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# Reducing Distracted Driving Among Adults: Child-to-Adult Interventions

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**16. Abstract**

Distracted driving is a problem for drivers and their passengers. Several programs exist to reduce the distracted driving habits of people who are already drivers. However, there are few programs that teach children before they become drivers, especially in elementary school, how to intervene with a driver who is distracted (e.g., a parent) and none that have been evaluated. After a search of the literature and active programs across the United States, one program was identified that was developing both a lesson to teach elementary school children how to intervene with distracted drivers and an evaluation of the lesson. The COVID-19 pandemic made it necessary to pivot from the classroom to online, and to broaden the program to include high school as well as elementary school students. Among high school students, the program produced statistically significant increases in students' knowledge of distracted driving and what they need to say to their drivers to refrain from driving distracted, statistically significant increases in the frequency of intervening with parents and passengers (but not friends), and a reported decrease in distracted driving of their parents and friends. The sample of elementary school students was too small to draw conclusions about the various broad categories of change.

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# 1    Executive Summary

Distracted driving is a contributor to crashes (NCSA, 2017), likely fueled by increases both in the number of apps available for the car and smart phone and in the levels of automation that require of the driver more in the way of monitoring than actual engagement with the driving task (Regan, Lee, & Young et al., 2009). A number of countermeasures to distracted driving have been proposed and evaluated. For example, laws, campaigns and programs exist to decrease distracted driving among adult and teen drivers (Richard et al., 2017). However, these typically target the drivers themselves; few if any efforts exist that attempt to get younger, elementary school children to intervene with their adult drivers. The benefit of such child-to-adult interventions is potentially twofold: (1) they may reduce the distracted driving behaviors of the drivers that the children target for an intervention and (2) they may reduce the distracted driving behaviors of the children when they themselves become licensed at some later age.

With this in mind, the Governors Highway Safety Association (GHSA) working together with the National Highway Traffic Safety Administration and the Volpe National Transportation Systems Center conducted a review of the research literature and of currently existing programs that met five criteria: the program was focused on the dangers of distracted driving; the program targeted younger, elementary school (ES) children; the program used child-to-adult interventions as a way to change the behavior of a child's driver; the program had a process for evaluating program effectiveness; and the program was willing to share evaluation data with the Volpe Center project team. Only one program met these criteria: a combined effort of two organizations, End Distracted Driving (EndDD at EndDD.org), a project of the Casey Feldman Memorial Foundation, and Safe Roads Alliance (SRA, at saferoadsalliance.org).

When Volpe selected EndDD/SRA in Fall 2019, the program was to be delivered in person by elementary school teachers. Program implementation had advanced to the point that contact had been made with several elementary schools willing to participate. The EndDD/SRA program consisted of the elementary school Distracted Driving Lesson (ES DDL) to be delivered by the teacher in person to the students and four or five related Distracted Driving Units (DDUs) to be delivered by teachers of different subjects (health, gym, math, English, etc.) to the students as special topics exercises. Unfortunately, the COVID-19 pandemic took hold just as the elementary school program was about to start. In order to increase the reach of the program when it looked like no information would be available from any school children, the decision was made by NHTSA and the Volpe Center to include in the evaluation not only elementary school students, but also high school students, for which a live, interactive program produced by EndDD already existed. The high school and elementary school programs overlapped in three critical areas: They focused on the dangers of distracted driving, they targeted child (teen)-to-adult driver interactions, and they were gathering information that could be used in an evaluation.

To adapt to the remote learning methods used during the pandemic, changes needed to be made in the developing elementary school program and the existing high school program. For the elementary schools, EndDD and SRA pivoted from a classroom delivery of the DDL (ES live DDL) to an online delivery of a 30-minute, prerecorded, asynchronous video lesson (the ES video DDL) and online delivery of a survey before and after the lesson to provide data to

evaluate the program. The special topics units (DDUs), which were also going to be delivered in the classroom, had to be available online and were made available to teachers who registered on the EndDD website. For high schools, EndDD pivoted from a live, interactive PowerPoint presentation (HS live DDL) led by someone from EndDD to online delivery of an interactive, PowerPoint presentation, usually over Zoom (HS virtual DDL).

Ultimately, EndDD and SRA provided data on both the pre-DDL and the post-DDL surveys from eight high schools and five elementary schools. From the eight high schools, 459 pre-DDL and 196 post-DDL survey responses were obtained. From the five elementary schools, 118 pre-DDL surveys and 34 post-DDL surveys were obtained. The data from three high schools and one elementary school could not be used in the analyses because there were either no responses to the post-DDL survey or too few responses to be considered representative.

 Forty-eight questions were given to high school students. For purposes of analysis, these were grouped into 9 categories made up of 17 subcategories. Responses were scored on a Likert scale (four or five points depending on the question) and averaged within people across questions within subcategories except for five questions scored correct or incorrect. Analyses were conducted using both unmatched and matched $t$-tests. The conclusions from the analyses were similar between both analyses.

Four conclusions were drawn from the analyses for high school students.

1. There was statistically significant improvement across 9 of the 17 subcategories (i.e., the average Likert scale post-DDL survey score was greater than the average Likert scale pre-DDL survey score; Likert scaled items all had the same valence – higher is better), indicating an overall significant effect of the program.
2. Significant improvements were seen in students' knowledge of distracted driving and words to use in interventions and their perceived ability to intervene with their driver when the driver is distracted.
3. Consistent with the above, significant increases were reported in the frequency with which students intervened with their drivers and passengers around issues of distracted driving.
4. There were significant decreases in the reported distracted driving activities of parents and friends.

Fewer questions were given to elementary school students because of their ages. Each pre-DDL and post-DDL survey included only 13 questions relevant to the effect of the program (Section 14). Furthermore, to keep the number of questions to a minimum on the pre-DDL and post-DDL surveys, an elementary school student was asked either about talking activities or texting activities, not about both. The talking or texting survey versions were randomly assigned to students. Both unmatched and matched analyses were undertaken. In the unmatched analyses, the only significant improvement observed was in the students' report of their understanding of the meaning of distracted driving. In the matched analyses, the sample size was too small to undertake meaningful comparisons.

There were limitations to a study such as this. First, there was no control group who received the intervention. Second, all behaviors were based on self-report, not independent observations. Third, the various schools enrolled in the DDL were self-selected, not randomly selected.

In summary, the HS DDL generated a significant increase in knowledge of what to say to a driver when that driver is distracted as well as the self-reported intention to intervene, the self-reported frequency of intervening, and the self-reported reduction in the distracting activities with which their drivers are engaged. The ES DDL results were inconclusive. The lack of an effect could be due to low power from a small sample size, but there are other reasons that the ES DDL may have not been as effective as the HS DDL. First, the ES DDL curriculum was originally designed for delivery in the classroom, not delivery online. Elementary school students may in general learn less well online than they do in the classroom. Such is true of high school students (Heppen et al., 2017). Perhaps the decrement is even larger in elementary school students. Not enough is known to draw firm conclusions. Second, the ES DDL was passive, an asynchronous, 30-minute, prerecorded video. This is what is referred to as passive learning. The HS DDL on the other hand is closer to what is referred to as active learning. It was a 70-minute, interactive program delivered online. The instructor in the HS DDL asked questions of the high school students in real time to which they could respond. Active learning is generally considered better than passive learning (Romoser & Fisher, 2009). Third, the HS DDL was more than twice as long as the ES DDL. More exposure to a given set of concepts generally leads to increases in learning.

## 2    Background

Distracted driving is a contributor to crash injuries and fatalities, with 3,142 distracted driving fatalities in 2020 (Stewart, 2022). Young drivers 16 to 24 years old have the highest rates of distracted driving and, not surprisingly as consequence, injuries and deaths related to distracted driving (Tison et al., 2011; NCSA, 2017).

Efforts to reduce distracted driving have had mixed results. Laws prohibiting cell phone use or texting while driving have not produced consistent decreases in crashes or insurance claims from incidents involving distracted driving. High-visibility enforcement campaigns have been shown to reduce observed phone use while driving Venkatraman et al., 2021). However, these efforts are often costly and time-consuming (Richardet al., 2017). Broad messaging campaigns against distracted driving have been evaluated, with mixed results; many produced no change in distracted driving citations or reported awareness of distracted driving reduction efforts, while others produced definite decreases in distracted driving (Chaudhary et al., 2014). General communication and education campaigns have not been researched enough to determine their efficacy, but they have the benefits of being lower in cost and broader in reach (Richard et al., 2017; Venkatraman et al., 2021).

Very little was available in the literature about campaigns targeting children and distracted driving before they start driving. Other public health efforts (e.g., smoking prevention) have successfully targeted younger children to prevent the onset of risky behaviors (Richard et al., 2017). An interesting element of child targeted education campaigns is their potential to be doubly effective, benefitting both (1) people who interact with the targeted person as well as (2) the person targeted with the message. This issue becomes particularly impactful when considering campaigns to reduce distracted driving that target children before they begin driving. These children are often passengers in vehicles, and as such may convey what they learn to those driving as well as learn the lessons themselves for when they become drivers in the future. In summary, campaigns that target younger children could decrease both current distracted driving rates and future distracted driving rates.

With targeted education campaigns focused on children, it is important to note the distinction between peer-to-peer and child-to-adult interventions. In peer-to-peer campaigns, one child targets the behavior of another child, a peer. Peer-to-peer education campaigns where both people are similar ages have been shown to be very effective for reducing the incidence of smoking, alcohol-impaired driving, and other risky behaviors in both advantaged and disadvantaged groups (Ford et al., 2013). Peer-to-peer campaigns are relatively rare for distracted driving, and some show promise (Teens in the Driver Seat, 2018a; Geedipally et al., 2013). Although peer-to-peer interventions focused on distracted driving do include younger drivers, they almost never appear to involve children before they start driving, especially elementary school children, nor do they include systematic, research-based programs to teach the children how to intervene with their drivers. Elementary school children are especially important as the focus of a program since changes in attitudes are fundamental to later changes in behavior (Fishbein & Ajzen, 1975).

As opposed to peer-to-peer interventions, in child-to-adult interventions a child focuses on the behavior of an adult. In the case of young children as passengers, the intervention involves a

child speaking to an adult or older teen about distracted driving behaviors. The term child-to-adult intervention will be used to characterize these campaigns and distinguish them from peer-to-peer campaigns focused primarily on the activities of the child himself or herself, not on the role that the child can take in reducing the distracted driving activities of adults behind the wheel when they are riding as passengers.

Both peer-to-peer and child-to-adult interventions adopt a one-on-one approach instead of broad messaging. The one-on-one approach may be helpful in overcoming the phenomenon of many drivers who report that distracted driving is dangerous but engage in distracted driving behaviors anyway. However, when considering just child-to-adult interventions, it is unclear what timing and types of individual messages would be most effective in such interventions.

First, consider the timing of an individual message. One experiment compared real-time driving feedback (flashing lights to re-engage attention to the roadway) and post-drive feedback (report cards showing driving performance compared to peers) in a driving simulator. That study found that post-drive feedback increased focus on the roadway in subsequent sessions and was rated more effective and useful by participants than real-time feedback, which decreased attention to the roadway (NCSA, 2013). Interventions that include children pointing out distracted driving to adults while driving may not be as effective as interventions designed to have children speak with parents once out of the vehicle or at home.

Second, consider the types of individual messages that might be delivered. One can imagine children saying to the driver something about the dangers of texting ("Mom, texting while driving is dangerous") or saying something to the driver about the child's own concern ("Dad, I am worried when you text while driving that we might get into a crash"). Information is not currently available on what is the best thing a child can say to a parent that will reduce the likelihood that the parent engages in distracting activities while driving.

Third, consider that the rates of intervening when someone is driving distracted are low, especially among young people (Tison et al., 2011). It is unclear if intervention efforts will increase rates of noticing and attempting to stop distracted driving as it is happening.

With that as a background, there is a need to research child-to-adult interventions as a potential strategy to reduce distracted driving, especially interventions that focus on elementary school children. The following three step approach was used in this study to further understand and possibly evaluate child-to-adult interventions that already had (or were in the process of collecting) data:

1. **Literature Review**. An extensive review of the literature was conducted to identify any potential programs and evaluations of child-to-adult interventions in distracted driving.

2. **Census and Analysis of Existing Programs**. We explored whether there are existing programs throughout the United States that contain child-to-adult interventions in distracted driving that have not been reported in the literature, interventions that have collected (or are collecting) data that could be used in an evaluation.

3. **Evaluation of Distracted Driving Lessons**. We identified a child-to-adult intervention with elementary school children that has not been studied yet and that is planning to

engage in gathering information on the effectiveness of the program. This evaluation used the information gathered by the program to determine whether the program was effective at getting children to intervene, at getting drivers to reduce distracted driving, and at getting children to change their attitudes toward distracted driving when they themselves become drivers.

# 3    Literature Review

The literature review focused on child-to-adult interventions and around the distracted driving of parents, caregivers, and friends. Two databases, PubMed and TRID, were searched using six related search sets. The search sets identified articles focused on campaigns, interventions, and programs involving distracted driving, general traffic safety, and general health that targeted families (teens, children) or students (elementary school, middle school, high school). The search included articles published from January 1, 2008, to February 1, 2019.

Using the six search sets, 45,529 abstracts were PubMed and 65 abstracts were TRID. Three search sets from PubMed had more than 100 abstracts. We limited the abstracts in those search sets to the top 100 most relevant as identified by PubMed.[1] As a result, 343 abstracts were included from PubMed and all 65 were included from TRID. Four reviewers were used. Each abstract was scanned by two reviewers. Only one abstract in the 408 reviewed was identified as both targeting child-to-adult interventions and as providing information on the effect of that evaluation on the adult's behavior. Three other abstracts described child-to-adult interventions but did not evaluate the effect of the intervention on the adult's behavior. All other abstracts were identified by both reviewers as not directly addressing child-to-adult interventions. However, among these 404 other abstracts, 9 were identified that provide what we thought was useful information that could potentially bear on child-to-adult interventions.

## 3.1  Method

The method used to identify relevant articles and then to narrow the search is described below.

### 3.1.1  Databases

Two databases were used in the search, TRID and PubMed. They were chosen because of their extensive set of works in the areas of transportation and behavioral interventions. They are described in more detail below.

- TRID is an integrated database that combines the records from TRB's Transportation Research Information Services (TRIS) Database and the OECD's Joint Transport Research Centre's International Transport Research Documentation (ITRD) Database. TRID provides access to more than one million records of transportation research worldwide. TRB's Research in Progress database is also searchable through TRID.

- PubMed comprises more than 29 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full-text content from PubMed Central and publisher web sites.

### 3.1.2  Search Sets

The primary target abstract was one that focused on a child-to-adult intervention where the child attempted to change the distracted driving behaviors of the adult (Sets 1 and 2 below). Knowing that there may be few such interventions, we also looked for interventions where the focus might

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[1] The Best Match sort order is based on an algorithm that analyzes each PubMed citation found with your search terms. For each search query, "weight" is calculated for citations depending on how many search terms are found and in which fields they are found. https://support.nlm.nih.gov/knowledgebase/article/KA-03719/en-us.

be on traffic safety (Sets 3 and 4) or more generally health (Sets 5 and 6). To make sure that we captured a broad set of interventions, we also included campaigns, programs, and preventative efforts for distracted driving and campaigns, programs and promotional efforts for traffic safety and health. To make sure that the focus was on the family or students in elementary, middle, and high school, we included terms in the search set relevant to these categories. Finally, to make sure that the focus was on evaluation, we included terms in the search set that would so limit it to such activities (effectiveness, efficacy, evaluation, assessment).

The six related search sets and their associated logic are listed below.

1. Distracted driving AND (campaigns, interventions, programs, prevention) AND (family, teens, children) AND (effectiveness, efficacy, evaluation, assessment);
2. Distracted driving AND (campaigns, interventions, programs, prevention) AND (students) AND (elementary school, middle school, high school) AND (effectiveness, efficacy, evaluation, assessment);
3. Traffic safety AND (campaigns, interventions, programs, promotion) AND (family, teens, children) AND (effectiveness, efficacy, evaluation, assessment);
4. Traffic safety AND (campaigns, interventions, programs, promotion) AND (students) AND (elementary school, middle school, high school) AND (effectiveness, efficacy, evaluation, assessment);
5. Health AND (campaigns, interventions, programs, promotion) AND (family, teens, children) AND (effectiveness, efficacy, evaluation, assessment); and
6. Health AND (campaigns, interventions, programs, promotion) AND (students) AND (elementary school, middle school, high school) AND (effectiveness, efficacy, evaluation, assessment)

### 3.1.3  Abstract Identification

There were 45,529 abstracts retrieved from PubMed (Table 1)and 65 were retrieved from TRID. Three search sets in PubMed had more than 100 abstracts. To reduce the number of abstracts retrieved from PubMed to a manageable number, we limited the abstracts in those search sets to the top 100 most relevant as determined by PubMed. As a result, 343 abstracts were included in the PubMed list. Thus, the total number of abstracts reviewed in PubMed and TRID was 408.

*Table 1. PubMed and TRID Abstract Totals and Total Reviewed*

| Search Set | PubMed | | | TRID | |
| --- | --- | --- | --- | --- | --- |
| | Total | Total Reviewed | | Total | Total Reviewed |
| 1 | 23 | 23 | | 4 | 4 |
| 2 | 1 | 1 | | 1 | 1 |
| 3 | 184 | 100 | | 34 | 34 |
| 4 | 19 | 19 | | 5 | 5 |
| 5 | 40,348 | 100 | | 19 | 19 |
| 6 | 1,954 | 100 | | 2 | 2 |
| | | | | | |
| Total | 42,529 | 343 | | 65 | 65 |

The abstracts were separately listed by search set for the PubMed and TRID databases and numbered sequentially within each search set. The first abstract in the first search set in PubMed is included below to provide an example of the typical detail that was available (Table 2). Each abstract was available as a separate Word document.

*Table 2. Example PubMed Abstract*

1. J Pediatr Nurs. 2015 Sep-Oct;30(5): e183-91. doi: 10.1016/j.pedn.2015.04.006. Epub 2015 Jun 3.
Distracted Driving in Teens With and Without Attention-Deficit/Hyperactivity Disorder.
Stavrinos D[1], Garner AA[2], Franklin CA[2], Johnson HD[3], Welburn SC[2], Griffin R[4], Underhill AT[2], Fine PR[5].

Author information:
1. University of Alabama at Birmingham University Transportation Center, Community Health Services Building-19, Birmingham, AL; University of Alabama at Birmingham, Department of Psychology, Birmingham, AL. Electronic address: dstavrin@uab.edu.
2. University of Alabama at Birmingham University Transportation Center, Community Health Services Building-19, Birmingham, AL.
3. University of Alabama at Birmingham, Department of Psychology, Birmingham, AL.
4. University of Alabama at Birmingham University Transportation Center, Community Health Services Building-19, Birmingham, AL; University of Alabama at Birmingham, School of Public Health, Department of Epidemiology, Birmingham, AL.
5. University of Alabama at Birmingham University Transportation Center, Community Health Services Building-19, Birmingham, AL; University of Alabama at Birmingham, Department of Medicine, Birmingham, AL.

Abstract

*OBJECTIVE*:
This study is among the first to examine the effect of talking on a cell phone or text messaging while driving in teens with and without attention deficit/hyperactivity disorder (ADHD).
*METHOD*:
Teens (average age 17years) with a diagnosis of ADHD (N=16) were matched with typically developing controls (N=18). All participants operated a driving simulator while (1) conversing on a cell phone, (2) text messaging, and (3) with no distraction during a baseline condition. Six indicators of driving performance were recorded: (a) time to complete the drive; (b) lane deviations; (c) variability in lane position (i.e., root mean square [RMS]); (d) reaction time; (e) motor vehicle collisions; and (f) speed fluctuation.
*RESULTS*:
Significantly greater variation in lane position occurred in the texting task compared to no task and the cell phone task. While texting, in particular, teens with ADHD took significantly less time to complete the scenario. No significant main effects of group were found.
*CONCLUSIONS*:
Generally, those with ADHD did not differ in regard to driving performance, when compared to controls, with the exception of one outcome: time to complete scenario. These

findings suggest that distracted driving impairs driving performance of teen drivers, regardless of ADHD status. Texting while driving had the greatest negative impact on driving performance, particularly with regard to variability in lane position (i.e., RMS). This study sheds light on key issues regarding injury prevention, with the intent of providing pediatric care providers with the knowledge to inform teen drivers of risks associated with distracted driving that will ultimately result in reduced rates of motor vehicle crashes and concomitant injuries.
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### 3.1.4  Abstract Rating Process

A two-step process was used to determine whether the abstracts provided information about child-to-adult interventions. In the first step, four reviewers rated the abstracts. Two reviewers scanned the first half of the abstracts in PubMed and TRID; the second set of two reviewers scanned the second half of the abstracts in PubMed and TRID. Reviewers indicated whether the abstract did or did not specifically address a child-to-adult intervention in distracted driving, traffic safety, or health. When it was not clear whether the research targeted a child-to-adult intervention, the reviewer indicated in a comment that further analysis of the full article might reveal something of relevance. Reviewers also included any comments that might be of future use. Importantly, reviewers worked on unmarked documents. The comments were only combined after all reviews were completed; no reviewer saw the comments of another reviewer before all reviews were finished. When reviewers disagreed as to the relevance, an agreement was reached by further discussion.

