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CENTER FOR DISEASE CONTROL

RUBELLA

SURVEILLANCE

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE: PUBLIC HEALTH SERVICE
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION

PREFACE

Summarized in this report is information received from state and local health departments and other pertinent sources. Much of the information is preliminary. It is intended primarily for the use of those with responsibility for disease control activities.

Contributions to the Surveillance Report are welcome. Please address to:

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I. INTRODUCTION:

After the recognition of congenital rubella by Sir Norman Gregg in 1941, the clinical and public health importance of rubella was established and the social and economic impact of rubella pandemics, the most recent in 1964-65, made it essential to control the disease. The isolation of the virus in 1962 and its attenuation in 1966, allowed development of a live rubella virus vaccine, and its licensure in 1969.

Over the past two years, a unique immunization program has been undertaken. To prevent rubella in pregnancy, an attempt has been made to control the disease among young children, the major source of maternal infection. This report reviews rubella activity and vaccine status over the past year.

II. RECENT TRENDS:

A. Source of Data

In January 1966, the Conference of State and Territorial Epidemiologists officially added rubella and congenital rubella syndrome to the list of notifiable diseases. Prior to 1966, some states voluntarily reported cases of rubella to the Center for Disease Control.

In this surveillance report, the data prior to 1966 are those transmitted voluntarily by the states. Since 1966, the data have been submitted to CDC in the Weekly Telegraphic Report of Notifiable Diseases and on Congenital Rubella Syndrome Case Report forms.

The considerable variability in the completeness and accuracy of rubella reporting, as well as the potential bias due to use of data from selected areas, emphasize that the surveillance data in this report be interpreted with caution. Although not quantitatively accurate, these data do depict trends and patterns of rubella occurrence in the United States.

B. Reported Rubella

Case reporting of rubella from states for the period 1961-70, has been inconsistent and sporadic (Table 1). The table shows those states not reporting and the variability in reporting from states within the same geographic region with similar demographic characteristics.

Figure 1 RUBELLA INCIDENCE-TEN SELECTED AREAS*, UNITED STATES, 1928 – 1970

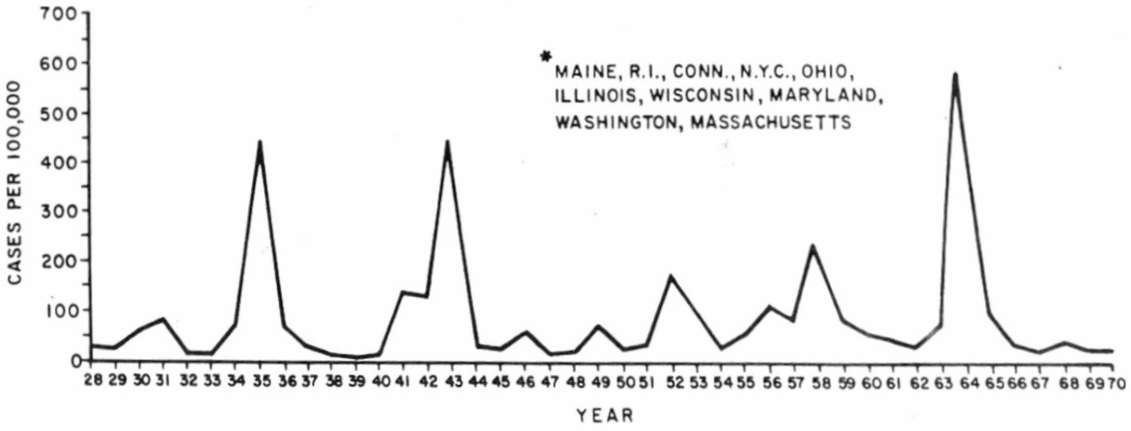


TABLE 1
REPORTED CASES OF RUBELLA BY STATE, 1961 - 1970

AREA	1970	1969	1968	1967	1966	1965	1964	1963	1962	1961
UNITED STATES	**55,111**	**55,549**	**48,446**	**46,888**	**46,975**	**100,842**	**448,796**	**60,431†**	**37,265**	**43,810**
No. States Reporting			(47)	(47)	(44)	(36)	(35)	(32)	(32)	(33)
NEW ENGLAND	**2,814**	**4,130**								
Maine	548	417	629	856	421	953	7,463	953	514	1,436
New Hampshire	159	109	92	214	133	163	1,331	453	57	217
Vermont	68	121	91	227	130	–	–	–	–	–
Massachusetts	1,288	1,463	3,608	1,429	2,056	2,839	37,105	11,739	3,766	6,443
Rhode Island	128	289	1,397	384	283	234	11,399	1,324	129	313
Connecticut	625	1,731	3,039	1,910	2,245	1,719	40,737	3,945	1,338	2,748
MIDDLE ATLANTIC	**4,262**	**3,505**								
New York	1,165	1,996	4,389	2,258	2,631	2,505	61,624	8,158	4,246	4,465
New Jersey	898	627	1,680	NN	–	–	–	–	–	–
Pennsylvania	2,199	882	208	179	114	–	–	–	–	–
EAST NORTH CENTRAL	**11,359**	**12,898**								
Ohio	2,176	1,320	2,099	771	1,254	2,348	19,194	2,953	979	1,607
Indiana	2,058	2,385	912	669	2,345	1,911	13,037	1,972	1,406	1,371
Illinois	1,791	1,786	3,355	1,621	2,935	4,850	29,685	2,108	2,030	3,438
Michigan	3,017	4,127	1,908	2,338	3,040	9,937	18,922	1,637	1,091	1,224
Wisconsin	2,317	3,280	2,980	3,340	5,446	9,570	96,583	4,731	4,365	5,418
WEST NORTH CENTRAL	**3,457**	**4,088**								
Minnesota	127	245	69	97	124	1,910	3,232	–	–	1
Iowa	2,082	2,541	2,053	1,896	1,952	3,798	18,481	1,727	416	482
Missouri	449	580	142	350	61	39	573	155	158	–
North Dakota	156	256	238	181	205	–	–	–	–	–
South Dakota	6,925	–	–	3	2	–	–	–	–	–
Nebraska	584	352	32	153	–	13	–	–	–	–
Kansas	55	114	128	16	NN	–	–	–	–	–
SOUTH ATLANTIC	**6,925**	**7,645**								
Delaware	46	211	150	84	55	111	802	135	144	276
Maryland	336	865	366	615	404	248	3,583	299	258	391
District of Columbia	23	166	14	9	15	16	455	149	17	50
Virginia	782	1,598	644	675	961	–	–	–	–	–
West Virginia	1,425	2,417	904	639	1,037	2,091	6,774	1,438	960	748
North Carolina	49	19	–	NN	–	–	–	–	–	–
South Carolina	676	301	259	231	284	–	†††	–	–	–
Georgia	–	–	–	784	493	285	497	85	315	34
Florida	3,657	2,068	1,491	1,174	1,447	892	8,661	1,008	501	732
EAST SOUTH CENTRAL	**3,021**	**3,156**								
Kentucky	973	1,187	861	2,141	1,960	1,190	18,027	2,158	914	2,034
Tennessee	1,550	1,635	1,135	1,367	2,578	–	–	–	–	–
Alabama	397	136	464	191	122	169	3,574	88	57	60
Mississippi	102	198	9	. . .	–	1,167	6,784	–	–	2
WEST SOUTH CENTRAL	**9,401**	**6,504**								
Arkansas	38	199	4	114	14	428	1,025	370	59	168
Louisiana	158	39	62	NN	–	–	–	–	–	–
Oklahoma	826	1,852	93	558	NN	–	–	–	–	–
Texas	8,379	4,414	2,923	640	140	–	–	–	–	–
MOUNTAIN	**2,154**	**3,064**								
Mountana	342	108	96	200	376	2,526	2,367	898	1,011	747
Idaho	207	94	130	72	119	1,088	462	82	116	87
Wyoming	136	103	14	5	239	–	25	–	–	–
Colorado	435	1,423	892	1,885	785	1,973	11,817	1,219	1,729	1,803
New Mexico	237	312	134	309	113	272	351	109	26	41
Arizona	624	861	700	1,168	2,619	2,076	6,653	1,608	1,732	1,751
Utah	173	158	110	71	80	1,489	588	85	111	110
Nevada	–	5	–	425	30	22	–	–	–	–
PACIFIC	**11,718**	**10,559**								
Washington	4,984	1,943	1,851	3,377	3,435	25,258	11,119	5,526	5,152	3,176
Oregon	1,006	743	625	986	1,174	12,956	4,190	2,114	3,318	2,298
California	5,385	6,174	4,890	9,539	2,847*	–	–	–	–	–
Alaska	112	543	289	381	112	451	747	1,127	152	89
Hawaii	231	1,156	287	356	159	3,345	929	78	198	50
Puerto Rico	27									
Virgin Islands	1									

