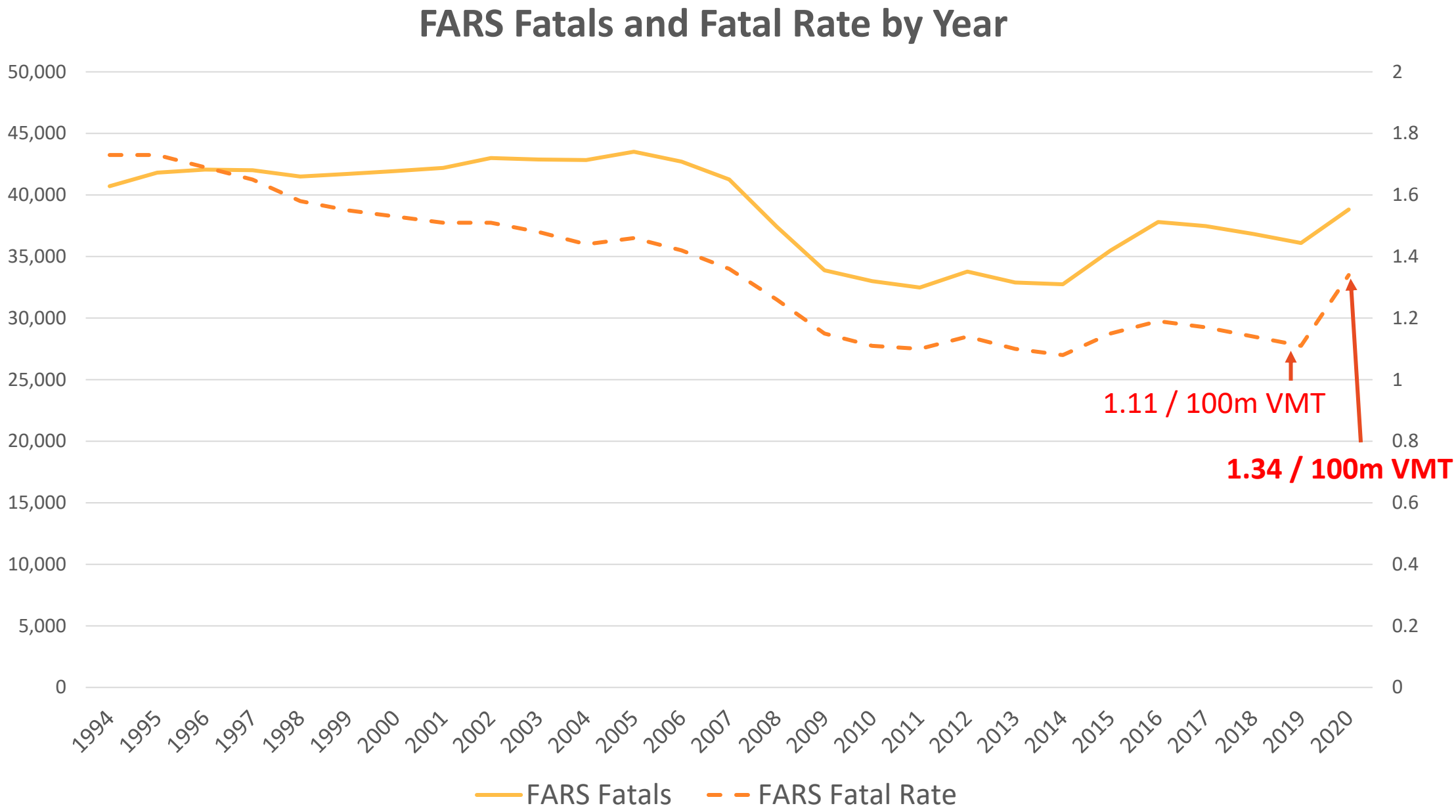
Estimated Contribution of Peak-Hours Non-Commercial Vehicle Traffic to Fatality Rates

