

Does Voice Matter for Youth Reports of Tobacco Use? An Interactive Voice Response Experiment

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Abstract

Household telephone surveys on youth tobacco use yield lower estimates than school-based self-administered surveys. Researchers generally assume the lower estimates from telephone surveys reflect underreporting due to youths' concerns about parents or others overhearing their responses. Interactive voice response (IVR) has been shown to generally increase youth reports of smoking compared to interviewer-administered CATI surveys. Nevertheless, a significant gap remains between estimates from IVR and school-based surveys. One potential limitation of the IVR mode is that the "standard" human voice used to record the survey items is an adult female. Youth who respond via IVR may still feel like they are reporting to an adult, even though the voice is part of a computerized system. This may discourage some youths from fully reporting smoking behavior, as it could remind them that there is some risk, however small, of their smoking behavior being disclosed to their parents. For in-school surveys, the primary risk is that classmates who are also participating in the survey could see youths' responses.

In order to assess what role, if any, concerns about disclosure play in youth smoking reports in IVR, we designed a survey experiment where youth respondents were randomly assigned to one of two different voices – an adult female who sounded old enough to be the respondents' mother and a teen female who sounded close to the expected average age of respondents. To test whether the IVR voice had any impact on youth smoking reports, we compared responses across the two experimental conditions on two smoking behavior items. We also examined whether the IVR voice led to different response patterns for additional questions on youths' intentions to smoke. This paper reports findings from the experiment and discusses the implications of the findings for measuring youth smoking in telephone surveys.

Introduction

Household telephone surveys on youth tobacco use yield lower estimates than school-based self-administered surveys. Researchers generally assume the lower estimates from telephone surveys reflect underreporting due to youths' concerns about parents or others overhearing their responses. School-based surveys eliminate concerns about parents overhearing youths' responses, but they exclude youth who have dropped out of school entirely and underepresent those who often do not attend. As a result, the best methods for accurately measuring youth smoking behavior remain under debate (Fowler and Stringfellow, 2001; Gfroerer, Wright, and Kopstein, 1997).

For household telephone surveys, using interactive voice response (IVR) to allow youth to self-report has been shown to increase youth reports of smoking compared to interviewer administration (Curriyan, Nyman, Turner, and Biener, 2004; Moskowitz, 2004). Nevertheless, this research shows that a significant gap remains between estimates from IVR and school-based surveys for the same population (Curriyan, et al. 2004). One potential limitation of the IVR mode is that the "standard" human voice used to record the survey items is an adult female. Therefore, youth who respond via IVR may still feel like they are reporting to an adult, even though the voice is part of a computerized system. If youth responses to questions on smoking are in fact influenced by the voice reading the survey instrument in IVR, this raises the possibility that youth may respond in different ways to different voices.

In order to assess whether youth vary their reports on smoking behavior based on the IVR recorded voice, we designed an experiment where youth respondents were randomly assigned to one of two different voices. The first voice was similar to the "standard" adult female voice, which sounded similar in age to the mother of most youth respondents. The second voice was a teenage female who sounded close to the expected average age of the youth respondents. To test whether the IVR voice had any impact on youth smoking reports, we compared responses across the two experimental conditions on behavioral and intentional items. The paper reports findings from the experiment and discusses the implications of these findings for measuring youth smoking in telephone surveys.

Youth Reports on Smoking across Modes and Settings

Two experiments published at the same time in 2004 clearly showed some differences in youth reports on smoking behavior between those assigned to interviewer-administered (CATI) mode and those assigned to IVR mode, which is also known as T-ACASI (Curriyan, et al. 2004; Moskowitz, 2004). The general pattern across these two studies was that youth, or at least some demographic subgroups, were more likely to report actual smoking and intentions to smoke soon in IVR mode than in CATI mode. Overall, these two studies indicated that using IVR appeared to reduce the bias toward under-reporting smoking behavior when youth could enter their responses via IVR rather than stating their answers verbally to an interviewer.

