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Examining the effects of COVID-19 on pharmacy dispensing of naloxone and syringes sales across Massachusetts and New Hampshire

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ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) lockdowns disrupted access to harm reduction supplies and services known to be effective in overdose prevention and contributed to a worsening of the opioid crisis. However, because pharmacies can provide naloxone and sell over-the-counter (OTC) sterile syringes, their continued operation throughout the pandemic potentially reinforced a public health role as a distribution hub for safer use supplies.

Objectives: The objective of this analysis was to examine patterns of naloxone and OTC syringe sale volume at 463 community pharmacies in 2 states with high overdose rates during the COVID-19 pandemic.

Methods: We analyzed weekly pharmacy-level dispensing data from January 5, 2020, to December 31, 2020, from one corporate community pharmacy chain in Massachusetts (n = 415 pharmacies) and New Hampshire (n = 48 pharmacies). Descriptive statistics and visualizations over the analytical period were generated as initial explorations of the outcome. Zero-inflated Poisson and negative binomial models were used to analyze distribution data along with county-level COVID-19 case rates and store-level COVID-19 testing location status during the same time. Interactions tested the effect of COVID-19 case rates on naloxone and OTC syringe sales.

Results: Pharmacies that reported selling nonprescription syringes and dispensing naloxone during the study period averaged 210.13 OTC syringes sold and 0.53 naloxone prescriptions per week. Pharmacies in communities that experienced greater COVID-19 case burden also exhibited higher naloxone dispensing and OTC syringe sales during this period. The odds of selling OTC syringes increased over time but naloxone dispensing remained constant over the pandemic year. Pharmacies hosting COVID-19 testing tended to have lower OTC syringe sales and naloxone provision than nontesting sites.

Conclusion: During the COVID-19 pandemic, pharmacies provided harm reduction services and dispensed lifesaving medications by quickly adapting to fulfill community needs without disrupting co-located services for COVID-19 response.

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Disclosure: The authors declare no relevant conflicts of interest or financial relationships.

Funding: This work was supported by the National Institute of Health/National Institute on Drug Abuse under grant R01 DA045745.

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Background

The drug overdose epidemic in the United States substantially worsened during coronavirus disease 2019 (COVID-19) as synthetic opioids including fentanyl, and fentanyl analogs continued to drive overdose rates that increased 15% from 2020 resulting in more than 107,000 reported overdose deaths between December 2020 and December 2021. The challenges of the opioid epidemic were further exacerbated by
COVID-19-related state lockdowns, business restrictions, travel restrictions, diminished funding, and staff shortages, which greatly restricted community health organizations’ ability to provide harm reduction services including the distribution of the opioid antagonist naloxone and over-the-counter (OTC) syringe programs to people who use drugs. Studies have suggested a correlation between these co-occurring public health crises to a substantial increase in opioid overdoses emphasizing the need to treat these issues simultaneously. Community pharmacies were uniquely positioned to respond to both the COVID-19 public health emergency (i.e., offer pharmacy-based testing, supply personal protective equipment, and administer COVID-19 vaccines) and the opioid crisis.

**Objective**

Our objective was to characterize trends in community pharmacy-based provision of naloxone and OTC syringes during the COVID-19 pandemic in 2 states with a high overdose burden.

**Methods**

Study data were derived from a community pharmacy chain participating in the Respond to Prevent (R2P) clinical trial and nonstudy pharmacy locations in Massachusetts (n = 415) and New Hampshire (n = 48) from January 5, 2020, to December 31, 2020. R2P was a pharmacy-based intervention centered around promoting naloxone access and OTC syringe sales at community pharmacies. Naloxone dispensed via pharmacist prescription or standing order and OTC syringes sales data provided by the study pharmacy chain were coupled with state health department reported county-level COVID-19 case rates to evaluate how the evolving pandemic affected access to these harm reduction supplies. Because many pharmacies also provided COVID-19 testing services, we also examined how pharmacy testing availability affected the provision of naloxone and OTC syringes.

Descriptive statistics and visualizations over the analytical period were generated as initial explorations of the outcome. In addition, zero-inflated models were used to predict naloxone and OTC syringe distribution. Our dependent variables were weekly measures of pharmacy-level naloxone prescriptions and OTC syringe sales as count variables. Owing to excessive counts of zeros in the dependent variables at the week level, zero-inflated models were used. In addition, a dispersion test indicated a zero-inflated Poisson (ZIP) model for naloxone and a zero-inflated negative binomial (ZINB) model for syringes best fit the data. Independent variables were time in weeks (continuous), weekly county-level COVID-19 case rates per 100,000 people, state in which pharmacy was located (Massachusetts was the reference group), and a dummy variable to indicate whether the pharmacy offered COVID-19 testing, which began as early as May 10 for some sites and as late as December 20 for others during the 2020 time frame. A log function was used for time in week intervals, and weekly COVID-19 case rates were included as time-varying fixed effects in the model. We included interactions in the models to test for differences by time for all covariates.

