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## Dental Practice in Western Pennsylvania

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The recent estimates made by the Health Resources Advisory Committee of the National Security Resources Board (now of the Office of Defense Mobilization) regarding the requirements for dentists in a period of mobilization are based on the assumption that it will be necessary to maintain the 1949 ratio of dentists to population while meeting military and mobilization needs (*1*). The Odontological Society of Western Pennsylvania, to test the validity of the underlying assumption that the supply and effective demand for dentists' services are in equilibrium for this area, has queried local dentists concerning their patient load and their capacity to increase it.

At the request of the society, the Department of Biostatistics of the Graduate School of Public Health, University of Pittsburgh, assisted in the preparation of a questionnaire and analyzed the returns.

Although this study had a limited objective, namely, to determine the ability of dentists in this area to assume additional patients, we feel that it illustrates how probing for facts will save much time and energy in the discussion of such controversial points as the oversupply or shortage of dentists and other health personnel. This study was not planned to obtain information on the broader issues of long-term supply and demand problems, but it should point out that there are ways and means of getting such information provided there is willingness to do so.

### Material and Method

A questionnaire was sent to approximately 1,500 dentists—some 1,200 of whom were members of the Odontological Society—practicing in the nine counties covered by the society: Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Washington, and

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Westmoreland. This area contains more than 2,700,000 persons according to the 1950 census.

The questionnaire covered the week of May 7–13, 1951 (see sample form). It asked first for the hours in the office during the week, at chairside, in the laboratory, and other work, and number of free hours. Other questions asked for hours in professional activities outside the office and for the total number of visits by patients. Important questions on additional patients were:

"Could you have seen more patients without reducing the quality or quantity of services rendered to the patients that were seen? If yes, how many more?"

In an allied question, the dentist was asked how soon he could see new patients—in 1 week, 2 weeks, a month, or not at all within this period.

The remaining questions covered items with which the answers to the above questions were likely to be associated—employment of assistants or hygienists, number of dental chairs, place of practice, year of birth, and whether the dentist was in general or special practice.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA

Mobilization and Defense Manpower Studies

For the week May 7–May 13, inclusive, please answer the following questions:

1. How many hours of the week did you spend in the office?
   - (a) Total _____
   - (b) At the chair treating patients _____
   - (c) In the laboratory _____
   - (d) On other work _____
   - (e) Number of free hours _____
2. How many hours did you spend in professional activities outside the office?
   - (a) clinic _____ (c) other (specify) _____
   - (b) teaching _____
3. What was the total number of visits by patients? _____
4. (a) Could you have seen more patients without reducing the quality or quantity of services rendered to the patients that were seen? _____
   If yes, how many more? _____
   (b) If calls by new patients (nonemergency) warranted, would you spend more time in the office? _____
   If yes, how many additional hours per week? _____

* * * * *

5. (a) Do you employ a dental assistant? Number _____
   (b) Do you employ a dental hygienist? Number _____
6. How many dental chairs are used by you and your auxiliary personnel (excluding other dentists)? _____
7. If a new patient (nonemergency) called for an appointment, could you see him (check one):
   Within 1 week ☐ Within a month ☐
   Within 2 weeks ☐ Could not see patient within month ☐
8. Place of practice (check one):
   (a) If Allegheny County:
   - (1) Office building in Downtown, Oakland or East Liberty ☐
   - (2) Elsewhere in Pittsburgh ☐
   - (3) Outside of Pittsburgh ☐

   (b) Other than Allegheny County:
   - (1) Community of less than 5,000 population ☐
   - (2) 5,000–10,000 population ☐
   - (3) 10,000–25,000 population ☐
   - (4) Over 25,000 population ☐

9. (a) Year of birth _____ (b) Years in practice _____
10. Comments _____
11. Are you in general practice ☐ In a specialty ☐

**Sample questionnaire**

To preserve anonymity and induce a greater response, signatures were not requested of the respondents. This makes possible only a rough estimate of the representativeness of the 632 dentists who replied. If we suppose that the replies came principally from the 1,200 members practicing in the area, we can say that about 50 percent of the membership in active private practice filled out and returned the questionnaire. In the light of other experiences with mailed questionnaires, this can be considered a high rate of return.

Distribution by age and by place of practice of the dentists who received the questionnaire and of the 632 who replied, are given in table 1. Succeeding data are based on somewhat smaller numbers, depending on how many dentists supplied information on the particular question.

Table 1. *Percentage distribution of all dentists in area and of dentists replying to questionnaire*

| Dentists | By age (years) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Under 35 | 35–44 | 45–54 | 55–64 | 65 and over | Total | Number dentists |
| Receiving questionnaire | 9.0 | 17.4 | 41.3 | 18.7 | 13.6 | 100.0 | [1] 1,485 |
| Replying to questionnaire | 12.7 | 21.8 | 43.8 | 14.6 | 7.1 | 100.0 | 632 |

| Dentists | By geographic distribution | | | | | | |
|---|---|---|---|---|---|---|---|
| | Allegheny County | | Other than Allegheny County (population) | | | | Total |
| | Pittsburgh office buildings | Elsewhere in the county | Over 25,000 | 10,000–25,000 | 5,000–10,000 | 5,000 or less | |
| Receiving questionnaire | 22.9 | 44.0 | 4.6 | 13.6 | 7.1 | 7.8 | 100.0 |
| Replying to questionnaire | 22.1 | 43.2 | 4.8 | 16.9 | 6.1 | 6.9 | 100.0 |

[1] Distribution based on 1,394 dentists of known age.

