Published in final edited form as:

Drug Alcohol Depend. 2009 January 1; 99(1-3): 58–67. doi:10.1016/j.drugalcdep.2008.06.013.

Correlates of extramedical use of OxyContin® versus other analgesic opioids among the US general population

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Abstract

Background—There has been substantial public and media attention regarding extramedical use of OxyContin®, but few studies focus on the characteristics of extramedical OxyContin® users and whether they differ from extramedical other opioid users.

Methods—We used data from 8,218 respondents who were past-year extramedical opioid analgesic users in the 2005 and 2006 National Survey of Drug Use and Health (NSDUH). We investigated differences in socio-demographic and psychiatric characteristics associated with past-year extramedical OxyContin® use (n=1,144) versus extramedical other opioid analgesics use (n=7,074). Data on opioid sources was compared among past-month users. We also compared extramedical opioid users (n=8,218) versus other drug users (n=16,214), and individuals with an analgesic disorder who had past-year extramedical OxyContin® use (n=339) versus those with other opioid use (n=820).

Results—Past-year opioid users were more likely than users of other illegal drugs to be more educated and have a past-year major depressive episode. Past-year OxyContin® users were more likely than other opioid users to be 18–25 years old (aOR=1.9[1.1,3.2]), and have mental health and deviant behavior problems. Those with past-year analgesic disorder who used OxyContin® were more likely to be younger, sell illegal drugs (aOR=2.5[1.5,4.2]), and use illegal drugs than those who used other opioids. Past-month OxyContin® users were more likely than past-month other opioid users to buy analgesics from drug dealer/other stranger and obtain opioid analgesics from multiple sources.

Conclusion—Our findings point out differences between OxyContin® and other opioid users that might help prevention specialists and assist efforts to curb opioid analgesics diversion.

Keywords

OxyContin®; Opioid use disorders; Mental health

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1. Introduction

There has been substantial public and media attention regarding the ‘extramedical’ use (defined as ‘use of a drug or medicine to get high, using more than prescribed, using it for indications other than those intended by the prescriber, or for other experiences, sensations, or effects beyond the boundaries of approved prescribing procedures or indications as dispensed’ - Anthony et al., 1994) of the opioid analgesic OxyContin®. OxyContin® is a sustained-release oxycodone (a schedule II opioid analgesic) preparation with twice the potency of morphine that is typically prescribed for chronic pain and pain associated with cancer (Curtis et al., 1999; DEA, 2005; Carise et al., 2007). OxyContin® has become a target for abusers of controlled substances because of the larger amounts of the active ingredient in relation to other previous oxycodone products and the ability of abusers to easily compromise the sustained-release formulation. Cicero and colleagues (2007a) have shown a strong correlation between therapeutic opioid analgesic use and extramedical use of opioid analgesics in portions of the U.S. OxyContin® has the highest rates of extramedical use among opioid analgesics when data are corrected for the number of persons filling a prescription (Cicero et al., 2007a). In this study, we will explore differences among a population sample of individuals using opioid analgesics in ways other than intended by the health care system, more specifically; we compare extramedical users of OxyContin® and those with analgesic disorders who use OxyContin® to users of other opioid analgesics.

The proportion of the US population aged 12 years of age or older ever using opioid analgesics for extramedical purposes has more than doubled in less than 10 years; 5.8% in 1998, 9.8% in 2001, and 13.6% in 2006 (SAMSHA, 2007). Epidemiologic studies in the US describe demographic characteristics, drug use and deviant behaviors associated with extramedical opioid analgesic use (Simoni-Wastila et al., 2004; McCabe et al., 2005a, 2005b, 2005c, Sung et al., 2005, Becker et al., 2008a; Tetrault et al., 2007; Wu et al., 2008) and disorders (Becker et al., 2008a, 2008b). Studies of clinical pain populations and of opioid analgesic users in the general population have found positive associations between extramedical use of analgesic opioids with psychiatric disorders and illegal drug use (Busto et al., 1998; Romach et al., 1999; Reid et al., 2002; Rosenblum et al., 2003; Dowling et al., 2006, Huang et al., 2006; Becker et al., 2008a). Drug diversion and sources of opioids include ‘doctor shopping’, leftover supplies from physical illness, friends, buying prescription drugs on the streets, pharmacy and hospital theft, and ‘stealing from family member’s medicine cabinet’ (Inciardi et al., 2007). Very few studies compared opioid analgesic users to other substance users, most of them compared opioid analgesic users to non-opioid analgesic users in the general population (that might or not be using other substances). Of note, Becker and colleagues (2008b) found that respondents aged 12–16 years old, women, and unemployed were more likely to have an opioid use disorder (including those with heroin use disorder) than a non-opioid substance use disorder.

Extramedical OxyContin® users are often found to be White, male, unemployed, using a wider array of other drugs and they score higher on the family problem areas of the Addiction Severity Index as compared to those who use other opioids (Carise et al., 2007, Grau et al., 2007). Similar problem behavior and drug involvement have been found among high school seniors using Vicodin® and OxyContin® (McCabe et al., 2005a). Using data from 1999–2001 collected as part of an annual US national survey of household residents aged 12 years and older, lifetime extramedical OxyContin® use was more common among those aged 18–25 years old versus those in older age groups, and users were more likely to be White, to live in smaller metropolitan or rural areas, to use other illegal drugs, and to meet criteria for analgesic opioid and other drug disorders as compared to lifetime users of other opioid analgesics (Sees et al., 2005). Analgesic abuse/dependence disorders are more common among OxyContin® users (24.5%) than among those using other opioid analgesics (13.2%) (SAMHSA, 2007). Yet very few studies examine

whether the characteristics of OxyContin® users differ from those who use other opioid analgesics (Sees et al., 2005; Carise et al., 2007, Grau et al., 2007).

