The Safety Illusion

Eric Horvitz

Microsoft Research
&
Decision Education Foundation

In memory of Nica, Samantha, Ana Maria, and Robert.

http://www.robertandanamaria.com

Note of Introduction

I hope that this presentation will help you to understand and master the *safety illusion*. My primary goal is to share insights with both new and experienced drivers about the surprising link between actions that seem safe when taken one at a time, and terrible surprises that you can *expect* will follow from repeated "safe" actions. The ideas run deeper than driving; they promise to help you to connect your decisions in the "now" with longer-term outcomes in your life. The insights about how rare events fuse together into high probability outcomes can help you to minimize costly unexpected surprises—and to raise the likelihood of achieving valuable outcomes that seem magical and serendipitous. Full mastery of the content makes use of some knowledge about probability, which you can learn from a mentor or via online materials. However, the key insights about the safety illusion (and it's generalization, the *single-action illusion*) do not require probability. I hope you'll make the investment in time and effort to understand the safety illusion, and then share the insights with your friends and family. They will likely find the ideas valuable and interesting—and perhaps surprising.

Overview

We'll be reflecting about the things that you do on a daily basis—your *patterns of action*. These are the actions that you tend to do in situations that continue to arise.

<u>Here are sample statements about such patterns:</u>

"I'm usually late for events because I tend to underestimate how long things take to do."

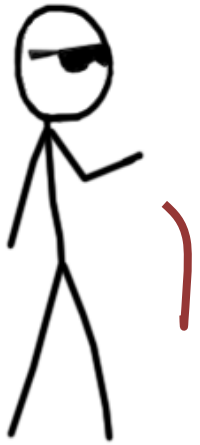
"I think it's pretty safe to text while I'm driving, and I often do this when text messages arrive from friends."

What patterns of action do you see in yourself?

Actions and Streams of Actions

For patterns of action, the single action you take in the present moment is just the view through *the lens of now* on a *stream of actions that arches into the future.*

The stream *leaps across time* and continues into the future.



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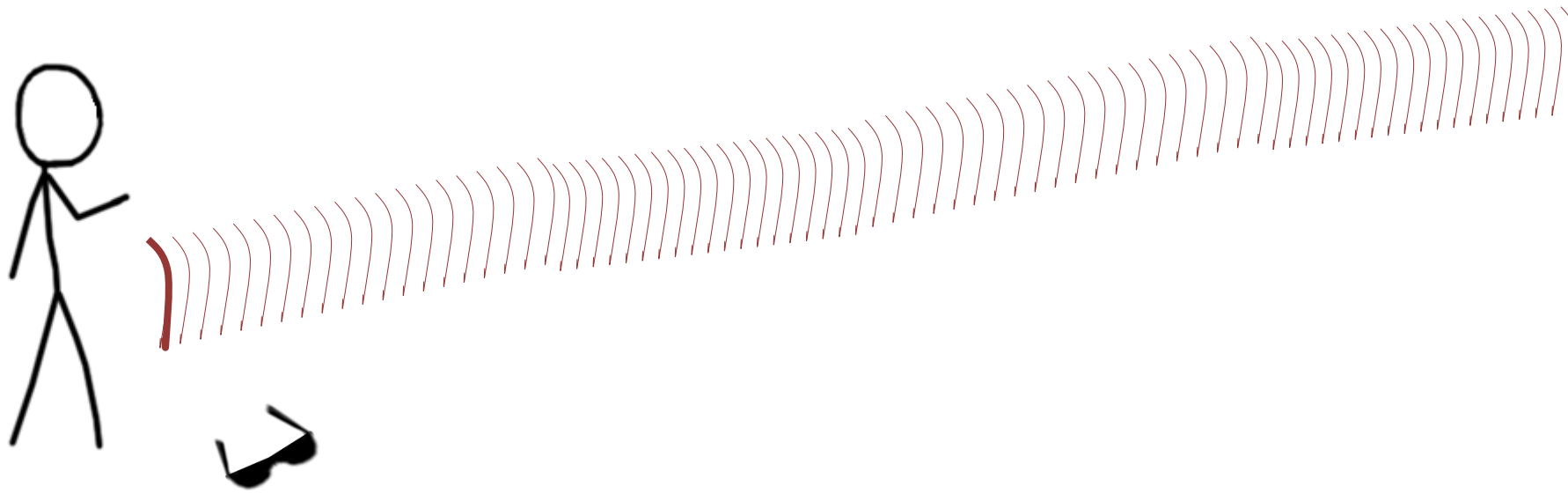

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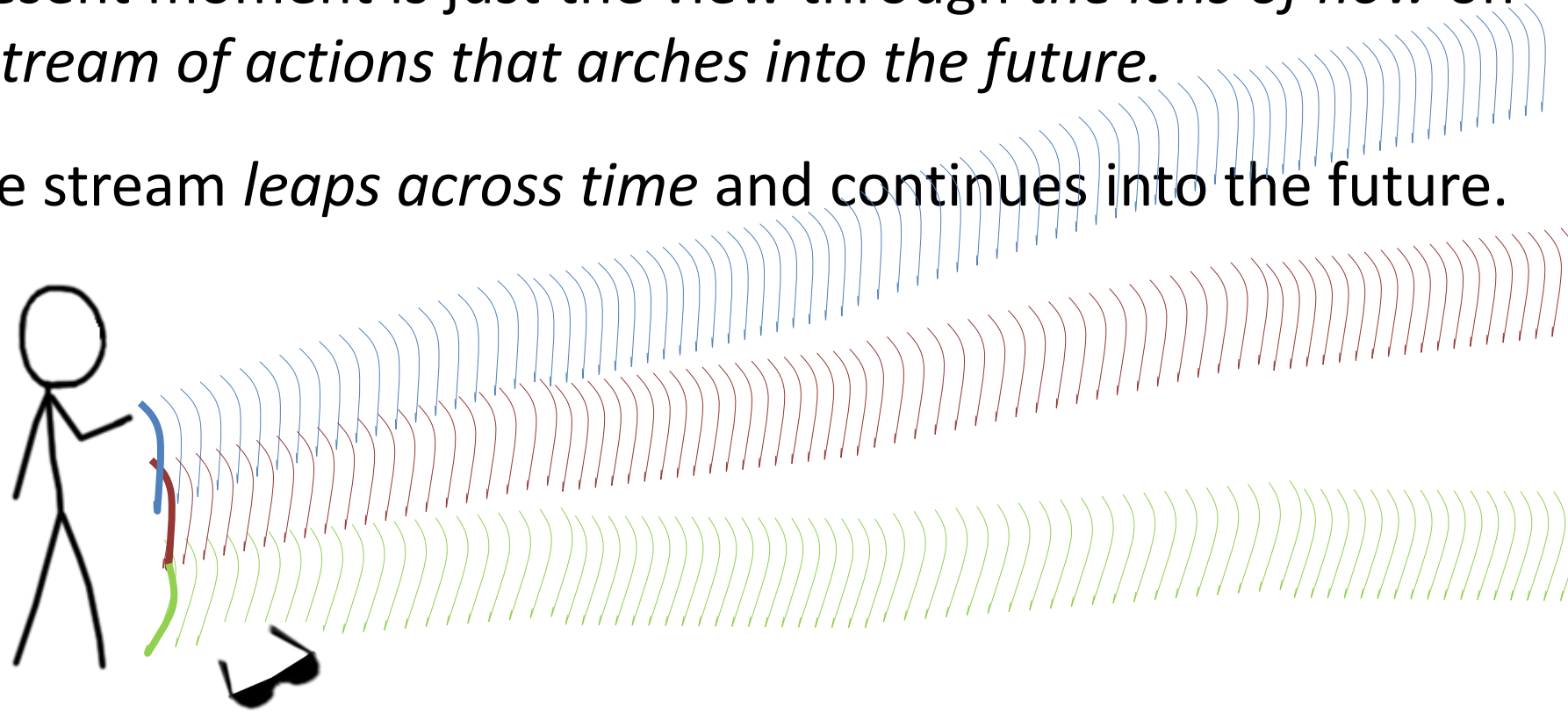

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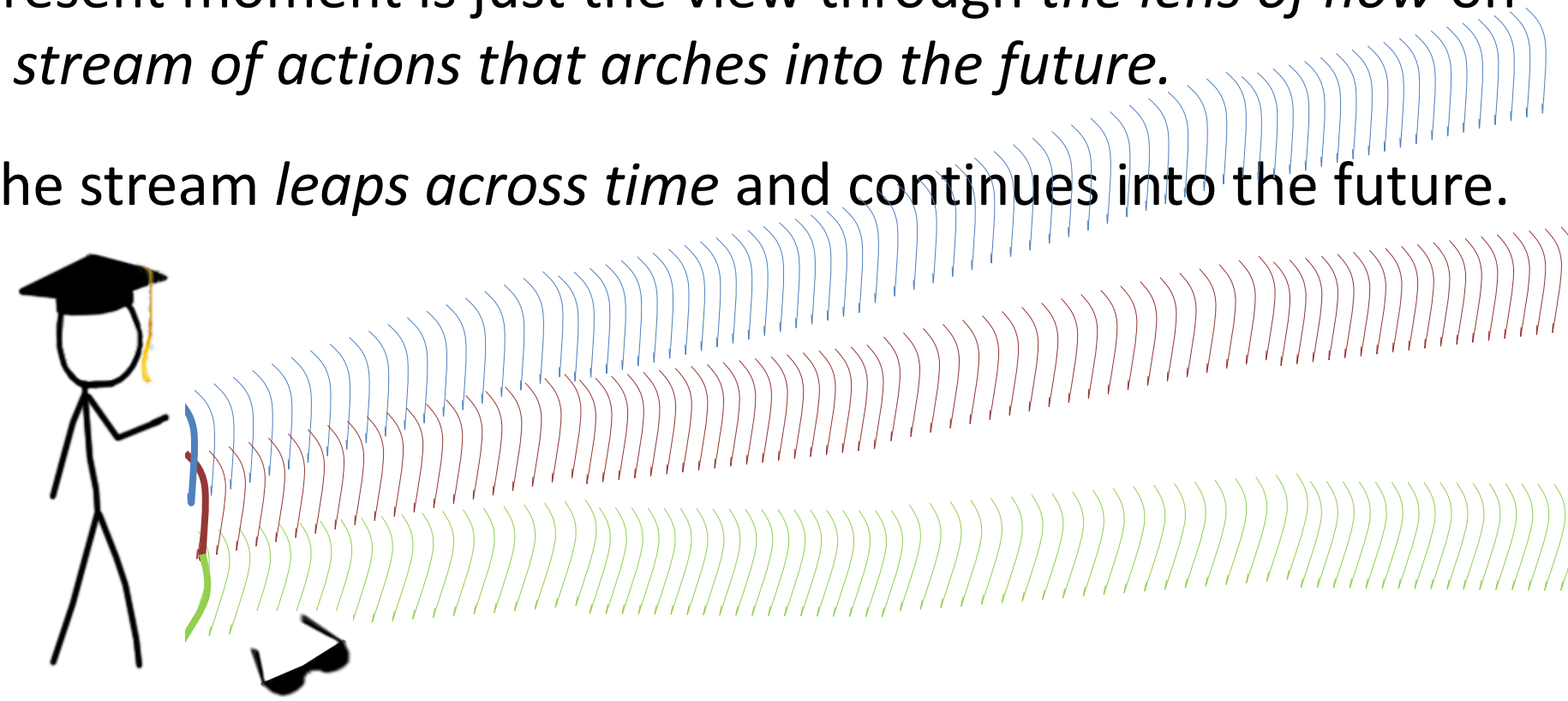

These streams of action can have huge influences on our lives—and it's worth reflecting about them.

A Heads Up

In case you don't have time to go further, or simply want the punchline right away, here are the key insights:

While each separate risky action that you take may have little downside, continuing to take the same actions over time can lead to a costly outcome *with a much higher probability than you may expect.*

The details on how rare events combine together may come as a surprise. That is, a terrible outcome may come as a shock, but we can show that the outcome may be expected—and we can even compute its likelihood!

We can learn about the safety illusion and act now to change the future for the better.

Focus: Driving a Car

In a deeper dive, let's now consider actions that seem relatively safe while driving, and investigate the implications of these patterns of activity.

Here are actions that seem relatively safe to many people—and they indeed may be relatively safe:

1. Reading or writing text messages (or email) while driving.

2. Speeding to get to a destination more quickly.

3. Passing slower moving cars on narrow roads by temporarily moving into the oncoming traffic lane.

Let’s examine texting while driving

From Habits to Surprises

Common thought—and it's true:

"I can glance at a phone and it's not a problem."