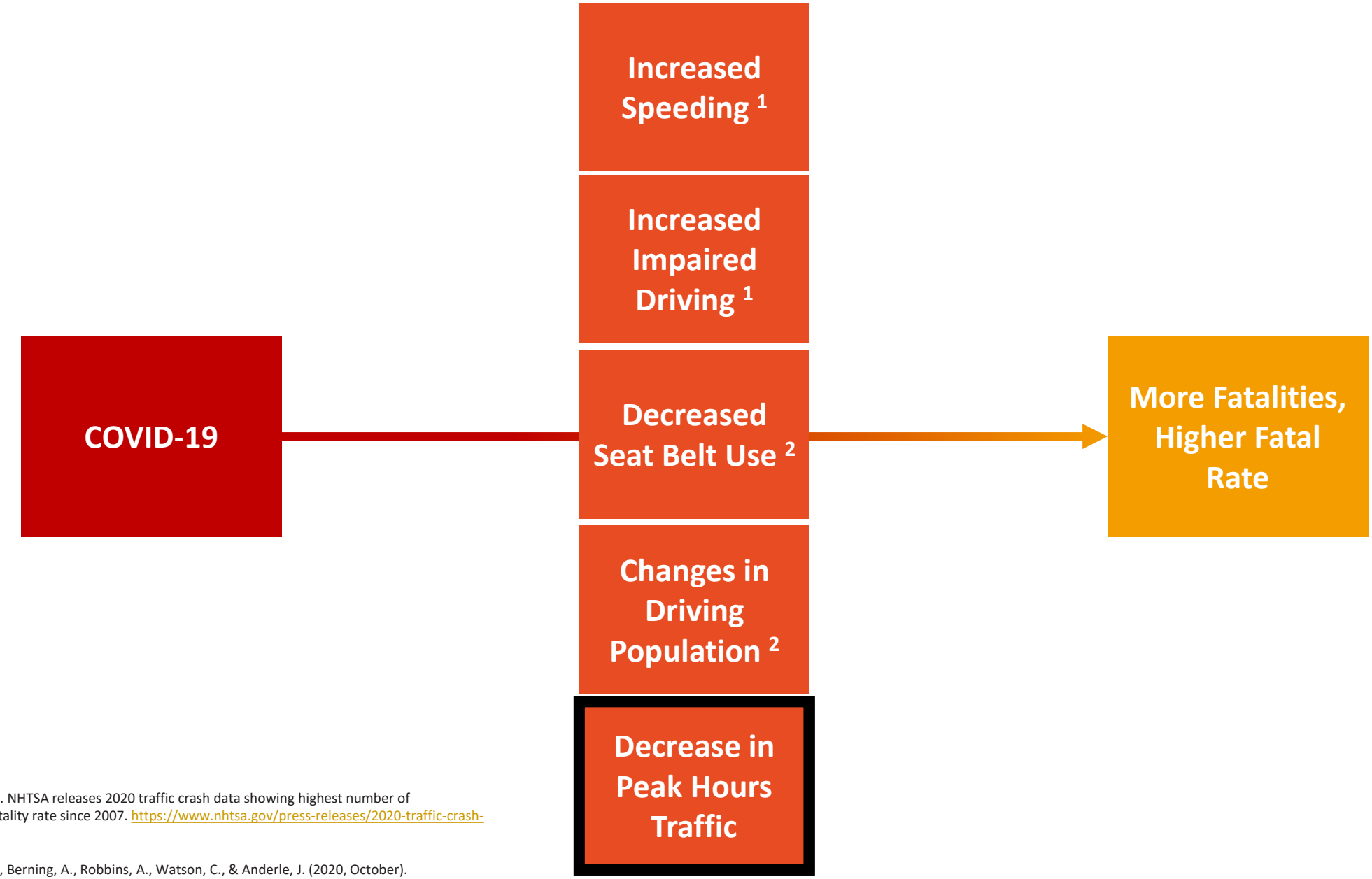
Annette Tucker

VMT goes down, fatals go up:



SOURCE: https://www-fars.nhtsa.dot.gov/states/statesfatalitiesfatalityrates.aspx

What's the mechanism?