In the second step, the research team retrieved articles that had an indication there was something of relevance to child-to-adult interventions, based on the abstract. One of the reviewers who made the comment about the relevance then read the article to determine whether something that had appeared as possibly relevant in the abstract was truly relevant on further reading.

## 3.2  Results

The background, method, and results of the one article that was identified as directly relevant and for which information on the effect that the child-to-adult intervention had on the adults' behaviors are summarized below (Section 3.2.2). Next, articles that discussed child-to-adult interventions without an adult evaluation component are described in somewhat less detail (Section 3.2.3). Finally, those abstracts for which articles were downloaded in which something was contained relevant to child-to-adult interventions were briefly summarized in a separate section to make clear the relation that was perceived between what the article described and future and current child-to-adult interventions (Section 3.2.4).

### 3.2.1  Overall

Four of the 408 abstracts discussed child-to-adult interventions. Only one of these four abstracts included an evaluation of the effect of the child-to-adult intervention on the parents' behaviors below (Section 3.2.2). The remaining three articles discussed child-to-adult interventions, but

they did not report an evaluation of the intervention on the adults' behavior (3.2.3). Of the remaining 404 abstracts, 9 contained information that some bearing on the conduct of current and future child-to-adult interventions (3.2.4).

### 3.2.2  Child-to-Adult Interventions With Evaluations

Only one article, *A multiyear assessment of a hospital-school program to promote teen motor vehicle safety*, was identified as addressing child-to-adult interventions that also included an evaluation of the effect of the child's intervention on the parent's behavior (Unni et al., 2017).

There were two phases in the intervention. In the first phase, 137 teens were exposed to training given by emergency department staff, trauma surgeons and injury prevention specialists. In the second phase, these students were asked to put together activities in their high school targeting solely students in the high school as well as designing messaging campaigns that they were expected to bring to the larger community, including local media outlets, police departments, and hospitals. Observations were used to document the effect of the program on distracted driving. Specifically, they were made of all drivers' texting activity at places where the driver came to a stop close to the high school. There were 12,309 drivers (adults and teens) observed in the first round of data collection in the fall and 13,153 drivers (adults and teens) were observed in the second round of data collection in the Spring. The percentage of adults texting dropped from 13% to 10%; the percentage of teens texting dropped from 12% to 9%. The differences were significant both individually for adults and teens and overall ($p < 0.001$). In summary, although this intervention did not focus on the one-on-one activities between a child (teen) and adult (parent or other caregiver) that might cause the parent to reduce his or her distracted driving, the intervention highlights a novel way of gaining information on drivers' behaviors. Unfortunately, as promising as this might have been, the pandemic made implementation of such an evaluation by any of the programs considered not feasible.

### 3.2.3  Child-to-Adult Interventions Without an Evaluation

Next, there were three child-to-adult interventions that were identified as part of the literature review that did not focus on distracted driving and that did not include an evaluation of the effect of the intervention on the adults. In the first study the intervention was designed to reduce the obesity of children between the ages of 10 and 17 (Burke et al., 2014). Researchers found that children who were exposed to the HealthMPowers program in the classroom were more healthy and, in particular, demonstrated improvements in knowledge, self-reported behaviors, and body mass index scores with particularly significant improvements for third-graders in schools in the second year of the program. In the program, teachers, and parents served as role models. But critically, the students could also potentially serve as role models for family members, including parents. This has relevance to child-to-adult interventions focused on distracted driving. In particular, it suggests that children can learn to model behavior that is not distracting to their drivers and can actually intervene with parents when they are distracted by a text or call, taking the text or call for the parents where appropriate. In the second study, the program (SYDCP, Stanford Youth Diabetes Coaches Program) included a child-to-adult intervention focused on teaching the student the diabetes management of one of their family members (Gefter et al., 2016). In post-test, the student coaches improved significantly on knowledge, worth, problem solving, and self-efficacy. As a model of child-to-adult interventions focused on distracted

driving, the research suggests that the knowledge, behaviors, and attitudes of students can be changed, at least with respect to diabetes management. Finally, in the third study, nutrition information was provided to kindergarten children in school and their parents or other primary caregivers (Larsen et al., 2017). There was a change in parents' behaviors (use of food labels), but there was no control group with which to compare the change in the behaviors of the parents in the treatment. Moreover, not only the students, but also the schools, gave parents information on nutrition. From our standpoint, it is important to note the change in students' behaviors even if the effects of the students' intervening with their parents cannot adequately be assessed.

The three studies above indicate that programs exist with school children, from kindergartners all the way to teens, that can change the knowledge, attitudes, and behaviors of children around issues of health. The effect of these changes on parents' behaviors could not be determined. However, if the behavior of children around issues of health can successfully be modified, then intervening with an adult is potentially a behavior that can be modified. These findings suggest that child-to-adult interventions in the area of distracted driving could indeed work.

### 3.2.4  Other Relevant Interventions

Finally, there were studies that did not specifically mention child-to-adult interventions but were considered relevant. Nine studies contained information on novel places that a child-to-adult intervention might be introduced (e.g., a well-child visit) (Mirman et al., 2018; Schwebel et al., 2017), distracting activities in which adult drivers were engaged while their children were in the car (Macy et al., 2014), elements that were similar in some respects to child-to-adult interventions (e.g., adult-child to parent of adult-child interventions, particular adult children trying to manage their elderly parents' driving behavior) (Anstey et al., 2016), and elements of child-to-adult interventions that were critical to their success (Carter et al., 2014; Schwebel et al., 2015; Taubman – Ben-Ari, 2016; McKay, et al., 2014; Zhao & Young, 2018).

# 4    Census and Analysis of Existing Programs

In addition to a literature review for this study, the research team conducted an assessment of existing programs in the field that focused on children discussing with their parents the dangers of their parents driving distracted while the children were in the car. These potential programs were identified by reaching out to organizations such as SADD (Students Against Destructive Decisions) whose missions include, among other things, decreasing distracted driving. This led to a series of Tier I, Tier II, and Tier III efforts including emails and open-ended interviews to 51 people and organizations (Tier I), focused interviews on the three programs most relevant to this study using a standard set of questions (Tier II), and detailed written analyses of the nine versions of the three programs (Tier III).

The three programs included Teens in the Driver Seat (www.t-driver.com/); End Distracted Driving (EndDD.org) that was partnering with Safe Roads Alliance; and Andy Pilgrim (andyilgrim.org). There were six different versions of Teens in the Driver Seat (TDS): (1) Teens in the Driver Seat – High School; (2) Teens in the Driver Seat, Middle School; (3) Zero Crazy: High School; (4) Zero Crazy – Middle School; (5) Ride With Me – High School; and (6) Ride With Me – Middle School. There were two versions of End Distracted Driving (EndDD) and Safe Roads Alliance (SRA): (1) EndDD – High School and Middle School and (2) EndDD/SRA – Elementary School. There was only one version of Andy Pilgrim.

Ten factors were identified that were pertinent to the evaluation of the relevance of a program to the study and then were used to describe the nine different versions of the three programs. Additionally, given that none of the programs were classified as currently fully operational as child-to-adult interventions that targeted elementary school children, an analysis was performed of the modifications to the programs (if any) that might be required, the types of evaluations that could be undertaken with the data that were collected by the programs, the sample size available for the evaluation, and the effort needed to complete the evaluation.

The research team selected EndDD partnering with SRA (EndDD/SRA) because it was the only program that was ready to be piloted, targeted elementary school children, provided the children with information on how to intervene with their parents both while driving and while not driving, and planned to gather data that the Volpe Center could use to evaluate the effectiveness of the program. It should be noted that the Tier I, Tier II, and Tier III analyses were conducted before the pandemic.

## 4.1   Tier I Analysis

Tier I outreach involved four waves and 51 attempts to reach out to different organizations and people. The first wave (Wave (1) consisted of programs the research team read about in the literature review or identified on the web (Table 14, Section 10).  nine organizations and/or people were identified that might have child-to-adult interventions focused on distracted driving. The second wave (Wave (2) consisted of organizations uncovered through the first wave (Table 15). The third and fourth waves consisted of organizations that were identified by the National Association of Women in Highway Safety Leaders (NAWHSL, Wave 3, Table 16) and NHTSA Regional Offices (Wave 4, Table 17).

## 4.2 Tier II Analysis

Based on the Tier I analyses, the research team conducted additional, targeted interviews with three programs. Volpe asked each of the three programs and, where multiple versions of a program were offered, about each of the different versions when relevant. Fourteen questions with various subparts were included in the interview (Section 11). A summary of those interviews follows below.

### 4.2.1 Teens in the Driver Seat

Teens in the Driver Seat has programs in the middle school and high school focused on five high risk categories of teen behaviors: distractions, impairment, speeding, passengers, and seat belts. The program has been developed in collaboration with researchers at Texas A&M Transportation Institute. The activities typically last over the course of a year and are largely student initiated. Because the focus of the overall program is peer to peer, none of the surveys query the teens about their interactions with their parents or their parents' risky driving behaviors. Teens in the Driver Seat has two subprograms, Zero Crazy and Ride With Me. Zero Crazy is a 3-week, teen-initiated activity. The entire school receives the messaging. In the fall, seat belt use is the targeted behavior, in the spring distracted driving is the targeted behavior. The messaging for the middle school students in Zero Crazy is designed for the parents. Zero Crazy encourages the middle school teams to gather observations in the drop-off/pick-up lines before and after the 3-week program on seat belt use (fall) and electronic device use (spring). Ride With Me is a teen-parent workshop led by teens, usually held at a Parent Teacher Association meeting and lasting about 90 minutes. Ride With Me targets the same five behaviors as the overall Teens in the Driver Seat Program. Middle school students have been encouraged to measure seat belt use before and after the workshop, but there is no mention of their measuring electronic device use.

### 4.2.2 EndDD and Safe Roads Alliance

EndDD (End Distracted Driving) has parent, high school, and middle school programs. EndDD and Safe Roads Alliance (EndDD/SRA) partnered on a program for elementary schools. The elementary, middle, and high school programs focus on both involving children in discussions with their parents about the dangers of distracted driving and providing children with tools for intervening with drivers who are distracted. Unlike Teens in the Driver Seat, the only focus of EndDD and EndDD/SRA is distracted driving. The EndDD program for middle and high school students was developed in collaboration with researchers at the Children's Hospital of Philadelphia (Jacobsohn & Winston, 2014). The EndDD program in the middle school and high school consists of a Distracted Driving Presentation given by either the founder of the program (Joel Feldman) or local attorneys and law enforcement officers. The live, PowerPoint, and video presentation lasts 60 to 75 minutes. Questions are asked and taken throughout the presentation. Only a portion of the high school or middle school students will usually attend the presentation, the exact number often not known before the speaker presents. An electronic survey is administered at the beginning of the presentation and then several weeks later. It includes sections on teens' self-report of their own attempts to ask the driver (parent or other teen) of the car in which they were a passenger to stop using electronic devices while driving and of the likelihood that they would ask the driver of the car in which they were a passenger to stop using electronic devices. An elementary school lesson was being developed by EndDD/SRA to include a half-hour lesson (typically to be delivered by a teacher in the classroom). Five other units were

being developed around distracted driving topics that teachers of health, gym, English, or math classes could deliver for a half hour. In total, the student would then potentially be exposed to up to six half-hour sessions. The program will consist of combined units for 2nd and 3rd grade, 4th and 5th grade, and 6th grade. At the time of preparing this report, EndDD/Safe Roads Alliance were considering how best to gather data that would be used to evaluate the program, including both surveys and observations of parents' behavior around the school. It was hoped that the program could be piloted in the late fall 2019 with some 30 schools, several in the Boston area.

### 4.2.3  Andy Pilgrim: Mobility Program

Andy Pilgrim created the Traffic Safety Education Foundation in 2008 to improve vehicle driver and non-driver safety in 2008, with the most recent (at the time of preparing this report) iteration of material created in 2014. He developed a mobility program targeting children 8 to 11 years old in grades 4 to 6. Pilgrim reached out to the American Driver and Traffic Safety Education Association (ADTSEA) and the larger driver education community for input on the mobility program, though it is not clear to what extent this input was included in the final program. Pilgrim engaged teachers to administer the intervention's free curriculum, including 18 sections originally designed for sequential delivery on a weekly basis throughout an 18-week semester. Each section is designed to be approximately 12 to 15 minutes long and includes talking points, one or several related videos, and discussions that vary in breadth and depth based on level of student-teacher engagement. The curriculum and related videos are also available via the foundation's website, and free DVDs are also sent to those who request them. Users in 46 U.S. States received parts or all the curriculum, though subsequent use of this material has not been tracked. The mobility program targets two primary areas: (1) Driver distraction: children talking to their parents about the dangers of distracted driving, and (2) Pedestrian/other distraction: children's own need to be situation-aware of other vehicles as a pedestrian. Note, the 18-week curriculum includes 11 weeks covering both vehicle driver distraction and pedestrian distraction, 4 sections covering pedestrian distraction, and 3 sections covering vehicle driver distraction. The sections are generally interspersed and not in a particular order with respect to coverage area (driver, pedestrian, or both). Finally, a few sections also introduce other safety concerns such as seatbelt use.

For the first targeted intervention (children talking to parents about the dangers of distracted driving), the mobility program shares ideas and materials with children that help them to separately discuss with their parents or caregivers distracted driving issues outside of classroom instruction/discussion time. Evaluations (typically 8 or 9 yes/no questions) were distributed to participating children at 0, 9, and 18 months in a sample of approximately 200 students from several classes in Gibson City, IL. Survey questions were sometimes modified, but they typically covered distracted driving and seat belt use. Other survey iterations also addressed situation awareness while not in a vehicle. There were also occasional subsequent parent nights where Mr. Pilgrim—and at times a now-retired teacher who taught the mobility program in her classroom —discussed the program with parents to further learn about distracted driving. Although the program is no longer offered by any teacher, Pilgrim expressed interest in restarting the program. He indicated that he would welcome any support on ways to potentially improve the program and conduct a more formal and comprehensive evaluation. Pilgrim has also worked with ADTSEA and the driver education community to distribute materials. From his own presentations and others' presentations and use of materials, the program has collected thousands

of surveys across many States during an approximately 4-year period that ended in 2017. However, the Gibson City surveys were the only ones that captured intervals targeting the age group of interest. The surveys have not been analyzed beyond raw percentages of responses.

## 4.3 Tier III Analysis

Having reviewed the above three programs in detail, the objectives of the Tier III analysis were threefold. First, Volpe wanted to provide an enumeration and discussion of the features that should ideally be present in program that is evaluated. For each program, we indicated which of the ideal features were present and made the program a likely candidate for further evaluation and that of the ideal features were not present and could create roadblocks to further evaluation. Ten factors were identified.

1. **Target populations and target activities**. What were the target populations and target activities of the campaign?
2. **Randomized control trials**. What type of assignment, if any, is used to place people in treatment (campaign/intervention/program) and control groups?
3. **Research-based**. Is the program method and content based on published research?
4. **Existing evaluations**. Were there any prior evaluations of program effectiveness?
5. **Mechanisms for incorporating feedback**. Does the program have a history of obtaining and incorporating feedback?
6. **Program standardization**. If the program has more than one site, is it standardized across sites?
7. **Program exposure**. How much time do students spend in the program?
8. **Program penetration and maturity**. How many students has the program reached and for how long has it been in operation?
9. **Incentives to complete the program**. How effective is the program at getting the students to complete all activities?
10. **Dependent variables**. What outcome variables are being used to evaluate the program?

Second, when a program was not currently one that could be evaluated as is, but with further modifications could be evaluated, we described what the program might have to change to make it worth evaluating and what data needed to be collected by the program to evaluate it. Two factors were considered:

11. **Modifications to content**. What modifications were needed to the program to refocus it appropriately?
12. **Evaluations**. Assuming that a program was willing to share evaluation data with the research team, what was needed in order to complete an evaluation including estimates of the sample size, the effort that might be needed in the field, and the effort that would be needed to analyze the data?

Finally, we provided a summary evaluation of the program, placing it into one of four categories for evaluation: do not recommend, weakly recommend, tentatively recommend, and fully recommend. Note that these recommendations reflect how well a program would serve the needs of this study and not on the quality of the program.

### *4.3.1 Program Features*

The 12 features described below are ones possibly being initially determinative of whether a program should be considered for evaluation. Some that we thought might be determinative turned out not to be such, but we included our notes on our discussion.

#### 4.3.1.1 Target Populations and Target Activities

The target population whose behavior it is hoped will change as a function of the intervention by the child is the parent. Yet, there are programs where the behavior is the teen driver but could have as easily included that of the parent as well. In fact, information is being gathered in some programs, like Zero Crazy, on drivers in general by the enrolled teens. These teens are asked (1) when they are a passenger, have they asked the driver to stop a distracted driving activity and (2) if they intend in the future to ask drivers who are doing something distracted to stop the activity. Although the teens are not asked to differentiate between driver types (parents or teens), they easily could be. Thus, we did not narrow the selection to programs that target only the distracted driving behaviors of parents. Moreover, we did not limit our selection to programs that target only distracted driving, but distracted driving must be one of the behaviors in the program. So, for example, in Teens in the Driver Seat, five risky behaviors are targeted, distracted driving being one of them.

#### 4.3.1.2 Randomized Control Trials

The ideal program for evaluation would employ a randomized controlled trial (RCT). In such a program, half of the schools in a State (or other jurisdiction) would be assigned randomly to the child-to-adult intervention; the other half would be assigned to some placebo intervention.

Where randomized control trials are not possible, as may typically be the situation, a case-control method can be used. In this situation, the cases (the schools with a program) would be matched as closely as possible with the schools without a program on factors that were thought to be important, including, demographic factors. Matching can take place systematically using something often referred to as propensity analysis (Ho et al., 2018; Cummings & McKnight, 2004). Then, in order to determine whether there is still some selection bias, one can use the Heckman correction (Heckman, 1979). However, one can never control for all differences or be sure that selection bias is eliminated.

As an alternative to RCTs and case-control studies, a program with a quasi-experimental design might be acceptable. For example, a program might be chosen by a set of schools and evaluated before and after the program was implemented. The advantage of a within-subjects design is that the number of participants needed to obtain an effect of a given size is much smaller than a between-subjects design (case-control or RCT). The primary limitations to such a quasi-experimental design are twofold. First, without a control group it is not possible to know whether the changes between the before and after evaluations of the intervention are due to the program itself or to changes that are occurring outside of the program. Second, without random assignment it is not possible to generalize with confidence whatever effect the program might have in the treatment schools to other schools that might have implemented the program but did not.

### 4.3.1.3 Research Based

A program that we recommend for evaluation is more strongly situated if it was built on an evidence base, either drawing upon existing research during the development phase or being developed in collaboration with researchers. However, this criterion was not meant to rule out programs that contain elements that pedagogically are known to have an effect on the success of child-to-adult interventions but were not developed with knowledge of such elements.

### 4.3.1.4 Existing Evaluations

Programs with existing positive evaluations were generally preferred over programs without any existing evaluations or evaluations that show no effect of the intervention. The reasons here are threefold. First, it makes sense to build on what already has a positive effect. Second, the people in charge of programs that have undertaken an evaluation of their effectiveness have shown a willingness to participate in the scientific enterprise and take it seriously. We felt it is of importance that there is a culture in the organization that recognizes the importance of evaluation. Third, when we want to know the number of schools (or observations) we would need to find an effect of a given size, it helps tremendously to have estimated effect sizes from prior evaluation in the power calculations.

### 4.3.1.5 Mechanisms for Incorporating Feedback

Related to the above criterion in the selection process is evidence that a program has a record of incorporating feedback from their evaluations into their program. An evaluation has several benefits, the first of which is to determine whether a program is effective. However, in choosing among programs that have undertaken evaluations, an additional benefit can be the modification of the program that might be suggested by the evaluation. Programs that have shown a willingness to modify their program based on evaluation results are therefore preferable to those that have not changed anything based on evaluations (when, of course, the evaluations indicated a need for change).

### 4.3.1.6 Program Standardization

There seemed to be good reasons for both the standardization and the diversity of program content. Having a standardized content makes it possible to evaluate whether the program would work in the future since the content is known. However, the standardization of content is not necessarily desirable when it comes to the engagement of teens, either with each other or with their parents, as it is assumed that the standardized components do not involve individualized or active engagement. The same holds true for teachers and others who deliver elements of a program within their curriculum. Engagement is generally improved when the person involved has had an active role in developing one or more aspects of the program. In a more technical form, active learning is generally more effective than passive learning (Freeman, et al., 2014). Overall, we see the benefits of both standardization and heterogeneity.