Thus, building upon previous research, we sought to contribute new findings on the basic descriptive epidemiology of opioid analgesic use from more recent national representative samples. Since 2004 the NSDUH has included questions that assess OxyContin® use in the 12 months prior to the assessment. Using NSDUH data, this study's main aim was to investigate differences in demographic, psychiatric characteristics and sources (only past-month data available) associated with past-year OxyContin® use (comparing OxyContin® versus other opioid analgesic users). By focusing on past-year users, we lessen subject recall bias often associated with lifetime measures (Grant et al., 2004; Desai and Potenza, 2008). Past-year measures are also useful because they characterize the potential burden by estimating the magnitude or number of 'active' drug users requiring intervention or treatment (Anthony and Helzer, 2002). We begin by describing the extramedical opioid analgesic users and explore personal characteristic differences between the opioid users and users of illegal drugs (e.g., marijuana, cocaine, heroin, hallucinogens, inhalants) and other extramedical prescription drugs (e.g., stimulants, sedatives and tranquilizers). Then, within the subsample of extramedical opioid analgesic users, we examine whether OxyContin® use is associated with different personal and psychiatric characteristics, and sources of opioids as compared to the characteristics of those using other extramedical opioid analgesic compounds.

2. Methods

2.1. Sample and Measures

We analyzed data from the 2005 (n=55,905) and 2006 (n=55,279) National Survey on Drug Use and Health (NSDUH) public use data files, two consecutive NSDUH years were combined in order to increase sample size. The NSDUH is sponsored by the Substance Abuse and Mental Health administration (SAMHSA) and is designed to provide estimates of the prevalence of extramedical use of legal drugs and illegal drugs in the household population of the United States 12 years of age and older (SAMSHA, 2006, 2007). The survey employs a 50 state design with an independent multistage area probability sample for each of the 50 states and the District of Columbia. African-American, Hispanics, and young people were over sampled to increase the precision of estimates for these groups. The response rate was 91% for household screening in 2005–2006, and 71% (2005) and 74% (2006) for completed interviews. Survey items were administered by computer-assisted personal interviewing conducted by an interviewer (CAPI) and audio computer-assisted self-interviewing (ACASI). Use of ACASI was designed to provide respondents with a highly private and confidential means of responding to questions and to increase the level of honest reporting of illegal drug use and other sensitive behaviors (SAMSHA, 2006, 2007). Respondents were offered a \$30 incentive payment for participation in the survey. There is no overlap of respondents between NSDUH 2005 and 2006. Detailed information about the sampling and survey methodology in the NSDUH are found elsewhere (SAMSHA, 2006, 2007). All respondents provided information about their drug experiences and other personal data (e.g., socio-demographic data). Socio-demographic variables selected for this study were age, sex, race/ethnicity, marital status, employment status, educational attainment, annual family income, insurance status, and population density of residence.

2.1.1. Measurement of extramedical analgesic opioid use, OxyContin® use, and extramedical opioid disorder—

A screening question assessed whether the respondent had ever used an analgesic that was not prescribed, or taken one for the experience or feeling it caused. If the response was positive, the respondent was given a card with pictures of many types of opioid analgesics and was asked which ones he/she had used, as well as frequency of use. Past-year opioid analgesic use was defined based on the response to the following question,

'how long has it been since you last used any prescription pain reliever that was not prescribed for you or that you took only for the experience or feeling it caused.' If the response indicated that extramedical use occurred during the preceding 12 months, the respondent was classified as an extramedical opioid analgesic user within the past-year.

The respondent was classified as an extramedical user of OxyContin® if he/she identified having used OxyContin® when given the card with opioid analgesics types and past-year OxyContin® was defined based on the response to the following question, 'how long has it been since you last used OxyContin® that was not prescribed for you or that you took only for the experience or feeling it caused.' If the response indicated that extramedical use occurred during the preceding 12 months, the respondent was classified as a past-year extramedical opioid OxyContin®. Based on responses to these questions we subdivided the NSDUH sample of extramedical opioid analgesic users (n=8,218) into 2 mutually exclusive groups: 1) past-year extramedical users of OxyContin®, (who could use other opioid analgesics, n=1,114), and 2) past-year extramedical users of other opioid analgesics (non-OxyContin® users, n=7,074). For simplicity, from this point onwards extramedical opioid and OxyContin® users are simply referred to as users of these drugs.

Respondents who had used opioids in the year preceding the assessment were asked several items that assessed DSM-IV opioid analgesic abuse and dependence (APA, 1994). NSDUH researchers classified individuals responding yes to three out of the seven dependence criteria or to at least one of the four abuse criteria as having a past-year analgesic disorder (SAMSHA 2006, 2007). Based on the extramedical opioid analgesic abuse and dependence variables available in the NSDUH, we subdivided past-year opioid analgesic users who met criteria for past-year opioid analgesic disorder into 2 subgroups: 1) past-year OxyContin® users (who could use other opioid analgesics) who met criteria for past-year opioid analgesic disorder (Analgesic disorder with OxyContin® use, n=339); 2) past-year other opioid analgesic users (who did not use OxyContin®) who met criteria for past-year opioid analgesic disorder (Analgesic disorder with other opioid analgesic use, n=820).

2.1.2. Other substance use—Data on past-year substance use was obtained via self-report in the NSDUH. Besides data on extramedical opioid analgesic use, past-year use of tobacco, alcohol, marijuana, cocaine, heroin, hallucinogens, inhalants, and extramedical use of several other prescription drugs (tranquilizers, stimulants and sedatives) was collected.

For the purpose of our initial set of analyses (to compare extramedical users of opioid analgesics to users of other drugs) we created an 'other drug use variable' (n=16,214) which combined data on any past-year illegal drug use (marijuana, cocaine, heroin, hallucinogens, inhalants) and extramedical use of other prescription drugs (tranquilizers, stimulants and sedatives) without use of opioid analgesics.

2.1.3 Mental health variables—Mental health status was assessed in the NSDUH in two ways. For example, clinical features of depression were assessed via several questions that allowed the NSDUH team to derive a proxy for major depressive episode while, on the other hand, other mental health variables were subject to a self-report recall of receiving health care for mental health problems (SAMSHA 2006, 2007).

Major depressive episode (MDE) questions were adapted from the depression section of the National Comorbidity Survey-Replication (NCS-R; Harvard School of Medicine, 2005), and the National Comorbidity Survey-Adolescent (NCS-A; Harvard School of Medicine, 2005). Adult and youth respondents were administered their respective age-appropriate depression module (for more details see SAMSHA 2006, 2007). MDE was classified as having at least five or more of nine DSM-IV clinical features (APA, 1994) nearly every day in the same 2-

week period, where at least one of the features was either a depressed mood or loss of interest or pleasure in daily activities. The questions specifically referred to ‘the worst or most recent period of time when the respondent experienced symptoms’ and thus those reporting these happening in the 12 months preceding the interview were classified as having a past-year major depressive episode. The adolescent depression module was made developmentally appropriate for youths, with minor wording changes in a few questions occurring between the adult and adolescent modules. For the purpose of our analyses we used the adult and adolescent past-year major depressive episode variable provided in the datafile created by the NSDUH team (SAMSHA, 2006, 2007).

