Vehicle Idling in Canadian Communities" and Earthcare Sudbury – Idling Campaign. These campaigns and their resultant reports provided valuable guidance.

An anti-idling campaign, also called "Turn It Off", took place in the City of Toronto in early 2001. The campaign focused on increasing community awareness of the importance of reducing green house gas (GHG) emissions by avoiding idling, while examining ways to reduce idling incidence. Six community centres and six schools were selected as locations to measure idling[4;5]. Barriers were identified and strategies were implemented to address these barriers during the anti-idling campaign. Some of these strategies included prompts such as signs and vehicle stickers, reminding people to turn off their engines, and obtaining a commitment from the drivers to reduce idling. The 12 sites were randomly divided into three groups to provide a combination of the different strategies; one group received only signs, another group received signs, information leaflets and a commitment request from drivers, and the other group did not receive any intervention and was used as a control group. Baseline and post-intervention data was collected during 10 days at these 12 sites. The results showed a reduction of incidence by 27% and a reduction of duration by 78% overall, at those sites where a combination of signs and commitment was used, compared to sites where just signs were used. Meanwhile, the use of prompts only,

without a commitment, was less effective. The study concluded: “A successful anti-idling campaign can serve as a potential catalyst for public involvement in the reduction of greenhouse gas emissions in Canada”[4;5].

Following the success of the City of Toronto’s “Turn It Off” Campaign, NRCan developed a web-based information kit in 2001, and approached Mississauga and Sudbury to take part in a pilot project. Since each community has unique features, the cities worked with NRCan to develop a campaign to target drivers at municipal facilities (recreation centers and libraries, for example). They used a community-based social marketing approach and they designed the anti-idling campaign taking into account lessons from previous programs. The report found that drivers need to be reminded about the benefits of not idling, personal contact is important to achieve a commitment from the drivers, and the results improve significantly when the drivers are asked to be committed[4].

In Mississauga, the campaign was called “Towards Idle-Free Zone”, and consisted of public awareness and media dissemination in different locations such as schools, GO Transit, private sector, and municipal facilities. Telephone interviews were done in two stages of pre- and post-campaign. Positive results were obtained in all settings, with an increased awareness and idling time reduction. With the school initiative, information kits were distributed to 200 public and separate elementary schools in Mississauga. The kits consisted of anti-idling information cards and windshield decals, suggested activities, and sample inserts for use in school newsletters. Lura Consulting collected baseline data and post-campaign data at 20 elementary schools before and after distributing the kits. As part of the campaign, bus and passenger car drivers were approached and asked to minimize idling during pick ups and drop offs. They were also asked to make a commitment to reduce frequency and duration of idling by placing a decal on their vehicle’s windshield. During the school initiative, a decrease in the frequency of idling from 54% to 29% was observed, as well as a reduction in the duration of idling from 8 to 3.5 minutes[4].

Sudbury’s project was delivered by Earthcare Sudbury in 2001 and targeted idling that occurred when parents and bus drivers are waiting to pick up children from schools in the City of Greater Sudbury. As with the Mississauga project, this one included the three elements learned from previous projects: signs, personal contacts and commitments. Forty-nine schools in the area received these three strategies, but measurements were only made at three of the schools for 10 days during pre-intervention and 10 days during the post-intervention. Results were very similar to those of the Mississauga project: a decrease of idling incidence from 50% in the pre-intervention to 33% in the post-intervention periods (reduction of 34%) and a reduction in the idling duration from 220 seconds average (3.7 minutes average) during the pre-intervention to 150 seconds average in the post-intervention period (2.5 minutes average). This represents a 32% reduction in the duration of idling[6].

Both measurements, idling incidence and duration, were analyzed per vehicle type. Idling incidence reduction varied by vehicle type, including school buses. However, drivers who drove trucks/SUVs showed a greater reduction in idling incidence (52% to 30%), than those driving cars or vans (30% to 14%, or 44% to 32%, respectively). Idling duration also varied noticeably by vehicle type. Drivers of school buses significantly decreased their idling time by 139 seconds on average. Drivers of cars decreased their idling time as well by 27 seconds, however, trucks/SUV or vans increased their idling time by 32 and 22 seconds on average, respectively. A possible reason for this increase was colder temperature/weather during the post-intervention measurement[6].

These studies show that an anti-idling initiative can significantly affect the incidence and duration of idling. Many of these campaigns used various strategies, engaging citizens and providing them with an opportunity to take constructive action to lower their impact upon our atmosphere. However, there is less information available to support our understanding of why people choose to idle and what anti-idling measures and polices would be supported by the public.

As a component of the Mississauga Pre-Anti-Idling Campaign Awareness Study a telephone survey was conducted over two days in August 2002. The main purpose of the study was to collect baseline data on the awareness of and attitudes towards the impacts of vehicle idling. The survey questions included current driving and idling behaviours, perceived severity of the issue, compelling arguments to stop idling, pre-campaign awareness and demographics. Respondents who self-reported idling, reported doing it most frequently when waiting for or picking up someone, and less frequently when stopping for take-out, doing an errand or stopping to talk to someone. Less than half of the respondents self-reported that they do not idle their vehicles. Those who did not idle were more likely to perceive idling to be a serious problem compared to those who reported idling their vehicle. When identifying the perceived severity of the problem, respondents reported pollution from fumes and exhaust and carbon dioxide as the most serious problems with vehicle idling. Based on this, respondents also identified that the most compelling reason to stop idling would be in an effort to help improve air quality.

In another study, students from the University of Waterloo surveyed residents in the Waterloo region to understand idling behaviours and beliefs. The survey was administered during the fall of 2001 to adult pedestrians in public parking places. The survey included questions to assess the public's views about how effective various anti-idling measures would be, and how would they affect their behaviour. Most of the drivers surveyed admitted to idling sometimes, and over half of them supported fines for idling as an anti-idling measure. A fine was considered the measure most likely to be effective and stickers placed inside their vehicles the least likely to be effective[7].

Both studies identified that the public is interested in cooperating to reduce idling. In the Mississauga study, they assessed idling awareness and factors influencing idling behaviour, while the Waterloo study provides a better understanding of the residents' opinions regarding measures to support anti-idling behaviour.

2 PURPOSE

The Simcoe Muskoka District Health Unit, with the support of many other agencies, has identified that outdoor air quality is an important public health issue. A comprehensive outdoor air quality strategy includes addressing the impacts of idling vehicles. The 'Turn It Off' Campaign was designed to increase knowledge and understanding of idling behaviour. It was also identified that it is important to recognize successful interventions to reduce vehicle idling for future planning.

The purpose of the "Turn It Off" Campaign was to:

1. Engage students, parents and school boards in initiatives to take action to improve air by reducing vehicle idling practices in school zones and communities;
2. Engage municipalities in initiatives to take action to improve air by reducing vehicle idling practices at community centers and recreation centers;
3. Provide information/resources/education to the public to reduce vehicle idling practices and
4. Provide information/resources/education to municipalities to promote municipal strategies to improve outdoor air quality.

The Simcoe Muskoka District Health Unit policy related to research initiatives required that the 'Turn It Off' program complete a Research Review Proposal and Evaluation Plan. The Simcoe Muskoka District School Board also required the approval of the Simcoe County District School Board's Research Design and Evaluation Team in order to implement the campaign.

3 ETHICAL REVIEWS

As part of the research and innovation process of the SMDHU (Public Health Research Planning, Approval and Conduct Policy and Data Collection Use Policy), a review and approval of this initiative was required by the health unit's Research Review Committee.

Key areas included in the research review are:

- Clear purpose, use and reporting of data collected.
- Clear understanding of sample size calculations and statistical significance.
- Protecting the identities of schools, observers and students.
- Feasibility of the initiative.

In addition to the internal review, a written research proposal, specific to Phase 2 of the campaign was prepared and presented to the Simcoe County District School Board (SCDSB) for their review. Their feedback was valuable in the development and implementation of the campaign and observations in Simcoe County.

3.1 SMDHU Research Review

Based on the SMDHU research review results, several changes were suggested to the data collection tool to protect the confidentiality and safety of observers and the students. The SMDHU research review committee suggested the utilization of observer codes and school codes, rather than individual names, and to provide training to the observers in order to prepare them for questions from drivers or other individuals regarding their presence on school property. A tiered response strategy was developed in the event that observers were asked questions beyond the scope of their awareness of the project. The secondary response tier included the school principals, who were involved in the process, as well as a SMDHU program manager/supervisor. Although the review process was lengthy and contributed to a delay in the implementation of Phase 2 of the project, the feedback assisted in the planning and implementation of the initiative.

However, due to local conditions and some unanticipated events, changes from the initial research plan proposal were implemented which included:

- Not observing drivers at community sites. The primary reason for the change was due to a shortage of available volunteers/observers.
- The addition of a community intercept survey in Phase 2. The survey was conducted to collect information regarding awareness of the campaign (community intervention) and idling knowledge. An addendum to the initial proposal was created and approved by the SMDHU's Service Area Director.

3.2 Simcoe County District School Board Review

The SCDSB requires a formal proposal to be submitted for approval when data collection is proposed at school facilities or requires the use of teachers'/students' time. Due to the time invested in the SMDHU research review process, the proposal to the SCDSB Educational Research Advisory Committee was delayed. The research proposal was submitted in April 2007. Approval from the SCDSB Educational Research Advisory Committee was received in August 2007. Therefore implementation of Phase 2 (Simcoe County) of the initiative was rescheduled for spring 2008 while Phase 1 (District of Muskoka) was completed in autumn 2007.

Members of the SCDSB Evaluation/Review Committee were very supportive of the initiative. Based on the SCDSB review results, two schools in a community in the County of Simcoe were selected for the campaign. This selection was based on the principals' willingness to participate in the initiative and on the location of the elementary schools.

4 METHODOLOGY

4.1 Research Questions

The primary research question to be answered with this project was:

What is the impact of the anti-idling initiative on idling behaviour, specifically in terms of changing incidence and frequency of idling?

The following objectives of the evaluation were achieved through observation of idling behaviours:

- To determine the impact of an anti-idling initiative on idling behaviours of drivers at intervention elementary schools.
- To measure rate and duration of idling during drop-off/pick up hours at intervention elementary schools.
- To estimate the production of CO_2 from the observed vehicles at intervention elementary schools.

The following objectives of the evaluation were achieved through the community intercept surveys:

- To determine the level of knowledge about the impact of vehicle idling on health, environment and personal expenditures.
- To determine the awareness and recognition levels of the “Turn It Off” Campaign.
- To identify if the campaign influenced a change in behaviour.
- To identify obstacles to behaviour change.
- To determine support for measures that will decrease idling.

4.2 School and Community Interventions

There were four key objectives to the “Turn It Off” Campaign:

- Engage students, parents and school boards in initiatives to take action to improve air by reducing vehicle idling practices in school zones and communities.
- Engage municipalities in initiatives to take action to improve air by reducing vehicle idling practices at community and recreation centres.
- Provide information/resources/education to public to reduce vehicle idling practices.
- Provide education/information/resources to municipalities to promote municipal strategies to improve outdoor air quality.

In order to meet the objectives of this campaign, the health unit employed a health promotion approach that utilized a social marketing campaign as its key strategy. Health promotion strategies are used to help produce specific outcomes in individuals or populations. These outcomes can include: increasing awareness and knowledge, changing attitudes and perceptions, improving and increasing personal skills, and changing behaviour.

Behaviour change is a complex process that involves a variety of factors. It does not happen quickly, often taking many years to occur. Different psychosocial theories are applied to the use of health promotion strategies for a particular health-related issue. These theories can be helpful in the planning, implementation and evaluation of a health promotion intervention to explain why and how it may affect a certain change. Two theories, the Theory of Reasoned Action and the Diffusion of Innovation Theory, helped to inform the social marketing intervention developed for this campaign.

The Theory of Reasoned Action suggests that behaviour change happens when people change their beliefs. It also suggests "that people will perform behaviour if they think they can perform it" (Montano et al., 1997, as cited in Health Promotion Planning, 2004 (Collins)). This theory can be applied in the development of a health promotion strategy to produce change around vehicle idling behaviour. Providing information and awareness about the link between vehicle idling and air pollution can help people understand that their actions can make a difference in improving air quality, and further, that turning off their car when it is parked is an easy task to perform.

Diffusion of Innovation Theory explains the way that a new idea or innovation is adopted by individuals. In health promotion this theory is used to understand how people adopt health-related behaviours or practices. The theory is based on research that has found that people will adopt a new idea (or behaviour or practice) if it is simple, flexible, cost efficient, reversible and advantageous to them. Diffusion theory suggests that ideas or practices are adopted by individuals at different rates. Adoption begins with a small group of people, the innovators, who are the source of the idea. They are followed by the early adopters, who quickly recognize the benefit of the change. Over a longer period the practice is adopted by the majority of people. There is a small group, the laggards, who resist the change. Health promotion strategies that are used to mobilize behaviour change must recognize the barriers and challenges faced by this group. (Egger et al., 1999, as cited in Health Promotion Planning, 2004 (Collins)). This theory can be applied to affect idling behaviour. The use of a communications strategy that provides key messages, resources and information to reinforce the simplicity, cost savings and benefits of not idling a vehicle will resonate with early adopters, whose behaviour will help to influence the majority. Additional health promotion strategies that include community engagement and policy development for municipal anti-idling bylaws can help to support the late adopters and laggards.

Another theoretical approach used in planning the "Turn It Off" Campaign was community-based social marketing (CBSM). In a CBSM approach, barriers to the desired behaviour are identified and a campaign is developed to specifically reduce those barriers. Research has shown that anti-idling campaigns from other jurisdictions which have used a multi-strategy approach, including education/awareness, commitment, and prompts, were successful in influencing idling behaviours[6].

The "Turn It Off" campaign intervention was designed using health promotion theories and the successful outcomes of CBSM approaches from similar campaigns. The interventions included education and awareness, verbal commitments and use of prompts, such as the use of signs and window decals. There were two distinct elements to the campaign in each phase. The first was an educational intervention for schools, known as the "school intervention". The second was a communications campaign targeted at the general public. This was known as the "community awareness campaign". These components are discussed in greater detail below.

4.2.1 School Intervention

The school intervention was an educational program that targeted three main audiences:

- Elementary school aged children.
- Teachers and staff of elementary schools.
- Parents of elementary aged school children.

In Phase 1, two elementary schools from District of Muskoka and in Phase 2, two elementary schools from Simcoe County, participated in this study. As mentioned previously, only the Intervention School, not the Control School, received the school intervention during the campaign period. The intervention was two weeks in duration and consisted of awareness and education for students, teachers and parents. It included the following elements:

4.2.1.1 For Students:

- *Kick-Off Assembly*: A 30-minute assembly was held at the school on the first day of the intervention. All students, teachers and staff of the school were in attendance. The assembly included a presentation by a Clean Air Champion (Clean Air Champions are respected national and Olympic level athletes committed to motivating Canadians to adopt practices and lifestyles that enhance both environmental and personal health). The presentation was followed by a short presentation by a health unit staff member to explain the "Turn It Off" Campaign and to deliver key anti-idling and air quality messages.
- *Banner Challenge*: Each class in the school was invited to participate in making a banner about air quality and/or anti-idling. The challenge was coordinated by the SMDHU and art supplies were provided by the agency. All classes participated and were recognized at the closing assembly.

- *Closing Assembly*: An assembly presentation (30 minutes) was delivered by health unit staff, in consultation with the school principal, on the final day of the two-week intervention. The assembly was a recognition event for all of the banners. Each class had two minutes to explain and display their banner to the rest of the school. Each class then received a framed certificate of participation. A plaque was presented to the school for their overall participation in the campaign.

- *Classroom Activities*: Teachers were asked to deliver classroom and curriculum activities/lesson plans on air quality and anti-idling. Sample activities, resources and lesson plans were included in packages which were provided to teachers by the health unit.

4.2.1.2 For Teachers/Staff:

- *Staff Meeting Presentation*: Health unit staff presented a 10-minute overview of the initiative to school staff at staff meetings at the Intervention and Control Schools.

- *Reminder to Staff*: The principals at the participating schools were asked to send a memo to staff via email or hard copy (in mail slots) the Friday before the initiative started, to remind staff of the upcoming campaign.

- *Resource Package for Teachers*: The health unit assembled a resource package for each teacher which included (see *Appendix A: Teacher's Resource Package*):

    - overview of anti-idling initiative
    - curriculum links
    - David Suzuki Foundation lesson plans
    - copies of resources for parents: notepad, poster, decal, postcard
    - other pertinent resources such as fact sheets on air quality
    - list of pertinent resources/websites
    - details and guidelines for banner activity

- *Supplies for Banner Challenge*: All classes received banner-making supplies/materials including paper, paints, markers, etc., provided by the health unit, along with banner activity guidelines.

- *Evaluation Form*: All teachers were asked to fill out a one-page evaluation form that provided feedback about intervention components.

4.2.1.3 For Parents:

- *Parent Council*: A meeting was held with both the Intervention and Control School Parent Councils to explain the campaign.

- *Newsletter Insert*: A short air quality article was provided by the health unit for insertion into the school newsletter during the intervention period.

- *Send-Home Information Package*: Information for parents was sent home with their children. The package included a letter, decal, postcard and notepad.

- *Personal Contact with Drivers*: Drivers of vehicles picking up students at the end of the school day on a selected day during the intervention period received a personal contact intervention by a health unit staff member who discussed the benefits of not idling and provided a double-sided information postcard. Drivers were asked to make a verbal commitment to not idle their vehicle, and were asked to place an anti-idling decal on their windshield as a symbol of their commitment and to remind them to turn their vehicle engine off when parked.

At the request of the Control Schools, the intervention was delivered to those schools following the post-observation period. The intervention was similar to that received at the Intervention Schools with the exception of personal contacts with drivers. This provided an opportunity for the health unit to further deliver awareness and education about idling to the community and to acknowledge the Control Schools for participating in the idling observation component of the study.

4.2.1.4 Teachers Feedback:

A questionnaire was developed (see *Appendix B: Teacher Evaluation*) to receive feedback from teachers regarding the school intervention portion of the campaign. Evaluation questionnaires were provided in the teachers' resource package and were submitted following completion of the intervention program. The questionnaire was developed using Likert-like scale and free text responses to gather teachers' feedback about the assembly, banner competition, teacher resource package, and the approximate number of hours spent on the activities.

4.2.2 Community Awareness Campaign

Following the post-intervention observations at the schools, a two-week communication campaign was implemented in each of the participating communities. The campaign was targeted at a general public audience that included a public awareness and education component consisting of the following elements:

- Health unit presentation or letter to municipal councils to inform councillors and staff about the study and the objectives of the intervention.

