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## RESEARCH NOTES

## Examining nonprescription syringe sales in Massachusetts and Rhode Island community pharmacies

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## ABSTRACT

**Background:** The role pharmacies play in addressing the opioid crisis and drug-related risks such as injection drug use is evolving. Estimating the prevalence of injection drug use at the community level is challenging because of the stigma of drug use. Many community pharmacies sell nonprescription sterile syringes; thus, pharmacy-level sales of injection equipment may be an indicator of drug-related harms and unmet needs of high-risk populations.

**Objectives:** To describe, compare, and assess the convergent validity of staff-reported nonprescription syringe (NPS) sales volume and NPS administrative sales data from community pharmacies in Massachusetts (MA) and Rhode Island (RI).

**Methods:** This study employed both prospective cross-sectional survey data collection and utilization of administrative pharmacy sales data. Between November 2017 and January 2018, we administered a telephone-based survey to estimate average weekly NPS type and volume for 191 chain pharmacies (CVS Health) located in communities experiencing fatal opioid overdoses above the state's 2015 annual median rate. For the same time period, we obtained NPS sales data from surveyed pharmacies and all CVS Health pharmacies in the 2 states. We calculated Spearman correlations to assess convergence of average weekly volume between pharmacy staff reports and sales data.

**Results:** All pharmacies responded to the survey. Most (98.4%) pharmacies surveyed sold NPS, but 42.0% reported running out of stock monthly or more frequently. Pharmacy staff tended to under-report syringe sales. Staff-reported weekly NPS sales volume was 67,922 versus 70,962 syringes from administrative pharmacy sales data. Spearman correlation between reported and actual NPS sales was 0.40 (95% CI 0.27–0.51).

**Conclusion:** The counts of administrative pharmacy syringe sales data in MA and RI indicate high need, substantial volume, and notable access at community pharmacies. Future research should use NPS sales data rather than self-report data to track emerging trends and tailor local responses.

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Nationally, drug poisoning is the leading cause of adult accidental death,<sup>1</sup> associated with 43 potential life years lost.<sup>2</sup> Prescription opioid medications,<sup>3</sup> heroin, and more recently, illicitly manufactured fentanyl are driving concerning new surges in injection drug use, increasing the burden of injection-related health problems and contributing to unprecedented rates of overdose death.<sup>1,2</sup> Thus, surveillance data are needed to assess the community need for sterile syringes and changes in uptake that may reflect important nuances in drug use or supply.<sup>3,4</sup>

Many public health departments have long suffered from inadequate funding and expertise to conduct drug use and overdose epidemiologic surveillance, while being expected and asked to do more in this area. Recent opioid-related

national surveillance investments, such as the Centers for Disease Control and Prevention—funded Enhanced State Opioid Overdose Surveillance, are helpful but focus on a state's retrospective death and hospitalization data. A persistent inquiry across opioid and public health surveillance systems is how to best estimate real-time burden of opioid misuse, especially with respect to increases in injection-related outbreaks of infectious diseases<sup>4,5</sup> and other injection-related health problems.<sup>6,7</sup>

Data from community pharmacies are increasingly used as surveillance sources and to measure the impact of payer, government, and public health policies developed in response to the opioid crisis. For instance, prescription drug monitoring programs (PDMPs) are used to assess changes in prescriptions dispensed at pharmacies and as a proxy for changes in prescribing patterns.<sup>8,9</sup> In addition, laws in most states permit nonprescription sale of syringes in community pharmacies.<sup>10</sup> The contribution of nonprescription sterile syringe (NPS) access through pharmacies to injection-related risk reduction and public health is well documented.<sup>11-13</sup> Over-the-counter NPS access through pharmacies complements the work of community-based syringe service programs (SSPs) and may be the sole source of new syringes in geographic locations where SSPs do not operate.<sup>14</sup> However, although SSPs catalog and publicly report their volume,<sup>15,16</sup> pharmacy NPS volume remains unaccounted for in local, state, and national public health surveillance efforts.

Pharmacy-level NPS sales may serve as an indicator of drug-related activity and thus an opportunity to identify unmet needs of high-risk populations in a locality. However, few efforts have attempted to estimate NPS sales statewide,<sup>14</sup> and none have considered pharmacy administrative NPS sales as a data source potentially useful for assessing trends, measuring intervention impact or reach, or gauging disparities in health service provision. A critical step in understanding the validity of NPS sales as a measure of syringe access is a comparison of 2 conceptually similar measures, administrative and self-reported NPS sales data, to measure their correlation.