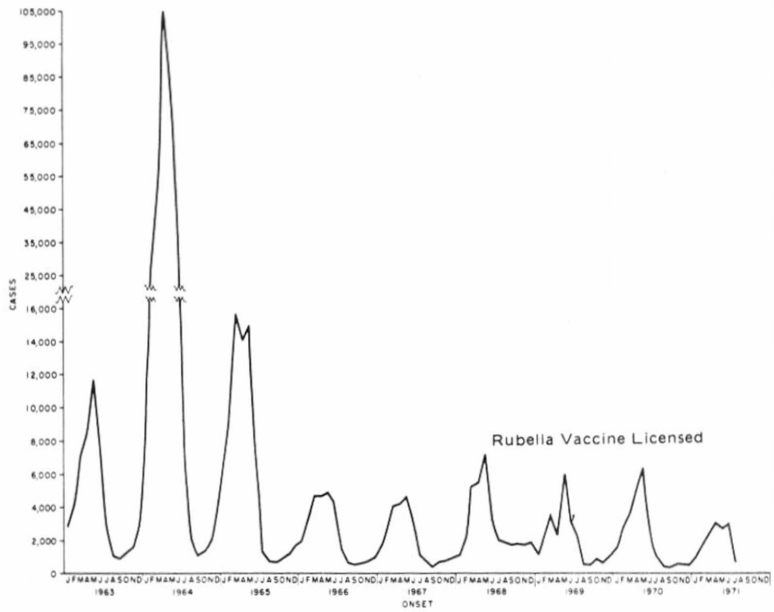
NN – Report not required by State Health Dept.
– No cases reported.
† – Includes data for Maine from State Report.
†† – Hawaii not included in U.S. total.
* – Vol. reports prior to 11/66.
. . . Data not available
††† Included in measles.

Source: Reported Incidence of Notifiable Diseases in the United States Annual Supplement for Respective year.

Rubella incidence in 10 selected areas has varied considerably (Figure 1). This suggests that major epidemics occurred throughout the country in 1935, 1943, and 1964, and that periods of high incidence were also noted in 1952 and 1958. These irregular periods of increased rubella activity have occurred at 6- to 9-year intervals, which contrasts strikingly with the regular 2-year periodicity observed for rubeola in the United States before widespread use of measles vaccine.

The reported cases by month of onset for 24 selected states (Figure 2) show the seasonal variation in disease incidence. The number of reported cases, in epidemic and non-epidemic years, increases in early winter, peaks in the spring, and falls to a low point in late summer and autumn. These data also show that the incidence of reported rubella was similar for EY's 1966-67 through 1969-70, but decreased in 1970-71.

Figure 2 REPORTED RUBELLA CASES, BY MONTH OF ONSET, 24 SELECTED STATES, JANUARY 1963 – JULY 1971

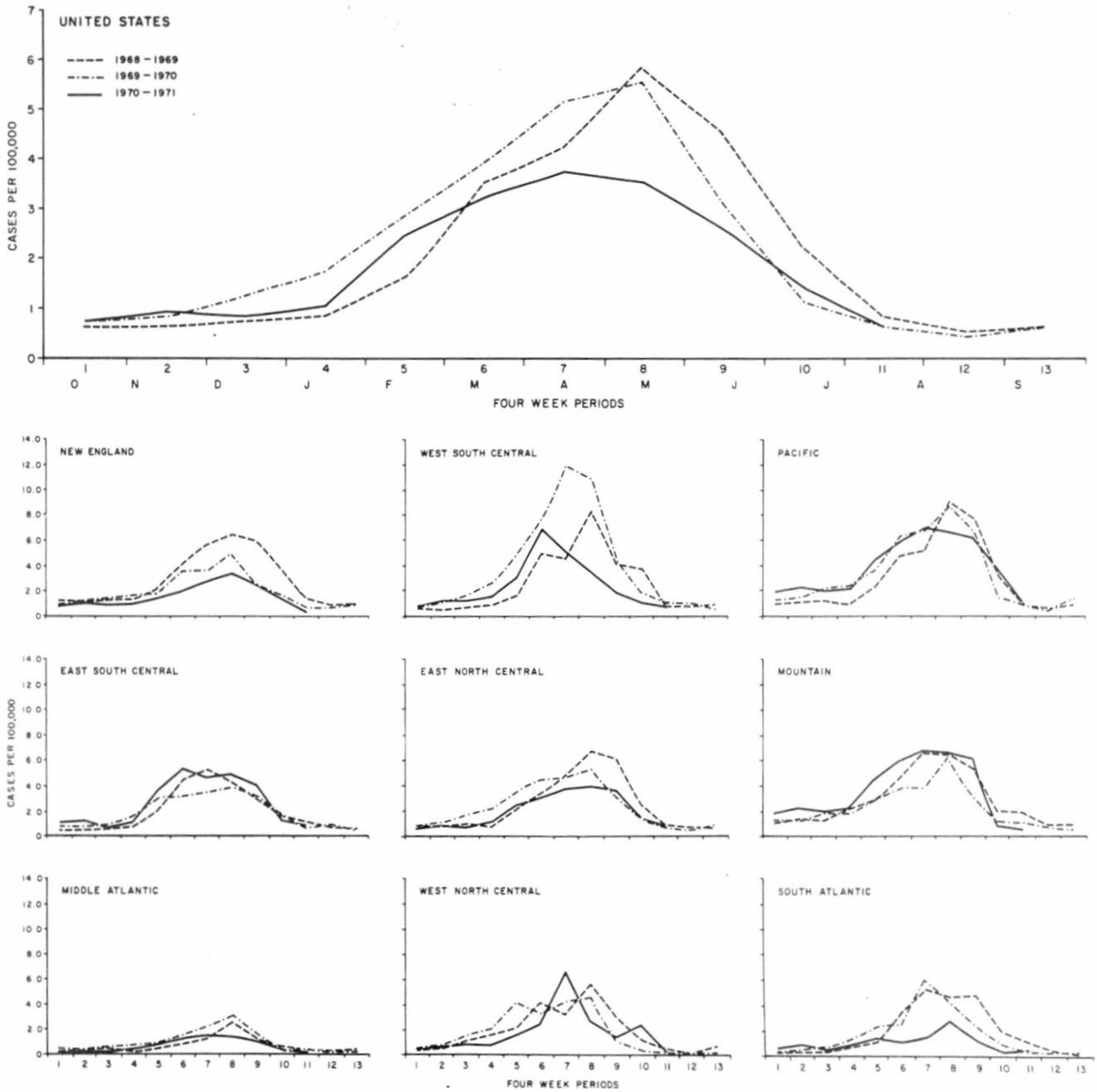


The uniformity of the seasonal pattern of rubella in the different regions of the United States is shown in Figure 3 and Table 2. The pattern seen in the individual regions is similar to that noted nationally.

Rubella case rates by 4-week periods for the nation as a whole and the individual regions during the last 3 epidemiologic years are shown in Figure 3. In the first 44 weeks (October-August) of EY 1970-71, the incidence of reported rubella decreased 21.9 percent over the same time period for 1969-70. A decrease in incidence during the current EY compared with the past EY was noted in the New England, Middle Atlantic, East North Central, South Atlantic, and West South Central regions. During the same period, the East South Central and Mountain regions were the only regions demonstrating an increase in case reporting.