The age distribution of the replying dentists compares favorably with that of the total profession, although there were more young men and fewer older men in the replying group. This greater tendency on the part of the younger men to reply was also observed in the 1950 Survey of the Dental Profession (*2*).

The percentage distribution of replies by place of practice corresponds closely with that of the profession: 66.9 percent of the practitioners in this area are in Allegheny County while 65.3 percent of the replies came from there. The distinction between inside and outside Pittsburgh shown on the questionnaire cannot be used here for analysis because the lists of the dental society are maintained on a postal zone basis which covers many units politically independent of Pittsburgh proper.

## Characteristics of Practice

We are mainly concerned here with questions related to the ability or willingness of dentists to increase their patient load. But first, certain general characteristics of practice in this part of the State will be described and compared with the findings of the American Dental Association 1950 Survey of the Dental Profession.

In the latter study, a far lengthier questionnaire than the one employed here was sent to a sample of 20,000 dentists throughout the country. Replies were received from more than 4,000, or better than 20 percent. The week for which the dentists were asked to supply data was April 16–22, 1950. This is comparable seasonally to the date May 7–13 of the present study.

Both studies show a marked similarity in the average number of hours spent in the office during the week and the hours at chairside and other activities (table 2). The pattern of how much time dentists devote to the office and to activities within the office is apparently the same, and it is doubtful that the slightly greater time noted by western Pennsylvania dentists is really meaningful. There was little variation within the present study from one type of community or place of practice to another.

The findings of both these studies are similar to those of Klein (*3*) who found that in February 1942 dentists spent 46.9 hours a week in the office, 34.3 hours of which were spent at the chair. By the corresponding week in 1943, when a substantial number of dentists had joined the armed forces, civilian dentists were spending 50.0 hours in the office and 37.7 hours at the chair.

A complementary question in the study reported here, which was not included in the ADA survey, concerned the dentist's professional activities outside the office, that is, in clinical work, teaching, or other pursuits. The average amount of time per dentist proved to be rather small: 1.2 hours in clinical work at schools and hospitals, 0.8 hour in teaching, and 0.5 hour attending meetings, postgraduate courses, and the like. However, a small number of practicing dentists devote a considerable amount of time to outside work and teaching. One hundred twenty-eight dentists, 21.3 percent of the total, averaged 5.5

Table 2. *Average number of hours in office during 1 week by type of activity: Present study and ADA survey*

| Activity | Present study | ADA survey |
|---|---|---|
| Total | 43.9 | 42.2 |
| At chair treating patients | 34.5 | 33.0 |
| Laboratory | 4.9 | 3.8 |
| Other work | 1.0 | 2.2 |
| Free hours | 3.5 | 3.2 |

hours in outside clinical work during the week; 33 dentists, 5.5 percent of the total, reported an average of 14.3 hours in teaching.

If the findings of the ADA survey on the employment of ancillary personnel are representative of the profession as a whole, then the dentists of this area are somewhat deficient in this respect. Only 49 percent of them stated they employed assistants, and the dental hygienists reported were negligible; whereas in the ADA survey, 64 percent of the dentists reported they employed one or more assistants on a full-time basis, and 5 percent reported the employment of dental hygienists. About one-fourth of the western Pennsylvania dentists, usually from among those who employed an assistant, reported that they used more than one dental chair.

## Number of Visits by Patients

Since only 31 of the replying dentists classified themselves as specialists, the data on patient load will be limited to general practitioners. Patient load is defined in this paper as number of visits or sittings.

The average number of patient visits reported was 57.0. This is similar to the findings in the ADA survey, 56.0, and to Klein's 1942 figure of 55.3. The variation in averages for different types of communities was, however, marked:

| *Community* | *Average number of patient visits* |
|---|---|
| Allegheny County: | |
| Medical office buildings, Pittsburgh | 45.4 |
| Elsewhere in Pittsburgh | 60.2 |
| Outside of Pittsburgh | 59.8 |
| Other than Allegheny County: | |
| 25,000 and over | 62.7 |
| 10,000 to 25,000 | 59.1 |
| 5,000 to 10,000 | 50.3 |
| Under 5,000 | 64.6 |

The patient load for each age group was as follows:

| *Age of dentist (years)* | *Patient visits* |
|---|---|
| Under 35 | 60.0 |
| 35–44 | 63.8 |
| 45–54 | 59.0 |
| 55–64 | 44.6 |
| 65 and over | 31.8 |

These age differences agree well with the findings of the ADA survey and with Klein. On the average, practicing dentists, and this is true of physicians as well, reach a peak in their patient load somewhere between the ages of 35 and 44. The decline that follows seems to be fairly rapid, a fact of extreme importance when the civilian welfare has to be considered in times of mobilization of the younger dentists.

The ADA survey found, as have other studies, that dentists who employ assistants or hygienists see more patients on the average than those who do not. Such was also the case here. Dentists employing auxiliary help saw 40 percent more patients than the group without employees. But which is cause and which is effect is hard to say. Does a dentist employ help because of the pressure of numbers of patients, or does the assistant make it possible for him to handle more people per unit of time and permit him to book more appointments? The answer may well be that both are true.

More patients were seen when the dentist had additional dental chairs. But no clear-cut interpretation of the findings can be made since the dentists who used more than one chair tended also to have assisting personnel.

## Capacity To See More Patients

As previously indicated, the primary purpose of the study was to determine the situation which exists in this area with respect to the demand for dental services and the ability of practicing dentists to assume additional patients. That the answer has important implications for a policy on dental manpower with respect to defense and mobilization efforts goes without saying.

