Gender Differences in the Journey to Suicide

Catherine Stevens

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Presenting my Undergraduate research project which draws on multi-disciplinary knowledge.

It’s a ‘small part of the puzzle’, contributing to the design of tools that can mathematically predict search and rescue parameters.

**Aims:**
- To spark and encourage thinking.
- To show the practical value of this research.
Importance of the topic area

- Average cost of a MP investigation = £1,325 (Shalev-Greene & Pakes, 2013). Dramatic rise if the outcome is fatal.

- Weekly, 20 missing people are found dead (Fyfe, Stevenson & Woolnough, 2015) → effects on the wider community.

- National reform and budget cuts = the need for ‘investigative competence’ (Alys, Massey & Tong, 2013) and cost effective tools.

<table>
<thead>
<tr>
<th>UK cases</th>
<th>Missing</th>
<th>Suicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latest annual figures</td>
<td>180,000 people reported missing (Missing People, 2018)</td>
<td>5,821 suicides registered (Samaritans, 2018)</td>
</tr>
</tbody>
</table>
- **Suicide**: At least 10% of suicides occur outdoors (Hannon, Giles, Deacon & Tocque, 2009). ‘Suicide hotspots’. ‘Suicide tourism’.

- **Suicidal MP**: 58% of reported MP suicides occurred in natural outdoor settings compared to 11% in non MP suicide cases (Sveticic et al., 2012).

- **Suicidal Males and Females & distance travelled**: Grampian Police MP Report (Gibbs & Woolnough, 2007).

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Method</strong></td>
<td>Traditionally more violent. Hanging, shooting, jumping, high impact moving vehicle</td>
<td>Drowning, overdose, jumping</td>
</tr>
<tr>
<td><strong>Likely locations to be found at</strong></td>
<td>Woods, rivers</td>
<td>Rivers, beaches, rural beauty spots</td>
</tr>
<tr>
<td><strong>Distance (km) where 90% of the cases will be found within when travelling by foot</strong></td>
<td>2.40</td>
<td>6.90</td>
</tr>
<tr>
<td><strong>Distance (km) where 90% of the cases will be found within when travelling by motor vehicle</strong></td>
<td>50</td>
<td>44</td>
</tr>
</tbody>
</table>
- Looked at spatial behaviours of different MP risk groups.
- Distance decay = the rate of decrease between two spatial points (I.E. between the last seen and found location).
- Identified various functions to demonstrate the decay.
- For high risk groups a log, quadratic and negative exponential function significantly demonstrated the decay, showing **distinct movement habits for high risk groups**.
Purpose & Data

- **Purpose:**
  - (Study 1) Comparatively look at the effect of gender, suicidal intent and vehicle possession on the distance travelled by MPs.
  - (Study 2) Examine suicidal MP spatial patterns through decay functions.

- **Data:** Secondary data reutilised from Walter et al., (2015).
  - 1,037 solved adult missing person cases from Lancashire Police Constabulary’s Missing from Home System between January-June 2015.
Study 1

- **Data**: Removed incomplete data entries, repeat cases and distance values more than 2SDs (99.40km) away from the mean (20.28km). N=293.

- **Data analysis**: Conducted a 2 (gender) x 2 (suicidal likelihood) x 2 (vehicle possession) between groups analysis of variance (ANOVA).

- **CAVEAT**: Data was positively skewed.

- **Results**: A significant main effect for vehicle possession $F(1, 285) = 5.16, p=.024, \eta^2=.18$, observed power .62 was found.
  - Missing individuals who had possession of a vehicle travelled significantly further (M=17.16±19.77) than those not in possession (M=9.44±13.89).
Means and Standard Deviation (±) for Distance Travelled

<table>
<thead>
<tr>
<th>Gender</th>
<th>Suicidal likelihood</th>
<th>Vehicle possession</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Yes</td>
<td>Yes (n=13)</td>
<td>14.36</td>
<td>17.66</td>
</tr>
<tr>
<td>N=158</td>
<td>No (n=23)</td>
<td></td>
<td>5.20</td>
<td>9.05</td>
</tr>
<tr>
<td></td>
<td>Total (n=36)</td>
<td></td>
<td>8.51</td>
<td>13.35</td>
</tr>
<tr>
<td></td>
<td>Yes (n=7)</td>
<td></td>
<td>22.65</td>
<td>27.08</td>
</tr>
<tr>
<td></td>
<td>No (n=15)</td>
<td></td>
<td>11.05</td>
<td>19.22</td>
</tr>
<tr>
<td></td>
<td>Total (n=22)</td>
<td></td>
<td>11.71</td>
<td>17.08</td>
</tr>
<tr>
<td>Female</td>
<td>Yes</td>
<td>Yes (n=2)</td>
<td>11.66</td>
<td>6.09</td>
</tr>
<tr>
<td>N=135</td>
<td>No (n=25)</td>
<td></td>
<td>9.62</td>
<td>12.90</td>
</tr>
<tr>
<td></td>
<td>Total (n=27)</td>
<td></td>
<td>9.79</td>
<td>12.47</td>
</tr>
<tr>
<td></td>
<td>Yes (n=5)</td>
<td></td>
<td>18.66</td>
<td>19.95</td>
</tr>
<tr>
<td></td>
<td>No (n=103)</td>
<td></td>
<td>8.53</td>
<td>11.93</td>
</tr>
<tr>
<td></td>
<td>Total (n=108)</td>
<td></td>
<td>9.01</td>
<td>12.46</td>
</tr>
</tbody>
</table>

