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Secular Trends in Alcohol Consumption over 50 Years:

The Framingham Study

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Abstract

Background—Population trends in patterns of alcohol use are important data for policymakers but are generally based on repeated cross-sectional surveys.

Methods—We used self-reported alcohol consumption data collected repeatedly over 50 years (1948–2003) among 8,600 Framingham Heart Study participants to determine patterns of alcohol use and disorders according to sex, age and birth cohorts.

Results—Among drinkers, there was a decrease across succeeding birth cohorts in average alcohol intake: among individuals between ages 30 and 59, age-adjusted mean intake was 30.6, 25.5, and 21.0 g/day for those born in 1900–19, 1920–39, and 1940–59, in men ($p < 0.001$), and 14.2, 12.3 and 10.4 g/day in women ($p < 0.001$), respectively. In all birth cohorts, proportion of abstinence increased and average consumption among drinkers decreased with age. Furthermore, proportion of moderate use was higher but heavy use was lower in the younger birth cohorts than in the older cohorts. The proportion of alcohol from beer decreased and that from wine increased with age for all cohorts. Among the two earlier birth cohorts, the cumulative incidence of an alcohol use disorder from age 40 to 79 was much higher in men (12.8%) than in women (3.8%); it tended to be slightly higher among subjects born after 1920 than among those born 1900–1919.

Conclusions—We found a decrease in average intake and more wine consumption over the more than 50 years of follow up. The cumulative incidence of alcohol use disorders, however, did not show a decrease.

Keywords

Alcohol drinking; alcohol-related disorders; cohort studies; drinking behavior; epidemiology

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The adverse effects on health and on society of excessive alcohol use have been well described.¹⁻⁵ On the other hand, numerous studies have shown that “moderate” alcohol consumption without heavy drinking episodes is associated with a reduced risk of most cardiovascular diseases⁶⁻⁸ and many other diseases associated with ageing,⁹⁻¹¹ and with improved morbidity and mortality among the elderly.¹² Further, there is appreciation of the importance of the pattern of alcohol consumption in determining the net effects of alcohol consumption, with the greatest health benefits and fewest adverse effects being associated with regular moderate consumption without binge drinking.^{13,14}

A number of studies have described trends in alcohol use, drinking patterns, and frequency of unhealthy use in the United States.^{15,16} Studies have generally used data collected from sequential cross-sectional surveys, hospital discharge records, or sales and traffic data. The results suggest that the total amount of alcohol consumed in the United States has declined slightly over recent decades, and that certain indicators of unhealthy use, such as death from driving while intoxicated or alcohol-related cirrhosis, have generally decreased since the middle of the 20th century, although there have been recent increases in the prevalence of heavy episodic drinking among young people and certain adverse consequences.¹⁷⁻¹⁹ To date, no study has prospectively examined secular trends for the amount of alcohol consumed and patterns of drinking among subjects in a well-defined population-based sample followed over many decades.

The Framingham Study has been monitoring alcohol use since recruitment of the original cohort of subjects began in 1948 and an introduction of an offspring cohort in 1971. In addition to repeated measures of amount and frequency of alcohol consumed recorded in the study database, a new endeavor, the Lifetime Health Study, is currently conducting a page-by-page review of all paper records available on each Framingham Study participant to better elucidate the pattern of drinking, seek evidence of consequences of alcohol use, and identify individuals with alcohol use disorders.

The present analysis of 8,600 participants in the Framingham Study whose record reviews have been completed seeks to determine the effects of sex, age, and birth cohort over time on (a) the total amount of alcohol consumption among drinkers; (b) the proportion of alcohol from specific beverages (beer, wine and liquor); (c) the prevalence of abstainers and, among drinkers, the proportion who were “moderate” drinkers and “heavy” drinkers; and (d) the cumulative incidence of an alcohol use disorder from age 40 to age 79.