Table 3 shows rubella incidence during the first 44 weeks of EY 1969-70 and EY 1970-71 for the 12 areas vaccinating the highest percentage of their target population, age 1-12, by October 31, 1970; these areas had all reached at least 52 percent of their target group by October 31, 1970. The 12 areas vaccinating the lowest percentage of their target group by June 30, 1971 are depicted in Table 4; none of these states had reached over 44 percent by June 30, 1971. Thus, these two groups, respectively, represent public programs in which a large quantity of vaccine was given early and those that have administered relatively little vaccine. Overall, the "highest percentage" group demonstrated a 60.5 percent decrease in rubella cases compared with a 49.4 percent increase in the "lowest percentage" group during the

Figure 3 RUBELLA CASE RATES, BY 4-WEEK PERIODS, EPIDEMIOLOGIC YEARS,* 1968 - 1969; 1969 - 1970; 1970 - 1971, UNITED STATES



* THE RUBELLA EPIDEMIOLOGIC YEAR IS THE 52 WEEKS BEGINNING WITH THE FIRST REPORTING WEEK IN OCTOBER

TABLE 2
REPORTED RUBELLA CASES BY 4-WEEK PERIODS, 1970

AREA	4-WEEK PERIODS													Total 1970
	1/31	2/28	3/28	4/25	5/23	6/20	7/18	8/15	9/12	10/10	11/7	12/5	1/2/71	
UNITED STATES	**3,473**	**5,750**	**7,889**	**10,362**	**11,224**	**6,241**	**2,223**	**1,223**	**880**	**1,142**	**1,448**	**1,834**	**1,592**	**55,281**
NEW ENGLAND	**175**	**205**	**413**	**416**	**579**	**292**	**198**	**81**	**68**	**105**	**84**	**124**	**98**	**2,838**
Maine	20	20	100	65	89	50	33	5	4	42	28	59	57	572
New Hampshire	29	17	38	29	27	12	—	—	—	1	2	1	1	157
Vermont	5	1	18	4	13	4	4	—	4	3	3	5	4	68
Massachusetts	62	67	185	221	297	156	95	52	43	32	28	32	18	1,288
Rhode Island	5	2	19	13	12	18	12	14	12	7	4	8	2	128
Connecticut	54	98	53	84	141	52	54	10	5	20	19	19	16	625
MIDDLE ATLANTIC	**277**	**329**	**594**	**765**	**1,101**	**594**	**112**	**119**	**48**	**69**	**85**	**87**	**82**	**4,262**
New York City	44	51	59	122	130	79	39	43	13	25	33	27	19	684
Upstate New York	40	36	56	73	85	70	28	21	20	18	10	8	16	481
New Jersey	70	86	253	139	149	108	4	39	6	3	12	17	12	898
Pennsylvania	123	156	226	431	737	337	41	16	9	23	30	35	35	2,199
EAST NORTH CENTRAL	**831**	**1,399**	**1,778**	**1,854**	**2,122**	**1,237**	**549**	**294**	**174**	**262**	**261**	**312**	**286**	**11,359**
Ohio	46	216	343	349	606	333	77	31	26	31	26	43	49	2,176
Indiana	120	284	364	442	317	131	74	53	59	66	52	64	32	2,058
Illinois	91	159	162	312	554	230	152	21	9	14	36	21	30	1,791
Michigan	317	314	493	461	362	370	166	131	35	79	73	102	114	3,017
Wisconsin	257	426	416	290	283	173	80	58	45	72	74	82	61	2,317
WEST NORTH CENTRAL	**344**	**645**	**539**	**692**	**734**	**182**	**60**	**38**	**37**	**34**	**60**	**58**	**131**	**3,554**
Minnesota	17	30	14	16	12	5	22	1	—	1	4	2	3	127
Iowa	247	366	349	468	470	70	15	9	7	6	23	40	14	2,084
Missouri	8	55	57	116	60	69	16	19	11	13	16	2	102	544
North Dakota	13	38	17	19	16	16	5	8	16	3	3	1	1	156
South Dakota	—	1	—	—	—	—	—	—	—	—	—	—	3	4
Nebraska	59	154	92	70	150	15	1	1	2	11	14	11	4	584
Kansas	—	1	10	3	26	7	1	—	1	—	—	2	4	55
SOUTH ATLANTIC	**406**	**719**	**768**	**1,818**	**1,317**	**708**	**285**	**111**	**103**	**98**	**181**	**266**	**145**	**6,925**
Delaware	6	4	8	17	2	3	1	—	—	3	2	—	—	46
Maryland	21	17	70	62	97	24	15	5	4	5	4	6	6	336
District of Columbia	1	3	5	2	4	2	—	2	—	1	2	—	1	23
Virginia	69	123	151	107	134	47	34	12	15	23	18	24	25	782
West Virginia	168	170	133	355	168	148	65	37	42	41	49	40	9	1,425
North Carolina	—	1	3	6	18	3	6	2	—	4	—	3	3	49
South Carolina	6	34	97	260	122	67	17	18	21	10	1	11	12	676
Georgia	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Florida	135	367	301	1,009	772	414	147	35	21	11	105	182	89	3,588
EAST SOUTH CENTRAL	**175**	**371**	**390**	**441**	**486**	**400**	**188**	**83**	**99**	**68**	**114**	**138**	**68**	**3,021**
Kentucky	42	166	106	147	165	219	34	19	23	10	27	9	6	973
Tennessee	112	174	190	194	266	157	136	55	61	43	46	71	45	1,550
Alabama	16	29	79	67	40	14	9	9	15	14	38	53	13	396
Mississippi	5	2	15	33	15	10	9	—	—	1	3	5	4	102
WEST SOUTH CENTRAL	**474**	**930**	**1,444**	**2,278**	**2,089**	**835**	**343**	**183**	**187**	**102**	**135**	**209**	**229**	**9,438**
Arkansas	—	—	4	20	7	1	1	1	—	—	1	—	3	38
Louisiana	—	3	46	33	46	7	11	1	3	—	4	2	3	159
Oklahoma	188	202	115	111	125	47	17	2	1	3	9	3	18	841
Texas	286	725	1,279	2,114	1,911	780	314	179	183	99	121	204	205	8,400
MOUNTAIN	**144**	**223**	**307**	**312**	**514**	**247**	**95**	**80**	**46**	**44**	**46**	**54**	**42**	**2,154**
Montana	26	54	71	79	42	11	17	15	—	4	5	11	7	342
Idaho	3	6	14	21	86	34	9	5	11	6	4	2	6	207
Wyoming	27	2	10	14	80	—	—	—	1	—	—	1	1	136
Colorado	30	53	52	26	111	71	26	17	7	6	15	13	8	435
New Mexico	6	16	15	69	38	21	15	23	6	4	10	9	5	237
Arizona	41	71	85	83	130	99	22	16	19	24	11	9	14	624
Utah	11	21	60	20	27	11	6	4	2	—	1	9	1	173
Nevada	—	—	—	—	—	—	—	—	—	—	—	—	—	—
PACIFIC	**647**	**929**	**1,656**	**1,786**	**2,282**	**1,746**	**393**	**234**	**118**	**360**	**482**	**586**	**511**	**11,730**
Washington	299	437	858	906	1,292	700	82	16	10	62	116	123	94	4,995
Oregon	81	106	92	102	98	164	118	50	28	38	40	42	47	1,006
California	210	324	672	725	861	848	186	150	75	253	312	413	356	5,385
Alaska	35	16	6	13	8	11	—	5	1	4	7	1	6	113
Hawaii	22	46	28	40	23	23	7	13	4	3	7	7	8	231
Puerto Rico	2	7	1	7	3	5	1	—	—	1	—	—	1	28

— No cases reported.

Source: Morbidity and Mortality Weekly Reports.

period cited. Not only the effect of vaccination programs, but also the completeness of reporting and cyclical variations in rubella incidence must be considered in interpreting these data.

Table 3
Incidence of Rubella in Selected Areas with Highest Percentage of Target Population Given Rubella Vaccine by October 31, 1970

State or Area	Reported Cases of Rubella 10/5/69-8/1/70	Reported Cases of Rubella 10/4/70-7/31/71	Percent Change
1. Hawaii	280	152	- 45.7
2. Minnesota	149	279	+ 87.2
3. Iowa	2,338	737	- 68.5
4. Virgin Islands	*	*	*
5. Alaska	290	57	- 80.3
6. D. C.	32	11	- 65.6
7. Idaho	214	51	- 76.2
8. Utah	211	62	- 70.6
9. Oklahoma	938	95	- 89.9
10. North Dakota	180	94	- 47.8
11. Wyoming	157	860	+447.8
12. Maine	2,354	425	- 81.9
TOTAL	7,143	2,823	- 60.5

Table 4
Incidence of Rubella in Selected Areas with Lowest Percentage of Target Population Given Rubella Vaccine by June 30, 1971

State	Reported Cases of Rubella 10/5/69-8/1/70	Reported Cases of Rubella 10/4/70-7/31/71	Percent Change
1. Pennsylvania	2,071	1,080	- 47.9
2. Missouri	446	1,443	+223.5
3. Kentucky	948	1,125	+ 18.7
4. Indiana	1,760	2,096	+ 19.1
5. Delaware	52	48	- 7.7
6. Arizona	671	343	- 48.9
7. Michigan	3,077	2,848	- 7.4
8. New Jersey	947	1,481	+ 56.4
9. N. Carolina	64	51	- 20.3
10. California	2,182	8,399	+284.9
11. New York	1,022	865	- 15.4
12. Nevada	*	*	*
TOTAL	13,240	19,779	+ 49.4

* Data not available.

