



## Tobacco and alcohol use disorders: Evaluating multimorbidity<sup>☆</sup>



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### HIGHLIGHTS

- Alcohol use disorder (AUD) and tobacco use disorder (TUD) frequently co-occur.
- Comorbidity assumes one disorder is primary.
- Compared to single disorder groups, AUD + TUD have problems across multiple domains.
- A multimorbid approach may provide a more comprehensive assessment for treatment.

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#### Abstract.

There is growing interest in applying the multimorbidity model for mental health disorders – i.e. the interactive effects of co-occurring diagnoses. Alcohol use disorder (AUD) and tobacco use disorder (TUD) often occur together, but distinctive correlates of their co-occurrence have not been studied. Veterans treated by the Veterans Health Administration (VHA) nationally in FY 2012 with diagnoses of both AUD and TUD were compared to those with only AUD or only TUD on socio-environmental factors, medical and psychiatric diagnoses, and service use. Multimorbid effects were defined as those in which patients with both AUD and TUD had more serious problems greater likelihood of specific co-occurring conditions than those with either AUD alone or TUD alone. Veterans with concurrent AUD and TUD (N = 153,397), as compared to those with AUD only (N = 191,900) or with TUD only (N = 643,377), had significantly higher rates of homelessness [odds ratios (ORs) = 1.24, 1.68], hepatic disease (ORs = 1.11, 2.18), substance use disorders (ORs = 1.42, 3.14), receipt of a VA disability pension (ORs = 1.26, 1.30) and use of substance and mental health outpatient services (ORs = 1.04, 1.12). Veterans with AUD and TUD appear to have more severe problems in some, but not all, socio-environmental, medical, psychiatric, and service use domains than veterans with either of these diagnoses alone. The combination of AUD and TUD yield generally more adverse effects in diverse areas and thus reflect an emergent phenomenon that may require a distinctive treatment approach.

### 1. Introduction

Tobacco and alcohol use disorders are modifiable conditions that cause extensive morbidity and mortality (Ezzati, Lopez, Rodgers, Vander Hoorn, & Murray, 2002; Lopez, Mathers, Ezzati, Jamison, & Murray, 2006; Mokdad, Marks, Stroup, & Gerberding, 2004). Smoking increases the risk for cancers of the lung, larynx, esophagus, mouth, and bladder as well as heart disease, chronic obstructive pulmonary disease (COPD), kidney disease, and hypertension – collectively responsible for approximately 5 million deaths per year worldwide (Carter, Freedman, & Jacobs, 2015; Centers for Disease

Control and Prevention, 2008; Ezzati, Henley, Lopez, & Thun, 2005; Ezzati & Lopez, 2003). Alcohol use has been found to increase risk for cirrhosis of the liver, cancer, hemorrhagic stroke, hypertensive disease, and other medical conditions (Rehm et al., 2009; Stahre, Roeber, Kanny, Brewer, & Zhang, 2014). Although alcohol use disorder (AUD) and tobacco use disorder (TUD) are usually treated and studied independently, decades of research have demonstrated that these two disorders frequently occur together, and the consequences of co-occurrence have not been systematically studied.

Introduced in 1970, the term “comorbidity” is defined as any distinct clinical entity that may occur together with an index disorder that

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is considered the “primary” condition of clinical or research interest (Feinstein, 1970). The primacy of a single disease (i.e., the index disorder) is reflected in clinical practice guidelines that are derived from research based almost exclusively on patients with only one medical condition or disorder (Uhlig, Leff, Kent, et al., 2014). Akin to other comorbidities, AUD and TUD commonly present together rather than in isolation. Heavy episodic alcohol use and cigarette smoking are the most prevalent types of substance misuse in both US veterans and civilians (Hoggatt, Lehavot, Krennek, Schweizer, & Simpson, 2017). Using Wave I and II of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) researchers reported that among individuals with alcohol dependence, use of alcohol and tobacco together (32.5%) was more prevalent than alcohol use alone (27.5%) (Moss, Goldstein, Chen, & Yi, 2015). A recent study of US veterans found that approximately 58% of patients diagnosed with AUD were also diagnosed with TUD (Rubinsky, Chen, Batki, Williams, & Harris, 2015). Despite multiple studies establishing the high prevalence of concurrent alcohol and tobacco use, it is not known whether the joint presence of these disorders represents more than coincident sum of psychiatric and medical problems associated with each individual disorder or whether AUD and TUD may interact to form a far larger tapestry of conditions, without one identifiable diagnoses being any more “primary” than the others.

To date, studies examining the additive effect of concurrent use of alcohol and tobacco use have been typically limited to a single domain. For example, medical studies investigating alcohol and tobacco use have reported significant health problems including a dose-dependent increase in the risk for mouth and throat cancer (Franceschi, Talamini, Barra, et al., 1990; Pelucchi, Gallus, Garavello, Bosetti, & La Vecchia, 2006; Zheng, Boyle, HF, et al., 1990) and liver cancer (Marrero et al., 2005). Additionally, among individuals with AUD, concurrent TUD is associated with greater risk of concurrent psychiatric and substance use disorders (Le Strat, Ramoz, & Gorwood, 2010). Though such studies have been informative, the current study is based on the notion that descriptive investigation of a wider scope of potential problems associated with this comorbidity may enhance our understanding of the joint presentation of AUD and TUD and eventually of the underlying genetic and physiological processes and the mechanisms of their distinctive functional consequences.

