HHS Public Access

Author manuscript

Int J Drug Policy. Author manuscript; available in PMC 2024 May 08.

Published in final edited form as:

Int J Drug Policy. 2021 November ; 97: 103321. doi:10.1016/j.drugpo.2021.103321.

Socio-ecological and pharmacy-level factors associated with buprenorphine stocking at pharmacies in New York City

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Abstract

Background: Research is lacking on community and pharmacy-level factors that are associated with stocking buprenorphine. To address these gaps, this study applied a socio-ecological framework to estimate the association between community- and pharmacy-level factors and buprenorphine stocking among a sample of pharmacies in New York City.

Methods: A telephone survey recruitment strategy was used to administer surveys to 662 pharmacies on the New York City Naloxone Standing Order Pharmacy list in 2018. The survey assessed pharmacy-level factors of private spaces to consult with pharmacists, type of pharmacy (chain/independent), size of pharmacy, having buprenorphine in stock and being open on nights and weekends. Socio-ecological variables drawn from census tract and public health data consisted of racial and ethnic composition, rates of poverty, rates of people without insurance, and rates of overdose. Mixed effects logistic regression estimated odds ratios (OR) of carrying buprenorphine in stock after adjusting for socio-ecological and pharmacy-level factors.

Results: Fewer than half of the pharmacies reported having buprenorphine in stock (43.81% n = 290). Logistic regression analyses indicate that several pharmacy-level factors - the number of private spaces (aOR = 1.67 95% CI = 1.20, 2.32 p = .002), large size of the pharmacy (aOR = 1.52 95% CI = 1.04, 2.22, p = .032), having naloxone in stock (aOR = 1.54, 95%CI = 1.03, 2.32 p = .037), as well as neighborhood-level factors of higher rates of poverty (aOR = 2.07 95%CI =1.07, 4.02 p < .001) and higher rates of uninsured residents were associated with carrying buprenorphine (aOR = 0.23 95%CI = 0.14,.38).

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Ethics

The following research study was approved by the Columbia University Institutional Review Board. All research adheres to ethical conduct of research and standards set forth by the Columbia University IRB.

Declarations of Interest

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.drugpo.2021.103321.

Conclusions: Using a socio-ecological framework, this study identified inequities in pharmacy stocking of buprenorphine by neighborhood rates of health insurance. At the pharmacy level, increasing private spaces for consultation and encouraging co-stocking of naloxone with buprenorphine stocking may reduce inequalities in buprenorphine availability.

Keywords

Pharmacies; buprenorphine; socioecological factors; racial/ethnic disparities

Over the last two and a half decades, the alarming rise in opioid misuse has resulted in a public health crisis, most notably a dramatic increase in drug overdose deaths (Mattson et al., 2021). Pharmacies are the gatekeepers to accessing buprenorphine and yet existing research suggests that fewer than half of pharmacies stock buprenorphine (Hill et al., 2020). Stocking buprenorphine in pharmacies is an advantage over methadone where patients must attend clinics that impose many rules and restrictions on how patients can access treatment (Cooper et al., 2020). Although buprenorphine distribution is growing, significant disparities exist in the geographic distribution of the availability of buprenorphine (Pashmineh Azar et al., 2020). Further, the COVID-19 pandemic has emphasized the need to increase buprenorphine availability to meet the growing demand for treatment (Cochran, Bruneau, Cox, & Gordon, 2020; Peckham et al., 2021); however, numerous barriers remain in stocking buprenorphine in pharmacies. Studies have found low rates of buprenorphine stocking and pharmacists unable or unwilling to dispense buprenorphine (Cooper et al., 2020; Hill et al., 2020; Sisson, McMahan, Chichester, Galbraith, & Cropsey, 2019; Thornton, Lyvers, Scott, & Dwibedi, 2017; Ventricelli et al., 2020). Identifying and eliminating barriers to buprenorphine stocking at the pharmacy-level is critical to ending the overdose epidemic.

The social-ecological framework for opioid-related harms and treatments categorizes barriers and facilitators on individual, interpersonal, communal or neighborhood, organizational (i.e. pharmacy), and societal levels (Jalali et al., 2020). Little research has been conducted into factors that may impede or facilitate access to buprenorphine in pharmacies at the neighborhood or pharmacy levels. The current study, couched in the socio-ecological framework, investigates the association between neighborhood-level (racial and ethnic composition, community overdose rates, and insurance coverage rates) and pharmacy-level factors (carrying naloxone, private spaces to consult with patients, the size of the pharmacy, and clinic hours) and the likelihood that the pharmacies carry buprenorphine in stock. Greater research is critically needed to inform implementation strategies of increasing the availability of buprenorphine in the community by increasing pharmacy stocking.