### 4.3.1.7 Program Exposure

In general, a complex manual skill takes time to learn. A complex visual, manual, and cognitive skill like driving takes at least six months of solo driving experience to bring down the crash risk to something approaching acceptable levels (Vlakveld, 2005). However, evidence indicates that behaviors can change in a short time when it comes to traffic safety among teens. For example, a 17-minute training program designed to reduce novice driver crashes reduced crashes among

16-, 17- and 18-year-old males on average by 23% (Thomas et al., 2016). More broadly, one-trial learning is still a viable concept (Roediger & Arnold, 2012). We concluded that the duration of a standard traffic safety training program provides teens with what they need to make their parents aware of the set of activities that qualify as distracted driving. This also includes the risks that are encountered when engaging in distracted driving (both to them as drivers and to their passengers) as well as the tools needed to engage with their parents when their parents were distracted while driving and the teens were passengers in the car with their parents. There are many bystander-intervention tools one can use. A typical one with distracted drivers is referred to as the AVS bystander intervention tool. Basically, the passenger needs to **A**cknowledge the behavior in a non-confrontational manner, **V**oice their feelings, and provide a **S**olution to the problem.

### 4.3.1.8 Program Penetration and Maturity

The penetration of a program (the number of sites at which it is currently operating) and the length of time it has been operating at those sites should influence the selection of the programs to be evaluated. There is an inherent risk in selecting a program that has not yet been developed or has not yet been implemented.

### 4.3.1.9 Incentives to Complete the Program

Crucial to the success of any before and after evaluation is a sufficient number of responses both before the program is initiated and after it is completed. Programs like Zero Crazy are highly incentivized since the before and after observations need to be completed to receive a monetary prize and to be recognized formally by Teens in the Driver Seat. Programs like the EndDD Distracted Driving Presentation have more difficulty obtaining observations after a presentation given the increased logistical challenge of administering a survey six weeks after the presentation (Jacobsohn & Winston, 2014). All other things being equal, one would prefer to evaluate a program where the incentives are high enough to guarantee participation of the teens both in the program activities and of the teens and parents in the before and after responses.

### 4.3.1.10 Dependent Variables

There have been several categories of dependent variables used for evaluation, including those from observations and those from surveys. Zero Crazy used observations of electronic device use. Pairs of teens made the observations of parents' engagement in distracting activities while in the car at the school (say in drop-off/pick-up lines) or in areas located closely to the school. There are several limitations to such a method. First, at the beginning of an intervention parents may not have been on the lookout for someone observing their use of electronic devices while in the drop-off/pick-up lines at the school. However, after the teens spoke with their parents about the dangers of distracted driving, there was the possibility that parents were more sensitive to any activity in the drop-off/pick-up lines at the school towards the end of the program that looks like it is measuring their use of electronic devices. Second, even with standardized instructions and videos, it was reported to be difficult getting students to record electronic device use the same way[2]. This could be a problem if the scoring was done one way in the pre-intervention observations and another way in the post-intervention observations. Third, and perhaps most important, the teens knew the effect that the intervention was supposed to have on the parents' use of electronic devices in their vehicles. Thus, the teens could have been more lenient in their

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[2] Personal communication, Stacey Tisdale, Coordinator, Teens in the Driver Seat.

reports of observed distracting activities after the completion of the program without any real intention to change their criteria for reporting observed distraction.

Self-report surveys were used in all three Tier II programs. As an example, the EndDD surveys in the high school presentations gathered information on a teen driver's (1) knowledge of risky driving behaviors, (2) frequency of engaging in those behaviors, (3) set of driving-related and non-driving related behaviors, (4) frequency as passenger of asking a driver to stop engaging in distracted driving activities, and (5) willingness as a passenger to ask the driver to stop engaging in risky driving activities. There are obvious limitations to self-report. First, especially in this case, the people doing the reporting may well be biased, even if unintentionally, towards proving an intervention is effective. Second, when asked about the frequency with which one's self, or some other individual, engages in a given behavior, it is difficult to know across people (or even within an individual), what each person interprets as, say, "almost never." People in the control and treatment groups, independent of any bias, may have different interpretations of these qualitative categories used to place frequencies into buckets. Finally, asking people about the frequency of distracting behaviors in which they engage, or simply the list of driving related and non-driving related behaviors in which they engage, misses out on an essential element of what makes a glance away from the forward roadway distraction. In particular, it is the frequency of especially long glances, not just the existence of glances of any length away from the forward roadway, that is problematic for safety (Klauer et al., 2014).

### 4.3.1.11  Modifications to Content
A program may not target the age group we would like to study or may not teach the children how to intervene with their parents. However, it does not mean that an existing program that did neither of the above was necessarily a poor choice if the organization sponsoring the program were interested in pivoting. Given the relatively few programs we identified that focused on teaching elementary school children how to intervene with their parents as drivers around the issue of distracted driving, we felt that it was important to assess whether an organization could pivot their program in ways that more directly met the goals of this study.

### 4.3.1.12  Program Evaluations
Ultimately, we wanted to evaluate a program based on the data the program itself supplied to the research team. Some programs might be already collecting information that could be used for evaluation. Other organizations may have provided solid elementary school programs, but it did not need to be the case that the organizations were collecting any information that could be used to inform or complete an evaluation. Thus, we wanted to determine whether an organization could possibly collect this information if such were not occurring presently.

### *4.3.2  Summary Recommendations*

With the above twelve features in mind, we undertook an evaluation of each of the three different programs and their various subprograms. Again, the recommendations made are not about the quality of the program but, instead, about how well the program fits the objectives of this study.

Briefly, two programs were strongly recommended for potential further evaluation: the middle school Zero Crazy Teens in the Driver Seat Program, and the EndDD/SRA elementary school

primary and secondary lessons. Both programs were the only ones directly addressing issues relevant to children speaking with adults about distracted driving in exposures to program content. Zero Crazy extended over three weeks. EndDD/SRA extended over an entire semester as planned with up to six units, each unit about 30 minutes. Additionally, both Teens in the Driver Seat and EndDD had experience with research-based programs and undertaken evaluations of their programs. Both programs also incorporated the evaluation information into their ongoing program or related programs and were open to gathering information through surveys and observations.

After further discussions with NHTSA project leaders, it was determined that the focus should be on elementary school children, which led to our choosing to select the EndDD/SRA program.

# 5    EndDD/SRA and Pivoting in the Pandemic

In 2019 when the review and final selection were undertaken, EndDD/SRA developed an elementary school lesson. The lesson included a half-hour, in-class distracted driving lesson (DDL) using PowerPoint slides delivered by the teacher as a standalone unit. The lesson also included five additional half-hour units focused on distracted driving units (DDUs or special topics) that teachers could incorporate into their lesson plan in classes such as, health, gym, English, or math. In total the student would be exposed to up to six half-hour sessions. The DDL by itself would be delivered to each of grades 2 through 6. For teachers interested in extending students' knowledge of distracted driving, the DDL was going to be combined with one or more DDUs and packaged together for three combined DDU/DDL programs: one combined program for the 2nd and 3rd grades, one for the 4th and 5th grades, and one for the 6th grade.

At the time of the final selection, EndDD/SRA was considering how to evaluate the program. Pre-program and post-program surveys were to be administered and, in addition, it was being determined whether observations could be made of parents' smart phone behavior as they approach the school to drop off their children in the morning and pick up their children in the afternoon. It was hoped that the program could be piloted in early 2020 among some 30 schools that had indicated an interest, several in the Boston area.

## 5.1   Pivoting in the COVID-19 Pandemic

Unfortunately, the proposed start date of the program (and evaluation) coincided with the start of the COVID-19 pandemic, and the intervention had to pivot from the classroom to completely online. This shift meant major changes to: (1) the platform used to deliver the content and the surveys, (2) the type of interaction between the teachers and the students, (3) the breadth of the audience, (4) the type of dependent variables that could be measured, (5) the survey length, and (6) the matching of students' surveys before and after the program.

First, in terms of platform, the program could not, at least at the beginning, be delivered in the classroom by a teacher. Neither the standalone DDL nor any of the five other DDUs to be integrated into special topics courses, could be handed in person to the teachers as written materials or digital materials. Neither could the surveys be filled out in class by the students. All lesson materials had to be available online, and all survey responses had to be recorded online.

Second, in terms of the communications between the teachers and students, the elementary school lessons were designed to be interactive, involving the teacher throughout the presentation of the DDL. Given how overwhelmed teachers were at the start of the pandemic, and continued to be through the completion of the study, it became clear that a 30-minute, prerecorded, asynchronous video, rather than an interactive program, could be more easily integrated by the teachers into an online curriculum.

Third, in terms of the breadth of the audience, given that EndDD's reach previous to the pandemic was primarily to high school students, it became clear that it would be useful to have some information, even if only on high school students, rather than little or none, as may have been the case if the focus were restricted to elementary school students. This led to the development of four different online formats for delivering the DDL.

- **Teacher-driven (30-minute, prerecorded, asynchronous ES video DDL): Elementary School**. ES teachers interested in teaching a lesson on distracted driving send a link to their students to the 30-minute, prerecorded, asynchronous video DDL (ES video DDL).
- **Teacher-driven (flexible lesson plan): Elementary School**. Elementary school teachers develop their own lesson plans for teaching about distracted driving, lesson plans that could include the ES video DDL as well as separate activities (DDUs) that were designed by EndDD for Grades 2 and 3, 4 and 5, and 6 that were available on the EndDD website. The teachers then deliver the links to the DDL and DDUs to their students.
- **Parent-driven (30-minute, prerecorded, asynchronous ES video DDL): Elementary school**. The parents of an ES student register for the ES video DDL on EndDD and are sent a link to that video that they can watch and provide to their children.
- **EndDD-driven (50-minute, interactive PPT DDL): High school**. The EndDD online lesson is delivered live by someone from EndDD as an interactive PowerPoint lesson (HS PPT DDL) usual a virtual platform like Zoom. In this case, the content of the HS PPT DDL varies slightly from one presentation to the next because the online presentation is interactive.

Fourth, in terms of the dependent variables, it was clear that observations in the pick-up and drop-off lines at school of drivers' (parents') interactions with their smartphones would not be possible. Thus, only survey information would be available. While considerable time had gone into the planning of how to collect observations and an assessment by EndDD and SRA of the willingness of superintendents and parents to be observed, this collection method was no longer feasible.

Fifth, the length of the elementary school pre-DDL and post-DDL surveys had to be shorter online than it would have been in the classroom. Thus, half of each elementary school class that was given the ES video DDL had a pre-survey and post-survey that focused on the dangers of talking, the other half had a pre-survey and post-survey that focused on the dangers of texting (13 questions in each form of the survey). The number of questions for the high school students could be and would be longer (48 questions).

Finally, in terms of evaluation, once the program was placed on-line, it became clear that for logistical reasons it would be difficult to obtain information on the identity of a student in the pretest and posttest. Thus, matching scores on the pretest and posttest would be challenging, which in combination with an already small sample size, would severely limit the ability to identify statistically significant changes from the responses on the pre-DDL survey to the post-DDL survey. It was hoped that the online, asynchronous delivery of the DDL would facilitate the adoption of the program by elementary school teachers since it required no preparation on their part, increasing the number of responses and thereby making the conservative statistical tests, which assumed independent samples, more robust.

Ultimately, the pandemic made it difficult to implement the parent driven elementary school path and the teacher driven, flexible, elementary school path. The other two paths were used to varying degrees. Although not immediately relevant to the evaluation, it should be noted that the various plans required the development of a sophisticated logic for emailing students, teachers, and parents to make sure that the pre-DDL survey, the DDL, and the post-DDL survey were

sequenced in order. This did not always happen. For example, teachers could mistakenly email the pre-DDL survey link after the DDL had been completed or students could fail to complete the pre-DDL survey until after they had been exposed to the DDL. Steps were taken during the survey design process to embed questions designed to catch these mistakes. Additionally, the logic made sure that students could not fill out the pre-DDL or post-DDL twice. However, these could not prevent errors from occurring during survey distribution by third parties or rectify any erroneous survey responses that were collected.

## 5.2   The EndDD/SRA Program for High Schools

At the time of the pandemic EndDD had an interactive PowerPoint presentation that would be delivered live to high school students (and sometimes their parents) by someone from EndDD. The high school DDL consisted of 60 slides.

Once the pandemic started it was relatively easy to migrate the high school PPT DDL (HS PPT DDL) to a platform like Zoom. However, the delivery of the link to the HS pre-DDL surveys and the link to the HS post-DDL surveys 3 weeks after the delivery of the HS PPT DDL still had to be orchestrated by the teachers.

Here and for the elementary school DDL, the surveys of program effectiveness were not designed to evaluate all of the content or the way in which it was delivered. Rather, the high school survey in particular was designed to determine whether high school students increased their knowledge of key facts around distracted driving, whether they increased both in their confidence that they would intervene and in their actual intervention activities, and finally whether the distracted driving activities of their drivers decreased three weeks after the HS PPT DDL had been delivered.

## 5.3   The EndDD/SRA Program for Elementary Schools

As noted above, the EndDD/SRA program for the elementary schools originally consisted of a PowerPoint presentation of 21 slides. However, as noted, the pandemic required that EndDD and SRA pivot to an online 30-minute, prerecorded, asynchronous video. Every administration of the ES video DDL was to be accompanied by an ES pre-DDL survey and an ES post-DDL survey.

With the online ES video DDL version, the teacher was responsible for orchestrating the sequence of ES pre-DDL surveys, delivery of the 30-minute, prerecorded, asynchronous DDL, and ES post-DDL surveys. In particular, the sequence was as follows.

1. If EndDD identified a teacher interested in using the ES video DDL, EndDD would send to the teacher a link to the 30-minute, prerecorded, asynchronous video available on YouTube. Joel Feldman, founder of EndDD, speaks at the beginning and end of the ES DDL (Figure 1). Elementary school teachers provided the entire instruction in the video.

*Figure 1. EndDD distracted driving lesson plan[3]*

2. If the teacher thought that the video was useful for the students, the teacher was then given a link to the ES pre-DDL survey and asked to send the link to the ES pre-DDL survey to the students. SurveyMonkey was used to collect the responses to the ES pre-DDL and post-DDL surveys.

3. The teacher sent the link to the ES video DDL to the students soon after the link to the ES pre-DDL survey had been sent to the ES students.

4. After 3 weeks, the teacher was sent an email with a link to the ES post-DDL survey, which the teacher would forward to the students.

As noted for the high school DDL survey, the survey of the elementary school DDL was not designed to evaluate the entirety of what was delivered in the ES video DDL.

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[3] www.youtube.com/watch?app=desktop&v=v9qEjD3ymSY&feature=youtu.be

# 6    Evaluation of Distracted Driving Lessons

The method for collecting data was identical for the elementary and high school pre- and post-DDL surveys. Thus, we combined the discussion of the data collection methods for the elementary schools and high schools into one section below (Section 6.1). We also combined the discussion of matching the students on the pre-DDL and post-DDL responses in the elementary and high school surveys in so far as they were similar (Section 6.2). However, as noted above, it EndDD and SRA created separate online elementary and high school surveys given that EndDD and SRA felt that the length of the high school survey was too long for the elementary school students. Because of this, we separated the discussion of the surveys and analyses; one section is devoted to the high school program (Section 6.3) and one section to the elementary school program (Section 6.4).

## 6.1    Data Collection

EndDD collected high school and elementary school pre-DDL survey and post-DDL survey responses using SurveyMonkey and exported the SurveyMonkey responses to Google Sheets. EndDD obtained responses from students on both the pre-DDL and post-DDL surveys from 8 high schools and 5 elementary schools (Table 3). The 8 high schools collected 459 responses to the HS pre-DDL survey and 196 responses to the HS post-DDL surveys. The 5 elementary schools collected 118 responses to the ES pre-DDL survey and 34 responses to the ES post-DDL survey.

*Table 3. Data Collection Status*

| Grade | School | Pre-Numbers | Pre-Date | DDL Date | Post Numbers | Post Date (Planned) |
|-------|--------|-------------|----------|----------|--------------|---------------------|
| HS | 1 | 40 | 12/7/2020 | | 20 | 12/21/2020 |
| HS | 2 | 58 | 2/3/2021 | | None | 2/24/21 |
| HS | 3 | 42 | 2/9/2021 | | 39 | 3/11/2021 |
| HS | 4 | 14 | 2/24/2021 | | 10 | 3/12/2021 |
| HS | 5 | 66 | 3/3/2021 | | 6 | 3/24/2021 |
| HS | 6 | 29 | 3/8/2021 | | 27 | 3/29/2021 |
| HS | 7 | 154 | 4/20/2021 | | 40 | 5/11/2021 |
| HS | 8 | 56 | 4/19/2021 | | 54 | 5/10/2021 |
| **Total HS** | | **459** | | | **196** | |
| ES | 9 | 21 | 2/3/2021 | 3/2/2021 | 21 | 4/8/2021 |
| ES | 10 | 21 | 4/16/2021 | | 10 | 5/7/2021 |
| ES | 11 | 38 | 4/19/2021 | | 3 | 6/11/2021 |
| ES | 12 | 15 | 6/5/2021 | | N/A | 6/26/21 |
| ES | 13 | 23 | 4/19/2021 | | None | |
| **Total ES** | | **118** | | | **34** | |

Note: N/A indicates that survey responses were obtained, but the wrong survey was used.

Many high schools participated in the HS DDL, but for various reasons did not want to be surveyed. Additionally, two high schools provided information on the pre-DDL survey but no or

little information on the post-DDL survey. In one case, the school decided not to allow a post-DDL survey. In the other case, the class terminated immediately after the HS DDL was administered, and the former students returned very few post-DDL surveys. As for elementary schools, one elementary school had no post-DDL survey data, and one elementary school used an earlier post-survey was sent out, one not equivalent to the survey used in the other elementary schools.

## 6.2   Matching Pre/Post Surveys

As noted earlier, it was anticipated that each student would be assigned a unique, random number to match the pre-DDL and post-DDL surveys from the same student without obtaining any personally identifiable information. However, with the online delivery, the teachers emailed the students a link to the pre-DDL and post-DDL surveys in bulk rather than individually. EndDD and SRA considered it too cumbersome to ask the teachers to mail each student with a unique identifying number when sending out the link to the surveys. Rather, the teachers sent one email link to the entire class, which did not include any identifying numbers.

Without a unique identification number to directly match surveys from the same student, EndDD and SRA decided instead to use matching based on several questions that collected non-personally identifying information from students. The assumption was that each student would select the same responses on the pre- and post-DDL surveys and that the probability of more than one student selecting the exact same pattern of responses was low.

## 6.3   High School Survey and Analyses

The high school questionnaires, both the pre-DDL survey and the post-DDL survey, required 48 responses that were spread among 21 questions, some questions containing responses (Section 12). Listed below each question in Section 12 are the possible responses as well as what options were grouped together as correct responses and what options were grouped together as incorrect responses. This grouping allowed us to perform two separate analyses, treating the responses like a continuous Likert scaled item or treating the responses in a binary fashion (as correct or incorrect). Statistical and descriptive analyses were undertaken of the Likert scale scores. Only descriptive analyses were undertaken of the percentage scores. The second, percentage analyses were used to provide readers with an understanding of the change in the percentage of students that gave correct responses on the pre-DDL and post-DDL surveys, which cannot be determined from the Likert analyses.

### 6.3.1   Categories and Groups of High School Questions

The surveys consisted of a series of single item measures. For the purposes of data reduction as well as to improve the reliability of measurement, the research team partitioned the 48 questions on the pre-DDL survey and post-DDL survey into nine different categories and related subcategories. All categories were validated to ensure that they had sufficient internal consistency between items to justify grouping them together (Cronbach's alpha of at least 0.70). Briefly, it is hypothesized that after the lessons the students would:

- understand more about distracted driving and its dangers (Categories 1 and 2, Table 4 below);

- be more worried about the dangers of distracted driving to themselves as passengers (Category 3);
- be more concerned that when their driver is distracted the safety of others around them (other drivers and vulnerable road users) is compromised and be more convinced that not driving distracted is respectful of others (Category 4);
- know what to say to their drivers in order best to intervene when their drivers are engaging in distracting activities (Category 5);
- increase the behaviors that are assumed to lead to decreases in distracted driving including increases in their confidence that they would say something to their parents and actually intervene more frequently with their driver (Categories 6 and 7);
- see a decrease in the distracted driving activities of their drivers (Category 8); and
- say that they are less likely to engage in distracted driving activities in the future (Category 9).

The numbers of the questions in the high school pre-DDL and post-DDL associated with each of these categories are listed in Table 4 as well (see Section 12 for the actual questions themselves).

