



MORBIDITY AND MORTALITY WEEKLY REPORT

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Erosion of Dental Enamel among Competitive Swimmers — Virginia

In September 1982, a Charlottesville, Virginia, dentist reported treating two women, one 17 and one 28 years old, for dental enamel erosion. Both exhibited general erosion of enamel from the anterior surfaces of the incisors and premolars, clinically consistent with exposure to acid (1,2). Neither had any history of unusual occupational, dietary, or medical exposures to acid. However, both were competitive swimmers who trained regularly at the same private club pool.

To identify any additional cases, a questionnaire was mailed to all club-member households. A total of 747 members responded to the survey. Club members were considered to have symptoms compatible with enamel erosion if, during the summer of 1982, they reported having one or more of the following symptoms "a lot" or two or more of these symptoms "sometimes": 1) gritty or rough teeth; 2) transparent or yellow teeth; 3) "chalky" white teeth; 4) painful teeth when chewing. Members were also considered cases if their dentists had clinically diagnosed enamel erosion during or after the summer of 1982.

Of the 452 frequent swimmers,* 69 (15%) reported symptoms compatible with enamel erosion, compared to nine (3%) of 295 infrequent or nonswimmers ($p < 0.001$). In addition, of 59 members of a swim team, 23 (39%) met the case definition, compared to 12% (46/393) of all other frequent swimmers ($p < 0.001$). A second questionnaire was sent to all 452 frequent swimmers and was returned by 294 (65%). Of the 132 persons who swam 5 or more days per week, 35 (27%) were cases, compared to 14 (9%) of 162 persons who swam less than 5 days per week ($p < 0.001$).

An oral pathologist examined 30 individuals who met the case definition and 60 control swimmers matched for age, race, and sex. Four (13%) of 30 cases had clinically evident general enamel erosion, compared to none of 60 controls ($p = 0.005$). Each of these four trained regularly in the pool for competitive swimming meets, compared to one of eight matched controls ($p = 0.01$). The four patients with clinically evident erosion did not differ significantly from controls with respect to history of occupational, dietary, and medical exposures to acid.

A water sample, obtained from the pool in September by one of the swimmers and tested by Virginia's Consolidated State Laboratories, exhibited no buffering capacity and a pH of 2.7, i.e., an acid concentration approximately 100,000 times that recommended for swimming pools (3). State health department epidemiologists were unable to obtain additional samples directly from the pool because it had been drained at the conclusion of the swimming season.

Site inspection in November by the Virginia State Department of Health revealed a gas-chlorinated pool with corrosion of metal fixtures and marked etching of unpainted cement exposed to the pool water. A review of pool management practices revealed the water was usu-

*Persons who reported swimming "laps" regularly.

Erosion of Dental Enamel – Continued

ally tested each morning for pH and the level of free chlorine. Soda ash (Na_2CO_3) was added to neutralize the acid when a standard colorimetric phenol red pH indicator (pH range 6.8-8.2) indicated the water was acidic. The manager did not report that the pool water was rechecked to verify that the pH had been brought up into the accepted range for swimming pools (pH 7.2-7.8) (4). No records were kept either of the daily readings of free chlorine levels and pH or of the daily use of chlorine gas and soda ash. According to the pool manager, the pH indicator kit commonly registered a pH of 6.8 during the 1982 season.

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Editorial Note: Large pools are sometimes chlorinated with chlorine gas (Cl_2), instead of hypochlorite, because of the economic advantages (5). Unlike hypochlorite, gas chlorination causes pool water to become acidic because chlorine gas reacts with water to form hydrochloric acid (HCl): $\text{Cl}_2 + \text{H}_2\text{O} \rightarrow \text{HOCl} + \text{HCl}$. Hypochlorous acid (HOCl) is the germicidal agent in chlorination; HCl is an unwanted byproduct. Excess acidity is commonly neutralized and buffered by the addition of soda ash.

Tooth enamel does not decalcify in acidic solutions unless the pH is below 6.0 (6). Even at a pH between 5 and 6, hours of cumulative exposure are required for clinically evident decalcification to occur (6). With proper buffering to maintain a recommended pool pH (pH 7.2-7.8) (4), gas-chlorinated pools operate with a substantial margin of safety as regards enamel erosion. However, if a gas-chlorinated pool becomes inadequately buffered through the addition of inadequate quantities of soda ash, the pH may decrease rapidly—in one observed instance, from a pH of 7.4 to approximately 4.0 overnight (5).

General enamel erosion has been observed among industrial workers exposed to acid fumes (1) and among people consuming excessive quantities of acidic fruit, beverages, and medication (2). In 1980, an outbreak of enamel erosion similar to the present one was investigated at a gas-chlorinated public pool in New Jersey. The swimming pool water was epidemiologically implicated as the cause, but the mechanism could not be determined (7). In the present outbreak, the epidemiologic evidence showed that prolonged exposure to the pool water was associated with enamel erosion and that, on at least one occasion, the water was far below the recommended pH. These findings, plus the apparently inadequate maintenance practices, implicated the pool water as the cause of the enamel erosion.

The American Public Health Association recommends that proper pool maintenance records be kept, including thrice-daily chlorine levels and pH readings, as well as the daily use of chlorine gas and soda ash (3). Since, with a standard phenol red indicator system (pH range 6.8-8.2), any pool water sample with a pH below 6.8 will read as pH 6.8, the person testing the water should take into account the accuracy of the colorimetric pH indicator. If the phenol red indicator shows pH 6.8, the pool should be promptly corrected to pH 7.2 or above and so verified.

