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Research Article

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Racial/Ethnic Disparities in Consistent Reporting of Smoking-Related Behaviors

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Abstract

This study assessed the effect of race/ethnicity on the prevalence of inconsistent reports regarding ever smoking, time since smoking cessation, and age of initiating regular smoking. We used the Tobacco Use Supplement to the Current Population Survey data, which came from a test-retest reliability study, and considered three racial/ethnic subpopulations, Hispanics, Non-Hispanic (NH) Blacks and NH Whites. Initial exploration of highly disagreeing reports of time since smoking cessation and age of onset of regular smoking initiation indicated that the majority of these reports corresponded to NH Whites. However, the proportion of the extremely discrepant reports was very small (less than 0.8%), and these reports were not included in the main analyses. Univariate analyses revealed that for each smoking measure, NH Whites tended to report most consistently when compared to Hispanics and NH Blacks. However, the only statistically significant result was that Hispanics were more likely to report their regular smoking initiation age inconsistently than were NH Whites. Analyses that adjusted for other factors confirmed this finding, i.e., Hispanics were 1.8 times more likely to provide inconsistent reports of their age of onset of regular smoking than were NH Whites. Furthermore, these analyses showed that the impact of race/ethnicity on the prevalence of inconsistent reporting may depend on other factors, e.g., age and employment status. For example, non-employed NH Blacks were 1.9 times more likely to recant ever smoking than were non-employed NH Whites. The lower consistency in reports by Hispanics and NH Blacks underscores the importance of developing new survey design and research strategies for detecting relatively small differences in reporting among the racial/ethnic minorities. Additional efforts to motivate racial/ethnic minorities to participate in national surveys may not only help increase representation of these subpopulations in study samples but also help improve overall data quality.

Keywords

Smoking; Racial/Ethnic; Health-risk behaviors

Introduction

Racial/ethnic health and health care disparities

Despite substantial efforts to close the gap in health and health care for racial/ethnic minority subpopulations in the US and worldwide, disparities persist. Recent literature indicates that some racial/ethnic subpopulations still have considerably higher mortality rates from cancer, heart disease and other leading causes of death [1-3]. In 2006, 15 leading causes of death accounted for about 81.5% of all deaths in the US. For 9 of these leading causes, the age-adjusted death rates for Blacks were higher than the rate for Whites [1].

Contemporary research targeted at detecting the key reasons for the racial/ethnic health disparities gives great attention to individuals' social settings and psychological states and no longer limits the focus to biological factors [4]. Social factors related to immigration and socioeconomic disadvantage are among the most important factors associated with the racial/ethnic health disparities [4]. For recent immigrants, the disparities are associated with the country of origin [5-7], with language barriers for Spanish speaking Hispanics [8], and, for all minorities, with perceived racial and ethnic descrimination [9]. The stress associated with perceived discrimination can result in initiation of unhealthy coping behaviors such as tobacco use [10-13], alcohol use [10,14,15] and/or illicit drug use [10,14,16]. These health-risk behaviors can trigger new health problems or worsen existing ones for minorities who sense discrimination [9,17]. In addition, the physician's unconcious race bias [18] and the behavior of public health care providers [19] may also contribute to health disparities.

Race/ethnicity and quality of self-assessed health indicators

The health-risk behaviors examined in population-based studies are primarily self-reported, e.g., studies use self-assessed health when identifying overall health status, which is an important indicator of mortality and adverse changes in physical functioning [4]. A review of 21 studies that examined a number of physical health outcomes revealed that racial/ethnic differences exist with respect to overall health status as well as multiple self-reported indicators of overall health and health-risk behaviors, e.g., self-reported cardiovascular disease and cigarette smoking [9,20].