Past-year anxiety disorder was assessed via a self reported acknowledgement that the respondent had been assessed by a health care professional. Respondents read a list of health conditions and marked any of the conditions that a doctor or other medical professional had ever told them they had. Anxiety disorder was listed as number one in this list. Then, respondents are asked: ‘Which, if any, of these conditions did a doctor or other medical professional tell you that you had in the past 12 months? Please type in the numbers of any that apply.’ Based on the response to these questions the NSDUH investigators created a past-year anxiety disorder variable that we use in this study.

Separate age-appropriate questions inquired about mental health treatment in the year preceding the interview. Both adult and adolescent respondents answered a series of questions that investigated whether they had seen a clinician for emotional, nervous, behavioral or mental health issues as well as if they had taken medications prescribed for them for mental health problems in the past-year (similar to Becker et al., 2007). All respondents that received either inpatient or outpatient mental health treatment in the past-year or reported receiving prescription medication for mental health treatment in the past-year were classified as receiving mental health treatment (SAMSHA, 2006, 2007). The NSDUH team produced dichotomous responses for adult and adolescent past-year mental health treatment separately which were combined into one variable in this study (because we are analyzing both adult and adolescent data combined).

2.1.4 Deviant behavior variables—To assess deviant behaviors we used the following NSDUH questions, chosen because they were identical for adults and adolescents (SAMSHA, 2006, 2007; similar to Martins et al., 2006): ‘During the past 12 months, how many times have you attacked someone with the intent to seriously hurt them?’, ‘During the past 12 months, how many times have you sold illegal drugs?’, ‘During the past 12 months, how many times have you stolen or tried to steal anything worth more than US\$50?’ Response options available in the 2005–2006 NSDUH were: never and 1 or more times (dichotomous response); and never, 1–2 times, 3–5 times, 6–9 times and 10 or more times (categorical response). In order to be parsimonious and because we were interested in the occurrence of the event, not in the frequency of the event per se, for this study, we chose to use the dichotomous response variables. We also selected the NSDUH variable that asked whether the respondent was involved in criminal activity in the past-year similar to Wu et al. (2008). All respondents answered the following questions: ‘Not counting minor traffic violations, have you ever been arrested and booked for breaking the law? Being ‘booked’ means that you were taken into custody and processed by the police or by someone connected with the courts, even if you were then released. Not counting minor traffic violations, how many times during the past 12 months have you been arrested and booked for breaking a law?’ NSDUH response options were ‘none’, ‘one time’, ‘two times’, ‘three or more times’, which we again recoded as dichotomous (yes/no) because we were interested in the simple occurrence of this event and not the frequency.

2.1.5. Opioid analgesic sources variables—Respondents who used opioid analgesics extramedically in the past 30 days were asked a series of questions on how they had access to

these types of drugs. The questions inquired about access via prescriptions, such as ‘doctor shopping’ or writing fake prescriptions, theft from clinics as well as friends/relatives, purchasing them from friends/relative or drug dealers, and obtaining them via the internet (SAMSHA, 2006, 2007).

2.2. Statistical Analyses

Data were weighted to reflect the complex design of the NSDUH sample and were analyzed by Stata 10.0 software (StataCorp, 2007). We used Taylor series estimation methods (STATA ‘svy’ commands) to obtain proper standard error estimates for the cross-tabulations and logistic regressions. Exploratory data analyses did not show any statistically significant differences in the NSDUH samples across years (data not shown, available upon request).

After basic contingency table analyses, we conducted a series of weighted unadjusted and adjusted (adjusted for age, race, gender, population density, marital status, education, and survey year) binary logistic regressions. First, we compared past-year opioid analgesic users to users of other illegal drugs (reference group) on socio-demographics, past-year mental health and deviant behaviors, and alcohol and tobacco use variables. Then, with past-year other opioid analgesic use as the reference, odds ratios and 95% confidence intervals were used to estimate the associations between socio-demographics, past-year mental health and deviant behavior variables, and other past-year substance use with past-year OxyContin® use. Unadjusted and adjusted results were fairly similar, and we present the adjusted results (aOR). We did not adjust for all covariate variables in order to avoid over-correlation and over-adjustment.

Then, we ran basic contingency tables and binary logistic regression models (adjusted for demographics and survey year) to compare past-year OxyContin® users who met criteria for past-year opioid analgesic disorders versus past-year other opioid analgesic users who met criteria for past-year opioid analgesic disorder.

Next, we tested for differences in sources of opioid use comparing OxyContin® and other opiate users (data available only for past-month users). Basic contingency tables were followed by binary weighted logistic regression models (adjusted for demographics and survey year). With past-month other opioid analgesic users as the reference, odds ratios and 95% confidence intervals were used to estimate the associations between opioid analgesic sources in the past-month with past-month OxyContin® use. Similar analyses were conducted to estimate the associations between opioid analgesic sources and opioid analgesic disorder (further subdivided by OxyContin® or other opioid use).

3. Results

3.1. Opioid users compared to other drug users

Among the NSDUH 2005–2006 respondents, 4.7% were opioid analgesic users and 9.6% individuals used other types of drugs (but did not use opioid analgesics). There were no employment status, income, health insurance status, or population density differences between opioid users and other drug users. However as seen in Table 1, there was a trend for opioid users to be female, opioid users were more likely to be aged 18–25 years old (as compared to those 35 years of age and older), among certain race/ethnicity groups (e.g., non-Hispanic White, Hispanic or of Other race/ethnicity as compared to non-Hispanic Black) and to have higher levels of education, as compared to other drug users. Opioid users were also more likely to have a major depressive episode, to receive mental health treatment, and to engage in deviant behaviors in the past year as compared to other drug users (Table 1). Alcohol and tobacco use was more common among other drug users.