- Anti-idling posters placed in local community sites (arena, community centre, library or town office).

- Three 30-second paid radio spots focusing on anti-idling, broadcast on the local station every day for the duration of the community awareness campaign.

- Public service announcements and press releases sent to local media.

- Photo opportunities for local media.

- Air quality display at community sites for the duration of intervention – included postcards, decals and notepads available for the public to take.

- Resource packages (decal, notepad, postcard, and other resources) for community site managers and staff, and town council.

- School banners from Intervention School posted in community sites.

- Community centre's outdoor sign posted with an anti-idling message.

- Hot button and anti-idling information highlighted on health unit website.

The rationale for including a community awareness campaign in this initiative was twofold:

- To reach a broad and varied audience (other than parents with children) with key anti-idling messages through personal contacts and other public education strategies, and;

- To engage municipal partners in this initiative in order to generate awareness about air quality issues, build relationships and create momentum toward developing a municipal anti-idling bylaw in participating communities.

During Phase 2, a community intercept survey was implemented to evaluate the level of knowledge about the impact of vehicle idling on health, environment and personal expenditures. It was also considered important to determine the awareness and recognition levels of the "Turn It Off" Campaign. In terms of future planning around idle-free initiatives, it is critical to understand whether the campaign influenced a change in behaviour, in order to identify obstacles to behaviour change and to determine environmental supports that will decrease idling. Ninety-five (95) surveys were completed by the public at a variety of public venues.

4.3 Data Collection

4.3.1 Idling Observations at Elementary Schools

Two elementary school sites were selected in two communities in the District of Muskoka and Simcoe County. Phase 1 was completed during the fall of 2007 in the District of Muskoka and Phase 2 during spring 2008 in Simcoe County. The community in the District of Muskoka was selected due to the absence of anti-idling by-laws. The community in Simcoe County was selected based on the recommendations of the SCDSB Educational Research Advisory Committee. The two elementary schools in each community were selected because of their close proximity, similar demographics, and student population size.

The intervention consisted of a two-week public awareness and educational intervention (see section on Intervention). The intervention took place at one of the schools in each community. Throughout this report these schools will be called Intervention Schools. The other schools, which did not initially receive the intervention, will be called Control Schools. The information provided to parents and drivers during the intervention did not include information about the idling observations. Drivers observed during the observations were not aware that the observations included idling behaviour measurements.

4.3.1.1 Data Collection

4.3.1.1.1 School Idling Behaviour Observations

The intervention period was flanked by a week each of pre- and post-intervention observations of the idling behaviour of drivers picking students up at school (school sites).

Pre-measurement observations were conducted prior to the pre-intervention observations to estimate the number of expected vehicles who would collect students at the elementary schools. This information was a critical component of the implementation planning. The physical layout for parking was assessed to determine the number and placement of observers needed during the observation period. An observation zone was selected based on the assessment that an observer could likely observe and record approximately 3-4 cars at one time. Based on the pre-assessments, one hour of observation was scheduled to begin before the closing bell rang at each school, to coincide with the high traffic period at the end of the school day.

Pre-intervention and post-intervention observations were conducted at the end of the school day at the Intervention and Control Schools. Pre-intervention observations of idling behaviour at the participating schools in District of Muskoka occurred from September 17th - 21st, 2007; the post-intervention observations took place from October 9th – 14th, 2007. At the participating schools in Simcoe County, the pre-intervention idling observations occurred between March 31st – April 4th, 2008 and the post-intervention observations took place from April 21st – April 28th, 2008. In some instances additional days of observation were added in order to ensure the required sample size was achieved.

4.3.1.1.2 Sample Size

The target sample size per school was 200 observations at each school during each observation period. A total of 400 observations were expected to be collected during the pre-intervention period and another 400 during the post-intervention. This number (200 observations) would provide sufficient power to detect statistical significance in idling reductions or differences. The required sample size then determined the number of days of pre- and post-intervention observations that would be needed. Once 200 observations were recorded for a site, no additional observation periods were conducted at that site. (See *Appendix D: Sample Size Calculation* for the method used to calculate required sample size).

During the pre-measurement observations, 50 - 60 cars were observed per day. Based on these numbers the sample size target per school per observation period was projected to require 5-6 days of observations. Reaching the sample size target of 200 observations per site per period was enough to detect statistically significant reduction in idling incidence and frequency and to calculate statistically significant differences between the intervention and control groups.

4.3.1.1.3 Documentation Tool

Observers were assigned an observation area to maximize the number of observations and prevent duplicate results. Observers monitored idling behaviour of cars collecting students from each of the participating schools. Observers used the same observation form during both observation periods (see *Appendix E: Observation Form and Instructions*). Each form had space to record information on 25 vehicle observations. The form included the following information:

- Field for pre- or post-intervention period.
- Observer and site codes.
- Date of observation.
- Time of day (start and end of observation).
- Description of vehicles:
    - Type of vehicle based on NRCan classification: automobiles, special purpose vehicles, trucks, vans, or school buses. This was collected in order to calculate CO_2 emissions.
    - Colour: collected to assist observers in identifying the cars, when observing more than one at a time.
- Time of arrival (beginning of observation): Recorded as hours:minutes:seconds (hh:mm:ss). Hours were expected to be recorded as 00, since observations were conducted for a period of one hour each day.
- Idle end point (when vehicle is turned off, or departs): Recorded as hh:mm:ss. These times are recorded to be able to calculate an initial idling time.
- Additional observations included:
    - Start and End #1, #2 and #3: Recorded as hh:mm:ss each. These times are recorded to be able to calculate any additional idling that occurs after the initial idling time.
    - Notes. Notes included comments about the type of vehicle, if the vehicle was already parked on site when the observation began, or the car was still on site when the observation finished, etc.

An ***observation*** was defined as a vehicle coming to a stop within the observation area. Some observations were treated differently due to the conditions, such as:

1. If a vehicle was parked on-site when the observation began, but no driver was inside, the vehicle would be ignored. However, if during the 1 hour of observation, the driver came to the car and turned it on, the vehicle idling time would be recorded as Start #1 and End #1. The initial idling would be 00:00:00 (both Time of Arrival and Idle End Point) since the vehicle was already parked and off.

2. If a vehicle was parked (engine off) on-site when the observation began, and the driver was inside the vehicle, the initial idling recorded would be 00:00:00 (both Time of Arrival and Idle End Point). Observation of the vehicle began at the time the observation began, and since the vehicle was turned off, it counted as no initial idling.

3. If a vehicle was parked (engine on) on-site when the observation began, and the driver was in or outside the vehicle, the Time of Arrival would be recorded as 00:00:00 (beginning of observation) and Idle End Point would be recorded as when the vehicle departed or was turned off.

4. If a vehicle was parked (engine on) on-site when the observation ended, and the driver was or was not inside the vehicle, observers were encouraged to remain for 5 minutes after the observation end time to be able to record the Idle End Point. However, if after this time the vehicle was still on, the Idle End Point would be recorded as the time when the observation ended.

4.3.1.1.4 Observer Recruitment

Observers were recruited from within the SMDHU Health Protection Service area and from the Georgian College Research Analyst program and the Georgian College University Partnership Centre (UPC) Environmental Science course. All observers participated in a training session. The training session provided a brief overview of the “Turn It Off” Campaign, and data collection process and form. For practical experience, the observers participated in a training simulation exercise. The simulation exercise consisted of several model cars in various idling scenarios. These scenarios included having parked cars, one idling observation from one car, multiple idling observations from one car, and multiple cars idling. This simulation helped the observers become familiar with the equipment and data collection forms. Revisions to the forms were made based on feedback received from the observers.

The number of observers at each site varied each day depending on availability, ranging from 3 to 7 observers per site.

Observers were provided with a scripted response if drivers asked questions about the observations. If the driver requested additional information, they were directed to a pre-arranged project contact person who was a health unit supervisor/manager, or to the school principal.

4.3.2 Community Intercept Survey

Face-to-face community intercept surveys were completed during the Phase 2 post-intervention period at Simcoe County community locations to evaluate the level of community awareness of the key messages from the "Turn It Off" community intervention. The two-week intervention consisted of a "Turn It Off" public awareness and educational intervention delivered at the community intervention sites. The media campaign was implemented May 5th to May 17th, 2008. The key messages for the campaign focused on awareness related to idling of vehicles and actions to reduce idling behaviour.
Several public locations in a community in Simcoe County were selected to approach people from the community and ask them about: their awareness about the "Turn It Off" campaign, their knowledge about the effects of idling and their behaviour before and after learning about the campaign and the effects of idling. The locations selected for the intercept surveys were the library, city hall, bus terminal and a beach park and trails.

4.3.2.1 Sample Size

The population consisted of public visiting sites mentioned above, during May 20th – 24th, 2008. Because this methodology was planned to be qualitative in nature, no minimum sample size was calculated. However, it was expected to generate approximately 50 completed surveys.

4.3.2.2 Tool

Interviewers used a survey designed to collect responses about idling and anti-idling campaign awareness (see *Appendix F: Simcoe County Community Survey*). The survey collected the following information:

- Self-reported idling behaviour.
- Self-reported idling knowledge.
- Anti-idling campaign awareness and knowledge.
- Participants' knowledge about anti-idling, if not aware of the anti-idling campaign.
- Participants' support for anti-idling initiatives.
- Location of residence.

4.4 Data Analysis

Key data analysis included calculation of idling incidence or rate (for further explanation, see point 4.4.1.3.) and duration during the pre- and post-intervention periods. This provided the data necessary for analysis between the Intervention Schools and Control Schools. Idling incidence is reported as a percentage. It is calculated as the number of cars idling divided by the number of total cars observed for each site and period. Idling duration is reported as the median[i] in seconds of the total idling time at that site and/or period.

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i Median = The value of the middle item when the data is arranged from lowest to highest; a measure of central tendency. If there is an even number of observations, the median is the average of the two middle observations. In raw data, the median is the middle value, the point at which exactly half of the data are above it and half below. (Definition from Statistics Canada, retrieved on January 25, 2008 from http://www.statcan.ca/english/edu/power/glossary/gloss.htm#M)

Microsoft Excel and SPSS version 15.0 were used to analyze the data. Due to the non-normal distribution[ii] of the data, group comparisons were made using non-parametric tests, such as the Mann-Whitney test and chi-square test for independence.

Other indicators included:

- Idling times: idling time was recorded for instances when engines were turned off and subsequently restarted. Idling time was recorded for up to 4 restarts.
- Idling duration categories: duration was divided in 3 categories for better understanding of duration. Categories were: 0 seconds (no-idling), 1 seconds – 3 minutes, and more than 3 minutes.
- Temperature was recorded and used as part of the analysis to analyze changes in idling based on weather conditions and temperature.
- Idling incidence and duration of idling was calculated by vehicle type in order to be able to generate estimates of CO_2 emissions.

4.4.1 About the Data

The definition of the population observed in this project was vehicles driven by adults dropping off or picking up children at two schools in the District of Muskoka (Phase 1) and two schools in Simcoe County (Phase 2). Each phase was analyzed separately. Each phase was an experimental design which had two populations (one for the Intervention School and another for the Control School). Each of these populations was sampled twice (pre-intervention week and post-intervention week). The four sets of observations are not statistically independent, since many of the same people in each school during the pre- and post-intervention periods were observed. Therefore, for purposes of this study, there are two independent samples (intervention and control), each with two sets of observations (pre- and post-intervention periods), constituting a non-identical, but overlapping, set of individuals. Due to this, these samples can be assumed to be semi-dependent. Because the intervention was implemented at the group (school) level rather than at the individual level, there is no certainty that every individual measured received the intervention.

ii Normal Distribution = Often just called the bell-curve or bell-shaped curve. Most of the scores in this graph accumulate around the middle. The mean, median and mode are all equal, and the scores at either end of the distribution occur less often. For example, a curve representing the results of an intelligence test would have the most number of people in the middle or around the 'average' intelligence range. Whereas the number of people decreases as the scores get farther away on either side of the average, giving the curve its shape and name. (Definition from Statistics Canada, retrieved on February 26, 2008 from http://www.statcan.ca/english/edu/power/glossary/gloss.htm#N)

4.4.1.1 Types of Vehicles

The types of vehicles observed were recorded in four categories based on Natural Resources Canada classification. The classification includes:

- Automobiles: including two-seater cars, subcompact cars, compact car, mid-size car, full-size car, and station wagon.
- Vans/Mini vans: including large vans and mini-vans.
- Pick-up trucks.
- Special Purpose vehicles: including SUVs, jeeps, or similar.

4.4.1.2 Calculation of Total Idling

Total idling was computed to subtract 10 seconds from those vehicles that idled more than 10 seconds, based on information obtained from NRCan. At the time of the project NRCan recommended that drivers turn off the engine if parked for more than 10 seconds[iii]. For the purposes of this project, only vehicles idling more than 10 seconds at a time were considered to be demonstrating idling behaviour. Vehicles which were observed to idle for longer than 10 seconds had 10 seconds subtracted from the idling duration used in data analysis. Vehicles idling between 0-10 seconds were re-coded into 0 (which means no idling).

4.4.1.3 Idling Incidence (rate)

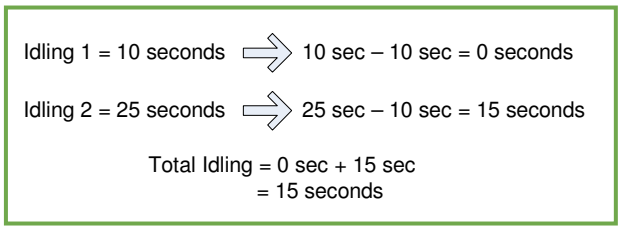
Idling incidence is reported as a percentage of the number of vehicles observed and is calculated as the number of vehicles idling divided by the number of total vehicles observed. Idling duration is reported as median minutes.

$$\text{Idling incidence (rate)} = \frac{\text{\# of vehicles idling}}{\text{\# of vehicles observed}} \quad \text{at a site during a period of observation}$$

Because the idling calculations are based on vehicles observed, a vehicle was considered to be one observation when it idled at least once. However, idling duration was calculated by adding up the duration of each of the times the vehicle idled. Each of these times was considered an idling observation[iv]. This means, that if a vehicle idled twice, but each time it idled was under 10 seconds, it is not considered an idling vehicle; if the vehicle idled twice, one time was under 10 seconds and the other was 25 seconds, the total idling time of the vehicle is 15 seconds (see figure next page for sample calculation).

iii According to NRCAN: http://www.oee.nrcan.gc.ca/transportation/idling/issues/why-idling-problem.cfm?attr=16: A good rule of thumb for smart, idle-free driving is this: If you are going to be parked for more than 10 seconds, turn off the engine. Ten seconds of idling can use more fuel than turning off the engine and restarting it.

iv For purposes of this report, 'idling observations' refers to each time the car is idling; it began when a vehicle entered the observation area and stops or when a parked vehicle turned on its engine, and it ended when a vehicle either turned off its engine or departs the observation area.



4.4.1.4 Statistical Distribution of Idling Time

Data from the Real Idling Time variable was non-normally distributed. This means that most of the drivers would idle for a short period of time while few drivers idled for long periods of time. Because of the non-normal distribution and those few outliers, the mean[v] is not a good measure of the average of the data. A more realistic central measurement of the data is the median[vi], which is considered a geometrical mean. Therefore, for the results section of this report, the median will be considered as the central measurement rather than the mean.

4.4.1.5 Number of Times a Vehicle Idled

Some vehicles were observed idling more than once. During the observation period, observers recorded the initial idling of the vehicles as they arrived. Some vehicles were observed restarting and stopping their engines several times while waiting. The observers recorded up to three restart/stop times per vehicle, resulting in a maximum of 4 idling observations per vehicle. The idling times were recorded as initial idling, idling #1, idling #2 and idling #3.

4.4.1.6 Idling Duration Categories

There were a total of 851 observations. To analyze the distribution of the idling duration, the observations were grouped into 3 categories:

- drivers idling 0 = did not idle = category I
- drivers idling 1 seconds – 3 minutes at a time = category II
- drivers idling more than 3 minutes at a time = category III

Three minutes was selected as the upper threshold, because according to NRCan[vii], 3-minutes is a common idling time allowed by municipal bylaws, where they exist.

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v Mean = The most common measure of central tendency, the mean is the arithmetic average of a set of numbers. (Definition from Statistics Canada, retrieved on January 25, 2008 from http://www.statcan.ca/english/edu/power/glossary/gloss.htm#M)

vi Median = The value of the middle item when the data are arranged from lowest to highest; a measure of central tendency. If there is an even number of observations, the median is the average of the two middle observations. In raw data, the median is the middle value, the point at which exactly half of the data are above it and half below. (Definition from Statistics Canada, retrieved on January 25, 2008 from http://www.statcan.ca/english/edu/power/glossary/gloss.htm#M)

vii A Model Idling Control By-Law. NRCAN, Office of Energy Efficiency. Retrieved on December 16th from http://oee.nrcan.gc.ca/communities-government/transportation/municipal-communities/reports/model-bylaw.cfm

4.4.1.7 Temperature

The temperature varied from the pre-intervention period to the post-intervention period. However, both the Intervention and Control School experienced the same variation of temperature from pre- to post-intervention periods. Since the schools were in the same geographical location the temperatures would have been the same at the Intervention and Control Schools during the pre- and post-observations.

4.4.1.8 Gas Emission

Based on the Energuide 2007 issued by NRCan[viii], the median carbon dioxide (CO_2) emission was calculated for each one of the vehicle type categories recorded during the observations. According to Energuide 2007, automobiles or passenger vehicles have an engine size of 3.0 L, special purpose vehicles have an engine size of 3.6 L, vans or mini-vans have an engine size of 4.3 L and pick-up trucks have an engine size of 4.7 L. The median engine size of all the observed vehicles was 3.5 L.

Based on an NRCan gas emission calculation tool (see *Appendix H: NRCan Gas Emission Calculation Tool*), CO_2 emission was calculated for each vehicle type category observed. The tool was also used to calculate the number of days a car would have to be driven non-stop to produce the same amount of CO_2. The tool makes the assumption that if drivers idle during the observation periods at school sites, they will likely idle at other times or places 365 days a year. It was acknowledged that during colder temperatures and seasons, drivers tend to idle more often or for longer periods of time. This also happens during high temperatures when the humidity index is high. Since there is no calculation or index to control or compare idling rates during the various seasons and temperatures, the formula provided by NRCan was used to calculate gas emission (CO_2) in tonnes per year (365 days).

