

The ACBC Study: Alcohol Causes Breast Cancer

# Literature review

A rapid review of the literature to inform messaging to young women that alcohol use is a breast cancer risk factor

Julie Von Behren, Diane Schmidt, Christina Tam, William  
Kerr, Peggy Reynolds, Priscilla Martinez  
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## I. List of search terms

Topics/Search characteristics	Search terms
Epidemiologic literature on alcohol use among young women	
Time limitations	2015-2020
Language limitations	English publications
Regional limitations	US populations
Trends	Drinking/alcohol; trends; young women
Beverage Type Preferences	Drinking/alcohol; beverage type; young women
Drinking context	Drinking/alcohol; context; alcohol settings; alcohol situations; young women
Motivations and Behavioral Traits	Drinking/alcohol; motivations; expectations; attitudes; young women
Norms and Values	Dinking/alcohol; norms; values; young women
Database	Pubmed; Google Scholar
Epidemiologic Literature on Alcohol Consumption as a Risk Factor for Female Breast Cancer	
Time limitations	2010-2020
Language limitations	English publications
Alcohol and Breast Cancer Risk	Review; breast neoplasm/cancer; alcohol consumption
Database	Pubmed
Literature on Health Messaging and Communications	
Time Limitations	2005-2020
Language limitations	English publications/campaigns
Awareness of Cancer Risk	Alcohol; alcohol drinking; breast cancer incidence; women; young women; college students; risk awareness; cancer risk
Health Information Seeking	Health information-seeking/information seeking; women's health; young women's health; health communication; information sources
Campaigns	Health campaigns; health education; breast cancer; alcohol consumption; health messages; information seeking; alcohol drinking; health promotion; message design

Database	PubMed, grey literature including Google searches for campaign websites
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## II. Purpose

The purpose of this rapid literature review is to provide a foundation of empirical evidence upon which to develop messaging to effectively communicate to young women that alcohol use increases the risk of developing breast cancer. Thus, we conducted searches on the broad topics of alcohol use among young women, alcohol use and breast cancer risk, and health messaging and communications. The searches were limited to either the past 5-15 years, dependent on the topic and amount of information available, to ensure the relevance of the evidence for developing messaging that will be aimed at the young women of today.

## III. Summary of Epidemiologic Literature on Alcohol Consumption among young women

### Trends in alcohol use

Trends in alcohol use among young women are largely drawn from the Monitoring the Future (MTF) panel studies and the National Survey on Drug Use and Health (NSDUH). The Monitoring the Future Survey is the longest and largest running survey of health among adolescents to young adults, spanning 45 years and including approximately 15,000 respondents on an annual basis<sup>1</sup>. NSDUH is also an annual survey that began in 1971 and is conducted in all 50 states and the District of Columbia. Approximately 70,000 people aged 12 and older participate in NSDUH study annually. According to MTF, past 30-day alcohol use among women aged 19 to 22 in the United States declined notably from the 1980s to the 1990s, from 75% to 62%, increased slightly through 2008, remained approximately level to 2017, then declined slightly to 57.1% in 2018, an all-time low. Among the 23-26 year old women, however, past 30 day use rose gradually between the early 1990s and the early 2000s, and stands at 71% in 2018. In NSDUH, binge drinking decreased over time among women aged 18 to 20, from 29.9% in 2002 to 27.1% in 2012<sup>2</sup>. Interestingly, data from MTF showed binge drinking for women ages 18 to 21 declined historically, that is, from year-to-year, and then increased among women ages 22 to 30<sup>3</sup>. While there are reports of declines in youth drinking overall, any drinking and binge drinking among young women in recent years is declining

less rapidly than men, and may be increasing depending on which alcohol measure and which age bands are being considered<sup>4</sup>.

Beyond the MTF and NSDUH surveys, much of the literature on alcohol use and heavy drinking among young women is based on college samples. This is in large part because alcohol use and heavy drinking is highly common in college settings, and also because college samples are an easily accessible data source for university-based researchers. While college-samples are an important source of information about young women's alcohol consumption, young women not in college by default are not represented in these samples and are an important group for messaging about the risk of breast cancer from consuming alcohol. Unfortunately, there is scant literature from the last 5-10 years about non-student female populations. One recent, small study among non-student men and women between the ages of 18 and 25 found that women reported heavy drinking days as 25% of all drinking days over the previous 2 weeks, and an average of 2.3 drinks per 1.8 hour drinking session<sup>5</sup>.