To the question whether more patients could have been seen during the study week, 233 of the general practitioners said yes and 339, no. (For brevity's sake, the two groups will be referred to as the Yes and No groups, respectively.) Thus, the majority, 60 percent of the dentists, indicated an inability to see additional patients. Forty percent of the dentists stated that they could have seen more patients "without reducing the quality or quantity of services rendered to the patients that were seen."

Proportionally, there were more dentists under 35 years and 55 years and over in the Yes group than in the No group. In terms of the respective age groups, 52 percent of all dentists under 35 years and 47 percent of the group 55 years and over said yes to the question. For the younger group, this percentage very likely reflects the difficul-

**Table 3.** *Percentage distribution by age of dentists who could see additional patients during study week and dentists who could not*

| Age (years) | Could have seen more patients | | Percent in age group who could see more patients |
|---|---|---|---|
| | Yes | No | |
| Under 35 | 15.9 | 10.0 | 52.1 |
| 35–44 | 20.2 | 24.8 | 35.9 |
| 45–54 | 41.6 | 47.8 | 37.5 |
| 55 and over | 22.3 | 17.4 | 46.8 |
| All ages | 100.0 | 100.0 | 40.7 |
| Number of dentists | 233 | 339 | 572 |

ties confronting a beginning practitioner. In the older group, this answer may be a consequence of declining practice with increasing age. It the age groups, 35–54 years, 37 percent of the dentists said yes, while 63 percent could not see additional patients (table 3).

Table 4. *Percentage distribution by place of practice of dentists who could see additional patients during study week and dentists who could not*

| Place of practice | Could see more patients | | Percent in place of practice who could see more patients |
|---|---|---|---|
| | Yes | No | |
| Allegheny County: | | | |
| Medical office buildings, Pittsburgh | 21.0 | 17.1 | 45.8 |
| Elsewhere in Pittsburgh | 20.6 | 16.5 | 46.2 |
| Outside of Pittsburgh | 28.8 | 26.0 | 43.2 |
| Other than Allegheny County: | | | |
| 25,000 and over | 1.3 | 7.7 | 10.3 |
| 10,000 to 25,000 | 17.6 | 17.4 | 41.0 |
| 5,000 to 10,000 | 8.1 | 5.0 | 52.8 |
| Under 5,000 | 2.6 | 10.3 | 14.6 |
| All places | 100.0 | 100.0 | 40.7 |
| Number of dentists | 233 | 339 | 572 |

The percentage in the Yes group was about the same throughout Allegheny County and in the middle-sized communities outside Allegheny County (table 4). These places account for all but about 12 percent of the dentists. The low percentages saying yes in the communities of 25,000 population and over and under 5,000 may be related to the higher patient load in these places.

As might be expected, the two groups differed with respect to other characteristics. The Yes group reported an average of 0.3 assistant and 1.2 chairs per dentist, while the No group had 0.6 assistant, or twice as many, and 1.3 chairs. The Yes group had an average of 7.9 free hours in the office during the study week while the No group reported only 0.7 hour. With respect to the question of how soon a new patient could be seen the results were:

| *Could see new patient within* | *Percentage distribution* | |
|---|---|---|
| | *Yes group* | *No group* |
| 1 week | 87.1 | 23.6 |
| 2 weeks | 11.6 | 38.3 |
| Month | 1.3 | 25.1 |
| Could not see new patient within month | ------ | 13.0 |
| Total | 100.0 | 100.0 |

The Yes group was on the whole consistent in its replies in that it clearly demonstrated its capacity and willingness to accept new patients. The No group was not as definite since 24 percent could see new patients within a week and 38 percent, within 2 weeks. On the other hand, 13 percent of them would not take new patients in



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a month, and 25 percent indicated that new patients would have to wait at least 2 weeks to a month.

There were differences in patient load between the Yes and No groups (table 5). Average number of patients seen by the No group, 67.5, was 63 percent greater than the number seen by the Yes group, 41.4. Similar disparities occurred in each of the age groups.

Table 5. *Comparison of patient load of dentists who could see additional patients in study week with those who could not*

| Age of dentist (years) | Average number of patients, May 7–13 | | Ratio of No group to Yes group (=1) |
|---|---|---|---|
| | Dentists who could see more patients | Dentists who could not see more patients | |
| Under 35 | 42.8 | 78.8 | 1.84 |
| 35–44 | 45.9 | 72.8 | 1.59 |
| 45–54 | 44.8 | 67.8 | 1.51 |
| 55–64 | 32.1 | 56.7 | 1.77 |
| 65 and over | 21.9 | 38.6 | 1.76 |
| All ages | 41.4 | 67.5 | 1.63 |

The chart illustrates the distribution of the two groups according to number of patients seen, that is, the number of dentists with specified patient load is presented for each group. The two distributions are quite distinct, and a statistical test (chi square) shows that the chance is less than one in a million that the two distributions could have come from the same universe of dentists.