METHODS

The Framingham Heart Study began in 1948 in Framingham, Massachusetts.²⁰ The original cohort, hereafter referred to as the “Original Cohort,” included 5,209 subjects, aged 28-62 years at the first examination. Starting with the second examination, surviving participants have been examined biannually. At each examination, participants received a medical history interview, a physical examination, and a series of laboratory tests. In 1971-1974, examinations were offered for the children of the Original Cohort and their spouses, and a total of 5,124 subjects were examined as part of the Framingham Offspring Study. The second examination in the Offspring Cohort occurred approximately 8 years after the baseline examination; subjects have been followed in 4-year cycles since then, with evaluations similar to those of the Original Cohort.

Assessment of alcohol consumption

Average alcohol consumption—Information on amount of alcohol consumption has been collected repeatedly from both the Original Cohort and the Offspring Cohort. At early

examinations (up to the 7th examination) of the Original Cohort, subjects were asked how many 2-oz cocktails, 8-oz glasses of beer, and 4-oz glasses of wine they consumed in a month. At subsequent examinations (the 12th-15th, the 17th-23rd, and the 26th-27th examinations) of the Original Cohort and at all examinations (the 1st - 7th examinations) of the Offspring Cohort, subjects were asked about the number of 1.5-oz cocktails, 12-oz glasses (or cans) of beer, and 4-oz glasses of wine they consumed in a week. Total alcohol consumption (grams per day) has been computed by multiplying the average amounts of alcohol in beer, wine, and mixed drinks times the amount drunk. We adjusted for secular changes that occurred in the late 1960's in the alcohol content of liquor commonly consumed (from 100 to 80 percent proof) and the type of wine generally consumed (from fortified to table wine), as well as a change in the average serving sizes of drinks to calculate the total ethanol content according to when the data were collected.

Heavy episodic drinking—In the later examinations of Original Cohort (the 15th and 17th-23rd examinations) and starting at the 2nd examination of the Offspring Cohort, subjects were asked by trained interviewers prompted by an examination form to specify, “On average, what is your limit for number of drinks at one period of time?” Using this information, subjects reporting more than 4 drinks per occasion for men and more than 3 drinks per occasion for women were identified as having heavy episodic drinking.

Alcohol use disorders—Trained research assistants reviewed all available medical records, including Framingham Study questionnaires, hospital records, letters from private doctors, and other original source documents, for each study participant. An ICD-9 code was assigned for every disease or condition that could be coded. For the current analysis, alcohol use disorders included ICD-9 codes of 305.0 (alcohol abuse), 303.9 (alcohol dependence) and other diagnoses considered to be due exclusively to alcohol (“100% attributable”), such as alcohol withdrawal symptoms (291.81), delirium tremens (291.0), alcoholic cardiomyopathy (425.5), alcoholic cirrhosis (571.2), and alcohol detoxification therapy (94.62).

We also identified an additional group that did not meet criteria for ICD-9 coding for an alcohol use disorder, but review of their medical records identified words/phrases indicating a “possible” alcohol use disorder. The record review leading to this designation included a search for key words such as “lost job because of drinking,” “attends AA,” “arrested for drunk driving,” “advised to decrease my drinking,” “physically injured because of drinking,” and many others. To check the quality of record review, we randomly selected 450 records from the Original Cohort and 450 records from the Offspring Cohort and had them re-reviewed independently by both the project manager (ES) and the principal investigator (RCE). The proportion of agreement on key words indicating a possible disorder was 99 percent for both the Offspring Cohort and the Original Cohort.

Statistical analysis

Subjects were grouped into four birth cohorts: born before 1900, 1900-1919, 1920-1939, and 1940-1959. Since data on alcohol consumption were collected biannually in the Original Cohort and every four years in the Offspring Cohort, we divided age into 2-year age categories, with the first age category being 18-21 and the last being ≥ 86 years of age. Data included in these analyses were those collected from 1948 through November 19, 2003 (end of the 27th Examination) for the Original Cohort and from 1971 through October 26, 2001 (end of the 7th Examination) for the Offspring Cohort.

