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Is there a recent epidemic of women's drinking? A critical review of national studies

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Abstract

Alcohol consumption is increasing in the United States, as is alcohol-attributable mortality. Historically, men have had higher rates of alcohol consumption than women, though evidence for birth cohort effects on gender differences in alcohol consumption and alcohol-related harm suggest that gender differences may be diminishing. We review studies using U.S. national data that examined time trends in alcohol consumption and alcohol-related harm since 2008. Utilizing a historical-developmental perspective, here we synthesize and integrate literature on birth cohort effects from varying developmental periods (i.e. adolescence, young adulthood, middle-adulthood, and late adulthood), with a focus on gender differences in alcohol consumption. Findings suggest that recent trends in gender differences in alcohol outcomes are heterogeneous by developmental stage. Among adolescents and young adults, both males and females are rapidly decreasing alcohol consumption, binge and high intensity drinking, and alcohol-related outcomes, with gender rates converging because males are decreasing consumption faster than females. This pattern does not hold among adults, however. In middle-adulthood, consumption, binge drinking,

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and alcohol-related harms are increasing, driven largely by increases among women in their 30s and 40s. The trend of increases in consumption that are faster for women than men appears to continue into older adult years (60 and older) across several studies. We conclude by addressing remaining gaps in the literature and offering directions for future research.

Accumulating evidence indicates that patterns of alcohol consumption are changing in the United States (Grucza et al., 2018; Haughwout et al., 2016). The evidence for these changes is drawn from a variety of sources. Per capita alcohol consumption has been increasing since approximately 2002 (Haughwout et al., 2016), and hospital inpatient admissions related to alcohol disorder have increased since then as well (Sacco et al., 2015). Recent meta-analyses of survey data sources suggest that overall, adult alcohol use, binge drinking (Grucza et al., 2018) and alcohol use disorders (Grant et al., 2017; White et al., 2015) are increasing, perhaps most among adults in middle-age and older. In contrast, during this same period, national data indicate that adolescent alcohol use and binge drinking are decreasing rapidly (CDC, 2016; Miech et al., 2018; White et al., 2015). Historically, epidemiological analyses of trends over time in alcohol use have demonstrated strong birth cohort effects; that is, birth cohorts born after the 1950s having higher alcohol consumption through the life course than previously born cohorts (Keyes et al., 2011), after 1950, some cohorts (particularly those born in the late 1970s and early 1980s) have increasingly high risk regardless of developmental stage (Kerr et al., 2012; Keyes et al., 2011).

Within these broad trends, however, many data sources suggest important differences by gender. While men traditionally have had higher rates of alcohol use, heavy drinking, and alcohol disorders (Keyes et al., 2011), this gender difference has narrowed over time, warranting increased surveillance of alcohol problems among women (Grucza et al., 2018). Gender differences have also been found in cohort effects; for example, differences in alcohol use between adolescence boys and girls are minimal or non-existent among recently born cohorts (Cheng and Anthony, 2017; Slade et al., 2016). However, few studies explicitly tested for gender differences in overall cohort effects (i.e., gender by cohort interactions) or gender by cohort by age interactions (i.e., the extent to which gender by cohort interactions vary depending upon the point of the lifecourse). Gender convergence could arise in multiple ways; women could be increasing drinking while men are decreasing, both men and women could be increasing with women increasing at a faster rate, or men and women could both be decreasing, with women decreasing at a slower rate. Moreover, the way in which gender convergence could arise may vary by developmental period. Understanding the ways that gender differences are narrowing historically and at what point of the lifecourse this narrowing is most evident is essential in order to inform the public health response to changing drinking patterns.

While the literature is sparse on cohort effects by gender and age, increases in alcohol consumption among adult women, especially those in young adulthood (White et al., 2015), have caused concern about the potential adverse effects on pregnancies and young children. Messaging around alcohol consumption for women in their childbearing years has generally focused on the risks of alcohol use for a fetus (O'Leary, 2004), given that a substantial proportion of pregnancies are unintended (thus women may not have decreased or abstained

from drinking in preparation for pregnancy) (Finer and Zolna, 2011). Women face more stigma related to problem alcohol use (Keyes et al., 2010a), and have lower rates of treatment and service utilization for alcohol (Keyes et al., 2010b), underscoring the importance of tracking prevalence of potential alcohol-related harm in the community. However, a full understanding of the patterns of alcohol use by gender across the entire span of the life-course, from initiation in adolescence to post-retirement, is needed to fully inform the epidemiology of alcohol use by gender in the United States.

Historical and developmental time trends in gender differences by developmental period: A review of the drinking literature

The present review focuses on two sources of time-related variation: historical and developmental. Historical time is year-to-year variation in incidence and prevalence; developmental time is variation at different age-related developmental stages (e.g. adolescence, young adulthood, middle adulthood, older adulthood). Within the lenses of historical and developmental variation, we reviewed the evidence from national studies of alcohol consumption and related harm. We focus on national studies because these provide the most generalizable results, and the most reliable surveillance due to consistency in methods, e.g., sampling frames and measurements. Among adolescents, three survey sources provide such information: Monitoring the Future (MTF), the Youth Risk Behavior Survey (YRBS), and the National Survey on Drug Use and Health (NSDUH) (see Online Table 1). Additionally, we included national administrative surveillance sources of data on alcohol-related hospitalizations and deaths among adolescents using data from the National Inpatient Sample (NIS), and vital statistics data. Finally, we include data on alcohol-related motor vehicle crashes and driving after drinking among adolescents, using Fatality Analysis Reporting System (FARS), NSDUH, and MTF.

Survey sources among adults are more diverse in sampling strategies. Five survey sources routinely report results from young adulthood through older age (see Online Table 1). Monitoring the Future (MTF) has a longitudinal panel component that allows for assessment of historical trends in alcohol use that are specific to young adults, and follows them through older adulthood. Large cross-sectional surveys with regular assessments of alcohol consumption include the NSDUH, the Behavioral Risk Factor Surveillance Survey (BRFSS), the National Alcohol Survey (NAS), National Health Interview Survey (NHIS) and the National Epidemiological Survey on Alcohol and Related Conditions (NESARC). To provide additional information on historical trends in more severe consequences of heavy alcohol use, we include studies of alcohol-related motor vehicle crashes, driving under the influence of alcohol, entry into alcohol treatment, hospitalization including emergency department visits, treatment for alcohol-attributable conditions such as chronic liver disease, and alcohol poisoning. These historical trends are drawn from five data sources, including the National Inpatient Sample (NIS), National Emergency Department Sample (NEDS), Treatment Episode Datasets (TEDS), the National Roadside Survey, and vital statistics data from the CDC on alcohol-related mortality.

