Spatial and temporal patterns of crime
heartbeat of the data

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<thead>
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<th>Mon</th>
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Heartbeat of the data

Heartbeat of crime

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Graph showing weekly data and crime patterns.
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</table>

- Data
- Heartbeat of the data
- Heartbeat of crime
- Heartbeat of crashes
crime

Thursday

Sunday

Saturday

Friday

Monday
<table>
<thead>
<tr>
<th>Days of the Week</th>
<th>before Easter</th>
<th>Holy Week</th>
<th>+100%</th>
<th>after Easter</th>
<th>+100%</th>
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<td>Sun</td>
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<td>+100%</td>
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</tbody>
</table>
The heartbeat of the city

Rafael Prieto Curiel1*, Jorge Eduardo Patino2, Juan Carlos Duque2, Neave O’Clery1

1 Centre for Advanced Spatial Analysis, University College London, London, United Kingdom, 2 Research in Spatial Economics, Universidad EAFIT, Medellin, Antioquia, Colombia

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Journal of Quantitative Criminology (2023) 39:97–124
https://doi.org/10.1007/s10940-021-09533-6

Weekly Crime Concentration

Rafael Prieto Curiel1

Accepted: 3 August 2021 / Published online: 1 September 2021
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How to identify a criminal suspect?
How to identify a criminal suspect?
Fear of crime is the problem
Insecure

Secure

Less crime

More crime

Fear

Crime

Mexico City
insecure

secure

less crime

more crime

fear

crime
insecure

secure

less crime

more crime

fear

crime
fear of crime

secure
insecure

not victim
victim
fear of crime

secure
insecure

not victim
victim
fear of crime

secure

insecure

not victim

victim
fear of crime

secure

not victim

insecure

victim
fear of crime

secure

insecure

not victim

victim
stressed
secure
insecure

fear of crime

not victim
victim
mean fear

fear of crime

secure

insecure

not victim

victim
fear of crime

secure  insecure

not victim

victim
fear of crime

secure  insecure

not victim

victim
fear of crime

secure  insecure

not victim  victim
fear of crime

secure  insecure

not victim  victim
mean fear

fear of crime

secure

insecure

not victim

victim
fear of crime

mean fear

secure

insecure

mean fear
Mathematical model of the fear
initial perception

$s_k^t$

fear of crime $s_k$

0

1

suffered crime ?

updated perception

victims

$s_{k}^{t+1} = 1$

memory decay

$s_{k}^{t+1} = \psi s_k^t$

with $\psi < 1$

interaction with $j$ ?

fearful $(s_j^t > s_k^t)$

$s_{k}^{t+1} = s_k^t + \nu (s_j^t - s_k^t)$

with $0 < \nu < 1$

fearless $(s_j^t < s_k^t)$

$s_{k}^{t+1} = s_k^t + \mu (s_j^t - s_k^t)$

with $0 < \mu < \nu < 1$
Simulate crime and social interactions
crimes “follow” a Poisson distribution
yearly rate = $\lambda_k$
crimes “follow” a Poisson distribution
yearly rate = \( \lambda_k \)
crimes “follow” a Poisson distribution
yearly rate $= \lambda_k$
crimes “follow” a Poisson distribution
yearly rate = $\lambda_k$
suffered a crime
The diagram shows the frequency distribution of secure and insecure behaviors across three groups. The secure behaviors range from 0.2 to 1, and insecure behaviors range from 0.2 to 1.

- **Group 1**: Mean = 0.48, Rate = 0
- **Group 2**: Mean = 0.59
- **Group 3**: Mean = 0.85

The frequency distribution for each group is indicated by different colors and shading styles.
Insecure<br>
secure<br>
less crime < > more crime

population crime rate

\( \lambda \)
Insecure vs. secure: less homophily < 0.25 < 0.5 < 0.75 < 1

Mixed vs. segregated: 0 < 0.25 < 0.5 < 0.75 < 1

Modelling the fear of crime

Rafael Prieto Curiel and Steven Bishop

Department of Mathematics, University College London, Gower Street, London WC1E 6BT, UK

Research

rspl.royalsocietypublishing.org

Check for updates
concentration of crime

- low concentration
- medium concentration
- high concentration

lower concentration ➔ higher concentration
fear of crime

- low concentration
- medium concentration
- high concentration

concentration of crime

fear = 0.4

fear = 0.6

population

crime rate \( \lambda \)

higher concentration

medium concentration

low concentration
Should we aim for fewer victims?
Should we aim for fewer victims?
The diagram illustrates the relationship between insecurity and fear of crime. It shows a linear increase from secure to insecure conditions as the crime rate increases from less to more crime.
insecure

fear

secure

less crime

more crime

crime

Sounds good, doesn't work.
“Best photo ever”
18 countries in Latin America
70 days
32 million tweets
“crime tweet” if it contains a crime word
0.5 million crime tweets
tweets per 1,000

crime-related: 15.41

violence-related: 6.5

murder-related: 4.0

property crime-related: 1.7

organised crime-related: 1.4

robbery-related: 0.8

gun-related: 0.7

sexual crime-related: 0.4
Crime and its fear in social media

Rafael Prieto Curiel, Stefano Cresci, Cristina Ioana Muntean & Steven Richard Bishop
Should we monitor social media?
Should we monitor social media?
Thank you!

Rafael Prieto Curiel
@rafaelprietoc
How to identify a criminal suspect?

Should we aim for fewer victims?

Should we monitor social media?