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Breast and Cervical Cancer Surveillance, United States, 1973–1987

Cancer Screening Behaviors Among U.S. Women: Breast Cancer, 1987–1989, and Cervical Cancer, 1988–1989

Surveillance of Congenital Cytomegalovirus Disease, 1990–1991

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
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Abbreviations

NCCDPHP	National Center for Chronic Disease Prevention and Health Promotion
NCEHIC	National Center for Environmental Health and Injury Control
NCID	National Center for Infectious Diseases
CIO	Centers/Institute/Offices
NCPS	National Center for Prevention Services
EPO	Epidemiology Program Office
NIOSH	National Institute for Occupational Safety and Health

Breast and Cervical Cancer Surveillance, United States, 1973–1987

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Summary

Breast and cervical cancer incidence and mortality rates were reviewed for the period 1973–1987. For breast cancer, mortality has been relatively stable, increasing from 26.9/100,000 women in 1973 to 27.1 in 1987. Alternatively, data from the National Cancer Institute's Surveillance, Epidemiology, End Results Program (SEER) showed a 36% increase in the incidence of this malignancy over the same period. In 1987, overall incidence of invasive breast cancer was 111.9/100,000 women. White women experienced lower overall mortality rates and higher overall incidence than black women; however, these differences varied by age. Examination of breast cancer incidence by stage of disease at diagnosis revealed that rates for distant and regional disease have remained relatively stable since 1973. In contrast, rates of localized and in situ cancers exhibited an increase in the 1980s that may correspond to increased use of mammography in this country.

The rate of decline in cervical cancer incidence and mortality has slowed in recent years. In 1987, 3.0 cervical cancer deaths/100,000 women occurred. SEER incidence for invasive disease for that year was 8.2/100,000. Rates varied by race, age, state, and stage of disease. In general, black women experienced much higher incidence and mortality from invasive cervical cancer than white women. For both races, rates of in situ disease were highest among young women and decreased rapidly with age. Rates of in situ cervical cancer were consistently higher than rates of invasive cancer for the time period studied.

INTRODUCTION

Use of early detection techniques has directly affected breast and cervical cancer incidence and mortality rates. The decline in cervical cancer rates from the 1950s through the 1970s has been attributed to widespread implementation of the Papanicolaou (Pap) smear (*1*). Likewise, the increase in breast cancer incidence over the past decade has been attributed, in part, to greater use of mammography (*2,3*).

In 1990, Congress passed the Breast and Cervical Cancer Mortality Prevention Act (Public Law 101-354). This Act led to the creation of a CDC program for awarding funds to states for establishing comprehensive breast and cervical cancer control programs. These programs emphasize the development and implementation of appropriate screening, follow-up, and treatment programs for these two cancers, specifically among low-income and minority women. To aid planning and to facilitate future evaluation of these programs nationally, this investigation reviewed trends in both incidence and mortality from these malignancies for the period 1973–1987. Trends in screening prevalence are reviewed in the companion article in this surveillance report (Ackermann SP, Brackbill RM, Bewerse BA, Cheal NE, Sanderson LM: Cancer screening behaviors among U.S. women: breast cancer, 1987–1989, and cervical cancer, 1988–1989. MMWR 1992;41[No. SS-2]:17–34).

METHODS

Mortality

Deaths from breast cancer (*International Classification of Diseases, Adapted, Ninth Revision* [ICD-9] 174.0-174.9) and from cervical cancer (ICD-9 180.0-180.9) were identified from public-use files compiled by the National Center for Health Statistics (NCHS), CDC (*4,5*). Underlying cause of death was used. Denominators for rate calculations were obtained from intercensal estimates. These population estimates are for the total female population, as well as for white and black women. Intercensal estimates for other specific racial/ethnic groups were not available on the public-use tapes (*6*).

Mortality rates were directly standardized to the age distribution of the 1970 U.S. population. Analyses by race, state, and calendar year are presented, as well as age-specific mortality rates. Small numbers resulting from stratification of the data across several variables produced some rates that were statistically unstable. This was particularly true for cervical cancer mortality. Therefore, for a few analyses, data from several calendar years were combined to increase precision.

Incidence

Incidence data were obtained from public-use tapes provided by the Surveillance, Epidemiology, End Results Program (SEER) of the National Cancer Institute (NCI) (*8*). This program has collected information on newly diagnosed cancers since 1973 and covers about 10% of the U.S. population. The public-use file contains data through 1987 from the initial SEER reporting centers (San Francisco-Oakland standard metropolitan statistical area, Connecticut, metropolitan Detroit, Hawaii, Iowa, New Mexico, and Utah) as well as Seattle (Puget Sound [added in 1974]) and metropolitan Atlanta (added in 1975). Breast cancer cases were defined as tumors with primary sites of codes 740-749 (ICD for Oncology, 1976). The codes 800-809 were used to identify cervical cancers. All lymphomas (morphology codes 9590-9980) were excluded from the case groups.

The annual population estimates for the geographic areas covered by the SEER registries were also provided by NCI. These estimates are based on data from the U.S. Department of the Census and serve as the denominators for incidence calculations. As in the mortality analyses, both age-specific and age-adjusted incidence were calculated for invasive disease. Also examined was the stage of disease at diagnosis, classified as in situ, local, regional, distant, or unknown. This variable is of particular interest in evaluating breast and cervical cancer detection programs because one would expect changes in the distribution of stage over time if cancer screening levels changed.

RESULTS

Breast Cancer

Breast cancer is the most commonly diagnosed cancer and the second leading cause of cancer death among American women. In 1987, about 41,000 women died from this malignancy. The mortality rate was 27.1 deaths/100,000 women (Figure 1). Mortality has been relatively stable since 1973, increasing only 1%. Alternatively, a 36% increase in the incidence of invasive breast cancer occurred over the same period. Most of this increase occurred in the past decade: between 1980 and 1987, the overall incidence of breast cancer rose from 84.8/100,000 to 111.9/100,000 women. When these rates were stratified by race, white women experienced a greater increase in overall incidence during the 1980s. For white women, rates rose from 86.7/100,000 women in 1980 to 115.9/100,000 women in 1987. Among black women, rates over the same time period rose from 73.3 to 90.9/100,000 women.

Breast cancer mortality rates varied by state. Average annual age-adjusted breast cancer mortality rates for all races, whites, and blacks in 1986–1987 are presented (Table 1). No rate is presented for states whose black or white female population was less than 75,000. Overall, mortality ranged from 18.9/100,000 in Hawaii to 32.6/100,000 in Vermont. In some states, differences between rates for "all races" are a reflection of differences in racial/ethnic composition. Thus, the reported number of deaths among various racial/ethnic groups as well as the distribution of these groups in the population should be reviewed to help interpret rate differences among states.

In general, white women experienced lower overall mortality rates for breast cancer than black women (27.1 versus 30.3/100,000 women in 1987). However, differences between whites and blacks varied by age (Figure 2). Average annual age-specific rates for the years 1983 to 1987 indicated that white women ages ≥60 experienced higher mortality than black women in this age range. In contrast to their mortality rate, white women have higher overall incidence than black women. However, black women <40 years of age experienced slightly higher incidence than white women in corresponding age strata. This relationship has been relatively consistent since 1973. For both races, incidence decreased in the oldest age group.

Trends in breast cancer mortality for 1973–1987 were examined for whites and blacks by calendar year and 10-year age groups (Figure 3). Overall, mortality has been relatively stable among white women (data not shown). However, since 1980, small increases in mortality rates have occurred for white women ≥60 years: rates rose 5.3% among those ages 60–69 years, 11.5% among those ages 70–79 years, and 8.3% among those ages ≥80. In the same period, small decreases in mortality (<1% to about 8%) were observed for each age group <60 years. In contrast, breast cancer mortality rates among black women have increased for all age groups since 1980. Moreover, black women ages ≥60 exhibited higher increased mortality over time than white women in comparable age groups: between 1980 and 1987, rates for black women rose 17.2% for those ages 60–69 years, 17.9% for those ages 70–79 years, and 17.8% for those ages ≥80 years.

SEER incidence data, stratified by race, calendar year, and 10-year age group, are provided (Figure 4). Small numbers for black women necessitate caution in interpreting these rates. As previously noted, breast cancer incidence for whites and blacks has increased over time. For both races, the largest increases are seen among women diagnosed at ages ≥60 years.

Rates of in situ and localized cancers showed an increase in the 1980s (Figure 5) that may correspond to increased use of mammography in this country. Except for a small increase in 1974 for regional cancers, rates for distant and regional disease have remained relatively stable. No trend was noted in rates of disease among persons with unknown disease stage (data not shown). Differences were apparent when in situ rates were examined by race, age group, and time period (Table 2). A large increase in the rate of in situ disease was evident among both black and white women for the most recent time period (1983–1987); however, the increase was much more dramatic for white women.

White women ages 40–59 years tended to have a much higher proportion of cancers diagnosed at the in situ stage than women in other age groups. Interestingly, screening tends to be higher at these ages than at others. Given that the prevalence of mammography is increasing and that women in the oldest age groups are less likely to be screened, the results presented in Table 2 are not surprising.

Cervical Cancer

Since 1950, the incidence of invasive cervical cancer in the United States has decreased about 78% and U.S. mortality has decreased about 73% (*8*). Since the early 1980s, however, the rate of decline in incidence and mortality from this disease has slowed and, in most recent years, may be leveling off (Figure 6). In 1987, 3.0 cervical cancer deaths/100,000 women occurred. The invasive cervical cancer incidence at SEER sites for that year was 8.2/100,000.

As with breast cancer, cervical cancer mortality varied by state. Average annual age-adjusted rates for the years 1986–1987 combined are presented (Table 3). Small numbers preclude calculating rates for black women in several states. Mortality rates for all races combined ranged from 1.6/100,000 in Utah to 6.8/100,000 in the District of Columbia.

Black women experienced much higher incidence and mortality from invasive cervical cancer than white women. In 1987, the death rate was 2.6 times higher among black women (6.8/100,000 versus 2.6/100,000), and disease incidence was twice as high among blacks (15.1/100,000 versus 7.3/100,000). A number of reasons are thought to be involved, such as differences in the prevalence of risk factors for the disease; differences in screening, follow-up, and treatment; and differences in stage of disease at diagnosis (*9,10*).

Age-specific analyses, which combined data from the years 1983–1987, also revealed significant racial differences in the patterns of disease incidence and mortality (Figure 7). For both races, similar rates of invasive disease were diagnosed among women in age groups 30–34 years or younger. However, although the increase in incidence slowed and leveled for white women after this age, rates among black women continued to increase rapidly through age 44, decreased slightly between the ages of 45 and 54, and then increased again. Mortality among blacks followed a somewhat similar trend. In general, death rates among white women increased with age.

Examination of trends in mortality revealed that, in general, cervical cancer incidence and mortality have decreased over time for all age groups (Figures 8 and 9). Women <35 years have consistently experienced low rates of this malignancy over the past 15 years.

Data from NCI and the Connecticut Tumor Registry indicate that the incidence of carcinoma in situ of the uterine cervix increased between the 1940s and the 1970s (*11*). Data for all races demonstrate a decrease in the rate of in situ disease after the mid-1970s and a slight increase in more recent years (Figure 10). This recent increase is most likely due to changes in data collection practices at SEER reporting centers in 1983; preinvasive cervical lesions included in SEER data after this time consist of all cervical intraepithelial neoplasia III (CIN III) cases, a classification that combines carcinomas in situ and severe dysplasias. For both whites and blacks, rates of in situ disease were highest among young women and decreased rapidly with age (Table 4). For each age group <50 years of age, over 60% of all cervical cancers diagnosed were staged as in situ disease. This number may underestimate the actual proportion of in situ diagnoses, because case ascertainment is probably incomplete for this stage of disease. Among women ≥50 years, there appear to be greater increases in the proportion of in situ diagnoses for white women than for black women since 1973.

DISCUSSION

The rates presented in this report may be biased by a number of factors. Changes in incidence can reflect differences in case finding and case definition over time (particularly for in situ cervical cancer). For cervical cancers, rates may also be influenced by changes in the proportion of women in the population who have had a hysterectomy, although this proportion is reported to have stabilized since the 1970s (*1*). Mortality rates are affected by how accurately breast or cervical cancer is reported on the death certificate; for example, rates are influenced by the specificity by which uterine cancer site (corpus; cervix; uterus, not otherwise specified) is recorded. No attempt was made in these analyses to adjust for any of the factors that could have influenced incidence or mortality rates.

Breast cancer and cervical cancer exhibit different patterns of disease. Common to both, however, is the potential that early detection and treatment can offer for successfully altering the natural history of these diseases and thus reducing mortality. The benefits of mammography have been demonstrated in a number of clinical trials (*12*). In the United States, data from the Health Insurance Plan of New York indicate that after 10 years, use of mammography combined with the clinical breast examination resulted in a 30% reduction in mortality from breast cancer in women screened (*12*). Currently, the value of breast cancer screening for women ages ≥50 years is widely accepted. Although the efficacy of cervical cancer screening using the Pap smear has not been evaluated in clinical trials, the marked decline in cervical cancer incidence and mortality rates testifies to its impact in the United States.

Improved survival results from early diagnosis and treatment of breast and cervical cancers. For cases diagnosed between 1981 and 1987, relative survival estimates from SEER (i.e., the observed survival rate adjusted for expected mortality) indicate that at least 77% of patients with invasive breast cancer and 66% of patients with invasive cervical cancer will survive 5 years (*8*). Survival increases dramatically when malignancies are diagnosed at earlier stages. For example, 92% of breast cancer patients with localized disease survive 5 years. For cervical cancer patients with localized disease, the 5-year survival is 88%; among women diagnosed with carcinoma in situ of the uterine cervix or with dysplastic lesions, survival is essentially 100% (*8*).