While self-assessments are an important means for gathering essential health-related information, they have a potential drawback of being subject to the response bias. The magnitude of the response bias in self-reported health and health care information may differ drastically across racial/ethnic subpopulations, leading to substantial variation in accuracy of self-reported data for these sub-populations. Several studies examined the quality of data on self-reported health-risk behaviors associated with race/ethnicity. While some studies did not detect any differences, e.g., consistency of reports on marijuana and alcohol use in high school students did not depend on race/ethnicity or gender [21], several other studies did detect a difference. For example, a study similar to [21] examined consistency of reports regarding marijuana use [22] based on the 1979-1984 National Longitudinal Survey of Youth (NLSY). The study showed that the prevalence of inconsistent reports was higher for Black and Hispanic respondents than it was for White respondents. A more recent study of the 1990-1998 NLSY also confirmed that the level of disagreement in reports on marijuana use was higher for Non-Hispanic/Non-Black respondents, although the effect was insignificant after adjusting for other factors [23]. Another study examined alcohol and cigarette use among adolescents based on the 1986-1988 Television, School and Family Project data [24]. The study revealed that the rates of inconsistent reports were higher for Black and Hispanic respondents than they were for White and Asian respondents. Furthermore, a

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test-retest reliability study concerning cocaine and marijuana use evaluated responses to the 1984-1994 National Longitudinal Survey of Youth [25]. The study showed that race/ethnicity was the most important predictor of recanting of substance use (out of several measured factors). A study of California residents also detected a significant effect of ethnic origin (Hispanic, non-Hispanic) on recanting of ever-smoking [26].

Study goals

While prior studies have examined the possible effect of race/ethnicity on accuracy of self-reported health-risk behaviors, the majority of these studies either have not adjusted for other important factors (e.g., gender, employment) or concerned a specific subpopulation (e.g., youth). Adjusting for other factors when evaluating the potential effect of race/ethnicity is essential because these other factors may be more strongly associated with report accuracy [27-30]. Therefore, ignoring those effects may result in incorrect over-estimated effect of race/ethnicity on report accuracy. Moreover, the impact of race/ethnicity may be different across specific subpopulations, e.g., employed and non-employed subjects. A few population-based studies have investigated the data quality of a number of self-reported adult smoking behaviors using population-based data [27-30]. These studies used the Tobacco Use Supplement to the Current Population Survey (TUS-CPS) which is the key source of tobacco use information in the US [31,32]. However, these studies did not consider different racial/ethnic groups and limited the analysis to Non-Hispanic (NH) Whites and "Others". Thus, there is a lack of information concerning differences across racial/ethnic subpopulations, e.g., Hispanics and NH Blacks.

The main goal of our study was to assess the effect of race/ethnicity on the prevalence of inconsistent reporting of smoking-related behaviors. We considered three smoking-related behaviors that were self-reported approximately 1 year apart: ever-smoking for current and former smokers, time since smoking cessation for former smokers, and regular smoking initiation age for ever-smokers (who were regular smokers currently or in the past). For each behavior, we defined a consistency measure and assessed the differences in the prevalence of inconsistent reporting among the Hispanic, NH Black and NH White subpopulations. We evaluated the effect of race/ethnicity with and without adjustment for other important factors, including respondent characteristics and survey method, and examined interactions between race/ethnicity and these factors.

Materials and Methods

Data set and respondent and survey characteristics

We used the 2002-2003 TUS-CPS targeted at assessing test-retest reliability of the survey measures. The survey has administered to the same respondents in 2002 and 2003, and the time between the two assessments was about 1 year [29]. While over a decade ago the data collected, the design of the TUS-CPS did not undergo drastic changes that could influence the data reliability in the past decade, and thus we anticipate that the data quality of 2002-2003 and more recent TUS-CPS administrations are similar.

Table 1 lists respondent and survey characteristics that we considered for each measure. These characteristics included the sociodemographic characteristics of respondents (gender, age, employment status, the highest level of education, geographical region, and metropolitan status), reported at the first assessment, and the method of interview. In addition, we considered several characteristics reported at the 1st assessment, i.e., we explored the potential effect of recent quitting (quit 5 years ago or less, quit more than 5 years ago). Done on consistency of reported time since smoking cessation, and the potential effect of current smoking habits (current smoker, former smoker) on consistency of reports of regular smoking initiation age.