We calculated the average amount of alcohol consumption among the drinkers and plotted it against age for each birth cohort for men and women separately. For comparison of birth cohorts that had overlapping data, we calculated age-adjusted average amount of alcohol

consumption between ages 30 and 59 for the three younger birth cohorts and between age 60 and 79 for the three older birth cohorts. We assessed the effect of age and birth cohorts on average total alcohol consumption using generalized estimating equations.²¹

We estimated the proportion of the total amount of alcohol consumed from beer, wine, and liquor by dividing the amount of beer, wine, and liquor consumed by subjects in a particular age group of the specific birth cohort by the total amount of alcohol consumed at the time by the same subjects.

We defined a participant as a non-drinker (abstainer) at a particular examination if he/she did not report any alcohol beverage intake at that examination. Among drinkers, we defined an individual as a “moderate” drinker if the subject’s average amount of alcohol met current guidelines of the United States Department of Agriculture/Health and Human Services (an average of ≤ 24 g of alcohol per day for men and ≤ 12 g of alcohol per day for women) and no heavy episodic drinking (defined as > 4 standard drinks per occasion for men and > 3 drinks per occasion for women). Since data on maximum drinking on an occasion were collected only in more recent examinations of the Original Cohort, the analysis evaluating secular trends of “moderate” and “heavy” alcohol consumption among alcohol consumers was limited to the three younger birth cohorts. For each birth cohort, we obtained the age- and sex-specific prevalence of abstainers and the proportion of consumers deemed “moderate” and “heavy” drinkers, and examined their association with age and birth cohort using generalized estimating equations.

Finally, we estimated the cumulative incidence of an alcohol use disorder from age 40 to 79 for the older cohorts (those with data extending to age 80). Since it is likely that very few subjects would become newly dependent after age 80 years, this is the closest we could come to giving the cumulative “lifetime risk” of an alcohol disorder for adults at age 40 or older. Since some members of the Framingham Study were not recruited into the study until they were older than 40 years, our analyses could not include everyone in the current study who may have developed an alcohol use disorder at an earlier age. For the present analyses, we excluded any individual who was identified as having such a disorder before age 40. We also calculated the cumulative incidence by age 80 of an alcohol use disorder when defined as having *either* an ICD-9 code for such a disorder *or* a key word indicating a possible alcohol use disorder.

RESULTS

The characteristics of the subjects at the time of their baseline examination (1948-1953 for the Original Cohort or 1971-1975 for the Offspring Cohort) are shown in Table 1. About one half of subjects were 40 years or younger at the time of their baseline examinations and over 40 percent were born before 1920. Approximately one quarter of participants did not graduate from high school. Prevalence of smoking was much higher in men than in women.

The average amount of alcohol intake, in grams of alcohol per day, for individuals reporting any drinking is presented in Figure 1. In both men (Figure 1A) and women (Figure 1B), average consumption was lower among those in the younger birth cohorts compared with the older ones. Among men between ages 30 and 59 the age-adjusted mean alcohol consumption was 30.6, 25.5, and 21.0 g/day for those born in 1900-19, 1920-39, and 1940-59, respectively ($p < 0.001$). Corresponding figures for women were 14.2, 12.3 and 10.4 g/day ($p < 0.001$). Among subjects for whom data between ages 60 and 79 years were available, i.e., those born before 1900, 1900-19, and 1920-39, a similar pattern was also observed. Among these older men, age-adjusted mean alcohol consumption was 27.9 g/d for those born before 1900, 24.0 g/day for those born between 1900 and 1919, and 19.3 g/d for those born between 1920 and 1939.

($p < 0.001$). The corresponding amount of alcohol consumption for these older women changed less over time (11.6, 12.0, and 11.0 g/day, respectively, $p = 0.36$).

Among men reporting any alcohol intake at an examination, the proportion derived from beer showed a striking decrease with age for all birth cohorts, being 50 percent or more of their total alcohol for subjects until they reached their mid-30s and decreasing to approximately 25 percent by their mid-70s. For the youngest birth cohort (born 1940-1959), the proportion of their alcohol use from beer was higher than among men in earlier cohorts. Over the same time period, the proportion of alcohol from wine showed a gradual increase with age for all birth cohorts. There was less than 15 percent of alcohol from wine for men before age 40, but it increased to more than 25 percent in later years. Between ages 40 and 60, men in the youngest birth cohort consumed a higher proportion of their alcohol from wine than did the earlier birth cohorts. There was less of an effect of age on the proportion of alcohol from liquor for all cohorts. However, the proportion of alcohol from liquor was lower at most ages for individuals born in the younger birth cohorts.

