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The Effect of Curfew Laws on Motor Vehicle Crashes

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Abstract

Twelve states in the U.S. have curfew laws, which prohibit young drivers from operating motor vehicles during late evening and/or early morning hours. The effect of such laws on motor vehicle crashes was studied in four of these states. In each state studied, the laws were found to substantially reduce the crashes of 16 year olds. Sixteen year old driver crash involvements during curfew hours were reduced by an estimated 69 percent in Pennsylvania (3.7 fewer drivers in crashes per 1,000 16 year old population per year), 62 percent in New York (5.0), 40 percent in Maryland (2.0), and 25 percent in Louisiana (2.0). Except in Maryland, the percentage of the 16 year old population licensed was lower in curfew than comparison states. New York, which has the strongest curfew law, has the lowest 16 year old licensure rate in the U.S., and Pennsylvania is second lowest. It is possible that curfew laws reduce early licensure, in which case reductions in crash involvements resulting from curfews are greater than shown above.

The Effect of Curfew Laws on Motor Vehicle Crashes

Twelve states in the U.S. have laws limiting the hours during which young licensed drivers may operate motor vehicles. These laws prohibit driving during late evening and/or early morning hours and are referred to as "curfew laws". The purpose of the present study was to examine the effect of such laws on motor vehicle crashes. Their effect is not known to have been studied previously.

Curfew laws vary in terms of the ages of drivers covered, hours restricted, and exceptions allowed. Four states (Louisiana, Maryland, New York, and Pennsylvania) whose laws are among the strongest in terms of these factors were selected for study. The laws in these four states are described in Table 1. In most of the other states with curfew laws, the restrictions apply only to 15 year olds and/or prohibit driving only after midnight.

Methods

To determine the effect of the laws, the crash involvement of young drivers affected by the curfews in each state studied was compared with the crash involvement of drivers of the same age in a state not having a curfew, but otherwise having the same or very similar laws pertaining to young drivers. New York (minus New York City and Nassau County) was matched with Ohio, Pennsylvania was also matched with Ohio, and Louisiana was paired with Mississippi. Maryland's curfew law was implemented in 1979, as part of a probationary licensing system applying to newly licensed 16 and 17 year old drivers. Maryland data prior to 1979 were used as the comparison for Maryland following adoption of its curfew law.

Preliminary analyses were conducted to provide estimates of the number of years of crash data needed from each curfew and comparison state to ensure adequate sample sizes. These analyses indicated that three years of data would be adequate in the larger states (New York, Pennsylvania, Ohio) and five years would be required for Louisiana and Mississippi. Accordingly, computer tapes containing records of all police reported crashes were obtained from New York, Pennsylvania, and Ohio for the years 1978-1980, and from Louisiana and Mississippi for 1976-1980. Examination of Maryland's curfew was based on crash data for the five years prior to the curfew (1974-1978) and the two years following its implementation (1979-1980).

The data presented on curfew affected drivers are limited to 16 year olds. The crash data obtained from New York and Pennsylvania did not allow identification of 17 year olds who had completed driver education and thus were not subject to the curfew laws. In Maryland, many 17 year olds (and some 16 year olds) are not subject to the law because they can apply for a license that frees them from curfew regulations after 6 months of driving without a crash or violation. Very few 15 year olds in Louisiana are licensed, and the crash data available did not allow them to be distinguished from younger, unlicensed drivers.

Crash involvement of curfew affected drivers during curfew and noncurfew hours was compared with the crash involvement at these times for drivers of the same age not affected by a curfew law. The hours just before and just after the curfews were examined separately, because of the possibility that curfews might affect these noncurfew hours as well. For example, curfew affected drivers might do most or much of their evening driving during the hours just prior to the curfew. If this in turn leads to increased numbers of crashes in these hours, it could reduce any positive effects that curfew laws might have on crash involvement. It was also considered possible that a reduction in the amount of driving by curfew affected drivers during curfew hours might produce an effect extending past the end of the curfew period.