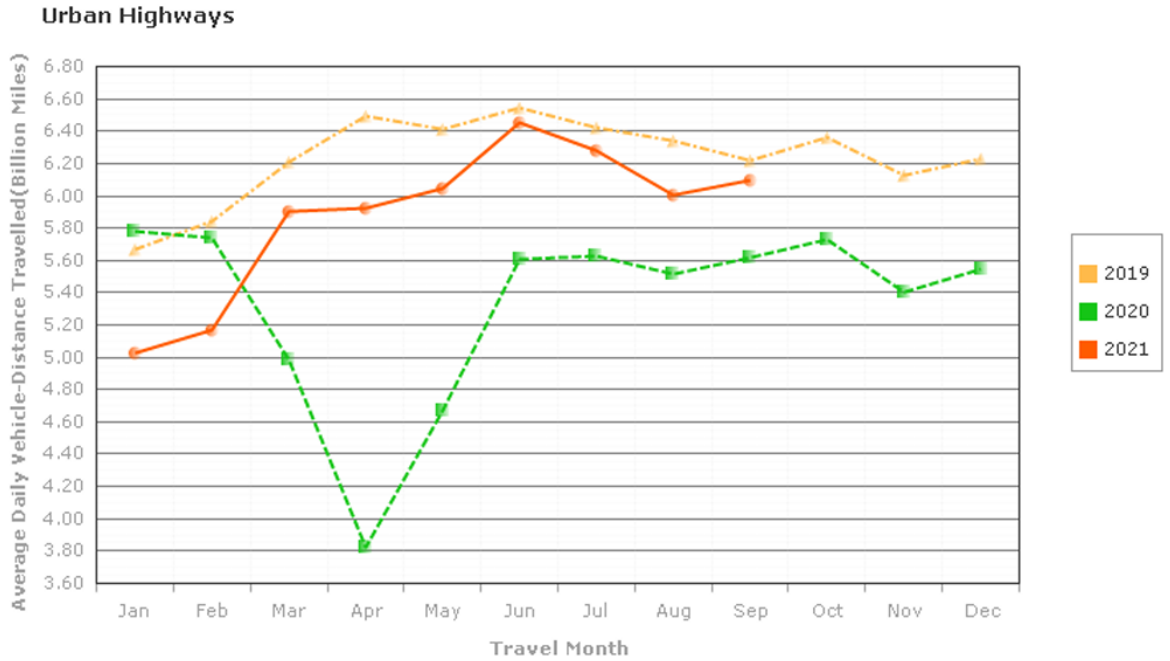


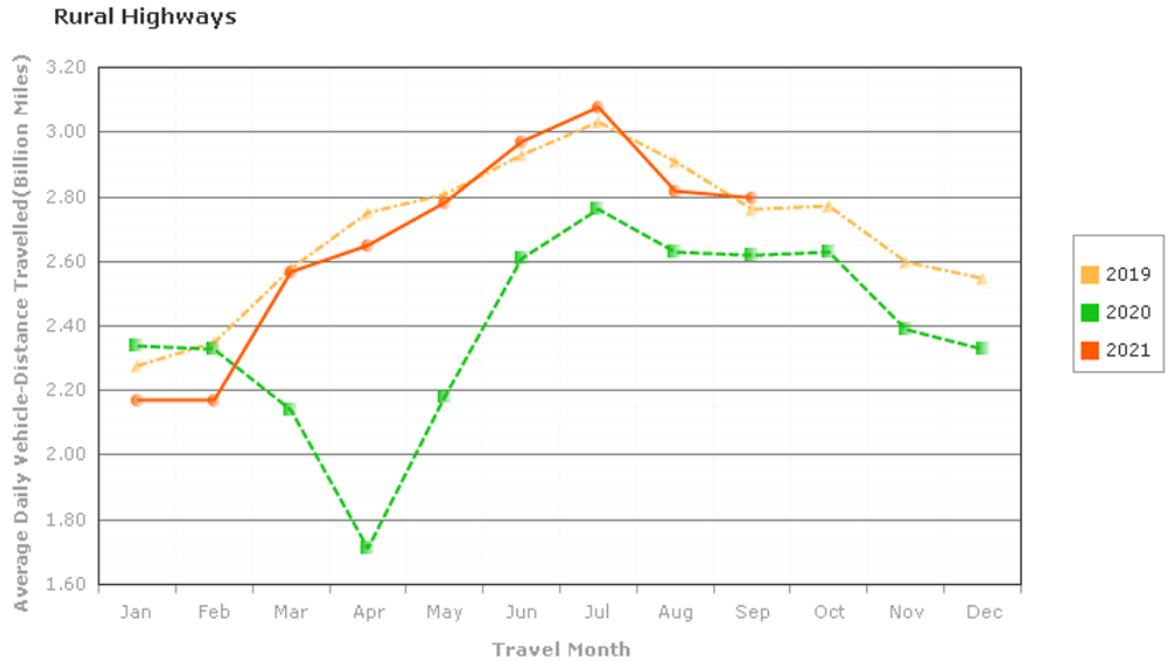
1. NHTSA (2022, March). NHTSA releases 2020 traffic crash data showing highest number of fatalities and highest fatality rate since 2007. https://www.nhtsa.gov/press-releases/2020-traffic-crash-data-fatalities

