# A COMPARISON OF INTERVIEWER EFFECTS MODELS IN AN RDD TELEPHONE SURVEY OF DRUG USE

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## INTRODUCTION

Measurement errors in epidemiologic surveys of substance use are widely acknowledged. The sources of these errors, however, are less well understood. Among the elements thought to contribute to measurement error are respondent cognitive difficulties with question comprehension and memory retrieval, as well as respondent editing due to concerns regarding survey legitimacy and privacy. These various processes are likely manifested in methodological studies that have identified differential drug use reporting across modes of survey administration (Aquilino, 1994) and respondent characteristics (Fendrich and Vaughn, 1994). Less explored is the possibility that measurement error in drug use surveys may also be a consequence of response editing associated with the quality of interactions between respondents and interviewers.

Although survey researchers have been aware of the existence of interviewer effects for many years, these effects have been predominantly examined in opinion rather than behavioral surveys. Conventional wisdom suggests these effects are most likely to operate: (1) when the respondent does not have a crystallized opinion regarding the topic of the survey question; and (2) the survey topic is sensitive and associated with an interviewer characteristic (e.g., opinions about gender or race relations). Yet, a small but growing body of literature has begun to also identify interviewer effects in responses to behavior-related variables, including sexual behavior, domestic violence and substance use (DeLamater, 1974; Norris and Hatcher, 1995; Johnson and Parsons, 1994), suggesting that interviewer effects may exist in self reports regarding sensitive topics with which interviewer characteristics may not be directly related. The purpose of this study is to review two potential models that may account for the presence and form of interviewer effects in drug use studies and examine a large scale epidemiologic telephone survey of drug use for evidence consistent with each of these alternatives.

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### Models of Interviewer Effects

A review of the literature suggests two theoretical approaches to the study of interviewer effects in survey research. Perhaps the most common of these is a *social attribution model.* This approach suggests that, under some circumstances, respondents may condition their answers to survey items in an effort to conform to the perceived norms they attribute to the interviewer asking the questions (Fendrich et al., 1997). In such instances, perceived interviewer norms are constructed from readily accessible cues, such as interviewer appearance, speech and mannerisms. Consequently, respondents may infer complete sets of beliefs, opinions and attitudes onto interviewers based upon the often minimal information available to them during the survey encounter. Often, the most readily available information about interviewers are their demographic identities, such as their age, race/ethnicity, and gender. Consequently, these characteristics may be used by respondents to stereotype and cope with survey interviewers.

Another approach to interpreting interviewer effects we refer to as the *social distance model.* This model suggests that respondents are more likely to condition their responses as social distance between themself and the person interviewing them increases. Under this model, differences and/or similarities in the social identities of respondents and interviewers jointly determine the likelihood that response editing will take place. As most often conceptualized, survey interactions between respondents and interviewers that produce greater social distance (i.e., fewer shared identities) are thought to be more characterized by interviewer effects than those between less socially distant dyads.

### Interviewer Effects in Telephone Surveys

It would seem intuitive that interviewer effects would be less intrusive in telephone surveys, where there are fewer visual cues available to respondents. Verbal cues, however, are still available for respondent processing. These verbal cues would appear to be more than sufficient to evoke interviewer effects, given the findings to be reviewed below.

We have identified 18 studies that report assessments of interviewer effects in telephone surveys. Of these, nine presented evidence of social attribution processes related to both interviewer race and gender. Four other studies identified patterns that may be

interpreted as being consistent with a social distance model. The remaining five studies reported no clear evidence of interviewer effects. (Space limitations prevent a more detailed listing of these studies. Contact the first author for this information).

The lack of consistency across these reports, of course, may be the consequence of a variety of factors, including sample composition and the survey topics examined. In addition, 12 of these 18 papers relied exclusively on bivariate analysis techniques such as crosstabulations and mean comparisons. Of the remaining six studies that introduced some statistical controls through multivariate analyses, only two controlled for respondent clustering within interviewers, an important source of variation that is commonly left unaccounted for in studies of interviewer effects (Dijkstra, 1983).

