

SAMUEL I. SCHWARTZ

No One at the Wheel

Driverless Cars and
the Road of the Future

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Consultants

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OUTLINE

- I. Introduction
- II. Safety and Health
- III. Traffic Impacts
- IV. The AV-Industrial Complex
- V. Recommendations
- VI. Time Travel
- VII. Next Generation Mobility

Introduction

I. Introduction

THE GOOD, THE BAD AND THE UGLY (POSSIBILITIES)

the **GOOD**

- Congestion diminishes
- Crashes, injuries, and deaths plummet
- Disabled and low-income well-served
- Mobility as a Service (MaaS) with transit integration
- Last mile solved
- Parking demand goes way down

the BAD

- VMT soars & congestion increases
- Many jobs disappear
- Peds, bikes squeezed out
- Unaffordable for poor and rural dwellers
- Reverses millennial trend eschewing driving
- Competes with and undermines existing transit

and
the UGLY

- Widespread gridlock
- Public transportation decimated
- Heart disease/stroke/diabetes skyrocket
- Everybody gets a license (even your dog)
- A new “modernist” view of cities
- Encourages sprawl

Good

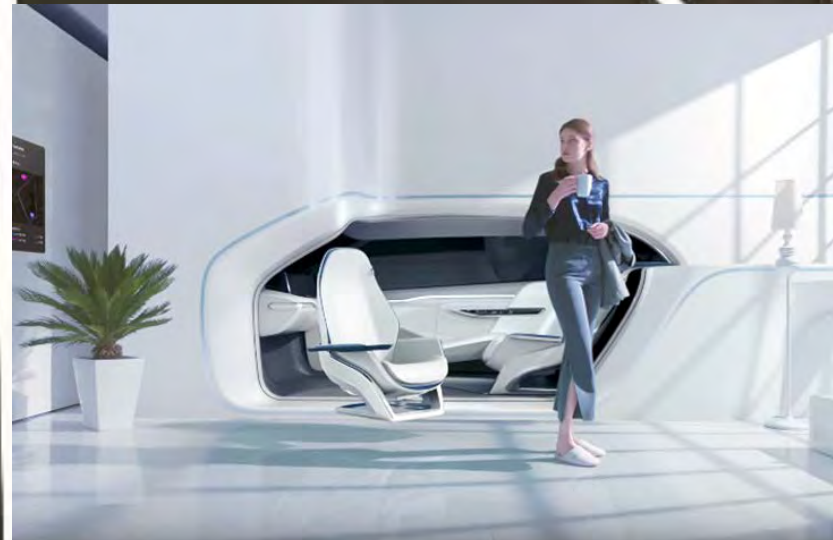
Bad

Ugly

2018

Less Traffic
Lower Carbon
Lower Societal Cost
Less Parking
Requires some walking

More congestion
Less sustainable
Higher cost
Keeps parking
Minimizes walking

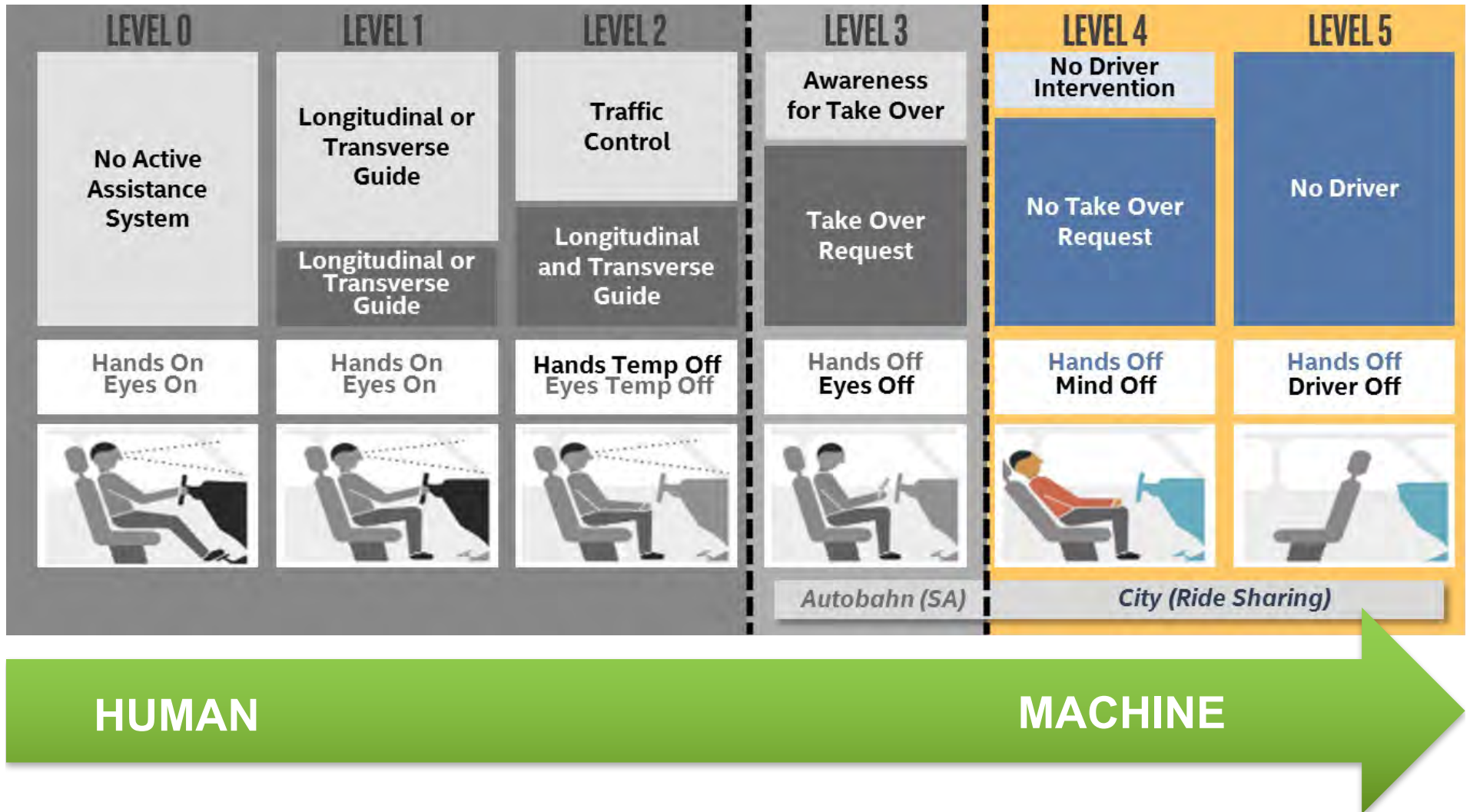


MaaS + Transit Integrated

MaaS vs. Transit

Private Ownership

STAGES OF AUTONOMY



Source: [Intel](#)

Safety and Health

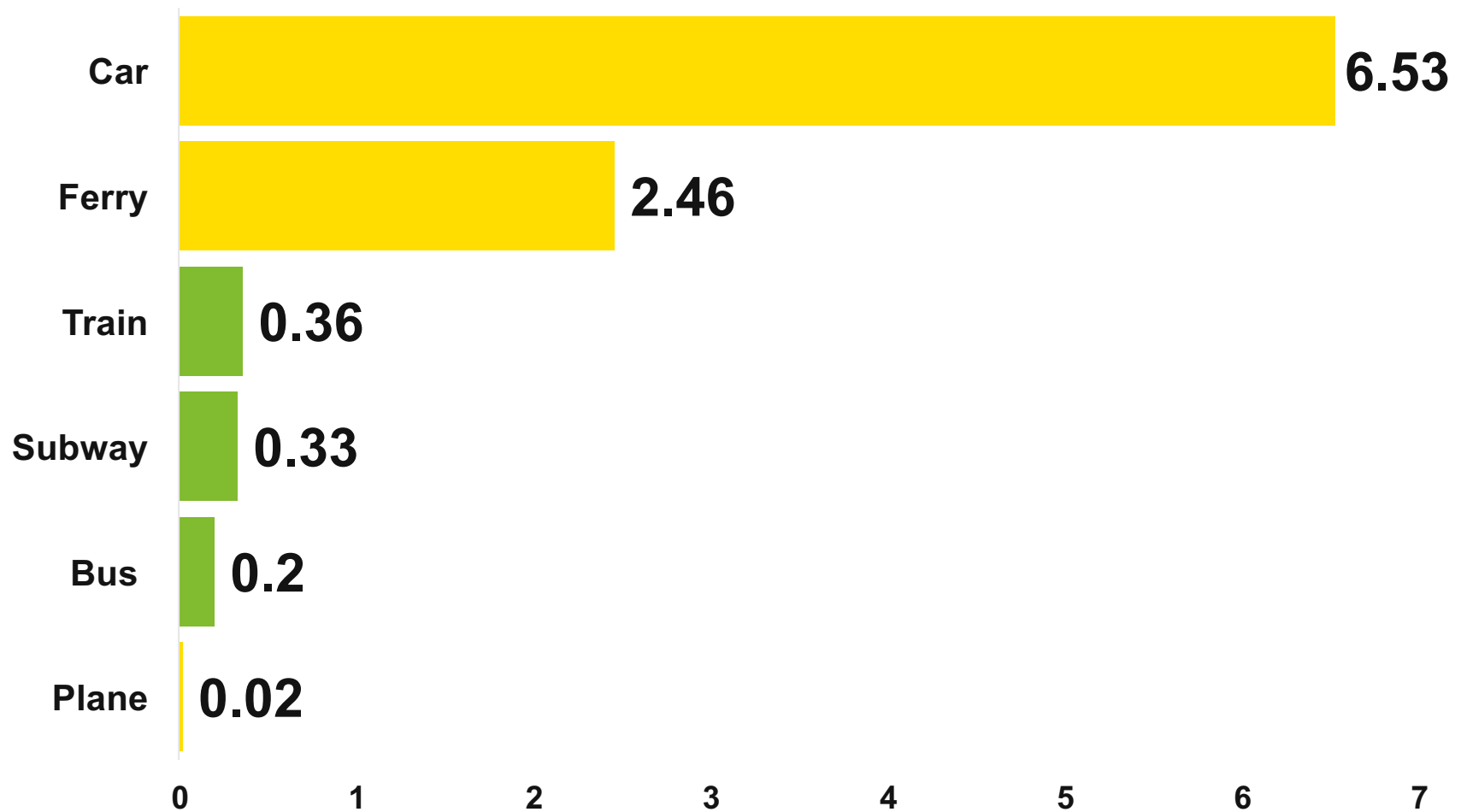


II. Safety and Health

EVEN IF 90% SAFER THAN CARS

Passenger Deaths per 1 Billion Passenger Miles, 2000-2014

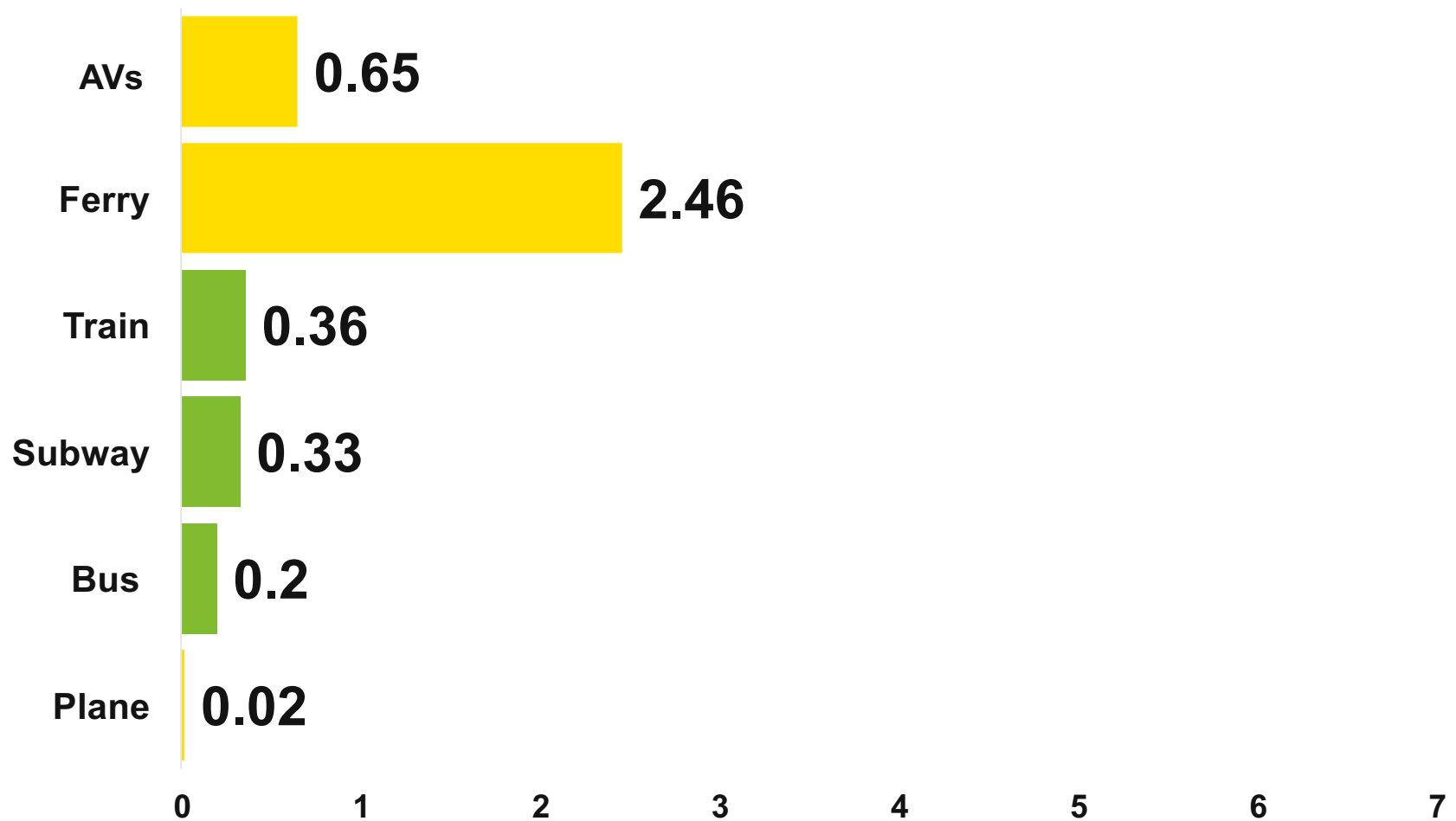
Deaths per Billion Passenger-Miles



EVEN IF 90% SAFER THAN CARS

Passenger Deaths per 1 Billion Passenger Miles, 2000-2014

Transit is Already 95% Safer



NO REASON TO WAIT FOR AVs TO SAVE LIVES

Most safety benefits can be achieved with “safe cars” without full automation.