Primary consistency measures

Recanting of ever-smoking: Figure 1 depicts the definition of recanting of ever smoking and the corresponding survey question. This binary measure differentiated between inconsistent reports, i.e., reports that indicated ever smoking in 2002 and never smoking in 2003, and the other (consistent) reports. The sample size for this measure was 15,040.

Time since smoking cessation consistency: We defined this measure for all former smokers who did not relapse between the assessments and reported their time since smoking cessation at both assessments. The survey question was "About how long has it been since you completely quit smoking cigarettes?" First, we constructed the difference between the 2002 and 2003 responses (in years), and then adjusted the difference for the time interval between the assessments. The initial sample size was 2,631. However, we detected 21 extreme observations for the difference score: 4 (19.0%) observations were between 30 and 50 years (in absolute value), and 17 (81.0%) observations exceeded 50 years (in absolute value). The extreme values primarily corresponded to NH Whites (19, 90.5%), 56-80 year olds (20, 95.2%), non-employed respondents (19. 90.5%), and non-recent quitters, i.e., former smokers who quit 5 years ago or longer (16, 83.8%). The extreme values were not included in the analysis. The binary consistency measure differentiated between "consistent" responses, where the difference did not exceed 1 year (in absolute value), and "inconsistent" responses, where the difference exceeded 1 year (in absolute value). The sample size was 2,610.

Regular smoking initiation age consistency: We defined this measure using responses to the survey question "How old were you when you first started smoking cigarettes fairly regularly?" If a respondent had never smoked regularly, then instead of reporting the exact age of onset the respondent indicated that he/she "never smoked regularly." We considered ever-smokers who reported their regular smoking initiation age (in years) at both assessments. First, we constructed the difference in responses. The initial sample size was n=5,186. There were 27 extreme observations for the difference: 14 (51.9%) values were between -30 and -16, and 13 (48.1%) values were between 16 and 27. The majority of these extreme responses, 20 (74.1%), corresponded to NH White respondents, whereas only 4 (14.8%) and 3 (11.1%) corresponded to NH Black and Hispanic respondents, respectively. The extreme values primarily corresponded to 46-80 year olds (23, 85.2%), females (16, 59.3%), current smokers (21, 77.8%), and those respondents who had interviews conducted by phone both times (19, 70.4%). The extreme values were not included in the definition of the consistency measure. We defined the consistency measure to differentiate between consistent responses, i.e., the ones with the difference not exceeding 1 year (in absolute value), and inconsistent responses, i.e., the ones with the difference exceeding 1 year (in absolute value). The sample size for this measure was 5,159.

Statistical methods

All statistical analyses incorporated the Balanced Repeated Replication (with Fay coefficient 0.5) method for variance estimation.

Table 1: Description of the samples.

Characteristic	Recanting of Ever-smoking		Time since Smoking Cessation		Age of Onset of Regular Smoking	
	Count	%	Count	%	Count	%
Race/ethnicity						
Hispanic	1,079	11.92	69	4.38	176	5.72
NH Black	1,245	76.44	2,418	89.27	4,688	86.08
NH White	12,716	11.65	123	6.35	295	8.20
Age						
15-35	3,729	32.35	216	10.07	902	22.33
36-45	3,237	20.38	422	16.63	1,097	20.59
46-55	3,110	18.52	641	23.35	1,272	22.82
56+	4,964	28.74	1,331	49.95	1,888	34.26
Gender						
Male	6,182	43.07	1,307	52.03	2,479	50.44
Female	8,858	56.93	1,303	47.97	2,680	49.56
Highest level of education completed						
High school or less	7,278	49.77	1,222	46.19	2,687	52.37
More than high school	7,762	50.23	1,388	53.81	2,472	47.63
Employment Status						
Employed–at work	9,066	59.97	1,451	55.44	3,151	61.37
Other (employed–absent, unemployed or not in labor force)	5,974	40..03	1,159	44.55	2,008	38.63
Metropolitan Status						
Metropolitan	10,791	78.77	1,875	78.61	3,647	77.18
Non-metropolitan	4,249	21.23	735	21.39	1,512	22.82
Region						
Northeast	3,166	18.02	660	21.67	1,172	19.29
Midwest	4,169	24.13	709	25.33	1,473	26.22
South	4,385	36.46	658	31.80	1,407	33.92
West	3,320	21.38	583	21.20	1,107	20.57
Interview Method*						
Phone both times	8,466	54.34	1,573	58.88	2,995	56.51
In-person both times	3,547	24.76	573	22.71	1,191	23.87
Mixed	3,027	20.90	459	18.41	973	19.62
Recent quitting indicator*						
Recent quitter			518	22.09		
Non-recent quitter			2,092	77.91		
Current Smoking Status						
Current smoker					2,390	47.32
Former smoker					2,768	52.68