Given that no gold standard for youth smoking estimates exists, these studies also examined factors related to possible motivations for youth to report more accurately in IVR mode than in CATI mode. Moskowitz (2004, p. 566) noted that many youth respondents reported that a parent was present at some point during the interview. Parental presence was noted more frequently among those who responded via CATI (59 percent) versus those who responded by IVR (42 percent). Parental presence was substantial in both modes and negatively associated with self-reported smoking and susceptibility to smoking (Moskowitz, 2004, p. 582). As the author points out, for youth responding by IVR mode, parents could not learn much about their child's behavior or intentions by listening to the interview. The privacy afforded by IVR suggests that youth would be more comfortable reporting their smoking behavior or intentions in this mode, to avoid disclosure to parents.

The lack of a gold standard for youth smoking estimates led Currihan, et al. (2004) to hypothesize about what factors would motivate youth to report differently in IVR versus CATI mode. These factors include the sensitivity of the smoking question, respondent age, and respondent gender. The authors hypothesized that more sensitive questions, such as recent smoking versus lifetime smoking, would create greater risk for youth respondents. That is, having to report more recent smoking would likely be more consequential to disclose to parents than reporting ever trying a cigarette. Similarly, smoking reports from younger respondents, such as those who are 14 or under, would likely be more consequential to disclose to parents than those from older teens. The authors also cited research indicating that girls are lower risk-takers than boys, so their reports on smoking behavior or intentions could also be more consequential than they would be for boys. Finally, the authors hypothesized that youth who perceived their parents would strongly disapprove of smoking would be more likely to report this behavior in IVR mode than in CATI mode (Currihan, et al. 2004, p. 545-546).

The expectations were that all four of these factors would exacerbate differences in youth reports between IVR and CATI mode, whereby youth who had greater motivation to avoid reporting their behavior would provide more accurate answers in IVR mode. The findings on these hypotheses were mixed. The authors did not observe a clear pattern with respect to less versus more sensitive questions about smoking behavior. Among all respondents, the difference between IVR and CATI was actually greater for past year smoking than for past month smoking. Likewise, the authors did not find a significant interaction between age and mode on smoking reports. Differences in smoking between IVR and CATI mode were not more pronounced for younger respondents versus older youth; both groups were similarly more likely to report smoking in IVR mode. One finding that was consistent with the authors' expectations was that females' smoking reports differed between modes more than males' reports. This outcome was mostly driven by the fact that girls who felt their parents would strongly disapprove of smoking were much more likely to admit smoking in IVR mode than in CATI mode. Overall, boys did not report their smoking differently across these two modes. As a result, the authors concluded that,

for girls only, CATI interviews could underestimate smoking prevalence by as much as 50 percent (Currihan, et al. 2004, p. 559).

Still, without a clear gold standard, these findings do not allow researchers to conclude that using IVR produces the most accurate assessment of youth smoking behavior or intentions for all youth respondents or specific youth subgroups. A key difference between household and in-school surveys is that the disclosure risk differs. At home, the greatest risk for youth is that parents or other household members may learn whether they have smoked or are susceptible to trying smoking. In school, the greatest risk is that other students could learn this same information by seeing how youth respond to questions in a paper or computer-administered mode. This distinction raises the question of how disclosure risk could influence how youth answer smoking questions. Do youth participating in a household survey focus on the consequences of disclosure of their responses to other household members, and especially parents? Do youth who participate in a school-based survey consider the consequences of disclosure to their peers? If youth respondents are thinking about disclosure risks in this way, then the possibility exists for manipulating the survey protocol to influence how youth think about the potential audience for their responses to smoking questions. For example, the "standard" adult female voice most commonly used in IVR applications may encourage youth to think about the risk of disclosure to adults, even though the voice is recorded for the computerized system. Following this logic, the possibility arises that a different voice, such as a youth voice, could encourage respondents to think about disclosure to another audience, such as their peers.

The Potential Impact of Voice on IVR Responses

Although it may be possible to manipulate an IVR survey protocol to influence how youth think about the potential for disclosure of their smoking behavior or intentions, little research exists to indicate whether different voices would influence respondents. Couper, Singer, and Tourangeau (2004) appear to have published the only experimental evaluation of whether different IVR voices appear to influence respondents' answers to a variety of survey questions, including sensitive items. This study assessed whether four different types of voices, which had both male and female versions, produced any differences in how adults responded to questions on both socially desirable and undesirable behaviors. The voices included (1) live CATI interviewers, (2) recorded human voices for IVR, (3) a human-like text to speech (TTS) voice for IVR, and (4) a machine like TTS voice for IVR (Couper, et al. 2004, p. 551). The authors did find consistent differences on responses to sensitive items between CATI and IVR modes, similar to findings on youth smoking behavior.