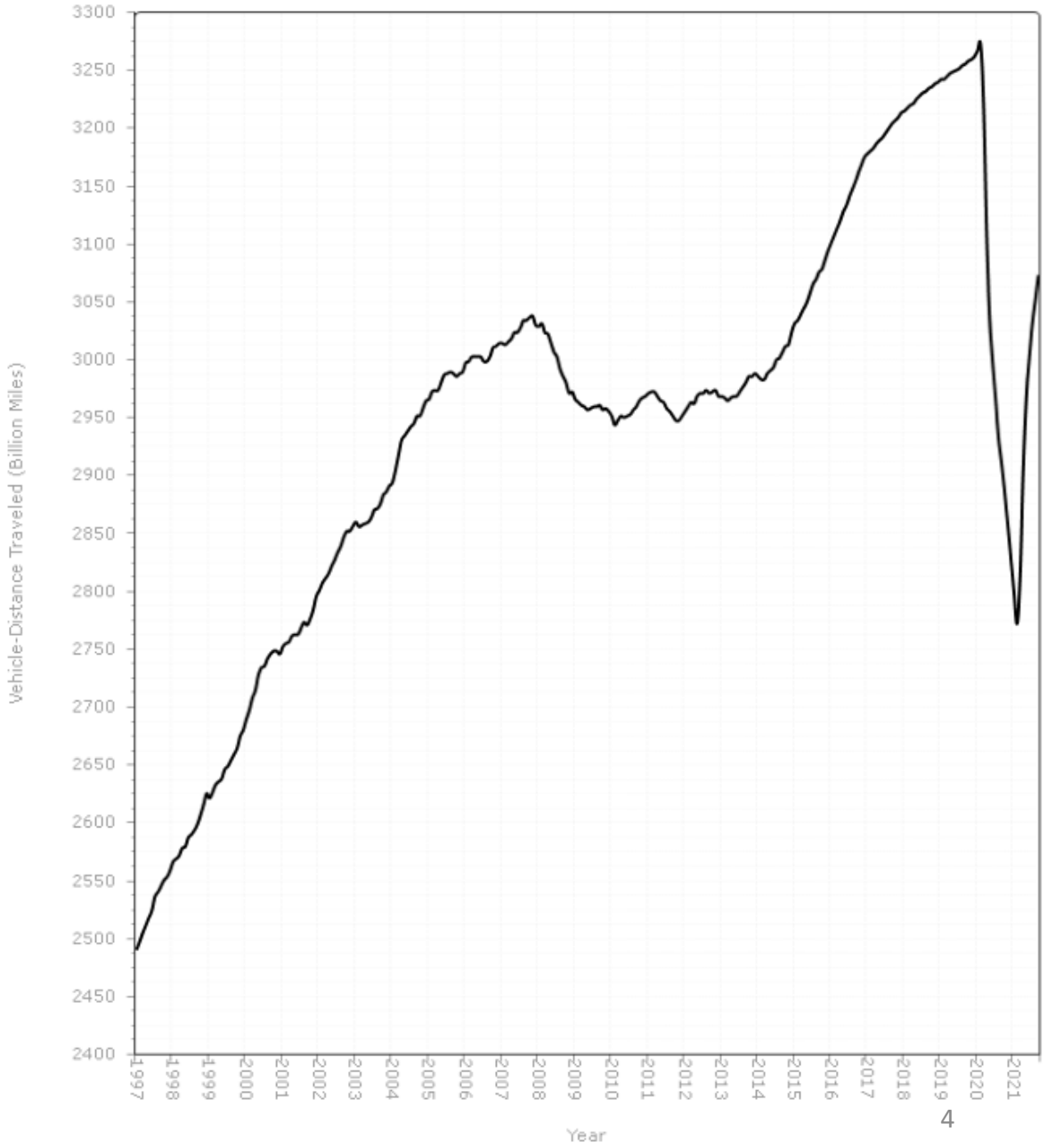
2. Wagner, E., Atkins, R., Berning, A., Robbins, A., Watson, C., & Anderle, J. (2020, October). E*xamination of the traffic safety environment during the second quarter of 2020: Special report* (Report No. DOT HS 813 011). National Highway Traffic Safety Administration. https:// rosap.ntl.bts.gov/view/dot/50940

COVID-19 and VMT

Federal Highway Administration. (2021, September). Traffic Trends.