4.5 Limitations

This project had several limitations or variables that influenced the results. These included:

- Even though the data collection and interventions of Phase 1 and Phase 2 had the same design, they cannot be compared to each other, since the phases were completed at different times of the year, and they were conducted in distinctly different communities (demographics, population, etc.).

- Weather changes: Indices for idling incidence or duration by increased temperature do not exist, so it was not possible to adjust for temperature.

- Schools have different traffic patterns due to availability of parking. Some schools provide parking lots dedicated to individuals who are picking-up children.

viii Energuide – Fuel Consumption Guide 2007 – NRCan. Retrieved on April 2007 from http://oee.nrcan.gc.ca/transportation/tools/fuelratings/fuel-consumption-guide-2007.pdf

- Idling behaviour might have been impacted at both Control Schools and Intervention Schools as a result of the educational materials that were distributed at Intervention Schools, as the schools were located in the same community. It was expected that bias would be in the direction of reduced idling at baseline for the control group.

- Interrater reliability[ix] issues with data collection (i.e. accurate timing, accurate recording, consistency of recording, etc.) could have affected validity. While there was some potential for error in volunteer recording of observations, data collection tools were quite simple to complete, an instruction form was provided, and volunteers were trained to ensure understanding.

- While this evaluation was exploring the impact of an anti-idling intervention, it focused specifically on observed idling behaviour. No data was collected on knowledge or awareness gain of the interventions at the school sites. However, Phase 2 of the initiative attempted to explore idling knowledge and campaign awareness through the community survey.

- A more comprehensive evaluation would explore impact on awareness, knowledge and other perceptions. Surveys or interviews of parents, students and school staff could be conducted in addition to observational data collection. Even though an intercept survey was implemented in Phase 2, this was addressed to the community rather than to the observed drivers.

- Because this was a small intervention evaluation, the results cannot be generalized to schools or community sites as a whole. Statistically significant impact results could suggest that the interventions show promise and may be worth exploring at other schools and community sites.

ix Interrater reliability is the extent to which two or more individuals (coders or raters) agree. Interrater reliability addresses the consistency of the implementation of a rating system.

5 RESULTS

5.1 Phase 1: District of Muskoka - Idling Behaviour Observations, Autumn 2007

5.1.1 Total Number of Observations in District of Muskoka:

Idling behaviour of drivers from a total of 851 vehicle observations are included in the analysis of Phase 1.

From the total of 851 vehicles observed and recorded, 417 vehicles were observed during the week before the intervention and 434 during the week after the intervention. Of these 851, 428 were observed at the Intervention School and 423 at the Control School. A sample size of more than 200 observations per site was achieved to ensure power for statistically significant group differences if estimates of incidence and reduction[x] were achieved. The standard used is a range of error, or confidence interval, of no more than +/-7% for each estimate, at a confidence level of 95%. Table 1 shows the number of vehicles per period and site.

Table 1: Total Number of Vehicles Observed in District of Muskoka

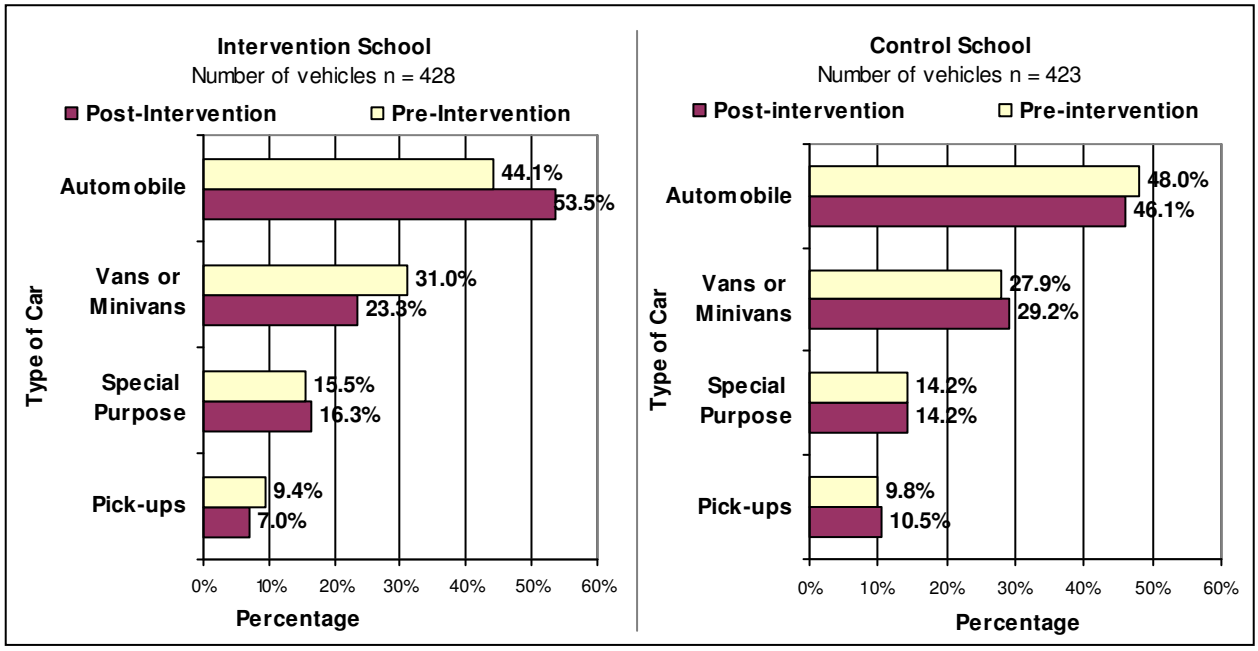
	Total	Pre-Intervention	Post-Intervention
Total	851	417	434
Intervention School	428	213	215
Control School	423	204	219

5.1.2 Types of Vehicles Observed in District of Muskoka

Of the 851 vehicles approximately half (48%) were passenger vehicles or automobiles, nearly one third (28%) were minivans or vans, 15% were special purpose vehicles (SUVs included), and 9% were pick-up trucks. Figure 1 compares the percentage of vehicles observed at the Intervention School to those observed at the Control School during the pre- and post-intervention periods.

x Expectations of incidence and reduction: When calculating the sample size needed for the observations, the results from the studies in Sudbury and Mississauga were used as benchmarks. Their results showed a reduction in idling incidence and duration. Researchers of this initiative calculated the sample size based on these reductions, which gave a parameter of the 'expected' reduction at Simcoe and Muskoka.

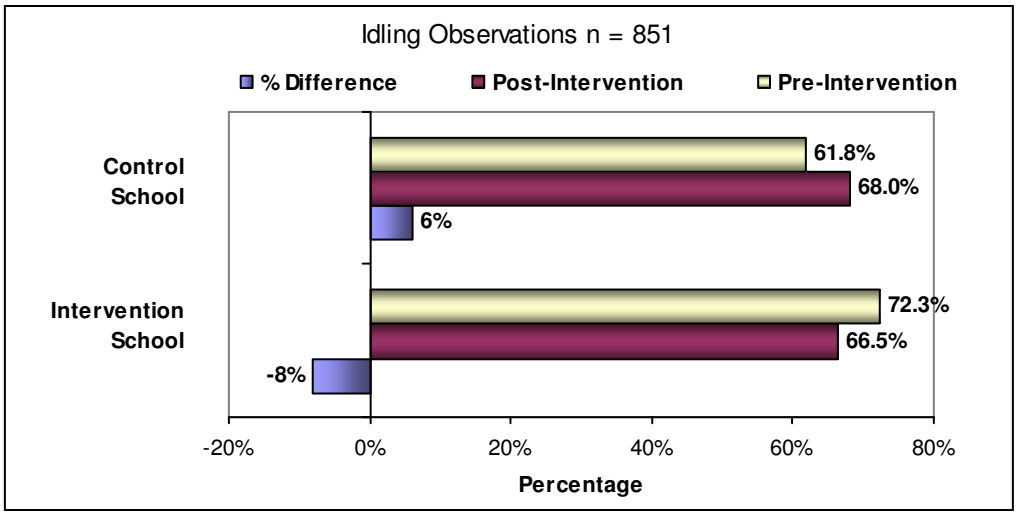
Figure 1: Number of Vehicles Observed in District of Muskoka During Pre- and Post-Intervention Periods



5.1.3 Idling Incidence in District of Muskoka

Of the 851 vehicles observed, 67% (CI, 63.8% - 70.2%) idled at least once during either period at either of the school locations. During the pre-intervention week more vehicles were observed to idle at the Intervention School (72.3% (CI, 66.3% - 78.3%)) than at the Control School (61.8% (CI, 55.1% - 68.5%)). However, idling incidence decreased by 8% at the Intervention School following the intervention. It is important to note that during the same time period, idling incidence increased by over 10.0% at the Control School. Figure 2 shows the idling incidence with differences between observation periods.

Figure 2: Comparison of Idling Incidence Between Observation Periods and Sites.



Based on the crosstab analysis for these groups, and using a Chi-Square test, the difference in idling incidence between pre-intervention period and post-intervention period was not statistically significant at either of the school sites ($p > .05$).

5.1.4 Idling Duration in District of Muskoka (Duration in seconds of vehicles idling)

The median idling duration recorded for all 851 vehicles observed was 30 seconds (CI, 26.9 – 33.1 seconds). However, the median varied by observation period and site. Table 2 shows the comparison between median idling duration at each site during each period.

Table 2: Comparison of Idling Duration Between Pre- and Post-Intervention at Both Intervention and Control Schools (median in seconds) in District of Muskoka

	Total Idling Duration (seconds)	Pre-Intervention Idling Duration (seconds)	Post-Intervention Idling Duration (seconds)	Absolute Difference (seconds)
Total	30.0	28.0	31.0	+3.0
Intervention School	30.0	28.0	31.0	+3.0
Control School	31.0	31.0	30.0	-1.0

Drivers at the Intervention School idled for 28 seconds (CI, 22 – 34 seconds) (median) during the pre-intervention period; drivers observed during the post-intervention period at the same site idled 31 seconds (CI, 25 – 37 seconds) (median). Meanwhile drivers at the Control School idled for 31 seconds (CI, 25 – 37 seconds) during the pre-intervention period and 30 seconds (CI, 24 – 36 seconds) during the post-intervention period.

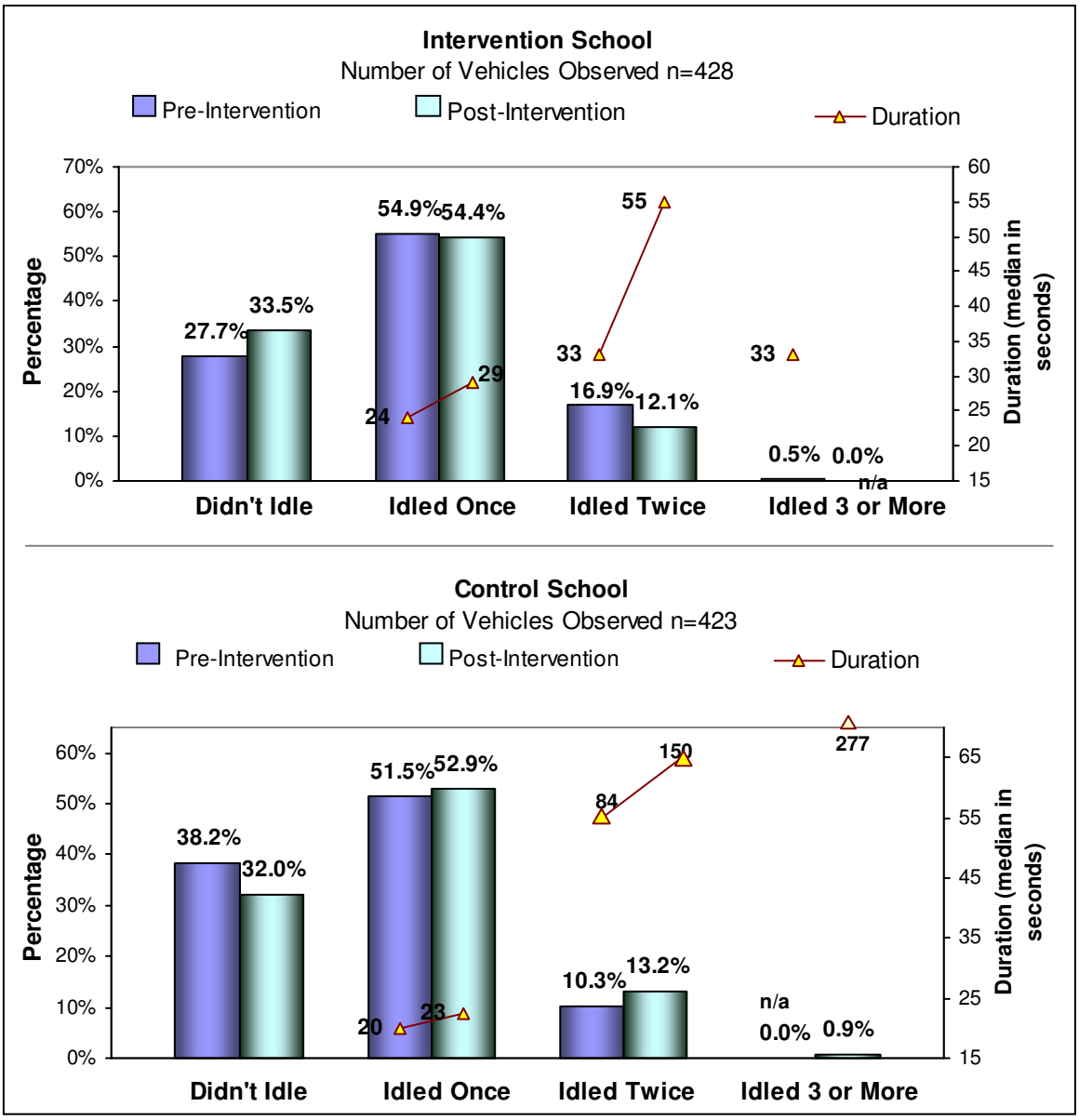
5.1.5 Number of Times Vehicles Idled and Their Duration Per Idling Time in District of Muskoka

Sixty-seven percent of vehicles (67% of 851 (CI, 64.0% – 70.4%)) idled at least once during the observation periods. Over half of drivers (54% (CI, 50.7% – 57.3%)) idled once, 13% (CI, 10.7% – 15.3%) idled twice and very few idled three or more times. There was minimal change in the proportion of vehicles that did not idle during the pre-intervention period, 137, (33% (CI, 0.0% – 0.8%)) and during the post-intervention period, 142 (33% (CI, 0.0% – 0.8%)).

The proportion of vehicles that did not idle at the Intervention School increased from the pre-intervention period (28% (95% CI, 21.7% – 33.7%)) to the post-intervention period (34% (95% CI, 27.2% – 39.8%)). In contrast, the proportion of the vehicles that did not idle at the Control School decreased from 38% (95% CI, 31.5% – 44.9%) to 32% (95% CI, 25.8% – 38.2%) from period to period.

Figure 3 shows the comparison of proportions of idlers with their duration at both sites.

Figure 3: Comparison of Idling Duration Among Idlers (duration in this table is in median seconds) in District of Muskoka

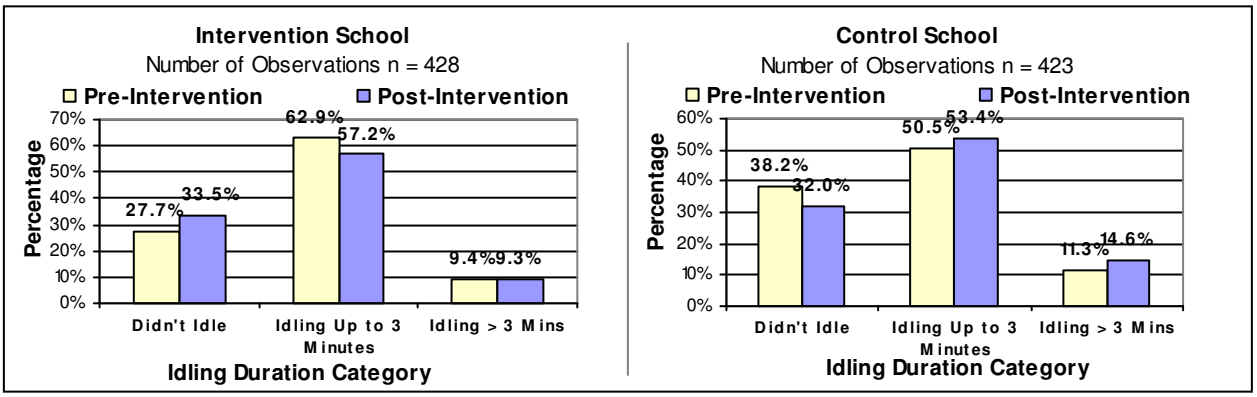


5.1.6 Duration Categories in District of Muskoka

As mentioned previously, the proportion of vehicles that did not idle increased at the Intervention School while decreasing at the Control School. The proportion of vehicles that idled up to 3 minutes decreased at the Intervention School from 63% (CI, 56.5% – 69.5%) during the pre-intervention period to 57% (CI, 50.4% – 63.6%) during the post-intervention period. Meanwhile, the proportion of vehicles that idled for up to 3 minutes increased at the Control School from 51% (CI, 44.3% – 57.7%) during the pre-intervention period to 53% (CI, 46.3% – 59.7%) during the post-intervention period.

Figure 4 shows the different percentages of the duration of idling observations during pre- and post-intervention.

