



## Short Communication

# Prevalence and correlates of co-ingestion of prescription tranquilizers and other psychoactive substances by U.S. high school seniors: Results from a national survey



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## HIGHLIGHTS

- Past year, 3.8% of US 12th graders co-ingested a prescription tranquilizer and other drug.
- 72.6% of nonmedical tranquilizer users co-ingested, often with marijuana or alcohol.
- Co-ingestion users were more likely to use other substances than other groups.
- Recreational motives and earlier nonmedical use onset were linked to co-ingestion.
- An increasing number of co-ingested substances appeared to increase risk.

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## ABSTRACT

**Introduction:** Nonmedical tranquilizer use (NMTU) is a concerning and understudied phenomenon in adolescents, despite being the second most prevalent form of nonmedical use in this population. Thus, this work aimed to examine the sociodemographic and substance use correlates of past-year co-ingestion of a prescription tranquilizer and another substance among adolescents.

**Methods:** Data were from the Monitoring the Future study, a nationally representative survey of U.S. high school students. Data from 11,444 seniors (12th graders) completing form 1 of the survey were used. The participants represented a population that was 52.7% female, 61.8% White, and had a modal age of 18. Weighted frequencies and Rao–Scott chi-square analyses were computed to describe the target population and examine associations of interest.

**Results:** An estimated 5.3% of the population engaged in past-year NMTU during this time period, with an estimated 72.6% of those users engaged in past-year co-ingestion of a tranquilizer and another substance. Marijuana and alcohol were the most commonly co-ingested substances. Those engaged in co-ingestion were more likely than past-year nonmedical users without co-ingestion to be engaged in other substance or nonmedical use (including past year nonmedical Xanax® (alprazolam) use), have an earlier onset of NMTU, and endorse recreational motives.

**Conclusions:** Adolescent nonmedical tranquilizer users engaged in co-ingestion may be a particularly vulnerable population, with higher rates of other substance use, other nonmedical use and problematic NMTU characteristics than nonmedical users without co-ingestion. Identification of and intervention with adolescent co-ingestion users are important avenues for future research and clinical practice.

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## 1. Introduction

Nonmedical prescription tranquilizer use (NMTU) is the second most prevalent type of nonmedical use in adolescents and across the U.S. population (SAMHSA, 2012). Given the potential for adverse

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outcomes, NMTU represents an ongoing public health concern (CDC, 2012). Work by McCabe, West, Teter, and Boyd (2012) highlighted adolescent opioid co-ingestion users as a vulnerable population, suggesting the need to elucidate tranquilizer co-ingestion processes.

Investigations of co-ingestion of prescription medication and another psychoactive substance have focused on college or young adult populations and co-ingestion involving opioids or stimulants. Co-ingestion appears to be common in young adult nonmedical users at nightlife venues (Kelly, Wells, Pawson, Leclair, & Parsons, 2014), and co-ingestion is common at both the most recent and first ever nonmedical use episode (Barrett, Darredeau, & Pihl, 2006; Olthuis, Darredeau, & Barrett, 2013). Co-ingestion users had elevated levels of substance use and other risk indicators relative to nonmedical users without co-ingestion (Garnier et al., 2009; McCabe, Cranford, Morales, & Young, 2006).

In the only published study on adolescent co-ingestion, approximately 5.6% of adolescents co-ingested a prescription opioid and another drug; co-ingestion users were more likely to engage in problematic drug use and have recreational (versus self-treatment) motives than nonmedical users without co-ingestion (McCabe et al., 2012). Nattala, Leung, Abdallah, Murthy, and Cottler (2012) conducted the only study of adult nonmedical sedative use (including benzodiazepines) with co-ingestion; there, 61% of nonmedical users co-ingested a sedative and alcohol, and co-ingestion users were younger, more likely to have used marijuana, and more likely to have recreational motives (Nattala et al., 2012).

No studies have examined co-ingestion of prescription tranquilizers and psychoactive substances in U.S. adolescents. This work will examine this phenomenon in a nationally representative sample of U.S. high school seniors, examining correlates (e.g., motives for NMTU) based on past research (see Measures section). This work had three aims. First, we evaluated the prevalence of co-ingestion both overall and by the substance co-ingested with tranquilizer medication. Second, we investigated the prevalence of selected substance use and mental health outcomes as a function of NMTU status and (among nonmedical users) co-ingestion status. Finally, we evaluated whether selected non-medical (e.g., age of NMTU onset) and mental health variables differed among nonmedical users based on the number of substances co-ingested with tranquilizer medication.

