

2



# Lawrence Berkeley Laboratory

UNIVERSITY OF CALIFORNIA, BERKELEY

## Information and Computing Sciences Division

RECEIVED  
LAWRENCE  
BERKELEY LABORATORY

OCT 19 1987

LIBRARY AND  
DOCUMENTS SECTION

Submitted to International Journal of Epidemiology

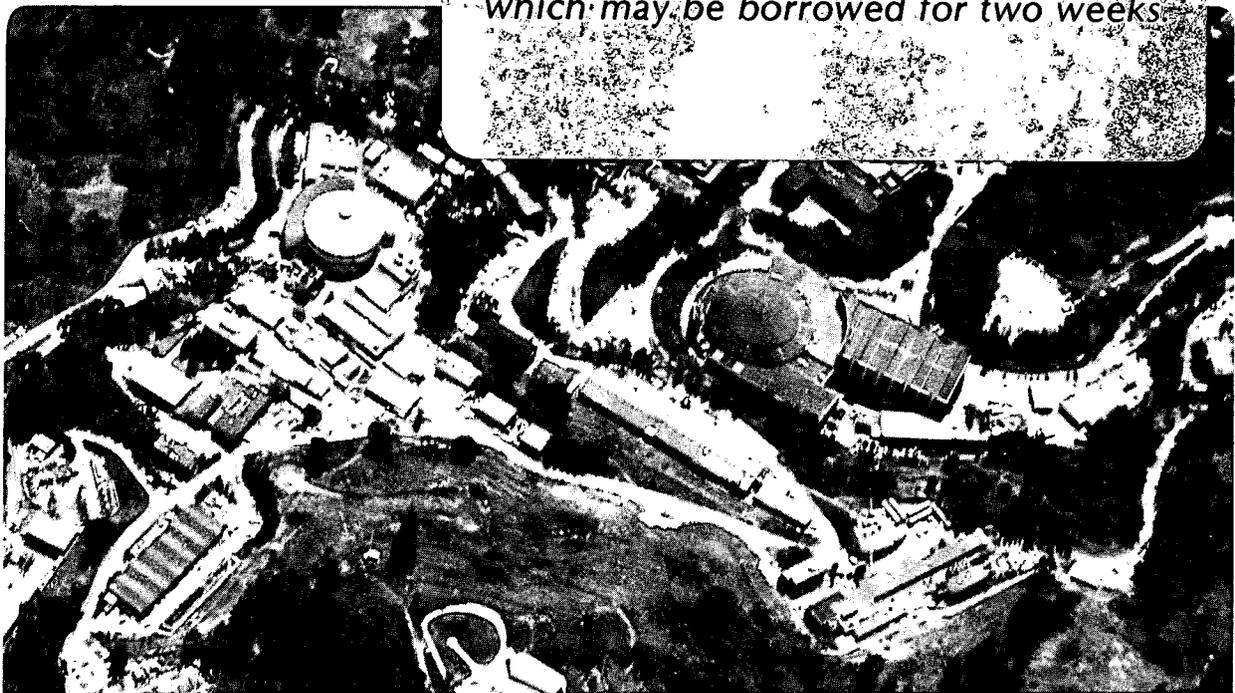
**Recent Trends in Lung Cancer and Smoking in the  
United States**

M. Castle and K. Ragland

July 1987

**TWO-WEEK LOAN COPY**

*This is a Library Circulating Copy  
which may be borrowed for two weeks*



LBL-23755  
2

## **DISCLAIMER**

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.

Recent Trends in Lung Cancer and Smoking in the United States

Mary Castle and Kathleen Ragland

Computer Science Research Department  
Lawrence Berkeley Laboratory  
University of California  
Berkeley, California 94720

July 1987

Submitted to the International Journal of Epidemiology, July 1987.

This research was supported by the Office of Health and Environmental Research, United States, U.S. Department of Energy under contract DE-AC03-76SF00098.

**ACKNOWLEDGMENT**

This research was supported by the Office of Health and Environmental Research, United States Department of Energy under Contract number DEAC03-76SF00098.

**ABSTRACT**

Trends in the prevalence of cigarette smoking in the U.S. and lung cancer incidence and mortality are examined by age, sex and race. The overall prevalence of smokers has decreased from 1955-1983. There is some evidence, however, that among women and blacks there was a slower decline in smoking prevalence, and among women the proportion of heavy smokers may have increased over the time period. Of concern is the prevalence of smoking female teenagers, which does not show the decline apparent among adults.

Lung cancer incidence and mortality rates, examined from the 1930s to 1979 show a decrease among young men. In other age-sex-race groups, increases in rates occur but at a slower rate of increase over time. Rates for females have approached the rates for males among younger age groups, and rates for nonwhite males reached and then exceeded those of white males.

The overall decline in smoking prevalence should be reflected in declines in lung cancer incidence in years to follow. The decrease among young men may be evidence of this. Lesser declines in smoking prevalence among women and blacks, however, may be reflected in smaller declines in lung cancer as these cohorts age.

## INTRODUCTION

Epidemiologists have traditionally used the time and place of disease occurrence to describe a disease and to derive hypotheses concerning the risk factors causally associated with it. Once a risk factor has been established as causally related to a disease, studies of the risk factor can be important predictors of disease rates. Although the interpretation of ecologic data can be difficult<sup>1-3</sup>, changes in the prevalence of a known risk factor over time should be followed by changes in subsequent disease rates, taking into account other changes that occur.

Lung cancer accounts for more deaths than any other cancer. Approximately 21 percent of all newly diagnosed cancers are lung cancer, and the case fatality is high<sup>4</sup>. There is an accumulation of scientific evidence showing a causal association between the use of cigarettes and lung cancer. Given the high attributable risk of cigarettes<sup>5,6</sup>, any changes in smoking habits should be reflected in changes in lung cancer. Wynder predicted a levelling and eventual decline in lung cancer among men and an increase in rates for women<sup>7-9</sup>. He reasoned that women's rates would approach but not equal those of men because their exposure came at a later time, when cigarettes were presumably less carcinogenic.

This is a review of recent research on the trends in the prevalence of smoking and lung cancer incidence and mortality in the United States. Good information is available from major studies establishing smoking prevalence in the mid-fifties, prior to the Report to the Surgeon General<sup>10</sup>, which established initial evidence for its relationship with lung cancer, through the 1970s. Data are also available in major national studies from the 1930s on, establishing time trends in lung cancer incidence and mortality.

## METHODS

For this review, a number of national studies were reviewed which investigated smoking prevalence, defined as the proportion of persons who are current smokers at the time of the survey. Studies selected were felt to represent generalizable information on the U.S. They include three surveys taken by the National Center for Health Statistics (NCHS) before and after the development of the Health Interview Survey<sup>11-13</sup>. States were divided into sampling areas and households within each area were identified for inclusion in each sample. The survey was made by personal interview and included civilian, noninstitutionalized persons 18 years and older (17 during some surveys). The survey years were 1955, 1965, 1970, 1974, 1978 and 1983<sup>12,13</sup>. Another national survey was conducted in 1964, 1966, 1970 and 1975 under the sponsorship of the National Clearinghouse for Smoking and Health of the Centers for Disease Control<sup>14,15</sup>. These surveys also were from probability samples of the contiguous United States, using random combinations of area codes and telephone numbers. Non-telephone samples were designed in geographic areas known to have a high prevalence of households without telephones. The surveys included persons at least 21 years of age.