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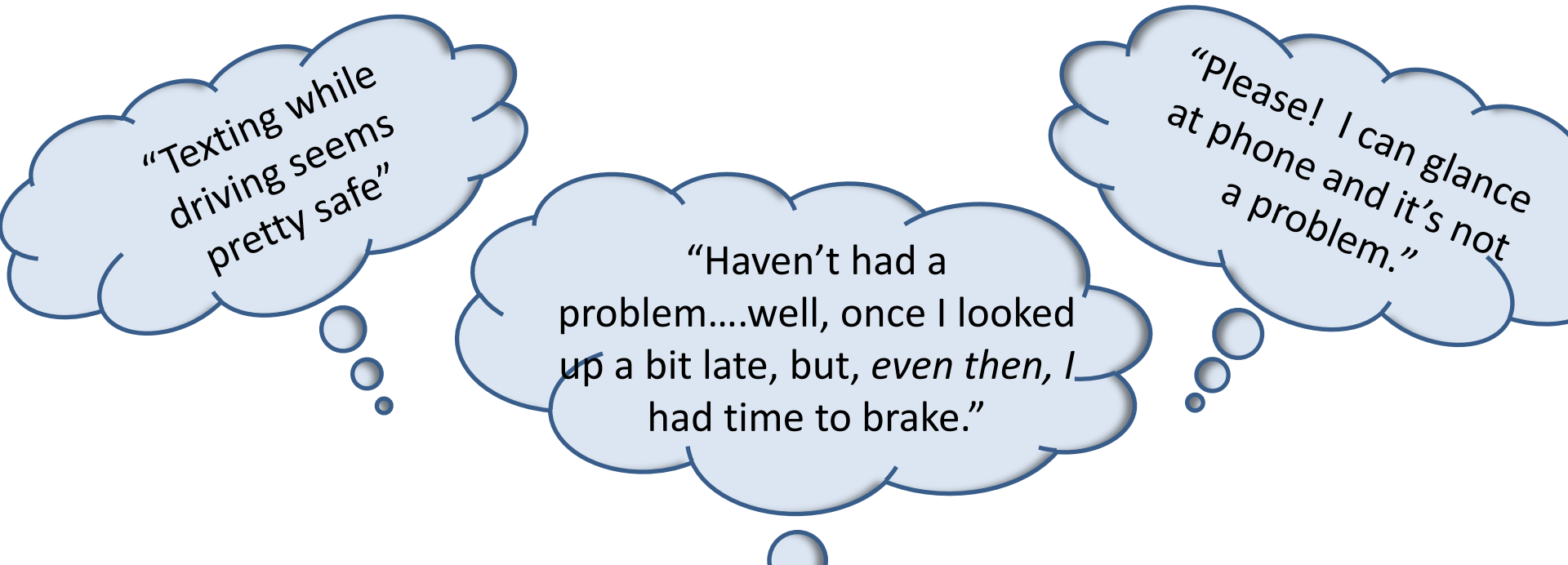


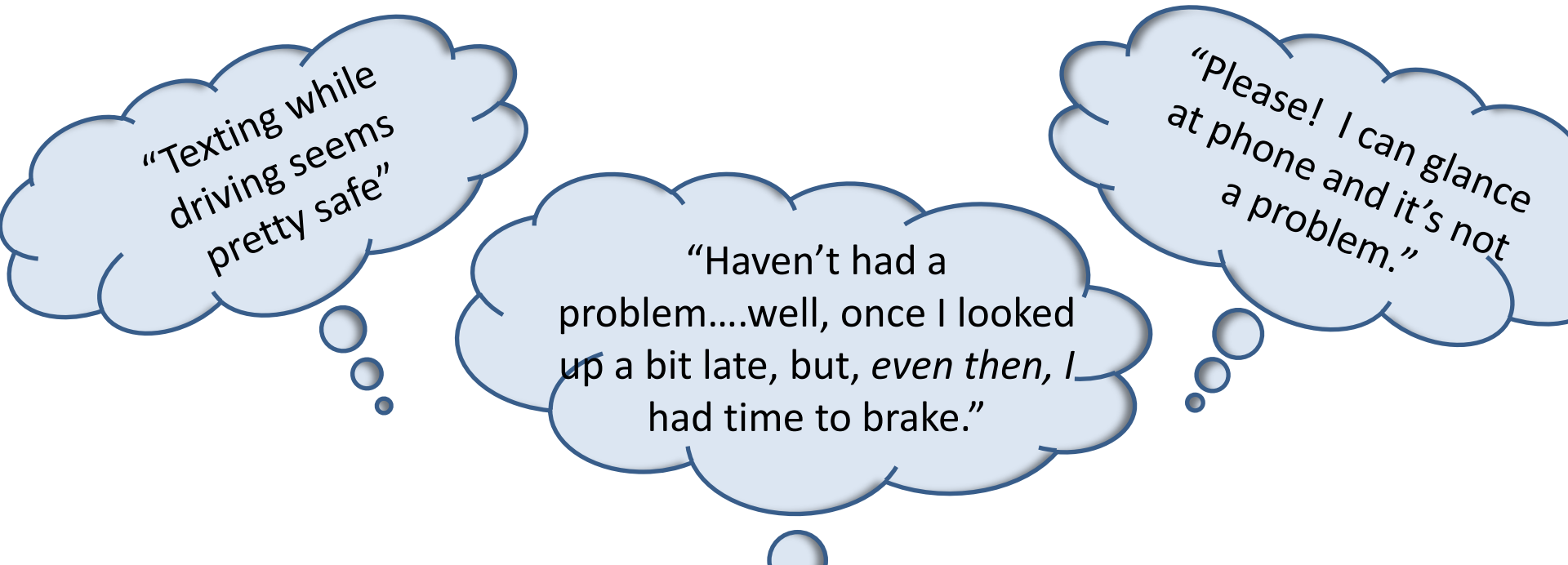
From Habits to Surprises

Common thought—and it's true:

"I can glance at a phone and it's not a problem."

Problem:

You can *expect an eventual surprise*!



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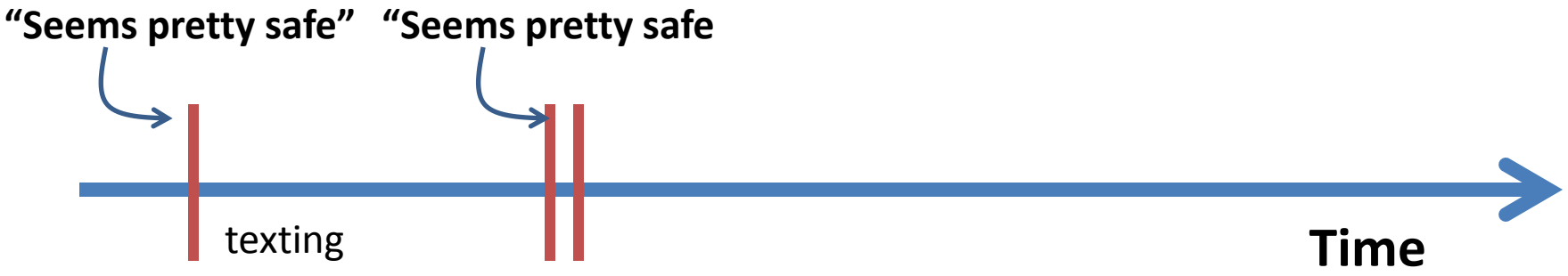

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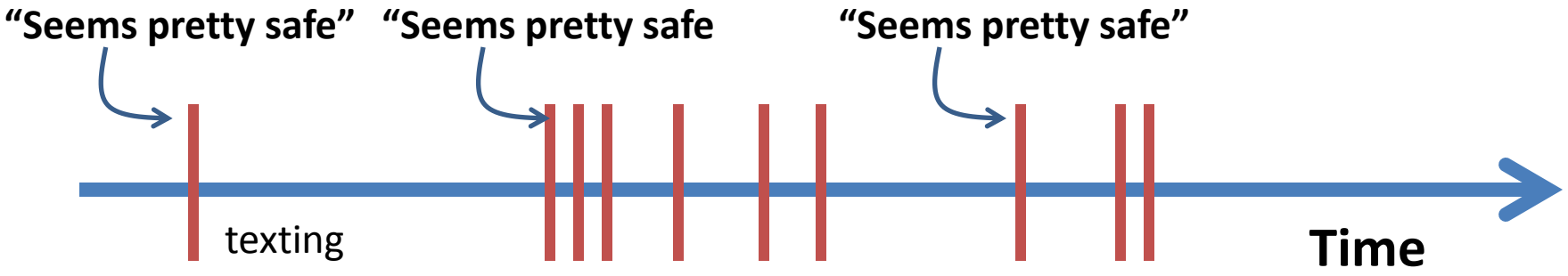
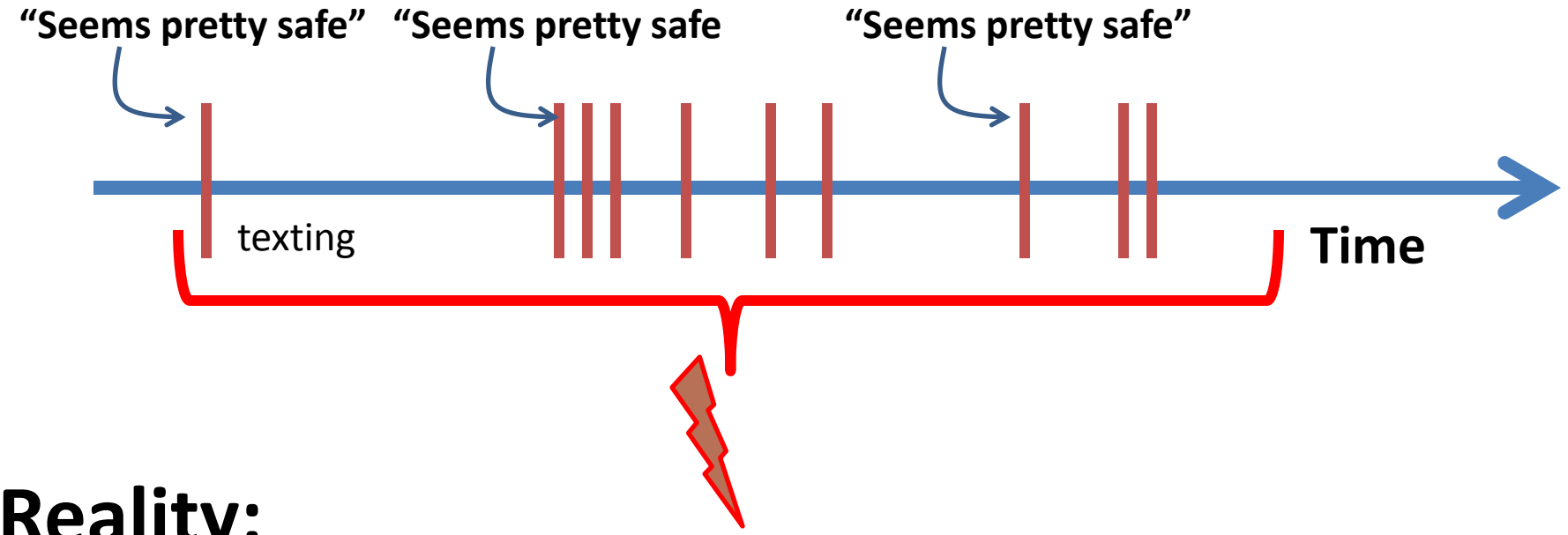


<u>Illusion</u>: I am as safe as the “small risk” that comes each time I text while driving.

From Habits to Surprises



Reality:

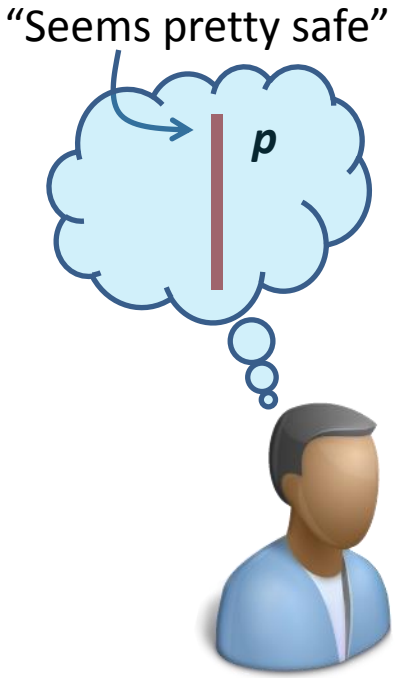
Behavior *over time* → Terrible *single outcome*

Illusion: **I am as safe as the "small risk" that comes each time I text while driving.**

The Safety Illusion

One usually thinks about the risks and benefits of a single action, rather than the influential outcomes that arise from the continuing pattern of action over time.