To be included in this review, published reports were required to report historical trends using data that included a most recent date of data collection after 2008 to provide information on the most current historical trends, as well as report data across men and women separately. We detail the array of outcomes related to alcohol use in Table 1. Note that studies vary in the terms used for drinking behavior, the definitions of various drinking-related outcomes, and the outcomes considered. From each paper, we extracted the evidence for gender differences, historical trends overall and by gender, and whether the studies presented evidence for tests of gender differences in the historical trend (i.e., whether the gender difference narrowed or expanded) in the historical trend.

Adolescence

In MTF data adolescent alcohol use generally declined for over two decades, except for a 2016–2017 slight increase in binge drinking (from 15.5% to 16.6%) among 12th grade students (Miech et al., 2018). Considering a shorter historical time span, several other data sources confirm the decreases observed in MTF, e.g., the NSDUH (White et al., 2015) and adolescent emergency department visits for alcohol-related causes (White et al., 2018). Table 2 includes national studies of gender differences in alcohol outcomes over historical time among adolescents. MTF data show that boys have higher prevalence of alcohol use and binge drinking than girls, but declines have been steeper in the prevalence of use among boys than girls, narrowing the gender gap. For example, past two week binge drinking decreased among boys from 28.4% in 2008 to 18.5% in 2017 (a 35.1% decrease), and among girls, the decrease was from 21.3% in 2008 to 14.6% in 2017 (a 31.4% decrease) (Johnston et al., 2018). In NSDUH data, the declines in drinking were of less magnitude, but similar between boys and girls; the prevalence of binge drinking among boys aged 12–17 decreased from 8.9 in 2008 to 7.4 in 2012 (an 16.9% percent decrease), among girls aged 12–17, the decrease was from 8.3 in 2002 to 6.8 in 2012 (an 18.1% percent decrease) (White et al., 2015). Methodological differences between the MTF and NSDUH surveys may explain the differences in prevalence, e.g., time frame of assessment (MTF uses past two weeks and NSDUH uses past 30-days), age ranges covered in publications, as well as sampling frame and setting (e.g. MTF surveys students in school and at specific grade levels, whereas NSDUH surveys adolescents at home at a broader age range). Thus, the extent to which declines are faster among boys compared with girls remains an open question for which continued surveillance and comparisons across data will be necessary.

Further, these trends in adolescents differ by age. For example, MTF data indicate that in recent years, older adolescent boys were likelier to engage in drinking, binge drinking, and high-intensity drinking than girls (Patrick et al., 2013; Patrick and Terry-McElrath, 2017; Schulenberg et al., 2018). However, since approximately 2002, younger adolescent girls report *higher* levels of drinking incidence (e.g. taking the first full drink) than boys; specifically, two studies found that the rate of newly incident drinking among female adolescents exceeded that among male adolescents by 2% (Cheng and Anthony, 2018, 2017; Seedall and Anthony, 2013).

Harms related to alcohol are also decreasing among adolescents, with differential patterns by gender. Although alcohol-related ED visits declined overall through 2014 (Naeger, 2017;

White et al., 2018), girls aged 12 to 14 visited the ER for alcohol-related incidents more frequently than boys the same age (Naeger, 2017).

Young adulthood (ages 18 to 30).

Results regarding young adults are largely drawn from MTF panel studies and NSDUH. These data suggest that young adults age 18–25 follow similar patterns as adolescents, with decreases across time. For example, among those 19–22, the prevalence of binge drinking declined from 37.9% in 2008 to 32.3% in 2016 (Schulenberg et al., 2018). From 2005 to 2015, high-intensity drinking also declined among individuals in their early 20s, with less decline among those in their late 20s, and increasing rates among those approaching their 30s (Patrick et al., 2017). Declines in drinking among those 18–25 are apparent among college students, and less so among those not in college (Schulenberg et al., 2018; White et al., 2015). In NSDUH data, binge drinking decreased over time among those aged 18–20, from 43.2% in 2002 to 34.1% in 2012 among men, and from 29.9% in 2002 to 27.1% in 2012 among women (White et al. 2015). Similar to adolescents, declines in young adulthood, particularly among those age 19–25, were greater in men than women. However, at this age, the prevalence of binge drinking, high intensity drinking, and alcohol-related ED visits remains substantially higher among young men than young women (Naeger, 2017; Patrick and Terry-McElrath, 2017; Terry-McElrath and Patrick, 2016). These studies are largely descriptive, with little statistical quantification of the magnitude of gender differences.

There is evidence to suggest that the direction of historical variation in young adult binge drinking varies sharply depending upon which portion of young adulthood is examined. For example, in MTF data from participants who graduated from high school from 1976 to 2004, binge drinking frequency (Jager et al., 2013; 2015) and binge drinking prevalence (Patrick et al., 2019) decreased historically during the initial portion of young adulthood (i.e., approximately ages 18 to 22) but thereafter (i.e., from approximately ages 22 to 30) binge drinking frequency and prevalence both generally increased historically. Moreover, Patrick et al (2019), which formally tested for gender differences, found that the extent to which these historical trends varied by age differed somewhat by gender. Specifically, for men binge drinking frequency declined historically across ages 18 to 22, remained historically stable from ages 22 to 24, then increased historically from ages 25 to 28, and then again remained historically stable from ages 28 to 30. For women binge drinking declined historically from ages 18 to 21, and then increased historically from ages 22 to 30.

Taking the overall findings on young adults into account, mirroring adolescence, alcohol consumption is declining historically for those in the initial young adulthood years (~18–22), but during the remainder of the young adulthood years (~22 to 30) alcohol consumption is generally *increasing* historically. This general trend is reflected within the data from what we term “middle-adulthood” below, especially as many studies that cover adulthood include those in their 20s within studies that also covered historical trends in older age group. That is, alcohol consumption is decreasing among those in adolescence and the early stages of young adulthood, more so for men than women, but as the most recent cohorts progress into their 30s and 40s, their alcohol consumption is increasing, more so for women than for men.

Middle-Adulthood

In adulthood, many studies found either decreases or no change in drinking among men across time, but steady and significant increases among women (Grant et al., 2017; Grucza et al., 2018; Polcin et al., 2014; Schulenberg et al., 2018). Two studies found increases among women in the prevalence of 12-month alcohol use, binge drinking, high-risk drinking, and DSM-IV Alcohol Use Disorder from 2000 to 2013 and 2000 to 2015, when the prevalences among men did not change (Grant et al., 2017; Grucza et al., 2018). Three studies showed a slow narrowing of gender differences in current drinking, binge drinking, and DSM-IV AUD among 26–34 year-olds and 45–64 year-olds, due in large part to increases in women's drinking (Keyes et al., 2011; Schulenberg et al., 2018; White et al., 2015).

