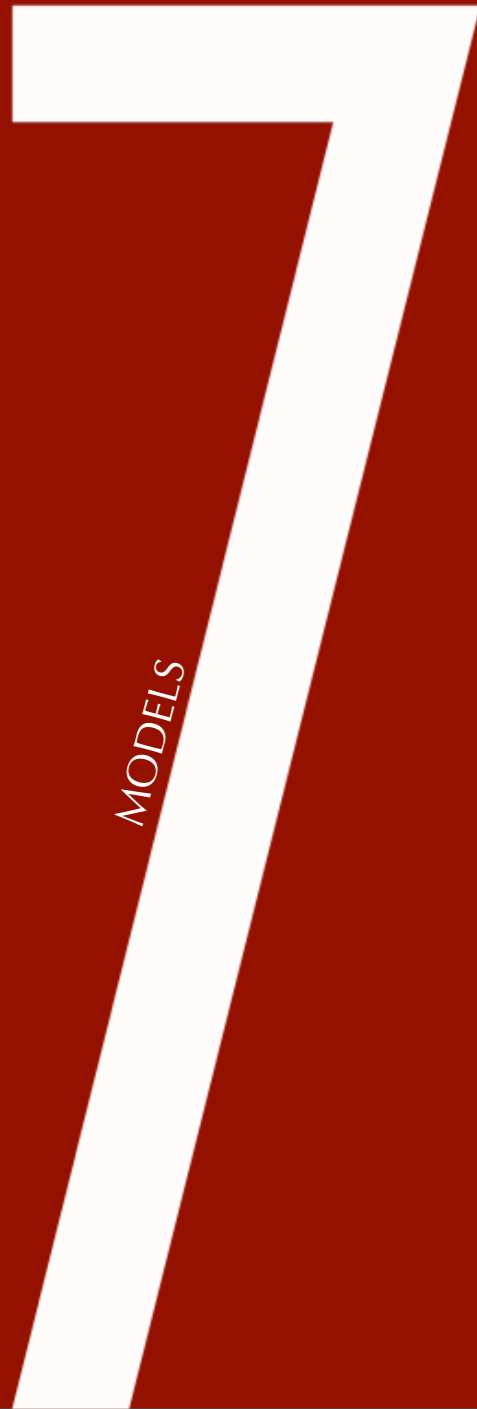# CHAPTER 7: ARE YOU TOO INTOXICATED TO DRIVE SAFELY?

7

MODELS

Drivers under the influence of alcohol are thought to be responsible for half the fatal traffic accidents in the U.S. To curtail this loss of life, it is imperative to have a means of detecting whether drivers are impaired. Several models of driving under the influence are used in Texas.

The Problem: Lots of deaths from a combination of alcohol and driving

For people your age (18-24) in the U.S., 51% of the 8242 traffic deaths in 2001 involved alcohol. About 32% of that age group was in college, so an estimated 1349 traffic deaths of college students involved alcohol. The rate was 15 per 100,000, or about 7 per UT population. (This value is about twice that of the national average for suicides.) From another perspective, there is about a 1% chance that at least one of your classmates in your Bio301D section will die in an alcohol-related traffic accident this semester.

To put these numbers into perspective, the traffic deaths in your age group is about the same level as for U.S. personnel who died each year during the main 8 years of the Vietnam War. The turmoil caused by U.S. protests against the Vietnam War caused probably the most extreme social disruption of the post WWII generation. There has never been much of a protest against the same magnitude of traffic fatalities.

THE SOLUTION: DETERRENCE

Alcohol is such an integral part of our society, especially in social gatherings, that people have not voluntarily avoided driving after drinking. In 2001, nearly 1/3 of college students in the U.S. reported driving while under the influence of alcohol. To increasingly discourage "driving under the influence," we have increased the chance of being caught and increased the penalties. Nor are these tactics limited to the U.S. – Canada and many European countries are very aggressive about catching impaired drivers.

