CENTERS FOR DISEASE CONTROL July 10, 1987 / Vol. 36 / No. 26

MMWR

MORBIDITY AND MORTALITY WEEKLY REPORT

Recommendations of the Immunization Practices Advisory Committee

Measles Prevention

*These revised recommendations of the Immunization Practices Advisory Committee (ACIP) on measles prevention update the previous recommendations (*MMWR *1982;31:217-224,229-231) to include current information about vaccine effectiveness and measles elimination efforts. Although there are no basic changes in approach, the statement includes an additional option for outbreak control (revaccination of persons initially vaccinated at 12-14 months of age) and new recommendations for international travelers and medical personnel.*

INTRODUCTION

Measles (rubeola) is often a severe disease, frequently complicated by middle ear infection or bronchopneumonia. Encephalitis occurs in approximately one of every 2,000 reported cases; survivors often have permanent brain damage and mental retardation. Death, predominantly from respiratory and neurologic causes, occurs in one of every 3,000 reported measles cases. The risk of death is greater for infants and adults than for children and adolescents.

Subacute sclerosing panencephalitis (SSPE) is a "slow virus" infection of the central nervous system associated with measles virus. Widespread use of measles vaccine has led to the virtual disappearance of SSPE from the United States.

Contracting measles during pregnancy increases fetal risk. Most commonly, this risk involves premature labor and moderately increased rates of spontaneous abortion and of low birth weight. One study has suggested that measles infection in the first trimester may induce congenital malformations; confirmatory reports have not been published.

Before measles vaccine was available, more than 400,000 measles cases were reported each year in the United States. However, since virtually all children acquired measles, the true number of cases was probably more than 4 million per year (i.e., the entire birth cohort). Both the type of measles vaccine and the recommended age for measles vaccination have changed several times since 1963, when both an inactivated and a live, attenuated vaccine (Edmonston B strain) were licensed for use in the United States. The inactivated vaccine was used until 1967, and Edmonston B vaccine, until 1972. A live, further-attenuated Edmonston vaccine was first introduced

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in 1965 (Schwarz strain), and a similar vaccine (Moraten strain) was licensed in 1968. These further-attenuated vaccines cause fewer reactions than the Edmonston B vaccine yet are equally effective. The Moraten vaccine is the vaccine currently used in the United States.

Because of evidence of increased vaccine efficacy at older ages, the recommended age for vaccination, originally set at 9 months in 1963, was changed to 12 months in 1965 and to 15 months in 1976. Although vaccination is currently recommended at 15 months of age for optimal efficacy, vaccination as early as 12 months of age (on or after the first birthday) is considered appropriate evidence of measles immunity, and children vaccinated at 12-14 months of age are not routinely revaccinated. Vaccination as early as 6 months of age is recommended in settings of increased risk of disease.

MEASLES ELIMINATION

Since licensure of vaccine in 1963, the collaborative efforts of professional and voluntary medical and public health organizations in vaccination programs have resulted in a 98%-99% reduction in the reported incidence of measles in the United States. The number of reported measles cases decreased during the late 1960s and early 1970s to between 22,000 and 75,000 cases annually, with incidence rates falling dramatically in all age groups. Children <10 years old had the greatest decline in incidence, whereas older children had a slightly less dramatic decrease. As a result, the proportion of total cases occurring in different age groups changed so that by the period 1976-1980, 46% of cases occurred in children ≥10 years of age, compared with the period 1960-1964, when only 9.9% of cases occurred in this age group.

A Measles Elimination Program was announced in 1978, with a goal to eliminate indigenous measles from the United States by October 1, 1982. There are three components of this program: 1) achievement and maintenance of high levels of immunity, 2) effective surveillance of disease, and 3) aggressive outbreak control. As a result of these efforts, the number of cases of measles reported annually dropped from 26,871 in 1978 to approximately 13,500 in 1979 and 1980, to 3,124 in 1981. In 1982, the total fell to 1,714. In 1983, an all-time low of 1,497 reported cases was reached. However, the number of reported cases increased to 2,587 and 2,822, respectively, in 1984 and 1985. During 1986, a provisional total of 6,273 cases were reported.

Since 1984, a classification system has been used to differentiate cases that occurred because of failure to implement the current strategy (preventable cases) from cases that occurred despite appropriate strategy implementation (nonpreventable cases). Of the total cases provisionally reported in 1986, 36.4% were classified as preventable (Table 1). Preschool children 16 months-4 years of age were most likely to have preventable cases (83.2%), whereas only 29.4% of cases in school-aged children (5-19 years of age) were considered preventable. The greatest reason for nonpreventability was a history of previous measles vaccination on or after the first birthday (Table 2). These vaccine failures accounted for 59.8% of the nonpreventable cases and 38.0% of the total reported cases.

In the past several years, most of the outbreaks have occurred in school settings; in 1986, however, several large outbreaks involved communitywide transmission, primarily among unvaccinated preschool-aged children.

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Impediments to Measles Elimination

Despite the great success achieved to date in reducing the occurrence of measles in the United States, the goal of eliminating indigenous measles has not yet been reached. Part of the problem is failure to implement the current strategy. Preventable cases (i.e., those in unvaccinated persons) account for approximately one-third of all cases. The age group with the largest proportion of preventable cases is the preschool group. Children at this age may not yet be enrolled in institutions covered by day-care or school-entry immunization requirements.

A substantial proportion of cases occur among persons who have previously received vaccine. Theoretically, vaccine failures may be primary (the person never developed an adequate immune response to vaccination) or secondary (the person initially developed an adequate response but lost immunity over time). Some of the reported vaccine failures may be among persons whose records incorrectly indicate that they were properly vaccinated. Measles vaccine is at least 95% effective in children vaccinated at ≥15 months of age. However, efficacy may be slightly lower in persons vaccinated between 12 and 14 months of age, presumably because transplacental maternal antibody may persist beyond the first birthday in some children and

TABLE 1. Total and preventable measles cases, by age group – United States, 1986*

Age Group	Total Cases	Preventable	
		No.	(%)
<16 months	1,229	0	(0.0)
16 months-4 years	1,225	1,019	(83.2)
5-19 years	3,156	927	(29.4)
20-29 years	460	332	(72.2)
≥30 years	166	0	(0.0)
Unknown	19	0	(0.0)
Total	**6,255** †	**2,278**	**(36.4)**

*Provisional data.
†Cases with known preventability status.

TABLE 2. Measles cases, by preventability status – United States, 1986*

Classification	No.	(%)
Nonpreventable Cases		
Too young (<16 months)	1,230	(19.7)
Too old (born before 1957)	194	(3.1)
History of vaccination†	2,377	(38.0)
Importation by non-U.S. citizen	48	(0.8)
Exemption§	128	(2.0)
Subtotal	3,977	(63.6)
Preventable Cases	2,278	(36.4)
Total	**6,255**	**(100.0)**¶

*Provisional data.
†Vaccinated on or after the first birthday.
§Includes medical, religious, and philosophic exemptions.
¶Cases with known preventability status.

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interfere with effective immunization. There are no data to indicate that waning immunity of clinical importance is occurring after measles vaccination.

Another problem is importation of measles from outside the United States. Although importations account for a small proportion of cases (2%), they have initiated several outbreaks and, in some parts of the United States, may be responsible for more measles cases than the number indicated by available surveillance data.

Augmentation of Measles Elimination Activities

The Committee considered, in detail, current measles epidemiology and the measles elimination strategy, as well as potential modifications. It concluded that the current strategy needed more complete implementation to ensure that vaccination takes place at 15 months of age rather than being delayed, for example, until it is required for school entry.

After consideration of possible modifications of the measles elimination strategy, including administering two doses, lowering the age for vaccination, and routinely revaccinating those vaccinated between 12 and 14 months of age, the Committee determined that no change in the routine policy is indicated at present. Continued careful observation and analysis of measles epidemiology is indicated so that any necessary change in strategy can be implemented.

MEASLES VIRUS VACCINE

Live measles virus vaccine,* available in the United States, is prepared in chick embryo cell culture. It is available in monovalent (measles only) form and in combinations: measles-rubella (MR) and measles-mumps-rubella (MMR) vaccines. All vaccines containing measles virus are recommended for use at 15 months of age under routine conditions. MMR is the vaccine of choice for routine vaccination programs. In all situations in which measles vaccine is to be used, a combination vaccine should be given if recipients are likely to be susceptible to rubella and/or mumps as well as to measles. There is no harm in revaccinating persons already immune to any of the components of MMR vaccine.

Measles vaccine produces a mild or inapparent noncommunicable infection. Measles antibodies develop in at least 95% of susceptible children vaccinated at $\geq$15 months of age. Both serologic and epidemiologic evidence extending through 23 years indicates that, although the titers of vaccine-induced antibody are lower than those following natural disease, the protection conferred appears to be durable.