For women, the percentage of alcohol derived from beer was much lower than it was for men, but a similar decrease with age was seen for all birth cohorts. Women consumed a higher percentage of alcohol from wine and, as in men, the percentage increased with age for all birth cohorts. The highest percentage from wine was seen for the youngest birth cohort. For liquor, the pattern with age was similar for women as for men, without dramatic effects for the older birth cohorts. Women in the youngest birth cohort, however, consumed less of their alcohol from liquor, and showed a steady decrease with age.

For both men and women, there was a steady increase in abstinence with age for all birth cohorts. By age 80, more than 40 percent of men and 60 percent of women reported no alcohol consumption. For the earliest birth cohort (born before 1900), women in their 50s and 60s were more likely to be abstainers than were women in later cohorts. In the three younger birth cohorts, the prevalence ratios (PR) of abstinence among men were 0.75 and 0.73, respectively, for participants born between 1900 and 1919 and 1920-1939 in comparison with those born in 1940-1959. In women, in the later cohorts, the corresponding figures were 0.80 and 1.01, respectively.

For the birth cohorts with available data, among individuals reporting any alcohol intake the proportion reporting “moderate” amounts of alcohol increased with age in men (Figure 2A), but somewhat less so in women (Figure 2B). Further, where the ages overlapped, for both men and women the younger birth cohort tended to show a higher prevalence of such a drinking pattern than the older one. For example, for men between ages 40 and 55, the age-adjusted PR of “moderate” drinking among alcohol consumers in the youngest cohort was 1.21 (95 percent CI: 1.12-1.32) in comparison with subjects born between 1920 and 1939; for women in these cohorts, the PR was 1.18 (95 percent CI: 1.10-1.27). Between ages 60 and 75, for men and women combined, the age-adjusted prevalence ratio of “moderate” alcohol drinking was 1.17 (95 percent CI: 1.07-1.28) when comparing individuals born between 1920 and 1939 with those born between 1900 and 1919 ($p < 0.013$).

In contrast, the prevalence of “heavy” drinking for the three more recent birth cohorts was lower in the younger cohorts than in the older cohorts for both men (Figure 3A) and women (Figure 3B). For men, the proportion with “heavy” drinking tended to decrease with age, although the pattern was less clear among women.

As shown in Table 2, the cumulative incidence of evidence of an alcohol use disorder between ages 40 and 79 showed a slight increase from the cohort born between 1900 and 1919 to the later birth cohort; the overall cumulative incidence for the combined cohorts was 12.8 percent for men and 3.8 percent for women. When the analysis included individuals with *either* a code

for an alcohol use disorder *or* a keyword indicating a possible disorder, the cumulative incidence increased very little: 13.8 percent for men and 4.4 percent for women.

DISCUSSION

Using repeatedly collected data on alcohol use and consequences over 50 years in the Framingham Heart Study, we found that the average amount of alcohol consumed by drinkers decreased across birth cohorts. The proportion of individuals reporting “moderate” consumption increased and the proportion reporting “heavy” intake decreased. Further, the percentage of the alcohol intake from beer decreased and the percentage from wine increased across birth cohorts.

The effects of age were similar for most cohorts. The average amount of alcohol was highest between ages 30 and 50, then decreased with age. The percentage of alcohol derived from beer decreased and that derived from wine increased with age; the proportion from liquor showed little change with age. Proportion of abstinence increased markedly with age. Among participants in the older cohorts where data were available, the cumulative incidence of identifying an alcohol use disorder between ages 40 and 79 was about three times higher for men than for women, but showed little change across cohorts.

