

A large, stylized compass rose graphic on the left side of the slide. It has eight points, with the top, bottom, and side points being larger and more prominent. The points are colored in shades of blue and grey. A thick blue arc is visible behind the rose, curving around the right side.

Crash Fatality Increase Factors

Presented to TTAC

July 10, 2024

By Robert B. Case, PhD, PE

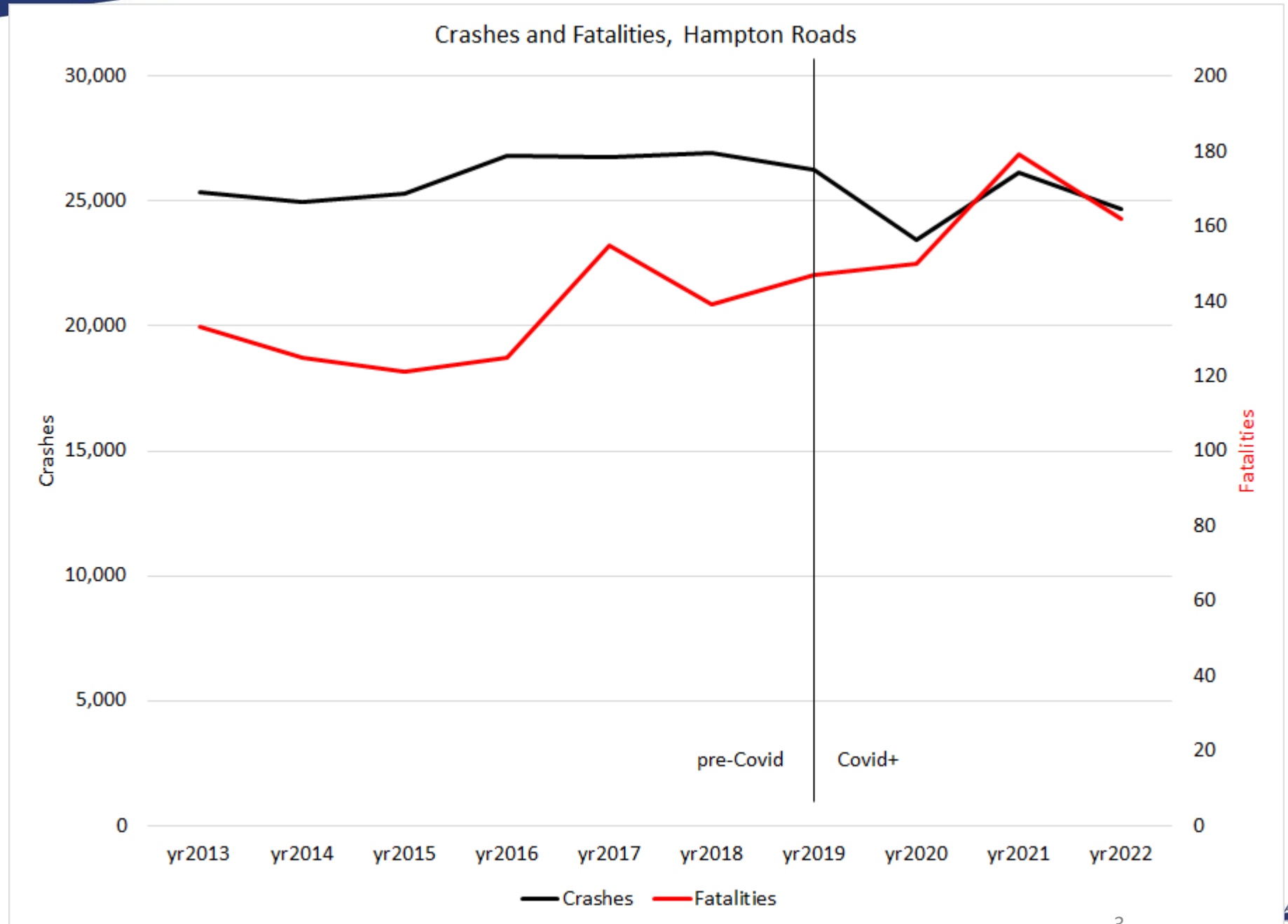
Impetus

City of Virginia Beach staff asked the HRTPO to investigate “the **factors** contributing to the **unexpected uptick in accidents/fatalities.**”

Although the number of annual crashes has been fairly consistent, the number of **fatalities has increased significantly since 2015**.

Note that this increase started **before Covid**.

The refined question is “What is the primary **cause of the 34% increase in fatalities over the 2015-2022 period?**”.



Literature- causes

Associated Press¹

- 43,000 US deaths 2021, **highest** in 16 years
- “12% rise in fatal crashes involving at least one **distracted** driver”
- “The number of **unbelted** passengers killed rose 8.1%”
- “fatalities involving **alcohol-impaired** driving were up 14%”
- “**Speeding-related** deaths increased 7.9%”
- “deaths involving **large trucks** weighing over 10,000 pounds were up 17%.”

¹ “Distracted driving key factor in rise of 2021 traffic deaths”, Va. Pilot, 4-4-23

Literature- traffic enforcement

NEWSNATION¹

- “The Texas Department of Public Safety went from 2.8 million vehicle stops in 2019 to 1.7 million in 2022.”
- “In Connecticut, traffic stops **fell by 40%** over the same three-year period.”
- “The **pandemic pull-back coincided with a spike in traffic deaths**, which jumped 10.5% in 2021 compared to the previous year — the largest percentage increase since 1975. That correlation has led **some in the media to attribute the rise in fatal accidents directly to the decline in traffic enforcement**. Other research has found **no association between traffic stops and deadly car accidents**.”
- “There’s no single explanation for the decline in traffic stops. Instead, law enforcement experts say a combination of factors including **staffing shortages, low morale and explicit policies** banning police from enforcing certain violations are the main drivers.”
- “Less police could mean **more cameras**” (red-light cameras, speeding cameras)

¹ <https://www.newsnationnow.com/crime/traffic-stops-plummeted-during-pandemic-may-not-return/>

Literature- solutions

USDOT¹

- Overhauling the MUTCD
- Promoting road designs that **slow down vehicles**
- **Complete** streets
- Removing **drug** abusers
- Reworking the **safety goals** state transportation agencies set
- Updating the department's crash-rating system for **new vehicles**

¹ <https://www.route-fifty.com/infrastructure/2022/01/feds-announce-sweeping-plan-reduce-surging-traffic-deaths/361267/>

Scientific Method

Staff examined the causes of the increase in fatalities by **developing a hypothesis and then testing it.**

Based on observation, staff formed the following hypothesis:

Lower enforcement has increased speeds which have increased fatalities

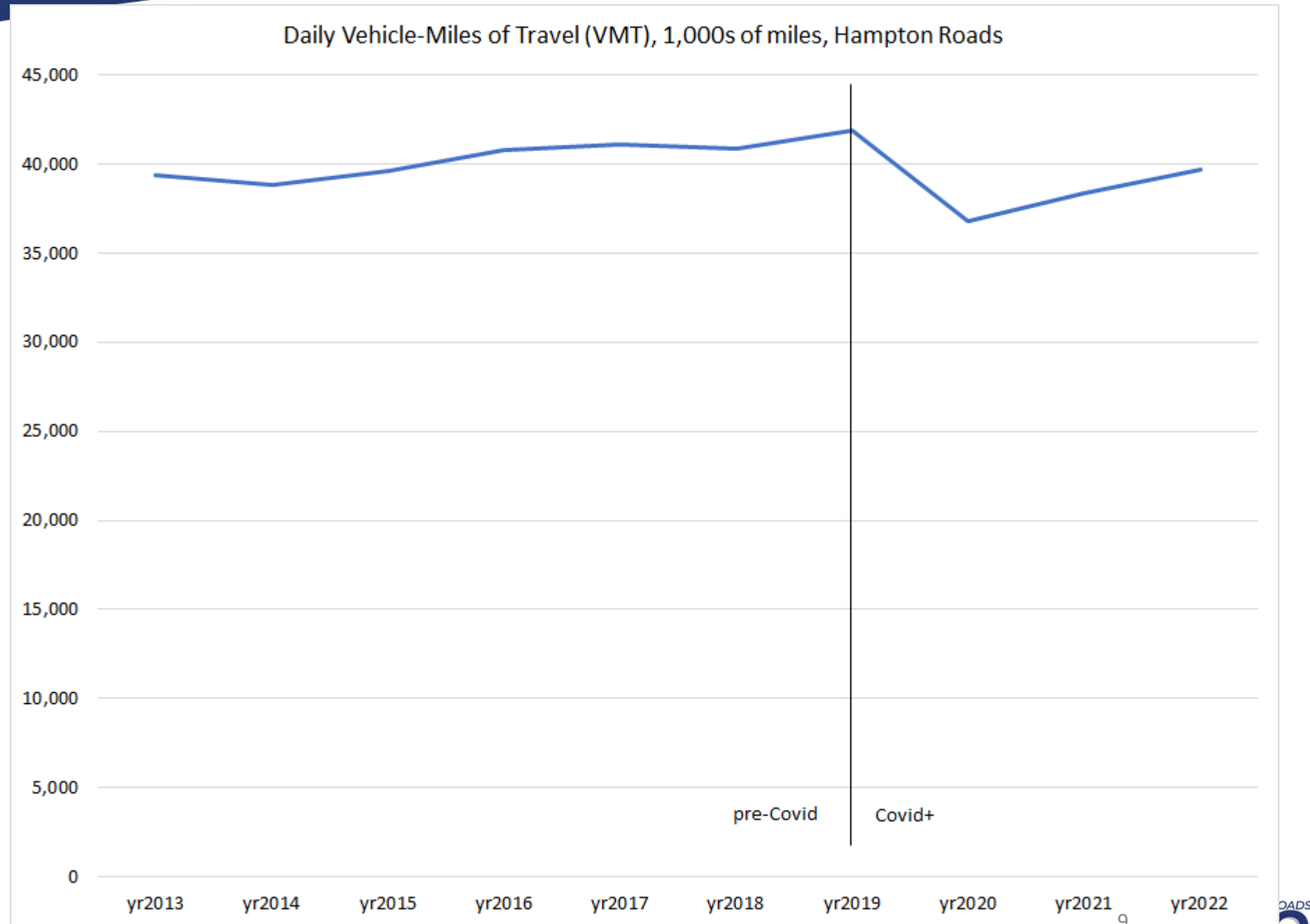
Hypothesis Testing

Staff examined the following illuminating data:

- changes over time in **vehicle-miles-traveled** (VMT)
- changes over time in the **vulnerability** of each type of traveler
- changes over time in **crash-severity** factors

The VMT in 2022 is **almost identical** to that of 2015, indicating that changes in **VMT did not contribute to the increase in fatalities.**

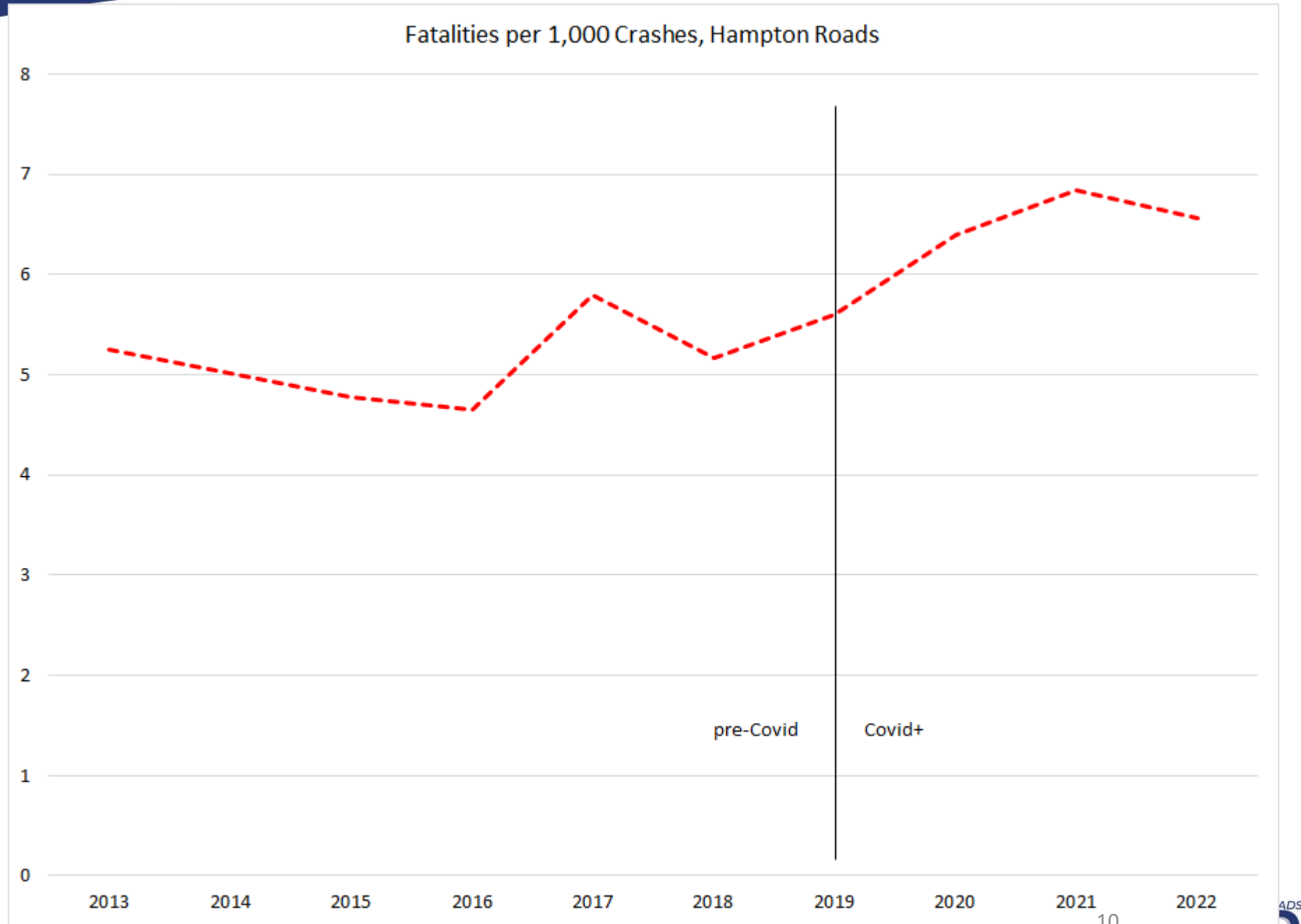
Having ruled out increased travel, staff looked for **other causes of the fatality increase.**



Crashes have become **more fatal**.

Whereas 4.8 people died per thousand crashes in 2015, 6.6 people died per thousand crashes in 2022, an **increase of 37%**.

So staff attempted to find out **why crashes have become more fatal**.