Vaccine Shipment and Storage

Vaccine that has been improperly stored may not provide protection against measles. Although data indicate that current measles vaccine may be more thermostable than vaccine produced in the past, it should be kept at 2 C-8 C (35.6 F-46.4 F) or colder during storage. It must also be protected from light, which may inactivate the virus. Vaccine must be shipped at 10 C (50 F) or colder and may be shipped on dry ice.

VACCINE USAGE

General Recommendations

Persons are considered immune to measles only if they have documentation of 1) adequate immunization with live measles vaccine on or after the first birthday, 2) physician-diagnosed measles, or 3) laboratory evidence of measles immunity.

Most persons born before 1957 are likely to have been naturally infected and generally need not be considered susceptible. All other children, adolescents, and

*Official name: measles virus vaccine, live attenuated.

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adults are considered susceptible and should be vaccinated if there are no contraindications (see **Precautions and Contraindications**). This includes persons who may be immune to measles but who lack adequate documentation of immunity. A parental report of immunization, by itself, is not considered adequate documentation. A physician should not provide an immunization record for a patient unless he/she has administered the vaccine or has seen a record documenting vaccination.

The most commonly used laboratory test for assessing immunity to measles has been the hemagglutination-inhibition (HI) test. Other sensitive assays, such as the enzyme immunoassay (EIA), are now being used by many laboratories. Probably most, if not all, persons with detectable antibody are immune. Routine serologic screening to determine measles immunity is not recommended.

Dosage

A single dose of live measles vaccine (as a monovalent or combination product) should be given subcutaneously in the volume specified by the manufacturer. There is no need for a "booster" dose of vaccine if vaccine is given on or after the first birthday.

Age at Vaccination

Measles vaccine is indicated for persons susceptible to measles, regardless of age, unless otherwise contraindicated (see below). Current evidence indicates that for a maximum seroconversion rate, measles vaccine should be given when children are ≥15 months of age. Because cases continue to occur in preschool children, increased emphasis must be placed on vaccinating children promptly at 15 months of age. It is particularly important to vaccinate young children ≥15 months of age before they might encounter measles in day-care centers or other environments where young children cluster.

The risk of complications from measles is high among infants <1 year of age. Therefore, considering the benefits and risks, the Committee recommends that infants as young as 6 months of age should be vaccinated with monovalent measles vaccine when exposure to natural measles is considered likely. Because infants vaccinated before the first birthday have a significantly lower rate of seroconversion, they should be revaccinated when they are 15 months old to ensure protection.

Revaccination of Persons Vaccinated According to Earlier Recommendations

Previous vaccination with live vaccine: Persons vaccinated with live measles vaccine before their first birthday should be identified and revaccinated. Some serologic studies show lower seroconversion and seroprevalence rates in children vaccinated between 12 and 14 months of age (80%-95%) than in those vaccinated at ≥15 months (>95%). Many outbreak investigations have also found higher attack rates in persons vaccinated between 12 and 14 months of age than in those vaccinated at ≥15 months of age. However, a few other studies have not found a difference. Between 1965 and 1976, the recommended age for vaccination in the United States was 12 months; therefore, a large proportion of persons who are between 10 and 21 years of age in 1987 are likely to have been vaccinated when they were between 12 and 14 months of age. Because the vast majority of persons vaccinated between 12 and 14 months of age are fully protected against measles, routine revaccination of such persons is not warranted. However, if revaccination is requested, there is no immunologic or safety reason to deny the request. In an outbreak setting, such revaccination may be useful. (See **Outbreak Control.**)

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Edmonston B vaccine was effectively administered with immune globulin (IG). However, the immune response to further-attenuated measles vaccine strains may be impeded by IG. Therefore, the Committee recommends that persons who received measles vaccine of unknown type or further-attenuated measles vaccine accompanied by IG should be revaccinated.

Previous vaccination with killed vaccine or vaccine of unknown type: Some persons who have received inactivated vaccine are at risk of contracting a severe atypical measles syndrome when exposed to the natural virus. Consequently, persons vaccinated at any age with inactivated vaccine (available in the United States from 1963 to 1967) and persons vaccinated with inactivated vaccine followed by live vaccine within 3 months should be revaccinated. Revaccination is particularly important when the risk of exposure to natural measles virus is increased, for example, during foreign travel.

A wide range (4%-55%) of prior recipients of killed measles vaccine who were revaccinated with live measles vaccine have reportedly had adverse reactions to the live vaccine. Most of these reactions have been mild, consisting of local swelling and erythema, with or without low-grade fever lasting 1-2 days. Rarely, more severe reactions, including prolonged high fevers and extensive local reactions requiring hospitalization, have been reported. However, prior recipients of killed measles vaccine are more likely to have serious illness when exposed to natural measles than when given live measles virus vaccine.

These same recommendations for revaccination apply to persons vaccinated between 1963 and 1967 with a vaccine of unknown type, since their only vaccination may have been with inactivated vaccine. Because killed measles vaccine was not distributed in the United States after 1967, persons vaccinated after 1967 with a vaccine of unknown type need not be revaccinated if the original vaccination occurred on or after the first birthday and was not accompanied by IG.

Individuals Exposed to Disease

Use of vaccine: Exposure to measles is not a contraindication to vaccination. Available data suggest that live measles vaccine, if given within 72 hours of measles exposure, may provide protection and is preferable to the use of IG in persons at least 12 months of age if there is no contraindication. If the exposure does not result in infection, the vaccine should induce protection against subsequent measles infection.

Use of IG: IG can be given to prevent or modify measles in a susceptible person within 6 days after exposure. The recommended dose of IG is 0.25 ml/kg (0.11 ml/lb) of body weight (maximum dose = 15 ml). IG may be especially indicated for susceptible household contacts of measles patients, particularly contacts under 1 year of age, pregnant women, or immunocompromised persons, for whom the risk of complications is highest. The recommended dose of IG for immunocompromised persons is 0.5 ml/kg of body weight (maximum dose = 15 ml). If the individual is at least 15 months old and there is no contraindication to vaccination, live measles vaccine should be given 3 months later, by which time the passively acquired measles antibodies should have disappeared. IG should not be used to control measles outbreaks.

SIDE EFFECTS AND ADVERSE REACTIONS

Experience with more than 160 million doses of measles vaccine distributed in the United States through 1986 indicates an excellent record of safety. From 5% to 15% of vaccinees may develop a temperature of ≥103 F (≥39.4 C) beginning about the fifth

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day after vaccination and usually lasting several days. Most persons with fever are otherwise asymptomatic. Transient rashes in approximately 5% of vaccinees have been reported. Central nervous system conditions including encephalitis and encephalopathy have been reported with a frequency of less than one case per million doses administered. The incidence rate of encephalitis or encephalopathy following measles vaccination is lower than the observed incidence rate of encephalitis of unknown etiology, suggesting that some or most of the reported severe neurologic disorders may be only temporally related to measles vaccination rather than due to vaccination. Limited data indicate that reactions to the vaccine are not age related.

Personal and Family History of Convulsions

As with the administration of any agent that may produce fever, some children may have a febrile seizure following measles vaccination. Although children with a personal or family history of seizures are at increased risk for developing idiopathic epilepsy, febrile seizures—including those following vaccinations—do not, in and of themselves, increase the probability of subsequent epilepsy or other neurologic disorders. Most convulsions following measles-containing vaccines are simple febrile seizures, and they occur in children without known risk factors. Recent data suggest that there is an increased risk of these convulsions among children with a prior history of convulsions or those with a history of convulsions in first-degree family members (i.e., siblings or parents). Although the precise risk cannot be determined, it appears to be low.

In developing vaccination recommendations concerning these children, the Committee considered a number of factors including risks from measles disease, the large number (5%-7%) of children with a personal or family history of convulsions, and the fact that convulsions following measles vaccine are uncommon and have not been associated with permanent brain damage. The Committee concluded that the benefits of immunizing children with a personal history of convulsions or a family history of convulsions in first-degree relatives greatly outweigh the risks. These children should be vaccinated in the same way that children without such histories are vaccinated.

Because the period for contracting vaccine-induced fever begins approximately 5 days after vaccination and lasts approximately 1 week, effective reduction of the risk of a febrile seizure is difficult. Prophylaxis with antipyretics is one alternative, but these agents probably would be ineffective if given after the onset of fever. To be effective, they would have to be given before the expected onset of fever and continued for another 5-7 days. Nevertheless, parents should closely observe children for fever during this period, and if fever occurs, the child should be treated appropriately.

Children who are receiving anticonvulsants should continue to take them after measles vaccination. Because protective levels of most currently available anticonvulsant drugs (e.g., phenobarbitol) are not achieved for some time after the initiation of therapy, prophylactic use of these drugs does not seem feasible.

The parents of children who have either a personal or family history of seizures should be advised that such children have a small increased risk of seizures following vaccination. In particular, they should be told in advance of measles vaccination what to do in the unlikely event that the child has a seizure. The permanent medical record

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should document that the small risk of postvaccination seizures and the benefits of vaccination for these children have been discussed.