Current racial differences in mortality may be explained by differences in stage of disease at diagnosis and by differences in survival at given stages. Although these analyses found that both races had a similar proportion of cervical cancers staged as in situ, a higher proportion of invasive disease has been diagnosed at regional and distant stages among black women than among white women. This is also true for invasive breast cancer. Moreover, regardless of stage of diagnosis, black women with either cancer experience poorer survival (*8*).

Historically, the proportion of black women who have received screening examinations has been lower than that of white women (*9*). However, the use of both breast and cervical cancer screening has increased among black women in recent years and, for cervical cancer screening, may have surpassed whites (*9*). Selected results from the Behavioral Risk Factor Surveillance System (BRFSS) are discussed in a separate article in this publication and appear to indicate that comparable proportions of white and black women reported having ever been screened for breast or cervical cancer in the 1989 survey (Ackermann SP, Brackbill RM, Bewerse BA, Cheal NE, Sanderson LM: Cancer screening behaviors among U.S. women: breast cancer, 1987–1989, and cervical cancer, 1988–1989. MMWR 1992;41[No. SS-2]:17–34). However, the results of the 1989 BRFSS, the 1990 Jacob's Institute Survey of mammography utilization, and the 1987 National Health Institute Survey also indicate that screening prevalence is much lower in three segments of the population: low-income women, women with low educational attainment, and older women (for Pap smears) (*9,13*).

Despite the increasing frequency of cervical and breast cancer screening (especially for black women) (*9*) and improvements in the management of these neoplasms, 45,319 women died from these malignancies in 1987. The Public Health Service has targeted reducing breast cancer mortality rates almost 8% and cervical cancer mortality rates almost 50% by the year 2000 (*13*). To achieve these goals, special screening objectives have targeted all women and selected subgroups for whom regular screening has been lacking. In addition to screening, follow-up and treatment of detected abnormalities are essential. All states currently funded by CDC to establish breast and cervical cancer control programs are required to track women with abnormal screening results and to ensure that appropriate follow-up and medical treatment are provided.

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TABLE 1. Breast cancer deaths* and age-adjusted mortality rates†, by state and race — United States, 1986–1987

	No. deaths			Rate/100,000 women		
State	All races	White	Black	All races	White	Black
Alabama	1,195	873	321	24.5	23.3	29.3
Alaska	73	64	1	26.8	31.7	—
Arizona	1,001	963	24	24.7	25.2	30.2
Arkansas	707	630	76	22.2	23.0	18.5
California	8,307	7,502	576	26.8	27.8	31.6
Colorado	807	778	23	24.9	25.1	28.4
Connecticut	1,300	1,246	54	29.7	30.2	25.9
Delaware	249	200	47	32.0	29.3	49.7
Dist. of Columbia	269	67	201	31.8	24.3	34.8
Florida	4,576	4,170	401	23.7	23.3	27.6
Georgia	1,749	1,305	439	26.3	25.6	28.9
Hawaii	206	82	1	18.9	27.7	—
Idaho	238	234	1	22.0	21.8	—
Illinois	4,192	3,635	545	29.5	29.1	34.2
Indiana	1,890	1,755	132	27.8	27.6	32.4
Iowa	1,019	1,008	11	25.8	25.8	—
Kansas	789	747	38	24.0	23.7	33.0
Kentucky	1,103	1,023	80	24.5	24.4	28.7
Louisiana	1,131	783	347	23.9	22.6	28.1
Maine	401	400	1	25.7	25.8	—
Maryland	1,575	1,259	307	29.9	29.4	32.6
Massachusetts	2,551	2,476	66	30.6	30.9	29.1
Michigan	3,111	2,734	369	28.7	28.4	31.6
Minnesota	1,411	1,393	11	27.3	27.4	—
Mississippi	714	486	224	23.7	23.2	24.7
Missouri	1,832	1,673	158	26.4	26.3	28.5
Montana	252	248	0	26.9	26.6	—
Nebraska	536	537	8	26.6	27.0	—
Nevada	291	274	11	26.8	27.2	—

*From National Center for Health Statistics mortality tapes, underlying cause of death.
†Adjusted to the 1970 U.S. population.
—Less than 75,000 in denominator.

TABLE 1. Breast cancer deaths* and age-adjusted mortality rates†, by state and race — United States, 1986–1987 — Continued

	No. deaths			Rate/100,000 women		
State	**All races**	**White**	**Black**	**All races**	**White**	**Black**
New Hampshire	356	354	1	28.7	28.7	—
New Jersey	3,214	2,918	284	31.1	31.4	29.1
New Mexico	378	362	5	24.9	25.9	—
New York	7,513	6,651	815	31.1	31.7	28.7
North Carolina	2,055	1,585	459	26.8	25.6	32.5
North Dakota	200	197	0	24.8	24.8	—
Ohio	4,130	3,759	367	30.0	30.0	31.3
Oklahoma	983	886	71	25.3	25.4	35.7
Oregon	904	883	14	26.4	26.6	—
Pennsylvania	4,974	4,583	387	28.9	28.9	30.6
Rhode Island	424	413	9	30.6	30.7	—
South Carolina	934	695	239	24.6	24.6	25.2
South Dakota	252	244	0	27.6	27.8	—
Tennessee	1,522	1,256	266	25.5	24.5	33.0
Texas	3,916	3,407	490	23.1	22.6	28.5
Utah	319	316	1	22.7	23.0	—
Vermont	210	210	0	32.6	32.8	—
Virginia	1,815	1,486	324	28.0	28.0	29.8
Washington	1,343	1,290	31	25.3	25.7	37.8
West Virginia	678	654	22	27.6	27.6	—
Wisconsin	1,705	1,661	36	27.5	27.5	25.7
Wyoming	130	130	0	30.0	30.6	—
Total	**81,430**	**72,475**	**8,294**	**27.2**	**27.3**	**29.8**

*From National Center for Health Statistics mortality tapes, underlying cause of death.
†Adjusted to the 1970 U.S. population.
—Less than 75,000 in denominator.

TABLE 2. Age-specific incidence and proportion of in situ breast cancers, by age group, race, and time period — SEER*, 1973–1987

	In situ rates/100,000 women			Proportion of all breast cancers (%)		
Race/age	**1973–1977**	**1978–1982**	**1983–1987**	**1973–1977**	**1978–1982**	**1983–1987**
Whites						
20–29	0.2	0.2	0.3	5.0	5.0	7.0
30–39	2.5	2.1	3.9	6.0	5.0	8.0
40–49	11.9	10.7	24.0	8.0	7.0	14.0
50–59	11.3	10.8	30.5	5.0	5.0	11.0
60–69	10.6	10.5	30.4	4.0	3.0	8.0
70–79	9.6	11.9	28.9	3.0	3.0	6.0
≥80	0.5	9.4	14.5	3.0	2.0	3.0
Blacks						
20–29	0.0	0.2	0.2	—	2.0	2.0
30–39	2.4	1.8	3.7	5.0	4.0	6.0
40–49	5.8	10.3	15.1	4.0	8.0	9.0
0–59	6.6	6.2	14.3	4.0	3.0	7.0
60–69	7.3	7.7	21.1	3.0	3.0	7.0
70–79	12.4	15.4	32.9	5.0	5.0	9.0
≥80	—	—	16.8	1.0	3.0	4.0

*SEER = Surveillance, Epidemiology, End Results Program, National Cancer Institute.

TABLE 3. Cervical cancer deaths* and age-adjusted mortality rates†, by state and race — United States, 1986–1987

	No. deaths			Rate/100,000 women		
State	All races	White	Black	All races	White	Black
Alabama	226	133	93	4.6	3.5	8.4
Alaska	11	6	0	3.8	2.7	—
Arizona	122	104	9	3.1	2.8	10.0
Arkansas	95	75	20	3.1	2.8	5.2
California	863	702	100	2.8	2.6	5.4
Colorado	88	77	5	2.6	2.4	5.6
Connecticut	96	77	18	2.3	2.0	8.9
Delaware	29	17	12	3.7	2.5	13.1
District of Columbia	57	8	47	6.9	3.6	8.2
Florida	473	349	121	2.9	2.4	8.3
Georgia	256	121	133	3.7	2.3	8.6
Hawaii	26	6	0	2.2	1.7	—
Idaho	35	30	0	3.4	3.1	—
Illinois	453	331	118	3.3	2.7	7.1
Indiana	232	206	26	3.6	3.4	6.2
Iowa	82	78	3	2.3	2.2	—
Kansas	75	64	9	2.5	2.2	7.7
Kentucky	212	193	19	4.8	4.7	7.0
Louisiana	214	92	122	4.5	2.6	9.8
Maine	71	68	0	4.9	4.6	—
Maryland	149	92	55	2.9	2.2	5.7
Massachusetts	182	161	18	2.3	2.1	8.0
Michigan	306	231	71	2.9	2.5	6.1
Minnesota	89	85	2	1.8	1.8	—
Mississippi	116	43	72	4.0	2.1	8.3
Missouri	185	152	33	2.8	2.6	5.7
Montana	26	20	0	2.5	2.1	—
Nebraska	44	35	7	2.5	2.0	—
Nevada	40	33	6	3.6	3.2	—
New Hampshire	42	40	0	3.5	3.3	—
New Jersey	311	223	86	3.1	2.6	8.6
New Mexico	44	34	3	2.7	2.3	—
New York	729	531	187	3.2	2.7	6.4
North Carolina	281	172	106	3.8	2.9	7.6
North Dakota	22	20	0	3.0	2.8	—
Ohio	436	374	61	3.2	3.0	5.0
Oklahoma	125	98	18	3.3	2.9	7.8
Oregon	78	73	0	2.2	2.1	—
Pennsylvania	455	385	68	2.8	2.6	5.4
Rhode Island	26	24	1	2.3	2.2	—
South Carolina	164	75	88	4.2	2.6	9.0
South Dakota	13	11	0	1.7	1.5	—
Tennessee	235	165	70	4.1	3.3	9.4
Texas	550	423	126	3.1	2.7	7.0
Utah	25	23	0	1.6	1.6	—
Vermont	14	14	0	2.4	2.4	—
Virginia	236	152	82	3.6	2.8	7.5
Washington	106	94	6	2.1	2.0	7.6
West Virginia	110	106	4	4.7	4.7	—
Wisconsin	116	104	8	1.9	1.7	5.1
Wyoming	9	9	0	2.0	2.0	—
Total	**8,980**	**6,740**	**2,033**	**3.1**	**2.6**	**7.2**

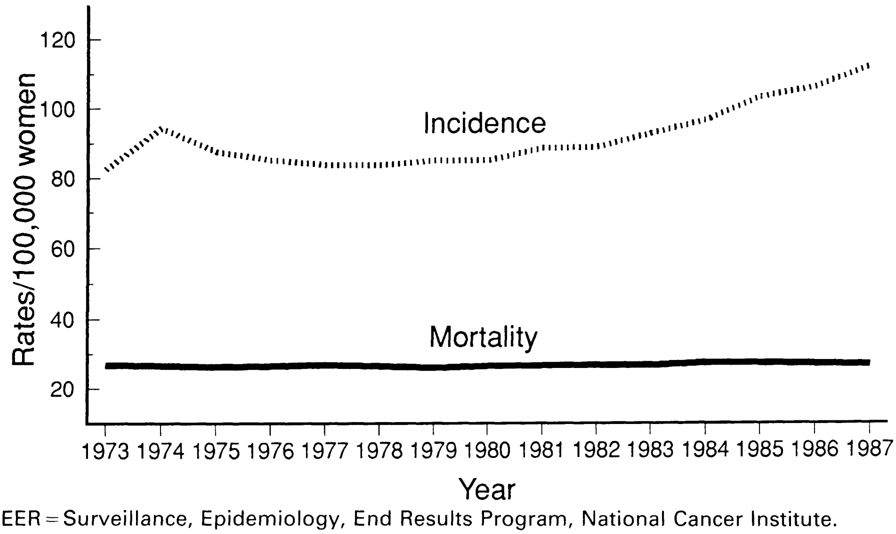
*From National Center for Health Statistics mortality tapes, underlying cause of death.
†Adjusted to the 1970 U.S. population.
—Less than 75,000 in denominator.

TABLE 4. Age-specific incidence and proportion of in situ cervical cancers, by age group, race, and time period — SEER*, 1973–1987

	In situ rates/100,000 women			Proportion of all cervical cancers (%)		
Race/age	1973–1977	1978–1982	1983–1987	1973–1977	1978–1982	1983–1987
Whites						
20–29	81.4	79.2	86.3	93.6	94.3	94.8
30–39	105.7	90.3	84.1	86.2	87.3	86.5
40–49	47.4	39.8	43.3	70.7	71.8	73.8
50–59	20.5	15.2	16.3	47.2	48.0	52.0
60–69	15.2	11.7	12.6	36.6	35.6	44.4
70–79	9.6	7.8	8.7	28.0	28.3	33.6
≥80	3.7	3.9	4.7	11.3	15.9	22.3
Blacks						
20–29	169.5	111.3	75.6	94.4	94.2	94.7
30–39	174.4	116.6	78.5	85.5	85.2	82.7
40–49	82.2	64.4	55.5	65.9	65.0	64.3
50–59	41.6	33.8	24.4	42.6	44.4	46.2
60–69	33.9	22.9	22.6	36.6	36.0	36.4
70–79	34.3	28.2	24.1	30.3	29.0	32.2
≥80	21.1	21.5	16.8	19.0	18.6	21.1

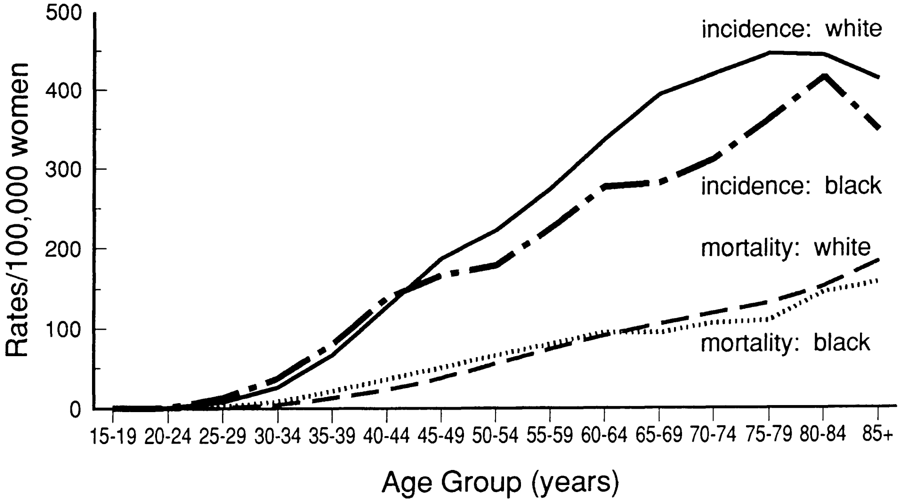
*SEER = Surveillance, Epidemiology, End Results Program, National Cancer Institute.