3.2 OxyContin® users compared to other opioid users

In the NSDUH 2005–2006 combined sample, 0.5% used OxyContin® in the past year while 4.2% used other opioid analgesics in the past year. There were no employment status, income, or population density differences between OxyContin® users and other opioid analgesic users. OxyContin® users were more likely to be non-Hispanic White and Hispanic versus non-Hispanic Black, single, aged 18–25 years-old (versus aged 35 years and older), less educated, and uninsured ($aOR=1.5[1.1–2.1]$) as compared to those using other opioids. In addition, compared to use of other opioids, OxyContin® use was associated with more mental health and deviant behavior problems in the past year (Table 2), including the use of other substances and initiating use of other drugs at younger ages (initiate other drug use ≤ 12 years of age- $aOR=10.0[4.9,20.1]$). OxyContin® users tended to have been more frequent users of other opioid analgesics (data not shown, available upon request), specifically hydrocodone (84.6% vs. 65.3%), oxycodone (93.1% vs. 36.5%), and codeine (51.3% vs. 23.4%) for OxyContin® versus other opioids users, respectively.

3.3 Analgesic disorder by type of opioid analgesic use (OxyContin® versus other)

Of those who used opioid analgesics in the past-year, 14.4% met criteria for a past-year opioid analgesic disorder, 23% of them were OxyContin® users and 77% of them used other opioid analgesics. There were no employment status, income, or population density differences between respondents with analgesic disorders who were OxyContin® users or other opioid analgesic users. Among those with an analgesic disorder, respondents with OxyContin® use were more likely to be younger, non-Hispanic White, Hispanic or of Other race/ethnicity versus non-Hispanic Black, no longer married, and uninsured ($aOR=1.8[1.0,3.9]$). In addition, respondents with OxyContin® use were more likely to have been told by a medical professional that they had an anxiety disorder, but there were no differences in seeking mental health treatment or past-year MDE. Those using OxyContin® were also more involved with drugs, such as selling illegal drugs and using other drugs in the past year (Table 3).

3.4 Drug diversion or sources of opioid analgesics

Respondents who had used OxyContin® ($n=285$) or other opioid analgesics ($n=2,954$) in the past 30 days were asked about 10 different sources of opioid analgesics (Table 4). Overall, 25% of the past-month opioid users had obtained opioid analgesics from multiple sources, the most common sources for all opioid analgesics users were ‘getting analgesics from friends/relatives for free’ and ‘obtaining prescriptions from just one doctor’. There were very little distinction between the two opioid using groups in gaining access via various strategies that involved obtaining multiple or fake prescriptions (Table 4). Instead, the differences in access appear more prominently in where users can buy their drugs. Past-month OxyContin® users were four times more likely than past-month other opioid users to buy opioid analgesics from a friend/relative or a drug dealer/other stranger, and two times more likely to take analgesics from friends/relatives without asking. Most importantly, OxyContin® users were more than two times more likely to obtain opioid analgesics from several sources in the past month as compared to other opioid users. Of note, a very low proportion of past-month OxyContin® users and other opioid users bought opioid analgesics on the internet.

Buying analgesics from friends/relatives was also the most common source among those with an analgesic disorder with past-month OxyContin® use (64%, $n=123$), while getting analgesics from friends/relatives for free was the most common source among those with an analgesic disorder who used other opioids in the past month (50%, $n=533$). Among those with an analgesic disorder, those with OxyContin® use were more likely to buy analgesics from friends/relatives (64% vs. 27%, $aOR=3.4[1.7,7.0]$), buy analgesics from drug dealers/strangers (52% vs. 18%, $aOR=3.6[1.7,7.5]$), and obtain analgesics from multiple sources (67% vs. 41%, $aOR=1.8[1.0,3.3]$) versus those with other opioid use.

4. Discussion

Although other studies have compared opioid users to non-opioid users in the general population (Simoni-Wastila et al., 2004; McCabe et al., 2005a, 2005b, 2005c, Sung et al., 2005, Becker et al., 2008a; Tetrault et al., 2007; Wu et al., 2008), to our knowledge, this is the first epidemiologic study that finds that opioid users in the general population differ from other illegal drug users in several socio-demographic, mental health and deviant behavior characteristics. The main findings can be summarized as: 1) opioid users were more likely to be younger, White or Hispanic, better educated, to have a MDE, to have received mental health treatment, and to have engaged in deviant behaviors in the past-year as compared to other drug users; 2) OxyContin® users were more likely to be younger, White or Hispanic, less educated, uninsured and with more mental health and deviant behavior problems as compared to users of other opioids; 3) among those with an analgesic disorder, OxyContin® users were more likely to be younger, White or Hispanic, uninsured, have been told that they had a past-year anxiety disorder, and have greater involvement with illegal drugs, as compared to other opioid users; 4) OxyContin® users (including those with an analgesic disorder) were more likely than other opioid users to buy opioid analgesics from a friend/relative or a drug dealer/other stranger, and to obtain opioid analgesics from several sources.

Although OxyContin® use is associated with a higher level of mental health problems and deviant behaviors than other opioid use, it is important to put the proportion of use into perspective. Only a very small proportion of the general population sample (0.5%) used extramedical OxyContin® in the year prior to being surveyed. Thus, it does not seem that extramedical use of this particular drug constitutes a ‘major epidemic,’ in the entire United States as far more people (4.2%) are using other types of opioids extramedically within the same time frame. However, the prevalence of extramedical OxyContin® use is high in relation to other opioid analgesics in some geographical areas of the country, which, unfortunately, cannot be described with the NSDUH data (Cicero et al., 2007). Due to the characteristics of OxyContin® (which contains larger amounts of the active ingredient in relation to other previous oxycodone products), its use should continue to be monitored.

Our sociodemographic profiles and the associations with past-year use are similar to those from Sees et al. (2005) and Becker et al. (2008b). Analyses of lifetime data from the 1999–2001 NSDUHs did not find Hispanics to be more likely than African-Americans to be OxyContin® users and differences in education level or insurance status were not investigated (Sees et al., 2005). A study using NSDUH 2002–2004 data by Becker et al. (2008b) did not distinguish between OxyContin® use and other opioids (including heroin) when examining characteristics associated with opioid use disorders. The socio-demographic findings from all these studies identify individuals at higher risk for OxyContin® use who could benefit from prevention and intervention strategies aiming to curb the extramedical use of OxyContin® and other opioid analgesics. Mechanisms for the findings of this study that indicate that OxyContin® users were more likely to be less educated and uninsured than other opioid users need to be further explored. Whether those uninsured started using OxyContin® extramedically for a legitimate reason (e.g., treat chronic pain) because they did not have access to treatment cannot be answered by the NSDUH data.