Socio-Ecological framework of buprenorphine stocking in pharmacy settings

Socio-ecological models suggest that neighborhood-level factors influence the occurrence of opioid overdose as well as the availability of buprenorphine and other medication treatments for opioid use disorders (Mair, Sumetsky, Burke, & Gaidus, 2018; Dasgupta et al., 2017). Recent research has called attention to lack of health insurance and poverty

as social determinants of health that increase risk of overdose by introducing barriers to accessing buprenorphine (Park et al., 2020; Saloner, Levin, Chang, Jones, & Alexander, 2018). Nationally, it is estimated that as many as 18.43% of people with recent opioid use disorder are uninsured in 2019 (National Survey on Drug Use & Health, 2019). Tsui, Burt, Thiede, and Glick (2018) found a strong association between having insurance and receipt of buprenorphine among people who inject drugs and have opioid use disorders. No studies to date have examined the association between neighborhood insurance rates and the extent to which pharmacies carry buprenorphine in stock.

Neighborhood-level disparities in health insurance coverage and rates of poverty may perpetuate inequities in buprenorphine stocking across neighborhoods in New York City. Hansen et al. (2013) found that neighborhood-level treatment with buprenorphine rates were lowest in neighborhoods with higher poverty and percentage of Black and Latinx residents In New York City (Hansen et al., 2013). Building on this work by utilizing national level data, Lagisetty, Ross, Bohnert, Clay, and Maust (2019) demonstrated similar disparities in the receipt of buprenorphine prescriptions, finding that black patients were significantly less likely to receive prescriptions for buprenorphine compared to white patients. In New York City, rates of synthetic-involved opioid overdose deaths increased the most among Black Americans aged 45–54 (19.3–41.9 per 100,000) and older populations between 55 and 64 (21.8–42.7 per 100,000) (Colon-Berezin, Nolan, Blachman-Forshay, & Paone, 2019). This pattern is congruent with recent data from the Centers for Disease Control suggest that opioid-related overdose death rates are increasing most rapidly among racial and ethnic minorities and within socioeconomically disadvantaged neighborhoods (Altekruse, Cosgrove, Altekruse, Jenkins, & Blanco, 2020) . Data from the Centers for Disease Control suggest that opioid-related overdose death rates are increasing most rapidly among racial and ethnic minorities and within socioeconomically disadvantaged neighborhoods (Scholl, Seth, Kariisa, Wilson, & Baldwin, 2019).

Pharmacy-level factors associated with having buprenorphine in stock

Prior literature has examined the role of individual attitudes of pharmacists as barriers and facilitators of buprenorphine stocking. Raisch et al. (2020) found that pharmacies in New York and 6 other states expressed positive attitudes regarding stocking of buprenorphine. Most recently examined pharmacy-related buprenorphine barriers in counties with high rates of opioid-related overdose deaths and found that 20% of the 921 pharmacies did not stock buprenorphine. Findings from the study indicated that independent (as opposed to chain) pharmacies were less likely to stock buprenorphine. Other studies have found low rates of buprenorphine stocking and reluctance on the part of pharmacists to dispense buprenorphine (Cooper et al., 2020). Hill et al. (2020) investigated the availability of buprenorphine/ naloxone films and naloxone spray in Texas and found the availability of buprenorphine differed by pharmacy type (chain versus independent). Prior studies are yet to examine physical characteristics of the pharmacy that may function as facilitators to carrying buprenorphine in stock. Our prior literature has found that features of the built environment within pharmacies including having private spaces to consult with pharmacists, clinic hours, and the size of the pharmacy are associated with increased likelihood of having naloxone in stock using data from the Naloxone Standing Order list (Theodorsson-Norheim, 1986a;

Abbas et al., 2021). Though no prior studies have investigated whether features of the built environment and clinic hours are associated with having buprenorphine in stock, pharmacies that provide private spaces to answer questions, fill prescriptions and receive consultations promote harm reduction respecting confidentiality and reducing stigma (Biancarelli et al., 2019; Paquette, Syvertsen, & Pollini, 2018; Tsai et al., 2019). Pharmacies that provide private spaces to answer questions, fill prescriptions and receive consultations promote harm reduction by respecting confidentiality and reducing stigma. Pharmacies that stay open into the evening and throughout weekends may be more equipped to provide buprenorphine compared to pharmacies that provide do not provide buprenorphine. Greater insight into pharmacy-level predictors of buprenorphine availability is needed to inform organizational level interventions to increase buprenorphine availability.