Of the studies reviewed for teenage smoking rates, the first was a study undertaken by the National Institute of Education (NIE) in 1979<sup>16</sup>. The methods used were similar to the NCHS earlier design, that is telephone (and in-person interviews in households without telephones) surveys by random selection of stratified probability samples of phone numbers. The second study of teenagers was a survey of nationally representative samples of private and public high schools by geographic area in the U.S.<sup>17</sup>. Data were collected by questionnaires in normal classroom settings or by large group administration. Efforts were made to substitute similar schools for those refusing to participate (in terms of size, geographic area, urbanicity). Between 77 and 83 percent of questionnaires were completed, and the authors suggest an underestimation of the prevalence rate because of absentees during questionnaire sessions who may be higher users of cigarettes.

Information on smoking by race was reviewed from a large prospective study conducted by the

American Cancer Society (ACS) 1959-1972<sup>18</sup>. In this study, 68,000 ACS volunteers collected confidential questionnaires from over one million friends, relatives and neighbors. Because this was not a random sample of the population, however, the usefulness of these data is uncertain. Smoking was also a variable asked in the Health and Nutrition Examination Surveys conducted 1971-1980 by NCHS<sup>19</sup>. Representative samples were taken from census tracts, similar to the methods used in the NCHS surveys conducted for the Health Interview Survey.

Incidence rates for lung cancer in the U.S. have been derived from four cancer surveys: the First, Second and Third National Cancer Surveys (FNCS, SNCS, TNCS respectively), and the Surveillance, Epidemiology, and End Results (SEER) program, each of which includes approximately 10 percent of the entire population of the U.S. The first two cancer surveys (FNCS and SNCS) were conducted in 1937-1939 and 1947-1948 respectively. Data were collected in a one-year period in Atlanta, Birmingham, Dallas, Denver, Detroit, Pittsburgh, San Francisco-Oakland, Chicago, New Orleans and Philadelphia. The TNCS was conducted in 1969-1971 and included the above areas with the exceptions of Chicago, New Orleans and Philadelphia, and with the additions of Fort Worth, Minneapolis-St. Paul and the entire states of Colorado and Iowa. TNCS data were collected over a three-year period and averaged<sup>4</sup>, thereby making the rates more stable.

SEER is an ongoing population-based surveillance program designed to replace the periodic cancer surveys. It began in 1973 with 7 areas: Detroit, San Francisco-Oakland, Connecticut, Hawaii, Iowa, New Mexico and Utah, and has been expanded over the years to include Seattle, New Orleans and Atlanta<sup>20</sup>.

Devesa and Silverman examined temporal trends in lung cancer mortality from 1935-1974<sup>4</sup>. The mortality figures for 1935-1950 were abstracted from *End Results and Mortality Trends in Cancer*<sup>21</sup>, and for 1951-1974 NCHS mortality figures were used. Population figures used were those of the census; for intercensal years linear interpolations were used, and Census Bureau projections were used for the years 1971-1974. Klebba's examination of mortality trends used death certificate data for the entire U.S., 1950-1977<sup>22,23</sup>, as did the research of Horm and Asire for

1969-1978<sup>24</sup>.

## TRENDS IN THE PREVALENCE OF CIGARETTE SMOKING

The percent of persons who were current smokers from 1955-1983<sup>11-15</sup> are shown for males and females in Figures 1 and 2. In men, smoking rates have decreased over the 28 year time period from 52.6 percent to 35.7 percent. The decline was gradual between 1955 and 1965, the year following the first Report to the Surgeon General on the risk of smoking<sup>10</sup>, followed by a sharper decrease between 1965 and 1983. In women, the percent of smokers initially increased from data obtained in 1955 (24.5 percent) to 1965 (33.3 percent) before beginning a more gradual decrease to 29.4 percent in 1983.

Over this time period the number of persons who quit smoking increased, as did the number of persons who never began smoking. These changes also occurred more dramatically in the time period from 1965 to the present<sup>25</sup>.

### *Smoking by Age*

The percent of adult men who smoke increased from 1955 to 1965 and then decreased from 1965 to 1983 in all age groups except those over age 65. Among those over 65, the rates did not change appreciably<sup>12</sup>. Among adult women, the rate of current smokers increased markedly in all age groups from 1955 to 1965. From 1965 to 1983 the percent of women smokers less than 65 years old decreased, but the prevalence of smokers age 65 and older continued to increase in each survey between 1965 and 1983.

Harris reconstructed data from the Health Interview Surveys of 1978-1980 to analyze cigarette smoking prevalence in successive birth cohorts of men and women<sup>26</sup>. After adjusting for differential mortality rates among smokers and nonsmokers, he found a decreasing prevalence of smokers from age 30 onward in all cohorts of men, the decrease sharper in cohorts reaching age 30 after 1960. In men born between 1921 and 1960, the highest prevalence of smoking was lower with each successive 5-year cohort. Further, with each successive cohort of men smoking rates began to decline at earlier ages. In women, prevalence rates decreased only for women reaching

age 30 after 1950. Among women born after 1940, the highest smoking rates in each group decreased with successive cohorts. Whereas nearly all men began smoking before age 25, many women in the early cohorts began smoking after age 30, resulting in a delayed peak smoking rate for each group. Further, in each cohort, the decrease in smoking prevalence was sharper among men than women.

Smoking rates for teenagers are summarized for males and females in Figures 3 and 4. Among males, rates of smokers are higher in each older age group. The rates decrease over time, most markedly in the 17-18 age group, which decreased from a high of 37.8 percent in 1970 to 19.6 percent in 1979<sup>16</sup>. Among females, the rates increased gradually from 1968 to about 1974 in all age groups, then decreased among 15-16 year olds. Females age 17-18 showed a slight increase in smoking rates and 12-14 year olds a slight decrease from 1974 to 1979. Females age 17-18 exceeded males in smoking rates for 1979.

#### *Smoking by Race*

Prevalence rates for current smokers by race are shown on Table 1. Black men had the highest rates of smoking and black women the lowest. Among whites, the trends shown in the overall prevalence rates for men and women held: an overall decrease among men over time and an initial increase followed by a smaller decrease for women. Among blacks, both men and women showed a marked increase in the early 1970s, declining in the late 1970s to lower rates; black men had a 50.7 percent smoking prevalence in 1980, whereas black women were slightly lower than white women in smoking rates (31.6 percent vs. 33.3 percent).

## NUMBER AND NATURE OF CIGARETTES SMOKED

Table 2 shows the proportion of male and female smokers who consumed 25 or more (21 or more in 1955) cigarettes over the same time period<sup>11,12,14,15,27</sup>. Among men, the proportion smoking 25 or more per day increased from 24.1 percent in 1965 to 36 percent in 1975 and then declined to 33.6 percent in 1983. The proportion of smokers in this category remains higher than it was in 1955. Among women, the proportion of smokers in this category increased from 1955 to 1980 and only slightly decreased from 23.2 percent to 20.6 percent in 1983, also higher than the proportion of heavy smokers in 1955.

