Research paper

Is crime associated with over-the-counter pharmacy syringe sales? Findings from Los Angeles, California

Thomas J. Stopka [a],[*],[1], Estella M. Geraghty [b],[c], Rahman Azari [b], Ellen B. Gold [b], Kathryn DeRiemer [b]

[a] Department of Public Health and Community Medicine, Tufts University School of Medicine, United States
[b] Graduate Group in Epidemiology, Department of Public Health Sciences, University of California, Davis, United States
[c] Department of Internal Medicine, University of California, Davis, Sacramento, CA, United States

ARTICLE INFO

ABSTRACT

Background: More than 50,000 new HIV infections occur annually in the United States. Injection drug users represent twelve percent of incident HIV infections each year. Pharmacy sales of over-the-counter (OTC) syringes have helped prevent HIV transmission among injection drug users in many states throughout the United States. However, concerns exist among some law enforcement officials, policymakers, pharmacists, and community members about potential links between OTC syringe sales and crime.
Methods: We used a geographic information system and novel spatial and longitudinal analyses to determine whether implementation of pharmacy-based OTC syringe sales were associated with reported crime between January 2006 and December 2008 in Los Angeles Police Department Reporting Districts. We assessed reported crime pre- and post-OTC syringe sales initiation as well as longitudinal associations between crime and OTC syringe-selling pharmacies.
Results: By December 2008, 9.3% (94/1010) of Los Angeles Police Department Reporting Districts had at least one OTC syringe-selling pharmacy. Overall reported crime counts and reported crime rates decreased between 2006 and 2008 in all 1010 Reporting Districts. Using generalized estimating equations and adjusting for potential confounders, reported crime rates were negatively associated with OTC syringe sales (adjusted rate ratio: 0.89; 95% confidence interval: 0.81, 0.99).
Conclusion: Our findings demonstrate that OTC pharmacy syringe sales were not associated with increases in reported crime in local communities in Los Angeles during 2006–2008.

© 2014 Elsevier B.V. All rights reserved.

Introduction

In the United States (U.S.), approximately 56,000 individuals are infected with HIV each year and injection drug users (IDUs) represent 12 percent of new HIV infections (Hall et al., 2008). While HIV incidence and prevalence still pose challenges to public health officials, much progress has been made in disease prevention efforts. During the past two decades, a number of states and counties in the U.S. have introduced and passed legislation to permit operation of syringe exchange programs (SEPs) (Bluthenthal, Kral, Gee, Erringer, & Edlin, 2000; Hurley, Jolley, & Kaldor, 1997; MacDonald, Law, Kaldor, Hales, & Dore, 2003) and over-the-counter (OTC) sale of syringes by pharmacies (Burris, Welsh, Ng, Li, & Ditzler, 2002;

Compton et al., 2004; Deibert et al., 2006; Fuller et al., 2007; Singer, Baer, Scott, Horowitz, & Weinstein, 1998). Pharmacy sales of over-the-counter (OTC) syringes have been associated with decreases in injection-mediated HIV transmission risks (Fuller et al., 2007; Neaigus et al., 2008; Pouget et al., 2005; Wodak & Cooney, 2006) and decreases in HIV infection rates (Friedman, Perlis, & Des Jarlais, 2001; Holmberg, 1996). Despite this progress, there are continuing challenges around provision of harm reduction efforts in many areas of the U.S. While there has been widespread implementation of OTC pharmacy syringe sales, some local policymakers, law enforcement officials, community members, and pharmacists have voiced concerns about community safety, fearing potential links between OTC syringe-selling pharmacies and crime (Backes & Rose, 2010; Cooper et al., 2010; Garfein et al., 2010; Reich et al., 2002). In the current study, we aimed to address this concern through rigorous and systematic quantitative analysis of reported crime in neighborhoods with and without pharmacies registered to sell OTC syringes.

The Los Angeles (LA) County Department of Public Health began to register pharmacies for OTC syringe sales in 2007. By the end of

* Corresponding author at: Department of Public Health and Community Medicine, Tufts University School of Medicine, 136 Harrison Avenue, Boston, MA 02111, United States. Tel.: +1 617 636 2110; fax: +1 617 636 4017.
E-mail address: thomas.stopka@tufts.edu (T.J. Stopka).
[1] Thomas Stopka was with the UC Davis Graduate Group of Epidemiology at the time this research was conducted.

2007, 183 (11%) pharmacies in LA County were registered to sell OTC syringes (Garfein et al., 2010). Using novel spatial methods, and longitudinal analyses, we sought to determine whether initiation of OTC syringe sales was associated with reported crime in Los Angeles Police Department (LAPD) Reporting Districts. Specifically, we aimed to: (1) assess unadjusted associations of "all crime," economically motivated crime, violent crime, nuisance crime, and "other crime" with OTC syringe sales in LAPD Reporting Districts; and (2) determine associations between reported crime and OTC syringe sales while controlling for potential temporal trends and confounders. We tested the following null hypotheses: (1) reported crime rates were the same pre- and post-OTC syringe sales implementation; and (2) reported crime rates (overall and by subcategory) were not associated with OTC syringe sales.