*Mixed interview method refers to interviews conducted once by phone and once in-person; recent quitters are former smokers who quit smoking 5 years ago or less and non-recent quitters are former smokers who quit smoking more than 5 years ago.

This approach, together with the replicate weights allows one to correctly adjust for the complex design of the TUS-CPS [31,32]. The significance level was 5%. We used the survey package in SAS®9.4 to run all analyses [33].

To perform univariate analyses we first used Rao-Scott Chi-square (RS) tests (unadjusted for other factors) to seek evidence that the rates of inconsistent reports differed across the racial/ethnic subpopulations. If the overall test was significant, we performed pair-wise comparisons without adjustments for multiplicity, because the resulting testing strategy incorporated a closed hypothesis family, and hypotheses were tested in the pre-specified order [34]. Next, we fitted simple survey logistic regressions (with an intercept) to identify the most important individual predictors out of the factors depicted in Table 1.

To estimate the effect of race/ethnicity on the prevalence of inconsistent reporting (while adjusting for other important factors) we built a multiple logistic regression model for each consistency measure. We explored the significance of all two-way interactions between race/ethnicity and the other factors depicted in Table 1 using an analog of backward elimination (with a 5% significance level for each elimination step). We used Bonferroni adjustments (with a 0.83% significance level) for 6 multiple comparisons between the racial/ethnic subpopulations within each factor. The final models contained all factors as main effects regardless of their significance.

Results

Univariate analyses

Recanting of ever-smoking: The overall rate of inconsistent reporting was 6.7%. The three subpopulations did not differ significantly in terms of prevalence of inconsistent reporting (RS=3.87, df=2. p=0.1443): the rates of inconsistent reporting (i.e.,

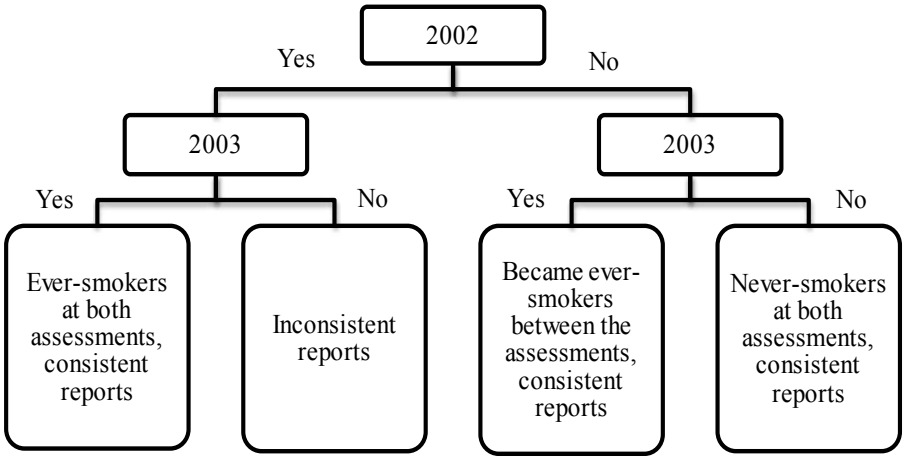

Figure 1: Recanting of ever-smoking: consistent and inconsistent reports of ever-smoking; Yes/no responses correspond to the survey question "Have you ever smoked 100 cigarettes in your entire life?"