The number of cigarettes consumed in the U.S. per capita per year increased from 3597 in 1955 to a high of 4280 in 1967, and in 1979 3924 cigarettes per person per year were consumed<sup>28</sup>. This further suggests that although the overall prevalence of smoking has decreased, those who do smoke consume more cigarettes. Winkelstein determined the prevalence of heavy smokers by multiplying the proportion smoking 25 or more cigarettes per day by the prevalence of current smokers<sup>5</sup>. There is a higher prevalence of heavy smokers among men than women in each age group, in 1965 and in 1980. The change over this period, however, shows a decrease or no change in the proportion of heavy male smokers under the age of 45, whereas among women the proportion of heavy smokers increases in every age group.

Changes in the nature of cigarettes also occurred during this time period. Cigarettes made with filters were introduced in the 1950s and by 1978 accounted for more than 90 percent of production<sup>29</sup>. At the same time, the "tar" and nicotine content of cigarettes decreased as well as the tobacco content<sup>7-9,28</sup>, and in the 1978 National Health Interview Survey nearly 25 percent of smoking adults used lower "tar" cigarettes<sup>12</sup>.

## TRENDS IN LUNG CANCER INCIDENCE

Devesa and Silverman<sup>4</sup>, Horm and Asire<sup>24</sup> and Pollack and Horm<sup>30</sup> have examined incidence trends in lung cancer using data from the national surveys described. Devesa and Silverman have examined the period 1937-1971, restricting their analysis of FNCS, SNCS and TNCS to the seven areas common in all surveys. Their results indicated rising incidence of age-adjusted lung cancer rates among men over the entire time period, 1937-1971, for both whites and nonwhites (Figure 5). For whites, the rates rose from 13.7 per 100,000 in 1938 to 68.0 per 100,000 in 1970, a nearly fivefold increase. Among nonwhite men the incidence rate increased from 7.7 per 100,000 to 77.9 per 100,000 over the same time period, a tenfold increase. At some point between the SNCS (1937-1939) and TNCS (1969-1971) the incidence rates for nonwhite men (primarily blacks) began to exceed those for white men. Any deviations from a linear relationship among the 3 data points over the 34 years, however, would go unnoticed in this analysis.

Lung cancer incidence also rose dramatically for women, as shown in Figure 6. The rate increased from 4.1 per 100,000 in 1938 to 14.9 per 100,000 in 1970, an increase of over 300 percent. Among nonwhite women the rate increased from 2.9 per 100,000 to 13.5 per 100,000 for the same period, an increase of over 400 percent. Unlike the findings among men, however, the incidence rate for nonwhite women remained below that of white women throughout the time period studied.

Horm and Asire extended this incidence analysis to 1979<sup>24</sup>; they examined the trend in lung cancer incidence between 1969 and 1978 using the TNCS and SEER data. Their results indicated increasing lung cancer incidence for men age 45 and over, with increases ranging from 1.4 percent to 6.0 percent per year, as shown in Table 3. Men age 35-44 experienced an average annual decline of 2 percent per year in incidence rates over the time period. The percent change for each age group was significant ( $p < .05$ ). The age-adjusted rate for men increased an average of 2.4 percent per year. Among women, lung cancer incidence rates increased for all age groups, ranging from 5.1 percent per year for those age 85 and over to 10.9 percent for those age 65-74. As with the men, the trends for women were significant in all age groups ( $p < .05$ ) (Table 3). One should

note that in 1978 for the first time incidence rates were similar among white women age 35-44 (16.3 per 100,000) and white men age 35-44 (17.2 per 100,000). The overall age-adjusted rate for women increased an average of 8.2 percent per year.

Pollack and Horm also used the TNCS and SEER data to examine age-adjusted lung cancer incidence trends for the years 1969-1971 and 1973-1976 and found similar results<sup>30</sup>. For white men, the average annual increase in lung cancer was 1.4 percent and for white women it was 8.6 percent for 1969-1976. Incidence trends were examined for whites only.

Horm, Asire, Young and Pollack have recently published SEER data indicating that incidence was still declining among younger white men<sup>31</sup>. Similar declines were not found among black men or white women. Rates in black women, however, declined slightly in age groups 35-39, 40-44 and 45-49.

## TRENDS IN LUNG CANCER MORTALITY

Over the time span studied by Devesa and Silverman (1935-1974) lung cancer among men was increasing in both incidence and mortality as shown in Figure 5<sup>4</sup>. In 1935 lung cancer mortality was higher in white men (6.4 per 100,000) than nonwhite men (3.5 per 100,000), but by 1974 this finding had reversed, with rates for nonwhites (67.0 per 100,000) exceeding those for whites (56.5 per 100,000). Cancer mortality rates for nonwhite women, like those for white and nonwhite men, increased steadily over time (Figure 6). Rates for white women, however, began to increase later, in the mid-1950s. From the 1950s on, the mortality rates for white and nonwhite women were identical.

Klebba has examined temporal changes in lung cancer mortality from 1950-1977 for age-adjusted and age-race-sex-specific mortality rates<sup>22,23</sup>. She observed that the rate of increase for men (both white and nonwhite) had begun to decrease. From 1950-1957 the average annual increase in age-adjusted mortality rates was 6.1 percent for white men and 8.7 percent for nonwhite men. By 1968-1977, however, the average annual increase declined to 2.1 percent for white men and 3.6 percent for nonwhite men. Among women, both white and nonwhite, the reverse was true. The average annual increase in age-adjusted mortality rates increased from 1.0 percent in 1950-1957 to 6.7 percent in 1968-1977 for white women. For nonwhite women it increased from 3.0 percent to 6.6 percent.

Klebba also observed a decline in age-specific mortality for white men age 35-44 and noted declining age-specific rates for cohorts of men, both white and nonwhite, born after 1928-1932.

Horm and Asire also examined both age-adjusted and age-specific mortality trends for 1969-1978<sup>24</sup>. The temporal pattern for mortality is overall quite similar to that of incidence which, given the high case fatality for lung cancer, is not surprising (Table 3). All age groups of white men experienced increasing mortality rates, except those 35-44, who experienced an average decline of 2.9 percent per year ( $p < .05$ ).

Mortality among black men increased at a faster rate than that of white men for each age group. The increase was smallest among younger men (age 35-44), averaging 0.3 percent per year, indicating a possible slowing of mortality rates in this age group.

White women experienced a greater average annual increase in mortality rates than did white men in all age groups and black men in all but one group (age 75-84). Mortality among white women was similar to incidence with the exception of younger women (age 35-44) for whom lung cancer incidence grew rapidly (annual average increase of 6.8 percent), while mortality increased only 2.3 percent per year.

## DISCUSSION

Overall, the prevalence of current smokers has decreased from 1955 to 1983, indicating both the effect of smoking cessation and the decrease in rates of smoking initiation. The decline in smoking over time is more marked in men (52.6 percent to 35.7 percent) than in women (33.3 percent to 29.4 percent), although men currently continue to have higher rates of smoking than women. Among those who smoke, a higher proportion of men are heavy smokers than women (33.6 percent versus 20.6 percent), but this proportion among men decreased over time in younger (<45) age groups. In women, the proportion of heavy smokers increased in every age group over time.