**Results**

From January to December 2020, 453 of the pharmacies (97.8%) both dispensed naloxone and sold OTC syringes in a given week (Table 1). On average, those pharmacies dispensed 0.51 naloxone prescriptions and sold 203 OTC syringes per week. Notably, 407 of the pharmacies (90%) were in Massachusetts and 46 of the pharmacies (10%) were in New Hampshire (Table 1). Descriptive statistics highlighted the average weekly naloxone dispensing and syringe sales remaining consistent throughout the study period yet pharmacies that offered COVID-19 testing experienced a 14% increase in average weekly naloxone dispensing from the pretesting period (January to April) to the testing period (May to December) (Figure 1, Table 1).

Results from the multivariable ZIP and ZINB models indicated that, if pharmacies were engaged in doing so already, naloxone dispensing and nonprescription syringe sales were higher for pharmacies in communities with high rates of COVID-19 cases (Table 2). COVID-19 case burden was not associated with whether a pharmacy engaged in these harm reduction activities over the study period. Models also indicated that pharmacies offering COVID-19 testing services were less likely to dispense naloxone and sell OTC syringes (i.e., logit models) but dispensed fewer naloxone kits and sold fewer syringes on average during 2020 (i.e., log models) (Table 2). However, pharmacies that were selected to offer COVID-19 testing distributed less naloxone before offering COVID-19 testing (Figure 1). The state in which the pharmacy was located was associated with whether and how many syringes were sold at a pharmacy and how much naloxone was distributed during the study period. In particular, New Hampshire exhibited lower odds of syringe sales and lower log counts of naloxone dispensing and syringe sales than...
Massachusetts sites. The 2 states did not differ in the odds of a pharmacy distributing any naloxone during this time (Table 2). Time was not significant in either of the ZIP model components for naloxone dispensing (i.e., no change over time). Time was positively associated with the log odds of selling syringes at all but negatively associated with the log counts of syringes sold (ZIP model) (Table 2), although the effect (beta) of time was small. None of the interactions between covariates and time were significant in either model (Appendix 1); thus, only main effects were retained in the model (Figures 1 and 2, Table 2).

### Discussion

Findings from our study indicate that community pharmacies continued to dispense the lifesaving overdose antidote naloxone and to sell OTC syringes throughout the first year of the pandemic and even in communities with high COVID-19 case rates. During the study period, our corporate partner and pharmacies participating in the R2P intervention did not note naloxone or syringes shortages. Our findings highlighted a large spike in OTC syringes sales in pharmacies during March of 2020, which may have coincided with harm reduction services being

### Table 1

| Description                  | MA n (%) | NH n (%) | Total N (%) |
|------------------------------|----------|----------|-------------|
| Total stores                 | 415 (90) | 48 (10)  | 463 (100)  |
| Dispensing naloxone          | 407 (89.8) | 46 (10.2) | 453 (97.8) |
| Selling syringes             | 409 (89.5) | 48 (10.5) | 457 (98.7) |

| Testing vs. nontesting       | Testing | Nontesting | Total |
|------------------------------|---------|------------|-------|
|                              | MA      | NH         | Total |
| Average weekly naloxone...   |         |            |       |
| Pretesting period (January to April 2020) | 0.4012 | 0.1731 | 0.3539 | 0.5691 | 0.3052 | 0.5516 | 0.4938 |
| Testing period (May to December 2020) | 0.4427 | 0.2374 | 0.4029 | 0.5759 | 0.2531 | 0.5559 | 0.5111 |
| Year 2020                    | 0.4285 | 0.2172 | 0.3875 | 0.5745 | 0.2697 | 0.5546 | 0.51   |
| Average weekly OTC syringe...|         |            |       |
| Pretesting period (January to April 2020) | 218.1 | 216.2 | 217.7 | 223 | 163.5 | 219 | 200.4 |
| Testing period (May to December 2020) | 198.9 | 204.1 | 192.5 | 201.1 | 158 | 198.3 | 204.8 |
| Year 2020                    | 198.6 | 207.9 | 203.6 | 208 | 159.8 | 204.8 | 203   |

Abbreviations used: MA, Massachusetts; NH, New Hampshire; OTC, over-the-counter.
closed or offering limited services during the initial COVID-19 state restrictions. After the spike in initial stages of state restrictions, pharmacies were more likely to sell OTC syringes as the pandemic wore on, and naloxone continued to be provided at prepandemic rates. During COVID-19, there were immense personal and professional pressures placed on health care providers, including pharmacies. A study looking at sources of pharmacist burnout identified elevated prescription requests, utilization of drive-through windows, the onset of COVID-19 testing, and COVID-19 and influenza vaccination drives as major contributors. In addition, COVID-19 changed pharmacy workflows substantially, which led to a gross imbalance between the supply and demand of drugs increasing the vulnerability of patients and their pharmaceutical needs. Considering the enormous challenge of providing pharmacy care in the community and the hazardous work of essential workers during this time, the fact that harm reduction supplies continued to be provided and even exhibited some element of growth is profound. Pharmacy adaptations during COVID-19 may have resulted in the removal or relocation of harm