Changes in Vulnerability of Travelers

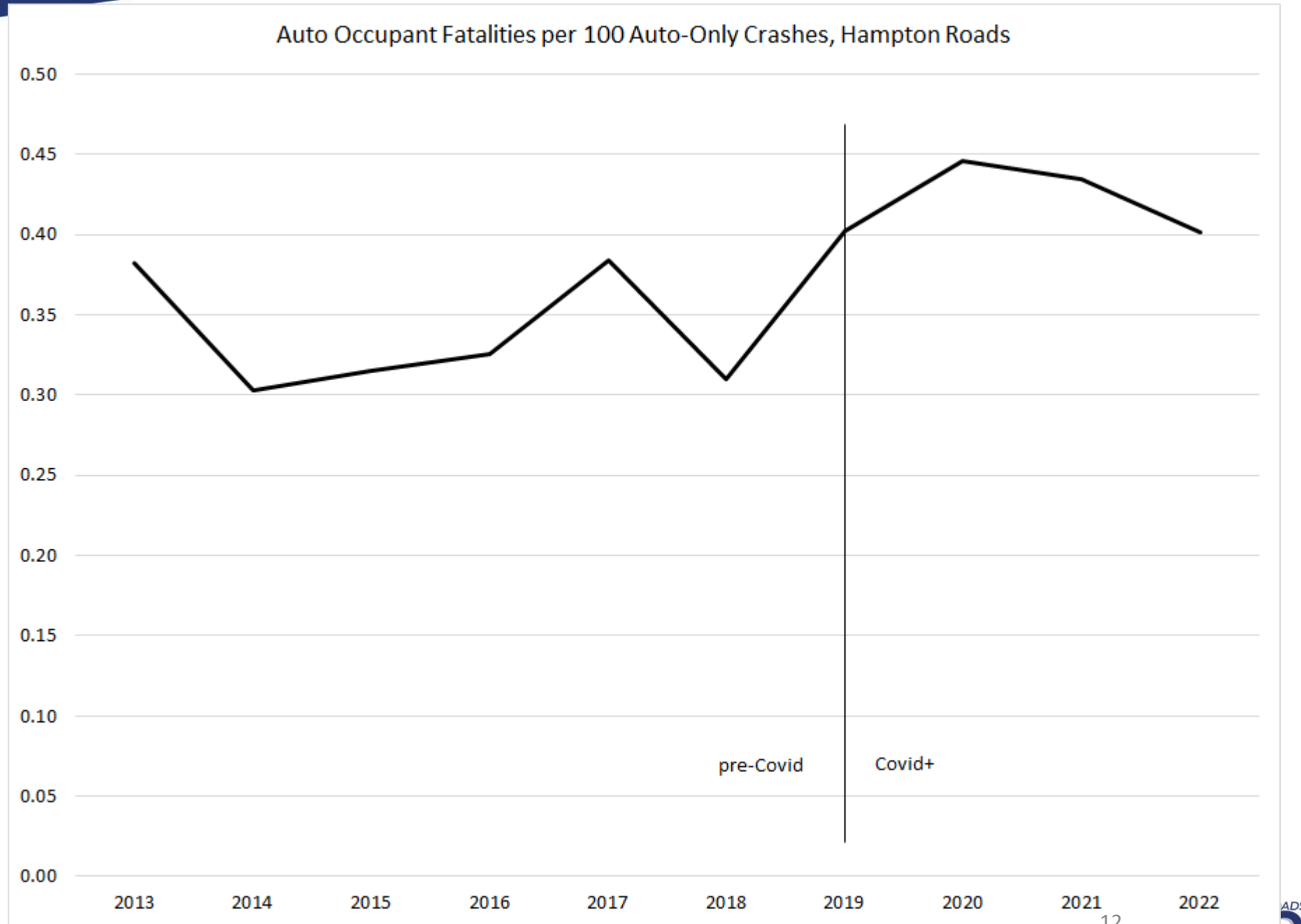
To discover **why crashes have become more fatal**, staff first examined the vulnerability of each type of traveler involved in motorized vehicle crashes:

- Automobile occupants
- Motorcyclists
- Bicyclists
- Pedestrians

For auto occupants,
crashes became **more
fatal**:

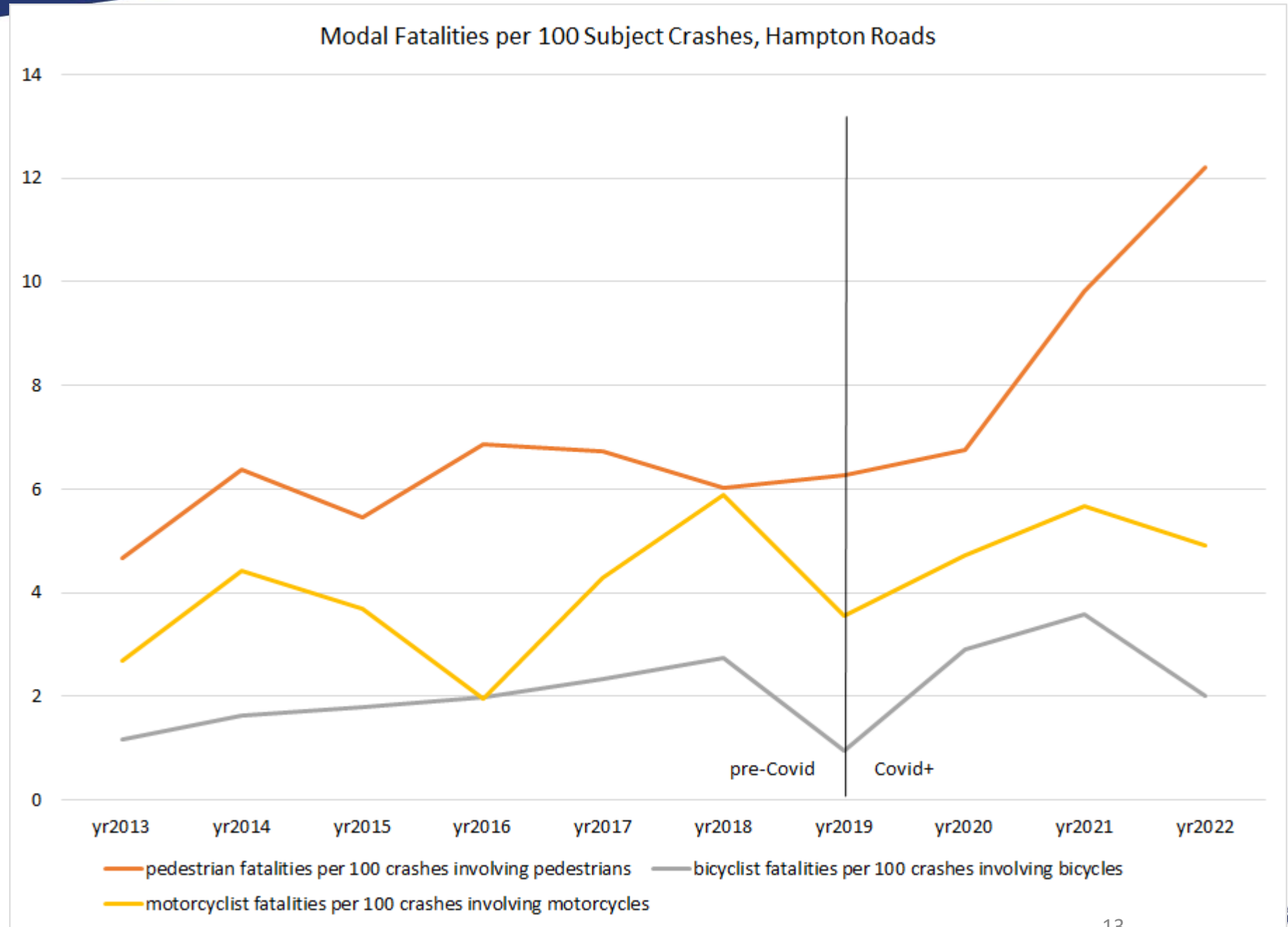
- fatalities per 100 auto-
only crashes in 2022
(0.40) were
significantly higher
than that of 2015
(0.31), an **increase of
27%**.

This increase in fatalities
per crash causes the
researcher to suspect an
increase in auto speeds.

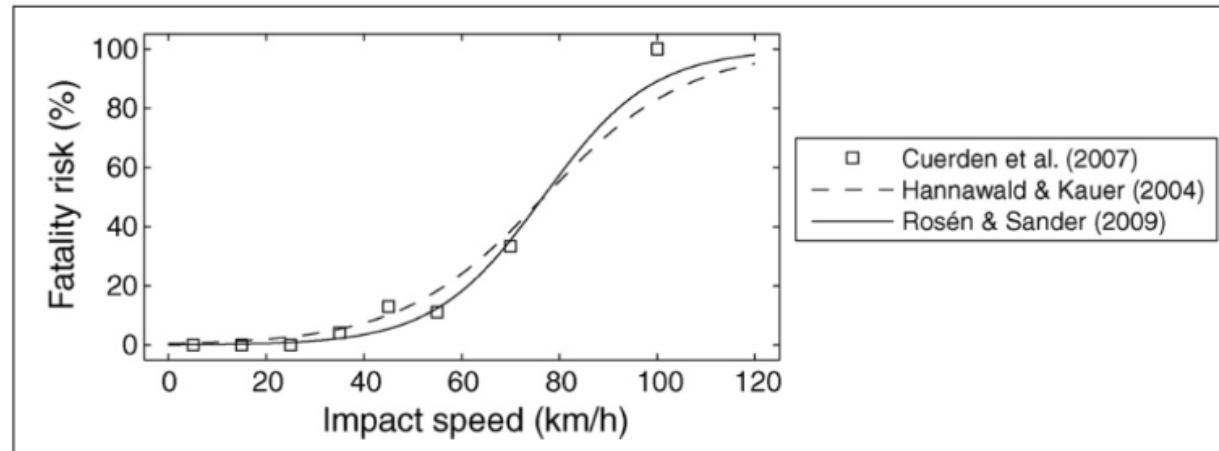


Crashes have become more fatal for bicyclists, motorcyclists, and particularly for pedestrians.