By age, the percent of male and female smokers in each age group increased prior to 1966 and then decreased in men under age 65 and women under age 55. In older age groups, especially in women, the prevalence of current smokers increased from 1966 to 1983. Analysis of birth cohorts provided more information that women in earlier cohorts took up smoking later than men (in their 30s rather than in their 20s) and that women in later cohorts had higher prevalence rates than those in earlier cohorts<sup>32</sup>.

Among teenagers, older age groups have higher prevalence rates for smoking. Low rates among very young teenagers (age 12-14) have not changed much over time. This finding may be a result of a relatively constant number of young people who experiment with cigarettes rather than a reflection of initiation of continuing smoking behavior. Boys have higher rates than girls in all age groups. All age groups of teenagers have declined in smoking over the periods studied (1968-1979) except girls age 17-18. In this group the prevalence of current smokers has remained the same in one study reviewed and gradually increased to 37 percent in 1979 to exceed the rate in boys the same age (32 percent) in another study.

Some information is available on race, showing a higher prevalence of black male smokers and a lower prevalence of black female smokers than white males or females. In all 4 groups the trend of decreasing prevalence following the time period of the Surgeon General's report continued.

Important trends have occurred in lung cancer rates as well, in terms of both incidence and mortality. For men, both white and nonwhite, lung cancer has been increasing at a decreasing rate. The rate of increase is higher for nonwhite men than for white men. Lung cancer incidence, as well as mortality, is actually decreasing in younger white men (age 35-44). The trend in mortality rates among younger nonwhite men (age 35-44) is nearly level.

Among women lung cancer rates have been increasing at an increasing rate; the rate of increase has been far greater among women, both white and nonwhite, than it has been among men. However, except for the youngest group of white women (age 35-44) whose incidence rates now equal those of white men in the same age group, lung cancer rates (both incidence and mortality) are higher among men than women, and highest among nonwhite men.

Lung cancer mortality rates have also risen greatly for women. The rate of increase in mortality among younger women (age 35-44), however, has not been as great as the increase in incidence, which may mean that younger women experience better survival, at least over the short term.

In examining temporal trends in disease over relatively long periods of time one must keep in mind that changes in diagnostic techniques can artificially alter disease rates. Gilliam has reported this to be a significant problem with lung cancer in the first half of the present century, when lung cancers were often diagnosed as some other form of respiratory disease<sup>1</sup>. Additionally, changes in coding of lung cancer deaths accounted for some of the increase in 1968, the first year of the Eighth Revision of the *International Classification of Diseases*<sup>4</sup>. However, during the more recent period of interest, lung cancer is unlikely to have been affected in any important way by any such changes.

The overall decline in the prevalence of smoking should be reflected in a decline in lung cancer incidence and mortality. Because the time period between exposure and disease is long, this parallel decrease may only be beginning to show. In fact, lung cancer rates have shown a slowed increase and in young men (age 35-44) a decrease in rates has begun.

Women have never smoked as much as men, and they began to smoke later than men as a group; the corresponding lung cancer rates have approached but not equalled those of men. Of interest, however, is the increasing proportion of heavy smokers among women in all age groups, as well as the stabilizing or increasing prevalence of smokers among teenage girls. Lung cancer incidence and mortality rates among older cohorts may continue to increase, although more slowly, as a reflection of higher lifetime exposures to smoking. As younger cohorts which are now experiencing a decline in lung cancer rates age, this decline should become more dramatic. The future rates for women, however, may not follow this pattern. Lung cancer may become more a disease of women and blacks than it has been in the past.

## REFERENCES

1. Gilliam AG: Trends of mortality attributed to carcinoma of the lung: Possible effects of faulty certification of deaths to other respiratory diseases. *Cancer* 1955; 1130-36.
2. King PE: Problems of spatial analysis in geographical epidemiology. *Soc Sci Med* 1979; 13D:249-52.
3. Gruchow HW, Rimm AA, Hoffman RG: Alcohol consumption and ischemic heart disease mortality: Are time-series correlations meaningful? *Am J Epidemiol* 1985; 118:641-50.
4. Devesa SS, Silverman DT: Cancer incidence and mortality in the United States: 1935-1974. *JNCI* 1978; 60:545-71.
5. Winkelstein WW: Some ecological studies of lung cancer and ischaemic heart disease mortality in the United States. *Int J Epidemiol* 1985; 14:39-47.
6. Cummings KM: Changes in the smoking habits of adults in the United States and recent trends in lung cancer mortality. *Can Det Prev* 1984; 7:125-34.
7. Wynder EL: Etiology of lung cancer - Reflections of two decades of research. *Cancer* 1972; 30:1332-39.
8. Wynder EL, Covey LS, Mabuchi K: Lung cancer in women: Present and future trends. *JNCI* 1973; 51:391-401.
9. Wynder EL, Covey LS, Mabuchi K: Current smoking habits by selected background variables. *Am J Epidemiol* 1974; 100:168-77.
10. U.S. Public Health Service: Smoking and health: Report of the Advisory Committee to the Surgeon General of the Public Health Service. DHEW Pub. no. (PHS) 1103, Washington, D.C., U.S. Government Printing Office, 1964.

11. U.S. Department of Health, Education, and Welfare: Changes in cigarette smoking habits between 1955 and 1966. DHEW Pub.no.(PHS) 1000-Series 10,no.59, Washington, D.C., U.S. Government Printing Office, 1970.
12. U.S. Department of Health, Education, and Welfare: Changes in cigarette smoking and current smoking practices among adults: United States, 1978. *Advancedata* 1979; 52:1-15.
13. U.S. Department of Health and Human Services: Trends in smoking, alcohol consumption, and other health practices among U.S. adults, 1977 and 1983. *Advancedata* 1986; 118:1-13.
14. U.S. Department of Health, Education, and Welfare: Adult use of tobacco 1970. DHEW Pub.no. (HSM)73-8727. Washington, D.C., U.S. Government Printing Office, 1970.
15. U.S. Department of Health, Education, and Welfare: Adult use of tobacco 1975. Bethesda, MD, National Cancer Institute, 1976.
16. U.S. Department of Health, Education, and Welfare: Teenage smoking: Immediate and longterm patterns. Washington, D.C., U.S. Government Printing Office, 1979.
17. Bachman JG, Johnston LD, O'Malley PM: Smoking, drinking and drug abuse among American high school students: Correlates and trends, 1975-1979. *Am J Pub Health* 1981; 71:59-69.
18. Garfinkel L: Cigarette smoking and coronary heart disease in blacks: Comparison to whites in a prospective study. *Am Heart J* 1984; 108:802-7.
19. Rowland ML, Fulwood R: Coronary heart disease risk factor trends in blacks between the first and second National Health and Nutrition Examination Surveys, United States, 1971-1980. *Am Heart J* 1984; 108:771-9.
20. Ernster VL, Sacks ST, Holly EA, Wong L, Merrill DW, Selvin S: U.S. cancer incidence rates by sex, race, and age: Graphics of SEER program data, 1973-1977. Professional Education Publications, American Cancer Society, New York, 1985.