The present study

Prior literature has disproportionately focused on factors associated with naloxone stocking (Abbas et al., 2021; Carpenter et al., 2019; Egan et al., 2020; Nielson et al., 2016; Nielsen & Van Hout, 2016; Rudolph et al., 2018; Stewart, Thomas, & Tutag-Lehr, 2018; Stone, Hur, & Young, 2020) and naloxone standing order pharmacy programs are shown to increase naloxone stocking (Davis & Carr, 2015; 2017; Gangal et al., 2020; Meyerson et al., 2018; Xu, Davis, Cruz, & Lurie, 2018) yet research is lacking that examines buprenorphine stocking among participating pharmacies. To address gaps in the literature, we examined the relationship between socio-ecological and pharmacy-level factors and the likelihood that pharmacies will report having buprenorphine in stock in a sample of pharmacies in New York City. Findings from our prior research indicates that community-level socioeconomic marginalization contributes to disparities in naloxone availability and features of the built environment including having private spaces to consult with pharmacists was associated with greater likelihood of having naloxone in stock (Abbas et al., 2021). However, our prior research did not include buprenorphine. We extend this prior research by hypothesizing that pharmacies located in neighborhoods with a greater proportion of white residents, with lower rates of deprivation in the form of poverty, and lack of health insurance would be more likely to stock buprenorphine compared to pharmacies located in neighborhoods with greater rates of poverty, and health insurance coverage. This study also hypothesized that pharmacies that carried naloxone would be more likely to report having buprenorphine in stock.

Methods

Material and methods

Recruitment and data collection procedures—We used the Standing Order Naloxone Program pharmacy list of 1200 pharmacies to recruit our sample which is updated monthly by the New York City Department of Health and Mental Hygiene (New York State Department of Health) Trained research assistants and masters students contacted all pharmacies on the Standing Order Naloxone Program list as of June 20th, 2018 to participate in the study. The Columbia University Institutional Review Board exempted the study from review. The inclusion criteria were any pharmacy in a) New York City who

b) consented to participate in the study. There were no exclusion criteria as our goal was to recruit as many pharmacies as possible who were on the Naloxone Standing Order list. A total of 1151 pharmacies remained after removing duplicate and disconnected numbers. Recruitment of the pharmacies, verbal consent, and data collection was conducted over the phone. Approximately 57.5% (662) of the pharmacies consented and were included. Reasons for non-participation included inadequate time, corporate policy, or unspecified refusal. More details regarding the study approach can be found in Abbas et al. (2021).

Measures

Dependent variable

Carrying buprenorphine in stock.: We created a variable measuring whether the pharmacy reported having buprenorphine in stock at the time of the survey.

Independent variables

Socio-ecological factors.: Sociological variables consisted of aggregate health and socioeconomic variables at the neighborhood using boundaries designed by the United Hospital Fund (UHF). UHF neighborhood boundaries consist of 42 distinct neighborhoods throughout New York City (New York State Department of Health [NYDOH], 2019). Neighborhood-level data used in this study is from a total of 34 UHF neighborhoods provided by the Epi Dashboard from the New York City Department of Health because 8 neighborhoods were collapsed to prevent suppression of potentially identifiable data.

Community overdose rates consisted of 2017 age-adjusted neighborhood-rates of overdose deaths (per 100,000) for each neighborhood (NYDOH, 2019). **Race and ethnicity** was measured using aggregate U.S Census data measuring percent of residents living in each neighborhood that reported their identity as non-Hispanic black, Asian, non-Hispanic white, Hispanic (NYDOH, 2019). **Socioeconomic conditions** was measured using aggregate neighborhood rates of unmet medical needs, and poverty. Unmet medical needs consisted of variables measuring the percent of individuals who reported needing to see a doctor for a medical problem but not receiving medical care (NYDOH, 2019). Poverty included a variable that measured the percent of residents who reported earning yearly incomes that were beneath the federal poverty line in 2017 (NYDOH, 2019).