Professor Alain Kornhauser,
Princeton University

U.S. Meme: 94% of traffic fatalities due to human error

Swedish Meme: Humans are fallible and make mistakes. Vision Zero through design: road system, vehicles, technology, enforcement

- U.S. Fatalities down 11% (1997-2016)
 - Swedish Fatalities plummet 49% (1997-2017)
-
- NYC adopts VZ, fatalities drop 28% 2014-2017 (Pedestrians down 45%)
 - Unsafe at Any Speed (1965) by Ralph Nader - fatalities per 100M miles driven drops 78% in 50 years

Source: Motor Vehicle Fatality Rate In U.S. By Year, (NHTSA) 2016

KEY TAKEAWAY

Don't let the safety argument blind you to a more holistic approach toward the introduction of AVs to our society.



A close-up photograph of Elon Musk speaking. He is looking slightly to his left with an open mouth, as if in the middle of a sentence. He is wearing a dark jacket over a dark shirt. The background is dark and out of focus.

“..if, in writing some article that’s negative,
“..If you're not concerned about A.I. safety, you
should be. Vastly more risk than North Korea.”

Elon Musk

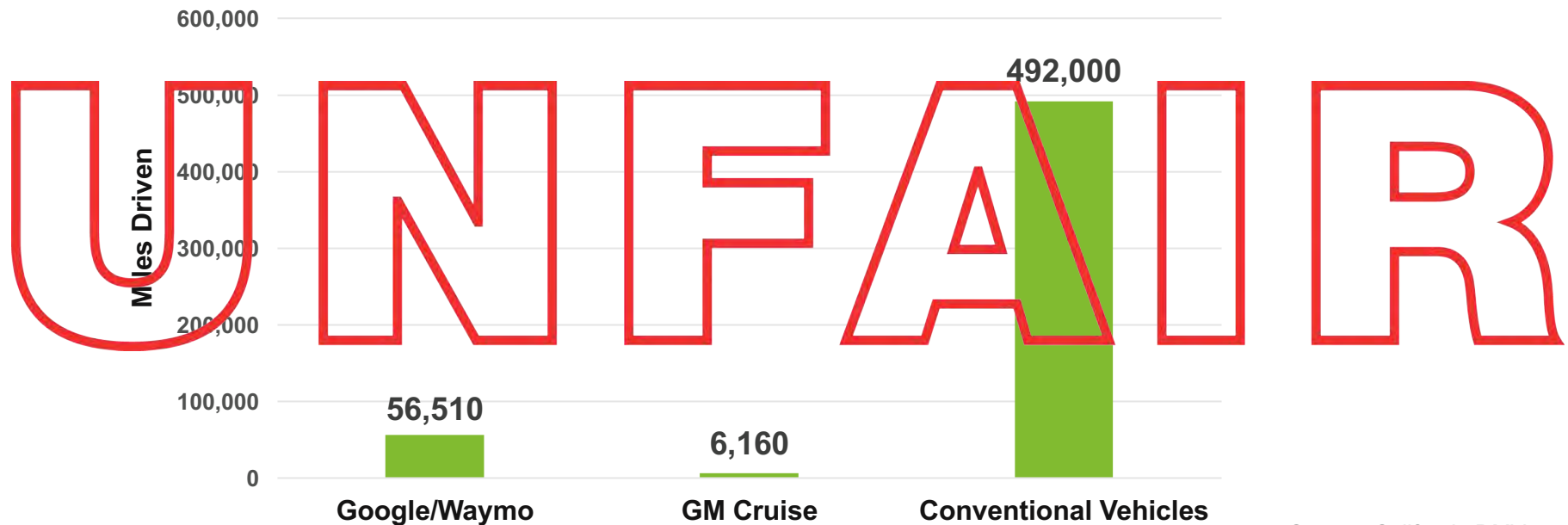
Twitter, August 11, 2017¹⁶

SELF-DRIVING CRASH HISTORY (WHAT WE KNOW*)

Fatalities: 3 Known in USA

- In 2016, there were 1.17 fatalities per 100 million miles, conventional driving
- 3 fatalities in conventional vehicles would take avg. 258 million miles driven
- Number of miles driven to date in AV mode unknown
- AVs may have to be driven hundreds of billions of miles to demonstrate safety per Rand Corporation Study

**Crash Frequencies: Self-Driving vs Conventional Vehicles
(September 2014 - November 2017)**



Source: California DMV

DISENGAGEMENTS

- California only state recording disengagements:
 - Automated disengagement: 68% (Google)
 - Manual disengagement: 32% (Google)
- All Companies - 507,087 miles / 2,304 disengagements (1 disengagement / 220 miles.)
- Waymo & GM Cruise: 484,219 miles / 168 disengagements (1 disengagement / 2,882 miles).
- If a driver drives 12,000 miles/year s/he would have had 4-54 disengagements
- In sample studied, 1 crash every 178 disengagements

Sources: California DMV, Favaro et al. 2017 "[Analysis of Disengagements in Autonomous Vehicle Technology](#)"

AV CARS WORK WELL WITHOUT PEDESTRIANS & CYCLISTS

Some pedestrians such as the following may not be detected by the radar sensor and camera sensor, preventing the system from operating properly:

- Pedestrians shorter than approximately 3.2 ft. (1 m) or taller than approximately 6.5 ft. (2 m)
- Pedestrians wearing oversized clothing (a rain coat, long skirt, etc.), making their silhouette obscure
- Pedestrians who are carrying large baggage, holding an umbrella, etc., hiding part of their body
- Pedestrians who are bending forward or squatting
- Pedestrians who are pushing a stroller, wheelchair, bicycle or other vehicle
- Groups of pedestrians which are close together
- Pedestrians who are wearing white and look extremely bright
- Pedestrians in the dark, such as at night or while in a tunnel

MOTOR VEHICLES USED AS WEAPONS RISING



Nice Attack: At Least 84 Killed By Lorry At Bastille Day Celebrations

BBC News – July 15, 2016



**Christmas Carnage In Berlin
12 Killed**

The Times – December 20, 2016



Van Hits Pedestrians in Deadly Barcelona Terror Attack 13 Killed

NY Times – August 17, 2017



8 Killed As Truck Plows Into Pedestrians In Downtown NYC Terror Attack

NY Post – October 30, 2017

MORE INACTIVITY: A LEADING CAUSE OF DEATH

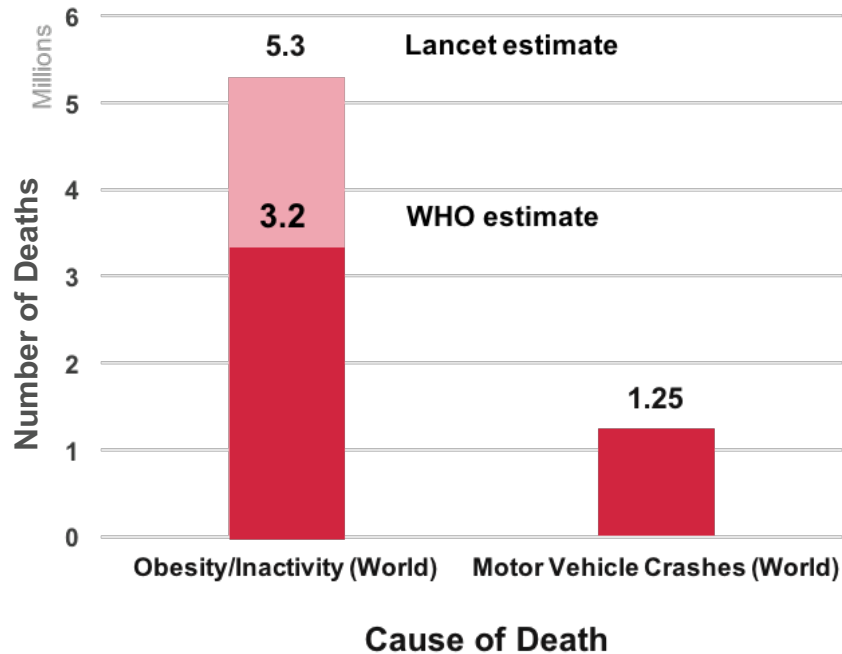
“The leading causes of death aren’t infections or accidents, but non-communicable diseases like diabetes, stroke and cardiovascular disease.... and probably 80% of all preventable deaths. A sizeable chunk ... is due to inadequate exercise...”

- *Street Smart: The Rise of Cities and The Fall of Cars*, based on interview with Dr. Karen Lee

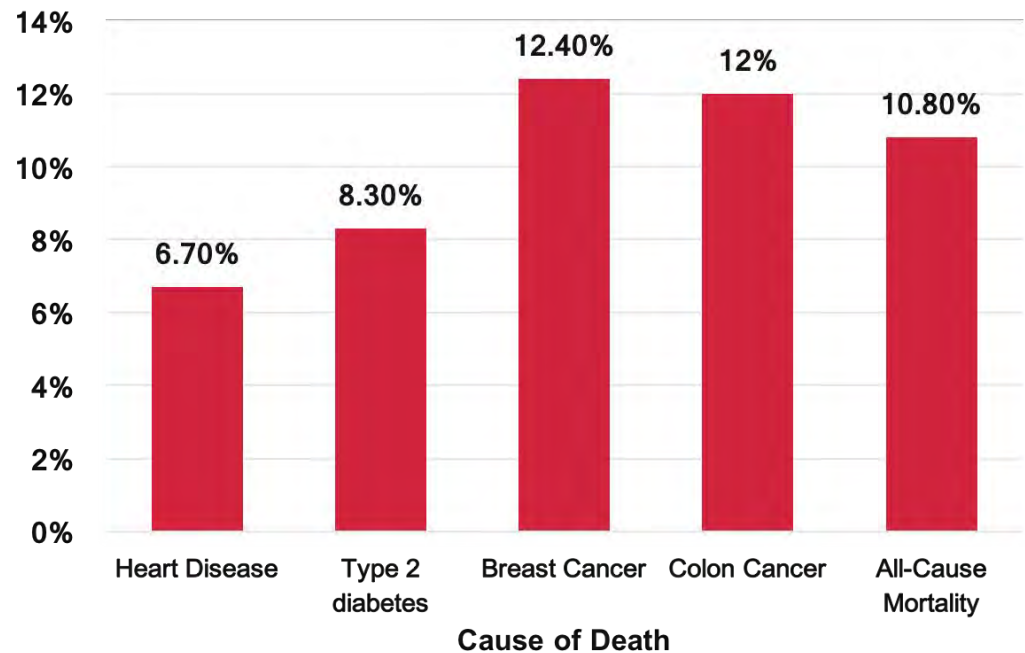


NATURAL ALLIES: PUBLIC HEALTH AND TRANSPORTATION PROFESSIONALS - **INACTIVITY TAKES MORE LIVES THAN CRASHES**

World Deaths (Inactivity vs. Crashes)



U.S. Percent of Deaths Attributable to Inactivity



Inactivity Levels:
U.S. - 40.5%

Sources:
WHO, National Safety Council, 2013
The Lancet, 2008

Source:
CDC, 2014

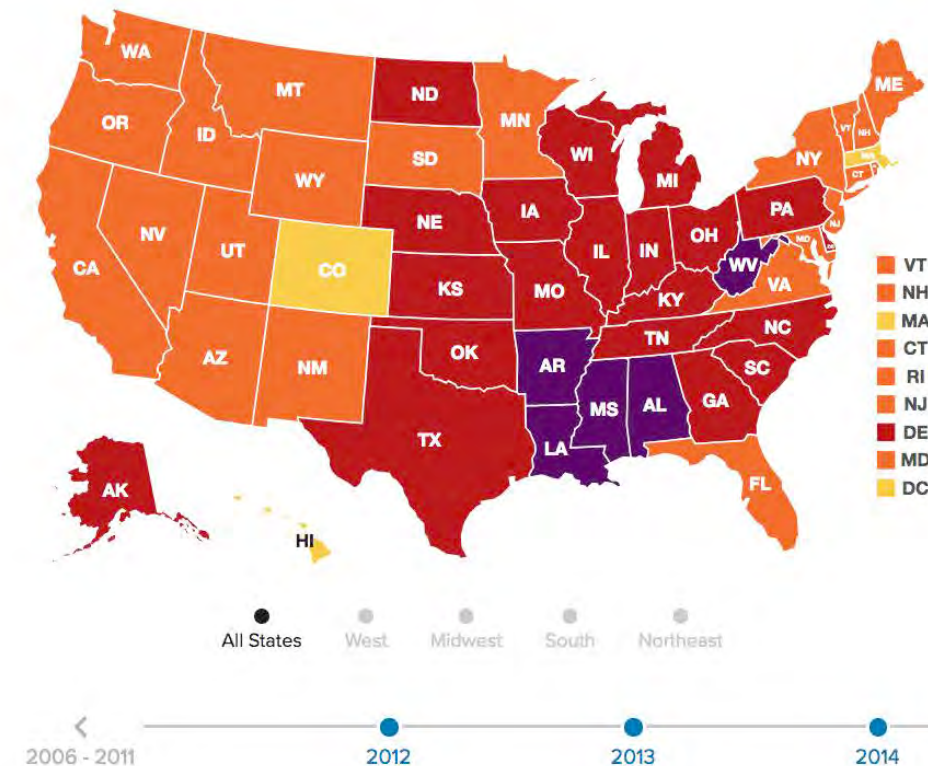
OBESITY TRENDS

Adult Obesity Rate by State, 2016

Select years with the slider to see historical data. Hover over states for more information. Click a state to lock the selection. Click again to unlock.