The diverse nature of the various pharmaceutical compounds merits further monitoring, as extramedical use of particular analgesics, such as OxyContin®, have been found to be increasing among certain subgroups of the population (Cicero et al., 2005). Particularly important is the association between younger age (especially young adults) and OxyContin® use but not other opioid use among those with a disorder, which means that not only adolescents and young adults are using OxyContin® extramedically but that they may be developing problems secondary to their OxyContin® use, which has implications for treatment strategies.

Also, it is important to keep in mind that among those with an analgesic disorder, non-Hispanic Whites and Hispanics are more likely to use OxyContin® than non-Hispanic Blacks.

One finding of note in this study was that past-year opioid users were more likely than other illegal drug users to have a major depressive episode in the past-year. Furthermore, past-year OxyContin® users were more likely than past-year users of other opioids to have a possible past-year major depressive episode, to have been told by a medical professional that they had a past-year anxiety disorder, and to receive treatment for mental health problems in the past-year. Even though this is a cross-sectional study and causality cannot be established, clinical and psychopharmacologic studies indicate that the acute effects of opioid analgesic use include a reduction in depressive symptoms (Emrich et al., 1982; Gold et al., 1982). Thus, one might speculate that opioid users might be using these drugs to 'self-medicate' (Khantzian, 1997; Khantzian, 2003). Furthermore, if respondents with possible psychiatric problems are using extramedical opioids to self-medicate, they might prefer the larger amounts of active ingredients in OxyContin® in lieu of other opioid analgesics. On the other hand, a potent drug such as OxyContin® might cause more rapidly neuroadaptations in brain reward pathways that can lead to subsequent development of psychiatric disorders (McEwen, 2000, Brady and Sinha, 2005).

Interestingly, past-year OxyContin® users were more likely than past-year users of other opioids to engage in deviant behaviors in the past year. The magnitude of the association was stronger with selling illegal drugs, which might be associated with the fact that OxyContin® users were also more likely to use other substances (including extramedical use of other prescription drugs) as compared to other opioid users. Regarding selling illegal drugs, similar associations were seen among those with analgesic disorder. Those using OxyContin® may be more entrenched with the illegal drug market than users of other opioid analgesics. While these data are cross-sectional and preclude us from establishing causal relationships, it might be that those that are already more predisposed to use more potent opioids extramedically are also those more prone to engage in other types of deviant behaviors. Our findings regarding other substance use resemble findings from other studies and show that extramedical users of OxyContin® and other opioids are not substance use naïve individuals (Sees et al., 2005; Carise et al., 2007).

A major strength of the most recent NSDUH data is the availability of information on opioid analgesic sources in the past month. Past-month OxyContin® users were more likely than past-month other opioid users to buy opioid analgesics from friends/relatives/drug dealers/strangers, and to take analgesics from friends/relatives without asking, as well as obtain opioid analgesics from multiple sources. Similar associations were observed when comparing those with OxyContin® use versus those with other opioid use among those with an analgesic disorder. These findings reinforce the notion that OxyContin® users might be more involved in illegal drug use markets than other opioid users. Most importantly, they suggest that friends and family members dispose easily of their own opioid medication and might not fully aware of the abuse risks associated with OxyContin® and other opioid use. These findings highlight the importance of educating the general population regarding the potential abuse and side-effects associated with the extramedical use of OxyContin® and other opioids. Despite public health concerns of opioid diversion through the internet (Compton and Volkow, 2006; Manchikanti, 2006); less than 2% of the past-month OxyContin® and other opioid users bought opioid analgesics on the internet. Our findings resemble findings from two recent studies in which internet sales represented a small proportion of opioid analgesic diversion among extramedical prescription drug users in Miami (Inciardi et al., 2007), and among treatment-seeking extramedical opioid users (Cicero et al., 2007b).

This study has several strengths mostly due to the NSDUH research design and methods, including its large sample size and generalizability to the U.S household population. However, our findings should be interpreted in light of several limitations, mainly inherent to data unavailable in the NSDUH. One is that it is not possible to distinguish whether these extramedical opioid/OxyContin® users first started using these drugs because they were legitimately prescribed or if they initiated opioid analgesic use illegally. This is important when trying to understand the natural history of the use of these substances, as well as the profile of these users, which may be distinct depending on the pathway to initiate use of these drugs. Another limitation of our study relates to the fact that of the past-year mental health measures, only major depressive episode was assessed via a screening instrument, while past-year anxiety disorder and mental health treatment were subject to health care utilization, which might lead to some bias on these findings. For instance, respondents who might qualify for an anxiety disorder but have not seen a doctor for this problem in the past-year might be under-reporting the existence of an anxiety disorder. As in all large-scale epidemiologic surveys, information is based on self-report, and there might be recall bias in reporting both drug use and other sensitive behaviors. Also, there is the possibility that respondents might be under-reporting their extramedical opioid OxyContin® use in the NSDUH survey. And as mentioned previously, cross-sectional survey data limits the capacity to establish causal relationships.

Withstanding these limitations, we believe this study contributes important epidemiologic findings on extramedical analgesic use by describing the profile of current OxyContin® users and highlighting sources of access to opioid analgesics in the general U.S. population. Future research needs to further investigate the role of these sources of access in the development of analgesic disorders, particularly, whether greater availability and access via involvement in the illegal drug market might lead to a rapid transition into developing an analgesic disorder. In addition to prevention efforts alerting new users, especially adolescents and young adults with legitimate medical conditions, about the risks associated with extramedical OxyContin® use, interventions among young OxyContin® users involved in illegal drug activities appear to be needed. Yet in order to curb opioid analgesic use we must not limit ourselves to eradicating illegal drug markets, as the foremost source of opioids used extramedically appears to be the nearest medicine cabinet. Educational efforts are warranted to change what appears to be lax management and handling of controlled substances in the household.

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Table 1

Personal characteristics of past-year extramedical opioid analgesic use compared to past-year other drug use in a community sample of the U.S. population aged 12 and older: data from 2005–2006 National Survey on Drug Use and Health.

