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Modifiable risk factors associated with disposal of unused prescription drugs by parents of adolescents

Kathleen L Egan, PhD, MS¹, Eric Gregory, EdD, CPS², Samantha E Foster¹, Melissa J Cox, PhD, MPH¹

¹Department of Health Education and Promotion, College of Health and Human Performance, Greenville, NC, USA

²Community Survey Solutions, LLC, Bowling Green, KY, USA

Abstract

The safe disposal of unused medications is one primary prevention strategy to reduce nonmedical prescription drug use among adolescents. We sought to identify modifiable risk factors associated with disposal of unused prescription drugs by parents of adolescents residing in ten south central Kentucky counties with disposal programs. In the fall of 2017, 4148 parents of adolescents participated in an anonymous, paper-based survey. We conducted generalized logit mixed models adjusted for within-school clustering to assess the relationship between disposal behaviors and modifiable risk factors while controlling for respondents' sociodemographic characteristics. The analytic sample consisted of parents in households in which someone had been prescribed an opioid medication within the past 12 months ($N=627$). Our findings indicated that almost 42% of parents reported disposing of unused prescription medication within the past 12 months, and the majority disposed of medications at home rather than using a disposal program. Parents who perceived that any, compared to none, of their child's close friends engaged in nonmedical prescription opioid use had higher odds of reporting use of a disposal program. Parents who were aware of disposal programs, compared to those who were not aware, had greater odds of using them, rather than not disposing at all or disposing them at home. Compared to parents who perceived prescription drugs to be hard for adolescents to obtain for nonmedical use, parents who believed that prescription drugs were easily accessible to adolescents for nonmedical use had lower odds of using disposal programs than disposing of medications at home. Collectively, our

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Correspondence concerning this article should be addressed to Kathleen Egan, Ph.D., M.S., Department of Health Education and Promotion, East Carolina University, 3105 Carol G. Belk Building, Greenville, NC 27858. Telephone: 252-328-2719. eganka18@ecu.edu.

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Compliance with Ethical Standards

Disclosure of potential conflicts of interest

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findings suggest that enhancing awareness of disposal programs, while addressing parents' perceptions of their children's peers' use of nonmedical prescription opioids, should be considered to facilitate the disposal of unused medications and optimize current public health prevention efforts related to adolescent nonmedical use.

Keywords

Prescription drug; Opioid; Adolescent; Parent; Norm; Availability; Prevention; Disposal

Background

Nonmedical prescription (NMP) drug use is defined as use of a medication by someone to whom it was not prescribed, or use in a way not directed by a doctor, including use of the prescription for the experience or feeling the medication caused, use in larger quantities, more frequent use, or use for longer duration (SAMHSA, 2019). In the United States, between 2015–2017, 11.0% of adolescents ages 12–17 years old reported nonmedical use of prescription tranquilizers, sedatives, or stimulants, and 3.5% engaged in NMP opioid use over 12 months (Carmona et al., 2020). Access to substances in the home has been associated with substance use behaviors among adolescents (Windle, 2000). This finding holds for NMP drug use as adolescents have reported easy and unsupervised access to prescription drugs at home (Ross-Durow et al., 2013) and friends and family members are the most common sources of prescription drugs for nonmedical use (Hulme et al., 2018; McCabe et al., 2019). Together, these findings suggest that medicine cabinets may be a source of prescription drugs for nonmedical use, knowingly or unknowingly, to the prescription-holder. Thus, primary prevention efforts to deter adolescent NMP drug use should include family-based strategies to safeguard medications while using them, and to encourage the disposal of unused medications, thereby minimizing adolescents' unsupervised access to prescription medications in the home.