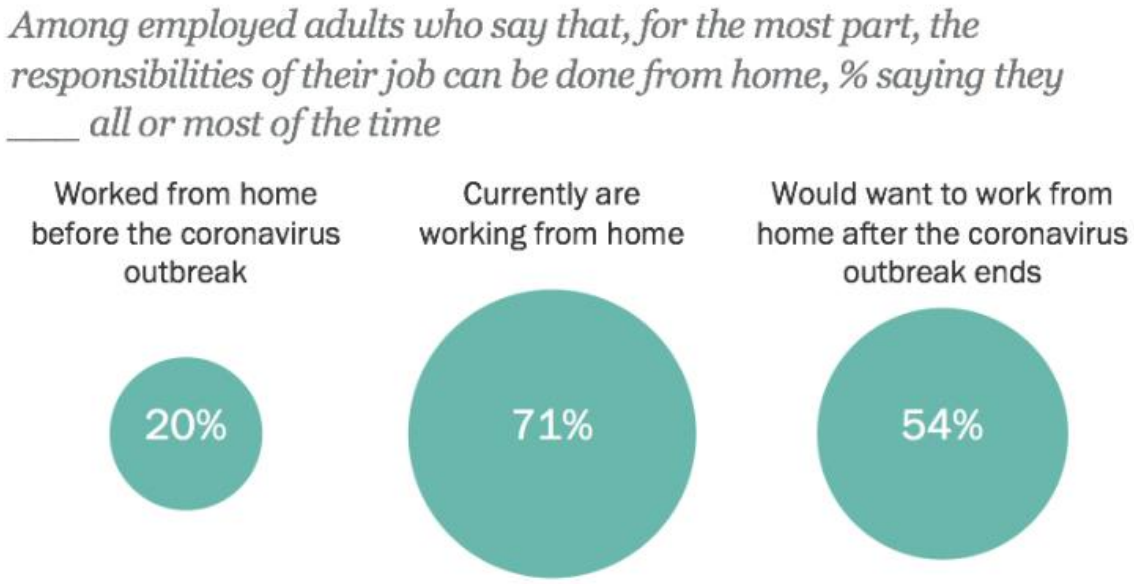




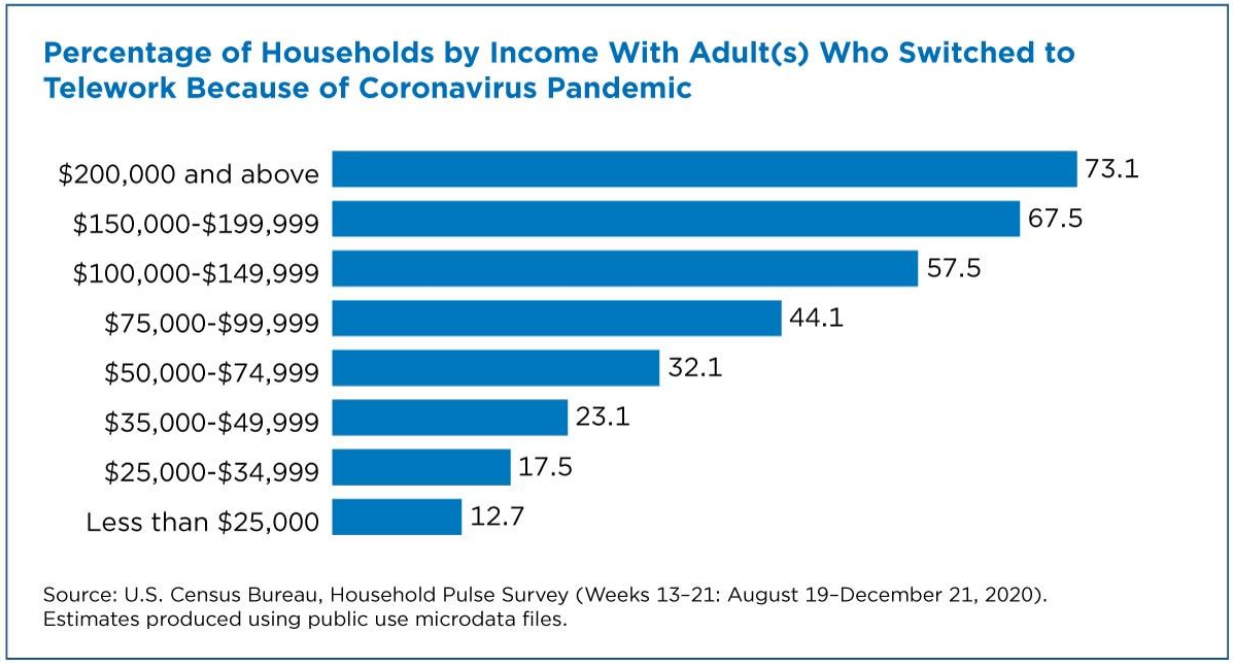
Is all VMT created equal?

VMT declined precipitously in early 2020.

What if it's not just the decrease in VMT, but the decrease in commuting?