Characteristic	N	Opioid analgesic use % wgt (95%CI)	N	Other drug use %wgt (95%CI)	Adjusted odds ratio [†] aOR (95%CI)
Total	8218	4.7 (4.5,4.9)	16214	9.6 (9.3,9.8)	
Gender					
Male	4205	55.6 (53.7,57.5)	8690	58.6 (57.2,60.0)	1.0
Female	4013	44.4 (42.5,46.3)	7524	41.4 (40.0,42.8)	1.1 (1.0,1.3)
Age (years)					
12–17	2443	13.9 (13.1,14.7)	5002	13.9 (13.3,14.5)	0.9 (0.8,1.2)
18–25	4278	34.2 (32.7,35.7)	7931	30.8 (29.7,31.8)	1.3 (1.1,1.6)
26–34	708	19.7 (18.0,21.3)	1486	20.2 (19.0,21.5)	1.1 (0.9,1.3)
35 and older	789	32.2 (30.0,34.4)	1795	35.1 (33.5,36.7)	1.0
Race/ethnicity					
Non-Hispanic White	5920	73.8 (72.1,75.6)	10270	67.7 (66.5,69.1)	2.1 (1.7,2.5)
Non-Hispanic Black	679	8.4 (7.4,9.4)	2396	15.7 (14.6,16.7)	1.0
Hispanic	1015	13.4 (11.9,14.9)	2236	12.0 (11.1,12.9)	2.0 (1.6,2.5)
Other [‡]	604	4.3 (3.5,5.1)	1312	4.6 (4.1,5.1)	1.8 (1.3,2.4)
Marital status					
Married	1068	27.8 (25.8,29.8)	1820	25.5 (24.0,26.9)	1.0
No longer married	451	13.0 (11.4,14.6)	918	14.0 (12.8,15.2)	0.9 (0.7,1.1)
Never been married	6112	55.8 (53.8,57.8)	12003	56.6 (55.1,58.1)	0.8 (0.7,0.9)
<14 years old	587	3.4 (3.0,3.8)	1443	3.9 (3.6,4.2)	0.7 (0.5,0.9)
Education (only for those 18 and older)					
Less than high school	1262	18.1 (16.4,19.8)	2196	14.2 (13.2,15.2)	1.0
High school graduate	2064	28.0 (26.3,29.7)	3814	28.3 (27.2,29.7)	0.7 (0.6,0.9)

Characteristic	N	Opioid analgesic use % wt (95%CI)	N	Other drug use %wt (95%CI)	Adjusted odds ratio [†] aOR (95%CI)
Some college	1790	25.2 (23.5,26.8)	3542	24.9 (23.7,26.1)	0.7 (0.6,0.9)
College graduate	659	14.8 (13.2,16.4)	1660	18.7 (17.4,20.0)	0.6 (0.5,0.7)
12–17 years old	2443	13.9 (13.1,14.7)	5002	13.9 (13.3,14.5)	1.0 (0.8,1.2)
Population density					
Urban: 1 million or more persons	3252	51.0 (49.2,52.9)	7139	55.4 (54.0,56.8)	0.9 (0.7,1.1)
Urban: less than 1 million persons	4243	42.8 (40.9,44.7)	7903	39.2 (37.9,40.6)	0.9 (0.8,1.2)
Non-urban area	723	6.2 (5.4,7.0)	1172	5.4 (4.7,6.0)	1.0
Past-year mental health and deviant behaviors					
Major depressive episode	1479	17.0 (15.6,18.4)	2061	12.6 (11.6,13.5)	1.4 (1.2,1.6)
Anxiety	685	8.3 (7.3,9.2)	865	6.6 (5.9,7.3)	1.2 (0.9,1.4)
Mental health treatment	1208	18.5 (17.0,20.0)	1807	15.3 (14.3,16.4)	1.2 (1.1,1.4)
Arrested and booked	2559	34.3 (32.4,36.1)	4439	32.4 (31.0,33.8)	1.1 (1.0,1.3)
Sold illegal drugs	1651	14.7 (13.6,15.8)	1691	7.9 (7.3,8.7)	2.0 (1.8,2.3)
Stole anything worth \$50 or more	899	7.9 (6.9,8.8)	1108	4.2 (3.7,4.6)	2.0 (1.7,2.4)
Attacked someone	1056	8.6 (7.8,9.5)	1564	6.2 (5.6,6.7)	1.5 (1.3,1.7)
Alcohol use in past year	7273	87.6 (86.1,89.1)	14442	90.3 (89.4,91.1)	0.7 (0.6,0.8)
Tobacco use in past year	6080	67.6 (65.6,69.5)	12057	73.4 (72.1,74.6)	0.7 (0.6,0.8)

* Combines past-year users of marijuana, cocaine, heroin, inhalants, hallucinogens, and extramedical users of stimulants, sedatives and tranquilizers who did not use opioid analgesics in the past-year.

[†] Odds ratio is adjusted for age, race, gender, population density, marital status, education and survey year. Odds ratio refers to comparison between Opioid analgesic use versus Other drug use (comparison group).

[‡] Includes Native Americans, Asians, Hawaiians, Pacific Islanders and non-Hispanics who reported more than one race.

Personal characteristics of past-year extramedical OxyContin® use compared to other opioid analgesic use in a community sample of the U.S. population aged 12 and older.