The Food and Drug Administration (FDA) recommends disposing of unused medications, such as prescription opioids, promptly at a disposal program (e.g., take-back event or dropbox) and, if one is not available, to dispose of medications at home (FDA, 2019). Disposal of unused medications is an important substance-specific parenting practice for adolescent prevention programs (SAMHSA, 2020). However, research related to the medication disposal behaviors of parents is scant. Among a clinical sample of parents with children between 12–18 years of age and with a household member who had been prescribed a controlled medication, 83.5% of parents reported disposing of unused medications, and the majority (77.0%) utilized a disposal program (Engster et al., 2019). Parents who practiced unsafe household management, including inadequate storage and disposal behaviors, were more likely to hold risky attitudes about prescription medication (e.g., the belief that it is acceptable to share medication with others or take someone else's medication one or more times; Engster et al., 2020). In comparison, a study utilizing a school-based sample found that 17.8% of parents, living in a household that was prescribed a controlled medication in the past year, disposed of unused of medications; among those who disposed of these medications, 36.7% used a disposal program. Awareness of disposal

programs was significantly associated with their use and inversely associated with the disposal of unused medications at home. Additionally, having a household member who was prescribed an opioid medication, compared to other controlled medications, was associated with an increased likelihood of disposing unused medication (Egan, Gregory, Wolfson, et al., 2019).

The identification of modifiable attitudes and beliefs for disposing of unused medications is needed to augment disposal strategies. In this study, we used the Social Norms Theory (Perkins & Berkowitz, 1986), the Theory of Reasoned Action (Fishbein, 1979), and the Theory of Planned Behavior (Ajzen, 1991) to inform the selection of modifiable attitudes and beliefs for disposing of unused medications. In accordance with the Social Norms Theory (Perkins & Berkowitz, 1986), peer use of substances is a robust predictor of an adolescent's own substance use (Prinstein et al., 2001; Windle, 2000), including NMP drug and opioid use (Egan, Gregory, Osborne, et al., 2019; Nargiso et al., 2015; Osborne et al., 2017). Parents' awareness or perceptions that their child's friends are engaging in substance use may induce them to alter their own behaviors, such as securely storing (Friese et al., 2013) or disposing of substances in the home. The Theory of Reasoned Action and the Theory of Planned Behavior suggest that behavior is guided by the perceived normative expectations of others (e.g., perceived approval) and the perceived consequences of the behavior (e.g., perceived risk). These perceptions result in the formation of a behavioral intention, and ultimately, the behavior of interest (Ajzen, 1991; Fishbein, 1979). Parents' permissive attitudes about substances reflect messages about approval of use by their children or other youth. These parental attitudes towards substance use have been associated with their children's actual use (Bahr et al., 2005; Lipari et al., 2012; Tael- Öeren et al., 2019). Not only are permissive parental attitudes directly related to youth behavior, but they are also linked towards more lenient substance-specific parenting practices (Koning et al., 2010). However, youth are less likely to engage in substance use when their parents clearly communicate with them about the risks of substance use and use language and actions that relay messages of disapproval of substance use (Brooks-Russell et al., 2015; Collins et al., 2011; Conn & Marks, 2014; Fleary et al., 2013). Related to prescription drugs, permissive attitudes about the severity or consequences of NMP drug use may lessen their likelihood of removing unused medications from the home. Thus, modifiable factors such as use by child's peers, parental disapproval of use, and perceived risk of harm may promote parental disposal of unused medications, thus preventing future NMP drug use among adolescents.

In the current study, we sought to expand upon the literature by examining modifiable factors associated with disposal of unused prescription drugs by parents of adolescents. We hypothesized that parents would be more likely to dispose of unused prescription medications if they were aware of disposal programs in their community, perceived that their child's close friends engaged in NMP drug use, disapproved of adolescent NMP drug use, perceived adolescent NMP drug use to be high risk, and perceived NMP drugs to be readily available for adolescents to use nonmedically. Based on previous research (Egan, Gregory, Wolfson, et al., 2019), we hypothesized that these relationships would be more pronounced for the use of community-based disposal programs compared to disposal of medications at home.