Several characteristics of this study are noteworthy. First, unlike cross-sectional surveys that have described patterns of alcohol consumption, in this study data on alcohol were collected repeatedly in the same subjects followed for long periods of time. Secondly, as almost 90 percent of the participants in the Original Cohort and more than 16 percent of those in the Offspring Cohort had died by the end of the follow up in these analyses, and the average age of survivors was 86.8 for the cohort and 61.6 for the offspring, the data tend to reflect the lifetime exposure to alcohol for a substantial proportion of the sample. Furthermore, since individuals in the current analysis were born over many decades (ranging from those born before 1900 to those born in 1940-1959), we have been able to describe secular changes in alcohol use over a large proportion of the 20th century, and to separate the effects of age from those of birth cohort.

Similar questions were asked to assess alcohol consumption at each examination, and we took into consideration secular changes in the alcohol content of specific alcoholic beverages as well as changes in the average serving sizes of drinks. Since reports of intake at repeated examinations of individuals were generally very stable, we believe that the overall estimates we report are unlikely due to measurement error. Further, the reported intake has been shown to relate to measured high-density lipoprotein levels in studies that included these subjects.²²

Interestingly, cigarette smoking, another lifestyle factor, showed a similar trend of decrease across birth cohorts. Smoking rates declined after the 1970s, and the percentage of current cigarette smokers was lower among the Offspring Cohort than among the Original Cohort.²³ Participants in the Framingham Study have been found to have values of lipids and other characteristics that reflect those of non-Hispanic whites in the United States;²⁴ thus, we believe that the secular trends of alcohol use and misuse that we describe among the participants probably mirror national patterns.

Our study has some limitations as well. First, the estimates of alcohol intake were all based on self report, and sought data on the subject’s usual intake over time, which may be less accurate than estimates based on records kept of alcohol consumption. Because ethanol content and serving size changed during the study period, we developed a conversion formula to account for such changes; however, when we repeated our analyses excluding data collected at the earlier examinations we found no appreciable differences. Secondly, an important measure of alcohol intake is the drinking pattern, and such information was not systematically recorded

for some of the earlier examinations. When such data were collected, we used a commonly used definition for “heavy episodic drinking” based on the reported limit for number of drinks at one period of time. Also, our data are from mainly middle-aged and older white adults; we have limited data on younger individuals and none on minorities. Since many participants did not enter the Framingham Study until they were in their 50s, we are unable to calculate the lifetime risk of developing an alcohol use disorder. Our estimates of risk of developing such a disorder are limited to those not showing such alcohol problems in medical records before age 40. However, since most alcohol use disorders develop before age 40, it is likely that the disorders first recognized in these records as incident represent disorders that had their initial symptoms in young adulthood.

The Framingham Study did not have specific questions to solicit the evidence of an alcohol use disorder; thus, our estimate on the occurrence of such a disorder was based on the appearance of a relevant diagnosis in the medical records. It is quite possible that we may have underestimated the prevalence of these disorders, even after adding those with possible disorders from key-words within the text of records, since many such consequences do not come to medical attention.

Grant et al¹⁵ showed that “alcohol abuse” increased between cross-sectional surveys in 1991-1992 and surveys in 2001-2002, whereas “alcohol dependence” showed a decline. Of note, the prevalence of current alcohol use disorder in their sample (12% for men, 5% for women) was similar to the proportions identified in our study. However, it is difficult to compare the cumulative rates of alcohol use disorders among the same subjects over the very long period of time that we report with the prevalence from cross-sectional surveys among different individuals.^{15,16}

CONCLUSION

These analyses provide data that may be useful for groups making recommendations about drinking and setting alcohol policy. Research continues to support potentially beneficial effects of moderate drinking on cardiovascular disease and other diseases of ageing, as well as adverse health and social effects of heavy alcohol use. The findings in this study may be considered encouraging in many ways: the average amount of alcohol has decreased in more recently-born cohorts, the percentage of the population exhibiting “moderate” alcohol intake has been increasing steadily, and the percentage reporting “heavy” drinking has decreased over time. Further, with greatly increasing numbers of elderly people, the trends for less “heavy” drinking with advancing age for all birth cohorts is also encouraging. While these data suggest the development of more favorable patterns of alcohol consumption over the latter part of the 20th century, it shows that at the same time the cumulative incidence of alcohol use disorders has not shown a decrease, and continuing efforts at preventing them are warranted.