## Objective

This analysis sought to describe, compare, and assess the convergent validity of administrative NPS sales data and pharmacy staff-reported sales volumes from a community pharmacy chain in Massachusetts (MA) and Rhode Island (RI).

## Methods

### *Pharmacy sample and survey*

CVS Health is the largest community pharmacy chain in MA and RI. We selected CVS Health pharmacies from RI and MA located in communities experiencing fatal opioid overdoses above the state's 2015 annual median rate, based on publicly available data. These pharmacies were part of a larger study focused on pharmacy naloxone access.<sup>17-22</sup> Pharmacies were contacted by phone, and then, a pharmacist or pharmacy technician was asked to complete a 3- to 5-minute anonymous survey about syringe sales, stocking, and local procedures. Sites were asked to nominate a staff member knowledgeable about syringe sales as the survey respondent. A standardized

telephone script was administered,<sup>14</sup> and survey responses were entered directly into an electronic database. A key question posed was, "About how many syringes do you sell per week?" This question specifically followed up to inquire about the number of single syringes, 10-packs, and boxes of 100 syringes sold. Pharmacies were surveyed between November 2017 and January 2018.

### *Pharmacy syringe sales*

From the medical supplies databases of CVS Health corporate office (Woonsocket, RI), we obtained a complete dataset of nonprescription Becton Dickinson brand syringes (the primary brand stocked by the chain) sold between October 2017 and March 2018 at all 462 RI and MA CVS Health pharmacies. We performed calculations using all-pharmacy and surveyed-pharmacy sales counts, matching survey respondents by store number.

### *Analysis*

Descriptive statistics were used to analyze survey responses. We calculated the average number of syringes sold per week on the basis of the number of single syringes, 10-packs, and boxes of 100 syringes sold as reported by pharmacy staff. We calculated the same variable on the basis of the national drug code for comparable syringes types sold, on average, in a given week using the medical supplies database. We also calculated the modal syringe gauge, length, and volume characteristics of NPS sold at RI and MA pharmacies during the study period on the basis of survey responses. Because of non-normal data distributions, we include median and interquartile ranges (IQR) for both data sources. We assessed Spearman correlations to determine the association between staff-reported and actual pharmacy sales data. The administrative data of NPS sales were further compared between survey months and nonsurvey months to check for historic or seasonal trends. The institutional review board of the Boston University Medical Campus reviewed and approved this protocol.

## Results

There were 462 RI and MA CVS Health pharmacies open during the study, of which, 191 (41.3%) were situated in counties with fatal opioid overdoses above the state's median rate and thus were surveyed for this study. Responses were received from all pharmacies surveyed (100% response rate), where respondents included staff pharmacists (43.5%), pharmacy managers (9.9%), technicians (41.9%), and interns (4.7%). Staff at nearly all (98.4%) pharmacies reported selling nonprescription syringes, most commonly in packages of 10, and 42.0% reported that they ran out of stock of the most popular type monthly or more often (Table 1). The modal syringe type sold was 30 gauge, half inch length, 1 cm<sup>3</sup> volume.

Across all 462 RI and MA community CVS Health pharmacies, on any given week during the study period, approximately 152,193 syringes were sold over-the-counter, which is nearly 8 million syringes sold per year. In the study sample of 191 pharmacies, on the basis of the counts reported by surveyed pharmacy staff, the total average number of syringes sold per week in the 2-state pharmacy sample was 67,922

**Table 1**

Nonprescription sterile syringe sales reported by pharmacy staff in 191 surveyed pharmacies in high overdose burden communities, Massachusetts and Rhode Island (N = 191), November 2017–January 2018

Characteristic	N (%)
State location	
Massachusetts	126 (65.9)
Rhode Island	65 (34.1)
Survey respondent	
Pharmacist	83 (43.5)
Pharmacy manager	19 (9.9)
Pharmacy technician	80 (41.9)
Intern	9 (4.7)
Types of nonprescription syringes sold (check all that apply)	
Singles	50 (26.2)
10-packs	179 (93.7)
Boxes of 100	29 (15.2)
Do not permit nonprescription syringe sales	3 (1.6)
Characteristics of most commonly sold syringes (n = 188 pharmacies)	
Modal syringe gauge: 30 gauge	87 (46.3)
Modal syringe length: Half inch	98 (52.1)
Modal syringe volume: 1cc	127 (67.6)
Modal combination of form of syringe sold: Half inch by 1 cm <sup>3</sup> by 30 gauge <sup>a</sup>	50 (26.6)
Out of stock frequency of most commonly sold nonprescription syringes (n = 188 pharmacies)	
Monthly or weekly	79 (42.0)
A few times a year	50 (26.6)
Never	58 (30.9)
Don't know	1 (0.5)

