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Age Cohort Differences in the Nonmedical Use of Prescription Zolpidem: Findings from a Nationally Representative Sample

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HIGHLIGHTS

- Age cohort differences in nonmedical zolpidem use correlates were examined.
- Nationally representative data from nearly 175,000 participants were used.
- Substance use correlates differed most by age, with highest odds in adolescents.
- Mental health correlates operated more uniformly across cohorts.
- Findings may indicate age-based differences in nonmedical zolpidem use motives.

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ABSTRACT

Background: Recent warnings from the FDA have highlighted the potential risks associated with zolpidem use. These risks may be especially acute in nonmedical users of zolpidem, but little work has examined the characteristics of such nonmedical users. This study aims to investigate the correlates of nonmedical use of zolpidem (NUPZ) across the lifespan and potential age cohort-based differences in NUPZ correlates.
Methods: Data from the 2009–2011 versions of the National Survey on Drug Use and Health were used (n = 174,667). Analyses used weighted design-based logistic regressions to examine a set of substance use and mental health correlates within five separate age cohorts and differences in correlate magnitude between these cohorts.
Results: Most examined substance use and mental health variables were significant correlates of NUPZ, though odds ratio (OR) magnitude tended to drop with increasing age. Age-based differences were most apparent for substance use correlates of both lifetime and past year NUPZ, with significantly higher ORs in adolescent nonmedical users. Mental health variables operated more consistently across age, with OR magnitudes that were generally in the same range, regardless of age cohort.
Conclusions: Age-based differences in NUPZ correlates suggest motives may change for NUPZ through the lifespan, though this cannot be established with the cross-sectional data used in this work. Clinicians screening for NUPZ should emphasize such screening in high-risk individuals with substance use and/or mental health problems.

1. Introduction

Zolpidem, marketed most commonly as Ambien® or Ambien CR®, is a controlled non-benzodiazepine indicated for insomnia treatment. Oral zolpidem has a long history of use, with significant evidence of its effectiveness in short-term treatment (Dang, Garg, & Rataboli, 2011). The benefits of zolpidem extend to improving work performance over a 6-month period in those with chronic insomnia (Erman, Guiraud, Joish, & Lerner, 2008), and zolpidem may help those with insomnia related to psychopathology (Fava et al., 2011).

Despite these benefits, concern about the effects of zolpidem prompted the US Food and Drug Administration to recommend lower dosing to prevent next-day impairment, particularly in women (Kuehn, 2013). Recent evidence also associates zolpidem with increases in suicidality (Brower et al., 2011), emergency department utilization (Mitka, 2013), motor vehicle accidents (Yang, Lai, Lee, Wang, & Chen, 2011) and various other injuries, especially in elderly individuals (Chung, Lin, Wang, Lin, & Kang, 2013). The increased risk of zolpidem-related injury may result from similar effects of both zolpidem and traditional benzodiazepines on memory (Pompeia, Lucchesi, Bueno, Manzano, & Tufik, 2004), balance (Frey, Ortega, Wiseman, Farley, & Wright, 2011) and attention (Troy et al., 2000).

Zolpidem is on Schedule IV of the US Controlled Substances Act, denoting therapeutic benefits with some degree of abuse potential. The

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World Health Organization echoed this assessment, recommending zolpidem for international control (WHO, 2001). Research evidence largely supports the controlled status of zolpidem, with evidence of modest reinforcing effects in drug-naïve individuals (Licata, Mashhoon, Maclean, & Lukas, 2011), and concern about abuse in those with substance use disorder histories (Hajak, Muller, Wittchen, Pittrow, & Kirch, 2003). Furthermore, zolpidem is used nonmedically (Ford & McCutcheon, 2012), either for the mild reinforcing effects, or as self-treatment for undertreated or undiagnosed insomnia.

That said, only one study has examined the correlates of nonmedical use of prescription zolpidem (NUPZ). Ford and McCutcheon (2012) used data from the 2009 National Survey on Drug Use and Health (NSDUH) to examine the correlates of lifetime NUPZ in adolescents. Their findings were consistent with other work (e.g., Boyd, McCabe, Cranford, & Young, 2007) examining correlates of adolescent nonmedical use of other medications: lifetime other substance use, major depression and permissive parental and peer attitudes towards substance use increased NUPZ odds. After controlling for sociodemographic characteristics, they found a more limited set of correlates, including other nonmedical use and lifetime marijuana use (Ford & McCutcheon, 2012).