Table 2

Characteristic	N	OxyContin® use (n=1144) %wgt (95%CI)	N	Other opioid analgesic use (n=7074) % wgt (95%CI)	Adjusted odds ratio * aOR (95%CI)
Gender					
Male	622	57.2 (52.3, 62.2)	3583	55.4 (53.3, 57.4)	1.0
Female	522	42.8 (37.8, 47.7)	3491	44.6 (42.6, 46.7)	0.9 (0.7, 1.2)
Age					
12–17	325	15.8 (13.3, 18.2)	2118	13.7 (12.8, 14.5)	1.7 (0.9, 3.2)
18–25	673	45.2 (40.5, 50.1)	3605	32.6 (31.3, 34.4)	1.9 (1.1, 3.2)
26–34	77	16.8 (12.4, 21.1)	631	20.3 (18.2, 21.8)	1.4 (0.9, 2.2)
35 and older	69	22.2 (16.2, 28.1)	720	33.4 (31.1, 35.8)	1.0
Race/ethnicity					
Non-Hispanic White	1038	87.9 (86.5, 93.2)	4955	71.9 (69.9, 73.8)	8.2 (3.6, 19.1)
Non-Hispanic Black	546	1.4 (0.4, 2.5)	657	9.1 (8.2, 10.4)	1.0
Hispanic	122	6.3 (3.2, 9.4)	931	14.4 (12.6, 15.9)	3.0 (1.2, 7.7)
Other	510	2.4 (1.4, 3.4)	531	4.6 (3.7, 5.5)	3.5 (0.3, 9.6)
Marital status					
Married	703	13.4 (9.5, 17.3)	980	29.5 (27.4, 31.7)	1.0
No longer married	1109	17.7 (12.4, 23.0)	371	12.4 (10.8, 14.1)	3.4 (1.9, 6.1)
Never been married	1038	67.0 (61.5, 72.6)	5174	54.5 (52.3, 56.6)	1.9 (1.1, 3.1)
<14 years old	546	1.8 (1.0, 2.6)	549	3.6 (3.2, 4.0)	0.8 (0.4, 1.7)
Education (only for those 18 and older)					
Less than high school	510	22.5 (17.0, 28.0)	1078	20.8 (18.8, 22.9)	1.0
High school graduate	325	32.7 (27.7, 37.6)	1739	32.5 (30.4, 34.7)	0.8 (0.5, 1.2)
Some college	253	34.5 (28.8, 40.2)	1537	28.6 (26.6, 30.6)	0.9 (0.6, 1.4)

Characteristic	N	OxyContin® use (n=1144) % wgt (95%CI)	N	Other opioid analgesic use (n=7074) % wgt (95%CI)	Adjusted odds ratio aOR (95%CI)*
College graduate	57	10.3 (6.5,14.1)	602	18.0 (16.0,20.1)	0.5 (0.3,0.9)
12–17 years old	325	15.8 (13.3,18.2)	2118	13.7 (12.8,14.5)	1.7 (0.9,3.2)
Population density (CBSA segment)					
Urban: 1 million or more persons	372	43.4 (38.3,48.5)	2880	52.0 (50.0,54.0)	0.8 (0.5,1.2)
Urban: less than 1 million persons	635	48.8 (43.7,53.8)	3608	42.0 (40.1,44.1)	0.9 (0.6,1.4)
Non-urban area	137	7.8 (5.7,10.1)	586	6.0 (5.1,6.8)	1.0
Past-year mental health and deviant behaviors					
Major depressive episode	250	21.8 (18.0,25.6)	1229	16.4 (14.9,17.9)	1.3 (1.0,1.8)
Anxiety	157	14.4 (11.1,17.6)	528	7.5 (6.5,8.5)	1.8 (1.4,2.5)
Mental health treatment	204	23.0 (18.6,27.5)	1004	17.9 (16.3,20.0)	1.4 (1.0,2.0)
Arrested and booked	511	48.5 (43.4,53.5)	2048	32.6 (30.6,34.5)	1.9 (1.4,2.5)
Sold illegal drugs	466	34.4 (29.9,38.9)	1185	12.3 (11.2,13.3)	3.3 (2.6, 4.3)
Stole anything worth \$50 or more	215	14.6 (11.8,17.4)	684	7.0 (6.1,8.0)	2.1 (1.5,2.9)
Attacked someone	207	14.8 (11.7,17.8)	849	7.9 (7.0,8.7)	1.8 (1.2, 2.7)
Substance involvement in the past-year					
Alcohol use	1109	95.9 (94.0,97.8)	6164	86.6 (84.9,88.2)	2.6 (1.4,4.9)
Tobacco use	1038	87.9 (84.2,91.5)	5042	65.1 (62.9,67.2)	2.8 (1.9,3.8)
Cocaine use	546	44.9 (39.9,49.9)	1327	18.2 (16.7,19.7)	3.1 (2.5–3.9)
Heroin use	122	10.7 (7.3, 14.2)	92	1.7 (1.0, 2.3)	7.5 (4.3–13.2)
Hallucinogen use	510	36.5 (32.0,41.0)	1294	13.4 (12.3,14.5)	3.0 (2.4–3.7)
Other illegal drug use [†]	1002	80.0 (75.4,84.6)	4300	51.0 (48.9,53.1)	2.9 (2.2,4.0)
Other extramedical prescription drug use ^{††}	703	58.5 (53.3,63.7)	2276	31.9 (30.0,33.8)	2.5 (2.0,3.1)

* Odds ratio is adjusted for age, race, gender, population density, marital status, education and survey year. Odds ratio refers to comparison between OxyContin® use versus Other opioid analgesic use (comparison group).

†† Includes Native Americans, Asians, Hawaiians, Pacific Islanders and non-Hispanics who reported more than one race.

[†]Combination of past-year marijuana, cocaine, heroin, inhalant and hallucinogen use.

^{††}Combination of past-year sedative, stimulant and tranquilizer use.

Table 3

Personal and drug using characteristics of individuals with a past year analgesic disorder differentiated by the type of opioid use (extramedical Oxycontin® versus other opioid use) in a community sample of the U.S. population aged 12 and older.

Characteristic	Analgesic disorder OxyContin® use (n=339)		Analgesic disorder Other opioid use (n=820)		Adjusted odds ratio* aOR (95%CI)	
	N	% wgt (95%CI)	N	%wgt (95%CI)		
Gender						
Male	173	52.1 (44.0,60.2)	366	53.8 (48.1,59.4)		1.0
Female	166	47.9 (39.8,55.9)	454	46.2 (40.6,51.9)		0.9 (0.6,1.4)
Age (years)						
12–17	91	17.2 (12.3,22.0)	292	17.0 (14.1,20.0)		2.7 (1.0,7.6)
18–25	205	49.2 (41.2,57.2)	368	29.0 (24.9,33.2)		3.1 (1.3,7.3)
26–34	18	14.5 (6.8,22.2)	88	24.1 (18.9,29.3)		1.0 (0.4,2.8)
35 and older	25	19.1 (11.2,27.0)	72	29.9 (23.6,36.2)		1.0
Race/ethnicity						
Non-Hispanic White	302	93.4 (90.6,96.3)	544	67.3 (61.7,73.0)		27.0 (7.6,95.7)
Non-Hispanic Black	3	0.4 (0.0,9)	79	9.7 (6.1,12.7)		1.0
Hispanic	19	4.0 (1.6,6.4)	118	16.0 (11.4,20.5)		6.6 (1.7,26.2)
Other [†]	15	2.1 (0.7,3.6)	79	7.3 (3.8,10.8)		6.5 (1.1,40.0)
Marital status						
Married	36	11.4 (6.3,16.5)	101	24.4 (18.7,30.2)		1.0
No longer married	34	20.7 (12.7,28.7)	54	12.8 (8.6,17.0)		3.2 (1.5,7.2)
Never been married	258	66.8 (58.5,75.1)	568	57.7 (51.8,63.6)		1.4 (0.6,3.1)
<14 years old	11	1.0 (0.2,1.9)	97	5.0 (3.6,6.4)		0.3 (0.1,0.8)
Education (only for those 18 and older)						
Less than high school	67	27.1 (18.3,35.9)	158	28.9 (22.5,35.3)		1.0
High school graduate	93	37.0 (28.1,45.9)	183	31.1 (25.1,37.1)		1.2 (0.6,2.2)
Some college	75	30.3 (21.9,38.6)	140	31.3 (25.1,37.7)		1.0 (0.5,1.8)