White et al (2015) disaggregated rates of binge drinking and other alcohol-related outcomes among men and women by age groups within adulthood. Increases in drinking were more apparent among women than men. For example, in those aged 26–34, binge drinking increased from 20.8% to 25.9% among women, but only 45.7% to 46.1% among men. In those aged 45–64, binge drinking increased from 9.5% to 13% among women, but only 26.9% to 27.5% among men. For other outcomes, there were not substantial historical increases (e.g. prevalence of alcohol use disorders; mean drinking days), but these same outcomes declined among men and but not among women.

Finally, studies of alcohol-related harm indicate substantial historical declines in alcohol-impaired driving (Bergen et al., 2012) and alcohol-involved motor vehicle fatalities (Macinko et al., 2015) in the past decade, but no change or increases in cirrhosis, acute and chronic liver damage, and alcohol poisoning (Allen et al., 2016; Bergen et al., 2012; Case and Deaton, 2017; Scaglione et al., 2015). However, gender differences were not systematically investigated.

Of particular note, however, is the paucity of studies that examined gender differences in consequences of drinking. Among those that did, few explicitly tested for gender convergence. Indeed, of the 24 published studies of historical trends in alcohol-related outcomes in the past decade, only 13 present evidence for gender differences, and of those, only one (White et al., 2015) included statistical tests for whether those gender gaps narrowed. Surveillance of time trends in drinking and related harms among women can and should be substantially improved with existing data sources, with explicit modeling to test whether they differ from trends for men. Finally, few studies addressed whether historical and developmental trends in gender differences varied by other demographic characteristics. Available evidence indicates that historical trends in alcohol consumption vary by socio-economic indicators such as college attendance, but whether alcohol consumption among college attenders and non-college attenders increases or decreases over time depends on the data source. For example, in NSDUH data, the gender gap in binge drinking narrowed among young adults without college education due to increasing prevalence among women and decreasing prevalence among men (White et al., 2015). In contrast, data from the NAS study found positive cohort effects indicative of increased drinking risk for more recently born cohorts of women for heavy drinking days, but only among those with a college

education or greater (no similar differential cohort effects by education were documented among men) (Lui et al., 2018). Thus, understanding how patterning of historical and developmental time trends in alcohol outcomes are differentially shaped by factors such as education and socio-economic status is a clear gap in the literature. Emerging data also suggest that gender differences in trends over time among adults vary by race/ethnicity; National Alcohol Surveys suggest increases in alcohol consumption among White women and men through 2010, as well as Black women; increases among Black women also led to a narrowing of gender differences among Black men and women (Zemore et al., 2013). Given the complexity of the intersection of other demographic characteristics with gender and time, a broader effort to understand interactions across social class and race is needed.

Older adulthood.

Several studies have focused on adults over 60. Male older adults are more likely than women to engage in binge drinking and meet criteria for DSM-IV AUD (Han et al., 2017); however, binge drinking and DSM-IV AUD rates have both increased historically, more so for older women, although older women have historical low rates overall (Breslow et al., 2017; Han et al., 2017). Indeed, rates of binge drinking have only significantly increased historically among older women, not among men, in NSDUH data (Breslow et al., 2017). Further, alcohol use and disorders increased across the past decade among older adults in NESARC (Grant et al., 2017), but to date findings by gender and age simultaneously across time have not been published.

Delineating age, period, and cohort effects

Several studies have examined alcohol consumption in the past decade through the lens of *age*, *period*, and *cohort* effects. It is worth an overview of what we mean by age, period, and cohort effects, and how these studies affect interpretation of recent trends.

Age effects reflect changes in risk linked to a developmental stage. For example, alcohol use is most likely to begin in adolescence (Chen and Jacobson, 2012), and tends to increase during the transition to adulthood (Schulenberg and Maggs, 2002).

Cohort effects occur when individuals who are born around the same time (birth cohorts) have higher alcohol use in adolescence, and maintain higher alcohol use throughout the life course than other birth cohorts (Keyes et al., 2011). As the papers in this review suggest, evidence indicates that US cohorts born in the late 1970s and early 1980s have higher alcohol consumption than earlier- and later-born cohorts (Kerr et al., 2012; Keyes and Miech, 2013) across the entire life course that they have been observed. The late 1970s-early 1980s birth cohorts have emerged as heavy drinking adults across two independent data sources (Kerr et al., 2012; Keyes and Miech, 2013). Further, examining cohort effects by socio-economic status, increased consumption among women born in the late 1970s through 1980s primarily occurred among women with the highest levels of education. However, these cohorts are not exclusively those at higher risk of adverse outcomes, compared to other cohorts that have been observed in the past decade. Indeed, data from the NAS indicate that women born between 1956–1960 have elevated risk for binge drinking compared with those

born from 1900 through 1955 (Kerr et al. 2009, 2013; Lui et al. 2018), and Case and Deaton (2015) documented higher alcohol-related mortality risks among men born 1945–1956, highlighting the overall increases in drinking and alcohol-related outcomes across adulthood in the past decade.

Period effects emerge when patterns of alcohol use in the population fluctuate across all age groups within a specific band of historical time. Most studies that present rates of alcohol-related outcomes across time and age do not distinguish between period and cohort effects, though among those that do, available evidence suggests few strong period effects influencing rates of alcohol consumption in the past decade. Therefore, most of the changes in alcohol outcomes since 2008 are determined by age and cohort effects. However, no studies have tested cohort by gender interactions within the context of age-period-cohort models. Therefore, disaggregating age, period and cohort effects with rigor, and gender trends within each type of effect, is an important area of future research.

Summary.

When considering the prevalence of alcohol-related outcomes across developmental age, historical time, and specific alcohol-related outcomes, a complicated story emerges. Gender differences in alcohol use, binge drinking, and alcohol-related hospitalizations have narrowed in adolescence and early young-adulthood (age 18 to 25) because drinking is declining faster among boys/men than among girls/women. Around ages 26–35 and 45–64, binge drinking and sequalae of heavy drinking such as alcohol-related hospitalizations are increasing, primarily due to increases among women. However, for women in these specific age groups, other alcohol outcomes, e.g., alcohol use disorders have not increased. Yet when considering all adults together (i.e., ages 18+), there has been a general historical increase in alcohol use disorders among women and men, with a greater increase among women. Alcohol use and binge drinking are increasing among older adults as well, with greater increases among women. Together, these results indicate that more adult women are now binge drinking compared to previous generations, suggesting that contemporary adult women face elevated risks of harm related to drinking. The summary of our findings is provided in Figure 1. Does this suggest an “epidemic” of women’s drinking? The answer is that it depends on the developmental age of interest. Certainly, U.S. women in their 30s and 40s are drinking more than in previous decades, suggesting that harms indicative of heavy drinking will increase among this age group. Yet adolescent and young adult women are drinking less than ever previously observed in survey data. Thus, there is no evidence of an “epidemic” in younger age groups.