To control for possible differences in the time of day crashes occurred in study and comparison states, unrelated to curfew laws, comparisons of crash involvement during curfew and noncurfew hours were also made between older drivers not covered by curfews. The crash experience of age groups unaffected by curfews in study and comparison states was used to develop linear regressions to estimate the crash involvement by time of day for 16 year olds that would have been expected without curfews. These expected values were then compared with the actual crash counts. Three separate estimates of 16 year old crash involvement were made in each curfew state, based on the crash experience of 18-20 year olds, 21-24 year olds, and 25-34 year olds. In each pair of states, numbers of driver crash involvements by time of day for these unaffected age groups were highly correlated. For example,

driver crash involvements by hour of day for New York 18-20 year olds correlated +0.88 with involvements of Ohio 18-20 year olds. For 21-24 year olds the correlation was +0.89; for 25-34 year olds it was +0.92. The three resulting regression equations were then used to generate expected numbers of crashes for 16 year olds in curfew states as derived from the actual numbers of involvements for 16 year olds in the comparison states.

For example, in New York-Ohio, the regression equation based on 21-24 year olds was:

$$NY_t = (.3008) Ohio_t + 423.1$$

In other words, the expected number of crashes for 21-24 year old drivers in New York at hour "t" was equal to the actual number in Ohio at hour "t" x .3008 + 423.1. Estimates for New York 16 year olds were generated using the actual Ohio 16 year old distribution in the above equation.

Data on crash injuries sustained by 16 year olds in curfew states as motor vehicle passengers, pedestrians, and pedalcyclists were also analyzed due to the possibility that these might be higher than expected during curfew hours because travel as nondrivers may be higher. Such an effect would tend to offset positive curfew effects that may exist for drivers.

Results

The extent to which motor vehicle crash and injury involvements of 16 year olds occurred during curfew hours in the curfew and noncurfew states studied is shown in Table 2. Sixteen year old drivers in New York and Pennsylvania were less likely to be involved in crashes during curfew hours than were 16 year old drivers in the comparison states without curfews. For example, 14 percent of New York's crashes involving 16 year old drivers occurred during curfew hours, whereas 28 percent of the crashes of 16 year old drivers in Ohio took place during these hours. Based only on driver involvements in crashes with fatal or nonfatal injuries, the comparable figures were 16 percent in New York and 31 percent in Ohio. Sixteen year olds in New York and Pennsylvania were also substantially less likely than Ohio 16 year olds to sustain motor vehicle related injuries during curfew hours.

In Louisiana, although the percentages of 16 year old drivers in all types of crashes during curfew hours were about the same as in Mississippi, there were relatively fewer 16 year old driver involvements in injury producing crashes. The data obtained from Louisiana and Mississippi did not allow a comparison on 16 year olds injured to be made.

The percentages of crash and injury involvements of Maryland 16 year olds during curfew hours were about the same subsequent to the curfew law as before the law went into effect.

The data in Table 2 cannot be fully interpreted, however, without reference to comparisons of crash and injury involvements during curfew and noncurfew hours between age groups not covered by curfews in both study and comparison states. In the New York-Ohio, Pennsylvania-Ohio, and Louisiana-Mississippi comparisons, the percentages of crashes and injuries of unaffected age groups that occurred during curfew hours were generally quite similar and indicated that the effect found for 16 year olds in the curfew states was not also present in these other age groups. However, in Maryland, older persons unaffected by the curfew had a larger percentage of their crashes during curfew hours after the law went into effect than before. Some of this change may be attributable to a trend in Maryland over this time period to reporting only more serious crashes, which more often occur late at night. This result suggests that the Maryland curfew law may be having an effect on 16 year olds even though the initial comparisons in Table 2 do not show any.

The expected numbers of crash involvements by hour of day for curfew-affected 16 year olds, whether based on the crash experience of 18-20, 21-24 or 25-34 year olds in curfew and comparison states, were quite similar. Figures 1-4 show expected versus actual numbers of 16 year old drivers in crashes in curfew states by hour of day, based on the age 21-24 regression equations. In each curfew state, actual numbers of driver crash involvements were lower than the predicted numbers at each hour of the day, with the exception of six hours in Pennsylvania. Reductions during the curfew hours were much greater than the reductions during the noncurfew hours, as indicated at the tops of Figures 1-4. Compared with earlier, noncurfew hours, the figures also show evidence of relatively small increases in numbers of curfew affected drivers in crashes in Pennsylvania for the three hours just prior to the curfew, and in Maryland for the two hours preceding the curfew. There was a slight increase in New York during the

hour preceding the curfew. There was also decreased involvement similar to that occurring during curfew hours for one or two hours after the curfew in each curfew state.