Revaccination Risks

There is no evidence of enhanced risk from receiving live measles vaccine to persons who are already immune to measles, either from vaccination or natural disease. (See **Previous vaccination with killed vaccine or vaccine of unknown type.**)

PRECAUTIONS AND CONTRAINDICATIONS

Pregnancy

Live measles vaccine should not be given to women known to be pregnant or who are considering becoming pregnant within 3 months after vaccination. This precaution is based on the theoretical risk of fetal infection, which applies to the administration of any live virus vaccine to women who might be pregnant or who might become pregnant shortly after vaccination. No evidence exists to substantiate this theoretical risk from measles vaccine. Considering the importance of protecting adolescents and young adults against measles with its known serious risks, asking women if they are pregnant, excluding those who are, and explaining the theoretical risks to the others before vaccination are the recommended precautions in a measles immunization program.

Febrile Illness

Vaccine administration should not be postponed because of minor illnesses, such as mild upper-respiratory infections. However, vaccination of persons with severe febrile illnesses should generally be deferred until they have recovered. Considering the importance of measles protection, medical personnel should use every opportunity to vaccinate susceptible children.

Allergies

Hypersensitivity reactions following the administration of live measles vaccine are rare. Most of these reactions are minor and consist of wheal and flare or urticaria at the injection site. With more than 160 million doses of measles vaccine distributed in the United States, there have been at least five reported cases of immediate allergic reactions in children who had histories of anaphylactic reactions to egg ingestion. These reactions to vaccine could potentially have been life threatening. Four children experienced difficulty in breathing; one of these had hypotension. Persons with a history of anaphylactic reactions following egg ingestion (hives, swelling of the mouth and throat, difficulty in breathing, hypotension, or shock) should be vaccinated only with extreme caution. Protocols have been developed for vaccinating such persons (*1*). Evidence indicates that persons are not at increased risk if they have egg allergies that are not anaphylactic in nature. Such persons should be vaccinated in the usual manner. There is no evidence that persons with allergies to chickens or feathers are at increased risk of reaction to the vaccine.

Since measles vaccine contains trace amounts of neomycin (25μg), persons who have had anaphylactic reactions to topically or systemically administered neomycin should not receive measles vaccine. Most often, neomycin allergy is manifested as a contact dermatitis that is a delayed-type (cell-mediated) immune response rather than anaphylaxis. In such individuals the adverse reaction, if any, to 25μg of neomycin in the vaccine would be an erythematous, pruritic nodule or papule at 48-96 hours. A history of contact dermatitis to neomycin is not a contraindication to receiving measles vaccine. Live measles virus vaccine does not contain penicillin.

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Recent Administration of IG

Vaccination should be deferred for 3 months after a person has received IG, whole blood, or other antibody-containing blood products because passively acquired antibodies might interfere with the response to the vaccine. If vaccine is given to a person who has received such products within the preceding 3 months, the person should be revaccinated. If IG is to be administered in preparation for international travel, administration of vaccine should precede IG by at least 2 weeks.

Tuberculosis

Tuberculosis may be exacerbated by natural measles infection. There is no evidence that the live measles virus vaccine has such an effect. Tuberculin skin testing is not a prerequisite for measles vaccination. If tuberculin testing is needed, it can be done the day of vaccination. Otherwise, it is prudent to wait 4-6 weeks after measles immunization before administering a tuberculin skin test, since measles vaccination may temporarily suppress tuberculin reactivity.

Altered Immunity

Replication of the measles vaccine virus may be potentiated in patients with immune deficiency diseases and by the suppressed immune responses that occur with leukemia, lymphoma, generalized malignancy, acquired immunodeficiency syndrome (AIDS), or with certain therapies (corticosteroids, alkylating drugs, antimetabolites, or radiation). Patients with such conditions should not be given live measles virus vaccine. Since vaccinated persons do not transmit vaccine virus, the risk to these patients of being exposed to measles may be reduced by vaccinating their close susceptible contacts. Management of such persons, should they be exposed to measles, can be facilitated by prior knowledge of their immune status. If susceptible, they should receive IG following exposure (see below).

Patients with leukemia in remission whose chemotherapy has been terminated for at least 3 months may receive live virus vaccines. Persons infected with the human immunodeficiency virus (HIV) who are asymptomatic also can receive measles vaccine (*2*). Short-term corticosteroid therapy (<2 weeks), topical steroid therapy (e.g., nasal, skin), and intraarticular, bursal, or tendon injection with corticosteroids should not be immunosuppressive and do not contraindicate measles vaccine administration. However, measles vaccine should be avoided if systemic immunosuppressive levels are reached by prolonged, extensive, topical application.

Management of Patients with Contraindications to Measles Vaccine

If immediate protection against measles is required for persons for whom measles vaccine is contraindicated, passive immunization with IG, 0.25 ml/kg (0.11 ml/lb) of body weight, should be given as soon as possible after known exposure (maximum dose = 15 ml). It is important to note, however, that IG in usual doses may not be effective in children with acute leukemia or other conditions associated with altered immunity. Consequently, for immunocompromised persons, the recommended dose of IG is 0.5 ml/kg of body weight (maximum dose = 15 ml).

SIMULTANEOUS ADMINISTRATION OF VACCINES

Simultaneous administration of MMR, oral poliovirus vaccine (OPV), and diphtheria and tetanus toxoids and pertussis (DTP) vaccines results in seroconversion rates and rates of side effects similar to those observed when the vaccines are administered separately. On the basis of these results, the Committee recommends routine administration of MMR, OPV, and DTP simultaneously to susceptible persons at 15 months of age (*3*). Some health-care providers may prefer to continue administering

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MMR at 15 months of age, followed by DTP and OPV at 18 months of age, especially for patients who are known to be compliant with health-care recommendations.

ONGOING PROGRAMS

The best means of reducing the incidence of measles is by having an immune population. Programs aimed at vaccinating children against measles at 15 months of age should be established and maintained in all communities. In addition, all other persons thought to be susceptible, regardless of age, should be vaccinated when they are identified, unless vaccine is otherwise contraindicated.

Official health agencies should take whatever steps are necessary, including development and enforcement of school immunization requirements, to achieve and maintain high immunization levels. Most states currently require evidence of immunity to measles for children enrolled in day-care centers. Enforcement of such requirements has been correlated with reduced measles incidence rates.

(Continued on page 423)

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

Disease	26th Week Ending			Cumulative, 26th Week Ending		
	July 4, 1987	June 28, 1986	Median 1982-1986	July 4, 1987	June 28, 1986	Median 1982-1986
Acquired Immunodeficiency Syndrome (AIDS)	292	252	N	9,074	6,136	N
Aseptic meningitis	148	188	163	2,704	2,513	2,295
Encephalitis: Primary (arthropod-borne & unspec)	11	18	19	420	397	459
Post-infectious	1	2	2	57	59	59
Gonorrhea: Civilian	10,634	15,580	17,576	389,381	418,867	423,044
Military	247	456	400	8,087	8,004	10,526
Hepatitis: Type A	322	381	381	12,121	10,925	10,701
Type B	438	458	460	12,599	12,669	12,384
Non A, Non B	50	73	N	1,535	1,789	N
Unspecified	43	95	104	1,584	2,352	2,780
Legionellosis	16	21	N	396	282	N
Leprosy	2	6	7	99	139	126
Malaria	6	20	20	341	431	399
Measles: Total*	96	178	89	2,637	4,222	1,786
Indigenous	89	163	N	2,335	4,003	N
Imported	7	15	N	302	213	N
Meningococcal infections: Total	33	40	47	1,712	1,509	1,672
Civilian	33	40	47	1,711	1,507	1,669
Military	-	-	-	1	2	6
Mumps	86	126	47	9,302	2,386	2,083
Pertussis	26	59	41	862	1,356	940
Rubella (German measles)	4	6	14	207	321	422
Syphilis (Primary & Secondary): Civilian	550	549	572	16,642	12,870	13,965
Military	3	4	5	84	94	172
Toxic Shock syndrome	6	3	N	148	175	N
Tuberculosis	256	505	505	10,103	10,384	10,433
Tularemia	6	2	6	66	50	89
Typhoid Fever	2	5	5	140	131	158
Typhus fever, tick-borne (RMSF)	30	40	40	214	234	315
Rabies, animal	52	111	110	2,476	2,875	2,875

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1987		Cum. 1987
Anthrax	-	Leptospirosis	8
Botulism: Foodborne (Wash. 1)	4	Plague	3
Infant	31	Poliomyelitis, Paralytic	-
Other	-	Psittacosis (Wash. 3)	47
Brucellosis (Ark. 1)	52	Rabies, human	-
Cholera	-	Tetanus (Tex. 1)	14
Congenital rubella syndrome	3	Trichinosis	26
Congenital syphilis, ages < 1 year	-	Typhus fever, flea-borne (endemic, murine)	14
Diphtheria	1	(Hawaii 1)	

*One of the 96 reported cases for this week was imported from a foreign country or can be directly traceable to a known internationally imported case within two generations.