FIGURE 1. Breast cancer — SEER* incidence and U.S. mortality rates, 1973–1987



*SEER = Surveillance, Epidemiology, End Results Program, National Cancer Institute.

FIGURE 2. Average annual age-specific SEER* incidence and U.S. mortality rates, by race, 1983–1987



*SEER = Surveillance, Epidemiology, End Results Program, National Cancer Institute.

FIGURE 3. Breast cancer mortality rates, by age group and race — United States, 1973–1987

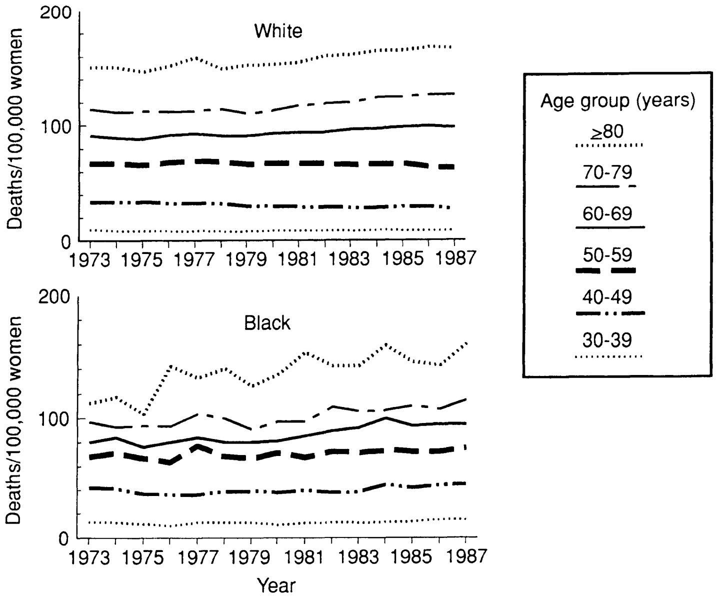
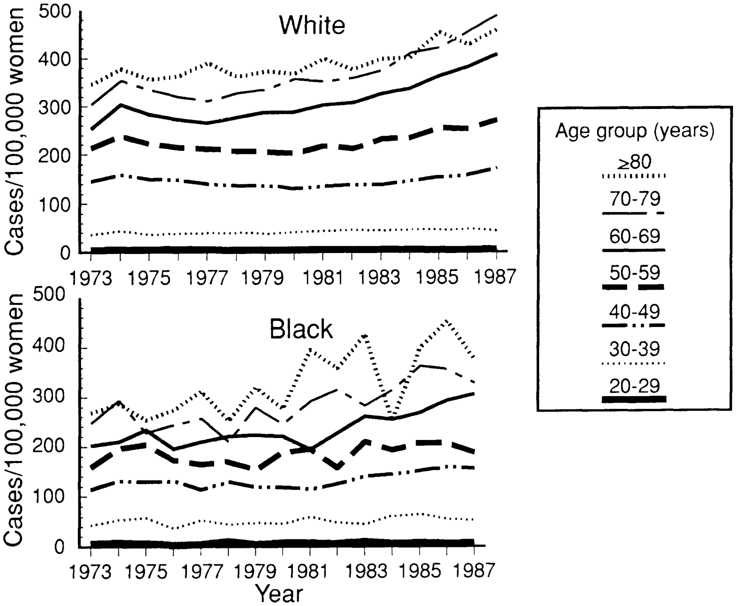
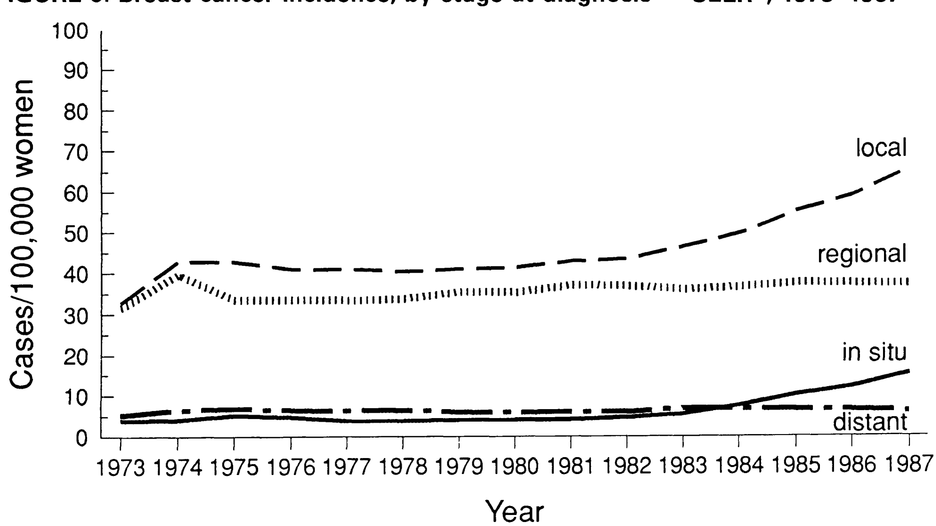


FIGURE 4. Breast cancer incidence, by age group and race — SEER*, 1973–1987



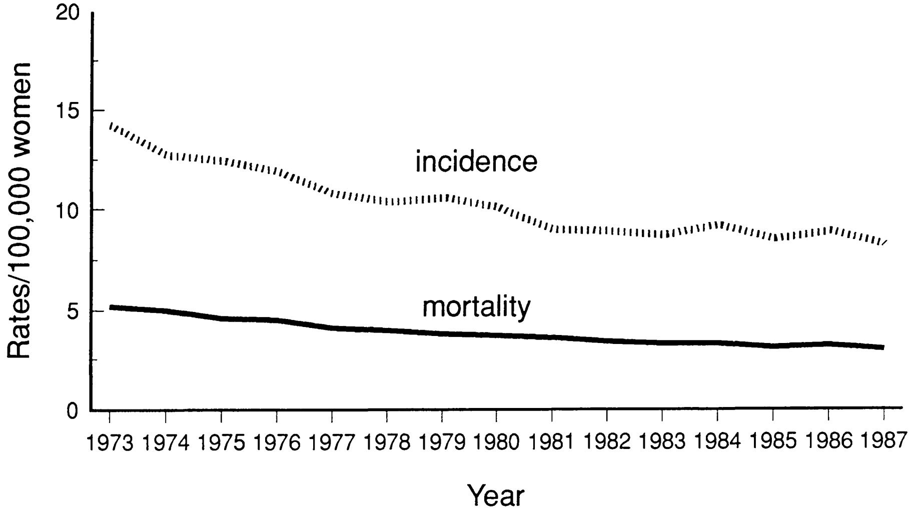
*SEER = Surveillance, Epidemiology, End Results Program, National Cancer Institute.

FIGURE 5. Breast cancer incidence, by stage at diagnosis — SEER*, 1973–1987



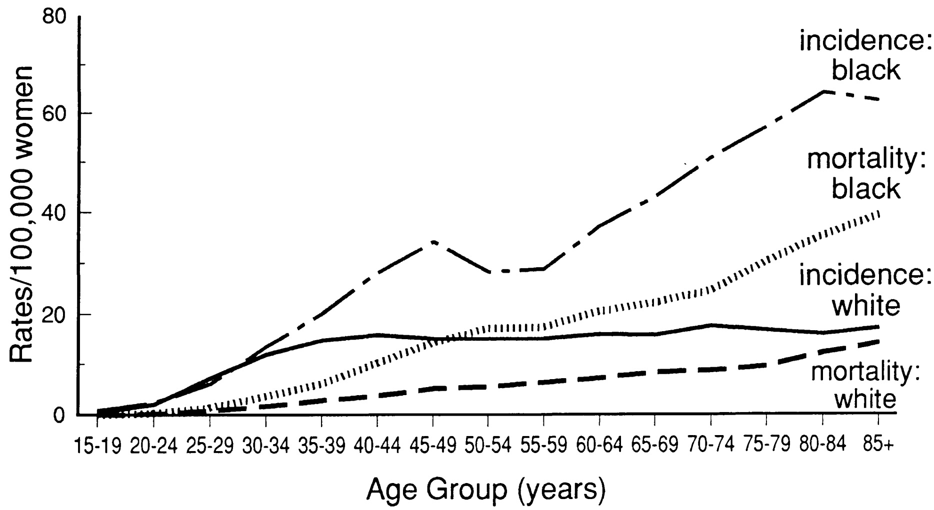
*SEER = Surveillance, Epidemiology, End Results Program, National Cancer Institute.

FIGURE 6. Cervical cancer — SEER* incidence and U.S. mortality rates, 1973–1987



*SEER = Surveillance, Epidemiology, End Results Program, National Cancer Institute.

FIGURE 7. Average annual age-specific cervical cancer SEER* incidence and U.S. mortality rates, by race, 1983–1987



*SEER = Surveillance, Epidemiology, End Results Program, National Cancer Institute.

FIGURE 8. Cervical cancer mortality rate, by age group and race — United States, 1973–1987

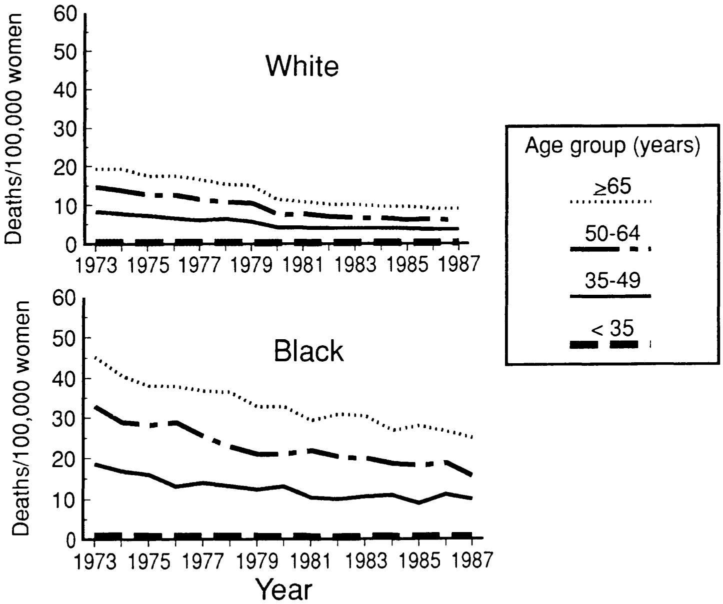
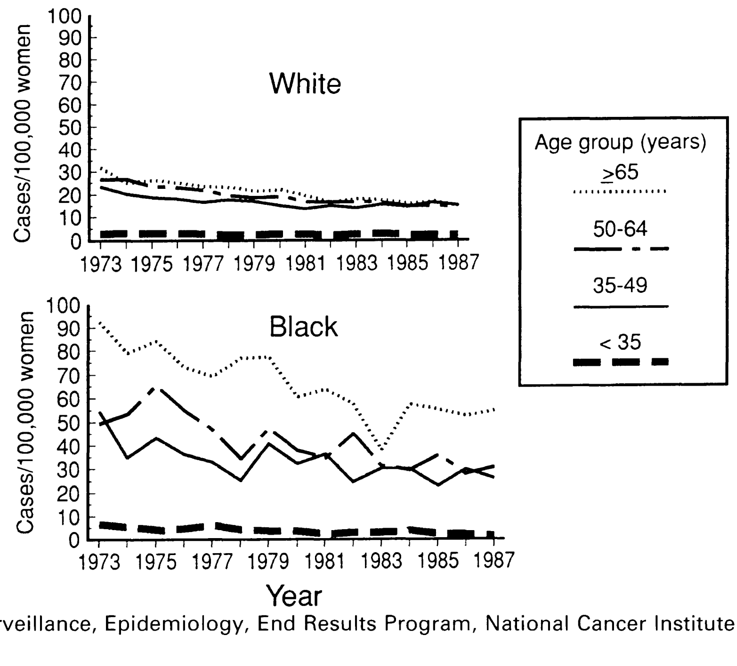
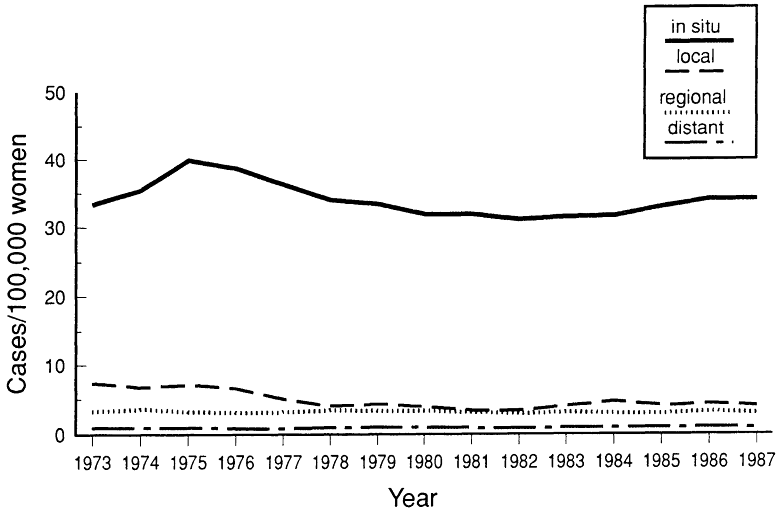


FIGURE 9. Cervical cancer incidence, by age group and race — SEER*, 1973–1987



*SEER = Surveillance, Epidemiology, End Results Program, National Cancer Institute.

