**Social Science Computer Review**
Volume 24 Number 4
Winter 2006 476-488

10.1177/0894439306288690
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# The Effects of Data Collection Mode and Disclosure on Adolescent Reporting of Health Behavior

Timothy J. Beebe
*Mayo Clinic College of Medicine*

Patricia A. Harrison
*Minneapolis Department of Health and Family Support*

Eunkyung Park
James A. McRae, Jr.
*Minnesota Department of Human Services*

James Evans
*Allina Medical Clinic*

This study examined how information obtained from an adolescent screening instrument administered in a medical clinic is affected by the method of data collection and knowledge that a summary report would be given to the provider. The Adolescent Health Review (AHR) was administered to 610 adolescent patients randomly assigned to 1 of 3 conditions to test the effect of mode of administration (paper vs. computer) and disclosure of results to the provider versus only to researchers (using the computer version). The AHR obtained information on mental health, sexual experiences, and use of psychoactive substances. Response patterns varied by mode of administration, with the paper version generally eliciting higher, and arguably more accurate, rates of disclosure. Knowing that the results would be provided to the doctor further attenuated disclosure. Results suggest that the paper version's higher rates of reporting must be weighed against the computer version's benefits of automated scoring and reporting.

***Keywords:*** *adolescents; screening; risk behavior; mode effects; computer screening*

Major threats to adolescent health include tobacco, alcohol, and other drug use, unprotected sexual activity, violence, and suicide attempts (Ford, Bearman, & Moody, 1999; Montalto, 1998; Resnick et al., 1997). Systematic screening in primary care clinics

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**Authors' Note:** The project described was supported by Grant 5 R01 AA12179-02 from the National Institutes of Health (NIH), National Institute on Alcohol Abuse and Alcoholism (NIAAA), and the Substance Abuse and Mental Health Services Administration (SAMHSA), Center for Substance Abuse Treatment (CSAT). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of NIH, NIAAA, SAMHSA, CSAT, or Allina Medical Clinics. The authors express their gratitude to Dan Bellandi and Ted Mika for the software development, Martha Arthur and Lori Foss for their diligent data collection, and all the staff at the Allina Clinic who so graciously accommodated our study procedures. We especially appreciate the contributions of all the adolescents who participated in the study.

for such health risks is critical because most adolescents are seen in these settings at least annually (Elster & Levenberg, 1997; Ford et al., 1999; Halpern-Felsher et al., 2000), screening has been shown to be clinically effective, and early intervention can avert serious harm (Mason & Adger, 1997; Paperny & Hedberg, 1999; Silverman, Raj, Mucci, & Hathaway, 2001). Despite the consensus evident in national screening guidelines (Elster & Kuznets, 1994; Green, 1994; Stein, 1997; U.S. Department of Health and Human Services, 1994; U.S. Preventive Services Task Force, 1996), adherence remains a problem (American Academy of Pediatrics, 1997; Blum, Beuhring, Wunderlich, & Resnick, 1996; Frankenfield et al., 2000; Halpern-Felsher et al., 2000). Barriers to screening include constraints on providers' time (Blum & Bearinger, 1990; Capelli et al., 1995; Fuller & Cavanaugh, 1995), provider and patient reluctance to discuss sensitive subjects (Malus, LaChance, Lamy, Macaulay, & Vanasse, 1987; Middleman, Binns, & Durant, 1995; Thrall et al., 2000; Vaughn et al., 1996), and an absence of useful clinical tools (Frankenfield et al., 2000; Harrison, Beebe, & Park, 2001).

Several characteristics of an efficient and effective screening procedure have been identified. Questionnaires that address a range of problems offer efficiency of scale to busy primary care providers (Knight, 2001) and are especially appropriate for adolescents because multiple risks often coexist (Belcher & Shinitsky 1998; DuRant et al., 2000; DuRant, Knight, & Goodman, 1997; Harrison, Fulkerson, & Beebe, 1997; Kandel et al., 1997; Silverman et al., 2001). Computerized instruments are ideal for this purpose because they are capable of being completed and scored quickly, even with complex scoring algorithms, so the provider has the results to address during the visit (Frankenfield et al., 2000; Knight et al., 1999).