### Table 2

Results from multivariable modeling of average weekly naloxone prescriptions dispensed and over-the-counter syringe sales from all Massachusetts and NH from one community pharmacy business

| Model output | Naloxone | Syringes |
|--------------|----------|----------|
| Zero-inflated Poisson distribution | Zero-inflated negative binomial distribution |
| **Log** β | SE | P | **Log** β | SE | P |
| State (NH) | −0.672 | 0.081 | < 0.001 | State (NH) | −0.096 | 0.023 | < 0.001 |
| Testing (Yes) | −0.549 | 0.131 | < 0.001 | Testing (Yes) | −0.104 | 0.04 | 0.04 |
| Wk | −0.019 | 0.018 | 0.30 | Wk | −0.029 | 0.009 | 0.03 |
| New cases/100,000 | 0.091 | 0.016 | < 0.001 | New cases/100,000 | 0.036 | 0.009 | < 0.001 |
| Constant | 0.096 | 0.015 | < 0.001 | Constant | 5.69 | 0.008 | < 0.001 |

| **Logit** β | SE | P | **Logit** β | SE | P |
| State (NH) | 0.184 | 0.143 | 0.194 | State (NH) | −0.033 | 0.036 | < 0.001 |
| Testing (Yes) | −2.057 | 0.913 | < 0.001 | Testing (Yes) | −0.644 | 0.102 | < 0.001 |
| Wk | −0.013 | 0.032 | 0.60 | Wk | 0.135 | 0.019 | < 0.001 |
| New cases/100,000 | −0.005 | 0.031 | 0.735 | New cases/100,000 | −0.027 | 0.019 | 0.13 |
| Constant | 0.034 | 0.026 | 0.18 | Constant | −0.824 | 0.0158 | < 0.001 |

Abbreviation used: NH, New Hampshire.

**Figure 2.** Avg. weekly over-the-counter syringe sales by month during 2020 in all MA and NH from one community pharmacy business by COVID-19 testing status. Abbreviations used: MA, Massachusetts; NH, New Hampshire; COVID-19, coronavirus disease 2019; Avg., average.
reduction signage and educational materials affecting patient awareness of the availability of these supplies at the pharmacies.

We also found that pharmacies offering COVID-19 testing had lower naloxone distribution and OTC syringe sales. There are several factors that may have contributed to these differences. The Centers for Disease Control and Prevention in 2020 recommended a series of modifications to pharmacy processes, including encouraging staff with symptoms of COVID-19 to stay home, handwashing after any direct contact with patients, frequent cleaning and disinfecting of workspaces, patient and staff protocol changes to ensure social distancing, COVID-19 symptom screening, and vaccine program administrations. It is conceivable that testing sites were preferentially selected in pharmacies that provided fewer ancillary public health services. However, from this study alone, it is not possible to determine the underlying mechanisms of how pharmacies were selected to offer COVID-19 testing.

Although aggregate findings of all pharmacies in the study reflect fluctuations in average weekly naloxone dispensing and OTC syringe sales rates, pharmacies were able to continually provide access to both harm reduction supplies during the study period regardless of whether COVID-19 retesting services were offered or not. Pharmacy’s ability to provide services that address co-occurring health crises is in part facilitated by standing orders and legislation in both Massachusetts and New Hampshire that exist to improve provision of naloxone to reduce overdoses. Massachusetts’s most recent 2021 amendment to the initial 2018 standing order allows any licensed pharmacist to offer naloxone to those at risk of an opioid overdose, while also mandating naloxone stocking. Because we did not detect a reduction in naloxone dispensing during this unprecedented period, study findings suggest that naloxone standing orders work in tandem with or without COVID-19 testing services to maintain broad geographic access to naloxone for all populations. Pharmacies are the most accessible health care providers and the first touchpoint of patient engagement within the health care system; naloxone provision benefits from this unique position. In addition, laws in both states permit the nonprescription sale of syringes in community pharmacies. With these policies, pharmacists are well positioned to continue efforts toward naloxone distribution and syringe sale by lessening harm reduction workload on a singular pharmacy staff member, especially at stores that also offer COVID-19-related services. New Hampshire’s laws supporting naloxone access and permitting OTC syringe sales in pharmacies are more recent, which may explain the observed state differences. Owing to similarities in state insurance profiles, results were not affected by insurance coverage. Although naloxone is covered by insurance in both states, syringe access could be enhanced by expanding insurance coverage to OTC syringes.

