

2012

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Recommended Citation

Originally published in *Computers in Human Behavior* (<http://www.journals.elsevier.com/computers-in-human-behavior/>)

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Does survey format influence self-disclosure on sensitive question items?

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1. Introduction

Behavioral science research focuses on designs that help explore, describe, explain, and predict human behavior (Cozby, 2007). Survey research modalities are frequently used when the researcher is seeking to explore or describe what humans are thinking or doing. Surveys can be in an interview or written format, and use questions to collect information from respondents which if standardized, increases reliability and validity. Some advantage of surveys is that they allow for the collection of large amounts of data with less expense and time, and they can collect information on a wide variety of subjects.

With the increased use of surveys, the science of research methodology has explored the comparative effectiveness of face-to-face interviews, phone surveys, mailed paper-pencil surveys, and now is sifting through the efficacy of a variety of web-based research formats (Knapp & Kirk, 2003). The current study explores whether there is a significant difference in item non-response rates on personally sensitive items when using Web-based surveys versus paper-pencil surveys, and also whether gender influences item non-response rates. This study attempts to validate the use of electronic Web-based surveys in the collection of sensitive information using archival data from the American College Health Association's National College Health Assessment (NCHA).

2. Changing survey considerations

With high use of the World Wide Web, research is quickly transitioning from paper-based survey formats to Web-based designs. There are a number of benefits offered by electronic Web-based formats including reduction of cost, increased ease of distribution, improved data accuracy and relatively effortless data entry and data coding (Dillman, 2007, Gunn, 2002, Lefever et al., 2007 and Tourangeau, 2004). While these benefits encourage the increasing use of this survey format within a number of fields including medicine (Raziano, Jayadevappa, Valenzuela, Weiner, & Lavizzo-Mourey, 2001), social science (Babbie, 2001), education (Kennedy, Kuh, & Carini, 2000), and business (Truell, Bartlett, & Alexander, 2002), it is especially popular in research with college students.

Current research directly comparing Web-based surveys with other survey methodologies has shown that Web-based and electronic survey formats are comparable to paper-based surveys with regard to data collection (Dillman, 2007, Knapp and Kirk, 2003, Porter and Whitcomb, 2007 and Suris et al., 2007). While some evidence suggests there is no difference between the

formats on measures of central tendency and variability (Leino, 2003), recent studies suggest differences do exist in areas including survey response rates (Hayslett & Wildemuth, 2004), social desirability effect (Booth-Kewley et al., 2007 and Kiesler and Sproull, 1986), and item non-response rates (Naus et al., 2009 and Turner et al., 1998).

Social desirability effects and specific item non-response (apparent intentional non-response) are evident most when the data being collected is personally sensitive in nature (Tourangeau and Yan, 2007 and Turner et al., 1998). With research increasingly studying personally sensitive information from respondents, it is important to consider the influence that survey format may create when interpreting data. Since using measurement of item non-response rates is one approach to evaluating social desirability and survey formats, this present study investigates whether there is a significant difference in item non-response rates on personally sensitive items are different when using Web-based surveys versus paper-pencil surveys, and also whether gender influences item non-response rates.

3. Web-based versus paper-based formats

Well-designed research includes careful selection of the survey format with the goal of limiting sampling error (i.e., limited sampled units of the survey population), coverage error (i.e., missing a representation of all elements of the study population), measurement error (i.e., survey subjects respond inaccurately due to “poor question wording and questionnaire construction” [p. 9]), and non-response error (i.e., subject characteristic differences between those who respond to the survey and those who do not; (Dillman, 2007). Some research finds Web-based and paper-based survey formats to be comparable (Leino, 2003, Luce et al., 2007 and Suris et al., 2007) while others found Web-based surveys to be superior (Carini et al., 2003, Gosling et al., 2004 and Riva et al., 2003). A growing body of literature suggests the option of directly inferring between survey formats when comparing psychometric equivalence (Couper, 2000, Kiesler and Sproull, 1986, Knapp and Kirk, 2003 and Uriell and Dudley, 2009); however, not all studies support generalizing between survey formats in all circumstances (Naus et al., 2009, Turner et al., 1998 and Wolfe et al., 2009). This lack of clarity in the literature has led some to conclude that survey formats “can be equivalent but are not always identical” (Riva et al., 2003 p. 79). Further clarification of possible similarities and differences between paper and web-based formats is needed.