Figure 4: Comparison of Idling Duration Categories Between Idling Observations at Both Intervention and Control School During Pre- and Post-Intervention Periods in District of Muskoka



5.1.7 Temperature Impact in District of Muskoka

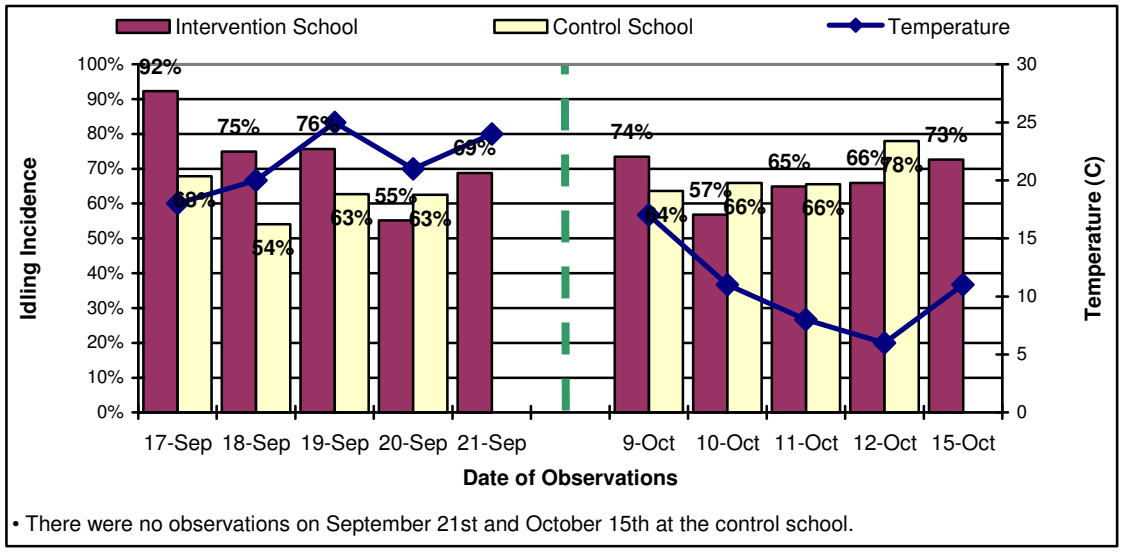
The mean outdoor air temperature decreased over the period of the project implementation from 21°C during the pre-intervention period to 11°C during the post-intervention period (95% confidence interval). Distribution of this variable is close to normal. There was no difference in the mean temperature at the Control and Intervention Schools because they are located in the same geographic area. Therefore, the difference in temperature will not be considered when comparing Control vs. Intervention School, but it will be taken into account when comparing pre-intervention vs. post-intervention periods. Idling incidence decreased from a median of 72% (CI, 66.3% – 78.3%) at the Intervention School during the pre-intervention period, to 67% (CI, 60.7% – 73.3%) during the post-intervention period, even though there was a ten degree decrease in outdoor air temperature between the observation periods. At the Control School, idling incidence increased from 62% (CI, 55.1% – 68.5%) to 68% (CI, 61.8% – 74.2%), in the same temperature and weather conditions. Table 3 shows the weather conditions recorded each day of the observation periods.

Table 3: Daily Weather Conditions in District of Muskoka

Day	Weather conditions
Pre-Intervention	
September 17	Sunny with breeze
September 18	Sunny with breeze
September 19	Sunny with smog advisory
September 20	Sunny with humidity – smog advisory terminated
September 21	Sunny
Post-Intervention	
October 9	Cloudy with breeze
October 10	Cloudy, windy, cold
October 11	Cloudy, windy, cold
October 12	Mainly cloudy
October 15	Mix of sun and cloud

Figure 5 demonstrates that as the daily temperature decreases, idling incidence increases. During periods of low temperatures, idling incidence did not increase at the Intervention School as would be expected; however, increased idling incidence was observed at the Control School during cooler conditions.

Figure 5: Idling Incidence and Temperature in District of Muskoka



• There were no observations on September 21st and October 15th at the control school.

5.1.8 Carbon Dioxide (CO_2) Emissions in District of Muskoka

Regardless of the number of vehicles that idled at both schools, the median idling duration is approximately the same and the median CO_2 emission is estimated to be 0.01 tonnes / year per vehicle. If each of these vehicles idled for the 30-31 seconds every day of the year, they would have emitted 0.01 tonnes of CO_2 each, which is equivalent to driving a vehicle 1.2 days straight or 28.8 hours. (*Appendix I: Muskoka Idling Duration and CO_2 Emission Per Type of Vehicle* shows idling duration and CO_2 emission per vehicle type).

At the Intervention School, although the number of idling vehicles decreased from pre-intervention to post-intervention, the CO_2 emitted remained the same (0.01 tonnes/year), due to the fact that the median idling time increased by 3 seconds from period to period.

Vehicle idling time at the Control School decreased slightly from pre-intervention period to the post-intervention; however, because a larger proportion of vehicles idled at this site, the CO_2 emissions increased.

The percentage of contribution for each type of vehicle at each site and during each period was calculated. See table 4 for an example. The contribution of idling for the idling automobiles at the Intervention School was calculated as the proportion (reported as percentage) of these vehicles to the total of vehicles that idled at this site. Contributions were calculated for idling incidence, idling duration and CO_2 emissions.

Because the number of automobiles was higher than the other types of vehicles during both periods, CO_2 emissions were largest for this vehicle type category. Forty-four percent of total CO_2 emissions were emitted by automobiles. However, the automobile category was the only vehicle type that was observed to decrease in both number (decreased by 4%), and idling (idled 30% less), therefore resulting in a decrease in the amount of CO_2 emission (decrease of 33%) from the pre-intervention period to the post-intervention period.

Table 4: Example of Calculation of Contribution of Idling Incidence.

Idling Incidence (rate) 572 vehicles of 851(67%) idled at least once at either site Of those 572 vehicles (67%) that idled at either site:			
276 were automobiles	154 were vans or mini-vans	87 were special purpose vehicles	55 were pick-up trucks
The percentage of each type of vehicle was calculated to the total of idling vehicles: For example: What percentage of 67% were idling automobiles: 276 x 67 / 572 = 32.4%			
Automobiles contributed to 32.4% of idling incidence	Vans or mini-vans contributed to 18.1% of idling incidence	Special purpose vehicles contributed to 10.2% of idling incidence	Pick-up trucks contributed to 6.5% of idling incidence

The vans or minivans were found to slightly decrease in percentage of idling vehicles (18.2% to 18.0% from period to period), while the special purpose vehicles and pick-up trucks showed an increase in percentage of idling vehicles (special purpose vehicles increased from 9.8% to 10.6%, and pick-up trucks increased from 6.0% to 6.9%). These three types of vehicles demonstrated increased idling time and CO_2 emissions from period to period. Analysis of the special purpose vehicle category found contribution to idling time and CO_2 emissions doubled from period to period. The other two categories of vehicles increased the idling time and CO_2 emission contributions by 3%-5%. Table 5 provides a comparison of contribution of CO_2 based on idling time and number of idling vehicles.

Table 5: Comparison of Vehicles Contribution to CO2 and Idling Time in District of Muskoka.

Both Sites (n=851)	**Total**			**Pre-Intervention**			**Post-Intervention**		
	% idling vehicles	*% idling time*	*% CO2 emission*	*% idling vehicles*	*% idling time*	*% CO2 emission*	*% idling vehicles*	*% idling time*	*% CO2 emission*
Automobiles (3.0 L) Total Number = 408	32.4%	50.0%	43.8%	33.1%	60.5%	54.0%	31.8%	42.2%	36.4%
Vans or Minivans (4.3 L) Total Number = 237	18.1%	18.8%	21.8%	18.2%	16.6%	19.7%	18.0%	20.4%	23.3%
Special Purpose Vehicles (3.6 L) Total Number = 128	10.2%	18.6%	18.7%	9.8%	11.8%	12.1%	10.6%	23.6%	23.4%
Pick-Up Trucks (4.7 L) Total Number = 78	6.5%	12.6%	15.7%	6.0%	11.1%	14.1%	6.9%	13.7%	16.9%
Totals	67.2 %	100 % 69096[1]	100 % 25.36[2]	67.1 %	100 % 29505[1]	100 % 10.61[2]	67.3%	100 % 39591[1]	100 % 14.76[2]

1. Total idling time expressed in seconds.

2. Total CO_2 emission expressed in tonnes/year.

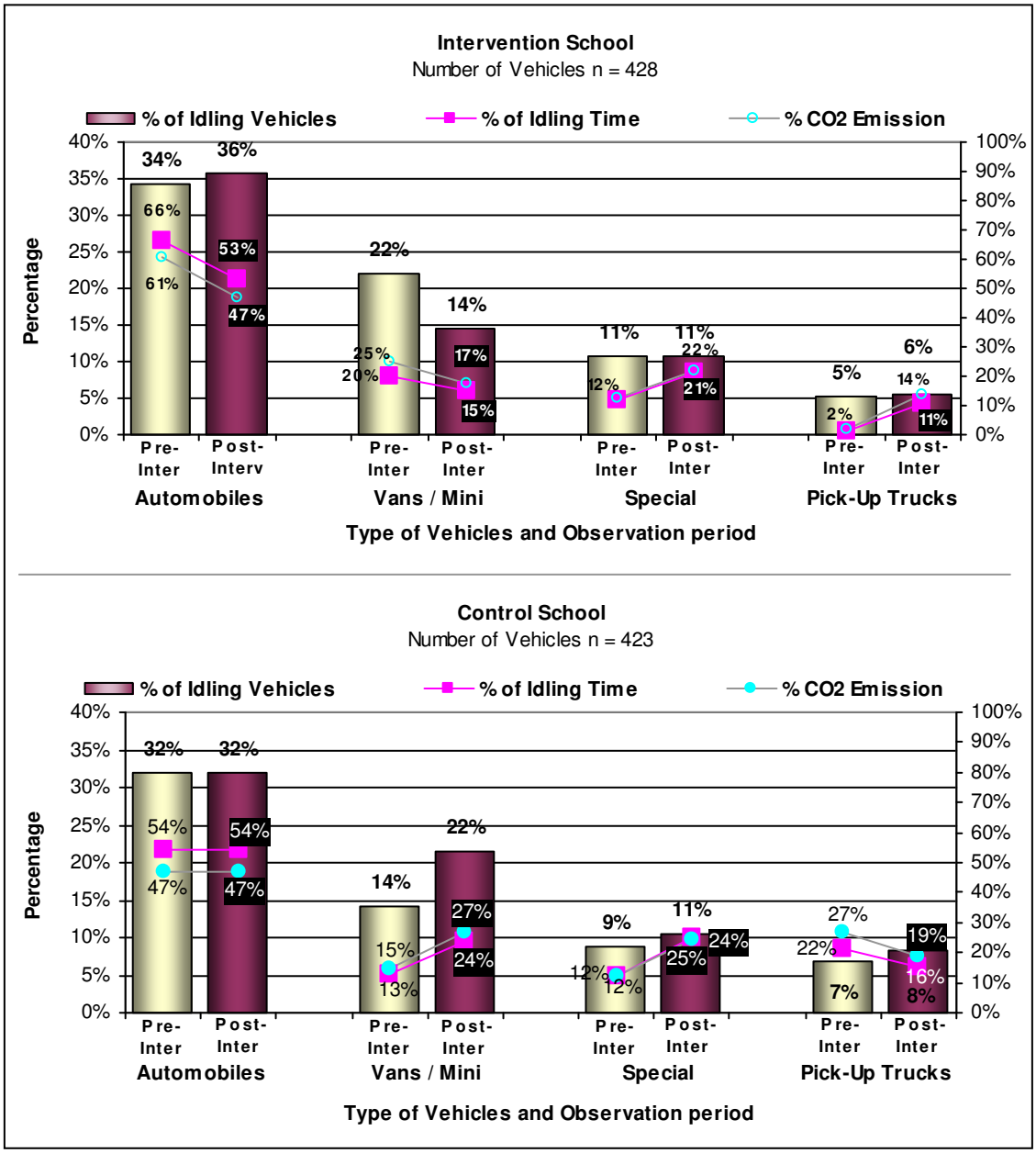
At the Intervention School, although the number of automobiles observed increased slightly, the duration of idling decreased, resulting in a reduction of estimated CO_2 emissions from period to period for this vehicle category. In contrast, the idling duration of both the special purpose vehicles and pick-up trucks categories increased from period to period. Since there was no change in number of idling vehicles in these vehicle categories, the contribution to estimated CO_2 emissions for those vehicle types increased from period to period.

At the Control School, the number of automobiles, idling duration and estimated contribution to CO_2 emissions remained constant from period to period. Pick-up trucks increased in number, but idling time decreased, resulting in reduced estimated CO_2 contribution. Meanwhile, vans/mini vans and special purpose vehicles increased in number and idling time, and therefore the CO_2 emissions contribution for this vehicle category also increased.

Overall, the CO_2 contribution at the Intervention School did not change from period to period (5.39 tonnes/year of CO_2 during the pre-intervention period to 5.37 tonnes/year of CO_2 during the post-intervention period). However, CO_2 emissions increased at the Control School from period to period. The CO_2 contributions in the post-intervention period nearly doubled from emissions in the pre-intervention period (5.22 tonnes/year during the pre-intervention period to 9.39 tonnes/year during the post-intervention period). Due to the intervention at the Intervention School, about 5 tonnes/year of CO_2 were not produced during the post-intervention period.

Figure 6 gives a visual image of the CO_2 emission contributions for each of the sites and observation periods.

Figure 6: Proportion of Idling Vehicles Related to the Proportion of Idling Time and CO2 Emission in District of Muskoka



5.2 Phase 2: Simcoe County – Idling Behaviour Observations, Spring 2008

5.2.1 Total Number of Observations in Simcoe County

Idling behaviour of the drivers of 914 vehicles were observed. From this total, 477 vehicles were observed during the week before the intervention and 437 during the week after the intervention. Of these 914, 451 were observed at the Intervention School and 463 at the Control School. A sample size of more than 200 observations per site was achieved to ensure power for statistically significant group differences if expectations of incidence and reduction were met. The standard used is a range of error, or confidence interval, of no more than +/-7% for each estimate, at a confidence level of 95%. Table 6 shows the number of vehicles per period and site.

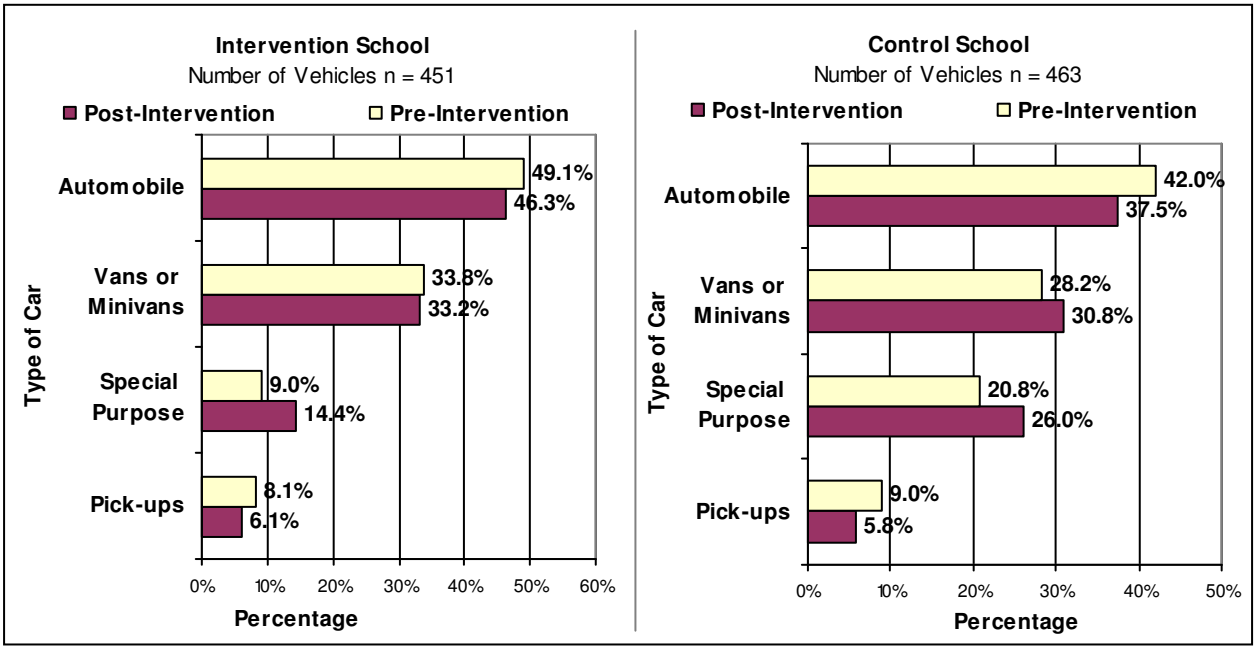
Table 6: Total Number of Vehicles in Simcoe County

	Total	Pre-Intervention	Post-Intervention
Total	914	477	437
Intervention School	451	222	229
Control School	463	255	208

5.2.2 Types of Vehicles in Simcoe County

Of the 914 vehicles, almost half (44%) were passenger vehicles or automobiles, just over one third (31%) were minivans or vans, 18% were special purpose vehicles (SUVs included), and 7% were pick-up trucks. Figure 7 compares the percentage of vehicles observed at the Intervention School to those observed at the Control School during the pre- and post-intervention periods.

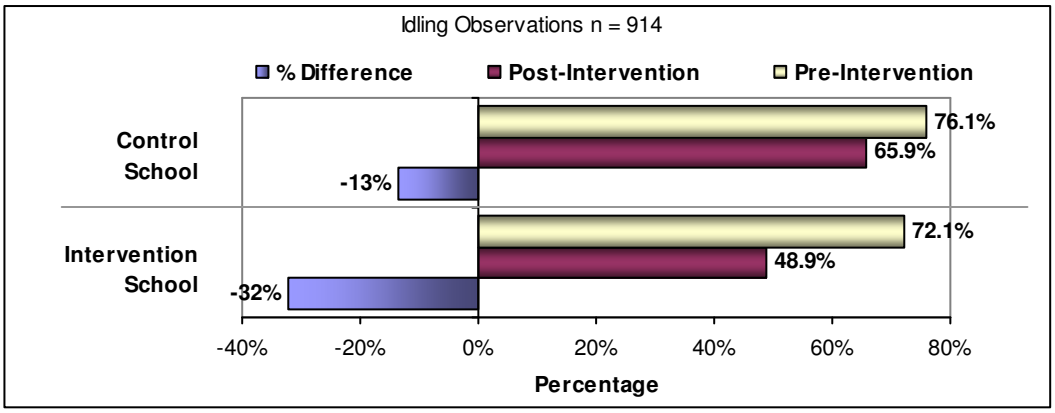
Figure 7: Number of Vehicles Observed During Pre- and Post-Intervention Periods in Simcoe County



5.2.3 Idling Incidence in Simcoe County

Of the 914 vehicles, 66% (CI, 62.9% – 69.1%) idled at least once during either period at either of the school locations. During the pre-intervention week vehicles idled more at the Intervention School (76% (CI, 70.4% – 81.6%)) than at the Control School (72% (CI, 66.5% – 77.5%)). However, idling incidence decreased by 32% at the Intervention School following the intervention, and by 13% at the Control School with no intervention. In other words, there was an increase in the proportion of drivers who chose to not idle their vehicle from the pre-campaign period (28%, (CI 22% - 34%)) to the post-campaign period (51%, (CI 45% - 58%)) at the Intervention School. Figure 8 shows the idling incidence with the differences between observation periods.

