Imagine a cold, wet, January afternoon. You arrive at your child’s school 10 minutes before the final bell sounds with the intention of beating other (less prudent) parents to the pick-up area, thus avoiding the inevitable traffic jam that ensues as cars are funneled from every direction through a single exit. Happy with your promptness and your position in the pickup line, you are faced with a critical decision: do you turn off your car and brave the cold, or do you leave the engine idling and stay toasty? As a warm-blooded being, it’s natural that your first inclination is to sacrifice some gas money in order to keep yourself cozy. Of course, you also care about your child’s health and have heard that car emissions can be especially dangerous to his/her respiratory system—but your car alone can’t possibly make a difference, right? When you reach this stage in your rationale, consider the fact you’re not alone in this decision. Not only are there 15, 30, 50 more parents parked behind you facing the exact same dilemma, but there might also be a parking lot full of student drivers attempting to get home early, as well as a fleet of school busses idling nearby (although illegal in many states). Hopefully you’ll realize that idling adds up! If you want some numbers behind this theory, consider the simple scenario calculations below that utilize idling emission data from the EPA for typical household passenger vehicles.

Of course, multiple factors influence the emissions from a given vehicle, such as the outside air temperature, as well as the make, model, year and condition of the vehicle. For the purpose of simplification, the EPA has created a classification scheme which separates household gas-powered automobiles into two broad categories: light-duty gasoline-fueled vehicles (LDGV, or passenger vehicles) and light-duty gasoline-fueled trucks (LDGT, or pick-up trucks, SUVs, minivans). Clearly, such generalizations may reduce the accuracy of any calculation, but it can still provide reasonable and informative approximations of vehicular emissions. Below are CO, NO\textsubscript{x}, and VOC emissions rates for LDGV’s and LDGT’s provided by the EPA:

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>CO (g/min)</th>
<th>NO\textsubscript{x} (g/min)</th>
<th>VOC (g/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDGV</td>
<td>6.19</td>
<td>0.103</td>
<td>0.325</td>
</tr>
<tr>
<td>LDGT</td>
<td>8.12</td>
<td>0.125</td>
<td>0.512</td>
</tr>
</tbody>
</table>

(Source: [http://www.epa.gov/oms/consumer/f98014.pdf](http://www.epa.gov/oms/consumer/f98014.pdf))
In the scenario calculations that follow, the major pollutants considered are carbon monoxide (CO), nitrogen oxides (NO\(_x\)), and volatile organic compounds (VOC’s), each of which are byproducts in the combustion of gasoline and are known to have adverse health effects. All of the calculations are based on a simple, albeit crude, formula for the amount of a given pollutant, \(P\), emitted by an idling car or group of cars:

\[
\text{Mass of } P \text{ emitted} = (\# \text{ of vehicles}) \times (\text{time idling}) \times (\text{emission rate of } P \frac{\text{mass}}{\text{time}})
\]

**HOW MUCH POLLUTION DOES YOUR VEHICLE CONTRIBUTE?...**

Back to your dilemma... You've arrived at the school 10 minutes early and you decide that being cold is not your thing, so you keep the car running and the heat blasting. Assuming it takes your child 5 minutes to pack up and find your car after the bell rings, you end up spending roughly 15 minutes idling in the pick-up line. Your contribution of atmospheric pollutants is calculated accordingly:

If you drive a sedan:

| 1 Vehicle | 6.19 gCO/min | 92.9g CO |
| 15 minutes idling | 0.103 gNO\(_x\)/min | = 1.55g NO\(_x\) |
| 0.325 gVOC/min | | 5.28g VOC |

If you drive a truck, minivan, or SUV:

| 1 Vehicle | 8.12 gCO/min | 121.8g CO |
| 15 minutes idling | 0.125 gNO\(_x\)/min | = 1.88g NO\(_x\) |
| 0.512 gVOC/min | | 7.68g VOC |

