Using Geographic Information Systems to Plan Pedestrian Safety Programs in a Large Metropolitan Area

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San Diego County

- Over 3 million residents
- Over 2 million resident drivers
- 15 million overnight visitors per year
- Busiest international land border
- Military
- 7,700 roadway miles

Source: County of San Diego Emergency Medical Services, SWITRS, 2003 - 2005
Motor Vehicle Crashes, Injuries, and Deaths (2005)

- 16,136 crashes
  - 23,503 Injuries
  - 308 deaths from MV crashes (1.3%)

- 1025 Pedestrian crashes
  - 1,165 Injuries
  - 62 deaths (5.3%)

Pedestrians made up 20% of traffic-related deaths
Health Care Burden:
Pedestrian Injuries: 2005

- 522 Ambulance transports
- 916 Emergency Dept. patients
- 359 Hospital Discharges
- 246 Major Trauma Patients
Pedestrian Crash Characteristics: San Diego County

- Drinking pedestrians: 13%
- Hit & run: 16%
- Pedestrian at fault: 38%
- 0 to 14 Years: 19%
- Noon – 6 P.M.: 38%
SWITRS

- StateWide Integrated Traffic Records System
- Police reports
- Maintained by California Highway Patrol
- All injury crashes in California
  - San Diego county crashes
- Incidents geocoded locally
SWITRS Geocoding

- Custom Program
  - Based on roads, distance & direction from intersection
- ~75% automatic
- 25% manual
  - Misspellings
  - Street aliases
  - Direction errors
  - Other
Objectives

- Identify areas with high pedestrian crashes
- Determine risk factors for those areas
Methods

- Density function at county level
- Examine clusters by crash, victim, and environmental factors
Pedestrian Drinking Status: Gaslamp Quarter vs. County

- Gaslamp Quarter
  - Not Drinking: 13%
  - Drinking: 17%

- County
  - Not Drinking: 87%
  - Drinking: 83%
Pedestrian Crashes by Driver's Drinking Status: Gaslamp Quarter
2003 - 2005

Driver's Drinking Status
- Had Not Been Drinking
- Had Been Drinking

Source: County of San Diego Emergency Medical Services, SWTRIS, 2003 - 2005
Driver’s Drinking Status: Gaslamp Quarter vs. County

- **Not Drinking**: 95% (Gaslamp) vs. 96% (County)
- **Drinking**: 5% (Gaslamp) vs. 4% (County)
Pedestrian Crashes by Pedestrian Age: Gaslamp Quarter
2003 - 2005

Pedestrian Age Group
- 0 to 14
- 15 to 19
- 20 to 24
- 25 to 54
- 55+
- >1 Pedestrian Age Group
- Unknown

Source: County of San Diego Emergency Medical Services, SWITRS, 2003 - 2005
Pedestrian Age Groups:
Gaslamp Quarter vs. County

- **0 - 14**
  - County: 10%
  - Gaslamp: 19%

- **15 - 19**
  - County: 9%
  - Gaslamp: 2%

- **20 - 24**
  - County: 2%
  - Gaslamp: 13%

- **25 - 54**
  - County: 36%
  - Gaslamp: 55%

- **55+**
  - County: 20%
  - Gaslamp: 27%

- **>1 Age Group**
  - County: 3%
  - Gaslamp: 1%

- **Unknown**
  - County: 3%
  - Gaslamp: 1%
Pedestrian Crashes by Driver Age: Gaslamp Quarter
2003 - 2005

Driver Age Group
- 0 - 14
- 15 - 19
- 20 - 24
- 25 - 54
- 55+
- >1 Age Group
- Unknown

Source: County of San Diego Emergency Medical Services, SWIRES, 2003 - 2005
Driver Age Groups:
Gaslamp Quarter vs. County

<table>
<thead>
<tr>
<th>Age Group</th>
<th>County</th>
<th>Gaslamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 14</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>15 - 19</td>
<td>1%</td>
<td>7%</td>
</tr>
<tr>
<td>20 - 24</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>25 - 54</td>
<td>45%</td>
<td>50%</td>
</tr>
<tr>
<td>55+</td>
<td>22%</td>
<td>26%</td>
</tr>
<tr>
<td>&gt;1 Age Group</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Unknown</td>
<td>8%</td>
<td>15%</td>
</tr>
</tbody>
</table>
Time of Day of Crash: Gaslamp Quarter vs. County