FIGURE 10. Cervical cancer incidence, by stage at diagnosis — SEER*, 1973–1987



*SEER = Surveillance, Epidemiology, End Results Program, National Cancer Institute.

Cancer Screening Behaviors Among U.S. Women: Breast Cancer, 1987–1989, and Cervical Cancer, 1988–1989

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Summary

Data from the Behavioral Risk Factor Surveillance System (BRFSS) were used to examine trends in breast and cervical cancer screening behaviors among U.S. women in selected states. Data reported are from the 1987, 1988, and 1989 BRFSS for breast cancer screening (mammography) and from the 1988 and 1989 BRFSS for cervical cancer screening (Papanicolaou [Pap] smear). Results are presented as either state-specific or state-aggregate data for the years noted above.

State-specific analyses indicated that self-reported mammography utilization increased between 1987 and 1989. Although whites and blacks reported similar mammography utilization rates both for screening and for a current or previous breast problem, disparities were evident among women of different ages and incomes. The proportion of women who reported ever having had a Pap smear and having heard of a Pap smear were extremely high and remained fairly consistent across the 2 survey years. State-aggregate analyses, however, showed that the percentage of women who had had a Pap smear within the previous year was negatively associated with age and positively associated with income. A higher proportion of blacks than whites obtained Pap smears. These results indicate that certain segments of the population are not taking full advantage of available breast and cervical cancer screening technologies. Public health strategies, such as those outlined in the Breast and Cervical Cancer Mortality Prevention Act of 1990 (Public Law 101-354), should enhance screening opportunities for these women.

INTRODUCTION

Scientifically proven screening procedures can detect breast and cervical cancers in the early, more treatable stages. Nevertheless, in 1992, 180,000 women will be diagnosed with breast cancer and 46,000 will die of the disease. Furthermore, in 1992, 13,500 women will be diagnosed with cervical cancer and 4,400 will die of the disease (*1,2*). Early detection and diagnosis of breast and cervical cancers can markedly improve a woman's chance of survival. Following the recommended mammography and clinical breast examination screening guidelines can reduce deaths due to breast cancer by approximately 30% among women ages ≥50 years (*2,3*). Although increased use of the Papanicolaou (Pap) smear since 1969 has contributed to a 50% reduction in the cervical cancer death rate among blacks and whites, it is estimated that improved compliance could reduce the death rate by 75% of the 1969 level (*2,3*).

Guidelines for breast cancer screening endorsed in 1989 by the American Cancer Society (ACS), the National Cancer Institute (NCI), and other medical organizations recommend that a) asymptomatic women ages ≥40 years receive an annual clinical breast examination, b) women ages 40–49 years receive a screening mammogram every 1–2 years, and c) women ages ≥50 years receive an annual screening mammogram. Guidelines for cervical cancer screening endorsed in 1987 by ACS, NCI, and the American College of Obstetrics and Gynecology recommend an annual Pap smear with a pelvic examination for women who are or have been sexually active or who are ages ≥18 years. After three or more consecutive normal annual examinations, the Pap smear may be performed less frequently at the discretion of the physician.

In 1990, the U.S. Public Health Service developed and initiated directions and recommendations designed to reduce breast and cervical cancer incidence and mortality among U.S. women. Objectives, set forth in *Healthy People 2000* (*3*), include increased compliance with early detection procedures and target for the year 2000 a reduction in deaths due to breast cancer to no more than 20.6/100,000 women and a reduction in deaths due to cervical cancer to no more than 1.3/100,000 women. Special objectives were developed to target specific subgroups, including black and Hispanic women, women with low incomes, and women with less than a high school education. Other objectives promote adherence to screening guidelines by health-care providers and promote quality control standards for cytology laboratories and mammography facilities.

TRENDS IN SCREENING

Mammography

In several national surveys, investigators have examined trends in the utilization of early detection procedures of breast cancer. In 1978, a survey by Lieberman Research, Inc., of public attitudes toward cancer and cancer screening revealed that 13% of women ages 30–49 years and 17% ages ≥50 years reported ever having had a mammogram (*4*). Results from a 1983 Gallup Organization survey of public awareness and use of cancer detection tests revealed that 40% of women ages 40–49 years and 41% ages ≥50 years received a breast x-ray at some point in their lives. Additionally, 15% of the women surveyed reported having a yearly breast x-ray (*4*).

Data from the 1987 National Health Interview Survey (NHIS) provide national estimates of the prevalence of preventive practices related to breast cancer for women ages ≥40 years (*5*). The results revealed that 38% of women ages ≥40 years reported having had at least one mammogram in their lifetime. Fifteen percent of these women reported having had a mammogram in the previous 11 months, 14% in the previous 12–36 months, and 7% in the previous 37 months or more; approximately 2% indicated they were unsure of the time interval since their last mammogram. Mammography use decreased with age: 42% of women ages 40–54, 41% ages 55–64, 35% ages 65–74, and 25% of women ages ≥75 years reported ever having had a mammogram. Results from the 1987 NHIS also showed a strong association between mammography use and race and income. The proportion of women receiving a mammogram within each screening interval was comparatively smaller for blacks than for whites. Additionally, the proportion of women reporting ever having had a mammogram was positively associated with income.

In February 1990, the Jacobs Institute of Women's Health conducted the Mammography Attitudes and Usage Study to determine whether mammography use had increased as a result of the promotion of the screening procedure (*6*). Of the women ages ≥40 years who reported ever having had a mammogram, 65% were white and 58% were black. As was true with the NHIS results, mammogram use differed with age: 64% of women ages 40–49, 71% of those 50–59, 65% of those 60–69, and 56% ages ≥70 years reported ever having undergone the procedure. Mammography use was also positively associated with income.

Even though the proportion of women reporting ever having had a mammogram increased across survey years, the magnitude of the increase is difficult to summarize, given the different survey methodologies employed. Trends in use, however, tended to be higher among women ages 40–50 years, tapering off slightly for women ages 50–70 years, and reaching the lowest levels for women ages ≥70 years. Other variables related to mammography use were race and income, with white and high-income women utilizing the procedure more than black and low-income women.

Papanicolaou Smear

NHIS also provides national estimates of the prevalence of preventive practices related to cervical cancer screening for women ≥20 years (*7*). The age-adjusted rates for women reporting ever having had a Pap smear within the previous 2 years was 64% in 1973 and 65% in 1985. Results from both the 1973 and 1985 surveys revealed that age was negatively associated and income was positively associated with having had a Pap smear within the previous 2 years. In 1973, whites were more likely than blacks to have had a Pap smear within the previous 2 years, whereas in 1985 this trend was reversed.

Data from the 1987 NHIS indicated that 48% of all women had a Pap smear within the previous year and an additional 17% had a Pap smear within the previous 1 to 3 years (*8*). After the age of 40, the proportion of women reporting ever having had the procedure decreased, with women ages ≥70 years reporting the lowest utilization rates. Generally, blacks were more likely than whites to have had a Pap smear within the previous year.

Although the national surveys previously discussed have provided an indication of the proportion of women who have ever had a mammogram or Pap smear, they do not provide a comprehensive picture of trends in screening utilization. The data are limited by the years in which the surveys were conducted and because the surveys used varying methodologies. Therefore, this report presents data from the Behavioral Risk Factor Surveillance System (BRFSS) to examine trends in breast and cervical cancer screening behaviors among U.S. women. The BRFSS provides state-specific estimates of the prevalence of certain health-risk behaviors; however, it also can be used to monitor trends in U.S. health behaviors that affect chronic disease rates and to assess progress toward the year 2000 objectives for the nation (*9*).

METHODS

Behavioral Risk Factor Surveillance System

In 1981, CDC, in collaboration with state health departments, began to conduct a system of telephone surveys on health behaviors as a means of aiding in the development of health promotion and education programs based on state-level data. In 1984, these surveys evolved into BRFSS. By 1990, 45 states and the District of Columbia had conducted telephone surveys using CDC's training, coordination, and standard methods. The BRFSS has three components: a core of questions asked by all states; standardized modules of questions developed by CDC that are added at each state's discretion; and questions developed by the individual states to meet specific data needs (*10*).

Most of the states using the BRFSS utilize a multistage-cluster-design procedure, based on the Waksberg random-digit dialing technique. The sampling frame includes adult respondents (≥18 years of age) at noninstitutional private residences with telephones. Telephone numbers are randomly generated using the first eight digits of the 10-digit telephone number. A cluster of 100 numbers is then randomly generated by using the last two digits of the telephone number. Clusters are screened by calling the first randomly selected telephone number. If the number is for a private residence, the entire cluster is accepted; otherwise, the entire cluster is rejected. This screening procedure improves efficiency by accepting clusters with a high probability of having residential numbers. After a cluster is accepted, numbers are sequentially dialed from a randomly ordered list until three interviews are completed.

Interviewers make up to 20 attempts to contact a respondent at a given number before replacing it with the next telephone number. After contacting a household, the interviewer randomly selects one adult from among all adults residing in the household. If the selected adult is not available at the time of the initial call, subsequent calls are made according to a specified protocol until the interview is completed. Interviews are conducted during a 7- to 10-day period every month.

Data reported are from the 1987, 1988, and 1989 BRFSS for breast cancer screening (mammography) and from the 1988 and 1989 BRFSS for cervical cancer screening (Pap smear). Cervical cancer screening questions were not asked in 1987. All results are presented as either state-specific or state-aggregate data for the years noted above. The state-specific rates, by year, were based on data that had been edited and originally weighted to the age-, race-, and gender-specific population counts from the currently available census data in each state and by the respondent's probability of selection. These analyses were restricted to women ages ≥40 years for mammographies and to women ages ≥18 years for Pap smears. For both mammography and Pap smear data, analyses were restricted to black-white comparisons because of sample size. The sample sizes for the states varied by year.

Aggregation of state data for a portion of the analysis permitted the evaluation of screening procedure use by specific race, income, and age subgroups. For the aggregated portion of these analyses, only those states (N = 16 [15 states and the

District of Columbia]) that used the mammography questions in 1987, 1988, and 1989 were included, and only those states (N = 16 [15 states and the District of Columbia]) that used the Pap smear questions in 1988 and 1989 were included. The state-aggregate data were weighted by 1989 census data by age- and race-specific population counts as well as by the respondent's probability of selection. The four age groups used to weight the mammography portion of these analyses were 40–49 years, 50–59 years, 60–69 years, and ≥70 years. The three age groups used to weight the Pap smear portion of these analyses were 18–39 years, 40–59 years, and ≥60 years. For both mammography and Pap smear data, analyses were restricted to black-white comparisons because of sample size.

Prevalence estimates for all analyses were computed by using the sampling weights. SESUDAAN, a procedure for analyzing complex sample survey data, was used to calculate the standard errors for the prevalence estimates (*11*).

RESULTS

Mammography Use

Results from the state-specific analyses of women ages ≥40 years who self-reported ever having had a mammogram showed that mammography use varied by state, ranging from 38% to 62% in 1987; 45% to 69% in 1988; and 52% to 79% in 1989 (Table 1). All states included in the analyses recorded an increase in the proportion of women ages ≥40 years ever having had a mammogram between 1987 and 1989. The increase ranged from 7% to 23%. Analyses, by year, of women reporting ever having had a mammogram for a current or previous breast problem revealed that the rates remained fairly constant across years, ranging from 4% to 16% in 1987, from 9% to 13% in 1988, and from 6% to 14% in 1989 (Table 2).

Some racial differences in mammography use were noted in the state-aggregate results. In 1987 and 1988, whites reported slightly higher utilization rates than blacks; in contrast, in 1989 blacks reported slightly higher utilization rates than whites (Table 3). For all four age categories, the percentage of women reporting ever having had a mammogram increased substantially between 1987 and 1989 (Figure 1). In both 1987 and 1988, a higher proportion of whites ages 40–69 years than blacks ages 40–69 years reported ever having had a mammogram. In 1989, however, blacks ages ≥50 years reported higher screening rates than whites in this same age range. For all 3 years, use was highest for women ages 50–59 years, decreasing between the age ranges of 50–59 and 60–69, and decreasing again between the age ranges of 60–69 and ≥70 years. For both blacks and whites, ever having had a mammogram was positively associated with income (Figure 2).

In all 3 survey years, a slightly higher proportion of whites than blacks reported ever having had a mammogram for a current or previous breast problem (Table 3). No clear trends emerged related to utilization rates by income or age.

A high percentage of both black and white women reported having had a screening mammogram within the previous 24 months, as compared with having had the procedure ≥25 months preceding the interview (Table 4). The proportion of both blacks and whites having had the procedure within the previous 24 months increased across the 3 survey years. Younger and higher income whites were more likely to have had a mammogram within the previous 24 months. For blacks, higher income was also associated with having had a screening mammogram within 24 months preceding the interview.

Various reasons were reported for why some women have never had a mammogram (Table 5). A substantially higher percentage of women reported never having had a mammogram because it was not recommended by a physician. Marked differences were found between racial groups, with over one-half of all blacks, as compared with approximately one-third of all whites, reporting never having had a mammogram because it was not recommended by their physician. Never having had a screening mammogram because it was not recommended by the physician was positively associated with age. For both blacks and whites, the next most frequently reported reason was that respondents did not think the procedure to be necessary. A higher proportion of whites indicated that they never had a mammogram because of cost (they could not afford the procedure or their insurance would not pay for the procedure), as compared with never having heard of the procedure. A similar percentage of blacks reported never having had a mammogram because they had never heard of it or because of cost.