### Beverage Type Preferences

Ascertaining beverage type preferences (e.g., beer, wine, spirits) for a target demographic is challenging due to shifts in cohort preferences and marketing trends<sup>6,7</sup>. For instance, results from the Monitoring the Future Study suggest adolescent preference for beer decreased between the years 1990 and 2008<sup>7</sup>. However, two studies that sampled young people within the current campaign's demographic may suggest women today between ages 18 and 25 prefer liquor. In a study investigating beverage preferences and negative consequences of alcohol among a sample of college students, young women were endorsed using mixed drinks the most (liquor; 42%), followed by beer (22%), shots (of liquor; 19%), and then wine (15%)<sup>8</sup>. Although alcohol drinks mixed with energy drinks or caffeine has been widely studied among an earlier cohort<sup>9</sup>, only 2% of the study sample preferred this beverage type<sup>8</sup>. Finally, there also is evidence for beverage type preferences by racial/ethnic identification regardless of cohort membership<sup>10,11</sup>. A community-wide study on young women in Pittsburgh found that, despite different preferences across adolescence for Black and White girls, the increasing preference for liquor was common for both racial groups (among wine and beer as other choices)<sup>11</sup>.

### Drinking Contexts

The contexts under which young women today consume alcohol take into account expectancies, where and with whom they are drinking, and social media influences. Limited evidence suggests that while

young women drink less during weekdays compared to men, gender did not predict weekend increases in drinking<sup>12</sup>. Furthermore, tension reducing expectancies were associated with weekday drinking while social expectancies predicted weekend consumption<sup>12</sup>. A study using a sample of sexual minority young women (N=670) presented findings that paralleled extant research with heterosexual women: About a third of young women were classified as convivial drinkers, or with others on a weekly basis, and another third at home in an intimate setting, e.g., weekly with a partner<sup>13</sup>. Finally, results from a college sample (in which a majority were women) show while drinkers are more likely to have and to check their social media accounts compared to non-drinkers, the latter group were at greater risk for gleaning normative information about peer approval regarding risky drinking from their online networks<sup>14</sup>. Because there are very few studies relevant to this campaign in particular, results should be interpreted with caution.

### Motivations and Behavioral Traits

Motives to drink alcohol are widely-understood as the cognitive factors that contribute to the decision to consume alcohol. Behavioral traits such as impulsivity and inhibitory control also play a role in the ability to restrain from drinking or drinking in excess. Drinking motives are categorized as negative or positive and internal or external<sup>15, 16</sup>. Coping motivation (internal and negative) is described as the decision to drink to alleviate stress or, more broadly, escape from unpleasant feelings or experiences. Enhancement motives (internal and positive) are associated with drinking to enhance and prolong enjoyment. Social motivation (external and positive) is the desire to drink in order to better facilitate a social situation, while conformity motivation (external and negative) is the decision to drink in order to fit in with one's peers. Research has found that enhancement and coping motivations are predictive of heavy episodic drinking and problems, while social motivations are more often associated with drinking frequency.

The majority of research conducted on young adults' drinking motivations involve college campuses where alcohol consumption is more prevalent and students are more likely to engage in risky-drinking than their non-college peers<sup>17</sup>. Such risky-drinking usually occurs in a student's first year of college rather than in later years since over-consumption of alcohol is often used to cope with the stress of transitioning from dependence (living at home) to independence<sup>18</sup>. Such transitions can also lead to depression or other mental health issues or deepen already-existing symptoms, which further increases the risk of problem drinking and can extend into adulthood. Motivations such as enhancement and conformity have also been shown to predict excessive alcohol use among college students<sup>16, 18</sup>. Social motivators play a strong role, and because college drinking is often done within peer groups, and such

social contexts have been associated with excessive alcohol use, it creates a culture where heavy drinking is normalized<sup>19</sup>.