Despite generally consistent results across data sources, however, there is considerable room to improve the rigor of existing research. Specific tests of gender convergence and divergence in drinking patterns are rare in the literature, and adulthood is often considered as a broad category (e.g. grouping adults as “18+”), even though trends vary considerably across distinct segments of adulthood (e.g., young adults, middle adults, older adults). Indeed, only when we separate “adulthood” into these distinct, more refined age groups can we synthetize the literature together in terms of the driving force underneath all of the

historical patterns currently being observed, which is that age trajectories of drinking vary by birth cohort. This variation can be conceptualized as an age by cohort interaction.

Integrating historical and developmental perspectives to understand gender differences in drinking

Cohort by age interactions, which occur when cohort effects vary by the age or point of the life span considered, provide a useful framework to integrate the literature on adolescents and adults. As noted above, the nature of cohort differences in drinking patterns varied by developmental period (e.g., the same cohorts that declined in drinking as adolescents went on to increase in drinking as middle-aged adults) and within developmental period (e.g., binge drinking decreased historically during the initial years of young adulthood but increased historically during the rest of the years of young adulthood). Turning more specifically to gender differences in drinking, cohort by age by gender interactions are key to consider. Cohort by age by gender interactions hold when a gender by cohort interaction (i.e., extent to which cohort effects differ by gender) itself varies depending upon age. And once again, cohort by age by gender interactions were noted above within our literature review (e.g., the gender by cohort interaction during adolescence – where gender differences narrowed historically – differed from the gender by cohort interaction during young-adulthood – where gender differences were stable) (Patrick et al., 2019). Put another way, to truly explicate population level trends in drinking (and how those trends vary by gender) a historical perspective is insufficient (because historical effects vary markedly across developmental period) and a developmental perspective is insufficient (because developmental effects vary markedly across historical time). Instead, we argue that a historical-developmental perspective, that allows for the conceptualization and examination of cohort by age interactions, is required.

Although rarely considered within the literature on historical trends in drinking, there are at least four approaches to illuminating cohort by age interactions (and in turn cohort by age by gender interactions, if gender is also addressed). The first approach, which we utilized here, is a literature review that incorporates a set of studies that range in both the time periods examined and the ages or developmental periods examined in order to decipher if and how historical trends have varied by the period of the lifecourse examined. The other three approaches involve more direct empirical tests. The second approach incorporates sets of cross-sectional historical data sets that collectively assess overlapping cohorts but assess them at different points of the life span, such as the paper by White et al. 2015 (White et al., 2015) that separated historical trends in gender differences by small age categories. The third approach incorporates a set of developmental data sets that collectively assess overlapping developmental periods but vary as to which cohort is assessed, that can assess developmental and historical variation simultaneously through age-period-cohort estimation (Kerr et al., 2012; Keyes and Miech, 2013). By utilizing either the second or third approach, cohort effects could be compared across the lifespan. The fourth approach would use a single data set that is both historical and longitudinal in its design. Out of all four approaches, this fourth approach provides the most leverage for determining age by cohort interactions, and in turn age by cohort by gender interactions. The work reviewed above by

Jager et al. (2013; 2015) and Patrick et al., (2019) that utilized data from MTF are examples of studies using this fourth approach. More specifically, Jager et al. found a cohort by age interaction, with the decline in binge drinking among US adolescents during the 1980s, 1990s, and the early 2000s counterbalanced with a faster acceleration or rate of growth in drinking during the transition to adulthood through age 26 (Jager et al., 2015, 2013). Although (Jager et al., 2015, 2013) demonstrated an age by cohort interaction through data that were both historical and longitudinal in design, they did not examine gender differences. Because Patrick et al. (2019) did formally test for gender differences, they were able to document gender differences in age by cohort interactions (or age by cohort by gender interactions). Further, exemplifying the insights that can be gained from this approach, Patrick et al., (2019) also documented historical shifts in peak ages of binge drinking as well as gender differences in those shifts. Specifically, Patrick et al. (2019) found that across historical time peak age of binge drinking shifted upward by two years for both males (i.e., from age 20 to 22) and females (i.e., from age 21 to 23). While data that have sufficient developmental as well as historical variation are relatively less well common then data with one or the other only, sources such as MTF as well as other national sources such as the National Longitudinal Survey of Youth (e.g., (Williams et al., 2018)) may be leveraged to gain additional insight in the future.

Pinpointing not just the cohorts that are most at risk but also the developmental period when those risks are most evident

Studies reviewed here indicate that increases in alcohol consumption in the past decade are particularly concentrated among women through young adulthood, with additional evidence demonstrating increases among women currently in their 30s and 40. These are the same birth cohorts of women who evidenced declines in adolescent binge drinking in the 1980s and 1990s, yet faster acceleration in binge drinking during the transition to adulthood in the 1990s and 2010s. These women together comprise the birth cohorts born in the late 1970s and early 1980s. Cohorts of women born in the late 1970s and early 1980s have been shown to have high levels of lifetime drinking compared to other cohorts of women (Kerr et al., 2012), despite the evidence that these cohorts had less adolescent binge drinking than previous cohorts (Miech et al., 2018). Increased risk of alcohol consumption through the life course for late 1970s/early 1980s birth cohorts has been confirmed in other data as well (Keyes and Miech, 2013). Thus, the literature is remarkably consistent when changes over historical time in alcohol use are examined by birth cohort, in that age-period-cohort analysis indicates that the same cohorts of women who had the highest risk of heavy alcohol consumption were the same group who evidenced faster acceleration in drinking during young adulthood. Yet acceleration in drinking in young adulthood has been documented as continuing among cohorts of young adults who have not yet aged into middle adulthood, especially women (Jager et al. 2013; 2015; Patrick et al., 2019). Thus, we would expect that the next cohorts of women who progress into middle adulthood will have higher risks for heavy alcohol use than the current cohorts of women in their middle adulthood. Continued surveillance, through a variety of study designs, is needed to confirm these patterns, and cohorts of women in middle adulthood, especially those who will be entering middle

adulthood in the coming years, should be monitored closely for harmful drinking patterns and related health problems, with provisions made in the medical system to treat them.