TABLE III. Cases of specified notifiable diseases, United States, weeks ending July 4, 1987 and June 28, 1986 (26th Week)

Reporting Area	AIDS	Aseptic Meningitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis(Viral), by type				Legionellosis	Leprosy
			Primary	Post-infectious			A	B	NA,NB	Unspecified		
	Cum. 1987	1987	Cum. 1987	Cum. 1987	Cum. 1987	Cum. 1986	1987	1987	1987	1987	1987	Cum. 1987
UNITED STATES	9,074	148	420	57	389,381	418,867	322	438	50	43	16	99
NEW ENGLAND	374	8	18	2	12,316	9,512	16	37	3	10	1	10
Maine	13	2	1	-	369	454	-	5	-	-	1	-
N.H.	9	1	-	-	202	249	-	-	-	-	-	2
Vt.	4	-	3	-	102	135	-	2	-	-	-	-
Mass.	222	5	10	1	4,507	4,118	8	29	2	10	-	7
R.I.	32	-	3	1	1,034	818	1	1	1	-	-	-
Conn.	94	-	1	-	6,102	3,738	7	-	-	-	-	1
MID. ATLANTIC	2,452	26	57	5	63,869	68,678	35	58	3	7	1	5
Upstate N.Y.	353	5	21	3	8,393	8,117	18	15	1	1	1	-
N.Y. City	1,325	9	5	-	33,936	39,856	4	18	-	5	-	5
N.J.	518	9	6	-	8,261	8,633	6	9	-	-	-	-
Pa.	256	3	25	2	13,279	12,072	7	16	2	1	-	-
E.N. CENTRAL	617	29	119	10	56,200	57,929	20	42	2	-	5	3
Ohio	112	3	46	4	12,352	14,027	4	10	-	-	4	1
Ind.	43	2	9	-	4,543	5,839	4	2	-	-	-	-
Ill.	312	-	18	6	17,494	14,998	-	4	1	-	-	-
Mich.	106	24	37	-	17,165	17,010	12	26	1	-	1	1
Wis.	44	-	9	-	4,646	6,055	-	-	-	-	-	1
W.N. CENTRAL	201	4	15	-	15,735	18,225	26	26	-	-	1	-
Minn.	54	1	9	-	2,514	2,490	2	4	-	-	-	-
Iowa	15	-	1	-	1,516	1,859	-	2	-	-	-	-
Mo.	92	1	-	-	8,200	9,360	18	17	-	-	-	-
N. Dak.	1	-	-	-	134	166	-	-	-	-	-	-
S. Dak.	2	1	-	-	294	374	-	-	-	-	-	-
Nebr.	11	1	3	-	920	1,278	1	2	-	-	-	-
Kans.	26	-	2	-	2,157	2,698	5	1	-	-	1	-
S. ATLANTIC	1,447	34	53	18	102,618	107,446	23	98	12	5	4	5
Del.	9	1	1	1	1,561	1,698	-	2	-	-	-	-
Md.	192	1	8	4	12,409	12,588	1	26	4	2	-	2
D.C.	196	-	-	-	6,980	8,178	1	1	-	-	-	-
Va.	105	-	19	2	7,475	8,707	1	11	3	1	-	-
W. Va.	11	-	6	-	769	1,166	-	1	1	-	1	-
N.C.	61	7	9	-	15,495	16,472	5	7	1	-	-	-
S.C.	37	2	-	-	8,548	9,611	1	14	1	-	-	1
Ga.	210	6	-	-	17,531	18,842	6	17	-	1	-	-
Fla.	626	17	10	11	31,850	30,184	8	19	2	1	3	2
E.S. CENTRAL	107	9	21	4	29,158	34,319	3	19	1	-	1	-
Ky.	21	2	10	1	2,912	3,961	-	2	-	-	1	-
Tenn.	11	2	4	-	10,165	13,342	1	6	-	-	-	-
Ala.	63	3	7	-	9,411	9,606	2	11	1	-	-	-
Miss.	12	2	-	3	6,670	7,410	-	-	-	-	-	-
W.S. CENTRAL	908	25	41	3	44,526	50,761	42	44	6	12	3	4
Ark.	22	-	-	1	4,551	4,734	1	-	-	-	-	-
La.	120	-	6	-	8,121	8,759	-	2	-	-	-	-
Okla.	37	6	12	1	4,788	5,704	5	7	-	1	3	-
Tex.	729	19	23	1	27,066	31,564	36	35	6	11	-	4
MOUNTAIN	246	10	13	3	10,204	12,420	84	57	8	4	-	1
Mont.	2	2	-	-	261	355	1	2	-	-	-	-
Idaho	4	-	-	-	376	430	-	-	-	-	-	-
Wyo.	2	-	-	-	220	288	-	-	-	-	-	-
Colo.	100	2	1	-	2,181	3,226	24	2	1	1	-	-
N. Mex.	15	-	1	-	1,111	1,277	17	10	1	-	-	-
Ariz.	77	4	9	1	3,560	4,083	39	24	3	3	-	-
Utah	15	-	-	2	324	541	2	4	1	-	-	-
Nev.	31	2	2	-	2,171	2,220	1	15	2	-	-	1
PACIFIC	2,722	3	83	12	54,755	59,577	73	57	15	5	-	71
Wash.	114	-	8	2	4,003	4,688	60	35	12	3	-	3
Oreg.	61	-	-	-	2,100	2,366	12	21	3	1	-	-
Calif.	2,489	-	71	10	47,332	50,387	-	-	-	-	-	53
Alaska	8	-	2	-	865	1,465	1	-	-	1	-	-
Hawaii	50	3	2	-	455	671	-	1	-	-	-	15
Guam	-	-	-	-	105	74	-	-	-	-	-	-
P.R.	65	1	1	1	1,099	1,176	4	1	-	1	-	5
V.I.	-	-	-	-	126	115	-	-	-	-	-	-
Pac. Trust Terr.	-	-	-	-	240	170	-	-	-	-	-	38
Amer. Samoa	-	-	-	-	45	22	2	1	-	-	-	-