Figure 8: Comparison of Idling Incidence Between Observation Periods and Sites. Idling Duration (duration in seconds of vehicles idling) in Simcoe County



Based on the crosstab run for these groups, and using a Chi-Square test, the difference in idling incidence between the pre-intervention period and post-intervention period was statistically significant at both school sites ($p < .05$).

5.2.4 Idling Duration in Simcoe County (Duration in seconds of vehicles idling)

The median idling duration recorded for all 914 vehicles observed was 33 seconds (CI, 30% – 36%). However, it varied between periods and sites. Table 7 shows the comparison of median idling duration at each site during each period.

Table 7: Comparison of Idling Duration Between Pre- and Post-Intervention at Both Intervention and Control Schools (median in seconds) in Simcoe County

	Total Idling Duration (seconds)	Pre-Intervention Idling Duration (seconds)	Post-Intervention Idling Duration (seconds)	Absolute Difference (seconds)
Total	33.0	48.0	20.0	-28.0
Intervention School	25.0	35.5	15.5	-20.0
Control School	42.0	55.5	26.0	-29.5

Drivers at the Intervention School idled for 36 seconds (median) (CI, 29.2% – 41.8%) during the pre-intervention period, while drivers observed during the post-intervention period at the same site idled 16 seconds (median) (CI, 10.8% – 20.2%). Drivers at the Control School idled for 56 seconds (CI, 49.4% – 61.6%) during the pre-intervention period and 26 seconds (CI, 20.0% – 32.0%) during the post-intervention period.

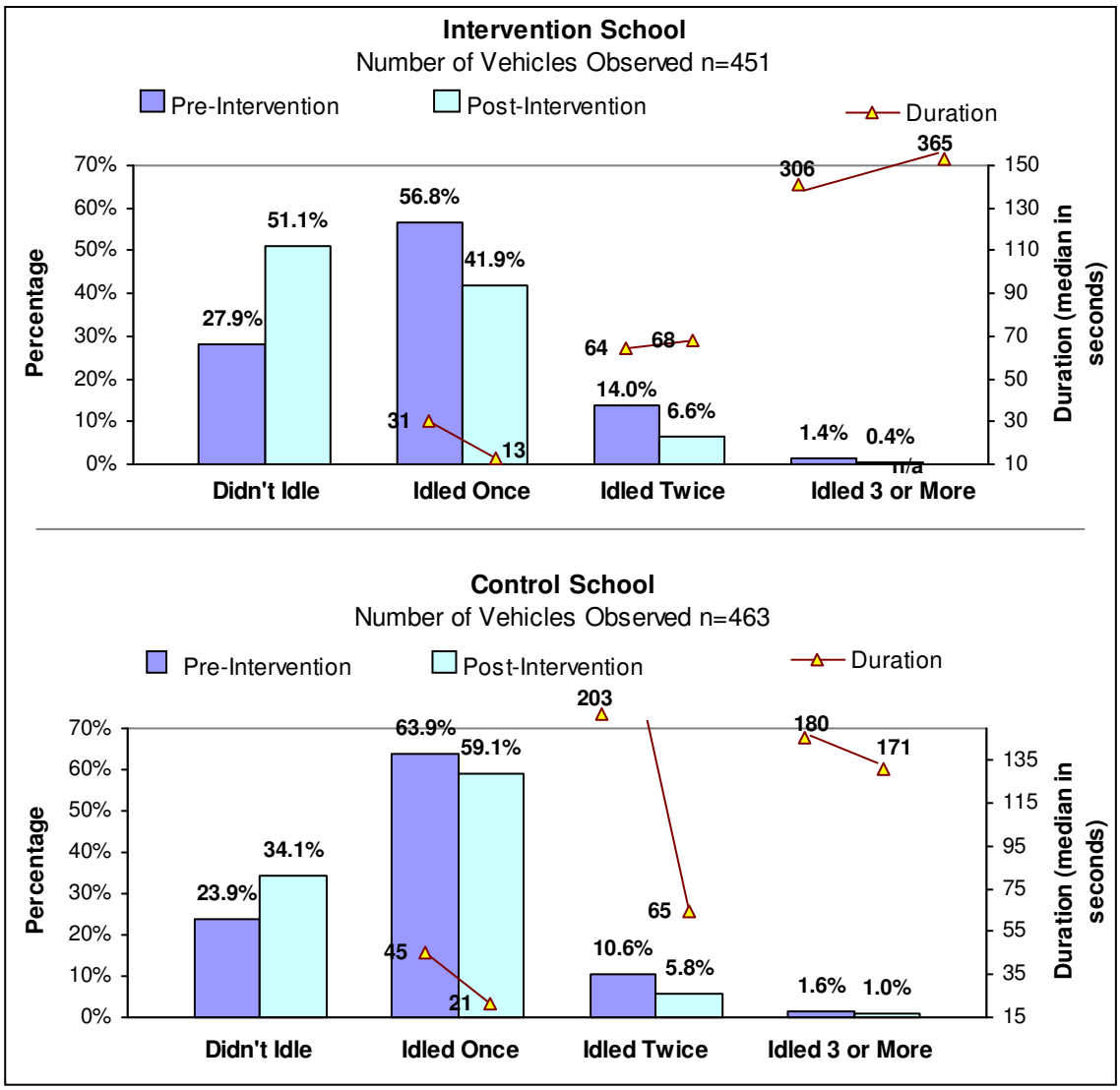
5.2.5 Number of Times Vehicles Idled and Their Duration Per Idling Time in Simcoe County

Sixty-six percent of vehicles (66% of 914 (CI, 62.9% – 69.1%)) idled at least once during the observations periods. More than half of the vehicles (56% (CI, 52.8% – 59.2%)) idled once, 9% (CI, 52.8% – 59.2%) idled twice and very few idled three or more times. The proportion of the total of vehicles that did not idle at all increased from 26% during the pre-intervention period to 43% during the post-intervention period.

The proportion of vehicles that did not idle at the Intervention School increased from the pre-intervention period (28% (CI, 22% – 34%)) to the post-intervention period (51% (CI, 44.6% – 57.6%)). During the same period, the proportion of the vehicles that did not idle at the Control School increased from 24% (CI, 18.8% – 29.2%) to 34% (CI, 27.6% – 40.4%) from period to period.

Figure 9 provides a comparison of proportion of idlers, and idling duration at both sites. At the Intervention School, the vehicles observed to idle one or more times were found to have a decrease in idling incidence from period to period (bars). However, only vehicles that idled once demonstrated a decrease in idling duration (line). At the Control School, similar to the Intervention School, vehicles that idled one or more times demonstrated a decrease in idling incidence from period to period. All vehicles were found to decrease in idling duration.

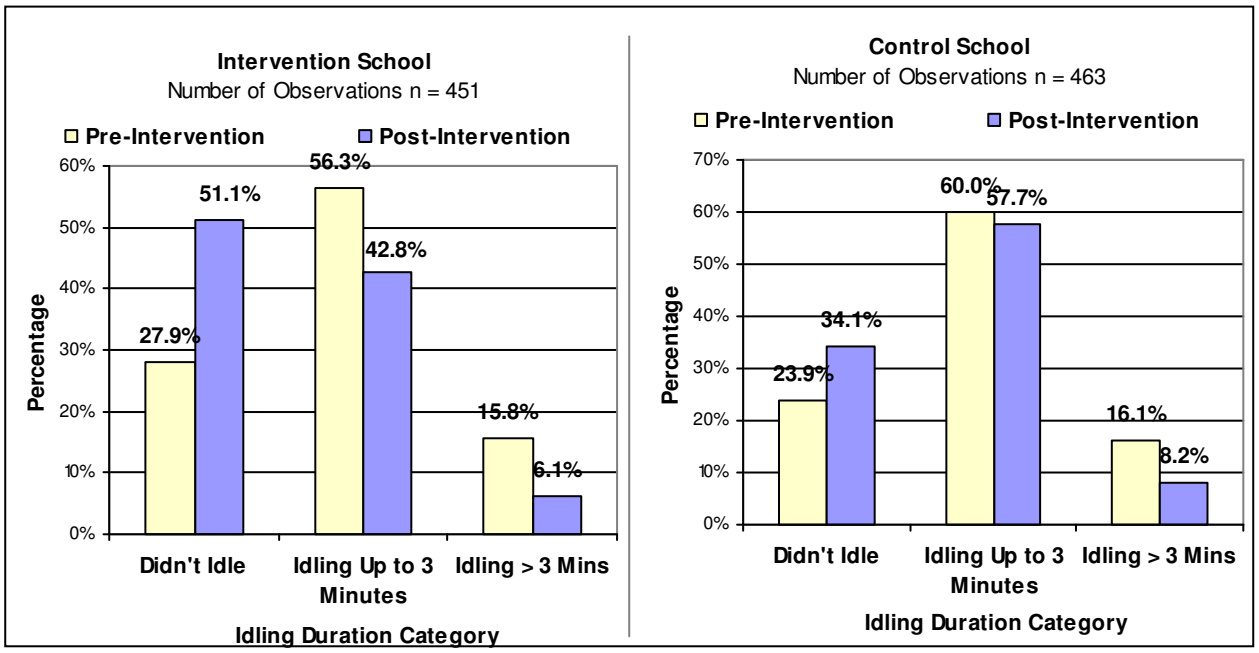
Figure 9: Comparison of Idling Duration Among Idlers (duration in this table is in median seconds) in Simcoe County



5.2.6 Duration Categories in Simcoe County

As mentioned previously, the proportion of vehicles that did not idle increased both at the Intervention School and at the Control School. The proportion of vehicles that idled up to 3 minutes decreased at both schools. This proportion decreased from 56% (CI, 49.5% – 62.5%) during the pre-intervention period to 43% (CI, 36.6% – 49.4%) during the post-intervention period at the Intervention School and from 60% (CI, 54% – 66%) to 58% (CI, 51.3% – 64.7%) at the Control School, from period to period. Figure 10 shows the duration of idling observations as a percentage of total observations during pre- and post-intervention.

Figure 10: Comparison of Idling Duration Categories Between Idling Observations at Both Intervention and Control School During Pre- and Post-Intervention Periods in Simcoe County



5.2.7 Temperature Impact in Simcoe County

The mean temperature increased from 5°C during the pre-intervention period to 14°C during the post-intervention period (95% confidence interval). Distribution of this variable is close to normal. There was no difference between the mean temperature at the Control School and Intervention School, since they were located in the same geographic area. Therefore, the change in temperature will not be considered when comparing the Control and Intervention Schools, but it will be taken into account when comparing pre-intervention and post-intervention periods.

Idling incidence decreased from a median of 76% (CI, 70.4% – 81.6%) at the Intervention School during the pre-intervention period, to 51% (CI, 44.6% – 57.6%) during the post-intervention period. Meanwhile, at the Control School, idling incidence decreased from 72% (CI, 66.5% – 77.5%) to 49% (CI, 42.2% – 55.8%). The decrease in idling incidence could be due to the change of temperature and warmer weather conditions. However, the Intervention School showed a larger decrease (-32%) than the Control School (-13%), in the same temperature and weather conditions. Table 8 shows the weather conditions recorded each day of the observation periods.

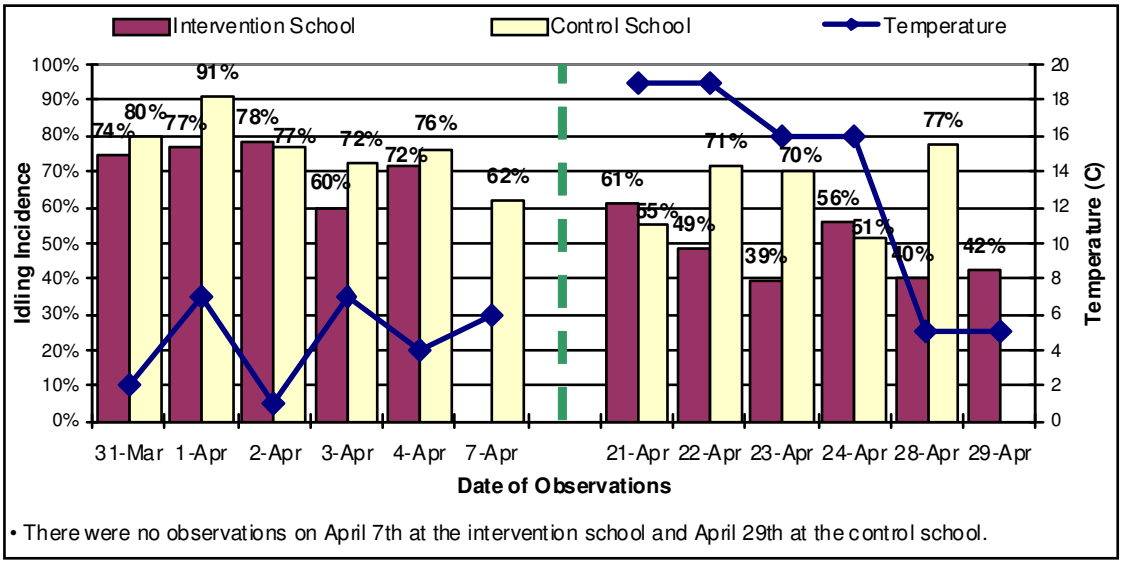
Table 8: Daily Weather Conditions in Simcoe County

Day	Weather conditions
Pre-Intervention	
March 31st	Rain & fog
April 1st	Cloudy with strong cold wind
April 2nd	Sunny with cold wind
April 3rd	Sunny
April 4th	Cloudy with drizzle
April 7th	
Post-Intervention	
April 21st	Sunny with light breeze
April 22nd	Sunny
April 23rd	Sunny and windy
April 24th	Sunny
April 28th	Cloudy & windy
April 29th	Sunny with brisk wind

There were no observations on April 7th at the Intervention School and April 29th at the Control School.

Figure 11 shows that although the daily temperature sharply decreased on April 28 and April 29, idling incidence at the Intervention School remained low. However, in the same time period, idling incidence was observed to increase at the Control School.

Figure 11: Idling Incidence and Temperature in Simcoe County



5.2.8 Carbon Dioxide (CO_2) Emissions in Simcoe County

As previously mentioned, more vehicles idled at the Control School (331) compared to the Intervention School (272) during both periods. Also, the median idling duration was higher at the Control School (25.0 seconds at Intervention School versus 42.0 seconds at Control School). Based on this, the median CO_2 emission was calculated as 0.02 tonnes/year, which is higher than that calculated for the Intervention School (0.01 tonnes/year). If each of the vehicles that idled at the Control School continues to idle for 42 seconds each day of the year, this would result in the emission of 0.02 tonnes of CO_2 per vehicle, which is equivalent to driving a vehicle 1.7 days straight. (*Appendix G: Simcoe Idling Duration and CO_2 Emission Per Type of Vehicle* shows idling duration and CO_2 emission per vehicle type).

At the Intervention School, although the number of idling vehicles decreased from the pre-intervention to post-intervention by 30%, and idling duration decreased by 20 seconds from period to period, the CO_2 emitted remained unchanged (0.01 tonnes/year). This is because the reductions in idling were not large enough to result in a change in calculated CO_2 emissions.

The number of idling vehicles at the Control School decreased by 30% from the pre-intervention period to the post-intervention period. Idling duration also decreased (by 29 seconds) from period to period. Due to a larger decrease in idling duration from period to period at the Control School, the calculated CO_2 emissions were shown to decrease by 0.01 tonnes/year.

At both schools, all vehicle types, with the exception of special purpose vehicles, decreased in proportion of idling incidence and idling duration from period to period. Because the number of automobiles observed was higher than the other types of vehicles, the CO_2 emissions are largest for this vehicle type. Thirty percent of the total calculated CO_2 emissions were produced by the automobile category. However, the automobiles were the only vehicle category that decreased in idling time contribution[xi] from period to period (idled 20% less), and therefore decreased the amount of CO_2 emission by half (decrease of 17.7%) from pre-intervention period to post-intervention period.

In comparison, the vans or minivans and pick-up trucks decreased in percentage of idling vehicles (vans/minivans decreased from 24.7% to 18.3%, and pick-up trucks decreased from 5.7% to 3.4% from period to period), while the special purpose vehicle category increased from 11.5% to 12.8% from period to period. In spite of the decrease in percentage of idling vehicles of vans or minivans and pick-up trucks, the idling time increased for these vehicles resulting in increased CO_2 emissions. Table 9 provides a comparison of contribution of CO_2 based on idling time and number of idling vehicles.

xi Idling incidence. Idling duration and CO2 emissions contributions are explained in page 36 of the report.

Table 9: Comparison of Vehicle Contribution to CO_2 and Idling Time - Simcoe County.

