



## The Effect of Survey Mode on High School Risk Behavior Data: a Comparison between Web and Paper-based Surveys

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There has been increasing interest in using of web-based surveys—rather than paper based surveys—for collecting data on alcohol and other drug use in middle and high schools in the US. However, prior research has indicated that respondent confidentiality is an underlying concern with online data collection especially when computer-assisted surveys are administered in group settings such as computer labs and classrooms. Using a sample of 341 high school students, we conducted a study comparing alcohol risk behavior prevalence rates from the web-based surveys with paper-form version of the same survey. The online surveys used in the study implemented several programming safeguards to enhance privacy. The goal of our study was to see if the risk-behavior items—when transitioned to an online format with these additional safeguards—would provide prevalence estimates that are comparable to its paper form version. Results showed that overall alcohol prevalence rates did not vary significantly between the two conditions. However, there was a significant interaction between gender and survey mode. Females reported lower mean risk indicator rates compared to males, possibly indicating stronger privacy concerns among the former group. The results suggest that online survey administration may require targeted efforts to help alleviate confidentiality concerns among adolescent girls.

*Keywords:* online, alcohol, youth risk behavior, school health, web-based survey, methods.

Access to computers and the Internet has become almost universal in schools in the United States (Wells & Lewis, 2006). Consequently, there has been increased research on the potential use of web-based surveys in elementary, middle and high schools for collecting data on high-risk health behaviors (Boyd, McCabe, Cranford, & Young, 2007; Cooper et al., 2006; McCabe, Boyd, Young, Crawford, & Pope, 2005). Computer and Internet-based survey administration has several significant advantages over traditional paper and pencil data collection methods (Lessler, Caspar, Penne, & Barker, 2000; O' Reilly, Hubbard, Lessler, Biemer, & Turner,

1994; Turner et al., 1998). For example, it is quicker, and more cost-effective as it completely eliminates the need for manual data entry thus reducing transcription errors as well as workload (Turner, Rogers, Hendershot, Miller, & Thornberry, 1996; Turner et al., 1998; Lessler, Caspar, Penne, & Barker, 2000; O' Reilly et al., 1994). Moreover, unlike paper surveys, the computerized survey allows for complex questionnaire designs by providing automated skip patterns (i.e. questions that do not apply to a specific respondent are automatically skipped). This feature makes computer-based surveys especially attractive for interviewing younger children who may be unable to

maneuver complex branching in questionnaires (Beebe, Harrison, McRae, Anderson, & Fulkerson, 1998).

One particular concern has been the effects of mode of data collection (web-based surveys, paper surveys) on respondents' actual and perceived privacy and anonymity regarding data collected online. These perceptions are especially critical as they impact respondents' willingness to disclose socially undesirable behaviors such as unsafe sexual practices and/or substance abuse (Sudman, 2001). The evidence is mixed in this regard. Several recent school-based studies in the United States and elsewhere using school computer labs have found that web-based surveys and paper modes generally produced equivalent youth risk behavior prevalence estimates (Bates & Cox, 2008; Denscombe, 2006; Eaton et al., 2010; McCabe et al., 2005; Van de Looij-Jansen & de Wilde, 2008). However, confidentiality remains an underlying concern especially when responses are visible on monitor screens and the online surveys are administered in group settings such as computer labs and classrooms (Beebe et al., 1998; Brenner et al., 2006). In particular, substance use prevalence among adolescents has varied depending on their perceptions of privacy (Aquilino, Wright, & Supple, 2000), anonymity (Supple, Aquilino, & Wright, 1999), and trust (Wright, Aquilino, & Supple, 1998).

Recently, Denniston and his team of researchers (2010) conducted a comprehensive study comparing paper and pencil vs. web administration of the Youth Risk Behavior Survey (YRBS), which is the primary instrument used by schools in the United States for collecting data on a variety of adolescent high-risk behaviors. The research, sponsored by the Center for Disease Control, involved 85 high schools in the US. The study found that students taking an online health-risk behavior survey expressed greater concerns about privacy than those who took the same survey in paper form (Denniston et al., 2010). The study also found that the web-based survey produced more missing data due to nonresponses, compared to in-class administrations of paper surveys. The authors recommended against the administration of the YRBS in an online format: however, they indicated that steps to improve respondent privacy would possibly enhance the feasibility of using web-based surveys in schools, especially for small surveys that can be completed quickly. Similar observations about privacy were also noted by Beebe et al. (1998) who found that teen risk behavior reporting was higher among paper and pencil respondents—as compared to computer-based respondents—when computers were placed closer (Beebe et al., 1998).

