

**Changes in Age-adjusted Cancer Incidence Rates Associated with Age-adjustment Using the 2000 U.S. Population Standard**

In 1998, all federal agencies were directed by the secretary of the U.S. Department of Health and Human Services to use the year 2000 standard population for age-adjusted rate calculations beginning with 1999 health events. The directive resolves long-standing problems associated with the fact that age-adjusted rates for health-related outcomes have been calculated using different population standards, making data comparisons often impossible.

To date, the Illinois State Cancer Registry (ISCR) has used the 1970 U.S. standard population to calculate age-adjusted rates. ISCR has employed this standard population because the National Cancer Institute has used the 1970 U.S. standard population to age-adjust cancer rates for the last 30 years. Moreover, the Surveillance, Epidemiology and End Results Program (SEER), the North American Association of Central Cancer Registries (NAACCR) and other state population-based central cancer registries have used the same approach. With 1999 cancer data, all of these organizations, including ISCR, will be age-adjusting their cancer rates using the 2000 U.S. standard population.

**Difference between the 1970 and 2000 Standard Populations**

Figure 1 shows graphically the change that has occurred in the U.S. population structure from 1970 to 2000. As shown, the population presence of the six youngest five-year age groups decreased from 1970 to 2000. The increased population percentages from 1970 to 2000 for the next five age groups (including ages 35 through 54) clearly reflect the aging of the post-World War II baby boomers. Minimal change is observed for ages 55 through 69, which includes those born during the Great Depression and World War II eras. The increase in the oldest four age groups (70 years and older) reflects several factors: the increased life span for persons in the United States as well as the effect of the large cohort of immigrants coming into the U.S. during the early 1900s. Overall, the 1970 - 2000 adjustments reflect an older population standard that more closely resembles the age structure of the current population.

**Changes in Cancer Rates with Age-adjustment to the New 2000 Population Standard**

Figure 2 displays statistics and rate calculations for invasive cancer incidence from all sites combined occurring among Illinois residents during 1998. The two age-adjusted rates, using the 1970 and 2000 standard populations, differ considerably because the age structure of the 1970 and 2000 standard populations are substantially different. The age-adjusted rate using the year 2000 standard population is about 20 percent higher than the one calculated based on the 1970 standard population. This would be expected given that cancer incidence increases with age and there are larger populations in the older age groups for 2000 when compared with 1970. Indeed, the total adjusted number of cases for 2000 exceeds those for 1970 as shown in columns E and G, even though the actual number of cases, 55,166, is the same for both calculations. Moreover, the differences in the adjusted numbers of cases within an age group category reflects the information in Figure 1. That is, those age groups with population increases from 1970 to 2000 have greater adjusted numbers for 2000 than 1970 and vice versa. It also should be noted that the year 2000 age-adjusted rate is closer to the crude rate because that standard population is very close in age structure to the current population.

The new calculations using year 2000 for the standard population will consistently produce higher cancer rates than those reported using the 1970 standard population. A comparison of these rates for the major cancer control sites by race/ethnicity is shown in Table 1. As shown, every age-adjusted rate is higher for every race/ethnic group using the year 2000 standard population compared with using the 1970 standard population.

Figure 1.  
Change in Population by Age Group  
Between Standard Populations 1970 and 2000

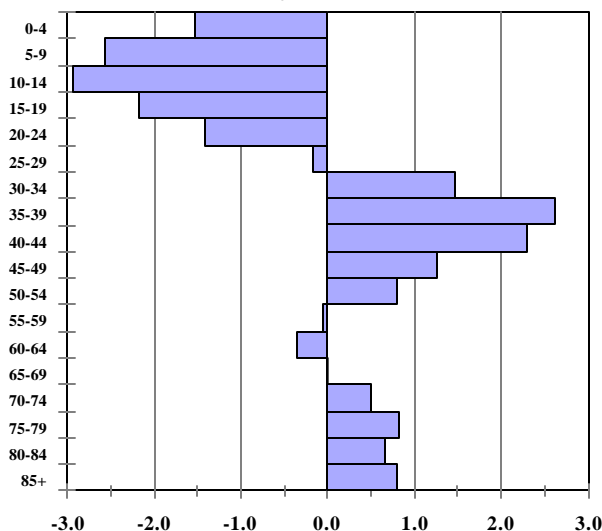
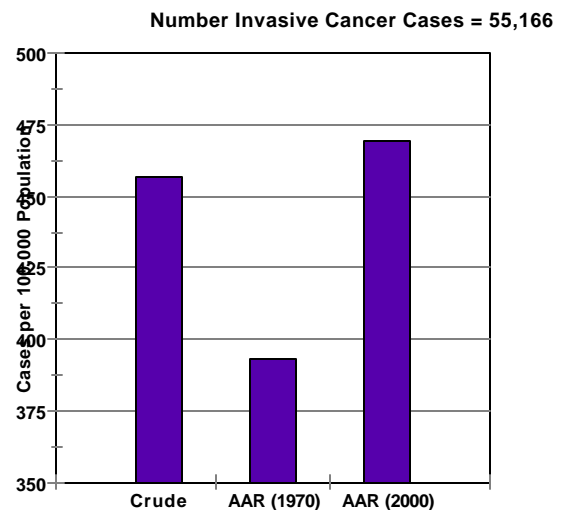