References

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Measles — United States, First 26 Weeks, 1983

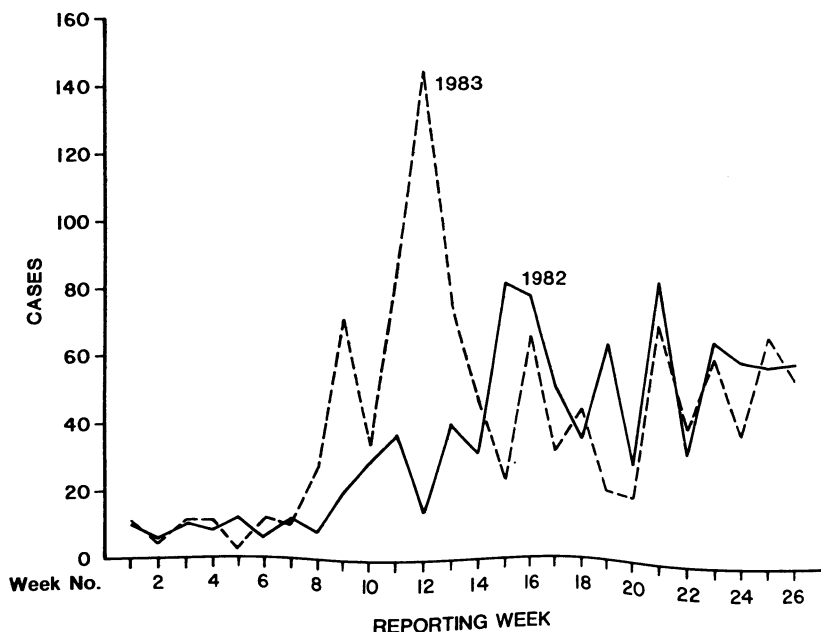
Provisional data for the first 26 weeks of 1983 (January 2–July 2) show an 11.0% increase (1,037 vs. 934) in reported measles cases in the United States, compared with the same period in 1982 (Figure 1). Transmission was limited to a few foci; 97% of the nation's 3,138 counties reported no measles cases during the 26-week period. Of the 1,037 reported cases, 784 (75.6%) occurred in 16 separate outbreaks or chains of transmission*. Eight of the 16 outbreaks occurred on college and university campuses.

The proportion of all measles cases on college campuses has increased from 1.5% (200/13,506) in 1980 to 27.2% (282/1,037) in the first 26 weeks of 1983 (Table 1). During the latter period, cases were reported from 22 campuses in 14 states. In addition, 248 secondary cases resulted from campus outbreaks; campus outbreaks and campus-associated cases together accounted for 51.1% (530/1,037) of all reported measles cases in the first 26 weeks of 1983. Extensive outbreaks lasting more than two generations occurred in Indiana, Ohio, and Texas (2,3). The outbreak that began at Indiana University ultimately accounted for 38.9% (403/1,037) of all measles cases reported in the United States in the first 26 weeks of 1983. During the Ohio outbreak, younger siblings of undergraduates visited the campus for a special event; one incubation period later, at least six siblings—all high school students—were reported to have measles. One of them caused a school-based outbreak in Summit County, Ohio, that has resulted in 49 additional cases to date.

Of the 1,037 reported cases, 51 (4.9%) were international importations, and nine (0.9%) were out-of-state importations. The international importations were reported in travelers (30 U.S. citizens and 21 foreign nationals) who arrived from 23 countries. The number of international importations (51) was not substantially different from that reported in the first 26

*Chains of transmission are defined as consisting of two or more generations of infection (1).

FIGURE 1. Measles cases, by reporting week — United States, 1982, 1983



Source: MMWR provisional data.

Measles — Continued

weeks of 1982 (64) (4). Two of the international importations occurred in college students; one was the index case for a campus outbreak in Louisiana.

Overall, campus outbreaks, campus-associated cases, and international importations accounted for 61.6% (639/1,037) of reported measles cases in the first 26 weeks of 1983, leaving 398 indigenous, non-campus-associated cases, a 37.6% reduction from the same period in 1982.

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Editorial Note: Campus outbreaks, campus-associated cases, and imported cases have accounted for a greater proportion of reported measles cases in the first 26 weeks of 1983 than in previous years. Data continue to show that the impact of imported measles is limited when immunity levels are high (5,6). However, the increased morbidity on campuses is of special concern because measles is a more serious disease in adults than in schoolchildren; mortality rates from measles have been highest among adults in recent years (7).

Predictably, the most dramatic reductions in measles incidence rates have occurred among schoolchildren—a group easily targeted by school immunization laws. Provisional data indicate that 97% of children entering kindergarten and first grade in the fall of 1982 had

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TABLE I. Summary—cases specified notifiable diseases, United States

Disease	28th Week Ending			Cumulative, 28th Week Ending		
	July 16, 1983	July 17, 1982	Median 1978-1982	July 16, 1983	July 17, 1982	Median 1978-1982
Aseptic meningitis	232	193	149	2,768	2,694	2,084
Encephalitis: Primary (arthropod-borne & unsp.)	31	39	25	485	531	373
Post-infectious	1	1	2	41	52	115
Gonorrhea: Civilian	17,273	18,006	20,554	467,851	500,343	509,293
Military	356	362	375	12,689	14,623	14,562
Hepatitis: Type A	296	361	498	11,602	11,897	14,521
Type B	424	399	311	11,906	11,244	9,062
Non A, Non B	65	53	N	1,788	1,232	N
Unspecified	112	155	163	4,142	4,519	5,351
Legionellosis	6	12	N	382	251	N
Leprosy	8	5	5	139	107	103
Malaria	35	33	35	390	539	539
Measles: Total	-	32	171	1,092	1,005	10,976
Indigenous	-	N	N	912	N	N
Imported*	-	N	N	180	N	N
Meningococcal infections: Total	26	39	42	1,753	1,891	1,685
Civilian	26	39	42	1,738	1,880	1,673
Military	-	-	-	15	11	12
Mumps	20	36	75	2,112	3,964	6,635
Pertussis	62	29	27	992	609	628
Rubella (German measles)	14	38	38	699	1,785	2,960
Syphilis (Primary & Secondary): Civilian	504	495	453	17,050	17,435	13,684
Military	5	10	3	229	212	167
Toxic-shock syndrome	8	N	N	232	N	N
Tuberculosis	513	488	519	12,261	13,484	14,296
Tularemia	11	15	5	138	110	97
Typhoid fever	15	4	11	191	209	245
Typhus fever, tick-borne (RMSF)	63	45	50	504	478	478
Rabies, animal	97	144	107	3,352	3,421	3,421

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1983		Cum. 1983
Anthrax	-	Plague	21
Botulism: Foodborne	12	Poliomyelitis: Total	2
Infant (Wash. 1)	36	Paralytic	2
Other	-	(Upstate N.Y. 2, N.Y. City 1, Ohio 1)	65
Brucellosis (Mo. 2, Tex. 5)	99	Rabies, human	2
Cholera	-	Tetanus (Ala. 1, Alaska 1)	38
Congenital rubella syndrome	14	Trichinosis (Upstate N.Y. 1)	23
Diphtheria	-	Typhus fever, flea-borne (endemic, murine) (Tex. 2)	24
Leptospirosis (Ala. 1, Wyo. 1)	24		