C. Serological Survey for Rubella Immunity Among Adolescents

In the spring of 1971, several reports of outbreaks of rubella in adolescents were submitted to CDC. These reports suggested that the susceptibility of adolescents to rubella was higher than previously thought. Therefore, to better define the epidemiology of rubella in this group, a protocol for serological surveys in several areas was designed. The combined results of serosurveys in three high schools (urban, suburban, suburban-rural) in DeKalb County (Atlanta), Georgia, indicated that immunity rates in the three schools varied between 67.3 percent (suburban) and 82.1 percent (urban) (Table 5). Results were combined to provide an overall index of immunity to rubella among high school students in DeKalb County. Of the 1,004 students tested, 76.6 percent were immune; there was minimal variation in immunity rates by age, 13-18 years. These data suggest that, in this geographic area, approximately 75 percent of rubella infections occur in those under age 13 and that immunity levels among adolescents are relatively high.

Table 5
Rubella Immunity Survey
DeKalb County, Georgia, 1971

Age	Total Pop.	Number Immune*	Percent Immune
13	111	84	75.7
14	228	182	79.8
15	208	150	72.1
16	208	158	76.0
17	168	131	78.0
18	79	59	74.7
19	2	2	100.0
TOTAL	1,004	766	76.6

* Rubella HI antibody titer $\geq$1:8

III. CONGENITAL RUBELLA SYNDROME SURVEILLANCE

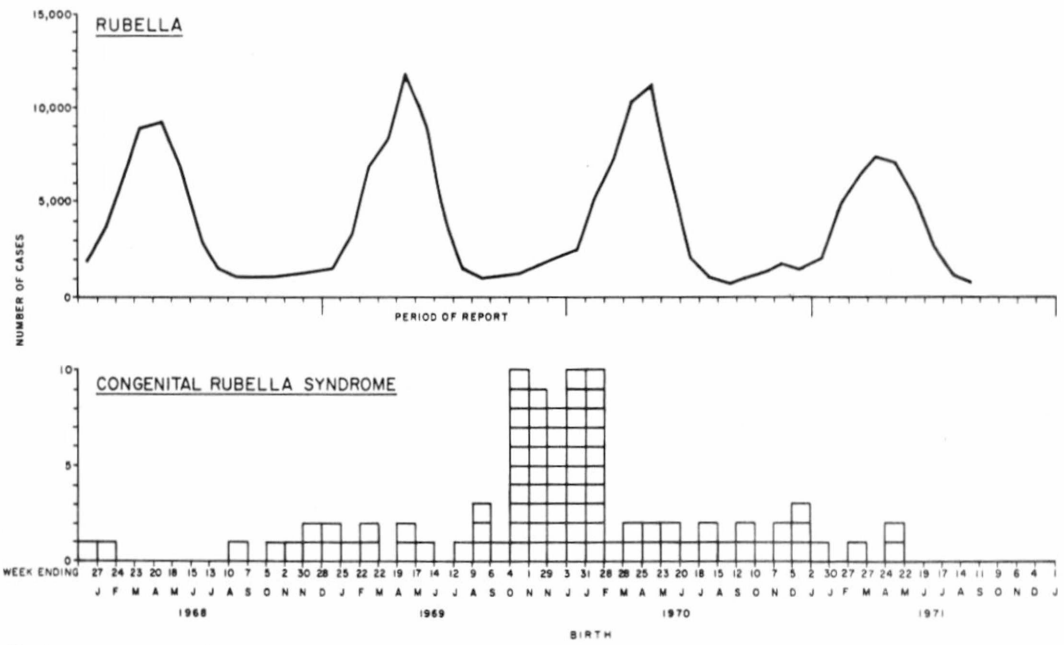
The 1965 Conference of State and Territorial Epidemiologists made congenital rubella syndrome a notifiable disease. However, since then, reporting has been incomplete. In 1966, 11 cases were reported in the Morbidity and Mortality Weekly Report (MMWR); in 1967, 10 cases were reported; in 1968, 14 cases were reported; and in 1969, 18 cases were reported. Because of persistent inadequate reporting, the 1969 Conference of State and Territorial Epidemiologists re-emphasized the importance of congenital rubella syndrome surveillance. Accordingly, the Center for Disease Control established a National Registry for Congenital Rubella Syndrome (CRS) to provide epidemiological data and to measure the effect of vaccination programs.

The Registry began to function in September 1969. At that time, state epidemiologists were asked to complete a CRS case report form (see appendix) on every case of CRS diagnosed after September 1969. Between September 1, 1969, and July 31, 1971, 111 cases were reported to CDC on the Weekly Telegraphic Report of Notifiable Diseases and listed in the MMWR. During the same period 101 case report forms from 27 states and the District of Columbia have been filed in the National Registry.

Of the 101 cases, 33 were confirmed as congenital rubella infection by serologic tests or by rubella virus isolation. Additionally, 45 had multiple defects compatible with the clinical diagnosis of CRS. The remaining 23 infants had single defects and

laboratory tests did not confirm congenital rubella; therefore, definitive diagnosis in those infants has not been established. Forty-nine of the 101 reported cases were diagnosed in the first month of life, and 71 were diagnosed by age 6 months. Twenty-three of the children died, most under 2½ months of age. In 56 of the 101 cases there was a history compatible with first trimester maternal rubella. Figure 4 shows the reported cases of rubella and births of the 90 infants with CRS with known dates of birth since 1968. The peak incidence of reported congenital rubella births occurred 7-9 months after the 1969 peak incidence of rubella.

Figure 4 CASES OF RUBELLA* AND OF CONGENITAL RUBELLA SYNDROME BY BIRTH,** BY 4-WEEK PERIODS, UNITED STATES, 1968 — 1971



*OFFICIAL TELEGRAPHIC REPORTS FROM STATES AND AREAS
**FROM CASE REPORT FORMS

The primary goal of rubella vaccination programs is to reduce the incidence of congenital rubella. Despite considerable efforts to establish effective surveillance systems, reporting remains inadequate. Because of the low incidence of congenital rubella syndrome and the variable periodicity of rubella, it is unlikely that sentinel surveillance systems would improve reporting. Therefore, each state is urged to establish a congenital rubella surveillance system. Effective surveillance of pediatric referral centers, schools for the deaf and blind, agencies for maternal and child welfare services, and state bureaus of vital statistics should result in the reporting of over 80 percent of congenital rubella cases (Table 6). The establishment of such a surveillance system is an integral part in the overall rubella immunization program.

Table 6
Congenital Rubella Surveillance
Recommended Sources for Case Finding

I. Hospitals - Pediatric Referral Centers*
Children's Hospitals
Cardiology Centers
Hospital Laboratory

II. Clinics - Birth Defects
Eye Clinics
Speech and Hearing
Pediatric Cardiology

III. Special Schools - Blind*
Deaf*
Mentally Retarded
Emotionally Disturbed

IV. Birth Certificates - Congenital Defect Section*
Congenital Heart Disease
Cataracts
Glaucoma
Hepatosplenomegaly
Thrombocytopenia
Purpura
Deafness
Rash

V. State Agencies - Department, Division or Agencies for Blind, Crippled, Education*

VI. State Laboratories

VII. Periodic Physician Reminders

* Highest priority

In addition to congenital rubella syndrome, increased fetal wastage is associated with rubella infection during pregnancy. The number of therapeutic abortions for rubella may be an indicator of this wastage. Currently, 10 states report abortions by indication. In 1970, these 10 states accounted for 19,722 (10.9%) of the 180,119 reported abortions performed in the United States. Table 7 shows the number of reported abortions performed for risk of fetal deformity in the 10 states for which reporting exists. In five of these states, data is available to indicate the number of abortions performed specifically for rubella (Table 8). It is anticipated that such information will be a valuable addition to surveillance data in estimating the frequency of rubella infection during pregnancy. A reduction in both fetal wastage due to rubella and incidence of congenital rubella syndrome cases is the only valid indicator of the success of rubella immunization programs.

