

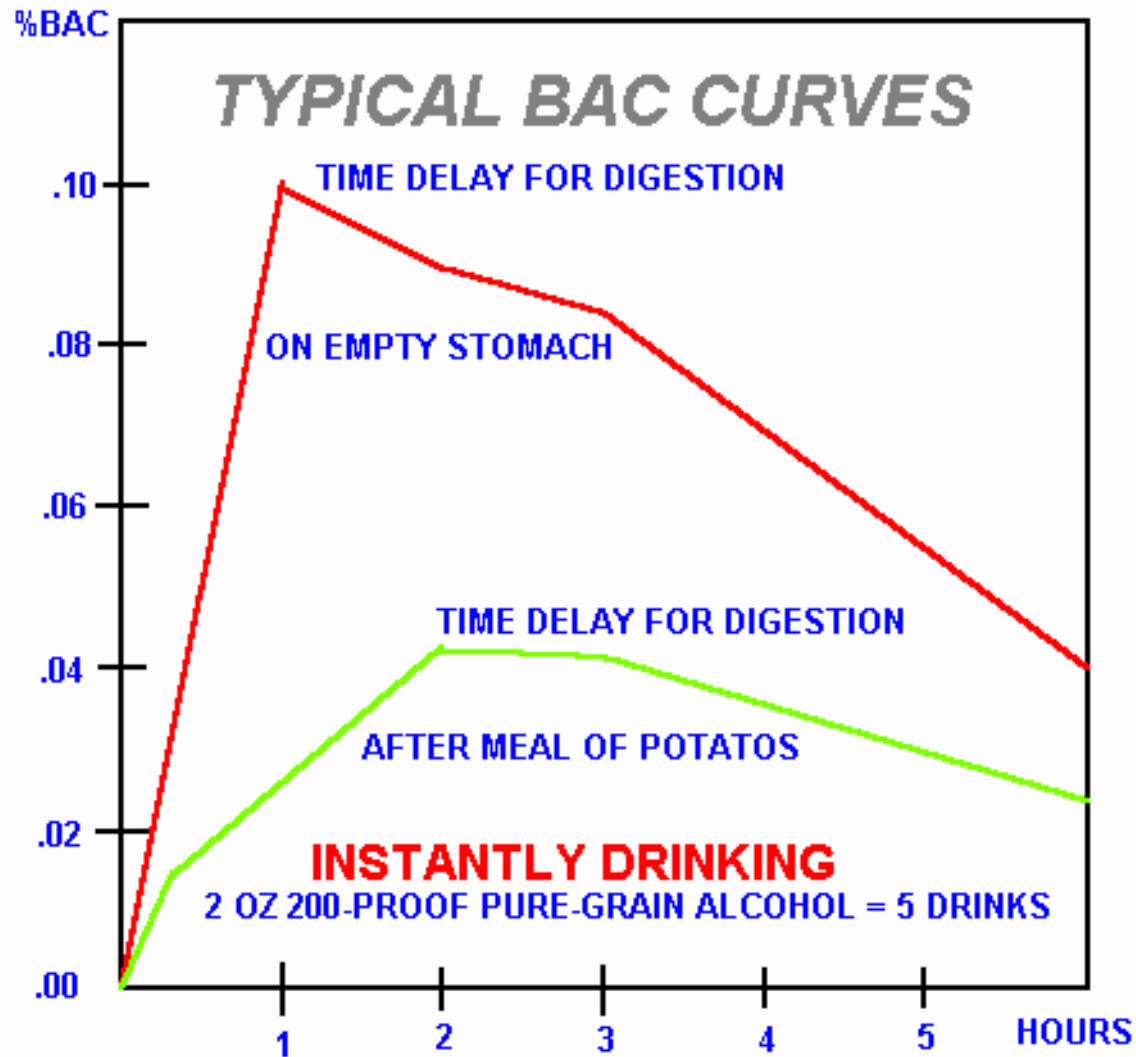
Chapter 6

Blood Alcohol Analysis

Facts of Alcohol Abuse

- Alcohol (ethyl alcohol, C_2H_5OH) is a colorless liquid normally diluted with water and consumed as a beverage.
- Depressant
 - effects the central nervous system (brain)
- many domestic violence, fights, crime, driving offenses and accidents, etc.
- In USA, ~88K death from too much drinking (YR. 2011)

Blood Alcohol Concentration (BAC)



Reproduced from Alcohol and Highway Safety: A Report to the Congress (1968)