In contrast, the findings did not reveal a consistent pattern of differences in responses between male versus female voices. This finding indicated that the gender of the voice did not influence respondents, even for when answering questions on gender related attitudes and other

sensitive items involving gender. In addition, among the three different voices in IVR mode, the authors did not find consistent differences on responses to sensitive items. Despite evidence from debriefing questions that respondents could clearly distinguish between the three IVR voices, these distinctions did not appear to influence respondents' answer in a consistent way. Voice type also did not have a significant association with survey breakoffs or item nonresponse.

Overall, the study by Couper, et al. (2004) suggests that different IVR voices are unlikely to have a significant influence on how survey respondents answer sensitive questions. As the authors noted, these findings failed to support the "computers as social actors" paradigm. This research suggests survey respondents would tend to interact with computer voices similarly to the way that they would with actual human actors, such as live interviewers (Reeves and Nass, 1997). Couper, et al. (2004) actually found that respondents treated live humans differently than recorded voices in terms of the answers they provided to sensitive items, but they did not appear to treat the various recorded or generated voices differently. The Couper, et al. study only included adult survey respondents. We could not find any published studies that directly assessed how IVR voices might influence youths' survey responses. It is possible that youth may respond differently to alternative IVR voices to a greater degree than adults. Youth may perceive the risks of revealing sensitive information greater than similar revelations for adults. This factor could increase the potential for youth to consider voice when responding to sensitive questions in a survey.

To investigate this issue directly, we developed an experiment where youth respondents to a survey on tobacco use and health were randomly assigned to one of two different voices. The first voice was similar to the "standard" adult female voice and the second voice was a teenage female. By comparing responses across these two experimental conditions to questions on smoking behavior and intentions items, we were able to assess whether the IVR voice had any impact on these data.

Research Questions

Our primary goal was investigating whether youth would report smoking behavior and intentions differently depending on which of the two IVR voices they responded to in the survey. The first voice, an adult female voice, sounded like a woman who was similar in age to the mother (or female guardian) of the youth respondents. The second voice, a teenage female voice, sounded like an adolescent who was close to the expected average age of the respondents. Assuming youth respondents were thinking about disclosure risks in terms of the potential audience, we would expect youth who received the first voice to be thinking more about the risk of parents or other adult household members learning their smoking behavior. Likewise, we would expect youth who received the second voice to be thinking more about the risk of siblings or friends learning their smoking behavior. These expectations are consistent with the "computers as

“social actors” viewpoint whereby youth would have to imagine the person behind the voice and think about how that person would react to their responses to questions on smoking behavior and intentions (Reeves and Nass, 1997). The contrasting view, based on the Couper et al. (2004) study, would be that the youth responded to the two voices as similar computer applications that did not vary significantly in disclosure risk.

We therefore sought to answer two related research questions based on this experiment:

1. Did youth responses to questions on smoking behavior and intentions differ based on whether they received the adult versus the youth voice in IVR mode?
2. Were factors such as age, gender, or race associated with any observed differences in smoking behavior and intentions based on the voice received in IVR mode?

The following sections describe how we designed and implemented the experiment, collected and analyzed the data, and interpreted the results.

Data

The data we used to address our two research questions come from the Florida Youth Cohort Tobacco Study (FL YCS). Sponsored by the Florida Department of Health (FL DOH), the FL YCS is a three year longitudinal telephone survey designed to track tobacco-related beliefs, attitudes and experiences of youth aged 12 to 16. Initial baseline interviews were conducted with Florida youth September – December 2009 and are the basis for this research. RTI designed the FL YCS to evaluate how FL DOH programs may have been influencing smoking rates among youth and to provide insight into optimal ways to curb youth smoking. For this reason, the study includes measures on tobacco use, secondhand smoke exposure, the social acceptability of tobacco use, and media use and anti-tobacco campaign exposure.