Perception



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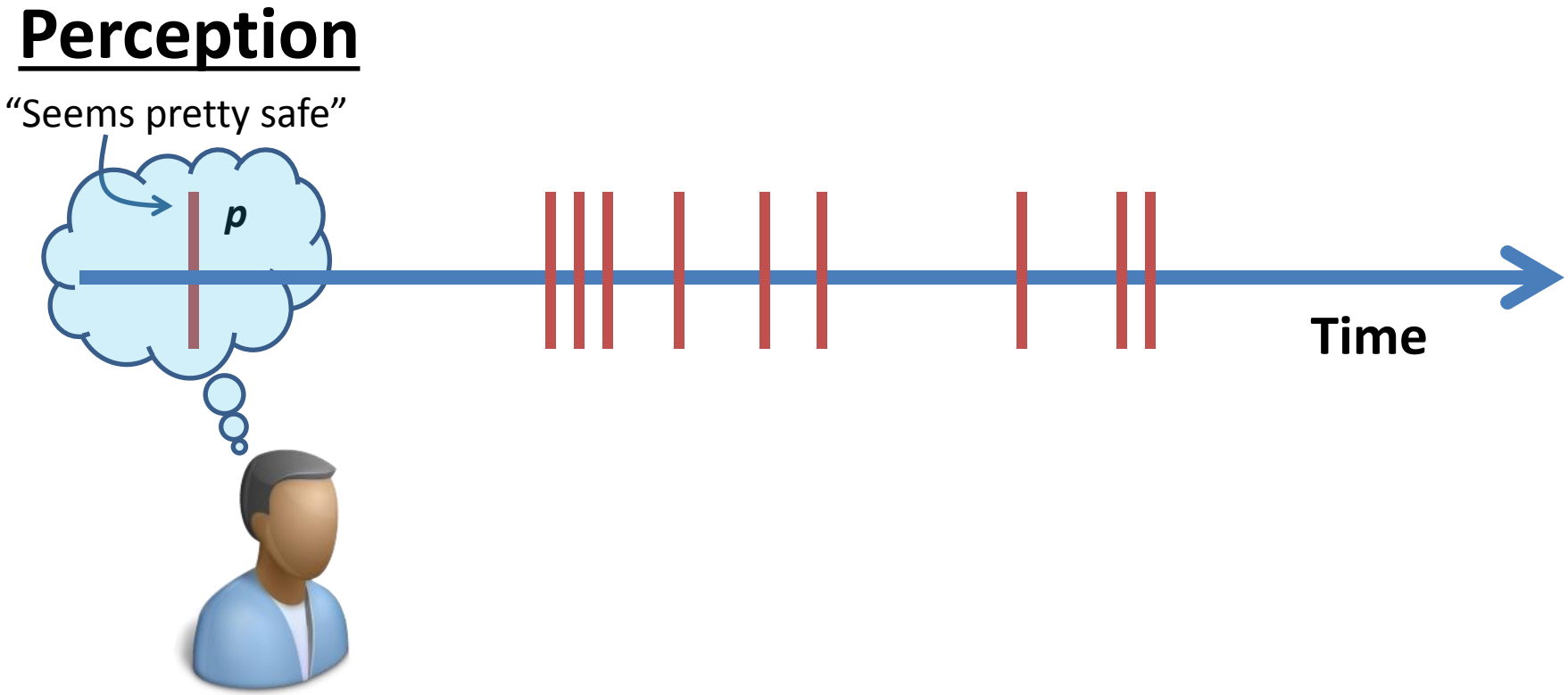

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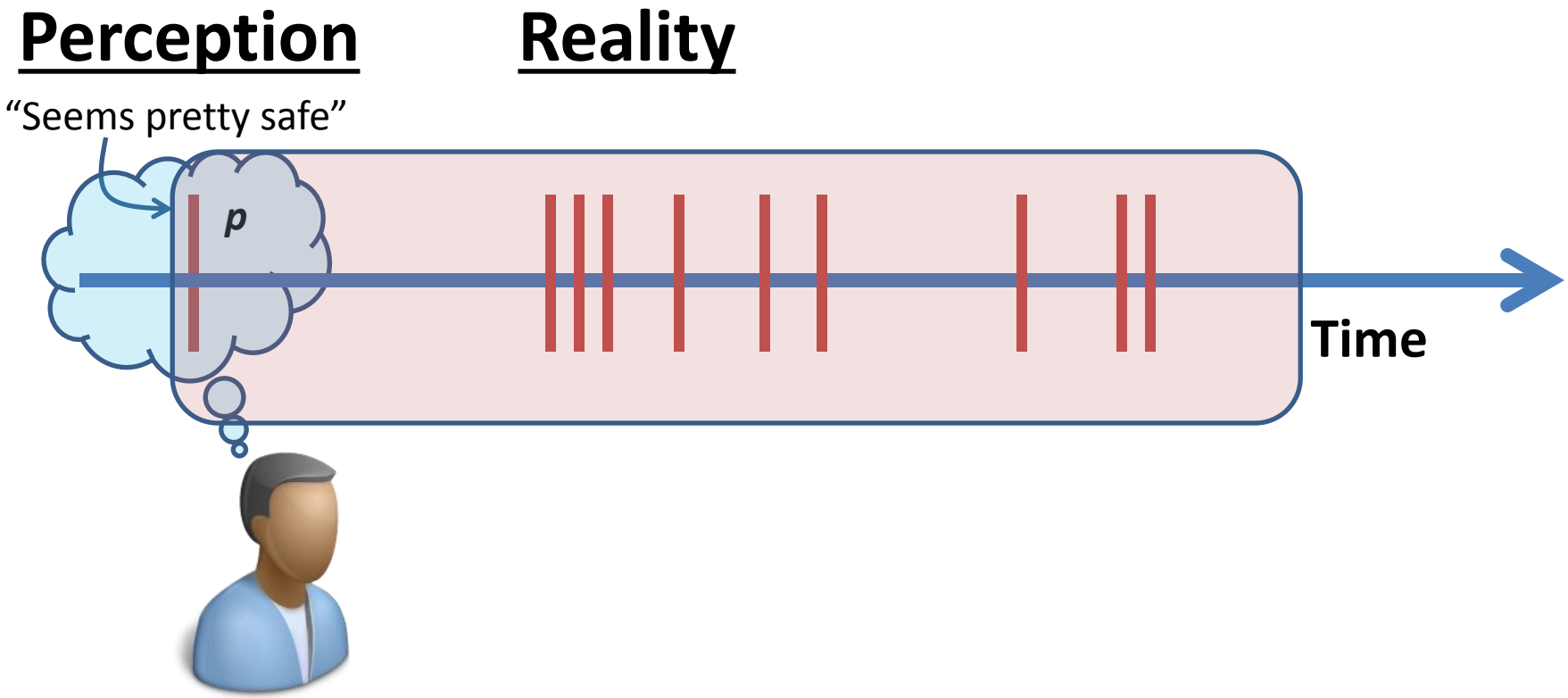
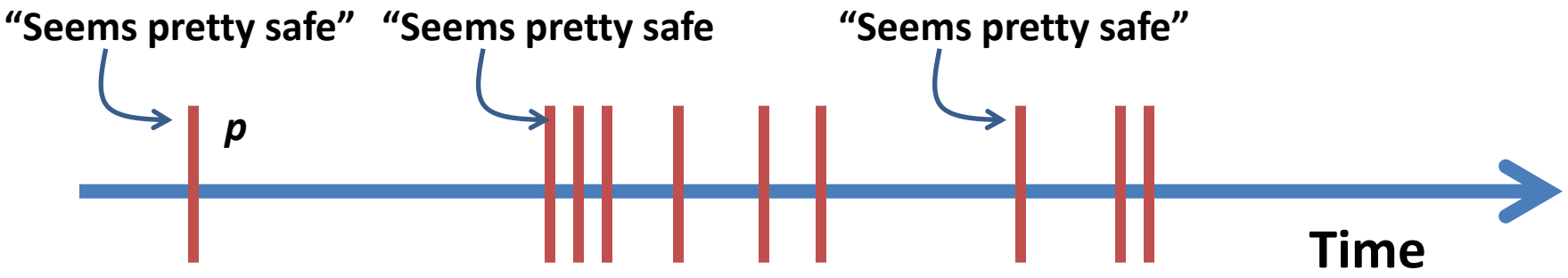


Good News

You can estimate the long-term challenge immediately—so you don't have to simply wait for the bad outcome.

Let's explore this more deeply...

From Habits to Surprises



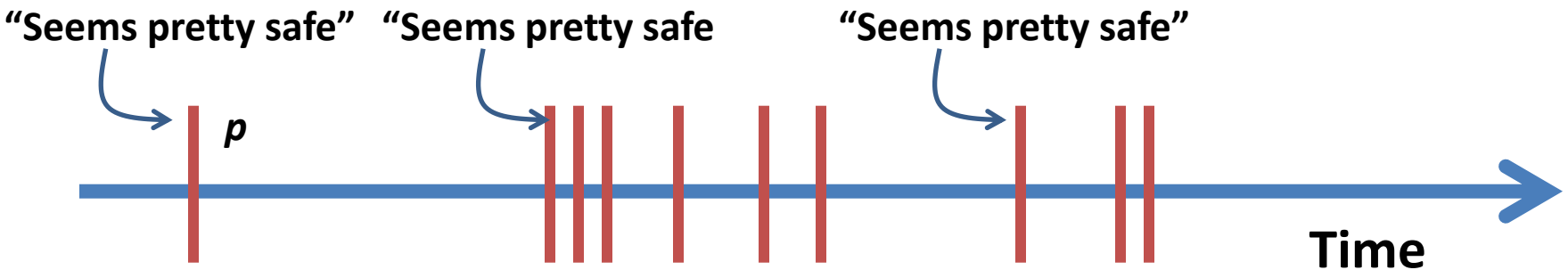
Let's consider the probability *p* that a major accident will happen because of the inattention due to your texting session while driving. *p* may be small but it is not 0.

Let's assume that *p* is 1 in a 100. So, *p* = 0.01

This means that we assume a 1% chance of a crash with a single txting session while driving.

For each text session, the probability that "things are fine!" is 1-.01 = .99. ***That is 99% of the time, things will be okay!***

From Habits to Surprises



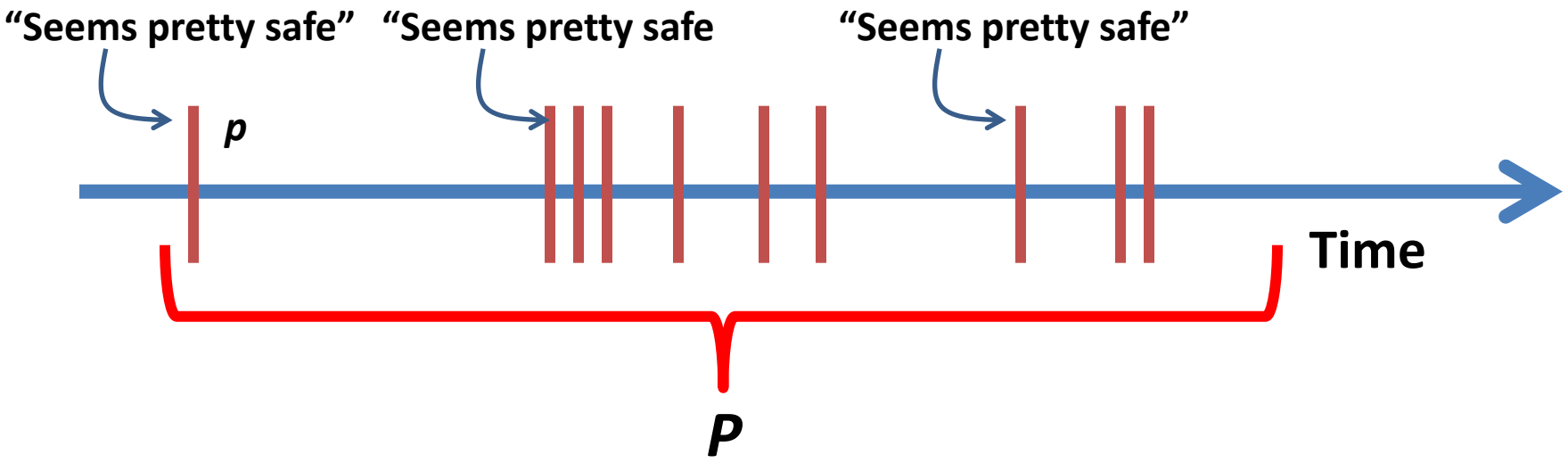
Wait. Given that you're comfortable texting…

You will be sending an expected stream of txt messages over time…

So, if you have 50 texting sessions over a month, what is the probability that things are still okay?

