Second-hand Risks of Firearm Ownership

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What are “secondhand” risks?
Roadmap

Background: the LongSHOT Cohort

Secondhand risks of homicide study

Secondhand risks of suicide study

Conclusions
LongSHOT team

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Dealer Record of Sale (DROS) system

The Dealer Record of Sale (DROS) system is a record-keeping process used in California for the sale of firearms. It is designed to ensure that firearm sales are tracked and recorded accurately. The system helps in maintaining public safety and compliance with firearms laws.

### Dealer’s Record of Sale (DROS) Worksheet

The worksheet includes the following sections:

1. **Transaction Information**
   - Transaction Date
   - Delivery Date
   - Gun Show Transaction

2. **Waiting Period Exemptions**
   - Peace Officer Status
   - California Firearms Dealer
   - Special Weapons Permit
   - Collector Status (curio/lieutenants only)

3. **Revolver/Pistol Information**
   - Make: Colt, S&W, etc.
   - Model: .44, Revolver, etc.
   - Caliber
   - Barrel Length
   - Serial Number
   - Other Number (if different)

4. **Purchaser Information**
   - First Name
   - Middle Name
   - Last Name
   - Suffix
   - Street Address
   - City
   - Zip Code
   - ID Type: DL, ID, ML
   - ID Number
   - US Citizen
   - Alien Registration Number
   - Date of Birth
   - Telephone Number
   - Sex
   - Age
   - Height
   - Weight
   - Hair Color
   - Eye Color
   - HSC Number or Exemption Code (handguns only)

The worksheet also includes a section for comments and additional information specific to the firearm being sold.
Assembly of LongSHOT cohort

LongSHOT cohort


Zhang et al *Injury Prevention* 2019
The LongSHOT cohort

- 28.6m adults followed for up to 12.2 years
- 1.2m cohort members purchased ≥1 handguns during follow-up
- 1.7m cohort members died
  - 13,868 from firearm injuries

Firearm-related deaths

<table>
<thead>
<tr>
<th>Category</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suicide</td>
<td>9,231</td>
</tr>
<tr>
<td>Homicide</td>
<td>4,264</td>
</tr>
<tr>
<td>Accidental</td>
<td>181</td>
</tr>
<tr>
<td>Legal intervention</td>
<td>64</td>
</tr>
<tr>
<td>Undetermined intent</td>
<td>128</td>
</tr>
</tbody>
</table>

Information on cohort members:
- Age, sex, race
- Geocoded place of residence (time varying)
- Dates of all lawful handgun (+ some long gun) acquisitions (running tally)
- Prior handgun acquisitions back to 1985
Individual-level cohort
Individual-level cohort

time

study end

study end

study end

study end
Household composition changes over time
Creation of households within LongSHOT cohort

- Households defined as “clusters” of cohort members residing at same address during same time period

- Took advantage of 13 historical extracts:
  - Geocoded addresses for all cohort members
  - Addresses kept up to date

- Linked individuals into households, which were re-formed at each extract & death
Individual-level → household-level cohort
Roadmap

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Conclusions
Context

• ~18,000 homicides per year
  ➢ ¾ involve firearms
  ➢ ~½ occur in or around victim’s home

• 29% of US adults personally own guns; 10% don’t own but live with owners

  National Firearm Survey 2021

• Personal protection is the leading reason for owning guns, especially handguns
  ➢ Steady increase in prevalence of this motivation over last 25 years
Does access to firearms protect against assaults?

- Gun could thwart or deter attacks.... or it could be turned on family or housemates
- Available evidence suggests availability of guns is \textit{positively} associated with risk of fatal assaults
What is the available evidence?

- Ecological studies show areas with more guns have more homicides

- Case-control studies find relatively high odds of homicide among people living in homes with guns

- 1 cohort study of individual owners
  Wintemute et al 1999
Study question

What is the risk of dying by homicide for people who don’t own guns but live with lawful handgun owners, compared to near neighbors living in handgun-free homes?
Study sample – comparison groups
Exposed to household handguns

Not exposed to household handguns
Exposed to household handguns
(n=821,225)

Not exposed to household handguns
(n=18,901,967)
### Study sample

<table>
<thead>
<tr>
<th></th>
<th>Nonowners residing with owners (N=595,448)</th>
<th>Nonowners not residing with owners (N=17.0m)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>33%</td>
<td>47%</td>
</tr>
<tr>
<td>Female</td>
<td>67%</td>
<td>52%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(mean)</td>
<td>41 yrs</td>
<td>43 yrs</td>
</tr>
<tr>
<td><strong>Race/ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>73%</td>
<td>61%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>17%</td>
<td>22%</td>
</tr>
<tr>
<td>Asian</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td>Black</td>
<td>4%</td>
<td>6%</td>
</tr>
<tr>
<td>Other</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td><strong>Residential location</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>85%</td>
<td>91%</td>
</tr>
<tr>
<td>Suburban</td>
<td>10%</td>
<td>7%</td>
</tr>
<tr>
<td>Rural</td>
<td>5%</td>
<td>3%</td>
</tr>
</tbody>
</table>
2,293 homicides (1,495 firearm homicides) in study sample — what circumstances?
Circumstances of homicides