Analyses based on drivers in injury producing crashes yielded in each state the same pattern of results as the analyses based on all crashes. When the data were separated by driver sex, male and female drivers were found to be about equally affected by curfew laws.

Table 3 presents estimated reductions in driver crash involvements during curfew hours, based on the extent to which curfew hour reductions exceeded reductions at noncurfew hours. For example, based on the regression equations, the actual number of crashes for New York 16 year old drivers during noncurfew hours was 47 percent lower than the expected number. Therefore, for curfew hours, the number of driver crash involvements estimated by the regression equation was reduced by 47 percent. Similarly, the expected numbers in Pennsylvania, Louisiana, and Maryland were reduced by 17 percent, 20 percent, and 15 percent, respectively.

The data in Table 3 show that there were estimated reductions in 16 year old driver crash involvements during curfew hours in all four curfew states studied. These are probably conservative estimates since some of the crashes of 16 year old drivers that are reduced during curfew hours would otherwise have also involved older drivers. Reductions in the crashes of older drivers that occur in this way are an additional positive effect of curfew laws. However, the estimation method on which the data in Table 3 are based would have predicted greater reductions for 16 year olds without this effect.

The estimated reductions of drivers in crashes during curfew hours were greatest in Pennsylvania (69 percent) and New York (62 percent). Estimated crash reductions per 16 year old population were greater in New York than in Pennsylvania because the New York curfew applies to more hours of the day.

Additional analyses extending curfew hours plus or minus one, or plus or minus two hours, indicated that the estimated crash reductions per 16 year old population either remained about the same as when only curfew hours were included, or increased. The one exception was in Maryland, where the estimated reduction in 16 year old driver crash involvements in curfew hours plus or minus two hours decreased from 2.0 to 1.3 per thousand 16 year old population.

A major reason why the actual numbers of 16 year old driver crash involvements in curfew states were generally lower than the predicted numbers at all hours of the day, not only curfew hours, was that, except in Maryland, the percentage of the 16 year old population licensed was lower in curfew than comparison states (Table 4). Licensing data available from the Federal Highway Administration and New York State covering 44 of the 49 states that license 16 year olds indicated that in 1980, New York (excluding New York City and Nassau County) had the lowest 16 year old licensure rate per population, and Pennsylvania had the second lowest rate of any of the 44 states. Louisiana's 16 year old licensing rate was the sixth lowest, lower than Mississippi's, and lower than rates in Arkansas and Texas, which also border Louisiana. It is possible that curfew laws reduce early licensure, perhaps because licenses that are not valid during nighttime hours are less attractive than licenses without such restrictions. Maryland experienced no change in 16 year old licensure rate subsequent to the curfew law. However, Maryland 16 year olds have to wait only 6 months from the date of licensing to be free of the curfew law, which may provide motivation to be licensed as early as possible, rather than to delay licensure.

If curfew laws do reduce licensure rates of young drivers, the reductions in driver crash involvements resulting from curfews would be substantially greater than estimated in Table 3. Differences in driver crash involvements across all hours of the day were -57 percent in New York (-29.3 fewer drivers in crashes per 1,000 16 year old population per year), -27 percent in Pennsylvania (-10.4), -22 percent in Louisiana (-23.8), and -18 percent in Maryland (-13.5).

Estimates of curfew effects on injuries, rather than driver involvements, were also made based on the extent to which curfew hour reductions exceeded reductions during noncurfew hours. These analyses indicated that motor vehicle related injuries to 16 year olds were reduced during curfew hours by 31 percent in New York (-3.1 per 1,000 16 year olds per year), 51 percent in Pennsylvania (-2.2), and by 1 percent in Maryland (-0.03). (Analyses based on crash injuries could not be done for Louisiana.) Sixteen year old motor vehicle passengers, pedalcyclists, and pedestrians are not subject to the curfew laws, and the estimated reductions based on 16 year olds injured were not as large as those shown in Table 3 based on numbers of drivers in crashes. In Maryland, there was virtually no effect on injuries to 16 year olds.

It is apparently not the case, however, that curfew-related reductions for 16 year old drivers are offset by increases in injuries to 16 year olds as nondrivers during curfew hours. In fact, the New York and Pennsylvania curfew laws pertaining to 16 year old drivers reduced the extent to which 16 year olds were injured as motor vehicle passengers during curfew hours. For example, 34 percent of the 16 year old passenger injuries in New York occurred during curfew hours, compared with 42 percent in Ohio. In Pennsylvania, 12 percent were injured during curfew hours, compared with 19 percent in Ohio.