3.1. Sensitive versus non-sensitive material

When surveying non-sensitive material, there is little or no difference in item response rates between paper and web-based survey methods (Huang, 2006). However, in studies investigating highly sensitive material, web-based surveys tend to elicit less social desirability bias (Booth-Kewley et al., 2007, Couper, 2000, Greene et al., 2008, Knapp and Kirk, 2003 and Tourangeau et al., 2003). Web-based survey responders are more likely to express genuine emotions and demonstrate less inhibition (Hanna et al., 2005, Huang, 2006 and Joinson, 1999). Web-based administrations elicit greater reports of alcohol consumption and sexual risk-taking behaviors (Booth-Kewley et al., 2007, Knapp and Kirk, 2003, McCabe et al., 2002 and Turner et al., 1998), more truthful self-reports (Booth-Kewley et al., 2007 and Knapp and Kirk, 2003), and electronic formats have fewer non-responses to items (Kiesler & Sproull, 1986). With college students Web-based surveys asking for sensitive material are not found to adversely influence quality of the survey data (Hayslett and Wildemuth, 2004, McCabe et al., 2002 and Miles and Wesley,

1998). Additionally, younger teens produce less missing data on the Web-based version of the Risk Behavior Survey than on the paper-based version (Denniston et al., 2010).

3.2. Non-response errors

Although, non-response errors are primarily an issue of concern when surveys are not returned, an additional version of non-response error is non-response to individual items within a survey, known as item non-response (Dillman, 2007). Item non-response is found to be more frequent on lengthy surveys or when surveys seek information pertaining to sensitive information. While survey research design suggestions include limiting survey length to alleviate this potential error, length of survey does not completely account for the respondents' reasons for non-response. Frequently, item non-response is connected to respondent concerns with confidentiality of disclosure, particularly regarding highly sensitive information (Booth-Kewley et al., 2007 and Joinson et al., 2004).

4. Self-disclosure of sensitive information in research

Self-disclosure is the revealing of previously private information about one's self to others and can include thoughts, feelings or experiences (Derlega et al., 1993 and Joinson, 2001) Joinson & Paine, as cited in Joinson, McKenna, Postmes, and Reips (2007). Individual personal self-disclosure is growing at a rapid rate on the internet (e.g., chat rooms, instant messaging, social networks, and blogs) and participants frequently share intimate and sensitive information. However, it is known that individuals commonly skew their presentation in order to enhance social-desirability (Booth-Kewley et al., 2007 and Derlega et al., 1993). Interestingly, trends in the increasing rates of self-disclosure are appearing. A meta-analysis of 39 studies covering 25 years of research reveals a consistent pattern of increasing personal disclosure on computer surveys as compared to interview or paper-based surveys (Weisband & Kiesler, 1996). With the increasing use of Web-based research there is a fresh interest in the influences of self-disclosure of sensitive information (Bates and Cox, 2008, Joinson et al., 2004 and Valkenburg and Peter, 2009).

4.1. Gender differences

Early research exploring gender differences on response rates for sensitive self-disclosure items revealed relatively small differences, suggesting no interaction effect between survey mode and gender (Dindia and Allen, 1992 and Miles and Wesley, 1998). However, more recent research suggests survey format influences males more than females on sensitive self-disclosure measures (Booth-Kewley et al., 2007 and McCabe et al., 2006). In situations where privacy is perceived to be greater, particularly in electronic formats, men have higher disclosure rates, while women maintain a stable rate of disclosure across privacy conditions (Joinson, Paine, Buchanan, & Reips, 2008).

5. Purpose of the study

The American Educational Research Association, American Psychological Association, and National Council on Measurement in Education (1999) indicate the need for cross-format equivalencies to be established prior to direct comparison of data on paper-pencil and internet surveys. With the current trend moving from paper-pencil formats to Web-formats, establishing

when and where there are cross-format equivalencies is critical. The present study explores whether there is a significant difference in item non-response rates on personally sensitive items are different when using Web-based surveys versus paper-pencil surveys, and also whether gender influences item non-response rates. Data from the corresponding forms (paper-based and Web-based) of the National College Health Association's (NCHA) national reference data set from spring 2006 were explored in order to assess the impact of survey format, gender, and item sensitivity on item non-response rates. Given the respondents' assumption of greater confidentiality and anonymity on Web-based surveys, higher rates of non-response to sensitive item questions are expected on the paper-based survey format. As a result of prior research on participant self-disclosure of sensitive material, higher rates of self-disclosure are anticipated on the Web-based format surveys. It is also predicted that a higher rate of self-disclosure will be found on the Web-based format for male participants.