Table 7
Legal Abortions by Indication
Selected States*
1970

State	Risk of Fetal Deformity		All Indications Total	
	No.	%	No.	%
Alaska[1]	5	1.2	408	100.0
Colorado	19	0.8	2,263	100.0
Delaware	10	1.8	560	100.0
Georgia	36	5.1	705	100.0
Hawaii[2]	3	0.1	2,780	100.0
Maryland[3]	13	0.4	3,210	100.0
North Carolina	10	0.8	1,293	100.0
Oregon	97	1.3	7,476	100.0
South Carolina[4]	14	3.6	392	100.0
Virginia[5]	16	2.5	635	100.0
Total	223	1.1	19,722	100.0

[1]July 29-December 31.
[2]March 11-December 31, provisional data.
[3]July-December.
[4]February-December.
[5]January-July
* All states with data available.

Table 8
Number of Legal Abortions for Rubella in Pregnancy
Selected States 1968-1971

	1968	1969	1970	1971
Colorado	19	44	19	4[A]
Delaware	--	--	2	0[A]
Oregon	--	--	30	23[A]
South Carolina	--	--	8	3[B]
Virginia	--	--	21	12[B]

A = January-June
B = January-May

IV. SURVEILLANCE OF VACCINE USE

Through June 30, 1971, 31,850,795 doses of rubella vaccine had been distributed in the United States. Of this amount, 22,936,867 doses were administered in public programs. The remaining 8,913,928 doses of vaccine were distributed for both private and public use.

In public programs, 48.8 percent of the target population, age 1-12, was vaccinated by June 30, 1971. Vaccine was administered to 36.8 percent of children ages 1-4 and 66.0 percent of those 5-9 years.

V. REPORTED COMPLICATIONS ASSOCIATED WITH ADMINISTRATION OF RUBELLA VACCINE

A. Joint Reactions

Arthralgias, arthritis, and paresthesias are frequent complications of natural rubella in adults. These symptoms have also been observed in children following natural rubella, but until recently the frequency of such complaints was not appreciated (see special investigations, Bermuda).

Initial prelicensure rubella vaccine field trials showed that vaccine-associated joint reactions occurred with all attenuated rubella vaccines; however, these reactions were more common in adult than children vaccinees. Reactions were generally mild, occurred in less than five percent of vaccinated children, and appeared to be more frequent among susceptibles and dog kidney rubella vaccine (DK) recipients. However, with extensive usage in public programs following licensure, many areas were alarmed by a greater frequency and severity of reactions than had been anticipated.

In general, symptoms have been self-limited and mild. The most common sites of involvement are the knees; however, pain has been reported in some children in the small joints of the hands, wrists, ankles, feet, elbows and neck. Characteristically, pain has been most severe in the early morning hours, disturbing sleep, and tends to abate during the day with increased activity. Joint pains are often accompanied by paresthesias, particularly of the hands or feet. In a small percentage of cases, signs of arthritis (redness, warmth, swelling) have been observed. In addition, post-vaccination muscular complaints have been reported. The so-called "Catcher's Crouch Syndrome" refers to involvement of the hamstring muscles causing affected children to walk on their toes or assume a crouched position for relief.

Vaccine-associated reactions usually occur 1-8 weeks after vaccination. In most cases symptoms last 1-3 days;however, occasionally such complaints may persist for several weeks, and in rare instances patients may experience episodic recurrences. However, to date, no permanent sequelae have been reported.

Surveys in several areas have shown that the DK vaccine, which induces the highest geometric mean antibody titer, also has the highest incidence and longest duration of vaccine-associated reactions. The duck-embryo and Cendehill strains, in general, have a lower incidence and shorter duration of vaccine-associated joint, muscular and neuritic symptoms (Table 9).

Table 9
Summary of Comparative Rubella Vaccine Joint Reaction Studies

	Vaccine	Reaction Rate Vaccinees	Reaction Rate Non-vaccinees	Median Onset (Days)	Median Duration (Days)
Utah	*DK-12	12.9%	2.7%	25-31	7.4
	**DE-5	7.6%	2.7%	25-31	6.1
Buffalo	DK-12	20.7%	4.2%	15-21	1-7
	DE-5	5.9%	0.6%	7	1-3
New Jersey Retrospective	DK-12	10.9%	0.1%	29-35	1-7
	DE-5	4.7%	0.1%	15-21	1-7
New Jersey Semi-prospective	DK-12	14.4%	2.8%	30	7
	DE-5	5.4%	2.8%	25	4
	Cendehill	5.1%	2.8%	28	5
New Orleans Prospective	Cendehill	8.9%	5.7% (Prospective)	14	1-3
	DE-5	7.3%	5.7%	14	1-3
North Carolina Prospective	DK-12	8.1%	1.2% (Retrospective)	28	12
	DE-5	1.8%	1.2%	14	3

* HPV-77 DK-12; ** HPV-77 DE-5

The CDC has received sporadic reports of persistent or recurrent joint symptoms among rubella vaccinees. Follow-up studies of children with such symptoms have been conducted in several areas. In these studies, persistent or recurrent joint symptoms have been found in .04 to 1 percent of all vaccine recipients, and in 1.3 to 9.2 percent of children with acute joint reactions following vaccination. However, a non-vaccinated "control" population reported a similarly high frequency of persistent or recurrent joint complaints. In general, DK recipients have had a higher frequency and greater severity of these symptoms. Typically, such children have had moderate to severe symptoms in the acute post-vaccination period. Recurrent symptoms have lasted from 1-7 days with a frequency range of twice a week to once every 3 months. Repeated laboratory studies and X-ray examinations have been unremarkable, and physical findings have been limited to decreased range of motion of the involved joint. Severity of symptoms appears to decrease over a period of several months, and to date, there is no evidence showing a predisposition to a chronic arthritis in such children.

B. Central Nervous System Reactions Occurring within 30 Days after Rubella Vaccine Inoculation

Neurological disorders in temporal relation to rubella vaccine inoculation have occurred infrequently. Since 1969, 31.8 million doses of rubella vaccine have been distributed in the United States, and during this period CDC has received 14 reports of central nervous system (CNS)involvement within 30 days after the patient received rubella vaccine (nine of these were summarized in Rubella Surveillance Report # 2).

The relationship between administration of rubella vaccine and occurrence of these neurological disorders is obscure and probably not the same in all cases. Two cases were proven definitely due to causes other than vaccine: one was shown at post-mortem to be herpes simplex encephalitis (case # 8 in Rubella Surveillance Report # 2) and another was Flavobacterium meningosepticum sepsis (case # 13). The attack rate in the remaining 12 cases was 0.4 cases per million vaccine doses distributed. In these cases, the clinical pictures varied, and include aseptic meningitis, transverse myelitis, Gullain-Barré syndrome, cerebellar ataxia, hemiparesis, and diffuse encephalitis. Seroconversion to rubella was demonstrated in four of five patients where acute and convalescent serum specimens were collected, and positive convalescent rubella titers were found in another four patients. Rubella virus was not isolated in any instance from nervous tissue or spinal fluid.

Epidemiologic assessment of these cases shows no evidence of a relationship to a single vaccine manufacturer or vaccine lot. Furthermore, cases of encephalitis may be expected to occur among any large group of children regardless of whether they have received vaccine. For example, a survey in New Jersey in 1965 showed that 2.8 cases of encephalitis of unknown cause occurred per million children in a 30-day period (Encephalitis Surveillance: 1965 Annual Summary).

C. Inadvertent Vaccination During Pregnancy

Since it is not known whether attenuated rubella virus can cross the placenta and infect the fetus, or whether such infection causes fetal damage, live rubella vaccine should not be given to pregnant women. However, some physicians have not followed strictly the recommended guidelines regarding pregnancy precautions and prevaccination serologic screening for rubella immunity. As a result, many women have inadvertently been inoculated shortly before conception or in the first few weeks of pregnancy.

The Center for Disease Control has received reports of 193 vaccinated pregnant women, 171 of whom had unknown immune status prior to vaccination (Table 10). Of the 171, 88 elected to have therapeutic abortions, nine had spontaneous abortions, and 56 carried to term (18 continuing pregnancy). Virus was not isolated from any products of conception, and histopathologic changes were detected in only one case (deciduitis). Fifty-three of the 56 term infants were clinically normal at birth; of the remaining three infants, two had physiologic jaundice of the newborn and one, cystic fibrosis.