Discussion

In the four curfew states studied, the laws were found to substantially reduce 16 year old driver crash involvements during curfew hours. New York's curfew had the largest effect, in part because it has the longest curfew, beginning at 9 p.m., which is earlier than curfews in the other states. It appears also that in states with curfews that do not start until midnight or later, there is increased crash involvement among curfew-affected 16 year old drivers during the two or three prior hours. This is offset, however, by the continuations in crash reductions one or two hours after curfews end.

The curfew laws in New York and Pennsylvania are more effective in reducing highway losses than those in Louisiana and Maryland. Telephone interviews conducted with small numbers of teenagers, police officers, high school principals, and driver education instructors in the four states studied suggested that awareness, compliance, and enforcement of the curfew was less in Louisiana than in the other states. In Maryland, an unknown percentage of 16 year old drivers is not subject to the curfew law because they can obtain an unrestricted license after six months of crash and violation-free driving, and this probably reduces the curfew effect somewhat.

The effects of the curfews in the eight states not studied is unknown, but these curfews are generally weaker with respect to the ages covered and hours restricted than those studied. However, it is clear from the present study that curfew laws are effective in reducing the high crash rates of teenage drivers which result in large numbers of injuries to themselves and others [Karpf and Williams, 1982; Williams and Karpf, 1982, 1982a]. If curfew laws also reduce early licensure, their effect in reducing crashes is greater than reported in this paper. The possibility that curfew laws delay licensure is currently being investigated by the Insurance Institute for Highway Safety.

References

1. KARPF, R.S. and WILLIAMS, A.F. (1982) "Teenage drivers and motor vehicle deaths." *Accident Analysis and Prevention*, in press.
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3. WILLIAMS, A.F. and KARPF, R.S. (1982a) "Teenaged drivers and fatal crash responsibility." Insurance Institute for Highway Safety, Washington, D.C., August 1982.

Table 1

Curfew Laws Studied

State	Ages Covered	Curfew Hours	Primary Exceptions
Louisiana	15, 16	11 pm - 5 am	none
Maryland	16, 17	1 am - 6 am	- accompanied by licensed driver at least 21 years old - school and work waivers granted upon request
New York ^a	16; 17 without driver education	9 pm - 5 am	- accompanied by parent - driving to and from work or school
Pennsylvania	16; 17 without driver education	Midnight - 5 am	- accompanied by parent, or spouse 18 years of age or older - driving to and from work

^a Excluding New York City and Nassau County, where driving by 16 year olds and those 17 year olds who have not completed driver education is prohibited at all times of the day.

Table 2

Crash and Injury Involvement of 16 Year Olds During Curfew Hours
In Curfew and Noncurfew States

	<u>Drivers in All Crashes</u>		<u>Drivers in Injury Producing Crashes</u>		<u>Sixteen Year Olds Injured*</u>	
	Total No.	% During Curfew Hours	Total No.	% During Curfew Hours	Total No.	% During Curfew Hours
Louisiana (11pm - 5am curfew)	36,402	7%	11,046	9%	not available	
Mississippi (no curfew)	8,504	8%	1,894	12%		
Maryland 1979-80 (1am - 6am curfew)	10,071	5%	3,976	6%	5,020	9%
Maryland 1974-78 (no curfew)	33,611	4%	9,935	6%	12,028	9%
New York (9pm - 5am curfew)	12,261	14%	7,790	16%	13,002	28%
Ohio (no curfew)	59,078	28%	17,097	31%	18,310	37%
Pennsylvania (midnight - 5am curfew)	18,538	6%	10,970	6%	13,963	10%
Ohio (no curfew)	59,078	11%	17,097	13%	18,310	17%

* Includes all motor vehicle related injuries, e.g., as drivers, passengers, pedalcyclists, pedestrians.

Table 3

Estimated Reductions in 16 Year Old Driver Crash
Involvements During Curfew Hours

Curfew State	Number of Driver Crash Involvements		Estimated Crash Reductions		
	Actual	Expected*	No.	Per 1,000 16 Yr. Olds Per Year	Percent (Actual vs. Expected)
Louisiana	2,509	3,340	- 831	-2.0	-25%
Maryland	517	855	- 338	-2.0	-40%
New York	1,694	4,419	-2,725	-5.0	-62%
Pennsylvania	1,063	3,432	-2,369	-3.7	-69%

* Based on the extent to which curfew hour reductions exceeded reductions at noncurfew hours. See text for estimation procedure.