Further examination of the feasibility of web-based data collection in schools is needed because there is evidence that students themselves prefer taking online surveys despite privacy concerns (Mangunkusumo et al., 2006; Case & Haines, 2004; Hallfors, Khatapoush,

Kadushin, Watson, & Saxe, 2000; McCabe et al., 2005; McCabe, Boyd, Young, & Crawford, 2004). This preference may be based on the fact that web-based surveys—especially those that are audio-enhanced—are in a format that is more comprehensible to junior-high and vocational high school students, who might have lower literacy skills than senior-high school students (McCabe et al., 2004). In fact, the Office of Management and Budget (OMB) requires federally sponsored data collection efforts to offer an electronic mode of response whenever feasible, as this process is believed to reduce respondent burden (Office of Management and Budget, 1998). Indeed, given the cost and time advantages of online surveys compared to paper formats, the trend towards electronic data collection seems inevitable.

### **Study Purpose**

Our study extends the research on the mode effects of web-based data collection of adolescent health data in school settings. Recently, our project team was invited to evaluate the feasibility of web-based data collection in a high school in rural Washington. Each year, the school collected risk indicator data from 9-12th graders by administering a 17-item paper survey on alcohol use risk behavior and attitudes. These items are drawn from the widely used Youth Risk Behavior Survey (YRBS), the same instrument that was the focus of the study by Denniston et al. (2010) discussed earlier.

Our study incorporated several survey design features that were specifically addressed privacy concerns of the survey respondents. First, our survey was much smaller in scope and included just 17 items focused primarily on alcohol risk indicators (instead of all 90 plus items in the YRBS) as the school was mainly interested in measuring alcohol risk-behavior. We also incorporated programming features that promoted response confidentiality. The survey layout was designed to hold just one question at a time on the computer screen. Once a response was entered by the student, the survey automatically progressed to the next question thereby instantly refreshing the screen. This auto progression feature also eliminated nonresponses as the students could move on to the next question only after the previous one was answered. Online respondents were also automatically logged out after the last question.

These privacy safeguards programmed into the web-based survey system were far more comprehensive than those used in prior research using online YRBS instruments, and were expected to enhance the confidentiality and anonymity of survey respondents<sup>1</sup>. Consequently, we hypothesized that alcohol use risk prevalence estimates would be higher among the group taking the online survey, compared to those using the paper survey, as the former group would be more forthcoming about their high risk behaviors when assured of complete confidentiality and anonymity.

## Methods

### Sample

The study used a convenience sample of high school students in grades 9-12. Students were drawn from a single school from a predominantly rural school district in Washington State. A total of 341 high school students participated in this study comparing online versus paper form administration of an abbreviated version of the YRBS. The sample was fairly evenly split between male (50.4 percent) and female (49.6 percent) students. Almost two-thirds of students (63.6 percent) were in either 9th or 10th grade. About 60% of the sample was White, with 30% Native American<sup>2</sup>. About half the students were eligible for free or reduced priced school lunches.

The school was given a stipend to assist with the study, and for supplying their computer lab for the study. Students were randomly assigned into two research conditions: one that took the online version of the survey (Condition A), and the other that took the paper form version (Condition B). The sample size of Condition A (online version) was 160 students, while Condition B consisted of 181 students.

### Data Collection Instruments and Procedures

Project staff programmed the High School Youth Risk Behavior Survey as an online survey. The survey included 17 items on a number of alcohol use and risk indicator measures including short and long-term use, binge drinking, and perception of harm. Online surveys were administered in the school computer lab, while paper surveys were administered in classrooms.

Several measures were undertaken to maximize privacy of responses. Each student was assigned a unique ID by a study coordinator hired by the project. Students in Condition A logged into the survey by entering his or her unique student ID and self-administered the survey.