More thorough examination of NUPZ correlates is warranted, particularly because of the lack of research on adult correlates and ongoing concerns about adverse outcomes associated with zolpidem use. Nonmedical users would also experience these effects, possibly at higher rates due to improper medication use. Furthermore, nonmedical use rates decrease with age (SAMHSA, 2012), indicating the potential for different processes related to nonmedical use throughout the lifespan. Nonetheless, no work has directly examined age-based differences in nonmedical use generally or NUPZ specifically. Furthermore, more thorough examination of adverse characteristics associated with NUPZ can inform prevention efforts to limit it across the lifespan. Examination of a diverse set of potential substance use and mental health correlates of NUPZ across different age cohorts will allow this work to evaluate the fit of Problem Behavior Theory on NUPZ at different timepoints in the lifespan. Problem Behavior Theory posits that deviant behavior clusters, particularly in adolescents, and that such behavior is influenced by both risk (e.g., chaotic home environment) and protective (e.g., church attendance) factors (Jessor, 1987; Jessor & Jessor, 1977). While this work will not evaluate protective factors, it will evaluate potential risk factors to allow for partial examination of NUPZ through the lens of Problem Behavior Theory.

The primary aims of this work are to examine the sociodemographic, substance use and mental health correlates of lifetime and past year NUPZ across five cohorts, with separate examination of correlate magnitudes by age cohort. We hypothesized that substance use and mental health problems would increase NUPZ odds, with the highest odds linked to nonmedical and illicit substance use. We also wanted to evaluate the utility of Problem Behavior Theory in understanding NUPZ across the lifespan. We posited that NUPZ and other substance use would clearly cluster in adolescents, with less marked clustering as individuals aged, given that some deviant behaviors in adolescents (e.g., alcohol use) are not deviant in adults and that deviant behavior likely decreases through the young adult period (Jessor, Donovan, & Costa, 1991).

2. Methods

2.1. NSDUH Design

The NSDUH is an annual survey conducted by the US Substance Abuse and Mental Health Services Administration (SAMHSA) to investigate substance use and associated behaviors in a sample that is representative of non-institutionalized population of the US. The NSDUH is designed to oversample adolescents, young adults, African–Americans and Hispanics. It used an independent, multistage area probability sample for all states and the District of Columbia, with yearly population estimates from the U.S. Census Bureau informing population-based weights (SAMHSA, 2009). More information on survey sampling is available elsewhere (Research Triangle Institute, 2012). The NSUDH combined both computer-assisted interviewing and audio computer-assisted self-interviewing (ACASI) methods. During the ACASI portion of the survey, the participant wore headphones to hear questions and the field interviewer remained out of view of the computer screen; these procedures were employed to maximize honest responding. All substance use (including NUPZ-related) and psychopathology measures were asked in ACASI format. The 2009–2011 NSDUH versions included automatic skip-outs and questions serving as consistency checks based on previous answers to increase full responding and data consistency.

2.2. Participants

For the 2009–2011 NSDUH versions, 174,667 respondents were included in the public use files. Of those, 33.0% were young adults (aged 18–25; n = 57,678) and 32.7% were adolescents (aged 12–17; n = 57,142). Females composed 51.6% of the sample (n = 90,161), with Caucasian (n = 108,016; 61.8%), Hispanic/Latino (n = 28,541; 16.3%) and African–American individuals (n = 22,545; 12.9%) comprising the three largest ethnic groups.

2.3. Measures

2.3.1. Primary Outcomes and Control Variables

The primary outcome measures are lifetime and past year NUPZ. Current age is used in two ways: first, it separates participants for analyses of correlates by age cohort; and second, it is used in an interaction term with the examined correlates to evaluate potential cohort differences in associations between NUPZ and correlates. Control variables were sex, race/ethnicity, family income, educational attainment and metro status in area of residence.

Current age was a five-level variable, with age group choices restricted by the available variables in the NSDUH public use file. Groups came from the CATAG3 variable and were ages 12–17, 18–25, 26–34, 35–49, and 50 and older.

Lifetime NUPZ is defined as zolpidem use when "the drug was not prescribed for you, or you took the drug only for the experience or feeling it caused."

Past year NUPZ is queried in participants endorsing lifetime NUPZ by asking whether the respondent engaged in NUPZ within the past 12 months.

2.3.2. Correlates

Correlates were selected from previous examinations of NUPZ, with selection of articles ensuring coverage of the lifespan. Correlates were chosen to be consistent across NUPZ timeframes (allowing comparison between timeframes), with greater public health impact (i.e., daily smoking over any 30-day smoking), while ensuring sufficient base rates engaged in the behavior.

Substance use correlates were: daily smoking, 30-day binge alcohol use, 30-day heavy drinking, 30-day marijuana use, lifetime cocaine use, lifetime opioid nonmedical use, lifetime tranquilizer nonmedical use, lifetime stimulant nonmedical use and past year substance use treatment. For all substance use variables, assessment began with queries about any lifetime use, followed up by questions about recency of use (e.g., past 30-day). Smoking on all of the past 30 days was defined as daily smoking. 30-day binge alcohol use was defined as one occasion ("at the same time or within a couple of hours of each other") of consuming 5 or more alcoholic drinks. 30-day heavy drinking was defined as five episodes of binge alcohol use in the past 30 days. Finally, nonmedical use was assessed via a similar query as was used to assess NUPZ (above).

Mental health correlates were: past year anxiety diagnosis, past year major depression, past year mental health treatment, past year serious psychological distress (SPD; adult only), past year suicidal ideation (adult only). Anxiety diagnosis was assessed via a single item asking if