During the past five years, there has been a phenomenal growth in the number of substance use surveys conducted in the United States collected via telephone. Much of this research has been supported by the Center for Substance Abuse Treatment (CSAT) at the U.S. Substance Abuse and Mental Health Services Administration (SAMHSA), which has funded substance abuse treatment needs assessment telephone surveys in virtually every state. Although the use of telephone surveys to collect self reports of substance use behaviors is itself controversial, the large scale application of this methodology demands continued efforts to understand sources of measurement error associated with this approach. This study presents analyses from one state's telephone needs assessment in order to begin addressing this issue.

## METHODS

The data examined in this study were collected as part of the Illinois statewide substance abuse treatment needs assessment survey conducted in 1993. The survey instrument and field collection procedures were similar to those recommended by the National Technical Center for Substance Abuse Needs Assessment (McAuliffe, LaBrie, Mulvaney, Shaffer, et al., 1994).

Between July and December of that year, 4,644 telephone interviews were completed with adults (age 18+) residing in Illinois. The sample was selected using a random digit dialing (RDD) design that was stratified statewide by region and by ethnicity within Chicago. All field work was conducted by the University of Illinois Survey Research Laboratory using their Computer-Assisted Telephone Interview (CATI) system. Interviews averaged 18 minutes in length and the response rate for the survey was 70.1 percent. In this paper, unweighted data are analyzed.

Telephone numbers were assigned to interviewers for calling in a non-systematic, or haphazard, manner with two exceptions. First, respondents preferring to be interviewed in Spanish (n = 377) were assigned to one of a small subset of interviewers who were bilingual. Second, interviews completed in households that initially refused to participate were assigned to another subset of interviewers who were responsible for refusal conversions.

### Variable Measurement

The dependent variables of interest are composite indicators of willingness to report lifetime and recent (last 18 month) drug use. The indicator for each time interval is whether or not respondents reported having used marijuana, cocaine, or hallucinogens. Those respondents giving an affirmative response to one or more of the following items were classified as being lifetime drug users: (a) "have you ever used marijuana, even once in your entire life?"; (b) "Have you ever used cocaine, even once in your entire life?; and (c) "Have you ever used hallucinogens, even once in your entire life?" In a similar manner, respondents reporting use of any of these three substances at least once during the last 18 months were classified as recent drug users. The specific wording of the questions used to infer recent use were: (a) "About how many times in the last 18 months have you used marijuana, in any form, for non-medical reasons?"; (b) "About how many times in the last 18 months have you used cocaine, in any form, for non-medical reasons?"; and (c) "About how many times in the last 18 months have you used hallucinogens, in any form, for non-medical reasons?"

In assessing potential interviewer effects that might be associated with each of these measures, we will introduce controls for several respondent characteristics commonly associated with the substance use indicators of interest, including age, gender, race/ethnicity, and years of education.

Several interviewer demographic characteristics were also appended to the final data set for use in these analyses, including age, gender, race/ethnicity, and years of education. Each of these variables was employed as a proxy measure of perceived interviewer norms for tests of the social attribution hypothesis.

These four interviewer characteristics were also used to construct an overall index of social distance for each respondent-interviewer dyad. This index is a simple count (range = 0-4) of the number of social identities, as measured by shared demographic characteristics, that each respondent and interviewer had in common. Consequently, higher index values represent less, and lower index values represent more social distance between respondents and the persons interviewing them. Respondents and interviewers were classified as having a shared identity if they were: (a) of the same

gender; (b) of the same race/ethnic group; (c) within five years of having the same age; and (d) within the same education classification (ie, high school or less vs. at least some college). This measure was used to examine the social distance hypothesis.

**Data Analysis**

We analyzed the responses of 3,714 survey participants (80.0% of the total sample). Cases were excluded for one of three reasons: (1) incomplete data for constructing both drug use indicators; (2) if interviewers completed a very small number of interviews (i.e., less than 5); or (3) respondents reported belonging to a race/ethnic group other than Blacks or Whites. This latter exclusion was made in an effort to avoid including cases that may have had truncated or inflated social distance scores. Latino respondents, for example, were excluded from these analyses because many were interviewed in Spanish, which required them to be "matched" with Spanish-speaking interviewers. Consequently, Latino respondents would have been, on average, assigned higher similarity scores on our social distance measure. Respondents from race/ethnic groups other than Blacks and Whites were excluded because only interviewers from these three groups were employed on this study. These respondents would have consequently been, on average, assigned lower similarity scores on our social distance measure. A total of 27 interviewers conducted interviews with the 3,714 eligible respondents (mean = 137.6 per interviewer; SD = 94.9; range = 6-316).

