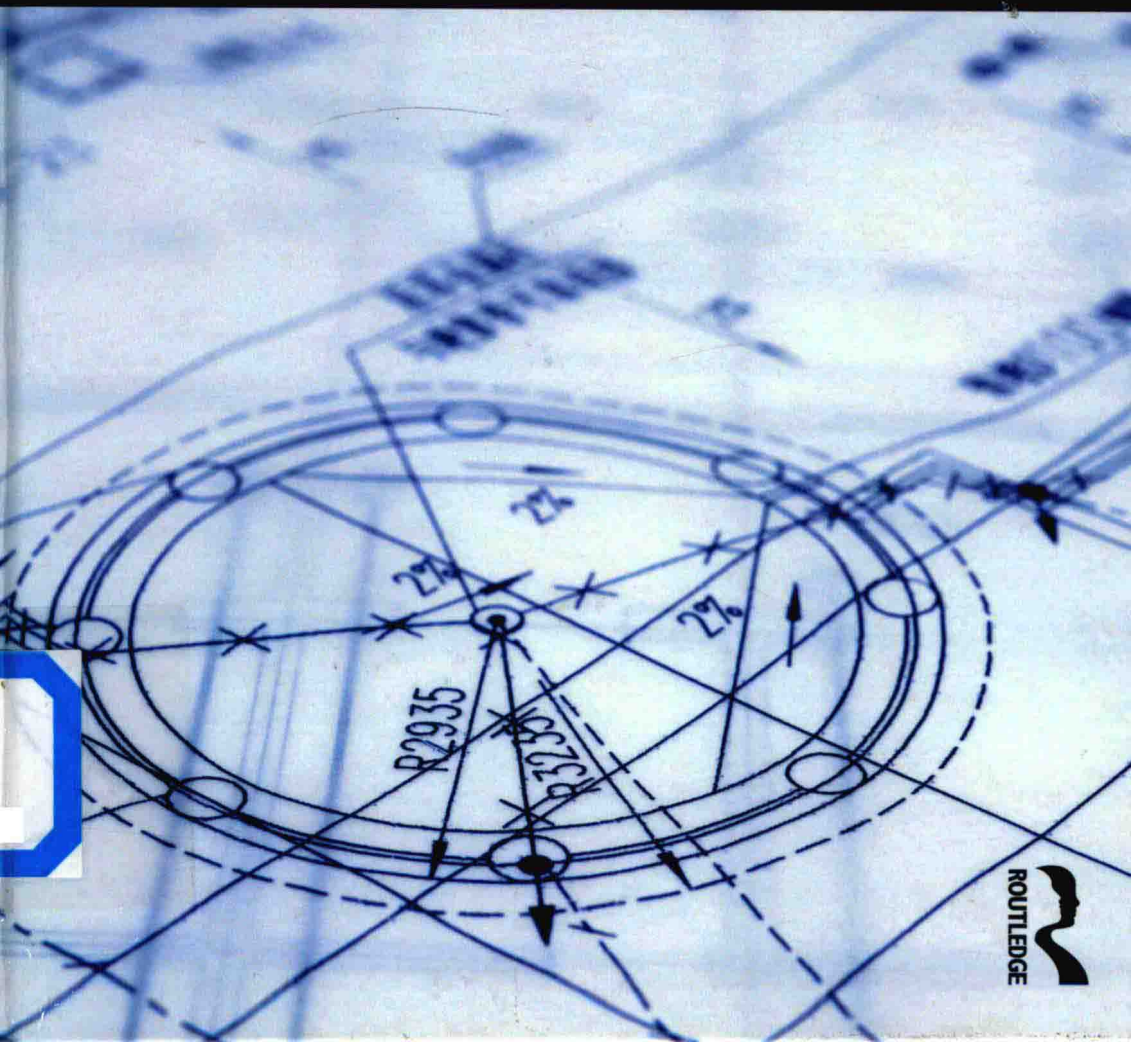


THE SCIENCE OF CRIME MEASUREMENT

Issues for spatially referenced crime data

MARTIN A. ANDRESEN



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First published 2013

by Routledge

2 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN

Simultaneously published in the USA and Canada

by Routledge

711 Third Avenue, New York, NY 10017

Routledge is an imprint of the Taylor & Francis Group, an informa business

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British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data

A catalog record has been requested for this book

ISBN: 978-0-415-85609-6 (hbk)

ISBN: 978-0-203-72825-3 (ebk)

Typeset in Times New Roman

by Cenveo Publisher Services



Printed and bound in Great Britain by
TJ International Ltd, Padstow, Cornwall

The Science of Crime Measurement

Crime statistics are ubiquitous in modern society – but how accurate are they? This book investigates the science of crime measurement by focusing on four main questions: how do we count crime? How do we calculate crime rates? Are there other measurements of crime? What are the issues surrounding crime statistics? All too often we take the measurement of crime at face value when there is, in fact, a science behind it.