Thus according to the EPA, if you drive a sedan, you've contributed 92.9g CO, 5.28g VOC, and 1.55g NO\(_x\) to the atmosphere during this time. If you drive a truck, minivan, or SUV, your contribution is 121.8g CO, 7.68g VOC, and 1.88g NO\(_x\).
**HOW DOES YOUR DECISION MAKE A DIFFERENCE?...**

By itself, the emissions from your vehicle may not seem like much, but when combined with the emissions from everyone else’s vehicles, it indeed adds up. The problem is that many people fail to see the big picture—the cumulative effects of individuals idling can be significant and can put your children at risk. Consider the cases below with multiple vehicles idling, which may be representative of your own pick-up experiences. To help visualize the numbers of vehicles used, each car symbol represents 5 LDGV’s, and each SUV symbol represents 5 LDGT’s:

**Case 1:**

\[ \times 15 \text{ min Idling} = 2756 \text{g CO, } 168 \text{g VOC, and } 43.7 \text{g NO}_x \]

There are 25 vehicles (15 SUVs/minivans and 10 sedans), all of which are idling for 15 minutes in the pickup line with you. Cumulative emission from these vehicles: 2756g CO, 168g VOC, and 43.7g NOx.

**Case 2:**

\[ \times 15 \text{ min Idling} = 5657 \text{g CO, } 348 \text{g VOC, and } 89.1 \text{g NO}_x \]

Your child goes to a larger school, where 50 vehicles (35 SUVs/minivans and 15 sedans) are idling for 15 minutes. Total pollutants released into the atmosphere is 5657g CO, 348g VOC, and 89.1g NOx.

**Case 3:**

\[ \times 10 \text{ min Idling} + \]

\[ \times 10 \text{ min Idling} = 9235 \text{g CO, } 564.2 \text{g VOC, and } 146.1 \text{g NO}_x \]

There are now 50 student drivers (25 SUVs and 25 sedans) idling for 10 minutes as they try to leave school early. Combining their emission contributions with the contributions from you and other idlers, the total pollutants released would be roughly 9234g CO, 564.2g VOC, and 146.1g NOx. Recall that all of these pollutants are accumulating into the atmosphere before children are even released from school! If there is little wind and little atmospheric mixing, the concentration of these pollutants in the air surrounding the pick-up zone could potentially reach levels that are harmful to your children, especially to those with asthma and other respiratory illnesses.
WHAT CAN YOU DO TO HELP PROTECT YOUR CHILD?

The best way to keep your children’s lungs happy and healthy is to reduce their exposure to car exhaust. A simple way to do this would be to walk your children home, as long as the route you use avoids heavy traffic congestion. Not only would this keep your children safe from dangerous pollutants, but it would also help them (and you!) maintain an active lifestyle. If you live beyond walking distance from the school, you could always park your car a short distance away from school and walk with your child from the school to your car. The amount of time you spend walking to and from your car would be counterbalanced by the time you save by avoiding all the traffic congestion and lengthy pick-up lines. However, if you still don’t feel comfortable walking your children home due to perilous traffic conditions, consider raising the issue to your local school board and pushing for safer pedestrian pathways.

If your child must be picked up and dropped off, and if riding the bus is not an option, then the next best thing you can do is carpool. For instance, if every child being picked up could carpool with two friends, then the number of vehicles at the school during pick-up and drop-off, as well as the total emissions released by idling vehicles, would be cut by roughly two thirds. As an additional benefit, since less cars picking up and dropping off implies less congestion, the amount of time that the cars spend idling will also be reduced.

Referring back to the equation above describing the mass of pollutant released by an idling vehicle, you, as parents, have complete control over two major components of this equation: 1) the number of vehicles idling, and 2) the time spent idling. Why not do everything in your power to protect your children from harmful vehicle emissions and TURN OFF YOUR ENGINE?! If you’re worried about the cold, consider the fact that your child’s health is worth much more than 15 minutes of slight discomfort!