TABLE III. Cases of specified notifiable diseases, United States, weeks ending
July 16, 1983 and July 17, 1982 (28th week)

Reporting Area	Aseptic Menin- gitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis (Viral), by type				Legionel- losis	Leprosy	Malaria
		Primary	Post-in- fectious			A	B	NA,NB	Unspeci- fied			
	1983	Cum. 1983	Cum. 1983	Cum. 1983	Cum. 1982	1983	1983	1983	1983	1983	Cum. 1983	Cum. 1983
UNITED STATES	232	485	41	467,851	500,343	296	424	65	112	6	139	390
NEW ENGLAND	12	21	-	11,770	11,943	4	13	1	11	1	3	20
Maine	-	-	-	600	562	-	-	-	-	-	-	1
N.H.	3	4	-	360	410	1	-	-	-	-	2	-
Vt.	-	1	-	223	233	1	2	1	-	-	-	1
Mass.	3	8	-	5,050	5,532	1	4	-	11	-	-	8
R.I.	-	-	-	638	805	-	3	-	-	-	-	3
Conn.	6	8	-	4,899	4,401	1	4	-	-	1	1	7
MID ATLANTIC	21	55	3	59,494	60,549	52	110	7	14	1	19	49
Upstate N.Y.	3	14	-	8,935	9,640	6	12	2	2	-	-	15
N.Y. City	2	7	-	24,493	25,423	11	36	-	8	1	18	14
N.J.	12	13	-	11,149	10,993	13	33	3	2	-	-	15
Pa.	4	21	3	14,917	14,493	22	29	2	2	-	1	5
E.N. CENTRAL	26	103	9	64,611	71,221	25	45	6	6	1	5	20
Ohio	4	41	6	18,061	19,477	10	17	3	2	1	1	3
Ind.	13	14	1	7,016	8,068	4	9	-	1	-	-	-
Ill.	1	-	-	16,104	20,639	3	4	2	-	-	2	5
Mich.	8	41	-	17,708	16,639	6	15	1	3	-	2	10
Wis.	-	7	2	5,722	6,398	2	-	-	-	-	-	2
W.N. CENTRAL	8	46	5	21,666	23,582	15	17	4	6	-	5	16
Minn.	-	18	1	3,099	3,545	4	-	-	-	-	4	5
Iowa	-	22	-	2,468	2,495	1	2	-	-	-	-	2
Mo.	5	2	-	10,503	11,042	3	9	2	4	-	-	2
N. Dak.	-	-	-	228	321	-	-	-	-	-	-	2
S. Dak.	2	-	2	610	638	5	-	1	-	-	-	-
Nebr.	1	3	-	1,361	1,440	2	6	1	2	-	-	1
Kans.	U	1	2	3,397	4,101	U	U	U	U	U	1	4
S. ATLANTIC	35	77	14	120,974	130,290	32	101	9	8	2	7	58
Del.	-	-	-	2,159	1,967	1	1	-	1	-	-	-
Md.	3	12	-	15,507	16,228	2	6	-	1	-	1	13
D.C.	-	-	-	8,182	7,080	1	3	-	-	-	-	7
Va.	1	20	2	10,400	10,617	1	13	1	-	2	-	7
W. Va.	-	2	-	1,287	1,440	-	2	1	-	-	-	1
N.C.	20	22	-	17,689	20,564	3	14	-	2	-	-	1
S.C.	-	2	-	11,479	12,659	4	10	-	1	-	-	5
Ga.	1	4	-	25,255	25,283	1	22	-	-	-	1	5
Fla.	10	15	12	29,016	34,452	19	30	7	3	-	5	19
E.S. CENTRAL	2	16	-	39,418	42,567	14	22	3	1	-	-	7
Ky.	-	-	-	4,597	5,735	4	4	-	1	-	-	-
Tenn.	1	3	-	15,995	16,498	1	11	3	-	-	-	-
Ala.	1	13	-	12,308	12,787	2	2	-	-	-	-	5
Miss.	-	-	-	6,518	7,547	7	5	-	-	-	-	2
W.S. CENTRAL	92	62	2	67,481	69,388	39	21	1	33	-	14	43
Ark.	1	6	-	5,059	5,689	1	2	1	7	-	-	1
La.	3	7	-	12,811	12,424	2	1	-	-	-	1	4
Okla.	26	14	1	7,827	7,652	10	6	-	1	-	-	8
Tex.	62	35	1	41,784	43,623	26	12	-	25	-	13	30
MOUNTAIN	5	30	3	14,599	17,235	42	19	2	8	-	12	19
Mont.	-	-	-	635	723	1	-	-	-	-	-	-
Idaho	-	-	-	662	807	1	-	-	-	-	-	2
Wyo.	-	2	-	383	502	3	-	-	1	-	-	1
Colo.	2	16	-	4,111	4,614	4	8	-	-	-	2	6
N. Mex.	-	1	-	1,771	2,168	2	3	-	3	-	-	5
Ariz.	2	3	3	4,073	4,730	29	4	1	3	-	9	3
Utah	1	8	-	721	804	-	2	-	-	-	1	2
Nev.	-	-	-	2,243	2,887	2	2	1	1	-	-	-
PACIFIC	31	75	5	67,838	73,568	73	76	32	25	1	74	158
Wash.	6	5	1	4,985	5,885	7	9	4	-	-	10	4
Oreg.	-	-	2	3,533	4,182	6	1	1	1	-	1	5
Calif.	20	66	2	56,176	60,372	58	65	27	24	1	42	149
Alaska	-	-	-	1,731	1,832	2	-	-	-	-	-	-
Hawaii	5	4	-	1,413	1,297	-	1	-	-	-	21	-
Guam	U	-	-	69	79	U	U	U	U	U	-	2
P.R.	U	-	1	1,480	1,649	U	U	U	U	U	-	1
V.I.	U	-	-	145	150	U	U	U	U	U	-	-
Pac. Trust Terr.	U	-	-	-	237	U	U	U	U	U	-	-

N Not notifiable

U Unavailable

TABLE III. (Cont'd). Cases of specified notifiable diseases, United States, weeks ending
July 16, 1983 and July 17, 1982 (28th week)