While there is extensive research on young adults' motivations for drinking, there is a lack of studies specifically focused on young women's motives as alcohol use and abuse has largely been labeled a male trait<sup>20</sup>. Analyses of differences in drinking motives by sex and/or gender showed women's heavy alcohol use is motivated largely by factors related to reducing anxiety (coping) and social concerns (conformity) than external motives such as enhancement<sup>15</sup>. Women are also more likely to engage in pre-drinking than men in order to relieve feelings of discomfort or to enhance confidence (coping motive); college students who drink to cope are more likely to continue excessive drinking into adulthood<sup>18</sup>.

Behavioral traits such as sensation-seeking and impulsivity also affect a person's drinking patterns. In Weafer et al's study on sex differences in impulsivity in at-risk drinkers aged 18 to 30, women had poorer inhibitory control than men<sup>21</sup>. The researchers noted that other studies have linked these differences to biologically-based mechanisms suggesting that females could be at greater risk of problem drinking than males. In addition, among young heavy drinkers, women had significantly less impulsivity control than men, and impulsivity predicted alcohol dependence in young women. Evans-Polce et al's study that assessed sensation-seeking, substance use, and age-variations found, for women, sensation-seeking leading to binge-drinking was strongest at ages 24 to 28 and that as women aged, sensation-seeking was replaced by coping motives<sup>22</sup>.

## Norms and Values

Social networks appear to influence drinking norms and values among young women overall, and these networks vary by self-selected involvement in Greek life in university and college settings, sexual identity and, among other factors, ethnic/cultural identity. These reviewed studies were mostly drawn from college samples. The most salient findings pertaining to drinking norms are within certain peer contexts: For example, analyses with the Monitoring the Future Study found women who lived in sorority houses had greater prevalence of binge drinking compared to all other women (including those who had not attended college), with sustained differences lasting several years through the early 20s<sup>23</sup>.

Generally, young people will rate their friends' drinking status and quantity in alcohol consumption fairly accurately<sup>24</sup>, but there appears to be an overestimation of drinking frequency and quantity of others in their cohorts. Sexual minority women (bisexual or lesbian; SMW) perceived greater frequency of alcohol consumption among other SMW relative to heterosexual women<sup>25-27</sup> and some results suggest these descriptive norms predict drinking patterns over time<sup>27</sup>. Similar patterns were

observed in a large national study of students from tribal colleges and universities where the majority is generally comprised of young women; higher perceived descriptive norms among fellow students were significantly associated with more individual drinking <sup>28</sup>.

There is some evidence that service learning, which aims to increase college students' contact with peers outside their friend group, may be effective for behavioral modification around drinking. Women who engaged in service learning on campus (e.g., in the form of creating campaign messages on drinking with campus statistics) had greater likelihood of increasing their protective behaviors related to drinking (including alternating non-alcoholic beverages with alcoholic ones, using a designated driver, paying attention to their own drinking) compared to women who were only given information on drinking <sup>29,30</sup>.

Other individual characteristics such as racial/ethnic identity and endorsing traditional gender norms may also influence drinking norms within certain contexts. For example, spirituality among Mexican American young women <sup>31</sup> and endorsing traditional gender norms <sup>32, 33</sup> showed associations with nondrinking status or light drinking (as opposed to heavy drinking). Also of interest is Latinx young women's propensity to engage in greater frequency of light drinking when stress levels are elevated and they endorse gender-related norms. The study authors speculated young women may be drinking to socialize to cope with stress <sup>33</sup>.

### Summary and applications to messaging

While there have been declines overall in youth drinking over the past 3 decades, alcohol use among young women remains at levels that warrant attention, particularly due to the prevalence of binge drinking which is known to have negative acute (hangover, injury) and chronic (long-term health) effects. Evidence showing a preference for liquor among young women suggests that messaging about alcohol use and breast cancer should include images of a variety of beverage types, including liquor, and should not be limited to the popular idea of women as predominantly consumers of wine. The dearth of evidence on the contexts in which young women are drinking limits its application to our messaging. However, in conjunction with the literature on the norms and values of young women regarding alcohol use, studies overall suggest drinking alcohol is by far a social activity, whether in a group or intimate setting, and that the amount consumed is highly influenced by peers and social networks. Thus, portraying such contexts and situations could potentially be effective in tailoring the messages to young women. Motivations for drinking, such as drinking to cope or conform, are associated with hazardous drinking among young



women, and should thus be considered for inclusion in messages or information provided to women engaging in heavy or binge drinking.