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References

- (1). Bloss G. Measuring the health consequences of alcohol consumption: current needs and methodological challenges. *Dig Dis* 2005;23:162–169. [PubMed: 16508279]

- (2). Dawson DA, Grant BF, Li TK. Quantifying the risks associated with exceeding recommended drinking limits. *Alcohol Clin Exp Res* 2005;29:902–908. [PubMed: 15897737]
- (3). Saitz R. Clinical practice. Unhealthy alcohol use. *N Engl J Med* 2005;352:596–607. [PubMed: 15703424]
- (4). Ellison RC, Zhang Y, McLennan CE, Rothman KJ. Exploring the relation of alcohol consumption to risk of breast cancer. *Am J Epidemiol* 2001;154:740–747. [PubMed: 11590087]
- (5). McPherson K. Moderate alcohol consumption and cancer. *Ann Epidemiol* 2007;17(5 Suppl):S46–S48.
- (6). Rimm EB, Giovannucci EL, Willett WC, Colditz GA, Ascherio A, Rosner B, et al. Prospective study of alcohol consumption and risk of coronary disease in men. *Lancet* 1991;338:464–468. [PubMed: 1678444]see comments
- (7). Walsh CR, Larson MG, Evans JC, Djousse L, Ellison RC, Vasan RS, et al. Alcohol consumption and risk for congestive heart failure in the Framingham Heart Study. *Ann Intern Med* 2002;136:181–191. [PubMed: 11827493]
- (8). Mukamal K. Alcohol intake and noncoronary cardiovascular diseases. *Ann Epidemiol* 2007;17(5 Suppl):S8–S12. [PubMed: 17478332]
- (9). Koppes LL, Dekker JM, Hendriks HF, Bouter LM, Heine RJ. Moderate alcohol consumption lowers the risk of type 2 diabetes: a meta-analysis of prospective observational studies. *Diabetes Care* 2005;28:719–725. [PubMed: 15735217]
- (10). Stampfer MJ, Kang JH, Chen J, Cherry R, Grodstein F. Effects of moderate alcohol consumption on cognitive function in women. *N Engl J Med* 2005;352:245–253. [PubMed: 15659724]
- (11). Mukamal KJ, Robbins JA, Cauley JA, Kern LM, Siscovick DS. Alcohol consumption, bone density, and hip fracture among older adults: the cardiovascular health study. *Osteoporos Int* 2007;18:593–602. [PubMed: 17318666]
- (12). Lang I, Guralnik J, Wallace RB, Melzer D. What level of alcohol consumption is hazardous for older people? Functioning and mortality in U.S. and English national cohorts. *J Am Geriatr Soc* 2007;55:49–57. [PubMed: 17233685]
- (13). Breslow RA, Smothers BA. Drinking patterns and body mass index in never smokers: National Health Interview Survey, 1997–2001. *Am J Epidemiol* 2005;161:368–376. [PubMed: 15692081]
- (14). Rimm EB, Moats C. Alcohol and coronary heart disease: drinking patterns and mediators of effect. *Ann Epidemiol* 2007;17(5 Suppl):S3–S7.
- (15). Grant BF, Dawson DA, Stinson FS, Chou SP, Dufour MC, Pickering RP. The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991–1992 and 2001–2002. *Drug Alcohol Depend* 2004;74:223–234. [PubMed: 15194200]
- (16). Breslow RA, Guenther PM, Smothers BA. Alcohol drinking patterns and diet quality: the 1999–2000 National Health and Nutrition Examination Survey. *Am J Epidemiol* 2006;163:359–366. [PubMed: 16394204]
- (17). Newes-Adeyi, G.; Chen, CM.; Williams, GD.; Faden, VB. NIAAA Surveillance Reports 74. NIAAA; 2005. Trends in underage drinking in the United States, 1991–2003.
- (18). Yoon, YH.; Yi, HY. Surveillance report 75. NIAAA; 2006. Liver cirrhosis mortality in the United States, 1970–2003.
- (19). Yi, HY.; Chen, CM.; Williams, GD. Surveillance Report 76. NIAAA; 2006. Trends in alcohol-related fatal traffic crashes, United States, 1982–2004.
- (20). Castelli WP. The Framingham Heart Study - thirty years. *Proc Annu Meet Med Sect Counc Life Insur* 1987;103–114.
- (21). Zeger SL, Liang KY. Longitudinal data analysis for discrete and continuous outcomes. *Biometrics* 1986;42:121–130. [PubMed: 3719049]
- (22). Djousse L, Levy D, Herbert AG, Wilson PW, D'Agostino RB, Cupples LA, et al. Influence of alcohol dehydrogenase 1C polymorphism on the alcohol-cardiovascular disease association (from the Framingham Offspring Study). *Am J Cardiol* 2005;96:227–232. [PubMed: 16018848]
- (23). Wilson, PWF.; D'Agostino, RB.; Kannel, WB. Secular trends in cardiovascular risk factor levels” The Framingham perspective. In: Jacott, B., editor. *Atherosclerosis XI*. Elsevier; Singapor: 1998. p. 659–663.