<sup>a</sup> Other reported combinations of the most commonly sold forms of syringes were half inch by 1 cm<sup>3</sup>, irrespective of gauge (n = 82); half inch by 30 gauge, irrespective of volume (n = 61), 1 cm<sup>3</sup> by 30 gauge, irrespective of length (n = 68); and 10 did not report any specific form or combination sold (i.e., responses of “it varies” or “whatever is open”).

syringes (median sale per week/pharmacy = 150, IQR: 100, 400). According to actual sales data, the average number of syringes sold per week for the same pharmacy sample (n = 191) was 70,962 syringes (median sale per week/pharmacy = 329, IQR: 208, 476), or a difference (underestimate via survey) of 3040 syringes. The median sales per week per pharmacy during survey and nonsurvey months were identical (November–January: 396 syringes vs. October, February, March: 396 syringes).

The Spearman correlation estimate between survey-estimated and pharmacy syringe sales data was 0.40 (95% CI = 0.27–0.51), which corresponds to a moderate correlation.<sup>23</sup>

## Discussion

We found a moderate correlation between pharmacy-reported syringe sales data and administratively sourced sales data, suggesting that regularly collected NPS sales can provide a consistent accounting of public health relevant information. To our knowledge, this analysis is the first to investigate how these 2 data sources correlate and to summarize and compare NPS uptake in the community from each data source.

On the basis of pharmacy-reported frequency of syringe stocking shortages, there is clear indication that the actual need exceeds the supply of NPS in many RI and MA communities hard hit by the opioid crisis. The total number of syringes sold on average by pharmacies for a given week was remarkably high, hovering around 70,000 syringes in the 191 surveyed pharmacies and over 150,000 in the 462 CVS Health pharmacies, which themselves represent only approximately one-third of all licensed community pharmacies in the 2 states. On an annual basis, this is nearly 3.7 million NPS

syringes sold through the pharmacies in high overdose burden communities and nearly 8 million syringes sold in RI and MA through 1 chain pharmacy in a given year. The Massachusetts Department of Public Health reported that state-funded SSPs distributed over 650,000 syringes statewide in 2015<sup>24</sup>; Rhode Island's SSPs distribute over 70,000 syringes per year statewide.<sup>25</sup> As a result, in addition to syringes distributed by SSPs, the administrative sales data from both states reflect that pharmacies are likely a major source of NPS. These are outstanding accomplishments in NPS reach and volume over time in retail pharmacies. In 2017, a total of 246 SSPs purchased nearly 86 million syringes nationwide.<sup>26</sup> Given that there are more than 67,000 community pharmacies across the country,<sup>27</sup> there is enormous opportunity to improve public health through expanded pharmacy syringes access to attempt to better meet the need and promote safety and harm reduction among people who inject drugs, so that a new, sterile syringe is available for every injection.<sup>28</sup>

Administrative sales data were more comprehensive than self-reported data and thus represent a better choice of tracking NPS sales. The large volume of NPS sales and variety of staff members selling and stocking NPS may explain the moderate correlation with administrative NPS sales data. Technicians and interns more commonly sell NPS than pharmacists and pharmacy managers,<sup>29</sup> self-reported data obtained from pharmacists may be less precise based on fewer interactions in some stores. Because pharmacy staff were surveyed by telephone, there is a potential for social desirability bias. However, it is notable that the pharmacy sample was involved in a broader research study and participated at a 100% response rate, so the completeness and accuracy of staff-reported data may be higher than under other research conditions.

Our findings suggest several future analyses. Although CVS Health is the largest community pharmacy chain in the states included in this analysis, a next step could entail creating and validating a statewide syringe sales database involving all major community pharmacy chains and independent pharmacies. Pharmacies already participate in 2 existing near-real-time, 2-way public health reporting systems: state PDMPs and state immunization registries. In addition, future assessment of validity could correlate NPS sales data with incidence and prevalence of reportable blood-borne infectious diseases (e.g., HIV, Hepatitis C virus, Hepatitis B virus) and other injection and syringe scarcity-mediated health outcomes like abscesses and endocarditis and could test the sensitivity of the database by retrospective correlation to recent outbreaks.<sup>5,30</sup> In this way, a system that tracks NPS sales data could be vital to identify emerging outbreaks, curb adverse syringe-related health outcomes, inform health service provision, and develop evidence-based interventions.