6. Method

The missing data rates in the NCHA data were examined for data collected from men and women in web and paper-based survey formats for health-related questions of high, moderate, low, and no sensitivity. Currently in the literature there is no standard for measuring level of survey question sensitivity. As a result, question sensitivity was based on ratings by a sample of 78 college students.

6.1. Participants

This study examined archival data from the American College Health Association's National College Health Assessment (NCHA). The NCHA is a health-based survey designed to assist US Colleges in creating healthier communities. The survey has been taken by more than 350,000 students at over 300 US colleges and universities ([American College Health Association, 2007](#)). The present data reflects the Spring 2006 administration in which 97,357 students from 123 postsecondary institutions participated. Of these 123 institutions, 117 (45 private and 72 public colleges or universities) randomly selected their students yielding a total data pool of 94,806 students. This data pool is described as the reference group by the [American College Health Association \(2006\)](#).

A random sample was selected from the NCHA reference group by identifying respondents who answered the Web-based survey ($N = 75,648$), and those who had taken the Paper-based survey ($N = 16,833$), separating them into men and women (Paper male $N = 6346$; Paper female $N = 8607$; Web male $N = 26,461$; Web female $N = 47,725$), and selecting a random sample of 600 participants from each of these four groups. Some participants did not answer the query about their gender (Web $N = 1462$; Paper $N = 1880$) and their data was removed before random sampling. Respondents in the random sample were predominantly EuroAmerican (72%; African American = 5.4%; Hispanic/Latino = 6.5%; Asian American or Pacific Islander = 9.5%; Native American or Alaskan Native = 1.2%; Other = 3.2%; Missing data = 2.2%) and their mean age was 22.25 years ($sd = 6.06$).

6.2. Instruments

The NCHA is a survey designed to explore students' perceptions, behaviors, and health habits. The 200 multiple-choice questions take approximately 20–30 min to complete. Some of the health issues addressed include: health, weight, exercise, and nutrition. Additionally, the survey

probes mental health, alcohol use, tobacco use, other drug use, sexual health, and personal safety. According to the ACHA's web update, several studies comparing the NCHA data with four other national surveys of college students have been used to verify the reliability and validity of the NCHA.

6.3. Procedure

The NCHA is implemented by surveying all students, randomly selected students, or randomly selected students in a given classroom, at institutions that voluntarily participate. Institutions may also choose whether students are surveyed by web or paper. The students completing the Spring 2006 NCHA survey were surveyed via the paper scan version or the web version or both paper and web. Approximately 80% of surveys were completed in randomized classrooms with the paper version, and the remaining 20% with the web version.

The rating of the sensitivity of 200 of the NCHA questions was conducted in the Spring of 2010. To address the rating of question sensitivity, a convenient sample of 84 students in an introductory social science course at an urban public university in the Pacific Northwest responded to an invitation to participate. These students received extra credit for their participation. Participants were provided with the address of an internet survey, which they could access ad lib. The address led participants to an informed consent statement and a link to the survey. The survey presented each NCHA question and asked respondents to indicate, on a 4-point Likert scale, whether the item was *not at all sensitive*, had a *low level of sensitivity*, was *moderately sensitive*, or *highly sensitive*. The survey was open for responses for a period of two weeks. Of the 86 students who opened the internet survey, 78 (93%) rated the sensitivity of all 200 ACHA questions. These 78 respondents were predominantly female (79.5%), EuroAmerican (55.1%; African American = 2.6%; Hispanic = 3.8%; Asian American or Pacific Islander = 9%; Native American or Alaskan Native = 3.8%; other = 14.1%; Choose not to respond = 11.5%) and their mean age was 24.82 years ($sd = 7.04$). Although, the 78 students are not representative of the NCHA population in terms of ethnicity ($z = 3.06$, $p = 0.002$), they are representative of the population of US college students in 2009 ($z = 1.31$, $p = 0.19$) (US Department of Education, National Center for Education Statistics, 2011).