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## IV. Summary of Epidemiologic Literature on Alcohol Consumption as a Risk Factor for Female Breast Cancer

### Alcohol and Breast Cancer Risk

Alcohol is a known human carcinogen, according to the International Agency for Research on Cancer (IARC). In 2010, a report by IARC reviewed over 100 epidemiological studies on alcohol and breast cancer risk<sup>10</sup>. The report concluded that female breast cancer risk is increased at levels of alcohol consumption around one drink per day. Since 2010, several key review articles have been published on this topic. For the purposes of this targeted literature review, we focused on the risk for primary female breast cancer incidence and we excluded reviews that focused on breast cancer recurrence, survival, hormone receptor status, genetics, and metabolic pathways. In general, recently published review articles overwhelmingly agree with the conclusions of the IARC 2010 report in identifying alcohol consumption as a risk factor for female breast cancer<sup>11-22</sup>. There was one review article that did not find an effect of alcohol consumption on breast cancer risk, but this review was limited to publications on Chinese women and did not have information on levels of consumption (compared any alcohol to no alcohol)<sup>23</sup>.

### Levels of Consumption

The consensus in the epidemiologic literature is that breast cancer risk increases with increasing levels of drinking and risks do not vary by beverage type. A strong and consistent dose-response effect has been observed across most studies and breast cancer risk appears elevated even at relatively low levels of alcohol drinking<sup>19</sup>. However, a recent study reported that non-drinkers had elevated breast cancer risk when compared to low-level alcohol consumers<sup>24</sup>. The authors suggested that women who do not drink any alcohol may have other underlying health conditions that raise their breast cancer risk<sup>24</sup>. Two earlier large meta-analyses, each with over 50 studies included, did not see increased breast cancer risks for non-drinkers<sup>25, 26</sup>. The current literature also suggests that risk does not vary by the type of alcoholic beverage that is consumed<sup>16</sup>.

### Time Periods of Consumption

Some research has focused on drinking in adolescence and young adulthood as a potential critical window of exposure for breast tissue to the carcinogenic effects of alcohol. The issue of timing of exposure was specifically addressed in two key reviews and a recent editorial that focused on early lifetime alcohol consumption and breast cancer risk<sup>14, 15, 27</sup>. Some of the key studies that provided detailed insights into life-course drinking patterns are briefly summarized in Table 1<sup>24, 28-34</sup>.

<b>Author/Date</b>	<b>Study population</b>	<b># breast cancer cases and type</b>	<b>Key findings about age of drinking</b>
White 2017	U.S. Sisters Study	1,843 prospective	Risk did not vary significantly by early age at first drinking, categories were <15 yrs, 15-19, ≥20
Williams 2017	African American AMBER consortium	1,793 prospective and case-control	Evaluated drinking <30 yrs, 30-50, 50+, found no clear patterns by age at consumption
Jayasekara 2016	Melbourne Collaborative Cohort	651 prospective	Alcohol before first pregnancy increased risk, alcohol after did not
Fagherazzi, 2015	French cohort	2,812 prospective	Alcohol consumption after menopause, but not before, increased risk
Liu 2013	U.S. Nurses' Health Study II	1,609 prospective	Alcohol consumption before first pregnancy associated with increased risk
Chen 2011	U.S. Nurses' Health Study	7,690 prospective	Alcohol intake at ages 18-40 years and age 40+ both associated with elevated risk
Terry 2006	Long Island, NY	1,508 case-control	No clear differences in risk by age at consumption
Horn-Ross 2004	California Teachers Study	1,742 prospective	No clear pattern of differences for consumption during earlier periods of life

Most studies have found that breast cancer risk increases with increasing levels of alcohol consumption at any age, with no clear differences in risk by age at consumption, although results from a recent French cohort study suggested that breast cancer risks were elevated for post-menopausal consumption, but not for pre-menopausal drinking<sup>34</sup>. In contrast, a recent prospective cohort study from Australia specifically examined alcohol drinking before the time of a woman's first pregnancy and found increased risk for drinking during this time period but no increase in risk for alcohol consumption after the first pregnancy<sup>29</sup>. A similar analysis was done using data from the Nurses' Health Study II to look at alcohol use after menarche and before a first pregnancy<sup>30</sup>. Breast cancer risk was similarly elevated for drinking before and after first pregnancy. Because alcohol appears to be associated with increased breast cancer risk at any age in most of the studies to date, Colditz et al. have advocated for reducing alcohol consumption in adolescent and young adulthood as a potential strategy for the primary prevention of breast cancer<sup>14</sup>. Similarly, Jayasekara et al. suggested that limiting alcohol intake before a woman's first pregnancy may reduce breast cancer risk later in life<sup>29</sup>.