Reporting Area	Measles (Rubeola)					Menin- gococcal infections	Mumps			Pertussis			Rubella		
	Indigenous		Imported *		Total										
	1983	Cum. 1983	1983	Cum. 1983	Cum. 1982		Cum. 1983	1983	Cum. 1983	Cum. 1982	1983	Cum. 1983	Cum. 1982	1983	Cum. 1983
UNITED STATES	-	912	-	180	1,005	1,753	20	2,112	3,964	62	992	609	14	699	1,785
NEW ENGLAND	-	2	-	13	10	89	2	83	148	1	37	30	3	12	12
Maine	-	-	-	-	-	8	-	15	34	-	4	3	-	-	-
N.H.	-	-	-	3	2	3	-	16	13	-	5	4	-	2	8
Vt.	-	-	-	-	2	6	-	10	5	-	7	1	-	3	-
Mass.	-	2	-	2	2	28	-	19	67	1	17	10	3	7	-
R.I.	-	-	-	-	-	7	1	11	14	-	4	10	-	-	1
Conn.	-	-	-	8	4	37	1	12	15	-	-	2	-	-	3
MID ATLANTIC	-	57	-	20	147	298	1	164	249	3	245	98	-	124	86
Upstate N.Y.	-	-	-	6	102	93	1	63	54	3	80	57	-	21	41
N.Y. City	-	31	-	10	37	53	-	23	41	-	35	19	-	86	31
N.J.	-	26	-	1	4	52	-	29	36	-	15	11	-	3	14
Pa.	-	-	-	3	4	100	-	49	118	-	115	11	-	14	-
E.N. CENTRAL	-	538	-	55	66	313	3	1,060	2,194	4	202	162	2	98	161
Ohio	-	66	-	13	1	104	-	527	1,543	4	75	39	-	1	-
Ind.	-	375	-	4	2	34	-	26	33	-	20	12	-	22	26
Ill.	-	97	-	33	23	87	-	116	239	-	83	74	1	43	58
Mich.	-	-	-	5	40	62	3	336	285	-	12	9	1	15	45
Wis.	-	-	-	-	-	26	-	55	94	-	12	28	-	17	32
W.N. CENTRAL	-	-	-	-	39	101	-	129	518	-	61	31	-	30	55
Minn.	-	-	-	-	-	16	-	22	402	-	22	11	-	6	5
Iowa	-	-	-	-	-	11	-	35	29	-	5	5	-	-	-
Mo.	-	-	-	2	51	-	-	20	8	-	9	8	-	-	38
N. Dak.	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-
S. Dak.	-	-	-	-	-	4	-	-	1	-	3	3	-	-	1
Nebr.	-	-	-	-	-	1	-	2	-	-	-	1	-	-	-
Kans.	U	-	U	-	37	16	U	50	78	U	21	3	U	24	11
S. ATLANTIC	-	153	-	24	33	356	-	134	218	14	139	95	3	86	65
Del.	-	-	-	-	-	-	-	7	10	-	2	4	-	-	1
Md.	-	1	-	4	2	37	-	22	21	6	14	15	-	1	33
D.C.	-	-	-	-	1	4	-	-	-	-	-	1	-	-	-
Va.	-	10	-	12	14	52	-	25	30	1	43	14	-	2	12
W. Va.	-	-	-	-	2	3	-	28	80	-	4	4	-	-	1
N.C.	-	-	-	-	-	78	-	5	10	5	17	11	-	9	1
S.C.	-	-	-	4	-	38	-	7	13	-	11	13	-	1	1
Ga.	-	8	-	-	-	56	-	40	11	2	29	14	-	11	5
Fla.	-	134	-	4	14	88	-	-	43	-	19	19	3	62	11
E.S. CENTRAL	-	1	-	5	7	108	1	39	32	4	12	23	-	10	39
Ky.	-	-	-	1	1	20	-	15	9	-	3	4	-	9	22
Tenn.	-	-	-	-	6	40	-	19	13	2	4	9	-	-	1
Ala.	-	1	-	4	-	33	1	2	5	2	3	1	-	1	-
Miss.	-	-	-	-	-	15	-	3	5	-	2	9	-	-	16
W.S. CENTRAL	-	34	-	37	12	197	-	146	141	21	151	39	-	95	84
Ark.	-	-	-	11	-	15	-	2	6	6	12	2	-	-	1
La.	-	-	-	25	2	41	-	-	3	-	2	6	-	9	1
Okla.	-	1	-	-	-	24	-	-	-	14	104	3	-	-	3
Tex.	-	33	-	1	10	117	-	144	132	1	33	28	-	86	79
MOUNTAIN	-	1	-	3	6	66	7	92	67	12	100	39	3	29	64
Mont.	-	-	-	-	-	6	-	2	3	-	1	-	1	5	5
Idaho	-	-	-	-	-	6	-	5	3	-	3	6	-	8	6
Wyo.	-	-	-	-	1	2	-	-	2	-	4	1	-	2	7
Colo.	-	-	-	2	5	25	-	10	13	9	69	11	-	-	5
N. Mex.	-	-	-	-	-	5	-	-	-	2	7	4	-	-	5
Ariz.	-	-	-	1	-	13	7	66	29	-	9	16	-	6	8
Utah	-	-	-	-	-	8	-	6	13	1	7	1	2	7	19
Nev.	-	1	-	-	-	1	-	3	4	-	-	-	-	1	9
PACIFIC	-	126	-	23	685	225	6	265	397	3	45	92	3	215	1,219
Wash.	-	1	-	3	36	32	-	38	61	2	8	16	-	8	32
Oreg.	-	5	-	2	5	33	-	-	-	-	6	20	1	13	5
Calif.	-	119	-	18	640	154	6	204	323	1	31	56	2	194	1,174
Alaska	-	-	-	-	1	-	-	10	6	-	-	-	-	-	1
Hawaii	-	1	-	-	3	6	-	13	7	-	-	-	-	-	7
Guam	U	1	U	1	6	1	U	-	3	U	-	-	U	-	2
P.R.	U	82	U	-	78	11	U	102	48	U	7	13	U	3	7
V.I.	-	-	-	5	-	-	-	-	-	-	-	-	-	1	-
Pac. Trust Terr.	U	-	U	-	-	-	U	-	4	U	-	-	U	-	-

*For measles only, imported cases includes both out-of-state and international importations.