<table>
<thead>
<tr>
<th>Time Interval</th>
<th>County</th>
<th>Gaslamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-5am</td>
<td>17%</td>
<td>7%</td>
</tr>
<tr>
<td>6-11am</td>
<td>23%</td>
<td>24%</td>
</tr>
<tr>
<td>12-5pm</td>
<td>40%</td>
<td>38%</td>
</tr>
<tr>
<td>6-11pm</td>
<td>23%</td>
<td>31%</td>
</tr>
</tbody>
</table>

County of San Diego Division of Emergency Medical Services
Crash Day of Week: Gaslamp Quarter vs. County

<table>
<thead>
<tr>
<th>Day</th>
<th>Gaslamp</th>
<th>County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>14%</td>
<td>16%</td>
</tr>
<tr>
<td>Tuesday</td>
<td>15%</td>
<td>17%</td>
</tr>
<tr>
<td>Wednesday</td>
<td>12%</td>
<td>16%</td>
</tr>
<tr>
<td>Thursday</td>
<td>11%</td>
<td>15%</td>
</tr>
<tr>
<td>Friday</td>
<td>10%</td>
<td>17%</td>
</tr>
<tr>
<td>Saturday</td>
<td>13%</td>
<td>24%</td>
</tr>
<tr>
<td>Sunday</td>
<td>10%</td>
<td>11%</td>
</tr>
</tbody>
</table>

County of San Diego Division of Emergency Medical Services
Pedestrian Hit & Run Status: Gaslamp Quarter vs. County

- Not Hit & Run:
  - County: 85%
  - Gaslamp: 84%

- Hit & Run:
  - County: 16%
  - Gaslamp: 15%
Pedestrian Action:
Gaslamp Quarter vs. County

- Crossing in X-walk:
  - County: 36%
  - Gaslamp: 62%

- Crossing, Not in X-walk:
  - County: 34%
  - Gaslamp: 14%

- In Road:
  - County: 18%
  - Gaslamp: 13%

- Not in Road:
  - County: 7%
  - Gaslamp: 7%

- Other/Not Stated:
  - County: 5%
  - Gaslamp: 4%
Fault in Pedestrian Crashes: Gaslamp Quarter vs. County

- Pedestrian at Fault: 18% (Gaslamp) vs. 38% (County)
- Other Party at Fault: 43% (Gaslamp) vs. 45% (County)
- Fault Not Assigned: 19% (Gaslamp) vs. 34% (County)
Pedestrian Crash Density: Downtown San Diego
2003 - 2005

Mid-City
Pedestrian Age Groups: Mid-City vs. County

- **0 - 14**: County 19% vs. MidCity 31%
- **15 - 19**: County 10% vs. MidCity 13%
- **20 - 24**: County 7% vs. MidCity 9%
- **25 - 54**: County 20% vs. MidCity 25%
- **55+**: County 18% vs. MidCity 20%
- **>1 Age Group**: County 3% vs. MidCity 5%
- **Unknown**: County 0% vs. MidCity 3%
Pedestrians Crashes within 1/4 Mile of Elementary or Middle Schools: Mid City 2003 - 2005

Pedestrian Age Group
- 0 to 14
- 15 to 19
- 20 to 24
- 25 to 54
- 55+
- >1 Age Group
- Unknown
- Alcohol Outlets
- Parks
- Schools
- Schoolbuffer

Source: County of San Diego Emergency Medical Services SWITRS, 2003 - 2005
Percent within ¼ Mile of an Elementary or Middle School, by Age: Mid-City

<table>
<thead>
<tr>
<th>Age</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 14 Years</td>
<td>62.90%</td>
</tr>
<tr>
<td>&gt;=15 Years</td>
<td>48.10%</td>
</tr>
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County of San Diego  Division of Emergency Medical Services
Conclusions

- Unique risk factors down to the neighborhood level
- Grid street layout
- Alcohol
- Age patterns

Look for environmental issues where risk factors cluster

- E.g., crossing outside of crosswalk: more crosswalks needed?
Recommendations

- **Education**
  - Remind drivers to look out for drunk walkers
  - Don’t drink and walk! Messages
  - Message distribution sites
    - Schools
    - Bars

- **Engineering**
  - Targeted street closures
  - Pedestrian bridges

- **Enforcement**
  - Police presence at key hours
  - Drinking & walking legislation
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For More Information

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Pedestrian Action: Mid-City vs. County

- Crossing in X-walk: 36% County, 40.18% Mid-City
- Crossing, Not in X-walk: 34% County, 40.18% Mid-City
- In Road: 18% County, 9.82% Mid-City
- Not in Road: 7% County, 8.04% Mid-City
- Other/Not Stated: 5% County, 1.79% Mid-City