Percent of obese adults (Body Mass Index of 30+)

0 - 9.9% 10 - 14.9% 15 - 19.9% 20 - 24.9% 25 - 29.9% 30 - 34.9% 35%+



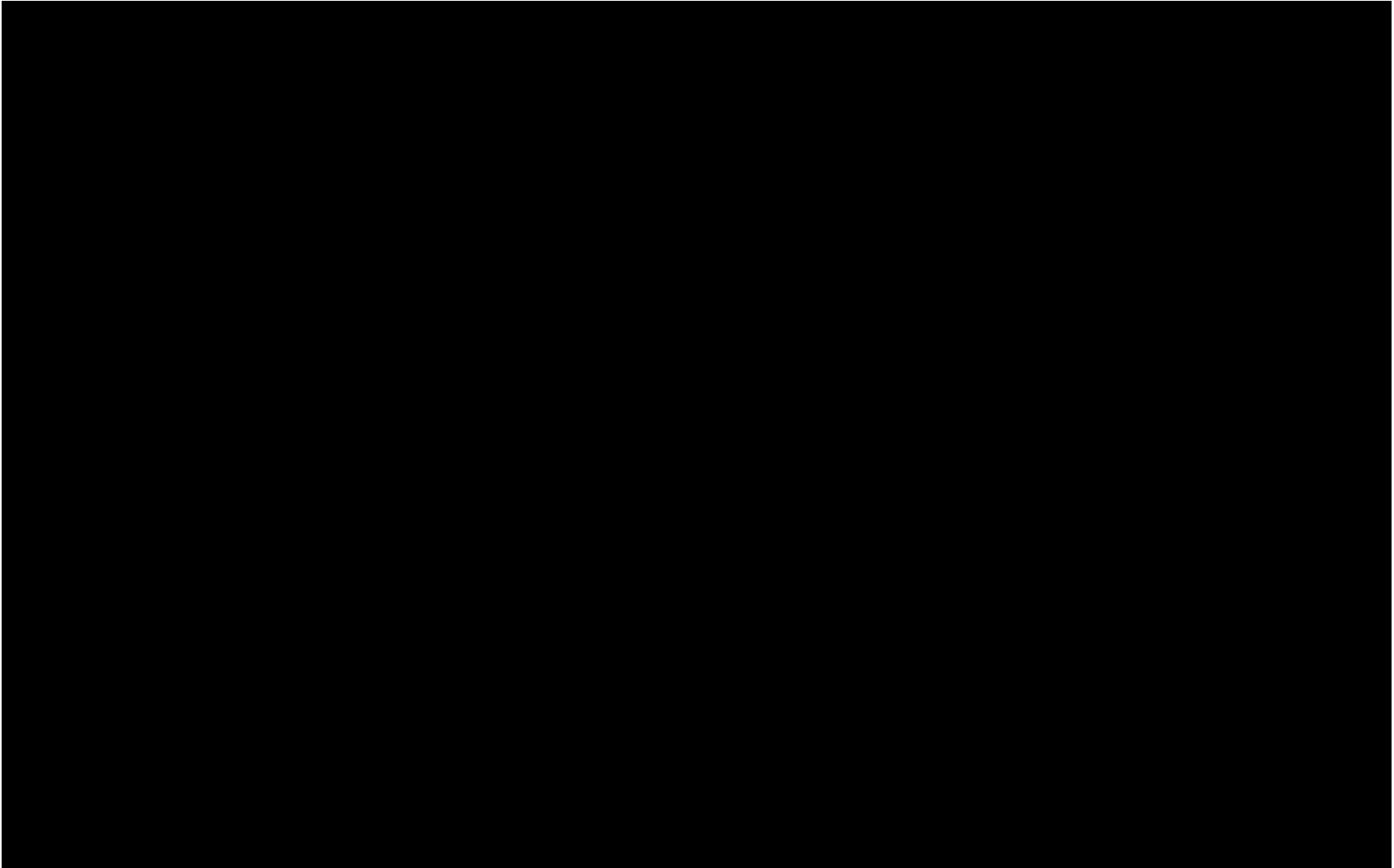
WALL-E



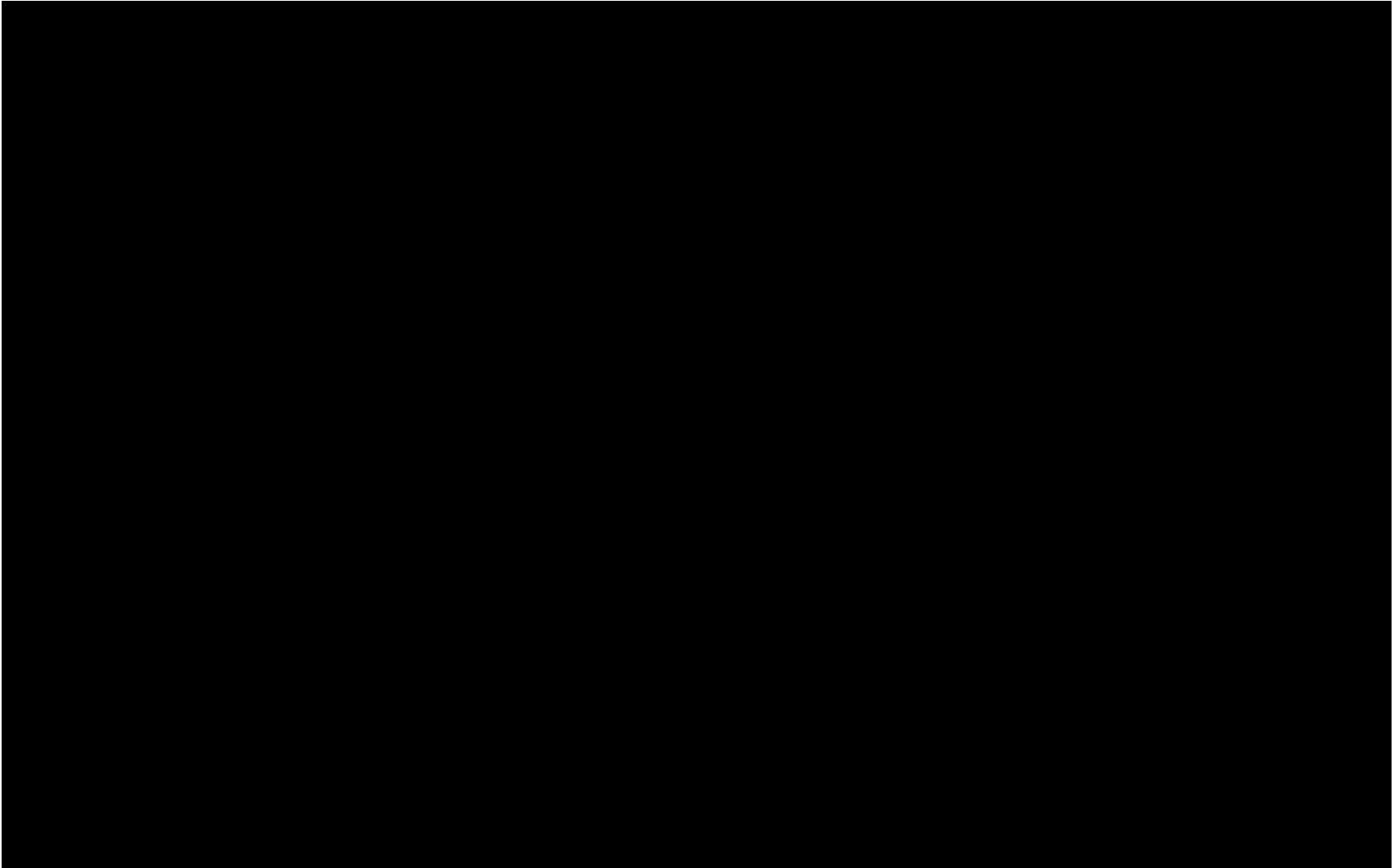
WALL-E



WALL-E IS NOT FAR-FETCHED



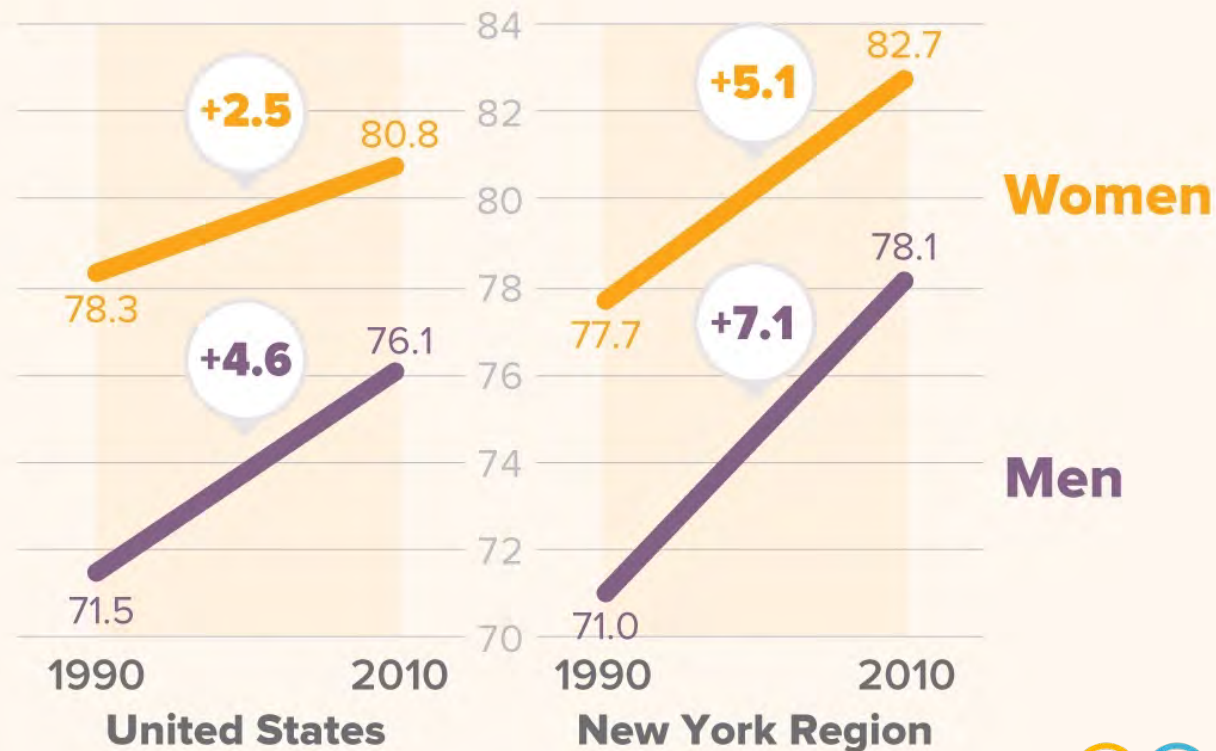
WALL-E IS NOT FAR-FETCHED



WHAT HAPPENS WHEN A CITY INCREASES WALKING, BIKING, & TRANSIT? (FUNCTIONAL ACTIVITY)

Life expectancy in the New York region has surpassed that of the United States.

Life expectancy, 1990-2010

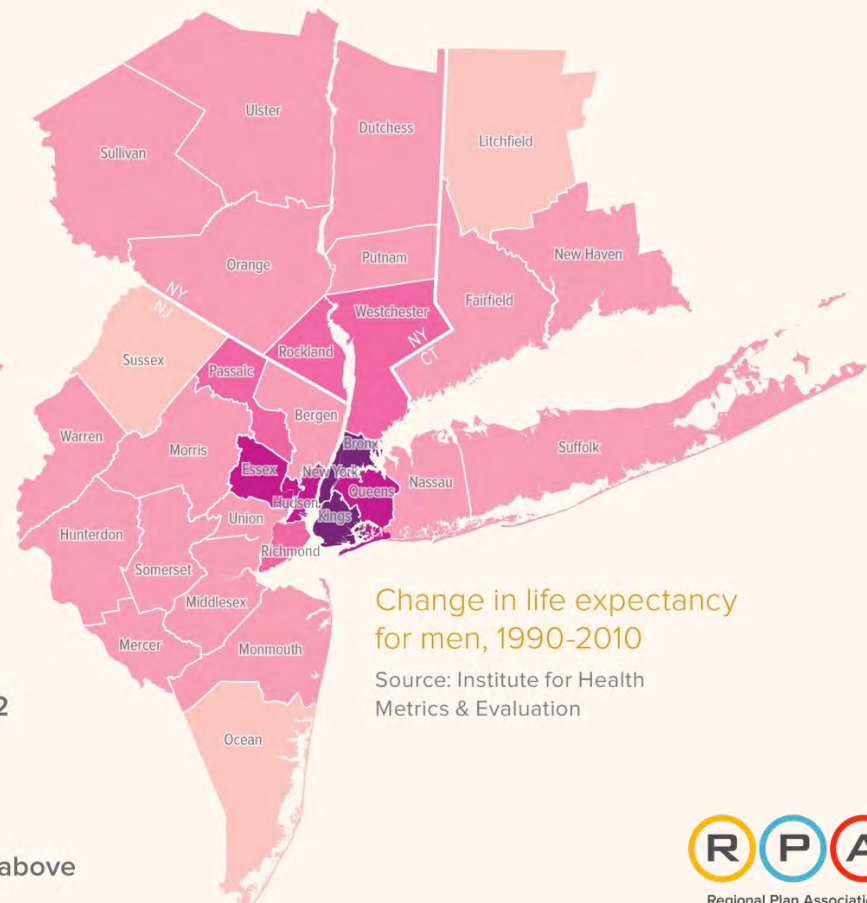
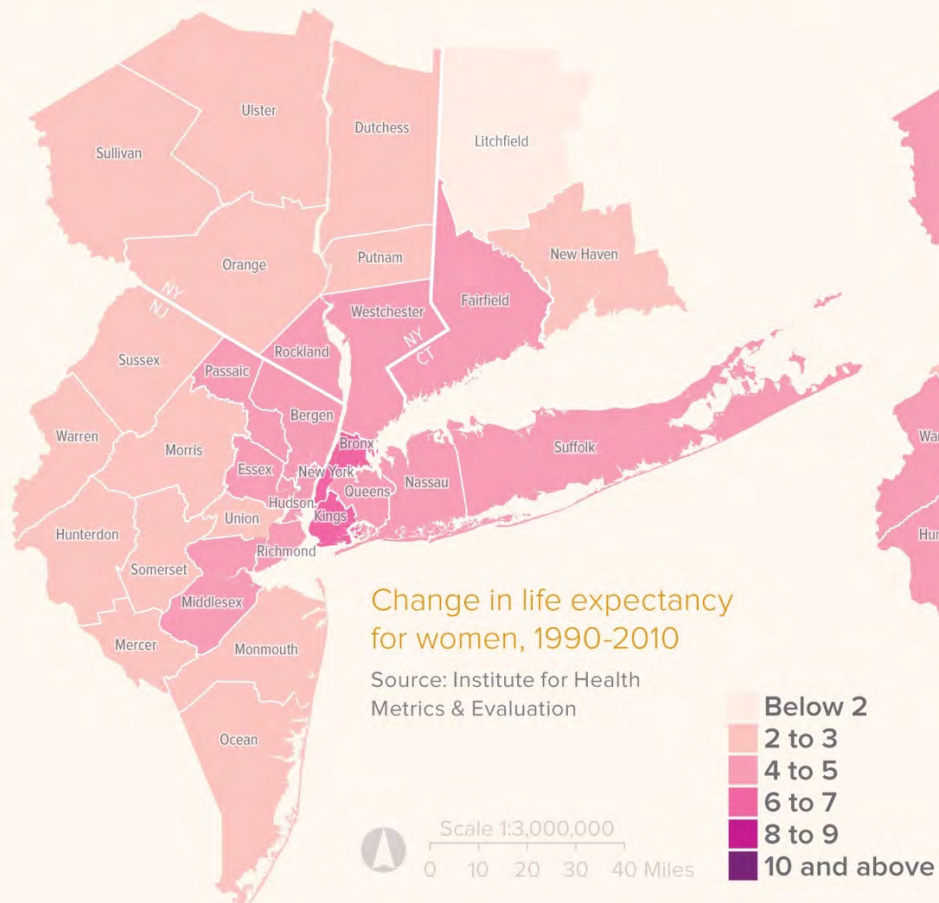