The Ideal Model of Impairment

Once it is decided that driving under the influence (DUI) is unacceptable (i.e., criminal), we face the problem of establishing criteria for being impaired while driving. From our perspective in this class, we need models of DUI. The main issue is a person's ability to drive safely, so if we were to consider the most accurate model of DUI, it would include the driver's performance in:

- coordination
- judgement
- reaction time

It would be great to have a model of DUI that included each of these criteria, but we don't, although as we will see below, one model adopts some of these criteria. (Note that there is a legal distinction in Texas between DUI and DWI – the latter means driving while intoxicated – but for our purposes here, we are not concerned with the distinction. DWI is the more serious offense; DUI is reserved for drivers under 21 and does not require the same level of proof as DWI.)

The reason that we don't have the perfect model of DUI is the usual problem with all of our models – all models have limitations. In particular, it is not practical to administer a test that covers all of these criteria, and it would probably be difficult to measure these behaviors objectively. But you might live to see a test of this sort in the future, administered as a video game in a police car to test your ability to drive in a simulation. While such a scenario might seem far-fetched, the concept of a breathalyzer was equally unimaginable forty years ago.

Texas law

The law in our state is both vague and specific about what constitutes impaired driving. The law (penal code 49.04) considers a driver to be legally impaired when:

1. not having normal use of physical faculties or mental faculties, or

2. having a blood alcohol concentration (BAC) of 0.08% or greater.

Older laws in some states used a BAC threshold of 0.15, later down to 0.10%, and most now use 0.08%. In Texas, a BAC may be measured in blood (gm EtOH in 100 mL of blood), breath (gm EtOH in 210L breath), or urine (gm EtOH in 67mL urine).

The vague model in this law is (i), lacking "normal use of physical or mental faculties." It is vague, because there is no criterion for "normal use." The test that is used to assess these behaviors is the Standardized Field Sobriety Test (SFST), although it is not part of the penal code. It typically consists of 3 parts administered where the driver is apprehended:

(A) The Walk and Turn test (WAT)

(B) The One Leg Stand (OLS)

(C) Horizontal Gaze Nystagmus (HGN)

We will return to these tests in the section on Data, but for now the WAT test consists of walking along a straight line for 9 steps, turning around in a specific way, and returning along the line for 9 steps. The OLS test consists of standing on one leg, arms at sides, for about 30 seconds, while counting. These two tests are tests of coordination and ability to follow directions. The HGN test is a measure of the involuntary behavior of your eyes as they track an object to the side of your field of vision. Each of these tests is scored according to a strict set of criteria that includes following directions.

Appraising Models of DUI

Many of you can relate to the limitations of the models of DUI, but it is also important to acknowledge the benefits:

| MODEL	STRENGTHS	LIMITATIONS
BAC of 0.08% using blood	easy to obtain accurate reading; is an objective criterion	one threshold does not produce the same level of impairment in all people
BAC of 0.08% using breath	easy to obtain accurate reading of breath alcohol; is an objective criterion	one threshold does not produce the same level of impairment in all people; breath concentration may differ from blood concentration
SFST	performance is relevant to driving impairment; easy to administer- no equipment required	scoring is subjective; performance is affected by many factors unrelated to driving (road surface, physical properties of the person, age, shoes); no baseline data exist for each person

Perhaps the major limitation of any legal definition of DUI is that there are no gradations, because the legal system either finds you guilty or not. Impairment is instead a graded property of a person's behavior. A person at 0.070% may be legal to drive, but they obviously will not be as safe as at 0.04%, and even that will not be as safe as 0.01%. The law needs to set a threshold, but that threshold is a compromise which allows some impairment, at least in some people. So the legal definition of DUI is not an accurate model of impairment.

New and Scarier Models

Suppose you are stopped while driving soon after leaving a restaurant, where you had a meal and 2 beers (or 1-2 glasses of wine). The SFST ordeal takes two hours. You pass (maybe they don't tell you this.) But then, in a moment of overconfidence, you blow for the breathalyzer. It comes out at 0.04, and you breathe a sigh of relief. Off the hook, you think. Not necessarily ....

