C19 Mobility and Health

Investigating COVID-19 data trends in North Carolina

Preliminary Trends in NC Crash Data During the COVID-19 Pandemic

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January 8, 2021

www.C19MobilityAndHealth.unc.edu

- Part of a study on *COVID-19 Mobility & Health Impacts in NC* funded by the NC Collaboratory at UNC

- Overall Study Motivation
  - Investigate the interrelationships amongst public health policies, mobility changes, traffic safety, and the transmission and impacts of COVID-19.
  - Inform policy decisions in North Carolina, specifically if there is resurgence of infections due to cyclical outbreaks throughout the year.
  - Support the development of expertise, provide foundational research, and build data infrastructure at UNC-CH for mobility research involving future respiratory and other infectious disease pandemics.

NC Mobility Trends

Mobility Data Sources (Jan 1- Sept 30, 2019/2020)

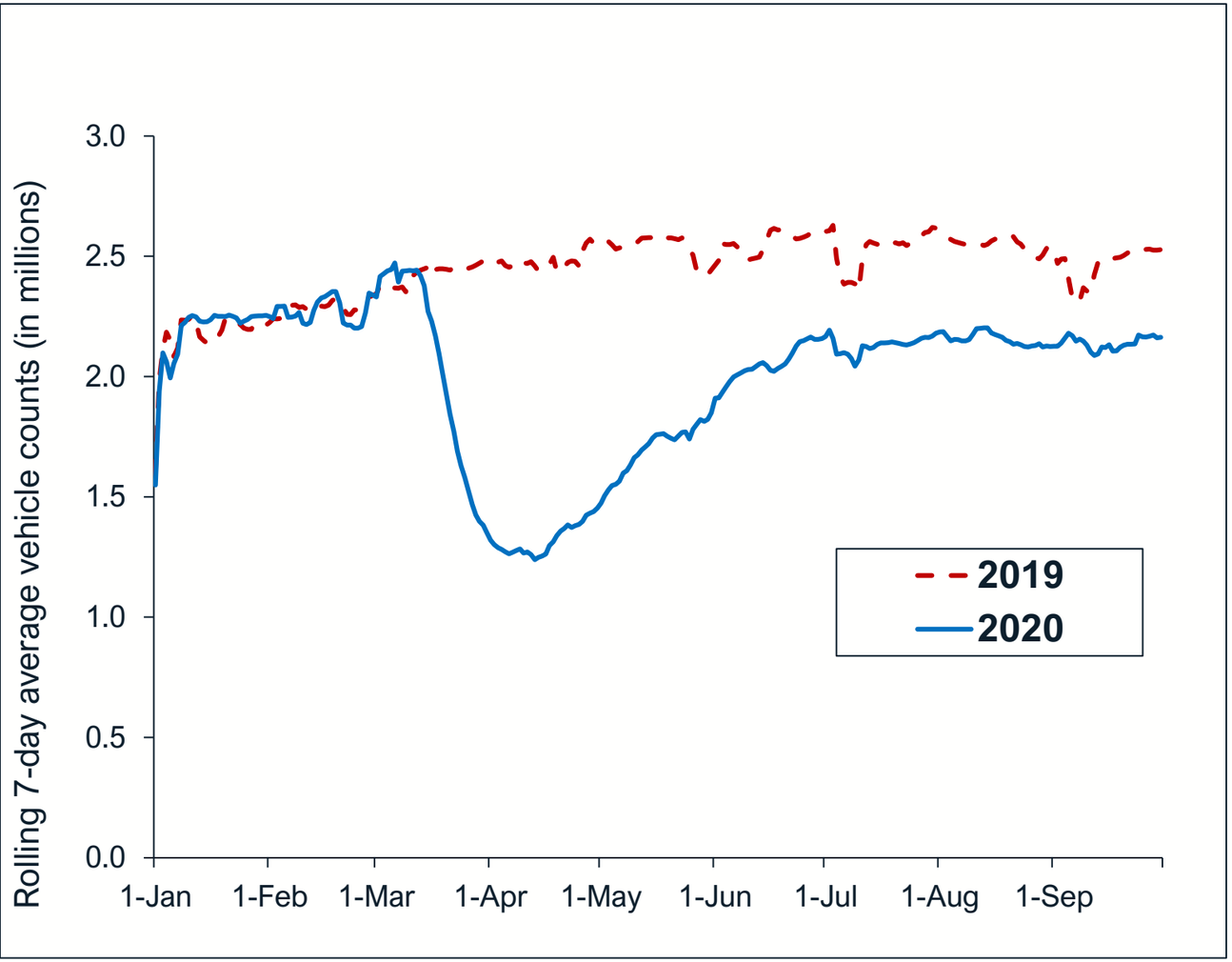
Data Format	Data Type	Data Source	Scope	Time Scale	Unit
Vehicle Count-Based	ATR Count Station Data	NCDOT	State-owned highways (in ~ 58 counties)	Daily Aggregate (collected hourly)	Vehicles per day
	VMT	NCDOT	Statewide (all counties)	Monthly (estimated)	Vehicle miles of travel
Cell Phone-Based	Mobility Index	Cuebiq	Statewide (all counties)	Daily	Unitless (logarithmic measure of median distance traveled)
	Contact Index	Cuebiq	Statewide (all counties)	Daily	Unitless (ratio of users with installed app to other cell phones within 50 feet)
	VMT	Streetlight	Statewide (all counties)	Daily & monthly	Vehicle miles of travel

Important Dates: *Key Executive Orders*

Implementation Date	Effect
March 10th, 2020	Declares a State of Emergency
March 14th, 2020	Closes K-12 public schools statewide
March 17th, 2020	Closes restaurants and bars for dine-in services
March 23rd, 2020	Closes K-12 public schools statewide through May 15th and bans mass gatherings of more than 50 people
March 27th, 2020	Issues statewide Stay-at-Home-Order
April 23rd, 2020	Extends until May 8th the Stay-at-Home-Order
May 5th, 2020	Eases some restrictions on travel, business operations, and mass gatherings
May 20th, 2020	Lifts the statewide Stay-at-Home-Order and implements a Safer at Home recommendation (Phase 2)
June 24th, 2020	Extends the Safer at Home restrictions and requires mask wearing
September 1st, 2020	Implements Safer at Home Phase 2.5
September 30th, 2020	Revises restrictions and implements Phase 3

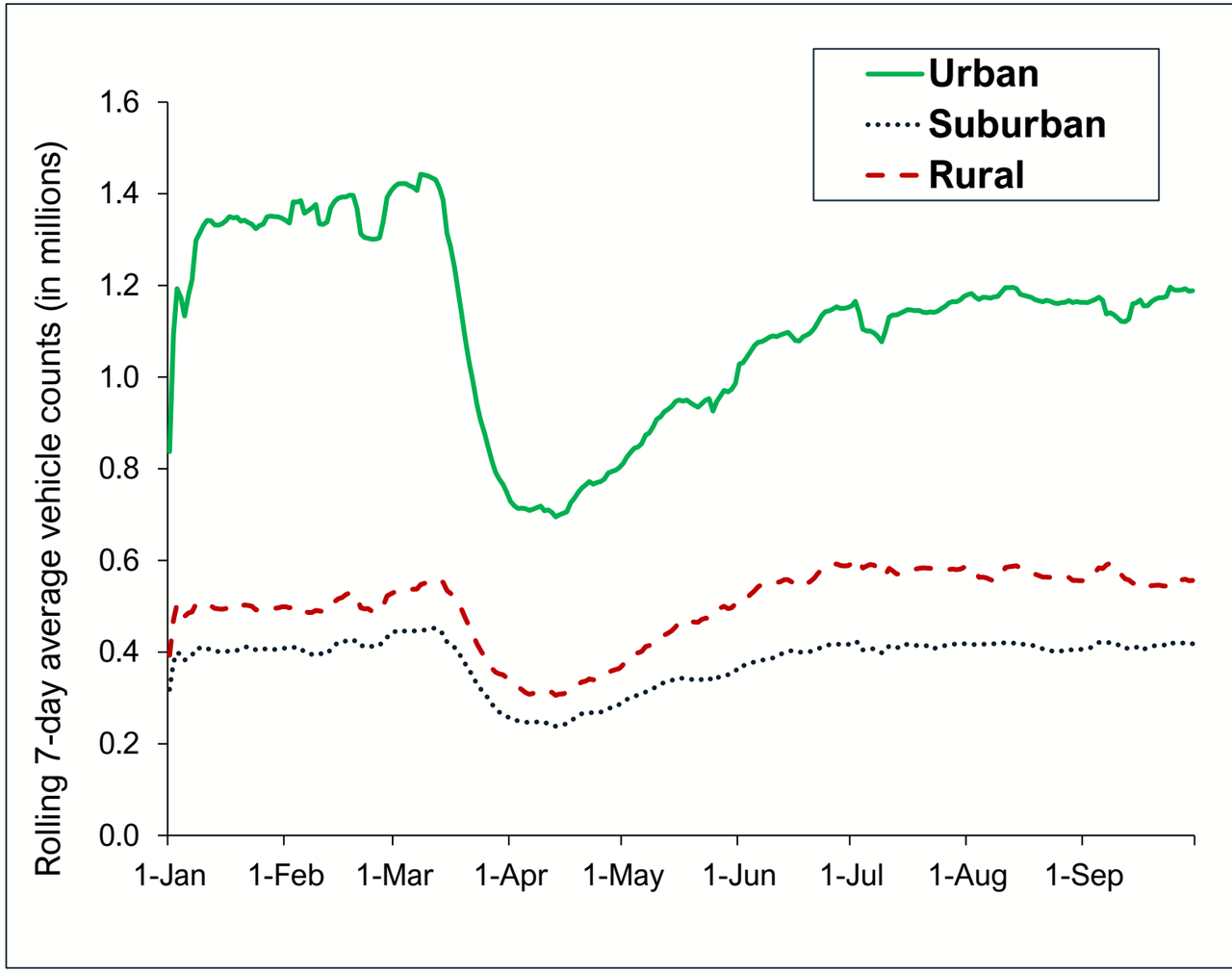
Statewide ATR Trends, 2019-2020

All counties - raw vehicle counts



ATR Trends by Area Type, 2020

Counties stratified by rurality-raw vehicle counts

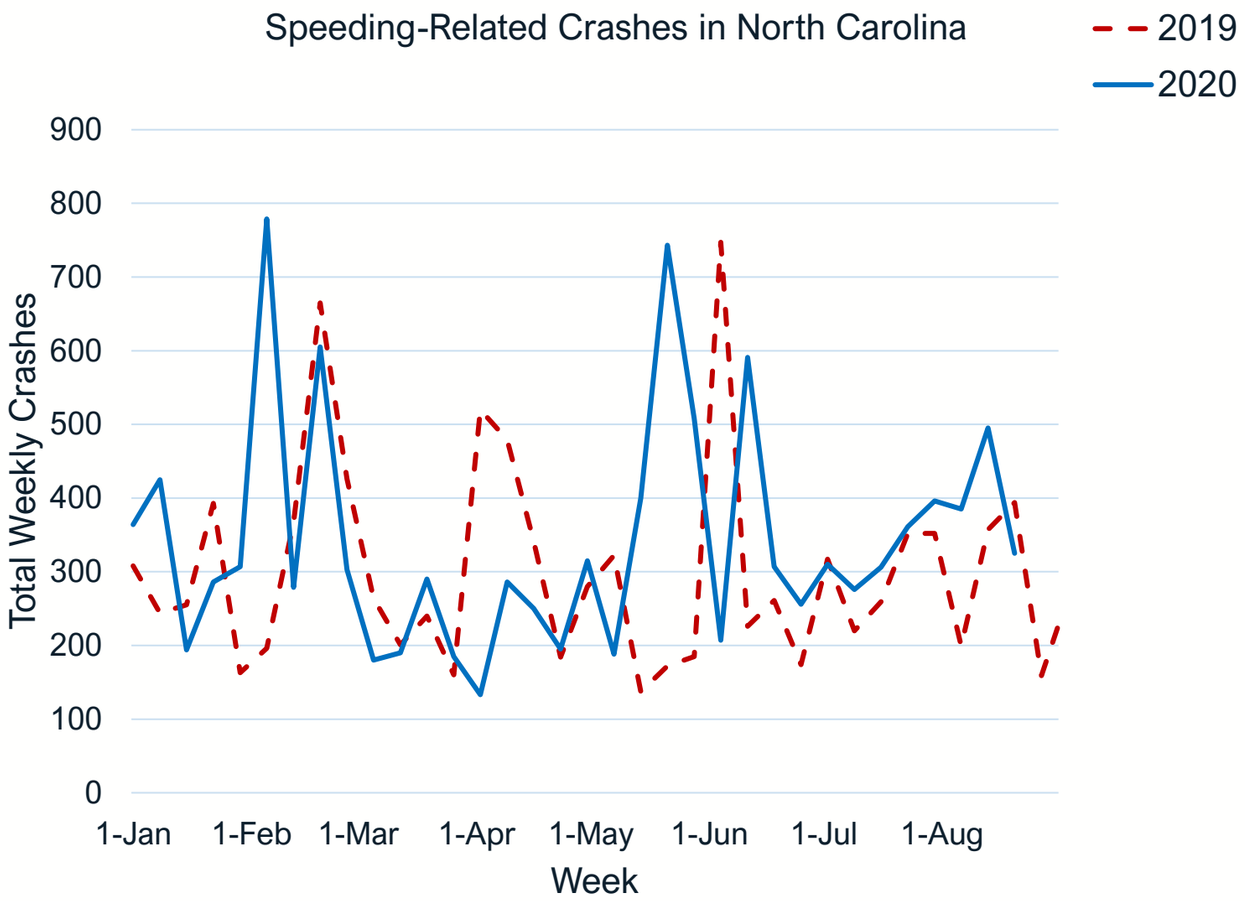


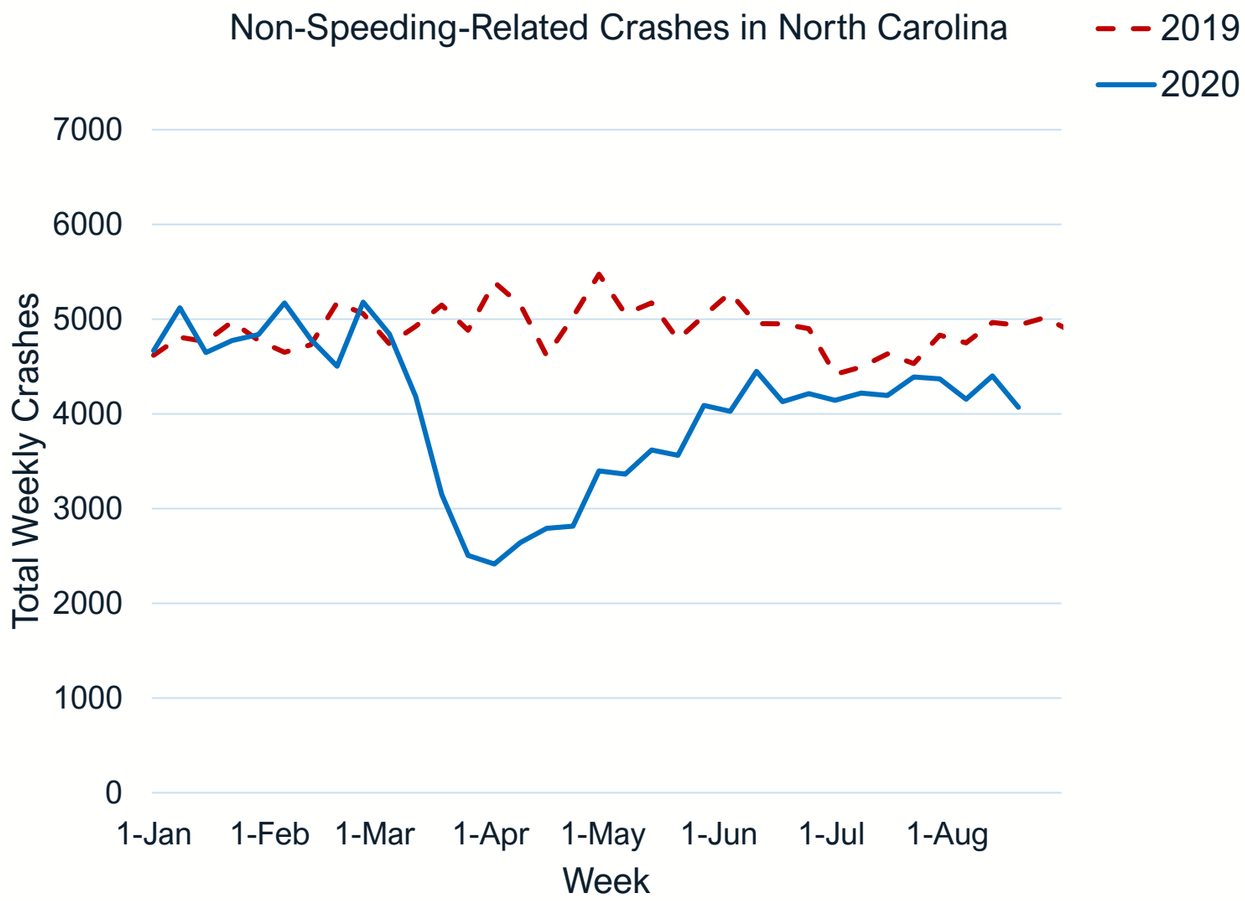
NC Crash Safety Trends
(Preliminary Analysis of Speeding-Related Crashes)

Speeding-Related crash definition in this analysis

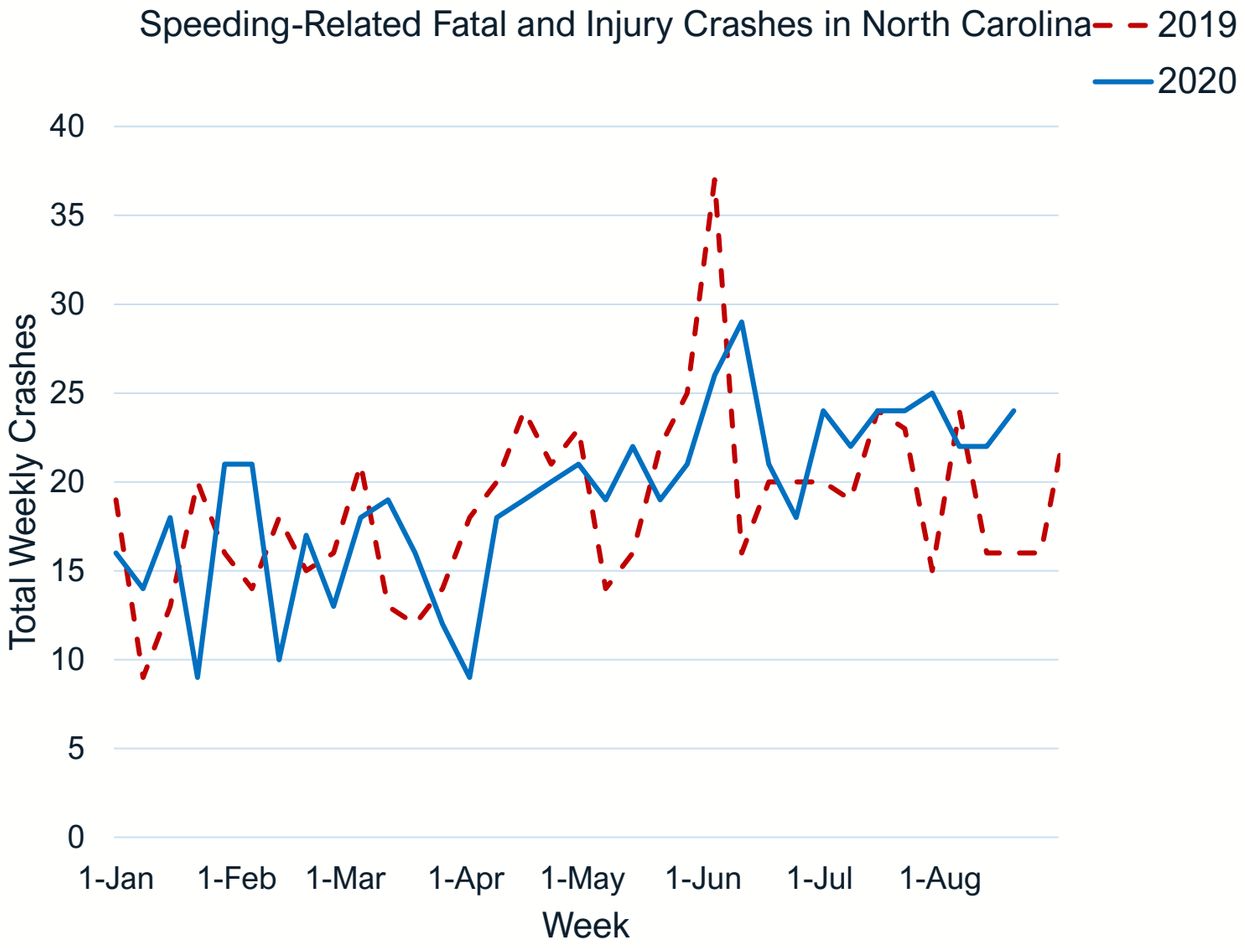
“Exceeded Safe Speed For Conditions“ or "Exceeded Authorized Speed Limit“ reported by the police officer reported as a contributing factor in the crash