Institute for Health Metrics & Evaluation



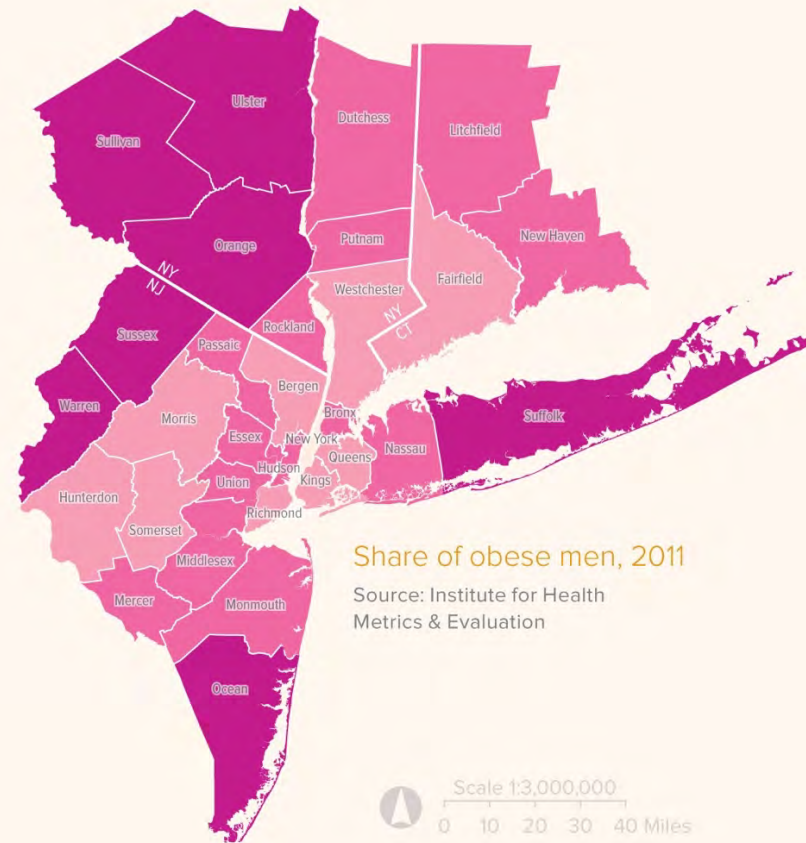
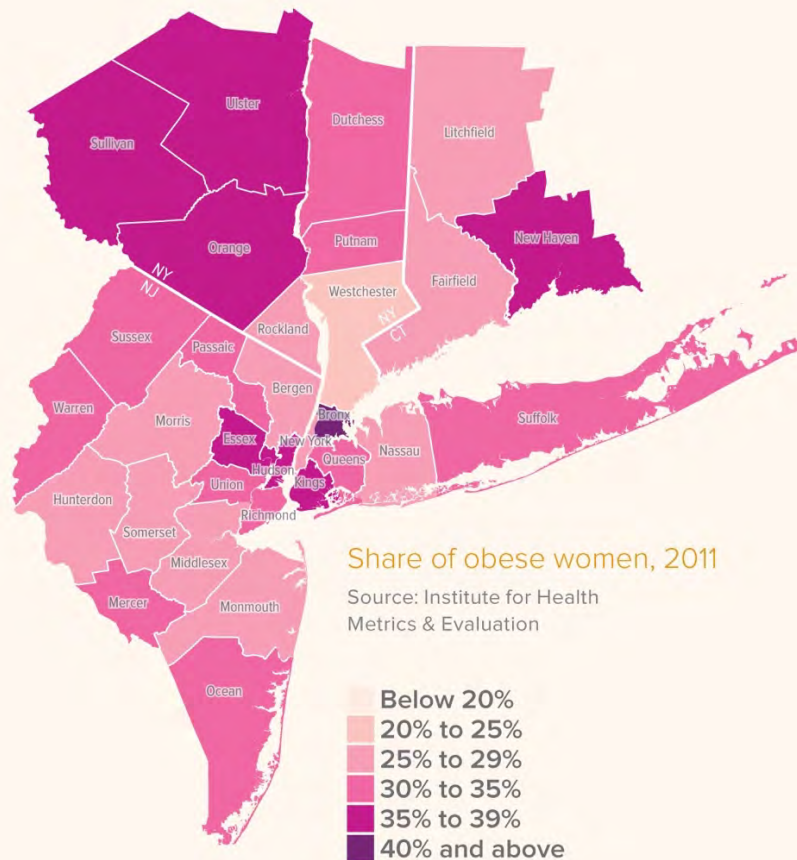
PAYOFFS HIGHEST IN MORE WALKABLE COUNTIES

While life expectancy has increased overall, New York City in particular has seen impressive gains.



OBESITY RATES GENERALLY HIGHEST IN COUNTIES FURTHEST FROM MANHATTAN – MORE CAR-RELIANT

There are big disparities in obesity rates between different counties.



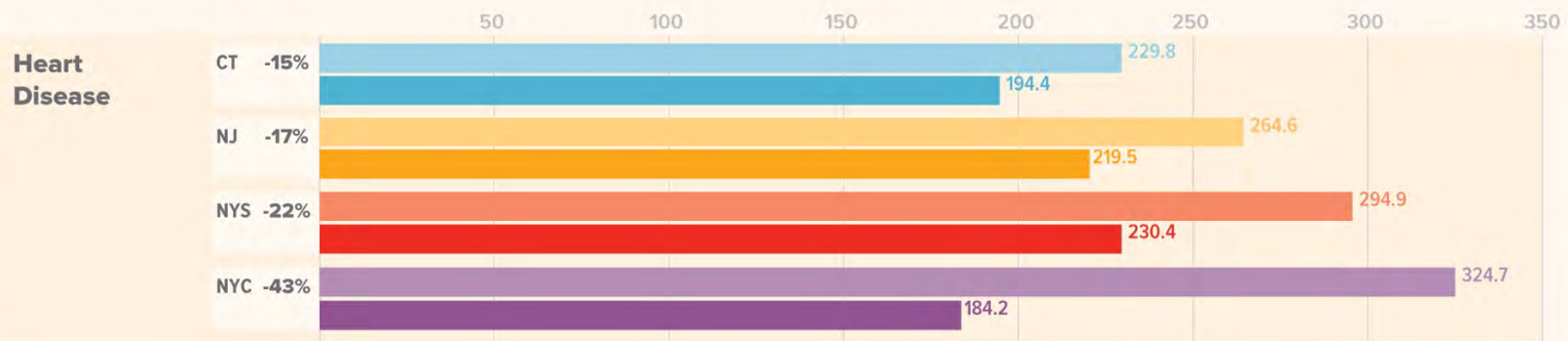
TRI-STATE METROPOLITAN AREA HEART DISEASE DEATHS DROP THE MOST IN NYC

The last decade saw a drop in mortality from many chronic diseases in Connecticut, New Jersey and New York.



Change in mortality rates per 100,000 people

Sources: Centers for Disease Control and Prevention, New York City Department of Health and Mental Hygiene

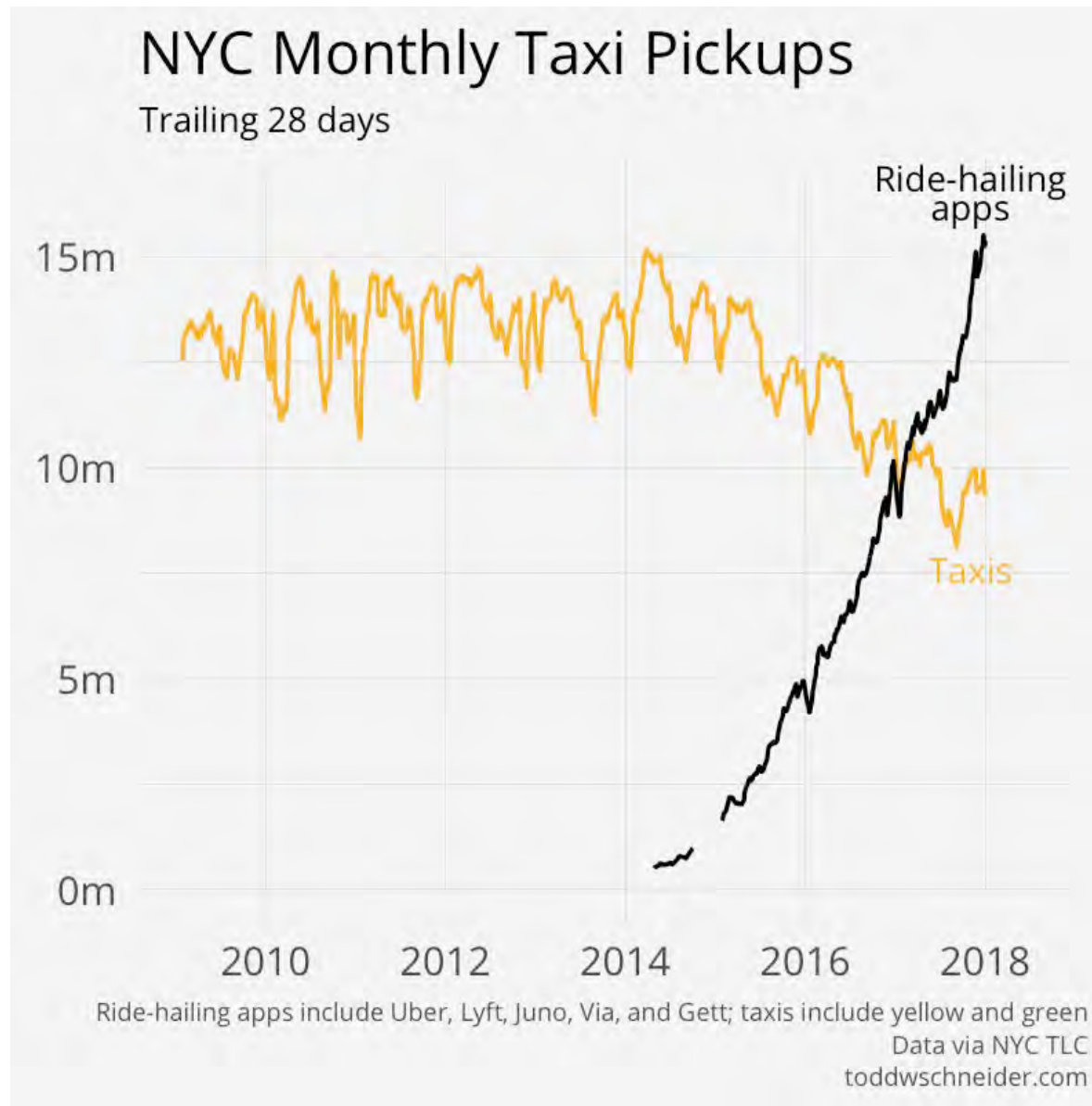


Traffic Impacts



III. Traffic Impacts

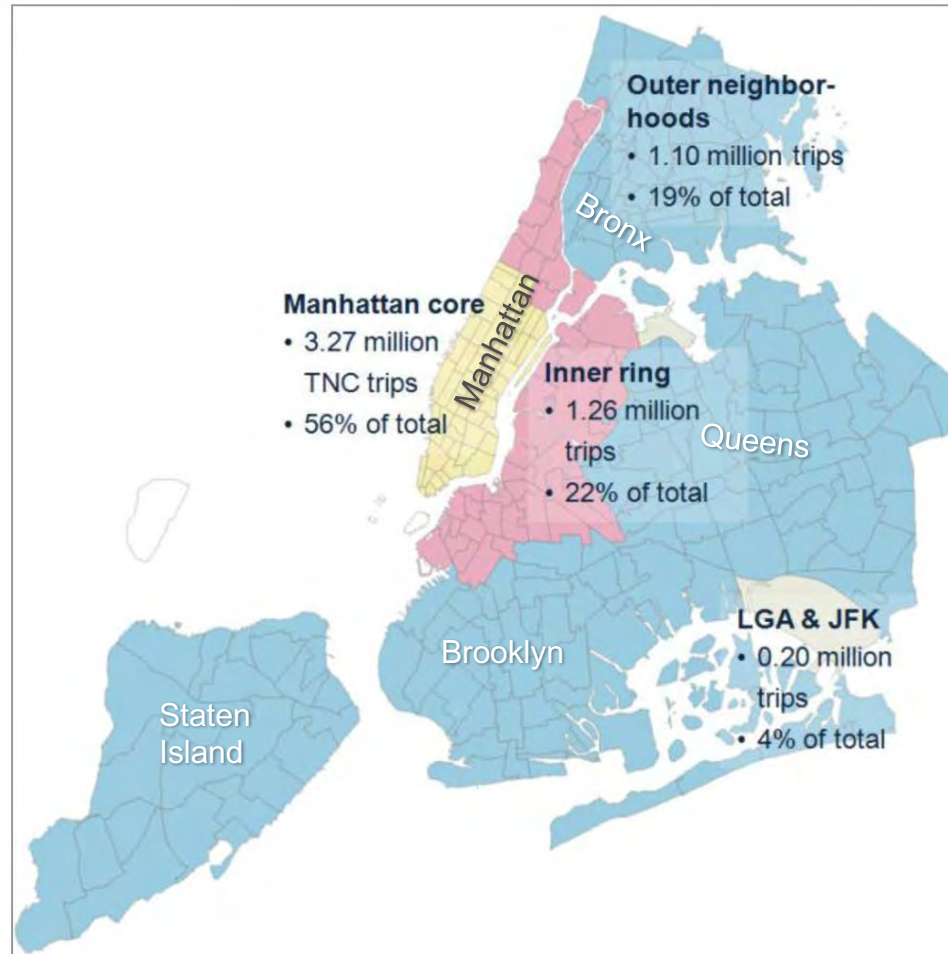
GLIMPSE INTO FUTURE COURTESY OF APP-BASED TRANSPORT



THE PROMISE – IMPROVED LAST MILE FOR TRANSIT ACCESS & SHARP REDUCTION IN PRIVATELY OWNED CARS



THE REALITY – APPS LARGELY SERVE MANHATTAN AND THE BROOKLYN-QUEENS EAST RIVER WATERFRONT – where transit is most plentiful, traffic is the worst and the highest income people live