*Table 4. High School Survey: Categories, Subcategories and Groups*

| Category | Subcategory | Questions | Group |
|---|---|---|---|
| 1) Knowledge | Meaning of Distracted Driving | Q1 | I |
| | Other Knowledge of DD | Q2 - Q5 | I |
| 2) Relative Risk | Understanding Relative Risk | Q15 | I |
| 3) Concerns | Worry About Distracted Driving | Q11 | I |
| 4) Safety & Consideration | Safety of Others | Q17 | II |
| | Consideration of Others | Q18 | II |
| 5) Right Words | Know Right Words to Say | Q6 | III |
| | "I Am Worried…" | Q7 | III |
| 6) Intervention Confidence | Distracted driving | Q12 - 13 | IV |
| | Overall | Q14 | * |
| 7) Intervention Freq. | Parents | Q8 | V |
| | Friends | Q9 | V |
| | Passengers | Q10 | V |
| 8) Program Effect | Parents | Q19 | VI |
| | Friends | Q20 | VI |
| | Passengers | Q21 | VI |
| 9) Future Behaviors | Engage in Distracting Activities | Q16 | VII |

*Note: Q1 is question 1 in Section 12.*

Additionally, the first six categories were combined into five groups based loosely on the theory of planned behavior (Ajzen, 1991) and the relations between knowledge and attitudes (Fabrigar et al., 2006). The theory of planned behavior assumes that attitudes, subjective norms, and perceived behavioral shape an individual's intentions and those intentions are most directly tied to actual behaviors (Group V). With that in mind, the first group, Group I, includes categories that inform students' knowledge of and attitudes towards distracted driving (Categories 1, 2, and

3). Group II includes categories of behaviors that inform students' normative understanding of distracted driving (Category 4). Group III includes categories of behaviors that it is hypothesized influence students' perceived behavioral control, i.e., the likelihood that a student has confidence that the student will decrease the distracted driving activities of the person who is driving the student (Category 5). Group IV includes the students' intentions to intervene with their drivers (Category 6). Group V includes the reported intervention behaviors of the students, not just the intentions to intervene. Note that both reported intentions (Group V) and reported interventions (Group VI) are spread out among parents, friends, and passengers. The last two groups are outcomes either of the students' intervention (Group V, Category 8, a decrease in the frequency with which drivers engage in distracting activities) or of a change in the current attitudes on future attitudes (Group VI, Category 9, a decrease in the students' expectation of engaging less frequently in the future when they become licensed to drive in distracting activities). Subcategory 2 in Category 6 is not included in a group as discussed in the analyses below.

### 6.3.2 Analyses of Likert Scale Data and Discussion: Between Subjects

Survey data were separately treated as continuous or binary for the purposes of analyses, and the Likert scale data were treated as either independent samples or matched pairs.

#### 6.3.2.1 Scoring of the Responses

To facilitate interpretation of the results, the responses to individual questions were scored so that higher scores were associated with a positive effect of the program. Sometimes the responses were assigned a continuous numerical score in the order they were presented in the question (e.g., Question 1, Section 12) while in other cases the order had to be reversed (e.g., Question 10, Section 12). The exceptions were items that each had only one correct response (e.g., Question 7). In this case, we gave all incorrect scores a value of 0 and the one correct score a value of 1. Finally, the number of possible responses varied by question although most had five. Where there were fewer than five, we assigned the bottom response a score of 1 and counted from there.

For the purposes of calculating descriptive statistics, when items were included in a category, the scores for the Likert scaled items were first averaged across questions within person and then averaged across people to get the average Likert scale score. The one exception to this was the four questions related to knowledge of distracted driving in Subcategory 2 (Other Knowledge of DD) of Category 1 (Knowledge) (Table 5), where the answers were either correct (1) or incorrect (0). The scores within a student response were summed across the four responses (Questions 2 – 5), and so the range was 0 to 4.

Note that this method of scoring means there are widely varying ranges across categories. The ranges are helpful when interpreting the average Likert scale scores, and so they are also included in Table 5. The varying ranges can make interpretation of results challenging. While we could have scaled all scores to the same range, we decided that unscaled scores would more accurately portray the results of the questions as administered than translated scores.

### 6.3.2.2 Statistical Tests

The null hypothesis was that the program would not show an improvement from the pre-DDL survey mean to the post-DDL survey mean, and we used one-tailed *t*-tests at a significance level of 0.05 to determine whether the null hypothesis could be rejected.

Only 40% of the respondents could be identified as being the same ones on the pre-DDL and post-DDL surveys. In some cases, more than one respondent may have chosen the same pattern of responses to the identification questions, making it impossible to distinguish between people, while in other cases, respondents may have forgotten how they responded on the pre survey and selected a different pattern of responses to the post survey. So, we decided additionally to use a between subjects *t*-test, gaining thereby more observations. The between subjects *t*-test is a conservative evaluation since if a result is significant using a between subjects *t*-test it would be significant using a paired *t*-test, but the opposite is not true (Burnham, 2015). Thus, we could easily miss significant results using the between subjects *t*-test, but in exchange we would have the greater statistical power afforded by the larger sample size.

For the between subjects tests, we used both uncentered and centered averages. For uncentered averages, the raw Likert scale score was used in the analysis. For centered averages, each individual's score in a given school was the difference between the individual's score on the question and the average score in the school. The reason for using centered means is that it reduces the variability that occurs across schools.

### 6.3.2.3 Summary Analyses Discussion

The uncentered averages for each of the 48 questions on the high school pre-DDL and post-DDL surveys are included in Section 13.1 (Table 17) along with the number of responses and the standard deviations. For each of the nine categories of data described above, the category label, subcategory, question number in the HS survey (Section 12), pre-DDL and post-DDL mean, *p*-value, and range of possible scores on each question or group of questions in a category are given in Table 5 below. Further information on the *t* value and the degrees of freedom used for each of the tests reported in Table 5 is given Section 14.2 for both the uncentered analyses (Table 18) and the centered analyses (Table 19).

Here, we focus on five things of note related to the nine categories and seven groups (Table 5).

*Table 5. High School Summary of Average Likert Scale Scores Across Categories (Uncentered): Subjects Not Matched*

| Category | Subcategory | Questions | Pre-DDL Mean (uncentered) | Post-DDL Mean (uncentered) | P-Value(centered) | Group | Range |
|---|---|---|---|---|---|---|---|
| 1) Knowledge | Meaning of Distracted Driving | Q1 | 3.35 | 3.64 | 0.00 | I | 1-5 |
| | Other Knowledge of DD | Q2 - Q5 | 1.01 | 1.76 | 0.00 | I | 0-4 |
| 2) Relative Risk | Understanding Relative Risk | Q15 | 3.76 | 3.83 | 0.18 | I | 1-5 |

| Category | Subcategory | Questions | Pre-DDL Mean (uncentered) | Post-DDL Mean (uncentered) | P-Value(centered) | Group | Range |
|---|---|---|---|---|---|---|---|
| 3) Concerns | Worry About Distracted Driving | Q11 | 2.92 | 3.09 | 0.05 | I | 1-5 |
| 4) Safety & Consideration of Others | Safety of Others | Q17 | 4.64 | 4.62 | 0.56 | II | 1-5 |
| | Consideration of Others | Q18 | 3.65 | 3.70 | 0.21 | II | 1-4 |
| 5) Right Words | Know Right Words to Say | Q6 | 2.41 | 3.25 | 0.00 | III | 1-4 |
| | "I Am Worried…" | Q7 | 0.26 | 0.57 | 0.00 | III | 0-1 |
| 6) Intervention Confidence | Distracted Driving | Q12 - 13 | 2.83 | 3.03 | 0.01 | IV | 1-4 |
| | Overall | Q14 | 3.57 | 3.70 | 0.06 | * | 1-5 |
| 7) Intervention Freq. | Parents | Q8 | 1.67 | 1.97 | 0.00 | V | 1-4 |
| | Friends | Q9 | 1.53 | 1.69 | 0.08 | V | 1-4 |
| | Passengers | Q10 | 1.80 | 2.12 | 0.00 | V | 1-4 |
| 8) Program Effect | Parents | Q19 | 3.63 | 3.77 | 0.04 | VI | 1-5 |
| | Friends | Q20 | 4.16 | 4.39 | 0.01 | VI | 1-5 |
| | Passengers | Q21 | 4.13 | 4.18 | 0.23 | VI | 1-5 |
| 9) Future Behaviors | Engage in Distracting Activities | Q16 | 3.00 | 3.08 | 0.11 | VII | 1-4 |

In general, responses rates dropped from the pre- to post-survey. However, only five of the eight high schools surveyed were used in the analyses because their numbers of post-DDL responses was at least 50% of the numbers of pre-DDL responses. Given that sample sizes dropped from the pre- to the post-survey, it was our assumption that the majority of the students in the classes that received the DDL lesson responded to the pre-DDL survey, while only a subset of these same students responded to the follow-up survey. Since the same people could not be directly matched across surveys, a subset of the schools was selected for between subjects analyses in an attempt to limit the analyses to schools where we could infer that mostly the same people were responding each time. A bias could easily be introduced if the people who responded to the post-DDL survey were systematically different from the ones who did not take the post-DDL survey.

First, the research team analyzed overall effect of the program. In 16 of the 17 subcategories an increase was noted from the pre-DDL survey mean to the post-DDL survey mean, though not all increases were statistically significant. Note that the pre-DDL and post-DDL means were uncentered to make their interpretation most easy, but the p-values were based on the centered means to account for systematic variation across schools.

Second, was the analysis of the program effect on students' attitudes, subjective social norms, and perceived behavioral control. As for students' attitudes, here we grouped conceptually Categories 1, 2 and 3 (Group I in Table 5). In all cases, except for relative risk, there was a

statistically significant increase in the students' understanding of distraction (alpha = 0.05). As for social norms (Category 4, Group II), there was no change in their evaluation of how important it will be to consider the safety impacts of their distracted driving on others (Question 17, Section 12) nor a change in their belief that being respectful of others requires the driver not to engage in distracting activities (Question 18, Section 12). It is likely there were no significant differences between the pre-DDL and post-DDL scores as they are both near the maximum values. Finally, as for students' perceived behavioral control, here we grouped conceptually Categories 5 and 6 (Group III in Table 5). Specifically, in order for students' interventions to be effective, we hypothesized that this required students to know the right words to say (Category 5, Questions 6 and 7, Table 5). The differences were significant between the pre-DDL survey mean and the post-DDL survey mean in both categories in Group III (Categories 5 and 6). Importantly, the students learned the right words to say ("I am worried about a crash,," Section 12, Question 7), and the change from the pre-DDL survey mean (0.26) to the post-DDL survey mean (0.57) was positive and significant (Question 7, Table 5). Note that the range for Question 7 was between 0 and 1. Thus, there was more than a doubling of the percentage of students that answered correctly after participating in the HS DDL. In summary, after participating in the program, students' attitudes, subjective social norms, and perceived behavioral control all either changed in the predicted direction or were already at ceiling before the program.

Third, the research team then analyzed the students' intentions to intervene. If students' attitudes, social norms, and perceived behavioral control increased, then so too should their intentions to intervene (Group IV). This happened, as students had statistically significant increased confidence that they will intervene (Category 6, Questions 12 and 13).

Fourth, if there was a change in behavioral intentions, which there appeared to be based on the analyses above, then there should be a change in behavior (Group V). Students should not only intend to intervene more frequently after they are exposed to the HS DDL, but they should indeed report that they intervened more frequently. This was the case for parents and passengers but not for friends (Category 7, Questions 8, 9, and 10).

Fifth, it was hypothesized that students' behaviors would be linked to decreases in distracted driving activities and would reduce those activities in parents, friends, and passengers (Category 8, Group VI). A decrease in activity (reported as an increase in means due to reverse coding of scores) was noted in all three cases, though it was significant only for parents and friends. It is worth noting that the increase in intervention frequency was not significant for friends (Category 7, Question 7, $p = 0.08$), but the program effect for friends was significant (Category 8, Question 20, $p = 0.01$). Contrariwise, the increase in intervention frequency was significant for passengers (Category 8, Question 10, $p = 0.00$), but the program effect for passengers was not significant (Category 8, Question 21, $p = 0.23$).

Sixth, we wanted to know whether the students were less likely to drive distracted in the future. Specifically, consider the expectation students have regarding their own future distracted driving behavior (Category 9, Group VII). The change was not significant here, and there does not appear to be an effect of the ceiling here since the averages could have moved up a full point.

One additional measure was taken on the HS pre-DDL and post-DDL survey. Specifically, EndDD and SRA wanted to know whether the program would increase not only students' confidence in their willingness to intervene in distracted driving activities (Category 6, Questions

12 and 13), but also whether the program would increase their overall willingness to intervene in situations other than distracted driving (Category 6, Question 14). There was no statistically significant change.

We also tested whether the program had different effects on students' interventions with their parents and their friends around texting versus talking behaviors. Texting (reading or sending) is generally perceived as more dangerous than talking (not taking into account dialing) and, in fact, is more dangerous (Klauer et al., 2014). This led to four hypotheses: (1) students' frequency of intervening with texting and looking at apps would be greater than their frequency of intervening with talking, (2) there would be an interaction between pre/post and testing/talking, such that the change in the frequency of interventions around texting and looking at apps from the pre-DDL survey to the post-DDL survey was smaller than the change for talking, (3) students would perceive their driver's engagement in texting and looking at apps as greater than the activities around talking, and (4) there would be an interaction such that the change in the frequency of students' perception of their drivers texting and looking at apps would be smaller than the change in their talking activities.

The means are presented below in Table 6. It should be noted that increases in the average Likert score indicate increases in the frequency with which students intervene with their parents or friends (Category 7) and, contrariwise, decreases in the frequency with which the students assess their drivers (parents or friends) as engaging in those activities (Category 8). With that said, it appears that there is an increase in both the frequency with which students intervene around texting and talking and a decrease in the frequency with which their drivers engage in such activities after the students were exposed to the DDL.

*Table 6. High School Distraction: Intervention Frequency and Engagement in Distracting Activity With Parents and Friends*

| Category | Subcategory | Questions (Section 11) | Pre-DDL Mean | Post-DDL Mean | Group | Range |
|---|---|---|---|---|---|---|
| 7) Intervention. Frequency | Parents & Friends (Talk) | Q8a, Q8b, Q9a, Q9b | 1.46 | 1.75 | V | 1-4 |
| | Parents & Friends (Text) | Q8c, Q8c, Q9d, Q9d | 1.76 | 1.95 | V | 1-4 |
| 8) Program Effect | Parents & Friends (Talk) | Q19a, Q19b Q20a, Q20b | 3.75 | 3.96 | VI | 1-5 |
| | Parents & Friends (Text) | Q19c, Q19d Q20c, Q20d | 4.04 | 4.20 | VI | 1-5 |

*Notes: Questions are listed in Section 12. A larger number is associated with a higher frequency of interventions in Category 7; a higher number is associated with a decrease in the frequency that the driver engages in distracting activities with Question 8.*

The changes and the possible interactions are perhaps most clearly seen in Figure 2 and Figure 3 below. In Figure 2 it appears that the frequency with which students intervene in the texting and talking activities of their drivers increases after the students have been exposed to the DDL, that texting interventions are more frequent than talking interventions both before and after the DDL, and that the frequency of talking interventions increases faster than the frequency of texting interventions.
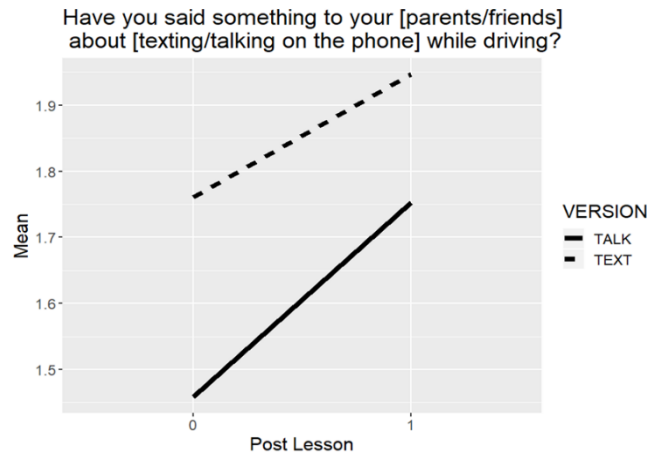


*Figure 2. The frequency of texting and talking
interventions with parents and friends while driving
before and after the students were exposed to the DDL*

Similarly, Figure 3 suggests that students estimate that their parents and friends engage less frequently in texting and talking activities after the students have been exposed to the DDL, that the students estimate that their parents and friends text less than they talk both before and after the DDL, and that the decreases in the frequency of talking activities is larger than the decrease in the frequency of texting activities. Note that the students estimate that their parents almost never engage in texting activities both before and after being exposed to the DDL, so some of the observed interaction could be due to a ceiling effect for texting.
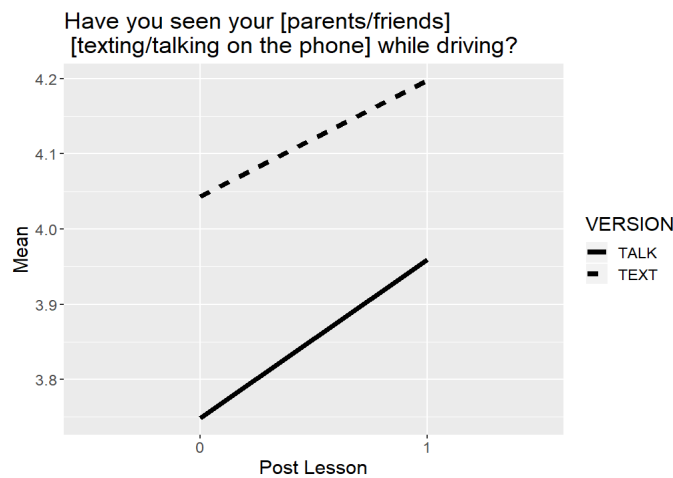


*Figure 3. The students' subjective evaluation of how
infrequently their parents and friends as drivers engage in
texting and talking activities before and after the students
were exposed to the DDL*

To determine whether the main effects of the time of administration of the survey (pre-DDL and post-DDL) and the version of the survey that was used (texting and talking) were significant and whether there was a interaction between time and version, we ran a series of two-way ANOVAs that allowed for main and interaction effects on two sets of outcomes, responses to the frequency of participants' interventions and to participants' subjective estimates of the frequency of drivers engaging in distracting activities. In the analysis of the frequency of participants' interventions in their drivers' activities centered around distraction, there was a main effect of the time of administration, $F(1, 606) = 11.016$, $p < 0.001$, and the version of the survey, $F(1, 606) = 12.486$, $p < 0.001$, but the interaction was not significant, $F(1, 606) = 0.563$. Second, in the analysis of the participants' subjective estimates of how frequently their drivers engaged in distracting activities, there was a main effect of the time of administration, $F(1, 644) = 7.928$, $p = 0.005$, and the version of the survey, $F(1, 644) = 17.313$, $p < 0.001$, but again the interaction was not significant, $F(1, 644) = 0.190$.

### 6.3.3 Analyses of Likert Scale Data and Discussion: Within Subjects

As noted previously, we would have used repeated measures when analyzing all of the results. However, it was not possible to have a unique identifier for each student, given that the surveys were no longer being administered by teachers in the classroom. Instead, we used a matching algorithm.

We matched students on the pretest and posttest using the three questions described in Section 6.2 in addition to school and grade (for centering as well as matching). We used students from all seven high schools from which we had a large percentage of pre-DDL and post-DDL responses (Table 3). The matching procedure was a three-step process. First, only pre-DDL records that had a unique combination of school, grade, favorite color, favorite ice cream, and favorite sport were considered for matching. It would be impossible to distinguish between students with a non-unique combination of these variables in the pre-DDL survey, so these records were removed. Second, the same process was used with the records in the post-DDL survey. Finally, the unique set of records in the pre-DDL survey was compared with the unique set of records in the post-DDL survey. Only records that we were able to match with one another were kept for analysis. If choices were random on the pre-DDL and post-DDL surveys in each of the three matching categories, we would expect fewer than 2 out of 1,000 records to match. The match rate was much higher than that, close to 31% after trimming on the pre-DDL survey (141 unique responses on the post-DDL survey, 56 responses in the matched set).

The analyses are presented below in Table 7. Of the 10 differences that were significant using the independent samples analysis, 9 were still significant using the matched samples analysis. The one difference that is not significant using matched pairs that was significant using independent samples involves Category 3 (Question 11). In this case, participants were significantly more worried about the dangers of distracted driving when analyzed as independent samples ($p = 0.05$) but were not significantly more worried when analyzed as matched pairs ($p = 0.08$). Of the seven differences that were not significant using the independent samples analysis, six were not significant using the matched pairs analysis. The one difference that is significant using matched pairs that was not significant using all of the participants involves Category 8, Question 21 (program effect on passengers). With matched pairs ($p = 0.01$), but not

independent samples ($p = 0.23$), passengers were reported to engage in fewer distracting activities after the students were exposed to the DDL.