Akin to comorbidity, the more recent term multimorbidity has been defined as the co-occurrence of multiple conditions. Unlike comorbidity, in the conceptualization of multimorbidity no one condition or disease takes precedence over any other (i.e., there is no primary diagnosis); rather, the combination of conditions is thought to represent a distinct entity. Since the likelihood of experiencing multiple chronic conditions increases with age, researchers and clinicians have especially recognized the importance of multimorbidity in the evaluation and care of the elderly (Marengoni, Angleman, Melis, et al., 2011; Salive, 2013). In this group, multimorbidity at its simplest level is caused by the underlying processes of ageing; however, multiple research studies have demonstrated that multimorbidity is also strongly associated with low socioeconomic status (Prados-Torres, Calderon-Larranaga, Hanco-Saavedra, Poblador-Plou, & van den Akker, 2014), is common in non-geriatric populations, and is associated with additional mental health diagnoses such as depression and substance use disorders (Barnett et al., 2012; Fraccaro, Arguello Casteleiro, Ainsworth, & Buchan, 2015; Haibach, Beehler, Dollar, & Finnell, 2014). One recent review extended the concept of multimorbidity to include social and environmental adversities relevant to the presentation and management of disease (North, Brown, & Pollio, 2016). Although evaluation of symptoms beyond a single or index disorder complicates clinical decision-making, many researchers and clinicians have suggested that a multimorbidity approach may offer important advantages to precision medicine and treatment effectiveness and constitutes an important new perspective for both research and clinical care (Guthrie, Payne, Alderson, McMurdo, & Mercer, 2012; Haibach et al., 2014;

Mangin, Heath, & Jamouille, 2012).

The present analysis is a comparative cohort study that used national Veterans Health Administration (VHA) administrative data to identify patients who had a diagnosis of TUD, AUD, or both in fiscal year 2012 (FY2012; October 1, 2011 to September 30, 2012). Correlates of the clinical combination of both an AUD and TUD diagnoses were compared to correlates of each single disorder group across multiple domains including medical, socio-environmental, psychiatric, and service use. Diagnoses or characteristics on which the group with both AUD and TUD was different from both the AUD and TUD alone groups were identified as a distinctive multimorbidity effects. Through comparison of joint and single conditions across multiple domains we sought to explore the utility of a multimorbid approach that can be further used to develop treatments specifically appropriate to the combination of disorders.

## 2. Methods

### 2.1. Sample

The sample included all veterans who had received a diagnosis of either AUD (ICD 9 code 300.xx or 305.00), TUD (ICD-9 code 305.1), or both during FY2012. Data on socio-environmental, medical, psychiatric (including other substance use disorders) and service use measures were documented from the VHA Computerized Personal Record System (CPRS).

### 2.2. Socio-environmental

Socio-environmental characteristics included age, income, sex, geographic location of residence, receipt of VA disability compensation or pension, and homelessness. Geographic location was categorized as either urban or rural based on zip code data and the Rural Urban Commuting Area (RUCA) codes (Rural Health Research Center, 2014). Ethnicity was bimodal reflecting Hispanic or non-Hispanic and race was categorized as Black, White, Other Race, or Mixed race. Data from the Department of Defense was used to determine Operation Enduring Freedom/Operation Iraqi Freedom status. VA service connection > 50% or less than/equal to 50% was also identified, as was receipt of a non-service connected pension. Homelessness was defined as veterans that used specialized VA homelessness program services in FY2012 and/or has a V60.0 ICD-10 diagnostic code that reflected a lack of housing during FY2012 (Edens, Kaspro, Tsai, & Rosenheck, 2011).

### 2.3. Medical

The selection of medical problems to evaluate consequences of multimorbidity was based on the Charlson index (Charlson, Pompei, Ales, & MacKenzie, 1987; Charlson, Szatrowski, Peterson, & Gold, 1994) whose components were identified from standard ICD-9 diagnostic codes. Medical problems included seizures, insomnia, myocardial infarction, peripheral vascular disease, cerebrovascular accident, dementia, COPD, peptic ulcer disease, hepatic disease, diabetes mellitus, complications of diabetes, renal disease, HIV, and cancer. Also included were several pain-related diagnoses such as headaches, diabetes pain, musculoskeletal pain, fibromyalgia, skeletal muscle spasm pain, and herpetic pain as well as a summary variable of any pain diagnosis. The above diagnoses were extracted from clinical encounters within FY2012.

### 2.4. Psychiatric and substance use

Psychiatric diagnoses were identified by ICD-9 diagnostic codes and included dementia, schizophrenia, bipolar disorder, major depression, other depression (e.g., dysthymia), post-traumatic stress disorder, anxiety disorder, adjustment disorder, personality disorder, and other

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