Characteristic	Analgesic disorder OxyContin® use (n=339)		Analgesic disorder Other opioid use (n=820)		Adjusted odds ratio [*] aOR (95%CI)	
	N	% wgt (95%CI)	N	%wgt (95%CI)		
College graduate	13	5.6 (1.9,9.3)	47	8.7 (5.4,11.9)		0.7 (0.3,1.6)
12–17 years old	91	17.2 (12.3,22.0)	292	17.0 (14.1,20.0)		2.7 (1.0,7.6)
Population density						
Urban: 1 million or more persons	103	34.3 (26.9,41.6)	321	48.6 (42.9,54.4)		0.5 (0.3,1.2)
Urban: less than 1 million persons	186	54.6 (46.7,62.6)	418	42.9 (37.3,48.5)		0.9 (0.4,1.8)
Non-urban area	50	11.1 (5.9,16.4)	81	8.5 (5.1,11.8)		1.0
Past-year mental health and deviant behaviors						
Major depressive episode	114	36.2 (28.4,44.0)	252	27.6 (22.6,32.6)		1.3 (0.8,2.2)
Anxiety	75	26.4 (18.7,34.1)	114	14.1 (10.5,17.7)		1.9 (1.1,3.3)
Mental health treatment	99	34.8 (26.9,42.6)	194	29.9 (24.5,35.3)		1.3 (0.7,2.2)
Arrested and booked	168	51.5 (43.4,59.6)	288	41.2 (35.5,46.9)		1.3 (0.8,2.2)
Sold illegal drugs	155	40.1 (32.6,47.7)	204	18.2 (14.5,21.9)		2.3 (1.4,3.7)
Stole anything worth \$50 or more	77	18.0 (12.7,23.3)	148	14.0 (10.5,17.5)		1.1 (0.6,2.0)
Attacked someone	79	18.9 (13.3,24.4)	163	13.0 (9.9,16.1)		1.5 (0.8,2.5)
Substance involvement in past year						
Alcohol use in past year	327	95.0 (91.1,99.0)	685	83.7 (79.2,88.1)		3.0 (1.2,7.7)
Tobacco use in past year	305	92.0 (87.9,96.1)	621	75.4 (70.0,80.7)		2.4 (1.2,4.7)
Other illegal drug use [†]	302	83.4 (76.0,90.8)	535	55.9 (50.0,61.7)		3.2 (1.7,6.1)
Other extramedical prescription drug use ^{††}	248	70.6 (62.8,78.4)	385	44.4 (38.7,50.0)		2.2 (1.4,3.4)

^{*} Odds ratio is adjusted for age, race, gender, population density, marital status, education and survey year. Odds ratio refers to comparison between past year analgesic disorder with OxyContin® use versus past-year analgesic disorder with other opioid use (comparison group).

[†] Combination of past-year marijuana, cocaine, heroin, inhalant and hallucinogen use.

^{††} Combination of past-year sedative, stimulant and tranquilizer use.

Table 4

Different types of opioid analgesic sources of past-month extramedical OxyContin® users compared to other opioid analgesic users in a community sample of the U.S. population aged 12 and older.

Sources of opioid analgesic	N	OxyContin® users %wgt (95%CI)	Other opioid analgesic users N	%wgt (95%CI)	Adjusted odds ratio aOR (95%CI)*
Got one or more analgesic prescription from just one doctor	52	20.5 (10.3,30.7)	558	22.6 (18.6,26.5)	1.0 (0.6,1.7)
Got analgesic prescription from two or more doctors	11	11.8 (0,23.7)	129	4.8 (2.9,6.6)	1.8 (0.7,4.9)
Wrote fake prescription for analgesics	4	0.3 (0,0.8)	17	0.6 (0,1.1)	0.9 (0.2,3.9)
Stole analgesics from Dr.'s office/clinic/hospital/pharmacy	4	0.5 (0,1.1)	27	0.8 (0.1, 1.5)	0.8 (0.2,3.3)
Got analgesics from a friend/relative for free	161	64.2 (53.1,75.3)	1674	60.7 (56.2,65.3)	0.8 (0.5,1.3)
Bought analgesics from a friend/relative	141	57.5 (45.9,69.2)	595	15.0 (12.4,17.5)	3.7 (2.3,6.0)
Took analgesics from friend/relatives without asking	56	25.1 (13.1,37.1)	356	9.7 (7.5,12.0)	2.2 (1.2,3.8)
Bought analgesics from drug dealer/other stranger	104	35.3 (23.5,47.0)	303	8.4 (6.2,10.5)	3.9 (2.5,6.1)
Bought analgesics on the internet	10	0.8 (0,1.9)	28	2.9 (0.7,5.0)	1.0 (0.4,2.8)
Got analgesics in some other way	29	6.4 (1.3,11.5)	227	3.9 (2.3,5.5)	1.0 (0.5,2.0)
Multiple sources (more than one source)	124	49.1 (39.3,59.0)	737	23.3 (20.9,25.8)	2.3 (1.4,3.7)

* Odds ratio is adjusted for age, race, gender, population density, marital status, education, and survey year. Odds ratio refers to comparison between past-month OxyContin® users versus past-month other opioid analgesic users (comparison group).