21. Gordon T, Crittenden M, Haenzel W: Cancer mortality trends in the United States, 1930-1955. Natl Can Inst Monogr 1961; 6:131-298.
22. Klebba AJ: Mortality from diseases associated with smoking: United States, 1950-1964. DHEW Pub.no. (PHS)1000-Series 20,no.4, Washington, D.C., 1966.
23. Klebba AJ: Mortality from diseases associated with smoking: United States, 1960-1977. DHHS Pub.no.(PHS)82-1854, Washington,D.C.,1982.
24. Horm JW, Asire AJ: Changes in lung cancer incidence and mortality rates among Americans: 1969-1978. JNCI 1982; 69:833-7.
25. Shopland DR, Brown C: Current trends in smoking control. Ann Behav Med 1985; 7:5-8.
26. Harris JE: Cigarette smoking among successive birth cohorts of men and women in the United States during 1900-1980. JNCI 1983; 71:473-9.
27. U.S. Department of Health and Human Services: Health, United States 1984. DHHS Pub.no. (PHS)85-1232, Washington, D.C., U.S. Government Printing Office, 1984.
28. Kristein MM: 40 years of U.S. cigarette smoking and heart disease and cancer mortality rates. J Chron Dis 1984; 37:317-23.
29. U.S. Department of Health, Education, and Welfare: Smoking and health, a report of the Surgeon General. DHEW Pub.no. (PHS)79-50066, Washington, D.C., U.S. Government Printing Office, 1979.
30. Pollack ES, Horm JW: Trends in cancer incidence and mortality in the United States, 1969-1976. JNCI 1980; 64:1091-1103.
31. Horm JW, Asire AJ, Young JL, Pollack ES (eds): SEER program: Cancer incidence and mortality in the United States. 1973-1981. National Institutes of Health Pub.no.85-1837, 1984.

32. Cummings KM: Changes in the smoking habits of adults in the United States and recent trends in lung cancer mortality. *Can Det Prev* 1984; 7:125-34.

TABLE 1

Prevalence (Percent) of Current Smokers by Race  
United States, 1959-1970  
from Selected Studies

---

---

	Year		
	1959 <sup>18</sup>	1975 <sup>19</sup>	1980 <sup>19</sup>
White Males	45.3	43.6	39.6
White Females	25.1	34.0	33.3
Black Males	47.3	55.4	50.7
Black Females	20.0	46.2	31.6

TABLE 2

Percent of Current Smokers  
 Consuming 21 or 25 or More Cigarettes per Day  
 Among U.S. Males and Females, 1955-1983  
 from Selected Studies

---



---

	Year of Study and Number of Cigarettes Smoked per Day					
	1955 <sup>11</sup>	1965 <sup>12</sup>	1970 <sup>14</sup>	1975 <sup>15</sup>	1980 <sup>27</sup>	1983 <sup>27</sup>
	>21	>25	>25	>25	>25	>25
Males	32.1	24.1	31.1	36.0	34.2	33.6
Females	13.2	13.0	17.4	23.0	23.2	20.6

TABLE 3

Average Annual Percent Change in Lung Cancer  
Incidence and Mortality  
United States, 1969-1978<sup>24</sup>

Age Group	Incidence*	Mortality	
	Whites	Whites	Blacks
Males			
35-44	-2.0	-2.9	0.3
45-54	1.4	1.7	2.2
55-64	1.2	1.2	4.1
65-74	2.5	2.2	4.3
75-84	4.3	4.9	7.0
85+	6.0	6.7	6.7
Females			
35-44	6.8	2.3	1.4
45-54	5.8	5.6	6.5
55-64	9.5	8.1	8.0
65-74	10.9	8.5	5.4
75-84	5.9	6.5	6.4
85+	5.1	7.0	3.9

\* Incidence is available for whites only.

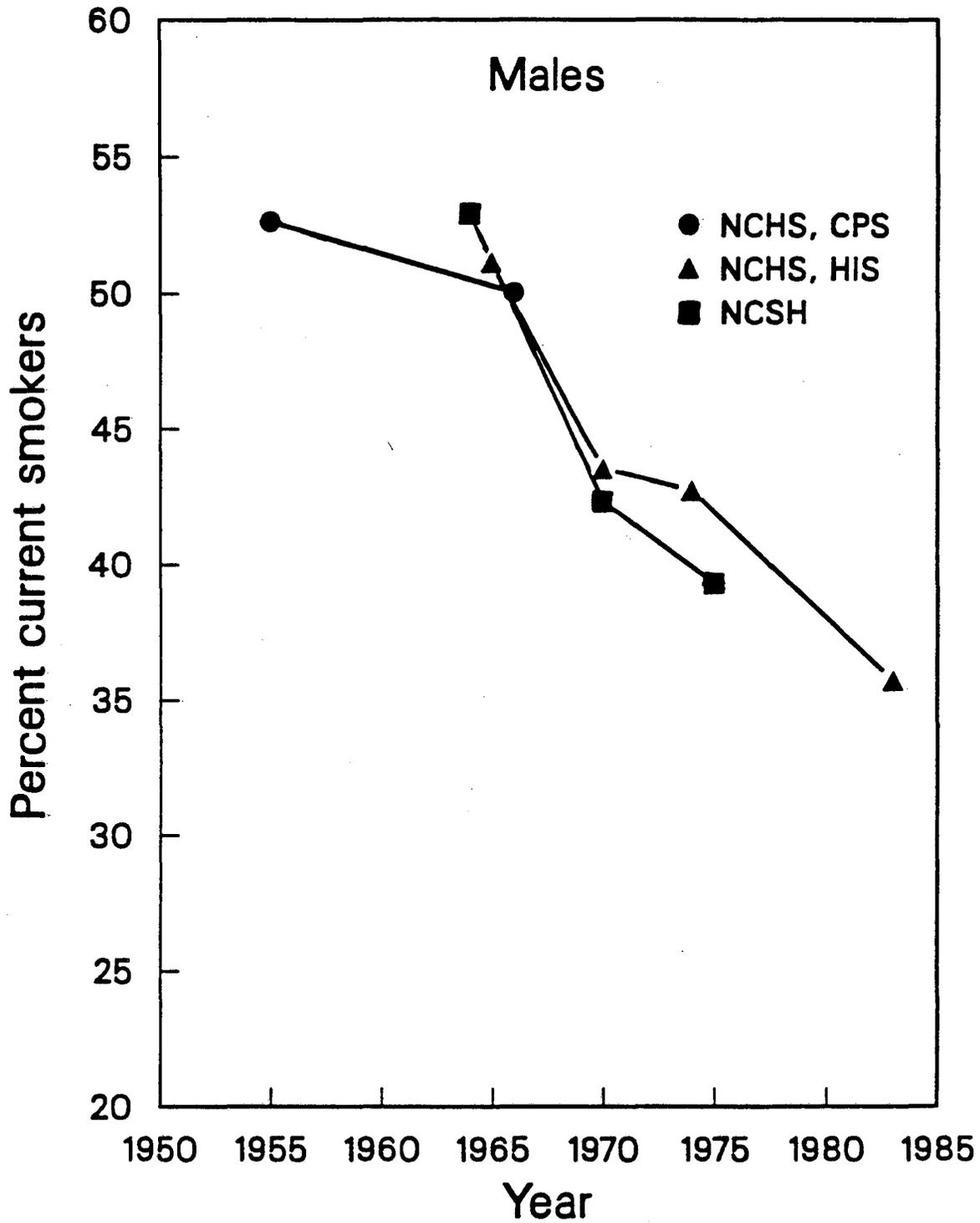


Figure 1. Prevalence of current male smokers, U.S., 1955-1983.