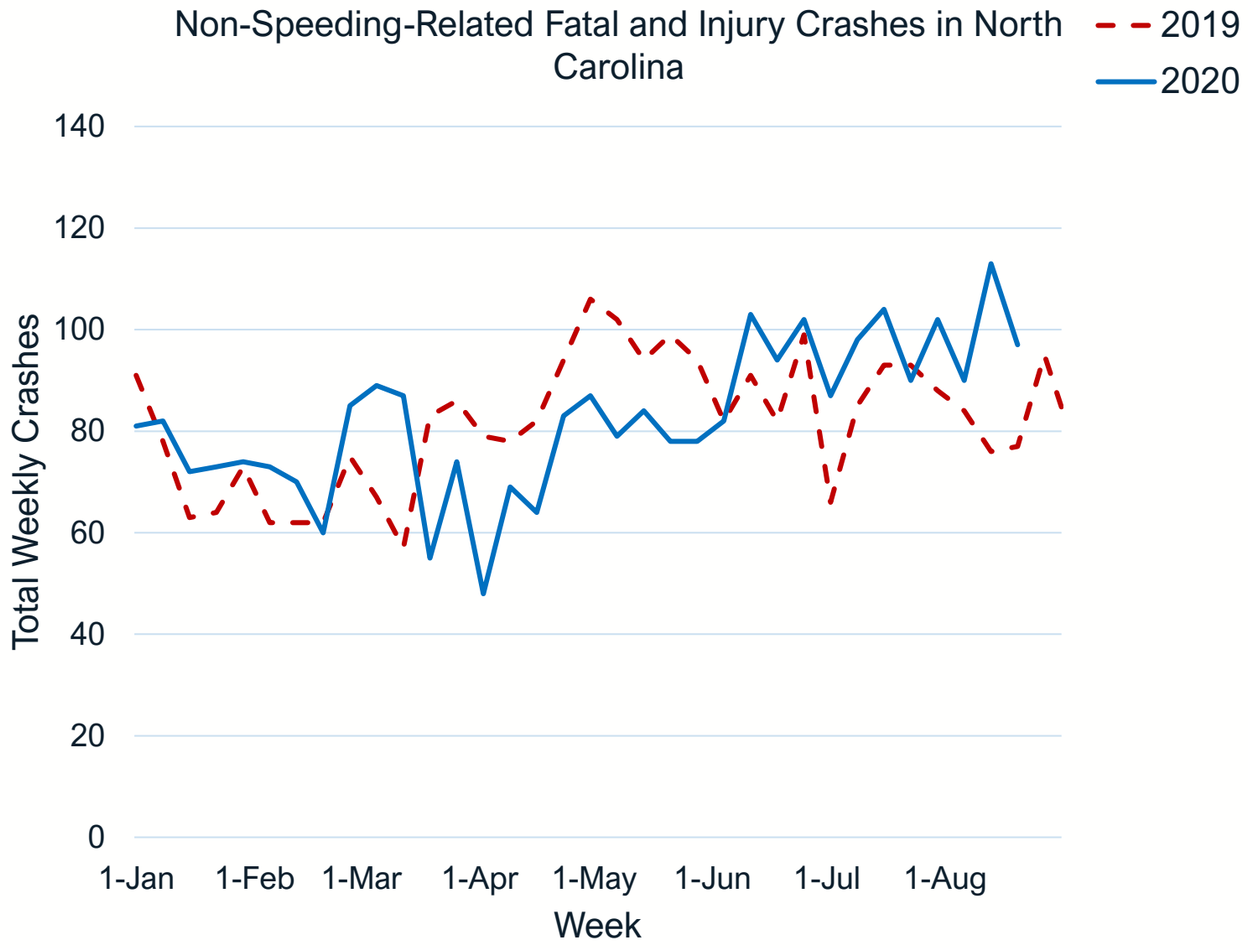
Speeding-Related Crash Trends – Total Crashes



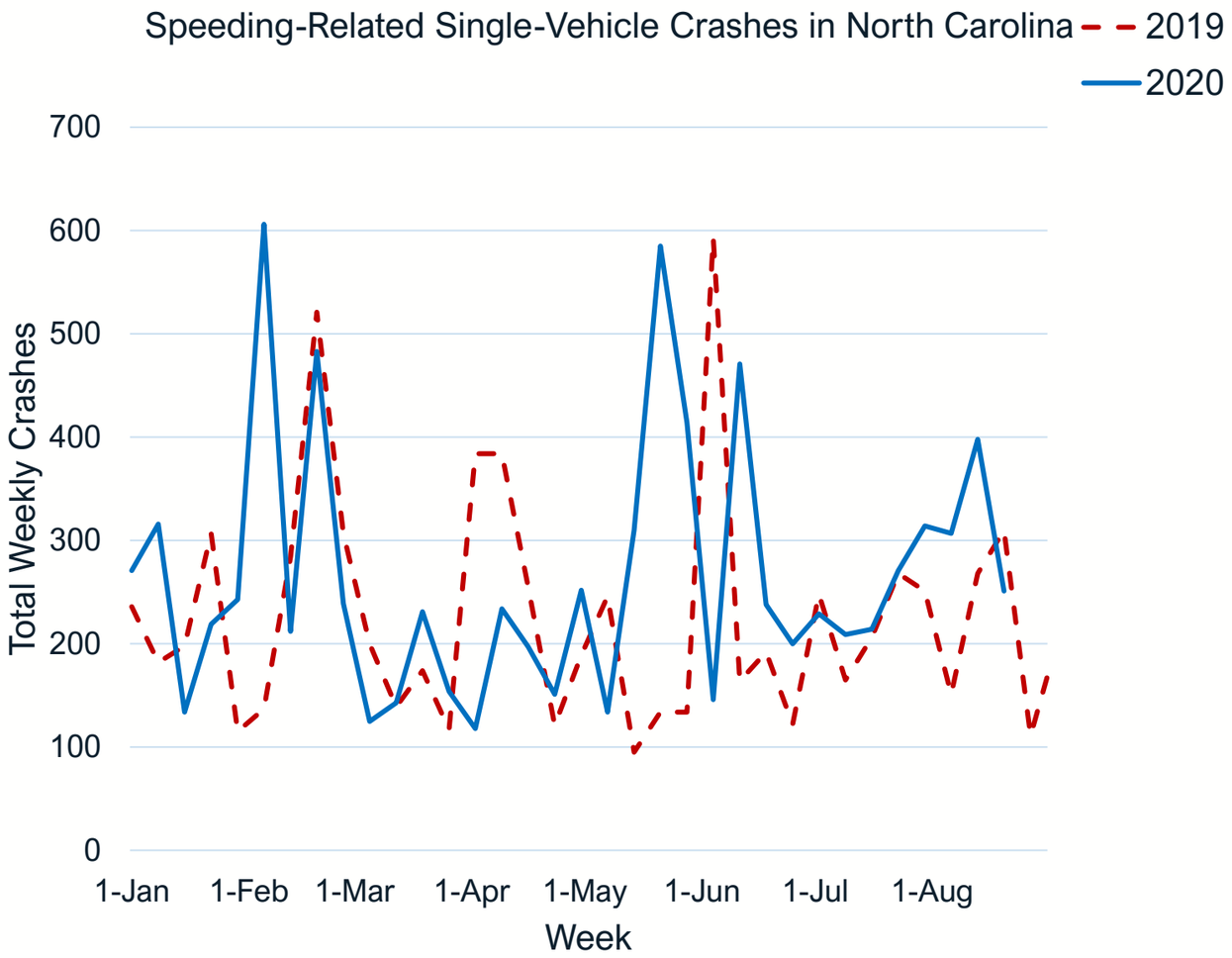


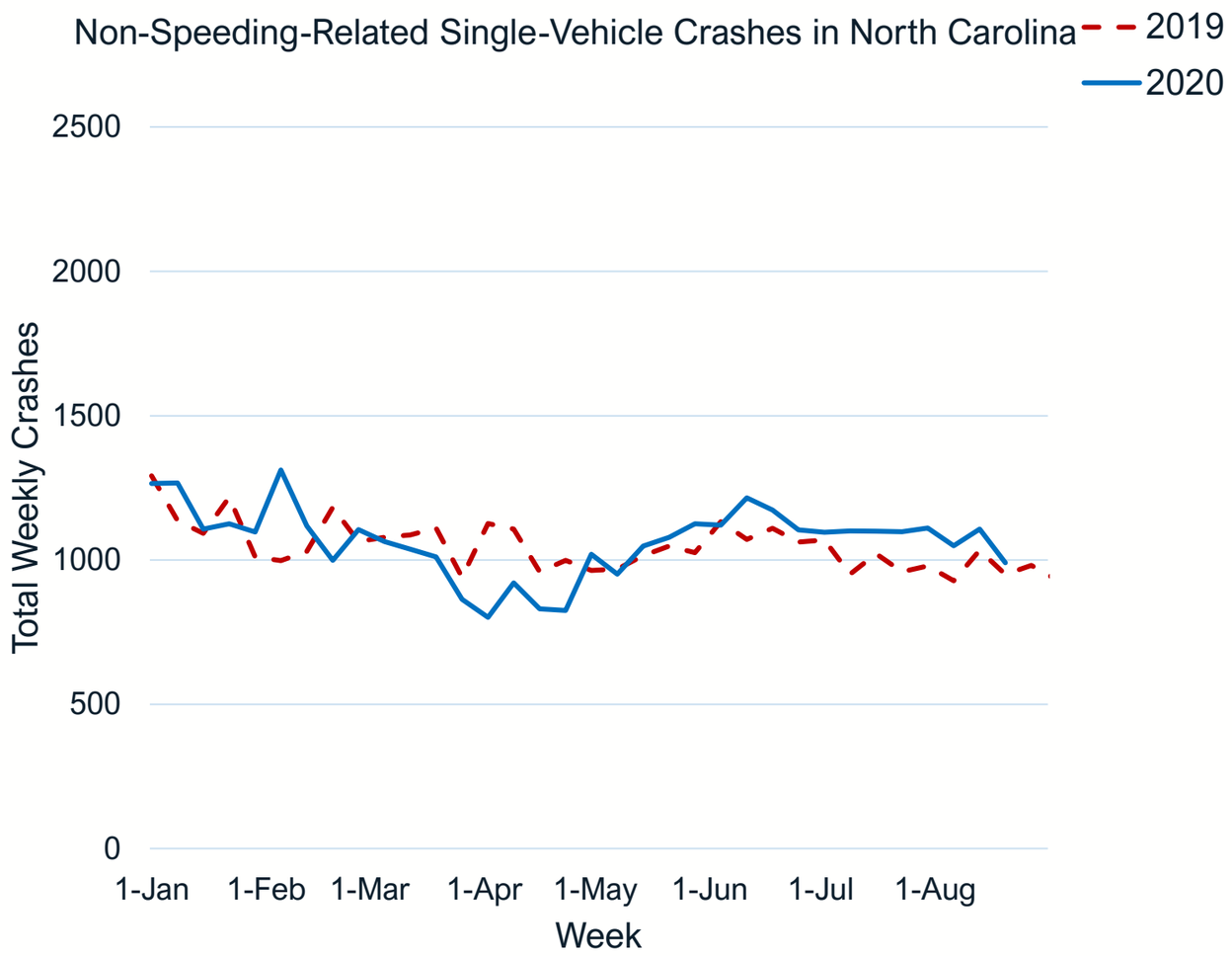
Speeding-Related Crash Trends – Fatal and Injury Crashes



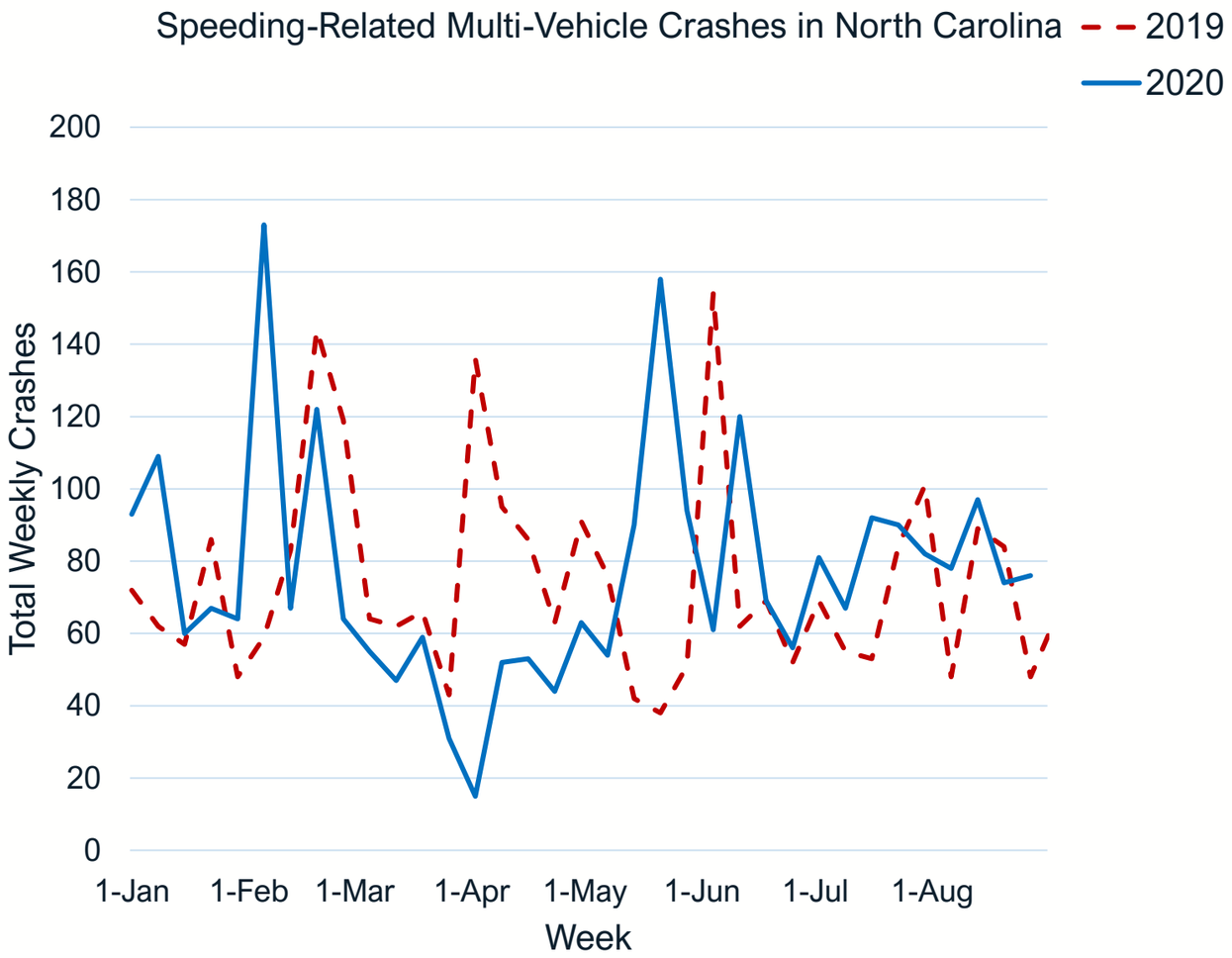


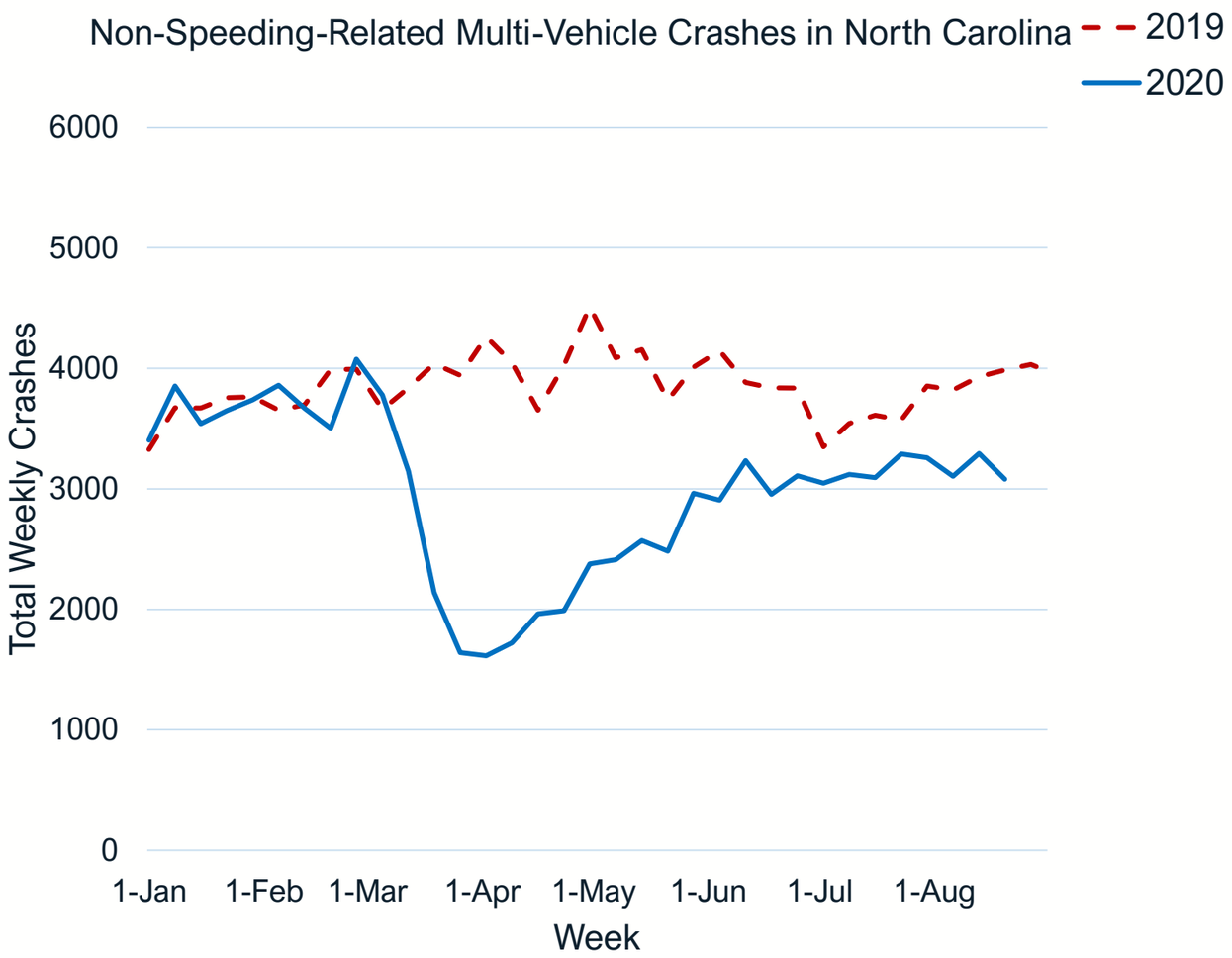
Speeding-Related Crash Trends – Single-Vehicle Crashes



