## Appendix S3: Alcohol-attributable fraction modeling methodology

*AAFs for chronic and infectious diseases, except ischemic heart disease*

AAF calculations were based on the distribution of alcohol consumption, prevalences of current drinkers, former drinkers and lifetime abstainers, and the RR as follows:



where Pabs represents lifetime abstainers, Pformer is the prevalence of former drinkers, RRformer is the RR for former drinkers, Pcurrent is the prevalence of current drinkers who consume an average daily amount (x) of alcohol, and RRcurrent is the RR given an average daily consumption of x.

*AAFs for ischemic heart disease*

Ischemic heart disease risk is impacted by both average volume of alcohol consumption and patterns of drinking [1,2]. For our modeling, we based RR on the well-known J-shaped curve [3–5], for people with at least one irregular heavy drinking occasion per month [6].

*AAFs for injuries (harms to oneself)*

The AAFs for injuries were modeled according to methodology which takes into account two dimensions of alcohol consumption:

1. binge drinking (both the number of occasions and the amount consumed per occasion), and
2. average daily alcohol consumption (on non-binge days).

When calculating the AAFs, we also included alcohol metabolism rates for men and women to calculate a person’s time at risk of an injury outcome, according to methods outlined by Taylor and colleagues [7]. The AAFs for intentional and unintentional injuries attributable to alcohol consumption were calculated as follows:

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where Pabs represents the prevalence of current abstainers, and Pcurrent(binge) and Pcurrent(non-binge) are the prevalence of current drinkers who engage in binge drinking and the prevalence of current drinkers who do not engage in binge drinking, respectively. The RRs were calculated separately for current drinkers who engage in binge drinking and current drinkers who do not engage in binge drinking:

$RR\_{current\left(non-binge\right)}=\left(RR\_{average}-1\right)\*P\_{nonbingedays}+$$RR\_{current\left(non-binge\right)}=\left(RR\_{average}-1\right)\*P\_{nonbingedays}+$1

and

$$RR\_{current\left(binge\right)}=\left(RR\_{average}-1\right)\*P\_{nonbingedays}+\left(RR\_{binge}-1\right)\*P\_{bingedays}+1$$

where



and

$$RR\_{binge}=P\_{dayatrisk}(x)\*\left(RR\_{binge}\left(x\right)-1\right)+1$$

In the above formulae, Pdayatrisk represents the proportion of a day at risk, and RRbinge and RRcurrent are the relative risks for injury given an amount of alcohol consumed. Pdayatrisk is calculated based on the average rate at which alcohol is metabolized, thus corresponding to the time during which the blood alcohol level was sufficiently elevated to increase the risk of injury.

Since these AAFs were calculated based on samples of emergency room patients, we adjusted the AAF for mortality from non-motor vehicle accidents by multiplying it by 9/4 [8], based on two studies that compared blood alcohol levels of emergency room patients with blood alcohol levels obtained from coroners’ reports of patients who died from an injury [9,10].

For women, the AAF for motor vehicle accidents was calculated by multiplying the AAF for motor vehicle accidents for men by the product of the *per capita* consumption of alcohol for women divided by the *per capita* consumption of alcohol for men. This was done as the RR function for motor vehicle accidents was considered valid only for men [11].

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