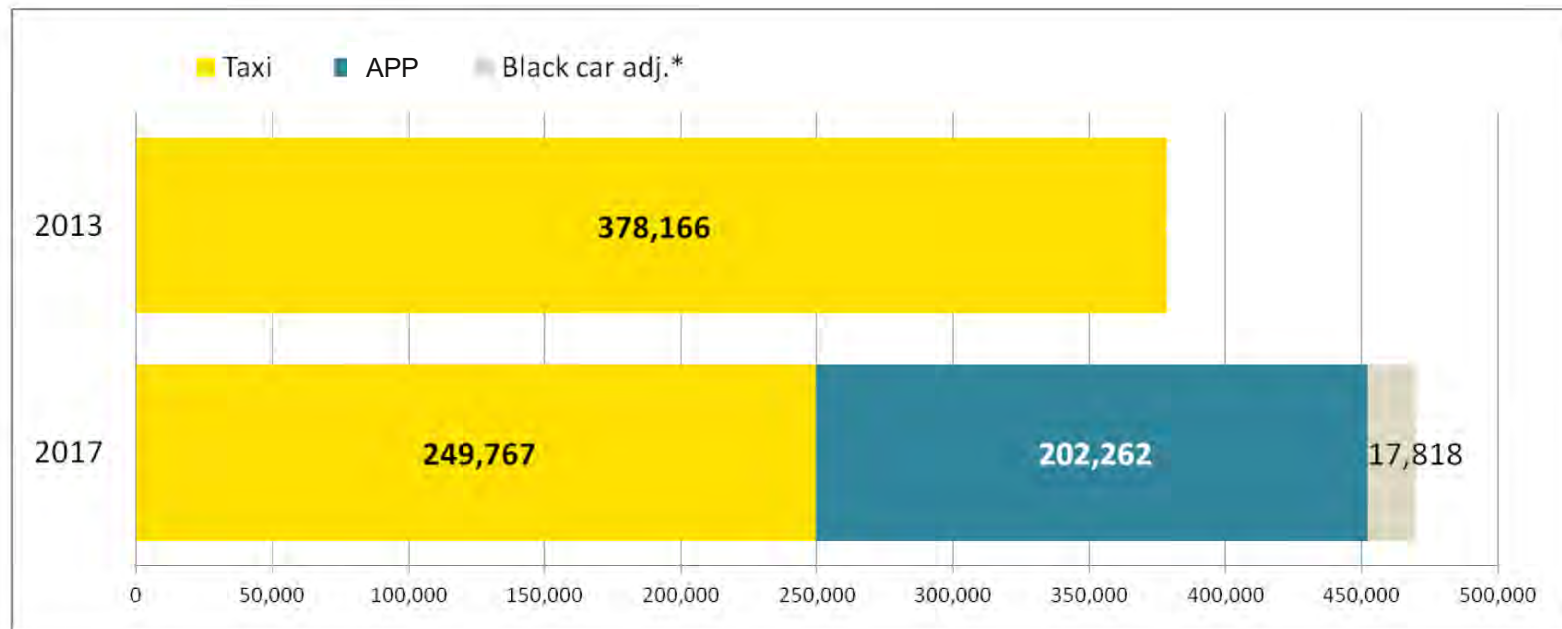


Source: “Unsustainable? The Growth of App-Based Ride Services and Traffic, Travel and the Future of NYC Report by Bruce Schaller, February 2017. TLC trip files. Data are for Uber, Lyft and Via. (Geographic distribution is not available for Juno and Gett trips in June 2016.)

THE APP EFFECT ON NYC 2013-2017

- Taxi Share Decreased 34%
- Vehicle Miles Travelled (VMT) Jumped 7% in Manhattan + the "Inner-ring" of the outer boroughs
- Speeds Dropped by 28% in Midtown (6.5 mph in 2012: 4.7 mph 2017)*

**Figure 1. Taxi and TNC trips in the Manhattan CBD, 2013-17
(15% increase)**



Sources: Unsustainable by Schaller Consulting, February 2017, Empty Seats, Full Streets by Schaller Consulting, December 2017, * Commissioner Polly Trottenberg, NYT October 23, 2017

NYC APP-BASED RIDERS SECOND CHOICE

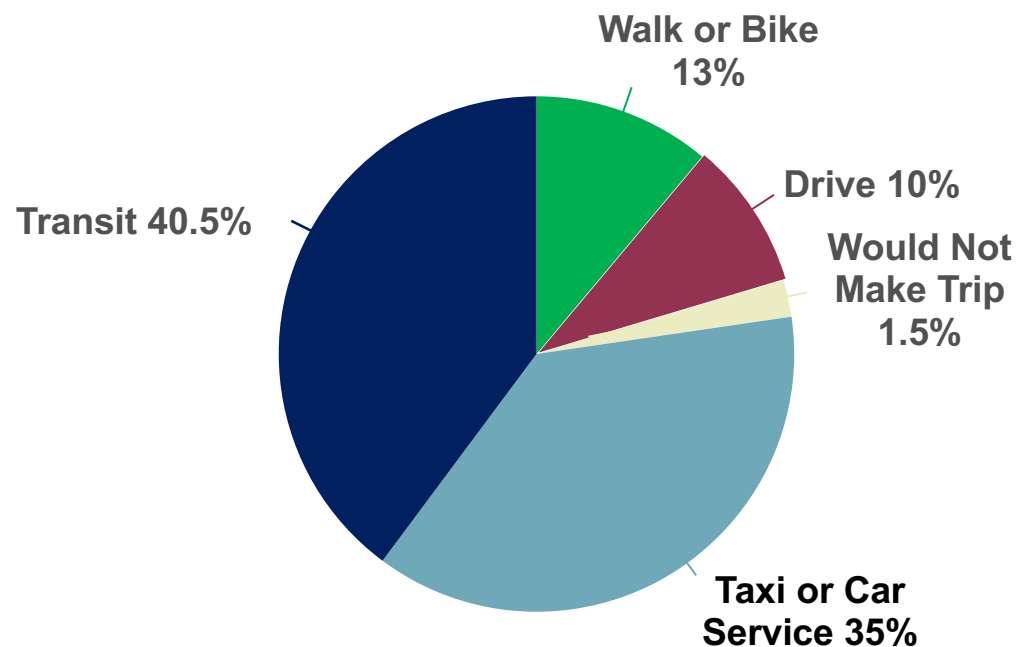
What mode of transportation would you have used had ride-hailing service not been available?

Responses
(more than one permitted)

- 12% personal vehicle
- 43% taxi or car service
- 50% public transportation
- 13% walk
- 3% bike
- 2% would not make trip

Total 123%

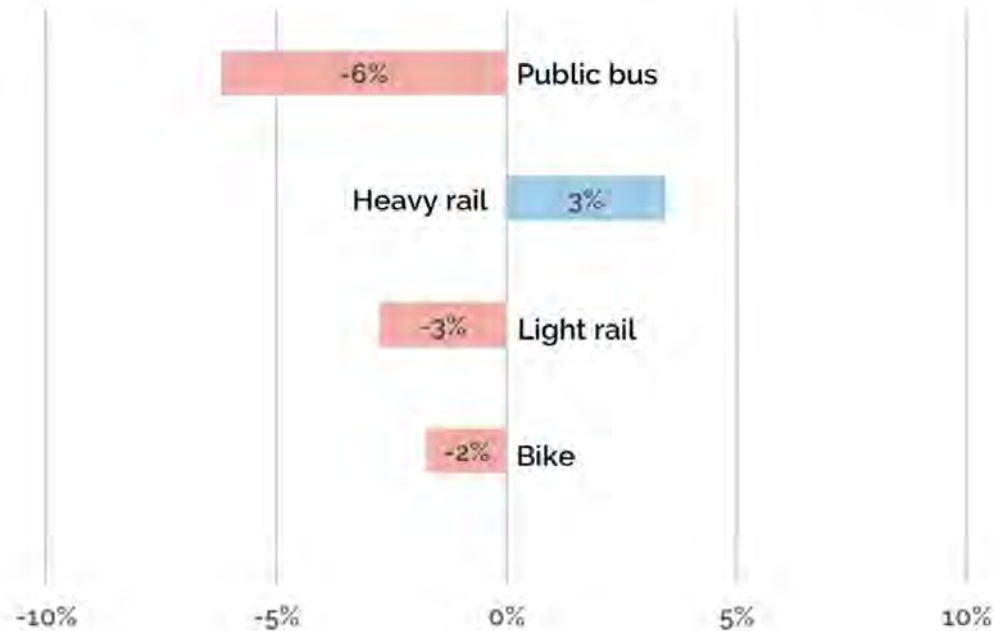
Responses Normalized
(to equal 100%)



Source: NYC DOT Mobility Report 2018, 616 respondents

U.S.: CHANGES IN TRANSIT, BIKING, & WALKING WITH APPs

Figure 12. Changes in transit use, biking, and walking after adoption of ride-hailing services



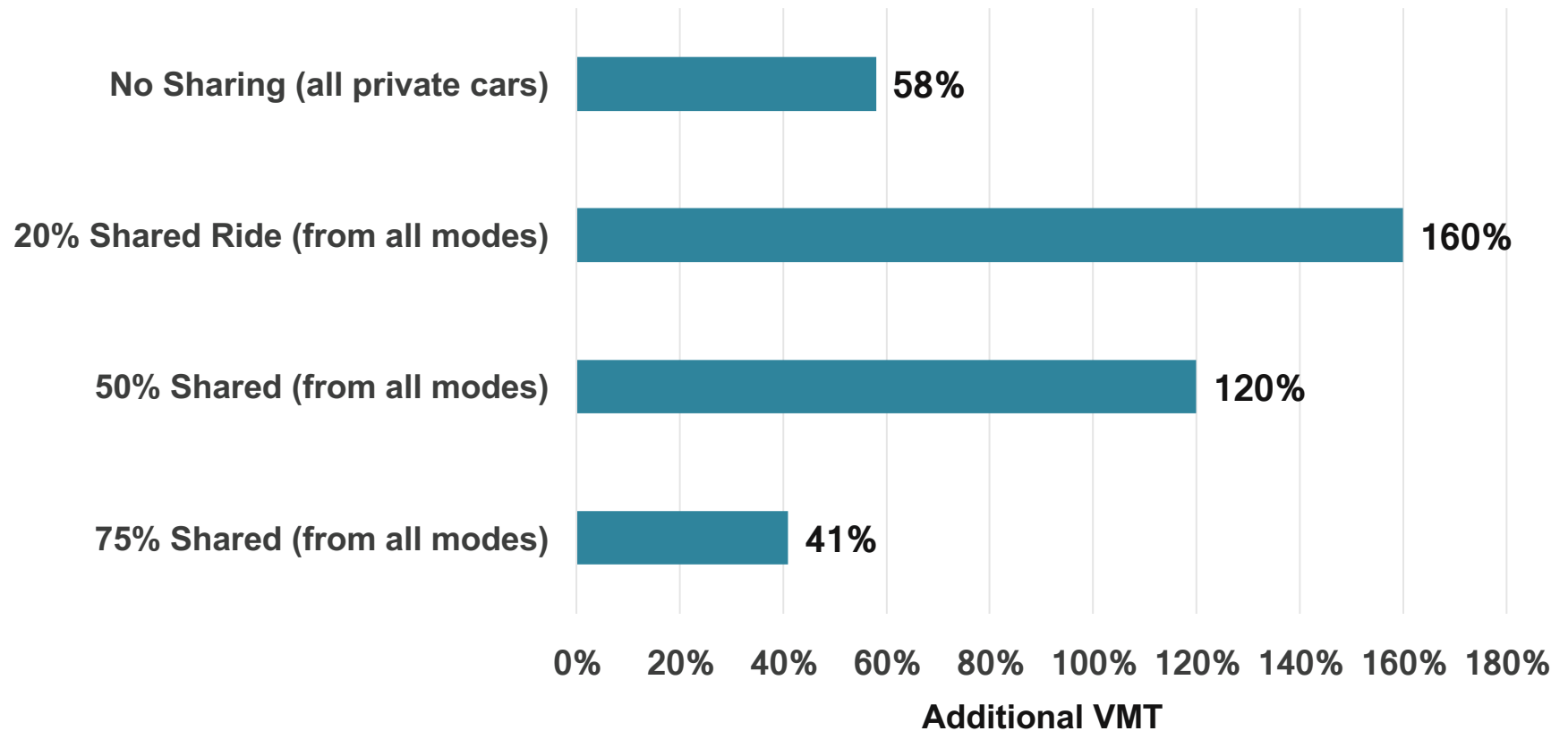
Survey question: "Since you started using on-demand mobility services such as Uber and Lyft, do you find that you use the following transportation options more or less?"

Clewlow, R.R. & Mishra, G.S. Working Paper, October 2017.