- (24). Vasan RS, Sullivan LM, Wilson PW, Sempos CT, Sundstrom J, Kannel WB, et al. Relative importance of borderline and elevated levels of coronary heart disease risk factors. *Ann Intern Med* 2005;142:393–402. [PubMed: 15767617]

Figure 1.

A. Mean alcohol intake (grams/day) among 4,097 male participants in the Framingham Study who consumed any alcohol, by age and birth cohort.

B. Mean alcohol intake (grams/day) among 4,541 female participants in the Framingham Study who consumed any alcohol, by age and birth cohort.

Figure 2.

A. Proportion of male participants reporting any alcohol intake whose intake was considered “moderate” (mean ≤ 24 g of alcohol per day and no heavy drinking episodes), by age and birth cohort

B. Proportion of female participants reporting any alcohol intake whose intake was considered “moderate” (mean ≤ 12 g of alcohol per day and no heavy drinking episodes), by age and birth cohort.

Figure 3.

A. Proportion of male participants reporting any alcohol intake whose intake was considered “heavy” (mean > 24 g of alcohol per day and/or heavy drinking episodes), by age and birth cohort.

B. Proportion of female participants reporting any alcohol intake whose intake was considered “heavy” (mean > 12 g of alcohol per day and/or heavy drinking episodes), by age and birth cohort.

TABLE 1
 Characteristics of participants at their baseline examination in The Framingham Heart Study, Framingham, MA, 1948-1975

Characteristics at Baseline	Men (N=4,097)	Women (N=4,541)
Age (%)		
≤ 30	18.7	20.6
31-40	32.7	32.7
41-50	30.3	29.9
> 50	18.4	16.9
Birth Cohort (%)		
< 1900	12.2	13.0
1900-1919	30.1	30.9
1920-1939	34.5	30.9
1940-1959	23.2	25.1
Education (%)		
< high school	26.2	24.7
High school graduate	28.8	34.2
Some college	16.0	19.0
College Graduate	29.0	22.1
Smoking (%)		
Never smoker	23.5	46.7
Past smoker not now	18.1	10.0
Current smoker	58.4	43.3

TABLE 2

Cumulative incidence of an alcohol use disorder (ICD-9 code for 100% attributable disease) between ages 40 and 79, by sex and birth cohort from The Framingham Heart Study, Framingham, MA, 1948-1975

Birth Cohort	Men		Women	
	Number	Risk and 95% CIs (%)	Number	Risk and 95% CIs (%)
1900-1919	694	11.7 (9.1,13.5)	768	3.5 (2.3 4.5)
1920-1939	902	13.6 (10.7, 15.9)	904	4.0 (2.6, 5.3)
Total	1596	12.8 (10.9, 14.3)	1672	3.8 (2.9, 4.6)