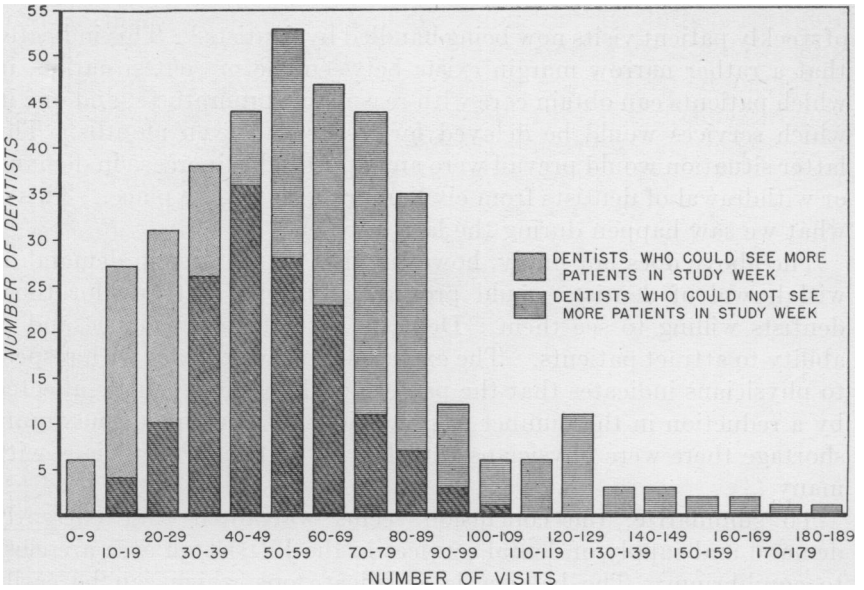
One interesting aspect of the two distributions is the overlap. Among dentists with the same patient load some indicated that they could not see more patients, others that they could. Among the dentists who said yes, 10.4 percent had patient loads equal to or higher than the average of those who said no. Among those who said no, 14.8 percent had a patient load equal to or less than the average of the dentists who said yes.

The dentists who had not achieved their maximum load were asked how many more patients they could take. The dentists in the Yes group to whom this question applied said that they could see, on the average, 15.4 more patients. This would mean for them a total of 56.8 patients in a week, which, it is important to observe, coincides with the over-all average of 57.0 patients.

## Summary and Discussion

The major pertinent findings of this survey seem to be:

1. The average weekly patient load of dentists in western Pennsylvania in 1951 is substantially the same as that observed for the country as a whole in 1950. Fewer dentists in this area have dental assistants than in the country as a whole.




**Distribution of dentists according to number of patients, western Pennsylvania, May 7–13, 1951.**

2. Approximately 60 percent of the dentists state that they are working to their desired capacity. However, among dentists under 35 and above 55 years, the percentage is about 50.

3. The patient load of dentists who have achieved their desired capacity is about two-thirds higher than the patient load of those who have not.

4. The additional patients that could be seen by the dentists who have not achieved their desired maximum would bring their patient load to the average observed for western Pennsylvania.

Consideration of these findings leads, first, to the expected conclusion that, as all human beings, dentists differ in their behavior, including their capacity to work. Among general practitioners with about the same patient load, many considered themselves fully busy and many did not; a full quota for some is not necessarily a full quota for others. The basis of such differences in behavior is in itself deserving of study.

With regard to the main issue under discussion, the evidence seems to indicate that there is the same demand for dental services as is generally found in periods of prosperity. Furthermore, the present average weekly patient load of 57 visits is about the limit to which dentists who can see more patients are willing to go. The fact that 40 percent of the dentists are not working to capacity is apparently balanced by the high patient load of the remaining 60 percent.

The additional patients that the former said they could see would result in an increase of approximately 11 percent in the total number

of weekly patient visits now being handled by dentists.[1] This indicates that a rather narrow margin exists between the present situation, in which patients can obtain care with reasonable promptness, and one in which services would be delayed for weeks and even months. The latter situation would prevail were any appreciable increase in demand or withdrawal of dentists from civilian practice to take place. This is what we saw happen during the last war (*3*).

The above does not imply, however, that an increase in demand or withdrawal of dentists would provide additional patients for those dentists willing to see them. Dentists differ in performance and in ability to attract patients. The experience of the last war with respect to physicians indicates that the pattern of differences is little affected by a reduction in the number of practitioners. In time of maximum shortage there were physicians with few patients and physicians with many (*4*).

To summarize, the conclusion seems warranted that currently demand and supply of dental services in the Pittsburgh area are close to equilibrium. The balance is a delicate one which can be easily disturbed. Any appreciable withdrawal of dentists, who will primarily come from the younger groups, can be expected to place a burden upon the remaining dentists.

## REFERENCES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(*2*) American Dental Association, Bureau of Economic Research and Statistics. 1950 Survey of the Dental Profession. The Association, Chicago, 1951.

(*3*) Klein, Henry.: Civilian dentistry in wartime. J. Am. Dent. Assoc. **31:** 648–661 (1944).

(*4*) Ciocco, Antonio, and Altman, Isidore.: A postwar survey of physicians practicing in Washington. Med. Ann. District of Columbia **16:** 575–580 (1947).


[1] If the average of 57.0 patient visits holds for all the practitioners in this area, then there were some 84,645 visits during the study week to 1,485 dentists. If we apply to this total the finding that 40.7 percent of the general practitioners could see an average of 15.4 more patients, then 9,300 more patients could be seen. This represents 11 percent of 84,645.