The efficiency afforded by automated scoring and reporting is one appealing aspect of computerized questionnaires in a clinical context. Another is that adolescents may prefer a computer interview over a written questionnaire (Paperny, Aono, Lehman, Hammar, & Risser, 1990), which may facilitate more candid disclosure of sensitive information to the former rather than the latter. To test the effect of mode of administration on rates of self-disclosure among adolescents, computerized questionnaires have been compared with paper-and-pencil questionnaires in household (Turner et al., 1998; Wright, Aquilino, & Supple, 1998) and school-based (Beebe, Harrison, McRae, Anderson, & Fulkerson, 1998; Hallfors, Khatapoush, Kadushin, Watson, & Saxe, 2000; Patton et al., 1999) surveys under the condition that responses would be available only to researchers. Two similar studies conducted in clinical settings (Millstein & Irwin, 1983; Webb, Zimet, Fortenberry, & Blythe, 1999) have also limited the disclosure of responses only to researchers. Relative rates of reporting for a variety of behaviors have been inconsistent, yielding no definitive conclusion as to the superiority of one mode over the other.

Only one study (Paperny et al., 1990) was identified that compared a computerized and a paper-and-pencil questionnaire under conditions applicable to screening in a clinical practice, that is, when participants knew that their results would be shared with a clinician. In that study, a subset of participants completed the questionnaire prior to the physical examination, and the computerized version generally elicited higher reports of sensitive behaviors. However, a number of methodological shortcomings and potential confounds render the generalizability the Paperny et al. (1990) findings unclear. First, there was a lack of equivalence between the written questionnaire and its computerized counterpart that may have contributed to lower reports of sensitive information in the paper-and-pencil questionnaire. For example, the minimum of 32 items in the questionnaire could expand to as many as 62 items based on how the adolescent responded to the initial questions. In the computer version, the branching was automatic, but in the paper version, the adolescent presumably had to follow what would likely be a cumbersome series of branching instructions. The observed reporting differentials, therefore, may merely be an artifact of higher item nonresponse propensity to the most sensitive follow-up questions in the more burdensome written questionnaire. Second, the computer questionnaires were completed in a "computer room," whereas the paper version was completed in the physical examination room. Finally, participants assigned to the computerized version were told they would be given automatic feedback, which could motivate them to give more honest responses. Because of this, an extension of this earlier work is warranted.

The objective of the current study was to measure the effects both of mode of administration and of disclosure of results to the provider. For the mode experiment, results were compared for a computer and a paper version. For the disclosure experiment, results of the computer version were compared for patients who were informed in advance that their results would be shared with the provider and those who were told that their results would be seen only by researchers.