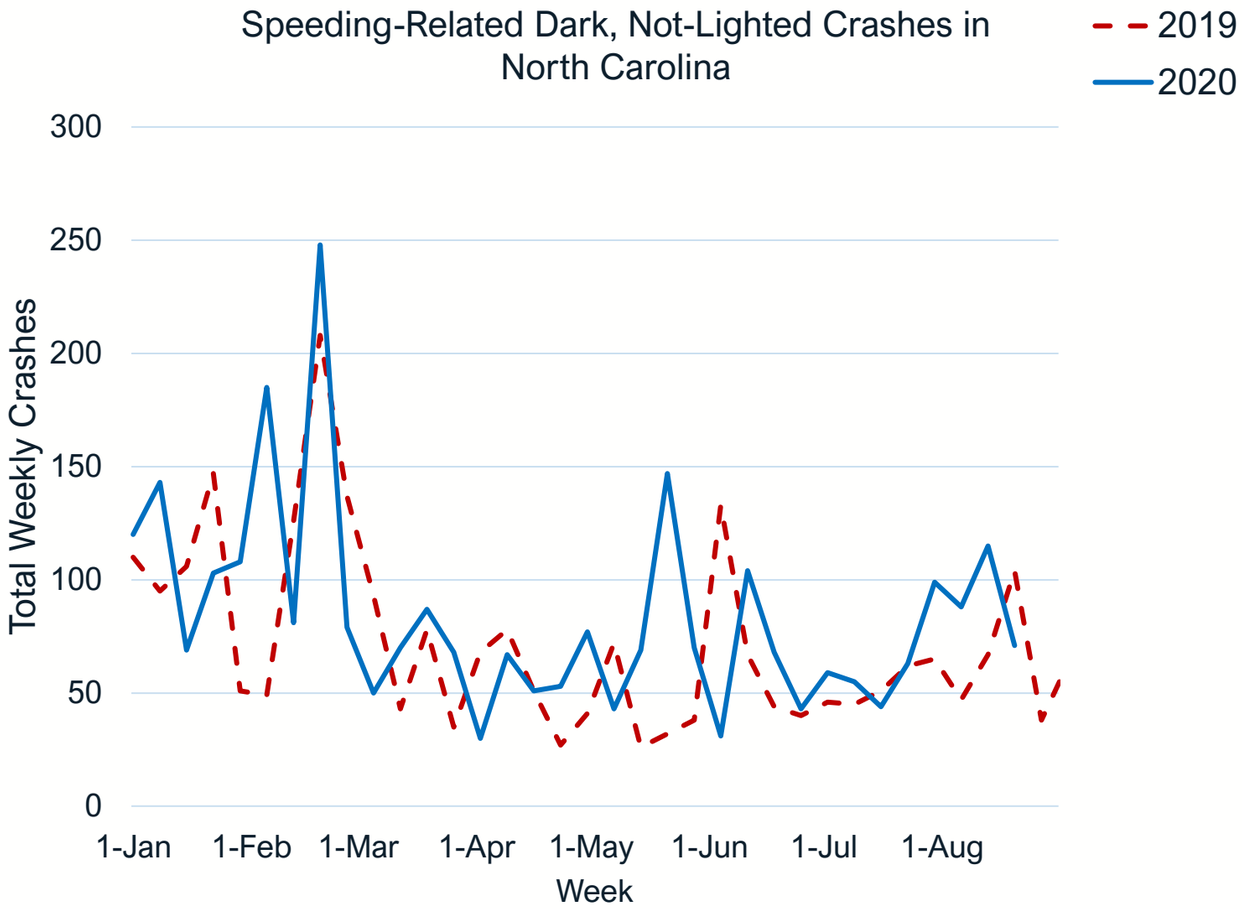


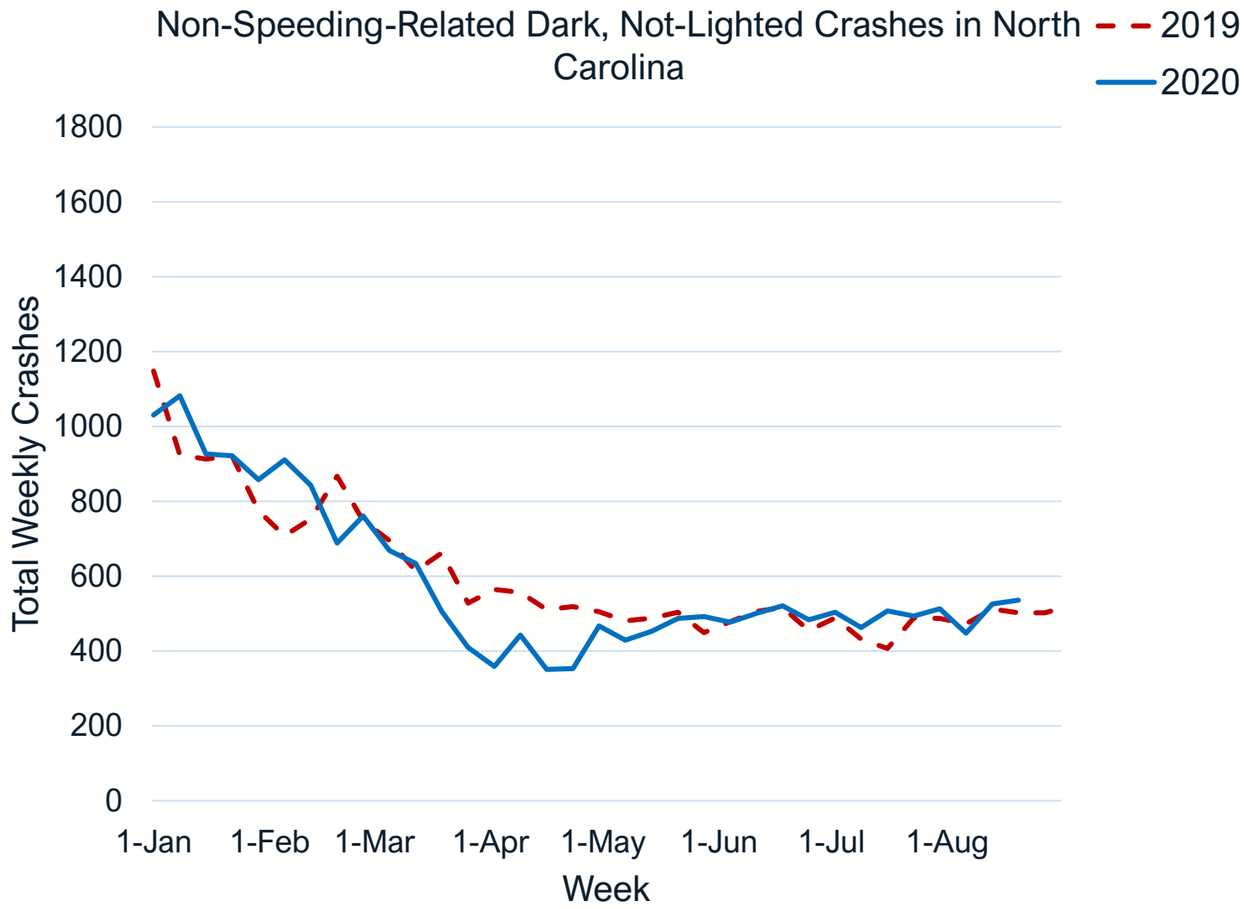
Speeding-Related Crash Trends – Multi-Vehicle Crashes



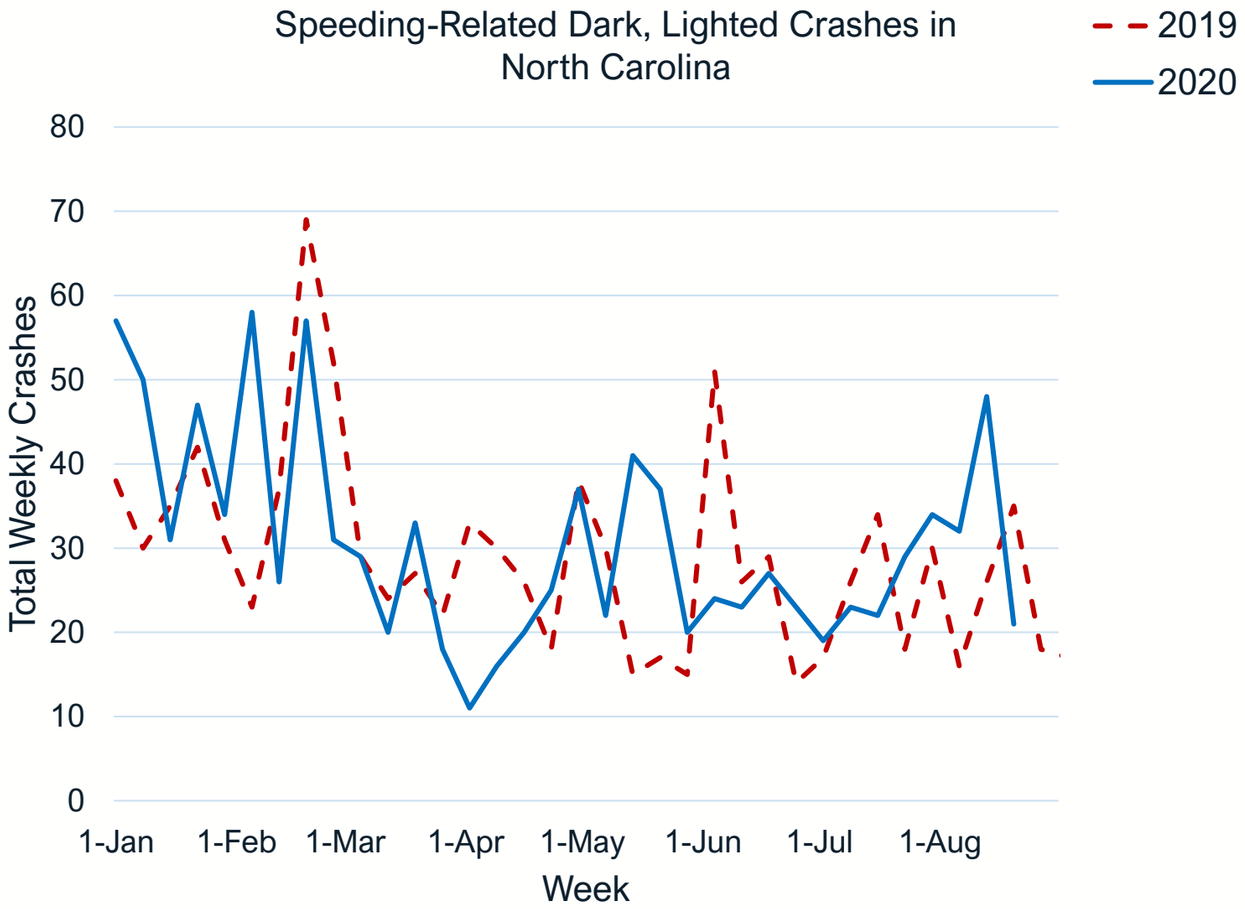


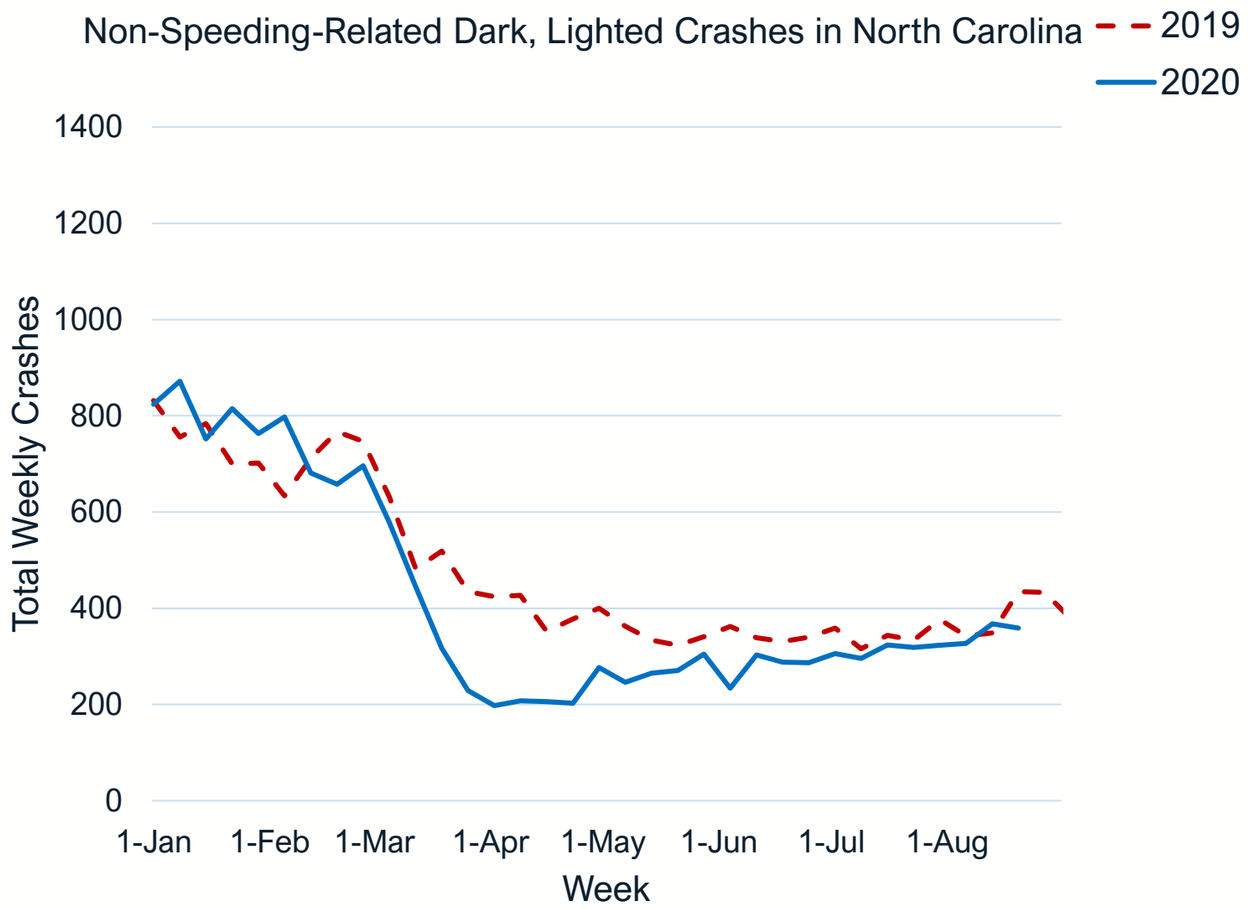
Speeding-Related Crash Trends – Dark (Not-Lighted) Crashes



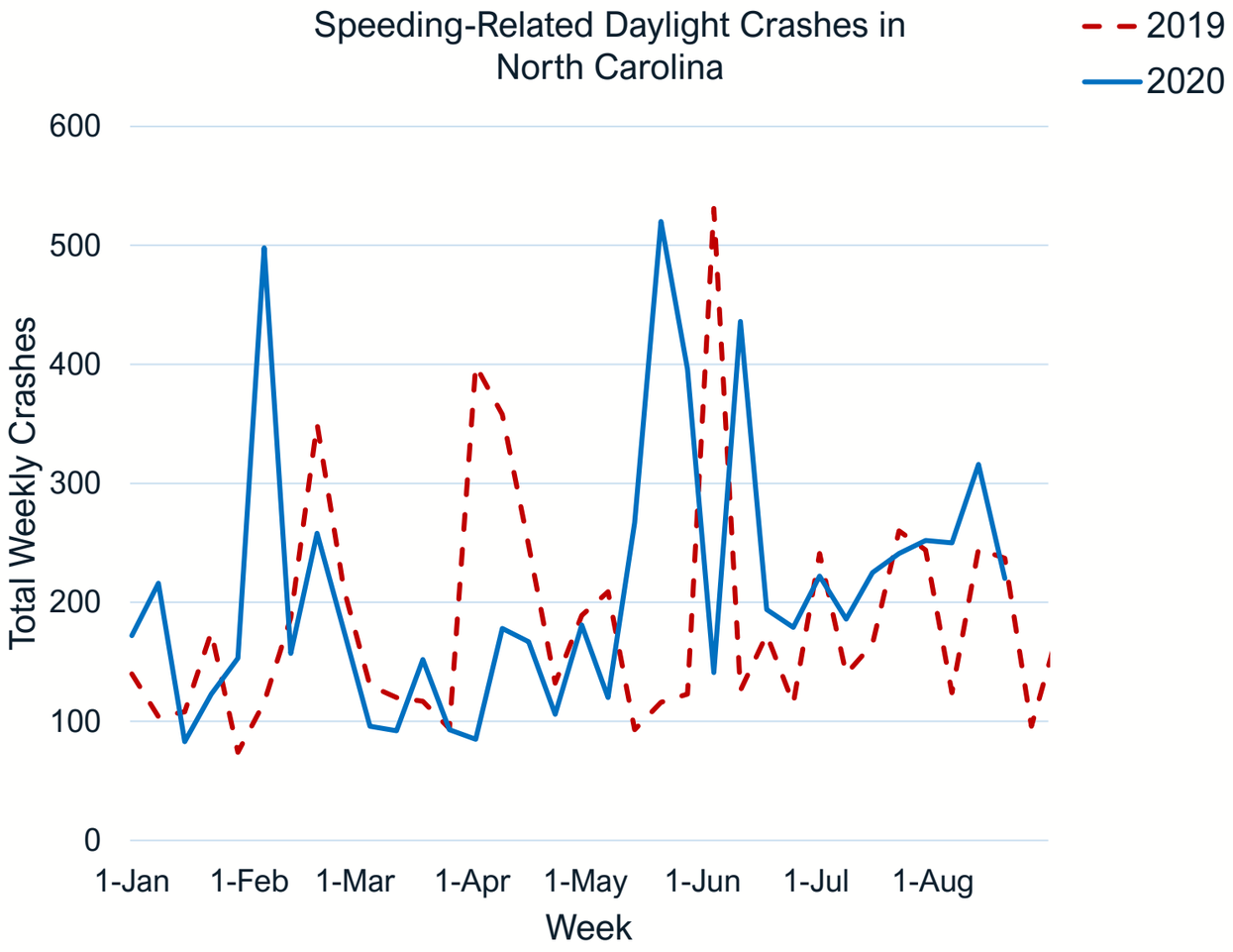


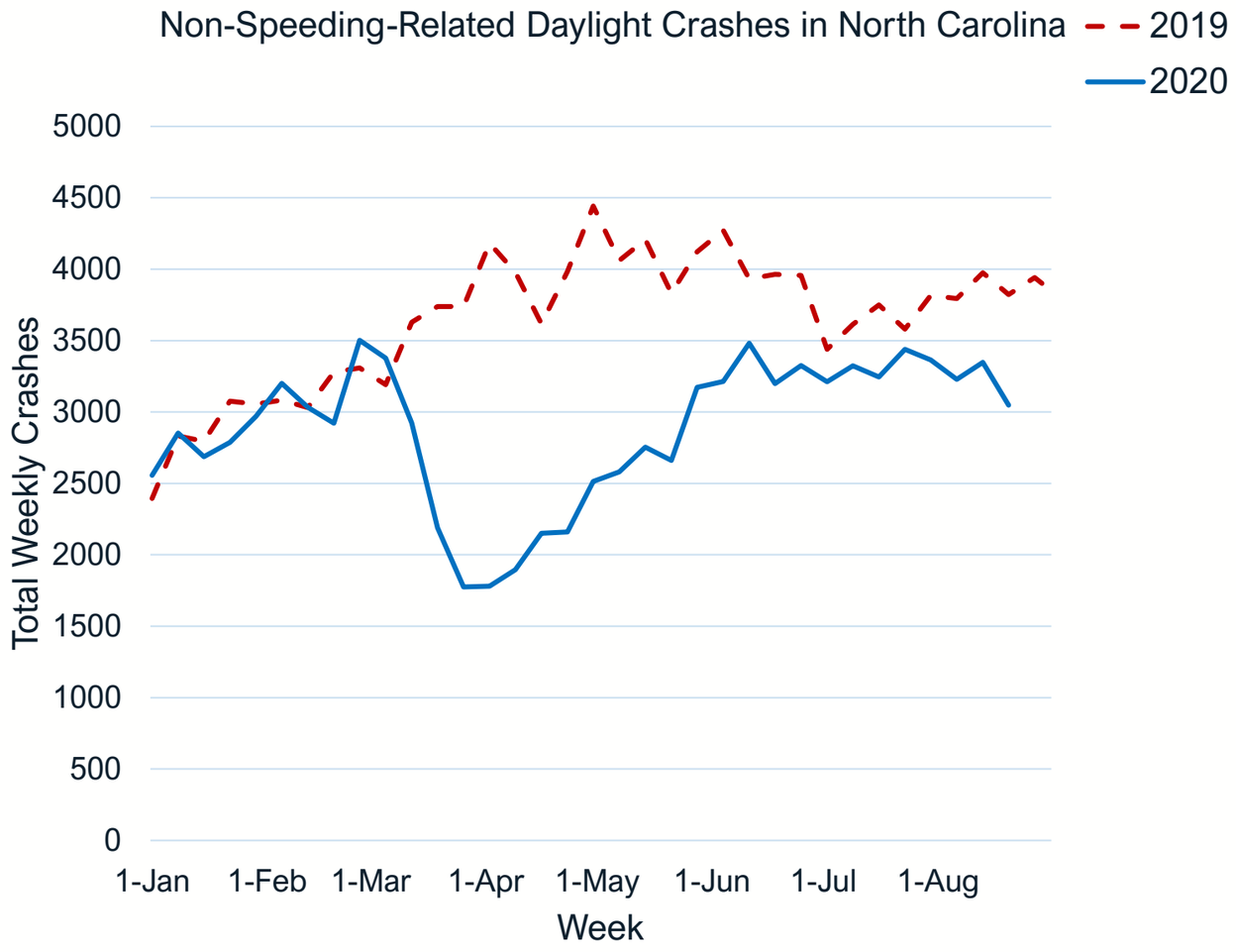
Speeding-Related Crash Trends – Dark (Lighted) Crashes