Pharmacy-level variables.: Pharmacy level variables included 1) having private area, 2) a room or 3) window to consult with a pharmacist when picking up medications 4) if the pharmacy was open on nights and weekends and 5) if it was a chain pharmacy. Variables measuring a private space were summed to create a cumulative index with a range of 0–3. Dichotomous variables indicated flexible hours (open on nights and weekends), being part of a chain of pharmacies, and naloxone stocking.

Statistical analyses

Descriptive and bivariate analyses.: We provided descriptive statistics that consisted of proportions (%) and counts (n) for dichotomous and categorical variables and means for continuous variables. Chi-square tests were used in bivariate analyses to test of differences between categorical and dichotomous indicators and the dependent variable

of buprenorphine stocking. Tests of differences between continuous neighborhood-level variables and having buprenorphine in stock were performed using Kruskall-Wallis rank-ordered (Caci, 1999; Dinno, 2015). Kruskall-Wallis rank order tests allow violations of assumptions of normality by providing non-parametric tests between variables (Breslow, 1970; Theodorsson-Norheim, 1986b).

Mixed-effects logistic regression analyses.: We performed logarithmic transformation on all socioecological variables prior to analysis. Mixed-effects logistic regression was used to obtain unadjusted and adjusted odds ratios (Huber, 2013; Rabe-Hesketh, Skrondal, & Pickles, 2004). Unadjusted associations included relationships between pharmacy-level variables (i.e. private space, open on weekends, carrying naloxone in stock), socio-ecological characteristics (race, ethnicity, poverty, overdose rates) and the likelihood of buprenorphine-stocking. Significant variables in unadjusted relationships were included in the adjusted model (aOR). All parameter estimates from multivariable regressions were reported as Odds Ratios. Robust standard error variance adjustment was performed to adjust for bias in 95% Confidence Intervals (95%CI) and standard error (SE) estimates (Skrondal & Rabe-Hesketh, 2004). Sensitivity analyses identified high multicollinearity between poverty and rates of the uninsured and Variance Inflation Factor estimates were calculated for poverty and rates of the uninsured in the same model and found high variance inflation statistics between poverty (4.05) and rates of uninsured (2.42) (results available upon request) (Kothari, 2015; Thompson, Kim, Aloe, & Becker, 2017). Adjusted and unadjusted mixed effects logistic regressions were separately performed with rates of the uninsured and poverty in separate models (available upon request). We performed sensitivity analyses that identified no significant interactions between any variables in the model.

Results

Descriptive statistics

Table 1 presents descriptive statistics and bivariate tests of significant differences between socio-ecological and pharmacy-level factors and whether the pharmacy reported carrying buprenorphine in stock.

Socio-ecological characteristics.—The mean neighborhood overdose rate was 16.33 per 100,000(SD = 6.83). On average pharmacies were located in neighborhoods with a fifth non-Hispanic black (M = 21.28, SD = 21.52), more than a third white (M = 37.14, SD = 25.84), more than a quarter Hispanic (M = 27.31, SD = 17.96) and more than 10 percent Asian (M = 11.67, SD = 9.24). Pharmacies that provided buprenorphine were in neighborhood with significantly fewer Black residents compared to pharmacies that did not provide buprenorphine (M = 18.7 SD = 20.82 vs. M = 23.3, 21.9, p < .001). Pharmacies that provided buprenorphine were in neighborhoods with significantly fewer Hispanic people compared to pharmacies that did not provide buprenorphine (M = 24.31 SD = 16.27 vs M = 29.64, SD = 28.86, p < .001). Pharmacies that provided buprenorphine were in neighborhoods with significantly more White people compared to pharmacies that did not provide buprenorphine (M = 42.33 SD = 25.5, vs. M = 33.11, SD = 25.37, p < .001). Rates of uninsured residents were significantly lower among pharmacies that had buprenorphine in

stock compared to pharmacies that did not have buprenorphine in stock (M = 18.90 SD = 9.32 vs. M = 21.95 SD = 9.58, p < .001). On average, pharmacies were in neighborhoods in which one fifth of the population lived below the poverty line (M = 20.61, SD = 4.45). Rates of residents living below the poverty line were significantly lower among pharmacies that had buprenorphine in stock compared to pharmacies that did not have buprenorphine in stock (M = 18.90, SD = 9.32 vs, M = 21.95 SD = 9.58, p < .001).