Table 4

1980 Licensure Rates For 16 Year Old Drivers in
Curfew and Noncurfew States

	% of 16 Year Olds Licensed	U.S. Rank*
Louisiana (11pm - 5am curfew)	38	6
Mississippi (no curfew)	49	21
Maryland 1979-80 (1am - 6am curfew)	42	12
Maryland 1974-78 (no curfew)	41**	--
New York (9pm - 5am curfew)	21	1
Ohio (no curfew)	48	18
Pennsylvania (midnight - 5am curfew)	28	2
Ohio (no curfew)	48	18

* Lowest to highest, based on the 44 states for which licensure data were available.

** Based on 1974-1978 licensure data.

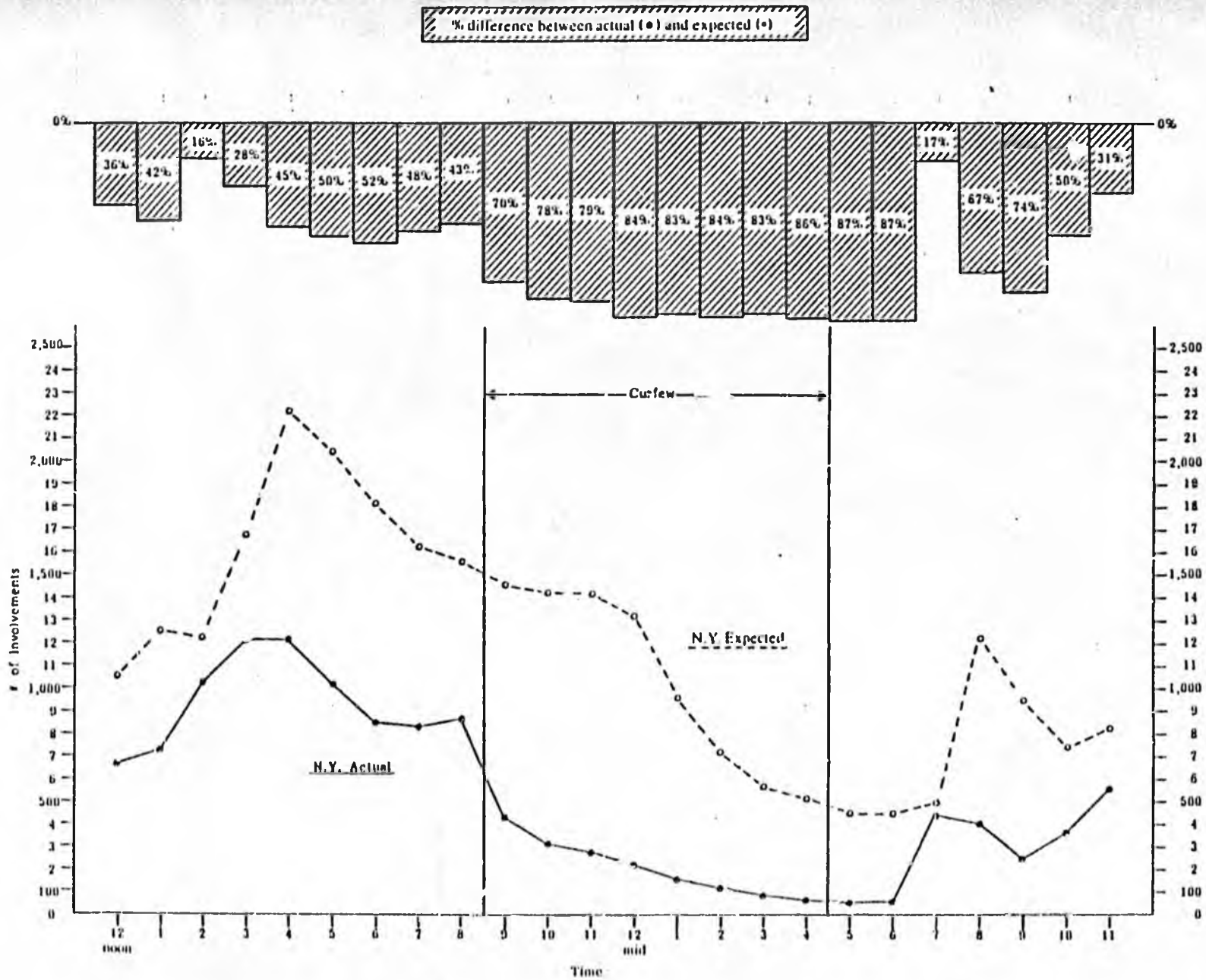


Figure 1. Actual numbers of crash involvements by hour of day for New York 16 year old drivers, versus expected numbers based on relationship between New York-Ohio 21-24 year olds and numbers of crash involved 16 year old Ohio drivers (1978-1980).