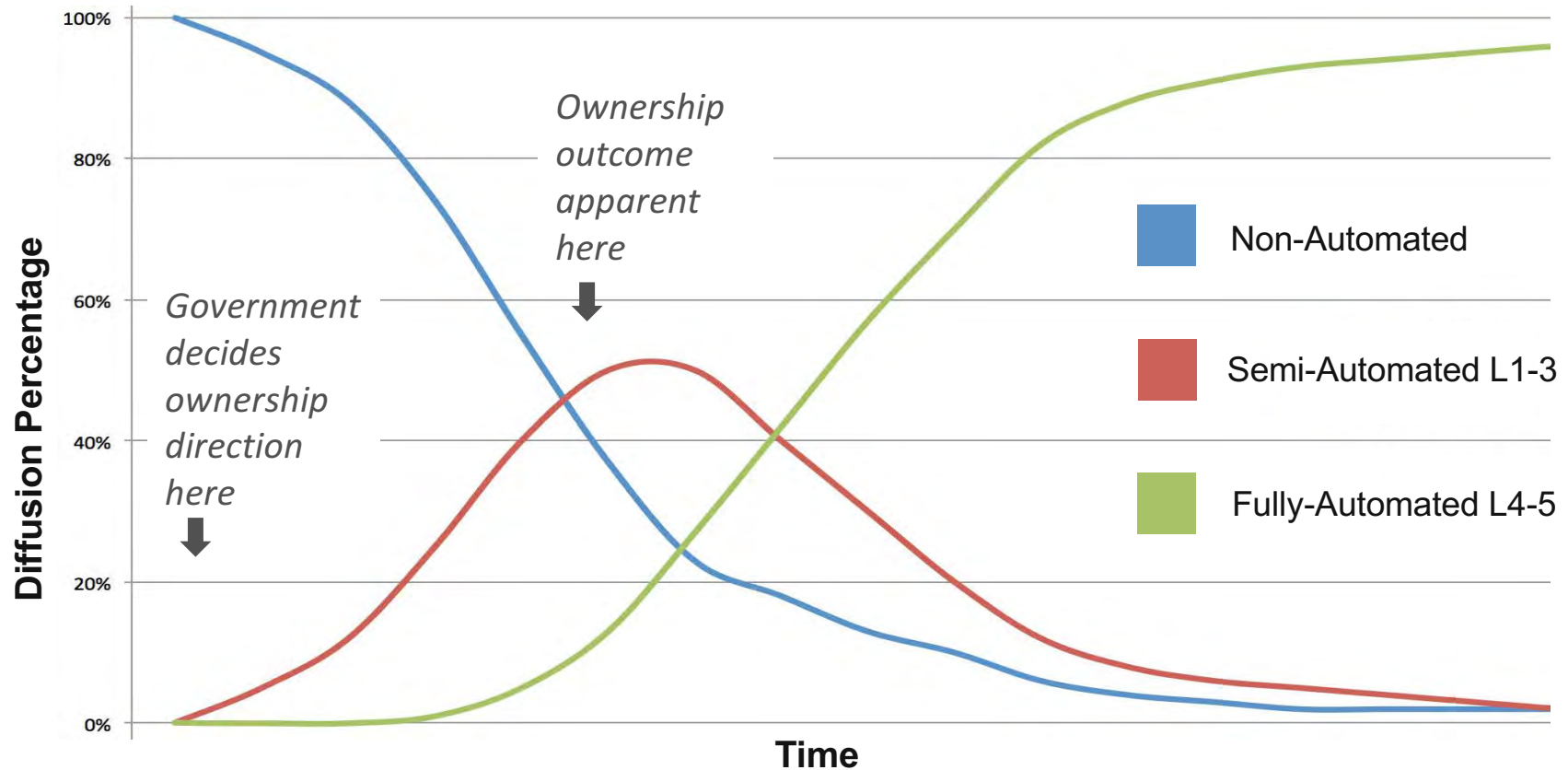
Source: Disruptive transportation: The adoption, utilization, and impacts of ride-hailing in the U.S., UC Davis, October 2017

APP-BASED CARS TRAVEL 1.58m FOR EACH PASSENGER MILE

Additional VMT Induced by TNC Rides



WARNING: MIXED TECHNOLOGIES AHEAD (UNCERTAIN TIME SCALE)

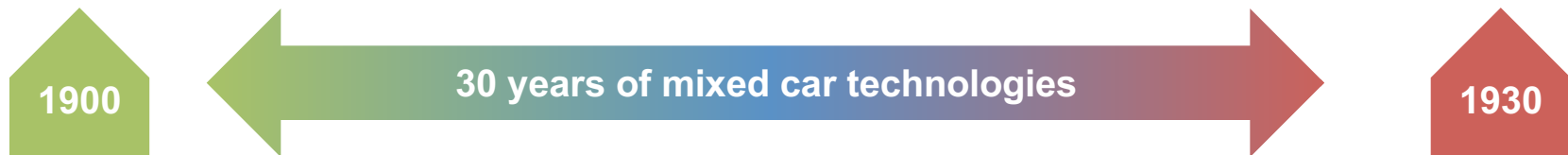
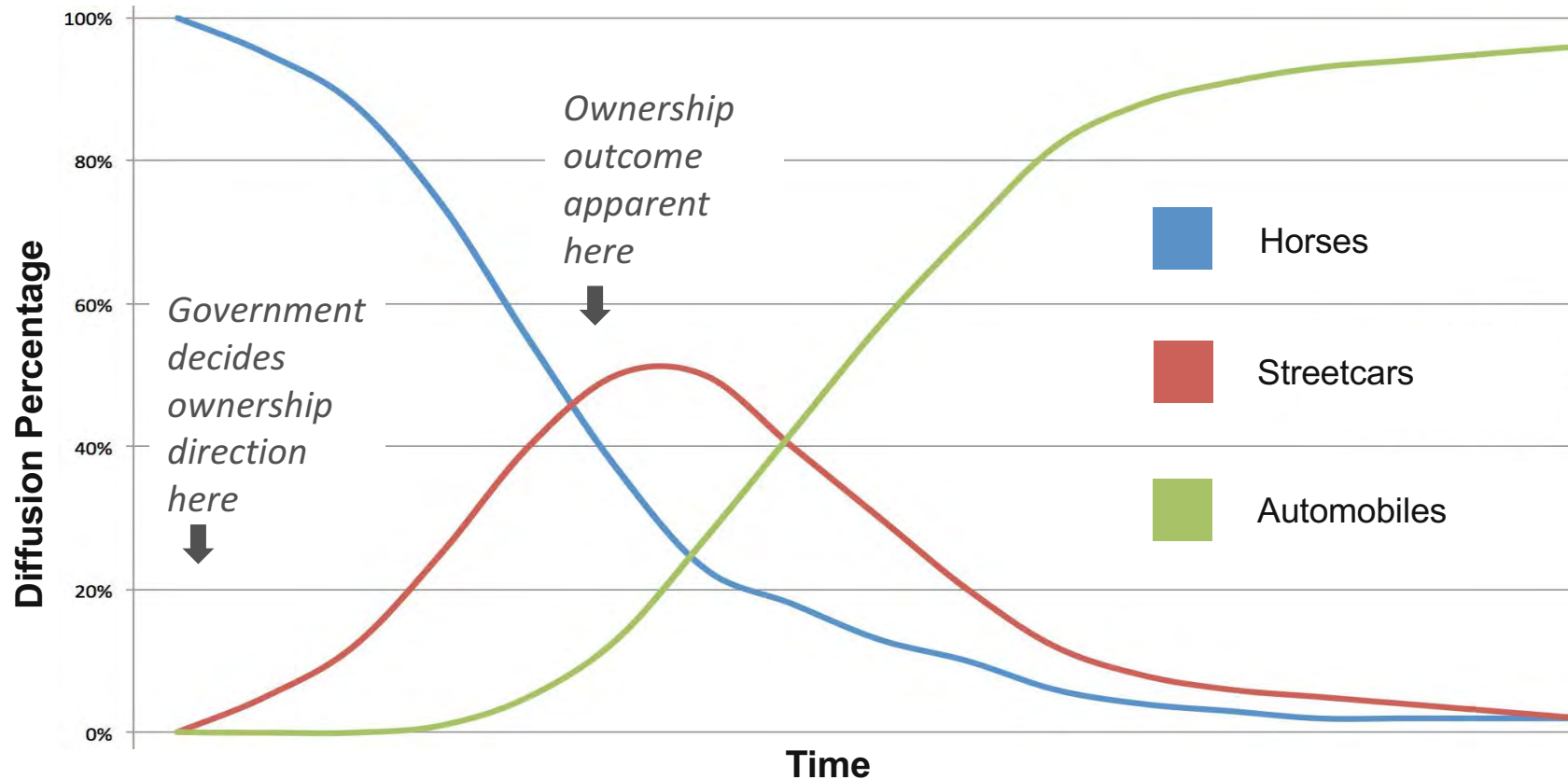


2020

40 - 50 years of mixed car technologies

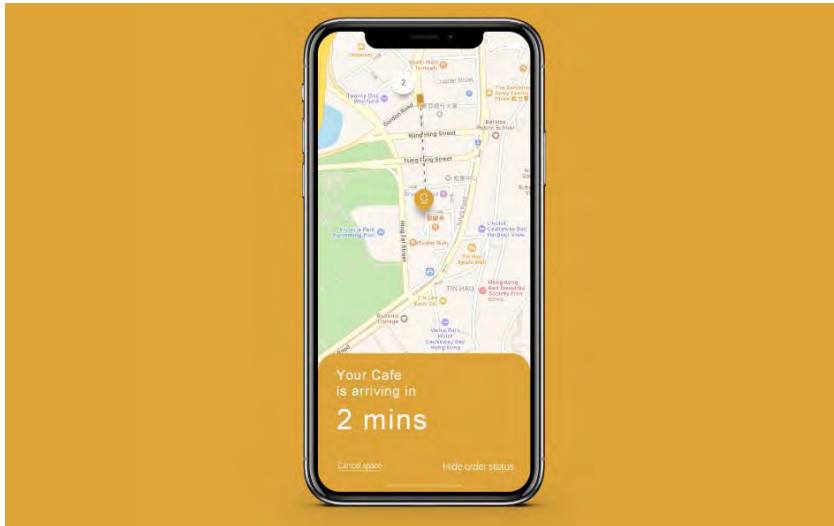
2050-2100

WARNING: MIXED TECHNOLOGIES AHEAD (UNCERTAIN TIME SCALE)



© Grush Niles Strategic

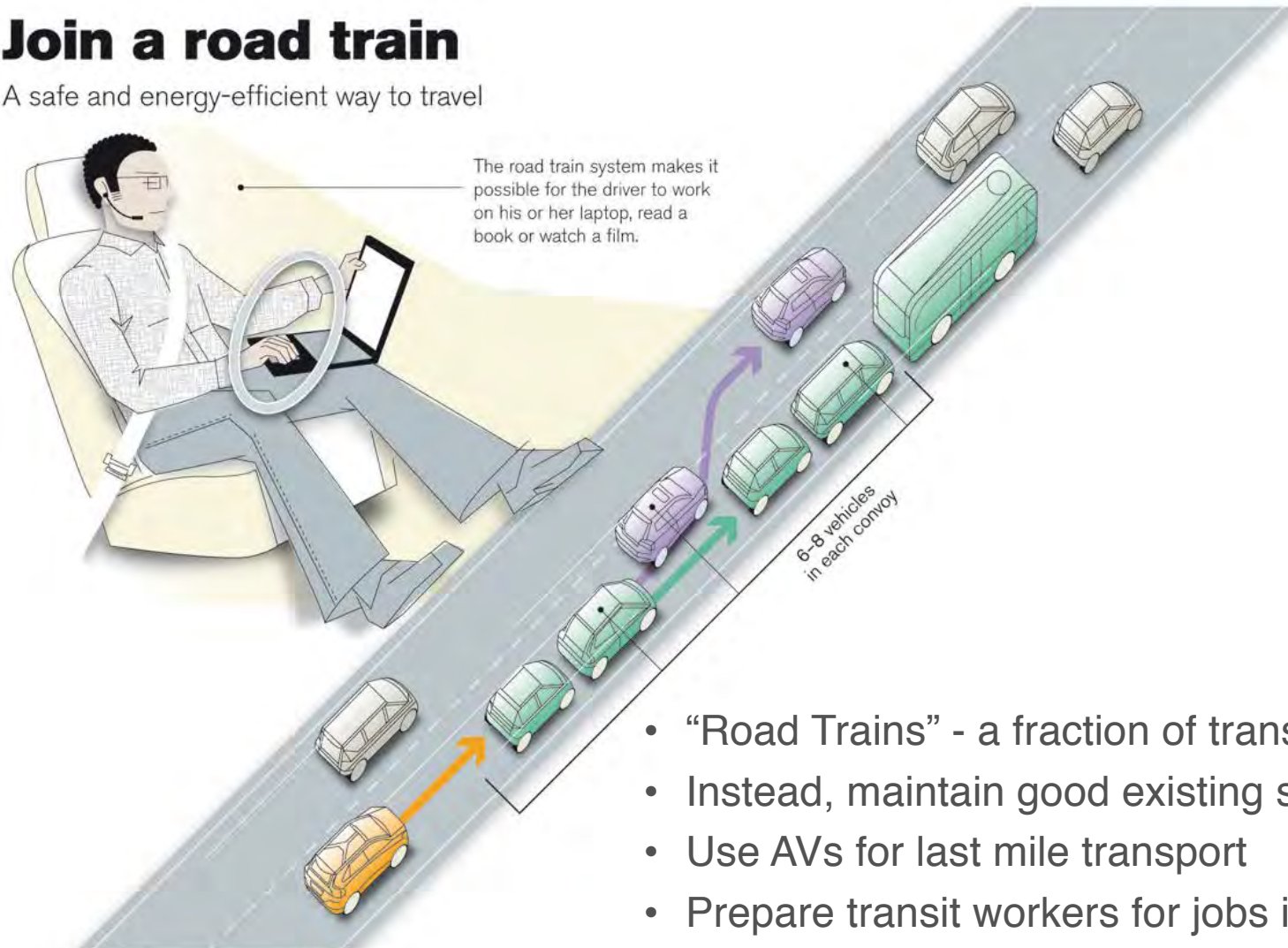
AVs NEED NOT LOOK LIKE CARS OF TODAY, COULD BE WIDER + LONGER, AND ANY SHAPE



DON'T BELIEVE THE HYPE ON “ROAD TRAINS”

Join a road train

A safe and energy-efficient way to travel



- “Road Trains” - a fraction of transit capacity
- Instead, maintain good existing systems
- Use AVs for last mile transport
- Prepare transit workers for jobs in AV transit

AVs DON'T CHANGE THIS EQUATION



Amount of space required to transport the same number of passengers by driverless car, by bus, or bicycle.
(Urban Ambassadors, Des Moines, Iowa – August 2010)