# Domestic Water and Dental Caries

## VII. A Study of the Fluoride-Dental Caries Relationship in an Adult Population

By A. L. Russell, D.D.S., M.P.H., and Elias Elvove, Ph.D.*

Exhaustive studies of the fluoride-dental caries relationship in children have invariably demonstrated a marked inhibition of the disease in children who have always used a domestic water containing 1.0 part per million or more of fluorides. In adults, however, very few such studies have been reported and the findings are not in general agreement. Weaver concluded that fluoride ingestion had merely postponed the onset of dental caries by about 5 years in 100 young British mothers (*1*, *2*). Deatherage, on the contrary, observed caries-inhibitory effects which were still pronounced in Illinois males with a mean age of 25 years (*3*, *4*), while McKay, after a study of natives of Colorado Springs, concluded that "the inhibitory effect of fluoride, once acquired, is permanent" (*5*). Further study of the fluoride-dental caries relationship in representative adult populations seemed to be indicated.

### The Study Cities

Colorado Springs, Colo., was selected for the present investigation, principally because of its long and reliable fluoride history. Nearby Boulder, Colo., was utilized as a control.

The populations of the two cities were 36,789 and 12,985, respectively, in 1940. Both lie in the semiarid plain at the eastern border of the Rocky Mountains, at altitudes of 6,098 and 5,404 feet. Since 1906 their average mean annual temperatures have been 48.1° and 50.6° and their mean annual precipitations, 14.8 and 18.9 inches, respectively; during this period the two weather stations have recorded about the same number of clear, partly cloudy, and cloudy days.

Native-born whites made up 98 percent of the Boulder population and 96 percent of the Colorado Springs population in both 1930 and 1940. Neither can be considered an aging nor a young population with respect to the other; both are highly literate. In general, workers in the two communities followed much the same occupations and earned about the same amounts in wages or salaries. Compared with the United States as a whole, the two communities depend for income

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rather more upon wholesale and retail trade, the professions, and services of various kinds, and sharply less upon manufacturing.

## The Water Systems

The two water systems are essentially similar. In both, water is collected and stored in well-demarcated mountain watersheds and conveyed to reservoirs in or near the cities through closed pipeline systems. The pipelines and the underlying granites of the watersheds preclude the entry of ground water at any point. Except for the enlargement of storage facilities within the present watersheds, neither has been significantly altered since the summer of 1906, when both pipeline systems were put in operation.[1]

### *Colorado Springs Water System*

An earlier report described the Colorado Springs water system in detail and summarized the epidemiological evidence that fluorine has been a constituent of Colorado Springs tap water for more than 50 years (*6*). Further evidence that a constant amount of fluoride has been present in Colorado Springs water for at least 44 years will be presented in this report. Twelve consecutive monthly samples of Colorado Springs tap water have twice been analyzed at the National Institutes of Health. Between November 1933 and October 1934 the mean annual level was 2.5 ppm of fluorides, with a high content of 3.0 ppm in February, March, and April and a low of 1.8 ppm in August (*7*). Between March of 1940 and February of 1941 a similar series of analyses showed a mean annual content of 2.55 ppm of fluorides, with a high level of 2.8 ppm in March and a low of 2.4 ppm in June and August (*6*).

### *The Boulder Water System*

The only known fluoride deposit in the Boulder watershed is about 60 feet below the surface and is virtually inaccessible to water in the system itself (*8, 9*). The entire watershed, comprising 19.3 square miles, is limited on the west by the Continental Divide and on the north and south by steep ridges varying in elevation from 11,100 to 13,515 feet. Its rocks are mainly pre-Cambrian schists and gneisses, with intrusions of tertiary granite and pegmatites (*8*). Water for winter use is stored in 11 mountain reservoirs which drain about 8.7 square miles of the watershed proper.

From these reservoirs the water flows for 17,800 feet through a pipeline into the Lakewood reservoir which, during the warmer months,

[1] Colorado Springs, in December of 1950, began to take about 2,000,000 gallons of water per day from Fountain Creek, which drains an area somewhat north of the present watershed. Clinical examinations were completed there during the following week. A sample of Fountain Creek water analyzed by Elvove in October 1944 contained 2.8 parts per million of fluorides.

drains the entire watershed; thence through 13.6 miles of pipeline to two reservoirs at the edge of the city; and finally into the distribution mains.

Twelve samples of Boulder tap water collected at monthly intervals between March of 1950 and February of 1951 have been analyzed for chemical content by Elvove. These findings are presented in table 1. Only trace amounts of fluoride were found, and these only in the samples collected in April, May, and August of 1950.

A sample of Boulder tap water analyzed by the same chemist in 1945 presented much the same composition.