U: Unavailable

† International

§ Out-of-state

TABLE III. (Cont.'d). Cases of specified notifiable diseases, United States, weeks ending
July 16, 1983 and July 17, 1982 (28th week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic- shock Syndrome	Tuberculosis		Tula- remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1983	Cum. 1982	1983	1983	Cum. 1983	Cum. 1983	Cum. 1983	Cum. 1983	Cum. 1983
UNITED STATES	17,050	17,435	8	513	12,261	138	191	504	3,352
NEW ENGLAND	383	297	-	20	344	2	8	2	11
Maine	10	1	-	1	20	-	-	-	2
N.H.	13	2	-	1	25	-	-	-	2
Vt.	2	1	-	-	7	-	-	-	-
Mass.	236	200	-	-	172	1	8	2	4
R.I.	13	14	-	-	24	1	-	-	-
Conn.	109	79	-	18	96	-	-	-	3
MID ATLANTIC	2,106	2,373	2	126	2,225	-	33	10	115
Upstate N.Y.	110	265	-	17	366	-	6	-	40
N.Y. City	1,280	1,412	-	40	892	-	14	1	-
N.J.	419	315	-	22	462	-	10	5	3
Pa.	297	381	2	47	505	-	3	4	72
E.N. CENTRAL	849	1,097	2	98	1,631	2	31	41	289
Ohio	249	164	2	9	252	-	6	31	35
Ind.	73	105	-	8	147	-	1	-	21
Ill.	370	615	-	39	727	1	15	6	153
Mich.	113	155	-	39	425	1	9	4	5
Wis.	44	58	-	3	80	-	-	-	75
W.N. CENTRAL	208	323	2	15	390	43	13	26	511
Minn.	88	64	-	4	81	-	2	-	94
Iowa	9	17	1	-	31	-	-	-	136
Mo.	72	195	-	9	205	34	6	15	70
N. Dak.	1	4	-	2	5	-	-	1	46
S. Dak.	9	-	-	-	28	2	-	3	71
Nebr.	11	8	1	-	11	3	-	-	46
Kans.	18	35	U	U	29	4	5	7	48
S. ATLANTIC	4,501	4,696	-	121	2,485	13	23	201	1,151
Del.	19	9	-	-	23	-	-	2	1
Md.	282	259	-	16	203	5	4	27	476
D.C.	191	265	-	8	94	-	-	-	1
Va.	321	337	-	12	242	1	5	28	420
W. Va.	13	19	-	6	81	-	2	8	80
N.C.	417	326	-	11	336	6	1	64	12
S.C.	280	249	-	11	232	-	1	35	16
Ga.	842	91	-	28	479	1	1	374	127
Fla.	2,136	2,261	-	29	795	-	9	3	18
E.S. CENTRAL	1,165	1,212	-	27	1,112	10	3	32	249
Ky.	67	65	-	2	276	-	1	3	58
Tenn.	322	318	-	4	328	8	1	23	156
Ala.	483	437	-	18	294	-	-	4	35
Miss.	293	392	-	3	214	2	1	2	-
W.S. CENTRAL	4,566	4,491	-	20	1,421	60	22	188	696
Ark.	108	113	-	4	160	42	1	16	116
La.	1,013	972	-	16	224	2	3	-	20
Okla.	121	99	-	-	126	14	-	121	75
Tex.	3,324	3,307	-	-	911	2	18	51	485
MOUNTAIN	375	435	1	5	328	5	7	3	108
Mont.	5	3	-	-	34	2	1	1	66
Idaho	6	19	-	1	17	1	-	1	1
Wyo.	7	11	-	-	8	-	-	1	3
Colo.	87	122	1	-	31	-	1	-	6
N. Mex.	114	89	-	3	72	1	-	-	6
Ariz.	90	102	-	1	134	1	3	-	25
Utah	13	13	-	-	22	-	1	-	1
Nev.	53	76	-	-	10	-	1	-	-
PACIFIC	2,897	2,511	1	81	2,325	3	51	1	222
Wash.	95	88	-	-	114	2	2	-	2
Oreg.	63	65	-	5	101	-	2	-	-
Calif.	2,696	2,282	1	71	1,945	1	45	1	205
Alaska	7	8	-	-	25	-	-	-	15
Hawaii	36	68	-	5	140	-	2	-	-
Guam	-	1	U	U	2	-	-	-	-
P.R.	400	350	U	U	263	-	-	-	-
V.I.	10	16	-	-	1	-	-	-	29
Pac. Trust Terr.	-	-	U	U	-	-	-	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending
July 16, 1983 (28th week)