Whereas 5.5 pedestrians died per 100 pedestrian crashes in 2015, 12.2 pedestrians died per 100 pedestrian crashes in 2022, a doubling of the fatalness of pedestrian crashes.



Given that pedestrians are more vulnerable at higher automobile speeds, the sharp increase in fatalities per crash for pedestrians in Hampton Roads causes the researcher to suspect an **increase in auto speeds**.



Fatality Rate of Pedestrians in Crashes with Cars as Function of Collision Speed¹

¹ Rosén, E., Stigson, H. & Sander, U. (2011). Literature review of pedestrian fatality risk as a function of car impact speed. In: Accident Analysis and Prevention, vol. 43, nr. 1, p. 25-33; as reproduced in "SWOV Fact sheet, The relation between speed and crashes", SWOV Institute for Road Safety Research, the Netherlands, April 2012, p. 2.

Changes in Crash-Severity Factors

“Crash-severity factors” are things that **worsen the result** of crashes, i.e. injury or fatality vs. property damage only.

Alcohol and distracted driving impact the *likelihood* of crashes but are not expected by the author—in and of themselves—to impact the *severity* of crashes.

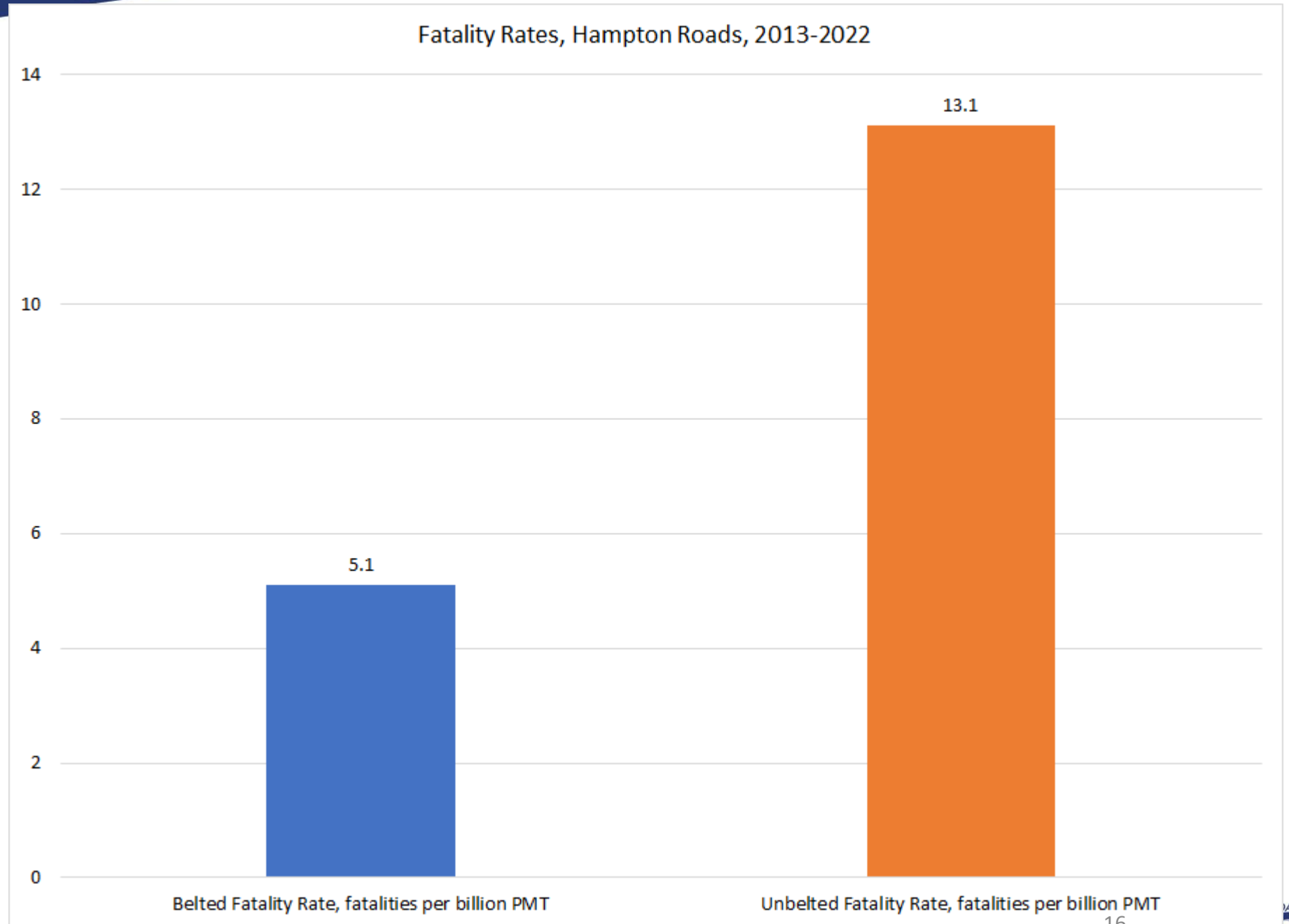
1. seatbelts and 2. speeding, however, impact crash severity:

- If one crashes without a seatbelt, and/or if one crashes at high speed, one is obviously **more likely to be killed**.

1. Seat Belt Usage

Because **unbelted persons** are more than twice as likely to die than **belted persons**, when the belted percentage changes, one would expect fatalities to change accordingly:

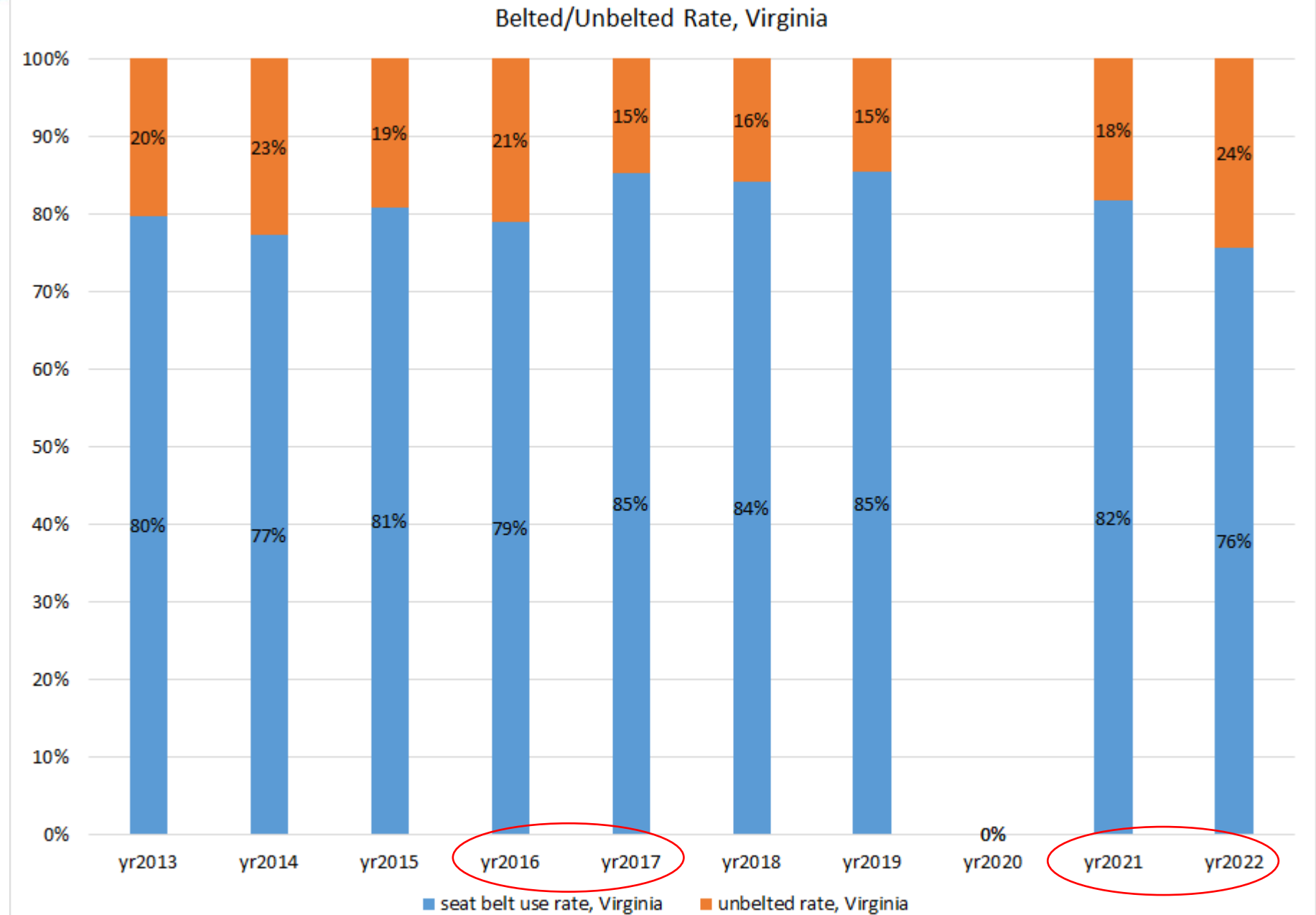
- if the belted percentage **increases**, one would expect fatalities to **drop**
- if the belted percentage **decreases**, one would expect fatalities to **rise**.