Table 1. *Analyses of water samples from Boulder, Colo.*

| Composition | Mar. 1950 | Apr. 1950 | May 1950 | June 1950 | July 1950 | Aug. 1950 | Sept. 1950 | Nov. 1950 | Dec. 1950 | Jan. 1951 | Feb. 1951 | Mar. 1951 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Parts per million | | | | | | | | | | | |
| Total dissolved solids (103° C.) | 21.9 | 32.0 | 27.2 | 18.8 | 15.2 | 16.0 | 16.0 | 26.4 | 24.0 | 16.0 | 32.0 | 36.0 |
| Loss on ignition | 3.5 | 10.8 | 10.0 | 4.4 | 3.6 | 4.8 | 4.0 | 5.6 | 4.8 | 4.0 | 8.0 | 8.8 |
| Fixed residue | 18.4 | 21.2 | 17.2 | 14.4 | 11.6 | 11.2 | 12.0 | 20.8 | 19.2 | 12.0 | 24.0 | 27.2 |
| Silica ($SiO_2$) | 4.0 | 2.4 | 6.4 | 4.0 | 1.6 | 1.6 | 2.4 | 4.0 | 4.0 | 6.4 | 9.6 | 10.4 |
| Iron (Fe) | .08 | .15 | .22 | .08 | .03 | .08 | .14 | .14 | .12 | .02 | .10 | .08 |
| Aluminum (Al) | .02 | 0 | .05 | .01 | 0 | 0 | .01 | .01 | .01 | 0 | 0 | .02 |
| Calcium (Ca) | 4.6 | 4.6 | 4.6 | 2.3 | 2.3 | 2.3 | 2.3 | 4.0 | 3.4 | 1.7 | 4.0 | 4.0 |
| Magnesium (Mg) | .9 | 1.4 | .9 | .5 | .7 | .7 | .7 | .9 | .7 | .5 | 1.2 | 1.2 |
| Sodium and potassium (calculated as Na) | .8 | 2.0 | .5 | 2.2 | 1.2 | .2 | .2 | .7 | .3 | .2 | .2 | .9 |
| Carbonate ($CO_3$) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bicarbonate ($HCO_3$) | 19.5 | 20.7 | 15.9 | 12.2 | 12.2 | 9.8 | 9.8 | 12.2 | 12.2 | 4.9 | 17.1 | 17.1 |
| Sulfate ($SO_4$) | 2.9 | 1.2 | 2.1 | 2.2 | 2.5 | 1.6 | 2.5 | 1.2 | 3.3 | 2.5 | 3.3 | 2.9 |
| Nitrate ($NO_3$) | .6 | .3 | .4 | .4 | .3 | .2 | .3 | .2 | .2 | .2 | .3 | .2 |
| Chloride (Cl) | .1 | .1 | .2 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .2 |
| Phosphate ($PO_4$) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fluoride (F) | 0 | .1 | .1 | 0 | 0 | .1 | 0 | 0 | 0 | 0 | 0 | 0 |

## Assembly of Examination Lists

The examination lists were based upon school census records, birth records, marriage records, and city directories; the same compilation procedure was followed in both cities. Age limits of 20 through 44 years were established because younger persons were not listed in the directories, and because Boulder tap water may have contained fluorides from adjacent watersheds prior to establishment of the pipeline system in 1906. A white male was included in the sample if he was listed as a student in the school census record for 1920, 1930, or 1940 and as a resident in the current city directory, and if his birth record indicated that his mother's usual residence at the time of his birth was accessible to the city water system as it then existed. The same procedure was followed for white females, except that it was necessary to procure the married name from the county marriage records before the lists could be checked against the birth records or the directories.[2]

[2] Listing of females was incomplete in both city directories; about 30 percent of females in the samples were discovered through a check of the city telephone directories.

## The Study Samples

When assembled, the sample lists were compared for race and occupation with 1940 census data. The samples proved to be random cross sections of all the people of the two communities. An attempt was made to examine each listed person, and it is believed that about five-sixths of the actual number of eligible persons was examined in each community.

All of the persons reported upon here were white native residents of one of the two cities. In each community about 90 percent of their parents had been born in the United States, about 3 percent in the British Empire, about 3 percent in one of the Scandinavian countries, and about 1 percent in Central Europe. More than half of the women were housewives and most of the rest were clerical and sales workers. Most of the men were professional or semiprofessional workers, business proprietors, skilled craftsmen, or students. There were comparatively few unskilled or semiskilled workers in either group. As estimated from 1940 census data, the past per capita incomes of the two groups seem to have been very nearly the same. College graduates made up a high percentage of each sample—about 40 percent at Boulder and about 20 percent at Colorado Springs. Both groups had received adequate dental care of high quality and personal dental hygiene was generally good.

## Criteria and Method of Examination

Clinical dental examinations were conducted in Boulder in July and August 1950, and in Colorado Springs during September, October, and December of the same year. All examinations were made by the senior author, using mouth mirror and explorer. Most of the examinations were made by appointment at a central clinic [3] where a dental chair and operating light were available. Nonresponse was tested through house calls or calls at the place of employment; examinations away from the clinic were made under light from a Hood head lamp.

"Catches," or deep pits and fissures, were not considered carious in the absence of other indications of caries. The outline of each lesion or restoration was sketched on a morphological tooth chart by the examiner. The primary reason for extraction, based upon a history of signs and symptoms, was recorded for each missing tooth. The condition of the gingival tissues was assessed in detail. The criteria for fluorosis followed those established by Dean (*10*). Also recorded for each examinee were his name, age, sex, present address, usual occupation, number of school years completed, water and residence histories, and the salient facts of his health history. The examination and history taking required about 15 minutes per person.

[3] In the Boulder Medical Center at Boulder and in Memorial Hospital, Colorado Springs.

The findings for each examinee were included in the tabulation if his residence and usage of the local water were unbroken except for periods not exceeding 60 days during the commonly accepted calcification and eruption periods of the permanent teeth, and if thereafter he had spent more than half of his life in residence with use of the water in question. The commonest history showed unbroken residence for 18 to 20 years, departure to enter school or the armed forces, and return when schooling or the period of service had been completed.

In tabulation a tooth with an unfilled carious lesion plus a restoration was counted as a filled tooth.

## Findings

### *Fluorosis*

All of the eligible persons examined at Boulder were free of fluorosis.

The distribution of fluorosis ratings by individuals at Colorado Springs is shown in table 2. The odds are about five to one that all variations from the common pattern are due to chance. This finding supports the deduction of Dean, Arnold, and Elvove that "the inhabitants of Colorado Springs . . . . have been using a relatively similar type of water for at least as long as 60 years" (*6*).