Methods

Research design

We analyzed secondary data from surveys conducted in the fall of 2017 by a Regional Prevention Center (RPC) in south central Kentucky. All ten county public school systems served by the RPC were invited and, subsequently, chose to participate in the survey. The median population size of the 10 participating counties was 18,345 (range: 10,004 – 131,264); they were, on average, 78% rural (range: 31.2% - 100%); and the majority of residents reported being non-Hispanic White (mean: 92.6%; range: 80.6–99.4%; US Census Bureau, 2019). Parents of students enrolled in 12 middle and 10 high schools within the participating counties were recruited to participate in the “Parent’s Voice Community Survey.” This survey was an anonymous, voluntary, paper survey distributed by each school as part of a back-to-school packet. Parents were informed that the purpose of the survey was to collect information to make their community a better place for their children and were instructed to maintain anonymity by not writing their or their child’s name on the survey, to skip any questions they did not feel comfortable answering, and to mail the survey to the survey administrator via a preaddressed envelope. A total of 4,148 parents completed the survey. We restricted the analytic sample (15%) to parents who reported that they or someone in their household had been prescribed an opioid medication within the past year and did not have missing data ($N=627$; 84.1% female, 88.5% White, 68.3% 25–44 years of age; see Table 1). The Wake Forest School of Medicine Institutional Review Board approved the study protocol for secondary data analysis.

Disposal programs

The surveyed region had both Drug Enforcement Administration (DEA)-sponsored take-back events and permanent disposal units (i.e., dropboxes) available prior to the survey. Take-back events were commonly held biannually by law enforcement agencies and all counties had at least one dropbox. Marketing of take-back events and dropboxes consisted of periodic advertisements in newspapers and on social media, inserts within pharmacy bags at checkout, and printed labels on controlled substances.

Measures

Disposal behaviors.—We assessed disposal behaviors (the dependent variable) with the following question: “Within the past 12 months, how have you disposed of your prescription medications?” The response options were “drug take-back event,” “permanent disposal site,” “trash,” “flushed in the toilet,” “N/A, did not dispose,” and “N/A, no prescriptions.” We created two separate variables using this survey question to assess disposal behaviors: any disposal and mechanism of disposal. We created a dichotomous variable to determine *any* versus *no* disposal of unused medications. Participants who endorsed disposal of medications via a “drug take-back event,” “permanent disposal site,” “trash,” or “flushed in the toilet,” and did not select “N/A, did not dispose” or “N/A, no prescriptions” were coded as ‘yes’ for any disposal; the other two were coded as ‘no’ for any disposal. We created a trichotomous variable to assess the mechanism of disposal: use of a disposal program (i.e., take-back events and dropboxes); disposal at home (i.e., flushing down the toilet and throwing them in the trash); and no disposal. If participants reported that they had disposed

of unused prescription medications at a “drug take-back event” or “permanent disposal site,” we coded their response as ‘use of a disposal program.’ Individuals within this category may have also disposed of their unused medications at home; however, they were included as the experience of using a disposal program was expected to differentiate them from participants who have never used this program. If participants reported they had disposed of unused prescription medications via the “trash” or “flushed in the toilet,” and did not endorse use of a “drug take-back event” or “permanent disposal site,” we coded their response as ‘disposal at home.’ If participants selected “N/A, did not dispose” or “N/A, no prescriptions,” we coded their response as ‘no disposal.’

Awareness of disposal programs and attitudes and beliefs about NMP drug

use.—We assessed whether or not parents were *aware of disposal programs* in their communities with two survey questions: (1) “Does your community participate in drug take-back events?” and (2) “Does your community have permanent medication disposal boxes where you can drop off your unused medications?” To create a single item on *awareness of disposal programs*, we coded affirmative answers to either of the two questions as ‘yes’ and negative responses to both questions as ‘no.’

We assessed *perceptions of NMP opioid use by their child’s peers* with the following question: “Think about people about your child’s age who your child considers to be their best friends. Over the past 12 months, how many of them do you think used prescription pain killers (e.g., Hydrocodone) to get high?” Response options were based on a 5-point Likert-type scale ranging from “none of them used” to “all of them used.” We recoded these responses into ‘none of them used’ versus ‘any of them used.’