Table 10
Rubella Immune Status of 193 Vaccinated Pregnant Women

	IMMUNE STATUS PRIOR TO VACCINATION	
	UNKNOWN	SUSCEPTIBLE
NO. OF WOMEN STUDIED	171	22
THER. AB.	88	9
Lab. Findings	Deciduitis (1)	*
SPONT. AB.	9	4
PREG. CONTINUING	18	1
TERM DELIVERY	56	8
Clinical Status of Infants	Normal (53) Physiologic Jaundice (2) Cystic fibrosis (1)	Normal (8)

* Laboratory Findings in Therapeutic Abortions in Susceptibles:

	Interval Between Vacc. and Ab. (Days)	Rubella Vaccine-Like Virus Recovered			Histopath. Changes
		Decidua	Placenta	Fetus	
1.	28		+		Placenta, decidua
2.	37	+	0		Decidua
3.	69	+	+	0	Placenta

Twenty-two known-susceptible women who received rubella vaccine shortly before or after conceiving have also been studied. Nine of these patients elected to have therapeutic abortions; in three cases, rubella vaccine-like viruses were isolated from decidua and/or placenta, (28, 37, and 69 days, respectively, after vaccination). Histopathologic changes in decidua and/or placenta, similar to changes seen with gestational rubella, were evident in all three from whom virus was recovered. In two cases, adequate fetal tissue specimens were obtained; in one, rubella virus was isolated from the fetal eye. Laboratory differentiation of this virus (wild or attenuated) is still in progress. In addition, four other patients had spontaneous abortions; no positive laboratory or pathologic findings were associated with these cases. Eight vaccinated susceptible women delivered clinically normal term infants. In the remaining case, the patient has not delivered.

Definite conclusions regarding the risk to a woman who had received vaccine shortly before or after she becomes pregnant cannot be made on these limited data. However, the ability of vaccine virus to persist in placental tissue for as long as 69 days post-vaccination and the observed histopathologic changes reemphasize the necessity for caution and selectivity in giving rubella vaccine to females of childbearing age. Likewise, rubella HI testing before vaccination of post-pubertal females should be stressed.

VI. SPECIAL INVESTIGATIONS:

A. Bermuda, 1971

From late March through July 1971, an outbreak of rubella involving 253 persons occurred in Bermuda, an island of 56,000 inhabitants. The last rubella epidemic there occurred in 1964. Overall, 60 percent of the patients in the present outbreak

were female; but patients under 13 years of age were evenly divided by sex. The majority of cases occurred in adolescents and young adults.

The illness was characterized by rash, post-auricular or occipital lymphadenopathy, and low-grade fever; sore throat, headache, cough, eye discomfort and pruritis, were less common complaints. Over 40 percent of the patients noted joint discomfort, with the hands and knees being most commonly involved. Proportionately, more females than males had joint complaints, which also increased with age. However, a surprisingly large proportion (25%) of rubella patients less than 13 years of age complained of discomfort in one or more joints.

A random serologic survey was conducted among children to determine age-specific rubella immunity levels. Serum specimens for rubella HI titer determinations were drawn from 296 children, ages 4-18 years. Overall, 65.6 percent were susceptible; of those ages 4-7 (born since the last rubella outbreak), 93.0 percent were susceptible. In addition, approximately one third of 49 adult women tested for rubella immunity were seronegative.

The low reported incidence of rubella since 1964 and the large number of cases in the postpubertal age group in this outbreak indicated a high overall susceptibility to rubella (confirmed by the serosurvey) and suggested that a wide-scale outbreak, particularly in primary-school children, was an immediate threat. Therefore, an island-wide vaccination program was carried out, with nearly 80 percent of the primary school children receiving rubella vaccine in the first week of the campaign. Furthermore, 70 percent of nursery school children were vaccinated by the end of June. Cessation of cases in children ages 5 to 12 years followed shortly by termination of the entire epidemic, suggests that the vaccination program was successful in halting further spread of rubella.

In summary, the major features of this outbreak were: 1) the high rate of joint reactions (25%) in prepubertal children, 2) the high rate of susceptibility to rubella in an island population, and 3) the effectiveness of rubella vaccine in preventing further spread of rubella.

B. Casper Wyoming, 1971

Between early January and June 1971, an outbreak of rubella involving 1,039 persons occurred in Casper, a town of 49,000 in east-central Wyoming. Seven months earlier the local health department had administered rubella vaccine to 52 percent of the preschool children and 83 percent of children in the first through sixth grades. Though the epidemic first peaked in late January, it continued until early May. A four-fold rise in hemagglutination-inhibition titer in 22 paired sera and 11 positive nasopharyngeal cultures confirmed the diagnosis of rubella.

The outbreak primarily involved two senior-high schools and three junior-high schools; 85 percent of cases occurred in unvaccinated children, 11-18 years of age. However, 11 percent of the cases were scattered in elementary schools, with only four percent in preschool children and adults. The grade-specific clinical attack rates for the eighth through the twelfth grades were uniform (14 to 17 percent); however, the attack rate for the various junior- and senior-high schools ranged from six to 22 percent with no geographic pattern, indicating the sporadic nature of the disease.

A serosurvey was conducted in one junior high early in the epidemic. Of 935 students who had blood specimens drawn, 33 percent in the eighth grade and 18 percent in the ninth were susceptible by the HI test. Thirteen percent of seventh graders were susceptible, but many had received rubella vaccination the previous year.

In Casper, a vaccination campaign protected children under 12 years from epidemic rubella. But the level of natural immunity in older schoolchildren was apparently not high enough to prevent spread of disease over an extended period of time. Other communities that have not had epidemic rubella in the last few years may experience similar outbreaks.

C. Gillette, Wyoming, 1971

Between mid-January and June 1971, 125 cases of clinical rubella were diagnosed in Gillette, Wyoming, a town of approximately 12,000, located 130 miles north of Casper, Wyoming.

Prior to this epidemic two rubella vaccination campaigns had been conducted in Gillette. Estimates of the percent of children vaccinated are presented in Table 11.

The epidemic began in the high school in January, and cases continued to occur there through the month of May. Cases did not appear in the junior high school until late in March. As can be seen from Table 11, attack rates were highest among the unvaccinated high school students and lowest among the groups previously vaccinated.

Table 11
Clinical Rubella Attack Rates and Percent of Children Previously Vaccinated by School Group, Gillette, Wyoming, 1971

	Population	Cases	Attack Rate (%)	% Previously Vaccinated
Preschool children	1,200	10	0.8	36
Elementary school children (grades 1-5)	1,268	3	0.2	85
Jr. High school children (grades 6-8)	726	19	2.6	24
High school students (grades 9-12)	808	87	10.8	0
Adults	8,000	6	0.1	0

This epidemic demonstrated the effectiveness of rubella vaccine in protecting children from clinical illness. However, when rubella was introduced into the community, an epidemic still occurred among the older, unvaccinated children.

The impact of this epidemic on the community in terms of congenital rubella infections is currently being assessed by obtaining prenatal rubella titers on pregnant women and cord blood titers on infants at the time of delivery. To date, there has been no documented seroconversion of a pregnant woman and no infant born with congenital rubella infection.

D. Grand Isle, Louisiana, 1970-71

Grand Isle, with a population of 2,236, is a small island one mile off the Louisiana coast, connected to the mainland by a single highway through the bayou. On August 31, 1970, a community-wide rubella immunization campaign reached 63 percent of children 1-10 years. However, from November 1970, through January 1971, a rubella outbreak occurred, affecting 108 people. Seventy-two percent of them were ages 11-20, only 17 percent were under 11. The attack rate (33%) in the 11-20 group was significantly higher than in other age groups.

Unimmunized children ages 1-10 had an attack rate nine times higher than immunized children of the same age, while the attack rate for all unimmunized persons was 12 times higher than that for the immunized group. Although three vaccinated children had clinical illness, overall vaccine efficacy was 92 percent (Table 12).

Table 12
Rubella Attack Rates by Age and Immunization Status, Grand Isle

Age Group	IMMUNIZED			UNIMMUNIZED			Vaccine* Efficacy
	Total	# Ill	% Ill	Total	# Ill	% Ill	
1-10	124	3	2.4	74	16	21.6	89%
11-20	2	0	0	232	75	32.3	
Total 1-20	126	3	2.4	306	91	29.7	92%

* Vaccine Efficacy = $\frac{\text{\% Ill Unimmunized - \% Ill Immunized}}{\text{\% Ill Unimmunized}}$ X 100

In attempting to explain the high susceptibility of the adolescent group in this population, the attack rate for those who lived in Grand Isle during the 1964 pandemic was compared with the attack rate for those living elsewhere in 1964. These rates were 36 percent and 15 percent, respectively.

In summary, Grand Isle experienced rubella among adolescents, who, geographically isolated and protected from the 1964 pandemic, probably remained highly susceptible. Although the potential of spread from an adolescent to a pregnant female was of major concern, no secondary cases in families occurred in this epidemic.