VMT SOARS, CONGESTION REMAINS AWFUL



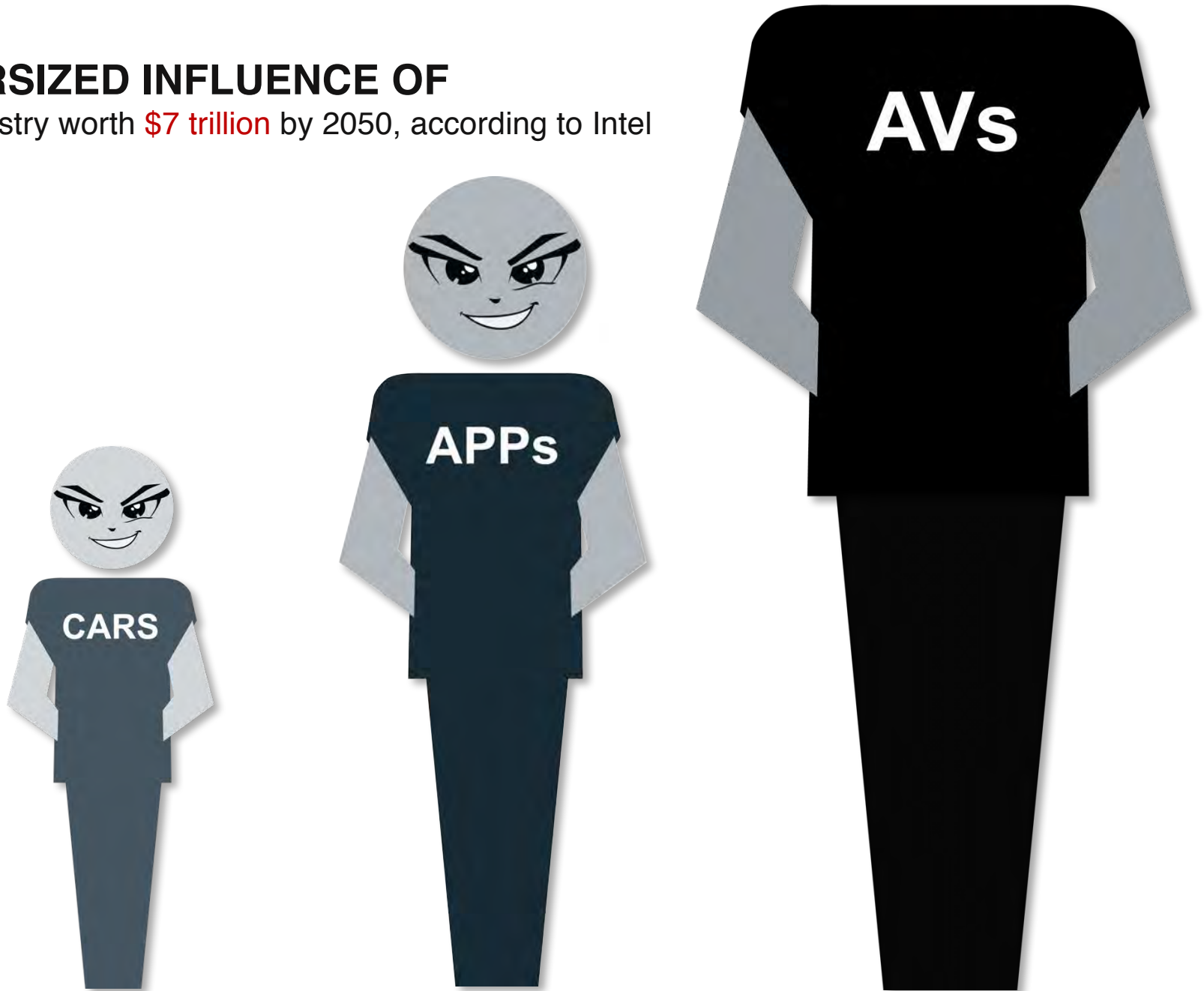
The AV-Industrial Complex

The background image shows a multi-lane highway with several cars and a large truck driving away from the viewer. The scene is set at sunset, with a warm orange glow on the horizon. A complex network of white lines and semi-transparent circles is overlaid on the image, suggesting a digital or data network. The circles vary in size and are connected by thin lines, creating a web-like structure across the entire frame.

IV. The Av-Industrial Complex

OVERSIZED INFLUENCE OF

AV industry worth **\$7 trillion** by 2050, according to Intel

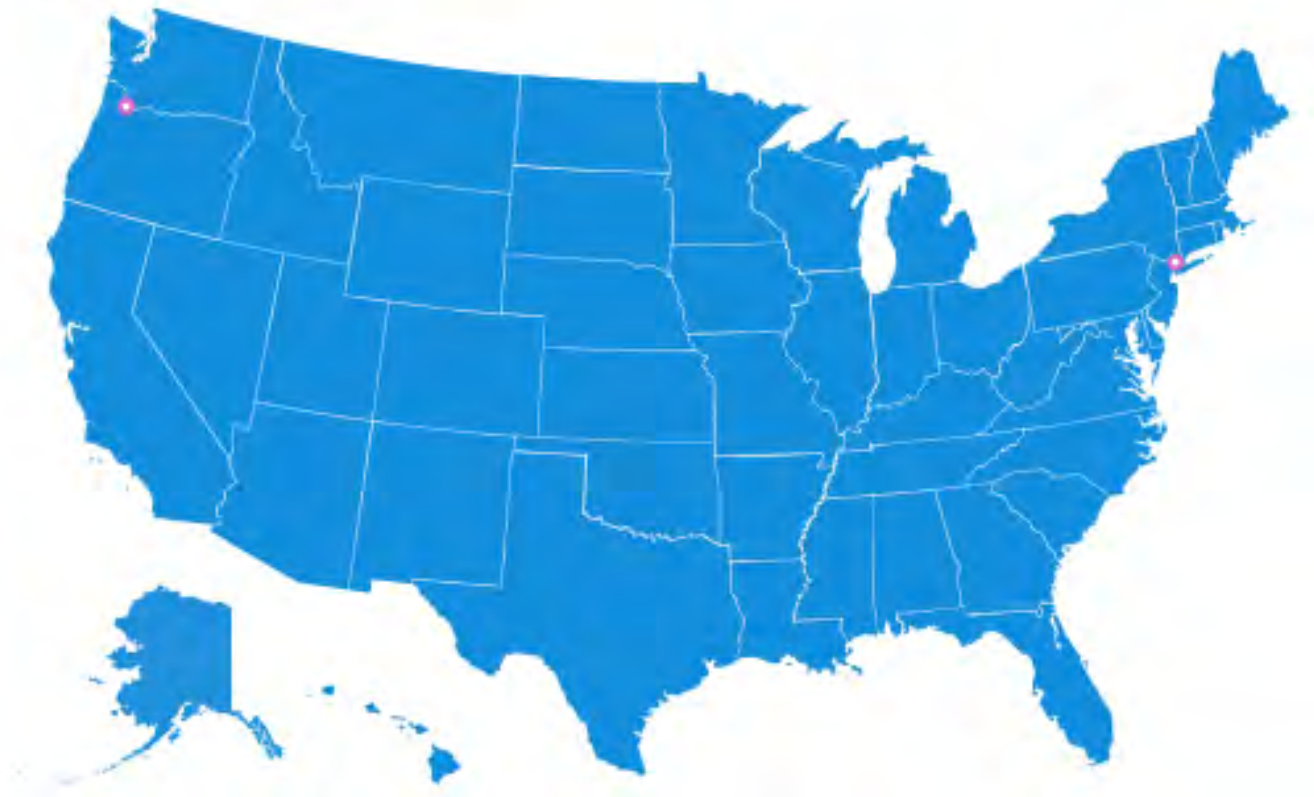


WE WERE CAUGHT FLAT-FOOTED BY UBER ET AL.

Uber's Lobbying Empire Extends From Coast To Coast

Uber pulled off a spectacular political coup and hardly anyone noticed

Uber's America



2018

Recommendations



V. Recommendations

SO WHAT SHOULD WE DO?

Government and Society Should Get Ahead of the Curve

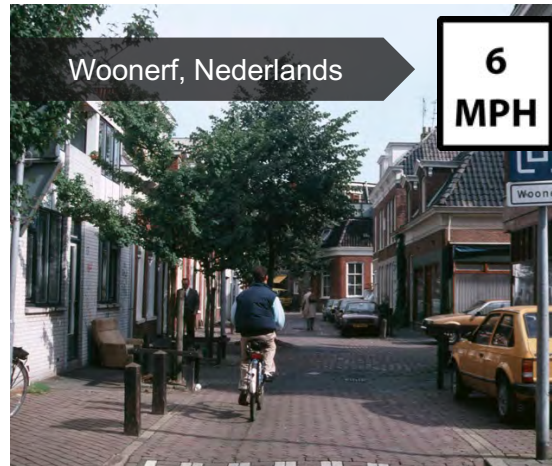
- Discourage private AV ownership; support AV-transit integration
- Maintain and support good *mass* transit
- Emphasize last mile in sprawl areas and transit deserts
- Ensure system equity for low income, disabled, and elderly
- Utilize congestion pricing strategies to maintain adequate mobility
- Don't mess with bike/ped growth in cities
- Reallocate parking for better use
- Enact legislation and enforcement policies preemptively
- Get AV sector \$upport for some infrastructure upgrades & maintenance
- Develop a counter-terrorism strategy
- Humanize street design: narrow lanes, widen sidewalks, don't add lanes
- Establish AV street typology plan

STREET TYPOLOGIES FOR AVs

Compliance Through Public - Private Agreements



Car Free



Pedestrians Rule, Car is Intruder



Slow Streets



Moderate



Urban Arterial



Freeway/Highway

HUMANIZE STREET DESIGN



New York City: Amsterdam Avenue

HUMANIZE STREET DESIGN



New York City: Amsterdam Avenue

HUMANIZE STREET DESIGN



Credit: Clarence Eckermen - StreetFilms

New York City: Amsterdam Avenue

Time Travel

- Mid Century
- 1911
- 2100

VI. Time Travel

FORD CITY OF TOMORROW



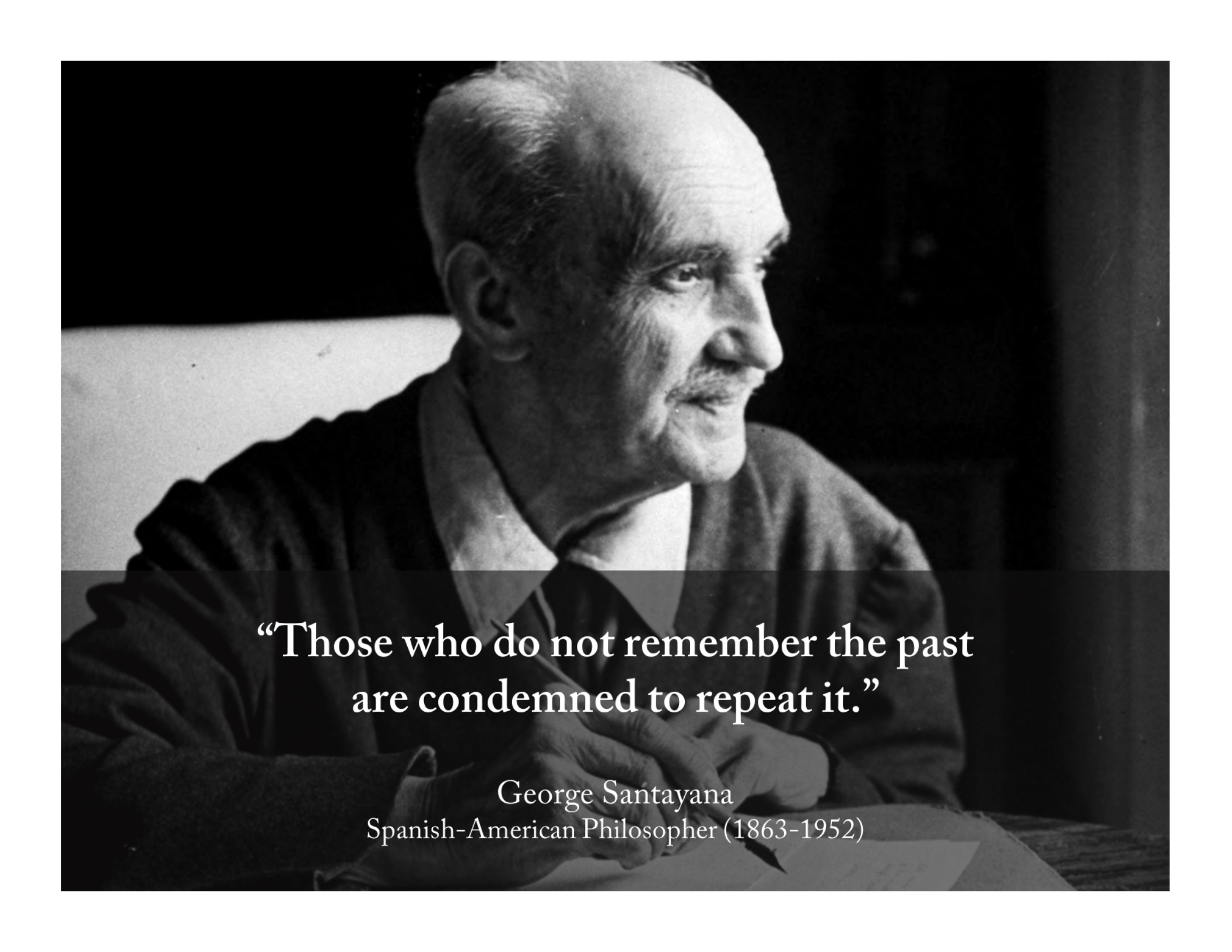
Bill Ford, Executive Chairman of Ford Motor Company warns of “*global gridlock*” by 2050 “*if we continue on the **path** we’re on.*” He adds, “*Our infrastructure cannot support such a large volume of vehicles without creating massive congestion that would have serious consequences for our environment, health, economic progress and quality of life.*”

FORD CITY OF TOMORROW



The background is a complex, abstract pattern of swirling lines in shades of green, blue, and purple. These lines create a sense of motion and depth, converging towards a bright, glowing center. The overall effect is reminiscent of a cosmic or digital landscape.

Let's go back to 1911

A black and white photograph of George Santayana, an elderly man with a mustache, looking thoughtfully to the right. He is wearing a dark sweater over a collared shirt. His hands are clasped in front of him, resting on a surface. The background is dark and out of focus.

“Those who do not remember the past
are condemned to repeat it.”