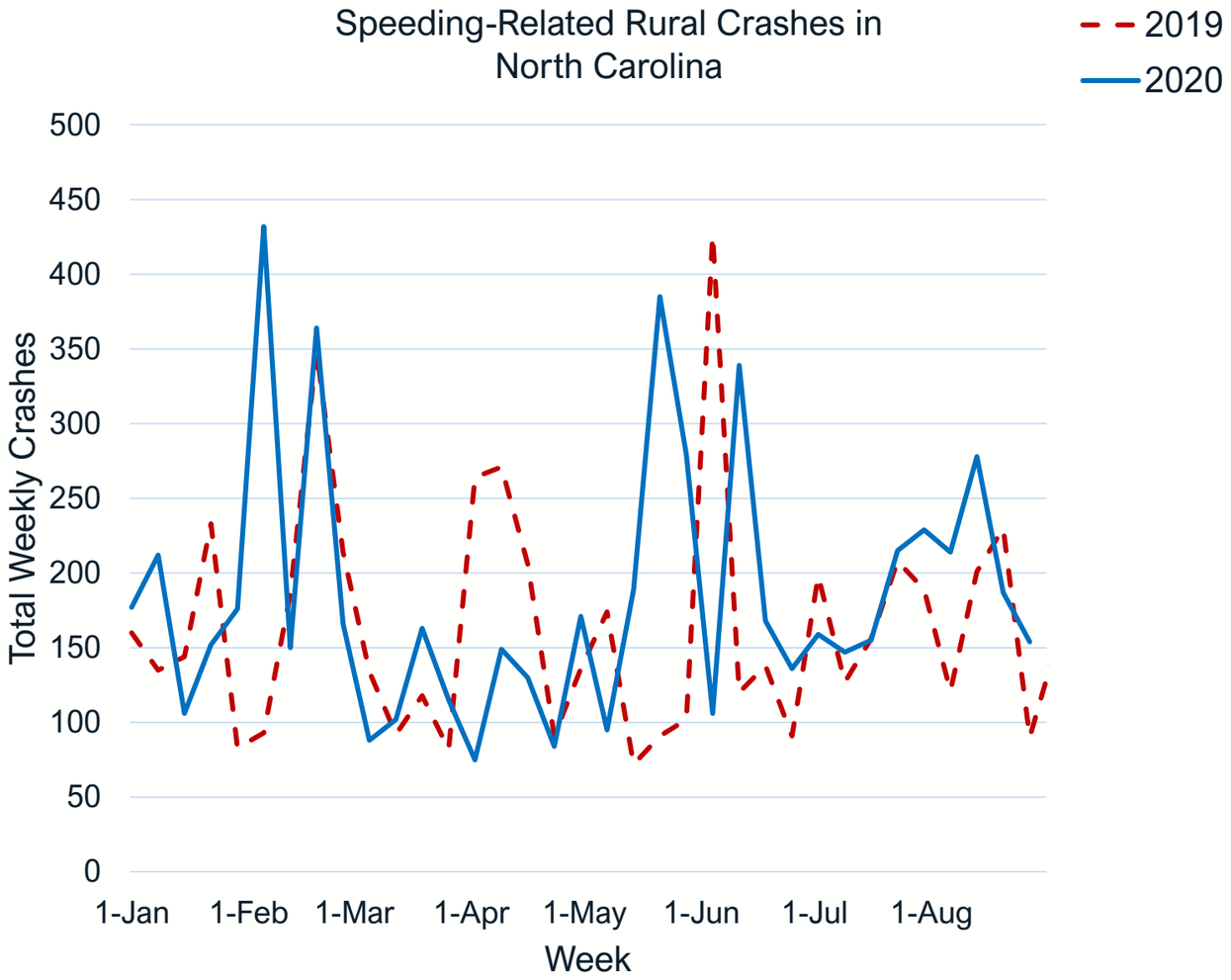


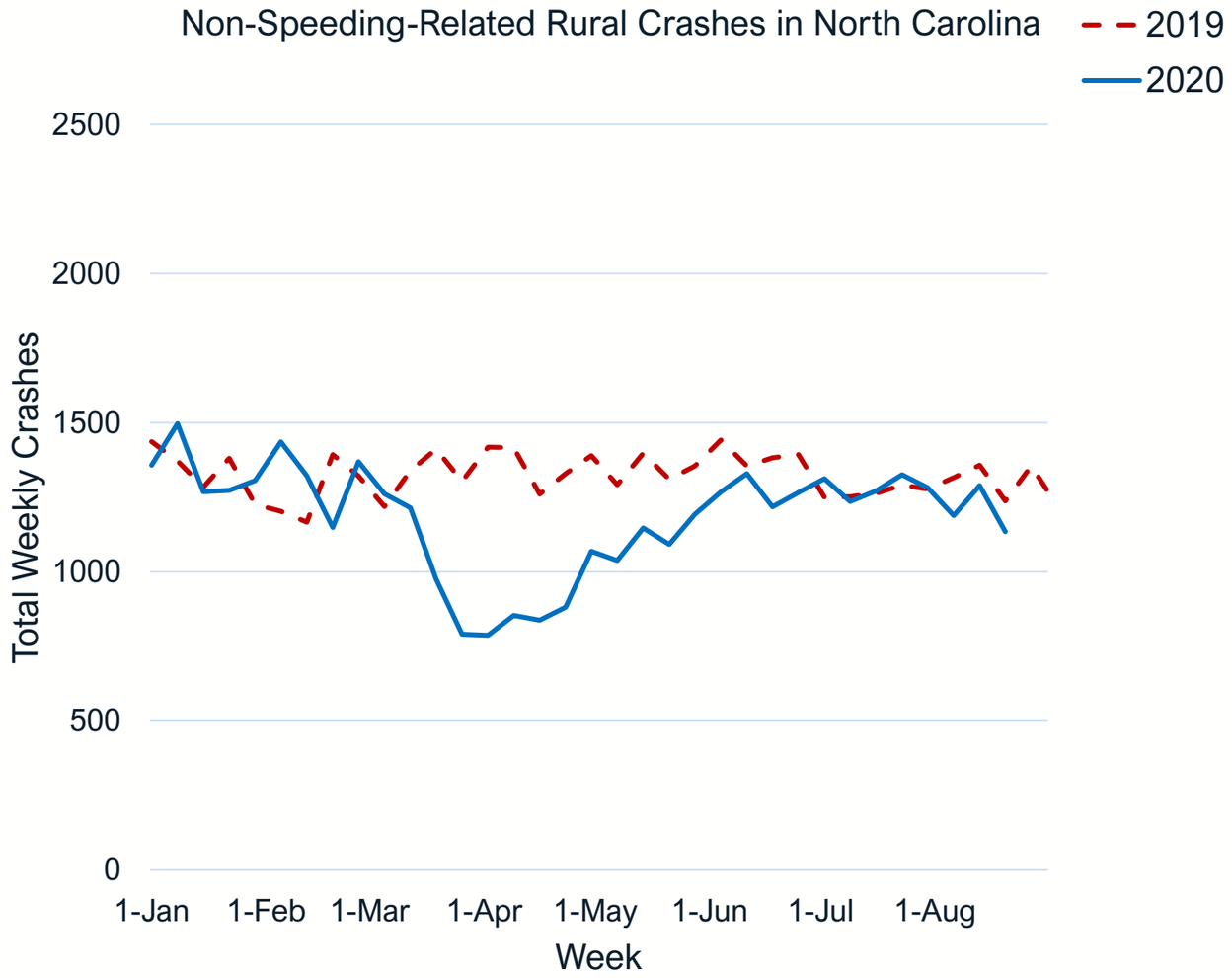
Speeding-Related Crash Trends – Daylight Crashes



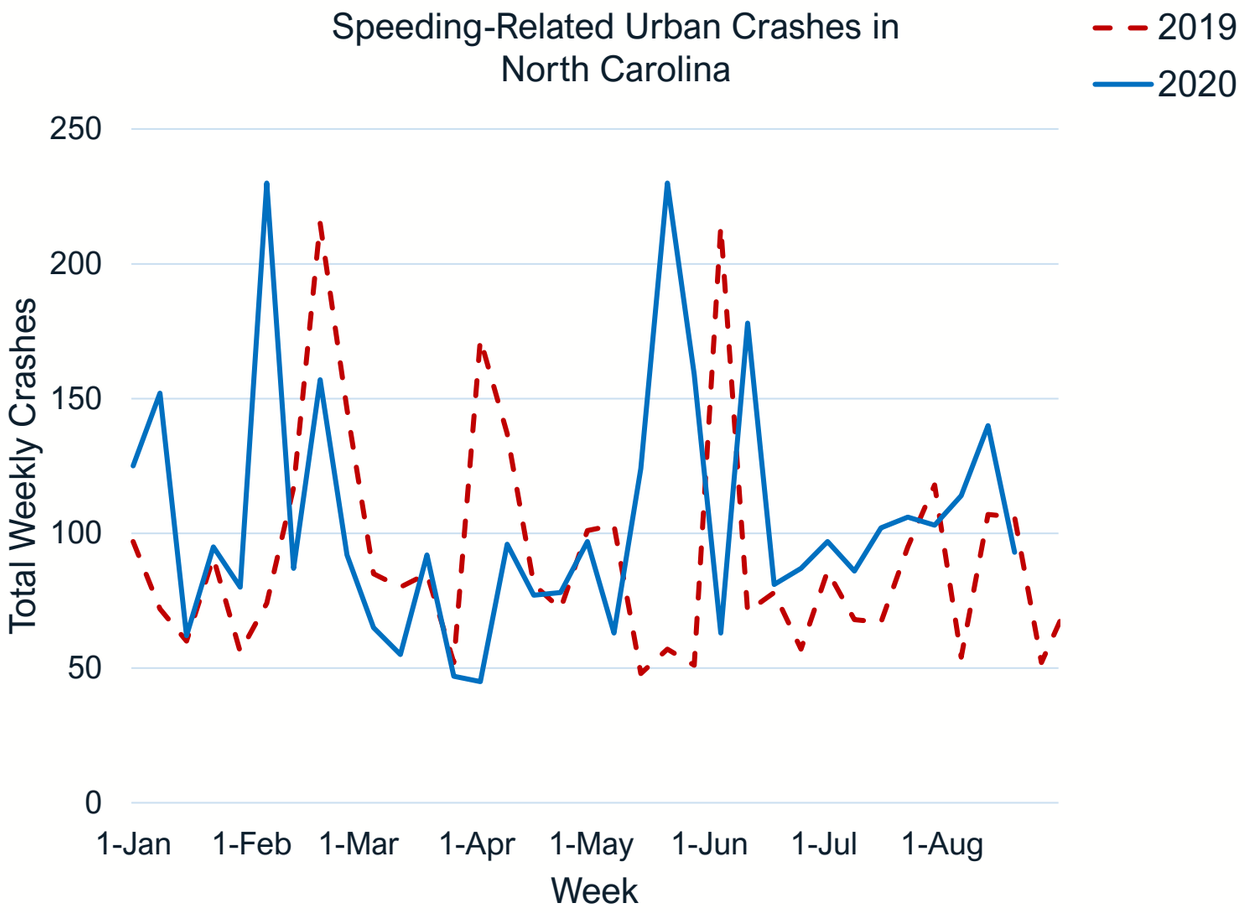


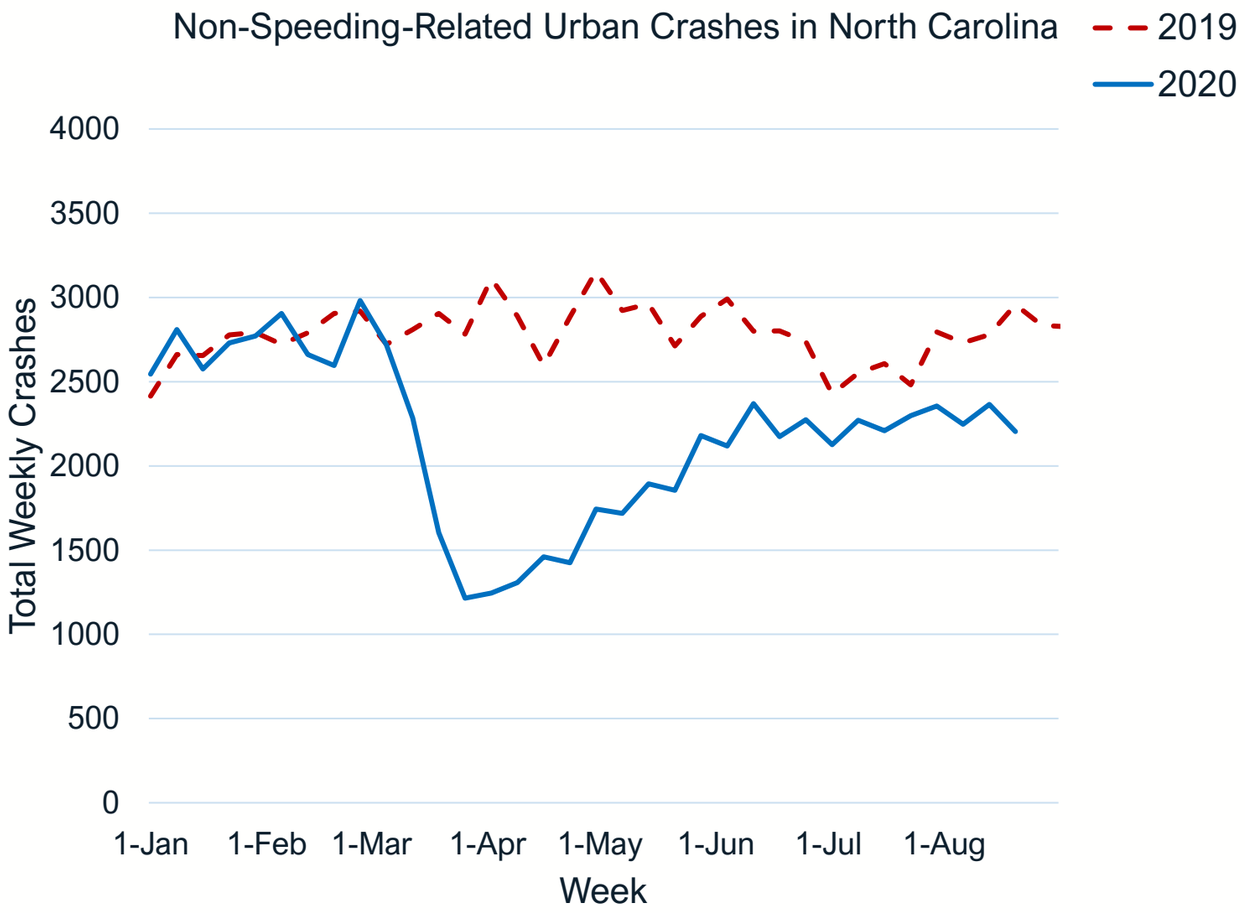
Speeding-Related Crash Trends – Rural Crashes



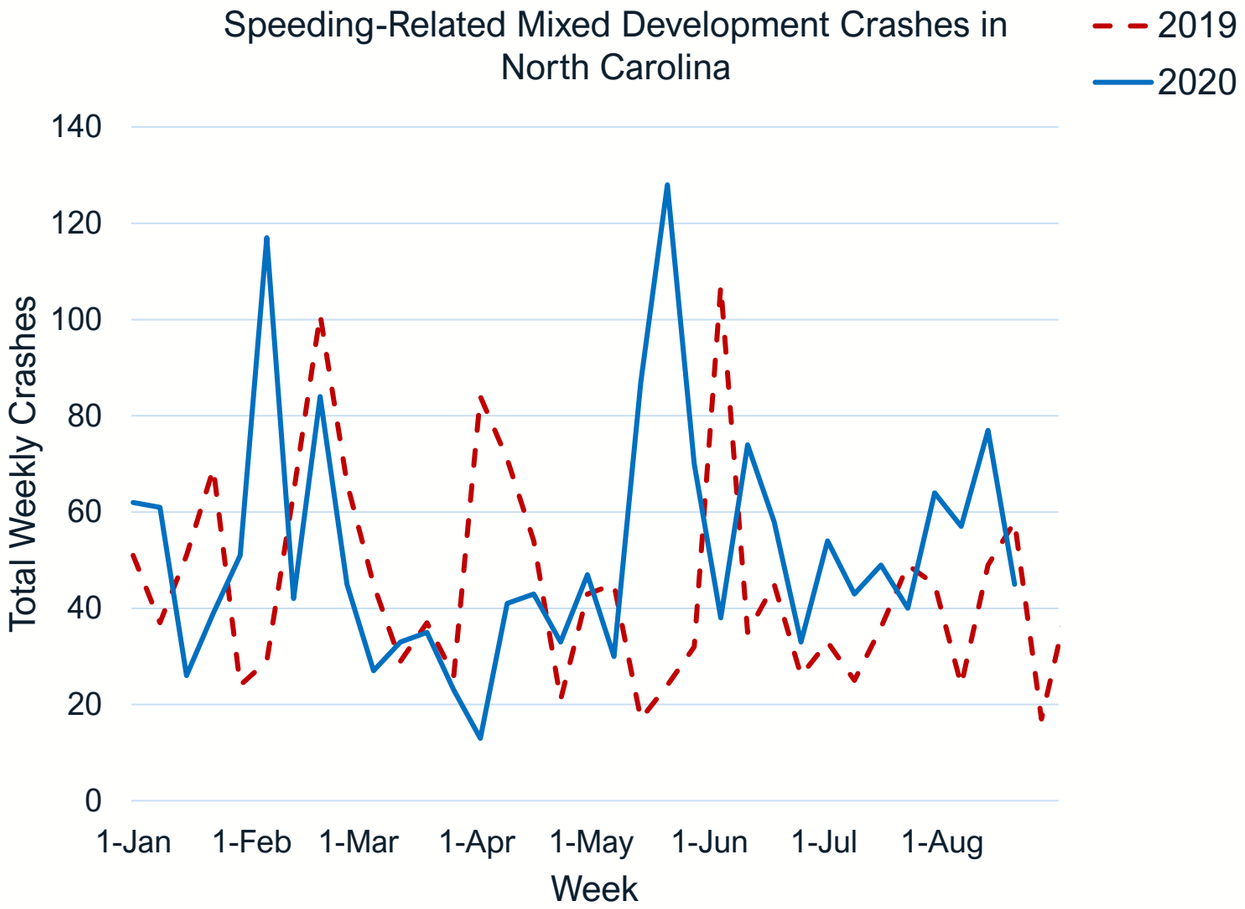


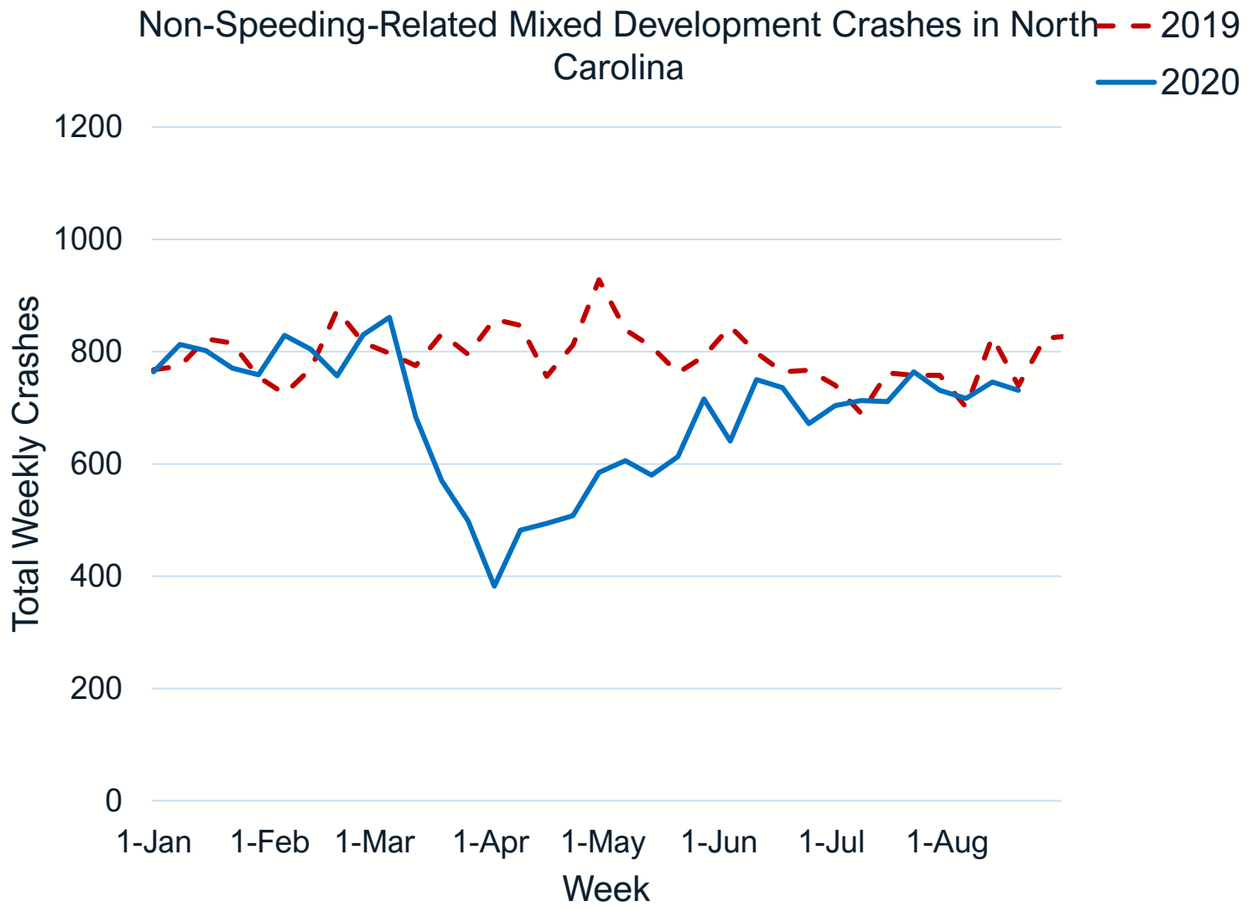
Speeding-Related Crash Trends – Urban Crashes