Preliminary analyses involved evaluations of the association between interviewer characteristics and willingness to report substance use. Chi-square difference of proportions tests were used in these analyses. These involved bivariate assessments of the relationships between our two drug use indicators and (a) four interviewer characteristics and (b) the social distance index.

Several sets of multivariate analyses were next completed to examine alternative interviewer effects models. Each multivariate analysis was first fit using fixed effect logistic regression analysis. These analyses were subsequently repeated using random effects logistic regression models that enabled us to concurrently estimate the usual model parameters and the random interviewer variance. This approach is useful for the present analysis because responses within interviewers will be more correlated than responses across interviewers. The MIXOR computer program developed by Hedeker and Gibbons (1996) was employed for this set of analyses. MIXOR is able to produce maximum marginal likelihood estimates for mixed-effects logistic regression models and assumes that data within clusters are dependent.

To assess the social attribution model, a separate logistic regression equation was estimated for each drug use measure. Each model contained indicators of four respondent demographic characteristics (age, gender, race/ethnicity, and education) that served as covariates. Measures of four interviewer demographic characteristics (age, gender, race/ethnicity and education) served as the independent variables in these equations. Significant relationships between any of these interviewer characteristics and respondent substance use reports would be interpreted as evidence supporting the social attribution model.

The social distance model was assessed using the logistic regression technique, which enabled us to examine the effects of the social distance index while controlling for respondent demographic characteristics. Significant partial regression coefficients for this similarity measure would be interpreted as evidence supporting the social distance model.

**RESULTS**

Lifetime use of one or more drugs was reported by 31.9 percent of our sample. Fewer than one in ten (6.5%) indicated recent (last 18 month) drug use.

**Social Attribution Model**

Willingness to report lifetime and last 18 month drug use were first examined for each of four interviewer characteristics. Table 1 indicates that none of these variables were associated with willingness to report either lifetime or recent drug use.

TABLE 1. WILLINGNESS TO REPORT LIFETIME AND 18 MONTH COMPOSITE DRUG USE BY INTERVIEWER CHARACTERISTICS

| | Lifetime use One or more % (n) | Recent use One or more % (n) |
|---|---|---|
| Interviewer Gender | | |
| Female | 31.9 (2694) | 6.6 (2688) |
| Male | 31.9 (1020) | 6.3 (1016) |
| Interviewer Race | | |
| Black | 30.1 (1644) | 5.7 (1641) |
| White | 33.3 (2070) | 7.2 (2063) |
| Interviewer Age | | |
| 18-30 | 31.7 (1843) | 6.2 (1837) |
| 31-40 | 31.3 (981) | 7.8 (979) |
| 41+ | 32.9 (890) | 5.9 (888) |
| Interviewer Education | | |
| High school or less | 31.1 (1090) | 7.6 (1086) |
| More than high school | 32.2 (2624) | 6.1 (2618) |

We next conducted a more formal evaluation of the social attribution model using fixed effects logistic regression. Two equations were estimated to assess the effects of each interviewer characteristic on lifetime and

recent drug use while controlling for respondent demographics. Not surprisingly, these analyses revealed strong associations between each respondent characteristic examined and likelihood of reporting drug use, confirming the importance of controlling for these variables when assessing interviewer effects. In these models, only one of ten coefficients associated with interviewer characteristics was found to be significantly associated with willingness to report drug use: when controlling for other respondent and interviewer identities, interviewers aged 31 to 40 were found to be more likely to elicit last 18 month drug use reports than were those aged 18 to 30.

A random effects logistic regression model was next estimated to evaluate the effects of interviewer age on willingness to report recent drug use after controlling for the clustering of respondents within interviewers. This model failed to converge, due to the small amount of variance associated with interviewer clustering in these data (see discussion below). We concluded from the above analyses that there was only very weak evidence to support a social attribution model for these data.

**Social Distance Model**

Willingness to report drug use by degree of social distance was next investigated. In Table 2, the proportion of respondents reporting the lifetime use of one or more drugs is first examined for each level of social distance. For all but the most demographically similar interviewer-respondent dyads, the proportion reporting lifetime drug use ranged between 26.4 and 33.5 percent. Respondents who had very little social distance between themselves and the person interviewing them, however, were almost twice as likely (63.4%) to report lifetime drug use. The relationship between our social distance index and lifetime reports was highly significant ($X^2 = 40.4$, df = 4, $p < .0001$).