This study has limitations. Only pharmacies in high overdose burden communities were surveyed and analyzed; lower burden sites may differ. The cross-sectional nature of the data reflects a snapshot in time and location; therefore, results such as modal syringe type may not be generalizable. Intended use of NPS was not surveyed because it is not a state legal requirement for NPS access. Our tabulated data reflect small, personal NPS quantities sold on a regular basis. Further, the correlation estimates derived are moderate; inferences from estimates should be made with caution. Finally, only the most commonly sold syringes were included; therefore, complete administrative syringe sales data estimates are likely to be greater.

## Conclusion

This analysis found that administratively collected NPS sales data are meaningful indicators of sterile injection supply sales in communities with high overdose risk. An easy-to-implement measure that counts NPS sold at the pharmacy through administrative sales data may be a promising indicator for tracking syringe-related health considerations in an anonymous, real-time, geographically specific fashion. Expansion of NPS sales in pharmacies is needed to advance progress toward attaining the goal of a new, sterile syringe available to protect every injection.

## References

- Rudd RA, Aleshire N, Zibbell JE, Gladden RM. Increases in drug and opioid overdose deaths—United States, 2000–2014. *MMWR Morb Mortal Wkly Rep.* 2016;64(50–51):1378–1382.
- Rudd RA, Seth P, David F, Scholl L. Increases in drug and opioid-involved overdose deaths - United States, 2010-2015. *MMWR Morb Mortal Wkly Rep.* 2016;65(50–51):1445–1452.
- Ciccarone D. The triple wave epidemic: supply and demand drivers of the US opioid overdose crisis. *Int J Drug Policy.* 2019;71:183–188.
- Broz D, Zibbell J, Foote C, et al. Multiple injections per injection episode: high-risk injection practice among people who injected pills during the 2015 HIV outbreak in Indiana. *Int J Drug Policy.* 2018;52:97–101.
- Alpren C, Dawson EL, John B, et al. Opioid use fueling HIV transmission in an urban setting: an outbreak of HIV infection among people who inject drugs—Massachusetts, 2015–2018. *Am J Public Health.* 2020;110(1):37–44.
- Centers for Disease Control and Prevention (CDC). Thrombotic thrombocytopenic purpura (TTP)-like illness associated with intravenous Opana ER abuse—Tennessee, 2012. *MMWR Morb Mortal Wkly Rep.* 2013;62(1):1–4.
- The Economist. Forecasting the opioid epidemic. Available at: <https://www.economist.com/united-states/2017/10/28/forecasting-the-opioid-epidemic>. Accessed August 16, 2020.
- Weiner SG, Baker O, Poon SJ, et al. The effect of opioid prescribing guidelines on prescriptions by emergency physicians in Ohio. *Ann Emerg Med.* 2017;70(6):799–808.e1.
- Huang KTL, Blazey-Martin D, Chandler D, Wurcel A, Gillis J, Tishler J. A multicomponent intervention to improve adherence to opioid prescribing and monitoring guidelines in primary care. *J Opioid Manag.* 2019;15(6):445–453.
- Centers for Disease Control and Prevention. Laws Related to the Retail Sale of Syringes/Needles | Policy and Programs | Division of Viral Hepatitis | CDC. Centers for Disease Control and Prevention, U.S. Department of Health and Human Services. Available at: <http://medbox.iiah.me/modules/en-cdc/www.cdc.gov/hepatitis/policy/RetailSaleOfSyringes.htm>. Accessed March 31, 2021.
- Fuller CM, Ahern J, Vadnai L, et al. Impact of increased syringe access: preliminary findings on injection drug user syringe source, disposal, and pharmacy sales in Harlem, New York. *J Am Pharm Assoc (Wash).* 2002;42(6 Suppl 2):S77–S82.
- Cooper HL, Des Jarlais DC, Ross Z, Tempalski B, Bossak B, Friedman SR. Spatial access to syringe exchange programs and pharmacies selling over-the-counter syringes as predictors of drug injectors' use of sterile syringes. *Am J Public Health.* 2011;101(6):1118–1125.