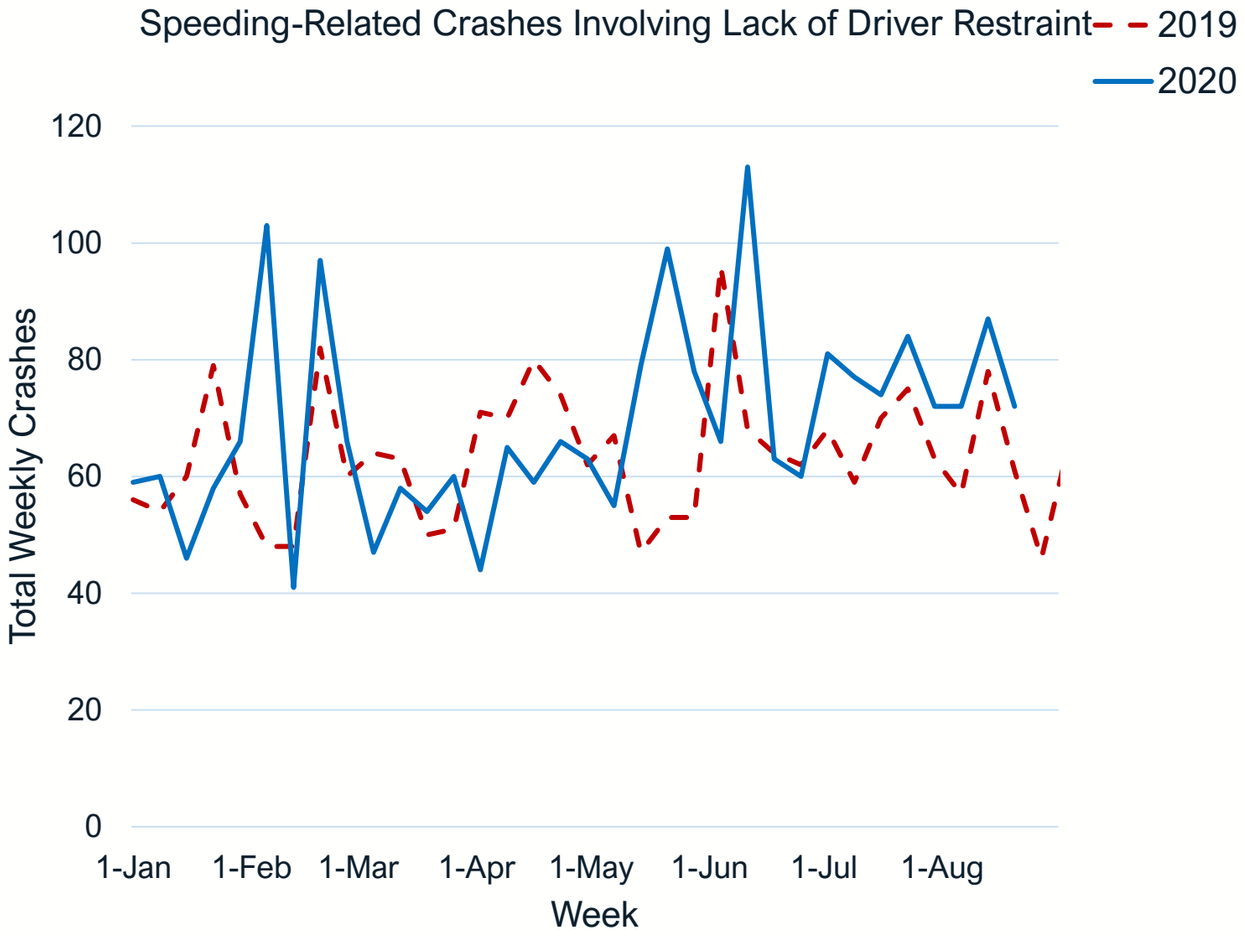


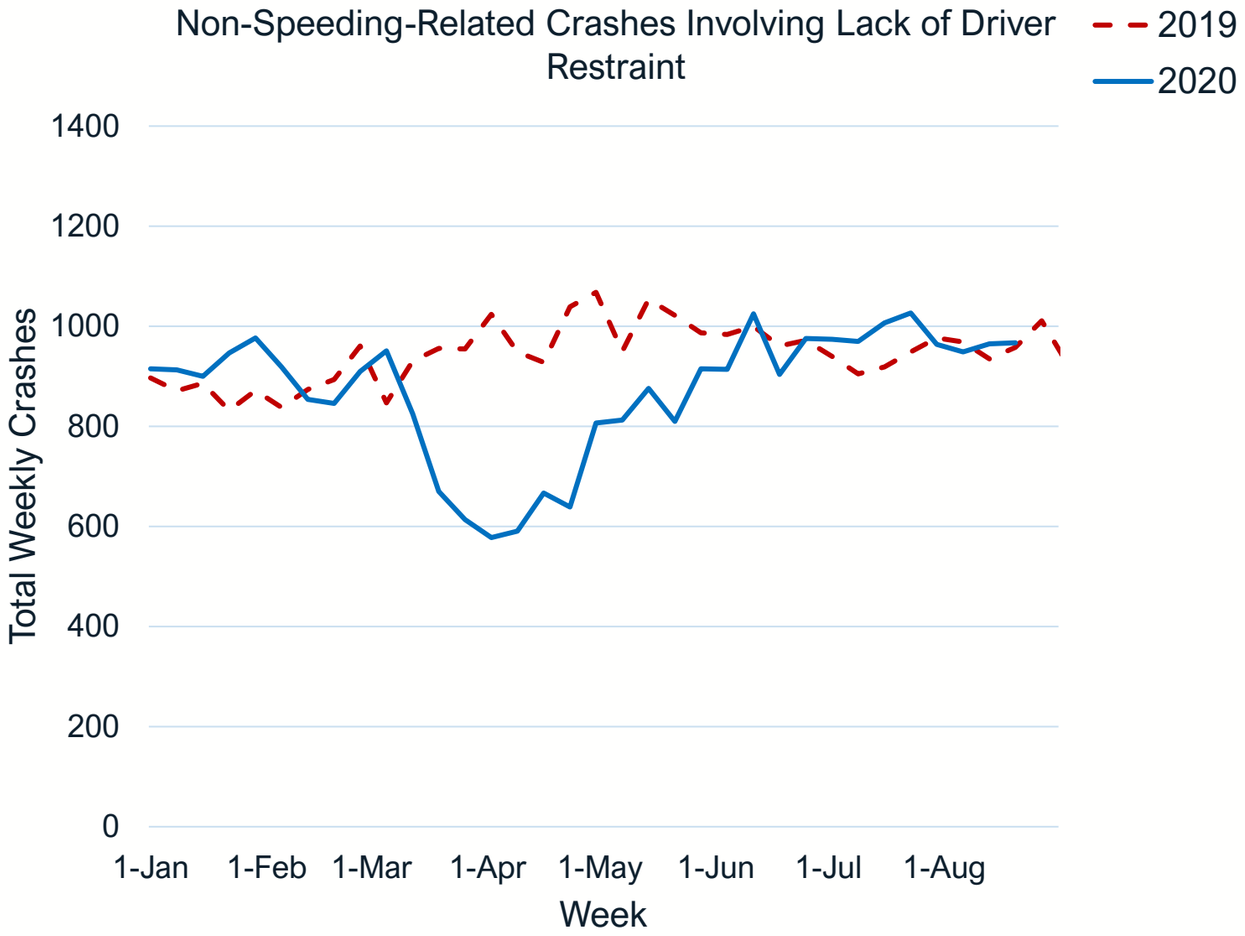
Speeding-Related Crash Trends – Mixed Development Crashes



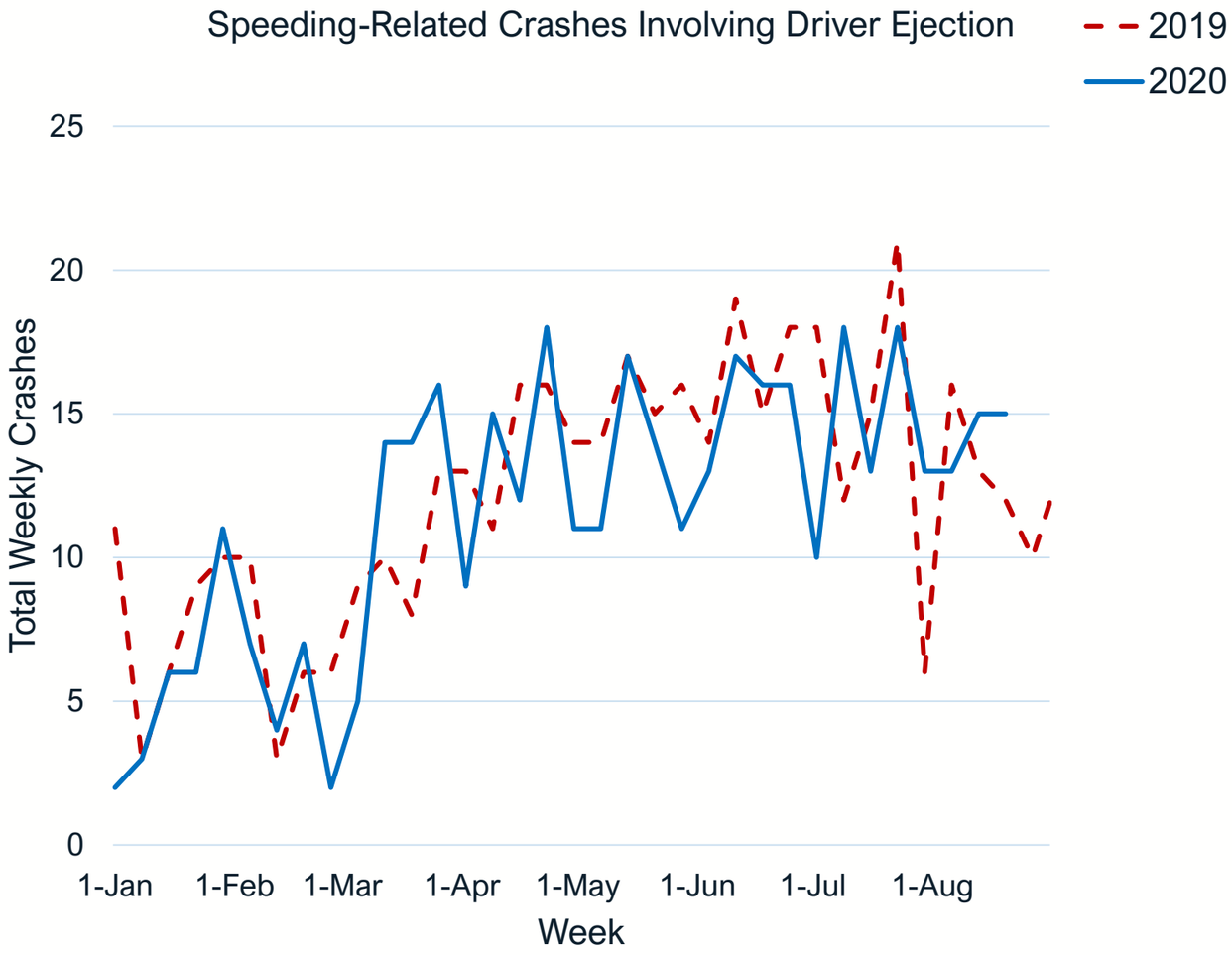


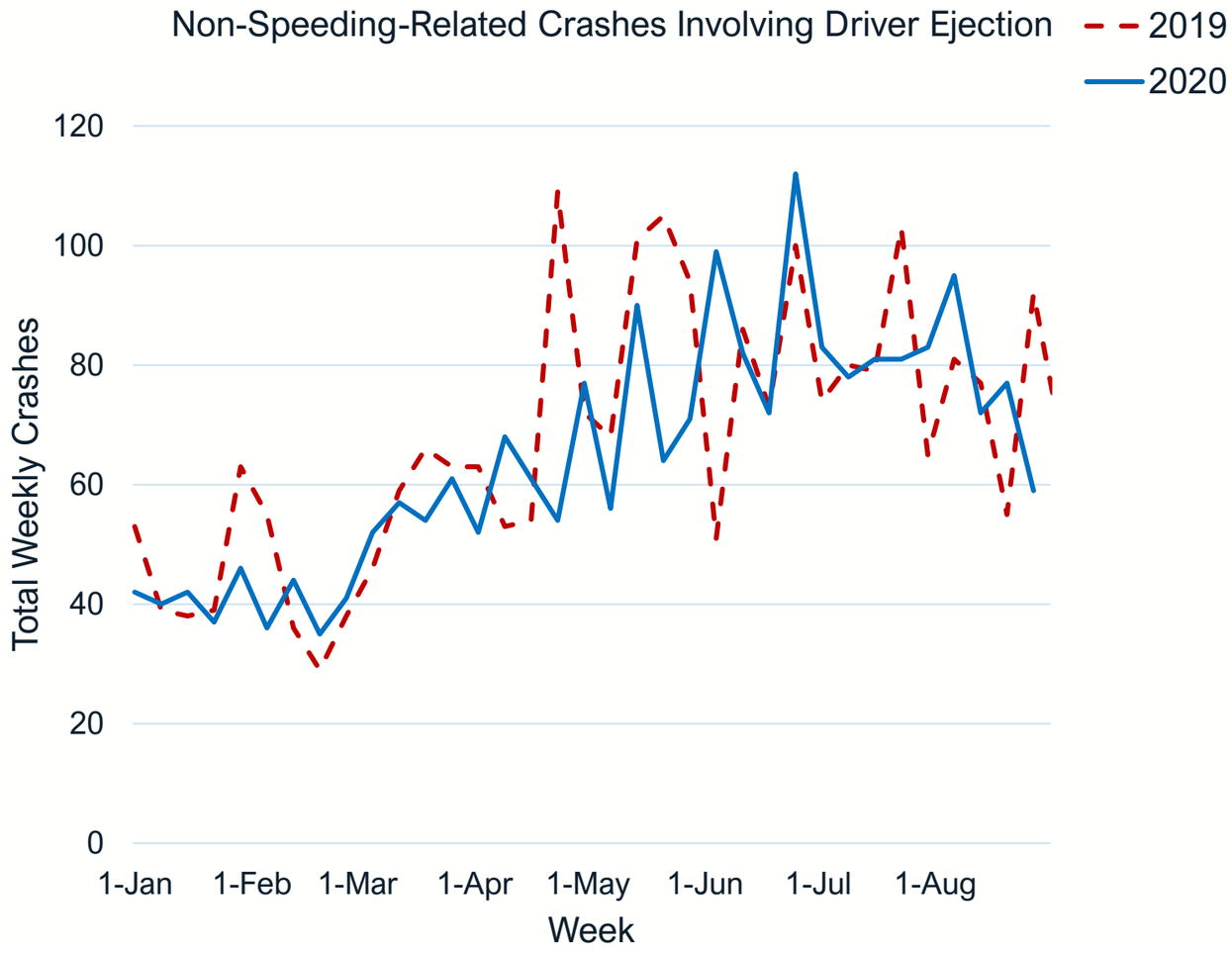
Speeding-Related Crash Trends – Driver Restraint



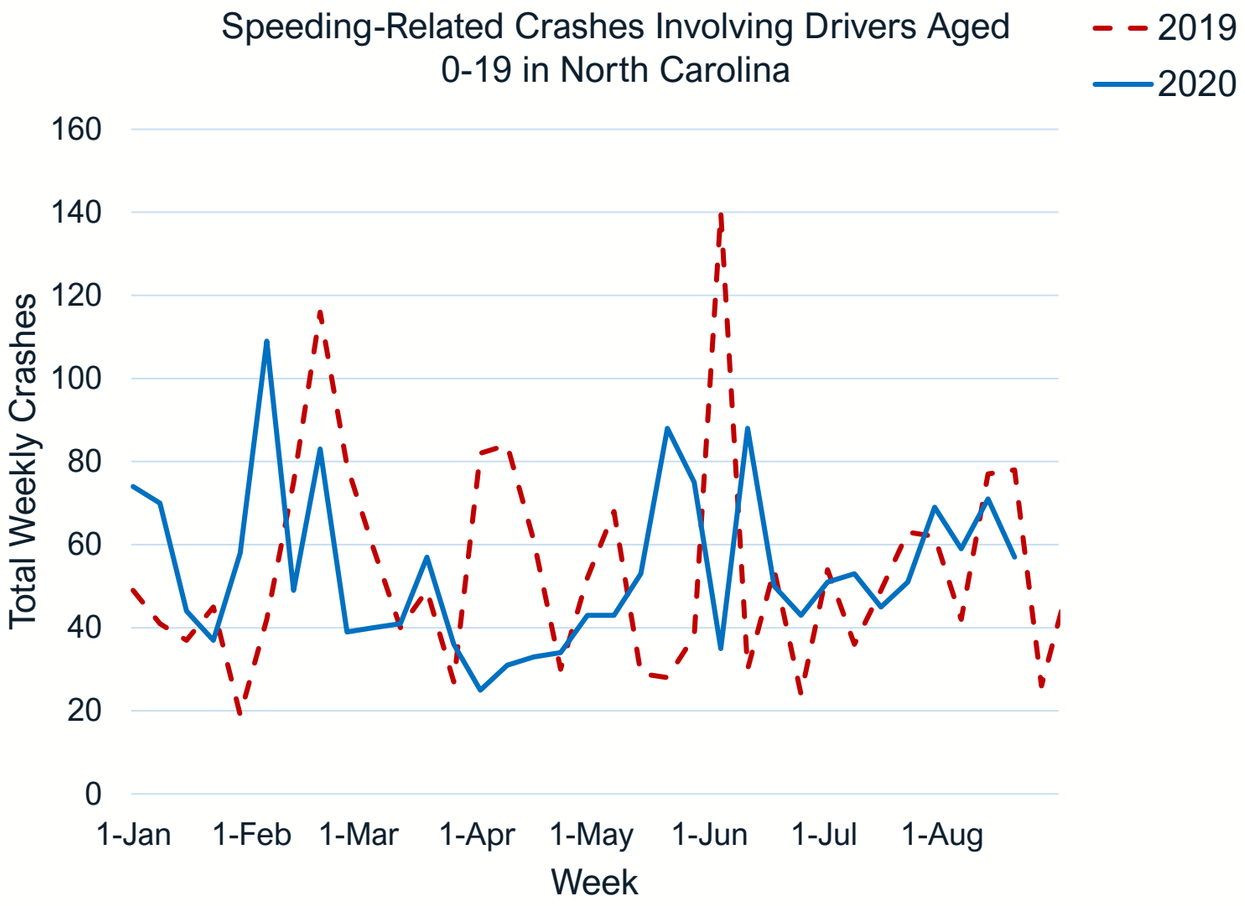


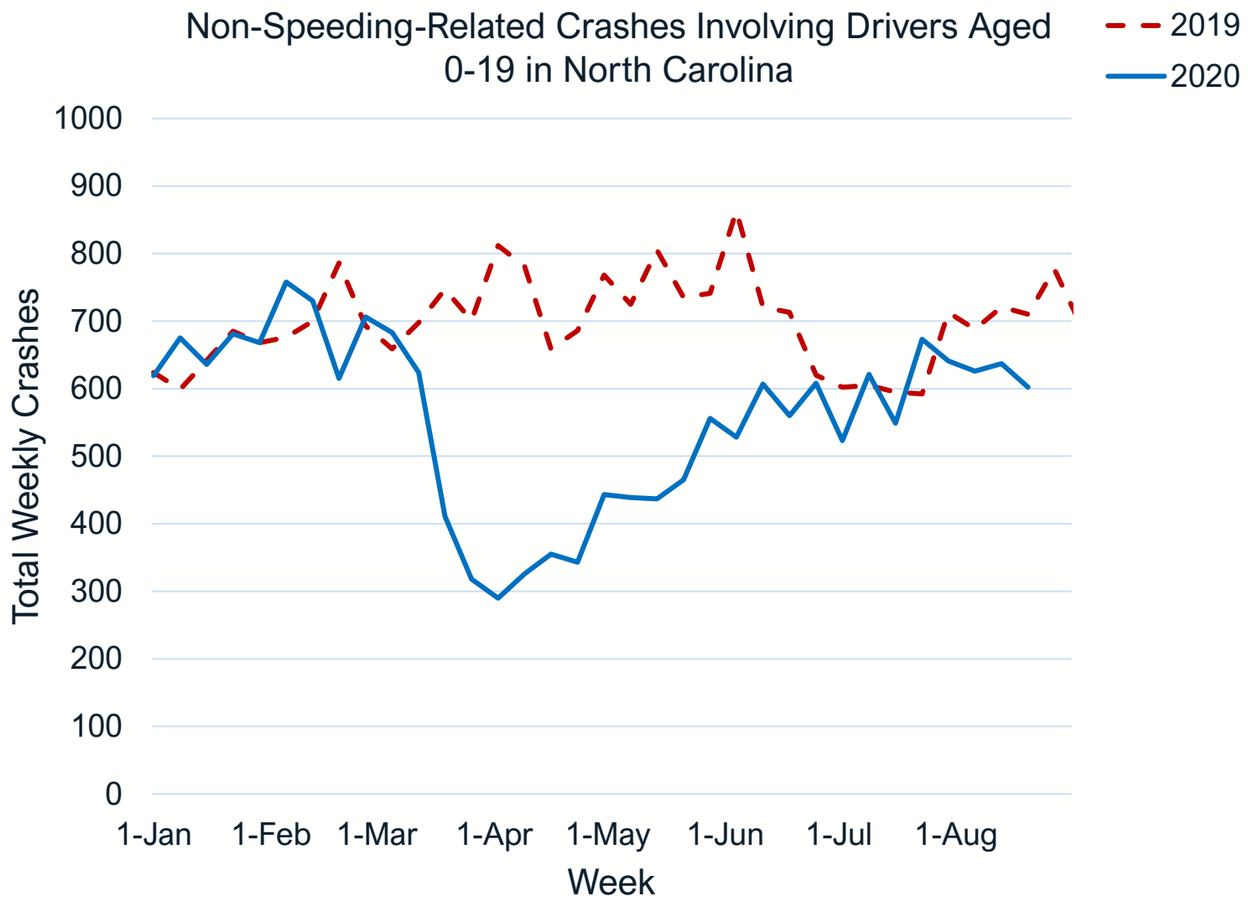
Speeding-Related Crash Trends – Driver Ejection