Differences between the two types of analyses can be explained. The sample of people that were used in the independent analyses included additional students, because it retained people who responded to the pre-DDL survey but did not respond on the post-DDL survey. The paired analyses included only people that responded on the post-DDL survey, and then only a subset of those people (the people that could be matched on the pre-DDL and post-DDL surveys).

*Table 7. High School Summary of Average Likert Scale Scores Across Categories: Subjects Matched*

| Category | Subcategory | Questions | Pre-DDL Mean | Post-DDL Mean | P-Value | Group | Range |
|---|---|---|---|---|---|---|---|
| 1) Knowledge | Meaning of Distracted Driving | Q1 | 3.23 | 3.73 | 0.00 | I | 1-5 |
| | Other Knowledge of DD | Q2 - Q5 | 0.61 | 1.91 | 0.00 | I | 0-4 |
| 2) Relative Risk | Understanding Relative Risk | Q15 | 3.77 | 3.94 | 0.09 | I | 1-5 |
| 3) Concerns | Worry About Distracted Driving | Q11 | 2.97 | 3.14 | 0.08 | I | 1-5 |
| 4) Safety & Consideration of Others | Safety of Others | Q17 | 4.71 | 4.58 | 0.85 | II | 1-4 |
| | Consideration of Others | Q18 | 3.72 | 3.76 | 0.19 | II | 1-5 |
| 5) Right Words | Know Right Words to Say | Q6 | 2.23 | 3.41 | 0.00 | III | 1-4 |
| | "I am worried…" | Q7 | 0.20 | 0.62 | 0.00 | III | 0-1 |
| 6) Intervention Confidence | Distracted driving | Q12 - 13 | 2.76 | 3.02 | 0.01 | IV | 1-4 |
| | Overall | Q14 | 3.44 | 3.69 | 0.03 | * | 1-5 |
| 7) Intervention Freq. | Parents | Q8 | 1.63 | 2 | 0.03 | V | 1-4 |
| | Friends | Q9 | 1.48 | 1.48 | 0.48 | V | 1-4 |
| | Passengers | Q10 | 1.71 | 2.02 | 0.02 | V | 1-4 |
| 8) Program Effect | Parents | Q19 | 3.51 | 3.76 | 0.01 | VI | 1-5 |
| | Friends | Q20 | 4.21 | 4.46 | 0.02 | VI | 1-5 |
| | Passengers | Q21 | 3.95 | 4.29 | 0.01 | VI | 1-5 |
| 9) Future Behaviors | Engage in Distracting Activities | Q16 | 3.02 | 3.11 | 0.21 | VII | 1-4 |

The differences in the independent and matched samples analyses do not change the five conclusions. Overall, the program appears to be effective. First, the effect of the program on students' attitudes, subjective social norms, and perceived behavioral control was positive. Second, there is an increase in the frequency with which students indicated that they intend to intervene. Third, there was an increase in the actual reported interventions with their drivers

around engaging in distracting activities (at least for parents and passengers). Fourth, there was a marked decrease in students' subjective estimates of how much their parents and friends (as drivers) and passengers are engaging in distracting activities. And fifth, there was no significant change in the likelihood that students believe they will engage in distracting activities in the future.

### 6.3.4 Percentage Correct Analyses

As noted above, for this analysis the same set of the responses to each question on the high school survey were instead partitioned into two groups, correct or incorrect (see Section 12). The results are presented below in Table 8. The students were not matched for these analyses.

*Table 8. High School Summary of Average Percent Correct Across Categories: Students Not Matched*

| Category | Subcategory | Questions | Pre-DDL Percent Correct | Post-DDL Percent Correct | Percentage Point Increase | Group |
|---|---|---|---|---|---|---|
| 1) Knowledge | Meaning of Distracted Driving | Q1 | 0.46 | 0.70 | 0.24 | I |
| | Other Knowledge of DD | Q2 - Q5 | 0.25 | 0.44 | 0.19 | I |
| 2) Relative Risk | Understanding Relative Risk | Q15 | 0.63 | 0.64 | 0.01 | I |
| 3) Concerns | Worry About Distracted Driving | Q11 | 0.35 | 0.40 | 0.05 | I |
| 4) Safety & Consideration of Others | Safety of Others | Q17 | 0.91 | 0.90 | -0.01 | II |
| | Consideration of Others | Q18 | 0.70 | 0.75 | 0.05 | II |
| 5) Right Words | Know Right Words to Say | Q6 | 0.78 | 0.97 | 0.19 | III |
| | "I Am Worried…" | Q7 | 0.26 | 0.57 | 0.31 | III |
| 6) Intervention Confidence | Distracted Driving | Q12 - 13 | 0.85 | 0.89 | 0.04 | IV |
| | Overall | Q14 | 0.51 | 0.57 | 0.06 | * |
| 7) Intervention Freq. | Parents | Q8 | 0.38 | 0.49 | 0.11 | V |
| | Friends | Q9 | 0.28 | 0.36 | 0.08 | V |
| | Passengers | Q10 | 0.49 | 0.59 | 0.10 | V |
| 8) Program Effect | Parents | Q19 | 0.54 | 0.58 | 0.04 | VI |
| | Friends | Q20 | 0.70 | 0.79 | 0.09 | VI |
| | Passengers | Q21 | 0.73 | 0.78 | 0.05 | VI |
| 9) Future Behaviors | Engage in Distracting Activities | Q16 | 0.68 | 0.72 | 0.04 | VII |

The above is being reported for three reasons. First, readers can easily determine the change in the percentage of students responding correctly on the pre-DDL and post-DDL survey.

Second, Table 8 is also useful for looking at floor and ceiling effects. With respect to ceiling effects, students were already very concerned for the safety of others (Question 17) and very confident that they will intervene when their driver is distracted (Questions 12 and 13). Thus, one cannot expect to find, and one does not find, much of a change. With respect to floor effects there were none. That is, there were no cases in which the students got none (or few) of the right answers correct both before being exposed to the DDL and after being exposed to the DDL. Thus, there were no questions that were too difficult for the students to understand, or for which students' responses were too negative, to be adequately captured by the provided response options.

Finally, the table is useful for diagnostic purposes. It is difficult to know a priori what Likert scale score average one might like to see as a likely consequence of exposure to the program. But it can be somewhat easier to determine a priori what percentage of students one might expect to learn a given category or subcategory. In this regard, it is encouraging that the percentage of students who learned what to say to effectively intervene with their parents increase by almost 120%. But the goal may not be the percentage increase. Instead, given that only 26% of the students know the correct thing to say before being exposed to the DDL it seems not unreasonable to expect that some 75% to 85% of the students would know the correct thing to say after being exposed to the DDL. The finding that only 57% knew the correct thing to say may suggest that more emphasis needs to be placed throughout the DDL lesson on what a student should say to their driver.

## 6.4 Elementary School Surveys and Analyses

As noted above, the surveys for the elementary school students were designed to be shorter than the surveys for the high school students, which required 48 responses. To shorten elementary school survey, even though the lesson addressed both the dangers of talking and texting on the cell phone, a random half of the students in the elementary school were given questions only about talking and the other half questions only about texting. Thirteen questions were included in the texting and talking ES surveys.

The elementary school talking DDL survey questions and responses to the questions are included in Section 14.1, and the elementary school texting survey questions and responses to the questions are included in Section 14.2. Listed below each question in Section 14.2 are the possible responses to the question and for each question what options were included together as correct responses along with the match of the elementary school survey question to a high school question. As with the analysis of the high school surveys, this grouping allowed us to perform two separate analyses, treating the separate responses like a Likert scale or treating the grouped responses in a binary fashion as correct or incorrect.

### 6.4.1 Categories and Groups of Elementary School Questions

The questions on the elementary school survey were also partitioned into categories, with several categories being excluded for reasons of differences in age and in the number of questions asked. To easily compare the categories and subcategories of questions that were asked on the high

school and elementary school surveys, we list all categories for the high school survey and, when a category or subcategory was not included on an elementary school survey, we indicate this by "NA." The elementary school question numbers assigned to each of the categories are listed below in Table 9.

*Table 9. Elementary School Survey: Categories, Subcategories and Groups*

| Category | Subcategory | Questions | Group |
|---|---|---|---|
| 1) Knowledge | Meaning of Distracted Driving | Q5 | I |
| | Other Knowledge of DD | NA | NA |
| 2) Relative Risk | Understanding Relative Risk | NA | NA |
| 3) Concerns | Worry About Distracted Driving | Q7 – Q9 | I |
| 4) Safety & Consideration of Others | Safety of Others | NA | NA |
| | Consideration of Others | NA | NA |
| 5) Right Words | Know Right Words to Say | Q3 | III |
| | "I Am Worried…" | Q4 | III |
| 6) Intervention Confidence | Distracted Driving | Q10 | IV |
| | Parents Will Stop | Q11 | IV |
| | Overall | Q13 | * |
| 7) Intervention Freq. | Parents | Q1 – Q2 | V |
| | Friends | NA | NA |
| | Passengers | NA | NA |
| 8) Program Effect | Parents | Q12 | VI |
| | Friends | NA | NA |
| | Passengers | NA | NA |
| 9) Future Behaviors | Engage in Distracting Activities | Q6 | VII |

Only two entire categories were omitted on the elementary school survey: Category 2, Relative Risk; Category 4, Safety and Consideration of Others. It was not clear that elementary school students would easily understand the relative risk of various distracting activities, and answers to questions about the safety and consideration of others would require the elementary school students to project further into the future, something that was considered too difficult for the age. Several subcategories were omitted. These included the intervention frequency and program effect on friends and passengers (Categories 7 and 8) and four questions about students' knowledge of distracted driving (Category 1, Knowledge; Subcategory 2, Other Knowledge of DD).

The same seven groups of questions (I – VII) were formed from across the categories in the elementary school survey as were formed in the high school survey. However, there were no questions that appeared as Group II questions.

### 6.4.2 *Likert Scale Analyses and Discussion: Between Subjects*

The Likert scale averages across talking and texting for each of the 13 elementary school questions on the pre-DDL and post-DDL survey are included in Section 15.1 (Table 21) along

with the number of responses and the standard deviations. For each of the nine categories of data described above, the category label, subcategory, question number in the ES survey (Section 14), ES pre-DDL and ES post-DDL mean, *p*-value, and range of possible scores on each question or group of questions in a category are given in Table 10. Further information on the value of t statistic and the degrees of freedom used for each of the tests reported in Table 10 is given Section 15.2 (Table 22).

The scoring of responses in the elementary school survey was the same as for the high school survey (Section 6.3.2.1). Likewise, the statistical tests on the elementary school survey were the same as those used on the high school survey (6.3.2.2).

The analysis of the elementary school program was not as robust as the analysis of the high school program, largely because of the lower power associated with a smaller number of respondents. The results of the analyses are presented below in Table 10. As with the high school surveys, the elementary school pre-DDL and post-DDL means were uncentered – to make their interpretation most easy. Because one question was not included in the early administration of the ES pre-DDL survey (Question 4), we could not use centered analyses. Thus, the *p*-values represent those for the uncentered means.

*Table 10. Elementary School Summary of Average Likert Scale Scores Across Categories: Subjects Not Matched*

| Category | Subcategory | Questions | Pre-DDL Mean | Post-DDL Mean | P-Value | Group | Range |
|---|---|---|---|---|---|---|---|
| 1) Knowledge | Meaning of Distracted Driving | Q5 | 2.91 | 3.41 | 0.01 | I | 1-5 |
| 3) Concerns | Worry About Distracted Driving | Q7 – Q9 | 3.58 | 3.14 | 0.97 | I | 1-5 |
| 5) Right Words | Know Right Words to Say | Q3 | 2.55 | 2.85 | 0.09 | III | 1-4 |
| | "I am worried…" | Q4 | 0.23 | 0.41 | 0.06 | III | 0-1 |
| 6) Intervention Confidence | Distracted driving; Parents will stop | Q10 – Q11 | 3.30 | 3.44 | 0.29 | IV | Q10:1-4 |
| | | | | | | | Q11:1-5 |
| | Overall | Q13 | 4.22 | 3.96 | 0.86 | * | 1-5 |
| 7) Inter. Freq. | Parents | Q1 – Q2 | 0.78 | 0.72 | 0.61 | V | 1-4 |
| 8) Program Effect | Parents | Q12 | 1.21 | 0.77 | 0.93 | VI | 1-5 |
| 9) Future Behaviors | Engage in Distracting Activities | Q6 | 3.50 | 3.81 | 0.12 | VII | 1-4 |

There are several things of note, as with the high school program. First, across the eight different times a category or subcategory represented a group of questions, the means appeared to go in a direction that indicated a benefit of the program (Categories 1, 5, 6, 9) five times.

Second, as with the high school program, the students indicated that they understood better the meaning of distracted driving (Group I, Category 1, Table 10). The difference between the average values on the ES pre-DDL and post-DDL surveys was significant ($p = 0.01$). But curiously this did not translate into differences in their concern about being in a car while someone was engaged in a distracting activity (e.g., the students gave the same average rating before and after the ES DDL to a question such as, "If you are in a moving car and saw your driver texting or looking at apps, how would you feel?"; Question 7, Section 14.2) (Group I, Category 3).

The lack of a statistically significant change in the concern across the three questions (Questions 7 – 9) could be a function of the fact that we lumped together the responses from the texting and talking surveys, so we also analyzed them separately. There appeared to be a decrease on all questions for texting and for talking (Table 11).

*Table 11. Elementary School Scores on Questions 7, 8 and 9 Separated by Version (Texting versus Talking) on the Pre-DDL and Post-DDL Surveys*

| Texting | Q7 | Q8 | Q9 |
|---------|------|------|------|
| Pre | 3.23 | 3.47 | 3.67 |
| Post | 2.86 | 3.07 | 3.29 |
| | | | |
| Talking | Q7 | Q8 | Q9 |
| Pre | 3.19 | 3.83 | 4.1 |
| Post | 2.85 | 3.42 | 3.58 |

Third, with respect to whether the elements important for intervening with a driver were in place (Group III), there was not a statistically significant difference.

Fourth, if the students' knowledge and attitudes, social norms, and perceived behavior control increased, we would expect an increase in the intentions to intervene. However, students' perceived behavior control did not significantly increase. Thus, it is not surprising that there was not a significant increase in the students' intervention confidence (Group IV, Category 6, Questions 10 and 11).

Fifth, the real test of whether the students are prepared to intervene is whether they actually intervene. In this case, there was no statistically significant difference in the likelihood to intervene after the DDL compared to before the DDL (Group V, Category 7, Questions 1-2).

Sixth, one would expect to find that there was a decrease in the distracted driving activities of the parents (Group VI). In this case, there was no statistically significant change in elementary students' reports of parents' behavior after the elementary students being exposed to the DDL (Category 8). Given that the students did not report intervening more frequently, the finding that the parents' distracted driving activities did not change is consistent with the results on the intention to intervene.

Finally, we wanted to know whether the students predict that in the future when they will begin to drive, they are less likely to drive while distracted. The movement from the pre-DDL to the post-DDL was not statistically significant (Group VII, Category 9, Question 6).

### 6.4.3 Likert Scale Analyses and Discussion: Within Subjects

We were able to match students on the pretest and posttest using the six questions described in Section 6.2. Because we had three additional questions that could be used to identify students on the pre-DDL and post-DDL survey, all 31 post-DDL surveys were unique. Of the 31 post-DDL surveys, 18 matched identifying information on the pre-DDL survey (58.1%). The analyses are presented below in Table 12.

*Table 12. Elementary School Summary of Average Likert Scale Scores Across Categories: Subjects Matched*

| Category | Subcategory | Questions | Pre-DDL Mean | Post-DDL Mean | $p$-value | Group | Range |
|---|---|---|---|---|---|---|---|
| 1) Knowledge | Meaning of Distracted Driving | Q5 | 3.44 | 3.50 | 0.40 | I | 1-5 |
| 3) Concerns | Worry About Distracted Driving | Q7 – Q9 | 3.43 | 3.25 | | I | 1-5 |
| 5) Right Words | Know Right Words to Say | Q3 | 2.78 | 3.06 | 0.16 | III | 1-4 |
| | "I Am Worried…" | Q4 | 0.17 | 0.39 | 0.50 | III | 0-1 |
| 6) Intervention Confidence | Distracted Driving | Q10 | 3.94 | 3.76 | 0.64 | IV | 1-4 |
| | Parents Will Stop | Q11 | 3.39 | 3.78 | 0.10 | IV | 1-5 |
| | Overall | Q13 | 4.39 | 4.11 | 0.93 | * | 1-5 |
| 7) Intervention Freq. | Parents | Q1 – Q2 | 0.78 | 1.49 | | V | 1-4 |
| 8) Program Effect | Parents | Q12 | 3.39 | 3.78 | 0.50 | VI | 1-5 |
| 9) Future Behaviors | Engage in Distracting Activities | Q6 | 3.56 | 3.81 | 0.20 | VII | 1-4 |

Much the same pattern is observed here in the paired analyses as was observed in the independent sample analyses. Out of eight times a category or subcategory was measured, in six cases the post-DDL mean was greater than the pre-DDL mean (as opposed to five when the samples were independent). It was no longer the case the there was a significant difference in the knowledge of distraction students reported across the pre-DDL and post-DDL surveys (Q5).

### 6.4.4 Percentage Correct Analyses

As noted above, the responses to each question on the elementary school survey were partitioned into two groups, correct or incorrect (see Section 14). The results are presented below in Table 13.

*Table 13. Elementary School Summary of Average Percent Correct Across Categories*

| Category | Subcategory | Questions | Pre-DDL Mean | Post-DDL Mean | *p*-Value | Group | Range |
|---|---|---|---|---|---|---|---|
| 1) Knowledge | Meaning of Distracted Driving | Q5 | 0.33 | 0.48 | NC | I | 1-5 |
| 3) Concerns | Worry About Distracted Driving | Q7 – Q9 | 0.52 | 0.48 | NC | I | 1-5 |
| 5) Right Words | Know Right Words to Say | Q3 | 0.17 | 0.29 | NC | III | 1-4 |
|  | "I Am Worried…" | Q4 | 0.12 | 0.35 | NC | III | 0-1 |
| 6) Intervention Confidence | Distracted Driving | Q10 | 0.63 | 0.77 | NC | IV | 1-4 |
|  | Parents Will Stop | Q11 | 0.64 | 0.77 | NC | IV | 1-5 |
|  | Overall | Q13 | 0.57 | 0.61 | NC | * | 1-5 |
| 7) Intervention Freq. | Parents | Q1 – Q2 | 0.32 | 0.37 | NC | V | 1-4 |
| 8) Program Effect | Parents | Q12 | 0.40 | 0.19 | NC | VI | 1-5 |
| 9) Future Behaviors | Engage in Distracting Activities | Q6 | 0.52 | 0.48 | NC | VII | 1-4 |

We did not perform tests of the statistical difference in the pre-DDL and post-DDL proportions because the number of participants (18) was so small. However, of the nine comparisons of the pre-DDL and post-DDL means, seven appear to indicate that the program has a positive effect.

# 7 Discussion

Distracted driving is a significant problem with many possible countermeasures. One promising countermeasure is one that focuses on teaching younger children how to intervene with their parents as drivers. Not only could such a countermeasure decrease the likelihood that the caregivers who drive children will engage in distracting activities, but it also promises to create a generation of future drivers who themselves have already embodied the dangers of driving while distracted.

## 7.1 General

With the above in mind, the research team evaluated a program that focused on helping elementary school children better understand the dangers of distracted driving and learn the skills needed to intervene with their parents when they were driving and distracted. After an extensive literature review and examination of existing programs, one program was identified that matched the criteria: a program that was being developed jointly by EndDD and SRA. Unfortunately, the COVID-19 pandemic struck just as the program was to be rolled out into the classroom.

Fortunately, EndDD and SRA were able to pivot to a virtual platform. For the elementary school students, the Distracted Driving Lesson (DDL) was a 30-minute, prerecorded, asynchronous video. Additionally, five Distracted Driving Units were included that were available online to special topics teachers. Given that teachers were overwhelmed with creating content that could be delivered online, especially elementary school teachers, EndDD and SRA also created content that could be accessed by parents, by high school students, and by high school teachers. The high school teachers, as opposed to the elementary school teachers, were not asked to deliver the DDL themselves. Instead, the high school teachers could make an appointment with EndDD or SRA to have an instructor from either group give the DDL virtually, the DDL usually lasting on the order of 70 minutes. This latter format is the only one that eventually took hold.