Pap Smear Use

State-specific analyses indicated that the percentage of women ages ≥18 years who reported ever having had a Pap smear was extremely high and did not vary appreciably by state (Table 6). Rates ranged from 93% to 100% in 1988 and from 98% to 100% in 1989. For all states, the proportion of women having heard of a Pap smear was also extremely high, ranging from 99% to 100% in 1987 and 99.6% to 100% in 1989.

In addition, analyses showed that for all states approximately two-thirds of women reported having had a Pap smear within 12 months preceding the interview (Table 7). Pap smear use varied by state. Utilization rates within the previous 12 months ranged from 49% to 75% in 1988 and from 54% to 73% in 1989. For Pap smears obtained 13–24 months preceding the interview, rates ranged from 9% to 19% in 1988 and from 11% to 16% in 1989; for those obtained ≥25 months preceding the interview, rates ranged from 7% to 25% in 1988 and from 5% to 21% in 1989.

In both 1988 and 1989, a higher proportion of blacks than whites reported having had a Pap smear within the previous 12 months; in contrast, a higher percentage of whites than blacks reported having had the procedure 13–24 months or ≥25 months preceding the interview (Table 8). For both races, younger women and women with higher household incomes were more likely to have had Pap smears within the previous 12 months. Women who were older or who had lower household incomes were more likely to have had the screening procedure ≥25 months preceding the interview.

DISCUSSION

Mammography Use

State-specific analyses of self-reported mammography use showed an increase between 1987 and 1989. Possible explanations include the increased media coverage of breast cancer in women's magazines and the popular press; the demonstrated efficacy of mammography technology; physician acceptance and referral; the increased emphasis on the importance of health promotion and prevention practices; the increased number of national, state, and local breast cancer demonstration projects; and expanded coverage of mammography screening by some insurance policies through state-sponsored legislation.

The analyses also showed that a substantially larger proportion of women reported having had a screening mammogram within the previous 24 months, as compared with having had one ≥25 months preceding the interview. Few differences were found between blacks and whites in terms of the proportion of the population of women ever having had a screening mammogram and the time since the last screening. These findings should be interpreted with caution because the BRFSS is a household telephone survey and not all households have telephones. Moreover, members of households without telephones tend to be young, poor, black, and residents of rural areas. As a result, these subpopulations are underrepresented in the survey sample (*10*).

Despite the increase in mammography use, inequalities still persist. Although whites and blacks reported approximately equivalent mammography use both for screening and for a current or previous breast problem, disparities exist among women of different ages and income segments of the population. These findings agree with those of previous researchers (*4,6*) who have shown lower mammography screening use among older women. Income was also associated with time since last screening; women in higher income groups were more likely to have had a screening mammogram within the previous 24 months.

The most noteworthy finding was related to the reasons why women reported never having had a screening mammogram. Over one-half of all blacks and slightly more than one-third of all whites who reported never having had a mammogram indicated that it was because their physician did not recommend it. The proportion of women reporting this reason increased with age. In addition, approximately one-third of whites and approximately one-fifth of blacks indicated that it was because they did not perceive the procedure as necessary. A much smaller proportion of women indicated never having had a mammogram because of cost or because of never having heard of the procedure. These findings suggest that low screening rates, particularly for older women, result in part from the lack of physician compliance with the screening guidelines and possibly from a failure to communicate effectively to women the value of mammography in detecting occult breast cancer.

Various reasons have been offered to explain adherence to breast cancer screening guidelines by U.S. physicians (Ackermann SP, Cheal NE: unpublished data, 1991). These include patient characteristics, such as age; patient reactions and feelings, such as refusal, anxiety, and embarrassment; physician characteristics, such as specialty, gender, knowledge of the guidelines, and recency of training; practice constraints, such as the availability of mammography facilities; test constraints, such as equivocal radiology reports, cost, and radiation risk; and professional considerations, such as unnecessary biopsies, threats of litigation, and the knowledge of the increasing incidence of breast cancer.

Pap Smear Use

The proportions of women who self-reported ever having had and ever having heard of a Pap smear were extremely high and remained approximately consistent across the 2 survey years. Almost two-thirds of the women reported having had a Pap smear within 12 months prior to the interview, with an additional 10% reporting having had one within 13–24 months. State-aggregate analyses, however, showed that the percentage of women having had a Pap smear within the previous 12 months was negatively associated with age and positively associated with income. A higher proportion of blacks than whites obtained Pap smears.

Although Pap smear utilization rates are high, low-income and older women still do not completely meet the screening guidelines. Unfortunately, the BRFSS did not ask women why they did not have Pap smears. A recent study of national trends in the use of preventive health care (*7*) has shown, however, that most of the women who did not receive a Pap smear did have recent contact with a physician. Underuse of the procedure could, therefore, result in part because a physician did not recommend it. A recent literature review (*13*) identified reasons why primary-care providers do not adhere to the cervical cancer screening guidelines. These include provider characteristics, such as knowledge of the guidelines, specialty, gender, time constraints, forgetfulness, and inconvenience; patient characteristics, such as age and refusal; test constraints, such as lack of supplies and cost; and type of patient, such as "new" versus "established" and "high risk" versus "low risk."

Future Directions

As the results from recent BRFSS surveys have clearly indicated, certain segments of the population are not fully utilizing available breast and cervical cancer screening technologies. What, then, can be done to increase both patient and provider compliance with breast and cervical cancer screening? In response to the large proportion of U.S. women—particularly minority, low-income, underserved, underinsured, uninsured, and unaware women—who are not using breast and cervical cancer early-detection services, the U.S. Public Health Service has developed directions and standards to enhance screening opportunities and to address the *Healthy People 2000* objectives.

In response to the Breast and Cervical Cancer Mortality Prevention Act of 1990 (Public Law 101-354), CDC funded 12 comprehensive breast and cervical cancer early-detection and control programs in California, Colorado, Maryland, Michigan, Minnesota, Missouri, Nebraska, New Mexico, North Carolina, South Carolina, Texas, and West Virginia (*14*). This constitutes the beginning of a national commitment toward increasing the early detection and control of breast and cervical cancers. The state-based programs are designed to reduce mortality resulting from breast and cervical cancer through a) screening and follow-up services; b) public health educational strategies addressing knowledge, attitudes, and practices; c) professional education and awareness strategies; d) cytology and mammography quality control; and e) the development of a comprehensive surveillance and evaluation system. With assistance from CDC, each of the funded states will begin to develop an infrastructure to support early-detection and control efforts. This infrastructure is designed to lead to the institutionalization of breast and cervical cancer early-detection, screening, and follow-up services for all women.

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TABLE 1. Percentage of women ages ≥40 years who reported ever having had a mammogram, in selected states, by year — Behavioral Risk Factor Surveillance System, 1987–1989

	1987*		1988†		1989§		
State	**%**	**(95% CI¶)**	**%**	**(95% CI)**	**%**	**(95% CI)**	**% Change****
Alabama	45.0	±(5.3)	—	± —	54.6	±(4.4)	9.6
Arizona	48.9	(5.7)	—	—	61.4	(5.0)	12.5
California	57.7	(4.9)	68.9	(4.2)	68.0	(4.5)	10.3
Dist. of Columbia	61.6	(6.1)	67.5	(5.9)	79.0	(4.3)	17.4
Florida	48.7	(5.5)	—	—	61.6	(4.2)	12.9
Georgia	46.0	(5.7)	—	—	63.0	(4.8)	17.0
Hawaii	56.0	(6.0)	—	—	69.2	(4.6)	13.1
Idaho	47.6	(4.3)	—	—	59.4	(4.3)	11.9
Illinois	50.3	(4.8)	57.9	(4.8)	61.8	(4.4)	11.5
Indiana	38.4	(4.3)	44.9	(4.1)	57.2	(4.0)	18.7
Kentucky	42.7	(4.5)	52.2	(4.6)	58.0	(4.1)	15.4
Maine	47.8	(5.1)	62.8	(5.0)	63.2	(5.1)	15.4
Maryland	50.4	(5.8)	64.0	(5.7)	67.2	(4.3)	16.8
Massachusetts	56.0	(5.3)	—	—	71.4	(5.5)	15.4
Minnesota	55.8	(3.6)	—	—	73.0	(2.9)	17.3
Missouri	44.9	(5.3)	—	—	53.3	(4.6)	8.4
Montana	44.6	(5.6)	54.9	(5.5)	60.1	(5.2)	15.5
Nebraska	38.8	(5.6)	44.8	(5.0)	52.0	(4.9)	13.2
New Hampshire	60.5	(5.6)	69.3	(5.0)	68.3	(5.0)	7.8
New Mexico	40.5	(7.3)	54.2	(6.1)	62.2	(5.8)	21.7
New York	50.9	(6.2)	58.3	(5.8)	62.1	(5.4)	11.2
North Carolina	51.8	(4.7)	57.3	(4.7)	61.2	(4.5)	9.4
North Dakota	42.1	(5.2)	—	—	65.3	(4.4)	23.2
Ohio	46.2	(5.5)	—	—	64.0	(4.6)	17.8
Rhode Island	59.4	(4.6)	—	—	70.9	(4.0)	11.5
South Carolina	50.9	(5.3)	52.2	(4.9)	58.2	(4.2)	7.3
South Dakota	47.5	(5.4)	—	—	60.8	(4.4)	13.4
Tennessee	42.6	(3.9)	—	—	56.2	(3.8)	13.5
Texas	49.1	(6.2)	—	—	67.0	(4.7)	17.9
Utah	46.8	(5.8)	—	—	64.0	(4.5)	17.2
Washington	51.3	(5.8)	61.9	(5.2)	66.5	(4.6)	15.2
West Virginia	43.4	(5.1)	—	—	56.3	(4.2)	12.9
Wisconsin	55.1	(5.7)	61.2	(5.6)	67.4	(5.2)	12.3
Median value	**48.7**		**57.9**		**62.6**		

*Sample sizes for individual states range from 236 to 879.
†Sample sizes for individual states range from 275 to 675.
§Sample sizes for individual states range from 356 to 1,013.
¶Confidence interval.
**Percent change between 1987 and 1989.
—Data not available.

TABLE 2. Percentage of women ages ≥40 years who reported ever having had a mammogram for a breast problem, in selected states, by year — Behavioral Risk Factor Surveillance System, 1987–1989

State	1987* %	1987* (95% CI¶)	1988† %	1988† (95% CI)	1989§ %	1989§ (95% CI)	% Change**
Alabama	8.9	±(3.0)	—	± —	10.4	±(2.7)	1.5
Arizona	12.1	(3.5)	—	—	10.9	(3.2)	-1.2
California	10.5	(2.9)	10.0	(2.5)	8.3	(2.5)	-2.3
Dist. of Columbia	8.7	(3.6)	11.6	(3.8)	14.4	(3.8)	5.6
Florida	11.4	(3.4)	—	—	13.3	(2.9)	1.9
Georgia	11.3	(3.3)	—	—	10.8	(3.2)	-0.4
Hawaii	12.2	(3.9)	—	—	7.3	(2.8)	-4.9
Idaho	15.7	(3.0)	—	—	10.8	(2.8)	-4.9
Illinois	11.6	(3.1)	10.0	(2.8)	10.9	(2.7)	-0.7
Indiana	12.4	(2.8)	11.4	(2.5)	13.7	(2.9)	1.3
Kentucky	9.3	(2.5)	12.7	(2.7)	10.6	(2.4)	1.3
Maine	7.6	(2.7)	11.1	(3.2)	10.1	(3.1)	2.5
Maryland	13.7	(4.0)	9.8	(3.4)	8.8	(2.5)	-4.9
Massachusetts	9.4	(2.9)	—	—	9.6	(3.5)	0.2
Minnesota	9.9	(2.1)	—	—	7.9	(1.9)	-2.0
Missouri	12.5	(3.4)	—	—	5.8	(2.1)	-6.7
Montana	9.3	(3.1)	9.1	(3.0)	10.3	(3.1)	1.0
Nebraska	9.0	(2.9)	10.2	(3.0)	8.8	(3.0)	-0.3
New Hampshire	9.7	(3.4)	11.1	(3.7)	6.2	(2.3)	-3.5
New Mexico	4.4	(2.4)	12.7	(3.9)	7.5	(2.8)	3.2
New York	13.0	(3.6)	10.5	(3.5)	8.3	(2.8)	-4.7
North Carolina	11.2	(2.8)	10.5	(2.9)	10.5	(2.7)	-0.7
North Dakota	6.9	(2.3)	—	—	7.9	(2.4)	1.0
Ohio	9.4	(3.0)	—	—	11.1	(3.3)	1.8
Rhode Island	10.9	(2.8)	—	—	8.0	(2.3)	-2.9
South Carolina	11.9	(3.0)	10.7	(2.7)	9.4	(2.4)	-2.5
South Dakota	6.1	(2.5)	—	—	7.7	(2.3)	1.6
Tennessee	10.0	(2.1)	—	—	9.2	(2.1)	-0.8
Texas	7.0	(2.9)	—	—	9.7	(3.0)	2.6
Utah	10.2	(3.1)	—	—	13.8	(3.3)	3.6
Washington	12.4	(3.9)	9.4	(3.2)	9.8	(2.9)	-2.6
West Virginia	11.4	(2.9)	—	—	10.6	(2.7)	-0.8
Wisconsin	8.0	(2.8)	10.4	(3.4)	9.1	(3.2)	1.1
Median value	**10.2**		**10.4**		**9.7**		

*Sample sizes for individual states range from 330 to 937.
†Sample sizes for individual states range from 330 to 719.
§Sample sizes for individual states range from 356 to 1,013.
¶Confidence interval.
**Percent change between 1987 and 1989.
—Data not available.