N: Not notifiable U: Unavailable

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending July 4, 1987 and June 28, 1986 (26th Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total									
	Cum. 1987	1987	Cum. 1987	1987	Cum. 1987	Cum. 1986	Cum. 1987	1987	Cum. 1987	1987	Cum. 1987	Cum. 1986	1987	Cum. 1987	Cum. 1986
UNITED STATES	341	89	2,335	7	302	4,222	1,712	86	9,302	26	862	1,356	4	207	321
NEW ENGLAND	25	2	89	7	149	56	150	-	21	3	23	69	-	1	9
Maine	-	-	3	-	-	2	9	-	-	3	4	2	-	1	-
N.H.	1	-	49	-	102	26	14	-	8	-	2	31	-	-	1
Vt.	-	-	7	-	14	-	8	-	2	-	3	3	-	-	1
Mass.	9	2	15	7†§	27	24	74	-	1	-	5	16	-	-	4
R.I.	5	-	1	-	1	2	14	-	2	-	1	1	-	-	2
Conn.	10	-	14	-	5	2	31	-	8	-	8	16	-	-	1
MID. ATLANTIC	34	18	463	-	43	1,283	209	1	152	1	110	105	-	10	27
Upstate N.Y.	15	3	23	-	9	54	74	1	72	1	83	70	-	8	19
N.Y. City	4	15	400	-	14	310	15	-	-	-	-	3	-	1	5
N.J.	8	-	19	-	3	897	43	-	39	-	6	7	-	1	3
Pa.	7	-	21	-	17	22	77	-	41	-	21	25	-	-	-
E.N. CENTRAL	17	4	252	-	18	859	245	62	5,465	1	101	204	-	20	50
Ohio	7	-	1	-	4	10	84	5	76	-	34	74	-	-	-
Ind.	2	-	-	-	-	2	25	2	756	-	1	22	-	-	-
Ill.	1	4	104	-	12	533	54	25	2,405	-	5	27	-	19	45
Mich.	7	-	29	-	-	31	67	29	805	-	28	22	-	1	4
Wis.	-	-	118	-	2	278	15	1	1,423	1	33	59	-	-	1
W.N. CENTRAL	11	61	191	-	21	231	73	10	1,176	2	49	67	-	1	10
Minn.	5	1	15	-	19	46	25	6	670	-	9	27	-	-	-
Iowa	2	-	-	-	-	41	3	4	358	1	9	9	-	1	1
Mo.	4	60	176	-	1	23	21	-	19	1	18	5	-	-	1
N. Dak.	-	-	-	-	-	23	1	-	6	-	1	3	-	-	-
S. Dak.	-	-	-	-	-	-	1	-	80	-	2	11	-	-	-
Nebr.	-	-	-	-	-	1	3	-	2	-	-	2	-	-	7
Kans.	-	-	-	-	1	97	19	-	41	-	10	10	-	-	-
S. ATLANTIC	58	-	77	-	6	467	282	6	206	4	175	522	-	12	3
Del.	1	-	27	-	-	1	4	-	-	-	-	219	-	2	-
Md.	12	-	2	-	-	27	26	1	19	1	7	142	-	2	-
D.C.	6	-	-	-	1	-	5	-	-	-	-	-	-	-	-
Va.	12	-	1	-	-	49	46	5	61	1	38	16	-	1	-
W. Va.	2	-	-	-	-	2	-	-	27	2	37	10	-	-	-
N.C.	7	-	1	-	1	2	37	-	12	-	65	20	-	-	-
S.C.	3	-	-	-	-	301	28	-	11	-	-	9	-	-	-
Ga.	3	-	-	-	-	70	53	-	40	-	17	74	-	1	-
Fla.	12	-	46	-	4	15	83	-	36	-	11	32	-	6	3
E.S. CENTRAL	4	-	2	-	-	43	80	1	1,180	3	17	22	1	3	1
Ky.	1	-	-	-	-	-	15	-	210	-	1	1	-	2	1
Tenn.	1	-	-	-	-	41	28	1	920	1	6	5	1	1	-
Ala.	-	-	-	-	-	-	31	-	50	-	6	16	-	-	-
Miss.	2	-	2	-	-	2	6	N	N	2	4	-	-	-	-
W.S. CENTRAL	23	-	199	-	3	570	113	2	684	3	58	96	-	5	53
Ark.	1	-	-	-	-	283	11	-	278	-	2	6	-	2	-
La.	-	-	-	-	-	2	10	-	197	1	13	6	-	-	-
Okla.	4	-	1	-	1	12	17	N	N	2	43	56	-	-	-
Tex.	18	-	198	-	2	273	75	2	209	-	-	28	-	3	53
MOUNTAIN	13	4	431	-	15	294	62	2	186	5	86	123	-	19	17
Mont.	-	-	122	-	1	7	3	-	4	-	3	5	-	3	1
Idaho	1	-	-	-	-	1	5	-	3	-	26	27	-	1	-
Wyo.	-	-	-	-	2	-	-	-	-	3	5	1	-	-	1
Colo.	4	-	5	-	-	7	18	2	28	1	21	36	-	-	-
N. Mex.	-	1	288	-	9	30	3	N	N	1	7	12	-	4	2
Ariz.	6	1	14	-	1	243	21	-	134	-	23	28	-	10	10
Utah	-	-	-	-	1	6	8	-	8	-	1	14	-	-	3
Nev.	2	2	2	-	1	-	4	-	9	-	-	-	-	-	-
PACIFIC	156	-	631	-	47	419	498	2	232	4	243	148	3	136	151
Wash.	14	-	5	-	-	97	63	2	34	2	35	52	-	1	8
Oreg.	4	-	2	-	33	5	23	N	N	-	14	9	-	88	-
Calif.	134	-	624	-	10	297	401	-	180	-	96	82	-	1	141
Alaska	3	-	-	-	-	-	4	-	6	-	3	2	-	46	-
Hawaii	1	-	-	-	4	20	7	-	12	2	95	3	3	1	2
Guam	-	-	2	-	-	3	4	-	5	-	-	-	-	2	2
P.R.	1	7	569	-	-	18	3	-	5	-	12	7	-	-	58
V.I.	-	-	-	-	-	-	-	-	9	-	-	-	-	1	-
Pac. Trust Terr.	-	-	1	-	-	-	1	-	5	-	1	-	-	-	1
Amer. Samoa	-	-	-	-	-	2	-	-	3	-	-	-	-		

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

N: Not notifiable U: Unavailable †International §Out-of-state

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending July 4, 1987 and June 28, 1986 (26th Week)

Reporting Area	Syphilis (Civilian) (Primary& Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1987	Cum. 1986	1987	Cum. 1987	Cum. 1986	Cum. 1987	Cum. 1987	Cum. 1987	Cum. 1987
UNITED STATES	16,642	12,870	6	10,103	10,384	66	140	214	2,476
NEW ENGLAND	262	254	-	319	326	-	14	2	2
Maine	1	15	-	17	27	-	1	-	1
N.H.	2	10	-	8	11	-	-	-	-
Vt.	1	6	-	7	10	-	1	-	-
Mass.	129	130	-	170	150	-	10	2	-
R.I.	7	16	-	25	24	-	1	-	1
Conn.	122	77	-	92	104	-	1	-	-
MID. ATLANTIC	3,205	1,807	1	1,706	2,063	-	17	5	180
Upstate N.Y.	104	88	1	261	306	-	7	3	14
N.Y. City	2,326	1,020	-	815	1,027	-	-	-	-
N.J.	342	336	-	319	372	-	10	1	6
Pa.	433	363	-	311	358	-	-	1	160
E.N. CENTRAL	477	528	-	1,219	1,282	1	18	28	79
Ohio	55	70	-	235	213	1	6	24	3
Ind.	33	58	-	125	143	-	4	-	11
Ill.	257	284	-	477	575	-	5	-	28
Mich.	95	90	-	327	291	-	2	4	11
Wis.	37	26	-	55	60	-	1	-	26
W.N. CENTRAL	74	125	1	303	299	22	8	27	569
Minn.	8	20	-	67	78	-	3	-	130
Iowa	11	6	1	18	22	3	2	-	159
Mo.	36	68	-	173	148	15	3	11	32
N. Dak.	-	3	-	1	4	-	-	-	69
S. Dak.	8	2	-	16	13	2	-	-	136
Nebr.	7	11	-	12	5	-	-	-	15
Kans.	4	15	-	16	29	2	-	16	28
S. ATLANTIC	5,693	3,796	-	2,171	2,016	4	11	67	680
Del.	45	27	-	20	21	1	-	-	-
Md.	292	219	-	196	142	-	2	24	238
D.C.	178	169	-	71	70	-	-	-	27
Va.	148	203	-	214	175	1	1	4	211
W. Va.	6	11	-	61	59	-	1	4	28
N.C.	305	254	-	240	282	1	1	14	2
S.C.	372	314	-	200	264	-	-	14	34
Ga.	788	753	-	336	281	-	-	7	101
Fla.	3,559	1,846	-	833	722	1	6	-	39
E.S. CENTRAL	972	880	2	837	919	3	2	23	187
Ky.	8	43	2	229	230	1	1	2	94
Tenn.	411	322	-	191	283	1	1	14	51
Ala.	249	275	-	254	295	-	-	5	42
Miss.	304	240	-	163	111	1	-	2	-
W.S. CENTRAL	2,125	2,654	1	1,193	1,320	19	9	52	368
Ark.	109	141	-	140	173	8	1	2	77
La.	372	428	-	133	228	2	-	-	9
Okla.	82	74	1	111	121	9	2	44	18
Tex.	1,562	2,011	-	809	798	-	6	6	264
MOUNTAIN	346	321	-	237	238	9	7	9	189
Mont.	8	6	-	9	12	1	-	7	98
Idaho	3	5	-	17	10	1	-	-	-
Wyo.	1	-	-	-	-	-	-	1	44
Colo.	51	79	-	12	18	2	-	-	-
N. Mex.	32	43	-	47	53	1	7	-	1
Ariz.	166	131	-	134	110	3	-	-	40
Utah	15	9	-	6	20	1	-	1	2
Nev.	70	48	-	12	15	-	-	-	4
PACIFIC	3,488	2,505	1	2,118	1,921	8	54	1	222
Wash.	46	72	1	124	98	3	5	-	-
Oreg.	131	56	-	58	68	3	-	-	-
Calif.	3,301	2,357	-	1,798	1,626	1	46	1	219
Alaska	2	-	-	34	27	1	-	-	3
Hawaii	8	20	-	104	102	-	3	-	-
Guam	2	1	-	25	30	-	-	-	-
P.R.	508	419	-	149	147	-	-	-	37
V.I.	3	-	-	2	1	-	-	-	-
Pac. Trust Terr.	107	145	-	89	28	-	15	-	-
Amer. Samoa	2	-	-	-	3	-	1	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending July 4, 1987 (26th Week)