Florida households were sampled using list-assisted RDD, supplemented by an oversample of directory-listed numbers to increase efficiency in reaching households with at least one eligible youth. While we conducted a total of 1,546 interviews with youth aged 12 to 16, we only present results for the 1,444 youth who provided sufficient data to be included in the final analyses. The survey data were weighted to be representative of Florida youth age 12-16 who lived in households covered by the sampling strata.

Gaining cooperation to conduct interviews with eligible youth was a two-step process that involved obtaining both parental consent and youth assent. Live telephone interviewers contacted households and spoke to adult residents to determine if any eligible youth age 12-16 resided there. If more than one eligible youth was identified, interviewers asked to speak with the child who most recently had a birthday, not the youngest child in the age range. Consent from the parent/guardian was obtained before speaking to the eligible youth and obtaining assent.

Youth were asked a series of demographic questions before being told that we would ask questions about their experiences with tobacco products through our automated phone system. Instructions were given to the youth as to how to use the IVR system before they were switched to it. Within the system, youth were randomly assigned to hear pre-recorded questions from either the adult female or youth female voice. Respondents entered their answers using the telephone keypad. After completing questions in the IVR system, youth were reconnected with a live telephone interviewer to finish the remainder of the study. Break-offs within the IVR system were low with less than 3% of respondents for each voice type. Attempts to re-contact all respondents who broke off in the IVR system were made in an effort to complete the interview.

Interviews were conducted in English only. Questions administered by live interviewers using a CATI system took an average of 20 minutes to answer. The average time spent answering questions in the IVR system was calculated as follows: non-smoker—3 minutes, haven't smoked in the past 30 days—7 minutes, current smokers—17 minutes. For this baseline study which consisted only of landline phone sample, the estimated eligibility rate for cases with an unknown status was 29.0 percent. Factoring the estimated eligibility rate for all cases into the AAPOR RR 4 calculation, the overall response rate was 15.4 percent and the CASRO response rate was 22.0 percent. Unlike general phone surveys of the adult population, our screening procedures required gaining parental permission for youth to participate and youth agreement to complete the interview, which had a negative impact on the response rate. Among eligible youth contacted and identified, the AAPOR COOP 1 cooperation rate was 62.5 percent while the AAPOR REF 2 refusal rate was 9.3 percent.

Analysis

Initially, cross-tabulations of demographic, tobacco use, and intentions to smoke survey items were conducted by voice type to determine which survey items of interest might contain significant differences. Chi-square tests were performed on selected survey items and included tests by voice type, age, gender, and/or race. These analyses allowed us to interpret whether youth responses to survey questions on smoking behavior and intentions significantly differed based on voice type. The chi-square tests also allowed us to determine if certain respondent characteristics were significantly associated with any observed differences in smoking behavior and intentions based on voice type. **Appendix A** contains all survey items used in our analyses along with coding and weighted frequencies.

Results

Research Question 1

Our first question of interest was whether youth responses to questions on smoking behavior and intentions differed based on voice type in the IVR mode. To get to this analysis, we first had

to examine the respondent characteristics of our sample to see how balanced they were between the two voice types.

Table 1. Respondent Characteristics by IVR Voice

Survey Item	Adult Female Voice	Youth Female Voice
Total Respondents	51.1% (738)	48.9% (706)
Age*		
12 to 13	30.8%	39.4%
14 to 16	69.2%	60.6%
Gender		
Male	49.7 %	53.2%
Female	50.3 %	46.8%
Highest grade completed		
8 th grade or lower	60.8%	61.6%
9 th grade or higher	39.2%	38.4%
Race/ethnicity*		
White Non-Hispanic	48.3%	52.4%
Black Non-Hispanic	19.9%	16.5%
Hispanic	25.6%	19.3%
Other Non-Hispanic	6.2%	11.7%
Employment status		
Working	6.8%	6.5%
Not Working	93.2%	93.5%
Attend religious services		
Once a month or less	41.4%	38.6%
More than once a month	58.6%	61.4%

*Differences in response patterns due to voice showed statistical significance at p<.05 for age and race.

Table 1 shows the results of the random assignment of respondents to voice types. While we observed an almost even number of respondents assigned to each voice, some significant differences were found ($p<.05$) when examining age and race. Overall, the adult female voice had slightly more respondents assigned to it and proportionately more black, non-Hispanic, and Hispanic respondents. However, this voice type had fewer youth aged 12 to 13 and fewer other non-Hispanic respondents assigned to it. We paid particular attention to these age and race subgroups later when looking at our second research question to see what role they play in examining smoking behavior and intentions.