George Santayana
Spanish-American Philosopher (1863-1952)

RESPECTING HISTORY – A WALK BACK IN TIME

NYC 1911



RESPECTING HISTORY – A WALK BACK IN TIME

NYC 1911



RESPECTING HISTORY – A WALK BACK IN TIME

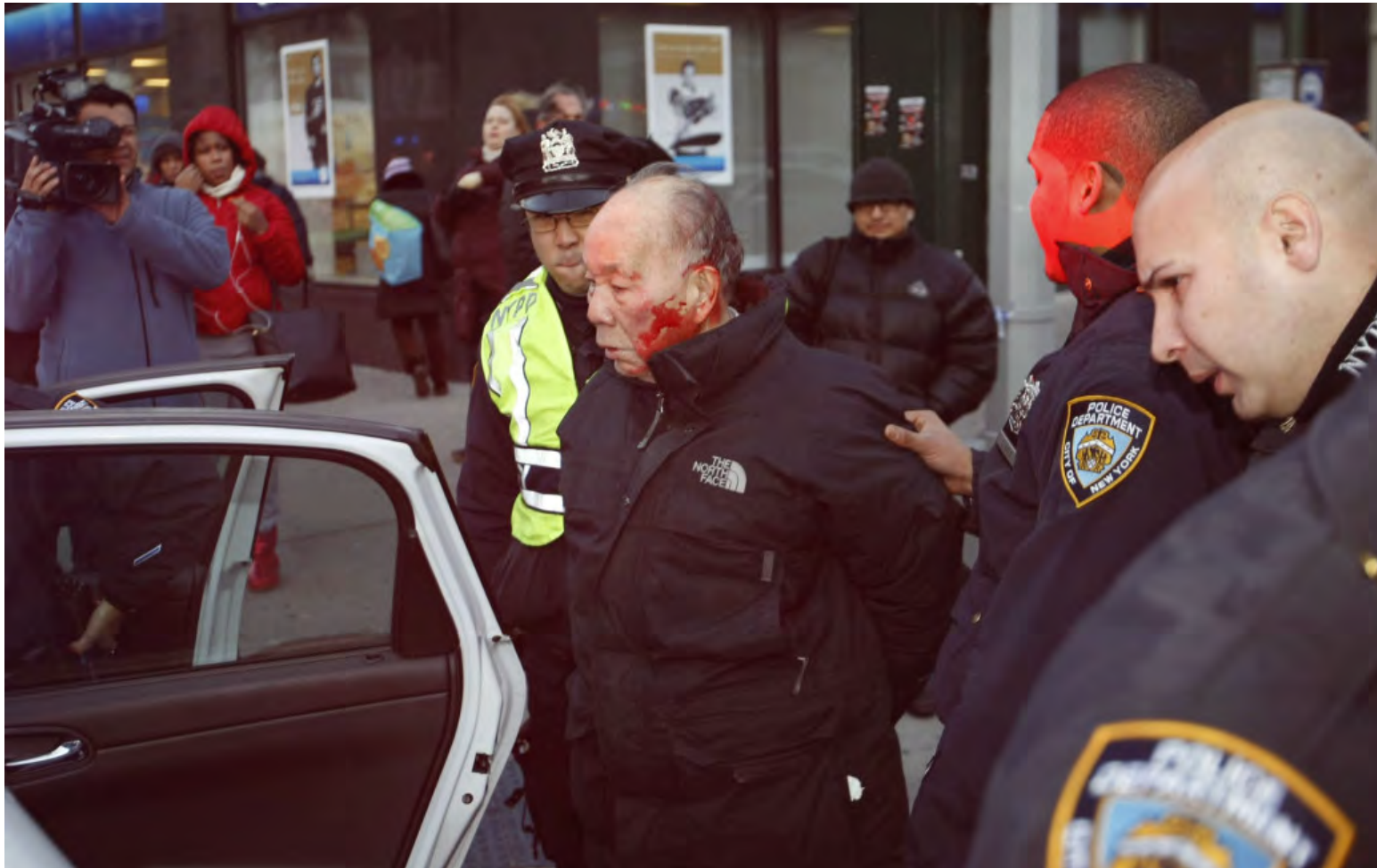
NYC 1911



Cops Bloody Old Man — For Jaywalking

By [Kevin Sheehan](#)

January 19, 2014 | 5:29pm



The background is a complex, abstract composition of light trails and a central glowing sphere. The light trails are primarily green and blue, with some purple and yellow accents, and they appear to be moving rapidly, creating a sense of motion and depth. The central sphere is a bright, glowing yellow-green, with a darker, more defined core. The overall effect is reminiscent of a high-speed astronomical observation or a digital simulation of a cosmic event.

A visitor from 2100 travels back to 2018

IN 2030 WALKERS IN CITIES SLOWED AV TRAFFIC TO A CRAWL



**IN 2030 WALKERS IN CITIES SLOWED AV TRAFFIC TO A CRAWL
SO WE FENCED IN PEDESTRIANS LIKE CATTLE, AND SOON WE
HOLLOWED OUT CITIES WHICH LED TO THE RIOTS OF THE 60s**



CITIES WILL FENCE IN PEDESTRIANS **ALREADY DONE IN ATHENS - LEOFRUS SYNGROU**

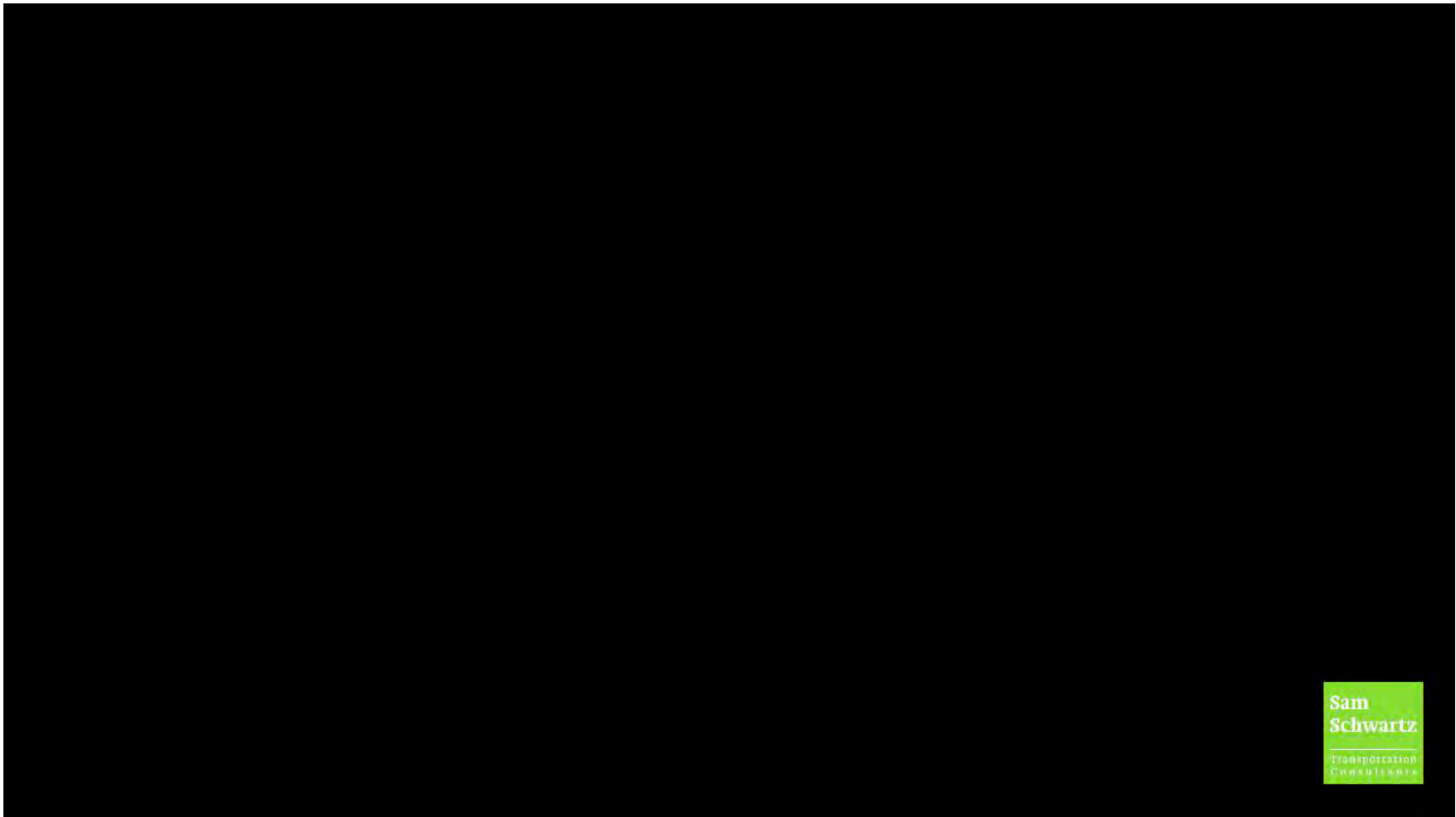


Next Generation Mobility

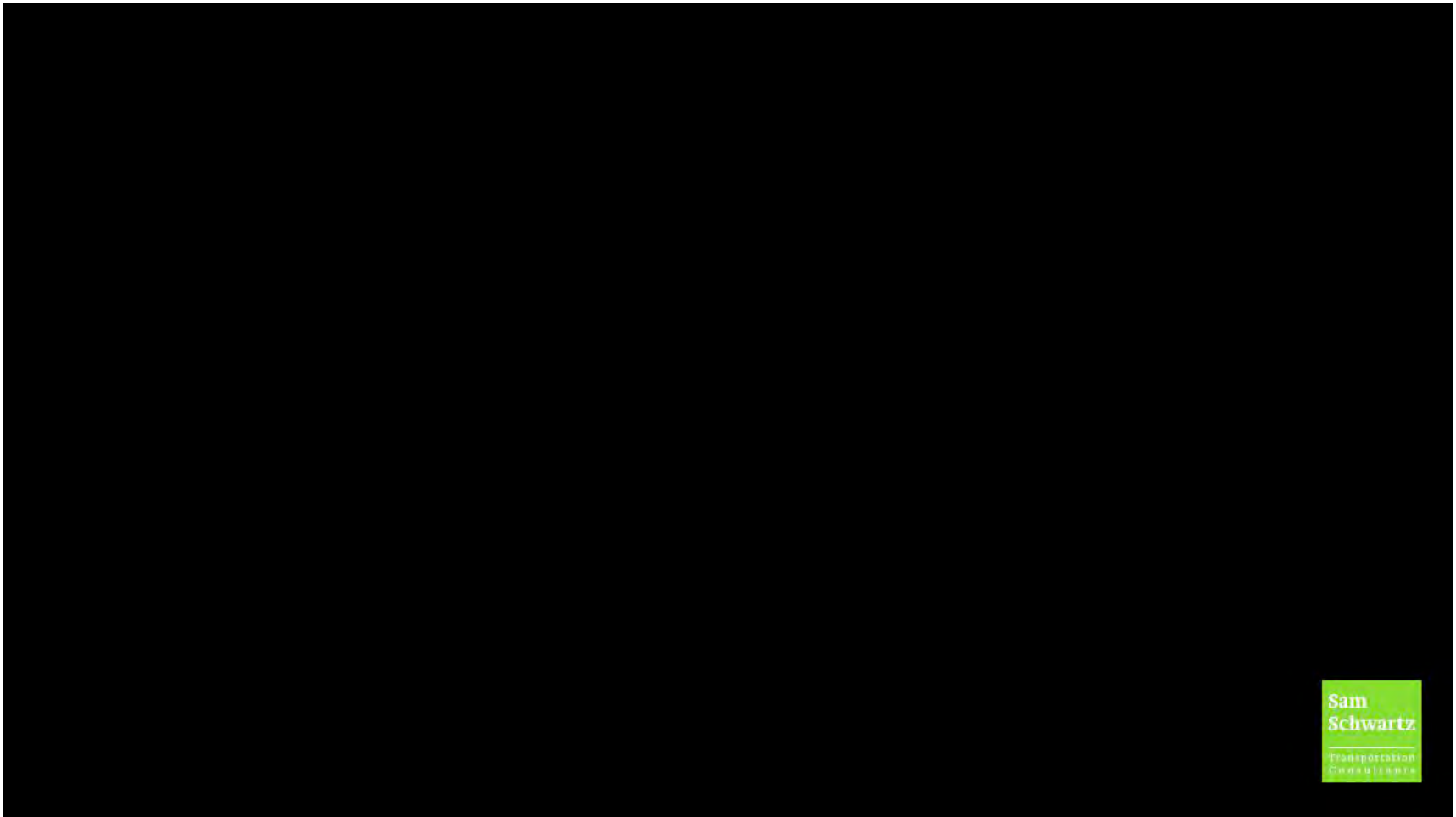


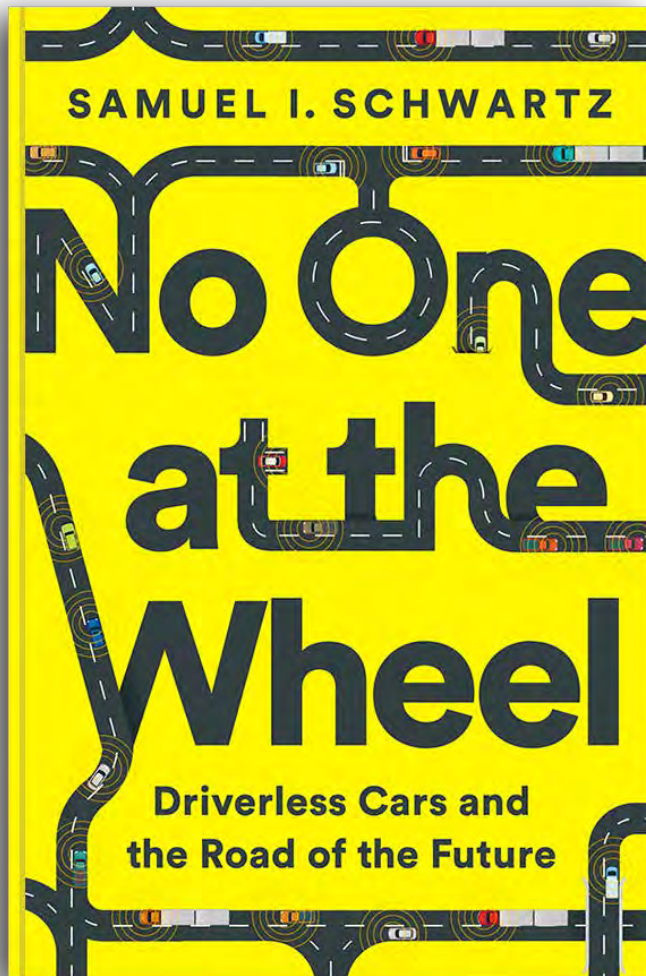
VII. Next Generation Mobility

NEXT GENERATION MOBILITY



NEXT GENERATION MOBILITY





To be released November 13, 2018.
Pre-order now at Amazon, Barnes &
Noble, GoodReads, and IndieBound.

www.samschwartz.com