# Method

## Data Sources and Study Setting

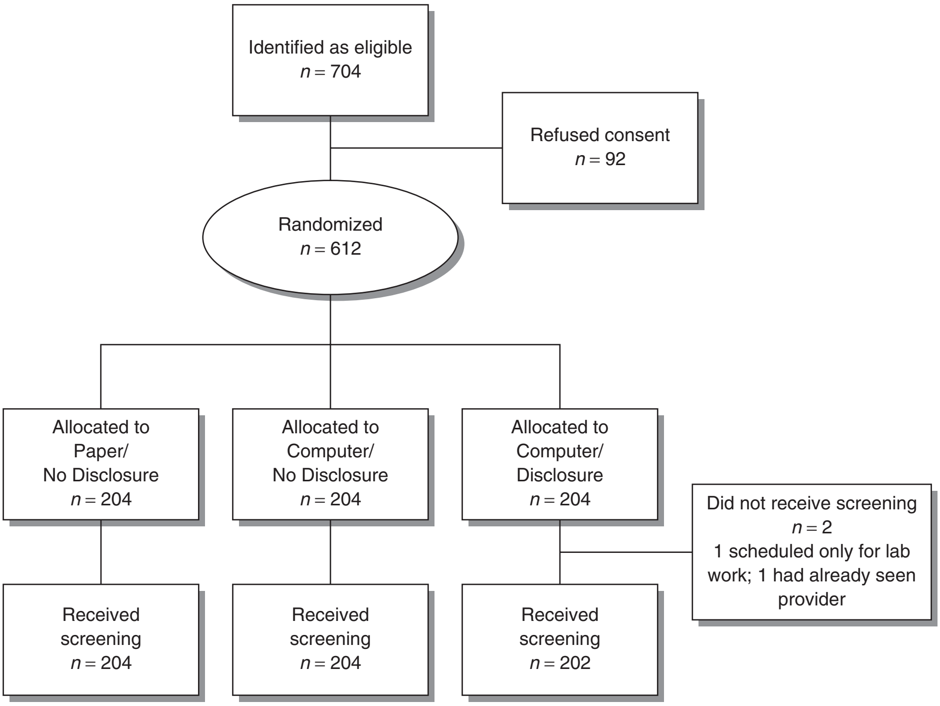
The study site was a Midwestern primary care clinic associated with a large managed-care organization in a small town. The target sample was adolescents between 12 and 18 years of age who appeared for a scheduled office visit between August 2000 and May 2001. Minors had to be accompanied by a parent or legal guardian to be eligible to participate. In all, 24 physicians and nurse practitioners who saw adolescents as part of their routine practice were involved in the study.

## Data Collection Methods

A daily roster that included the gender and age of scheduled patients was used to aid the two research assistants in identifying eligible participants. They approached prospective recruits in the waiting room to describe the study and provide a written description. The recruits were told that they would be completing a survey on a computer or on paper and that some questions in the survey were sensitive and may make some people feel uncomfortable. Participants were then informed explicitly about the randomization process where they would be assigned to one of three groups described below. For minors, a parent or legal guardian was required to sign a consent form, and the patient was required to sign an assent form. Patients who were 18 years old signed a consent form. A $10 gift certificate was provided to patients who consented to participate.

To conform to the requirements of the Minnesota Government Data Practices Act and stipulations of two institutional review boards, the study information sheet and consent form were explicit with respect to the content of the questionnaire, for example, mentioning "illegal behavior" and identifying the exceptions to patient confidentiality (risk of self-harm, drug use during pregnancy, and sexual or physical victimization of a minor). Also,

**Figure 1**
**Study Sample and Random Assignment**



both participants and the parents of minors were advised about exceptions to confidentiality. For example, they were told that a physician concerned about suicidal thinking might talk with other professionals or the parents of a minor; physical or sexual abuse of a child and use of a controlled substance by a patient who is pregnant might have to be reported to other agencies. In accordance with state law, minors were told that their parents could not find out their answers unless they wanted them to, and parents were told about their child's right to privacy.

A research assistant escorted consenting patients (without their parents) to a vacant examination room and randomly assigned them to a study condition. One group was assigned the paper version and told that their responses would not be given to their provider (paper and no disclosure). A second group was assigned the computer version and also told that their results would not be given to their provider (computer and no disclosure). The third group was assigned the computer version and told that a summary report would be given to their provider before they met (computer and disclosure). Figure 1 provides a graphical overview of the study design and data collection process.

After random assignment to condition, the research assistant recorded the patient's gender, age, and experimental condition and then stepped outside the room to allow the patient to complete the questionnaire in private. To maintain confidentiality of responses, patients assigned to complete the paper version were given an envelope in which to seal their questionnaire; patients completing the computer version closed out the final computer screen before calling the research assistant back into the exam room. For the computer and disclosure group, the research assistant then printed an automated, one-page summary report and gave it to a nurse to attach to the patient's clinical chart for the provider to review. The patient did not see the summary of his or her responses unless the provider chose to share them.