recanting) were 8.3% for NH Blacks, 6.5% for Hispanics and 6.4% for NH Whites. Among factors considered as potential predictors of recanting, the most important ones were the interview method ($p<0.0001$), gender ($p=0.0003$), age ($p=0.0085$), metropolitan status ($p=0.0335$), employment status (0.0396) and highest level of education completed ($p=0.0435$), whereas race/ethnicity ($p=0.1537$) and region ($p=0.1362$) were not significant.

Time since smoking cessation consistency: The overall rate of inconsistent reporting was 40.8%. The three subpopulations did not significantly differ in terms of prevalence of inconsistent reporting of the time since smoking cessation (RS=1.59, df=2. $p=0.4511$). The rates of inconsistent reporting were 45.4% for NH Blacks, 45.1% for Hispanics and 40.2% for NH Whites. The most important predictors for prevalence of inconsistent reporting were age ($p<0.0001$), employment status ($p<0.0001$) and the recent quitting indicator ($p<0.0001$), while race/ethnicity ($p=0.4118$) and the other factors were not significant.

Regular smoking initiation age: The overall rate of inconsistent reporting was 35.6%. Testing across the three subpopulations indicated that the racial/ethnic subpopulations did differ in terms of the prevalence of inconsistent reporting (RS=17.21, df=2, $p=0.0002$). The rates of inconsistent reporting were 49.6% for Hispanics, 40.1% for NH Blacks, and 34.2% for NH Whites. Pair-wise comparisons indicated that Hispanics were more likely to provide inconsistent reports in comparison to NH Whites (RS=14.62, df=1, $p=0.0001$), however there was no difference in terms of prevalence between NH Blacks and Hispanics (RS=3.54, df=1, $p=0.0600$) and NH Blacks and NH Whites (RS=3.20, df=1, $p=0.0737$). The most important predictors for prevalence of inconsistent reporting were race/ethnicity ($p=0.0003$), education ($p=0.0002$), and region ($p=0.0078$); the other factors were not significant.

Multiple logistic regression analyses

All three final models were significant at the 5% level ($p<0.0001$). The final model for recanting of ever-smoking included two interactions: between race/ethnicity and gender ($p=0.0286$) and between race/ethnicity and employment status ($p<0.0001$). Among the main effects not included in the interactions, the significant effects corresponded to age ($p=0.0056$), metropolitan status ($p=0.0258$) and interview method ($p=0.0002$). Table 2 presents the model-based results for comparisons between the racial/ethnic subpopulations for each gender and employment status. There was only one significant result: non-employed NH Black respondents were more likely to recant ever-smoking when compared to non-employed NH White respondents.

The final model for the time since smoking cessation consistency measure included only the main effects, and the effect of race/ethnicity was not significant ($p=0.1379$). The significant main effects included employment status ($p<0.0001$) and the recent quitting indicator ($p<0.0001$).

The final model for consistency of the age of regular smoking initiation included only the main effects, where race/ethnicity ($p=0.0014$), education ($p=0.0016$), and region ($p=0.0291$) were significant. The only significant individual comparison corresponded to Hispanics and NH Whites: Hispanics were more likely to inconsistently report their regular smoking initiation age than were NH Whites (OR=1.807, $p=0.0006$). There was no difference between Hispanics and NH Blacks (OR=1.484, $p=0.0627$) and between NH Blacks and NH Whites (OR=1.217, $p=0.1640$).

Discussion

This study explored potential differences in the rates of inconsistent reporting of smoking-related behaviors among Hispanic, NH Black and NH White subpopulations. Univariate analyses that did not adjust for other factors indicated that race/ethnicity was not associated with the rates of inconsistent reporting for ever-smoking and time since smoking cessation but was significantly associated with the rate of inconsistent reporting for regular smoking initiation age. For each smoking measure, NH Whites showed the smallest rate of inconsistent reporting. However, we only detected a statistically significant difference with respect to regular smoking initiation age, i.e., Hispanics were more likely report their regular smoking initiation age inconsistently than were NH Whites.