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	≥65	45-64	25-44	1-24	<1	Total
NEW ENGLAND	563	379	120	35	15	14	38
Boston, Mass.	158	95	43	9	6	5	12
Bridgeport, Conn.	44	33	7	2	2	-	3
Cambridge, Mass.	16	13	3	-	-	-	3
Fall River, Mass.	19	15	3	1	-	-	-
Hartford, Conn.	54	29	14	6	2	3	1
Lowell, Mass.	26	20	5	-	1	-	1
Lynn, Mass.	12	9	3	-	-	-	-
New Bedford, Mass.	23	17	5	-	1	-	1
New Haven, Conn.	35	26	7	2	-	-	3
Providence, R.I.	57	44	8	2	1	2	2
Somerville, Mass.	7	5	1	1	-	-	-
Springfield, Mass.	32	17	12	1	-	2	1
Waterbury, Conn.	26	16	5	4	1	-	4
Worcester, Mass.	54	40	4	7	1	2	7
MID. ATLANTIC	2,697	1,720	547	281	79	70	114
Albany, N.Y.	44	27	7	6	1	3	1
Allentown, Pa.	8	4	3	1	-	-	-
Buffalo, N.Y.	99	75	14	6	3	1	11
Camden, N.J.	30	20	5	2	2	1	-
Elizabeth, N.J.	20	14	6	-	-	-	3
Erie, Pa.†	35	25	6	1	3	-	-
Jersey City, N.J.	47	30	12	5	-	-	-
N.Y. City, N.Y.§	1,493	927	299	189	45	33	53
Newark, N.J.	88	38	27	16	5	2	-
Paterson, N.J.	21	13	6	1	1	-	1
Philadelphia, Pa.	400	253	86	32	14	15	25
Pittsburgh, Pa.†	57	39	11	4	-	3	-
Reading, Pa.	33	29	4	-	-	-	6
Rochester, N.Y.	102	72	19	6	3	2	4
Schenectady, N.Y.	24	22	1	1	-	-	-
Scranton, Pa.†	22	13	6	2	1	-	2
Syracuse, N.Y.	93	59	20	5	1	8	5
Trenton, N.J.	46	33	9	2	-	2	2
Utica, N.Y.	17	14	3	-	-	-	1
Yonkers, N.Y.	18	13	3	2	-	-	-
E.N. CENTRAL	2,123	1,374	497	126	56	69	85
Akron, Ohio	28	19	5	-	-	4	-
Canton, Ohio	24	19	1	2	2	-	2
Chicago, Ill.§	564	362	125	45	10	22	16
Cincinnati, Ohio	153	100	29	11	8	5	13
Cleveland, Ohio	129	78	33	10	4	4	-
Columbus, Ohio	121	73	37	4	1	6	8
Dayton, Ohio	106	69	28	4	4	1	4
Detroit, Mich.	222	127	58	19	5	12	5
Evansville, Ind.	44	30	10	2	1	1	1
Fort Wayne, Ind.	51	38	9	1	1	2	3
Gary, Ind.	17	7	9	-	1	-	3
Grand Rapids, Mich.	60	28	23	3	5	1	5
Indianapolis, Ind.	153	101	32	11	4	5	1
Madison, Wis.§	37	27	7	2	1	-	2
Milwaukee, Wis.	117	89	22	4	-	2	7
Peoria, Ill.	37	28	7	-	1	1	2
Rockford, Ill.	47	35	8	1	3	-	6
South Bend, Ind.	29	23	5	1	-	-	2
Toledo, Ohio	112	73	30	4	2	3	5
Youngstown, Ohio	72	48	19	2	3	-	-
W.N. CENTRAL	849	573	155	59	33	28	47
Des Moines, Iowa	55	40	10	3	2	-	2
Duluth, Minn.	28	22	2	3	1	-	2
Kansas City, Kans.	22	15	3	1	-	3	2
Kansas City, Mo.	145	93	33	8	8	3	8
Lincoln, Nebr.	35	28	4	1	1	1	5
Minneapolis, Minn.	272	179	47	29	7	10	17
Omaha, Nebr.	74	49	14	5	4	2	2
St. Louis, Mo.	125	84	22	4	7	7	5
St. Paul, Minn.	47	33	11	3	-	-	-
Wichita, Kans.	46	30	9	2	3	2	4
S. ATLANTIC	1,104	686	236	103	42	36	50
Atlanta, Ga.	145	85	32	23	4	1	3
Baltimore, Md.	230	142	50	16	12	10	7
Charlotte, N.C.	66	36	18	6	2	4	5
Jacksonville, Fla.	85	41	26	12	4	2	1
Miami, Fla.	89	60	14	8	6	1	-
Norfolk, Va.	42	22	9	2	4	5	3
Richmond, Va.	86	52	24	4	2	4	8
Savannah, Ga.	58	37	12	5	1	3	7
St. Petersburg, Fla.	77	60	10	2	1	4	3
Tampa, Fla.	63	44	13	5	-	-	7
Washington, D.C.	135	83	25	20	6	1	6
Wilmington, Del.	28	24	3	-	-	1	-
E.S. CENTRAL	667	423	128	71	16	29	39
Birmingham, Ala.	93	61	16	9	1	6	5
Chattanooga, Tenn.	40	28	8	1	1	2	5
Knoxville, Tenn.	74	47	18	5	1	3	4
Louisville, Ky.	103	62	16	14	5	6	4
Memphis, Tenn.	135	80	27	23	5	-	5
Mobile, Ala.	69	49	11	6	3	-	3
Montgomery, Ala.	45	30	10	2	-	3	6
Nashville, Tenn.	108	66	22	11	-	9	7
W.S. CENTRAL	1,169	722	249	104	55	39	47
Austin, Tex.	64	39	13	7	3	2	6
Baton Rouge, La.	41	24	12	1	3	1	2
Corpus Christi, Tex.	29	18	7	3	1	-	1
Dallas, Tex.	185	118	35	17	12	3	5
El Paso, Tex.	57	39	10	4	2	2	2
Fort Worth, Tex	78	50	14	6	1	7	5
Houston, Tex.§	308	176	74	34	13	11	7
Little Rock, Ark.	46	29	8	4	-	5	6
New Orleans, La.	124	75	30	7	11	1	-
San Antonio, Tex.	111	68	18	16	6	3	4
Shreveport, La.	56	35	17	2	-	2	2
Tulsa, Okla.	70	51	11	3	3	2	7
MOUNTAIN	587	366	136	48	20	17	35
Albuquerque, N. Mex.	83	54	14	6	6	3	5
Colo. Springs, Colo.	41	26	9	3	2	1	10
Denver, Colo.	99	63	30	3	-	3	5
Las Vegas, Nev.	85	49	25	9	-	2	4
Ogden, Utah	16	14	1	-	1	-	1
Phoenix, Ariz.	114	72	25	12	2	3	2
Pueblo, Colo.	31	18	5	5	3	-	5
Salt Lake City, Utah	42	22	9	4	3	4	2
Tucson, Ariz.	76	48	18	6	3	1	1
PACIFIC	1,685	1,094	306	161	61	54	84
Berkeley, Calif.	18	13	2	3	-	-	-
Fresno, Calif.	57	35	14	3	3	2	8
Glendale, Calif.	17	13	1	1	1	-	1
Honolulu, Hawaii	51	34	8	4	3	2	4
Long Beach, Calif.	57	41	6	4	1	5	1
Los Angeles Calif.	397	246	86	35	17	7	13
Oakland, Calif.	69	47	8	5	5	4	4
Pasadena, Calif.	25	14	6	3	2	-	-
Portland, Oreg.	160	115	28	8	6	2	3
Sacramento, Calif.	141	85	30	15	6	5	9
San Diego, Calif.	148	97	21	18	4	8	8
San Francisco, Calif.	154	88	30	28	4	4	3
San Jose, Calif.	154	94	33	13	4	9	15
Seattle, Wash.	141	92	23	17	4	5	6
Spokane, Wash.	48	38	5	4	1	-	2
Tacoma, Wash.	48	42	5	-	-	1	7
TOTAL	11,444††	7,337	2,374	988	377	356	539

*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 3 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.

ACIP: Measles — Continued

Vaccination for College Entry

Measles outbreaks continue to be reported from settings where young adults are concentrated, such as colleges. Measles control in these places requires careful evaluation of susceptibility and vaccination of those who are susceptible. The Committee recommends that colleges and universities require proof of measles immunity as a condition for matriculation.

Vaccination for Medical Personnel

Medical personnel are at higher risk for acquiring measles than the general population. Medical facilities should ensure that all employees born after 1956 have proof of immunity (See **Vaccine Usage**). Since a substantial proportion of medical personnel who have acquired measles were born before 1957, medical facilities may also consider requiring proof of measles immunity for older employees who may have occupational exposure to measles.

Outbreak Control

All reports of suspected measles cases should be investigated rapidly. A measles outbreak exists in a community whenever one case of measles is confirmed. Once an outbreak occurs, preventing dissemination of measles depends on promptly vaccinating susceptible persons. Control activities should not be delayed until laboratory results on suspected cases are received. All persons who cannot readily provide proof of immunity should be vaccinated or excluded from the setting (e.g., school). Documentation of vaccination should be considered adequate only if the date of vaccination is provided.

An effective means of terminating school outbreaks and quickly increasing rates of immunization is to exclude all children or adolescents from the outbreak area who cannot present valid evidence of immunity. Students can be readmitted immediately after vaccination. Experience with outbreak control indicates that almost all students who are excluded from the outbreak area because they lack evidence of immunity to measles quickly comply with requirements and can be readmitted to school. Pupils who have been exempted from measles vaccination because of medical, religious, or other reasons should be excluded until at least 2 weeks after the onset of rash in the last person with measles in the outbreak area.