For **2016-to-2017**, even though estimated belt usage rose, fatalities *increased* from 125 to 155.

And for **2021-to-2022**, even though estimated belt usage fell, fatalities *decreased* from 179 to 162.

These **counterintuitive results** indicate that this seatbelt usage survey data **cannot be used to explain** the increase in fatalities over the subject 2015-2022 period.



2. Speeding

Staff processed raw speed data from VDOT counters, starting with a database containing 191,996 records (one record for each counter-day) from 59 counters.

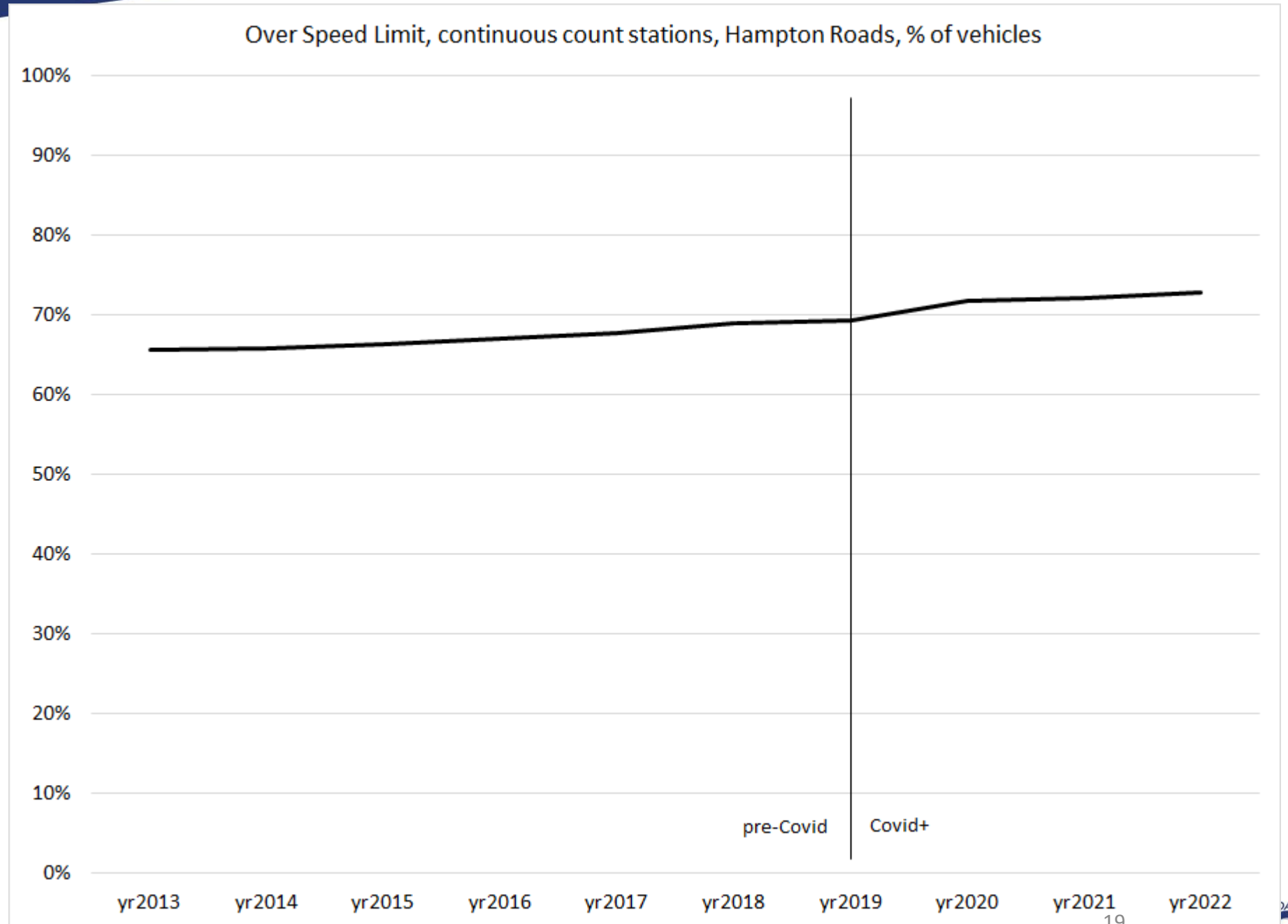
Cleaning the database by removing:

- records with unusual speed bin types
- records with poor speed quality
- counters with a mixture of speed bins
- counters with missing years
- counters with jumpy results by year
- counters with unrealistically high reckless speed percentages
- counters with odd reckless speed by year
- counters at which the speed limit changed in 2019

