



# School Start Times and Teen Driver Crashes

## Background

Sleep health has become an increasingly important and studied topic in the last decade. So much so that a number of school districts across the United States have explored changing, or have already changed their high-school start times to a later hour in order to improve academic performance.

During adolescent development, people's brains undergo substantial change leading to a shift in overall sleep length needs and circadian schedules. Researchers have suggested that moving school start times to 8:30 a.m. or later, to coincide with teens' changing circadian clocks, can produce improvements in academic performance and decreases in disruptive behavior. Researchers also suggest that lack of sleep can have negative effects on reaction time, alertness, hazard perception, and decision-making abilities – very important skills in academics as well as behind the wheel. By providing teens greater opportunity to sleep, not only academic performance could be improved but also traffic safety.

The National Highway Traffic Safety Administration (NHTSA) is fundamentally interested in how recent interest in changing school start times will affect teen driver safety. Drowsiness is a factor in many vehicle crashes and traffic fatalities. According to NHTSA's Fatality Analysis Reporting System (FARS) data, on U.S. roadways each year from 2008 to 2012, there were, on average, 740 fatal crashes in which the driver was reported as being drowsy, sleepy, asleep, or fatigued. The AAA Foundation for Traffic Safety estimates that 16.5 percent of fatal crashes involved a drowsy driver.

Most studies that explore the incidence of drowsy driving crashes by population conclude that young adults, especially males, are at a significantly higher risk of having a drowsy-driving crash. In addition to progressively later bed times across the U.S. population, teens undergo an unavoidable biological change during adolescent development that leads to a shift in their circadian rhythms, which results in teens requiring more sleep in the early morning hours (e.g., 6–7 a.m., when many students are leaving for school).

NHTSA funded a study to evaluate the effects of a shift in high school start time on 16- and 17-year-old drivers' traffic crashes on school days.

## School Start Times and Teen Driver Crashes

As the critical importance of sleep has become fully recognized and teen sleep patterns better understood, some school systems in the United States have reversed the decades-long trend toward earlier high school start times. This study examined the hypothesis that a later high school start time could reduce crash rates by aligning school start time with the sleep needs of adolescents. Researchers collected data from four comparable counties in North Carolina, one of which (Forsyth County) changed their school start time from 7:30 a.m. to 8:45 a.m. beginning in August 2003. In addition to the program in North Carolina, researchers explored previously collected teen crash data from an earlier study of a similar school start-time change in Kentucky. Researchers evaluated the data from these two changes in start time to determine whether there was a drop in crash rates among 16- and 17-year-old drivers due to later school start times.

## North Carolina Crash Data

Researchers compiled time-series data from the North Carolina Crash Data System, involving 16- and 17-year-old drivers involved in crashes on school days, adjusted for changes in the population in each of the counties. They applied an intervention time-series analysis to determine whether the change in school start times was accompanied by a downward shift in the crash rate compared to crash rates in comparable counties with no change in school start time.

Analysis of the time-series data indicated that the 75-minute shift in school start times in Forsyth County, North Carolina, suggests there was a small overall decrease in crashes among 16- and 17-year-old drivers on school days. The analysis demonstrated a downward shift in crash rates during school hours in Forsyth County, as expected. However, there were more crashes during the afternoon and evening hours. Most importantly though, there was a 14-percent drop in the overall crash rate across the entire day. It is unclear whether this was due to driving exposure differences (teens possibly did not have as much time to drive around at night after school), better sleep patterns, or a combination of both.

The fact that the researchers did not observe a similar statistically significant decrease in crash rates in the other large urbanized counties suggests this change was unique

to Forsyth County. In addition to the overall decline across the entire day, crash times across Forsyth County shifted, matching the later times when high school students would be driving to and from school.

## Re-Analysis of the Kentucky Crash Data

In 1998, Fayette County, Kentucky, schools introduced a later start time similar to the one in Forsyth County, North Carolina. Much like the current study performed on the North Carolina data, researchers (Danner & Phillips, 2008) explored crash rates both pre- and post-school start time change. The researchers found that teen crash rates decreased by 16.5 percent from the two years before the time change to the two years after. Due to a number of questions that the current researchers had about the Kentucky study methodology, they re-analyzed the historical crash data with the same methodology used for the North Carolina data.

Researchers obtained Kentucky crash data, age-specific population data, and recorded the days that schools were in session. They also added Jefferson County, Kentucky, data as a comparison county instead of using the rest of the State as a comparison.

Re-analysis of crash data for Fayette County, Kentucky, showed no overall shift in crash rates unlike the study by Danner and Phillips (2008). There were some changes in the daily crash pattern, consistent with what would be expected based on the shift in times when 16- and 17-year-old drivers would be on the roads driving. The fact that no comparable effects were evident in the re-analysis of the Kentucky data could be due to a number of methodological differences. The current analysis only included 16- and 17-year-olds, whereas the original analysis of the Kentucky data examined crashes for 17- and 18-year-olds who are typically more experienced drivers. In addition, the current research only looked at

crashes on days when school was in session, whereas the original study considered crashes on weekends and during the summer. Another possible reason for differences in the present analysis from the earlier analysis is the lack of an entirely appropriate comparison county.

## Summary

According to a growing number of research studies, high schools that change their morning start times from the 7 o'clock hour to the 8 o'clock hour or later can potentially create an environment that encourages positive health, behavior, and academic outcomes. The current study cautiously supports the hypothesis that changing high school start times can decrease crash rates among teen drivers. Additional studies of teen crashes in other school districts that have altered their start times would be highly useful in bringing clarity to this issue.

## References

Danner, F., & Phillips, B. (2008). Adolescent sleep, school start times, and teen motor vehicle crashes. *Journal of Clinical Sleep Medicine*, 4(6), 533–535.

## Additional NHTSA Drowsy Driving Reports

[www.nhtsa.gov/Driving+Safety/Drowsy+Driving](http://www.nhtsa.gov/Driving+Safety/Drowsy+Driving)

## How to Order

To order *School Start Times and Teenage Driver Motor Vehicle Crashes* (50 pages), prepared by Highway Safety Research Center, University of North Carolina, write to the Office of Behavioral Safety Research, NTI-130, NHTSA, 1200 New Jersey Avenue SE., Washington, DC 20590, fax 202-366-2766, or download from [www.nhtsa.gov](http://www.nhtsa.gov). Randolph Atkins, Ph.D., was the Contracting Officer's Representative for this project.

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