TABLE 3. Percentage of women ages ≥40 years who reported ever having had a mammogram and percentage of those who reported ever having had a mammogram for a breast problem, in selected states*, by year, race, age, and income — Behavioral Risk Factor Surveillance System, 1987–1989

Race by age and income	Percentage of women who had a mammogram						Percentage of women who had a mammogram for a breast problem					
	1987		1988		1989		1987		1988		1989	
	%	(95% CI[†])	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
White	**44.1**	**±(1.4)**	**53.0**	**±(1.3)**	**62.2**	**±(1.3)**	**11.1**	**±(0.9)**	**11.3**	**±(0.9)**	**10.3**	**±(0.8)**
Age group (years)												
40–49	47.1	(2.7)	56.8	(2.6)	62.7	(2.4)	13.5	(1.8)	14.0	(1.8)	12.4	(1.6)
50–59	50.9	(3.0)	62.1	(2.8)	69.5	(2.7)	13.3	(2.0)	12.7	(1.9)	9.8	(1.7)
60–69	43.5	(2.7)	55.2	(2.7)	64.9	(2.6)	10.0	(1.6)	9.0	(1.5)	10.3	(1.6)
≥70	35.2	(2.5)	42.1	(2.5)	53.2	(2.5)	7.3	(1.4)	8.9	(1.4)	8.3	(1.3)
Income (thousands of dollars)												
<10	29.5	(2.4)	39.4	(2.8)	50.7	(3.0)	7.6	(1.4)	10.9	(1.8)	10.6	(1.8)
10–20	40.7	(2.8)	48.3	(2.9)	56.6	(2.9)	10.5	(1.7)	10.3	(1.8)	10.4	(1.7)
>20	58.3	(3.3)	68.9	(2.8)	74.3	(2.5)	14.2	(2.4)	14.3	(2.1)	9.9	(1.6)
Black	**41.9**	**±(4.0)**	**48.8**	**±(3.9)**	**65.9**	**±(3.4)**	**6.1**	**±(1.8)**	**7.7**	**±(2.1)**	**8.2**	**±(2.0)**
Age group (years)												
40–49	44.3	(7.3)	48.4	(7.0)	59.6	(6.5)	8.0	(3.5)	8.3	(3.6)	9.1	(3.9)
50–59	45.1	(7.9)	56.1	(7.5)	75.2	(6.0)	5.7	(4.0)	9.4	(4.9)	13.5	(4.7)
60–69	34.7	(7.7)	50.2	(8.2)	68.4	(6.6)	4.4	(3.3)	6.1	(3.3)	3.5	(2.3)
≥70	40.8	(9.9)	37.7	(7.8)	62.4	(7.1)	4.7	(3.1)	5.7	(3.8)	4.3	(3.3)
Income (thousands of dollars)												
<10	39.1	(6.6)	39.0	(6.3)	61.5	(6.2)	8.1	(3.5)	8.6	(4.0)	9.0	(4.0)
10–20	40.6	(8.7)	49.0	(8.5)	69.2	(7.0)	3.7	(3.3)	6.6	(4.1)	7.8	(3.6)
>20	57.6	(1.2)	68.8	(1.0)	67.8	(9.7)	11.0	(7.2)	8.3	(5.9)	11.3	(6.9)

*Included in the analysis were 15 states—California, Illinois, Indiana, Kentucky, Maine, Maryland, Montana, Nebraska, New Hampshire, New Mexico, New York, North Carolina, South Carolina, Washington, and Wisconsin— and the District of Columbia.

[†]Confidence interval.

TABLE 4. Time since last mammogram among women ages ≥40 years who have ever had a mammogram for screening purposes*, in selected states†, by year, race, age, and income — Behavioral Risk Factor Surveillance System, 1987–1989

Race by age and income	Had mammogram within the previous 0–24 months						Had mammogram ≥25 months preceding the interview					
	1987		1988		1989		1987		1988		1989	
	%	(95% CI§)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
White	**82.4**	**±(1.8)**	**86.4**	**±(1.4)**	**88.0**	**±(1.2)**	**17.3**	**±(1.8)**	**13.3**	**±(1.4)**	**11.2**	**±(1.1)**
Age group (years)												
40–49	85.0	(3.3)	90.6	(2.2)	90.3	(2.0)	14.9	(3.3)	9.4	(2.2)	9.3	(1.9)
50–59	82.7	(3.6)	89.1	(2.8)	90.6	(2.2)	16.9	(3.5)	10.8	(2.8)	9.1	(2.1)
60–69	81.7	(3.6)	84.8	(2.9)	87.1	(2.5)	18.1	(3.6)	14.7	(2.9)	12.6	(2.4)
≥70	79.6	(4.1)	80.5	(3.5)	83.9	(2.6)	20.0	(4.0)	18.7	(3.5)	14.2	(2.5)
Income (thousands of dollars)												
<10	80.1	(4.4)	80.6	(4.3)	81.0	(3.7)	19.7	(4.3)	18.8	(4.3)	16.4	(3.5)
10–20	79.5	(4.3)	84.2	(3.6)	84.6	(3.1)	20.5	(4.5)	15.5	(3.5)	14.7	(3.0)
>20	87.3	(3.3)	92.0	(2.1)	92.1	(1.8)	12.7	(3.3)	8.0	(2.1)	7.7	(1.8)
Black	**85.4**	**±(5.1)**	**82.7**	**±(5.0)**	**88.5**	**±(2.9)**	**12.5**	**±(4.7)**	**14.9**	**±(2.4)**	**10.5**	**±(2.8)**
Age group (years)												
40–49	88.3	(8.6)	80.5	(10.3)	91.4	(5.0)	11.7	(8.6)	17.8	(10.0)	6.7	(4.3)
50–59	81.4	(9.6)	83.9	(8.3)	90.8	(4.6)	18.6	(9.6)	13.0	(7.5)	9.2	(4.6)
60–69	87.2	(8.7)	87.0	(6.5)	86.8	(5.8)	9.5	(7.4)	13.0	(6.5)	13.2	(5.8)
≥70	83.3	(14.5)	80.8	(11.3)	81.6	(7.6)	8.9	(12.4)	13.9	(9.6)	16.6	(7.4)
Income (thousands of dollars)												
<10	84.7	(8.5)	78.3	(9.4)	86.7	(5.8)	10.4	(6.8)	19.2	(8.7)	13.3	(5.8)
10–20	82.0	(13.8)	80.8	(10.7)	87.5	(5.8)	18.0	(13.8)	15.8	(9.9)	12.1	(5.8)
>20	93.0	(9.7)	92.5	(8.7)	90.4	(7.9)	7.1	(9.7)	7.5	(8.7)	9.6	(7.9)

*Within a given stratum, the categories may not sum to 100% because of other or missing responses.
†Included in the analysis were 15 states—California, Illinois, Indiana, Kentucky, Maine, Maryland, Montana, Nebraska, New Hampshire, New Mexico, New York, North Carolina, South Carolina, Washington, and Wisconsin—and the District of Columbia.
§Confidence interval.

TABLE 5. Percentage of women ages ≥40 years who reported the most important reason for never having had a mammogram*, in selected states†, by race, age, and income — Behavioral Risk Factor Surveillance System, 1989

Race by age and income	Never recommended by physician		Not needed		Never heard of it		Cost/no insurance	
	%	(95% CI§)	%	(95% CI)	%	(95% CI)	%	(95% CI)
White	**38.5**	**±(2.0)**	**30.4**	**±(2.0)**	**1.3**	**±(0.5)**	**5.2**	**±(1.0)**
Age group (years)								
40–49	35.9	(3.9)	27.0	(3.6)	1.1	(0.9)	6.7	(1.9)
50–59	36.2	(5.1)	29.3	(4.8)	1.2	(1.1)	6.5	(2.4)
60–69	38.8	(4.4)	33.7	(4.3)	1.0	(0.9)	5.1	(2.1)
≥70	43.2	(3.6)	32.6	(3.4)	1.8	(1.0)	2.2	(1.1)
Income (thousands of dollars)								
<10	38.6	(4.3)	29.4	(4.0)	2.6	(1.5)	9.5	(2.7)
10–20	39.2	(4.4)	31.8	(4.2)	1.2	(1.0)	6.4	(2.3)
>20	38.4	(5.5)	28.2	(4.9)	0.5	(1.0)	2.9	(1.8)
Black	**51.9**	**±(6.4)**	**22.1**	**±(5.4)**	**3.5**	**±(2.0)**	**2.6**	**±(1.7)**
Age group (years)								
40–49	42.9	(11.3)	26.2	(9.7)	2.3	(2.7)	4.1	(3.7)
50–59	51.7	(14.2)	27.4	(12.6)	3.0	(3.4)	1.0	(2.0)
60–69	56.2	(12.5)	16.7	(8.9)	4.5	(5.7)	3.6	(4.3)
≥70	64.8	(12.6)	12.6	(10.3)	5.5	(4.8)	1.1	(2.2)
Income (thousands of dollars)								
<10	57.6	(10.5)	22.0	(8.7)	5.2	(3.9)	2.1	(2.9)
10–20	51.7	(14.1)	21.0	(12.1)	2.2	(3.1)	3.5	(4.1)
>20	59.1	(17.7)	12.0	(10.8)	0.0	(0.0)	2.6	(5.1)

*Within a given stratum, the categories may not sum to 100% because of other or missing responses.
†Included in the analysis were 15 states—California, Illinois, Indiana, Kentucky, Maine, Maryland, Montana, Nebraska, New Hampshire, New Mexico, New York, North Carolina, South Carolina, Washington, and Wisconsin—and the District of Columbia.
§Confidence interval.

TABLE 6. Percentage of women ages ≥18 years who reported ever having had a Papanicolaou (Pap) smear and percentage of those who reported ever having heard of a Pap smear, in selected states, by year — Behavioral Risk Factor Surveillance System, 1988–1989

	Women who had a Pap smear				Women who had heard of a Pap smear			
	1988*		1989†		1988		1989	
State	%	(95% CI§)	%	(95% CI)	%	(95% CI)	%	(95% CI)
California	100.0	±(0.0)	100.0	±(0.0)	100.0	±(0.0)	100.0	±(0.0)
Connecticut	—	—	100.0	(0.0)	—	—	100.0	(0.0)
Dist. of Columbia	99.6	(0.5)	100.0	(0.0)	99.9	(0.3)	100.0	(0.0)
Georgia	—	—	100.0	(0.0)	—	—	100.0	(0.0)
Idaho	—	—	99.7	(0.3)	—	—	100.0	(0.0)
Illinois	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)
Indiana	—	—	100.0	(0.0)	—	—	100.0	(0.0)
Kentucky	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)
Maine	95.9	(2.0)	99.3	(0.9)	99.9	(0.2)	100.0	(0.0)
Maryland	95.3	(2.3)	99.5	(0.5)	99.5	(0.6)	100.0	(0.0)
Nebraska	92.5	(2.6)	99.4	(0.8)	100.0	(0.0)	100.0	(0.0)
New Hampshire	94.9	(2.5)	99.4	(1.0)	99.6	(0.6)	100.0	(0.0)
New Mexico	97.6	(1.8)	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)
New York	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)
North Carolina	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)
North Dakota	—	—	100.0	(0.0)	—	—	100.0	(0.0)
Oklahoma	94.4	(3.2)	99.2	(0.7)	98.5	(1.4)	99.6	(0.5)
Rhode Island	—	—	100.0	(0.0)	—	—	100.0	(0.0)
South Carolina	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)
South Dakota	—	—	99.5	(0.4)	—	—	100.0	(0.0)
Washington	95.4	(2.0)	97.5	(1.2)	98.6	(1.6)	100.0	(0.0)
West Virginia	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)
Wisconsin	94.7	(2.4)	100.0	(0.0)	98.6	(1.1)	100.0	(0.0)

*Sample sizes for individual states range from 618 to 1,380.
†Sample sizes for individual states range from 674 to 1,299.
§Confidence interval.
—Data not available.

TABLE 7. Percentage of women ages ≥18 years who reported time since last Papanicolaou smear*, in selected states, by year — Behavioral Risk Factor Surveillance System, 1988–1989

	Within the previous 12 months				13–24 months preceding the interview				≥25 months preceding the interview			
	1988[†]		1989[§]		1988		1989		1988		1989	
State	%	(95% CI[¶])	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
California	67.9	±(2.9)	66.3	±(3.1)	11.3	±(1.9)	11.9	±(2.0)	12.3	±(2.0)	13.3	±(2.1)
Dist. of Columbia	74.5	(3.8)	72.7	(3.3)	9.6	(2.4)	11.7	(2.5)	6.7	(2.1)	5.4	(1.7)
Illinois	61.4	(3.4)	61.5	(3.3)	14.2	(2.5)	12.9	(2.1)	14.8	(2.4)	15.9	(2.4)
Kentucky	59.8	(3.3)	61.4	(3.1)	11.1	(2.1)	13.7	(2.2)	18.7	(2.6)	17.0	(2.3)
Maine	63.1	(3.6)	61.5	(4.0)	14.1	(2.6)	11.6	(2.5)	15.6	(2.6)	18.7	(3.1)
Maryland	69.6	(4.4)	72.5	(3.1)	9.4	(3.0)	10.5	(2.1)	11.7	(3.0)	10.0	(2.0)
Nebraska	60.2	(3.7)	56.0	(3.7)	13.8	(2.5)	13.4	(2.6)	15.4	(2.6)	21.0	(2.9)
New Hampshire	64.0	(3.9)	58.8	(3.9)	12.8	(2.6)	13.9	(2.6)	15.1	(2.9)	16.2	(2.8)
New Mexico	61.8	(4.0)	64.0	(4.0)	11.4	(2.7)	11.8	(2.6)	15.1	(2.8)	14.8	(2.8)
New York	64.1	(4.2)	59.7	(3.9)	11.5	(2.8)	12.6	(2.7)	12.6	(2.7)	13.5	(2.6)
North Carolina	67.4	(3.2)	68.9	(3.4)	11.5	(2.2)	13.8	(2.5)	13.5	(2.2)	11.2	(2.0)
Oklahoma	48.7	(4.7)	60.9	(3.9)	9.3	(2.4)	11.5	(2.5)	17.2	(3.3)	17.6	(3.0)
South Carolina	65.6	(3.2)	65.8	(3.3)	12.2	(2.1)	11.4	(2.1)	11.1	(2.0)	13.0	(2.1)
Washington	64.0	(3.8)	61.3	(3.5)	15.1	(2.8)	15.5	(2.7)	16.1	(2.8)	19.1	(2.8)
West Virginia	56.1	(3.4)	53.6	(3.8)	13.9	(2.3)	14.2	(2.4)	18.9	(2.6)	20.2	(2.8)
Wisconsin	48.7	(4.4)	58.1	(4.0)	18.6	(3.5)	14.8	(2.9)	25.4	(3.9)	20.6	(3.2)
Median value	**61.8**		**58.5**		**11.5**		**11.6**		**14.8**		**12.1**	

*Within a given stratum, the categories may not sum to 100% because of other or missing responses.
[†]Sample sizes for individual states range from 618 to 1,380.
[§]Sample sizes for individual states range from 674 to 1,299.
[¶]Confidence interval.