A new tactic in some parts of Texas and perhaps throughout the U.S. is to back-calculate your BAC at the time you were stopped. If you were 0.04 some 2-3 hours after you last consumed alcohol, you may have been over 0.08 when you were stopped even if you were under 0.08 when you blew.

When people quickly consume alcohol on an empty stomach, a common pattern is that the BAC spikes soon after the alcohol is consumed and then the BAC beings a linear decay toward zero (this pattern is called a Widmark plot):
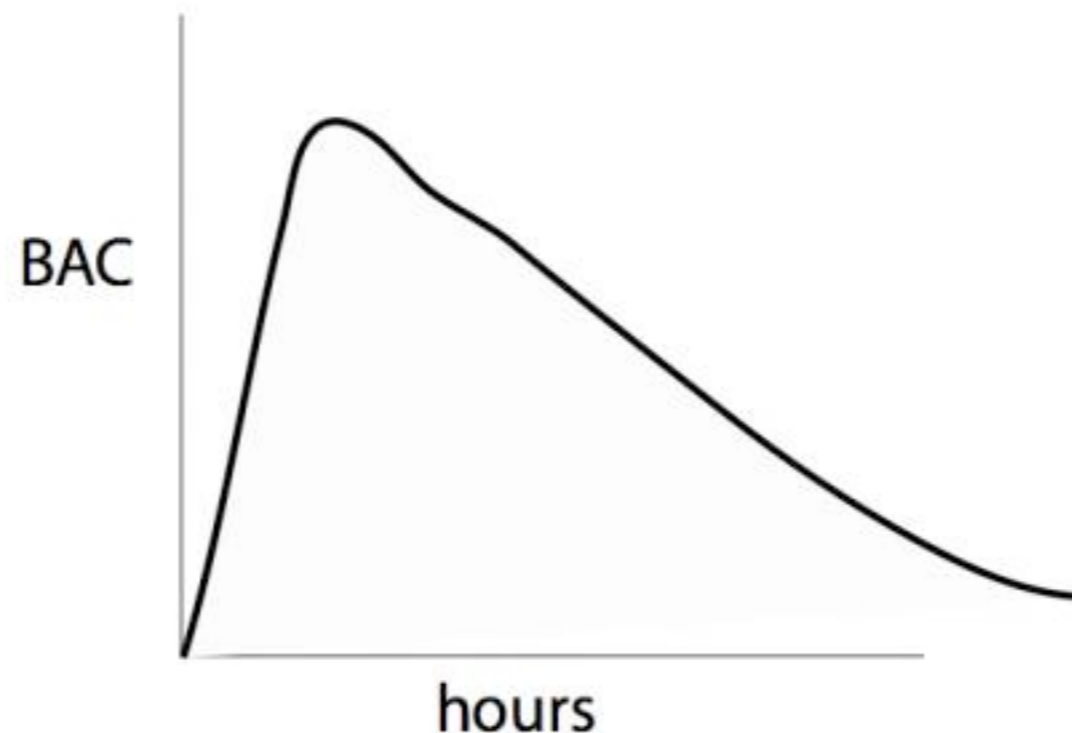
You can easily see how simple it would be to do the back calculation if you had one measure out near the right end (and knew the slope of the line). And this is what the courts are starting to do.

In this case, model accuracy is critical. Use of the Widmark plot is certainly 'convenient,' but if it is not accurate an accurate backwards measure of BAC, then most of us would think it should not be used to decide someone's guilt or innocence. It may come as no surprise to you that the model is not an accurate representation of BAC, largely because people and the circumstances under which it is applied, are not uniform. Measurements of breath alcohol content from people given known amounts of alcohol (of various types) have revealed that

1. the Widmark curve does not always apply, and even when it does,

2. there is considerable variation in the time of the peak and slope of the decay.

From this work, it seems almost impossible to make reasonably accurate back calculations. This limitation of the model has not stopped its use in court; in Texas, higher courts have even overturned lower courts' rejections of the method.

What this means is that a person could maintain their BAC well below 0.08 and still be convicted of DWI. Of course, this same outcome could happen from poor performance on the SFST.