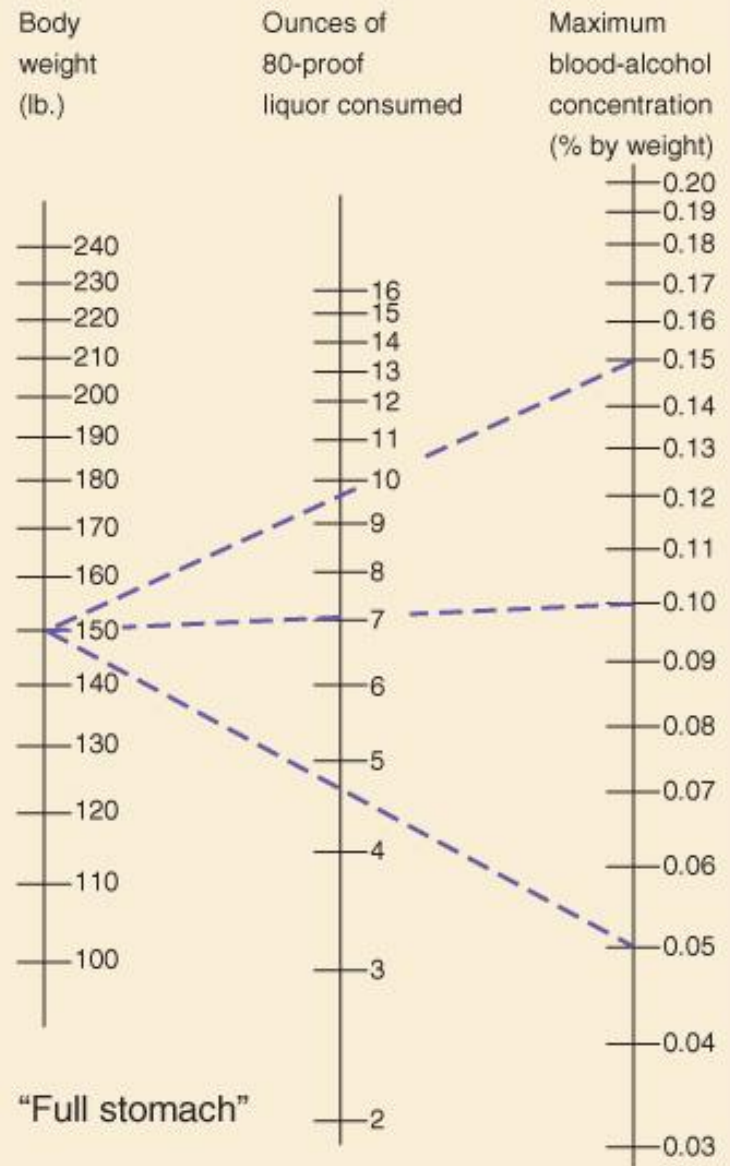
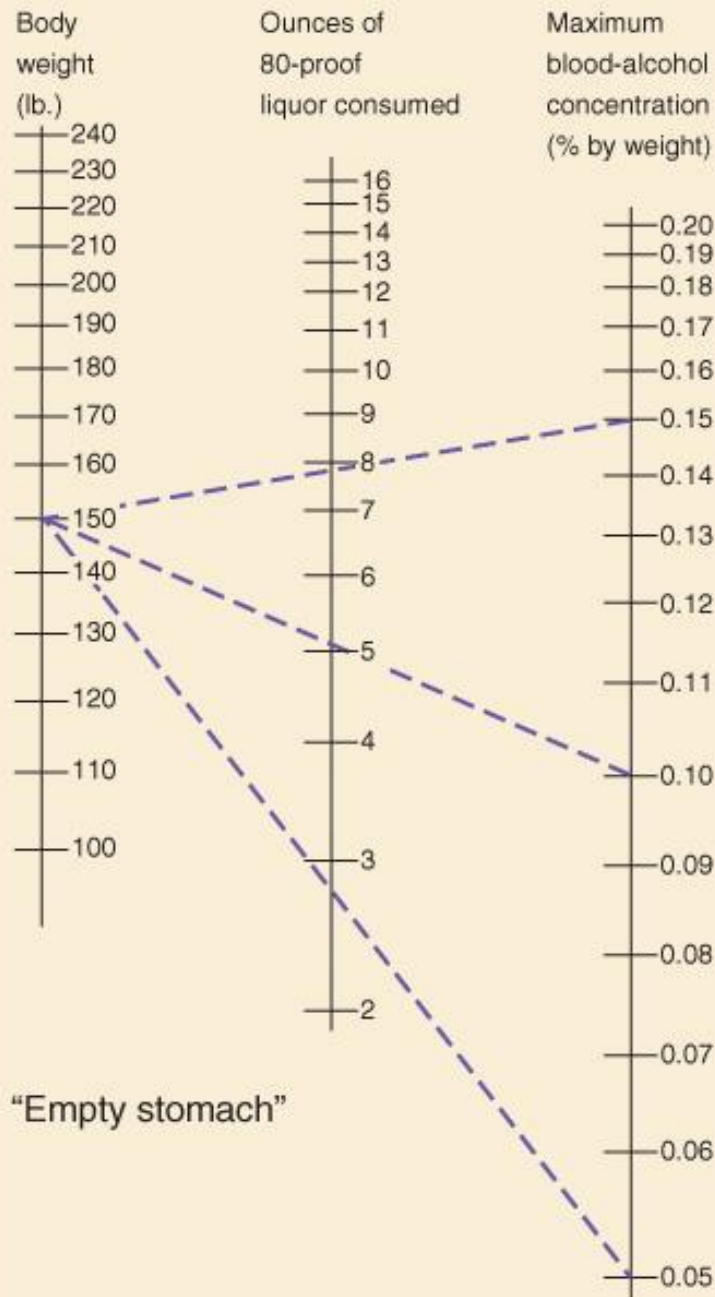
What is consider one drink