TABLE 8. Percentage of women ages ≥18 years who reported time since last Papanicolaou smear*, in selected states†, by year, race, age, and income — Behavioral Risk Factor Surveillance System, 1988–1989

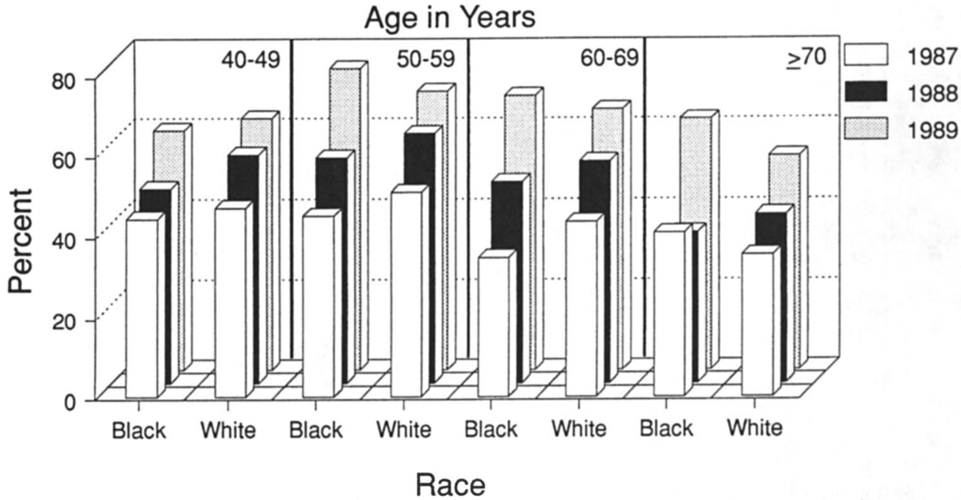
Race by age and income	Within the previous 12 months				13–24 months preceding the interview				≥25 months preceding the interview			
	1988		1989		1988		1989		1988		1989	
	%	(95% CI§)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
White	**60.7**	**±(1.0)**	**60.9**	**±(1.0)**	**13.4**	**±(0.7)**	**13.7**	**±(0.7)**	**17.1**	**±(0.8)**	**17.68**	**(0.7)**
Age group (years)												
18–39	72.6	(1.4)	72.8	(1.4)	11.5	(1.0)	12.4	(1.0)	8.7	(0.9)	7.82	(0.8)
40–59	60.5	(1.9)	59.8	(1.9)	16.5	(1.4)	15.1	(1.4)	18.3	(1.5)	22.03	(1.6)
≥60	41.4	(1.8)	42.5	(1.8)	13.2	(1.3)	14.3	(1.3)	29.5	(1.7)	29.11	(1.6)
Income (thousands of dollars)												
<10	46.6	(2.4)	47.8	(2.6)	11.9	(1.6)	13.5	(1.8)	24.8	(2.1)	24.19	(2.1)
10–20	57.5	(2.1)	57.9	(2.2)	14.8	(1.5)	12.7	(1.5)	20.7	(1.7)	21.49	(1.8)
>20	71.5	(2.0)	71.4	(1.8)	14.1	(1.5)	13.4	(1.4)	10.3	(1.3)	11.70	(1.3)
Black	**72.8**	**±(2.3)**	**73.8**	**±(2.2)**	**10.0**	**±(1.7)**	**10.2**	**±(1.5)**	**7.4**	**±(1.5)**	**8.00**	**(1.3)**
Age group (years)												
18–39	82.5	(3.2)	82.4	(2.8)	7.1	(2.0)	8.4	(2.0)	3.1	(1.4)	2.83	(1.1)
40–59	71.7	(4.8)	73.1	(4.2)	13.7	(3.7)	10.8	(2.8)	8.7	(3.0)	12.14	(3.2)
≥60	47.6	(5.7)	50.9	(5.2)	12.3	(3.7)	14.7	(3.9)	17.4	(4.5)	16.05	(3.8)
Income (thousands of dollars)												
<10	62.7	(5.0)	59.9	(5.1)	10.5	(3.2)	14.3	(3.9)	11.8	(3.5)	12.10	(3.6)
10–20	72.1	(5.1)	76.2	(4.2)	13.1	(4.0)	11.5	(3.2)	7.1	(3.0)	8.30	(2.8)
>20	84.7	(5.9)	85.2	(4.9)	6.7	(3.9)	7.6	(3.3)	4.7	(3.4)	4.18	(2.7)

*Within a given stratum, the categories may not sum to 100% because of other or missing responses.

†Included in the analysis were 15 states—California, Illinois, Kentucky, Maine, Maryland, Nebraska, New Hampshire, New Mexico, New York, North Carolina, Oklahoma, South Carolina, Washington, West Virginia, and Wisconsin—and the District of Columbia.

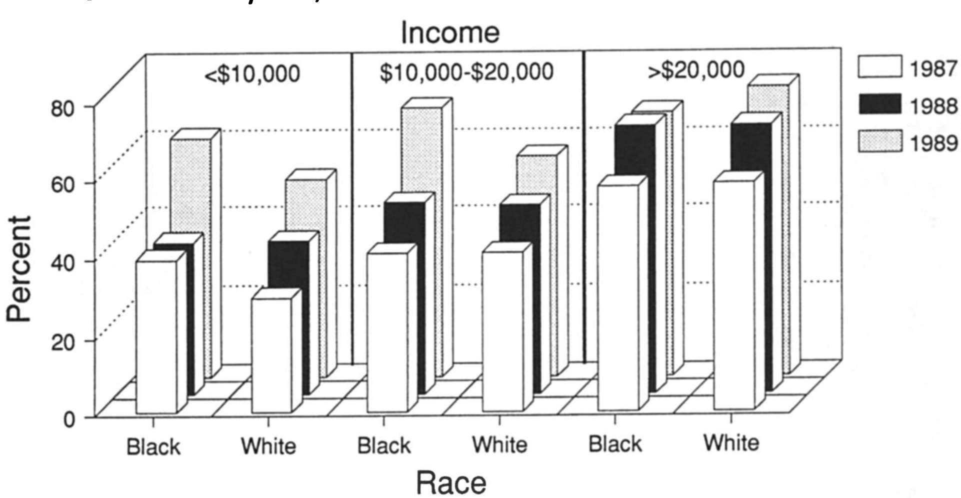
§Confidence interval.

FIGURE 1. Percentage of women ages ≥40 years who reported ever having had a mammogram, in selected states*, by year, race, and age — Behavioral Risk Factor Surveillance System, 1987–1989



*Included in the analysis were 15 states—California, Illinois, Indiana, Kentucky, Maine, Maryland, Montana, Nebraska, New Hampshire, New Mexico, New York, North Carolina, South Carolina, Washington, and Wisconsin—and the District of Columbia.

FIGURE 2. Percentage of women ages ≥40 years who reported ever having had a mammogram, in selected states*, by year, race, and income — Behavioral Risk Factor Surveillance System, 1987–1989



*Included in the analysis were 15 states—California, Illinois, Indiana, Kentucky, Maine, Maryland, Montana, Nebraska, New Hampshire, New Mexico, New York, North Carolina, South Carolina, Washington, and Wisconsin—and the District of Columbia.

Surveillance of Congenital Cytomegalovirus Disease, 1990–1991

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Summary

In January 1990, a registry was initiated for surveillance of infants with the often severe symptoms of congenital cytomegalovirus (CMV) disease. In the first 2 years, 100 cases were reported to the registry. Petechiae, the most commonly noted clinical sign, were reported for approximately 50% of infants, usually accompanied by hepatomegaly and splenomegaly. Of the various severe neurologic conditions that can result from congenital CMV infection, the most frequent was intracranial calcifications, which were noted in 43% of the cases. The most common laboratory abnormality was low platelet count, which was observed in 52% of the cases. Infants with severe neurologic damage were about twice as likely as infants with less severe damage to have most other clinical signs and laboratory abnormalities. Databases will be developed to facilitate comparisons among symptomatically infected infants and asymptomatically infected as well as noninfected infants.

INTRODUCTION

Congenital cytomegalovirus (CMV) disease is the most common serious viral infection among newborn infants in the United States (*1*). Congenital infection occurs in approximately 1% of all births each year, or 40,000 newborns. Approximately 10% of congenitally infected infants, or 3,000–4,000 newborns per year, are born with various hematologic, neurologic, and developmental symptoms and signs that define the disease. These include hepatosplenomegaly, intracranial calcifications, microcephaly, hearing impairment, and decreased size for gestational age. An additional 10%–15% of the asymptomatically infected infants, or 4,000–6,000 new-

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borns per year, subsequently develop neurologic or developmental problems in the first few months of life (*2*). Symptomatic congenital CMV infection is thought to result from a primary maternal infection and not from reinfection or reactivation of a prior infection (*3*), although evidence from prospective studies in England suggests that recurrent maternal infections may also cause severe symptomatic disease (*4,5*).

Congenital CMV disease results in financial and emotional hardships for the families of affected children and places a burden on state and local social services that provide for mentally and developmentally retarded infants and children. The annual cost of providing services for children afflicted with congenital CMV disease is conservatively estimated at $1.86 billion (CDC, unpublished data).

Approximately 50% of the adult U.S. population has been infected with CMV, and the prevalence exceeds 80% among those in lower socioeconomic groups. Transmission is thought to occur through contact with bodily secretions, primarily saliva, urine, and semen. Transmission of the virus can be prevented by taking simple precautions to avoid contact with these fluids.

Because transmission of CMV involves only direct contact with bodily fluids and because those mothers who have never been previously infected by CMV are at greatest risk of having an infant with congenital CMV disease, many cases may be preventable. Currently, however, there are no known behavioral risk factors for maternal infection. Furthermore, it is unclear why <50% of mothers with a primary infection pass the infection to their fetuses or why only 10% of infected fetuses develop symptomatic disease, although recent research indicates that congenital infection may be related to maternal weight gain (*6*). In addition, there is circumstantial evidence that the disease might be increasing as a result of CMV transmission from children attending day care to other members of their families (*7–9*).

The lack of understanding of the epidemiology of the disease, the presumption that primary maternal infections are preventable, and the concern that transmission might be increasing led to the call for surveillance for congenital CMV disease (*2*). In January 1990, a registry was established to characterize disease trends, identify risk groups, lay the groundwork for future intervention programs, and facilitate collaborative research (*10*). This report describes the results of the first 2 years of operation of the congenital CMV disease registry.

METHODS

Cooperating Centers

The congenital CMV disease registry was established by physicians and scientists at 16 cooperating medical and academic centers in the United States and Canada, with CDC coordinating the collection of data. These investigators are based primarily in pediatric infectious disease groups. Since its inception, the registry has grown to include 22 collaborating institutions (Figure 1).

Data Collection

With two exceptions, surveillance for congenital CMV disease is passive, with reports made only for symptomatic infants who are either born at the cooperating institution or referred to the institution for specialized care. The two exceptions to this surveillance method are those at the Baylor College of Medicine and the University of Alabama at Birmingham, where all infants born at certain hospitals are screened for

CMV infection. Regardless of the screening method, all infants included in the registry must have the virus cultured from bodily secretions within the first 3 weeks of life and have one or more specific clinical signs or laboratory abnormalities (Table 1).

Demographic data on the mother—including place of residence, age, race, ethnicity, marital status, insurance status, number of previous pregnancies, and number of living children—are collected from her medical records. Clinical data are collected from the infant's medical records. To estimate the prevalence of disease, we asked each collaborator to specify the size and location of that obstetric population from which all infants with congenital CMV disease would routinely receive medical treatment from the collaborator. Each case in the registry is then categorized as to whether it is from that population base or has been referred to the collaborator from elsewhere.

Statistical Analysis

The chi-square statistic was used to test differences in proportions and a two-tailed Student's t-test was used to determine differences in means. P-values <0.05 were considered statistically significant.

RESULTS

Data Collection

In the first 2 years of operation, 100 cases were reported to the registry (Table 2). More than 60% of cases were from five of the centers; five other centers reported no cases. Reports for a substantial number of cases did not indicate whether the cases were from the specified base population for the collaborator. Therefore, no estimate of prevalence will be made until the reporting status of these cases has been determined.

Maternal Characteristics

Eighty-one percent of mothers of infants reported with congenital CMV were <30 years of age; 49% were white, and 35% were black (Table 3). Just over one-half of the mothers were married at the time of delivery. Thirty-six percent had private medical insurance; 49% were covered by Medicaid. For one-half of those women of known parity, the infant reported to the registry was their first child.

Clinical Characteristics of Infants

Infants reported to the registry tended to be small in terms of weight, length, and head circumference (Table 4). The mean length of gestation was only 35.6 weeks, and the mean Apgar score at 5 minutes was 7.6. Cesarean deliveries were performed for 39% of newborns.