The computer version included an administrative screen on which the research assistant recorded patient demographic information and study condition, an instruction screen for the respondent, the screening items themselves presented on six screens, and a close-out screen. The computer and paper versions were designed to appear as similar as possible in terms of layout, color, and font; the computer version did not include any automated skip patterns. The computer version was designed so that the respondent could go back and forth from screen to screen to allow for the same freedom to maneuver and change answers that the paper version afforded.

## Measures

Both versions of the instrument were based on the Adolescent Health Review (AHR). Details regarding the AHR are provided elsewhere (Harrison et al., 2001) and are only briefly summarized here. In addition to demographic information, the AHR contains 29 items that address lack of exercise, poor nutrition, unhealthy weight control, family interaction problems, problems at school, emotional distress, suicidal ideation and behavior, violent behavior, sexual activity, cigarette smoking, alcohol use, marijuana use, substance abuse or dependence symptoms, and physical or sexual abuse. For purposes of the current analysis, days of exercise and servings of fruits and vegetables were treated as continuous variables. The seven substance use disorder questions were combined into a composite variable, so that a yes response to one or more questions was defined as a problem. The remaining variables were dichotomized so that 1 indicated a problem and 0 represented no problem. The responses defined as problem are shown in Table 1.

## Statistical Analysis

It was hypothesized that the two administration modes would yield comparable results and that the disclosure condition would yield fewer reports of risk behaviors or events. The hypotheses were tested by performing chi-square analyses of the binary dependent variables; *t* tests were used for the two continuous measures (see Table 1). The contingency tables were run separately to test mode effects (comparison of columns 1 and 2) and to test disclosure effects (comparison of columns 2 and 3).

# Results

The study sample consisted of 610 participants, 87% of those asked to participate (see Figure 1). Although patients were randomly assigned to conditions (204 to each), two patients in the computer and disclosure condition did not receive screening. The mean age

## Table 1
## Distributions of Self-Reported Health Information by Mode and Disclosure Conditions

| | A. Paper and No Disclosure[a] | | B. Computer and No Disclosure[b] | | C. Computer and Disclosure[c] | | Mode Effect (B – A) | Disclosure Effect (C – B) |
|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | | |
| Days exercised past week | 3.44 | 2.16 | 3.52 | 2.23 | 3.21 | 2.11 | 0.08 | –0.31 |
| Servings of fruits/vegetable yesterday | 2.50 | 1.23 | 2.41 | 1.22 | 2.45 | 1.25 | –0.09 | 0.04 |
| | % | | % | | % | | | |
| Vomited, took laxatives, used diet pills to lose or control weight past 30 days (yes) | 5.9 | | 4.4 | | 5.4 | | –1.5 | 1.0 |
| Feels family has lots of fun (not at all, a little) | 20.1 | | 16.6 | | 15.4 | | –3.5 | –1.2 |
| Parents care about you (not at all, a little, some) | 6.4 | | 6.9 | | 3.5 | | 0.5 | –3.4 |
| Teachers interested in you (none of them, a few of them) | 23.5 | | 21.1 | | 16.0 | | –2.4 | –5.1 |
| Skipped school past 30 days (1 or more days) | 19.9 | | 21.5 | | 18.9 | | 1.6 | –2.6 |
| Felt sad past 30 days (all of the time, most of the time) | 8.4 | | 6.9 | | 7.0 | | –1.5 | 0.1 |
| Felt nervous, worried, anxious past 30 days (all of the time, most of the time) | 14.8 | | 9.9 | | 9.5 | | –4.9 | –0.4 |
| Suicidal ideation past year (yes) | 28.2 | | 24.3 | | 19.0 | | –3.9 | –5.3 |
| Suicide attempt past year (yes) | 6.4 | | 9.4 | | 5.5 | | 3.0 | –3.9 |
| Beat someone up past year (1 or more times) | 30.7 | | 27.2 | | 20.1 | | –3.5 | –7.1* |
| Carried weapon past year (1 or more times) | 11.6 | | 13.3 | | 6.0 | | 1.7 | –7.3** |
| Has ever had sexual intercourse (yes) | 16.9 | | 16.3 | | 18.4 | | –0.6 | 2.1 |
| Used condom during last sexual encounter (no)[d] | 41.4 | | 32.4 | | 39.4 | | –9.0 | 7.0 |
| Cigarette use past 30 days (any amount) | 19.3 | | 13.9 | | 13.0 | | –5.4 | –0.9 |
| Alcohol use past year (1 or more times) | 35.8 | | 30.5 | | 30.7 | | –5.3 | 0.2 |