## Binge Drinking

Two recent studies have assessed the potential impacts of heavy episodic or binge drinking and breast cancer risks. White et al. found that periodic binge drinking, defined as four or more drinks at one time, increased breast cancer risk<sup>28</sup>. Chen et al. reported that binge drinking in the Nurses' Health Study increased risks even after controlling for overall alcohol consumption patterns<sup>31</sup>.

## Summary and applications to messaging

In conclusion, drinking alcoholic beverages increases female breast cancer risk even at relatively low levels of consumption and risk increases with increasing levels of consumption. The level of risk does not appear to vary by the type of alcoholic beverage consumed. Taken together, this suggests that our messaging does not need to specify risk from a specific beverage type, and that a range of drinkers, from light to heavy, will benefit from an increased awareness of the link between alcohol use and breast cancer.

Drinking during any phase of life, including during adolescent and young adulthood, increases risk. To reduce overall cancer risks, the U.S. Centers for Disease Control and Prevention (CDC) recommends that women drink in moderation, meaning no more than one alcoholic beverage per day<sup>35</sup>. This advice applies to women of all ages. The CDC also recommends that women do not start drinking if they do not currently drink alcohol. While there is limited literature focused specifically on breast cancer risks associated with alcohol consumption at young ages, there is some evidence to suggest that adolescent and young adulthood may be a period of higher risk. Whether or not that is the case, the adolescence and young adulthood years are an important period of life to target for interventions that can affect the establishment life-long drinking patterns, including those aimed at increasing awareness of the link between alcohol use and breast cancer.

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## V. Summary of Literature on Health Messaging and Communications

### Awareness of Alcohol and Cancer Risk

The American Institute for Cancer Research, which conducts the Cancer Risk Awareness Survey every two years, found respondents' knowledge of alcohol as a risk factor for cancer increased by 6% from 39% in 2017 to 45% in 2019<sup>1</sup>. However, when comparing changes over time, beginning with the first survey in 2001 when awareness was at 42%, significant fluctuations were observed: awareness fell to 33% in 2005 before peaking in 2009 at 46% then dropping down to 38% in 2013<sup>2</sup>. Researchers speculated such changes corresponded to various studies released during the survey periods that suggested moderate alcohol use was beneficial to heart health, which may have obscured cancer risk messaging.

In assessing youth and young adults' awareness of alcohol as a risk factor for cancer, few US studies targeted these populations. Schneider and colleagues' review of the literature on awareness of alcohol and cancer risk globally, identified 32 papers between 1988 and 2107 with 13 conducted in the US<sup>3</sup>. Of these, only one study surveyed people aged 18-25. Results from this college study showed the majority of respondents identified alcohol as a risk factor for liver cancer but missed other types including breast cancer<sup>4</sup>. Peacy and colleagues found similar results with only 10.1% of college respondents correctly identifying alcohol as a risk factor for breast cancer<sup>5</sup>.

### Health Information Seeking

Individual health-information seeking has increased over the last decade primarily due to an expansion of online material and greater access across most population groups, including information on cancer risk<sup>6</sup>; approximately 59% of Americans use the internet to access health information<sup>7</sup>. However, one study found that females were significantly more likely to use the internet to research cancer information than males; researchers speculated these differences were related to gendered perceived risk of illness and reaction to illness<sup>8</sup>.

### Alcohol and Breast Cancer Awareness Campaigns

In the US, there is a dearth of awareness campaign research that targets young women's alcohol use and risk of developing breast cancer. The majority of cancer campaigns used a broad-based approach to reduce risk across all cancer types and audiences, or focused on a specific cancer such as skin and HPV-related, or a specific risk factor such as tobacco, diet, sun exposure, and exercise<sup>9-17</sup>. Female-targeted breast cancer preventative campaigns were more likely to focus on screening uptake and awareness of



breast changes than risk factor awareness. Campaigns were also more likely to include women of all ages rather than by specific cohorts.