Clinical Signs

The most commonly noted clinical signs were hematologic; 51% of reported infants had petechiae, usually with hepatomegaly and splenomegaly (Table 5). The presence of either hepatomegaly or splenomegaly was noted in 52% of the infants. Jaundice was also present in 38% of the infants, in most instances occurring with hepatosplenomegaly. Of the severe, permanent neurologic conditions that can result from congenital CMV infection, intracranial calcifications were the most frequent sign (noted in 43% of the infants). Microcephaly was reported in 27%, chorioretinitis in

15%, and seizures in 10% of the infants. At least one of these signs was present in 55% of reported newborns. Two categories—"other neurologic abnormalities" and "hearing impairment"—which can be, but are not always, severe, were noted for 31% and 27% of infants, respectively.

Thirty-eight percent of infants with CMV disease were judged to be small for their gestational age. No other clinical sign was strongly associated with this developmental characteristic.

Laboratory Results

The most commonly reported laboratory abnormality was low platelet count, which was noted in 52% of all infants. Approximately 35% of all infants had elevated bilirubin, and 26% had an elevated level of alanine aminotransferase (ALT).

Comparison of Infants by Severity of Neurologic Damage

Maternal and obstetric characteristics for infants with and without severe neurologic damage were compared (Table 6). For the purposes of this comparison, "severe neurologic damage" refers to intracranial calcifications, microcephaly, chorioretinitis, and seizures. No statistically significant or biologically important differences were noted between the two groups. Mean head circumferences for the two groups were similar, despite the fact that one group included all infected infants born with microcephaly. A moderate difference in mean 1-minute Apgar scores was no longer present when 5-minute scores were compared.

In contrast, when the frequency of clinical signs was compared, we found important differences between the two groups (Table 7). All hematologic signs were almost twice as common and other less severe neurologic signs were even more common for those infants with severe neurologic damage. Only one sign, small for gestational age, was not significantly more common among infants with severe neurologic damage.

Laboratory abnormalities were also much more common for infants with severe neurologic damage than for those with less severe signs. This was especially true for low platelet count. The differences for elevated bilirubin and ALT were large but were not statistically significant. No abnormal test result was so common or specific as to be predictive for severe neurologic damage.

DISCUSSION

The demographic and clinical surveillance data collected by the registry help to define congenital CMV disease. However, without a comparison to an appropriate group, the demographic and clinical characteristics and signs reported here have limited epidemiologic value. Such a control group should be representative of the obstetric populations served by the collaborators. This population differs from the general population in that it includes a larger proportion of persons who are urban, black, and poor, and each of these characteristics is related to the variables studied here. The registry results can, however, be compared with the results of a long-term study in Birmingham, Alabama; in general, the clinical signs monitored by the registry were much more common in that study (*11*).

Only 50% of the mothers of infants with congenital CMV disease were multiparous. Recent studies of transmission of CMV at day care centers had raised the possibility that this proportion might be even higher. It is also interesting that abnormal results on the three routine laboratory tests (platelet count, bilirubin, ALT) were not more common among the infants. Even among those infants with severe neurologic damage, the most frequent laboratory abnormality occurred in only 67% of the cases. In spite of this, each test was significantly related to one or more of the clinical signs and therefore appears to be a useful variable to maintain in the registry.

The severe neurologic complications that can make congenital CMV disease so devastating clearly are related to the presence of multiple hematologic signs, especially hepatosplenomegaly. Nonetheless, 19% of infants reported to the registry had no hematologic signs. Severity was notably unrelated to parity, even though analysis of the first 60 registry cases found a consistently elevated but statistically insignificant odds ratio between primiparity and all clinical signs (*12*). Socioeconomic status as estimated by maternal medical insurance was also unrelated to severity of disease.

A major addition to the registry will be the formation of two parallel databases – one for asymptomatically infected infants and one for uninfected infants. This addition will permit a more detailed analysis of registry data. Other additions include a new definition of the base population served by each collaborator, which will facilitate calculation of prevalence rates for symptomatic disease. With these planned changes to the congenital CMV disease registry, new insight may be possible into more clearly describing those women who have a primary CMV infection during pregnancy, those infected women who pass on the infection to their fetuses, and those infected fetuses that develop manifest disease. This knowledge may lead to new steps in primary and secondary prevention that will lessen the burden from this illness on society, on families, and on individuals with congenital infection.

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TABLE 1. Case definition for congenital cytomegalovirus disease used by the Collaborating Registry Group

1. Positive virus culture in the first 3 weeks of life; AND
2. One or more of the following:
   Clinical signs:
   - Hematologic:
     - petechiae or purpura
     - hepatomegaly
     - splenomegaly
     - jaundice at birth
     - hemolytic anemia
   - Neurologic:
     - intracranial calcifications
     - microcephaly
     - other neurologic abnormalities
     - hearing impairment
     - chorioretinitis
     - seizures
   - Other:
     - small for gestational age

   Laboratory abnormalities:
   - low platelet count (<75,000/μL)
   - elevated direct bilirubin (>3 mg/dL)
   - elevated ALT (>100 mg/dL)*

*ALT = alanine aminotransferase.

TABLE 2. Number of infants with congenital cytomegalovirus disease, by collaborating center, reported from January 1, 1990, through December 31, 1991

City	State or province	Investigator	Cases
Atlanta	GA	Keyserling	0
Birmingham	AL	Pass	14
Cleveland	OH	Kumar	11
Columbus	OH	Brady	0
Fort Worth	TX	Shelton	2
Greenville	NC	Kenny	7
Hamilton	ON	Chernesky	0
Houston	TX	Demmler	16
Houston	TX	Walterspiel	1
Huntsville	AL	Montgomery	0
Iowa City	IA	Bale	4
Knoxville	TN	Patamasucon	10
Los Angeles	CA	Kovacs	1
Louisville	KY	Marshall	9
Nashville	TN	Gruber	6
Philadelphia	PA	Starr	2
Richmond	VA	Adler	2
San Antonio	TX	Leach	1
San Diego	CA	Dankner	10
St. Paul	MN	Gehrz	0
Syracuse	NY	Weiner	1
Toronto	ON	Ford-Jones	3
Total			**100**

TABLE 3. Demographic characteristics of mothers of infants with congenital cytomegalovirus disease reported from January 1, 1990, through December 31, 1991 (n = 100)

	Characteristic	Value
Mean age of mother (years):		22.9
Race:	white	49%
	black	35%
	Hispanic	12%
	other	4%
Marital status:	married	54%
	single	38%
	not reported	8%
Medical insurance:	private	36%
	Medicaid	49%
	none or unknown	15%
Other living children:	none	40%
	one or more	41%
	not reported	19%

TABLE 4. Selected clinical information on infants with congenital cytomegalovirus disease reported from January 1, 1990, through December 31, 1991 (n = 100)

	Characteristic	Value
Gender:	male	53%
	female	47%
Type of delivery:	vaginal	61%
	cesarean	39%
Mean gestational age (weeks)		35.6
Mean birth weight (grams)		2224.5
Mean length (centimeters)		43.8
Mean head circumference (centimeters)		30.6
Mean Apgar scores:	1 minute	6.1
	5 minutes	7.6

TABLE 5. Frequency of clinical signs and laboratory abnormalities for infants with congenital cytomegalovirus disease reported from January 1, 1990, through December 31, 1991 (n = 100)

Signs and abnormalities	Percent (%)
Clinical:	
Hematologic:	
petechiae/purpura	51
hepatomegaly	48
splenomegaly	46
jaundice at birth	38
Neurologic:	
intracranial calcifications	43
other neurologic abnormalities	31
microcephaly	27
hearing impairment	27
chorioretinitis	15
seizures	10
Developmental:	
small for gestational age	38
Laboratory:	
low platelet count (<75,000/μL)	52
elevated bilirubin (>3 mg/dL)	35
elevated ALT (>100 mg/dL)*	26

*ALT = alanine aminotransferase.

TABLE 6. Selected maternal and clinical characteristics by severity of neurologic damage among infants with congenital cytomegalovirus disease reported from January 1, 1990, through December 31, 1991

Characteristics		Infants with more severe damage (n=55)*	Infants with less severe damage (n=45)	p-value†
Mother:				
mean age of mother (years)		22.0	24.0	0.11
race:	white	55%	47%	0.52
	black	30%	44%	
	Hispanic	15%	9%	
marital status:	married	60%	57%	0.88
	single	40%	43%	
medical insurance:	private	35%	39%	0.98
	Medicaid	50%	50%	
	none/unknown	15%	11%	
parity:	primiparous	50%	49%	0.75
	multiparous	50%	51%	
Infant:				
type of delivery:	vaginal	56%	68%	0.24
	cesarean	44%	32%	
mean gestational age (weeks)		35.9	35.3	0.48
mean birth weight (grams)		2243	2203	0.80
mean length (centimeters)		44.1	43.4	0.59
mean head circumference (centimeters)		29.9	31.6	0.08
mean Apgar scores:	1 minute	5.7	6.6	0.05
	5 minutes	7.5	7.7	0.53

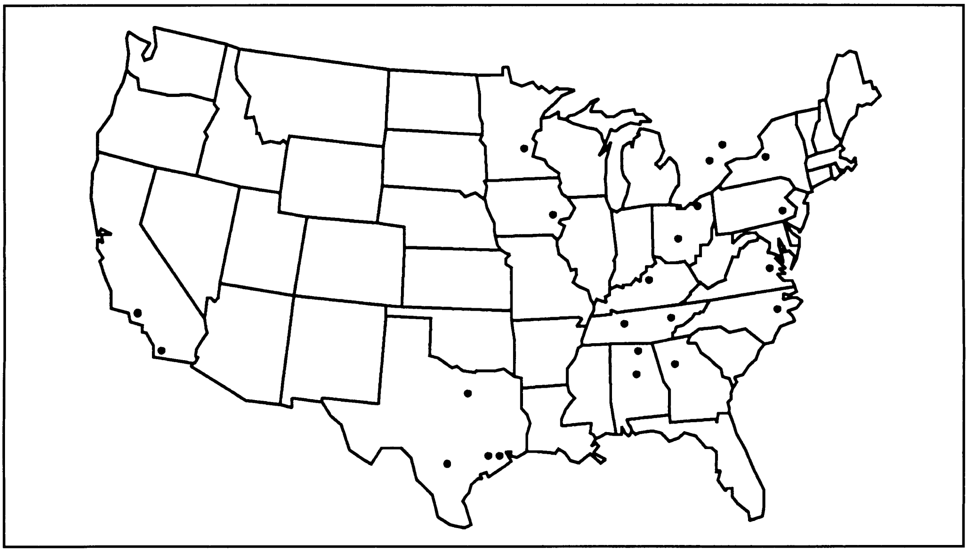
*Based on the presence of intracranial calcifications, microcephaly, chorioretinitis, or seizures.
†P-values for means estimated by using two-tailed t-test; for percentages, chi-square was used.

TABLE 7. Frequency of clinical characteristics and laboratory abnormalities by severity of neurologic damage among infants with congenital cytomegalovirus disease reported from January 1, 1990, through December 31, 1991 (n=100)

Characteristics and abnormalities	Percentage of infants with more severe damage (n=55) (%)*	Percentage of infants with less severe damage (n=45) (%)	p-value†
Clinical:			
petechiae/purpura	65	33	0.01
hepatosplenomegaly	65	36	0.01
small for gestational age	38	38	0.89
jaundice at birth	49	24	0.05
other neurologic abnormalities	44	16	0.01
hearing impairment	36	16	0.03
Laboratory:			
low platelet count (<75,000/μL)	65	36	0.01
elevated bilirubin (>3 mg/dL)	44	24	0.08
elevated ALT (>100 mg/dL)§	31	20	0.30

*Based on the presence of intracranial calcifications, microcephaly, chorioretinitis, or seizures.
†P-values for percentages estimated by using chi-square values.
§ALT = alanine aminotransferase.

FIGURE 1. Distribution of registry collaborators as of December 31, 1991*



*See Table 2 for specific sites and investigators.

State and Territorial Epidemiologists and Laboratory Directors

State and Territorial Epidemiologists and Laboratory Directors are gratefully acknowledged for their contributions to this report. The epidemiologists listed below were in the positions shown as of April 14, 1992, and the laboratory directors listed below were in the positions shown as of April 2, 1991.

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Alaska	John P. Middaugh, MD	Katherine A. Kelley, DrPH
Arizona	Steven J. Englender, MD, MPH	Thomas S. Davis
Arkansas	Thomas C. McChesney, DVM	Robert L. Horn
California	George W. Rutherford, MD	Michael G. Volz, PhD
Colorado	Richard E. Hoffman, MD, MPH	Ronald L. Cada, DrPH
Connecticut	James L. Hadler, MD, MPH	Sanders Hawkins, PhD
Delaware	Paul R. Silverman, DrPH	Mahadeo P. Verma, PhD
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Georgia	Joseph A. Wilber, MD	Elizabeth A. Frank
Hawaii	Eugene Pon, MD, MPH	Vernon K. Miyamoto, PhD
Idaho	Fritz R. Dixon, MD	Richard Hudson, PhD
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Iowa	Laverne A. Wintermeyer, MD	W. J. Hausler, Jr, PhD
Kansas	Andrew R. Pelletier, MD	Roger H. Carlson, PhD
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Missouri	H. Denny Donnell, Jr, MD, MPH	Eric C. Blank, DrPH
Montana	Todd Damrow, PhD, MPH	Douglas Abbott, PhD
Nebraska	Thomas J. Safranek, MD	John Blosser
Nevada	Debra Brus, DVM	Arthur F. DiSalvo, MD
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New Mexico	C. Mack Sewell, DrPH, MS	Loris W. Hughes, PhD
New York City	Kenneth Ong, MD	Alexander Ramon, MD
New York State	Dale L. Morse, MD, MS	Lawrence Sturman, MD, PhD
North Carolina	J. Newton MacCormack, MD, MPH	Samuel N. Merritt, DrPH
North Dakota	Larry Shireley, MS, MPH	James L. Pearson, DrPH
Ohio	Thomas J. Halpin, MD, MPH	Gary D. Davidson, DrPH
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Federated States of Micronesia	Steven Auerbach, MD, MPH	Vacant
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Marshall Islands	Tony de Brum	Vacant
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