Responses entered into the online survey were directly deposited on an external server ensuring that teachers did not have access to the data. The survey screen held just one question at a time and progressed automatically to the next page upon completion of each question. This ensured that the screen was continually refreshed and did not display answers that were visible to everyone. Besides enhancing privacy, this auto progression feature also meant that students had to complete each question before moving on to the next one, which completely eliminated nonresponses as students not wishing to answer a question had to check on a “decline to answer” box. Students took about 25-30 minutes to complete the survey, which did not feature any skip

patterns, and were automatically logged out upon completion.

Data collection for each test was conducted over 1-2 days in order to account for lab availability. All data collection procedures were approved by the study organization’s full Institutional Review Board for the rights of human subjects in research. Active consent was sought from parents, while students turned in assent forms. Teachers were responsible for parental notifications at least two weeks before the study and for devising the schedules for computer lab use. A study coordinator hired by the project explained survey procedures and supervised the students in the computer lab during the survey administration process. Students were reminded that their answers would be kept confidential and that they would be returning to take a retest in two weeks’ time. Once the test and retest data were collected, project staff conducted the data analysis.

### Results: Alcohol Use Risk Prevalence rates – online versus paper-form

The goal of the present study was to determine whether there were significant differences in the prevalence of high risk behaviors and attitudes regarding alcohol use depending on whether survey questions were presented on a computer versus on paper. Would the method of data collection have an effect on reporting tendencies of respondents? To examine this question, risk prevalence rates for each condition were examined. To simplify the analysis, questions were recoded into “high risk” versus “no risk” following coding used in past studies using the YRBS (e.g., Brenner et al., 2002). The coding procedure is outlined in Table 1.

A Chi-Squared analysis was used to assess whether prevalence in each of the behavior risk factors varied between the two conditions. Contrary to our hypothesis, risk indicator estimates using the above coding scheme were found to be comparable between the two conditions. In other words, mode of survey administration did not impact alcohol risk prevalence rates and no significant differences were found between the two conditions. Out of the 17 individual items, just three registered significant differences between different modes of administration (Table 2).

Analysis of Variance (ANOVA) was used to examine differential responses by subgroups, including Gender, Race, and Grade Level. Race and Grade Level did not vary significantly between conditions; however, a significant difference did emerge for Gender.

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<sup>1</sup> For example, in the study by Denniston et al. (2010), up to four questions appeared on each screen and response choices remained visible until students clicked the “next” button on the bottom of each screen. Also, students could advance to subsequent questions regardless of whether they left questions blank, which led to substantial nonresponses.

<sup>2</sup> The school district lay in the outskirts of a reservation and has a high proportion of Native American students.

Table 1  
*Coding Scheme for Computing Alcohol Risk Prevalence Estimates*

ITEM	HIGH RISK	NO RISK
Lifetime alcohol use	1 or more times	0 times
Alcohol use last 12 months	1 or more times	0 times
Alcohol use last 30 days	1 or more times	0 times
Binge drinking last 2 weeks	1 or more times	0 times
Parents upset if they found you had been drinking after party	Not at all upset to somewhat upset	Very to extremely upset
Been to party with other kids drinking over last 12 months	1 or more times	0 times
Driven a car after drinking over last 12 months	1 or more times	0 times
Ridden in car with someone who had been drinking over last 12 months	1 or more times	0 times
Number of friends who drink alcohol once a week or more	1 or more friends	0 friends
Easy for kids to get alcohol	Very easy	Sort of easy, difficult, or not sure
Believe people risk harming themselves with 1-2 drinks per day	No or not sure	Yes
Believe people risk harming themselves with 3-4 drinks per day	No or not sure	Yes
Believe people risk harming themselves with 5 or more drinks per day	No or not sure	Yes
Is underage drinking harmful to your health	No or not sure	Yes
Is binge drinking dangerous	No or not sure	Yes
Wrong for kids under 21 to drink	No or not sure	Yes
Able to say “no” when all friends are drinking	No or not sure	Yes

Table 2  
*Prevalence of Substance use Variables: Overall and Within Each Survey Mode*

