The Long-Term Effects and Safety Benefit Functions for Saskatchewan’s Graduated Driver Licensing Program

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Overview

• Background
• Objectives
• Study Data
• Analytical Approach
• Results
  – Overall and Relative Contributions
  – Long-Term Effects and Safety Benefit Functions
• Conclusions and Implications
Background

- Beginning drivers are an inherently risky bunch
- In Saskatchewan young driver risk twice that of older drivers
- Introduced Graduated Driver Licensing Program in 2005
- Initial effects of program
  - 18% reduction in at-fault crash risk of GDL participants
- No comprehensive long-term evaluation conducted to date
- At what point should GDL program be revamped?
Aim of Study

- Evaluate program effects long-term
  - Benefits over full program cycle
  - Relative contribution of program stages
  - Develop long-term safety benefit functions to identify points in time for revamping program
The Saskatchewan Program

• Learner Stage: 9 months
  – Supervision by qualified driver
  – Night-time restrictions
  – Passenger restrictions
• Novice 1 stage: 6 months
• Novice 2 Stage: 12 Months
• Full Cycle: 27 Months—Full Licensure
• Min Requirements
  – Minimum age 16
  – Zero tolerance for Blood Alcohol Content (BAC)
Study Data And Subjects

- SGI AutoFund database
- Traffic Accident Database
- Collisions involving two-month driver samples were tracked for 70 months (post-GDL cohort: October 2005 – August 2011; pre-GDL cohort: October 1999 – August 2005).
## Profile of tracked Subjects

<table>
<thead>
<tr>
<th>Age Category</th>
<th>Post-GDL Cohort (Starting 01 Sept ‘05)</th>
<th>Pre-GDL Cohort (Starting 01 Sept “99)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>15-19</td>
<td>1565</td>
<td>1562</td>
</tr>
<tr>
<td>&gt;19</td>
<td>145</td>
<td>90</td>
</tr>
<tr>
<td>Total</td>
<td>1710</td>
<td>1652</td>
</tr>
</tbody>
</table>
Analytical Procedure

- Negative Binomial Regression Technique
- Approximate collision counts with GEE accounting for correlation in longitudinal data
- Response Variable: Collision Incident Rate
- Post-GDL versus pre-GDL potential percent reduction in collision rates
- Development of Safety Benefit Functions
Modeling Results: GEE parameter estimates
Learner Stage Example

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>Z-score</th>
<th>P</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-7.8533</td>
<td>0.2575</td>
<td>-20.49</td>
<td>≤ 0.0001</td>
<td></td>
</tr>
<tr>
<td>Period</td>
<td>-1.1356</td>
<td>0.0288</td>
<td>1554.1</td>
<td>≤ .0001</td>
<td>0.3212</td>
</tr>
<tr>
<td>*Pre-GDL</td>
<td>0</td>
<td>0</td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>Month</td>
<td>0.1979</td>
<td>0.0458</td>
<td>4.32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Reference level

Percent Reduction in Collision Incidence
(1-0.3212)*100% = 68%
## Summary of Modeling Results:

<table>
<thead>
<tr>
<th>Model Categories</th>
<th>GDL Full Cycle 27 months</th>
<th>Learner Stage 9 months</th>
<th>Novice 1 Stage 10-15 Months</th>
<th>Novice 2 Stage 16-27 Months</th>
<th>Experienced Stage &gt;27-70 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>-36.7%* (-89)**</td>
<td>-67.9% (-26)</td>
<td>-29.2% (-24)</td>
<td>-23.1% (-20)</td>
<td>+17.6% (+49)</td>
</tr>
<tr>
<td>Female</td>
<td>-25.8% (-51)</td>
<td>-56.9% (-17)</td>
<td>-33.0% (-23)</td>
<td>-7.54% (-8)</td>
<td>+31.2% (+66)</td>
</tr>
<tr>
<td>Male</td>
<td>-43.3% (-126)</td>
<td>-78.6% (-37)</td>
<td>-26.3% (-24)</td>
<td>-33.3% (-52)</td>
<td>+9.0% (+31)</td>
</tr>
<tr>
<td>15-19</td>
<td>-34.1% (-85)</td>
<td>-75.4% (-29)</td>
<td>-28.8% (-24)</td>
<td>-24.4% (-32)</td>
<td>+17.6% (+51)</td>
</tr>
<tr>
<td>&gt;19</td>
<td>-15.4% (-23)</td>
<td>-14.8% (-6)</td>
<td>-41.9% (-16)</td>
<td>+7.22% (+6)</td>
<td>9.2% (+53)</td>
</tr>
</tbody>
</table>

*Percent Reduction in Collision Risk  
**Collisions per 1000
Long-Term Safety Benefit Function: Overall

![Graph showing collision rate reduction over program stages.](image-url)

- **Y-axis**: Collision Rate Reduction (%)
- **X-axis**: Program Stage
  - 1 = Start
  - 2 = Learner
  - 3 = Novice 1
  - 4 = Novice 2
  - 5 = Full Licensure
Overall Long-Term Safety Benefit Function By Age

Program Stage:
1=Start 2=Learner 3=Novice 1 4=Novice 2 5=Full Licensure
Overall Long-Term Safety Benefit Function by Gender

Collision Rate Reduction (%)

Program Stage
1=start 2=Learner 3=Novice 1 4=Novice 2 5=Full Licensure
Conclusions

• The GDL overall safety benefits: 36%.
• The greatest impact: GDL learner stage
• Significant reduction in benefits at Novice stages
• Most reductions attributed to 15-19 year olds
• The benefits not sustainable in the longer-term
• The overall safety benefits completely dissipates ten months following full licensure.
• Point of complete dissipation of benefits varies by age and gender
• Benefits sustained longer for males and 15-19 year olds
Policy Considerations

- Generally, program reinforcement should be effected 10 months following program completion.
- For targeted revamping, reinforcements directed at 15-19 year old should occur about 10 ten months following completion of the full program cycle.
- Reinforcement GDL program for older drivers should occur well before they complete the program.
Questions?