[NCHS,CPS: National Center for Health Statistics, supplement to Current Population Survey<sup>11</sup>

NCHS,HIS: National Center for Health Statistics, Health Interview Survey<sup>12,13</sup>

NCSH: National Clearinghouse for Smoking and Health<sup>14,15</sup>]

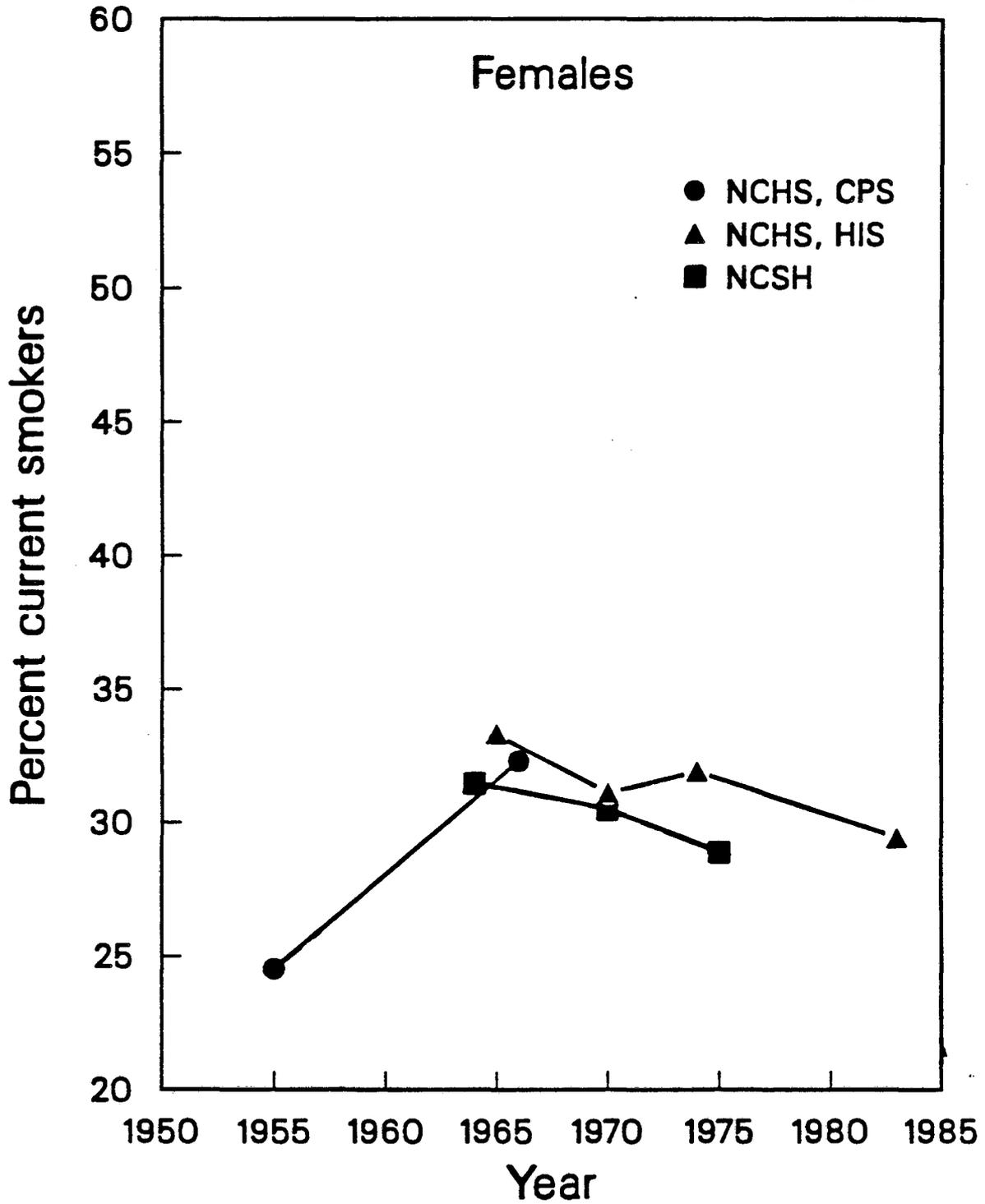


Figure 2. Prevalence of current female smokers, U.S., 1955-1983.

[NCHS,CPS: National Center for Health Statistics, supplement to Current Population Survey<sup>11</sup>

NCHS,HIS: National Center for Health Statistics, Health Interview Survey<sup>12,13</sup>