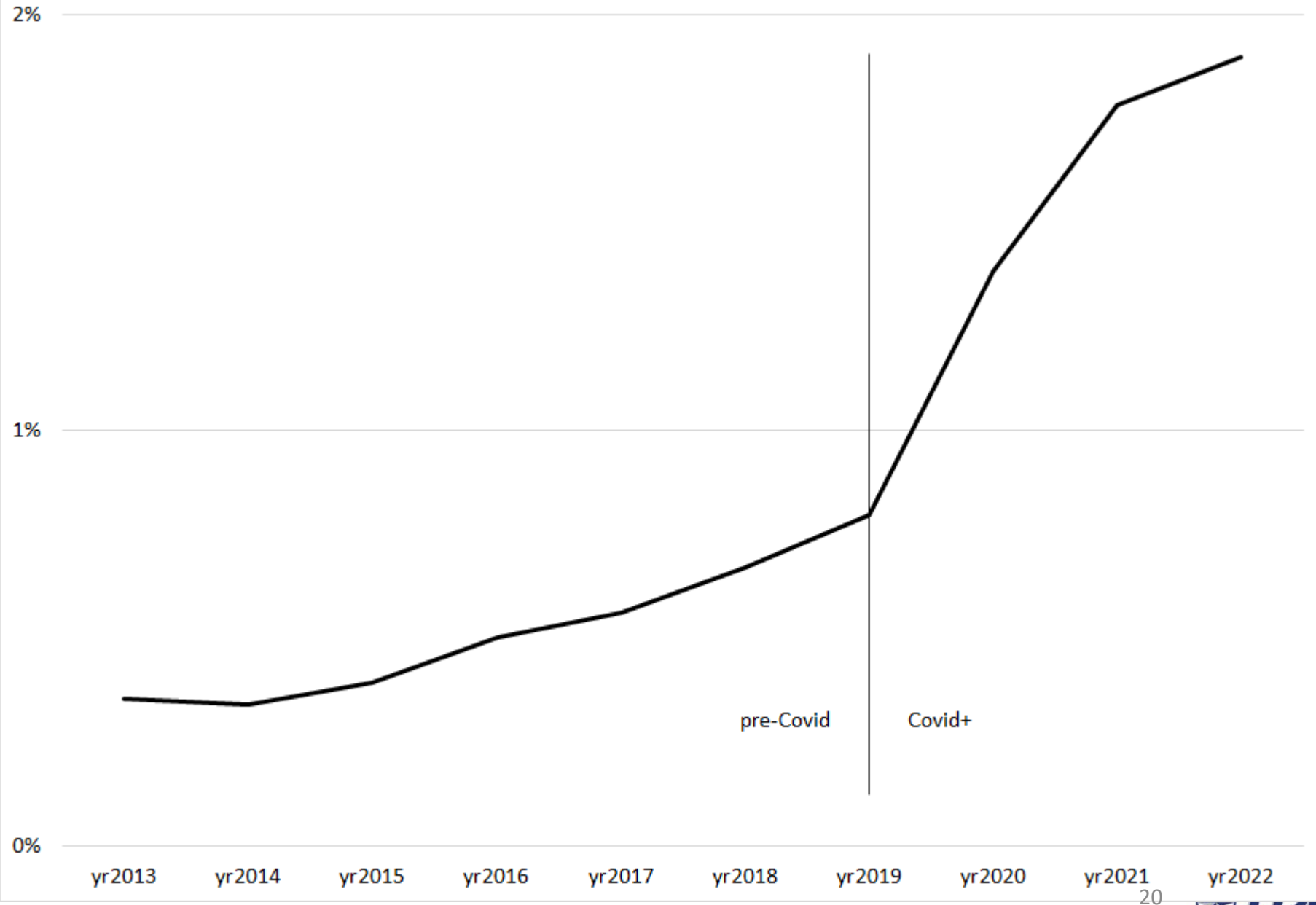
resulted in a database containing **136,756 records from 39 counters** covering a **wide variety of locations:**

- cities and counties
- urban and rural
- various lane counts
- various designs (divided, undivided, two-way left turn lane [TWLTL])
- Interstate and arterial
- various speed limits (35 mph to 70 mph)
- various levels of pre-Covid congestion

Speed-limit exceedance rose steadily, except for the first Covid year, in which it rose more rapidly. Whereas 66.2% of drivers exceeded the speed limit in 2015, 72.8% did so in 2022, a **significant increase**.



Drivers Driving Over Reckless Speed, continuous count stations, Hampton Roads, %



Reckless speeding

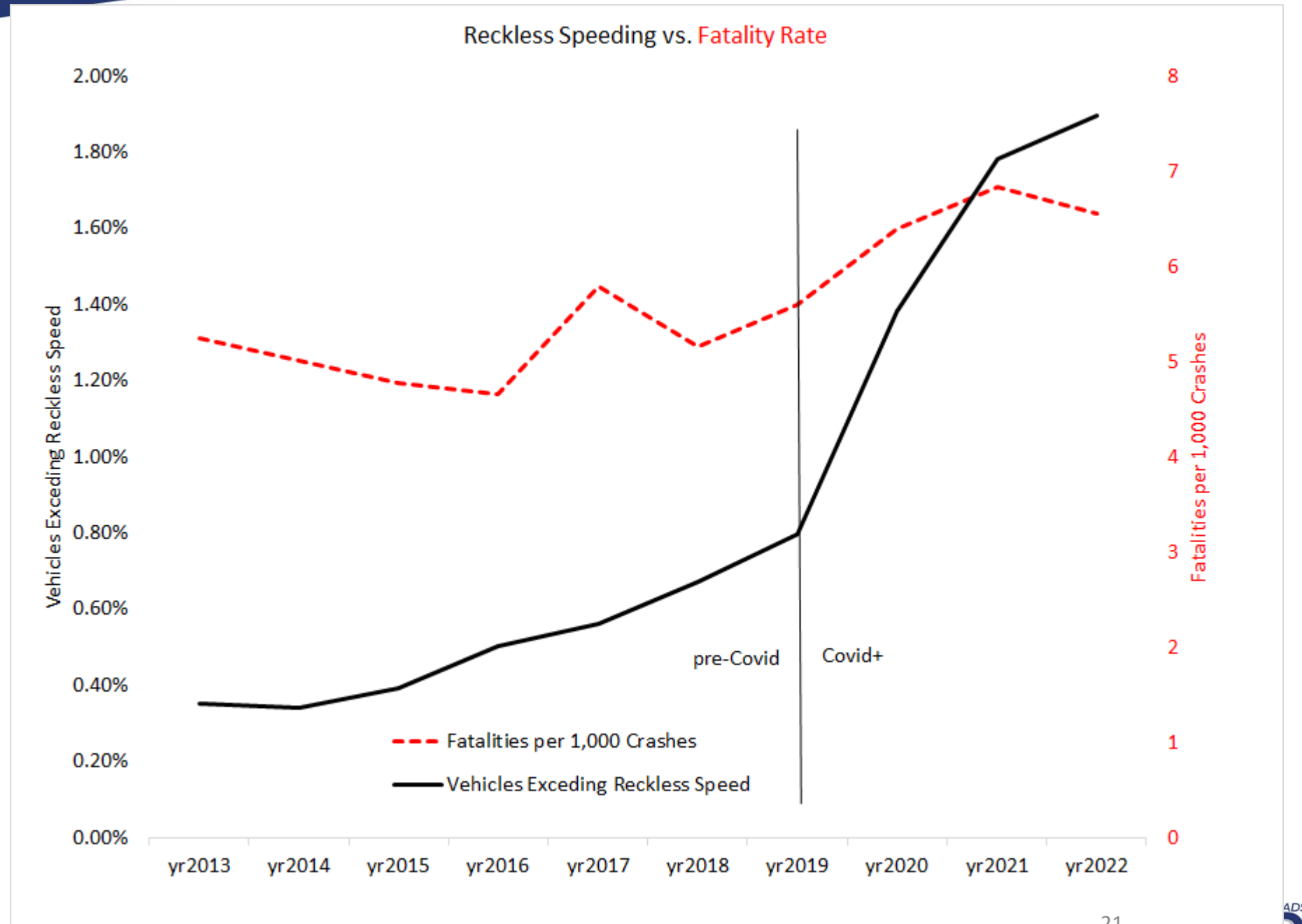
(basically 20 mph over the limit) increased:

- significantly before Covid
- dramatically during Covid
- **five-fold** (i.e. 400%) between 2015 (0.4%) and 2022 (1.9%)

With such a large increase in reckless speeding, one would expect an increase in the fatality of crashes.

Given the danger of speeding and the upward nature of both trends, it appears that the increase in speeding **may explain the increase in crash fatality.**