Historical trends in gender differences in drinking: Potential mechanisms

While cohort by age interactions aid in understanding the historical decline in alcohol use in adolescence coupled with later historical increases in alcohol use in adulthood, much remains unexplained. Boys in adolescence had even steeper declines in binge drinking during the 1980s and 1990s than girls (Miech et al., 2018), and accelerated their drinking patterns similarly to girls during the transition to adulthood (Jager et al., 2015, 2013). However, middle aged men have not shown the increases in drinking found in women (Grucza et al., 2018), suggesting that the mechanisms reinforcing relaxed drinking norms among middle-aged women are not operating the same way among middle-aged men (Keyes et al., 2011). Further, NAS data suggest that increases in drinking among women in middle adulthood are confined to those with higher levels of education (Lui et al., 2018). Historical increases in alcohol consumption among this group may reflect changing norms around alcohol use and less social sanctions against heavy use among those with higher educational attainment, given that social norms underlie in part population variation in alcohol use as well as binge drinking (Keyes et al., 2012; Skog, 1985). Additionally, burden of multiple role strain may underlie some alcohol increases among high socio-economic status women (Sumra and Schillaci, 2015), although this remains speculative as additional social roles among women generally predict lower, rather than higher, rates of problem alcohol use (Kuntsche et al., 2009). Changes in alcohol branding and marketing may also contribute to increases among adult women in this age group (Petticrew et al., 2017), with an increasing number of products aimed at women and mothers (Kindy and Keating, 2016). Changing dissemination of norms through social media (Lindsay and Supski, 2017) may be operating as well. Of course, however, the extent to which segmentation of alcohol marketing is a cause or effect of increases in drinking among adult women cannot be teased apart. This rapid increase may be indicative of a more prolonged period of heavy drinking now lasting into the adult years, particularly among women with higher socio-economic status. However, levels of alcohol consumption among women remain lower than men, thus while the burden associated with heavy alcohol use among women maybe be increasing, much of the burden will likely remain among men.

More broadly, the decline in adolescent drinking across the last three decades, among both boys and girls, has been particularly pronounced. The reasons for decreased adolescent drinking are likely multi-fold. Declines in adolescent drinking began in the 1980s, largely attributable to states rolling out increases in minimum legal drinking ages (Wagenaar and Toomey, 2002). All states had an MLDA of 21 by 1987, yet alcohol consumption and binge drinking have continued to generally decline among adolescents for the next thirty years, suggesting that MLDA does not explain all of the historical trends (Jager et al., 2015; Patrick et al., 2019). Investment in underage drinking prevention and public health messaging, restrictions on alcohol advertising to youth, and other public health measures are likely a major contributor to the historical decline (Group, 2010; Wagenaar and Toomey, 2002). However, the success has not been as apparent among adolescent girls, among whom drinking has declined but not to the extent of boys.

Future directions

While numerous studies have focused on historical declines in adolescent drinking, few studies have focused on gender differences in alcohol consumption among older adults. As longevity increases and US adults remain healthier into their later years, alcohol consumption is increasing among older adults in part because relatively good health is required to be able to drink at all (Han et al., 2018; Naimi et al., 2017). Those with chronic disease, medication contraindications, and functional impairments reduce or stop drinking (Nandi et al., 2014; Shaw and Agahi, 2012), and to the extent that health problems are delayed, older individuals may be able to prolong their drinking careers. Data from both NSDUH and NHIS indicate that historical increases in drinking in older age are more pronounced among women than men. The reasons underlying gender differences in these historical increases are unknown but important to determine.

We note limitations to the research reviewed here. Most descriptive surveillance studies do not explicitly test for gender convergences and divergences, making conclusions about the patterning of trends across time speculative. Further, few studies disaggregated adults into sufficiently refined age categories to understand the nuances of increased drinking across different segments of adulthood. Further, prevalence studies that do not present data over time by birth cohort may lead to inaccurate conclusions about particular age groups if several cohorts are driving trends. This has important implications for public health response. If several cohorts are engaging in heavier drinking throughout their lifecourse, then a focus on those cohorts, rather than on particular age groups, is needed. Further, these cohorts will likely need alcohol services and develop alcohol-related illnesses at a higher rate than other cohorts. These needs should be recognized and health services prepared.

Increased alcohol use among middle-aged women has implications for long-term health outcomes. A rigorous body of evidence indicates that even at moderate levels, alcohol consumption is associated with the development of breast cancer (Bagnardi et al., 2013). Among drinkers, women have higher rates of cardiovascular disease (Hanna et al., 1997; Urbano-Márquez et al., 1995) and alcohol-related cancers (Holman et al., 1996; Lindberg and Ågren, 1988; Smith et al., 1983) than men. These gender differences occur, in part, due to average differences in body weight and metabolism (Lieber, 1997). Thus, increases in alcohol consumption among women portend more health consequences in this group. Indeed, we reviewed several studies indicating that women are outpacing men in alcohol-related hospitalizations, suggesting that treating women for alcohol disorders and alcohol-related health problems are important for capacity-building to reduce alcohol-related harm in the coming decades.

A substantial gap remains in the literature for rigorous studies that address both historical and developmental variation. Most of our understanding of trends in drinking among women, especially among adults, is based on relatively short historical windows and broad age categories. Among studies that begin to disentangle age groups, cover longer historical periods, and disaggregate variation due to age, period, and cohort, an array of insights emerges about specific adult age groups at most risk. As data sources are assembled that address both historical and developmental variation, and as these data sources grow in size

and scope, we can conduct reliable tests of gender differences within fine-grained age categories, and through this, begin to learn more about the women and men at greatest need for alcohol prevention and intervention efforts in the coming decades.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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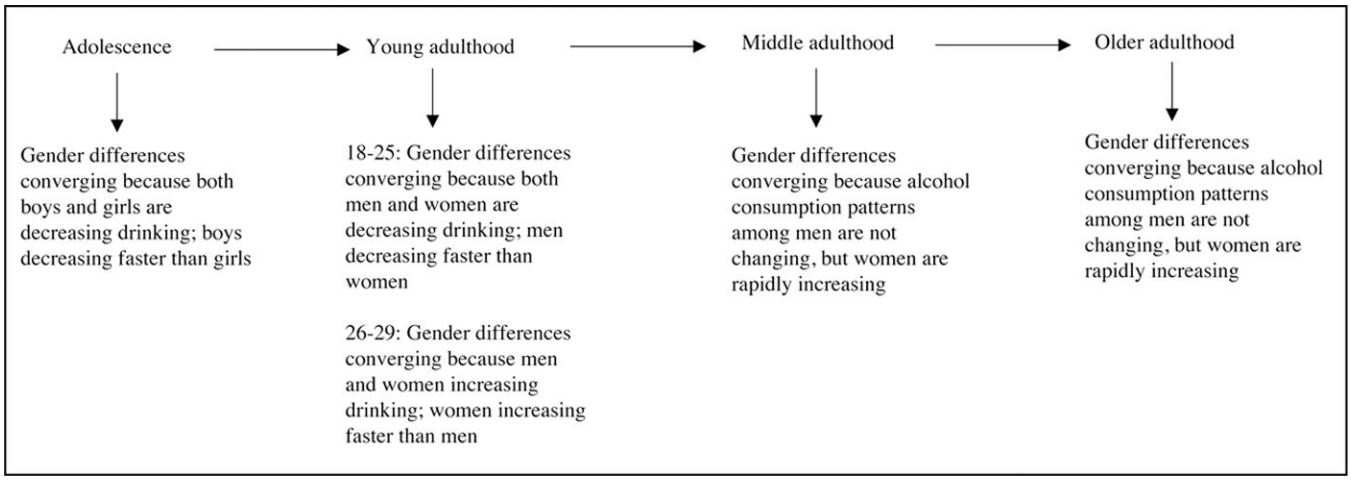

Figure 1.
Summary of findings: gender differences in alcohol use across the life course, since 2008

Table 1.