TABLE 2. WILLINGNESS TO REPORT LIFETIME AND 18 MONTH COMPOSITE DRUG USE BY INTERVIEWER/ RESPONDENT SOCIAL DISTANCE INDEX

| | Lifetime use One or more % (n) | Recent use One or more % (n) |
|---|---|---|
| Social Distance Index | | |
| 0 (low similarity) | 26.4 (330) | 4.2 (330) |
| 1 | 30.2 (1230) | 5.2 (1226) |
| 2 | 33.5 (1402) | 7.7 (1399) |
| 3 | 31.3 (681) | 6.9 (678) |
| 4 (high similarity) | 63.4 (71) | 12.7 (71) |

$X^2$ (Lifetime) = 40.4, df=4, $p < .0001$.
$X^2$ (Recent) = 14.1, df=4, $p < .01$.

Table 2 also reports a similar comparison between willingness to report recent drug use and the social distance index. This association between reports of drug use in the last 18 months and degree of social distance between respondents and interviewers was also significant ($X^2 = 14.1$, df = 4, $p < .01$). Similar to reports of lifetime use, there was a noticeable increase in the proportion willing to report recent drug use at the closest level of social distance (12.7% vs. 4.2-7.7% at other levels).

Multivariate assessments of the relationship between the social distance index and drug use reporting were first examined using fixed effects logistic regression models. After controlling for respondent characteristics, the social distance index was found to be unassociated with lifetime drug use reporting. The social distance coefficient for recent drug use, however, was significant, and a random effects regression equation designed to replicate this model (Table 3) revealed a significant social distance coefficient after adjusting for interviewer clustering.

Given the magnitude of the bivariate association between our social distance measure and willingness to report lifetime drug use (see Table 2), we next respecified the social distance model to determine if a nonlinear relationship would more adequately describe the association between these two measures. This was accomplished by adding an additional variable to represent the square of the social distance index. The fixed effects logistic regression model is presented in Table 4. This analysis indicated that a nonlinear model did in fact better describe the relationship between social distance and lifetime drug use reports. Inspection of the data in Table 2, however, suggests that the relationship being described is more of an elbow than a parabola-like function. This model was subsequently respecified using a random effects regression equation in order to take into account the clustering of respondents within interviewers. This final model did not converge due to the very small amount of variance associated with interviewer clustering observed in these data.

**Interviewer Clustering**

For the one random effects model that did converge (see Table 3), the random effects coefficient for interviewer clustering was found to be nonsignificant. In addition, we also examined the intracluster correlations associated with interviewer clustering for each drug use measure in random effects models that specified the intercept term only. The unadjusted interviewer clustering variability when expressed as the intracluster correlations for lifetime and recent drug use were 0.006 and 0.007, respectively. When adjusting for other covariates, the intracluster correlation for recent drug use was 0.01. These analyses thus confirmed that interviewer clustering accounted for very little of the

variance in drug use reports examined in this study.

## DISCUSSION

Our findings support a social distance model of interviewer effects in drug use surveys. In the RDD telephone survey examined for this study, the social distance between respondent and interviewer was found to be associated with respondent's willingness to report lifetime and recent drug use. Specifically, respondents in dyads that were characterized as being separated by relatively small amounts of social distance were most likely to report drug use. This research also suggests that the relationship between social distance and willingness to report drug use may not be a simple linear process. Almost any social distance (as measured by our index) between respondent and interviewer appears to decrease the probability of respondents reporting drug use, relative to interview situations characterized by very high respondent-interviewer similarity (or low social distance).

Somewhat surprisingly, the findings from our random effects regression analyses did not find substantial effects of interviewer clustering on our self-report measures. Several of the random effects models designed to control for this clustering failed to converge, we believe, because of the absence of meaningful clustering in these data. Results from the one random effects model that did converge (see Table 3) in no way changed our conclusions. In addition, the estimated intracluster random effect variable term was small and nonsignificant. These findings may be a consequence of the fact that our data were collected via telephone interviews where the cues available to respondents regarding the social identities of their interviewer are less clear, although still available.