*(continued)*

Table 1 (continued)

| | A. Paper and No Disclosure[a] | B. Computer and No Disclosure[b] | C. Computer and Disclosure[c] | Mode Effect (B – A) | Disclosure Effect (C – B) |
|---|---|---|---|---|---|
| | % | % | % | | |
| Typical alcohol quantity per occasion (3 or more glasses) | 19.5 | 13.4 | 15.0 | –6.1* | 1.6 |
| Marijuana use past year (1 or more times) | 16.5 | 12.8 | 12.6 | –3.7 | –0.2 |
| Symptom of substance use disorder (1 or more)[e] | 19.6 | 10.3 | 11.9 | –9.3** | 1.6 |
| Ever physically abused by adult in family (yes) | 6.4 | 3.4 | 4.0 | –3.0 | 0.6 |
| Ever sexually abused by any adult or older person (yes) | 4.5 | 3.0 | 0.5 | –1.5 | –2.5* |
| Victim of date rape or other date violence (yes) | 2.5 | 3.0 | 1.5 | 0.5 | –1.5 |

a. $n = 204$.
b. $n = 204$.
c. $n = 202$.
d. Of those reporting having had sexual intercourse.
e. Used because you were sad, lonely, or angry; used so much that the next day you could not remember what you had said or done; ever tried to cut down on use but couldn't; use has hurt relationships with friends and family; missed work or school because of use; use has caused problems with the law; hit someone or became violent while using.
*$p < .10$. **$p < .05$. ***$p < .01$.

was 15.0 years. A slight majority (52.0%) of the participants were female, and a majority were White (91.6%). Most (95.9%) were either attending school or on vacation; 2.6% had graduated, and 1.5% had dropped out of school or been suspended or expelled. Neither age nor gender varied significantly by condition (data not shown).

Table 1 provides the mean scores or percentages reporting problems by mode and by disclosure conditions. Comparing the two nondisclosure conditions to examine mode effects (column 4) reveals that reports of risk behaviors and events were generally higher in the paper condition than in the computer condition. Specifically, higher levels of risk (> 1%) were reported in the paper condition for 14 of 21 variables, although the differences approached or reached statistical significance for only two variables (alcohol quantity at $p < .10$ and substance use disorder symptom at $p < .01$). This general pattern ran counter to the study hypothesis of no mode effect. However, there were three notable—but not significant—exceptions. Recent truancy, a suicide attempt in the past year, and carrying a weapon, all sensitive behaviors, were reported more often (≥ 1.6%) in the computer condition.

Comparing the two computer conditions to examine disclosure effects (column 5) reveals that the effect of expected disclosure to the provider produced results for the most part consistent with the study hypothesis. For 11 of 21 variables, disclosure lowered the level of reporting (> 1%) vis-à-vis the no-disclosure condition. Differences on three of these approached or reached statistical significance (beat someone up and sexual abuse at $p < .10$ and carried a weapon at $p < .05$). Exceptions were seen, however, for a history of sexual intercourse, failure to use a condom during the last sexual encounter, drinking more than three drinks on a typical occasion, and a symptom of a substance use disorder reported (≥ 1.6%) in the disclosure condition.