Persons vaccinated between 12 and 14 months of age have been shown in some serologic and epidemic investigations to be at increased risk of acquiring measles compared with those vaccinated at ≥15 months of age.However, the increased risk of acquiring measles is small. Nevertheless, in many outbreaks, particularly in junior and senior high schools, persons vaccinated at 12-14 months of age appear to have played a substantial role in perpetuating transmission. Therefore, although the effectiveness of such a strategy in terminating outbreaks has not been demonstrated conclusively, the Committee recommends that revaccination of persons vaccinated at 12-14 months of age should be considered in outbreak settings, particularly in junior and senior high schools. If revaccination is recommended, local officials should establish a geographic zone of risk and limit revaccination to persons in this area. In the absence of an outbreak, routine revaccination of persons vaccinated at 12-14 months of age is not recommended.

Importations

Measles importations are a continuing source of reported measles cases in the United States. Although most importations result in limited transmission, several large outbreaks have occurred. If susceptible persons are exposed to a patient on a

ACIP: Measles – Continued

common carrier, such as an airplane, rapid reporting of such imported cases to state and local health departments is important. Other state health departments should be notified to identify exposed contacts as well as to initiate surveillance and control measures.

SURVEILLANCE

As the incidence rate of measles declines in the United States, aggressive surveillance becomes increasingly important. Known or suspected measles cases should be reported immediately to local health departments. Serologic confirmation should be attempted for every suspected case of measles that cannot be linked to a confirmed case. Reporting of suspected cases and implementation of outbreak-control activities should not be delayed while awaiting laboratory results. Effective surveillance of measles and its complications can delineate inadequate levels of protection, further define groups needing special attention, and assess the effectiveness of control activities.

Continuous and careful review of adverse events following measles vaccination is also important. All adverse events following vaccination should be evaluated and reported in detail to local and state health officials as well as to the vaccine manufacturer.

Laboratory Diagnosis

The traditional serologic diagnosis of measles requires a significant rise in antibody titer between the acute-phase and convalescent-phase serum specimen. However, a single specimen can be used to detect the presence of immunoglobulin M (IgM) antibody. Correct interpretation of serologic data depends on the proper timing of specimen collection in relation to onset of rash. This is especially important for interpreting negative IgM results, since IgM antibody peaks 10 days after rash onset and is usually undetectable 30 days after rash onset.

Asymptomatic reinfection with measles virus can occur in persons who have previously developed antibody, whether from vaccination or from natural disease. Symptomatic reinfections have been reported rarely. These infections have been accompanied by fourfold or greater rises in measles HI antibody titers, but measles-specific IgM antibodies have not been detected in appropriately timed serum specimens.

INTERNATIONAL TRAVEL

Persons traveling abroad should be immune to measles. Since the risk of serious complications and death is greater for adults than for children, it is especially important to protect young adults who have escaped measles and have not been vaccinated. Also, because measles vaccine is not 100% effective and because the risk of exposure to measles abroad may be substantially greater than in the United States, consideration should be given to providing a one-time dose of measles vaccine to persons born after 1956 who travel abroad regardless of their previous vaccination status, unless there is a contraindication. Persons born before 1957 need not be considered susceptible. MMR is preferred for persons likely to be susceptible to mumps and rubella. If single-antigen measles vaccine is not readily available, travelers should receive MMR regardless of their immune status to mumps and rubella.

The age for measles vaccination should be lowered for children traveling to areas where measles is endemic or epidemic. Children 12-14 months of age should receive MMR vaccine before their departure (without need for revaccination). Children 6-11

ACIP: Measles – Continued

months of age should receive a dose of single-antigen measles vaccine before departure and subsequently should receive MMR vaccine. Whereas the optimal age for revaccination is 15 months, the age for revaccination may be as low as 12 months if the child remains in a high-risk area. Since virtually all infants <6 months of age will be protected by maternally derived antibodies, no additional protection against measles in this age group is generally necessary.

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Progress in Chronic Disease Prevention

Protective Effect of Physical Activity on Coronary Heart Disease

Many studies have suggested that physical activity helps prevent coronary heart disease (CHD), but several others have shown no such association. Thus, evidence to support a beneficial association has been considered weak or questionable, primarily because physical activity is difficult to measure and assess (*1*).

An extensive review of studies on the possible association between physical activity and CHD focused on the quality of the measures and methods used. The results of that review indicate that physical activity does help prevent CHD.

A systematic review of the literature yielded 43 studies in English that provided relative risks or multiple regression coefficients of the association between physical activity and CHD. For each of these studies (36 cohort, three mortality, and four case-control studies), the reviewers used specific criteria to assess the quality of the physical activity measure, the CHD outcome measure, and the epidemiologic methods.

The seven criteria used in evaluating the physical activity measure were 1) clarity of the definition of physical activity, 2) reliability and validity of the measure, 3) assessment of individual physical activity rather than of group activity, 4) use of frequency, intensity, and duration of physical activity to characterize the behavior, 5) measurement of lifetime patterns of activity, 6) adherence to an activity pattern over time, and 7) systematic collection of the measure (usually via self-report surveys).

The four criteria used in assessing the CHD outcome measure were 1) specifically established diagnostic criteria, 2) objective diagnosis, 3) equal opportunity for diagnosis of CHD, and 4) systematic collection of CHD information.

The eight criteria used in evaluating the epidemiologic methods were 1) the temporal sequence of physical activity before CHD, 2) statistical control of other CHD risk factors, 3) representativeness of the sample, 4) whether subjects from the cohort studies who were lost to follow-up were located later or at least compared with the other subjects, 5) if random selection methods were used for placing subjects in active and inactive groups, 6) whether cases and controls were identified via predetermined selection criteria, 7) if they were equally subjected to exclusionary criteria, and 8) if neither subjects nor data abstractors were informed of the hypothesis being studied.

Primarily on the basis of these criteria, the authors considered 40% of the physical activity measures, 2% of the CHD outcome measures, and 30% of the epidemiologic methods to be unsatisfactory (Table 1).

These 43 studies reported 96 comparisons of the association between physical activity and CHD. The reviewers eliminated those comparisons that could not be interpreted (n=3), that focused only on angina (n=10) or women (n=15), that reported information on extra subpopulations or extra physical activity measures (n=5), and that reported multiple CHD outcomes for a given study (n=16). A total of 47 comparisons remained, and all of these were used to draw inferences about men.

Of these 47 comparisons, 32 (68%) showed a statistically significant inverse association between physical activity and CHD. Further, the reviewers' ability to detect such an association increased as the quality of the measures and methods

Heart Disease — Continued

improved (Table 2). For example, among the studies using unsatisfactory physical activity measures, the reviewers noted that 50% showed significant associations; among those using satisfactory measures, 76%; and among those using good physical activity measures, 88%. Similar trends were noted for CHD measures and epidemiologic methods.

The reviewers also examined the potential causal effect of physical activity on CHD by using six criteria: consistency of findings, strength of the association, appropriate temporal sequence, dose-response relationship, plausibility, and experimental evidence. A **consistent** statistically significant association between physical activity and CHD was found for more than two-thirds of the studies. The **strength** of the association between physical inactivity and CHD (median relative risk = 1.9 for the 47 comparisons) was of similar magnitude as that for several commonly accepted risk factors previously reported in the Coronary Pooling Project, which was based on five studies (*2*). In those studies, the median risk ratios were 2.1 for high systolic blood pressure (>150 millimeters of mercury [mm Hg] versus ≤130 mm Hg), 2.4 for serum cholesterol (>268 milligrams per deciliter [mg/dl] versus ≤218 mg/dl), and 2.5 for smoking (≥1 pack of cigarettes/day versus no smoking). Most of the 43 studies reviewed showed that the activity assessment predated the CHD outcome, demonstrating an **appropriate temporal sequence**. More than two-thirds of the studies demonstrated a **dose-response** relationship, with lower levels of physical activity leading to more instances of CHD. There are **plausible and coherent** mechanisms whereby physical activity could exert a beneficial influence on CHD. Although no **experimental evidence** exists in the form of a randomized, controlled clinical trial,

TABLE 1. Percentage of 43 epidemiologic investigations of the association between physical activity and coronary heart disease, by the quality of the measures and methods used

	Percentage of Studies, by Quality Category					
Measure/Method	**Unsatisfactory**		**Satisfactory**		**Good**	
Physical activity measure*	40	(17/42)	40	(17/42)	19	(8/42)
Coronary heart disease outcome measure	2	(1/43)	58	(25/43)	40	(17/43)
Epidemiologic methods	30	(12/43)	35	(15/43)	35	(15/43)

*In one study, the method used for measuring leisure-time physical activity was satisfactory and that for measuring work-time activity was unsatisfactory.

TABLE 2. Percentage of 47 comparisons from 43 epidemiologic investigations reporting significant inverse associations between physical activity and coronary heart disease, by the quality of the measures and methods used

	Percentage of Comparisons, by Quality Category					
Measure/Method	**Unsatisfactory**		**Satisfactory**		**Good**	
Physical activity measure	50	(9/18)	76	(16/21)	88	(7/8)
Coronary heart disease outcome measure	100	(1/1)	64	(18/28)	72	(13/18)
Epidemiologic methods	60	(9/15)	61	(11/18)	88	(12/14)

Heart Disease — Continued

better studies (i.e., those in which the measures and methods used were judged to be good or satisfactory) were more likely to report a significant inverse association. On the basis of these criteria, the authors concluded that a causal inverse association exists between physical activity and CHD.