Reporting Area	All Causes, By Age (Years)						P&I** Total	Reporting Area	All Causes, By Age (Years)						P&I** Total	
	All Ages	≥65	45-64	25-44	1-24	<1			All Ages	≥65	45-64	25-44	1-24	<1		
NEW ENGLAND	639	420	144	34	19	22	31	S. ATLANTIC	1,258	766	305	85	49	53	33	
Boston, Mass.	163	96	51	9	2	5	10	Atlanta, Ga.	184	113	40	14	8	9	4	
Bridgeport, Conn.	45	36	8	-	1	-	1	Baltimore, Md.	176	102	44	14	9	7	2	
Cambridge, Mass.	19	12	7	-	-	-	3	Charlotte, N.C.	85	45	22	5	6	7	3	
Fall River, Mass.	31	23	6	1	1	-	-	Jacksonville, Fla.	100	53	29	9	4	5	3	
Hartford, Conn.	72	49	15	3	1	4	-	Miami, Fla.	138	87	27	11	4	9	1	
Lowell, Mass.	29	18	5	6	-	-	2	Norfolk, Va.	50	38	9	2	1	-	3	
Lynn, Mass.	18	13	4	-	1	-	-	Richmond, Va.	105	70	20	4	4	7	6	
New Bedford, Mass.	23	16	6	1	-	-	1	Savannah, Ga.	30	21	5	3	1	-	2	
New Haven, Conn.	30	19	8	1	2	-	-	St. Petersburg, Fla.	101	82	12	3	3	1	4	
Providence, R.I.	65	42	10	2	2	9	3	Tampa, Fla.	59	33	15	1	5	5	2	
Somerville, Mass.	5	3	1	1	-	-	-	Washington, D.C.	173	92	62	15	1	3	3	
Springfield, Mass.	51	35	8	2	5	1	4	Wilmington, Del.	57	30	20	4	3	-	-	
Waterbury, Conn.	28	17	7	1	2	-	2	E.S. CENTRAL	683	424	162	43	31	23	27	
Worcester, Mass.	60	41	7	7	2	3	5	Birmingham, Ala.	98	60	22	6	4	6	3	
MID-ATLANTIC	2,504	1,586	609	181	64	56	77	Chattanooga, Tenn.	56	37	13	5	1	-	3	
Albany, N.Y.	37	26	9	2	-	-	1	Knoxville, Tenn.	41	25	13	1	2	-	1	
Allentown, Pa.	25	19	6	-	-	-	-	Louisville, Ky.	115	71	28	7	3	6	6	
Buffalo, N.Y.	105	61	35	3	5	1	1	Memphis, Tenn.	149	88	32	10	11	8	4	
Camden, N.J.	53	35	12	5	-	1	1	Mobile, Ala.	68	40	17	6	4	1	2	
Elizabeth, N.J.	29	21	5	2	1	-	2	Montgomery, Ala.	39	22	12	4	-	1	2	
Erie, Pa.	34	24	6	1	2	1	-	Nashville, Tenn.	117	81	25	4	6	1	6	
Jersey City, N.J.	40	19	12	5	3	1	1	W.S. CENTRAL	1,440	824	333	121	85	77	44	
N.Y. City, N.Y.	1,400	881	325	117	42	35	37	Austin, Tex.	45	28	9	4	3	1	2	
Newark, N.J.	64	32	17	9	2	4	2	Baton Rouge, La.	43	27	6	3	3	4	2	
Paterson, N.J.	26	11	6	-	-	1	-	Corpus Christi, Tex.	45	30	9	3	2	1	1	
Philadelphia, Pa.	288	181	82	21	3	1	18	Dallas, Tex.	242	134	60	21	13	14	1	
Pittsburgh, Pa.	62	40	14	4	-	4	-	El Paso, Tex.	106	52	31	6	9	8	5	
Reading, Pa.	26	24	1	1	-	-	-	Fort Worth, Tex.	112	64	27	7	7	7	4	
Rochester, N.Y.	99	68	25	3	-	3	6	Houston, Tex.	361	205	80	40	18	18	12	
Schenectady, N.Y.	25	16	5	1	3	-	1	Little Rock, Ark.	64	41	13	3	2	5	4	
Scranton, Pa.	22	18	4	-	-	-	-	New Orleans, La.	113	61	31	7	7	7	-	
Syracuse, N.Y.	92	61	23	4	3	1	3	San Antonio, Tex.	177	103	40	18	9	7	10	
Trenton, N.J.	34	18	10	3	-	3	1	Shreveport, La.	57	34	11	2	6	4	1	
Utica, N.Y.	20	14	6	-	-	-	2	Tulsa, Okla.	75	45	16	7	6	1	2	
Yonkers, N.Y.	23	17	6	-	-	-	1	MOUNTAIN	623	384	137	57	20	25	23	
E.N. CENTRAL	2,341	1,494	529	174	69	74	69	Albuquerque, N.Mex.	63	33	14	8	5	3	-	
Akron, Ohio	61	44	8	5	1	3	-	Colo. Springs, Colo.	39	25	9	3	1	1	3	
Canton, Ohio	39	25	10	3	1	-	4	Denver, Colo.	124	83	20	11	5	5	1	
Chicago, Ill.	540	328	129	50	16	17	16	Las Vegas, Nev.	71	33	24	11	-	3	4	
Cincinnati, Ohio	173	116	34	13	5	5	12	Ogden, Utah	16	11	3	1	1	-	1	
Cleveland, Ohio	171	91	52	14	10	4	5	Phoenix, Ariz.	154	95	27	17	6	9	4	
Columbus, Ohio	136	78	36	13	3	6	2	Pueblo, Colo.	24	16	6	-	1	1	2	
Dayton, Ohio	125	81	28	8	6	2	-	Salt Lake City, Utah	43	30	9	3	1	-	2	
Detroit, Mich.	296	170	75	26	11	14	7	Tucson, Ariz.	84	53	25	3	-	3	6	
Evansville, Ind.	53	41	9	3	-	-	2	PACIFIC	1,883	1,220	391	131	65	75	93	
Fort Wayne, Ind.	47	34	6	2	2	3	2	Berkeley, Calif.	15	12	3	-	-	-	-	
Gary, Ind.	18	13	3	2	-	-	-	Fresno, Calif.	72	45	14	3	6	4	5	
Grand Rapids, Mich.	50	29	14	1	2	4	-	Glendale, Calif.	25	21	2	-	1	1	3	
Indianapolis, Ind.	140	95	28	7	4	6	1	Honolulu, Hawaii	64	44	11	2	5	2	10	
Madison, Wis.	44	27	9	5	-	3	3	Long Beach, Calif.	94	61	19	6	2	6	3	
Milwaukee, Wis.	115	81	23	5	2	4	2	Los Angeles, Calif.	613	392	133	47	15	26	24	
Peoria, Ill.	40	38	-	-	1	-	2	Oakland, Calif.	95	60	19	10	2	3	3	
Rockford, Ill.	48	33	11	3	-	1	5	Pasadena, Calif.	27	22	4	1	-	-	-	
South Bend, Ind.	62	45	13	3	1	-	1	Portland, Oreg.	113	69	28	9	5	2	5	
Toledo, Ohio	120	80	27	9	4	-	4	Sacramento, Calif.	87	55	18	7	3	4	2	
Youngstown, Ohio	63	45	14	2	-	2	1	San Diego, Calif.	148	91	33	12	8	4	9	
W.N. CENTRAL	734	458	166	49	26	33	39	San Francisco, Calif.	135	85	30	9	2	9	3	
Des Moines, Iowa	55	40	12	1	1	1	6	San Jose, Calif.	163	102	35	11	8	7	18	
Duluth, Minn.	32	25	2	1	1	3	1	Seattle, Wash.	156	110	30	8	6	2	4	
Kansas City, Kans.	36	19	10	4	2	1	-	Spokane, Wash.	46	34	5	2	1	4	3	
Kansas City, Mo.	96	50	29	9	4	2	4	Tacoma, Wash.	30	17	7	4	1	1	1	
Lincoln, Nebr.	32	20	9	2	-	1	2	TOTAL	12,105 ^{††}	7,576	2,776	875	428	438	436	
Minneapolis, Minn.	88	59	16	3	2	8	3									
Omaha, Nebr.	79	47	14	9	7	2	5									
St. Louis, Mo.	164	95	46	10	3	10	6									
St. Paul, Minn.	70	46	12	8	3	1	2									
Wichita, Kans.	82	57	16	2	3	4	10									

* Mortality data in this table are voluntarily reported from 121 cities in the United States, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

** Pneumonia and influenza

† Because of changes in reporting methods in these 4 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

†† Total includes unknown ages.