There were a greater number of youth-targeted drinking awareness campaigns identified with the majority located in countries outside the US, in particular Australia and the United Kingdom, and most targeted all adults aged 18 and older. From 29 studies of alcohol harm reduction campaigns, Young and colleagues' identified three US-led that focused on youth<sup>18</sup>. Their analyses showed an increase in awareness and knowledge of alcohol's harms with strong recall of messaging. While the campaigns did not include reduced consumption as a study goal, the authors noted there was no evidence to show that exposure to harm reduction campaigns were effective in curbing alcohol use.

Two studies that assessed youth exposure to online alcohol warning messages found an inverse relationship between exposure to such messaging and alcohol consumption<sup>19,20</sup>. Further findings showed that these types of messages helped counter alcohol industry ads that promoted drinking and resulted in a reduced urge to drink. Stautz and colleagues compared youth responses to three sets of ads: 1) alcohol warning; 2) alcohol promoting; and 3) non-alcoholic beverages<sup>20</sup>. They found youth exposed to the alcohol warning messages had fewer urges to drink than the other two groups; similar results were found regardless of type of drinker (light, moderate or heavy).

## Social Marketing Theory and Framework

Social marketing is an effective audience-centered framework to increase awareness of health issues and promote behavior changes and has been used successfully in health education campaigns across population groups<sup>21</sup>. In applying social marketing techniques to health interventions, social marketing seeks to influence behavioral change in individuals and encourages community leaders to take regulatory and collective action to improve the health of the community. In a systematic review of social marketing effectiveness, Stead et al found that within alcohol prevention and harm reduction interventions, significant positive effects were reported in the short-term, with four of six studies that measured long-term effectiveness that reported reduced alcohol use two years post intervention<sup>22</sup>. The social marketing principles of formative research, segmentation, exchange and competition address many of the barriers to health information uptake. Direct involvement of the target audience by conducting formative research ensures their knowledge guides development of effective messaging and the use of appropriate delivery channels.

While social marketing has been applied in health behavior change campaigns since its inception in the 1970s, recently health communication researchers have applied a more comprehensive approach

that extends beyond a single focused campaign and target audience<sup>23</sup>. This approach has been used to address underage drinking by developing specific messages and materials aimed at the underage drinker, parents, and the entire community in order to shift social norms. Social marketing continues to evolve in response to new communication modes and delivery mechanisms such as social media which introduces a highly interactive approach; the consumer is also a content producer and distributor<sup>24</sup>. Such consumer-generated content may either support or inhibit health messaging initiatives. Conversely, health messaging delivered through social media platforms may help counter user-generated images that promote risky health behaviors.

### Summary and applications to messaging

There is a dearth of research on young women's knowledge of their breast cancer risk due to alcohol consumption; the vast majority of studies that assess youth or young adults' risk awareness were broad and included both women and men. While one study found college students were able to identify alcohol as a risk factor for some cancers, such as liver, only a small fraction associated drinking with breast cancer. Even with clear evidence of alcohol's risk, few campaigns have been dedicated to raising awareness in general and no specific, single campaign has been dedicated to drinking and breast cancer risk. Alcohol campaigns targeted to young adults tended to be broad in scope with a focus on other harms such as drink driving and social harms. Breast cancer prevention campaigns aimed at young women were centered on self-exams and the identification of breast changes; alcohol use was occasionally included in accompanying materials as part of a wider health message, along with diet and exercise. To support the development of health campaigns for young adults, social marketing was the primary framework used to ensure messaging is appropriate and effective by engaging the target audience throughout the process. Social media provides an accessible and highly interactive mechanism for sharing the message that alcohol is a breast cancer risk factor and for engaging and supporting young women to seek information about the causal relationship between alcohol use and breast cancer. Carefully crafted and tailored messaging could potentially inhibit consumer-generated content promoting risky drinking behaviors, while supporting the effort to increase awareness of the breast cancer risk in consuming alcohol.

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