Pharmacy characteristics.—The mean number of private spaces in the pharmacies was 1.74 (SD = 0.75). The number of private spaces to access buprenorphine was significantly greater within pharmacies that carried buprenorphine compared to pharmacies that did not carry buprenorphine (M = 1.94, SD = 0.63 vs. M = 1.58 SD = 0.80, p < .001). The proportion of the pharmacies that were chain pharmacies were greater among pharmacies that had buprenorphine in stock compared to pharmacies that did not have buprenorphine in stock (80.34%, n = 233 vs. 55.11%, n = 205, p < .001). The proportion of pharmacies that reported stocking naloxone was significantly greater among pharmacies that reported having buprenorphine in stock compared to pharmacies that did not have buprenorphine in stock (80.34% n = 233 vs. 55.11%, n = 205, p < .001).

Multivariable analyses

Table 2 presents Odds Ratios, (OR), Standard Errors (SE) and 95% Confidence Intervals (95% CI) from adjusted and unadjusted mixed effects logistic regression analyses.

Socio-ecological factors

In the unadjusted models neighborhoods with greater proportions of Black (OR = 0.80, 95% CI = 0.69, 0.93, p = .003) and Hispanic (OR = 0.66, 95% CI = 0.50, 0.87, p = 0.003) residents was significantly associated with lower odds of providing buprenorphine but was insignificant in the adjusted model. Neighborhood-level rates of poverty were associated with less likelihood that the pharmacy would stock buprenorphine (OR = 0.49, 95%CI = 0.31, 0.76, p < .001) but were insignificant in the adjusted model. The odds of providing buprenorphine was significantly lower among pharmacies that were located in neighborhoods with greater rates of uninsured residents compared to neighborhoods with lower rates of the uninsured after adjusting for socio-ecological and pharmacy-level factors (aOR = 0.23, 95% CI = 0.14, 0.38, p < .001).

Pharmacy-level factors.—The number of private spaces was associated with increased odds that the pharmacy would report having buprenorphine in stock (aOR = 1.67, 95%CI = 1.20, 2.32 p = .002). The odds of having buprenorphine in stock among chain pharmacies was more than one and a half times the odds of having buprenorphine among non-chain pharmacies (aOR = 1.52, 95%CI = 1.04, 2.22, p = .032). Pharmacies that had naloxone in stock had an increased odds of 1.54 (95%CI, 1.03, 2.32, p = .032) of carrying buprenorphine compared to pharmacies who did not stock naloxone.

Discussion

The following paper examined multi-level neighborhood social determinants and pharmacy-level factors that are associated with carrying buprenorphine in stock among pharmacies that participate in the Naloxone Standing Order Program in New York City. Findings from this study support several hypotheses put forth in this study. Furthermore, our findings highlighted that pharmacies located in neighborhoods with greater proportions of the population without health insurance were significantly less likely to report having buprenorphine in stock. These findings are congruent with prior literature that suggests lack of health insurance is a social determinant of health of the barriers that it introduces to accessing and staying engaged in treatment (Park et al., 2020; Tsui et al., 2018). At the pharmacy level, the number of private spaces, being a chain pharmacy and having naloxone in stock were associated with increased odds that the pharmacy would report having buprenorphine in stock. We did not find significant association between neighborhood racial and ethnic composition and buprenorphine stocking. These results are consistent with studies on medications for opioid use disorder that have found race does not predict availability or receipt of naloxone and buprenorphine when controlling for insurance status and other social determinants of health (Egan et al., 2020; Tsui et al., 2018).

Implications for public health policy and practice

This study presents several implications for public health policy as well as future research into improving access to buprenorphine through engaging pharmacies. At the socio-ecological level, greater research is needed that investigates if pharmacies that are located in communities with greater aggregate rates of people without insurance receive fewer prescriptions or are reluctant to keep buprenorphine in stock out of a lack of people in the immediate neighborhood who can afford to purchase buprenorphine. Future studies must investigate the potential impact of New York State instituting a buprenorphine cost assistance program to offset the costs of paying out of pocket without health insurance.