7. Results

7.1. Sensitivity of NCHA questions

Mean sensitivity ratings were calculated for 200 NCHA questions. Based on the mean sensitivity ratings by the sample of 78 students, questions were divided into quartiles. The mean sensitivity ratings, on a 4-point Likert scale, for the *least sensitive*, *low sensitivity*, *moderate sensitivity*, and *highest sensitivity* questions were 1.33 ($sd = 0.69$), 1.58 ($sd = 0.86$), 1.98 ($sd = 0.98$), and 2.62 ($sd = 1.14$), respectively. Of the 200 total items, 192 (96%) had no ethnicity difference in their sensitivity rating when Euro-American and non- Euro-American responses were compared. Thus, ethnicity differences were not evaluated further. Of the 200 total items, 114 (57%) had no gender difference in their sensitivity rating. Of the remaining 87 items which did differ in sensitivity ratings for males and females, all had a small effect size (mean $eta^2 = 0.02$, $sd = 0.009$) and only 9 (10%) were considered more sensitive by male respondents. Overall, female respondents found the survey more sensitive; women considered 39% of the items as more highly sensitive than men did. Because these gender differences existed in item sensitivity ratings, gender-matched sensitivity ratings were employed in the final analysis.

7.2. Missing data

Four missing data scores were calculated for each participant. The missing data scores represent the number of items with missing data in each sensitivity quartile (scores could range from 0 to 50). The mean number of missing items is shown in [Table 1](#) for men and women who took the survey on paper and on the web.

Table 1.

The mean percentage of items with missing data for men and women responding to questions of lowest, low, moderate, and high sensitivity.

Item sensitivity	Gender	Format	Mean	SD
Lowest	Female	Paper ^a	1.98	3.28
		Web ^a	.47	1.47
	Male	Paper ^a	2.96	5.84
		Web ^a	.47	2.19
Low	Female	Paper	1.80	2.62
		Web	1.19	1.16
	Male	Paper	2.23	4.11
		Web	.28	1.76
Moderate	Female	Paper	1.57	3.15
		Web	.45	1.60
	Male	Paper	3.23	3.98
		Web	1.50	2.02
High	Female	Paper	3.38	4.07
		Web	2.23	2.33
	Male	Paper	4.56	5.48
		Web	2.35	2.29

a Note: Sample sizes are $N = 600$ for Female paper survey, Female web-based, Male paper survey, and Male web-based groups.

7.3. ANOVA results and effect sizes

A 2 (gender) \times 2 (survey format) \times 4 (item sensitivity) ANOVA was employed and the results are summarized in [Table 2](#). The sphericity assumption was not met, Mauchly's $W(5) = 667.60$, $p < .05$, therefore the Greenhouse-Geisser correction was used throughout. Power of all main effects and 2-way interactions is 100% while power for the 3-way interaction is 78%. Because the power was so high for all the analyses, all main effect and interactions were statistically significant and a more appropriate way to interpret the results was to attend to the effect sizes

associated with them (Cohen, 1992). The ANOVA reveals three significant findings. First, there is a large effect of item sensitivity on the amount of missing data such that the highly sensitive questions have significantly more missing data than for questions from all of the other sensitivity quartiles. Table 3 shows the paired-sample *t*-test results when the missing data rates are compared for questions from the four sensitivity quartiles. Fig. 1 shows these results graphically. There was also a moderate sized main effect of survey format such that the web-based responses had significantly more disclosure of sensitive items than paper-based ones did. Finally, there was a small main effect of gender. This gender effect should be interpreted in light of an interaction of gender and sensitivity that was also of small effect size. The interaction of gender and sensitivity indicated that males had more missing data for questions in all the sensitivity quartiles except the second quartile (see Fig. 1).

Table 2.

Summary of ANOVA Results.

Factor	<i>F</i>	<i>df</i>	Sig	<i>eta</i> ²	Effect size ^a
Item sensitivity	452.99	2.53, 6057.24	<.001	.19	Large
Survey format	193.30	1, 2396	<.001	.08	Medium
Gender	23.88	1, 2396	<.001	.01	Small
Sensitivity × gender	72.25	2.53, 6057.24	<.001	.03	Small
Sensitivity × format	16.71	2.53, 6057.24	<.001	.007	No effect
Gender × format	18.74	1, 2396	<.001	.008	No effect
Sensitivity × gender × format	3.87	2.53, 6057.24	.013	.002	No effect

Notes: *eta*² values of less than .01 represent no effect of the independent variable on the dependent variable while values of between .01 and .06 are small, values between .06 and .14 are moderate, and values greater than .14 are large.

a According to Cohen (1992).

Table 3.

Paired-sample *t*-test results when the missing data rates are compared for questions from the four sensitivity quartiles.