To assess *perceived risk of NMP opioid use by adolescents*, parents were asked the following question: “How much do you think adolescents risk harming themselves physically or in other ways if they use prescription pain killers (e.g., Hydrocodone) to get high?” Response options were based on a 4-point Likert-type scale ranging from “no risk” to “great risk.” We collapsed the two middle response options into ‘slight/moderate risk.’

We examined *disapproval of NMP drug use by their child* with the following question: “How wrong do you feel it would be for your child to use prescription drugs that are not prescribed to them?” Response options were based on a 4-point Likert-type scale ranging from “not at all wrong” to “very wrong.” We consolidated the four responses into two: ‘very wrong/wrong’ and ‘a little bit wrong/not wrong at all.’

We assessed *perceived availability of prescription drugs* with the following question: “In your community, if youth your child’s age wanted to get any of the following, how easy would it be for them to get prescription drugs/pills?” Response options were based on a 4-point Likert-type scale ranging from “very hard” to “very easy,” and we categorized them into ‘very/sort of hard’ and ‘very/sort of easy.’

Parental sociodemographic characteristics.—Sociodemographic characteristics were used as covariates in statistical modeling. We included the parent’s sex, age, race, educational attainment, and marital status as covariates. Additionally, we determined the

type of school that the parent's child attended (middle vs. high school) based on the schools that were surveyed and included school type as a covariate.

We restricted analyses to parents who had a member of the household prescribed an opioid medication within the past 12 months. We assessed if a member of the household had been prescribed an opioid medication within the past year with the question "Within the past 12 months, has anyone in your household been prescribed any of the following?" and the option to select "pain killers" (other options were "ADHD medication" and "anxiety medication").

Data Analysis

We calculated descriptive statistics to describe the sociodemographic characteristics and modifiable risk factors by any disposal, mechanism, and type of medicine disposal. We conducted generalized logit mixed models adjusted for within-school clustering by treating school as a random effect to assess differences between disposal behaviors (i.e., the dependent variable) based on modifiable risk factors (i.e., the independent variables), while controlling for possible covariates (i.e., sociodemographic characteristics). Additionally, we conducted a binomial generalized logit mixed model to examine any disposal versus no disposal and a multinomial generalized logit mixed model to assess differences among the three mechanisms of disposal. We excluded cases with missing data ($n=131$) in the descriptive statistics and generalized logit mixed models. We conducted analyses with SPSS version 25 (IBM Corp., Armonk, NY).

Results

Disposal behaviors

Among our sample of 627 parents, 41.9% ($n=263$) reported disposing of unused medications within the past 12 months. There were 90 (14.4%) parents who used a disposal program, and 173 (27.6%) parents who disposed of medications at home. Of those who used a disposal program, 36.7% ($n=33$) used a take-back event and 66.7% ($n=60$) used a dropbox. A small percentage of parents who used disposal programs also reported flushing medications (4.4%; $n=4$) and discarding them in the trash (6.7%; $n=6$). Among those who only disposed of medications at home, 46.2% ($n=80$) flushed the unused medications and 59.0% ($n=102$) discarded them in the trash.

Association between awareness, attitudes, and beliefs with disposal behaviors

The odds of a parent disposing of unused medications using a disposal program were higher for those who were aware of disposal programs in their community as compared to those who were not aware of them ($AOR=2.34$; 95% CI:1.30, 4.37; referent=no disposal; and $AOR=2.45$; 95% CI:1.30, 4.60; referent=home disposal). Parents who believed that any, compared to none, of their child's close friends used prescription opioids nonmedically had significantly higher odds of reporting any disposal ($AOR=1.64$; 95% CI: 1.03, 2.62; referent=no disposal) and use of a disposal program ($AOR=3.06$ 95% CI:1.64, 5.70; referent=no disposal; and $AOR=2.70$; 95%:1.35, 5.39; referent=home disposal). Parents who perceived that prescription drugs were easily accessible to adolescents in their community had lower odds of disposing of medications using a disposal program compared to parents

who thought that they were difficult to obtain ($AOR=0.52$; 95% CI:0.29, 0.93; referent=home disposal). Parental perceptions of harm and disapproval were not statistically associated with disposal of prescription medications.