NCSH: National Clearinghouse for Smoking and Health<sup>14,15]</sup>

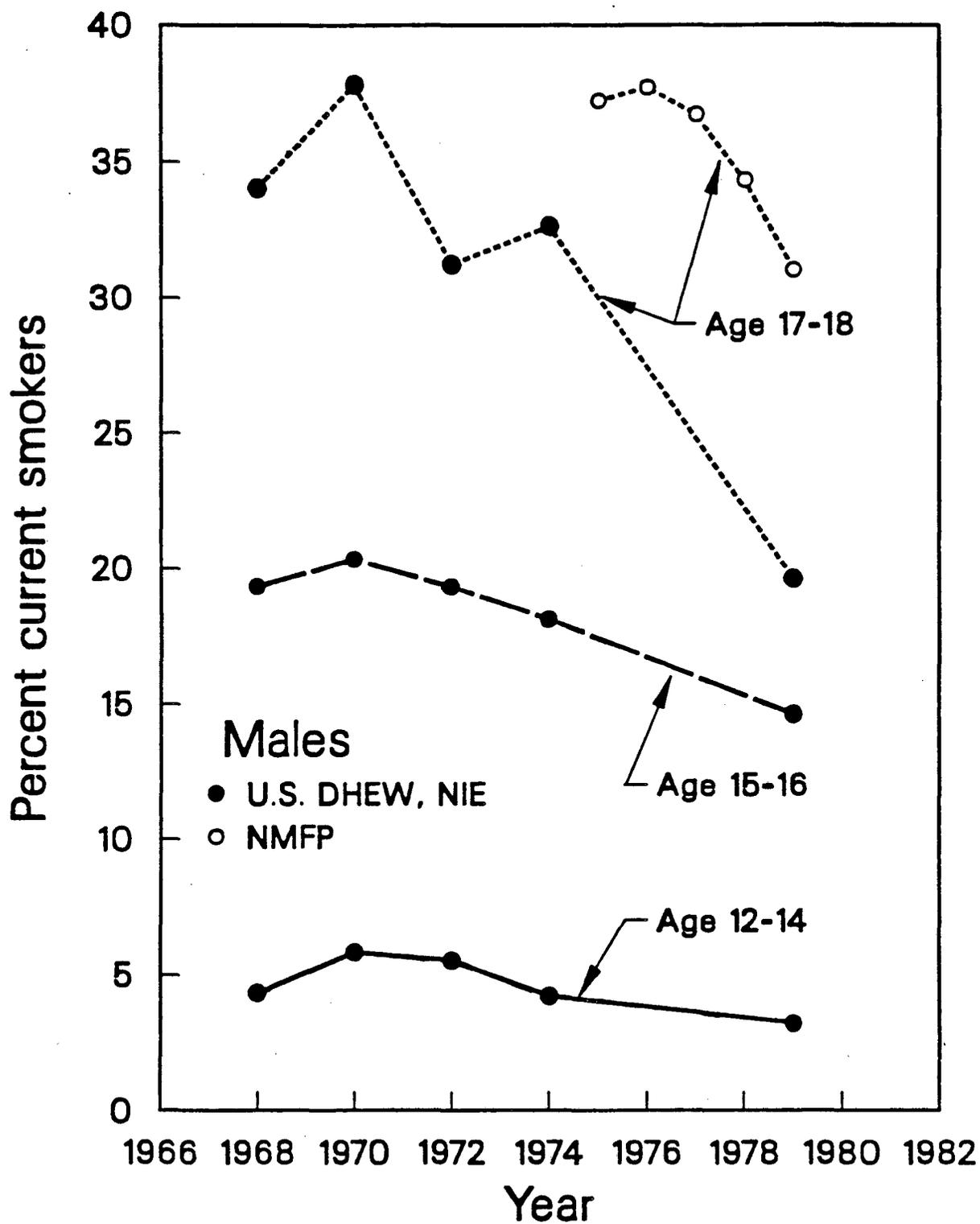


Figure 3. Prevalence of current smokers among 12-18 year old males, U.S., 1968-1979.

[USDHEW,NIE: U.S. Department of Health, Education, and Welfare, National Institute of Education<sup>16</sup>

NMFP: National Monitor the Future Project<sup>17</sup>]

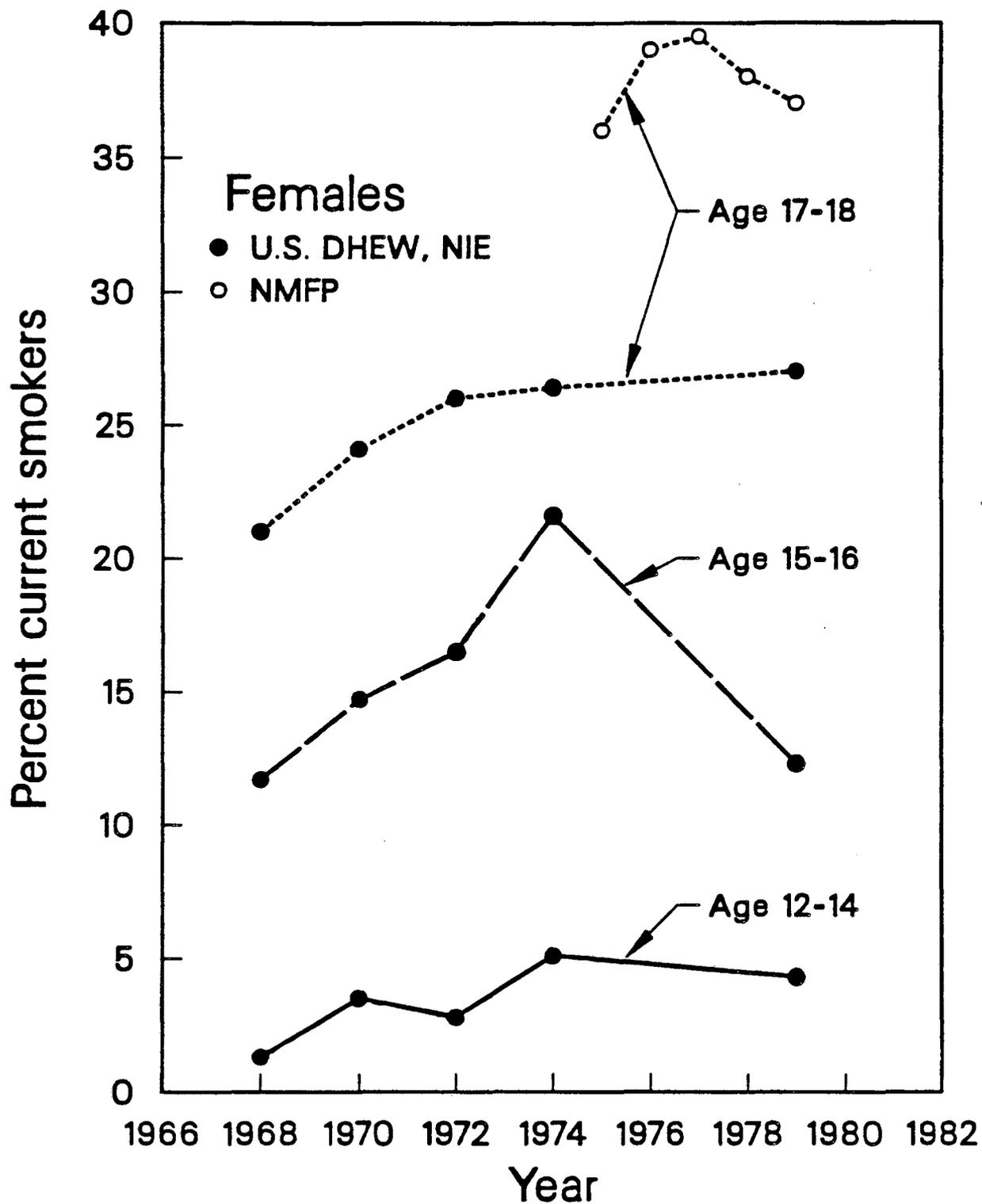


Figure 4. Prevalence of current smokers among 12-18 year old females, U.S., 1968-1979.

[USDHEW, NIE: U.S. Department of Health, Education, and Welfare, National Institute of Education<sup>16</sup>

NMFP: National Monitor the Future Project<sup>17</sup>]