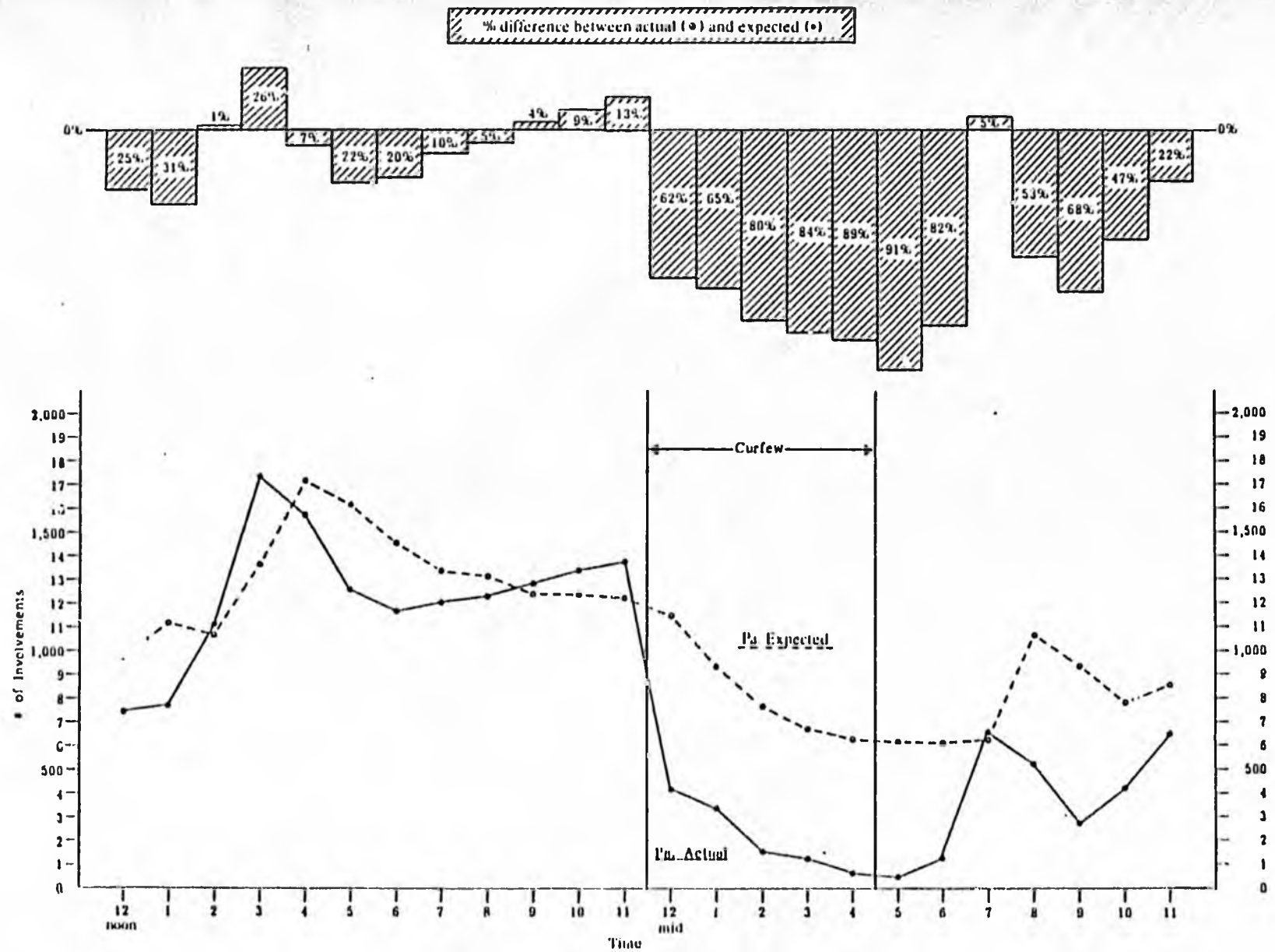


Figure 2. Actual numbers of crash involvements by hour of day for Pennsylvania 16 year old drivers, versus expected numbers based on relationship between Pennsylvania-Ohio 21-24 year olds and numbers of crash involved 16 year old Ohio drivers (1978-1980).