Table 2. *Individual fluorosis ratings of Colorado Springs natives, 1950*

| Age group | Number of persons | Numbers with stated degree of fluorosis | | | | |
|---|---|---|---|---|---|---|
| | | Normal or questionable | Very mild | Mild | Moderate | Severe |
| 20–24 | 72 | 15 | 29 | 20 | 7 | 1 |
| 25–29 | 101 | 18 | 41 | 35 | 6 | 1 |
| 30–34 | 82 | 15 | 41 | 16 | 8 | 2 |
| 35–39 | 75 | 10 | 34 | 24 | 6 | 1 |
| 40–44 | 55 | 5 | 29 | 14 | 5 | 2 |
| Total | 385 | 63 | 174 | 109 | 32 | 7 |

### *Decayed, Missing, or Filled Permanent Teeth*

The age-sex composition of the study groups, with their rates for DMF (decayed, missing, or filled permanent) teeth are summarized in table 3 and pictured in figure 1. For purposes of comparison, DMF rates reported for insurance company employees in New York City by Hollander and Dunning (*11*) are also shown in figure 1. The Boulder rates lag the New York rates at the three younger age points.[4] Particularly at Boulder there was a tight grouping of individual

[4] Delayed onset of dental caries may be typical of this geographical area. Senn reported a DMF rate of 11.8 for Colorado aviation cadets against a rate of 19.4 for similar cadets from the State of New York (*12*). While his Colorado group probably included men from fluoride as well as nonfluoride areas, his rates for Montana and Wyoming are also low (10.5 and 13.1, respectively) and fluoride waters are less common in the two latter States. Schlack and Birren found an average of 11.7 dental defects per man in 3,672 naval recruits from Arizona, Colorado, Idaho, Montana, Nevada, Utah, and Wyoming, compared with 17.6 per man in 12,972 recruits from New Jersey, New York, and Pennsylvania (*13*).



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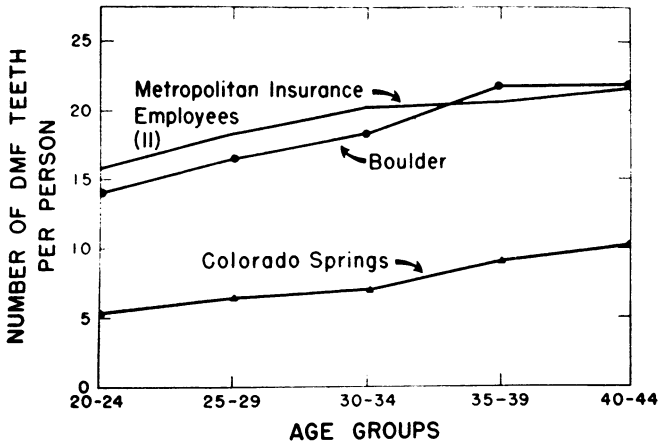


Figure 1. Total DMF rates, third molars excluded, in adult natives of Boulder and of Colorado Springs, Colo., compared with rates reported for Metropolitan Life Insurance Company employees.

findings around the average finding so that standard deviations are narrow in ratio to the rates, and the standard errors are small. Hence, these rates are more dependable than rates taken from typical samples of children many times larger would have been (*14*). They plot smoothly and follow the general shape of the Colorado Springs curve except at ages 40–44, where the standard error is wide and the actual finding may be somewhat low. The differences between the two communities are statistically valid at each age point and for the pattern as a whole.

In children the DMF rate is a measure of dental caries experience and little else. In adults it also includes an accumulation of teeth lost from periodontal disease or from trauma, or restored because of fracture, erosion, and the like. Those fractions of the present rates which were due primarily to causes other than dental caries are indicated in table 3. They are approximately equal in the two study groups—amounting, over-all, to about 1.0 tooth per person at Boulder and to about .8 tooth per person at Colorado Springs. Hence the disparity in the rates is due to a difference in dental caries experience in the two populations. The Colorado Springs rate is about 60 percent less than the Boulder rate at each age point. This is about the same magnitude of dental caries inhibition previously reported for children who were natives of a fluoride area (*15*).

### *Filled Tooth Surfaces*

In each group about three-quarters of all DMF teeth were filled. There was a tendency toward pit-and-fissure fillings at Colorado Springs, and toward multisurface restorations at Boulder. This difference is conservatively expressed by the ratio of filled surfaces to

Table 3. *Total numbers of decayed, missing, and filled permanent teeth in adult natives of Boulder and Colorado Springs, Colo., excluding third molars*