	Condition A		Condition B	X <sup>2</sup> p-value
	Total (n=341)	Online (n=161)	P & P (n=180)	
Lifetime alcohol use	73.1%	70.0%	75.8%	NS
Alcohol use last 12 months	56.6%	55.3%	57.9%	NS
Alcohol use last 30 days	31.9%	31.1%	32.6%	NS
Binge drinking last 2 weeks	19.8%	18.0%	21.3%	NS
Parents upset if they found you had been drinking after party	71.9%	71.9%	71.9%	NS
Been to party with other kids drinking over last 12 months	53.1%	47.8%	57.9%	NS
Driven a car after drinking over last 12 months	7.7%	8.7%	6.7%	NS
Ridden in car with someone who had been drinking over last 12 months	41.6%	36.6%	46.1%	NS
Number of friends who drink alcohol once a week or more	60.7%	57.8%	63.3%	NS
Easy for kids to get alcohol	66.0%	68.8%	63.5%	NS
Believe people risk harming themselves with 1-2 drinks per day	44.1%	37.5%	50.0%	p<.05
Believe people risk harming themselves with 3-4 drinks per day	24.2%	23.6%	24.7%	NS
Believe people risk harming themselves with 5 or more drinks per day	10.9%	8.7%	12.9%	NS
Is underage drinking harmful to your health	19.8%	16.1%	23.0%	NS
Is binge drinking dangerous	14.2%	10.6%	17.4%	p<.05
Wrong for kids under 21 to drink	47.6%	46.3%	48.9%	NS
Able to say “no” when all friends are drinking	27.1%	22.4%	31.5%	p<.05

Table 3  
Prevalence Rates by Condition and Gender

Question Item	Male			Female		
	Online (n=87)	P&P (n=84)	X <sup>2</sup> p-value	Online (n=74)	P&P (n=94)	X <sup>2</sup> p-value
Lifetime alcohol use	76.7%	78.6%	NS	62.2%	73.4%	NS
Alcohol use last 12 months	59.8%	59.5%	NS	50.0%	56.4%	NS
Alcohol use last 30 days	37.9%	35.7%	NS	23.0%	29.8%	NS
Binge drinking last 2 weeks	21.8%	26.2%	NS	13.5%	17.0%	NS
Parents upset if they found you had been drinking after party	67.8%	73.8%	NS	76.7%	70.2%	NS
Been to party with other kids drinking over last 12 months	54.0%	59.5%	NS	40.5%	56.4%	p<.05
Driven a car after drinking over last 12 months	10.3%	6.0%	NS	6.8%	7.4%	NS
Ridden in car with someone who had been drinking over last 12 months	43.7%	44.0%	NS	28.4%	47.9%	p<.01
Number of friends who drink alcohol once a week or more	62.1%	70.2%	NS	52.7%	57.0%	NS
Easy for kids to get alcohol	68.6%	65.5%	NS	68.9%	61.7%	NS
Believe people risk harming themselves with 1-2 drinks per day	45.3%	52.4%	NS	28.4%	47.9%	p<.01
Believe people risk harming themselves with 3-4 drinks per day	31.0%	22.6%	NS	14.9%	26.6%	p<.05
Believe people risk harming themselves with 5 or more drinks per day	10.3%	10.7%	NS	6.8%	14.9%	NS
P0Is underage drinking harmful to your health	23.0%	22.6%	NS	8.1%	23.4%	p<.01
Is binge drinking dangerous	18.4%	17.9%	NS	1.4%	17.0%	p<.001
Wrong for kids under 21 to drink	55.2%	47.6%	NS	35.6%	50.0%	p<.05
Able to say “no” when all friends are drinking	29.9%	32.1%	NS	13.5%	30.9%	p<.01
<b>Risk Index</b>	42.1%	42.6%	NS	31.2%	40.5%	p<.01

Notably, females reported lower mean risk indicator rates ( $M=36.4$  percent) compared to males ( $M=42.7$  percent),  $F(1,337)= 8.15$ ,  $p<.01$ . More importantly for this study, there was a significant interaction between gender and whether students took the survey online or on paper-and-pencil,  $F(1,335)=4.40$ ,  $p<.05$ . To analyze this trend further, a new variable, Risk\_Index, was created to assess for mean differences between all four conditions (Table 3). The Risk\_Index was simply the mean prevalence across all 17 items for

each student. While males had non-significant differences in responses across question items between the two survey methods, females had significantly higher risk prevalence rates in the paper-and-pencil condition (Risk index=40.5 percent) relative to the online condition (Risk index=31.2 percent).