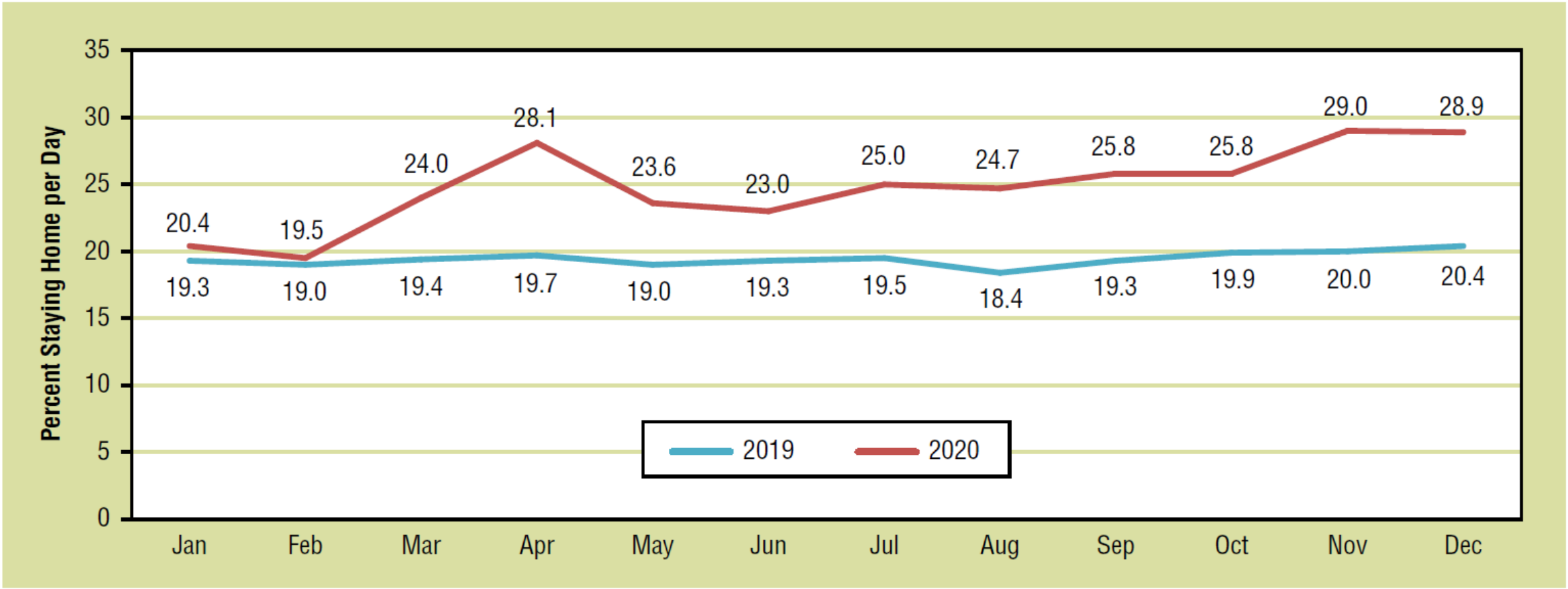


Source: Pew, https://www.pewresearch.org/social-trends/2020/12/09/how-the-coronavirus-outbreak-has-and-hasnt-changed-the-way-americans-work/



COVID-19 & Staying at Home

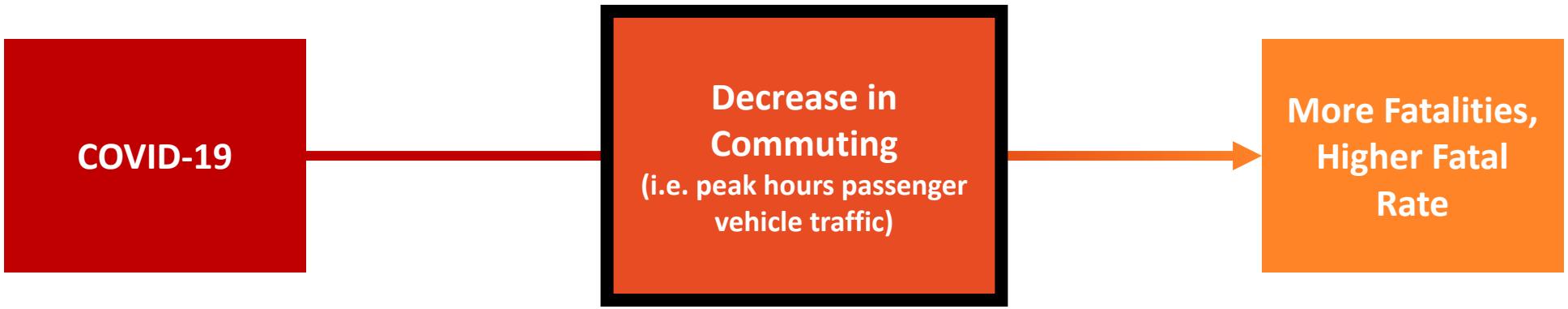
Percentage of People Staying Home per Day by Month, 2019 and 2020



Source: www.bts.gov/daily-travel

Office of Behavioral Safety Research. (2021, June). Update to special reports on traffic safety during the COVID-19 public health emergency: Fourth quarter data (Report No. DOT HS 813 135). National Highway Traffic Safety Administration.

What's the mechanism?



How did decrease in commuting contribute to observed increase in fatality rate in 2020?

The Problem:
How do we isolate the contribution of commuting to VMT & Fatality numbers?

Sub-Problem 1:
How to estimate VMT and fatals by hour?

Sub-Problem 2:
How to define passenger vehicle traffic?

FARS has:
- Fatalities by time of day
- VMT by year (from FHWA)

FHWA has:
- VMT by year
- VMT by vehicle type

National Household Travel Survey (NHTS) has:
- VMT for passenger vehicles only
- VMT by time of day
- BUT latest is from 2017

	2019*	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
Total**	36,096	36,835	37,473	37,806	35,484	32,744	32,893	33,782	32,479	32,999	33,883	37,423	41,259	42,708	43,510	42,836
Other National Statistics																
Vehicle Miles Traveled (Billions)	3,262	3,240	3,210	3,174	3,090	3,020	2,983	2,963	2,945	2,967	2,957	2,977	3,031	3,014	2,989	2,965

https://www-fars.nhtsa.dot.gov/Main/index.aspx

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The Approach:

1. Use FHWA and NHTS data to estimate 2017 non-commercial VMT for peak & off-peak hours.
2. Use 2017 peak & off-peak VMT to estimate a 2017 fatality rate that excludes commuting.
3. Compare that 2017 fatality rate to the 2020 fatality rate.