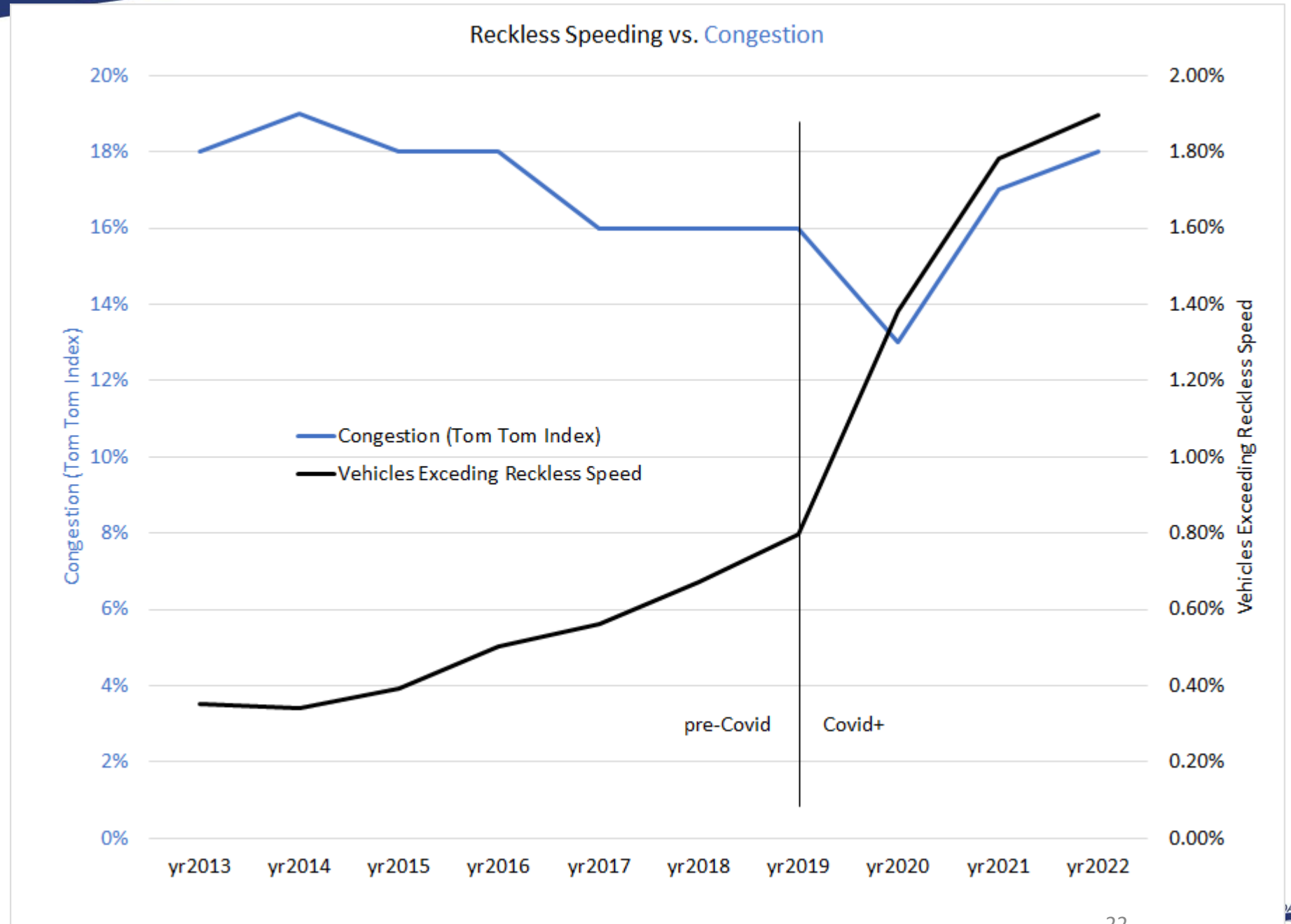
What caused speeding to increase?



Although congestion fell and speeds soared during the first Covid year, reckless speeding increased in both 2021 and 2022 as congestion returned to normal.

So reduced congestion **does not appear to explain the increase** in reckless speeding.

So what did cause speeding to increase?



Speeding Court Cases

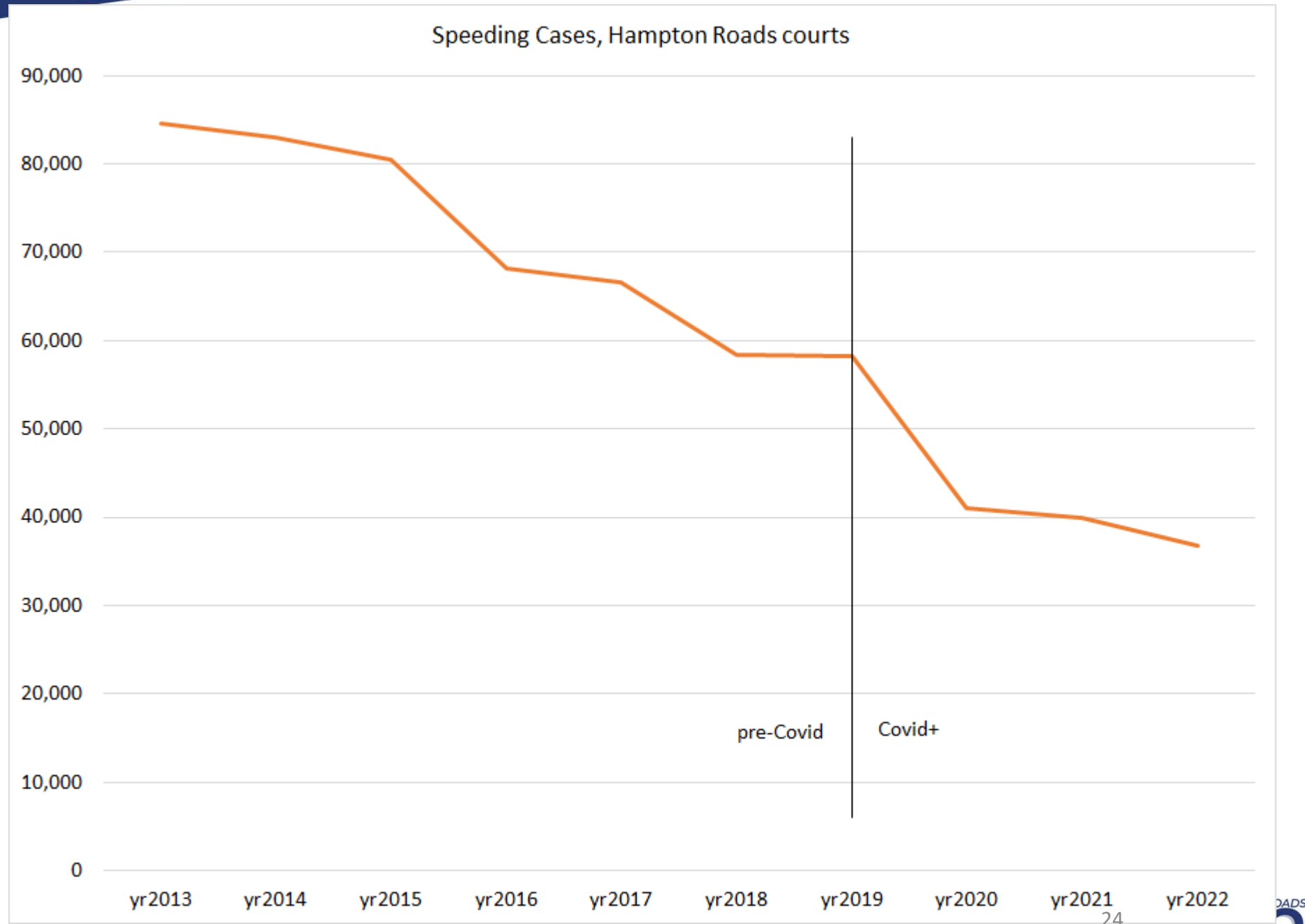
Staff obtained data from the Supreme Court of Virginia on the number of **speeding cases** filed (617,269 total cases for the years 2013-2022) in the following Hampton Roads courts:

- Chesapeake General District Court
- Franklin City General District Court
- Gloucester General District Court
- Hampton General District Court
- Isle of Wight General District Court
- Newport News-Criminal General District Court
- Newport News-Traffic General District Court
- Norfolk General District Court
- Norfolk General District-Criminal Division
- Norfolk General District-Traffic Division
- Portsmouth General District Court
- Southampton General District Court
- Suffolk General District Court
- Virginia Beach General District Court
- Williamsburg/James City County General District Court
- York General District Court

Speeding cases dropped **significantly before Covid** (30%).

And cases dropped dramatically during the first Covid year (additional 29%).

As a result of all decreases, in 2022 there were **less than half** the cases of 2015, seven years earlier.