	Paired differences				
	Mean	<i>SD</i>	<i>t</i>	<i>p</i>	ES
Lowest versus low	0.09	2.24	2.04	.04	.04
Lowest versus moderate	-0.22	2.95	-3.59	>.001	.07
Lowest versus high	-1.66	3.03	-26.83	>.001	.55
Low versus moderate	-0.31	2.61	-5.80	>.001	.11
Low versus high	-1.75	2.97	-28.94	>.001	.59
Moderate versus high	-1.44	2.41	-29.39	>.001	.59

Notes: $df = 2399$; The formula for effect size (ES) in a repeated measures t -test (Gibbons, Hedeker, & Davis, 1993) is defined as the mean change divided by the standard deviation of the change. According to Cohen (1992), effect sizes of less than .20 represent no effect of the independent variable on the dependent variable while effect sizes of between .50 and .80 are moderate in size.

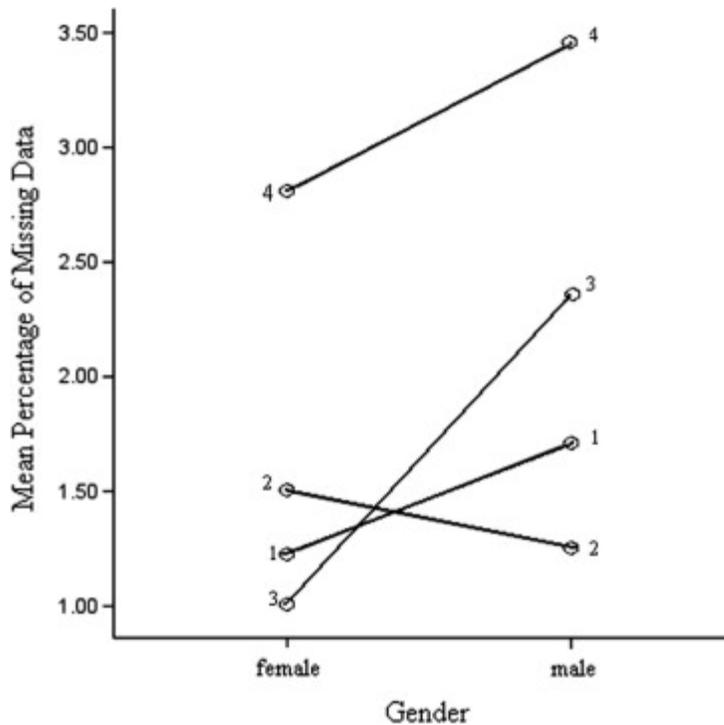


Fig. 1.

The mean percentage of missing data is affected by the interaction of gender and question sensitivity.

8. Discussion

Twenty-five years ago evidence initially supported the indication that fewer items remain unanswered on electronic formats, and that this could be a reason to question the interchangeability of data coming from two different survey modalities (Kiesler & Sproull, 1986). Our study confirms that Web-based surveys yield more data on sensitive questions than do paper-based surveys. Although recent studies (Gosling et al., 2004, Luce et al., 2007, Naus et al., 2009 and Suris et al., 2007) suggest it is possible to compare different modalities of survey data exploring non-sensitive subject matter, our research combined with other studies (Naus et al., 2009, Parks et al., 2006 and Wolfe et al., 2009) indicates direct comparisons of data from paper-pencil and Web-based surveys do not result in identical data sets, particularly on sensitive questions. As Carini et al. (2003) found, survey format does matter with college students, and a Web-based format is better with this population.

The current study explores whether there is a significant difference in item non-response rates on personally sensitive items are different when using Web-based surveys versus paper-pencil surveys, and also whether gender influences item non-response rates. Our sample consisted of a

subsample from the Spring 2006 administration of the American College Health Association (ACHA) National College Health Assessment (NCHA) health survey administered at over 300 US colleges and universities. The current study explored whether the Spring 2006 data collected from the paper-pencil based administration of the NCHA was equivalent to the data collected from the NCHA Web-based version based on item non-response rates. Additionally, this study explored the interaction of gender and question sensitivity level in answering survey questions. As expected, our findings confirm that there are higher rates of item non-response on paper-based survey formats. It also found that item non-response is highest on both survey formats for the questions asking the most sensitive information; and, Web-based surveys produced significantly lower item non-response on the most highly sensitive questions versus the paper-based format. Gender had a small effect on frequency of item non-response. Across the first three quartiles on paper-based surveys, female respondents had similar rates of non-response, with greater variability on female item non-response on the first three quartiles with the Web-based format. Both female and male respondents had higher non-response rates on the most sensitive questions. Overall, male item non-response was found to be significantly lower on Web-based survey formats.