	2019*	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
Total**	36,096	36,835	37,473	37,806	35,484	32,744	32,893	33,782	32,479	32,999	33,883	37,423	41,259	42,708	43,510	42,836
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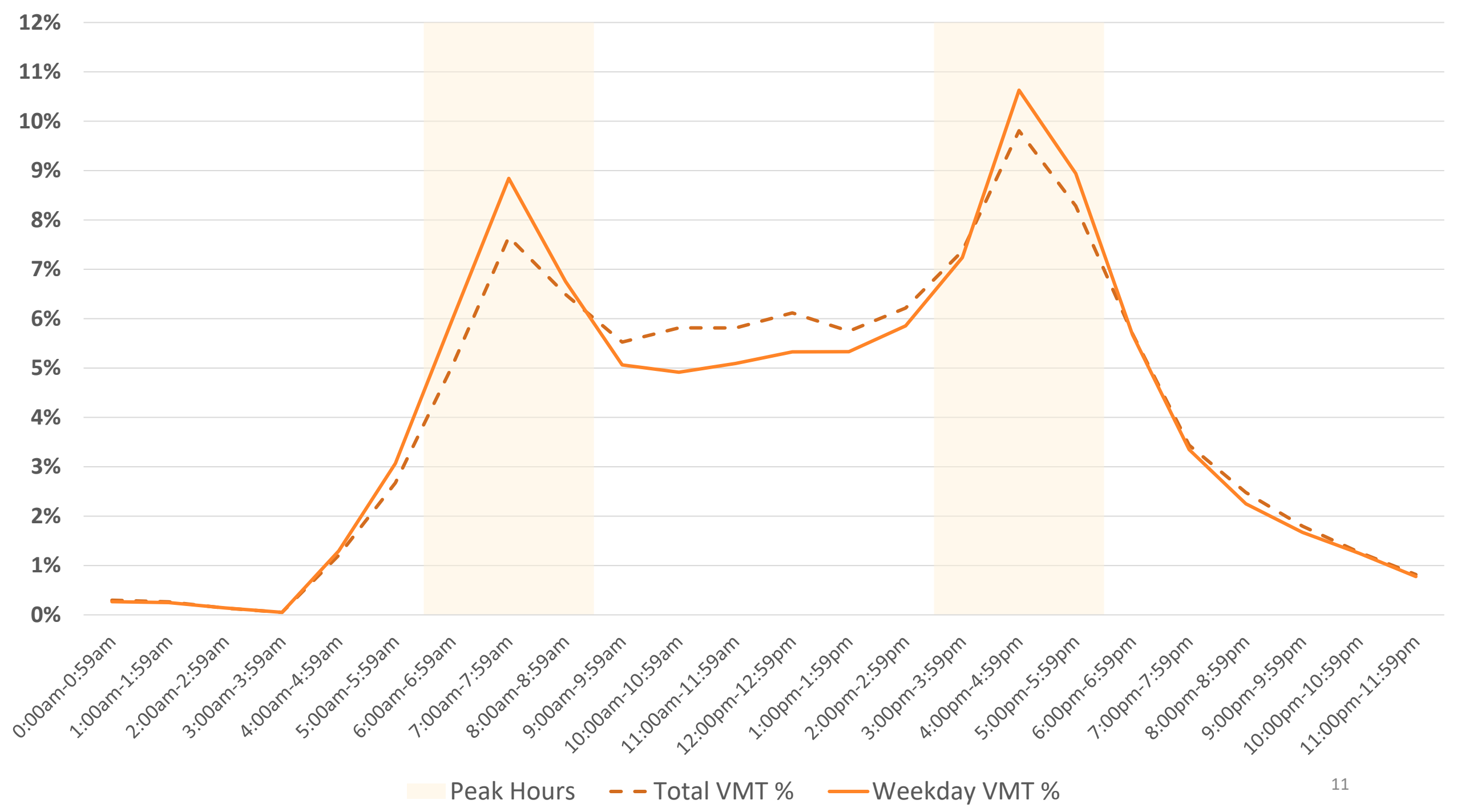
1. Use FHWA and NHTS data to estimate 2017 non-commercial VMT for peak & off-peak hours.