These data suggest pharmacies are essential for providing harm reduction even during pandemic times. Considering the enormous constraints on community syringe service programs throughout major U.S. cities during the pandemic, wherein a recent study documented 43% decreased services and 25% had one or more site closures, pharmacy access to harm reduction supplies can sustain needed access.

Limitations of this study permitted to data availability that restricted our ability to explore additional pharmacy elements that may have affected the dispensing of the naloxone and syringes during the study period. Another study limitation included lack of pharmacy size with respect to the site-specific capacity of pharmacy staff, which may have affected pharmacy’s ability to effectively integrate COVID-19 store adaptations, address staffing shortages, and dispense harm reduction supplies. We controlled for pharmacy capacity by including population rates that reflect the expected coverage of the pharmacy, because we lacked weekly or monthly staffing records. In addition, dispensing data were aggregated at the individual pharmacy level restricting our ability to determine whether the sale of naloxone or syringes was initiated by the patient or pharmacy staff. Analyses to explore naloxone and syringe dispensing rates from years before the study period were not included in the present work but such longitudinal research could be a worthwhile endeavor in future studies.

Conclusion

The results from this study highlight the importance of community pharmacies providing harm reduction services to combat the growing impacts of the opioid epidemic during COVID-19. With the continued expansion of pharmacist scope of practice, the public will come to rely on community pharmacies as a primary source of health care, including harm reduction services. In addition to continued provision of naloxone and OTC syringes, pharmacists and staff can act as advocates for harm reduction efforts and educational resources for patients and providers. Substance use disorder professionals indicate pharmacists have the capacity to bridge the gap between health care providers and their patient population during the ongoing opioid crisis and future public health emergencies. The unique health care challenges presented by co-occurring public health crises demonstrate the valuable role that community pharmacies play in providing harm reduction resources.

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### Appendix 1

Results from multivariable modelling of average weekly naloxone prescriptions dispensed and over the counter syringe sales with interactions by store testing status from all Massachusetts and New Hampshire locations from one community pharmacy business.

#### Model Output with Interaction

| Zero Inflated Poisson Distribution | Zero Inflated Negative Binomial Distribution |
|-----------------------------------|-----------------------------------------------|
| **Naloxone**                      | **Syringes**                                  |
| **Log**                           | **Log**                                       |
| State (NH)                        | Testing (Yes)                                 |
| Log                               | -0.672                                        |
| State (NH)                        | Testing (Yes)                                 |
| -0.672                            | -0.096                                        |
| SE                                | 0.081                                         | 0.023                                         |
| p                                 | p < 0.001                                     | p < 0.001                                     |
| Testing (Yes)                     | Testing (Yes)                                 |
| -0.549                            | -0.104                                        |
| Week                              | Week                                          |
| -0.019                            | -0.029                                        |
| New Cases per 100k                | New Cases per 100k                            |
| 0.091                             | 0.036                                         |
| Testing*Week                      | Testing*Week                                  |
| -0.044                            | -0.041                                        |
| Constant                          | Constant                                      |
| 0.096                             | 5.69                                          |
| p                                 | p < 0.001                                     | p < 0.001                                     |
| Log*                              | Log*(theta)                                   |
| State (NH)                        | Log*(theta)                                   |
| 0.184                             | 0.239                                         |
| SE                                | 0.141                                         | 0.01                                          |
| p                                 | p < 0.001                                     | p < 0.001                                     |
| Testing (Yes)                     | Testing (Yes)                                 |
| -2.057                            | -0.644                                        |
| Week                              | Week                                          |
| -0.013                            | 0.135                                         |
| New Cases per 100k                | New Cases per 100k                            |
| -0.005                            | -0.027                                        |
| Testing*Week                      | Testing*Week                                  |
| 0.825                             | 0.107                                         |
| Constant                          | Constant                                      |
| 0.034                             | -0.824                                        |
| p                                 | 0.18                                          | p < 0.001                                     |
| Logit                             | Logit                                         |
| State (NH)                        | State (NH)                                    |
| 0.184                             | -0.033                                        |
| SE                                | 0.141                                         | 0.036                                         |
| p                                 | p < 0.001                                     | p < 0.001                                     |
| Testing (Yes)                     | Testing (Yes)                                 |
| -2.057                            | -0.644                                        |
| Week                              | Week                                          |
| -0.013                            | 0.135                                         |
| New Cases per 100k                | New Cases per 100k                            |
| -0.005                            | -0.027                                        |
| Testing*Week                      | Testing*Week                                  |
| 0.825                             | 0.107                                         |
| Constant                          | Constant                                      |
| 0.034                             | -0.824                                        |
| p                                 | 0.18                                          | p < 0.001                                     |

SE=standard error; NH=New Hampshire