An important innovation of this study is the development and application of a simple composite index to empirically measure the social distance between respondent and interviewer. Use of this index has enabled us to test a wider variety of models than are typically examined in the interviewer effects literature. We would encourage other researchers with access to similar data sets to replicate these analyses and/or develop more sophisticated indicators of social distance. Future studies might also wish to consider in greater detail the most appropriate functional form for representing a social distance index similar to the one presented here.

Several limitations of the approach taken in this study should also be acknowledged. Perhaps most importantly, our analysis is in large measure based on assumption that survey respondents are able to draw accurate impressions of the social distance between themselves and an interviewer during a brief (roughly 15 minute) telephone encounter. Although the accuracy of this assumption remains unknown, evidence from a validation survey of telephone interviews conducted in Chicago has found that 97 percent of those respondents recontacted were able to correctly recall the gender of the person who interviewed them (Schejbal, Sachs and Lavrakas, 1993). A smaller proportion (73.1%), however, were able to correctly identify the race of their interviewer in a national survey of Black adults (Wolford, Brown, Marsden, Jackson, and Harrison, 1996). Certainly, further research is necessary to determine if the approach used in our study provides an accurate measure of respondent-interviewer social distance. Approaches that rely on respondent subjective assessments of social distance, rather than objective demographic measures of the type reported here should also be considered. In addition, readers should be reminded that only Black and White respondents were included in these analyses and cautioned against assuming that our findings can be generalized to other race/ethnic groups.

Finally, only about two percent of the respondents interviewed in this survey, at random, were matched with an interviewer who shared all four of the social identities examined. Given that our social distance findings suggest that increased drug use self reports are obtained only when all four identities are matches, the substantive effects of our findings on survey prevalence estimates are minimal. Another perspective though, suggests that some proportion of the majority of all respondents who were not interviewed by a highly similar interviewer may have underreported their drug use in this study. We therefore conclude that respondents in drug use surveys may condition their self reports based upon perceptions of the presence of social distance between themselves and their interviewer. Consequently, interviewer effects need to be taken seriously as yet another source of measurement error that must be recognized and confronted when conducting epidemiologic studies of substance use behaviors.

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TABLE 3. FIXED AND RANDOM EFFECTS LOGISTIC REGRESSION ANALYSES OF SOCIAL DISTANCE MODELS OF WILLINGNESS TO REPORT RECENT COMPOSITE DRUG USE: PARAMETER ESTIMATES (STANDARD ERRORS)

| | Fixed effects | Random effects |
|---|---|---|
| Respondent male | 0.90*** | 0.91*** |
| | (0.15) | (0.18) |
| Respondent Black | 0.38** | 0.37 |
| | (0.16) | (0.20) |
| Respondent education | 0.16 | 0.16 |
| | (0.15) | (0.16) |
| Respondent age 41-55 | -1.49*** | -1.49*** |
| | (0.21) | (0.23) |
| Respondent age 56+ | -3.19*** | -3.20*** |
| | (0.39) | (0.40) |
| Social distance index | 0.18* | 0.17* |
| | (0.08) | (0.08) |
| Interviewer clustering | -- | 0.18 |
| | | (0.21) |
| Intercept | -2.90*** | -2.89 |
| | (0.22) | (0.27) |
| Model $X^2$ | 280.59*** | 280.99*** |
| (n) | (3704) | (3704) |

*p<.05. **p <.01. ***p <.001

TABLE 4. FIXED EFFECTS LOGISTIC REGRESSION ANALYSIS OF NONLINEAR SOCIAL DISTANCE MODEL OF WILLINGNESS TO REPORT LIFETIME COMPOSITE DRUG USE: PARAMETER ESTIMATES (STANDARD ERRORS)

| | Fixed effects |
|---|---|
| Respondent male | 0.60*** |
| | (0.08) |
| Respondent Black | 0.11 |
| | (0.10) |
| Respondent education | 0.29*** |
| | (0.09) |
| Respondent age 41-55 | -0.74*** |
| | (0.09) |
| Respondent age 56+ | -2.99*** |
| | (0.14) |
| Social distance index | -0.36** |
| | (0.14) |
| Squared social distance index | 0.10** |
| | (0.04) |
| Interviewer clustering | -- |
| Intercept | -0.13 |
| | (0.15) |
| Model $X^2$ | 955.81*** |
| (n) | (3714) |

**p <.01. ***p <.001.