Table 2 presents a voice type comparison for lifetime and recent tobacco use behaviors among respondents in the IVR mode.

**Table 2. Tobacco Use Behaviors among All Respondents by IVR Voice
(More/Less Sensitive Questions)**

Survey Item	Adult Female Voice	Youth Female Voice
Ever tried a cigarette §		
Yes	13.4%	10.6%
No	86.6% (734)	89.4% (687)
Number of cigarettes smoked in entire life †		
5 cigarettes or less	72.6%	71.0%
More than 5 cigarettes	27.4% (70)	29.0% (71)
Number of days smoked in past 30 days. §†		
Didn't Smoke (0 days)	52.0%	55.6%
Smoked (1 day or more)	42.0% (77)	44.4% (76)
Ever tried chewing tobacco, snuff, dip		
Yes	4.1%	5.3%
No	95.9% (714)	94.7% (686)
Ever tried Snus, Taboka, Tobacco strips, or Electric cigarettes		
Yes	1.1%	1.6%
No	98.9% (732)	98.4% (641)
Ever tried cigars, cigarillos, little cigars		
Yes	9.1%	7.9%
No	90.9% (730)	92.1% (695)

§Differences in response patterns due to voice did not show statistical significance at p<.05 for “Ever tried a cigarette” and “Number of days smoked in past 30 days” (p=.1). However, we thought the difference could possibly be meaningful.

†Respondents routed to these questions must have answered “yes” to “Ever tried a cigarette.”

Youth respondents receiving the adult female voice were slightly more likely than those receiving the youth voice to report that they had ever tried a cigarette. Although this question wasn't significant at the conventional p<.05 level, the p-value did equal .10. While there may be a meaningful difference between the two voices, we cannot be fully confident that a true difference existed. There was minimal item non-response reported for this question with less than 2 percent of respondents answering “don't know” or refusing to answer.

When examining smoking in the past 30 days, our most sensitive question in the survey instrument, we found that youth receiving the youth female voice were slightly more likely to

report that they had smoked one day or more in the past 30 days.¹ While we didn't find significant differences at $p < .05$ for this question, and we were working with a small subset of respondents, it seemed worth noting this pattern as it seemed unlikely to have happened by chance ($p = .10$). However, in this case we also cannot be completely confident that a true difference existed by voice for this item.

Table 3 shows outcomes for intentions to smoke cigarettes by voice type. Youth respondents receiving the adult female voice were found to be significantly more likely than those receiving the youth female voice to report that they would probably smoke in the next year. This result seems unlikely to have happened by chance ($p < .05$). Also, item non-response was almost non-existent with only 1 percent of respondents answering "no opinion" to this question.

Likewise, youth respondents reported significantly more to the adult female voice their intention to smoke if a cigarette was offered to them by a best friend ($p < .05$). Again item non-response was not a major factor with less than 3 percent of respondents answering either "don't know, refused, or no opinion" for this question.

Table 3. Intentions to Smoke Cigarettes among All Respondents by IVR Voice

Survey Item	Adult Female Voice	Youth Female Voice
Think you will smoke a cigarette during next year*		
Definitely/probably yes	8.1%	4.8%
Definitely/probably no	91.9% (721)	95.2% (687)
Think you will try a cigarette soon		
Definitely/probably yes	4.4%	4.1%
Definitely/probably no	95.6% (721)	95.9% (692)
Would smoke a cigarette if best friend offered it *		
Definitely/probably yes	7.6%	4.3%
Definitely/probably no	92.4% (721)	95.7% (692)

*Differences in response patterns due to voice showed statistical significance at $p < .05$ for
"Smoking a Cigarette During the Next Year" and "Smoking a Cigarette if a Best Friend Offered it."

¹ While item non-response was small for this question, we did find more entering of don't know/refused responses to the adult female voice than to the youth voice (6% to 0%). We aren't sure what this means but can't rule out that the adult voice didn't somehow remind them of a parent, thus making them less comfortable to give a substantive answer.