This book specifically deals with issues related to spatially referenced crime data that are used to analyse crime patterns across the urban environment. The first section of the book considers alternative crime rate calculations, whilst the second section contains a thorough discussion of a measure of crime specialisation. Finally, the third section addresses a number of aggregation issues that accompany such data: crime type aggregations, temporal aggregations of crime data, the stability of crime patterns over time, and the importance of spatial scale.

This book builds on a growing body of literature about the science of crime measurement and offers a comprehensive account of this growing subfield of criminology. The book speaks to wider debates in the fields of crime analysis, environmental criminology and crime prevention and will be perfect reading for advanced level undergraduate and graduate students looking to find out more about the measurement of crime.

Martin A. Andresen is an Associate Professor in the School of Criminology and Institute for Canadian Urban Research Studies at Simon Fraser University. His research interests include crime measurement, spatial crime analysis, environmental criminology, and the geography of crime. This research has been published in leading journals on both criminology and geography including *Applied Geography*, *British Journal of Criminology*, *Environment and Planning A*, *Journal of Research in Crime and Delinquency*, and *Urban Studies*.

For my dad

Preface

As with most books, the origins of this one began long ago, approximately 10 years ago. During graduate school, studying international economics, I was discussing research ideas with my friend and colleague, Greg W. Jenion. Greg was a graduate student in criminology and we figured there must be some way we could combine our skill sets to investigate some criminological phenomenon. After many discussions, not unlike the ones we still have today, we settled on a measurement issue and its impact on homicide trends in Canada. From that moment forward I became fascinated with the measurement of crime, particularly from a spatial perspective as my own interests shifted from economics to economic geography. The research in this book is the culmination of the ideas I have had for a number of years, and it deals with issues that have made me wonder whether my ideas have had an impact on the spatial analysis of crime. As with most academics, I had a “plan” of what I hoped to accomplish and how everything was connected. But our world, more often than not, rewards piecemeal publication, not research monographs. This book brings together the original plan plus more in order to tell the original story I was interested in. As with most works, this is not an end, but the beginning of my interests in spatial criminology.

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Acknowledgements

As with most quests, this one was not done alone. A number of my professors have had profound impacts on my academic trajectory. Richard G. Harris, Peter Kennedy, and Nicolas Schmitt all had significant influences on my academic career while at Simon Fraser University (SFU). I literally owe my academic career to my PhD supervisor, Trevor J. Barnes, at the Department of Geography, University of British Columbia (UBC). Spanning my academic endeavors at both SFU and UBC and someone who continues to be an influential mentor of mine is Stephen Easton. I would like to acknowledge and thank you all for the roles you have had and continue to play in my career.

Upon graduation I switched academic disciplines again and have Greg W. Jenion to thank for that. Greg has been a great friend, colleague, and co-author over the past 20 years. Like it or not, spatial criminology has Greg to thank for my presence in this field.

At the School of Criminology, SFU I have a fantastic set of colleagues with whom I teach, research, and serve. The Institute for Canadian Urban Research Studies, where almost all of my data resides, has a brilliant set of scholars with whom I have the pleasure to work. I specifically like to thank Paul and Patricia Brantingham for welcoming me into their institute. It truly is a pleasure to be a part of their research team.

Last, but certainly not least, I would like to thank Thomas Sutton and Nicola Hartley of Routledge. These two individuals not only helped me in the process of writing the original proposal and successfully convinced Routledge to publish this book, but also proved to be extremely helpful throughout the process.

Of course, the usual disclaimer regarding any remaining errors in this book applies.

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1 The science of crime measurement

Introduction

Crime statistics are ubiquitous in contemporary society. In both Canada and the United States there are special government statistical bodies that solely measure criminological phenomena: the Canadian Centre for Justice Statistics and the Bureau of Justice Statistics, respectively. Whether it is through the nightly newscast, national or local papers, or discussions around the coffee machine, we are inundated with statistics regarding crime: crime is going up, crime is going down, or crime is higher/lower relative to other places in the country. Indeed, we torture our students in many introductory criminological courses by placing provinces or states in national contexts, and by placing our nations in international contexts. But how reliable is this information that we pass on to our students and colleagues? Many departments within the arts and social sciences are split between those who accept or reject the quantification of social phenomena. The rejection of this quantification, in many cases, is simply a mistrust of the data or the methods of data representation. Consequently, if we are going to use quantification we must do so critically.