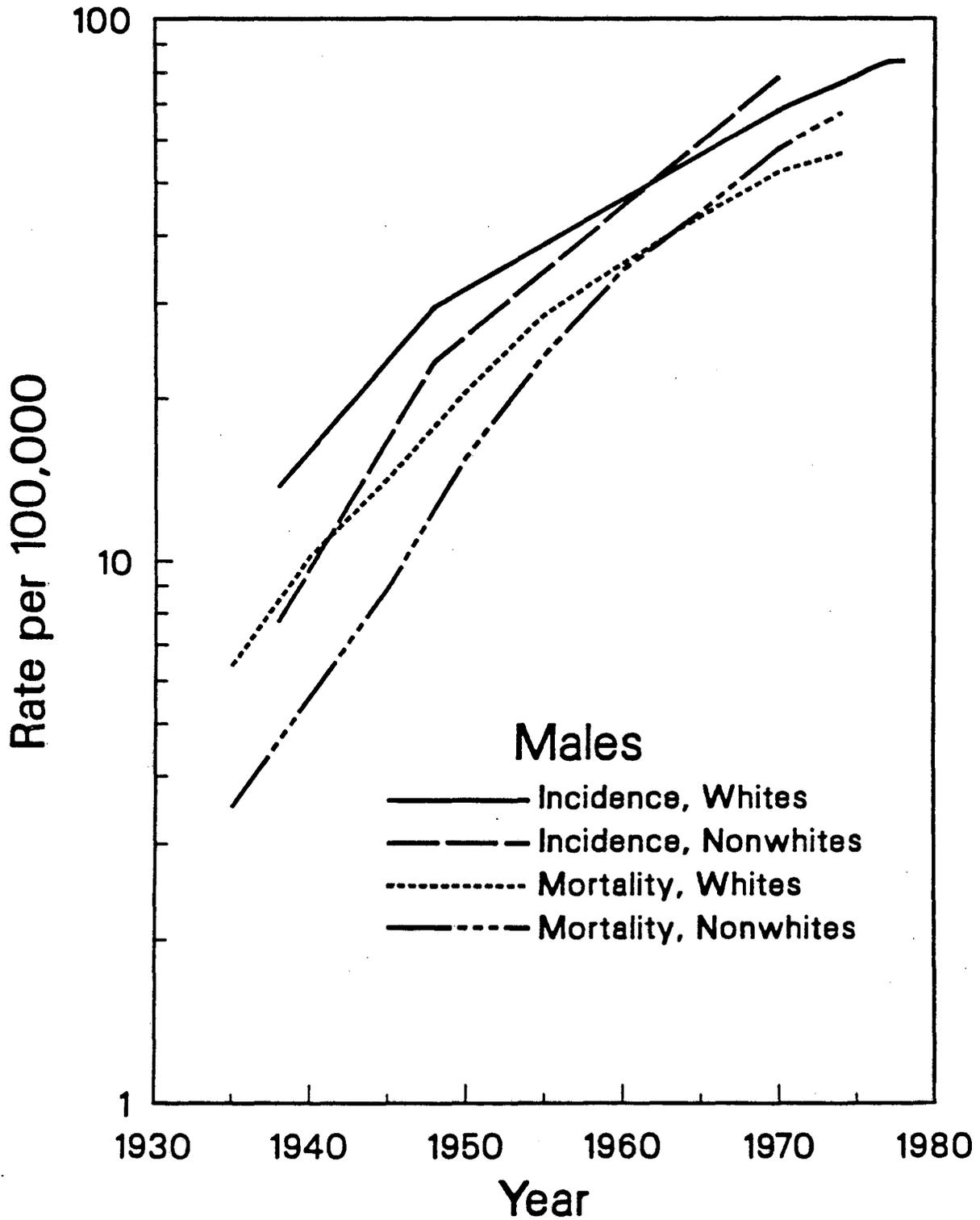


Figure 5. Trends in age-adjusted lung cancer incidence and mortality rates for males, U.S., 1937-1971.

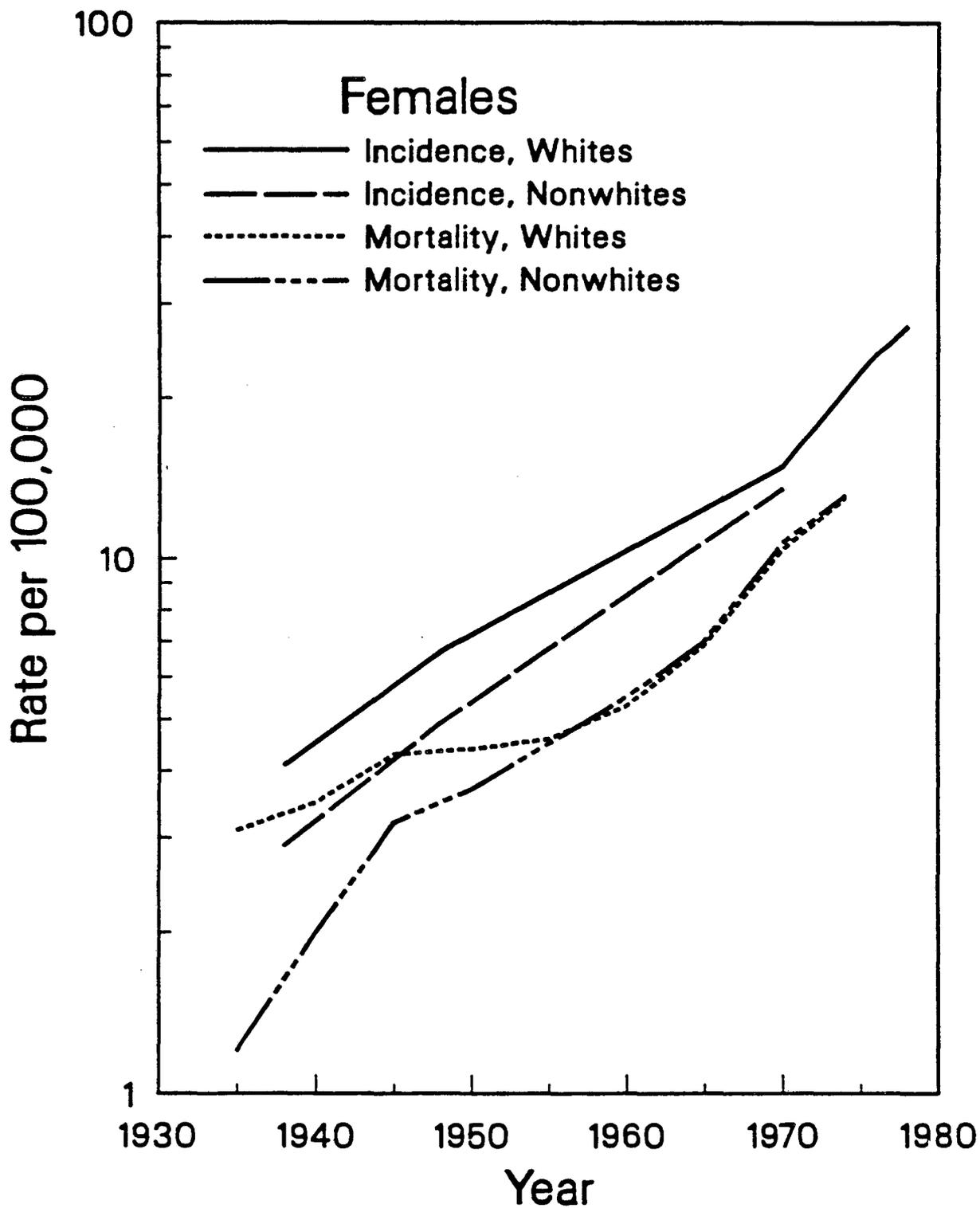


Figure 6. Trends in age-adjusted lung cancer incidence and mortality rates for females, U.S., 1937-1971.

*LAWRENCE BERKELEY LABORATORY  
TECHNICAL INFORMATION DEPARTMENT  
UNIVERSITY OF CALIFORNIA  
BERKELEY, CALIFORNIA 94720*