(a) suicidal likelihood and gender (b) 3 way interaction, between having possession of a vehicle with gender and suicidal likelihood

Graphs displaying the ANOVA interaction effects between gender, suicidal likelihood and vehicle possession. (a) suicidal likelihood and gender (b) 3 way interaction, between having possession of a vehicle with gender and suicidal likelihood.
Discussion

- Likely suicidal females travel further than likely suicidal males
  - More definite plan in mind?
  - Location choice? (seeking idyllic surroundings?)
- For males, car possession and distance travelled is dependent on their suicidal likelihood.
  - Thus, likely suicidal male possession of a vehicle may not necessarily mean it’s used it or they travel far – a precaution that search teams should keep in mind (in order to minimise over expenditure).
Study 2A

- **Data**: Again, removed incomplete data cases and repeats but kept in outlier distance cases. N=337 (males =180, females =157).

- **Data analysis**: Conducted a curve estimation analysis, by using a trial and error approach to test 6 functions (quadratic, exponential, logarithmic, inverse, cubic and linear) against each subgroup’s data in order to identify the ‘best fitting’ function.

- The $R^2$ coefficient produced, ranging between 0-1, indicated the goodness of fit with closer values to 1, signifying a better match to the the dataset.
Four functions were significant, the inverse had the highest significance, $R^2=.779$, followed by logarithmic, $R^2=.407$, quadratic, $R^2=.374$, and cubic $R^2=.433$.

Four functions were significant, the \textbf{quadratic} $R^2=.509$, cubic, $R^2=.515,$ logarithmic, $R^2=.135,$ and inverse, $R^2=.130$. 

Graphs displaying the six distance decay functions calibrated against the distance travelled in the suicidal subgroups (a) suicidal males (b) suicidal females
Discussion

- Likely suicidal male and females have different spatial patterns:
  - **Females**: Cubic and quadratic functions best fitted movements. Suggesting larger search parameters should be considered when investigating suicidal missing females.
  - **Males**: Inverse function was the most significant. Serve gradient decrease indicates local spatial movements.
- Fewer significant functions for the likely suicidal groups compared to non-suicidal groups were found.
  - Suggesting suicidal MP may have more specified and focused spatial movements (supported by Stevenson et al., 2013).
Aim: Cross validate Study 2A, by comparing the likely suicidal significant decay functions to found MP cases who had deceased through suicide (definite suicidal).


Data analysis: Curve estimations could not be conducted for the definite female sub-group due to it’s small sample size, however it was possible for the definite male group.

- The significant likely suicidal male functions from 2A (inverse, logarithmic, quadratic and cubic) were then mapped onto and compared to the same functions derived from the definite suicidal male group.

### Frequency and distance travelled (km) statistics for definite suicidal females and males

<table>
<thead>
<tr>
<th>Distance travelled (km)</th>
<th>Median (SD)</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female N=4</td>
<td>8.95 (31.77)</td>
<td>3.10</td>
<td>70.20</td>
<td>67.10</td>
</tr>
<tr>
<td>Male N=20</td>
<td>6.20 (356.27)</td>
<td>.60</td>
<td>1604.17</td>
<td>1603.57</td>
</tr>
<tr>
<td>Total N=24</td>
<td>6.55 (325.10)</td>
<td>.60</td>
<td>1602.17</td>
<td>1603.57</td>
</tr>
</tbody>
</table>
Comparison graphs displaying the significant likely suicidal male functions found in study 2A, against the same functions generated for definite suicidal males in study 2B (a) inverse function (b) logarithmic function (c) quadratic function (d) cubic function

Discussion:

- The function gradients of the definite suicidal males, are a lot shallower indicating broader spatial movements.
- Suggesting definite suicidal males travel further compared to males who are likely to take their lives, but may not necessarily do so.
Utility and Future Direction

- **Utility**: Understanding suicidal movement characteristics will lead to faster detection and promote safeguarding.

- Using significant decay functions in geographical profiling systems will help correctly create and tailor gendered specific search parameters.
  - Saving lives, time, money, resources...

- **Future**: Need to study this matter longitudinally (over time) with balanced gendered groups, and further drive the use of geographic profiling into MP search plans.
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