Research Question 2

The second question we sought to answer was whether factors like age, gender, or race were associated with observed differences in smoking behavior and intentions based on the IVR voice. We previously reported when examining the respondent characteristics of our sample that the age and race subgroups showed statistically significant differences. We will now discuss where these and other differences played out in the survey questions.

Tables 4a/b When looking at youth respondent reports of ever having tried a cigarette, we examined differences in reports among the age, gender and race subgroups to see if differences were more pronounced in these subgroups than in the overall total. While we didn't find any significant differences in regards to race, we did when looking at age and gender. For both age and gender, we found that younger youth and female respondents ($p<.05$) reported significantly more that they had ever tried a cigarette to the adult female voice. Currihan, et al. (2004) also found that young female respondents were more likely to report past smoking behavior when using IVR versus responding to a telephone interviewer.

Table 4a. 12 to 13 Year Olds' Reports About Ever Having Tried a Cigarette

Survey Item	Adult Female Voice	Youth Female Voice
Ever tried a cigarette		
Yes	8.9%	1.9%
No	91.1% (244)	98.1% (266)

Table 4b. Females' Reports About Ever Having Tried a Cigarette

Survey Item	Adult Female Voice	Youth Female Voice
Ever tried a cigarette		
Yes	15.4%	8.4%
No	84.6% (346)	91.6% (321)

Tables 5a-c We found similar findings when examining reports of intentions to smoke in the next year. Younger youth, female, and black respondents ($p<.05$) reported significantly more affirmative intentions to the adult female voice.

Table 5a. 12 to 13 Year Olds' Intentions to Smoke During the Next Year

Survey Item	Adult Female Voice (n=239)	Youth Female Voice (n=270)
Think you will smoke a cigarette during next year		
Definitely/probably yes	7.1%	0.8%
Definitely/probably no	92.9%	99.2%

Table 5b. Females' Intentions to Smoke During the Next Year

Survey Item	Adult Female Voice (n=340)	Youth Female Voice (n=318)
Think you will smoke a cigarette during next year		
Definitely/probably yes	8.8%	2.4%
Definitely/probably no	91.2%	97.6%

Table 5c. Blacks' Intentions to Smoke During the Next Year

Survey Item	Adult Female Voice (n=42)	Youth Female Voice (n=33)
Think you will smoke a cigarette during next year		
Definitely/probably yes	7.8%	0.7%
Definitely/probably no	92.2%	99.3%

Tables 6a/b Similarly when examining youth respondent reports of intentions to smoke if a best friend offered it, we saw more affirmative reporting to the adult female voice. Among the subgroups, we found that younger youth and female respondents ($p<.05$) reported significantly more affirmative intentions to the adult female voice.²

Table 6a. 12 to 13 Year Olds' Intentions to Smoke If Best Friend Offered It

Survey Item	Adult Female Voice (n=237)	Youth Female Voice (n=269)
Would smoke a cigarette if best friend offered it		
Definitely/probably yes	7.6%	0.4%
Definitely/probably no	92.4%	99.6%

² Among the race subgroup it is worth mentioning that black youth and non-Hispanic youth of races other than white and black appeared to report significantly more affirmative intentions to the adult female voice ($p<.05$). However, the sample size of these subgroups was very small (expected cell counts under 5 respondents).

Table 6b. Females' Intentions to Smoke If Best Friend Offered It

Survey Item	Adult Female Voice (n=335)	Youth Female Voice (n=318)
Would smoke a cigarette if best friend offered it		
Definitely/probably yes	7.1%	1.8%
Definitely/probably no	92.9%	98.2%

Discussion

From the onset of data collection, our assumption was that youth respondents in our sample might feel more comfortable disclosing undesirable cigarette smoking behavior and intentions to a voice type that sounded closer in age to a peer, rather than to a voice sounding like a parental or authoritative figure. Following the “computers as social actors” paradigm (Reeves and Nash, 1997), we assumed that the perceived “audience” for youth responses mattered and could significantly influence reporting among the voice types.

What we found was significant affirmative reporting to the adult female voice for questions regarding smoking intentions, even when examined by the key demographic groups of age, gender, and race. Likewise this was true for reports of ever having tried a cigarette when examined by age and gender. While we didn't find significantly more reporting on any items to the youth female voice, we did observe slightly more youth saying that they smoked one day or more in the past 30 days to the youth female voice. We also observed slightly more youth saying that they had ever tried a cigarette to the adult voice, though this too didn't have statistical significance.