Type of Drink	Avg. Alcohol Content	Calculation	Amount of Pure Alcohol
12 oz Beer	5 %	$12 * 0.05$	0.6 oz
5 oz Wine	12 %	$5 * 0.12$	0.6 oz
1 ½ oz 80-proof Liquor	40 %	$1.5 * 0.40$	0.6 oz
360 ml Beer	5 %	$360 * 0.05$	18 ml
150 ml Wine	12 %	$150 * 0.12$	18 ml
45 ml 80-proof Liquor	40 %	$45 * 0.40$	18 ml

They all contain ~0.6 oz or ~18 ml of pure alcohol

1 oz ≈ 30 ml

How to Tell What Your Blood Alcohol Level Is After Drinking



Alcohol and Law in NY State

- NY State
 - **DWI:** Driving While Intoxicated: 0.08 % BAC or higher or other evidence of intoxication (21 yr or older), 0.04 % commercial driver, 0.02 % (under 21 yr).
 - **Aggravated DWI:** 0.18% BAC or higher.

BAC by GC

- Advantages:
 1. Specificity for ethanol. Enhanced with the use of multiple columns or varying chromatographic conditions
 2. Quantitative assay
 3. Can also identify and quantitate methanol and isopropanol
- Disadvantages:
 1. Requires specialized instrumentation (gas chromatograph)
 2. Requires highly trained technical staff
 3. Analysis slower than enzymatic assay (not always)

BAC via GC:

Use internal standard (e.g. 2-propanol)

A. Direct Injection' analysis

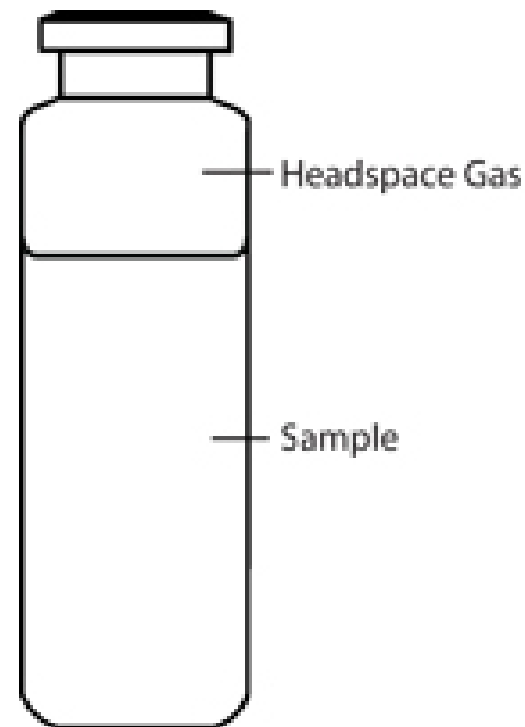
Diluted blood samples were injected directly into the GC

Advantage: rapid, simple sample preparation

Disadvantage: contamination and clogging of syringe, inlet, and column

Head Space GC

- Headspace: gas space above the sample in a chromatography vial.
- Suitable for very light volatiles in liquid or solid matrix samples.
- Complex sample matrices, which may be difficult to analyse directly or would otherwise require sample extraction or preparation, are ideal candidates



BAC via GC 2

B. Headspace' analysis

1. Sample is placed inside a sealed vial, and equilibrated at the elevated temperature (e.g. 50 °C)
2. The vapor above the liquid ('headspace') is transferred to a GC
3. Advantage: stability and long column life; can be automated (Auto Headspace Sampler)
4. Disadvantage: equilibration time (e.g., 15-30 min) delays turnaround time