Association between sociodemographic characteristics and disposal behaviors

As shown in Table 2, the odds of a parent disposing of unused medications using a disposal program were higher for those who were 45–64 years of age compared to those who were 25–44 years of age ($AOR=1.83$; 95% CI:1.12, 3.30; referent=home disposal). Parents who attained a college degree or higher were significantly less likely, compared to parents who attained less than a college degree, to dispose of unused medications at home ($AOR=0.66$; 95% CI:0.44, 0.97; referent=no disposal). There were no other statistically significant relationships between sociodemographic characteristics (i.e., sex, race, educational attainment) and medicine disposal behaviors.

Discussion

We found that 58.1% of parents of adolescents, with household members who had been prescribed an opioid medication in the past 12 months, did not dispose of unused medications within the same timeframe. Of the almost 42% who did report disposing unused medications, 34.2% used a disposal program, and 65.8% disposed of medications at home. We identified three modifiable factors associated with disposal of unused medications by parents of adolescents: awareness of disposal programs, the perception that child's peers use NMP opioids, and the perception that prescription drugs were unavailable to adolescents. Consistent with previous research (Egan, Gregory, Wolfson, et al., 2019), we found that parents who were aware of disposal programs were more likely to dispose of unused medications by using a disposal program. One novel finding from this study was that parents who believed that their child's peers used prescription opioids nonmedically were more likely to dispose of unused medications. Unexpectedly, another finding was that parents who believed that prescription drugs were accessible to adolescents for nonmedical use were *less likely* to dispose of medications using a disposal program rather than dispose of them at home. We found no relationship between perceptions of harm and disapproval with disposal behaviors. These findings suggest that enhancing awareness of disposal opportunities, while addressing nonmedical use of prescription drugs by adolescents in disposal messaging, may encourage parents to dispose of unused medications using community-based programs.

Consistent with previous findings (Egan, Gregory, Wolfson, et al., 2019), parents were more likely to use disposal programs (compared to both no disposal and disposal at home) if they were aware of their availability in their community. Even among those who reported using a disposal program, 20% were not aware that a disposal program existed within *their* own community. Possible implications of -- or reasons for -- this finding could be that some individuals may have traveled to other communities to dispose of their unused medications, or that the respondent's perception of community may not reflect our definition of community (e.g., neighborhood vs county), or that there was misreporting of disposal practices during data collection. We did not find a relationship between awareness of disposal programs and any disposal of unused medication, and we found a weak relationship

between awareness of disposal programs and home disposal. Our findings suggest that parents who have been exposed to information about disposal programs may be less likely to dispose of medications at home. Currently, the Food and Drug Administration (FDA) describes ways in which medications can be disposed of using both programs as the preferred method, and how they should be disposed of in the home, if formal disposal programs are not available (FDA, 2019). However, other messaging may only promote the use of disposal programs while advising against disposing of medications at home (e.g., “Medicine Disposal Myths and Facts,” n.d.). Further research is needed to better understand how parents interpret guidance on disposal of unused medication and its impact on their disposal behaviors.

A novel finding of our study is that parents who perceived that their children’s close friends engaged in NMP opioid use were more likely to report any disposal of unused medications and to report the use of a disposal program. Additionally, we found a weak, but not statistically significant, relationship between perception of NMP opioid use by child’s peers and home disposal. This finding confirms our hypothesis that parents’ awareness, or perception, of their child’s friends’ NMP opioid use may induce them to alter their own behaviors, specifically, securely disposing unused medications. It is beneficial that these parents are disposing of unused medications given that their own children are at heightened risk of use based on the research that suggests peers’ use of substances is a robust predictor of adolescent substance use (Prinstein et al., 2001; Windle, 2000), including NMP opioid use (Egan et al., 2019; Nargiso et al., 2015). It may be that these parents are more knowledgeable about the prevalence of adolescent NMP opioid use due to potential exposure to disposal messaging and campaigns. Prospective studies would lend more information about the directional relationship between these perceptions and disposal behaviors.