Can you figure this out?

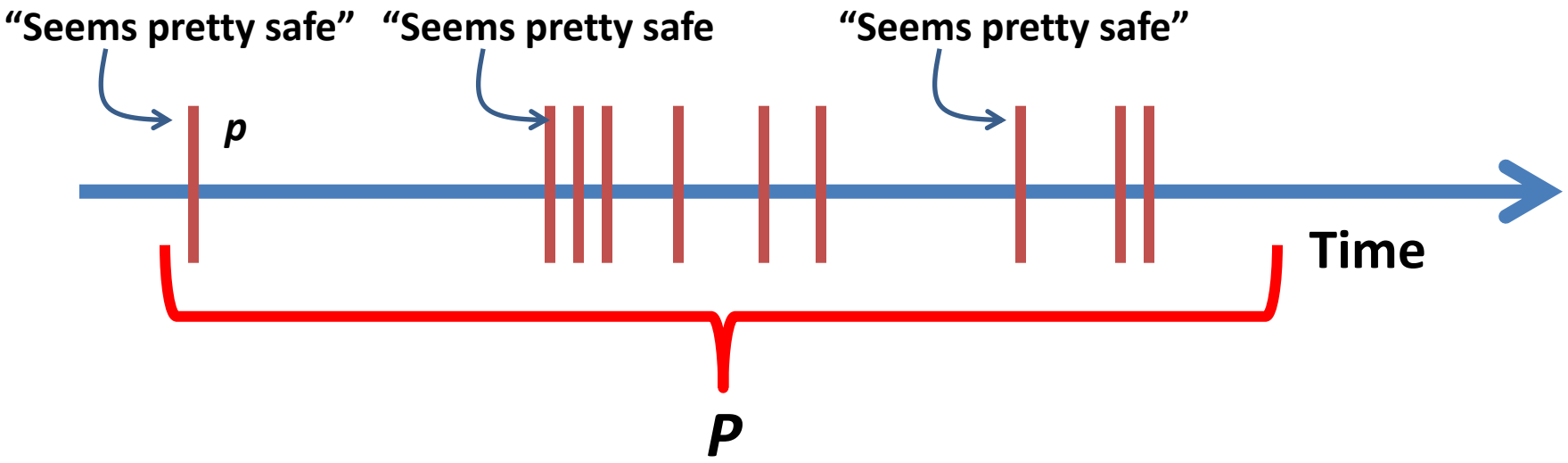
From Habits to Surprises



Let's consider another probability, that we'll call "Big ***P"***, the probability of an outcome for a number of actions over time. We'll write this as a capital ***P***.

To compute ***P,*** we first compute the probability that things are still okay after several text sessions—the probability you make it fine through ***n*** sessions of texting and driving.

From Habits to Surprises

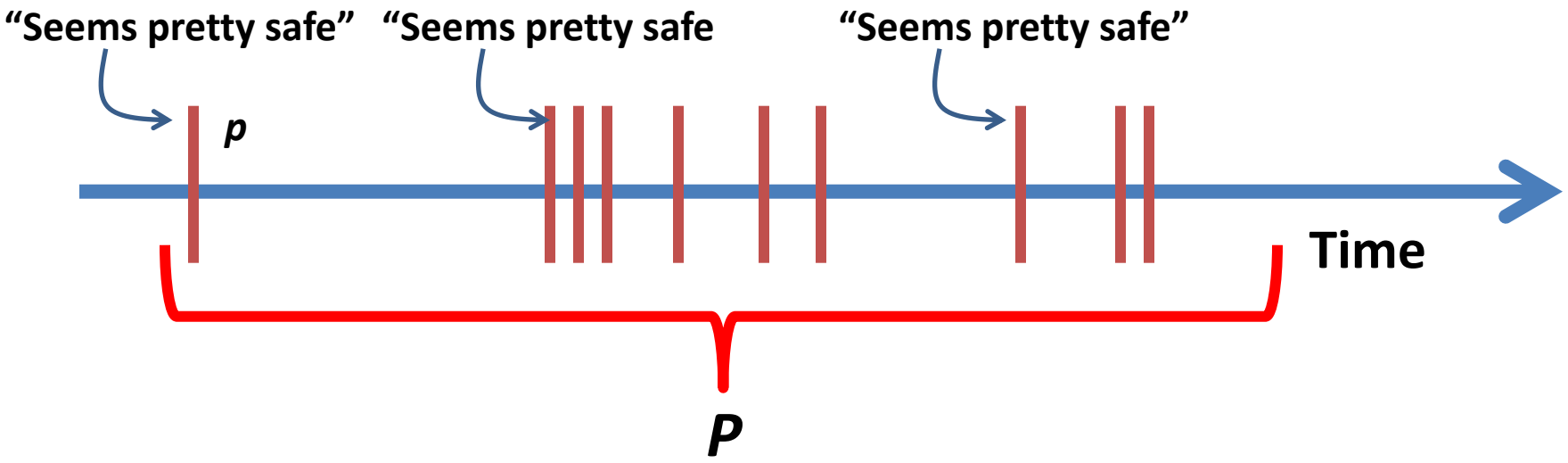


The probability you make it fine through ***n*** sessions of texting and driving is an ***and*** of all the separate, independent events or times that things are okay following each texting session.

This is computed as a multiplication of each probability of getting through okay:

Okay after n txt sessions → =.99 x .99 x …etc. or $(.99)^n$

From Habits to Surprises

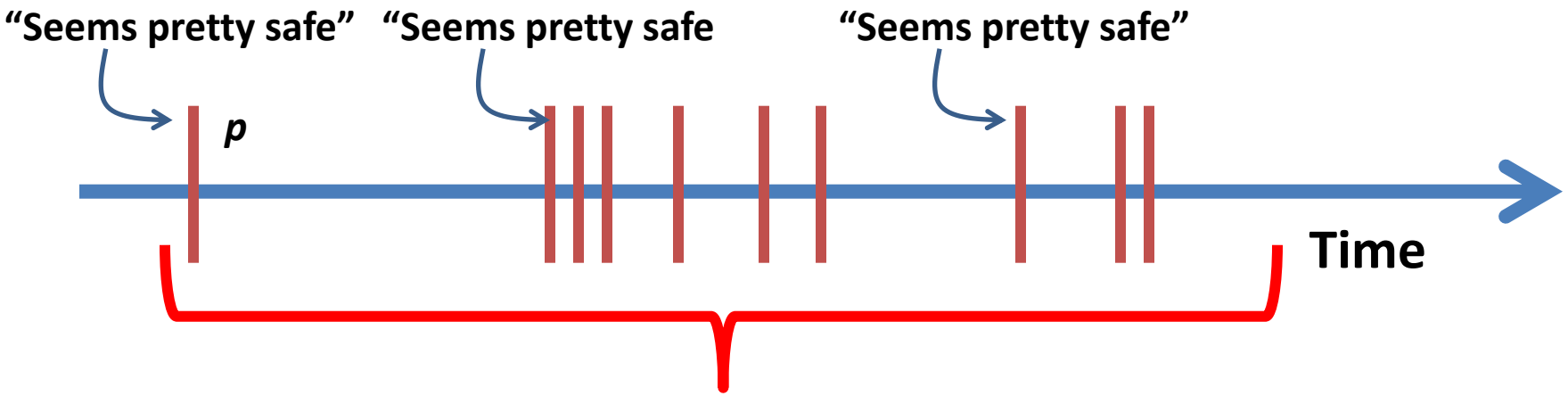


So, to compute the probability of not having an accident over ***n*** = 50 texting sessions (one month) of driving, we need to do 50 multiplications of .99, a 99% chance of getting through each texting session without a crash:

$$= .99 \times .99\ldots \text{ or } (.99)^{50} = .60$$

→ ***60% chance that everything is OK!***

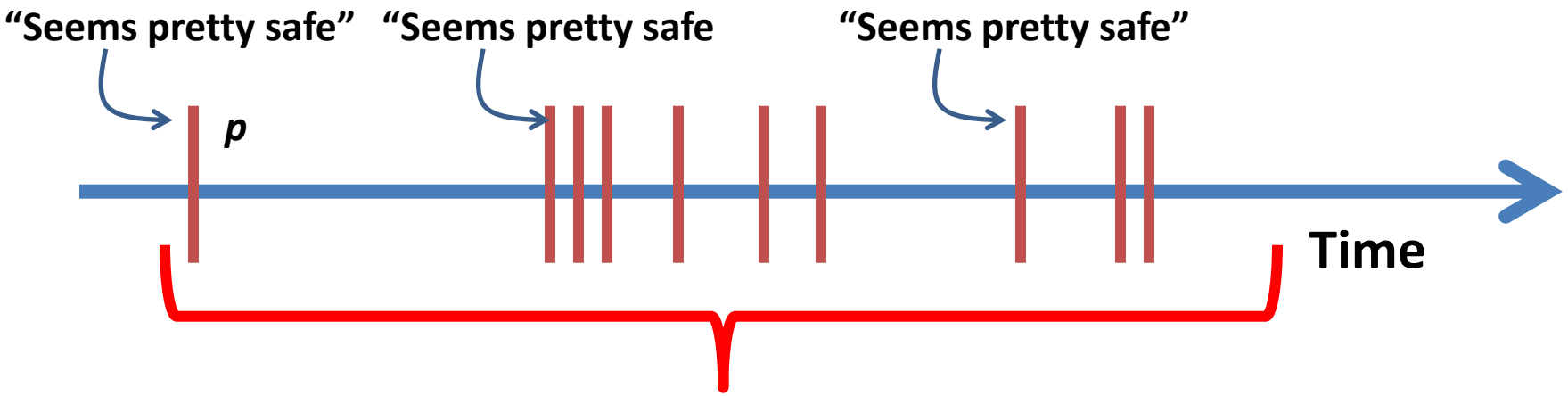
From Habits to Surprises



Finally, to compute ***Big P,*** the probability of a major accident over the month, we compute the **complement.** **60**% of the time there's no crash, but, there is a crash with the complement probability of **1 - .60 = .40.** So, you will *not make it through all 50 text sessions safely, with a P of:*

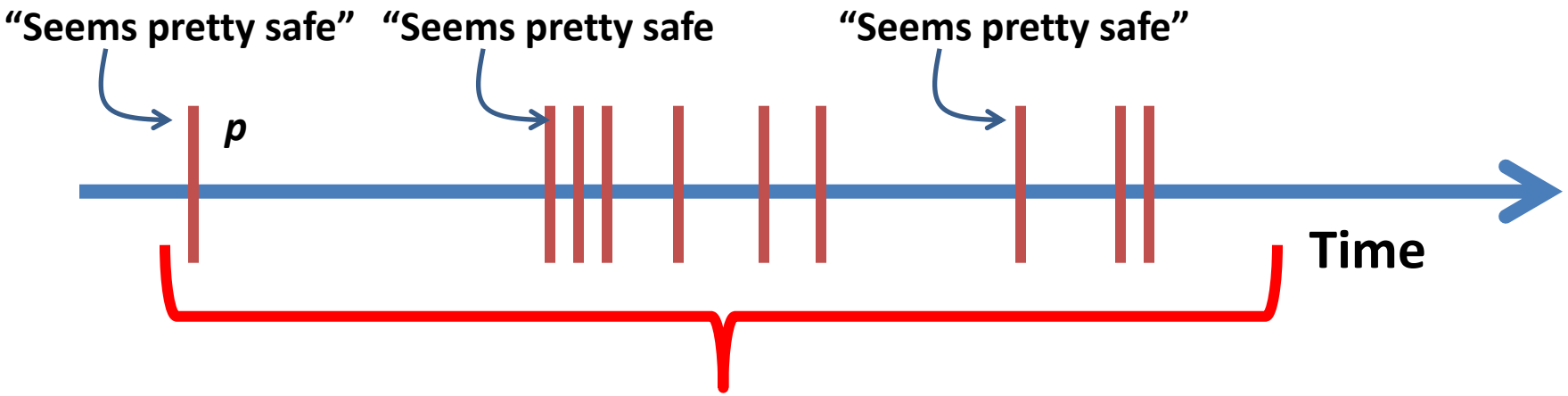
P = 1-.60 = .40 → **40% chance of a crash**

From Habits to Surprises



So, there's a 40% chance of a major accident within 50 texting sessions, even though the risk is only 1 in 100 each time.