Alcohol related outcomes examined across studies for potential gender convergences across the life course

Outcome	Definition	Publications
Acute on chronic liver failure	2+ extrahepatic organ failures in patients with cirrhosis	Allen et al., 2016
Alcohol dependence	Positive response to 1+ symptoms in at least 3 domains in DSM-IV	Zemore et al., 2013
Alcohol-related Emergency Department visits	Cases of acute alcohol poisoning and nondependent abuse	White et al., 2018 Naeger, 2017
Alcohol-related hospital discharges	Hospital discharges with diagnosis of alcoholic psychoses, alcohol dependence syndrome, nondependent abuse of alcohol, chronic liver disease, cirrhosis, and alcohol poisoning	Chen and Yoon, 2018 Kim et al., 2012
Alcohol-related motor vehicle fatalities	Death from motor vehicle collision involving alcohol consumption	Macinko et al., 2015
Alcohol volume	Frequency and quantity of past-year alcohol consumption	Lui et al., 2018 Kerr et al., 2014 Kerr et al., 2012
Alcohol Use Disorder (DSM-IV AUD)	Positive response to 1 or more of alcohol abuse criteria in DSM-IV or 3 or more of 7 alcohol dependence criteria over past 12 months	Han et al., 2017 Grant et al., 2017 White et al., 2015
Binge drinking/Heavy drinking episodes (HDE)	Consuming 5 or more drinks on one occasion (past 30 days: NSDUH, BRFSS, MTF, YRBS; past 12 months: NHIS (4 or more for women since 2014), NESARC (4 or more for women), NHANES, NAS, NSDUH; past 2-weeks: MTF [4 or more for women included in recent years])	Patrick et al., 2019 Cheng and Anthony, 2018 Fish and Baams, 2018 Grucza et al., 2018 Johnston et al., 2018 Lui et al., 2018 Schulenberg et al., 2018 Patrick et al., 2017 Grant et al., 2017 Breslow et al., 2017 Han et al., 2017 Patrick and Terry-McElrath, 2017 White et al., 2015 Keyes and Miech, 2013 Patrick et al., 2013
Chronic Liver Disease (CLD)	Nonalcoholic liver disease and alcoholic liver disease	Doycheva et al., 2017 Younossi et al., 2011
Cirrhosis	Presence of liver cirrhosis	Scaglione et al., 2015
Current drinking	Having 1 or more alcoholic beverages over the last 30-day period	Fish and Baams, 2018 Breslow et al., 2017 White et al., 2015
Daily alcohol use	Consuming alcohol every day	Schulenberg et al., 2018
Driving under the influence	Operating motor vehicle under influence of alcohol, including a combination of alcohol and other substances	Chen et al., 2017 Lipari et al., 2016 Ramirez et al., 2016 White et al., 2015

Outcome	Definition	Publications
		O'Malley and Johnston, 2013 Bergen et al., 2012
Frequent binge-drinking (FBD)	More than 2 occasions of consuming more than 5 drinks in a row on one occasion in prior 2 weeks (MTF); 5+ drinks in a single sitting on a weekly basis (NAS)	Jang et al., 2017 Polcin et al., 2014
High-intensity drinking (HID)	Consuming more than 10 drinks on one occasion; consuming more than 15 drinks on one occasion	Patrick et al., 2017 Patrick and Terry-McElrath, 2017 Patrick et al., 2013
Lifetime abstinence	Never having consumed alcohol	White et al., 2015
New incident drinking	Consuming first full drink in prior 12 months	Cheng and Anthony, 2017 Cheng et al., 2016 Seedall and Anthony, 2013
Number of drinking days per month	Measure of frequency of consuming alcohol over 30 day period	White et al., 2015
Pressure to alter drinking behavior	Measure of informal and formal pressure to quit or change alcohol consumption	Polcin et al., 2014
Substance abuse treatment	Entry of publicly-funded substance abuse treatment centers for alcohol, other substances, or some combination	McCabe and Arndt, 2012
30-day prevalence of intoxication	Being intoxicated at least once within the last 30 days	Schulenberg et al., 2018 Terry-McElrath and Patrick, 2016

Table 2.

Gender differences in alcohol initiation, consumption, binge and heavy drinking among adolescents and young adults.

Authors	Sample	Years (sorted by earliest date)	Age groups	Birth cohorts	Outcome	Trend over time	Difference by gender	Convergence	Examination/testing of gender convergence
Patrick et al., 2019	MTF	1976–2016	18–30	~1958–1986	HDE	Decreases in binge drinking from age 18 through approximately age 25; increases in binge drinking from approximately age 26 to 30; concomitantly, increaes in the peak age of binge drinking across historical time from age 18 to 30	Yes. Higher prevalence among men.	Convergences in gender differences in early young adulthood due to faster decreases among men; stable gender differences as development approaches age 30.	Yes, convergences occuring
Johnston et al. 2018	MTF	1976–2017	8th, 10th, 12th grade	~1958–2005	HDE	Declining	Yes, higher among males	Yes; boys declined faster than girls since the 1980s, leading to convergence	Does not test gender by age interactions
Jang et al., 2017	MTF	1991–2015	8–12th grade	~1973–2003	Frequent binge drinking	Decreasing	Yes. Higher male reporting of FBD.	Yes. Gap closing from 1991–1998 to 2007–2015	No gender by time/cohort interaction tested
Chen et al. 2019	NSDUH	1995–2015	12–17	1978–2003	Driving under the influence	Decreasing	Yes. Higher among males.	Yes. Gap is closing due to faster declines among boys. Declines are more apparent at driving ages, 15–17. Reports of driving under the influence from 12–4 are rare	Convergence not tested
O'Malley & Johnston, 2013	MTF	2001–2011	12th grade students	~1983–1993	Driving under the influence	Decreasing	Yes, higher among males	n/a	Does not examine gender convergence
Seedall and Anthony, 2013	NSDUH	2002–2009	12–17 years old	1985–1997	Incident drinking	n/a	Yes. Excess female risk among 12–17 year olds.	n/a	Does not examine time trends
White et al., 2015	NSDUH	2002–2012	12–25 years old	1977–2000	HDE, driving under the influence	Decreasing	Yes. Higher among men	Among college students, no change	Yes, convergences occuring