We hypothesized that parents would be more likely to dispose of unused prescription medications if they perceived NMP drugs to be easily accessible by adolescents in their community. Unexpectedly, we found that parents who perceived that prescription drugs were easily accessible by adolescents who sought to obtain them were less likely to report disposing medications using a formal disposal program than doing so at home. Potentially, parents who perceived that medications were easily available to adolescents may have elected to dispose of them using a disposal program, prior to completion of our survey, and may subsequently come to believe that ease in availability of these medications has been reduced. This may be more pronounced if parents utilize a disposal program rather than dispose of medications at home. This unanticipated finding further supports the need for longitudinal research to examine parental attitudes and beliefs over time in relation to their disposal behaviors.

We did not find a relationship between disapproval of adolescent NMP drug use and perceived risk of harm with disposing unused medications. The vast majority (over 99%) of the sample reported that they believed NMP drug use to be very wrong or wrong, and over 75% believed that the nonmedical use of prescription drugs posed a great risk. However, we are not able to determine with confidence whether these were actual beliefs or subject to social desirability bias. Additionally, parents were only queried about their level of disapproval of adolescent NMP drug use, and not specifically about NMP opioid use, which

may have impacted the strength of the relationship between disapproval and disposal. Regardless, the lack of variation in these variables likely made statistical significance difficult to ascertain.

Our findings, when considered in conjunction with previous research (Egan, Gregory, Wolfson, et al., 2019), reinforce the need to implement prevention strategies, such as influential educational materials and mass media campaigns, that are designed to raise awareness of behavior change opportunities. These opportunities include disposal of unused medicine by parents seeking to reduce adolescent NMP drug use. These messages should consider including information about the prevalence of NMP drug use among adolescents and how to dispose of unused medications. Implementation of both universal primary prevention strategies, such as mass media campaigns (Yanovitzky, 2016), and indicated primary prevention strategies, such as delivery of educational materials by the medical community to parents whose child is prescribed a medication with abuse potential, may increase the likelihood of prescription drug disposal. Several studies have examined the potential impact of delivering educational materials about disposal (Hasak et al., 2018; Maughan et al., 2016; McCauley et al., 2013) and drug deactivation products (Lawrence et al., 2019; Stokes et al., 2020) following surgery by medical staff. To our knowledge, only one study has examined delivery of educational materials to the parents of children who have been prescribed opioids for pain management following urologic or otolaryngologic surgery, which found that the provision of a drug deactivation product along with educational materials facilitated disposal of unused medication (Lawrence et al., 2019). Research including parents of children and adolescents who have been prescribed opioids for a range of medical procedures or diagnoses would enhance the evidence of this prevention strategy.

Messaging alone may be insufficient to facilitating disposal as there may be other barriers to disposal of unused prescription opioids. The physical distance to disposal programs may be a barrier, especially among rural populations (Gray et al., 2015). Additionally, the location of dropboxes at law enforcement agencies may be a deterrent to some individuals (Helme et al., 2020). The increasing proliferation of dropboxes at pharmacies (Egan et al., 2018) may mitigate barriers to access and concerns about the location of disposal programs.

There are several limitations that should be taken into consideration in the interpretation of the results of our study. While we did ask if someone in the household was prescribed an opioid medication, we were not able to discern if or how much excess medication they had, nor the type of medication. The items that assessed receipt of a controlled medication and disposal of a prescription drug were in close proximity, but we cannot infer how the participant perceived the meaning of “prescription drug.” We believe that the relationships between the modifiable factors and disposal behaviors would be strengthened if a specific controlled medication was specified. Future research should specify a control medication to thoroughly assess appropriate disposal options. While our survey questions have been used previously (Egan, Gregory, Wolfson, et al., 2019), we are not aware of efforts to test or validate the survey items. Disposal types were restricted to the most common disposal programs at the time of data collection; other disposal methods, including deactivation products, were not captured. There is a possibility of recall bias as disposal behavior over the

past year was queried. Parents may have provided socially desirable responses pertaining to medication disposal, attitudes, and beliefs rather than true responses. If parents had multiple children in different schools (e.g., middle and high), they may have been invited and, subsequently participated in the survey more than once. The results of our study, which was conducted in south central Kentucky, may not be generalizable to other communities.