In subsequent analyses, the mean number of summed risk behaviors or events was calculated. *T* tests for equality of means comparing the two modes ($p = .092$) and the disclosure or nondisclosure conditions ($p = .570$) revealed that these differences were not statistically significant.

## Discussion

Social desirability theory (Edwards, 1957) rests on the premise that the more highly stigmatized and negatively sanctioned a behavior, the stronger the tendency to deny having engaged in it. This theoretical perspective indicates that distorted responses, either under- or overreporting, will occur as a function of the perceived acceptability of the correct response (Harrell, 1985). Consistent with social desirability theory, the early research literature in this area has typically pointed to the finding that people tend to overreport socially desirable behaviors such as exercise and underreport socially undesirable behaviors such as substance use (Hyman, 1944; Parry & Crossley, 1950; Phillips & Clancy, 1970). In this context, lower reports of sensitive behaviors are usually assumed to reflect less honest self-disclosure. As Bradburn, Sudman, and associates (1979) state, “Threatening behavioral topics invariably elicit under-reporting; thus, higher reporting levels can be interpreted as a reduction in negative response effect rather than an increase in positive response effect” (p. 15). Even though researchers often assume that people tend to underreport sensitive information, “more” is not necessarily “better” (Fendrich & Johnson, 2001). However, there is reason to believe that higher reports of the types of sensitive health information solicited in the current study do reflect more honest reporting for the reasons embedded in the discussion of results below.

The results of the mode experiment showing that reports of risk behaviors and events were generally higher in the paper than in the computer version of the AHR run counter to the study hypothesis and several previous studies that found higher risk reporting in the computer condition (Paperny et al., 1990; Turner et al., 1998; Wright et al., 1998). However, these findings do comport with earlier research conducted in a school setting by the authors (Beebe et al., 1998), suggesting that the effect of mode may be context specific and affected by situational factors such as the presence of others and respondents’ perceptions of the level of privacy or confidentiality (Brener, Billy, & Grady, 2003). In the study (Paperny et al., 1990) most closely aligned with the current investigation, half of the exclusions in the paper-and-pencil condition and a few in the computer condition resulted from a parent being in the examination room. This leads to questions about the assurances of privacy adolescents were given. It may be that those in the paper group had more concerns about parents entering the room, which, in turn, could have led to diminished reporting of sensitive information in that condition. In the current study, parents were not allowed in the room where both versions of the questionnaire were administered, and this location was distinct from the examination room where the provider later met with the patient.

The generally lower reports of sensitive behaviors in the disclosure condition supported the study hypothesis. Fear of parents finding out about undesirable behavior is anxiety provoking (Ford et al., 1999; Vaughn et al., 1996) and a plausible motivation for underreporting. Studies have shown that adolescents are less forthcoming on computer surveys when they believe that others may see their answers (Aquilino, Wright, & Supple, 2000; Beebe et al., 1998). In this study, participants were assured that parents would not be able to see their answers, and only when a provider was concerned about suicidal threat would the provider talk to a parent. Even with such an assurance, the explicit nature of the consent form required for this study may have amplified adolescent concerns about privacy. Suicidal behavior and abuse victimization were both mentioned in the information given to participants as situations that may have to be discussed with parents or others, and these were among the questions that elicited lower rates in the disclosure condition.

Although there was a trend in both the mode and disclosure comparisons for lower risk reporting in one of the two conditions, neither comparison produced entirely consistent results; this was probably, at least in part, because of the relatively small sample. Also, some adolescents may exaggerate risky behavior to impress peers, and there is some evidence that this occurs in school-based surveys (Poulin, MacNeil, & Mitic, 1993). However, unlike a survey conducted in a classroom of peers that might lead to discussion of answers afterward, there is little reason to believe trying to impress peers would motivate dishonest answers in a family clinic-based survey.