From Habits to Surprises



We can compute *Big P* for any probability *p* and any number of text sessions *n* as follows:

$$P = 1 - (1- p)^n$$

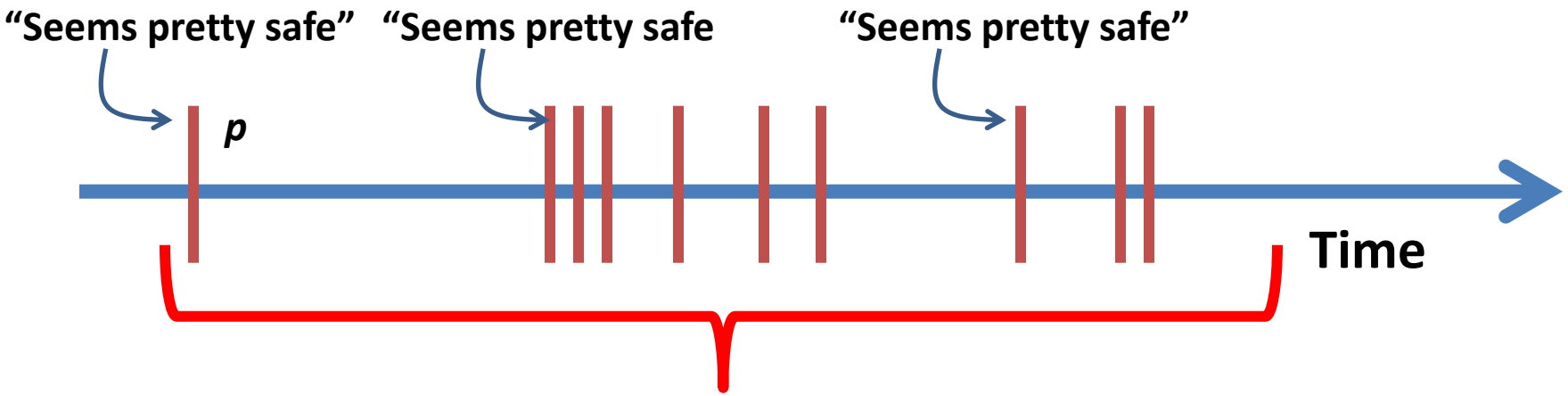
You can use this equation to compute the risk of having a major accident using your own numbers.

Putting Your Own Beliefs into the Equation

Providing your own guesses or “assessments” of the probability ***p*** of having a major accident during a single session of texting while driving allows you to explore the implications of your own beliefs.

If you are not sure about the probability, you can try out different guesses to see how the probability of having a major accident ***P*** changes with the number of texting sessions.

Your Beliefs → Implications



Try out your own numbers

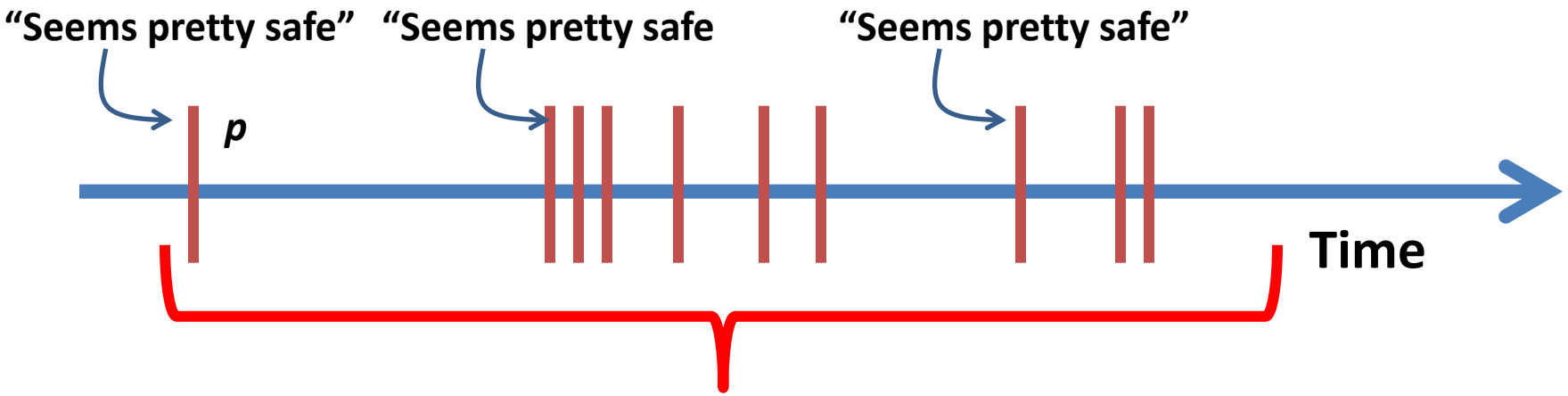
p:__ (prob. of an accident for each text session while driving)

n:__ (number of sessions of texting while driving)

$P = 1 - (1- p)^n$

$P =$ _____

Example 1



Assumed values

p: ***.001*** (prob. of an accident for each text session)

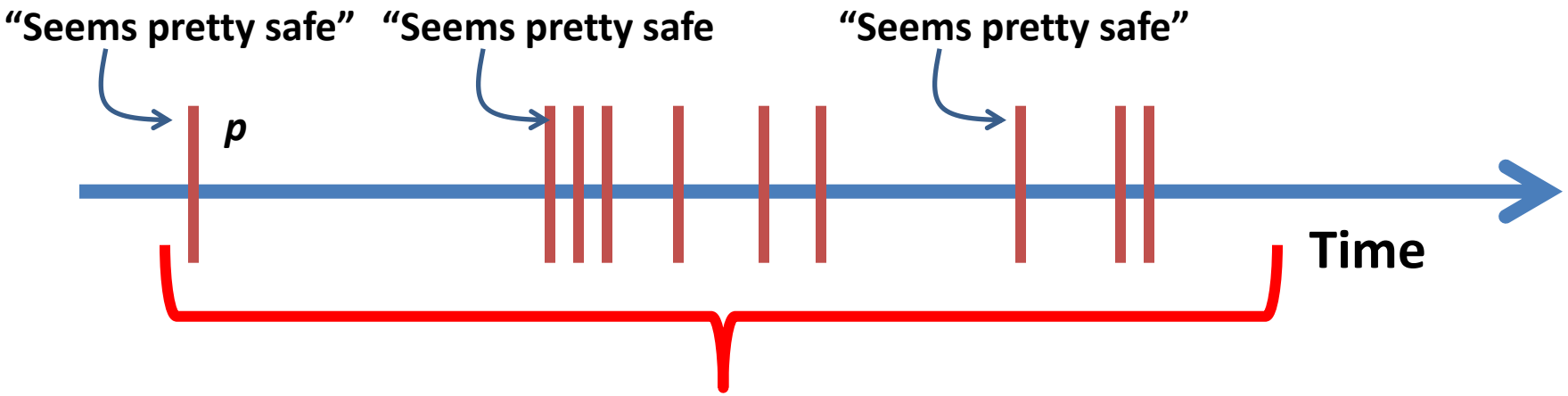
n: ***500**** (number of sessions of texting while driving)

$P = 1 - (1- p)^n$

$P = 1 - (1 - .001)^{500}$ = **34% of a major accident!**

*Note that 500 = 10 text sessions per week for year.

Example 2



Assumed values

p: ***.01*** (prob. of an accident for each text session)

n: ***100**** (number of sessions of texting while driving)

$P = 1 - (1- p)^n$

$P = 1 - (1 - .01)^{100}$ = **64% of a major accident!**

Explorations

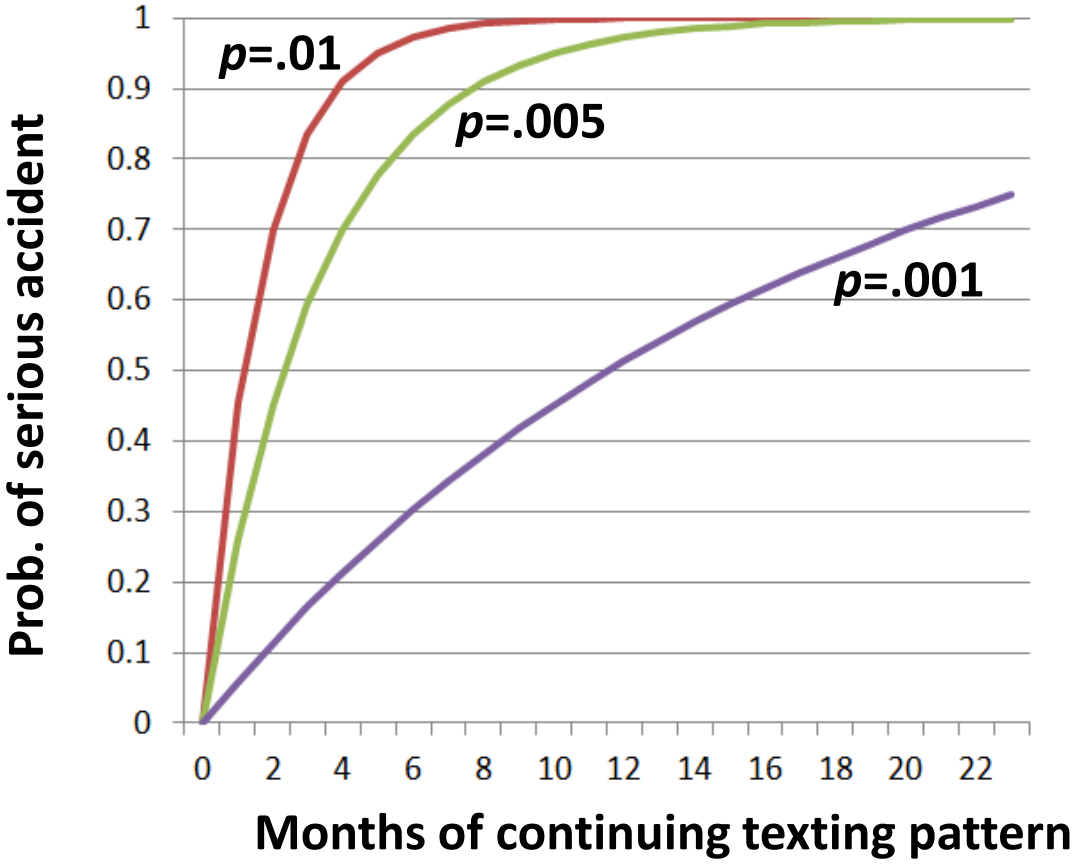
We can explore many different *p's* and *n's* by graphing the probability of a major accident over time.

We can see how the probability ***P*** of having an accident with multiple texting sessions changes for different assumptions about the probability ***p*** of having an accident during a single texting session.

Surprise over Time

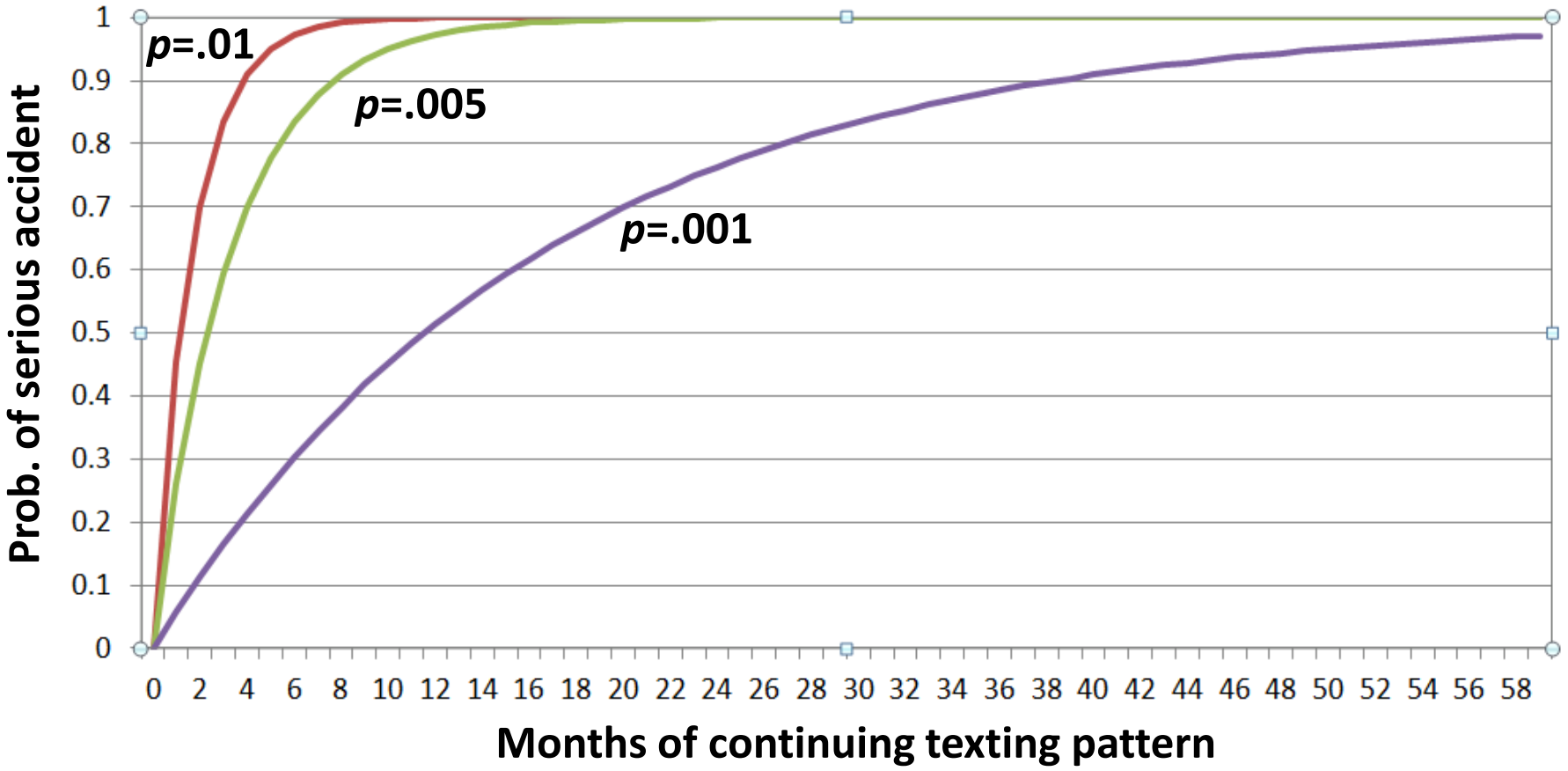
Let's consider that you text while driving about 2x per day on average.