The results for the high school DDL were encouraging. The 48 questions on the pre-DDL and post-DDL survey were grouped into 17 subcategories. In 16 of 17 of the subcategories the post-DDL mean was larger than the pre-DDL mean, indicating a potential benefit of the DDL. However, the differences in the means were statistically significant in 9 of the 17 subcategories. Students' knowledge of distracted driving and words to use in interventions, and their perceived behavioral control (intervention confidence for distracted driving) increased. According to the theory of planned behavior (Ajzen, 1991), one should see an increase in intentions to intervene, here intentions to intervene with a distracted driver, if one observes as change in attitudes, subjective social norms and perceived behavioral control. As predicted by the theory of planned behavior, this increase was observed. Furthermore, again according to the theory of planned behavior one should see an increase in the actual frequency with which the high school students intervened if one sees a change in the intentions to intervene. That increase was also observed for parents and passengers (but not for friends).

The fact that children reported intervening more with their drivers does not guarantee that their drivers will engage in distracting activities less frequently. The theory of planned behavior only links attitudes, social norms, and perceived behavior control to intentions and then intentions to behaviors of the actors. The effect depends on whether the behaviors of the actors (the children) influence those upon whom they act (the drivers). Importantly, the students did report significant

decreases in their drivers' activities that could be classified as distracting. Finally, it was expected that a significant decrease would be observed in the likelihood that the high school students reported that they themselves would engage in the future in distracting activities when they obtained their license. One might expect such in our case given the change in attitudes, but the change was not statistically significant.

The results for the elementary school DDL were mixed. In five of the eight unmatched (matched) comparisons between the pre-DDL means and the post-DDL means, the increase was in the direction one would expect if the program were having an effect. However, in only one of those cases was the difference in the means statistically significant.

Given the above, five things are worthy of mention. First, while there is anywhere between a doubling (unmatched) and tripling (matched) of the percentage of students who selected the right words to say when intervening with their drivers, the absolute percentage who did such is nowhere near ceiling. In the case of the high school students, the percentage varied between 57% (unmatched) and 62% (matched). More emphasis could be placed on this crucial piece of information: what to say to your driver. It is not clear why students could not remember a simple way of explaining something to their drivers such as "Mom, I am worried about a crash," But there are several possible reasons why the percent of correct answers was relatively small. One is that a 3-week period occurred between the administration of the pre-DDL and the post-DDL. While we expect students retain information, forgetting is a possibility. Another is that the example statements that the high school students were given as instances of "I" statements were: "I don't feel safe when you look at your phone while driving" or "I'm a little nervous when you look away from the road when driving." Compared to the possible responses to the question on the HS DDL asking students what they should say to their drivers (Section 12, Question 7): "Tell them about the dangers of not paying attention to the road"; "Tell them you are worried about a crash"; and "Tell them to pay attention to the road." The responses were not given in the form of "I" or "You" statements. Thus, the student must infer that the one response that has "you" in it ("Tell them you are worried about a crash") is the correct "I" statement. Perhaps the percentage getting the answer correct on this question would have been higher had the responses been: "Mom, you know it is dangerous not to pay attention to the road"; "Mom, I am worried about a crash"; and "Dad, you should pay attention to the road." With these responses, the "I" statement and the "You" statements are clearer and more closely match the training.

Second, the percentage of students who were willing to intervene with another teen when the teen was driving distracted was much smaller than expected. A major cause of teen crashes is having another teen in the car and the likelihood of a crash increases as the number of passengers increases (Simons-Morton, et al., 2011). Averaged across the four subparts to Question 9 that focuses on a teen passenger intervening with a teen driver (Section 13.1), one finds that only 36% were willing to intervene (Table 8). This compares with 49% who said they would intervene with their parents. Different ways of intervening may be needed for peer-to-peer interventions as opposed to child-to-adult interventions as it is difficult to imagine a teen passenger saying to a teen driver: "I don't feel safe when you look at your phone while driving."

Third, the pandemic prevented EndDD and SRA from obtaining observations of the frequency of distracted driving behaviors. Such observations can be obtained by observing drivers' distracted activities in the drop-off and pick-up lines at schools (Teens in the Driver Seat, 2018b).

Observations are a necessary supplement to the self-reported evaluations that were provided by the surveys.

Fourth, the same two caveats apply to the results with the elementary school students as applied to the results with the high school students: the small differences may be attributable to the 3-week interval between the pre-DDL and post-DDL surveys and the exact words the students were instructed to say to their parents in the DDL were not directly mimicked in the surveys as possible responses. There are three other reasons the elementary school program may have shown less of an effect than the high school program. To begin, elementary school students may learn much less effectively in a virtual environment than do high school students. It is known that in general learning in the classroom is greater than learning online, though there are many caveats (Heppen et al., 2017). Additionally, the high school program was not entirely passive as was the elementary school program. The instructor in the high school DDL asked questions of the students that the students could answer as the DDL was delivered over Zoom or a similar platform. It is known that active learning is generally more effective than passive learning (Romoser & Fisher, 2009). Finally, the amount of time that the HS students were exposed to the DDL program (70 minutes) was over twice amount of time that the ES students were exposed to the DDL (about 30 minutes). It is generally known that learning increases with increases in exposure (Bisson et al., 2014).

Finally, the study was originally intended to focus on elementary school adult-to-child interventions. The research team chose the program put together by EndDD and SRA in part for this reason. However, the pandemic made it necessary to pivot midway from a focus on just elementary school students to a focus on both elementary and high school students. Given that the analyses in this study included high school students, it is worth asking whether elements of the existing high school programs that have proven effects on the distracted driving behaviors of parents could be combined with this program into a single, more effective program. The only other high school and middle school programs with proven effects on self-reported distracted driving behaviors of parents and on the observed distracted driving behaviors of parents were programs organized by Teens in the Driver Seat (www.t-driver.com/). The two programs, Teens in the Driver Seat, and EndDD and SRA, are very different from one another. The Teens in the Driver Seat program involves a focus on peer-to-peer interactions with some emphasis on child-to-adult interventions around distracted driving. The program is spread over an entire semester. The EndDD and SRA program focuses on teacher-to-child or instructor-to-teen interactions with a more definite focus on child-to-adult interventions. The primary instructional piece is a 70-minute, interactive, online program.

## 7.2   Limitations of the Current Study

A study like this has limitations. First, there was no control group. The changes could have occurred, not because of the program, but because of an increase of some other activity in a community centered around distracted driving.

Second, related to the above, the students' evaluation of the frequency of their driver's engagement in distracting activities occurred on the pre-DDL and post-DDL surveys while the pandemic was still ongoing. We know that driving decreased for many adults during the pandemic. Thus, students' may have very few observations upon which to base their estimates of

the frequency with which their drivers engaged in distracting activities. Consequently, the estimates could be noisy.

Third, even if there were a control group, it would be difficult to determine whether the increases were due to students wanting to please their teachers, assuming that the students believed that such could be accomplished by indicating positive things about the program. However, there are several questions that test knowledge that students could only gain from the program. One such question we discussed above is whether the students knew the right words to say to get their parents to decrease distracted driving activities. Increases were seen among the high school students.

Fourth, because the students who took the post-DDL surveys are a subset of the students who took the pre-DDL surveys, the students who took the post-DDL surveys may have been more motivated and therefore answered more positively in general.

Fifth, because we could not match for every student the student's responses on the pre-DDL survey with the student's responses on the post-DDL survey in either the high school or elementary school analyses, we essentially performed two analyses of the effectives of the DDL. In one analysis, we assumed the samples were independent. This maximized the number of observations. The statistical tests for independent samples are more conservative than tests for matched samples, i.e., all of the result reported as significant with independent samples would still be significant if we had used matched tests; however, some of the results reported as insignificant using independent samples may have been significant if we had used matched tests instead. In a second analysis, we matched the student's responses on the pre-DDL and post-DDL surveys. However, matching was not perfect, i.e., it was not possible to identify for every student on the post-DDL survey the same student on the pre-DDL survey. Thus, the increased power that comes with matching was reduced because the number of students that could be matched was way fewer than the total number of respondents.

Sixth, the questionnaires were designed primarily to determine whether the high school and elementary school programs increased students' knowledge of what they needed to say to their drivers when their drivers were engaged in distracting activities, increased students' actual attempts to intervene, and decreased drivers' engagement in distracting activities. There is much more content that the high school and elementary school programs cover that was not measured in the surveys.

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[4] SWOV stands for Stichting Wetenschappelijk Onderzoek Verkeersveiligheid, the Institute for Road Safety Research based in the Hague, the Netherlands.

# 9    Acknowledgements

# 10   Appendix: Tier I Contacts

The four waves in Tier I are explained in Section 4.1

*Table 14. Tier I, Wave 1*

| Tier 1, Wave 1 |
|---|
| EndDD |
| Family, Career and Community Leaders of America (FCCLA) |
| FIA Foundation |
| Impact Teen Drivers |
| National Organizations for Youth Safety (NOYS) |
| National Safety Council (NSC) |
| People Against Distracted Driving (PADD) |
| Students Against Destructive Decisions (SADD) |
| Teens in the Driver Seat |

*Table 15. Tier I, Wave 2*

| Tier I, Wave 2 |
|---|
| National Road Safety Foundation |
| Vandy |
| StopDistractions.org |
| Safe Routes to School |
| Friday Night Lights |
| Project Yellow Light |
| Honda #TheTextTalk |
| AT&T |
| Connecticut Highway Safety Office |

*Table 16. Tier I, Wave 3*

| Tier 1, Wave 3 | Derivative Contacts |
|---|---|
| NAWHSL | |
| | Kentucky: Andy Pilgrim |
| | Minnesota: Shreya Dixit Foundation |
| | Oregon: Jingle Contest |
| | Kentucky: Andy Pilgrim (two responses from SHSO) |
| | Massachusetts: Safe Roads/End DD |
| | Kentucky: Local Health Department Programming |
| | Georgia: Jennie Glasgow |
| | Nebraska: Teens in Drivers Seat |
| | Nebraska: Drive Smart Coalition |

| Tier 1, Wave 3 | Derivative Contacts |
|---|---|
| | Mississippi |
| | Pennsylvania |
| | Iowa: Safe Roads/End DD |
| | MI: Strive for a Safer Driver |
| | • Lisa Meyer |
| | •Holly Always x2 responses |
| | •Leah Arnold |
| | •Chysten Gregory |
| | •Ken Raisanen |
| | •Michelle Turner |
| | CA: Three local programs |
| | •Jodi Putname (Butte County Public Health) |
| | •Rebecca Antillon (Be Wiser) |

*Table 17. Tier 1, Wave 4*

| Tier 1, Wave 4 | Derivative Contacts |
|---|---|
| NHTSA Regional Offices | |
| | Region 1 |
| | Region 2 |
| | Region 3 |
| | Region 4 |
| | Region 5 |
| | Region 6 |
| | Region 8 |
| | Region 9 |
| | Region 10 |

# 11   Appendix: Tier II Interview Guide

The Tier II Interview Guide is explained in more detail in Section 4.2.

**Contact Information** (identified in initial outreach)
**Organizational Information** (identified in initial outreach)
**Program Information**

1. What is the title of your child-to-adult intervention that includes distracted driving?

2. Could you provide us with an overview of the intervention?

3. Now let's get some specifics.

    a. Locations

    b. Overall length of operation

    c. Number of supervisory staff (program level)

    d. Target audiences

    e. Number of people reached to date

    f. Target intervention goals, delivery mechanism, associated materials for each goal:

        i. Goal 1, delivery mechanism, materials

        ii. Goal 2, delivery mechanism, materials

**Program Strengths, Weaknesses, Opportunities and Threat**

4. Can you speak a little more about the strengths, weaknesses, opportunities and threats relevant to the program?

    a. Strengths?

    b. Weaknesses?

    c. Opportunities?

    d. Threats?

**Intervention Unit Structure**

5. What is the intervention unit and size (student, class, grade, other)?

6. Are there both treatment and control groups in the intervention? (*This may need to be explained further.)

    a. Yes:

        i. Were students randomly assigned to the treatment and control groups (this may need to be explained further)?

        ii. How were subjects exposed (e.g., three 1-hour sessions in school)?

            a. Students

            b. Parents

            c. Other

iii. How long were subjects exposed to the intervention?

iv. When did the evaluation period start and end?

v. How many staff are needed to administer an intervention to whichever unit is being used (e.g., classroom)?

vi. Please explain the experimental design (interviewer may need to tease this out of the interviewee).

b. No:

i. How were subjects exposed (e.g., three one hour sessions in school)?

a. Students

b. Parents

c. Other

ii. How long were subjects exposed to the intervention?

iii. When did the evaluation period start and end?

iv. How many staff are needed to administer an intervention to whichever unit is being used (e.g., classroom)?

v. Please explain the experimental design (interviewer may need to tease this out of the interviewee).

**Data Collection and Program Assessment**

7. Has data been collected?[5]

a. Yes:

i. How were the data collected (e.g., paper, electronically)?

ii. In what format does the data reside (e.g., Excel, Sequel)?

b. No: skip to question 18.

8. Has a program assessment been completed for the intervention? (*Define assessment again for interviewee.)

a. Yes: Move to question 9.

b. No: Skip to question 18.

9. Could you tell us more about this assessment?

a. What data were collected? (What were the dependent variables?)

b. How many students/parents were involved in the collection of the data?

c. How were the data collected? (Paper responses dependent, responses entered into a computer?)

d. Who collected it? (The students? The parents? Instructors?)

---

[5] Note that data could have collected even though no evaluations have been undertaken and none are planned.

e. Where is the data stored? (Paper files? Electronic files?)

f. Were there any tools used? (For example, were students provided with a device that allowed them to count the number of times on each trip that their parents were distracted? The duration of the distraction? The number of miles traveled?)

g. What were the results? (Here we want both descriptive and inferential statistics if they are available.)

    i. Qualitative

    ii. Descriptive Statistics

    iii. Inferential Statistics

    iv. Other?

10. Have the assessment results been applied to improve the delivery of future versions of the intervention?

11. If there is assessment data, would you be willing to share the data and analysis with the Volpe Center?

12. If the data are available, would you be interested in a formal assessment?

13. Would you be interested in a formal evaluation of your program if resources were provided to assist with that evaluation?

a. Yes:

    i. Where do you think you will need the most help in your organization to support such an effort?

    ii. Will you need additional staff to implement the program?

    iii. Will you need additional staff to transfer the data to a format that can be used for analysis purposes?

b. No: Skip to question 20.

14. Do you think the program has been successful? Please explain.

## 12    Appendix: High School Survey and Answer Key

The entire high school list of questions and responses on the survey given before and after the Distracted Driving Lesson are listed below. In addition, the scoring of the responses is described after the last response ("**SCORING**"). Recall that for five questions, the answer was correct or incorrect for the independent samples tests: Questions 2, 3, 4, 5 and 7 (Section 13.1). For all other questions for the independent samples test, the responses were graded on a Likert scale (3 or more responses). Below, under the discussion of the scoring for independent samples, the response that represents the high or low end of the scale is indicated. All scales were transformed so that larger numbers for a question implied a greater effect of the DDL. So, for example, for Question 1, the high end of the scale is represented by "I completely understand."

The situation was slightly different for the matched samples. For the scoring of matched samples, the difference score between the pre-DDL survey and the post-DDL survey on a given question was a function of the direction in which the responses moved on the question. So, for example, if the numbers increased after the scale for a question had been transformed (assuming such was necessary), then the difference score was positive; otherwise, it was negative. As another example, Question 2 was scored as 0 or 1 for the independent samples test: the participant either answered correctly (two seconds) or did not answer correctly. However, for the matched analysis because we had change scores, we could determine whether the participant got closer to the correct answer or further away from the correct answer and computed the difference scores accordingly.

**Please read each question and circle the response that best describes your experience or your opinion. Remember, this is not a quiz, and you will not be graded. Please provide your best guess when you do not know the answer. We realize that there may be several questions to which you do not currently know the answer.**

1) How well do you think you understand what it means for a driver to be **distracted** when that driver is driving?
   - ☐ I don't understand
   - ☐ I have some understanding
   - ☐ I mostly understand
   - ☐ I completely understand
   - ☐ **SCORING**
     - o Independent. "I completely understand"
     - o Matched. Movement towards or away from "I completely understand"

2) Assuming that the driver is looking **away from the road**, when does the driver's risk of crashing first double?
   - ☐ One second after first looking away from the road
   - ☐ Two seconds after first looking away from the road
   - ☐ Three seconds after first looking away from the road
   - ☐ Four seconds after first looking away from the road
   - ☐ Five or more seconds after first looking away from the road

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- **SCORING**
  - Independent. "Two seconds…."
  - Matched. Movement towards 2 (e.g., 1 to 2) or away from 2 (e.g., 2 to 1, 4 to 5)

3) In the SPIDER acronym introduced in the Distracted Driving Lesson what does the "S" stand for?
   - I have not seen the Distracted Driving Lesson
   - Safely driving at night
   - Seeking advice from others
   - Scanning for potential threats
   - Steering in the center of the road
   - Scanning for potential threats
   - **SCORING**
     - Independent. "Scanning"
     - Matched. No change score.

4) What percentage of 16- to 18-year-olds will look at texts or snapchat while driving a moving car?
   - 0% — 9%
   - 10% — 19%
   - 20% — 29%
   - 30% — 39%
   - 40% — 49%
   - 50% — 59%
   - 60% — 69%
   - 70% — 79%
   - 80% — 89%
   - 90% — 100%
   - **SCORING**
     - Independent. Slide for 16- to 18-year-olds had percentages ranging from 30% to 50%. Therefore included: 30%-39%, 40%-49%, 50%-59%.
     - Matched. Movement towards or away from "40% -- 49%"

5) What percentage of teens will put their phones away while driving, if asked by a friend?
   - 0% — 24%
   - 25% — 49%
   - 50% — 74%
   - 75% — 100%
   - **SCORING**
     - Independent. "75% -- 100%"
     - Matched. Move towards or away from "75% -- 100%"

6) If your driver is distracted while driving, do you know the right words to use to ask your driver to stop from driving distracted?
- ☐ I don't know any of the right words to use
- ☐ I know some of the right words to use
- ☐ I know most of the right words to use
- ☐ Yes, I know all of the right words to use
- ☐ **SCORING**
  - o Independent. "I don't know any of the right words to use"
  - o Matched. Change towards "Yes, I know…"

7) Which is the best way to get the driver to stop driving while distracted?
- ☐ Tell them about the dangers of not paying attention to the road
- ☐ Tell them you are worried about a crash
- ☐ Tell them to pay attention to the road
- ☐ **SCORING**
  - o Independent. "Tell them you are worried"
  - o Matched. No clear progression, so do not compute.

8) While in a **moving car with** your **parent or caregiver driving**, have you said something in the past few weeks to your **parent or caregiver** about: (*please check one response for each item*)
- ☐ **SCORING**
  - o Independent. "No." Note that we are looking for a decrease here in the number of "No" answers from pretest to posttest.
  - o Matched. Movement up the scale.
  - o Not applicable on pre-DDL survey rules out respondent for any scoring

| | Yes, most times | Yes, some-times | Yes, once | No | Not applicable |
|---|---|---|---|---|---|
| a) **Not talking on a hands-free** cell phone | | | | | |
| b) **Not talking on a handheld** cell phone | | | | | |
| c) **Not looking at texts, apps, or otherwise looking away from the road** ahead for more than 2 seconds | | | | | |
| d) **Not typing a text or otherwise manually using their phone** | | | | | |

9) While in a **moving car** with **your friend driving**, have you said something in the past few weeks to your **friend** about: (*please check one response for each item*)
- ☐ **SCORING**: same as above
  - o Independent. "No."\ Note that we are looking for a decrease here.
  - o Matched. Movement up the scale.
  - o Not applicable on pre-DDL survey rules out respondent for any scoring

| | Yes, most times | Yes, some-times | Yes, once | No | Not applicable |
|---|---|---|---|---|---|
| **a) Not talking on a hands-free** cell phone | | | | | |
| **b) Not talking on a handheld** cell phone | | | | | |
| **c) Not looking at texts, apps, or otherwise looking away from the road** ahead for more than two seconds | | | | | |
| **d) Not typing a text or otherwise manually using their phone** | | | | | |

- SCORING
  - Independent. "No." Note that we are looking for a decrease here.
  - Matched. Movement up the scale.
  - Not applicable on pre-DDL survey rules out respondent for any scoring

10) When you have been in a **moving car**, have you asked a **passenger** in the past few weeks to stop doing something that was preventing the driver from paying full attention to driving?
   - Yes, most times
   - Yes, sometimes
   - Yes, once
   - No, though I wanted to
   - No, never thought to
   - SCORING
     - Independent. "No, never thought to" and "No, though I wanted to." Note that we are looking for a decrease here.
     - Matched. Movement up the scale.