Our study provides evidence that enhancing awareness of disposal opportunities, while addressing nonmedical use of prescription drugs by adolescents in disposal messaging, may facilitate disposal of unused medications by parents. This strategy may be most beneficial for parents who perceive that their child's close friends use prescription opioids nonmedically. Future research and intervention studies are needed to examine if increasing awareness of disposal opportunities and messaging that addresses adolescent NMP opioid use increases the disposal of unused or expired medications among parents of adolescents.

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Table 1.

Sample Characteristics ($N=627$ parents with a household member prescribed an opioid medication in the past year)

	Overall ($N=627$) n (%)	No Disposal ($n=364$) n (%)	Any Disposal ($n=263$) n (%)	Program ($n=90$) n (%)	Home ($n=173$) n (%)
Any disposal					
Yes	263 (41.9)	-	263 (100)	90 (100)	173 (100)
No	364 (58.1)	364 (100)	-	-	-
Mechanism of disposal					
Program	90 (14.4)	-	90 (34.2)	90 (100)	-
Home	173 (27.6)	-	173 (65.8)	-	173 (100)
Type of disposal					
Take-back event	34 (5.4)	-	33 (12.5)	33 (36.7)	-
Dropbox	69 (11.0)	-	60 (22.8)	60 (66.7)	-
Flush	92 (14.7)	-	84 (31.9)	4 (4.4)	80 (46.2)
Trash	116 (18.5)	-	108 (41.1)	6 (6.7)	102 (59.0)
Sex					
Male	100 (15.9)	60 (16.5)	40 (15.2)	12 (13.3)	28 (16.2)
Female	527 (84.1)	304 (83.5)	223 (84.8)	78 (86.7)	145 (83.8)
Age					
25–44	428 (68.3)	250 (68.7)	178 (67.7)	53 (58.9)	125 (72.3)
45–64	181 (28.9)	107 (29.4)	74 (28.1)	33 (36.7)	41 (23.7)
65 and up	18 (2.9)	7 (1.9)	11 (4.2)	4 (4.4)	7 (4.0)
Race					
White	552 (88.5)	321 (88.4)	231 (88.5)	83 (93.3)	148 (86.0)
Black	28 (4.5)	16 (4.4)	12 (4.6)	2 (2.2)	10 (5.8)
Other	44 (7.1)	26 (7.2)	18 (6.9)	4 (4.5)	14 (8.1)
Educational attainment					
< College Degree	352 (56.1)	192 (52.7)	160 (60.8)	50 (55.6)	110 (63.6)
College Degree +	275 (43.9)	172 (47.3)	103 (39.2)	40 (44.4)	63 (36.4)
Marital status					
Now married	462 (73.7)	265 (72.8)	197 (74.9)	71 (78.9)	126 (72.8)
Not now married	165 (26.3)	99 (27.2)	66 (25.1)	19 (21.1)	47 (27.2)
Grade of child					
Middle	276 (44.0)	165 (45.3)	111 (42.2)	32 (35.6)	79 (45.7)
High	351 (56.0)	199 (54.7)	152 (57.8)	58 (64.4)	94 (54.3)
Awareness of disposal programs					
Yes	421 (67.1)	328 (65.4)	183 (69.6)	72 (80.0)	111 (64.2)
No	206 (32.9)	126 (34.6)	80 (30.4)	18 (20.0)	62 (35.8)
Peer use					
None of them used	529 (84.4)	319 (87.6)	210 (79.8)	64 (71.1)	146 (84.4)
Any of them used	98 (15.6)	45 (12.4)	53 (20.2)	26 (28.9)	27 (15.6)