The past patient-provider relationship is another factor that could have affected participants' candor. Because concerns about parents' finding out could prompt denial of undesirable behavior, participants were assured that parents would not be able to see their answers, and only when a provider was concerned about suicidal threat would the provider talk to a parent. Whether participants trusted this assurance on the confidentiality of their answers may have depended on their prior relationship with the provider. It may also have been affected by whether they knew either one of the research assistants, particularly because one had a teenage child who went to school in the community.

Another consideration with respect to the provider-patient relationship in the disclosure condition could be the participant's desire to appear "normal" or "healthy." It seems plausible that participants may be more reluctant to acknowledge risky behaviors if they are worried about disappointing someone who has taken care of them for a long time. On the other hand, if the provider-patient relationship is characterized by open and trusting communications, adolescent patients may feel free to disclose candidly.

Because most self-report data cannot be verified independently in a cost-effective, feasible, and ethical manner (Brener et al., 2003), more research is needed to elucidate adolescents' perceptions of confidentiality with respect to the information they report on paper forms versus on a computerized instrument and the information they are willing to disclose to a medical provider. Debriefing interviews with research participants after they complete health risk screening instruments would help to elucidate the factors they weigh when deciding how much personal information to divulge.

Two limitations of the study merit attention. The first relates to the generalizability of the findings. The study was conducted in a single clinic where relatively few adolescents of color or adolescents from low-income families were represented. Testing the instrument in more diverse settings with larger samples is essential. The second limitation was the lack of a paper version and disclosure condition. This condition was regrettably not included because the paper-and-pencil version could not be scored and summarized as efficiently as the computer version. In retrospect, it would have been better to have resolved this problem because including this fourth condition would have allowed for calibrating the relative effects on self-report of both computerization and disclosure. As the study was implemented, it is unclear whether the effect of disclosure observed in the computer condition would be more pronounced, diminished, or the same if implemented in the paper form. Future research should include this manipulation.

Despite the need for further research with respect to honest self-disclosure by adolescents in health care settings and the apparent underreporting in the disclosure condition in this study, adolescents revealed a substantial amount of information that should elicit counseling or intervention. Because certain behaviors or situations may be especially hard for adolescents to reveal, providers need to approach these participants with heightened sensitivity. Adolescents' concerns over privacy also point to the importance of creating a trusting relationship over time and discussing the limits of confidentiality to foster more honest self-disclosure.

In conclusion, the benefits of the computer version may still justify its selection for health risk screening, despite the higher levels of risk reporting observed in the paper condition. These benefits include the automated scoring, synthesis of information, and report generation (Erdman, Klein, & Greist, 1985; Marks & Fisher, 1987; Synodinos & Brennan, 1988), coupled with the appeal of computers to technologically savvy adolescents (Anderson, 1992; Hallfors et al., 2000; Johnston & Walton, 1995; Paperny et al., 1990). In the current context of rather severe time constraints placed on health providers, a computerized, self-administered screener may represent the only viable method by which providers can administer care in accord with the national guidelines that recommend adolescents be screened in primary care for a variety of behavioral health risks.

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**Timothy J. Beebe**, PhD, is associate professor of health services research, Mayo Clinic College of Medicine, and director of the Survey Research Center in the Department of Health Sciences Research, Mayo Clinic. He may be reached at beebe.timothy@mayo.edu.

**Patricia A. Harrison**, PhD, is director of research and program development at the Minneapolis Department of Health and Family Support. She may be reached at Pat.Harrison@ci.minneapolis.mn.us.

**Eunkyung Park**, PhD, is a senior research scientist in the Performance Measurement and Quality Improvement Division at the Minnesota Department of Human Services. She may be reached at Eunkyung.Park@state.mn.us.

**James A. McRae, Jr.**, PhD, is a senior research scientist in the Performance Measurement and Quality Improvement Division at the Minnesota Department of Human Services. He may be reached at James.Mcrae@state.mn.us.

**James Evans**, MD, MPH, is a family physician at the Allina Medical Clinic in Northfield, Minnesota. He may be reached at js_evans@deskmedia.com.