11) Please indicate the extent to which each of the following behaviors would worry you if you were in a moving car and you saw your driver *(please check one response for each item)*.

| | Not at all worried | A little worried | Somewhat worried | Very Worried | Extremely worried |
|---|---|---|---|---|---|
| **Talking on a hands-free** cell phone | | | | | |
| **Talking on a handheld** cell phone | | | | | |
| **Looking at texts, apps, or otherwise looking away from the road** ahead for more than two seconds | | | | | |
| **Typing a text or otherwise manually using their phone** | | | | | |

- SCORING
  - Independent. "Very worried," "Extremely worried."
  - Matched. Movement up the scale.

12) If your **parent or caregiver** were engaged in one of the following activities while driving, how confident are you that you would ask the driver to stop the activity? (Please *check one response for each item.)*

| | Very confident | Moderately confident | Slightly confident | Not confident at all |
|---|---|---|---|---|
| **Talking on a hands-free** cell phone | | | | |
| **Talking on a handheld** cell phone | | | | |
| **Looking at texts, apps, or otherwise looking away from the road** ahead for more than two seconds | | | | |
| **Typing a text or otherwise manually using their phone** | | | | |

- SCORING
  - Independent. "Not confident at all."
  - Matched. Movement up the scale (to the left).

13) If your **friend** were engaged in one of the following activities while driving, how confident are you that you would ask the driver to stop the activity? (Please *check one response for each item.)*

| | Very confident | Moderately confident | Slightly confident | Not confident at all |
|---|---|---|---|---|
| **Talking on a hands-free** cell phone | | | | |
| **Talking on a handheld** cell phone | | | | |
| **Looking at texts, apps, or otherwise looking away from the road** ahead for more than two seconds | | | | |
| **Typing a text or otherwise manually using their phone** | | | | |

- SCORING
  - Independent. "Not confident at all."
  - Matched. Movement up the scale (to the left).

14) If you saw something (not related to driving) that could become dangerous for others nearby, how likely would you be to say or do something to help?
- Extremely likely
- Very likely
- Somewhat likely
- Not too likely
- Not at all likely
- SCORING

- o Independent. No one correct answer. However, will pick "Extremely likely" and "Very likely"
- o Matched. Movement up the scale

15) How likely is a driver engaged in one of the activities below to get into a crash compared to a driver who is paying full attention to his or her driving? (Please *check one response for each item.)*

| | A lot less likely to be in a crash | A little less likely to be in a crash | Just as likely to be in a crash | A little more likely to be in a crash | A lot more likely to be in a crash |
|---|---|---|---|---|---|
| **Talking on a hands-free** cell phone | | | Pre? | Post? | |
| **Talking on a handheld** cell phone | | | Pre? | | Post? |
| **Looking at texts, apps, or otherwise looking away from the road** ahead for more than two seconds | | | Pre? | Post? | |
| **Typing a text or otherwise manually using their phone** | | | | Pre? | Post? |

- □ SCORING
  - o Independent. "A lot less likely," "A little less likely," "Just as likely"; should be decrease from pretest to posttest.
  - o Matched. movement within up the scale (to the right)
  - o Post hands free/hand held: Compare hand held more likely than hands-free on post and pre; should be increase in number who say hand held more dangerous than hands free.
  - o Post look at text/texting. Compare typing text more likely than looking at text on post and pre; should be increase in in number who say typing more dangerous than looking.

16) When you are driving (either now or in the future), how likely do you think you would be to engage in the following activities? (Please *check one response for each item.)*

| | Very likely | Somewhat likely | Not too likely | Not at all likely |
|---|---|---|---|---|
| **Talking on a hands-free** cell phone | | | | |
| **Talking on a handheld** cell phone | | | | |
| **Looking at texts, apps, or otherwise looking away from the road** ahead for more than two seconds | | | | |
| **Typing a text or otherwise manually using their phone** | | | | |

- □ SCORING
  - o Independent. "Not at all likely," "Not too likely"; should be increase from pretest to posttest
  - o Matched. movement to the right

17) When you are driving (either now or in the future), how important will it be to consider the safety impacts on others of your distracted driving?

- ☐ Extremely important
- ☐ Very important
- ☐ Somewhat important
- ☐ Not too important
- ☐ Not at all important
- ☐ **SCORING**
  - o Independent. "Not at all," "Not too," "Somewhat." Movement out of these categories. Include "Somewhat" because it is expected that no one would answer below this.
  - o Matched. Up the scale.

18) How much do you believe being respectful or considerate of other drivers requires the driver not to drive while being distracted?
- ☐ Completely believe
- ☐ Somewhat believe
- ☐ Believe a little
- ☐ Not believe at all
- ☐ **SCORING**
  - o Independent. Movement to "Completely believe"
  - o Matching. Movement up the scale.

19) How often in the past few weeks have you seen your parent or caregiver engage in each of the following activities while driving? (Please *check one response for each item.*)

| | Never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| a) **Talking on a hands-free** cell phone | | | | | |
| b) **Talking on a handheld** cell phone | | | | | |
| c) **Looking at texts, apps, or otherwise looking away from the road** ahead for more than two seconds | | | | | |
| d) **Typing a text or otherwise manually using their phone** | | | | | |

- ☐ **SCORING**
  - o Independent. Move from "Sometimes," "Often," "Always"; should be a decrease
  - o Matched. Movement up the scale (to the left)

20) How often in the past few weeks have you seen your **friends** engage in each of the following activities while driving? (Please *check one response for each item.*)

| | Never | Rarely | Sometimes | Often | Always |
|---|---|---|---|---|---|
| **a) Talking on a hands-free** cell phone | | | | | |
| **b) Talking on a handheld** cell phone | | | | | |
| **c) Looking at texts, apps, or otherwise looking away from the road** ahead for more than two seconds | | | | | |
| **d) Typing a text or otherwise manually using their phone** | | | | | |

- SCORING
  - o Independent. Move from "Sometimes," "Often," "Always"; should be a decrease
  - o Matched. Movement up the scale (to the left)

21) In the past few weeks, have you been in a **moving car** where you or other passengers make it difficult for your driver to **pay attention** to his or her driving (for example, the driver has to tell you quiet down)?
- Never
- Rarely
- Sometimes
- Often
- Always
- **SCORING**
  - o Independent: movement away from "Sometimes," "Often," "Always"
  - o Matched. Movement up the scale

# 13 Appendix: High School Survey Data

The discussion of the analysis of the high school data grouped averages across some questions and provided only the pre-DDL mean, the post-DDL mean, and the p-value. Below, in Section 13.1 we present for each of the 48 questions the means, the number of responses, and the standard deviation on the pre-DDL and post-DDL surveys. In the next section (13.2), we present the uncentered means for the different categories and subcategories along with the p-value and the range, something we have already done previously, adding here the t statistic and the df (Table 19). We also present for the first time the centered means, t statistic, df, p-value and range (Table 20).

## 13.1 Likert Scale Averages for Each Question in High School Surveys

*Table 18. High School Likert Scale Averages for Each Question on the Pre-DDL and Post- Surveys and Related statistics. (All items had 3 or more response except those indicate by the addition of "Score" to the question number. These were scored 0 or 1, as appropriate.)*

| HS Item List | HS Item Text | HS Pre Mean | HS Pre N | HS Pre SD | HS Post Mean | HS Post N | HS Post SD |
|---|---|---|---|---|---|---|---|
| Q1 | How well do you think you understand what it means for a driver to be distracted when that driver is driving? | 3.35 | 181 | 0.69 | 3.64 | 148 | 0.61 |
| Q2_Score | Assuming that the driver is looking away from the road, when does the driver's risk of crashing first double? | 0.27 | 181 | 0.45 | 0.38 | 148 | 0.49 |
| Q3_Score | In the SPIDER acronym introduced in the Distracted Driving Lesson what does the "S" stand for? | 0.26 | 180 | 0.44 | 0.77 | 147 | 0.42 |
| Q4_Score | What percentage of 16-18 year olds will look at texts or snapchat while driving and the car is moving? | 0.31 | 181 | 0.46 | 0.35 | 149 | 0.48 |
| Q5_Score | What percentage of teens will put their phones away while driving, if asked by a friend? | 0.17 | 179 | 0.38 | 0.28 | 148 | 0.45 |
| Q6 | If your driver is distracted while driving, do you know the right words to use to ask your driver to stop from distracted driving? | 2.41 | 181 | 1.02 | 3.25 | 147 | 0.78 |
| Q7_Score | Which is the best way to get the driver to stop driving while distracted? | 0.26 | 180 | 0.44 | 0.57 | 145 | 0.5 |
| Q8A | While in a moving car with your parent or caregiver driving, have you said something in the past few weeks to your parent or caregiver about: (please check one response for each item) \| Not talking on a hands-free cell phone | 1.38 | 166 | 0.8 | 1.83 | 129 | 1.05 |

| HS Item List | HS Item Text | HS Pre Mean | HS Pre N | HS Pre SD | HS Post Mean | HS Post N | HS Post SD |
|---|---|---|---|---|---|---|---|
| Q8B | While in a moving car with your parent or caregiver driving, have you said something in the past few weeks to your parent or caregiver about: (please check one response for each item) \| Not talking on a handheld cell phone | 1.57 | 166 | 0.94 | 1.88 | 129 | 1.08 |
| Q8C | While in a moving car with your parent or caregiver driving, have you said something in the past few weeks to your parent or caregiver about: (please check one response for each item) \| Not looking at texts, apps, or otherwise looking away from the road ahead for more than two seconds | 1.84 | 169 | 1.01 | 2.1 | 131 | 1.15 |
| Q8D | While in a moving car with your parent or caregiver driving, have you said something in the past few weeks to your parent or caregiver about: (please check one response for each item) \| Not typing a text or otherwise manually using their phone | 1.87 | 166 | 1.05 | 2.05 | 128 | 1.21 |
| Q9A | While in a moving car with your friend driving, have you said something in the past few weeks to your parent or caregiver about: (please check one response for each item) \| Not talking on a hands-free cell phone | 1.39 | 134 | 0.81 | 1.68 | 109 | 1.02 |
| Q9B | While in a moving car with your friend driving, have you said something in the past few weeks to your parent or caregiver about: (please check one response for each item) \| Not talking on a handheld cell phone | 1.5 | 135 | 0.97 | 1.56 | 106 | 0.91 |
| Q9C | While in a moving car with your friend driving, have you said something in the past few weeks to your parent or caregiver about: (please check one response for each item) \| Not looking at texts, apps, or otherwise looking away from the road ahead for more than two seconds | 1.63 | 137 | 0.99 | 1.72 | 110 | 1.04 |

| HS Item List | HS Item Text | HS Pre Mean | HS Pre N | HS Pre SD | HS Post Mean | HS Post N | HS Post SD |
|---|---|---|---|---|---|---|---|
| Q9D | While in a moving car with your friend driving, have you said something in the past few weeks to your parent or caregiver about: (please check one response for each item) \| Not typing a text or otherwise manually using their phone | 1.54 | 136 | 0.92 | 1.81 | 107 | 1.13 |
| Q10 | When you have been in a moving car, have you asked a passenger in the past few weeks to stop doing something that was preventing the driver from paying full attention to driving? | 1.8 | 176 | 0.93 | 2.12 | 145 | 1.1 |
| Q11A | Please indicate the extent to which each of the following behaviors would worry you if you were in a moving care and you saw your driver: (please check one response for each item) \| Talking on a hands-free cell phone | 1.73 | 175 | 0.89 | 2.03 | 147 | 1.02 |
| Q11B | Please indicate the extent to which each of the following behaviors would worry you if you were in a moving care and you saw your driver: (please check one response for each item) \| Talking on a handheld cell phone | 2.67 | 175 | 1.05 | 2.83 | 147 | 1.12 |
| Q11C | Please indicate the extent to which each of the following behaviors would worry you if you were in a moving car and you saw your driver: (please check one response for each item) \| Looking at texts, apps, or otherwise looking away from the road ahead for more than two seconds | 3.45 | 176 | 1.04 | 3.63 | 147 | 1.21 |
| Q11D | Please indicate the extent to which each of the following behaviors would worry you if you were in a moving care and you saw your driver: (please check one response for each item) \| Typing a text or otherwise manually using their phone | 3.8 | 175 | 1.09 | 3.86 | 146 | 1.23 |

| HS Item List | HS Item Text | HS Pre Mean | HS Pre N | HS Pre SD | HS Post Mean | HS Post N | HS Post SD |
|---|---|---|---|---|---|---|---|
| Q12A | If your parent or caregiver were engaged in one of the following activities while driving, how confident are you that you would ask the driver to stop the activity: (please check one response for each item) | Talking on a hands-free cell phone | 2.4 | 175 | 1.14 | 2.66 | 146 | 1.16 |
| Q12B | If your parent or caregiver were engaged in one of the following activities while driving, how confident are you that you would ask the driver to stop the activity: (please check one response for each item) | Talking on a handheld cell phone | 2.74 | 174 | 1.07 | 2.92 | 145 | 1.08 |
| Q12C | If your parent or caregiver were engaged in one of the following activities while driving, how confident are you that you would ask the driver to stop the activity: (please check one response for each item) | Looking at texts, apps, or otherwise looking away from the road ahead for more than two seconds | 3.02 | 175 | 0.94 | 3.23 | 145 | 0.96 |
| Q12D | If your parent or caregiver were engaged in one of the following activities while driving, how confident are you that you would ask the driver to stop the activity: (please check one response for each item) | Typing a text or otherwise manually using their phone | 3.14 | 176 | 0.96 | 3.25 | 146 | 1.02 |
| Q13A | If your friend were engaged in one of the following activities while driving, how confident are you that you would ask the driver to stop the activity: (please check one response for each item) | Talking on a hands-free cell phone | 2.49 | 177 | 1.15 | 2.72 | 145 | 1.09 |
| Q13B | If your friend were engaged in one of the following activities while driving, how confident are you that you would ask the driver to stop the activity: (please check one response for each item) | Talking on a handheld cell phone | 2.79 | 177 | 1.01 | 2.95 | 146 | 0.96 |

| HS Item List | HS Item Text | HS Pre Mean | HS Pre N | HS Pre SD | HS Post Mean | HS Post N | HS Post SD |
|---|---|---|---|---|---|---|---|
| Q13C | If your friend were engaged in one of the following activities while driving, how confident are you that you would ask the driver to stop the activity: (please check one response for each item) \| Looking at texts, apps, or otherwise looking away from the road ahead for more than two seconds | 2.99 | 177 | 0.99 | 3.27 | 144 | 0.89 |
| Q13D | If your friend were engaged in one of the following activities while driving, how confident are you that you would ask the driver to stop the activity: (please check one response for each item) \| Typing a text or otherwise manually using their phone | 3.11 | 177 | 0.96 | 3.28 | 144 | 0.91 |
| Q14 | If you saw something (not related to driving) that could become dangerous for others nearby, how likely would you be to say or do something to help? | 3.57 | 174 | 0.91 | 3.7 | 145 | 0.9 |
| Q15A | How likely is a driver engaged in one of the activities below to get into a crash compared to a driver who is paying full attention to his or her driving? (Please check one response for each item) \| Talking on a hands-free cell phone | 2.73 | 179 | 1.27 | 2.98 | 145 | 1.23 |
| Q15B | How likely is a driver engaged in one of the activities below to get into a crash compared to a driver who is paying full attention to his or her driving? (Please check one response for each item) \| Talking on a handheld cell phone | 3.56 | 179 | 1.15 | 3.62 | 146 | 1.19 |
| Q15C | How likely is a driver engaged in one of the activities below to get into a crash compared to a driver who is paying full attention to his or her driving? (Please check one response for each item) \| Looking at texts, apps, or otherwise looking away from the road ahead for more than two seconds | 4.23 | 179 | 1.06 | 4.31 | 146 | 1.1 |

| HS Item List | HS Item Text | HS Pre Mean | HS Pre N | HS Pre SD | HS Post Mean | HS Post N | HS Post SD |
|---|---|---|---|---|---|---|---|
| Q15D | How likely is a driver engaged in one of the activities below to get into a crash compared to a driver who is paying full attention to his or her driving? (Please check one response for each item) \| Typing a text or otherwise manually using their phone | 4.5 | 178 | 0.94 | 4.42 | 146 | 1.11 |
| Q16A | When you are driving (either now or in the future), how likely do you think you would be to engage in the following activities? (Please check one response for each item) \| Talking on a hands-free cell phone | 2.3 | 178 | 0.98 | 2.54 | 146 | 0.93 |
| Q16B | When you are driving (either now or in the future), how likely do you think you would be to engage in the following activities? (Please check one response for each item) \| Talking on a handheld cell phone | 3.03 | 178 | 0.93 | 3.14 | 147 | 0.94 |
| Q16C | When you are driving (either now or in the future), how likely do you think you would be to engage in the following activities? (Please check one response for each item) \| Looking at texts, apps, or otherwise looking away from the road ahead for more than two seconds | 3.25 | 178 | 0.89 | 3.24 | 147 | 0.97 |
| Q16D | When you are driving (either now or in the future), how likely do you think you would be to engage in the following activities? (Please check one response for each item) \| Typing a text or otherwise manually using their phone | 3.41 | 177 | 0.87 | 3.42 | 146 | 0.96 |
| Q17 | When you are driving (either now or in the future), how important will it be to consider the safety impacts on others of your distracted driving? | 4.64 | 178 | 0.65 | 4.62 | 145 | 0.7 |
| Q18 | How much do you believe being respectful or considerate of other drivers requires the driver not to drive while being distracted? | 3.65 | 175 | 0.57 | 3.7 | 142 | 0.56 |

| HS Item List | HS Item Text | HS Pre Mean | HS Pre N | HS Pre SD | HS Post Mean | HS Post N | HS Post SD |
|---|---|---|---|---|---|---|---|
| Q19A | How often in the past few weeks have you seen your parent or caregiver engage in each of the following activities while driving? (Please check one response for each item) | Talking on a hands-free cell phone | 3.03 | 178 | 1.17 | 3.4 | 146 | 1.21 |
| Q19B | How often in the past few weeks have you seen your parent or caregiver engage in each of the following activities while driving? (Please check one response for each item) | Talking on a handheld cell phone | 3.73 | 178 | 1.13 | 3.76 | 145 | 1.16 |
| Q19C | How often in the past few weeks have you seen your parent or caregiver engage in each of the following activities while driving? (Please check one response for each item) | Looking at texts, apps, or otherwise looking away from the road ahead for more than two seconds | 3.82 | 178 | 1.03 | 3.9 | 146 | 1.09 |
| Q19D | How often in the past few weeks have you seen your parent or caregiver engage in each of the following activities while driving? (Please check one response for each item) | Typing a text or otherwise manually using their phone | 3.96 | 178 | 1.06 | 4.02 | 144 | 1.12 |
| Q20A | How often in the past few weeks have you seen your friends engage in each of the following activities while driving? (Please check one response for each item) | Talking on a hands-free cell phone | 4.03 | 178 | 1.13 | 4.31 | 145 | 1.1 |
| Q20B | How often in the past few weeks have you seen your friends engage in each of the following activities while driving? (Please check one response for each item) | Talking on a handheld cell phone | 4.2 | 178 | 1.07 | 4.39 | 145 | 1.03 |

| HS Item List | HS Item Text | HS Pre Mean | HS Pre N | HS Pre SD | HS Post Mean | HS Post N | HS Post SD |
|---|---|---|---|---|---|---|---|
| Q20C | How often in the past few weeks have you seen your friends engage in each of the following activities while driving? (Please check one response for each item) \| Looking at texts, apps, or otherwise looking away from the road ahead for more than two seconds | 4.15 | 178 | 1.09 | 4.41 | 144 | 1 |
| Q20D | How often in the past few weeks have you seen your friends engage in each of the following activities while driving? (Please check one response for each item) \| Typing a text or otherwise manually using their phone | 4.24 | 177 | 1.06 | 4.47 | 143 | 0.98 |
| Q21 | In the past few weeks, have you been in a moving car where you or other passengers make it difficult for your driver to pay attention to his or her driving (for example, the driver has to tell you quiet down)? | 4.13 | 178 | 0.93 | 4.18 | 146 | 0.92 |