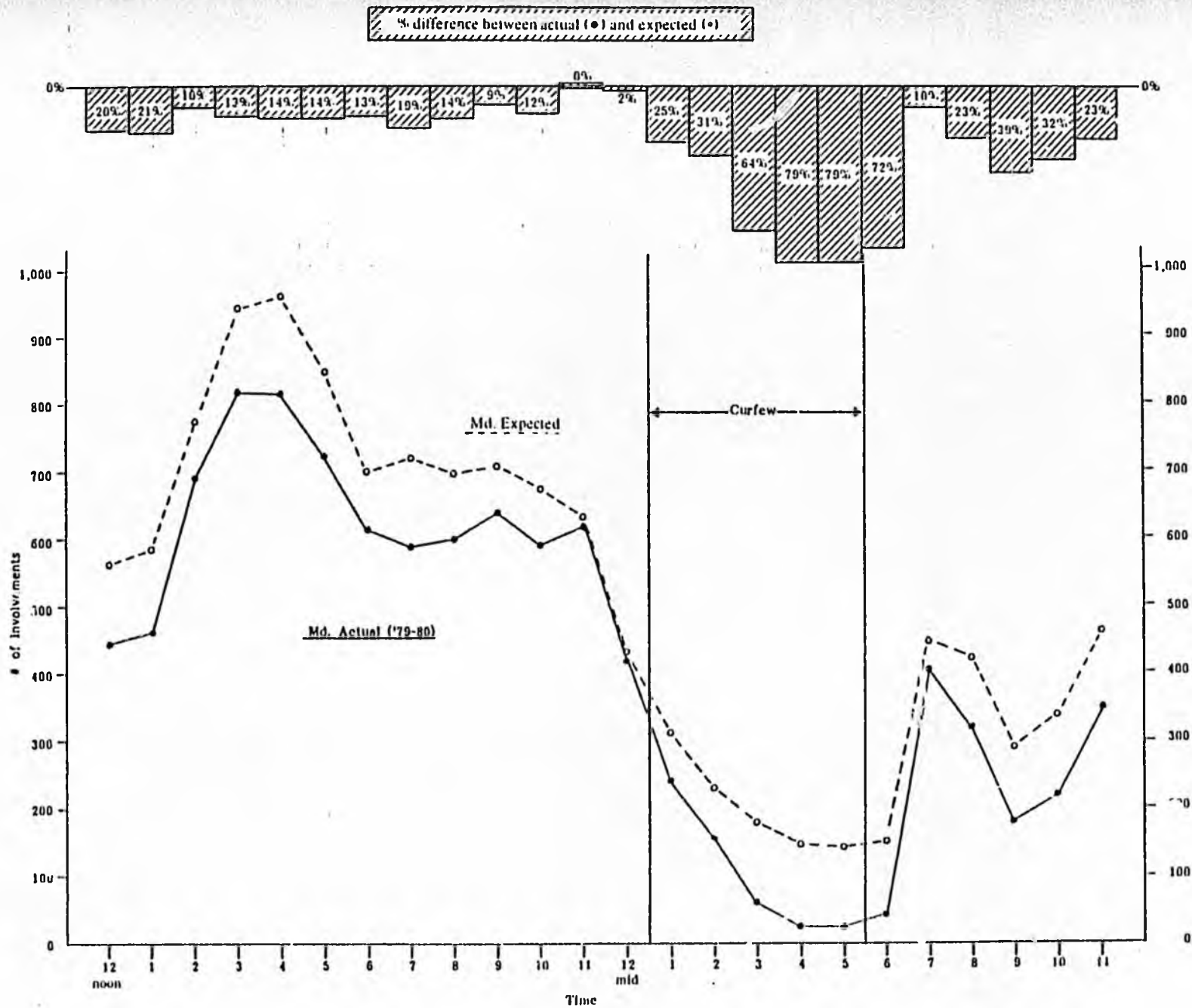


Figure 3. Actual numbers of crash involvements by hour of day for Maryland 16 year old drivers ('79-80) versus expected numbers based on relationship between Maryland ('79-80) - Maryland ('74-78) 21-24 year olds and numbers of crash involved 16 year old Maryland ('74-78) drivers.