But is this issue restricted to the academy? Generally, no. Despite our (unnecessary?) reliance on the quantification of social phenomena (Porter, 1996), there is a general mistrust of statistics in the public eye. Well known is the adage attributed to Benjamin Disraeli: “there are lies, damned lies and [then there are] statistics” (cited in Twain, 1906). Compounding this general mistrust of statistics are “journalists and politicians, among others, [who] often issue declarations about crime rates, ... [without encouraging the public] ... to think critically about what the crime rate measures really are” (Sacco and Kennedy, 2002: 92)—Pallone (1999) presents a rather scathing attack on nightly newscasts reporting on crime. This use and misuse of criminological statistics has implications for society at large because “[w]e may factor information about crime rates into our decisions about whether we will buy a home in a particular neighbourhood, vacation in a particular place, or allow our children to attend a particular school” (Sacco and Kennedy, 2002: 94).

It can be generally stated that the public and the authorities are most interested in crime rates as they pertain to both general societal risk and personal issues of

safety/security. This is one possible reason why the media give crime rates so much attention (Sacco, 2000). What has become increasingly problematic over the years is when academics, politicians, and the media depart from making broad general public risk statements and move toward inferences between conventional crime rates and personal risk.

The work in this book contributes to these discussions of the proper representation of (spatially referenced) crime data. This chapter begins with a relatively brief overview of some general issues with all forms of crime data, spatially referenced or not. It concludes with a brief outline of the subject matter covered in subsequent chapters.

Official crime data

One of the most common sets of data used in criminology is official crime data. These data may be from police agencies, the criminal justice system (courts), or (sub-)national criminal justice statistical agencies. Despite these data being “official,” they have a number of issues. One of the most important issues relates to the definitions of crime. This has implications for both temporal and cross-sectional analyses. If definitions change over time, any analysis of time-series crime data must account, or control, for changes in definitions; and for cross-sectional studies—just because a crime type has the same name in one place does not mean that it refers to exactly the same crime(s) in another.

The definitions of crime are all too often sociohistorical constructions such that behaviors once considered immoral or illegal became acceptable, or vice versa (LaFree, 1989). One such crime type is rape. Gender norms and patriarchal culture have dominated the response to sexual violence, more generally, in the criminal justice system (Clark and Lewis, 1977; Galvin, 1985; Estrich, 1986; Los, 1994). Historical definitions of rape are from English Common Law. In this context, women were considered the property of their fathers or husbands, such that the rape of a woman was considered a property crime, not a violent crime—the father or husband was the victim in these crimes (Clark and Lewis, 1977; Estrich, 1986; Los, 1994). Needless to say, these constructions of crime have come under much scrutiny during the past few decades. One such response in Canada was to change the definitions of sexual violence in 1983: the offenses of rape, attempted rape, indecent assault on a male, and indecent assault on a female were replaced with sexual assault (level 1), sexual assault with a weapon (level 2) and aggravated sexual assault (level 3) (Department of Justice Canada, 1990, 1992; Roberts and Grossman, 1994). These changes complicate any time series analysis of these data. Though 30 years have now passed allowing for a relatively long time-series for analysis, data on sexual violence are available at least back to 1962 in Canada. As such, 20 years of data can only be added to such an analysis with caution.

In the context of a cross-national comparison, even the crime of aggravated assault lends itself to complications. In Canada, assault, just as with sexual assault, is separated into “levels”: assault (level 1), assault with weapon or causing bodily harm (level 2), and aggravated assault (level 3). However, if one wanted to

compare aggravated assaults in Canada to those in the United States, the Canadian levels 1 and 2 would have to be added together to be equivalent to aggravated assault in the United States. Therefore, one must not simply assume that the same name means the same thing, even for countries that share an international border.

The most well-known, cited, and used official crime data are from the Uniform Crime Reporting (UCR) system. The UCR began in the United States in 1930—see Mosher *et al.* (2011) for a detailed history of the UCR in the United States. Nearly all of the law enforcement agencies in the United States provide data to the Federal Bureau of Investigation (FBI) that then produces a number of annual statistical publications (FBI, 2012).