§ Data not available. Figures are estimates based on average of past 4 weeks.

Measles — Continued

documented immunization against measles. In contrast, immunization levels on campuses are difficult to assess because very few colleges and universities require immunization records. The susceptibility problem on campuses has two components—inadequate protection and inadequate documentation. The former allows outbreaks to occur, while the latter escalates the cost of control by necessitating expensive, rapid record reviews. In addition, many students who were previously vaccinated but who lack immunization records may have to be vaccinated unnecessarily. The Indiana University outbreak alone, excluding campus-associated outbreaks, cost over \$250,000 to control.

To avoid such problems, colleges and universities should ensure that students are protected before an outbreak occurs. A permanent immunization record should be maintained in each student's academic file. Information can be updated when appropriate (e.g., for foreign travel) and will be available in the event of an outbreak. Although there is no vaccination requirement for entering the United States, it is recommended that students who anticipate foreign travel (as well as foreign students planning to study in the United States) have documentation of immunity to measles[†] before they travel (5). Because there is no evidence of adverse reactions following vaccination of immune individuals, combined measles-mumps-rubella (MMR) vaccine should be used whenever a person is likely to be susceptible to more than one component (8).

Indigenous measles is now extremely rare in the United States, with no cases reported in week 28. The final challenge is to break the remaining chains of transmission, particularly on college and university campuses.

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[†]For persons born after 1956, a written record certifying date of vaccination with live measles vaccine on or after the first birthday or physician-diagnosed measles illness.

TABLE 1. Reported measles cases on college and university campuses — United States, 1980-1983

Year	Reported cases on campuses	Total reported cases	Percentage on campuses
1980	200	13,506	1.5
1981	101	3,124	3.2
1982*	115	1,697	6.8
1983 [†]	282	1,037	27.2

*Provisional data.

[†]Provisional data, first 26 weeks.

Behavioral Risk Factor Prevalence Surveys — United States, Second Quarter 1982

During the second quarter of 1982, eight States (Delaware, Indiana, Kansas, Kentucky, Montana, New Jersey, North Carolina, and Ohio) and the District of Columbia conducted prevalence surveys of major behavioral risk factors among their adult populations through random-digit-dialing telephone surveys (Table 2). A standard questionnaire was used in six of these states and the District of Columbia. These self-reported data were adjusted for sex and weighted according to the respondents' probability of selection. The data presented in Table 2 are consistent with findings from similar state-based behavioral risk factor surveys conducted in the first quarter of 1982 (1).

TABLE 2. Behavioral risk factor levels* in eight states and the District of Columbia, by age group and sex — second quarter 1982

Risk factor, by state	Age group (years) by sex								Total respondents	
	18-34		35-54		≥55		All ages		Number	Rate
	M	F	M	F	M	F	M	F		
1. Obesity[†]										
Delaware	11.3	13.8	26.1	21.4	30.2	24.9	21.0	19.6	485	20.3
D.C.	10.9	10.8	24.7	34.4	19.4	46.4	17.4	28.9	483	23.7
Indiana	16.0	12.4	30.7	33.0	24.0	36.6	22.9	26.4	479	24.6
Kansas	12.2	15.7	28.9	28.4	21.6	24.0	19.8	22.5	481	21.2
Kentucky	19.0	14.7	31.3	31.2	26.0	31.7	24.8	25.0	456	24.9
Montana	8.0	9.2	30.1	17.7	23.4	24.6	19.1	16.7	500	17.9
New Jersey	17.5	8.7	27.6	32.7	31.2	31.6	24.7	22.6	973	23.6
North Carolina	16.8	9.0	31.6	29.6	37.2	41.7	26.6	26.1	462	26.3
Ohio	17.4	11.0	41.1	28.4	25.0	33.0	27.6	22.4	558	24.8
2. Sedentary lifestyle[§]										
Delaware	11.3	9.4	18.7	21.7	8.2	14.6	12.9	15.6	485	14.2
D.C.	7.1	9.7	13.8	21.2	37.5	27.9	15.7	18.7	483	17.4
Indiana	6.4	6.5	17.5	7.0	27.6	15.8	15.7	9.5	479	12.7
Kansas	3.5	3.9	14.5	11.9	10.8	15.2	8.8	10.2	481	9.5
Kentucky	10.2	7.9	8.7	13.1	30.0	15.8	15.2	11.9	456	13.5
Montana	5.8	9.6	1.9	6.5	18.1	19.0	8.1	11.3	500	9.7
New Jersey	11.3	10.0	22.9	16.5	25.9	23.5	19.2	15.8	973	17.4
North Carolina	7.8	7.8	11.4	19.9	19.7	15.9	12.1	14.2	462	13.2
Ohio	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	558	N/A
3. Uncontrolled hypertension[¶]										
Delaware	2.6	1.8	3.0	6.4	1.6	14.2	2.5	6.6	485	4.5
D.C.	3.9	0.6	5.4	4.8	6.9	17.9	5.0	6.8	483	6.0
Indiana	1.2	3.2	7.3	—	4.4	5.7	4.0	2.9	479	3.5
Kansas	—	—	2.8	3.5	8.8	8.5	3.1	3.9	481	3.5
Kentucky	2.7	2.6	6.1	5.6	3.0	11.2	3.9	6.2	456	5.1
Montana	1.4	0.9	—	2.8	5.3	10.6	2.1	4.4	500	3.3
New Jersey	1.6	—	0.4	7.7	7.6	7.7	2.8	4.5	973	3.7
North Carolina	4.5	3.6	4.4	6.7	3.6	11.2	4.2	7.1	462	5.7
Ohio	1.0	0.4	3.5	2.4	12.5	5.7	4.3	2.4	558	3.3
4. Cigarette smoking^{**}										
Delaware	32.1	32.7	32.1	28.0	27.8	23.2	30.9	28.5	485	29.7
D.C.	34.6	35.9	45.6	31.8	20.8	23.4	35.5	31.0	483	33.0
Indiana	46.2	29.2	40.9	38.8	21.3	15.0	37.8	28.1	479	33.2
Kansas	21.2	15.0	41.0	29.5	22.5	14.1	27.7	19.5	481	23.4
Kentucky	48.1	33.0	62.6	25.5	34.0	18.5	48.8	26.2	456	37.1
Montana	30.4	22.0	30.1	27.4	29.8	15.1	30.1	21.9	500	25.9
New Jersey	41.0	25.7	38.4	35.3	20.0	29.6	34.5	29.7	973	32.0
North Carolina	40.8	31.1	54.4	32.0	44.8	23.8	45.7	29.0	462	37.1
Ohio	32.4	23.7	48.4	38.4	30.2	16.5	37.8	27.2	558	32.2