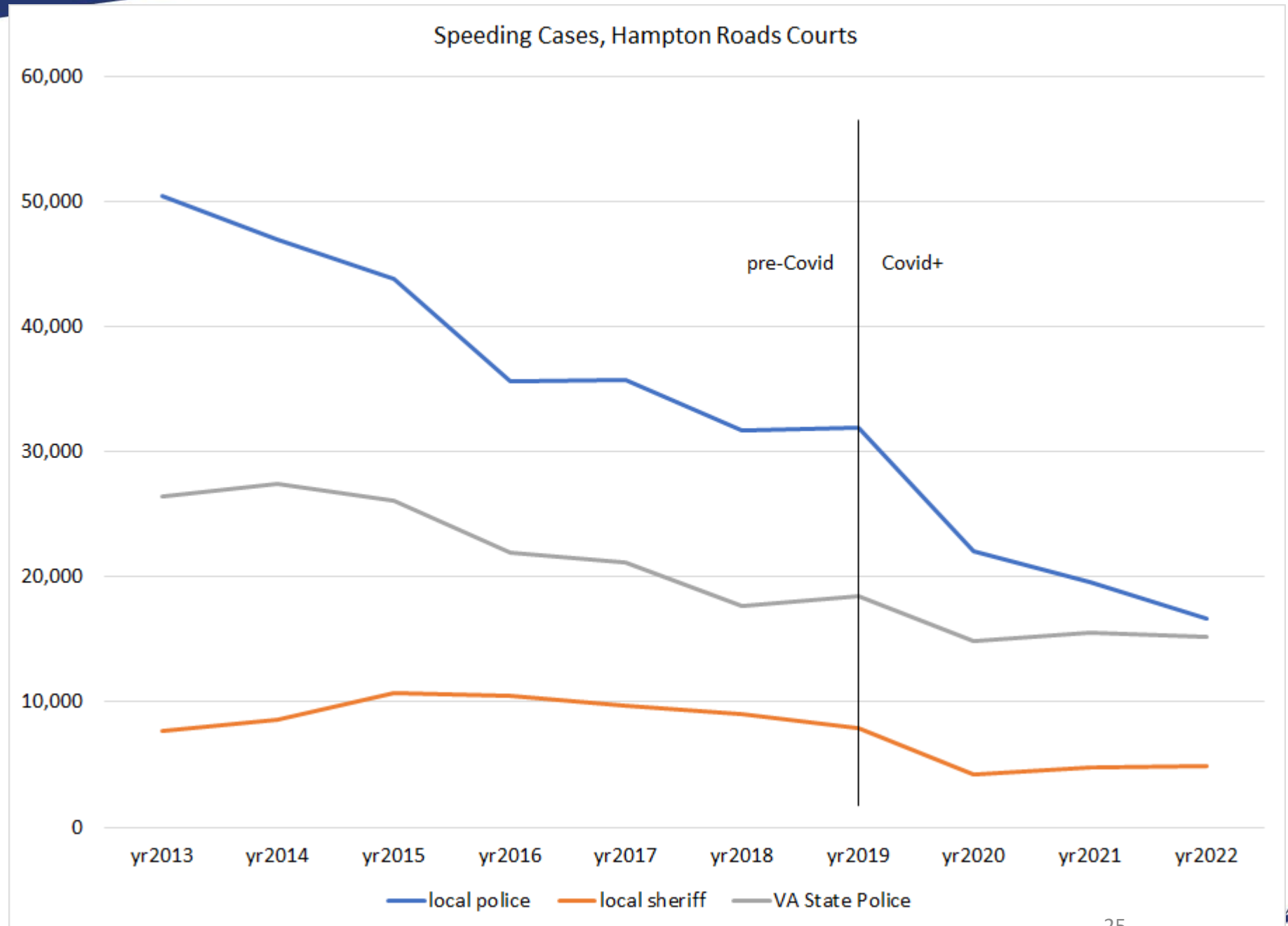


2022 vs. 2015

Local police reduced enforcement the most: 62%.

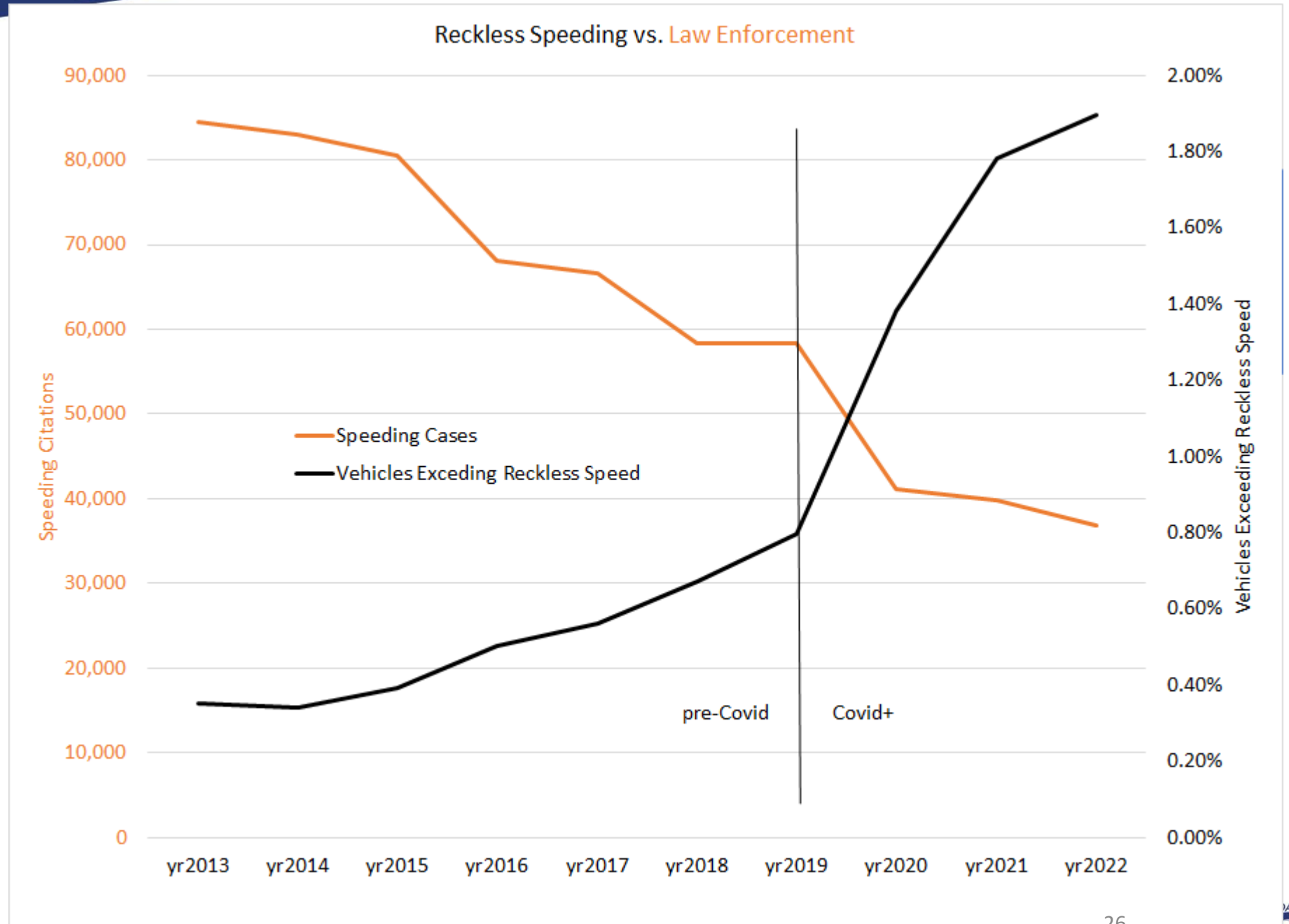
Local sheriffs reduced enforcement by 54%.

Virginia State Police (VSP) reduced enforcement by 42%.



As speed enforcement cases were **halved**, reckless speeding **increased five-fold**.

Both economic theory and the mirror-like nature of the data indicate that **the decrease in enforcement is likely the primary cause of the increase in reckless speeding**.



Finding and Next Steps

- Finding:

- The hypothesis that lower enforcement has increased speeds which have increased fatalities is supported by the data, and the answer to the question “What is the **primary cause of the 34% increase in fatalities** over the 2015-2022 period?” is apparently the **drop in speed enforcement**.

- Next Steps:

- When this analysis was presented to the HRTPO board May 16, 2024, board members discussed increasing in the ability of localities to use **speed cameras**.