E. Kauai, Hawaii, 1971

In October 1969, 86 percent of children ages 5-12 in Kauai, Hawaii, were vaccinated as part of a rubella vaccine study. Fifteen months later, in December 1970, a soldier on furlough from Fort Ord, California, returned to Kauai with rubella and a prominent cough. Fifteen secondary cases, all in unimmunized persons, resulted from contact with the soldier; three were in adults, eight in teenagers, three in preschoolers, and one in a 9-year-old girl. None of these patients had a cough, and no known tertiary cases occurred, despite the presence of susceptibles in several households.

During the epidemic, a 2-year-old boy, immunized by his private physician at age 13 months, developed a rubella-like rash and mild fever, of 1 day's duration. His rubella HI titer on the day of the rash was 1:1280, while his titer 1 week later was 1:81920. Fifteen days earlier the boy's mother had a rash, serologically confirmed as rubella. She had no contact with the soldier from Fort Ord. Thus, this boy's brief rash illness and tremendous boost in HI titer are suggestive of clinical reinfection with rubella.

As a result of this epidemic and similar introductions of rubella into Hawaii by military personnel, all recruits are to receive rubella vaccine prior to their departure from Hawaii.

MEDICAL RECORD, This form contains medical information the disclosure or release of which is restricted by 5 U.S.C. 552, (b) (6); 45 CFR Part 5.

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION
CENTER FOR DISEASE CONTROL
STATE AND COMMUNITY SERVICES DIVISION
IMMUNIZATION BRANCH
ATLANTA, GEORGIA 30333

FORM APPROVED
OMB No. 68-R1233

RUBELLA CASE INVESTIGATION REPORT

1. ☐ Case ☐ Immunity Testing
☐ Exposure ☐ Pregnant (EDC _____)

2. Case Number

3. Name

4. Phone

5. Address (Include Zip Code)

6. Age

7. Sex ☐ M ☐ F

8. Student ☐ No ☐ Yes

9. If Yes, Grade

10. School

11. Occupation

12. Place of Work

13. Had Rubella ☐ Yes ☐ No

14. Had Rubella Vaccine ☐ Yes ☐ No

15. Date of Exposure

16. Date of Onset of Symptoms

17. SIGNS AND SYMPTOMS:

Physical Examination ☐ Yes ☐ No

	Yes	No	Comments
Rash	☐	☐	
Fever	☐	☐	
Nodes	☐	☐	
Joint Pain	☐	☐	
Conjunctivitis	☐	☐	
Headache	☐	☐	

Other (Specify) _____

18. Source of Infection

19. Contacts (Family, Work, School, etc.)

20. LAB WORK

	Date	Results
S1		
S2		
Throat Swab		

21. Reported By

Date

HSM 10,17 (CDC)
7-71

MEDICAL RECORD. This form contains medical information the disclosure or release of which is restricted by 5 U.S.C. 552, (b) (6); 45 CFR Part 5.

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION
CENTER FOR DISEASE CONTROL
IMMUNIZATION BRANCH
ATLANTA, GEORGIA 30333

CONGENITAL RUBELLA SYNDROME CASE REPORT

FORM APPROVED
OMB NO. 68-R1150

1. CHILD'S NAME (last) (first) (middle) | CDC CASE NUMBER

2. ADDRESS (number, street, city, county, state, and zip code)

3. DATE OF BIRTH | 4. SEX ☐ M ☐ F | 5. BIRTH WEIGHT _____ Grams | 6. RACE ☐ White ☐ Negro ☐ Other

7. IS CHILD LIVING ☐ Yes ☐ No | 8. IF NO, DATE OF DEATH | 9. CAUSE OF DEATH

CLINICAL

10. MALFORMATIONS	YES	NO	UNK	11. NEONATAL MANIFESTATIONS	YES	NO	UNK
CATARACTS				LOW PLATELET COUNT			
HEARING LOSS				PURPURA			
MENTAL RETARDATION				ENLARGED SPLEEN			
CONGENITAL HEART DISEASE				ENLARGED LIVER			
CARDIAC DIAGNOSIS: Patent Ductus Arteriosus				LONG BONE RADIOLUCENCIES			
☐ Unk — Peripheral Pulmonary Stenosis				CONGENITAL GLAUCOMA			
Other (specify)				OTHER (specify)			

12. OTHER MALFORMATIONS
☐ Yes ☐ No ☐ Unk If yes, specify _____

13. AGE CONGENITAL RUBELLA SYNDROME DIAGNOSED _____ Years _____ Months ☐ <1 Month

MATERNAL HISTORY

14. MOTHER'S NAME (last) (first) (middle)

15. RUBELLA-LIKE ILLNESS DURING PREGNANCY ☐ Yes ☐ No ☐ Unk | 16. IF YES, MONTH OF PREGNANCY _____ ☐ Unk | 17. CLINICAL FEATURES

18. MOTHER IMMUNIZED WITH RUBELLA VACCINE ☐ Yes ☐ No ☐ Unk | 19. IF YES, DATE VACCINATED | 20. MANUFACTURER | 21. LOT NUMBER

LABORATORY

22. BLOOD SPECIMENS SUBMITTED TO (name of laboratory)

CHILD ☐ None		MOTHER ☐ None	
DATE COLLECTED	RUBELLA HI TITER	DATE COLLECTED	RUBELLA HI TITER

23. RECORD VIRAL ISOLATION STUDIES (date, specimen, source, and result) AND OTHER BLOOD STUDIES (date, test, and result) BELOW

APPRAISAL

24.
☐ CONFIRMED ☐ PRESUMPTIVE ☐ NOT RUBELLA SYNDROME

INVESTIGATOR | DATE

HSM 4.271 (CDC)
9-69

SEROLOGIC ASSISTANCE IN RUBELLA DIAGNOSIS

The rubella hemagglutination inhibition test, the most widely used technique for quantitating rubella antibodies, is a valuable diagnostic tool and an excellent means of expanding the surveillance system for rubella. The following is a listing of commonly encountered clinical problems relating to rubella in which serological testing can be helpful in diagnosis:

1. Confirmation of Acute Rubella Infection

   Specimens Required:

   Paired sera--first collected within 3 days after onset of illness, and a convalescent serum collected 1-2 weeks later.

   Interpretation:

   Only a 4-fold or greater rise in antibody titer is diagnostic of recent rubella infection. Stable, or falling titers indicate only past rubella infection at some undetermined time. In instances where stable rubella HI antibody titers are found, additional laboratory techniques such as CF or FA should be employed since antibody measurable by these latter two procedures appears later following the onset of rash than does the HI antibody.

2. Determination of Immune Status of Pregnant Women Exposed to Rubella

   Specimens Required:

   Single serum collected within 7 days after exposure.

   If the first specimen contains no detectable rubella antibody, then a second serum should be collected 3-4 weeks after the exposure.

   Interpretation:

   The presence of any level of rubella antibody within the 7-day period after exposure indicates prior infection with rubella virus, and immunity to primary infection.

   Absence of detectable rubella antibody at the time of exposure indicates susceptibility to rubella. The testing of a second serum 3-4 weeks after exposure will confirm whether or not rubella infection, apparent or inapparent, has resulted from the exposure.

3. Confirmation of Suspected Congenital Rubella Infection

   Specimens Required:

   Serum specimens from both the infant and mother (if infant is less than 6 months old, an additional serum should be obtained at 6-12 months of age).

   Specimens for viral isolation are of limited value for diagnosis and management of rubella syndrome infants.

Interpretation:

Congenital rubella infection can be confirmed serologically by demonstrating the persistance of antibody above and beyond that which is passively transferred from the mother. In general, the presence of rubella antibody in specimens submitted when the suspect case is 6-12 months old confirms the diagnosis. Above the age of 12 months the chance of antibody having resulted from natural post-natal rubella must be weighed against the likelihood of congenital origin. The degree of confidence in the serologic diagnosis therefore decreases with age above 1 year.

Defining Need for Rubella Vaccination

Specimens Required:

Single serum.

Interpretation:

The presence of any level of HI antibody (> 1:8) indicates past rubella infection at some undetermined time, thus immunity to primary infection.

Absence of rubella HI antibody indicates susceptibility to rubella.

Evaluation of Possible Post-rubella Vaccine Complications

Specimens Required:

Paired sera--first serum obtained as soon as possible after onset of illness; a convalescent specimen collected 1-2 weeks later.