## 2. Methods

The Monitoring the Future (MTF) study is a nationally representative, cross-sectional annual survey of 8th, 10th and 12th grade students in the U.S. The MTF uses multi-stage sampling, with selection of primary sampling units (PSU), followed by identification of schools within the PSU for administration. One-sixth of participants were randomly assigned form 1 (of six), which included assessment of co-ingestion of prescription tranquilizers and other drugs from 2002 to 2006. Response rates were either 82 or 83%. For more information, see Johnston, O'Malley, Bachman, and Schulenberg (2007). This work was granted a waiver from the Texas State University IRB.

### 2.1. Participants

From 2002 to 2006, 12,441 12th grade students completed form 1, with 11,444 (92.0%) providing sufficient data for analyses. The weighted population was 52.7% female, 61.8% Caucasian, 10.1% African-American, and 28.1% endorsing some other or not specifying a race/ethnicity. The modal age was 18 years.

### 2.2. Measures

*Nonmedical tranquilizer use (NMTU)* was assessed by asking about the frequency (if ever) of prescription tranquilizer (e.g., Xanax, Ativan) use “on your own – that is, without a doctor telling you to take [it] ...” Participants are dichotomized into those who did or did not engage in

past year NMTU. The substance use assessment of the MTF study, including of nonmedical use, is recognized as reliable and valid (Johnston et al., 2007).

*Past year mental health treatment* was assessed by asking the frequency with which a participant saw a “doctor or other professional ... for some emotional or psychological symptom”. Participants were dichotomized into those endorsing treatment and those denying, as past year mental health treatment is a NMTU correlate (Schepis & Krishnan-Sarin, 2008).

#### 2.2.1. Measures in those endorsing NMTU

*Co-ingestion of tranquilizers and another substance* was assessed by asking how often participants engaged in NMTU and use of another substance such that “their effects overlapped”. Co-ingestion substances included: alcohol; marijuana; LSD; non-LSD hallucinogens; barbiturates; and amphetamines. Responses ranged from 1 (never) to 5 (every time).

*Motives for NMTU* were investigated through a single question with multiple, non-exclusive responses. Participants were asked “What have been the most important reasons for your taking tranquilizers without a doctor's orders?” Selected motives were based on previous work (McCabe, Boyd, & Teter, 2009; McCabe et al., 2012).

*Typical intoxication during NMTU* was assessed by asking “how high do you usually get” when using a prescription tranquilizer. Participants were dichotomized into those endorsing getting “moderately or very high” and those endorsing “a little high”, “not high” or “I do not take them to get high”. This categorization was based on the work of McCabe et al. (2012).

*Age of NMTU onset* assessed when the participant first engaged in NMTU. Participants were dichotomized into a group initiating NMTU before 10th grade and those who initiated during 10th grade or later, based on evidence that adolescents initiating NMTU prior to age 16 (roughly 10th grade) had significantly elevated DSM-IV tranquilizer dependence rates (McCabe, West, Morales, Cranford, & Boyd, 2007).

*Likelihood of NMTU in 5 years* was assessed by asking whether the participant “will be using tranquilizers without a doctor's orders five years from now?” Answers were dichotomized as: definitely/probably will not and definitely/probably will.

### 2.3. Data analysis

MTF participant responses are weighted to create nationally representative estimates, and all analyses herein employed the MTF weight variable to ensure unbiased estimation. Estimates of past year NMTU rates and co-ingestion prevalence (Aim 1) were computed using weighted cross-tabulations. Analyses to complete Aims 2 and 3 used Rao-Scott chi-square tests of homogeneity (Rao & Scott, 1984) to compare those engaged in past year NMTU with co-ingestion to those without co-ingestion, and compare those two groups to those with no past year NMTU. Analyses for Aim 2 compared all three groups in terms of various outcomes, while analyses for Aim 3 compared past year non-medical tranquilizer users by number of substances co-ingested with the tranquilizer in the past year: 0, 1, 2, 3 or more. An average MTF design effect factor was used to multiply all linearized estimates of variance based on the MTF weights (Johnston et al., 2007) to correct for the complex cluster sampling effects of the MTF (West & McCabe, 2012). Similarly, all weighted chi-square statistics were divided by this average design effect factor (Rao & Scott, 1984). Analyses were conducted in Stata, version 13.1 (StataCorp, College Station, TX, 2013), using the survey data analysis commands.

## 3. Results

### 3.1. Prevalence of NMTU and co-ingested substance frequency

An estimated 72.6% of past year nonmedical tranquilizer users engaged in co-ingestion. Marijuana and alcohol were the most commonly

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