

RETROSPECTIVE SURVEY VALIDATION OF TEENAGE SMOKING

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for them to report, as teenagers, their current teenage smoking activity.

1. Introduction.

Smoking and Health¹, a National Status Report to Congress, 1987, cited smoking as the most preventable cause of death; and as such, one of the most important public health issues of our time. The same report indicated that the earlier that individuals start smoking, the more likely they are to experience early mortality. Most smokers started under the age of twenty. Over the years, many estimates have been made on smoking prevalence and consumption. Correspondingly, researchers have long questioned the validity of these estimates. Estimates in general are thought to be low, and estimates for teenagers in particular are thought to be low, especially in household surveys; in part, because of the sensitivity of the topic.

Previous attempts have been made to validate smoking estimates. One such study, by Kenneth E. Warner², examined cigarette consumption compared to cigarette production. Warner found that estimates of consumption ran about 27 to 36 percent below the estimates of production (after production estimates were adjusted for imports, exports and inventories) over a period of several years. Consumption was defined as the amount smoked per person times the number of individuals who smoke. Among the several possible explanations that Warner offers for the discrepancies that he found are: inappropriate interpretations of the comparisons; non-response biases and other methodological problems such as a change in basic survey technique; and underreporting by respondents who smoke because of perceived personal threat or social stigma. Also, individuals may have underreported the amount that they smoked.

In this paper, an attempt is made to focus on underreporting of smoking status in household surveys and a possible method to assess the degree of underreporting. The objectives of this study are fairly simple. They are: to develop retrospective cohort estimates, which are defined in the next section; to compare these retrospective cohort estimates with periodic, direct, cross-sectional estimates for those data years for which such estimates could be found; and to test some hypotheses about the sensitivity of teenagers reporting cigarette smoking in household surveys.

Three hypotheses are considered in this study: that underreporting by teenagers is inversely correlated with age, that there is more underreporting by teenage girls than by teenage boys (it is thought that girls might be more sensitive about smoking than boys), and that over time smoking has become a less sensitive issue. Two major assumptions that were made in order to test these hypotheses are: that individuals can report accurately when they started (and stopped) smoking, and that it is less sensitive for adults to report when they started smoking, than it was

2. Methods and Sources of Data

Both cross-sectional and retrospective cohort estimators are used in this study. The cross-sectional estimates are obtained from the National Health Interview Survey (NHIS) and Chilton Research Services. For the NHIS, a household interview survey, estimates are tabulated directly from the data files, using 'Present Smokers'. For Chilton, the estimates are taken from a published report entitled Teenage Smoking, Intermediate and Long Term Patterns³. Virtually all of the Chilton data are collected primarily by telephone interview. A small portion of the 1968 Chilton data was collected by face-to-face interview in households without phones, to determine whether there were differences in smoking behavior of youths from these households. Chilton concluded that these results showed little change in the data. Also, in a study by Massey⁴, et. al., it was concluded that there were only slight differences in estimates of smoking status due to the mode of data collection (i.e., telephone vs. face to face).

Teenage smoking data for ages 12-18 were available from Chilton surveys for the years 1968, 70, 72, 74, and 79. Smoking data for ages 17 and over were collected in the NHIS in 1970, 1974, and 1979. From the 1979 NHIS data retrospective estimates were formulated for 1968, 70, 72, and 74.

The retrospective cohort estimates for a given year X, were constructed from the 1979 NHIS data, using the age at which individuals started smoking, and adjusting for persons who quit before and during year X.

3. Comparisons and Results

NHIS retrospective cohort estimates are compared with the NHIS cross-sectional estimates for ages 17-24 in Table 1. This is the youngest age group for which NHIS publishes direct estimates of smoking. Some fairly wide differences exist here, with differences for males being larger than the differences for females. For males the retrospective cohort prevalence estimates were 6.5 to 8.0 percentage points larger than the cross-sectional estimates; while for females, the retrospective estimates were 2.0 to 3.5 percentage points larger. All but one of these differences were statistically significant at the 95 percent confidence level.