With these results we cannot rule out Reeves and Nass' (1997) theory regarding risk of disclosure or the conclusion of Couper, et al. (2004) that IVR voice type doesn't significantly influence respondent answers to sensitive questions for our overall sample. However, one thing was clear in examining our data: For older youth (ages 14-16), voice did not appear to make any significant differences in how they reported smoking behaviors or intentions. This finding does align with what Couper et al. (2004) observed in their study of adults age 18 and older.

We aren't sure why younger youth, where the consequences of disclosing to an adult “audience” would normally be perceived to be higher, appeared to feel more comfortable reporting affirmatively on some smoking behaviors and intentions to the adult voice. We assume that one's perceived consequences of disclosure depend on the beliefs of their peer reference group as well as those of their parents. Thus, if one or both of these sets of individuals smoke, the consequences youth perceive may be different from the “norm.”

When reviewing the demographic characteristics of our survey respondents, we did observe age and race imbalances within the sample. These imbalances could have contributed to the

higher rate of past and recent tobacco use that was reported among respondents receiving the adult female voice. However when we calculated what the response distribution might have been if age and race had been evenly balanced between voice types, we saw very little change in the proportion of positive answers within the voice groups.³ Thus, it does not appear that age and racial group imbalances were responsible for a large proportion of the differences we observed.

Rates regarding past tobacco use and intentions to smoke that were reported by black respondents may not represent youth in that demographic subgroup well. We interviewed a disproportionately small number of respondents who identified themselves as black, so respondents in this subgroup were given higher weights to compensate. However, this subgroup had a higher proportion of 14-16 year old respondents than contained in the sample overall. Since older youth in our sample generally reported more past tobacco use and higher intentions to use tobacco products in the future, our data probably overestimate past tobacco use and intentions to smoke for Black youth in general.

Thus, considering all of our results, we conclude that the selection of IVR voice type may have a greater impact on youth aged 12 to 13, females, and some racial and ethnic groups. We suggest that extra care should be taken in evaluating IVR voice types for these demographic subgroups. More insight into the underlying cause for some of the patterns we observed in this experiment might be obtained by conducting a survey with a larger sample size and a design that allows for comparisons between more IVR voice types and “live” CATI interviewers.

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³ In order to get a sense of how large the sample imbalance effect may have been, we examined the question, “Do you think you will smoke a cigarette during the next year?,” which showed a statistically significant difference in answers given to the two voice types. Using the overall rate of affirmative and negative responses for each age group, we calculated that balancing the sample by age group would only reduce the proportion of positive answers within the adult voice by about 0.1%. Similarly small differences were found when calculating the potential impact of balancing the distribution of race subgroups between the voice types for this question. Although we did not perform these calculations for all of our questions, the degree of age and race group imbalance for all of the questions was similar.

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Appendix: Survey Items, Variable Coding, and Overall Weighted Frequencies from the FL YCS

Demographic Characteristics	Survey Item	Coding	Frequencies	
			Adult Female Voice	Youth Female Voice
Age	What is your age? _____ (ENTER IN YEARS)	1. 12 to 13 2. 14 to 16	30.8 % 69.2 %	39.4 % 60.6 %
Gender	For survey purposes, I need to confirm if you are male or female?	1. Male 2. Female	49.7 % 50.3 %	53.2 % 46.8 %
School attendance	Did you attend school this <u>past</u> school year, the 2008-2009 school year? (for at least half of the school year)?	1. Yes 2. No	99.7% 0.3%	99.4 % 0.6%
School type	Is your school Public or Private?	1. Public 2. Private 3. Homeschooled 4. Other	79.6% 16.1% 3.3% 0.9%	80.3% 14.7% 3.2% 1.7%
Highest grade completed	What is the highest grade or year of school you have completed? 1. 4 th Grade 2. 5 th Grade 3. 6 th Grade 4. 7 th Grade 5. 8 th Grade 6. 9 th Grade 7. 10 th Grade 8. 11 th Grade 9. 12 th Grade or GED 10. 13 th (any mention of college) 11. In an un-graded program 12. Being home schooled	1. 8 th grade or lower 2. 9 th grade or higher	60.8% 39.2%	61.6% 38.4%