Specimens for viral isolation are essential for a complete laboratory evaluation of suspected rubella vaccine related illness. Specimens for viral isolation studies, if not tested within 24 hours, should be kept frozen at -60°C (or on dry ice) until virus isolation tests can be carried out.

Interpretation:

Minor qualitative and quantitative differences have been demonstrated between vaccine and wild virus induced rubella antibody. Using routine serologic techniques, however, such differentiation is generally not possible, and specimens should be referred to a reference laboratory for special tests (CF, differential FA, etc.).

Virus isolation with strain characterization of a rubella virus isolate is the most meaningful approach to evaluating rubella vaccine related illnesses. Strain characterization of rubella virus is available from a few specialty reference laboratories.

RECOMMENDATION OF THE PUBLIC HEALTH SERVICE ADVISORY COMMITTEE ON IMMUNIZATION PRACTICES

RUBELLA VIRUS VACCINE

INTRODUCTION

Rubella is generally a mild illness, but when the infection is acquired by a woman early in pregnancy, particularly the first 3 months, fetal infection with subsequent abnormalities often develops. Preventing infection of the fetus and the resulting congenital rubella syndrome is the principal objective of rubella control.

Live, attenuated rubella virus vaccine* is a highly effective immunizing agent, and its use provides the first suitable method of preventing rubella. While it is safe and protective for children, due to the possible risk of vaccine virus for the fetus, its safety for pregnant women has not been determined. The most feasible way to prevent fetal infection is to reduce virus transmission among children, the major source of infection for susceptible pregnant women. As of June 30, 1971, more than 28 million doses of vaccine had been distributed in the United States.

Rubella

Rubella is one of the common childhood exanthems. Most cases occur in school-age children, particularly in the winter and spring. Approximately 80 to 90 percent of young adults in the continental United States have serologic evidence of immunity.

Rubella is clinically variable, and its common features post-auricular and sub-occipital lymphadenopathy, arthralgia, and transient erythematous rash are often overlooked or misdiagnosed. A mild febrile illness may not be recognized as rubella. Moreover, inapparent infection often occurs, further decreasing the reliability of clinical history.

Transient polyarthralgia and polyarthritis may accompany or follow the illness. Joint symptoms are reported to occur most frequently in adult women but are also observed in adult men and in children. Rarely, there is involvement of the central nervous system or thrombocytopenia.

By far the most important feature of rubella is the frequent development of fetal anomalies when women acquire rubella in early pregnancy, especially in the first trimester.

Rubella Immunity

Immunity following rubella appears to be long lasting, even after mild illness or clinically inapparent infection. As with other viral diseases, re-exposure to natural rubella sometimes results in a booster-type antibody rise but no clinical disease, indicating asymptomatic reinfection.

The only reliable evidence of immunity is the presence of specific antibody. The hemagglutination-inhibition (HI) antibody procedure is the serologic test of choice for determining immunity. Because of the variations among reagents and technical procedures, only laboratories that regularly perform these tests should be used.

LIVE RUBELLA VIRUS VACCINE

Live rubella virus vaccines thus far licensed for use in the United States are prepared in duck embryo, dog kidney, or rabbit kidney cell cultures. They are administered as a single subcutaneous injection. Antibodies develop in approximately 95 percent of susceptible vaccinees. Differences in the frequency of adverse reactions and in the mean antibody titers induced by the available rubella vaccine preparations have been reported. Although titers are generally lower than those observed in response to natural rubella infection, vaccine-stimulated antibody protects against clinical illness on natural exposure.

Antibody levels have declined very little during the 5-year period of observation of children who were among the first to be immunized with rubella vaccine. Long-term protection is expected but can be documented only by continued observation.

Rash and lymphadenopathy occur occasionally in children after vaccination, but joint pain, usually of the small peripheral joints, has been the most common complaint. Arthralgia or arthritis has been reported in 1-15 percent of vaccinated children, but usually occurs in no more than 5 percent. Reports on the vaccine of dog kidney cell origin indicate that it commonly stimulates a somewhat higher level of antibody than other vaccines but is associated with higher rates of joint manifestations (7-15 percent). The joint symptoms are of greater severity and longer duration than symptoms caused by other vaccines.

Joint symptoms, or non-joint-associated pain and paresthesia in arms and hands or in the popliteal fossae, when they occur, begin 2-10 weeks after immunization. With the less reactive vaccines, they generally persist for 1-3 days. Recurrences have occurred, but rarely, and no permanent residua have been reported.

In susceptible women, arthralgia and generally transient arthritis following immunization are more frequent and tend to be more severe than in children. Not enough men have been studied to establish comparable data.

Vaccinees may shed small amounts of virus from the pharynx briefly at some time between the first and fourth weeks after immunization. Transmission of vaccine virus to susceptible contacts is, therefore, theoretically possible; however, when several thousand susceptible persons were deliberately exposed to numerous recent vaccinees, only a few of the contacts developed antibodies. Most of those who did had also been exposed to natural rubella at about the same time, and in only rare instances was seroconversion thought to be compatible with transmission of vaccine virus. In view of considerable experience with such investigations and with community vaccination programs, the probability of vaccine virus spread is exceedingly low.

Vaccinees exposed to natural rubella infection often have antibody titer rises but no clinical symptoms. Reinfection occurs most frequently in persons with low antibody titers, and it occurs both in vaccinees and in persons who have had rubella. In cases of reinfection, there is no detectable viremia and little pharyngeal excretion of virus. There is no evidence that rubella reinfection poses any risk for susceptible contacts. Furthermore, the apparent absence of viremia with reinfection suggests that immune women reinfected while pregnant would be unlikely to transmit virus to their fetuses.

*Official name: Rubella Virus Vaccine, Live.

Further study is needed, however, to define the clinical and epidemiologic significance of reinfection.

VACCINE USAGE

General Recommendations

Live rubella virus vaccine is recommended for all children between the age of 1 year and puberty. It should not be administered to infants less than 1 year old due to possible failure to respond to vaccination.

Priority for immunization should be given to children in kindergarten and elementary school because they are the major sources of virus dissemination in the community. For optimum program effectiveness, it is essential that immunization activities be developed to ensure ongoing, routine immunization of preschool children as well. A history of rubella is not reliable; all children should receive vaccine.

It is desirable that programs of rubella vaccine use in adolescent girls and adult women be extended. Because of the precautions which must apply, potential vaccinees in these groups should be considered individually. They should receive vaccine only if they are shown to be susceptible by serologic testing and if they agree to prevent pregnancy for 2 months after immunization.

To accomplish such extended use of rubella vaccine, serologic testing capabilities should be expanded. With sufficient laboratory services available, there is merit in undertaking prenatal or antepartum screening for rubella susceptibility and, if appropriate, immunization in the immediate postpartum period. **Pregnant women should not under any circumstances be given vaccine.**

Immunization of adolescent or adult males is of lower priority. It may be a useful practice in preventing or controlling outbreaks of rubella in circumscribed population groups.

There is no evidence that live rubella virus vaccine given after exposure will prevent illness. There is, however, no contraindication to immunizing children already exposed to natural rubella. Similarly, there is no harm in vaccinating persons who have had rubella.

Precautions and Contraindications

Pregnancy: Live rubella virus vaccine is **contraindicated.** (See General Recommentations.)

Altered immune states: Attenuated rubella virus infection might be potentiated by severe underlying disease such as leukemia, lymphoma, or generalized malignancy, and when immunologic response has been suppressed with steroids, alkylating drugs, antimetabolites, or radiation. Such patients should not be given live rubella virus vaccine.

Severe febrile illness: Immunization should be postponed until the patient has recovered.

Hypersensitivity to vaccine components: Theoretically, rubella vaccine should not be given to children clearly hypersensitive to the animals from which cells are derived for use in vaccine production or to other components of the vaccine. To date, there have been no documented reports of serious reactions to rubella vaccine clearly attributable to hypersensitivity.

Simultaneous Administration of Certain Live Virus Vaccines

Recently licensed combination live virus vaccines (measles-mumps-rubella, measles-rubella, and rubella-mumps) incorporate specific vaccine virus strains of demonstrated effectiveness and safety when administered simultaneously. Combinations of other strains of measles, rubella, and mumps vaccine viruses have not been tested sufficiently and, therefore, are not suitable for simultaneous administration at this time.

SURVEILLANCE

Careful surveillance of rubella infection is particularly important now that the vaccine is in general use. Accurate diagnosis and reporting of rubella, of the congenital rubella syndrome, and of vaccine complications are now more important than ever. All cases of birth defects suspected of being related to rubella should be thoroughly investigated and reported.

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