We plot the probability *P* of a major accident (y axis) over 2 years (x axis). We show curves for different assumed probabilities *p* that an accident will occur in each texting session, and show how *P* changes over time.



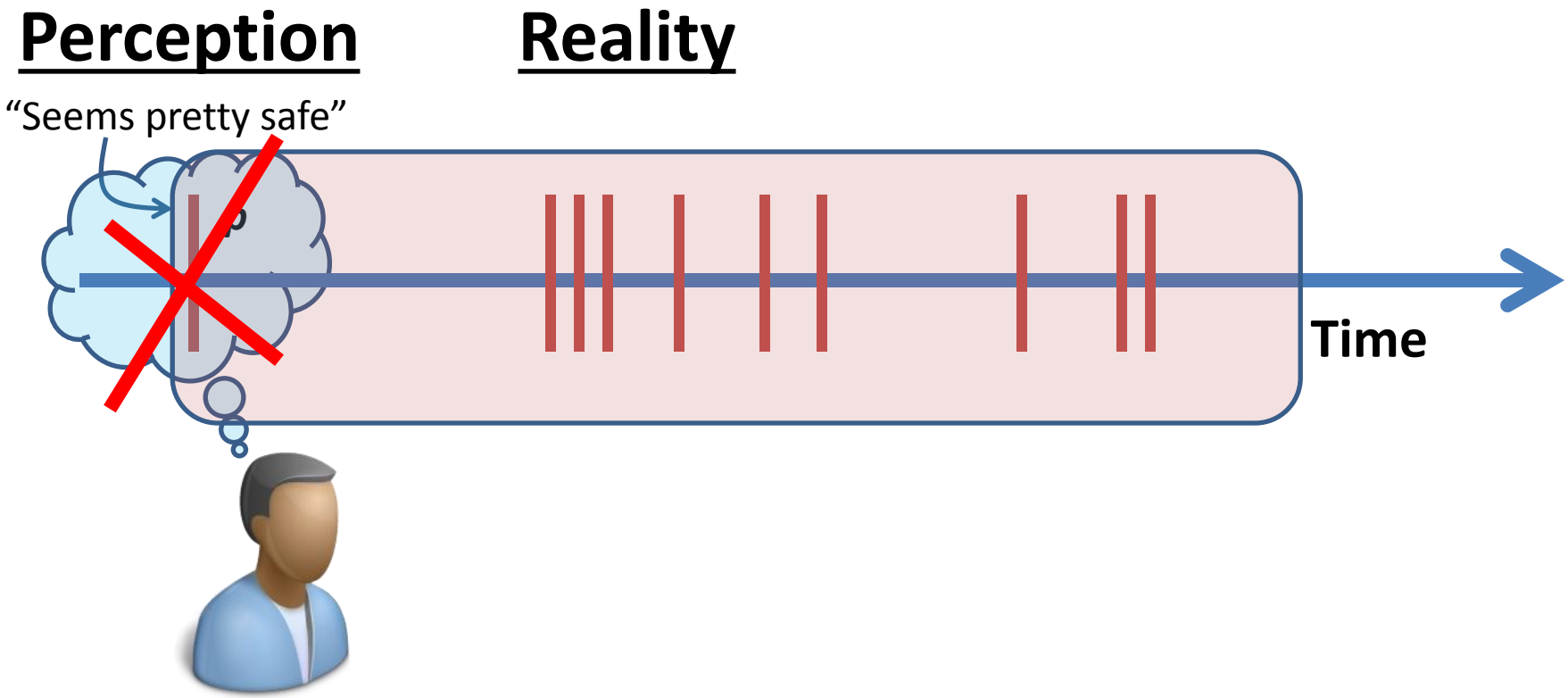
Surprise over Time

Let's now look and the probability of a crash over 5 years. If these probabilities are correct—or even close, you'll almost definitely have a crash within a few years when you text about 2x per day, even if there's only a 1 in 1000 chance each time (purple curve below).



Mastering the Safety Illusion

Critical need: A decision and commitment *now* to immediately stop or modify the long-term pattern.



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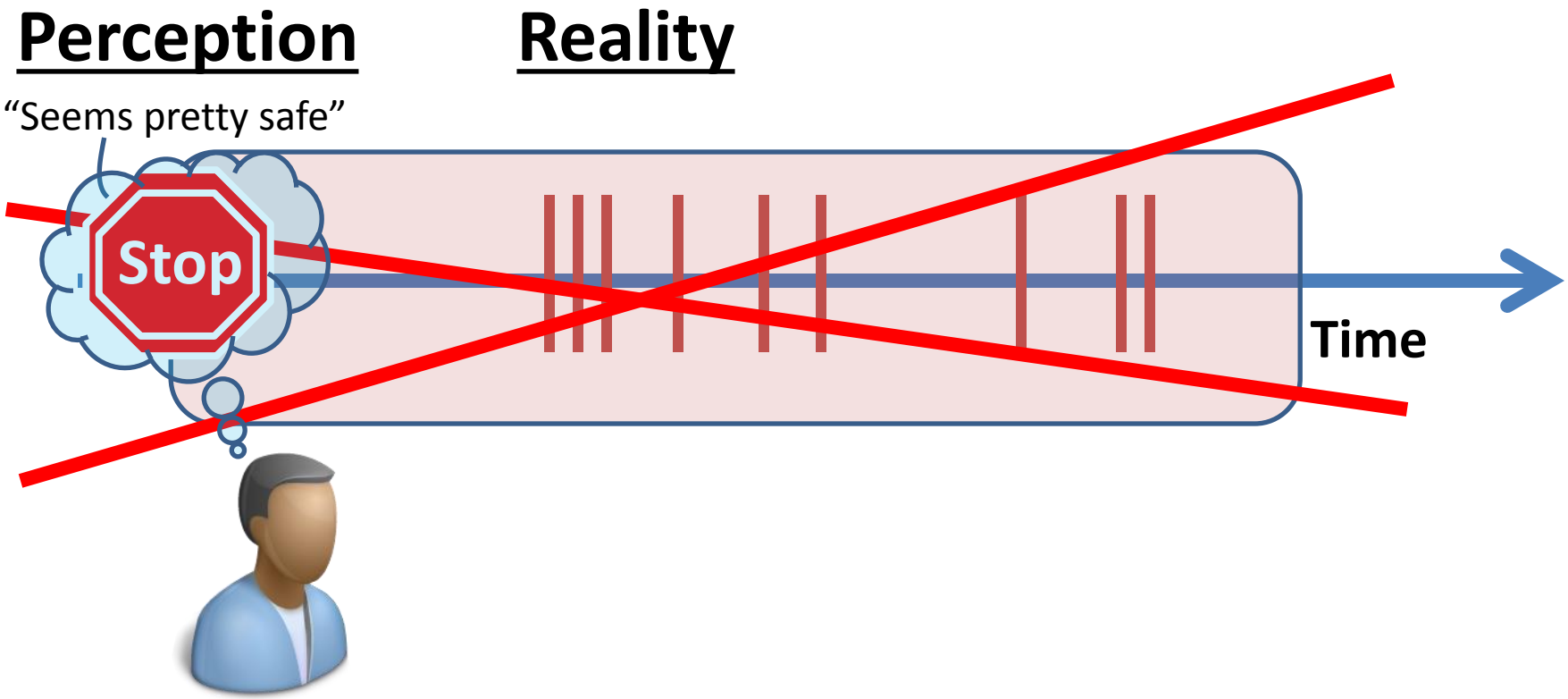

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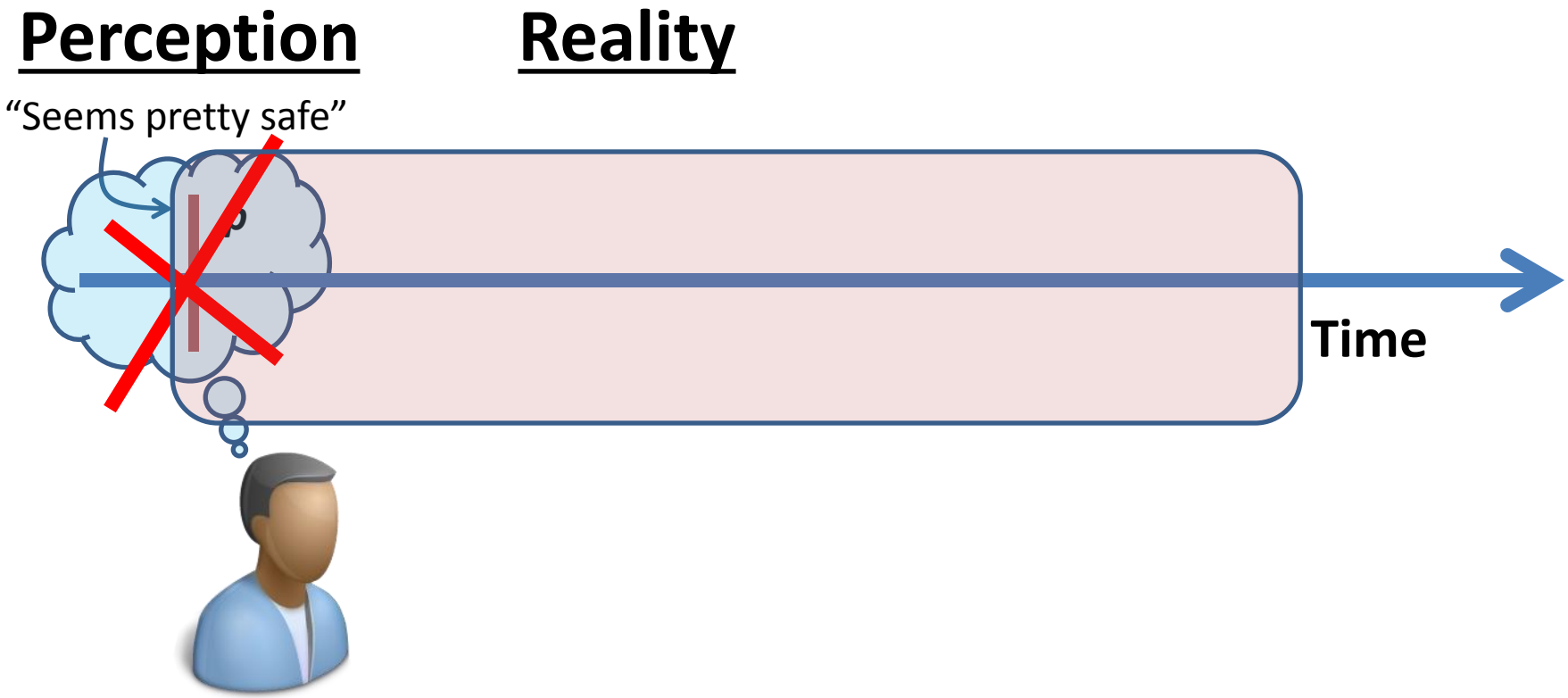