	13. Did not go to any school 14. Other, specify			
Race/ethnicity	<p>How do you describe yourself? You can choose more than one of the following categories.</p> <ul style="list-style-type: none"> 1. American Indian or Alaska Native 2. Asian 3. Black or African American 4. Hispanic or Latino 5. Native Hawaiian or Other Pacific Islander 6. White 7. Other, Specify 	<ul style="list-style-type: none"> 1. White Non-Hispanic 2. Black Non-Hispanic 3. Hispanic 4. Other Non Hispanic 	48.3% 19.9% 25.6% 6.2%	52.4% 16.5% 19.3% 11.8%
Employment status	<p>Do you currently have a full time or a part-time job for pay?</p> <ul style="list-style-type: none"> 1. Full-time job 2. Part-time job 3. Full-time and part-time job 4. No job 	<ul style="list-style-type: none"> 1. Working 2. Not Working 	6.8% 93.2%	6.5% 93.5%
Religious services attendance	<p>How often do you attend church or religious services? Would you say...</p> <ul style="list-style-type: none"> 1. Never 2. Less than once a month 3. About once a month 4. About 2 or 3 times a month 5. Once a week 6. More than once a week 	<ul style="list-style-type: none"> 1. Once a month or less 2. More than once a month 	41.4% 58.6%	38.6% 61.4%

More/Less Sensitive Questions	Survey Item	Coding	Frequencies	
			Adult Female Voice	Youth Female Voice
Ever tried cigarette	Have you ever tried cigarette smoking, even 1 or 2 puffs?	1. Yes 2. No	13.4% 86.6%	10.6% 89.4%
Cigarettes smoked in entire life	About how many cigarettes have you smoked in your entire life? 1. 1 or more puffs, but never a whole cigarette 2. 1 cigarette 3. 2 to 5 cigarettes 4. 6 to 15 cigarettes or about half a pack 5. 16 to 25 cigarettes or about a pack 6. 26 to 99 cigarettes or more than a pack but less than 5 packs 7. 5 packs or more	1. 5 cigarettes or less 2. More than 5 cigarettes	72.6% 27.4%	71.0% 29.0%
Days smoked in past 30 days	During the past 30 days, on how many <u>days</u> did you smoke cigarettes, even 1 or 2 puffs?	1. Didn't Smoke (0 days) 2. Smoked (1 day or more) 3. Don't know/refused	52.0% 42.0% 6.0%	55.6% 44.4% 0.0%
Ever tried chewing tobacco, snuff or dip	Have you ever tried chewing tobacco, snuff, or dip, such as Redman, Levi Garrett, Beechnut, Skoal, Skoal Bandits, or Copenhagen?	1. Yes 2. No	4.1% 95.9%	5.3% 94.7%
Ever tried other tobacco products	Have you ever tried Snus, Taboka, Tobacco strips, or Electric cigarettes?	1. Yes 2. No	1.1% 98.9%	1.6% 98.4%

Ever tried cigars	Have you ever tried smoking cigars, cigarillos, or little cigars, even one or two puffs?	1. Yes 2. No	9.1% 90.9%	7.9% 92.1%
Intentions to Use Tobacco	Survey Item	Coding	Frequencies	
			Adult Female Voice	Youth Female Voice
Smoke cigarette in the next year	Do you think you will smoke a cigarette anytime during the next year? Would you say... 1. Definitely yes 2. Probably yes 3. Probably not 4. Definitely not, or 5. You have no opinion	1. Definitely/probably yes 2. Definitely/probably no	8.1% 91.9%	4.8% 95.2%
Try cigarette soon	Do you think you will try a cigarette soon? Would you say... 1. Definitely yes 2. Probably yes 3. Probably not 4. Definitely not, or 5. You have no opinion	1. Definitely/probably yes 2. Definitely/probably no	4.4% 95.6%	4.1% 95.9%
Smoke cigarette from a best friend	If one of your best friends offered you a cigarette, would you smoke it? Would you say... 1. Definitely yes 2. Probably yes 3. Probably not 4. Definitely not, or 5. You have no opinion	1. Definitely/probably yes 2. Definitely/probably no	7.6% 92.4%	4.3% 95.7%