Figure 2.  
Comparison of Crude and Age-adjusted Rates (AAR) Using  
1970 and 2000 Standard Populations for All Invasive Cancer



Calculation of Rates: Crude and Age-adjusted by the Direct Method Using Two Standard Populations							
			Age Adjustment with 1970			Age Adjustment with 2000	
	Actual 1998 Cases	1998 Illinois Population	Age-specific Rate	1970 Standard Population	Adjusted 1998 Cases	2000 Standard Population	Adjusted 1998 Cases
Age Group	A	B	C (A ÷ B) x 100,000	D	E (C x D) ÷ 100,000	F	G (C x F) ÷ 100,000
0-4	165	888,229	18.6	84,416	16	69,136	13
5-9	83	911,701	9.1	98,204	9	72,533	7
10-14	104	855,833	12.2	102,304	12	73,032	9
15-19	161	869,276	18.5	93,845	17	72,169	13
20-24	255	780,469	32.7	80,561	26	66,477	22
25-29	430	828,165	51.9	66,320	34	64,529	34
30-34	668	915,459	73.0	56,249	41	71,044	52
35-39	1,231	1,018,801	120.8	54,656	66	80,762	98
40-44	1,956	974,053	200.8	58,958	118	81,851	164
45-49	2,765	833,138	331.9	59,622	198	72,118	239
50-54	3,825	687,625	556.3	54,643	304	62,716	349
55-59	4,775	554,943	860.4	49,077	422	48,454	417
60-64	5,711	453,728	1258.7	42,403	534	38,793	488
65-69	7,401	406,275	1821.7	34,406	627	34,264	624
70-74	8,485	377,438	2248.0	26,789	602	31,773	714
75-79	7,525	313,294	2401.9	18,871	453	26,999	648
80-84	5,355	214,830	2492.7	11,241	280	17,842	445
85+	4,271	186,517	2289.9	7,435	170	15,508	355
<b>Total</b>	<b>55,166</b>	<b>12,069,774</b>		<b>1,000,000</b>	<b>3,931</b>	<b>1,000,000</b>	<b>4,691</b>
<b>Crude Rate: A (total) ÷ B (total) x 100,000 = 457.1 per 100,000</b> <b>AAR (1970): E (total) ÷ D (total) x 100,000 = 393.1 per 100,000</b> <b>AAR (2000): G (total) ÷ F (total) x 100,000 = 469.1 per 100,000</b>							
Source: Illinois Department of Public Health, Illinois State Cancer Registry, October 30, 2000							

<b>Table 1.</b>			
<b>Comparison of Crude and Age-adjusted Rates (AAR)</b>			
<b>Using 1970 and 2000 Standard Populations for the</b>			
<b>Major Cancer Control Sites by Race/Ethnicity, Illinois, 1998</b>			
<b>All Races</b>	<b>Cases</b>	<b>AAR (1970)</b>	<b>AAR (2000)</b>
Colon and Rectum#	7,147	48.4	60.7
Lung and Bronchus#	8,344	60.5	71.1
Female Breast	8,538	111.9	132.3
Cervix	727	9.6	11.6
Prostate	7,342	124.4	147.1
<b>Whites</b>	<b>Cases</b>	<b>AAR (1970)</b>	<b>AAR (2000)</b>
Colon and Rectum#	6,042	46.8	58.8
Lung and Bronchus#	6,962	58.1	68.5
Female Breast	7,186	111.1	131.1
Cervix	538	8.6	10.3
Prostate	5,725	111.0	131.6
<b>Blacks</b>	<b>Cases</b>	<b>AAR (1970)</b>	<b>AAR (2000)</b>
Colon and Rectum#	900	57.6	71.9
Lung and Bronchus#	1,181	76.8	89.3
Female Breast	1,043	108.7	129.7
Cervix	162	15.7	18.6
Prostate	1,120	183.3	218.1
<b>Asian/Other Races</b>	<b>Cases</b>	<b>AAR (1970)</b>	<b>AAR (2000)</b>
Colon and Rectum#	102	30.9	39.6
Lung and Bronchus#	115	35.6	42.6
Female Breast	145	66.1	76.8
Cervix	19	8.2	10.1
Prostate	75	55.8	66.7
<b>Hispanics</b>	<b>Cases</b>	<b>AAR (1970)</b>	<b>AAR (2000)</b>
Colon and Rectum#	161	24.4	30.1
Lung and Bronchus#	165	27.1	32.5
Female Breast	268	67.0	78.4
Cervix	86	16.2	20.1
Prostate	207	78.1	95.7
<b>Non-Hispanics</b>	<b>Cases</b>	<b>AAR (1970)</b>	<b>AAR (2000)</b>
Colon and Rectum#	6,986	49.5	62.0
Lung and Bronchus#	8,179	62.2	73.0
Female Breast	8,270	114.2	135.0
Cervix	641	9.2	11.0
Prostate	7,135	127.0	149.8
# Both Sexes			
Rates are per 100,000 population.			
AAR (1970) rate is age-adjusted to the 1970 standard population.			
AAR (2000) rate is age-adjusted to the 2000 standard population.			
Source: Illinois Department of Public Health, Illinois State Cancer Registry, October 30, 2000			