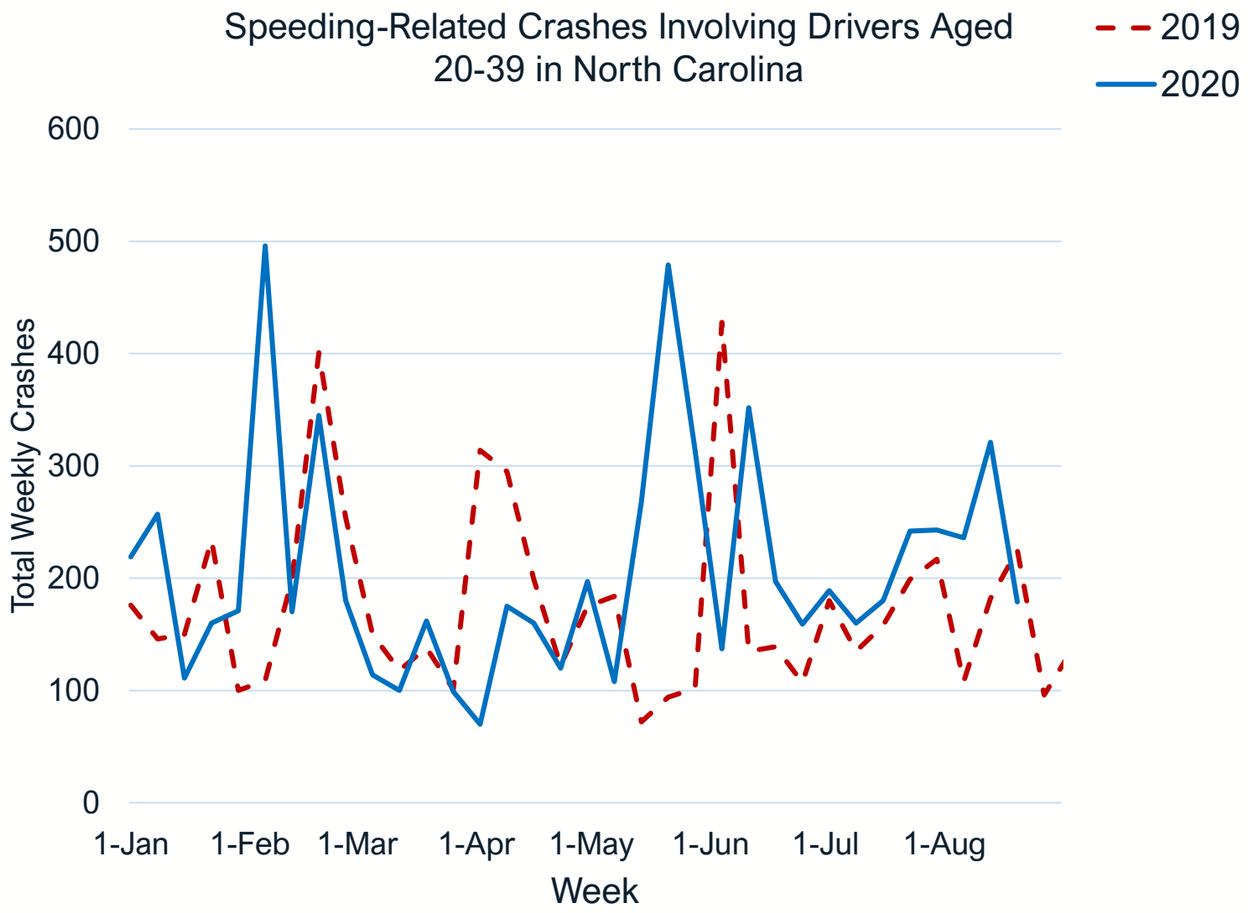


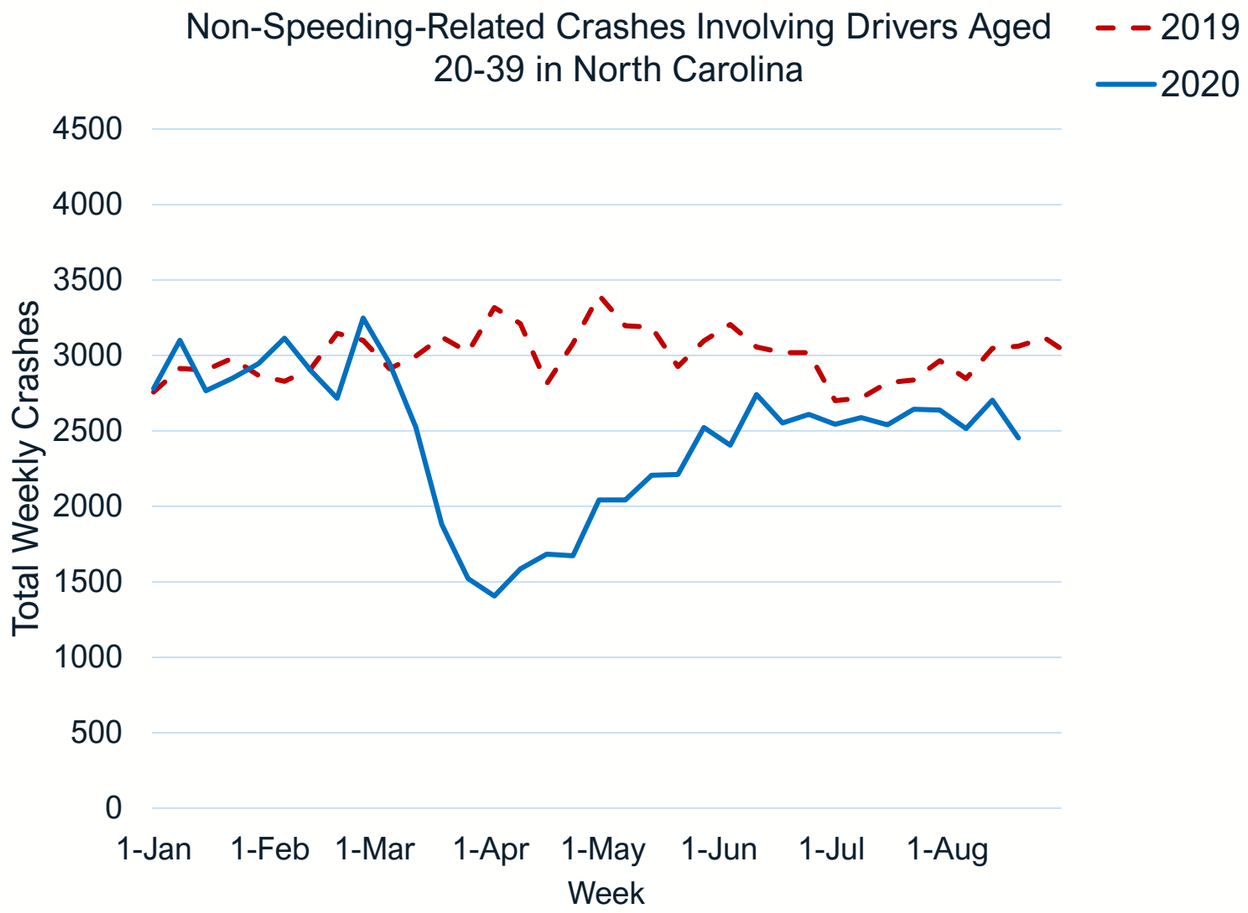
Speeding-Related Crash Trends – Drivers Aged 0-19



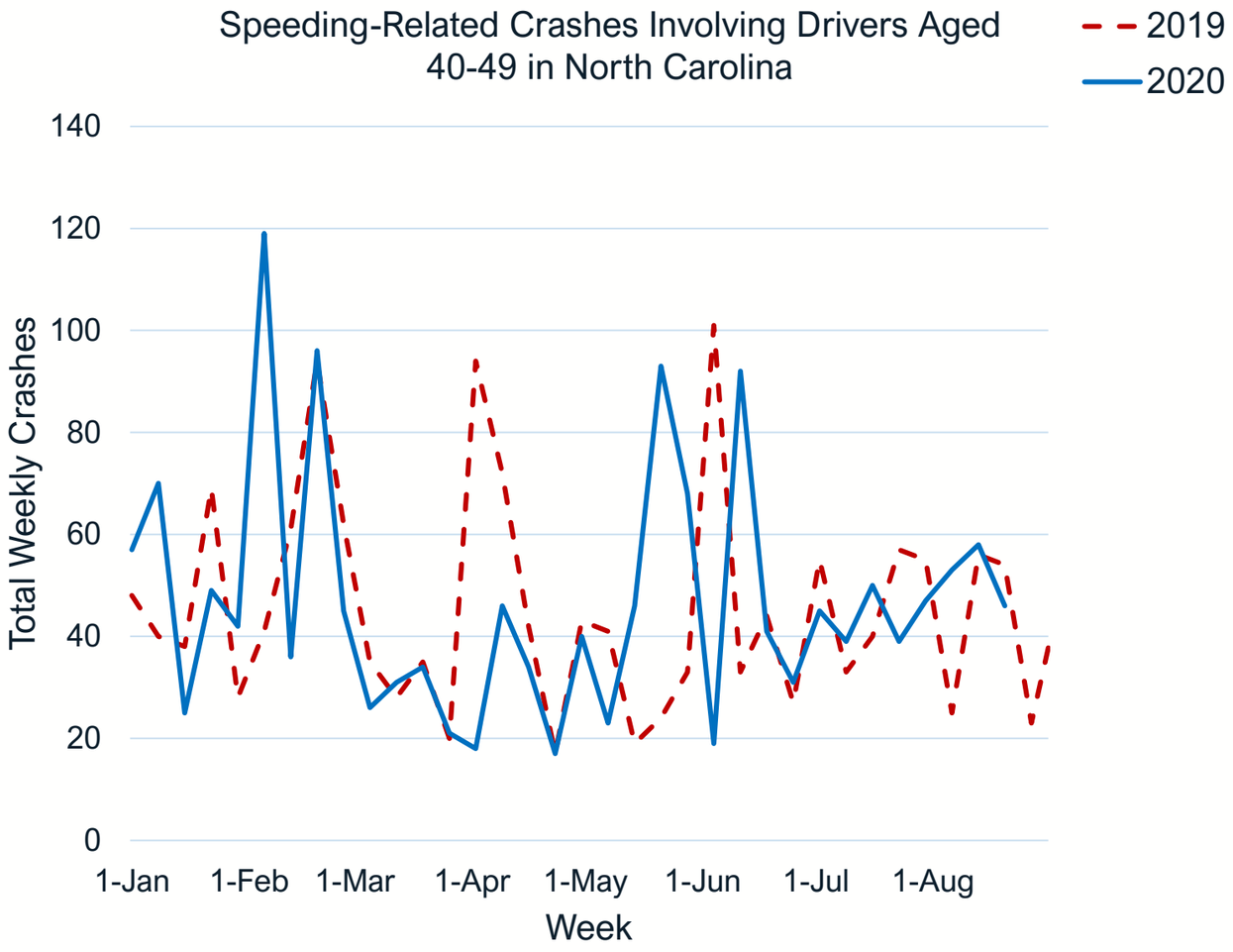


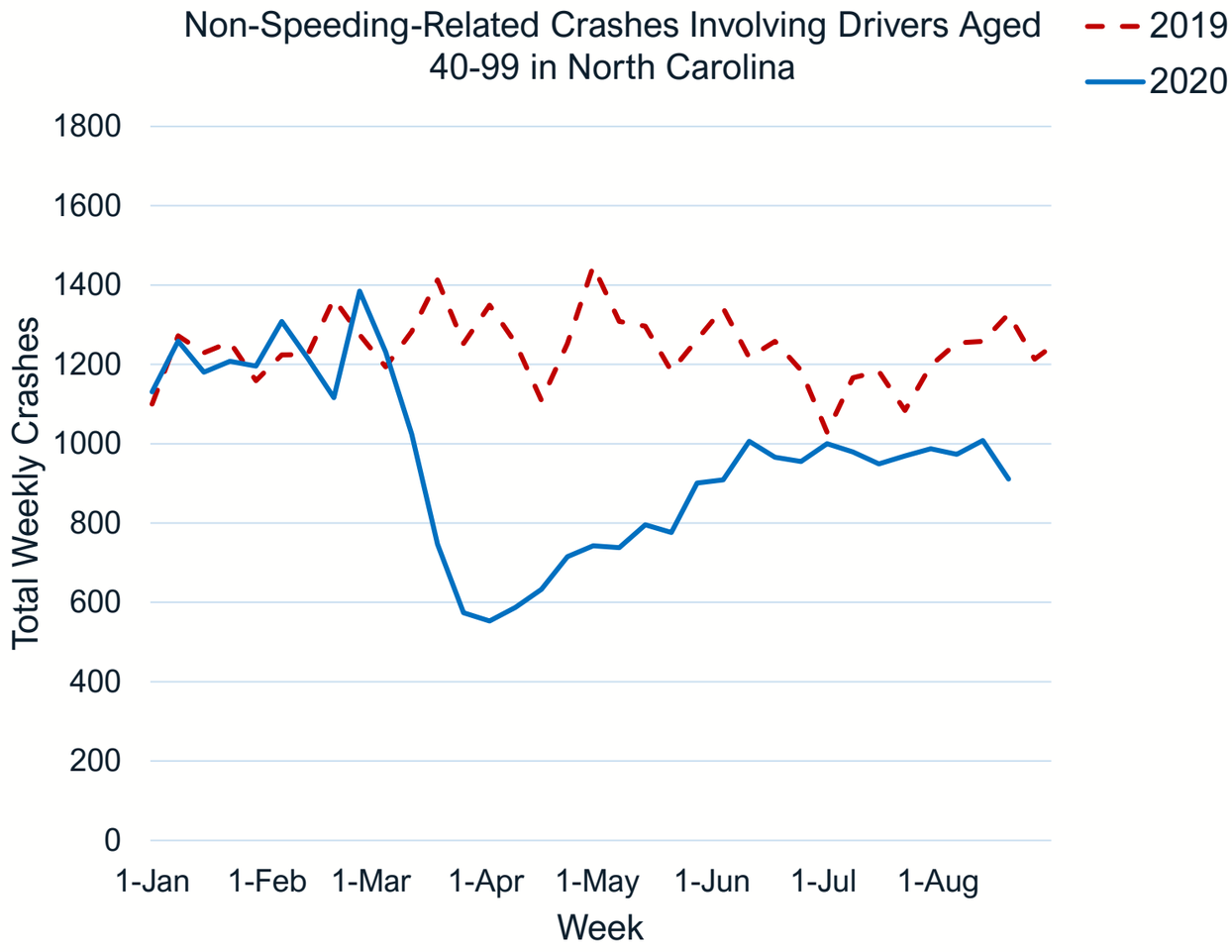
Speeding-Related Crash Trends – Drivers Aged 20-39



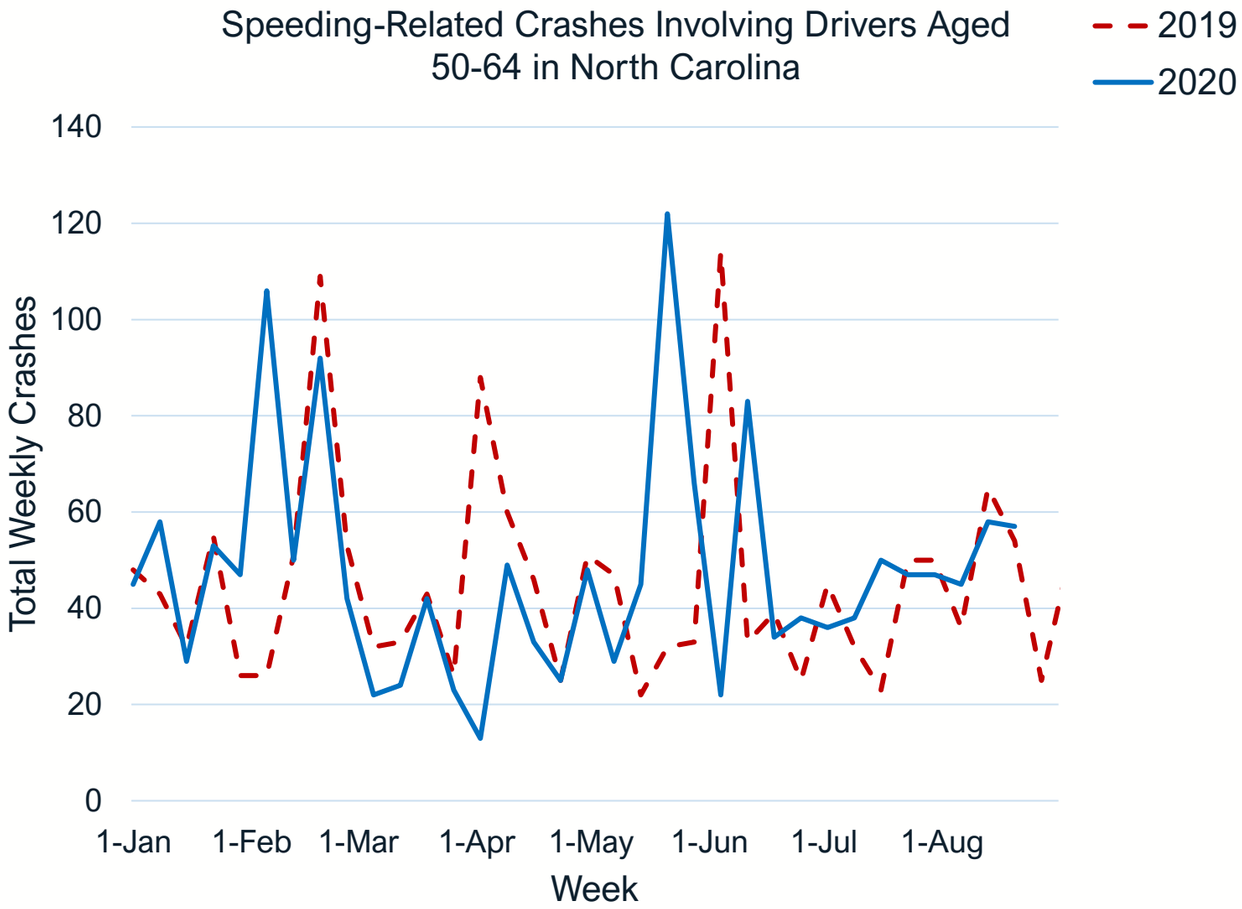


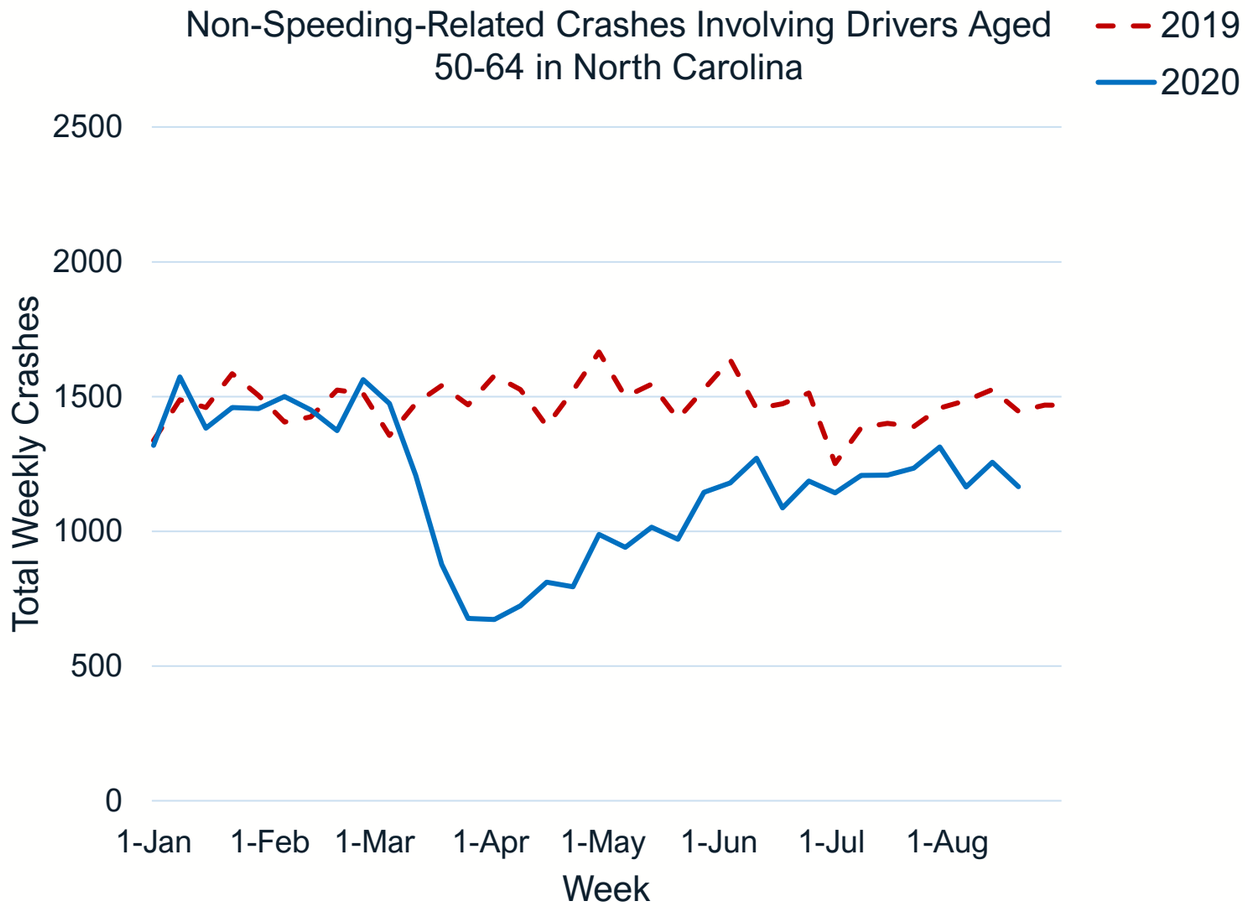
Speeding-Related Crash Trends – Drivers Aged 40-49