Our study found a large effect size when evaluating the interaction of sensitive questions and missing data. The more sensitive the question, the more likely that respondents failed to answer the questions. [Tourangeau and Yan \(2007\)](#) indicate that survey questions requesting respondent information about “drug use, sexual behaviors, voting, and income are usually considered sensitive” (p. 860). In the current study, questions of sexual practices, mental health and substance use were left unanswered most frequently.

Consistent with previous research ([Booth-Kewley et al., 2007](#) and [Tourangeau and Yan, 2007](#)), gender had a small interaction with the sensitivity level of the question. While male respondents have more missing answers than females on highly sensitive questions, males have far fewer missing answers on highly sensitive questions on Web-based formats versus paper-based formats. The sensitivity level of questions may possibly relate to a perceived invasiveness of the question or concern with social undesirability related to subject matter. Additionally, we found female students more likely to complete Web-based versions of surveys than male students consistent with recent findings ([Denniston et al., 2010](#)). Our study indicates that since men and women have fewer unanswered questions on Web-based survey formats, when surveying the most sensitive questions with college student populations there will be more data gleaned from Web-based surveys than from paper-based surveys.

8.1. Implications

It is worthwhile to consider the current adolescent and college populations and how interaction with technologically supported social interactions influences the self-disclosure of personally sensitive information. Many individuals disclose significant amounts of sensitive information through social networking or texting. It may be possible that current trends in use of these mediums for self-disclosure are instilling in this generation the expectation of higher disclosure rates, particularly in Web-based formats. If this is the case, then Web-based requests for sensitive information will obtain increasing amounts of disclosure from those most frequently using these mediums. Additionally, the common understanding of what is and is not sensitive will likely develop generational and population based definitions. This could impact (a) how studies of sensitive matters are compared between populations, (b) the choice of survey methods used with specific populations, (c) and sensitivity level of survey information sought. Moreover, this study

indicates an advantage for using Web-based formats in the development of sensitive item surveys.

It is important to note that with college populations, less missing data should be expected from both male and female respondents when using Web-based formats, particularly in situations exploring health practices such as when using a survey like the ACHA's NCHA. Since missing data is significantly reduced with male respondents on Web-based surveys it is especially important for researchers of sensitive subjects to consider use of this format. Less missing data will improve the information used by organizations addressing concerns, practices, intervention strategies, and policy-making. Additionally, caution is warranted in combining data sets from surveys using different formats, particularly when surveying sensitive information. In these cases it is advised to evaluate missing data levels to explore whether there are any practical differences in the samples obtained.

This study suggests there is still a need to explore how survey development and format can elicit higher response rates on sensitive items. Also of value would be further research on the influences of gender and other social factors on ratings of sensitive survey questions. While sensitive items should not be eliminated from research, developing clear best practices for collecting sensitive data will enhance the quality and generalizability of future research findings. However, this study clearly shows that Web-based survey formats garner higher levels of disclosure on sensitive items among college students.

8.2. Limitations

While possible generalizations to the larger population are present, this study primarily supports a greater understanding of college populations. With this in mind it is important to understand likely limitations of this study. First, this study's use of a convenient sample of college students evaluating question sensitivity level may not represent the general public. Further research should explore what information different populations view as sensitive and how information sensitivity develops.

Second, there is a possible weakness in the study regarding the restricted range of the sensitivity ratings (1.33–2.62) of the questions. While efforts were made to categorize the questions on a 1 to 4 scale, having a greater range of sensitivity would strengthen the explanation of the relationship between missing data, gender, and survey collection methodology. A third limitation is that the actual amount of missing data was small (i.e., less than 10% missing for males who took the paper survey and answered the most sensitive questions).

In future research it may be worthwhile to see if perception of greater confidentiality and anonymity on the Web-based format continues to be assumed within college populations in the future. Likewise, as these populations age, will perception of confidentiality and anonymity change regarding Web-based survey formats.

9. Conclusion

The results of this study support the benefits of Web-based surveys in research when collecting data on sensitive issues. While research suggests privacy and confidentiality perception play a greater role in sensitive information disclosure than does survey modality (Huang, 2006), alternative factors such as format familiarity and cultural expectation of self-disclosure may also

influence survey response. While Web-based surveys may be efficient with college populations and other populations with technology and internet experience, Web-based surveys continue to pose challenges with a number of other populations, including those unfamiliar with technology and those without ready access to the internet (e.g., elderly, poor, and those without Web-access). Consequently, researchers must consider the best fit in survey format with the population being studied. In the case of researching highly sensitive subjects with college populations, especially male students, Web-based survey formats are advised for improving rates of self-disclosure.

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