Methods

Study design and unit of analysis

We conducted a longitudinal and ecological study in the City of LA, covering a time period that began one year prior to the initiation of OTC pharmacy syringe sales and finished two years afterward (January 2006–December 2008). We used LAPD Reporting Districts ("police beats"; $n = 1010$) as the geographic unit of analysis because this was the ecological level at which crime was reported. The mean size of the reporting districts was 0.47 square mile (SD = 0.684 mile). Reporting Districts pertained to the City of LA.

We obtained publicly available data from multiple sources. Reported crime data for 2006 through 2008 came from the LAPD in September 2009. Reported crime counts were available for all LAPD Reporting Districts for the entire three year study period. 'Reported crimes' were crimes that were reported by citizens of the City of Los Angeles.

We received names and addresses for all licensed LA pharmacies from the California State Board of Pharmacy. The dates when pharmacies registered to sell syringes OTC within the City of LA were available from the LA County Department of Public Health. We used census tract-based sociodemographic variables for 2005–2009 from the U.S. Census Bureau's American Community Survey (United States Census Bureau).

Variables

Outcome variables: Our primary outcome variable was the rate of "*all reported crime*", as reported to LAPD by the citizens of LA, which included aggregate rates from the reported crime subcategories noted below. Each reported crime subcategory was also modeled. We developed crime sub-categories a priori based on previous definitions from the scientific literature (Marx et al., 2000; ONDCP, 2000), Federal documents (ONDCP, 2000), and local experts. We developed four subcategories for reported crime: (1) economically motivated crimes, (2) nuisance crimes, (3) violent offenses, and (4) other crimes. *Economically motivated crimes* were defined as property offenses (e.g., burglary, robbery, petty theft, theft from breaking into vehicles, and grand theft auto). *Nuisance crimes* included vandalism. *Violent offenses* consisted of assault, homicide, and rape. *Other crimes* included violation of court orders and obscene phone calls, generally considered to be non-drug-related crime.

Primary independent variable: The primary independent variable for our study of reported crime outcomes was the presence of one or more pharmacies that sold OTC syringes. The OTC syringe sales variable was coded as a binary categorical variable (0 = No OTC syringe-selling pharmacy present, 1 = OTC selling pharmacy[cies] present).

Covariates: We considered and analyzed several sociodemographic variables, previously found to be associated with crime (Bernasco & Block, 2011; Boyd et al., 2007; DePadilla, Perkins, Elifson, & Sterk, 2012), for potential inclusion in final multivariable models. We obtained 2005–2009 values for sociodemographic variables for all LA census tracts from the American Community Survey (United States Census Bureau) including: the percent of the population of the census tract that was white, percent African American, percent Latino, percent unemployed, percent of households that received public assistance, percent that were living below the federal poverty level, percent single-parent households, percent <18 years of age, total population, and median age. We conducted spatial analyses to transform sociodemographic variable values from census tract units to LAPD Reporting Districts (detailed below).

Spatial analyses

Sociodemographic variables are not typically available at the LAPD Reporting District level. We used areal interpolation within a geographic information system (ArcGIS version 10.1, Esri, Redlands, California) to obtain estimates for our sociodemographic covariates. Areal interpolation relies on the spatial Kriging technique, which allows for estimation of a variable at an unmeasured location (e.g., polygon) based on observed values in surrounding locations (e.g., surrounding polygons) (Krivoruchko, Gribov, & Krause, 2011b). Within the geographic information system, we first imported sociodemographic data at the LA census tract level. Next, we used geostatistical analysis tools to model each variable of interest according to its statistical distribution. Data were modeled with semivariograms and evaluated with cross-validation statistics (e.g., root-mean-square-standard between 0.9 and 1.4; root mean square <0.1). Once each variable was appropriately modeled within the geographic information system, we produced continuous prediction surfaces for each one (Krivoruchko, Gribov, & Krause, 2011a). These prediction surfaces were then used to obtain final estimated sociodemographic values for the polygonal unit of analysis for our study—LAPD Reporting Districts (Fig. 1). For total population size, to account for variation in densities of the underlying total population, we used census tract apportionment approaches to allocate census-tract-level data on population size to LAPD Reporting Districts (Cooper, Bossak, Tempalski, Des Jarlais, & Friedman, 2009).

We geocoded all pharmacies, obtaining latitude and longitude measures for each, using the browser-based geocoder available through the California Environmental Health Investigations Branch (http://www.ehib.org/toollist.jsp), and ultimately creating a point on a map for each pharmacy. To determine OTC syringe sales status by LAPD Reporting District (polygon), we conducted a "point-in-polygon" join to ascertain whether an OTC syringe-selling pharmacy was present in each LAPD Reporting District. Within the geographic information system, we created a summary report of the presence and number of OTC syringe-selling pharmacies by Reporting District, and assigned a binary categorical variable (e.g., OTC syringe sales; 0 = no, 1 = yes).

After compiling the pharmacy data and estimates for all sociodemographic variables at the Reporting District level, we linked the estimates to the reported crime data for all of the Reporting Districts in LA ($n = 1010$), and exported the data from the geographic information system for use in statistical software. Twelve Reporting Districts were unpopulated, and were excluded from analyses.

Statistical analyses

Longitudinal data were analyzed over six semiannual time periods—January–June 2006, July–December 2006, January–June 2007, July–December 2007, January–June 2008, and July–December 2008. Univariate analyses (measures of central