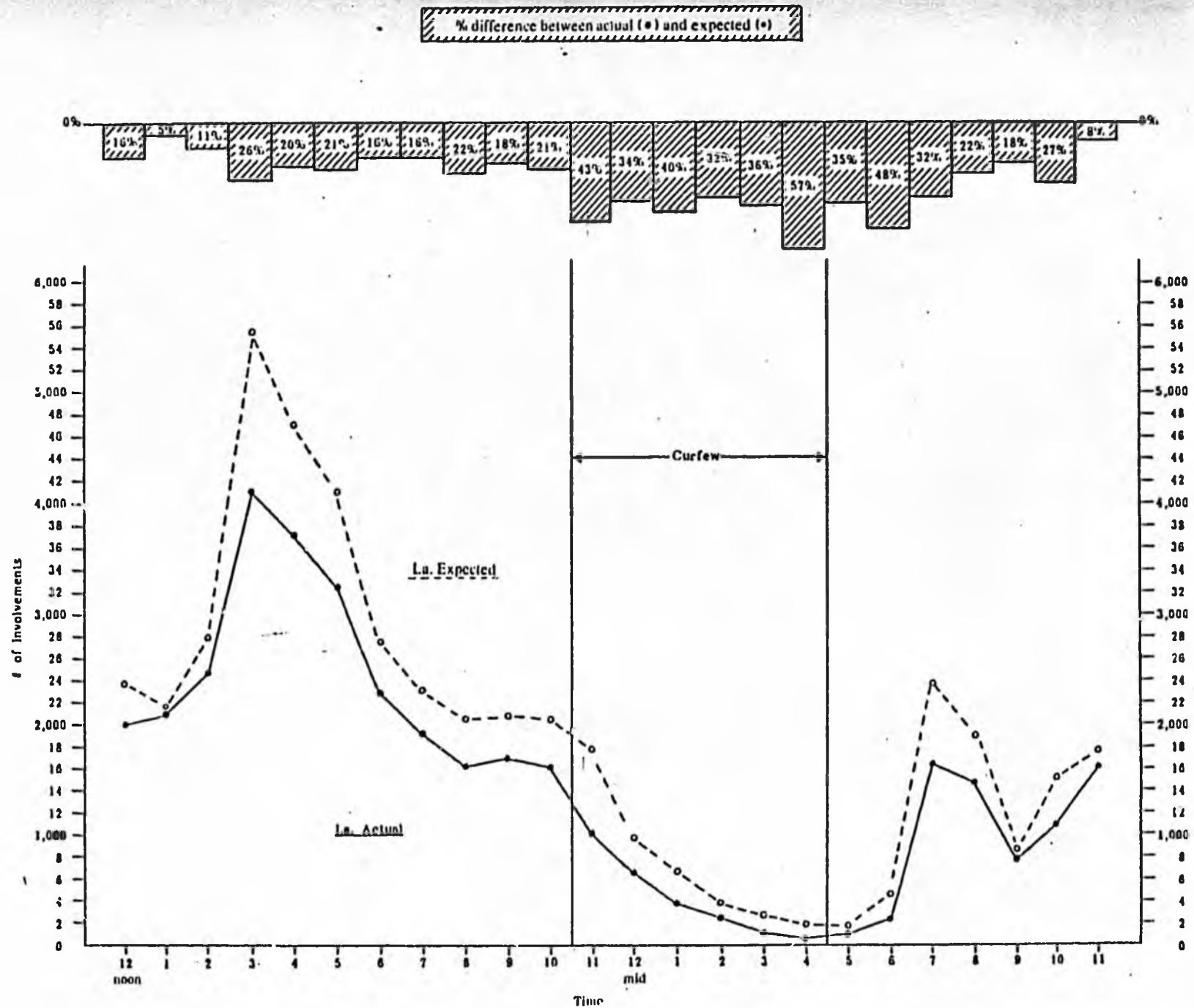


Figure 4. Actual numbers of crash involvements by hour of day for Louisiana 16 year old drivers, versus expected numbers based on relationship between Louisiana-Mississippi 21-24 year olds and numbers of crash involved 16 year old Mississippi drivers (1976-1980).