For ages 12-18, the NHIS retrospective cohort estimates were compared to Chilton's cross-sectional estimates in Table 2. This is the broadest teenage group for which Chilton published direct estimates. If differences are found here, then corresponding differences should be found in the more detailed age groups. In fact, significant differences for males are shown in 1968 and 72, and there is a difference for

females in 1968. Again, differences for males are larger than differences for females and the retrospective cohort estimates were larger than the cross-sectional estimates.

In order to examine the relationship between age and the differences between the retrospective and cross-sectional estimates, cohort estimates for 12-14, 15-16, and 17-18 years of age for males and females were constructed. For males, almost all of the retrospective estimates were larger than the cross-sectional estimates, with the largest differences found among the 17-18 year olds as shown in Table 3. For the 17-18 year old males the retrospective prevalence estimates were 3 to 7 percentage points larger than the cross-sectional estimates. When the three female cohorts were examined a different pattern emerged (see Table 4). For the 15-16 year olds the cross-sectional estimates for 1970, 72, and 74 were slightly larger than the retrospective estimates. For 12-14 year olds and 17-18 year olds the retrospective estimates were slightly larger than the cross-sectional estimates for all years. The differences for females were not as large as the differences for males. Neither the differences for males nor females was correlated with age. That is, underreporting by younger teenagers does not appear to be different than the underreporting by older teenagers. This result could possibly be produced by the forward telescoping by household respondents of the age of starting to smoke.

Some differences over time can be observed from the four tables mentioned above. If these differences can be interpreted as sensitivity, then for the older males, (i.e., ages 17-24 from Table 1), there appears to be a possible decline in sensitivity over time (1970-74). However, there appears to be a fairly wide fluctuating in the differences of the retrospective and cross-sectional estimates for younger males, (i.e., ages 12-18, Table-2); and wide fluctuations especially, for males of age 17-18 (Table-3). The same type of pattern was observed for females. It was concluded that the underreporting of cigarette smoking in household surveys did not change significantly during the 1968-1974 period. This is probably too short a time span, however, to be able to observe a difference in the sensitivity of reporting smoking behavior.

A comparison between NHIS' and Chilton's direct cross-sectional estimates for 17-18 year olds is shown in Table 5. The 17-18 year olds are the only ages for which NHIS cross-sectional estimates can be compared directly with Chilton's. Very significant differences were observed in 1970 for both males and females. For 1974 and 1979, however, the estimates of the two data sources show much more similarity, with the largest difference, here, shown for 1979 males. The greater similarity of the later years, may be the result of closer comparability of definitions between the two surveys.

4. Summary and Conclusions.

Some of the main points found in this study, include the following:

1) Where significant differences are found, the retrospective cohort estimates are larger than the cross-sectional estimates, indicating that there is some underreporting of smoking in teenage surveys.

2) Differences for males are greater than the differences for females, rejecting the hypothesis that girls are more likely to underreport smoking than boys.

3) Greater differences exist for NHIS to NHIS comparisons, than for Chilton to NHIS.

4) No consistently greater differences are found for younger teenagers than for older teenagers. In fact, the greater differences were among the younger girls, and the older boys.

5) The differences found in this study, were less than the differences found by Warner. However, Warner was looking at the amount smoked; whereas, this study examined only the smoking prevalence of teenagers.

5. Limitations of Analysis.

The conclusions reached in the last section are at best tenuous due to a number of possible confounding factors listed below.

1) Definitional and mode-of-data-collection differences exist between both data sources and data years. Although an attempt was made to adjust for some of the definitional differences, it was not always possible.

2) Long-term recall error effects are unknown for the retrospective cohort estimates. Respondents may also be sensitive about reporting very young ages of starting to smoke.

3) Calculation of the retrospective cohort estimates accounts only for the last quit of former smokers. Neither the earlier quit attempts of the 1979 current smokers, nor multiple quit attempts are taken into account.