Both Sites (n=914)	**Total**			**Pre-Intervention**			**Post-Intervention**		
	% idling vehicles	% idling time	% CO_2 emission	% idling vehicles	% idling time	% CO_2 emission	% idling vehicles	% idling time	% CO_2 emission
Automobiles (3.0 L) Total Number = 400	27.6%	36.0%	30.3%	32.3%	41.5%	35.4%	22.4%	21.9%	17.7%
Vans or Minivans (4.3 L) Total Number = 287	21.7%	39.7%	44.2%	24.7%	37.1%	41.9%	18.3%	46.2%	49.7%
Special Purpose Vehicles (3.6 L) Total Number = 160	12.1%	15.3%	14.8%	11.5%	13.6%	13.3%	12.8%	19.6%	18.3%
Pick-Up Trucks (4.7 L) Total Number = 67	4.6%	9.0%	10.8%	5.7%	7.7%	9.4%	3.4%	12.3%	14.3%
Totals	66.0%	100 % (77598[1])	100 % 29.67[2]	74.2%	100 % 55820[1]	100 % 21.05[2]	57.0%	100 % 21778[1]	100 % 8.62[2]

1. Total idling time expressed in seconds.
2. Total CO_2 emission expressed in tonnes/year.

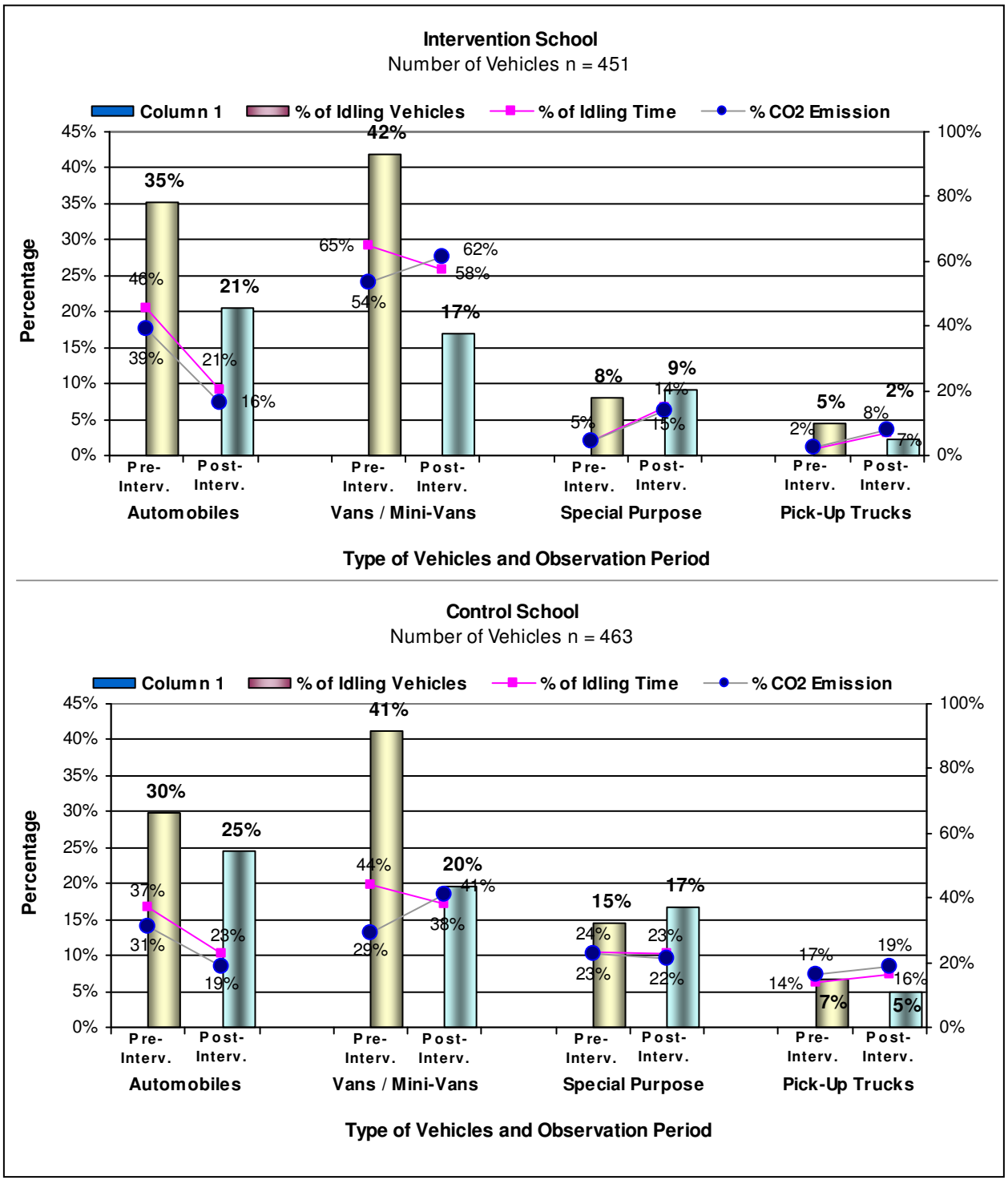
The automobiles demonstrated a larger decrease in CO_2 emissions at the Intervention School than at the Control School, as a result of a larger decrease in idling incidence and idling duration. In contrast, the CO_2 emissions for the special purpose vehicles, vans or minivans and pick-up trucks categories increased from period to period. For each of these categories a change in number of idling vehicles in these vehicle categories and/or an increase in idling duration contributed to the increase.

Overall, the CO_2 contribution at both schools decreased. However, the Intervention School achieved the largest reduction, decreasing calculated CO_2 emissions by almost two-thirds from 11 tonnes/year of CO_2 during the pre-intervention period to 3.54 tonnes/year of CO_2 during the post-intervention period[xii]. Meanwhile at the Control School, CO_2 emissions decreased by approximately half from period to period from 10.05 tonnes/year of CO_2 during the pre-intervention period to 5.08 tonnes/year of CO_2 during the post-intervention period. An estimated 2.5 tonnes/year of CO_2 were not produced during the post-intervention period.

Figure 12 gives a visual image of the CO_2 emission contributions at each of the sites and observation periods.

xii This calculation is based on calculations of carbon dioxide emissions assuming that the observed idling behaviour during the pre-intervention period were to continue unchanged for a one-year period

Figure 12: Proportion of Idling Vehicles Related to the Proportion of Idling Time and CO_2 Emission in Simcoe County



5.3 Phase 1 and Phase 2 – Teachers Feedback

Completed questionnaires were received from teachers at three of the participating schools. A more detailed report was developed (see *Appendix C: Teachers' Feedback – Analysis and Results*). The following are some highlights of the findings:

Respondents liked the overall campaign. There were suggestions provided about approaching parents, and changing the banner challenge to just an activity. The following is a summary of the key points of the school intervention:

- Most respondents thought that the information presented at the opening assembly was a good way to motivate students and to open the campaign at the schools. They particularly enjoyed the guest speaker; however, a better link between the speaker and the issue was recommended.
- Most respondents thought that the banner challenge was a good way of engaging students. However, students' interest in the topic depended on the grade level and in some cases the students were not able to link the activity with the issue of air quality. Discussion of ideas for other air quality projects did not occur in all classrooms and some students viewed the session as an art activity, not as a direct way of showing the importance of the issue.
- Respondents reported not having a chance to review the teachers' packages, either due to time constraints or because they didn't receive them.
- Respondents thought all of the components of the campaign were important. Most respondents found that the components that included student involvement were very important (such as banner challenge, opening and closing assembly). Some respondents found that the resources were somewhat important (such as overview of campaign at staff meeting, resource materials, parent take-home packages, and information to parents via school newsletter). Very few respondents thought that the campaign component which provided resources for lesson plans and curriculum links was important.
- Respondents did not spend much time on the activities organized for the "Turn It Off" Campaign. On average, they spent about an hour preparing for each component. The students spent about 2-3 hours, on average, on the banner challenge activity. A suggestion included having more lead time to plan for inclusion of the campaign.

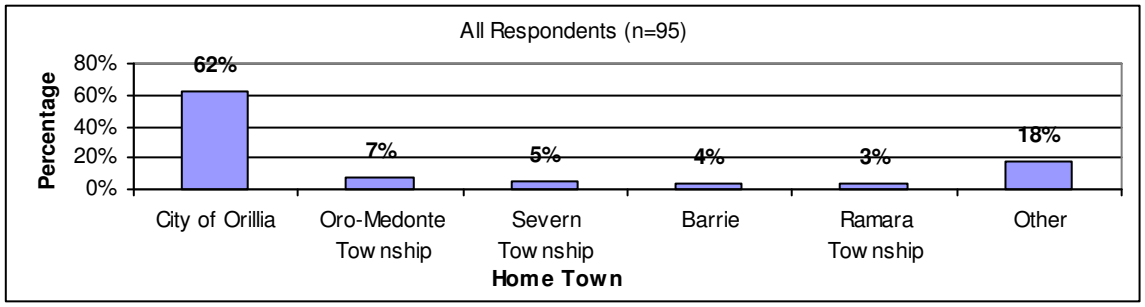
5.4 Phase 2: Simcoe County - Community Site – Intercept Survey, Spring 2008

One hundred and thirty (130) people were approached at a variety of community locations including the library, city hall, bus terminal and a beach park and trails. Ninety-five (95) questionnaires were completed. The response rate was 73%. Due to the low number of questionnaires completed, and because the main purpose of the questionnaire was to analyze qualitatively the perceptions of respondents about idling and the Anti-Idling Campaign, no statistical significance was calculated. Percentages (proportions) were calculated and a summary of open-ended answers was created.

5.4.1 Where Do Respondents Live

Respondents reported living in different areas in Simcoe County. The majority of the respondents reported living in the City of Orillia (62% of 95). Some of the other reported location of residences (26) included: Severn Township, Ramara Township, Oro-Medonte Township, Barrie, Essa Township, Midland and Wasaga Beach. Twelve (13% of 95) respondents reported to live in 'Other' which included areas outside of Simcoe. Figure 13 shows the distribution of respondents' residency.

Figure 13: Distribution of the Location of Respondents' Residences in Simcoe County

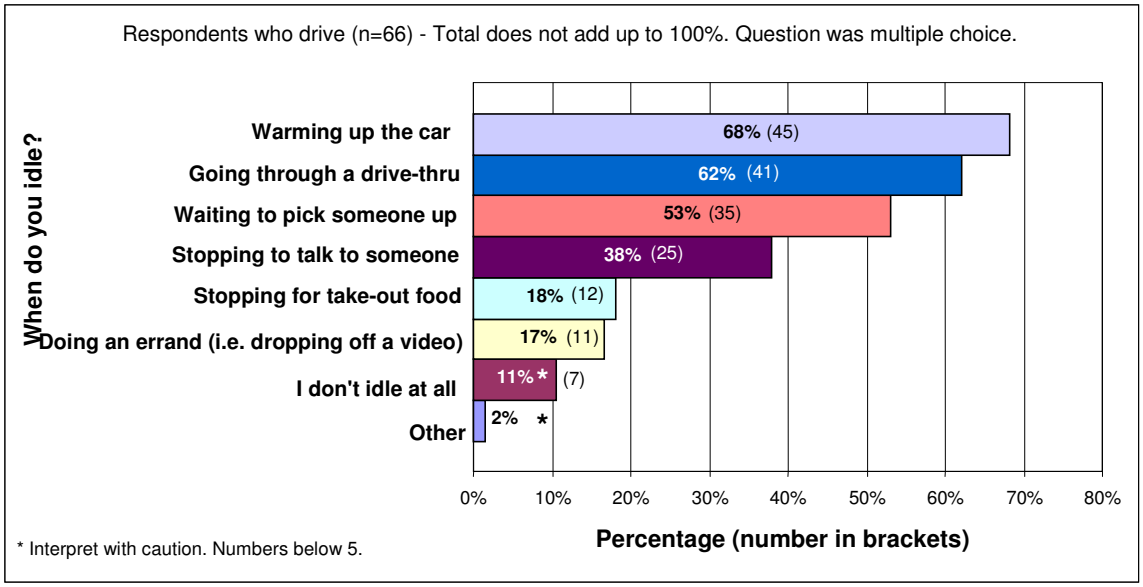


The media campaign was heard in most areas of Simcoe County. Other portions of the campaign took place at specific sites in Orillia. However, residents of other Simcoe County communities commute to this specific community, so all respondents living within Simcoe County were included in the analysis of the results. Eighty-nine percent (89%; n=95) of the respondents live in Simcoe County.

5.4.2 Idling Behaviour of Respondents Who Live in Simcoe County

Almost one quarter (22%; n= 85) of respondents living in Simcoe County reported that they did not drive. The 78% of respondents who reported driving (n=85), self-reported idling behaviour in a variety of circumstances. The most common idling circumstances, in order of frequency of response (multiple choice question), were: warming up the car (45), going through a drive-through (41), waiting to pick someone up (35) and stopping to talk to someone (25). Figure 14 shows the frequency of each circumstance identified by respondents who drive.

Figure 14: Circumstances Under Which Respondents Who Drive Idle in Simcoe County.



5.4.3 Knowledge About Idling Effects on Health, Environment or Pocketbook in Simcoe County

5.4.3.1 Effects on Health

Sixty-seven respondents (79%; n= 95) acknowledged knowing how idling can affect their health. These respondents were subsequently asked how they think idling affects their health. Fourteen (14) of these respondents did not explain their answer. However, there was a long list of effects provided by those who responded (53). The responses on types of health effects were grouped into general categories of health effects. Thirty-nine (39) percent of respondents identified health effects related to air pollution and 23 percent identified health effects related to air/breathing problems. Based on these categories, there was a short list (15) of responses that were related to health effects, see Table 10 .

Table 10: Responses Given by Those Who Identified Effects of Idling on Health in Simcoe County

Health Problems
* air/breathing problems
* asthma
* bad for air/asthma
* breathing
* breathing bad gases
* breathing problems
* breathing, cancer
* can cause poor health, headaches, cancer
* cause problems for people with cancer
* gives asthma
* inhalation
* lung/breathing problems
* lungs
* not good to breathe it in
* we should not be ingesting bad gases

5.4.3.2 Effects on the Environment

Seventy-eight respondents, or ninety-two percent (92%; n=95) acknowledged knowing how idling affects the environment. These respondents were then asked to explain how they think idling affects the environment. Twenty-four (24) respondents did not explain their response. However, there was a long list of effects provided by those who responded (54). The responses on types of environmental effects were grouped into broad categories. Thirty-five percent of respondents said that idling vehicles affect air pollution/air quality (including CO_2 emissions and greenhouse gases). See Table 11 for a summary of the responses within each category.

Table 11: Responses Given by Those Who Identified Effects of Idling on the Environment in Simcoe County

Air Pollution / Air Quality * air pollution / problems / quality * bad for air * cause pollution, smog * CO produced * CO_2 emissions * emissions * exhaust, smog and number of vehicles * exhaust * fumes * greenhouse gases * increased emissions pollution / pollutants in the air / the environment * fumes from cars pollute		**Climate Change** * climate change * global warming **Health** * affects kids with asthma * because of exposure to children **Other** * acid rain * significant amount in atmosphere * promotes tree growth * hurts ozone * increases life of environment

5.4.3.3 Effects on the Pocketbook

Sixty-eight respondents, or eighty percent (80%; n=95) acknowledged knowing how idling affects their pocketbook. These respondents were then asked how they think idling can affect their pocketbook. Eighteen (18) of these respondents did not explain their answer. However, there was a long list of effects provided by those who responded (50). The responses were grouped into 4 broad categories. Most respondents (46%) identified effects of gas prices or waste of gas when idling. See Table 12 for a summary of the responses within each category.

Table 12: Responses Given by Those Who Identified Effects of Idling on the Respondents' Pocketbook in Simcoe County

Gas * gas prices * burns gas * cheaper to shut * cost of gas * waste gas * expensive * high prices/increase in gas prices * uses gas up quickly * tax * unnecessary use of gas / money		**No Effects or Minimal** * minimal * no * not really
		Depends * depends on time idling * if excessive idling * it depends on how long you idle
		Other * damage vehicle

5.4.4 Awareness of the Anti-idling Campaign in Simcoe County

5.4.4.1 Respondents Aware of the Campaign

More than half of all respondents (55%; 47 of 95) were aware of the anti-idling campaign. They learned about the campaign mostly through newspapers articles (55%; 26 of 47), radio ads (28%; 13 of 47) and other (26%; 12 of 47). Other sources included word of mouth such as from a co-worker, family member, friend, children's information from school, farmer's market, etc. The displays at community sites and information from health unit office were sources of information to very few (less than 5), while banners at community sites and written information were not identified as sources of information by any of the respondents.

Respondents who were aware of the campaign were asked to recall the main message they heard or read. Responses varied widely and were grouped into broad categories. The two largest categories were recall of messages related to 'bad for environment, health and finances' (25.5%) and 'not to idle' (25.5%). Responses are summarized in Table 13 next page.

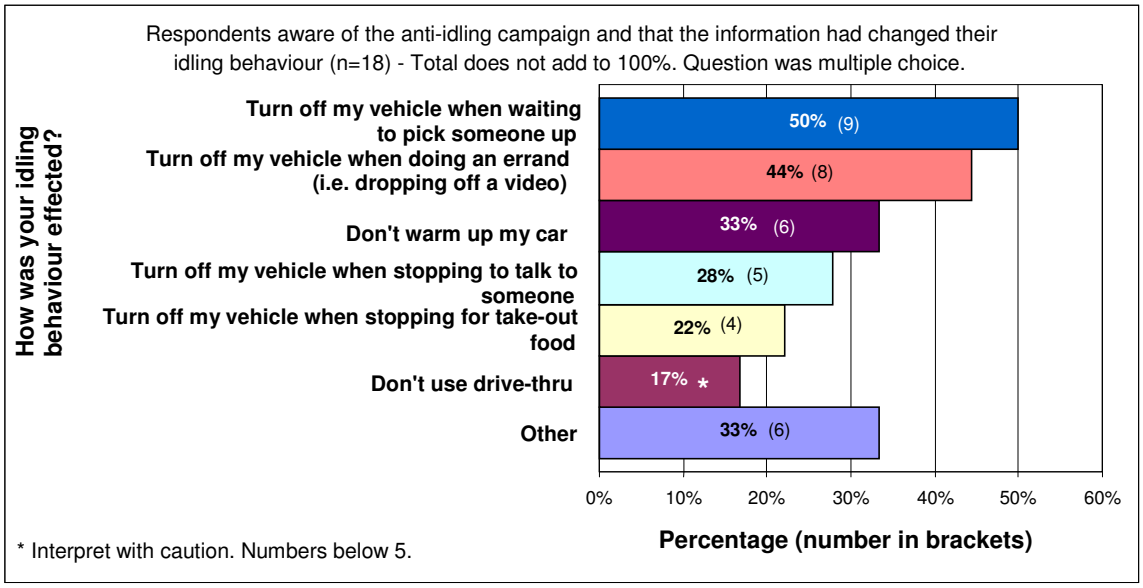
Table 13: List of Main Messages of the Media Campaign That Were Recalled by Respondents in Simcoe County

Bad for Environment, Health and Finances (12) * it contributes to health problems * not good for environment * idling bad for environment, health and financial * causes environmental problems * affects health & environment * negative impacts to health & environment * idling is bad * it is hazardous – not good * idling is stupid * emissions affect the environment * bad effects on environment	**Not to Idle (12)** * don't idle * don't idle for more than 3 minutes * not to do it * stop idling * Turn It Off * want people to stop idling – what about buses?
	Idling Time Limit (5) * 3 second idling only * no longer than 3 minutes * reduce idle times * reduce idling * reduce for better health
Other (5) * cost on gas * discussions: frustrations because did not know what to do * encouraging people to eliminate idling * promote awareness & implement tickets * stop idling through drive-thrus	

Most of the messages recalled by respondents were about the harmful effects of idling on the environment, health and finances, which could be grouped with the recalled messages that talk about air pollution and reducing emissions. They also recalled a 'not to idle' message. A small number recalled messages related to fines and bylaw, although there was not an idling by-law in place in the community at the time of the survey.

Respondents aware of the campaign were asked if the campaign information affected their idling behaviour. Eighteen (39%) of the 47 respondents provided an affirmative response to this question. These individuals identified that they had changed their behaviour, in order of frequency, by turning off their vehicles when waiting to pick someone up, when doing an errand and not warming up their cars. Figure 15 shows the distribution in descending order of the options given. The 'other' option included: informing friends, being more aware of their behaviour, walking more to places instead of driving, and trying to reduce idling.