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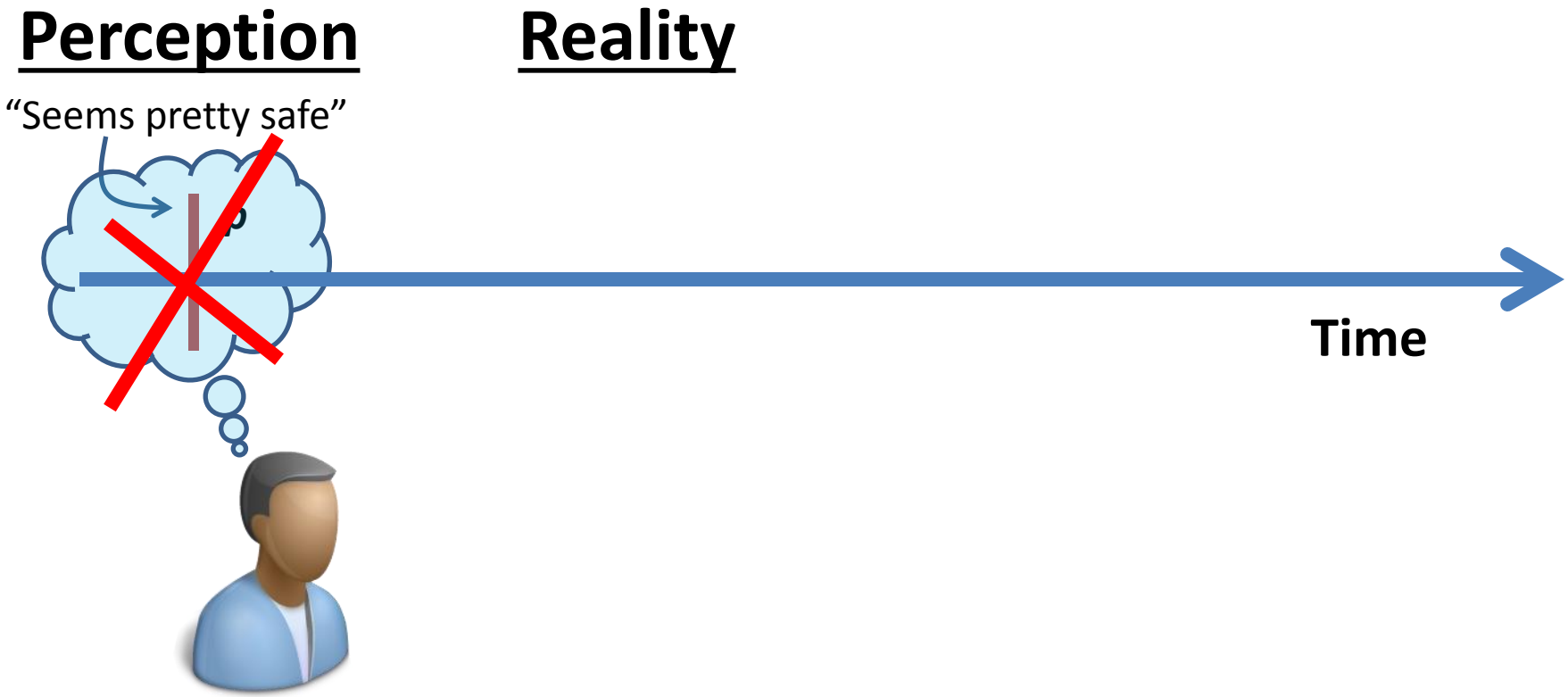

Now that you're in the know…

Mastery of the safety illusion highlights the value of making commitments *now* that change patterns of actions over the long term.

Such a mindful change takes effort, but can have a tremendously valuable influence on your life.

Now that you're in the know…

Don't fall for the safety illusion 

→ User deeper understanding to your advantage!

→ Make a long-term commitment *today* to reduce or halt risky patterns of action

→ Explain the *safety Illusion* to others*

*Without knowledge about the safety illusion, your friends may be surprised with a terrible outcome. Your sharing of these ideas can truly be a gift of life for them and others.

Discussion: Broader Implications for Living a Rewarding Life

How do long-term patterns of action influence other likelihoods of things good and bad over the long-term in life?

Discussion: Broader Implications for Living a Rewarding Life

You can apply the texting example to repeated patterns of action in *other aspects of your life*, and make commitments to changes that will *reduce bad "surprises."*

It is never too late to make an immediate commitment to shifting a long-term pattern of action.

Discussion: Broader Implications for Living a Rewarding Life

Other side of the coin…

We can flip the earlier analysis around and look at patterns of activity that are linked to small probabilities of **great things happening**.

Such small probabilities can combine together over time to lead to unexpectedly high likelihoods of **fabulous surprises** happening in your life.

Illusions and Realities

Thanks for taking the time to reflect about your patterns of actions.

The key point is that many of our single actions—the things we do in the "now" are really the tip of a long stream of many similar actions over time.

The streams of actions can have surprising influence on our lives, as they can combine together into big, life-changing events.

Tragic Outcomes

Meet Taylor Sauer

Bright, outgoing college teen

Graduated high school last year with a sparkling 3.9 grade point average, was class salutatorian, played first base on her softball team and was active in community charities.

Meet Taylor Sauer

Bright, outgoing college teen

After she was named a National Merit Scholar, she told a local TV station:

"I want to go even further and take on the world."

Meet Taylor Sauer

Bright, outgoing college teen

She was making a late-night, four-hour drive from the Utah State University campus in Logan to visit her folks in Caldwell, Idaho.

Meet Taylor Sauer

Bright, outgoing college teen

But she stopped short, writing in her final text msg:

"I can't discuss this now. Driving and facebooking is not safe! Haha.“

Meet Taylor Sauer

Bright, outgoing college teen

Moments later, going more than 80 mph, she slammed into a tanker truck that was slowly creeping up a hill at 15 mph.

She was killed instantly.

Meet Taylor Sauer

Bright, outgoing college teen

Investigators saw no signs that she applied the brakes before the fatal crash.

And in checking her cell phone records, they learned Sauer was posting about every 90 seconds during her drive.

Meet Taylor Sauer

Bright, outgoing college teen

“She just loved everybody and was an amazing friend," said her mother Shauna Sauer.

"She wanted to take on the world, and she would have."

Taylor is not atypical.

Meet Allison Smith

“Investigators: Teen Texting Before Fatal Collision With School Bus”

(ABC 6 NEWS) - The Iowa State Patrol believes a teen from Stacyville was texting before her car collided with a school bus, killing her.

The accident happened in November 2011 on Highway 218 near St. Ansgar. Authorities say 17 year old Allison Smith was alone in the car and died on the scene. No one on the bus was hurt.

Investigators used cell phone records and video from the school bus to determine that Smith was texting prior to the collision. They also determined that data from the car's airbags show smith never braked and likely never saw the bus before impact.

Smith was a junior at St. Ansgar High School. Before she was killed, there were only a class of 58 students.

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Smith was a junior at St. Ansgar High School. Before she was killed, there were only a class of 58 students.

“Deputies: Mother texting on cell phone before head-on collision that killed son”

Her 4-year-old son, Diego, was sitting in a booster seat and wearing a seatbelt, but he died at the scene.

The Safety Illusion is everywhere

Click on image for video.

Additional Exercises

Exercises

We can apply the same analysis to other continuing patterns.

Let's now consider these examples:

Speeding to get to a destination more quickly

Passing a slow car to get to a destination more quickly

Speeding

Problem

Envision a trip between starting point and destination that is x miles long. Assume a speed limit of y miles per hour. Compute the savings in time for a single trip if you travel, on average, z miles per hour, where (z - y) is the speed you travel on average over the speed limit.

Speeding

Steps

1. Choose an x, y, and z.

2. Compute the savings in travel time for the trip of distance x when you drive at speed z versus y.

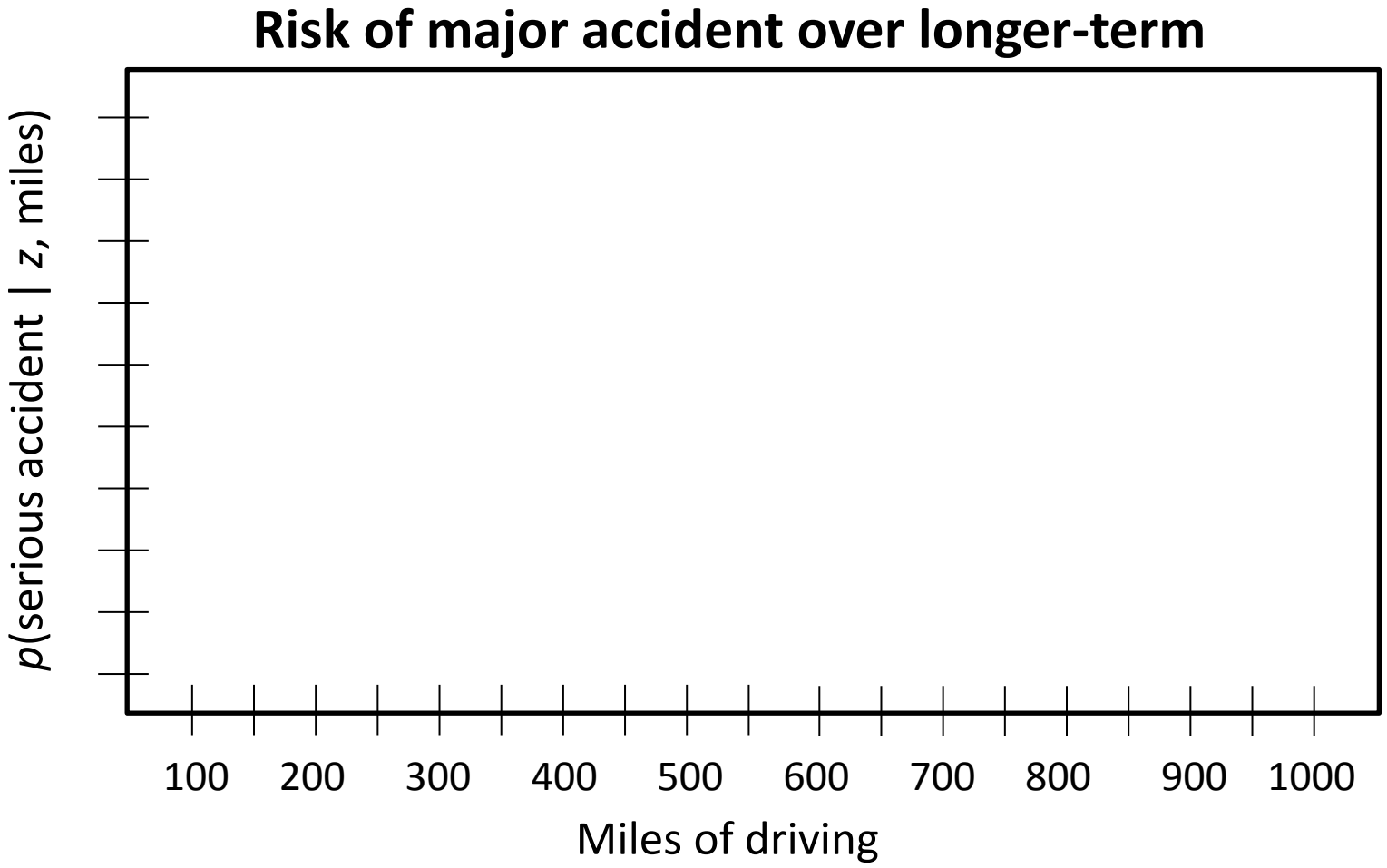
3 Assess (or look up) the increased likelihood of a serious accident per mile of driving at different average speeds z over the speed limit y,

$$p(\text{serious accident} \mid z, \text{drive for a mile})$$

4. Separately graph p(serious accident | z, miles) for 100, 500, and 1000 miles of driving.

Speeding

Distance: _____
Speed limit: _____
Speed: _____
p(acc. per mile): _____
Time saved / trip: _____



Speeding: Example

x= 5 mile trip
y=35 mph
z=50 mph
p = .001 per mile

Trip time @ 35 mph: 5 miles /35 mph = .14 hr. = 8.6 min
Trip time @ 50 mph: 5 miles / 50 mph = .1 hr = 6.0 min
Savings in time: 8.6 – 6.0 = **2.6 min**

p(accident | *50 mph in 35 mph* per mi.)=.001
p(accident | *50 mph in 35 mph* for 5 mi.) = $1-(1-.001)^5$