Homicides (n = 2293)

Location
- Away from home (n = 1225) 16%
- At home (n = 866) 38%
- Irregular dwelling* (n = 29) 19%
- Unknown location (n = 173) 15%

Relationship of Perpetrator to Victim
- Stranger (n = 103) 27%
- Spouse or intimate partner (n = 235) 16%
- Other family member (n = 165) 19%
- Friend or acquaintance (n = 133) 15%
- Unknown (n = 230) 27%
Statistical analysis

- Cox proportional hazards model

\[
\frac{h_s(t)}{h_{0s}(t)} = \exp\{\beta_1 \times \text{handgun}_t + \beta_2 \times \text{sex} + \beta_3 \times \text{age} + \beta_4 \times \text{race} + \beta_5 \times \text{o_longgun}_t + \beta_6 \times \text{h_longgun}_t\}
\]

- Individual level analysis

- Predictor of interest: time spent cohabitating with ≥1 handgun owners (vs not)

- Adjustment for sex, age, race or ethnic group, long gun ownership (individual and household)

- Allowed baseline hazard to vary according to neighborhood (census tract)
Exposed to household handguns
\(n=821,225\)

Not exposed to household handguns
\(n=18,901,967\)
Adjusted homicide risk homicide for people residing with handgun owners

hazard ratio $>1 = higher risk$

hazard ratio $<1 = lower risk$
Adjusted homicide risk homicide for people residing with handgun owners

<table>
<thead>
<tr>
<th>All homicides</th>
<th>Adjusted Hazard Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All methods</td>
<td>2.33 (1.78–3.05)</td>
</tr>
<tr>
<td>By firearm</td>
<td>2.83 (2.05–3.91)</td>
</tr>
<tr>
<td>By other methods</td>
<td>1.52 (0.93–2.48)</td>
</tr>
</tbody>
</table>

Hazard ratio $>1$ = higher risk
Hazard ratio $<1$ = lower risk

84% of victims in these deaths are women

Homicides at home

<table>
<thead>
<tr>
<th>All methods</th>
<th>3.02 (2.12–4.30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>By firearm</td>
<td>4.44 (2.84–6.93)</td>
</tr>
<tr>
<td>By other methods</td>
<td>1.68 (0.93–3.03)</td>
</tr>
</tbody>
</table>

Homicides away from home

<table>
<thead>
<tr>
<th>All methods</th>
<th>1.68 (1.08–2.59)</th>
</tr>
</thead>
<tbody>
<tr>
<td>By firearm</td>
<td>1.70 (1.03–2.81)</td>
</tr>
<tr>
<td>By other methods</td>
<td>1.63 (0.67–3.96)</td>
</tr>
</tbody>
</table>

Homicides at home perpetrated by spouses and intimate partners

<table>
<thead>
<tr>
<th>All methods</th>
<th>4.25 (2.63–6.86)</th>
</tr>
</thead>
<tbody>
<tr>
<td>By firearm</td>
<td>7.16 (4.04–12.69)</td>
</tr>
<tr>
<td>By other methods</td>
<td>1.33 (0.48–3.71)</td>
</tr>
</tbody>
</table>

Homicides at home perpetrated by other family members, friends, and acquaintances

<table>
<thead>
<tr>
<th>All methods</th>
<th>2.45 (1.44–4.15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>By firearm</td>
<td>2.88 (1.40–5.93)</td>
</tr>
<tr>
<td>By other methods</td>
<td>2.04 (0.96–4.33)</td>
</tr>
</tbody>
</table>

Homicides at home perpetrated by strangers

<table>
<thead>
<tr>
<th>All methods</th>
<th>1.47 (0.34–6.41)</th>
</tr>
</thead>
<tbody>
<tr>
<td>By firearm</td>
<td>3.57 (0.79–16.07)</td>
</tr>
<tr>
<td>By other methods</td>
<td>–*</td>
</tr>
</tbody>
</table>
Key findings from homicide study

- Cohabitants of handgun owners twice as likely to die by homicide as neighbors living in handgun-free homes
- Elevated risk driven by higher rates of firearm homicide
- Especially high risks of homicide at home at hands of spouses / intimate partners—and vast majority of these victims were women
- Small minority of homicides were perpetrated by strangers; they were also more—*not less*—common among cohabitants of handgun owners
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