Multiple logistic regression analyses that adjusted for other factors revealed that race/ethnicity may be associated with inconsistent reporting of some smoking-related behaviors, and the extent of the effect may depend on other factors. For example, the effect of race/ethnicity was significant for regular smoking initiation age, i.e., Hispanics were 1.8 times more likely to provide inconsistent reports

Table 2: Model-based odds ratios for inconsistent reporting of ever-smoking.

Fixed Factor	Comparison	Recanting of Ever-smoking	
		Odds Ratio	Raw p-Value*
Gender			
Male	Hispanic vs NH Black	1.139	0.6479
	Hispanic vs NH White	1.446	0.0732
	NH Black vs NH White	1.287	0.2123
Female	Hispanic vs NH Black	0.571	0.0370
	Hispanic vs NH White	0.672	0.0868
	NH Black vs NH White	1.178	0.3538
Employment Status			
Employed	Hispanic vs NH Black	0.929	0.7854
	Hispanic vs NH White	0.758	0.1788
	NH Black vs NH White	0.816	0.2974
Not Employed	Hispanic vs NH Black	0.700	0.2119
	Hispanic vs NH White	1.299	0.2763
	NH Black vs NH White	1.855	**0.0001**

* Significant (after multiplicity adjustments) results are bold

than were NH Whites. Moreover; the magnitude of the race/ethnicity effect depended on respondent's gender and employment status for recanting of ever-smoking, i.e., non-employed NH Blacks were 1.9 times more likely to recant ever-smoking than were non-employed NH Whites.

There could be several reasons for the above results. First, NH Whites may show the lowest prevalence of inconsistent reporting because respondents from ethnic/racial minorities are more likely to minimize their personal time when responding to a time-consuming national survey and thus tend to satisfice rather than devoting additional time and effort to ensure accuracy [26,35]. The second reason is that there were small sample sizes corresponding to the minority sub-populations analyzed for time since smoking cessation and relatively small counts of respondents who recanted their ever smoking. In addition, to perform meaningful analyses and assure representation of specific subpopulations we limited our measures to binary factors (e.g., employment status, highest level of education, recent quitting indicator) instead of using categorical, much more informative, analogs. This strategy could also limit our ability to detect true differences associated with race/ethnicity in multiple logistic regression analyses. In addition, the extreme discrepant observations omitted from the analyses (that primarily corresponded to NH Whites) could potentially, influence the results for consistency of time since smoking cessation and age of onset of regular smoking.

We also note that the study used specifically defined consistency measures; one could define consistency measures differently, and see different results. We addressed only the race/ethnicity effect on consistency of reports and did not discuss other considered factors, because prior studies addressed the latter effects [27-30].

This study revealed that even a national survey targeted at assessing reliability of smoking-related behaviors could yield insufficient sample sizes for detecting relatively small differences in reporting among of the racial/ethnic minorities, especially when particular subpopulations are considered. Moreover, assessing differences in reliability across racial/ethnic subpopulations (and other characteristics) could be challenging due to the relatively low prevalence of inconsistent reporting for some smoking-related behaviors. However, it is important that these difficulties do not impede current research on racial/ethnic health disparities. Some racial/ethnic minority individuals are skeptical regarding potential benefits (to themselves or their community) of their participation in social-behavioral or medical studies and perceive their involvement as a nuisance [26,35]. Additional efforts to motivate racial/ethnic minorities to participate in national surveys may not only help increase representation of these subpopulations in study samples but also help improve overall data quality. The available TUS-CPS data are representative of the US population (after weighting) and researchers should take advantage of this and other reliable sources of smoking-related behaviors when developing new research strategies and conducting much needed research on racial/ethnic health disparities.

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