## 13.2 Category and Subcategory Statistics for Centered and Uncentered Tests of Likert Scores

*Table 19. High School Uncentered Pre-DDL and Post-DDL Means and Related Statistics*

| Category | Subcategory Questions | Pre-DDL Mean | Post-DDL Mean | t | df | P-Value | Range |
|---|---|---|---|---|---|---|---|
| 1) Knowledge | Q1 | 3.35 | 3.64 | 4.12 | 325 | 0.00 | 1-5 |
| | Q2-Q5 | 1.01 | 1.76 | 6.53 | 305 | 0.00 | 0-4 |
| 2) Relative Risk | Q15 | 3.76 | 3.83 | 0.74 | 297 | 0.23 | 1-5 |
| 3) Concerns | Q11 | 2.92 | 3.09 | 1.75 | 288 | 0.04 | 1-5 |
| 4) Safety & Consideration of Others | Q17 | 4.64 | 4.62 | -0.26 | 298 | 0.60 | 1-5 |
| | Q18 | 3.65 | 3.70 | 0.72 | 303 | 0.24 | 1-4 |
| 5) Right Words | Q6 | 2.41 | 3.25 | 8.48 | 325 | 0.00 | 1-4 |
| | Q7 | 0.26 | 0.57 | 6.03 | 289 | 0.00 | 0-1 |
| 6) Intervention Confidence | Q12-Q13 | 2.83 | 3.03 | 2.37 | 313 | 0.01 | 1-4 |
| | Q14 | 3.57 | 3.70 | 1.20 | 308 | 0.12 | 1-5 |
| 7) Intervention Freq. | Q8 | 1.67 | 1.97 | 2.80 | 253 | 0.00 | 1-4 |
| | Q9 | 1.53 | 1.69 | 1.44 | 221 | 0.08 | 1-4 |
| | Q10 | 1.80 | 2.12 | 2.84 | 283 | 0.00 | 1-4 |
| 8) Program Effect | Q19 | 3.63 | 3.77 | 1.45 | 301 | 0.07 | 1-5 |
| | Q20 | 4.16 | 4.39 | 2.23 | 316 | 0.01 | 1-5 |
| | Q21 | 4.13 | 4.18 | 0.54 | 311 | 0.30 | 1-5 |

| Category | Subcategory Questions | Pre-DDL Mean | Post-DDL Mean | t | df | P-Value | Range |
|---|---|---|---|---|---|---|---|
| 9) Future Behaviors | Q16 | 3.00 | 3.08 | 1.03 | 294 | 0.15 | 1-4 |

*Table 20. High School Centered Pre-DDL and Post-DDL Means and Related Statistics*

| Category | Subcategory | Pre-DDL Mean | Post-DDL Mean | t | df | *p*-Value | Range |
|---|---|---|---|---|---|---|---|
| 1) Knowledge | Q1 | -0.14 | 0.17 | 4.30 | 324 | 0.00 | 1-5 |
| | Q2-Q5 | -0.35 | 0.43 | 7.20 | 301 | 0.00 | 0-4 |
| 2) Relative Risk | Q15 | -0.04 | 0.05 | 0.93 | 297 | 0.18 | 1-5 |
| 3) Concerns | Q11 | -0.07 | 0.09 | 1.66 | 287 | 0.05 | 1-5 |
| 4) Safety & Consideration of Others | Q17 | 0.01 | -0.01 | -0.16 | 300 | 0.56 | 1-4 |
| | Q18 | -0.02 | 0.03 | 0.82 | 303 | 0.21 | 1-5 |
| 5) Right Words | Q6 | -0.39 | 0.47 | 8.72 | 326 | 0.00 | 1-4 |
| | Q7 | -0.14 | 0.18 | 6.30 | 291 | 0.00 | 0-1 |
| 6) Intervention Confidence | Q12-Q13 | -0.09 | 0.11 | 2.49 | 313 | 0.01 | 1-4 |
| | Q14 | -0.07 | 0.09 | 1.56 | 308 | 0.06 | 1-5 |
| 7) Intervention Freq. | Q8 | -0.12 | 0.16 | 2.63 | 253 | 0.00 | 1-4 |
| | Q9 | -0.07 | 0.09 | 1.41 | 219 | 0.08 | 1-4 |
| | Q10 | -0.14 | 0.17 | 2.75 | 284 | 0.00 | 1-4 |
| 8) Program Effect | Q19 | -0.07 | 0.09 | 1.74 | 300 | 0.04 | 1-5 |
| | Q20 | -0.11 | 0.13 | 2.31 | 315 | 0.01 | 1-5 |
| | Q21 | -0.04 | 0.04 | 0.75 | 310 | 0.23 | 1-5 |
| 9) Future Behaviors | Q16 | -0.05 | 0.06 | 1.23 | 293 | 0.11 | 1-4 |

# 14 Appendix: Elementary School Survey

The entirety of the elementary school questions and responses included on the talking survey is listed in Section 14.1. The entirety of the elementary school questions and responses included in the texting survey is listed in Section 14.2. In addition, as with the discussion of scoring in Section 13 of the high school data, the discussion of the scoring is included in Section 14.2 along with the best match of the elementary school questions to the high school questions.

## 14.1 Talking Survey

1) When you have been in a **car**, have you ever said something to your driver about not **talking on the phone** while driving?
   - ☐ Yes, many times
   - ☐ Yes, sometimes
   - ☐ Yes, once
   - ☐ No, though I wanted to
   - ☐ No, I never thought about it
   - ☐ My parents or caregiver has never talked on the phone while driving

2) During times when you are **not** in the car, have you ever said something to your parents or caregiver about their **talking on the phone** while driving?
   - ☐ Yes, many times
   - ☐ Yes, sometimes
   - ☐ Yes, once
   - ☐ No, though I wanted to
   - ☐ No, never thought about it
   - ☐ My parents or caregiver has never talked on the phone while driving while driving

3) Do you think you know the right words to use to ask your driver to stop **talking on the phone** while driving?
   - ☐ I don't know any of the right words to use
   - ☐ I know some of the right words to use
   - ☐ I know most of the right words to use
   - ☐ Yes, I know all of the right words to use

4) Which is the best way to get the driver to stop driving while distracted?
   - ☐ Tell them about the dangers of not paying attention to the road
   - ☐ Tell them you are worried about a crash
   - ☐ Tell them to pay attention to the road

5) How well do you think you understand what it means for a person to be distracted when driving?
   - ☐ I don't understand
   - ☐ I have some understanding
   - ☐ I mostly understand
   - ☐ I completely understand

6) Picture yourself driving one day. While driving, how often will you think about how **talking on the phone** could affect the safety of other people inside or outside your car?
   - ☐ Very often
   - ☐ Often
   - ☐ Some of the time
   - ☐ Not often
   - ☐ Never

7) If you were in a moving car and saw your driver **talking on the phone** on a cell phone, how would you feel?
   - ☐ Not at all worried
   - ☐ A little worried
   - ☐ Somewhat worried
   - ☐ Very worried
   - ☐ Extremely worried

8) If you are in a moving car and the driver is **talking on the phone**, how likely is that to cause a big problem for yourself?
   - ☐ Extremely likely
   - ☐ Very likely
   - ☐ Somewhat likely
   - ☐ Not too likely
   - ☐ Not at all likely

9) If you are in a moving car and the driver is **talking on the phone,** how likely is there to be a big problem for others on the road such as pedestrians, bicyclists and other cars?
   - ☐ Extremely likely
   - ☐ Very likely
   - ☐ Somewhat likely
   - ☐ Not too likely
   - ☐ Not at all likely

**For the next two questions, please indicate how much you agree or disagree with each statement.**

10) When a parent/caregiver is **talking on the phone** while driving, I will speak to them on my own about their distracted driving.
   - ☐ Strongly disagree
   - ☐ Disagree
   - ☐ Neither agree nor disagree
   - ☐ Agree
   - ☐ Strongly agree

11) When a parent/caregiver is **talking on the phone** while driving, I can get them to stop on my own.
- ☐ Strongly disagree
- ☐ Disagree
- ☐ Neither agree nor disagree
- ☐ Agree
- ☐ Strongly agree

**When answering the next question only think about the last 3-4 weeks**.

12) If you have seen a parent/caregiver **talking on the phone** while driving a moving car and you said something to them at some point, did your parent/caregiver stop?
- ☐ I have not been in a car in the last 3-4 weeks
- ☐ Parent/caregiver always stopped talking on the phone
- ☐ Parent/caregiver sometimes stopped talking on the phone
- ☐ Parent/caregiver never stopped talking on the phone
- ☐ I have seen a parent/caregiver talking on the phone, but have not said anything
- ☐ I have not seen a parent/caregiver talking on the phone while driving a moving car

**I now have a more general question about when you are in any situation such as at school, at your home, or outside playing.**

13) If you see something that could become dangerous for others nearby, how likely would you be to say or do something to help when at school, at home, or outside playing?
- ☐ Extremely likely
- ☐ Very likely
- ☐ Somewhat likely
- ☐ Not too likely
- ☐ Not all likely

## 14.2 Texting Survey, Answers and Match to High School Questions

An explanation of how the scoring was completed was provided above in Section 13. As noted, this section also describes the best match between an elementary school question and a high school question. So, for example, Question 1 below best matches Question 8c in the high school survey (Sections 12 and 13.1).

**Elementary School Survey - TEXT Version**

1) When you have been in a **car**, have you ever said something to your driver about not **texting or looking at apps** while driving?
   a. Yes, most times
   b. Yes, sometimes
   c. Yes, once

    d. No, though I wanted to

    e. No, I never thought about it

    f. My parents or caregiver has never texted, scrolled through music, or looked at apps while driving

    g. **SCORING**

        i. Independent: "My parents or caregiver has never texted…," "No, though I wanted to," "No, never thought about it"

        ii. Matched: Move up

    h. **HS MATCH**

        i. Question 8c

        ii. Category, actual intervention (in car), parents

2) During times when you are **not** in the car, have you ever said something to your parents or caregiver about their **texting or looking at apps** while driving?

    a. Yes, many times

    b. Yes, sometimes

    c. Yes, once

    d. No, though I wanted to

    e. No, never thought about it

    f. My parents or caregiver has never texted, scrolled through music, or looked at apps while driving

    g. **SCORING**

        i. Independent: "My parents or caregiver has never texted…," "No, though I wanted to," "No, never thought about it"

        ii. Matched: Change towards "Yes, many times…"

    h. **HS MATCH**

        i. No exact HS question match, closest is 8c, in car;

        ii. Category, actual intervention (not in car), parents

3) Do you think you know the right words to use to ask your driver to stop **texting or looking at apps** while driving?

    a. I don't know any of the right words to use

    b. I know some of the right words to use

    c. I know most of the right words to use

    d. Yes, I know all of the right words to use

    e. **SCORING**

        i. Independent: "I know all"

        ii. Matched: Change towards "Yes, I know …."

    f. **HS MATCH**

        i. Question 6

        ii. Category, right words

4) Which is the best way to get the driver to stop driving while distracted?

    a. **HS MATCH**

        i. Question 7

        ii. Category, right words

5) How well do you think you understand what it means for a person to be distracted when driving?
    a. I don't understand
    b. I have some understanding
    c. I mostly understand
    d. I completely understand
    e. **SCORING**
        i. Independent: "I completely understand"
        ii. Matched. Movement towards "I completely understand"
    f. **HS MATCH**
        i. Question 1
        ii. Category, Knowledge

6) Picture yourself driving one day. How often will you think about how **texting or looking at apps** while driving could affect the safety of other people inside or outside your car?
    a. Very often
    b. Often
    c. Some of the time
    d. Not often
    e. Never
    f. **SCORING**
        o Independent: "Never," "Not often," "Some of the time"
        o Matched. Up the scale
    g. **HS MATCH**
        o No exact match; closest is Question 17 where it asks how important will it be for you as a driver to think about the impact of your distracted driving on the safety of others; here it asks how often will you think about the impact of your distracted driving on the safety of others
        o Category, concern for others, safety

7) If you were in a moving car and saw your driver **texting or looking at apps** on a cell phone, how would you feel?
    a. Not at all worried
    b. A little worried
    c. Somewhat worried
    d. Very worried
    e. Extremely worried
    f. **SCORING**
        i. Independent: "Very worried," "Extremely worried"
        ii. Matched. Movement up the scale.
    g. **HS MATCH**
        i. Question 11c
        ii. Category, worry about distracting activities

8) If you are in a moving car and the driver is **texting or looking at apps**, how likely is that to cause a big problem for yourself?
   a. Extremely likely
   b. Very likely
   c. Somewhat likely
   d. Not too likely
   e. Not at all likely
   f. **SCORING**
      i. Independent: "Not at all likely," "Not too likely"
      ii. Matched: movement up the scale
   g. **HS MATCH**
      i. No exact match. Question 11c is the closest. There the questions is how worried would you be if someone were texting and looking at apps. Here the question is how likely this would be to cause a big problem for you as a passenger.
      ii. Category, worry about distracted driving

9) If you are in a moving car and the driver is **texting or looking at apps,** how likely is there to be a big problem for others on the road such as pedestrians, bicyclists and other cars?
   a. Extremely likely
   b. Very likely
   c. Somewhat likely
   d. Not too likely
   e. Not at all likely
   f. **Scoring**
      i. Independent: "Not at all likely," "Not too likely"
      ii. Matched: movement up the scale
   g. **HS MATCH**
      i. No exact match. Question 11c is the closest. There the questions is how worried would you be if someone were texting and looking at apps. Here the question is how likely this would be to cause a big problem for others.
      ii. Category, worry about distracted driving

**For the next two questions, please indicate how much you agree or disagree with each statement.**

10) When a parent/caregiver is **texting or looking at apps** while driving, I will speak to them on my own about their distracted driving.
    a. Strongly disagree
    b. Disagree
    c. Neither agree nor disagree
    d. Agree
    e. Strongly agree
    f. **Scoring**

      i. Independent: Strongly disagree

      ii. Matched: move up

  g. **HS MATCHING**

      i. No exact match. Question 12c asks participant how confident participant is that participant will intervene. This question asks participant whether the participant will intervene.

      ii. Category, confidence that one will intervene

11) When a parent/caregiver is **texting or looking at apps** while driving, I can get them to stop on my own.

  a. Strongly disagree

  b. Disagree

  c. Neither agree nor disagree

  d. Agree

  e. Strongly agree

  f. **SCORING**

      i. Independent: Strongly disagree

      ii. Matched: move up

  g. **HS MATCH**

      i. No HS question

      ii. Category, agency (not an HS category); may relate to HS category, confidence that one would intervene. Specifically, one would presumably be more confident that one would intervene if one could actually impact driver's behavior.

12) If you have seen a parent/caregiver **texting or looking at apps** while driving a moving car and you said something to them at some point, did your parent/caregiver stop?

  a. Parent/caregiver always stopped texting or using apps

  b. Parent/caregiver sometimes stopped texting or using apps

  c. Parent/caregiver never stopped texting or using apps

  d. I have seen a parent/caregiver texting or looking at apps, but have not said anything

  e. I have not seen a parent/caregiver texting or looking at apps while driving a moving car

  f. **SCORING**

      i. Independent: "Never said anything," "Never stopped"

      ii. Matched: ideally move up, although not under the kids control

  g. **HS MATCH**

      i. Question 19c

      ii. Category, decrease in distracted driving activities

**I now have a more general question about when you are in any situation such as at school or at home.**

13) If you see something that could become dangerous for others nearby, how likely would you be to say or do something to help when at school, when at home, or when playing outside?
    a. Extremely likely
    b. Very likely
    c. Somewhat likely
    d. Not too likely
    e. Not all likely
    f. **Scoring**
        i. Independent: "Extremely likely," "Very likely"
        ii. Matched: Move up
    g. **HS MATCH**
        i. Question 14
        ii. Category, general intervention confidence

# 15   Appendix: Elementary School Survey Data

## 15.1  Likert Scale Averages of Elementary School Survey Questions

*Table 21. Elementary School Likert Scale Averages for Each Question on the Pre-DDL and Post-DDL Surveys and Related Statistics. (The stems for each question are from the talking survey.)*

| ES Item List | ES Talk Version | ES Text Version | ES Pre Mean | ES Pre N | ES Pre SD | ES Post Mean | ES Post N | ES Post SD |
|---|---|---|---|---|---|---|---|---|
| Q1 | When you have been in a car, have you ever said something to your driver about not talking on the phone while driving? | When you have been in a car, have you ever said something to your driver about not texting or looking at apps while driving? | 0.87 | 67 | 1.07 | 0.74 | 27 | 0.94 |
| Q2 | During times when you are not in the car, have you ever said something to your parents or caregiver about their talking on the phone while driving? | During times when you are not in the car, have you ever said something to your parents or caregiver about their texting or looking at apps while driving? | 0.7 | 66 | 1.04 | 0.70 | 27 | 0.99 |
| Q3 | Do you think you know the right words to use to ask your driver to stop talking on the phone while driving? | Do you think you know the right words to use to ask your driver to stop texting or looking at apps while driving? | 2.55 | 66 | 1.01 | 2.85 | 27 | 0.99 |
| Q4_Score | Which is the best way to get the driver to stop driving while distracted? | Which is the best way to get the driver to stop driving while distracted? | 0.23 | 44[6] | 0.42 | 0.41 | 27 | 0.5 |
| Q5 | How well do you think you understand what it means for a person to be distracted when driving? | How well do you think you understand what it means for a person to be distracted when driving? | 2.91 | 66 | 1.11 | 3.41 | 27 | 0.84 |
| Q6 | Picture yourself driving one day. While driving, how often will you think about how talking on the phone could affect the safety of other people inside or outside your car? | Picture yourself driving one day. While driving, how often will you think about how texting or looking at apps could affect the safety of other people inside or outside your car? | 3.50 | 66 | 1.46 | 3.81 | 27 | 1.04 |

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[6] Recall that Question 4 was not included in the initial pre-DDL survey questions mailed to respondents, which is why the number of respondents is smaller for this question than the other questions.

| ES Item List | ES Talk Version | ES Text Version | ES Pre Mean | ES Pre N | ES Pre SD | ES Post Mean | ES Post N | ES Post SD |
|---|---|---|---|---|---|---|---|---|
| Q7 | If you were in a moving car and saw your driver talking on the phone, how would you feel? | If you were in a moving car and saw your driver texting or looking at apps on a cell phone, how would you feel? | 3.21 | 61 | 1.29 | 2.85 | 27 | 1.26 |
| Q8 | If you are in a moving car and the driver is talking on the phone, how likely is that to cause a big problem for you? | If you are in a moving car and the driver is texting or looking at apps, how likely is that to cause a big problem for you? | 3.65 | 60 | 1.15 | 3.23 | 26 | 1.27 |
| Q9 | If you are in a moving car and the driver is talking on the phone, how likely is there to be a big problem for others on the road such as pedestrians, bicyclists and other cars? | If you are in a moving car and the driver is texting or looking at apps, how likely is there to be a big problem for others on the road such as pedestrians, bicyclists and other cars? | 3.88 | 60 | 1.14 | 3.42 | 26 | 1.17 |
| Q10 | When a parent/caregiver is talking on the phone while driving, I will speak to them on my own about their distracted driving. | When a parent/caregiver is texting or looking at apps while driving, I will speak to them on my own about their distracted driving. | 3.39 | 61 | 1.37 | 3.58 | 26 | 1.14 |
| Q11 | When a parent/caregiver is talking on the phone while driving, I can get them to stop on my own. | When a parent/caregiver is texting or looking at apps while driving, I can get them to stop on my own. | 3.21 | 61 | 1.37 | 3.41 | 27 | 1.25 |
| Q12 | If you have seen a parent/caregiver talking on the phone while driving a moving car and you said something to them at some point, did your parent/caregiver stop? | If you have seen a parent/caregiver texting or looking at apps while driving a moving car and you said something to them at some point, did your parent/caregiver stop? | 1.21 | 42 | 0.81 | 0.77 | 13 | 0.93 |
| Q13 | If you saw something that could become dangerous for others nearby, how likely would you be to say or do something to help when at school, at home, or outside playing? | If you saw something that could become dangerous for others nearby, how likely would you be to say or do something to help when at school, at home, or outside playing? | 4.22 | 60 | 0.92 | 3.96 | 27 | 1.06 |

## 15.2 Category and Subcategory Statistics for Uncentered Tests of Likert Scores

*Table 22. Elementary School Uncentered Pre-DDL and Post-DDL Means and Related Statistics*

| Category | Subcategory Questions | Pre-DDL Mean | Post-DDL Mean | t | df | P-Value | Range |
|---|---|---|---|---|---|---|---|
| 1) Knowledge | Q5 | 2.91 | 3.41 | 2.35 | 63 | 0.01 | 1-5 |
| 3) Concerns | Q7 – Q9 | 3.58 | 3.14 | -1.87 | 47 | 0.97 | 1-5 |
| 5) Right Words | Q3 | 2.55 | 2.85 | 1.35 | 49 | 0.09 | 1-4 |
| | Q4 | 0.23 | 0.41 | 1.56 | 48 | 0.06 | 0-1 |
| 6) Intervention Confidence | Q10 – Q11 | 3.3 | 3.44 | 0.55 | 50 | 0.29 | Q10:1-4 |
| | | | | | | | Q11:1-5 |
| | Q13 | 4.22 | 3.96 | -1.08 | 45 | 0.86 | 1-5 |
| 7) Intervention Freq. | Q1 – Q2 | 0.78 | 0.72 | -0.28 | 52 | 0.61 | 1-4 |
| 8) Program Effect | Q12 | 1.21 | 0.77 | -1.56 | 18 | 0.93 | 1-5 |
| 9) Future Behaviors | Q6 | 3.50 | 3.81 | 1.17 | 67 | 0.12 | 1-4 |

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