At the pharmacy level, pharmacies with more physical resources to protect patient confidentiality, and knowledge of where to refer patients when naloxone was not in stock was significantly associated with increased likelihood of carrying buprenorphine. Larger national chains may have the necessary resources to plan and build physical environments that promote client confidentiality, including private spaces such as private rooms, windows, spaces or drive-throughs that might help to lower stigma associated with opioid use and increase engagement of people with OUD who are seeking buprenorphine (Biancarelli et al., 2019). These resources might also translate into having the necessary reserves to pre-order and carry extra medication in inventories, mandating employees to pursue ongoing training. Smaller independent pharmacies that are more rooted and trusted in communities of color may need more capacity building, pharmacist training and resources to build private consultation areas to better serve consumers who receive buprenorphine. Although public health policies in New York City allow for the provision of naloxone and buprenorphine additional research is needed to identify the barriers to co-locating multiple harm reduction strategies at pharmacies. Greater research is needed into developing physician-pharmacist collaborative care models for buprenorphine treatment that

incorporates increasing health insurance (DiPaula and Menachery, 2015). At the policy level, future research should investigate the impact of providing incentives to pharmacies in NYC to co-stock buprenorphine and naloxone.

Research is needed that incorporates deeper perspectives provided by individual pharmacists, and patients into pharmacy-level organizational and socio-ecological factors. The current study is was not designed to assess individual pharmacists' attitudes regarding medication dispensing practices but prior research consistently suggests that community pharmacists sometimes refuse to dispense buprenorphine and naloxone (Cooper et al., 2020; Hill et al., 2020; Muzyk, Smothers, Collins, MacEachern, & Wu, 2019; Ventricelli et al., 2020). Future research should include qualitative work with pharmacists to inform assess acceptability to inform efforts education and training for pharmacists. In addition, more research is needed to investigate the perceptions of people with opioid use disorders about accessing buprenorphine at pharmacies. Research is needed to assess if pharmacies decisions to co-locate buprenorphine and naloxone shapes future community-level rates of overdose. Research is needed to examine how ecological contexts of racial and ethnic neighborhood composition interacts with the demographic characteristics of people who access naloxone and buprenorphine at pharmacies. Future research must examine how the physical characteristics of pharmacies shape individual decision-making about where to access buprenorphine in pharmacies in New York City. Future research must include co-locating syringe access services with buprenorphine and naloxone as a strategy to redress the overlapping crises of overdose and epidemic of HIV among people who inject drugs.

Findings from this study emphasize the need to remove the barrier of health insurance from buprenorphine provision in New York and nationally. Pharmacies residing in neighborhoods with concentrated populations of people without insurance may disincentivize pharmacy stocking of buprenorphine resulting in neighborhoods with less availability of buprenorphine. These findings point to strategic interventions that target specific pharmacies in neighborhoods with low rates of insurance to increase buprenorphine stocking. Research is needed investigating the impact of providing incentives for pharmacies to stock buprenorphine in neighborhoods with high rates of uninsured. Additionally findings from this study emphasize the importance of research examining the impact of insurance enrollment campaigns on increasing pharmacies' willingness to stock naloxone.

Limitations

There are several limitations of this study. The research is cross-sectional thus precluding causal inference from the parameter estimates in the study. This study did not measure utilization rates of pharmacies consisting of how many people received both naloxone and buprenorphine as opposed to only naloxone and buprenorphine. Similarly, this study did not measure the demographic client characteristics of who accesses naloxone and buprenorphine. This study did not examine how the physical characteristics of pharmacies shaped individuals' willingness to access naloxone and buprenorphine from pharmacies. Although the response rate is adequate for a telephone survey study, the non-response rate may have biased study findings to favor more well-resourced pharmacies.

There are limitations worth noting regarding the sampling framework used in this study. Using the publicly available list of participating pharmacies in the Standing Order Naloxone Program is likely to lead to a sample that is not representative of all pharmacies. Recruitment exclusively from pharmacies off the Naloxone Standing Order List introduces the possibility that our pharmacies may be more likely to provide buprenorphine because they are actively engaged in harm reduction practices in New York City. This introduces that our sample may overestimate the true prevalence of buprenorphine stocking in New York City. Additionally, pharmacies that are recruited off the Naloxone Standing Order List may be located in neighborhoods with greater rates of overdose deaths because these are the geographic locations with the greatest need for services. Additionally, pharmacies that participate in the Naloxone Standing Order Program may be more aware of stigma and thus more inclined to provide private spaces for their consumers. Similarly participating pharmacies may be more likely to stay open later in the evening out of a courtesy to clients with complex needs that could include substance use disorders. Lastly, pharmacies that are larger may have the necessary resources to provide harm reduction services and thus participate in the Standing order program.