4) The process of calculating the retrospective cohort estimates revealed that very recent and short-term quit attempts appear to lower the cross-sectional smoking estimates.

5) Not adjusting for mid-year smoking starts, appears to slightly over-inflate the retrospective cohort estimates.

6) Finally, sample sizes are too small to produce reliable estimates for single years of age.

6. Future Considerations.

More specific and consistent definitions of what we are trying to measure are needed. For example, we ask respondents 'About how old were you when you first started smoking fairly regular?' 'About how old ...' acknowledges the fact that the respondent may not remember exactly how old, and thus, accepts the reality of some

memory decay. On the other hand, some people know exactly when they started and stopped smoking and such information would be extremely valuable. What do we mean by 'fairly regular'? Since we do not define the phrase, the respondent must define it for himself in order to answer the question. This may be a source of some variation in our estimates, since different respondents may define the phrase in different ways.

As indicated by the number of confounding factors mentioned above, it is difficult to measure, retrospectively, the effects of specific cause factors such as sensitivity, from observed differences. In order to obtain better measures of such factors, appropriate questions to ferret out individuals' earlier and present sensitivities toward a subject of concern, might be included in the questionnaire. This would provide the opportunity to follow cohorts of individuals over time, and to study the relationship of such factors, to the observed differences between trends of cross-sectional type estimates and trends constructed retrospectively.

Finally, this retrospective procedure for estimating underreporting in household surveys suggests itself for other sensitive topics such as alcohol and other drug use. If such a validation procedure were considered, the retrospective study should be carefully planned to be consistent with the earlier studies.

Table 1. Comparison of NHIS' Annual Cross-Sectional with NHIS' Retrospective Cohort Estimates of Young Adult Smoking Prevalence for Selected Years; Ages 17-24; Total Sample.

Sex	Year	NHIS		NHIS		DIFF.	
		Retro.	Cohort	Cross	Sectional		
Males							
	1970	49.3	(1.1)	41.2	(0.6)	8.1	(1.3)
	1974	46.8	(1.1)	40.3	(1.1)	6.5	(1.6)
	1979	-	-	32.2	(1.0)	-	-
Females							
	1970	33.8	(1.0)	30.5	(0.5)	3.3	(1.1)
	1974	34.8	(0.9)	32.6	(0.9)	2.2	(1.3)
	1979	-	-	32.4	(0.9)	-	-

Standard errors are in parentheses.

7. References.

- Office of Smoking and Health, (1987), Center for Health Promotion and Education, Centers for Disease Control, Public Health Service, U.S. Department of Health and Human Services, Smoking and Health, A National Status Report, A report to Congress, (HHS/PHS/CDC-87-8396)
- Warner, K.E., (1978), Journal of the American Statistical Association, Vol. 73, Number 362; Possible Increases in the Underreporting of Cigarette Consumption
- Chilton Research Services, (1979), for the National Institute of Education, U.S. Department of Health, Education and Welfare, under Contract No. 400-79-0010, Teenage Smoking, Intermediate and Long Term Patterns
- Massey, James T., Barker, Peggy R., and Moss, Abigail J., (1979), National Center for Health Statistics, presented at American Public Health Association Meeting, Nov. 5, 1979, Comparative Results of Face-to-Face and Telephone Interviews in a Survey on Cigarette Smoking

Table 2. Comparison of Chilton's Cross-Sectional with NHIS' Retrospective Cohort Estimates; Teenage Smoking Prevalence for Selected Years; Males and Females, Ages 12-18; Households with Telephones.