In Canada, the UCR began in 1962 through what is now known as the Canadian Centre for Justice Statistics. The data in the Canadian UCR represent reported crime that has been substantiated by the police, including data on the number of criminal incidents, the clearance status of those incidents, and the person(s) charged, if any. In 1988, a new version of the Canadian UCR was created that includes data on incidents, victims, and accused, referred to as UCR2. Both the UCR1 and UCR2 are collected simultaneously—in the United States, the equivalent data are the National Incident-Based Reporting System (NIBRS), which began in 1987 (FBI, 2012; Statistics Canada, 2012). Unlike the United States, responding to the UCR survey is mandatory in Canada—very few police agencies in the United States do not respond to their UCR. More than 1,200 separate police detachments respond to the UCR survey, a total of 204 police forces (Statistics Canada, 2012).

Another form of official crime data—though this may better be considered “unofficial” official crime data—is calls for service to the police. Calls for service data have become increasingly available since the late 1980s (Sherman *et al.*, 1989). Such data most often come through a computer-aided dispatch (CAD) system that processes the requests for police service made directly to the police detachment, through an (911) emergency service and allocated to the police detachment, or calls made by police officers while out on patrol. The primary advantage of calls for service data is its raw form. Unlike official crime reports, such as those filled through the UCR, calls for service data are typically not screened. As such, they are sometimes referred to as police activity data. As discussed by Sherman *et al.* (1989), some police agencies have been found to file official crime reports for as few as 66 percent of the calls for service. Another advantage of calls for service data is that they necessarily include an address for spatial analysis—the UCR2.2 in Canada, which began in 2004, includes geocoding information.

Calls for service data do have their limitations relative to UCR data. Because they are (initially) unfounded, calls for service data may include too many crimes. In addition, because of the availability of reporting locations (this is less of an issue today with mobile phones), particular places such as police stations, gas stations, and convenience stores may suffer from substantial over-reporting (Sherman *et al.*, 1989).

Despite all the benefits of (unofficial) official crime data, they suffer from a number of more general limitations. First, crime reporting is a phenomenon that will vary from police detachment to police detachment. This may be due to the

history and/or culture of the population living within the police detachment, or the detachment itself which may focus on particular crime(s) because of issues with the detachment itself.

Second, as discussed in great detail in subsequent chapters, crime rates based on these official data need population figures for the calculation of crime rates. In addition to the issues discussed in subsequent chapters, the measurement of the census population is subject to significant error in most years. In most countries, the national census is conducted every 5 or 10 years. This means that population numbers and crime counts may be off by as many as 9 years. Mosher *et al.* (2011) cite an example of crime rates in 1949 using 1940 census population data, which greatly overestimated the crime rate because of the population growth in that particular decade. Of course, most countries (including Canada and the United States) use birth, death, and migration data to aid in yearly population estimates. However, with a decade between some census years, this allows for a lot of error to be generated and propagated over a span of 9 years.

Third, the crime funnel is particularly problematic. The crime funnel refers to the decreasing number of crimes that are reported as one moves through the criminal justice system: the total amount of actual crimes, the number of crimes reported to the police, the number of crimes that lead to charges, the number of crimes that actually make it to court, etc. As such, when we are working with official crime data, we are effectively working with a sample of criminal activity. The question is whether or not our samples of criminal activity are representative in a number of dimensions.

Victimization survey data

One method to address the last-mentioned limitation with official crime data, namely under-reporting, is to conduct a victimization survey. Rather than asking the police how many crimes have been committed, the researcher asks (potential) victims of crime. Victimization surveys may take a variety of forms from being rather small to quite large. Small victimization surveys, often referred to as self-report data (see Mosher *et al.*, 2011), will either lack a proper control group (non-victims of crime) or cover a relatively small geographic area. Large victimization surveys, discussed here, refer to national victimization surveys that contain information on a sample of the total population. These surveys gather data on both victims and non-victims of crime for the purposes of inference. This sampling technique alleviates the difficulties associated with not having a control group, but introduces another (geographical) difficulty—the ecological fallacy. Any activities inferred at the national level must necessarily be assumed to be representative of the local area under study if these national victimization surveys are to be used. However, if national statistical agencies wish to make inference at the sub-national level, such as with Canada, the methods of data gathering are modified appropriately.

One obvious question is: how many people to survey? Surveys are expensive. This is why most censuses are only undertaken every 10 years. However, there are statistical issues regarding how many individuals, for example, must be sampled