Figure 15: How the Respondents Who Were Aware of the Anti-Idling Campaign Think the Information Affected Their Idling Behaviour in Simcoe County



Twenty-eight respondents (61%; n=47) who were aware of the campaign said that the information did not affect their idling behaviour. Eighteen (64%; n=28) indicated that the campaign did not affect their idling behaviour because they "already don't idle that much". Two (7%; n=28) respondents reported that they did not drive, and four (14%; n=28) respondents provided other reasons. The 'Other' category included responses such as "I already do now what I can to help the environment", "just found out about it now", and "the weather is good right now, no need to heat up the car during the summer".

5.4.4.2 Respondents Not Aware of the Campaign

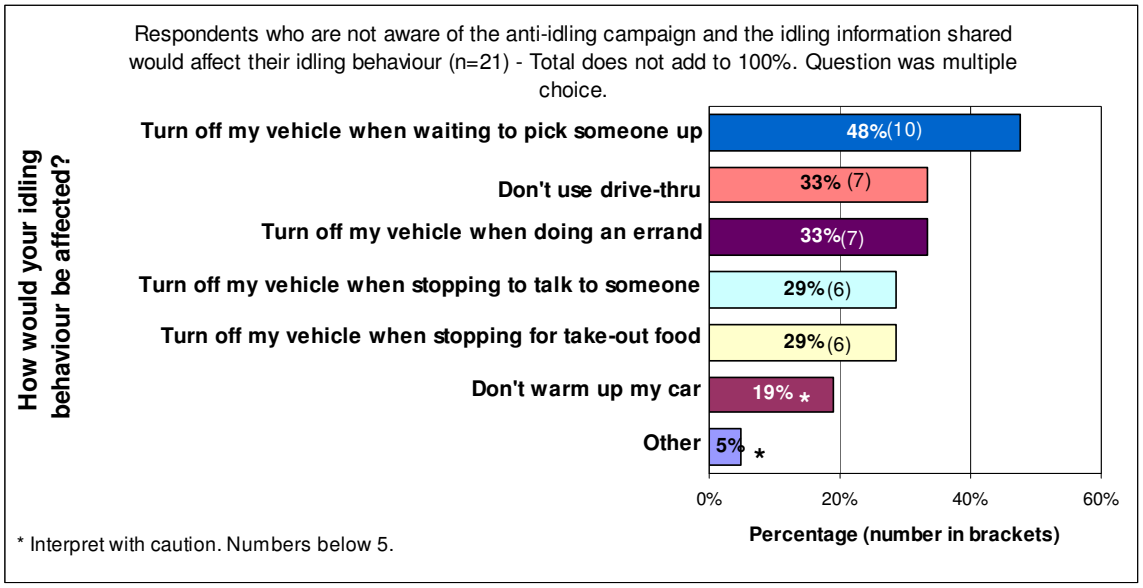
Thirty-eight (45%; n=85) of all respondents were not aware of the anti-idling campaign. These respondents were asked if they knew about the following effects of idling:

1. *Exposure to air pollution, caused in part by vehicle emissions, has been linked to asthma, lung cancer, heart attacks, strokes and high blood pressure.*
2. *Idling creates greenhouse gas emissions that contribute to climate change.*
3. *Idling burns gas for no reason. Reducing idling by 10 minutes a day can save you more than 80 litters of gas per year (or more than $100.00).*

Twenty-five respondents (68%; n=38) not aware of the campaign reported knowing the effects of idling on health (effect #1 above); twenty-eight (76%; n=38) reported knowing the effects of idling on the environment (effect #2 above); and eighteen (49%; n=38) reported knowing the effects of idling in their pocketbook (effect #3 above).

Twenty-one respondents (55%; n=38) not aware of the campaign said that knowing this information would affect their idling behaviour. They identified that they would change their behaviour by turning off their vehicle when waiting to pick someone up (10), not using drive-thrus (7) and turning off their vehicle when doing an errand (7). Figure 16 shows the distribution of the answers related to the respondents' changes in idling behaviour.

Figure 16: How the Respondents Who Were Not Aware of the Anti-Idling Campaign Think the Information Shared Would Affect Their Idling Behaviour in Simcoe County



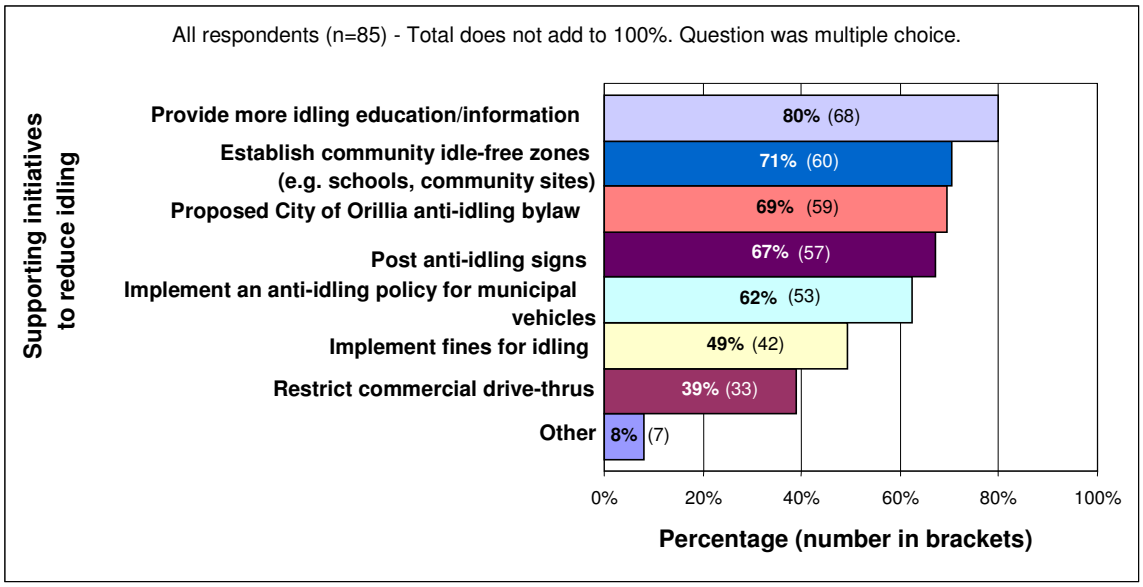
Seventeen respondents (45%; n=38) not aware of the anti-idling campaign did not think that their idling behaviour would be affected by the information shared. Ten (10) respondents did not give a reason why the information would not affect their idling behaviour. Among the seven (7) who answered, the following reasons were reported: "don't idle as much", "don't care", "it's not a serious problem".

5.4.5 Support for Idling Reduction Initiatives in Simcoe County

Almost three quarters of all respondents (73%; n=85) reported that they would share the idling information with others and that they would urge them to change their idling behaviour.

A majority of the respondents (62% - 80%; n=85) supported more than half of the initiatives proposed in the questionnaire. Fifty-nine respondents (69%; n=85) supported the proposed anti-idling bylaw in the community. Establishing community idle-free zones and posting anti-idling signs were strategies supported by 60 (71%; n=85) and 57 (67%; n=85) respondents, respectively. Figure 17 shows the distribution of supported initiatives.

Figure 17: Support of Anti-Idling Initiatives by All Respondents in Simcoe County



- Seven (8%; n=85) of all respondents would support other initiatives such as an anti-idling by-law for shuttle buses.

6 DISCUSSION AND RECOMMENDATIONS

For the purposes of this report, vehicle idling is considered as the operation of a vehicle engine at any location while the vehicle is stationary. Idling a vehicle releases twice as many exhaust fumes as a vehicle in motion. Idling pollutes the air, wastes fuel and does damage to the vehicle engine[3]. Despite the definition above, there is an uncertainty about what constitutes idling in the community. Several projects in Ontario have focused on studying drivers' idling behaviour and what influences behaviour change. These project reports provided guidance and best practices utilized in project planning.

The "Turn It Off" project was planned to apply health promotion theory and best practices identified from other similar projects in Ontario to influence the idling behaviour of drivers and to provide education and raise awareness in the community about local air quality and idling. Overall, the project was successful in increasing community awareness about idling. In addition, the research component of the project confirms that idling behaviour was influenced among the population that received the intervention.

Because interventions and observations in Phase 1 and Phase 2 were made during different seasons and under different temperature conditions, comparisons cannot be made between data collected in Phase 1 in the District of Muskoka and Phase 2 in Simcoe County.

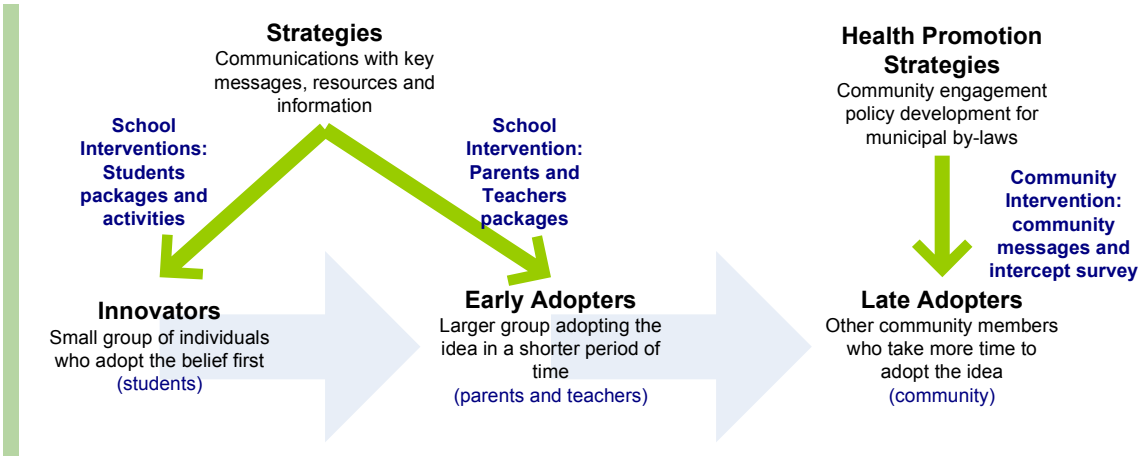
6.1 Observations at Schools Sites

6.1.1 Health Education and Awareness

A primary goal of the project was to provide public health education and raise awareness about outdoor air quality and idling. The school intervention was developed using health promotion theory and best practices to target a vulnerable population and empower behaviour change.

In consideration of the Diffusion of Innovation Theory, the intervention was planned to engage the interest of students, as *'innovators'*, individuals at a high level of readiness and receptiveness to the key messages relating to air quality and idling. In addition, the group of individuals chosen, children, are those most vulnerable to the health effects of idling. There is anecdotal evidence that these students adopted the belief that idling is bad for air quality and their health, and, as anticipated by the Diffusion of Innovation Theory, used their conviction on this issue to influence others in the community. An observer reported hearing a young student suggesting to his mother that, "to prevent idling, he could walk to school". The mother explained to her son that it was a 10-15 minute drive to school and that the distance was too long to walk. Another observer heard another student using the term "anti-idler" when talking to his mother about the observers at his school.

Figure 18: Comparing Rates of Diffusion Suggested by the Diffusion of Innovation Theory and the Steps Taken in the Simcoe Muskoka "Turn It Off" Campaign



As innovators and as a group of people that are usually heard by their parents when talking about environmental issues, students are expected to exert influence on their parents' behaviour. According to the results of the observations, many parents became the 'early adopters'. By sending information packages to the parents, the campaign successfully reached these early adopters who may go on to help influence the majority of the community.

In preparation for the school intervention, representatives from the health unit met with parent councils at the participating schools. The level of support from all parent councils involved was very high. The parents were aware of vehicle idling in student drop-off/pick-up locations as a concern relating to air quality and as a health and safety issue for their children. In some instances the parent council welcomed the project as a means to deal with an issue that had been previously identified at their school.

The school intervention, while targeting the school population directly, had the potential to reach a large proportion of the participating communities. Through the Clean Air Champion assemblies and classroom activities the school children learned about idling and air pollution and were empowered to share the information learned, thus influencing the behaviour of parents and others. As a result of this project more than 1400 school students in the District of Muskoka and County of Simcoe directly participated in the school intervention.

As a component of the school intervention the students were provided with art supplies and materials and encouraged to participate in a classroom banner project about air quality to be posted in several community sites. Students were very receptive to the intervention, and they were easily engaged in the banner project. A total of 70 banner art supply kits were provided to classrooms. Photos of banners produced by students during the intervention are included in *Appendix J*. As a result of this initiative, 62 banners were created and subsequently displayed at local community sites as a component of the community education campaigns.

Community media outlets were invited to attend the kick-off and closing assemblies at both Intervention Schools. Media interest in this issue was good. The story was picked up several times in local media through articles and photos, resulting in additional dissemination of the campaign key messages.

The project provided a platform for wide-scale dissemination of public health information and awareness materials. Packages containing public health education materials and curriculum links were prepared and provided to a total of 70 teachers to support classroom activities. The teachers' support and involvement in the intervention was important in engaging the students in the classroom and in providing students with time to work on the banners. In many instances, the teachers themselves were also residents of the participating community or nearby communities.

Parent packages containing information about the project, key messages about air quality and idling, note pads and electrostatic vehicle decals were sent home with each child in the participating schools, reaching a potential of 1400 homes in the participating communities. Anecdotal feedback obtained from drivers during the personal contact interventions indicated good recall of the parent packages and the key messages about idling.

6.1.2 Teachers Feedback

Teachers appear to like the concept of the campaign and how it was developed. Some of the teachers would have liked different timing in the year to participate in this type of activities. If this campaign were to be repeated at other schools, a recommendation would be to collaborate with teachers and principals to determine the most appropriate time in the school year to offer the campaign in order to tie in with curriculum and environmental programs and to avoid the busy autumn period.

6.1.3 Idling Incidence and Duration

In the District of Muskoka, comparison of the overall results from the post-intervention observations to the pre-intervention observations at the Intervention School shows that idling incidence was reduced by 8%. While small, it is interesting to note that a decrease occurred even though outside air temperatures had decreased by as much as 20^{o}C .In contrast, during the same time period, idling incidence at the Control School was found to increase (by 10%).

At the Intervention School, following the intervention, idling behaviour in the category of drivers that idled up to 3 minutes showed a reduction of 8%, while those drivers in the category of idling for more than 3 minutes showed no change. From this it appears that most drivers at the Intervention School in Muskoka were influenced by the intervention to change their idling behaviour, and that those drivers who were influenced modified their idling behaviour to a level consistent with the 3-minute restriction required most by-laws.

In Simcoe County, the same comparison from observation period to observation period at both sites showed a reduction in both idling incidence and duration. There was a greater reduction in incidence at the Intervention School (32%) than at the Control School (13%), while a greater reduction in idling duration was observed at the Control School (56%) compared to the Intervention School (53%).

In both phases, the decreases in observed idling behaviour occurred at both sites regardless of the changes in outdoor air of temperatures. The change in air temperature would have been expected to increase both idling incidence and duration as drivers used the vehicle engine to maintain driver comfort (heating or cooling systems).

Behaviour related to duration of idling was very similar at both schools in Simcoe County. However, for the idling behaviour category of up to 3 minutes the difference between the pre-intervention period and the post-intervention was greater at the Intervention School than at the Control School. Drivers that idled up to 3 minutes were more likely to stop idling (14%) at the Intervention School than those at the Control School (8%).

These results were consistent with results found by the other three projects identified in the literature review. All the projects, including this one, showed a reduction of idling incidence and duration. Mississauga, Sudbury and Toronto reported having reductions on incidence of 54%, 50%, and 27%, respectively. They also reported reductions on duration of 56%, 32% and 78%, respectively. However, their intervention differed from the one used in this initiative. These projects included three elements in their intervention: signs, personal contacts and commitments. Personal contact with drivers was a minimal component of the intervention in the SMDHU intervention. This initiative used an intervention focused on elementary schools in two communities, and social marketing as part of their community intervention, while the other three projects used an intervention that was spread out in several public locations, such as GO transit, private sector and municipal facilities. Any difference in the results may be attributed to differences in the design of the interventions. Additional review of the other studies also highlights the importance of soliciting personal commitments during driver contacts as a critical component of an intervention strategy.

6.1.4 Carbon Dioxide (CO_2) Emission

In Ontario, the most significant sources of air pollution are energy generation and transportation emissions[8]. There are many possible strategies to reduce the amount of pollutants such as CO, CO_2, NOx[xiii], SOx[xiv] and VOCs[xv] released into the atmosphere. Avoiding unnecessary idling is a simple way, and also the best way to cut fuel consumption.

In addition to the harmful health effects from air pollution, idling vehicles also produce greenhouse gases. Greenhouse gas emissions, measured as CO_2 emissions, pose a risk to our health and our environment by contributing to climate change. None of the other idling behaviour studies in Ontario reported estimates of CO_2 emissions, while this initiative did.