Sex	Year	NHIS		CHILTON		DIFF.	
		Retro.	Cohort	Cross	Sectional		
Males							
	1968	19.1	(1.0)	14.7	(0.8)	4.4	(1.3)
	1970	18.9	(1.0)	18.5	(1.1)	0.4	(1.5)
	1972	18.4	(0.9)	15.7	(1.0)	2.7	(1.3)
	1974	16.8	(0.9)	15.8	(1.0)	1.0	(1.3)
Females							
	1968	10.6	(0.7)	8.4	(0.6)	2.2	(0.9)
	1970	12.5	(0.7)	11.9	(0.9)	0.6	(1.1)
	1972	13.9	(0.8)	13.3	(0.9)	0.6	(1.2)
	1974	16.9	(0.8)	15.3	(1.0)	1.6	(1.3)

Standard errors are in parentheses.

Table 3. Comparison of Chilton's Cross-Sectional with NHIS' Retrospective Cohort Estimates of Teenage Smoking Prevalence for Selected Years; Males; Households with Telephones.

Age Year	NHIS Retro. Cohort.	CHILTON Cross Sectional	DIFF.
Ages 12-14			
1968	4.9 (0.8)	2.9 (0.5)	2.0 (0.9)
1970	5.1 (0.8)	5.7 (1.0)	-0.6 (1.3)
1972	5.2 (0.8)	4.6 (0.9)	0.6 (1.2)
1974	5.7 (0.8)	4.2 (0.9)	1.5 (1.2)
Ages 15-16			
1968	22.8 (1.9)	17.0 (1.5)	5.8 (2.4)
1970	16.9 (1.7)	19.5 (2.0)	-2.6 (2.6)
1972	20.0 (1.9)	17.8 (1.9)	2.2 (2.7)
1974	18.8 (1.8)	18.1 (2.0)	0.7 (2.7)
Ages 17-18			
1968	37.0 (2.3)	30.2 (1.8)	6.8 (2.9)
1970	40.2 (2.2)	37.3 (2.5)	2.9 (3.3)
1972	37.2 (2.2)	30.2 (2.3)	7.0 (3.2)
1974	35.3 (2.2)	31.0 (2.4)	4.3 (3.3)

Standard errors are in parentheses.

Table 4. Comparison of Chilton's Cross-Sectional with NHIS' Retrospective Cohort Estimates of Teenage Smoking Prevalence for Selected Years; Females; Households with Telephones.

Age Year	NHIS Retro. Cohort	CHILTON Cross Sectional	DIFF
Ages 12-14			
1968	3.6 (0.6)	0.6 (0.3)	3.0 (0.7)
1970	4.1 (0.7)	3.0 (0.7)	1.1 (1.0)
1972	5.2 (0.8)	2.8 (0.7)	2.4 (1.1)
1974	7.5 (0.9)	4.9 (0.9)	2.6 (1.3)
Ages 15-16			
1968	12.2 (1.3)	9.6 (1.2)	2.6 (1.8)
1970	14.0 (1.4)	14.4 (1.8)	-0.4 (2.3)
1972	15.2 (1.5)	16.3 (1.8)	-1.1 (2.3)
1974	17.5 (1.6)	20.2 (2.1)	-2.7 (2.6)
Ages 17-18			
1968	20.6 (1.8)	18.6 (1.5)	2.0 (2.3)
1970	23.2 (1.7)	22.8 (2.2)	0.4 (2.8)
1972	25.4 (1.8)	25.3 (2.1)	0.1 (2.8)
1974	30.9 (1.9)	25.9 (2.3)	5.0 (3.0)

Standard errors are in parentheses.

Table 5. Comparison of Chilton's Cross-Sectional with NHIS' Cross-Sectional Estimates of Teenage Smoking Prevalence for Selected Years; Males and Females, Ages 17-18; Households with Telephones.

Year	Males				Females			
	NHIS		Chilton		NHIS		Chilton	
1970	27.3	(1.0)	37.3	(2.5)	18.6	(0.9)	22.8	(2.2)
1974	30.9	(2.0)	31.0	(2.4)	24.6	(1.8)	25.9	(2.3)
1979	22.0	(1.7)	19.3	(2.0)	25.6	(1.8)	26.2	(2.3)

Standard errors are in parentheses.