Authors	Sample	Years (sorted by earliest date)	Age groups	Birth cohorts	Outcome	Trend over time	Difference by gender	Convergence	Examination/testing of gender convergence
								in gap; among non-college students, gap decreasing due to decreases among men and increases among women. Among 21–25, decreasing gap driven by slower decrease among females than males.	
Cheng et al., 2014	NSDUH	2002–2013	12–24 years old	1978–2001	First full drink	Decreasing	Yes. Higher female incidence among 13–16 year olds; higher male incidence after age 21.	Divergence between 13–17 due to excess female alcohol initiation; divergence after age 22 due to excess male initiation.	No gender by time/cohort interaction tested
Patrick et al., 2016	MTF	2005–2011	12th grade students	~1987–1994	HDE, HID	Decreased HDE, constant HID	Yes. Higher HDE and HID among males.	n/a	Does not examine gender convergence
Patrick and Terry-McElrath, 2017	MTF	2005–2014	18–20 years old	~1985–1997	HDE, HID	Decreasing	Yes. Higher male prevalence across HDE and HID.	n/a	Does not examine gender convergence
Patrick et al., 2018	MTF	2005–2015	18–30 years old	~1975–1997	HDE, HID	Decrease in some HDE, HID outcomes at ages 19/20, 21/22, 23/24. Increases in HDE, HID at 29/30.	Yes. Higher prevalence of HID among men in young adulthood; similar prevalence of HDE in young adulthood	Yes. Gapsnarrowing for some outcomes and age groups due to faster decreases among men and/or faster increases among women.	Yes, convergences occuring
Cheng and Anthony, 2018	NSDUH	2006–2014	12–21 years old	1985–2002	Time-to-HDE	n/a	Yes. Excess female risk age age 11–14. Excess male risk 15+.	Not explicitly tested.	Does not examine time trends
White et al., 2018	NEDS	2006–2014	12–17	1989–2002	Alcohol misuse-related Emergency Department visits	Decreases in acute alcohol-related ED visits among both boys and girls	n/a	n/a	Convergence not tested
Fish and Baams, 2018	YRBS	2007–2015	9th through 12th grade students	~1989–2003	Alcohol use, early onset use, past 30-day use, past 30-day HDE	Decreases in all outcomes across all sexual orientations	Mixed. Early onset use higher for boys, but past 30-day use, and HDE higher for girls in most years,	Yes. Gap is closing if not crossing over to higher rates among girls, especially those	No gender by time/cohort interaction tested, and no interactions tested by gender and sexual minority status simultaneously

Authors	Sample	Years (sorted by earliest date)	Age groups	Birth cohorts	Outcome	Trend over time	Difference by gender	Convergence	Examination/testing of gender convergence
							particularly sexual minority girls	identifying as sexual minorities	
Kim et al., 2012	NIS	2008	15–20 years old	1988–1993	Alcohol-related hospital discharges	n/a	Yes, higher among males.	n/a	Does not look at time trends
Naeger, 2017	NEDS	2010–2013	12–20 years old	1990–2001	Alcohol misuse-related Emergency Department visits	Decrease among 12–17 year olds	Yes. Excess male ED visits overall. Higher female rate among 12–14 year olds.	Yes. Constant gender gap among 15–17 year olds. Gap closing among 12–14 year olds, driven by female decrease.	No gender by time/cohort interaction tested
Cheng and Anthony, 2018	NSDUH	2010–2014	12–17 years old	1993–2002	Incident drinking	n/a	Yes. Excess female risk of ~2% among 12–17 year olds across years.	Not explicitly tested.	Does not examine time trends

* HDE = Heavy Drinking Episode; HID = high intensity drinking; AUD = Alcohol Use Disorder

Table 3.

Gender differences in binge and heavy drinking, alcohol volume, and other alcohol-related outcomes among adults 18+, as well as articles that include all age ranges

Authors	Sample	Years (sorted by earliest date)	Age groups	Birth cohorts	Outcome	Trend over time	Difference by gender	Convergence	Limitations
Schulenberg et al., 2018	MTF	1975–2017	1–4 years beyond high school	~1958–1998	HDE, 30-day any drinking	Decrease in HDE and 30-day any drinking	Yes. Higher prevalence among men across outcomes.	Convergence due to faster decreaess among men than women	Convergence not tested
Kerr et al., 2012	NAS	1979–2010	18+	1900–1992	HDE, alcohol volume	Highest volume consumed by 1976–1980 birth cohort among men and 1981–1985 among women; overall declining period effect	n/a	n/a	Does not examine gender convergence
Lui et al., 2018	NAS	1979–2010	21+	1900–1920, 5-year cohorts from 1921 to 1989	Alcohol volume, HDE, specific beverages	APC varied by education and sex. For consumption, declining period effect to 2005, then increase concentrated among those with high eduction. For HDE, declining period effect. Increasing cohort effects for both consumption and HDE.	Yes, higher among men for all cohorts.	Convergence in younger cohorts due to faster increase among women, restricted to those with higher education.	Convergence not tested
Macinko et al., 2015	FARS	1980–2010	0–75+	1905–2010	Alcohol-involved motor vehicle fatalities	Decrease over time period, and a greater speed of decrease for more recently born cohorts	Higher for male drivers at all ages; for all decdents, gender differences depend on age (no gender difference at younger ages)	n/a	Convergence not tested
Johnston et al., 2018	MTF	1980–2017	19–30	~1950–1998	30-day prevalence of alcohol, daily alcohol, HDE	Declines across outcomes among among19–22; increases across outcomes at 27–30	Yes. Higher among males.	At 19–22, convengence due to faster declines among men; at 27–30, stable gender gap	Convergence not tested

