Can social norms be leveraged to change driving behavior? 
A thought experiment

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Motivation

- The transportation sector accounts for one-third of total GHG emissions in the U.S. and is fastest growing sector
- Options for reducing emissions in transportation in the near-term are fairly limited
  - Technology → takes time
  - Reducing vehicle-miles traveled → people still drive!
- Often overlooked approach is eco-driving
  - 10% of fuel consumption attributed to driving behavior
- Using behavior change tools to encourage eco-driving is an important area of research
  - Not a lot being done in this area
Research Proposal

• Small experimental trials aimed at measuring the effectiveness of specific behavior change tools
• Not a programmatic approach!
• Lessons learned apply to program managers

• Funded by the Renewable and Sustainable Energy Institute, University of Colorado Boulder

• 2 experiments
  • Social norms
Social Norms

• **Definition:** Individuals respond to the actions and/or beliefs of their peers

• Why social norms?
  • Under-utilized but research continuously reveals their effectiveness
    • Hotel towel re-use rates, charitable contribution rates, voting behavior, littering, recycling, water use, etc.
  
• Energy use (0 Power)
  • Household energy consumption decreased by an average of 2% (e.g. Allcott 2011)

• Can social norms be leveraged to change driving behavior?
Experimental Design

- Randomized control trial
- College students in Denver-metro area
- Implementation: October 2011
Email Message

- Social norm
- Descriptive norm
- Injunctive norm
- Eco-driving tips

Avoid Idling
Idling uses fuel, but because the car is going nowhere, it translates to 0 mpg. A car can burn more than ½ gallon of gasoline for every hour spent idling. Make a habit of turning off your engine when waiting, even if it's just for a short period.

Avoid Rapid Starts and Stops
A few seconds of high-powered driving can use as much gas as driving for several minutes at more measured speeds. Ease into accelerations and brake smoothly, especially around corners, to raise your mileage and save up to $1 per gallon.

Your peers are getting better fuel economy than you - this means they are spending less money on gasoline than you! You could get even better fuel economy! Try using these tips to save money!
Problems Encountered

• Low response rate and high attrition rate
  • 408 interested in participating
  • 104 completed survey
  • 61 completed study in full
  • 43 sensible data entry
• Treatment – 19, Control - 24

• Snow at the start of week 3
  • Drive, distance, road type, time of day

• Descriptive results only
Randomization

- MPG during week 1 by treatment status

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Control</th>
<th>Difference (T - C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
</tr>
<tr>
<td>21.81</td>
<td>21.63</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$t$-stat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.09</td>
</tr>
</tbody>
</table>

- Individual Characteristics – differences are statistically insignificant
  - Driving habits and behaviors
  - Environmental attitudes
  - Socioeconomic characteristics (more married in C)
Percent Change in MPG

<table>
<thead>
<tr>
<th>Control</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0%</td>
<td>-0.003%</td>
</tr>
<tr>
<td>-0.5%</td>
<td></td>
</tr>
<tr>
<td>-1.0%</td>
<td></td>
</tr>
<tr>
<td>-1.5%</td>
<td></td>
</tr>
<tr>
<td>-2.0%</td>
<td></td>
</tr>
<tr>
<td>-2.5%</td>
<td></td>
</tr>
<tr>
<td>-3.0%</td>
<td></td>
</tr>
<tr>
<td>-3.5%</td>
<td>-3.2%</td>
</tr>
</tbody>
</table>
Relative Change in MPG (v.2)

\[
\Delta MPG_{Treatment} - \Delta MPG_{Control}
\]
Peer Comparison

- Below Peer Avg: 4.9%
- Above Peer Avg: 1.6%
Better Than Peer

- Above Avg: 1.6%
- Above Avg, Below Max: 2.9%
- Above Max: 0.4%
Worse Than Peer

- 4.9%
- 5.7%
- 12.4%
- 1.0%
- -2.0%
- 0.0%
- 2.0%
- 4.0%
- 6.0%
- 8.0%
- 10.0%
- 12.0%
- 14.0%

Legend:
- Below Avg
- Comp Inform
- Comp Over Tips
- Tips Over Comp

-1.0%
Which Behaviors Change?

- Types of behavior change
  - Technology (fuel-efficient vehicles)
  - Maintenance (oil change, tire pressure, etc.)
  - Daily use behavior (reduce vehicle use OR modify driving behavior)

- Generally, conversations about MPG leads to discussion about technology change
- Peer comparison and tips appears to change this conversation, focusing on what can be done with the current technology
When I fell below the average, my thought was “it's time to get an oil change/tune up”.

I didn't realize just how much my mileage would drop for [shorter/slower trips], and I am thinking about whether public transit would be an acceptable alternative after all (previously rejected because of timing issues).

I noticed that my car can get better fuel economy if I try to not speed and not take off quickly.
Key Challenges

• Comparison MUST be relevant
  • “I never specified tire size so comparisons aren't necessarily relevant.”
  • “It is likely that others drive on the highway much more than me and will obviously get better mileage.”

• Unobtrusive data would be better
• (Is there an app for that?)
  • Requiring fill-ups leads to short study duration and high attrition
  • Hawthorne effect
Conclusion

• Most solutions to reducing emissions in transportation will not occur in the near-term and, at least for now, a lot of people drive

• Behavior change tools offer a unique opportunity for immediate reductions by targeting eco-driving

• Social norms could be one tool
  • Key challenges to work out
Moblu

- [http://www.moblu.ca](http://www.moblu.ca)

Track MPG (or CO₂ emissions) over time

**Groups**

**The "In The Loop" Group**
A group of Moblu-ers who have used Moblu early and often.
13 members, 7 vehicles
- Created by mscott

**Group Statistics**

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Mileage (Since Joining)</th>
<th>Mileage (Since Last Fill)</th>
<th>Trend (Since Joining)</th>
<th>Trend (Since Last Fill)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Pearl</td>
<td>27.3 mpg</td>
<td>26.2 mpg</td>
<td>-4.2%</td>
<td>-5.0%</td>
</tr>
<tr>
<td>#2 AccordEX</td>
<td>25.7 mpg</td>
<td>24.8 mpg</td>
<td>-3.6%</td>
<td>-5.6%</td>
</tr>
<tr>
<td>#3 MyVolkswagen</td>
<td>25.3 mpg</td>
<td>24.6 mpg</td>
<td>+4.2%</td>
<td>+2.3%</td>
</tr>
<tr>
<td>#4 TheGreatWhite</td>
<td>23.9 mpg</td>
<td>26.2 mpg</td>
<td>+8.7%</td>
<td>+9.0%</td>
</tr>
<tr>
<td>#5 Sharkle</td>
<td>18.5 mpg</td>
<td>18.0 mpg</td>
<td>-2.6%</td>
<td>-3.8%</td>
</tr>
<tr>
<td>#6 Henry</td>
<td>18.0 mpg</td>
<td>18.2 mpg</td>
<td>+1.0%</td>
<td>+4.6%</td>
</tr>
<tr>
<td>#7 guzzler</td>
<td>11.4 mpg</td>
<td>10.0 mpg</td>
<td>-13.7%</td>
<td>-5.0%</td>
</tr>
</tbody>
</table>
Smarter Cab Drivers

- [http://www.smartercabdrivers.com](http://www.smartercabdrivers.com)
- Competition to improve fuel economy (individual and teams)
“Eco-drive and You”

- Nissan
  - Feature of in-vehicle navigation system
  - Compares fuel economy to other driver’s with the same vehicle and provides real-time feedback and tips
  - Available in Japan