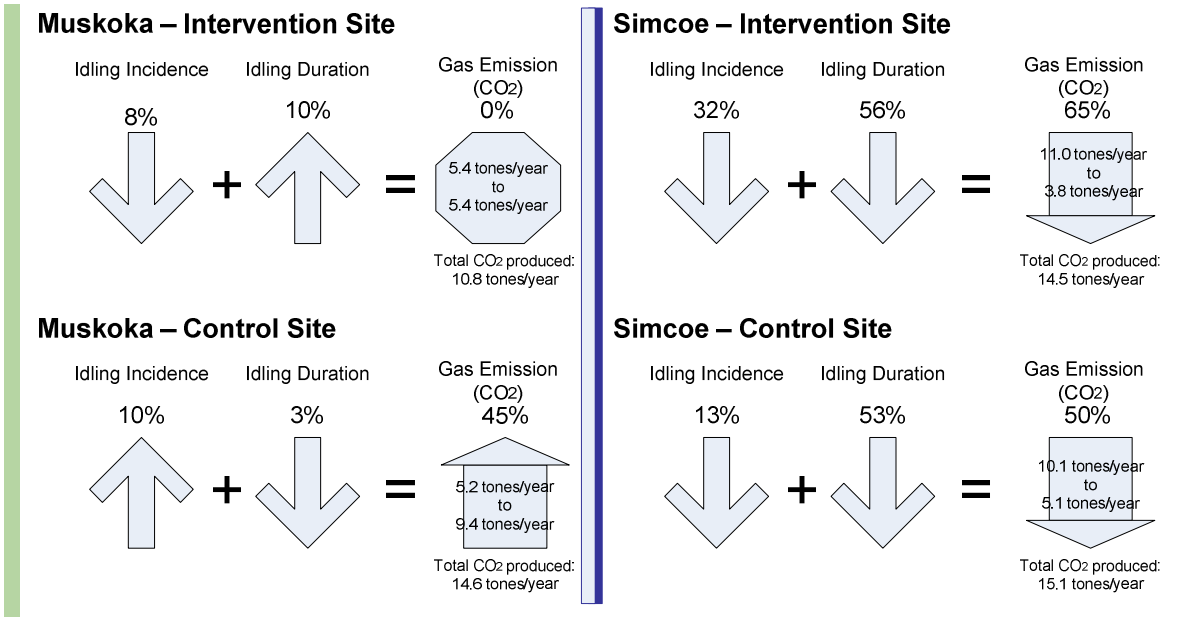
Based on comparisons between Intervention and Control Schools in the District of Muskoka and Simcoe County, the estimates of CO_2 emissions during the two weeks of observations varied based on idling incidence and duration. In the District of Muskoka, CO_2 levels remained unchanged from pre-intervention period to post-intervention period at the Intervention School, while at the Control School, CO_2 levels increased from period to period. In Simcoe County, CO_2 levels decreased at both schools. However, the reduction of CO_2 levels was greater at the Intervention School than at the Control School. Figure 18 shows the influence of idling incidence and duration on CO_2 production during the observations periods.

xiii NOx (Nitrogen Oxides): include the gases nitrogen oxide (NO) and nitrogen dioxide (NO_2). NOx is formed primarily from the liberation of nitrogen contained in fuel and nitrogen contained in combustion air during combustion processes. NO emitted during combustion quickly oxidizes to NO_2 in the atmosphere. NO_2 dissolves in water vapour in the air to form acids, and interacts with other gases and particles in the air to form particles known as nitrates and other products that may be harmful to people and their environment. (Source: Environment Canada website, retrieved Oct. 8th, 2008 from http://www.ec.gc.ca/cleanair-airpur/NOx-WS489FEE7D-1_En.htm)

xiv SOx (Sulphur Dioxide): or SO_2, belongs to a family of sulphur oxide gases (SOx). It is formed from the sulphur contained in raw materials such as coal, oil and metal-containing ores during combustion and refining processes. SO_2 dissolves in water vapour in the air to form acids, and interacts with other gases and particles in the air to form particles known as sulphates and other products that can be harmful to people and their environment. (Source: Environment Canada website, retrieved Oct. 8th, 2008 from http://www.ec.gc.ca/cleanair-airpur/SOx-WSBBB2123F-1_En.htm)

xv VOCs (Volatile Organic Compounds): Volatile organic compounds (VOC) are carbon-containing gases and vapours such as gasoline fumes and solvents (but excluding carbon dioxide, carbon monoxide, methane, and chlorofluorocarbons). Many individual VOC are known or suspected of having direct toxic effects on humans, ranging from carcinogenesis to neurotoxicity. The more reactive VOC combine with nitrogen oxides (NOx) in photochemical reactions in the atmosphere to form ground-level ozone, a major component of smog. (Source: Environment Canada Website, retrieved Oct 8th, 2008 from http://www.ec.gc.ca/cleanair-airpur/VOC-WS15B9B65A-1_En.htm)

Figure 19: Influence of Idling Incidence and Duration Changes From Period to Period on CO_2 Production



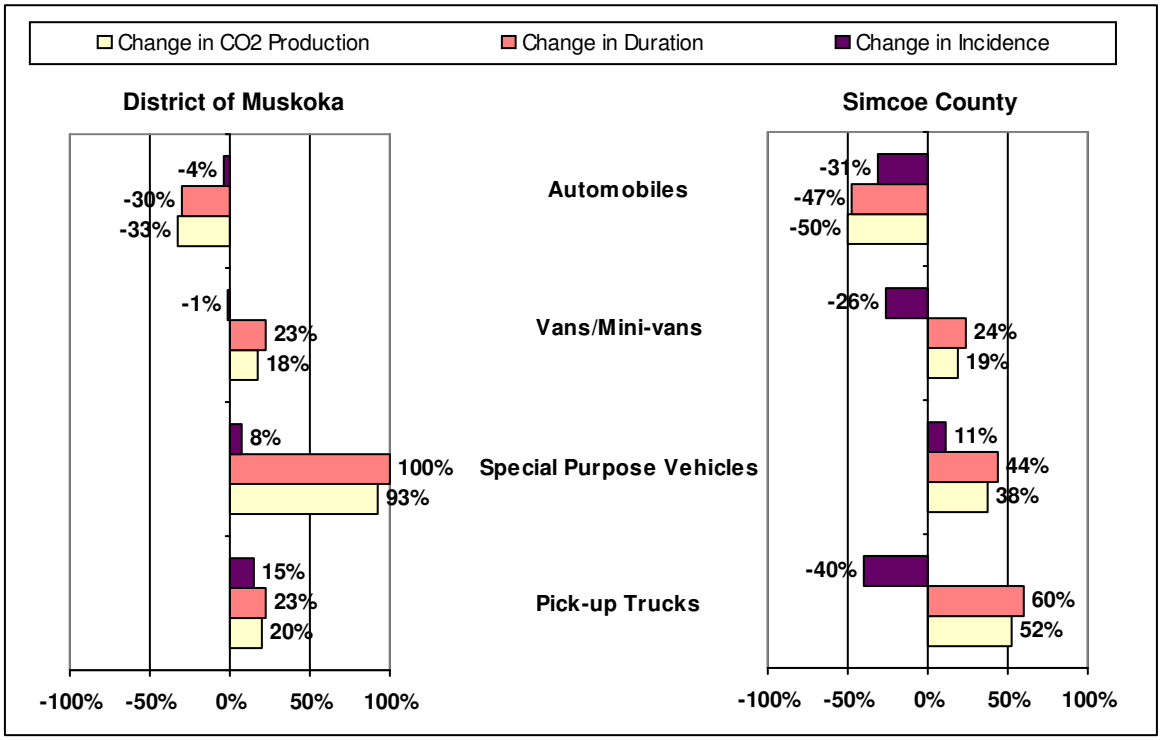
Extrapolating from the idling behaviours observed at the participating schools in both communities, it can be estimated that over 25 tonnes/year of CO_2 emissions were produced by idling vehicles at the school sites in the District of Muskoka and almost 30 tonnes/year at the sites in Simcoe County. This is equal to the emissions generated if all the cars observed (1175 vehicles) had driven non-stop at the same time for more than 1.5 days (36 hours) in the District of Muskoka and 1.7 days (41 hours) in Simcoe County. Based on the assumption that the intervention and social marketing campaign influenced drivers to change their behaviour, the intervention resulted in a reduction in CO_2 production by approximately 5 tonnes/year in the District of Muskoka and approximately 2.5 tonnes/year in Simcoe County. The resultant GHG savings of both phases of the project (7.5 tonnes per year) is equivalent to the amount of carbon sequestered by 192 tree seedlings, grown for 10 years.[9]

6.1.5 Drivers' Behaviour Based on Type of Vehicles

The majority of vehicles observed during both phases were in automobiles. Therefore, when CO_2 emissions were analyzed by vehicle type, the automobile was overall the greatest contributor to total CO_2 emissions. However, in both District of Muskoka and Simcoe County, only drivers of automobiles were found to decrease both idling incidence and idling duration contribution, and the resultant CO_2 production from period to period. Figure 19 shows the changes from period to period of all vehicle types observed in this initiative.

Drivers of vehicles in the special purpose vehicle category were found to increase in both idling incidence and idling duration, therefore increasing the resultant CO_2 contribution from period to period.

Figure 20: Changes in Contribution of Idling Incidence, Idling Duration and CO_2 Production From Pre-Intervention to Post-Intervention at Both Sites in Muskoka and Simcoe.



Differences in behaviour changes among drivers associated with the type of vehicle were similar to results found by Earthcare in Sudbury. Drivers of automobiles decreased idling incidence and duration from period to period. Other types of vehicles, vans and trucks/SUVs, demonstrated decreased idling incidence, but increased idling duration.

6.2 Community Intervention in Simcoe

While the level of community engagement was still fairly high from the school initiatives, a community intervention was implemented with a goal to reach the late adopters and to generate awareness in the community (See section 4.2.2 Community Awareness Campaign).

All the strategies proposed were well received by the municipalities, and posters, signs and students banners were posted in several community sites. The media was engaged through the purchase of radio advertisements, interviews and photo opportunities. Resource packages were available for community site managers and staff, together with a section available on the Health Unit website. In order to provide some qualitative information on the impact of the community intervention and social marketing campaign, an intercept survey was administered in Phase 2 after these strategies had been in place for 2 weeks.

Of the 95 surveys completed, over 90% were residents of Simcoe County. Even though respondents of this survey reported knowing about idling effects on health (79%), environment (92%) and their pocketbook (80%), they self-reported to engage in idling behaviour. In contrast, the results of the Earthcare study, where the public in Sudbury was approached by phone pre-campaign and post-campaign, a general knowledge deficit related to idling was found. These respondents reported increasing their idling duration and frequency (incidence) between phone calls.

Approximately half of the respondents (55%) were aware of the campaign in Simcoe County, and had heard the messages through the media (newspaper ads and radio spots). Few respondents reported learning about the campaign through the banners, posters and signs. Respondents aware of the campaign were more receptive to learning about idling effects and messages than those not aware of the campaign. These respondents reported that knowing this information would affect their behaviour, while half of the respondents not aware of the campaign reported that the information would not affect their behaviour. Reasons for this varied, but most of them reported not idling or already doing enough to help the environment.

The majority of respondents in Simcoe County would support any of the anti-idling initiatives presented in the survey. However, those most frequently accepted were establishing community idle-free zones, anti-idling by-laws and posting signs. This information is similar to that found in the University of Waterloo study where over half of respondents agreed with imposing a fine for idling as an anti-idling measure[7].

The results from the Simcoe survey conveyed that public awareness of the campaign was predominantly generated through the media components while recall of the displays in community centres was poor. The survey results indicate wide-spread and strong public support in this community for anti-idling by-laws and community idle-free zones. This support, combined with a high level of knowledge of idling effects on health and the environment, suggests that respondents in this community are ready for a move to a regulatory approach (by-law).

6.3 Factors Influencing Idling Behaviour

Several factors can be attributed to the changes in idling behaviour. Some of these changes were external and some were internal from the drivers' perspective:

External factors:

- Temperature: It is interesting to note that the overall idling incidence decreased even though temperatures changed, getting either colder (Phase 1), or warmer (Phase 2), during the post-intervention period compared to the pre-intervention period. Intuitively, one would expect that idling frequency would increase as temperatures rise or drop when drivers use the vehicle engine to maintain interior comfort.

- Word of mouth: The community intervention was planned to take place after the school intervention, to avoid impacting the results of the pre-and post-intervention observations through the word of mouth effect. However, it is reasonable to believe that parents from the two participating schools in each community would have interacted through work, daily lifestyle, or closeness of their homes and control school drivers may have heard the anti-idling messages.

- Observers' effect: The act of conducting observations potentially influenced idling behaviours at the Control Schools. While ideally observers would be as inconspicuous as possible, this was difficult to achieve given the layout of the school parking lots and the inherent suspicion regarding unknown adults near school property. Observers at the Control Schools reported overhearing parents referring to the project as the 'idling project" at one control location.

Internal factors (from the drivers perspective):

- Reasons why drivers idled may differ from site to site, as individuals are influenced by their own lifestyle and time available to pick-up their children. These factors may make them more or less receptive to changing their idling behaviours.

- The drivers' demographics may influence their idling behaviours and their reluctance or willingness to modify their idling behaviours.

- There may be other factors unique to the different sites that could encourage or discourage idling behaviour (for example, the presence of noise, fumes, dust, shade, wind, etc. may influence if a motorist keeps the vehicle window rolled up or down or is able to cool the vehicle naturally or with the air conditioner).

- The drivers' beliefs and involvement in the community may influence their idling behaviour. The more involved a driver is in community groups (i.e. environmental, child care, etc.), the more receptive they will be to environmental issues and they might act on them[10].

6.4 Impact of Pilot Project on Municipal and Institutional Policy Development

As a direct result of this campaign, the health unit was informed that a participating community endorsed a municipal fleet anti-idling policy in September 2007 to restrict idling times for all municipal vehicles. A member of town staff suggested that although the town had been considering adopting such a policy for more than a year, it decided to take action following the health unit's presentation to Town Council. Another participating community was in the process of considering a municipal anti-idling bylaw. The "Turn It Off" Campaign provided support to the public education associated with policy development and implementation. A municipal anti-idling bylaw was passed in June 2008. In addition, one participating school board introduced anti-idling practices on school grounds following the school intervention phase of the project in that jurisdiction.

6.5 Lessons Learned and Recommendations for Similar Projects

A more informal evaluation was completed using a number of strategies. The Health Unit team that implemented the campaign identified successes and challenges in the project. Teachers were asked to complete an evaluation of the program to assess the resources, the Clean Air Champion, the banner challenge and the time commitment. It is important to record some of the key recommendations and findings of these evaluations.

6.5.1 Project Planning

Although a small pilot project, the "Turn It Off" Campaign was successful in engaging students, the community and local decision-makers. The campaign was able to influence change in individual behaviours, as demonstrated by the reduction in idling incidence at the Intervention Schools. The project also built momentum in the participating communities related to idling policy development. However it is important to note that the project, while successful, was very time and labour intensive, and due to challenges recruiting volunteers, discussed further below, required a significant, unplanned, investment of staff resources.

6.5.2 School Components

The planning and approval times to implement school-based interventions can be complex, demanding and lengthy. The resultant delays, particularly when unexpected, can lead to a loss of momentum for the project and a need to readjust workload planning to accommodate shifting dates of implementation.

In some instances there may be multiple approvals required. For example, some school boards may have policies related to police security checks and clearances for non-school staff to be on school property. Depending on the jurisdiction involved, the security clearances can take several days to weeks to process. If not accommodated in advance, the requirement for security clearances can be detrimental to volunteer participation.

Similar projects have found that personal driver contact interventions were very successful in influencing idling behaviour. The personal contact interventions in this project would have been improved through development of a strong driver intercept methodology. The methodology would include better messaging to engage drivers and seek a personal commitment to not idle and to post the window decals.

The study included a pre-assessment school site visit to estimate the number of volunteers required, determine appropriate locations for observations and to evaluate traffic volume. The pre-assessment visit was beneficial to determine the minimum number of volunteers that would be needed each day to reach the target sample size.

The participation of Georgian College students as volunteers for the campaign was a successful aspect of the project. The project provided a catalyst to facilitate development of partnership opportunities with Georgian College. The students' participation in the observations and community intercept surveys provided the students with a valuable learning opportunity. Feedback from Georgian College partners indicates an interest to partner in other similar projects.

As a component of the observer training program, a simulation exercise was utilized to provide observers with an opportunity to gather data on a number of vehicle idling situations and to record data on the data collection form. This was found to be a successful training strategy as well as providing valuable feedback regarding the data collection form and methodology.

6.5.3 Volunteer Observers

The use of volunteer observers was a component of the project which posed some challenges. Although there were a number of groups who indicated an eagerness to assist with the campaign, it was difficult to gain commitment to participate when the implementation actually began. As a result, more staff time was needed to complete the observations than was initially anticipated. If volunteers were to be engaged in this type of campaign in future, it would be important to set clear recruitment objectives and have a contingency plan in place if these objectives are not met.

Other issues that arose with the volunteers involved ensuring a proper process was completed with Human Resources for the hours that they were involved in the project. Also, during one of the campaigns, an internal influenza immunization policy was initiated. As some of the volunteers were not immunized, they were not able to participate in the project.

Interrater variability is an issue that arises with the use of individual data collectors. There were inconsistencies found in the recording of data on the observation data collection forms. A short 'refresher' on the data collection form and methodology prior to each observation session may have been helpful in reducing Interrater variability.

7 CONCLUSIONS

The health unit would like to acknowledge, once again, the various partners that participated in the project. Without their support and assistance the project could not have achieved its goals. The health unit received funding from the Enbridge Gas 'Awaire' Fund to pilot the school and community based social marketing campaign. The campaign was completed in collaboration with the Trillium Lakelands District School Board, Simcoe County District School Board, Town of Gravenhurst and the City of Orillia. Students from the Georgian College Research Analyst program and the University Partnership Centre at Georgian provided volunteer assistance with the school observations and interventions.

The "Turn It Off" Campaign achieved success of varying degrees for the four primary goals identified, which were: engage students, parents and school boards in initiatives to take action to improve air by reducing vehicle idling practices in school zones and communities; engage municipalities in initiatives to take action to improve air quality by reducing vehicle idling practices at community centers and recreation centers; provide information/resources/education to the public to reduce vehicle idling practices; and provide information/resources/education to municipalities to promote municipal strategies to improve outdoor air quality. The campaign was able achieve these goals through implementation of a social marketing and awareness campaign which targeted selected schools and community sites within the participating communities.

The key objective of the school intervention was to influence idling behaviour among drivers picking up children after school. In the first phase, implemented in the District of Muskoka, idling incidence was found to decrease by 8% at the Intervention School following the intervention. It is important to note that during the same time period, idling incidence increased by over 10.0% at the Control School. As a result of idling behaviour change by drivers at the Intervention School, about 5 tonnes/year of CO_2 were not produced during the post-intervention period. In the second phase, in Simcoe County, idling incidence decreased by 32% at the Intervention School following the intervention, and by 13% at the Control School with no intervention. Overall, while CO_2 contribution at both schools decreased, CO_2 emission at the Intervention School showed the largest decrease.

The community social marketing campaign was planned to build on the momentum generated by the school intervention within the community. The intercept survey, conducted following the community intervention in Phase 2 of the project, found the "Turn It Off' radio ads were the most frequently recalled component of the campaign. In addition survey respondents were found to be supportive of a variety of idling reduction strategies and policies. This information was useful in supporting local policy development.

Although a small pilot project, the “Turn It Off” Campaign demonstrates that this type of small initiative can successfully engage students, the community and local decision-makers. The campaign was successful in both influencing individual behaviours, as demonstrated by the reduction in idling incidence at the intervention schools, and was found to build momentum in the participating communities related to idling policy development, at both the municipal and school levels. The “Turn It Off” Campaign reinforces the underlying principles of policy development, in particular the effectiveness of community education and awareness campaigns for building support for policy development.

The project sparked policy discussion at various levels in the participating communities. The process to consult with and gain approval or support from the various agencies and partners, such as municipal councils and school boards, was found to provide a valuable opportunity to engage these partners in discussions related to anti-idling in a very positive, and non-confrontational manner. The impacts from the consultation process can be seen in the development and implementation of several anti-idling policies in schools and municipalities in the participating communities.

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