To examine these differences further, a Chi-square analysis was performed for each question separately by gender (Table 3). For males, there were no question items that varied significantly between survey

modality types. For females, however, 9 of the 17 risk prevalence questions varied significantly in their prevalence rates between survey administration modality. In all cases, females reported higher risk prevalence rates in the paper-and-pencil administration compared to the online method, suggesting that former group was more comfortable about revealing sensitive information about their alcohol risk behaviors.

#### **Data Quality**

In a prior study, Denniston et al., (2010) saw far greater percentage of incomplete surveys and missing data among online respondents. Our efforts at improving data confidentiality by programming privacy safeguards and restricting survey length seem to have had a positive effect on data quality. The number of missing or invalid responses across all questions was nearly non-existent for both the online and paper and pencil version of the survey. These results indicate that students in both groups were responsive to questions. This could be due to short length of the survey as well as because of the additional programming safeguards taken to enhance respondent confidentiality in the computer condition.

#### **General Discussion**

The goal of this study was to gain a better understanding of differences that may exist when students take a health risk behavior survey using the traditional paper-and-pencil method of administration, compared to taking it online. Risk indicator rates for alcohol-related risk behaviors were examined between the online and the paper-and-pencil versions of a 17-item survey whose items were drawn from the YRBS. We developed innovative programming safeguards to enhance respondent privacy and anonymity. These included elements such as auto-progression, forced response, instant screen refreshing and automatic logout. Despite these features, our study did not detect higher risk prevalence among the online respondents, as was hypothesized. The alcohol risk indicators were comparable between the two survey modes, which is similar to the result found in earlier studies that used the YRBS (Eaton et al., 2010; Denniston et al., 2010). However, these additional privacy safeguards did improve data quality, and eliminated problems of missing data due to incomplete surveys and nonresponses that was found in the study by Denniston et al. (2010).

The most significant finding in our study, however, was revealed when examining the data separately by gender. On the majority of questions, females were more likely to endorse high risk items in the paper-and-pencil condition compared to the online condition. These results suggest that while overall risk prevalence rates for alcohol use do not vary much between survey conditions, there can be significant differences within specific subgroups (e.g., females). In this case, risk behavior prevalence rates for females were higher in the paper and pencil condition, indicating that

perhaps female respondents were more confident in disclosing high risk behaviors on paper than they were when responding on a computer.

These results are worthy of more investigation. There is some evidence in the field of ecommerce and consumer behavior that shows male-female differences in Internet privacy risk perception and protection behaviors. For example, Youn and Hall (2008) found that girls perceived themselves as more susceptible to unsolicited email than boys, and perceived privacy risks to be more severe than boys. Girls were also less likely to read unsolicited emails and tended to perceive provide inaccurate information boys online. It is therefore unsurprising that such online privacy concerns manifested themselves in self-reports of sensitive risk behavior data as well.

The practical implications of our finding are clear. Special attention should be paid to the specific environmental conditions, which may affect privacy concerns when students are completing surveys on sensitive information. This includes computer spacing, viewable area, the progression of survey questions, and other environmental factors that contribute to perceived privacy, which can have a profound impact on questions of a sensitive nature. Equally important, attention should be paid to understanding the deeper dynamics at play regarding how different subgroups of students respond to survey questions in light of the mode in which they are administered. Higher levels of risk perception and privacy concerns can cause girls to be less than forthcoming in their responses, and special efforts may needed to help girls alleviate these concerns, over and above environmental conditions. It would be a great contribution to the literature to create an established standard and best practice to follow when students are responding to surveys containing sensitive data. This issue is particularly important now as computers are ubiquitous and computer-based surveys are becoming more and more prevalent.

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