Behavioral Risk Factor — Continued

TABLE 2. Behavioral risk factor levels* in eight states and the District of Columbia, by age group and sex — second quarter 1982 — Continued

Risk factor, by state	Age group (years) by sex								Total respondents	
	18-34		35-54		≥55		All ages		Number	Rate
	M	F	M	F	M	F	M	F		
5. Acute heavy drinking^{††}										
Delaware	46.5	25.6	28.1	13.8	15.5	5.2	32.5	15.9	485	24.3
D.C.	30.4	14.6	27.2	12.1	8.3	4.7	24.7	11.0	483	17.2
Indiana	49.1	15.1	27.8	8.3	21.3	2.7	34.8	9.1	479	22.5
Kansas	36.2	20.3	15.7	9.8	7.8	2.1	22.6	11.0	481	16.6
Kentucky	38.0	15.2	18.3	5.6	4.0	—	22.3	7.5	456	14.7
Montana	65.2	25.2	32.0	9.8	20.2	3.4	42.4	13.4	500	27.6
New Jersey	41.6	25.3	27.6	11.6	14.0	7.3	29.4	16.0	973	22.3
North Carolina	32.9	18.5	27.2	1.3	7.2	4.6	24.2	8.6	462	16.1
Ohio	52.3	19.5	26.4	4.7	10.4	2.1	34.3	10.2	558	21.5
6. Chronic heavy drinking^{§§}										
Delaware	13.9	5.3	15.7	2.1	15.5	6.9	14.9	4.4	485	9.7
D.C.	9.3	6.6	26.4	7.3	8.3	1.6	15.0	5.4	483	9.7
Indiana	12.2	—	16.1	3.1	13.8	—	13.9	1.0	479	7.7
Kansas	16.8	3.9	14.9	3.5	8.8	6.4	14.2	4.6	481	9.2
Kentucky	7.5	2.1	9.6	1.2	3.0	—	6.9	1.2	456	3.9
Montana	13.0	3.7	10.7	3.7	13.8	0.6	12.5	2.8	500	7.5
New Jersey	16.6	4.8	13.3	6.6	7.1	4.8	12.9	5.3	973	8.9
North Carolina	6.7	—	15.8	1.3	2.7	2.0	8.2	1.1	462	4.5
Ohio	7.0	0.1	6.5	0.9	8.3	2.1	7.1	0.9	558	3.8
7. Drinking & driving^{¶¶}										
Delaware	18.5	7.6	1.3	2.1	3.3	—	9.0	3.6	485	6.3
D.C.	2.9	1.1	5.4	1.2	1.4	—	3.5	0.9	483	2.0
Indiana	12.2	3.3	5.8	3.1	—	—	6.9	2.2	479	4.7
Kansas	20.9	7.2	6.4	2.1	—	—	11.0	3.2	481	7.0
Kentucky	5.4	4.2	2.6	—	1.0	—	3.3	1.6	456	2.4
Montana***	89.9	72.5	75.7	72.1	71.3	51.4	80.3	66.2	500	73.1
New Jersey	15.6	8.1	5.5	1.1	3.0	1.2	8.7	4.0	973	6.2
North Carolina	10.6	10.1	7.9	—	—	—	6.9	3.6	462	5.2
Ohio***	44.4	16.1	22.3	4.7	12.5	—	29.8	8.3	558	18.4
8. Lack of seatbelt use^{†††}										
Delaware	51.4	66.5	46.2	60.3	55.9	45.1	50.9	58.8	485	54.8
D.C.	35.4	47.1	39.8	37.4	38.9	51.1	37.6	44.8	483	41.6
Indiana	62.5	62.2	76.6	59.0	52.0	59.0	64.3	60.2	479	62.3
Kansas	76.2	66.7	63.0	63.5	62.7	59.7	68.7	63.4	481	65.9
Kentucky	68.8	71.2	60.9	64.5	57.0	48.2	63.0	62.1	456	62.6
Montana	71.0	64.7	55.3	59.5	62.8	49.2	63.9	58.3	500	61.0
New Jersey	58.8	62.3	59.7	63.8	59.0	59.5	59.2	62.0	973	60.7
North Carolina	62.6	74.0	62.3	56.2	56.9	67.5	60.9	66.3	462	63.7
Ohio	65.8	61.6	57.8	58.0	60.4	58.8	61.8	59.7	558	60.6

*Percentage.

†120% of ideal weight (ideal weight defined as the mid-value of the medium-frame person on the 1959 Metropolitan Life Insurance Company height/weight tables).

§Combined low level of activity from exercise, work, and recreation.

¶Person who states having been told by medical professional he/she was hypertensive and who still has high blood pressure.

**Current cigarette smoker.

††Person who has drunk five or more drinks on an occasion, one or more times in past month.

§§Person whose average total alcoholic beverage intake exceeds 56 drinks per month.

¶¶Person who has driven after having too much to drink, one or more times in past month.

***Person who has driven after having too much to drink, one or more times in past year.

†††Person who states seldom or never using a seatbelt while riding in or driving a car.

Behavioral Risk Factor – Continued

Use of a standard questionnaire with questions comparable to those used in national surveys allows these states to compare the prevalence of risks in their adult populations to national levels of risks. For example, the proportion of adults reporting cigarette smoking in these eight states and the District of Columbia ranges from a low of 23.4% in Kansas to a high of 37.1% in Kentucky and North Carolina. Nationally, the most recent report (1980) shows that the level of cigarette smoking is 32.4% (2). Chronic heavy drinking ranges from 3.8% in Ohio to 9.7% in Delaware and the District of Columbia. Nationally, approximately 9.0% of the adult population reports a chronic, heavy intake of alcoholic beverages (3). For people ages 20 to 74 years, approximately 14% of men and 24% of women nationally meet the criterion for obesity (120% of ideal weight) (4). These states report levels of obesity in men ranging from 17.4% in the District of Columbia to 27.6% in Ohio. For women, these states report obesity ranging from 16.7% in Montana to 28.9% in the District of Columbia.

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