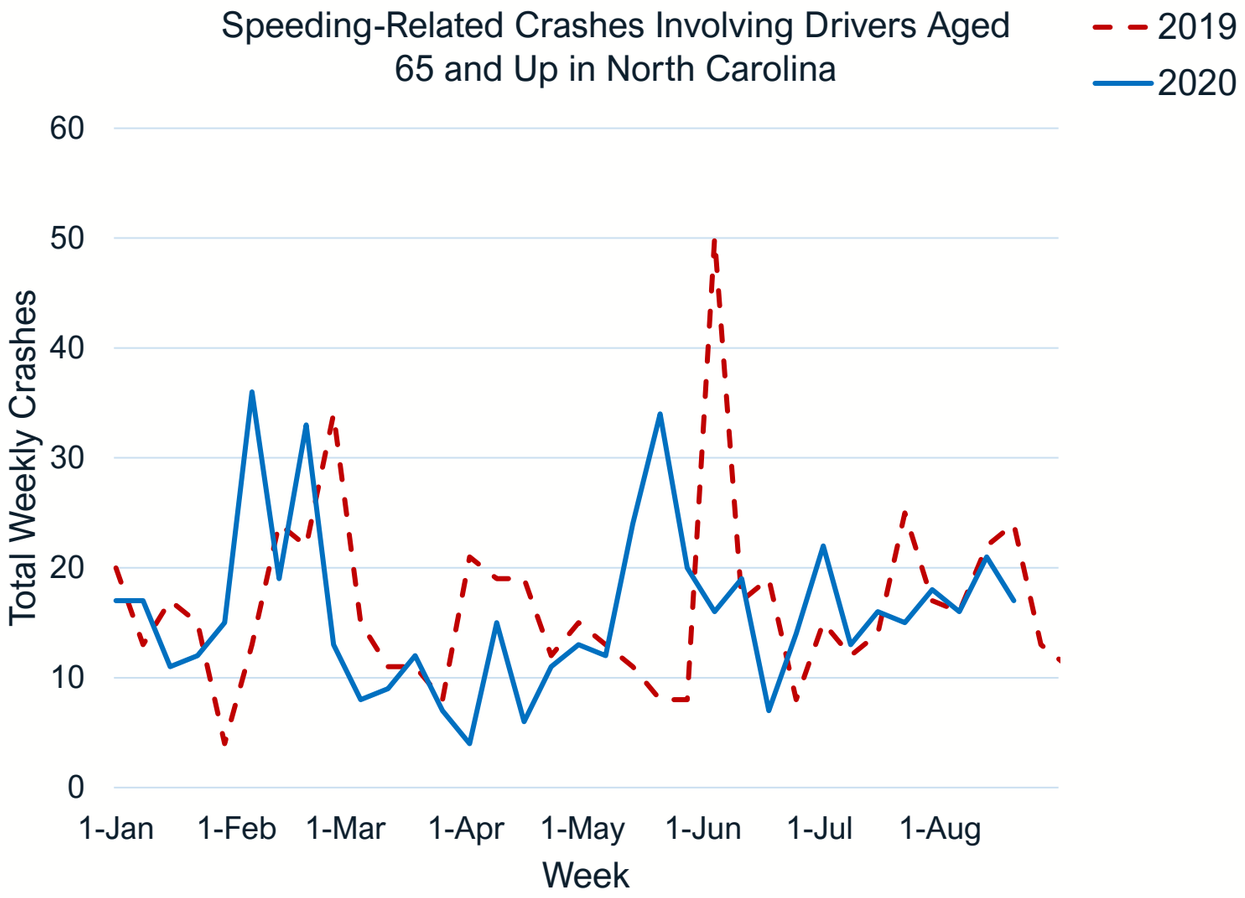


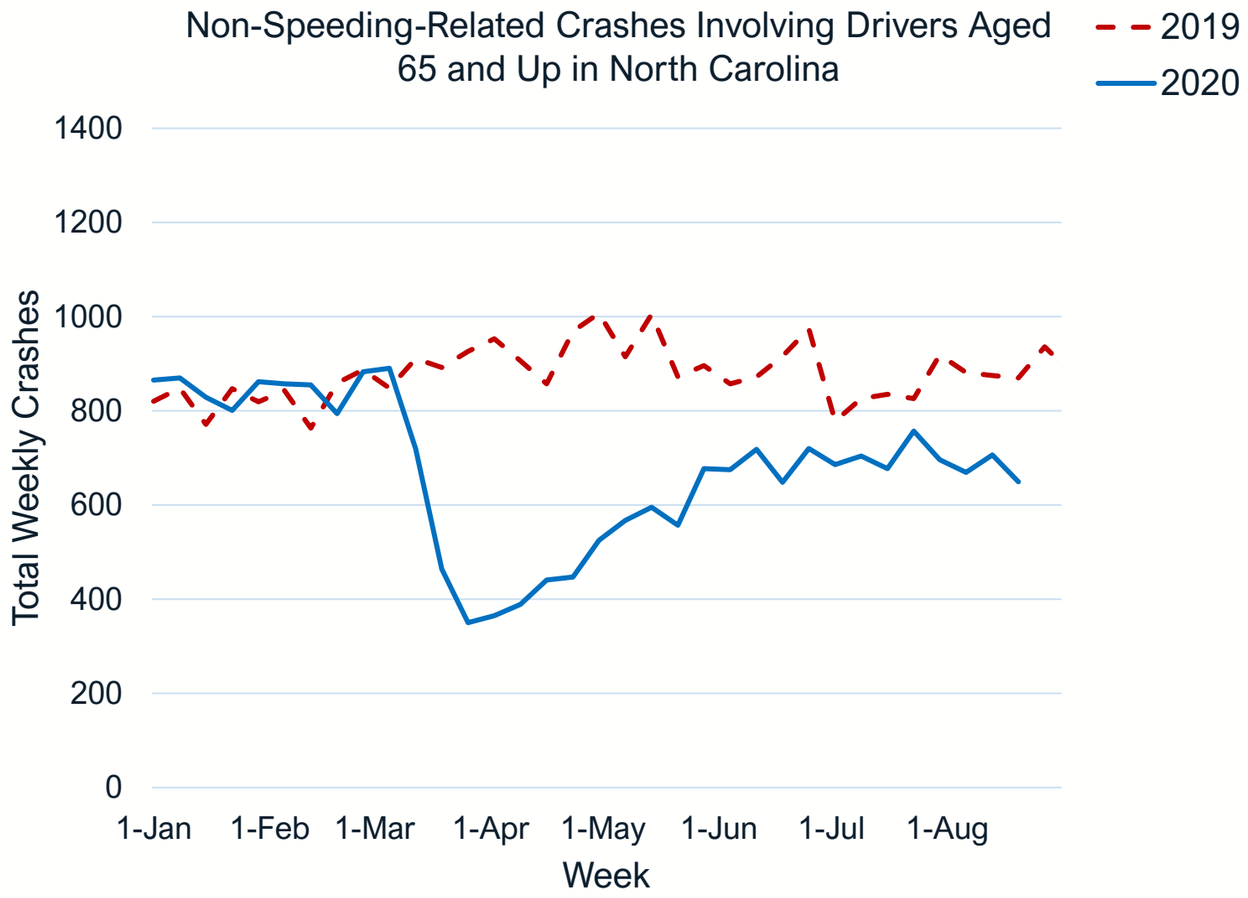
Speeding-Related Crash Trends – Drivers Aged 50-64



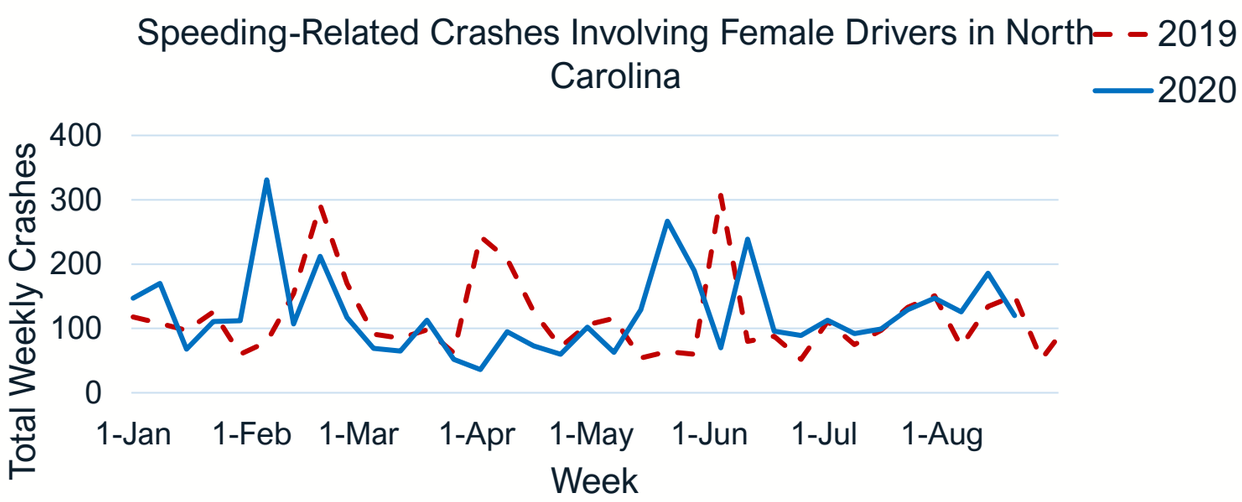


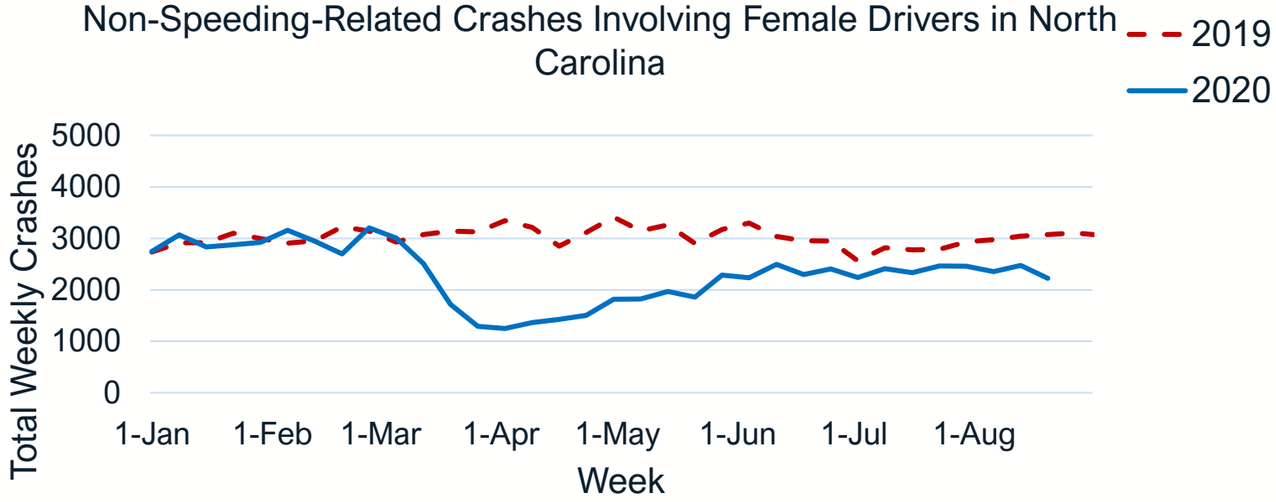
Speeding-Related Crash Trends – Drivers Aged 65+

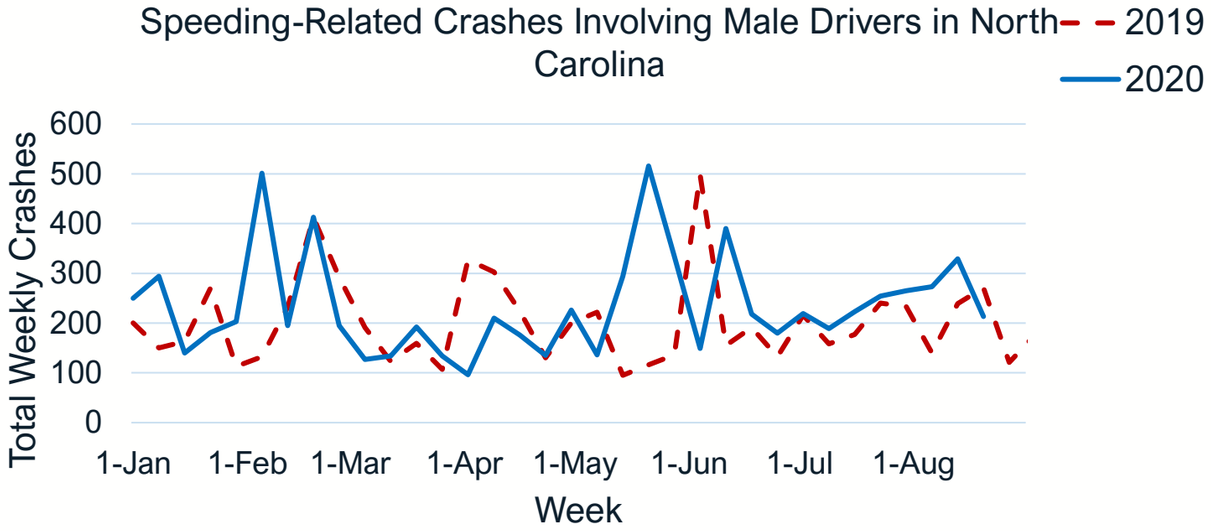


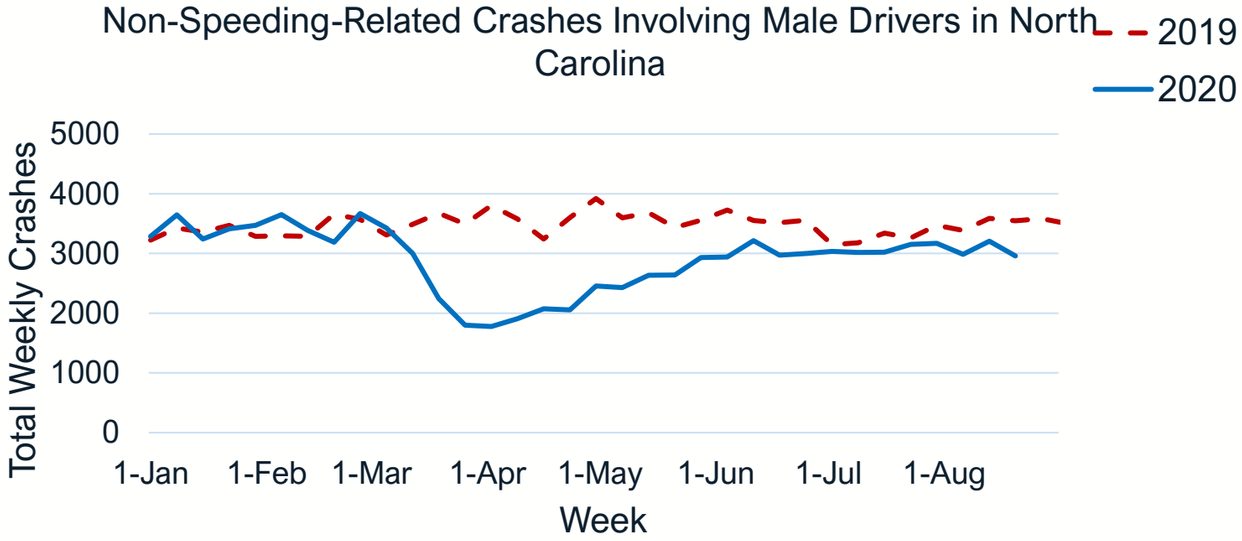


Speeding-Related Crash Trends – Drivers by Gender









Characteristics of Speeding & non-Speeding Related Crashes in NC

- 2019 & 2020 weekly crash averages:
  - Weeks of January 1 to March 4
  - Weeks of March 12 to August 19

- Speeding Related crash:
  - “Exceeded Safe Speed For Conditions“ or "Exceeded Authorized Speed Limit“ noted as a contributing factor

	2019 Periods		2020 Periods		2019 Periods		2020 Periods	
	Jan 1 - Mar 4	Mar 12 - Aug 19	Jan 1 - Mar 4	Mar 12 - Aug 19	Jan 1 - Mar 4	Mar 12 - Aug 19	Jan 1 - Mar 4	Mar 12 - Aug 19
	Weekly Mean				% of Total Crashes (weekly means)			
Speeding-Related Crashes	335	**291**	394	**329**	6.5%	5.6%	7.5%	8.2%
Non-Speeding-Related Crashes	4838	**4928**	4854	**3705**				

Average Weekly Crash Characteristics for Speeding-Related Crashes

Speeding or Not Speeding	Crash Type	2019 Periods		2020 Periods	
		Jan 1 - Mar 4	Mar 12 - Aug 19	Jan 1 - Mar 4	Mar 12 - Aug 19
		% of Total Crashes (weekly means)			
Speeding-Related Crashes	Total Crashes	335	291	394	329
	Fatal or Severe Injury Crashes	5%	7%	4%	6%
	Single-Vehicle Crashes	76%	75%	77%	78%
	Multi-Vehicle Crashes	24%	25%	23%	22%
	Crashes on Dark, Unlit Roadways	34%	19%	32%	21%
	Crashes on Dark, Lit Roadways	12%	9%	11%	8%
	Crashes on Roadways in Daylight	49%	68%	52%	66%
	Crashes in Rural (<30% Developed) Areas	53%	55%	55%	54%
	Crashes in Urban (>70% Developed) Areas	31%	31%	30%	31%
	Crashes in Mixed (30% To 70% Developed) Areas	16%	14%	15%	15%
	Crashes with Drivers Age 0-19 Involved	17%	18%	16%	16%
	Crashes with Drivers Age 20-39 Involved	59%	58%	60%	62%
	Crashes with Drivers Age 40-49 Involved	16%	15%	15%	13%
	Crashes with Drivers Age 50-64 Involved	15%	15%	15%	13%
	Crashes with Drivers Age 65+ Involved	5%	6%	5%	5%
	Crashes with Female Drivers Involved	40%	39%	39%	35%
	Crashes with Male Drivers Involved	65%	68%	67%	70%
	Crashes with Ejected Drivers	2%	5%	1%	4%
	Crashes with Unrestrained Drivers	18%	22%	17%	22%

Average Weekly Crash Characteristics for Non-Speeding-Related Crashes

Speeding or Not Speeding	Crash Type	2019 Periods		2020 Periods	
		Jan 1 - Mar 4	Mar 12 - Aug 19	Jan 1 - Mar 4	Mar 12 - Aug 19
		% of Total Crashes (weekly means)			
Non-Speeding-Related Crashes	Total Crashes	4838	4928	4854	3705
	Fatal or Severe Injury Crashes	1%	2%	2%	2%
	Single-Vehicle Crashes	23%	21%	24%	28%
	Multi-Vehicle Crashes	77%	79%	76%	72%
	Crashes on Dark, Unlit Roadways	18%	10%	18%	13%
	Crashes on Dark, Lit Roadways	15%	8%	16%	8%
	Crashes on Roadways in Daylight	62%	79%	61%	76%
	Crashes in Rural (<30% Developed) Areas	27%	27%	27%	30%
	Crashes in Urban (>70% Developed) Areas	57%	57%	56%	53%
	Crashes in Mixed (30% To 70% Developed) Areas	16%	16%	16%	17%
	Crashes with Drivers Age 0-19 Involved	14%	14%	14%	14%
	Crashes with Drivers Age 20-39 Involved	61%	61%	60%	61%
	Crashes with Drivers Age 40-49 Involved	26%	25%	25%	23%
	Crashes with Drivers Age 50-64 Involved	30%	30%	30%	28%
	Crashes with Drivers Age 65+ Involved	17%	18%	17%	16%
	Crashes with Female Drivers Involved	62%	62%	61%	55%
	Crashes with Male Drivers Involved	70%	71%	71%	72%
	Crashes with Ejected Drivers	1%	2%	1%	2%
	Crashes with Unrestrained Drivers	18%	20%	19%	23%

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This project is supported by the NC Policy Collaboratory at the UNC-CH with funding from the North Carolina Coronavirus Relief Fund established and appropriated by the NC General Assembly.