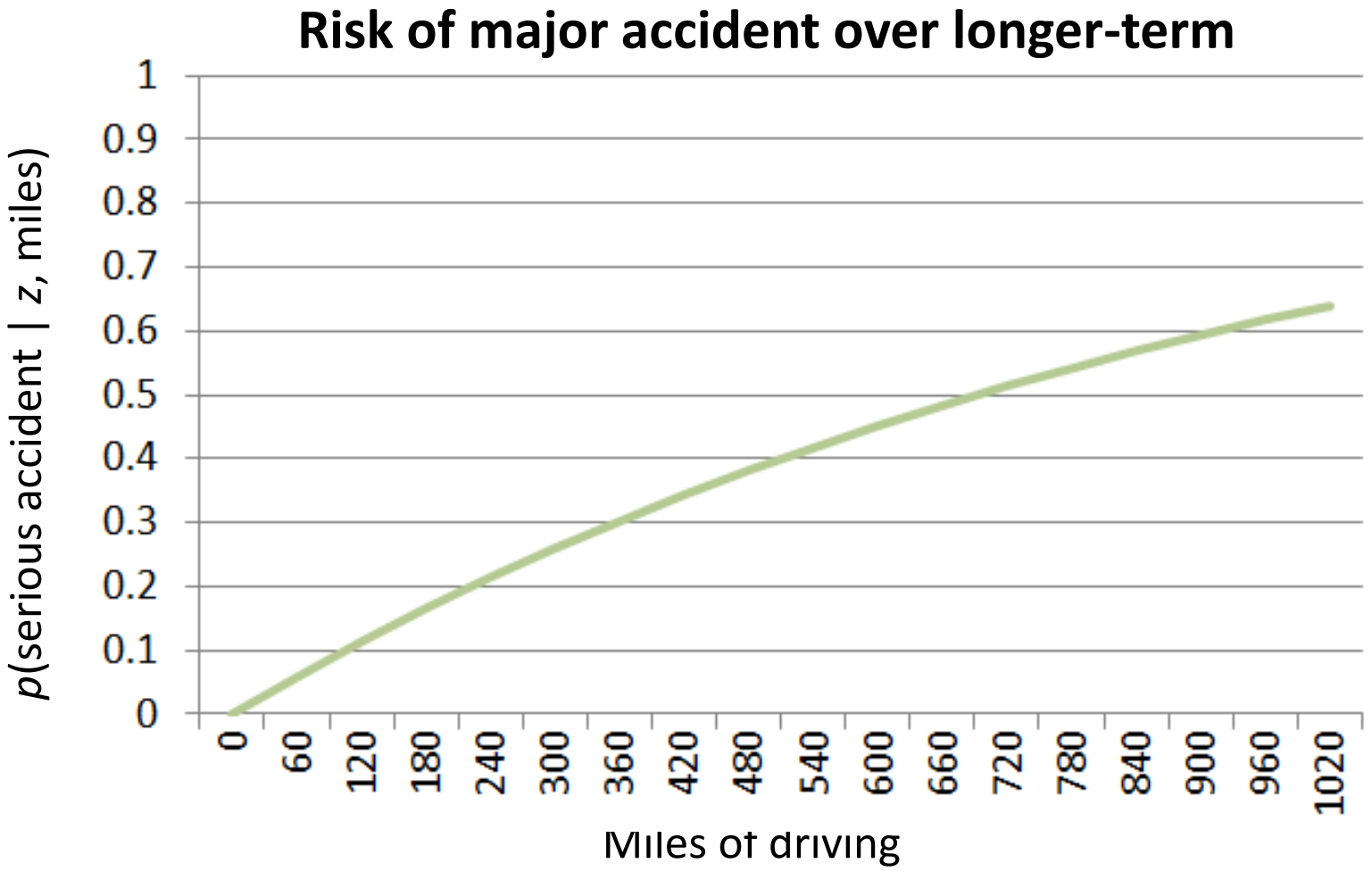
$= 1-(.999)^5 = 1-.995 =$ **.005**

Speeding: Example

y=35 mph

z=50 mph

p = .001 per mile



Passing

We can do similar study in savings in time for passing a slow moving vehicle, where we are on a trip of x distance, with speed limit y, and encounter a car that is moving at slower speed z.

Passing

Steps

1. Assume x, y, and z.

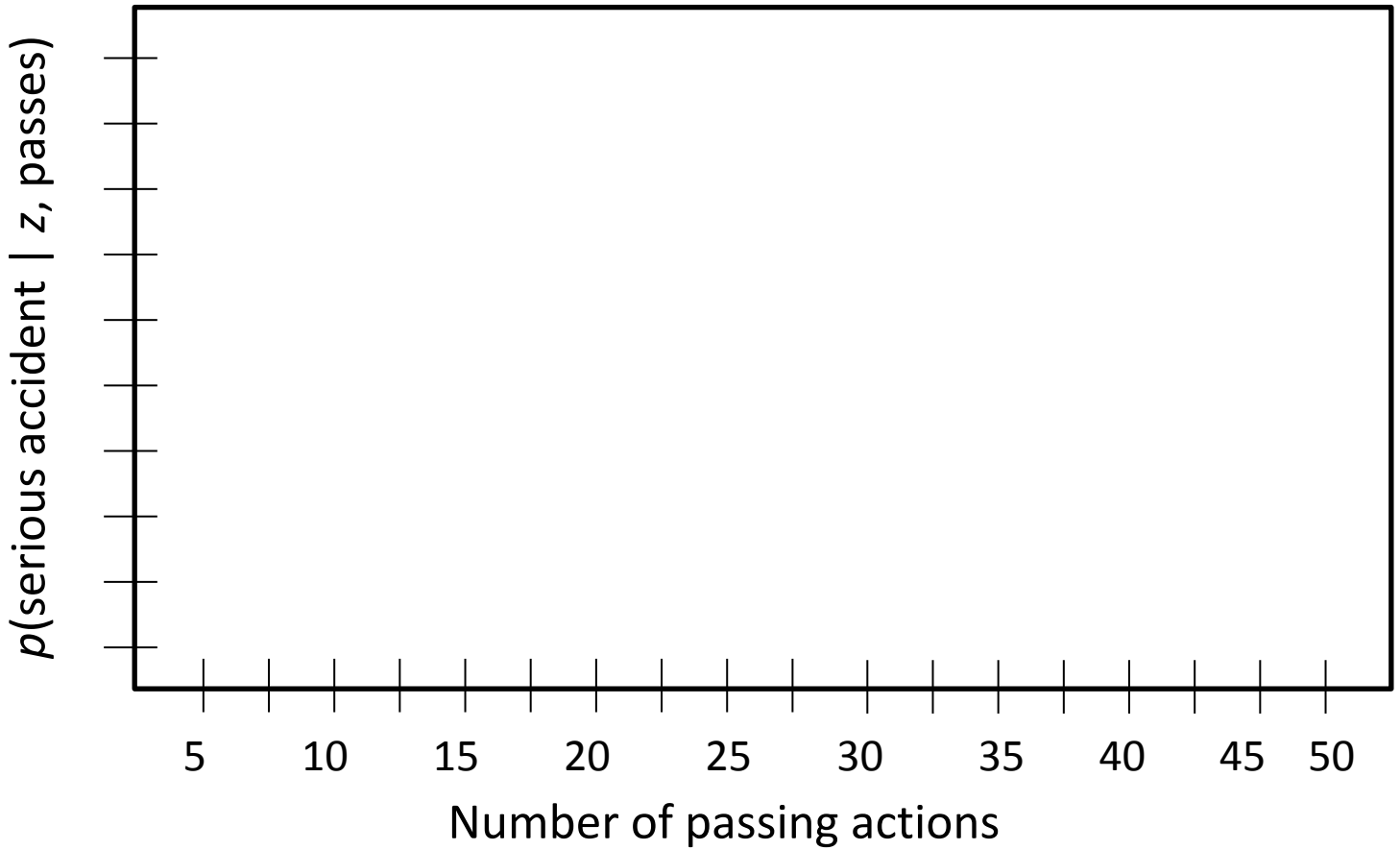
2. Compute the savings in travel time for each trip of distance x when you pass car driving at speed z versus speed limit y, and then travel at speed y.

3 Assess (or look up) the increased likelihood of a serious accident for each pass, given assumed type of road.

$$p(\text{accident} \mid \text{pass})$$

Passing

Distance: _____
Speed limit: _____
Speed: _____
p(acc. per pass): _____
Time saved / trip: _____



Additional Materials

The New York Times

Technology

In Study, Texting Lifts Crash Risk by Large Margin

The first study of drivers texting inside their vehicles shows that the risk sharply exceeds previous estimates based on laboratory research — and far surpasses the dangers of other driving distractions.

The new study, which entailed outfitting the cabs of long-haul trucks with video cameras over 18 months, found that when the drivers texted, their collision risk was 23 times greater than when not texting.

http://www.nytimes.com/2009/07/28/technology/28texting.html?_r=2&hpw

By MATT RICHTEL
Published: July 27, 2009

The first study of drivers texting inside their vehicles shows that the risk sharply exceeds previous estimates based on laboratory research — and far surpasses the dangers of other driving distractions.

Enlarge This Image

Virgina Tech Transportation Institute

In these videotape stills, a truck driver texts while at the wheel, top left, with other angles seen.

The new study, which entailed outfitting the cabs of long-haul trucks with video cameras over 18 months, found that when the drivers texted, their collision risk was 23 times greater than when not texting.

The Virginia Tech Transportation Institute, which compiled the research and plans to release its findings on Tuesday, also measured the time drivers took their eyes from the road to send or receive texts.

In the moments before a crash or near crash, drivers typically spent nearly five seconds looking at their devices — enough time at typical highway speeds to cover more than the length of a football field.

Even though trucks take longer to stop and are less maneuverable than cars, the findings generally applied to all drivers, who tend to exhibit the same behaviors as the more than 100 truckers studied, the researchers said. Truckers, they said, do not appear to text more or less than typical car drivers, but they said the study did not compare use patterns that way.

Multimedia

Virgina Tech Transportation Institute

In these videotape stills, a truck driver texts while at the wheel, top left, with other angles seen.

By Larry Copeland, USA TODAY

Updated 10h 29m ago

The high-profile campaign against distracted driving, especially among young motorists, has seeped deep into the national culture: April is Distracted Driving Month, and tonight's season premiere of the Fox teen hit TV show *Glee* features a distracted driving crash cliffhanger from last season.

By Pat Wellenbach, AP

Nearly half of drivers ages 16 and 17 say they've never texted while driving, a recent survey finds.

Despite all that focus, a new survey from insurer State Farm indicates that many teens might still be ignoring the message.

The survey, conducted for State Farm by Harris Interactive, finds that just 43% of drivers ages 16 and 17 say they have never texted while driving — the same percentage as in the insurer's first survey in 2010.

STORY: Strategies aimed at reducing deaths among young motorists

PHOTOS: Teen driving

Yet 76% of teens ages 14-17 agree that "if you regularly text and drive, someday you will be killed while driving," and 93% agree that "if you regularly text and drive, someday you will get into an accident."

http://www.usatoday.com/news/nation/story/2012-04-09/distracted-teen-driving-texting/54135840/1

The State Farm survey comes as *Glee* is expected to resolve a cliffhanger from last season. Drama queen Quinn Fabray, played by Dianna Agron, was rushing to her ex-boyfriend's wedding and texting while driving when her vehicle was blindsided by a truck. The screen went black, leaving viewers wondering about her fate.

Harris Interactive surveyed 652 teens 14-17 in February to examine their attitudes and behaviors around driving.

The message apparently isn't sinking in for some. "Unfortunately, it has not in terms of the teens who say they're texting while driving," says Chris Mullen, State Farm's director of technology research.

The survey shows some progress: Fewer teen drivers say they "very often" text while driving, and more say they do it "rarely" than in the 2010 survey.

Cheyenne Schorlig, 17, a junior at Eureka High School in Eureka, Calif., who has had her license about 10 months, says she never texts while driving.

"I've been in a couple of accidents where the driver was texting while driving," she says.

Jaylea Salk, 18, a senior at Eureka, says that among her peers who still text and drive, "a lot of it probably is the social media aspect with Facebook and Twitter. People want that connection, and they want to be able to talk with their friends. They don't think, 'If I just wait 10 minutes, I can do it safely.' They want that instant gratification with everything."

The survey emphasizes the vital role of parents in fighting teen texting and driving. Among the teens who text, 67% talk often with their parents about driving; that rises to 82% among teens who never text while driving.

"What it tells me is that parents do have an extreme influence and a role to play in teaching their teens how to drive," Mullen says.

Please send along your feedback, comments, and questions.
Your thoughts can help to make this presentation better.

Additional resources on decision skills can be found
at the Decision Education Foundation site:
http://decisioneducation.org