These limitations have implications for the interpretation of parameter estimates in this study. It is possible that the parameter estimates reported in this study are an underestimation of the true relationship between private spaces, clinic hours, pharmacy size, stocking naloxone and the likelihood of buprenorphine stocking. Similar limitations exist regarding sociodemographic characteristics. Pharmacies with the resources to participate may be disproportionately located in wealthier neighborhoods with fewer racial and ethnic minority populations, and greater health insurance coverage rates, and less socioeconomic disparities. The impacts of this geographical variation may underestimate the true relationships between sociodemographic and buprenorphine stocking. Implications of these limitations to interpretation of study estimates restricts the generalizability of findings to pharmacies participating in the naloxone standing order list. Future research is needed with representative samples to examine differences between pharmacies on the Naloxone Standing Order List to pharmacies who choose not to participate.

Conclusion

Limitations notwithstanding, this study addressed a previously unexplored area of research into pharmacy and neighborhood-level factors that are associated pharmacies carrying buprenorphine in New York City. These findings have implications for public health policy that ensures equitable access and care for all, especially for marginalized communities. Pharmacies are a natural source for deploying harm reduction interventions because they are an essential part of neighborhood health and are granted by policies the ability to provide multiple health services for people with opioid use disorders.

Acknowledgements

This paper was partially supported by National Institute of Drug Abuse F31DA044794, and R25037190, to Dr. Marotta, PhD and Stringer, PhD and T32DA019426 to Dr. Phillip Marotta, PhD, and T32DA037801 to Dr. Stringer, PhD.

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Table 1:

Descriptive and bivariate tests of differences between facilitators of access to naloxone, neighborhood sociodemographic factors and stocking buprenorphine.

		Buprenorphine		
	Overall	**Yes**	**No**	**p-value**
Buprenorphine in stock	43.81(290)			
Socio-ecological factors				
Community overdose rates M(SD)	16.33(6.83)	15.95(6.53)	16.33(6.83)	.256
Race M(SD)				
Asian	11.67(9.24)	12.11(9.49)	11.32(9.04)	.112
Black, (non-Hispanic)	21.28(21.52)	18.70(20.82)	23.28(21.86)	.001
Hispanic	27.31(17.96)	24.31(16.27)	29.64(28.86)	<0.001
Other race	2.59(1.66)	2.53(1.53)	2.64(1.74)	.823
White, (non-Hispanic)	37.14(25.84)	42.33(25.55)	33.11(25.37)	<0.001
Uninsured	19.61(6.76)	17.88(6.64)	20.97(6.56)	<0.001
Unmet medical needs M(SD)	10.40(2.56)	10.32(2.57)	10.46(2.54)	.239
Poverty M(SD)	20.61(9.58)	18.90(9.32)	21.95(9.58)	<0.001
Pharmacy-level factors				
Number of private spaces	1.74(0.75)	1.94(0.63)	1.58(0.80)	<0.001
Open on weekends and evenings%(n)	7.25(48)	8.97(26)	5.91(22)	.133
Chain pharmacy	54.98(364)	67.59(196)	45.15(168)	<0.001
Naloxone in stock	77.64(514)	80.34(233)	55.11(205)	<0.001

Table 2:

Multilevel mixed effects unadjusted (OR), adjusted (aOR), p-values, and 95% Confidence Intervals for the relationship between socio-ecological, pharmacy-level factors and stocking buprenorphine.

	OR	95%CI	p value	aOR	95%CI	*p*<.value
Socio-ecological factors						
Race M(SD)						
Non-Hispanic Black	.80	(0.69, 0.93)	.003	.89	(0.77, 1.03)	.110
Hispanic	.66	(0.50, 0.87)	.003	.94	(0.72, 1.24)	.688
Uninsured	.30	(0.22, 0.37)	<0.001	.23	(0.14, 0.38)	<0.001
Pharmacy-level factors						
Number of private spaces	2.03	(1.52, 2.72)	<0.001	1.67	(1.20, 2.32)	.002
Large pharmacy	2.45	(1.73, 3.45)	<0.001	1.52	(1.04, 2.22)	.032
Naloxone in stock	3.22	(2.10, 4.95)	<0.001	1.54	(1.03, 2.32)	.037
Model 2						
Poverty M(SD)	.49	(0.31, 0.76)	<0.001	.93	(0.34, 2.51)	.886

Model 2 adjusts for race/ethnicity and pharmacy-level factors of number of private spaces, chain pharmacy, naloxone in stock.