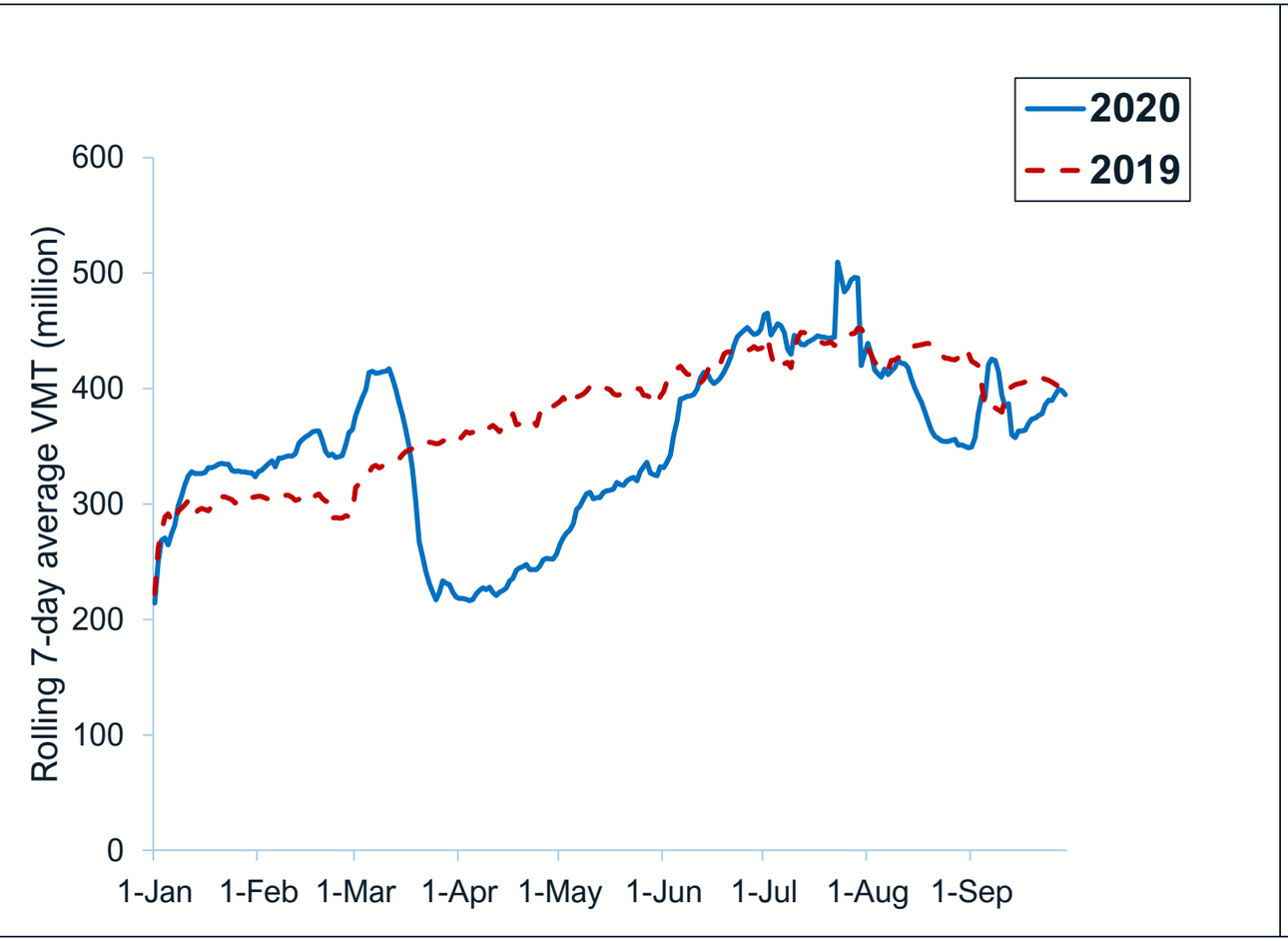
https://collaboratory.unc.edu/

NC Policy Collaboratory

Streetlight VMT

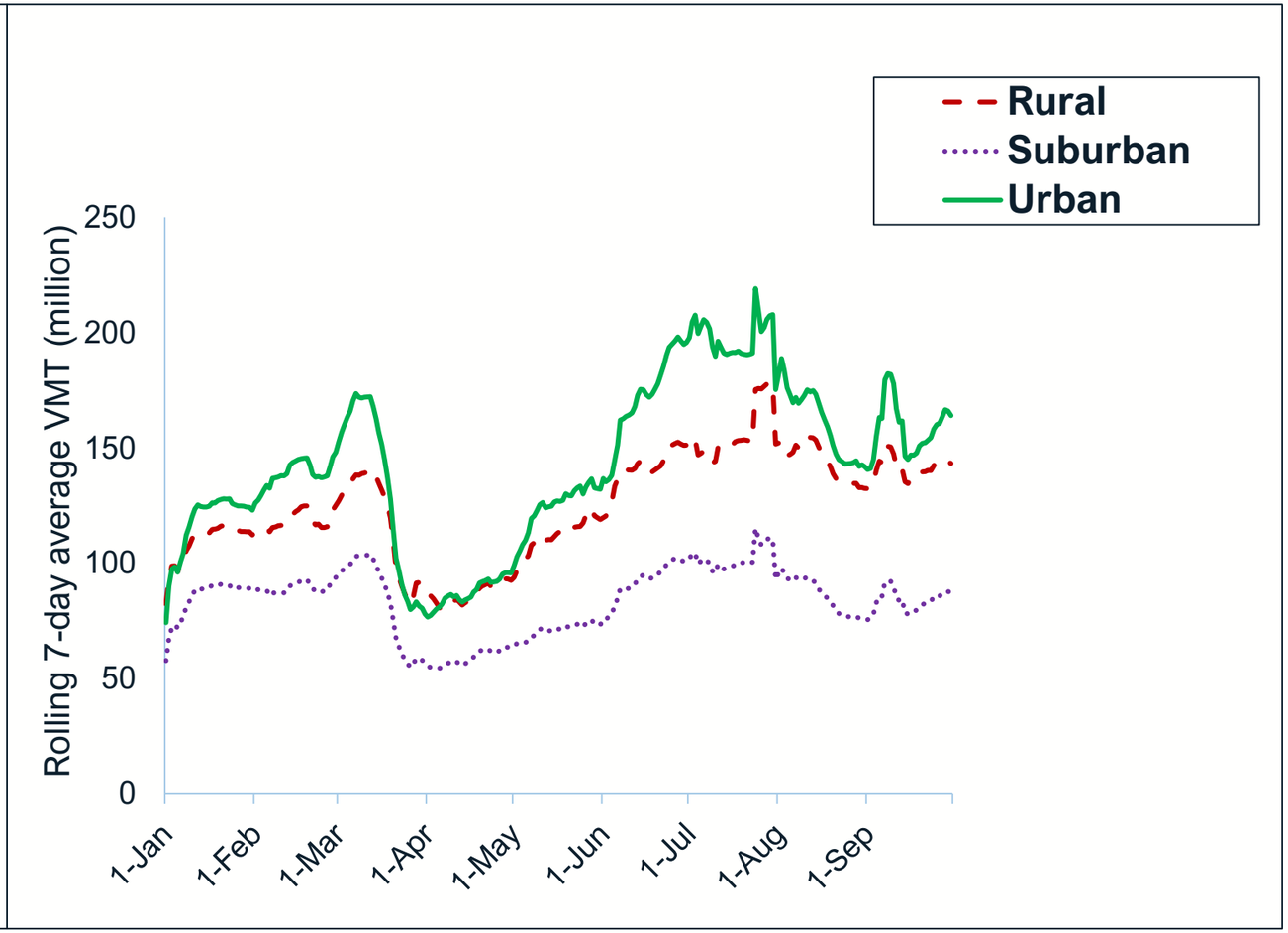
Statewide VMT Trends, 2019-2020

All counties - raw VMT



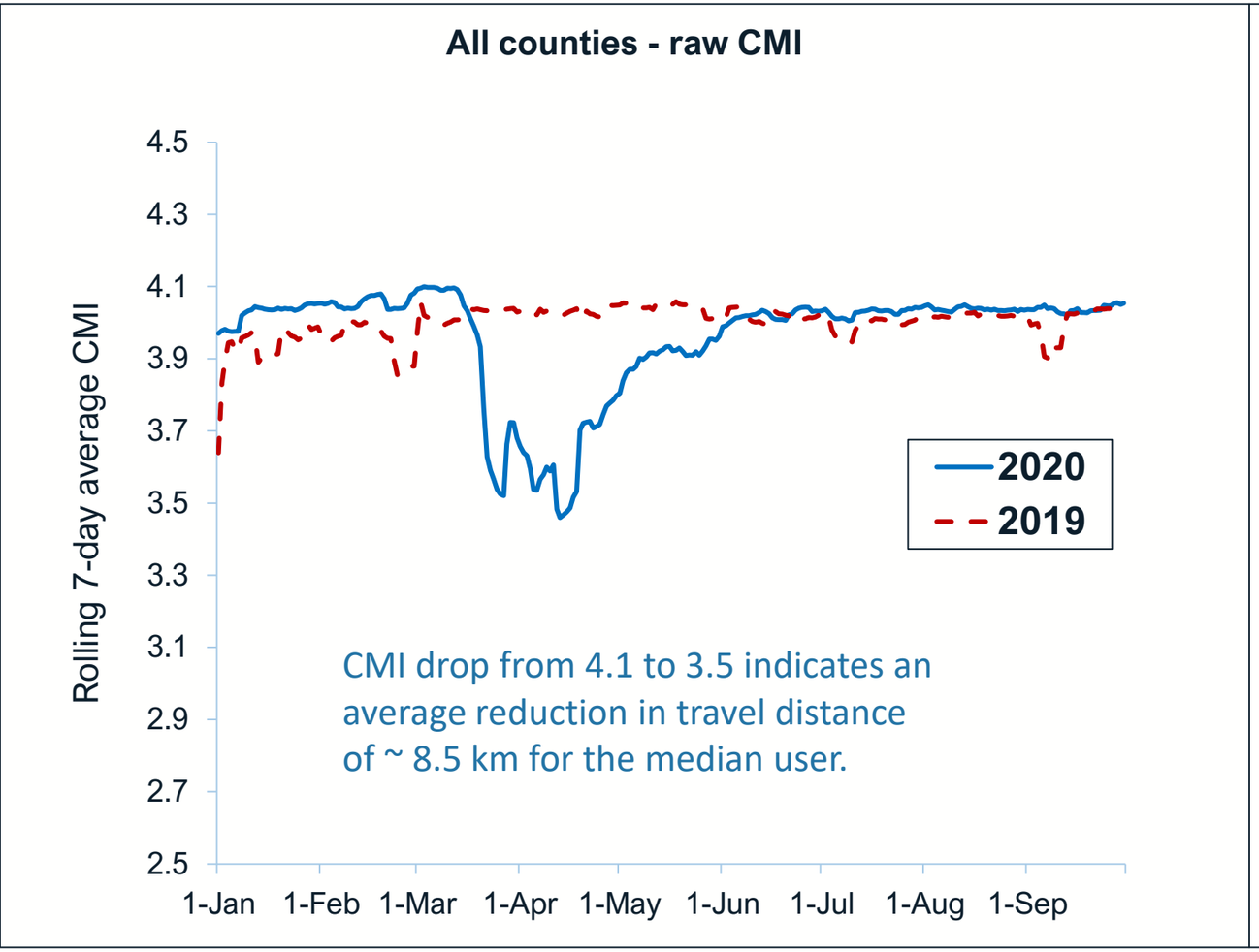
VMT Trends by Area Type, 2020

Counties stratified by rurality - raw VMT

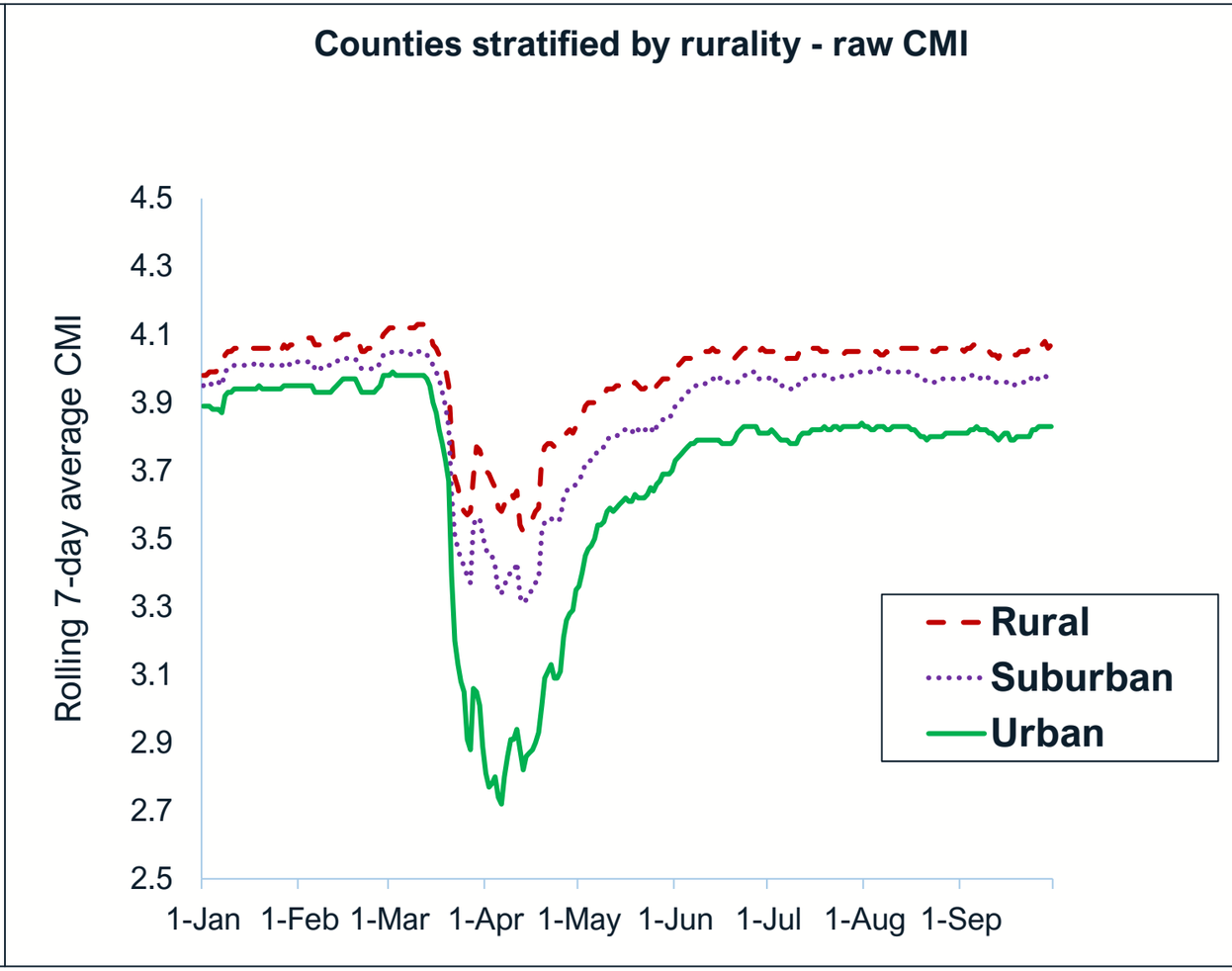


CMI – Cuebiq Mobility Index (A measure of the median distance traveled by all devices (log_{10} scale)

Statewide CMI Trends, 2019-2020



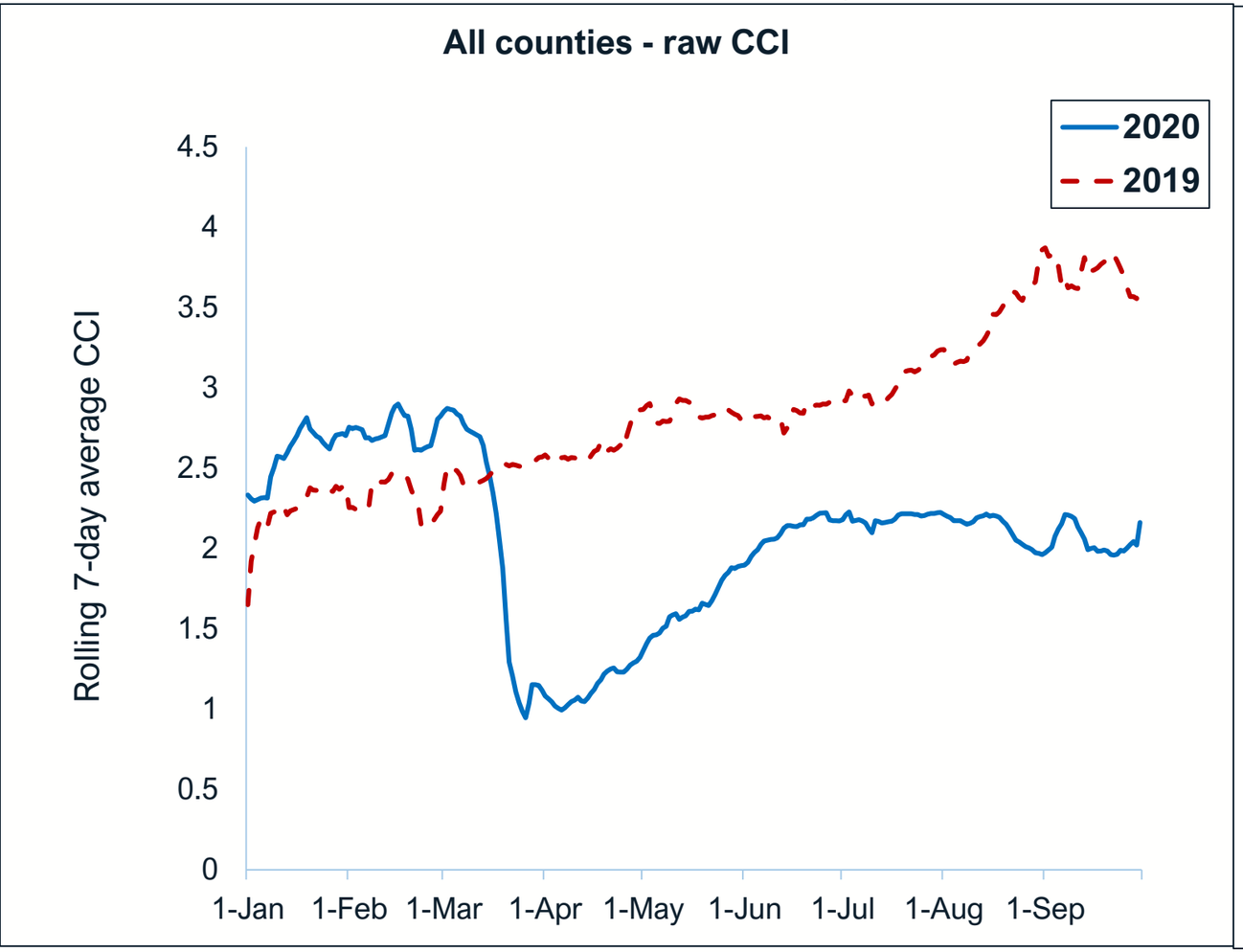
CMI Trends by Area Type, 2020



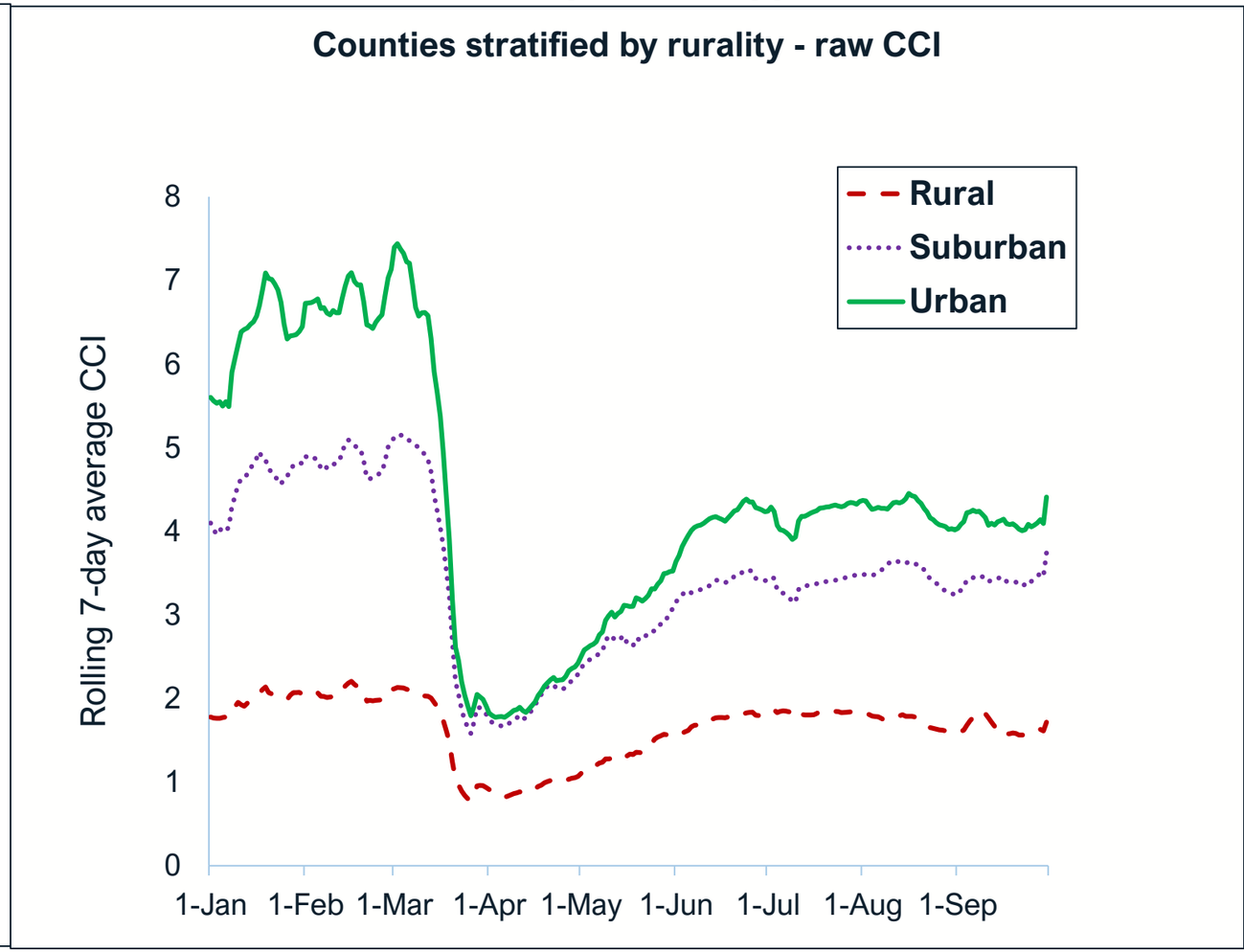
Cuebiq Contact Index (CCI)

Ratio of number of devices in proximity (within 50 ft) to number of devices in an area within 5 minutes

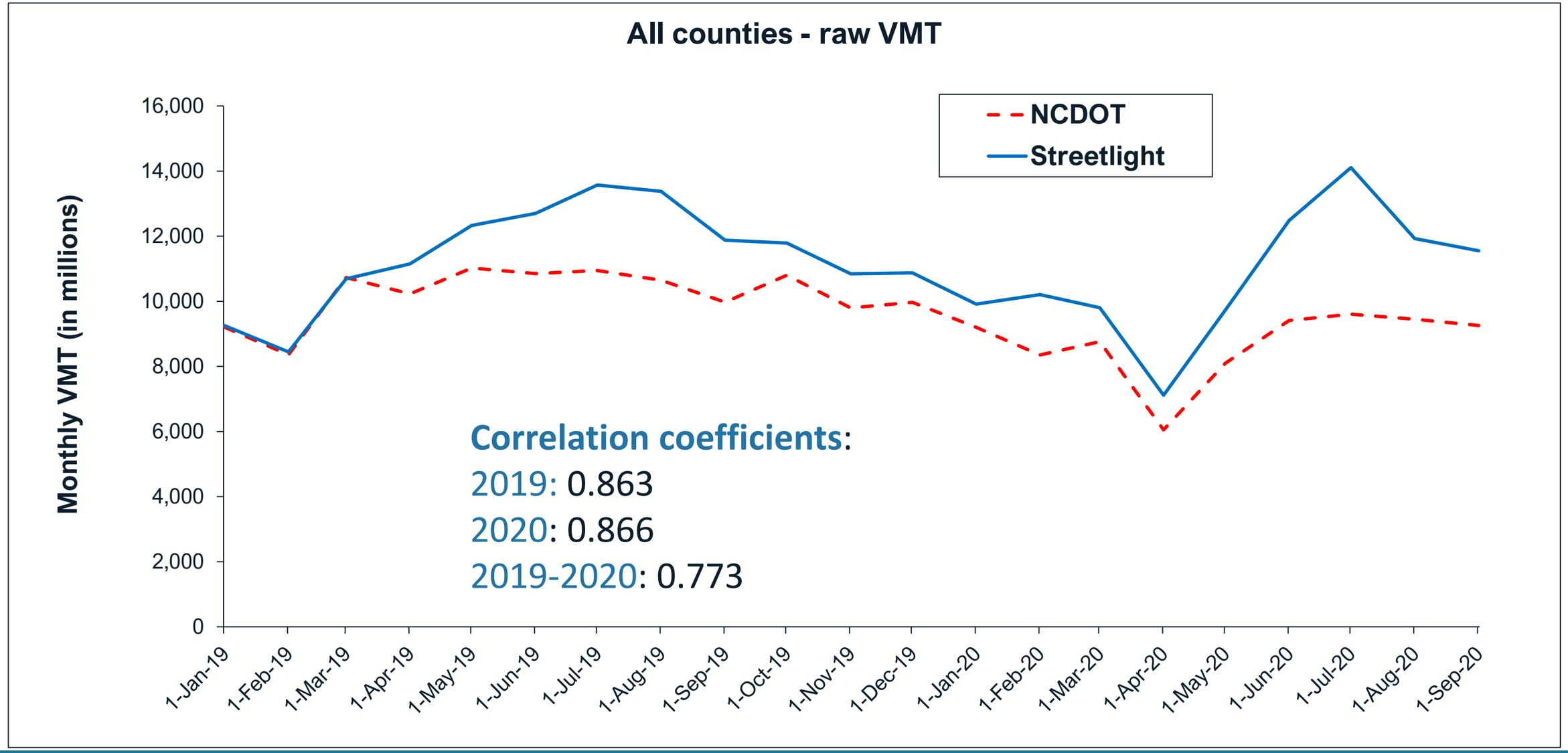
Statewide CCI Trends, 2019-2020



CCI Trends by Area Type, 2020



Vehicle Miles Traveled



Correlation Matrix of Mobility & Health Data
(Jan 1- Sept 30, day-by-day basis)

Variables	NCDOT ATR (7-day rolling average)	CMI (7-day rolling average)	CCI (7-day rolling average)	Streetlight VMT (7-day rolling average)
NCDOT ATR (7-day rolling average)				
CMI (7-day rolling average)	0.922			
CCI (7-day rolling average)	0.962	0.931		
Streetlight VMT (7-day rolling average)	0.898	0.869	0.923	
COVID-19 Cases (7-day rolling average)	0.6	0.617	0.601	0.802
COVID-19 Deaths (7-day rolling average)	0.35	0.48	0.371	0.463