	NHTS 2017	
	NHTS VMT (M)	NHTS Weekday VMT (M)
0:00am-0:59am	6269.74	4178.79
1:00am-1:59am	5550.21	3898.63
2:00am-2:59am	2879.62	2178.15
3:00am-3:59am	1097.98	795.78
4:00am-4:59am	25414.13	20248.58
5:00am-5:59am	56311.63	47926.69
6:00am-6:59am	106025.76	93307.98
7:00am-7:59am	161206.73	138157.36
8:00am-8:59am	136739.67	105549.97
9:00am-9:59am	116351.92	79126.00
10:00am-10:59am	122425.69	76812.54
11:00am-11:59am	122402.11	79590.44
12:00pm-12:59pm	128827.70	83260.29
1:00pm-1:59pm	121025.10	83323.68
2:00pm-2:59pm	130891.94	91475.41
3:00pm-3:59pm	155201.95	113107.83
4:00pm-4:59pm	206521.86	166070.58
5:00pm-5:59pm	174413.22	139715.56
6:00pm-6:59pm	119947.95	88705.00
7:00pm-7:59pm	72380.32	52321.40
8:00pm-8:59pm	52238.27	35156.41
9:00pm-9:59pm	37845.11	26109.95
10:00pm-10:59pm	26696.11	19491.92
11:00pm-11:59pm	17216.99	12128.76

Calculate VMT by hour with Trip Start & Stop Times

Find Peak-Hours Windows in Morning and Afternoon


12%
11%
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
0:00am-0:59am
1:00am-1:59am
2:00am-2:59am
3:00am-3:59am
4:00am-4:59am
5:00am-5:59am
6:00am-6:59am
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5:00pm-5:59pm
6:00pm-6:59pm
7:00pm-7:59pm
8:00pm-8:59pm
9:00pm-9:59pm
10:00pm-10:59pm
11:00pm-11:59pm
Peak Hours
Total VMT %
Weekday VMT %

1. Use FHWA and NHTS data to estimate 2017 non-commercial VMT for peak & off-peak hours.

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NHTS VMT (M)	
Total (2017)	2,105,882
Peak	755,909
Off-Peak	1,349,972

FHWA VM-1 (M)	
Highway, total (2017)	2,897,528
Light duty vehicle, short wheel-base	2,220,801
Motorcycle	20,149
Light duty vehicle, long wheel-base	656,578

*FHWA has vehicle body type, but not trip purpose

1. Use FHWA and NHTS data to estimate 2017 non-commercial VMT for peak & off-peak hours.

FHWA Peak VMT
= (FHWA Passenger VM – 1
÷ NHTS Passenger VMT)
× NHTS Peak Passenger VMT

FHWA Passenger VM-1 = 2,897,347

NHTS Passenger VMT = 2,105,881

NHTS *PEAK* Passenger VMT = 755,909

FHWA *PEAK* Passenger VMT = 1,040,071

FHWA Non-Peak VMT
= (FHWA Passenger VM – 1
÷ NHTS Passenger VMT)
× NHTS Non-Peak Passenger VMT

FHWA Passenger VM-1 = 2,897,347

NHTS Passenger VMT = 2,105,881

NHTS *NON-PEAK* Passenger VMT = 1,349,972

FHWA *NON-PEAK* Passenger VMT = 1,857,456

17.9% of time in a week accounts for 35.9% of VMT!

2. Use 2017 peak & off-peak VMT to estimate a 2017 fatality rate that excludes commuting.

	Estimated Non-Commercial VMT (M) (light duty + motorcycle)	Estimated Fatalities (FARS) (passenger veh/light duty + MC)	FATAL RATE
Peak	1,040,072	5237	0.50
Nonpeak	1,857,456	23652	1.27
Total	2,897,528	28889	1.00

In 2017, Non-Commercial Peak Hours Fatal Rate < Non-Commercial Off-Peak Hours Fatal Rate!

	VMT (FHWA)	Estimated Fatalities (All Vehicle Types)	FATAL RATE
Total (All Vehicles All Times)	3,212,347	37473	1.17
Total (All Vehicles All Times) MINUS Commuting (Passenger + MC Only, Peak Hours only)	2,172,275	32236	1.48

Fatality rate is higher without commuting!

3. Compare that 2017 fatality rate to the 2020 fatality rate.

2017 (sans commuting):

1.48 / 100m VMT

2020:

1.34 / 100m VMT

SOURCE: https://www.nhtsa.gov/press-releases/2020-traffic-crash-data-fatalities#:~:text=The%20fatality%20rate%20per%

Conclusions

- Excluding peak hours (6 – 9 am, 3 – 6pm weekdays) non-commercial vehicle traffic, 2017 had a fatality rate of **1.48 / 100m VMT**.
- Commuting depresses the fatality rate.
  - It accounts for lots of VMT, but not many fatalities.
  - Fatality rate during 2017 peak hours was **.5 / 100m VMT.**
- Commuting decreased in 2020 due to COVID-19, lockdowns, etc.
  - 2020 fatality rate: **1.36 / 100m VMT.**
- **Increased fatality rate in 2020 relative to past years likely due, in some part, to decrease in commuting.**
  - Shouldn’t take this to mean that commuting is good!

Thank you for listening!

Special thanks to Nanda, Rory, and Essie for their feedback & support!