Reported by: Behavioral Epidemiology and Evaluation Br, Div of Health Education, Center for Health Promotion and Education, CDC.

Editorial Note: Previous reviews have not provided sufficient evidence to show that the lack of physical activity is associated with coronary heart disease (CHD). In this study, by using criteria for causality, the authors systematically evaluated the most critical features of studies on the possible association between physical activity and CHD. Perhaps more importantly, the authors found that poor methods used in assessing physical activity had led to an erroneous inference (no causal association), illustrating the need for careful measures and methods in epidemiologic research.

Compared with measures of physical activity, fewer measures of CHD outcome were considered to be of poor quality, perhaps because CHD is easier to define and CHD-related morbidity and mortality are clearly measurable outcomes. Only recently have precise definitions of physical activity and exercise been offered (*3*). Unfortunately, physical activity is unlike the other CHD risk factors because standardized assessment methods do not exist (*4*). Methods for measuring physical activity are needed not only for determining its protective effect against CHD but also for determining its possible association with other diseases and health outcomes such as cancer, disability, and mental health.

When the results of this review were compared with the results of the Coronary Pooling Project, the strength of the association between lack of physical activity and CHD appears to be similar to that found for high serum cholesterol, high systolic blood pressure, and cigarette smoking (*2*). The relative risk ratios for these CHD risk factors appear to be similar to those for physical inactivity. Therefore, knowing the prevalence of each risk factor helps determine a U.S. population-based attributable risk (Figure 1). Using the measurements for each risk factor used by the Coronary Pooling Project (see above), the current nationwide prevalence estimates show that approximately 10% of persons have a systolic blood pressure >150 mm Hg (*5*), 10% have a serum cholesterol >268 mg/dl (*6*), and 18% smoke a pack or more of cigarettes per day (*7*). In the studies reviewed, the median risk ratio of 1.9 found for physical inactivity and CHD was based on study respondents considered to be least active versus those considered to be most active, and the contrast varied from study to study. Nevertheless, on the basis of study results, a nationwide prevalence estimate of minimal amounts of regular physical activity likely to protect against CHD can be determined. Approximately 59% of Americans do not perform physical activity regularly (three or more times per week for ≥20 minutes at a time) (*8*). Hence, the prevalence of persons at risk of CHD because of high serum cholesterol, high systolic blood pressure, or cigarette smoking is actually small compared with that of persons who do not perform regular physical activity. Since these four CHD risk factors are similar in strength, physical activity appears to be a far more important risk factor. This is so because the other three prevalence levels are comparatively low.

Current standards include a higher proportion of the population in the risk groups. For example, it is recommended that a systolic blood pressure >140 mm Hg and a diastolic blood pressure >90 mm Hg should be treated (*5*). At those levels, about 36% of Americans are at risk. A serum cholesterol >200 mg/dl is now considered the level

Heart Disease – Continued

at which treatment should begin (*9*). Approximately 25%-40% of Americans would be considered at risk at this level. As for cigarette smoking, approximately 30% of Americans are believed to be current smokers (*7*). In the light of these standards, more Americans are at risk of CHD because of physical inactivity than because of the other three main risk factors viewed separately. Systematic reviews for these other risk factors—as was done for physical inactivity and CHD—would be valuable.

Besides being protective against CHD, increased levels of physical activity also have been protective against other chronic diseases (*10,11*). Eleven objectives of the 1990 Objectives for the Nation proposed by the Public Health Service pertain to physical fitness and exercise (*12*). Although these objectives promote regular and vigorous physical activity, less intensive—yet regular—physical activity is also beneficial (*13*). Since so many Americans are physically inactive, additional steps should be taken to promote a life-style that includes regularly scheduled physical activity (*14*).

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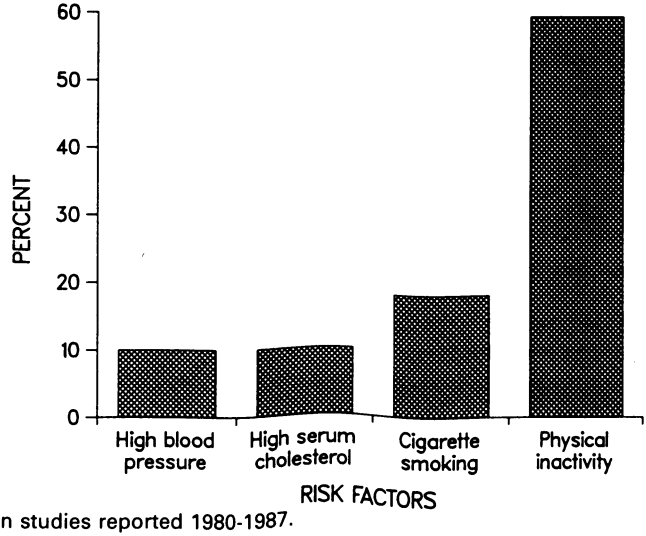
FIGURE 1. Estimated percentage of population having selected risk factors for coronary heart disease, by risk factor – United States*



*Based on studies reported 1980-1987.

Heart Disease — Continued

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Notices to Readers

Second National Conference on Chronic Disease Prevention and Control

The Second National Conference on Chronic Disease Prevention and Control, cosponsored by the Association of State and Territorial Health Officials and CDC, will be held September 16-18, 1987, at St. Anthony Intercontinental Hotel in San Antonio, Texas. Registration and a reception are scheduled for Tuesday evening, September 15. The theme of the conference, "Working Together—Players and Priorities," is designed to highlight the diversity of individuals and groups working in the chronic disease arena and to identify opportunities for creative collaboration among the various contributors.

Representatives of Federal, state, territorial, and local health agencies; voluntary health organizations; schools of public health; the private health care community; and others are invited to participate in the conference. For further information, contact the Division of Chronic Disease Control, Center for Environmental Health, CDC, telephone: commercial—(404) 452-4251; FTS—236-4251.

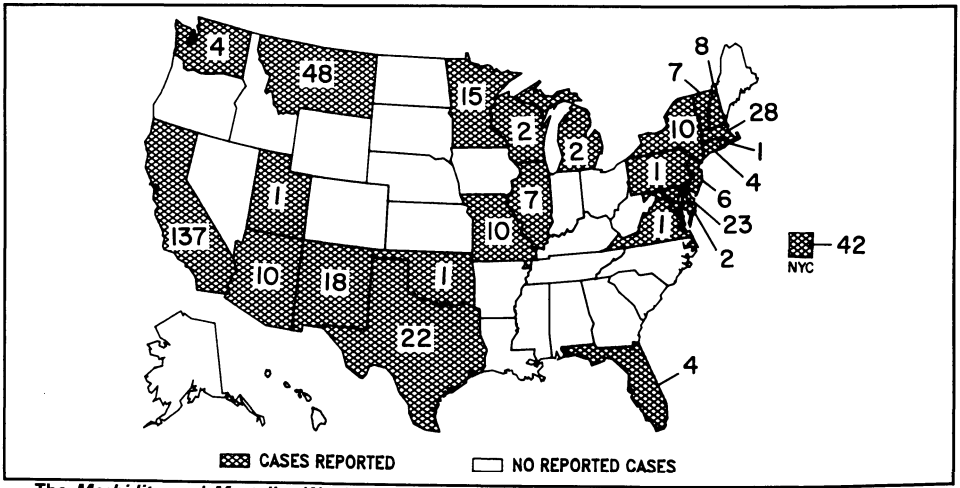
Call for Abstracts: XIII World Conference on Health Education, August 28-September 2, 1988, Houston, Texas

The deadline for submitting U.S. abstracts to be considered for presentation at the XIII World Conference on Health Education is September 30, 1987. (October 30, 1987, is the deadline for submissions from other countries.) This conference is sponsored by the International Union for Health Education in cooperation with CDC and the U.S. Host Committee, which represents over 40 U.S. public health organizations, including the American Public Health Association, the American Medical Association, and the American Red Cross. "Participation for All in Health" is the theme for this conference, which will stimulate and encourage attendees from around the world to exchange

Abstracts — Continued

information, skills, knowledge, and expertise related to health education. In addition, a number of special topics—AIDS Health Education, Maternal and Infant Health, Helping a Billion Children Learn About Health, and Smoking and Health—will be emphasized. Inquiries related to the conference or to the submission of abstracts should be directed to: United States Host Committee, Inc., P.O. Box 20186, Suite 902, Houston, TX 77225.

FIGURE I. Reported measles cases — United States, weeks 22-25, 1987



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The data in this report are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the succeeding Friday. The editor welcomes accounts of interesting cases, outbreaks, environmental hazards, or other public health problems of current interest to health officials. Such reports and any other matters pertaining to editorial or other textual considerations should be addressed to: Editor, *Morbidity and Mortality Weekly Report*, Centers for Disease Control, Atlanta, Georgia 30333.

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HHS Publication No. (CDC) 87-8017