Authors	Sample	Years (sorted by earliest date)	Age groups	Birth cohorts	Outcome	Trend over time	Difference by gender	Convergence	Limitations
Polcin et al., 2014	NAS	1984–2010	18+	< 1934–1992	Pressure to alter drinking behavior, HDE	Increased pressure from 1984 to 1990, then decreased. 1960–1964 cohort had highest cohort effect for HDE among both men and women	Yes. Higher male prevalence pressure and HDE.	Yes, convergence due to faster decline among men.	Convergence not tested
Keyes and Miech, 2013	NSDUH	1985–2009	15–64	1910–1994	HDE	Highest HDE among in the 1975–1979 cohort among men and 1965–1969 cohort among women; increasing period effect	n/a	n/a	Does not address gender convergence
Younossi et al., 2011	NHANES	1988–2008	18+	~1913–1990	Alcoholic liver disease	Prevalnce increased slightly from 1.38% to 2.05% from 1988 to 2008	Higher among males than females.	n/a	Convergence not tested
Doycheva et al., 2017	NHANES, adolescents and young adults	1988–2012	15–39 years old	~1949–1997	Chronic Liver Disease	Sharp increase from 1988–1994 to 1999–2004	Yes. Higher CLD among men, but higher alcoholic liver disease among women.	Stable gender differences across time	Methods for classification of CLD may have changed; gender convergence not explicitly tested
Case and Deaton, 2017	Vital Statistics, white non-Hispanic men with less than a college education	1990–2015		1935–1980	Alcohol poisoning; alcohol-related liver mortality	Increases across the lifecourse from ~25 to 60+ among cohorts born after 1950	Data among women not included	n/a	Did not include women
Bergen et al., 2012	BRFSS	1993–2008	18+	~1938–1990	Alcohol-impaired driving	Fluctuated, with peaks in 1993 and 2006, derease from 2006 through 2010	Higher among males than females.	n/a	Convergence not tested
McCabe and Arndt, 2012	TEDS; pregnant women entering treatment for substance use	1998–2008	18–44	~1954–1990	Substance abuse treatment	Decline in alcohol use at treatment entry from 1998 through 2008; increase in drug use over the same time period	n/a	n/a	Does not compare genders
Hingson et al. 2017	NIS	1998–2014	18–24	1974–1996	HDE, alcohol-impaired driving, alcohol-related mortality, overdose hospitalizations	From 20050214 Declines in HDE among college attenders, and declines in alcohol-impaired driving, as well as alcohol-related	Gender differences not assessed	n/a	Convergence not tested

Authors	Sample	Years (sorted by earliest date)	Age groups	Birth cohorts	Outcome	Trend over time	Difference by gender	Convergence	Limitations
						hospitalizations and deaths			
Scaglione et al., 2015	NHANES	1999–2010	18+	~1924–1992	Cirrhosis	Prevalence increased from 0.26% in 1999–2000 to 0.30% in 2009–2010	Higher among males than females.	n/a	Convergence not tested
Kerr et al., 2014	NAS	2000, 2005, 2010	18+	~1935–1992	Alcohol volume	Increase in total alcohol volume	Yes. Excess volume among males	Convergence due to increases among White women, not for other racial/ethnic groups	Does not examine birth cohorts, convergence not tested
Zemore et al., 2013	NAS	2000, 2005, 2010	18+	<1935–1998	Alcohol dependence	Among women, increases in alcohol dependence from 2005 to 2010 for Whites and Blacks, decrease for Latina. Among men, increases from 2005 to 2010 for Whites	Yes, prevalence of alcohol dependence higher for men in every period	Gender convergence among Black men and women; no changes for Whites, gender divergence for Latina	Convergence not tested
Chen and Yoon, 2018	NIS	2000–2015	12+	< 1935– 2003	Alcohol-related hospital discharges	Increase over time, particularly among 45+	Yes. Higher for males than females, except for cirrhosis without alcohol poisoning	Gender differences stable over time	Does not test for convergence; diagnoses by gender and age not diaggregated
Grucza et al., 2018	Pooled analysis of NESARC, NHIS, NSDUH, BRFSS, NHANES, NAS	2000–2015	18+	~1935–1997	Past-year alcohol use, HDE	Increase over time	Yes. Higher use and HDE among men.	Yes. Narrowing gap, driven by female increase (no change over time among men).	Does not disaggregate age and gender trends separately
Allen et al., 2016	NIS	2001–2011	12+	< 1935–1999	Acute and chronic liver failure	6-fold increase from 2001 to 2011	Higher among males than females.	n/a	Convergence not tested
Grant et al., 2017	NESARC	2001–2002, 2012–2013	18–65	~1936–1995	DSM-IV AUD, HRD, 12-month alcohol use	Increase across all outcomes	Yes. Excess male prevalence of all outcomes.	Yes. Narrowing gap across outcomes, driven by female increase.	Does not examine birth cohorts, convergence not tested

Authors	Sample	Years (sorted by earliest date)	Age groups	Birth cohorts	Outcome	Trend over time	Difference by gender	Convergence	Limitations
White et al., 2015	NSDUH	2002–2012	26–64	1938–1986	Lifetime abstinence, current drinking, BD, DSM-IV AUD, driving under the influence	Increases in current drinking and binge drinking, inconsistent evidence for other outcomes	Yes. All outcomes higher among males	Yes. Convergence in current drinking among 26–34 and 45–64 year-olds, driven by female increase. Convergence in HDE among 26–34 year-olds, driven by female increase. Convergence in driving under the influence, driven by slower female decrease.	None
Lipari et al. 2016	NSDUH	2002–2014	16+	<1920–1998	Driving under the influence	Decrease from 2002 to 2014	Yes. Higher among males	Convergence by 2014, due to faster declines among males.	Convergence not tested
Terry-McElrath and Patrick, 2016	MTF	2005–2014	25–26 years old	~1979–1988	30-day prevalence of intoxication, HDE, HID	Stable	Yes. Higher prevalence among men across outcomes.	n/a	Does not examine gender convergence
White et al., 2018	NEDS	2006–2014	25–65+	<1941–1989	Alcohol misuse-related Emergency Department visits	Increase across time among those 25+ and older	Yes. Higher rates among males in all age groups	Evidence of faster increases among women in young adulthood, although overall no substantial change in gender gap overall	Convergence not tested
Ramirez et al., 2016	National Roadside study	2013–2014	16+	<1948–1998	Driving under the influence	Decrease from 2007	Yes. Higher among males.	Convergence in 2013–14,	Convergence not tested

Authors	Sample	Years (sorted by earliest date)	Age groups	Birth cohorts	Outcome	Trend over time	Difference by gender	Convergence	Limitations
								driven by male decrease from 2007.	

*HDE = Heavy Drinking Episode; HID = high intensity drinking; AUD = Alcohol Use Disorder

Table 4.

Gender differences in binge and heavy drinking, alcohol volume, and other alcohol-related outcomes among adults 50+

Authors	Sample	Years (sorted by earliest date)	Age groups	Birth cohorts	Outcome	Trend over time	Difference by gender	Convergence	Limitations
Breslow et al., 2017	NHIS	1997–2014	60+ years old	< 1925–1954	Current drinking, HDE	Increased current drinking	Yes. Higher male prevalence across outcome.	Yes. Narrowing gap in current drinking and HDE, driven by female increase.	None
Han et al., 2017	NSDUH	2005–2014	50+	~1940–1964	HDE, DSM-IV AUD	Increases in HDE among those 50–64, increases in AUD among those 65+	Yes. Higher HDE and DSM-IV AUD among males.	Yes. Narrowing gap in HDE and DSM-IV AUD, driven by female increase.	Convergence not explicitly tested

*HDE = Heavy Drinking Episode; HID = high intensity drinking; AUD = Alcohol Use Disorder