	Overall (N=627) n (%)	No Disposal (n=364) n (%)	Any Disposal (n=263) n (%)	Program (n=90) n (%)	Home (n=173) n (%)
Perceived risk					
Great risk	442 (72.8)	262 (74.9)	180 (70.0)	62 (69.7)	118 (70.2)
Slight/Moderate risk	113 (18.6)	57 (16.3)	56 (21.8)	19 (21.3)	37 (22.0)
No risk	52 (8.6)	31 (8.9)	21 (8.2)	8 (9.0)	13 (7.7)
Disapproval of misuse					
Very wrong/Wrong	621 (99.0)	361 (99.2)	260 (98.9)	89 (98.9)	171 (98.8)
Little bit wrong/Not wrong at all	6(1.0)	3 (0.8)	3(1.1)	1(1.1)	2(1.2)
Perceived availability					
Very/Sort of hard	350 (55.8)	208 (57.1)	142 (54.0)	51 (56.7)	91 (52.6)
Very/Sort of easy	277 (44.2)	156 (42.9)	121 (46.0)	39 (43.3)	82 (47.4)

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Table 2.

Logistic regression analyses predicting any and mechanism of disposal by sociodemographic characteristics and modifiable risk factors ($N=627$)

	Any vs. None <i>AOR (95% CI)</i>	Program vs. None <i>AOR (95% CI)</i>	Home vs. None <i>AOR (95% CI)</i>	Program vs. Home <i>AOR (95% CI)</i>
Sex				
Female vs. Male (ref)	1.12(0.71, 1.77)	1.48 (0.74, 2.99)	0.99(0.59, 1.65)	1.55 (0.72, 3.33)
Age				
25–44 (ref)				
45–64	1.00 (0.69, 1.45)	1.46(0.87, 2.45)	0.81 (0.53, 1.26)	1.83 (1.12, 3.30)*
65 and up	2.20 (0.82, 5.91)	2.84(0.77, 10.57)	1.98 (0.66, 5.94)	1.46 (0.38, 5.53)
Race				
White (ref)				
Black	1.20 (0.54, 2.64)	0.55 (0.11, 2.64)	1.46 (0.63, 3.39)	0.39(0.08, 2.00)
Other	1.09(0.57, 2.08)	0.76(0.25,2.35)	1.27(0.62, 2.59)	0.77(0.50, 1.20)
Educational attainment				
College Degree + vs. < College Degree (ref)	0.74(0.52, 1.04)	0.94(0.57, 1.54)	0.66 (0.44, 0.97)*	0.63 (0.19, 2.08)
Marital status				
Now married vs. not now married (ref)	1.17(0.80, 1.71)	1.37(0.76, 2.46)	1.08 (0.71, 1.66)	1.26 (0.66, 2.37)
Grade of child				
High vs. Middle (ref)	1.03 (0.72, 1.49)	1.28(0.75,2.21)	0.93 (0.60, 1.44)	1.39(0.77, 2.51)
Awareness of disposal programs				
Yes vs. No (ref)	1.57(0.84, 2.95)	2.34(1.30, 4.37)**	0.95 (0.64, 1.42)	2.45 (1.30, 4.60)**
Peer use				
Any of them used vs. None of them used (ref)	1.64(1.03,2.62)*	3.06(1.64, 5.70)***	1.11 (0.64, 1.94)	2.70(1.35, 5.39)**
Perceived risk				
No risk (ref)				
Slight/Moderate risk	1.57(0.84, 2.95)	1.41 (0.55, 3.62)	1.63 (0.80, 3.33)	0.86(0.30, 2.43)
Great risk	1.15 (0.67, 1.97)	1.05 (0.46, 2.40)	1.17(0.63,2.18)	0.89(0.36, 2.24)
Disapproval of misuse				
Very wrong/Wrong vs. A little bit wrong/Not wrong at all (ref)	0.77(0.15,4.06)	0.91 (0.08, 9.79)	0.69(0.11,4.47)	1.25 (0.10, 16.08)
Perceived availability				
Very/Sort of easy vs. Very/Sort of hard (ref)	1.27(0.89, 1.81)	0.67(0.39, 1.13)	1.28 (0.86, 1.92)	0.52(0.29, 0.93)*

Note. *AOR*–Adjusted Odds Ratio; *CI*–Confidence Interval.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.