- Crawford ND, Amesty S, Rivera AV, Harripersaud K, Turner A, Fuller CM. Community impact of pharmacy-randomized intervention to improve access to syringes and services for injection drug users. *Health Educ Behav.* 2014;41(4):397–405.
- Stopka TJ, Donahue A, Hutcheson M, Green TC. Nonprescription naloxone and syringe sales in the midst of opioid overdose and hepatitis C virus epidemics: Massachusetts, 2015. *J Am Pharm Assoc (2003).* 2017;57(2S):S34–S44.
- Green TC, Martin EG, Bowman SE, Mann MR, Beletsky L. Life after the ban: an assessment of US syringe exchange programs' attitudes about and early experiences with federal funding. *Am J Public Health.* 2012;102(5):e9–e16.
- Des Jarlais DC, Nugent A, Solberg A, Feeleymer J, Mermin J, Holtzman D. Syringe service programs for persons who inject drugs in urban, suburban, and rural areas - United States, 2013. *MMWR Morb Mortal Wkly Rep.* 2015;64(48):1337–1341.
- Green TC, Donovan E, Klug B, et al. Revisiting pharmacy-based naloxone with pharmacists and naloxone consumers in 2 states: 2017 perspectives and evolving approaches. *J Am Pharm Assoc (2003).* 2020;60(5):740–749. <https://doi.org/10.1080/08897077.2020.1736236>, accessed August 16, 2020.
- Donovan E, Bratberg J, Baird J, et al. Pharmacy leaders' beliefs about how pharmacies can support a sustainable approach to providing naloxone to the community. *Res Social Adm Pharm.* 2020;16(10):1493–1497.
- Burstein D, Baird J, Bratberg J, et al. Pharmacist attitudes toward pharmacy-based naloxone: a cross-sectional survey study. *J Am Pharm Assoc (2003).* 2020;60(2):304–310.
- Donovan E, Case P, Bratberg JP, et al. Beliefs associated with pharmacy-based naloxone: a qualitative study of pharmacy-based naloxone purchasers and people at risk for opioid overdose. *J Urban Health.* 2019;96(3):367–378.
- Green TC, Bratberg J, Baird J, et al. Rural and differences in pharmacy characteristics and community factors associated with provision of naloxone in the pharmacy. *Int J Drug Policy.* 2020;85:102602.
- Schober P, Boer C, Schwarte LA. Correlation coefficients: appropriate use and interpretation. *Anesth Analg.* 2018;126(5):1763–1768.
- Office of National AIDS Policy. *Massachusetts Integrated HIV/AIDS Prevention and Care Plan: HIV/AIDS Services in the Commonwealth: 2017–2021*. Boston, MA: Massachusetts Department of Public Health Bureau of Infectious Disease and Laboratory Sciences, Office of HIV/AIDS; 2016.
- Rhode Island Department of Health. *2018 Rhode Island HIV Epidemiologic Profile with Surrogate Data*. Providence, RI: Division of Preparedness, Response, Infectious Disease, and Emergency Medical Services; 2019. <https://health.ri.gov/publications/epidemiologicalprofiles/2018HIVandSurrogateData.pdf>. Accessed August 16, 2020.
- Des Jarlais DCD, Feeleymer J, LaKosky P, Szymanski K, Arasteh K. Expansion of syringe service programs in the United States, 2015–2018. *Am J Public Health.* 2020;110(4):517–519.
- Qato DM, Zenk S, Wilder J, Harrington R, Gaskin D, Alexander GC. The availability of pharmacies in the United States: 2007–2015. *PLoS One.* 2017;12(8):e0183172.
- Lurie P, Jones TS, Foley J. A sterile syringe for every drug user injection: how many injections take place annually, and how might pharmacists contribute to syringe distribution? *J Acquir Immune Defic Syndr Hum Retrovirol.* 1998;18(Suppl 1):S45–S51.

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29. Kurian S, Baloy B, Baird J, et al. Attitudes and perceptions of naloxone dispensing among a sample of Massachusetts community pharmacy technicians. *J Am Pharm Assoc (2003)*. 2019;59(6): 824–831.
30. Cranston K, Alpren C, John B, et al. Notes from the field: HIV diagnoses among persons who inject drugs - Northeastern Massachusetts, 2015–2018. *MMWR Morb Mortal Wkly Rep*. 2019;68(10): 253–254.

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