| Age group, years | Number of persons | | | Numbers of teeth | | | | DMF rate | Standard deviation of the rate | Standard error of the rate | Segment of rate due to | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Both | Decayed | Missing | Filled | Total DMF | | | | Periodontal disease | Other causes |
| **Boulder** | | | | | | | | | | | | |
| 20–24 | 22 | 29 | 51 | 56 | 64 | 596 | 716 | 14.0 | 4.9 | 0.69 | ..... | 0.2 |
| 25–29 | 26 | 15 | 41 | 49 | 104 | 523 | 676 | 16.5 | 5.5 | .86 | ..... | .5 |
| 30–34 | 17 | 12 | 29 | 33 | 116 | 381 | 530 | 18.3 | 5.2 | .97 | 1.9 | .1 |
| 35–39 | 8 | 14 | 22 | 14 | 250 | 216 | 480 | 21.8 | 5.1 | 1.09 | 1.3 | .1 |
| 40–44 | 6 | 6 | 12 | 11 | 145 | 104 | 260 | 21.7 | 6.0 | 1.73 | 2.3 | .3 |
| All ages | 79 | 76 | 155 | 163 | 679 | 1,820 | 2,662 | 17.2 | ..... | ..... | .7 | .3 |
| **Colorado Springs** | | | | | | | | | | | | |
| 20–24 | 36 | 36 | 72 | 16 | 41 | 332 | 389 | 5.4 | 5.1 | 0.60 | ..... | 0.2 |
| 25–29 | 61 | 40 | 101 | 30 | 90 | 536 | 656 | 6.5 | 5.0 | .50 | ..... | .3 |
| 30–34 | 55 | 27 | 82 | 10 | 93 | 476 | 579 | 7.1 | 4.9 | .54 | ..... | .3 |
| 35–39 | 51 | 24 | 75 | 13 | 240 | 435 | 688 | 9.2 | 7.0 | .81 | 1.0 | .6 |
| 40–44 | 36 | 19 | 55 | 7 | 170 | 388 | 565 | 10.3 | 6.4 | .86 | .6 | 1.0 |
| All ages | 239 | 146 | 385 | 76 | 634 | 2,167 | 2,877 | 7.5 | ..... | ..... | .3 | .5 |

filled teeth. At all ages the mean number of filled surfaces per filled tooth was slightly more than two at Boulder and slightly more than one and one-half at Colorado Springs. The ratios for all teeth, by age groups, are shown in figure 2.

### *Caries-Free Individuals*

No person in the Boulder group was caries-free. Caries-free individuals made up the following percentages of persons examined at Colorado Springs:

| *Age group* | *Colorado Springs, percent caries-free* |
|---|---|
| 20–24 | 26.4 |
| 25–29 | 7.9 |
| 30–34 | 7.3 |
| 35–39 | 9.3 |
| 40–44 | 1.8 |

### *Tooth Mortality*

Data concerning tooth mortality in the two communities are given in table 4. The rates are significantly different at each age point and for the pattern as a whole. Compared with Colorado Springs, Boulder natives had lost more than three times as many teeth from dental caries, appreciably but not significantly more from periodontal disease, and slightly and insignificantly fewer from other causes.

When tooth mortality rates are plotted against the number of school years completed per person (fig. 3), there is a considerable difference in favor of those persons who had completed one or more years of

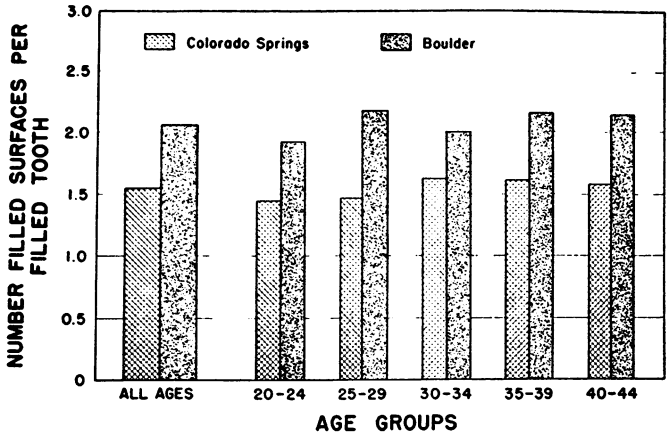


**Figure 2. Mean numbers of filled tooth surfaces per filled tooth in adult natives of Boulder and of Colorado Springs, Colo.**

college. This is not due to a preponderance of college people at the younger ages and of noncollege people at the older ages, a fact illustrated by the age-specific breakdown in figure 4.

**Table 4.** *Tooth mortality experience in adult natives of Boulder and of Colorado Springs, Colo., third molars excluded*

| Age group, years | Number persons | Number missing teeth | Total tooth mortality rates | | | Teeth missing due to— | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mortality rate | Standard deviation | Standard error | Dental caries | | Periodontal disease | | Other | |
| | | | | | | Number | Rate | Number | Rate | Number | Rate |
| **Boulder** | | | | | | | | | | | |
| 20–24 | 51 | 64 | 1.26 | 2.10 | 0.29 | 53 | 1.04 | ------ | ------ | 11 | 0.22 |
| 25–29 | 41 | 104 | 2.54 | 3.71 | .58 | 88 | 2.15 | 1 | 0.02 | 15 | .37 |
| 30–34 | 29 | 116 | 4.00 | 7.16 | 1.33 | 59 | 2.03 | 56 | 1.93 | 1 | .03 |
| 35–39 | 22 | 250 | 11.36 | 11.94 | 2.55 | 221 | 10.05 | 28 | 1.27 | 1 | .05 |
| 40–44 | 12 | 145 | 12.08 | 11.37 | 3.28 | 116 | 9.67 | 27 | 2.25 | 2 | .17 |
| All ages | 155 | 679 | 4.38 | ------ | ------ | 537 | 3.47 | 112 | .72 | 30 | .19 |
| **Colorado Springs** | | | | | | | | | | | |
| 20–24 | 72 | 41 | 0.57 | 1.50 | 0.18 | 28 | 0.39 | 2 | 0.03 | 11 | 0.15 |
| 25–29 | 101 | 90 | .89 | 1.54 | .15 | 74 | .73 | 1 | .01 | 15 | .15 |
| 30–34 | 82 | 93 | 1.13 | 1.93 | .21 | 75 | .92 | 1 | .01 | 17 | .21 |
| 35–39 | 75 | 240 | 3.20 | 6.42 | .74 | 122 | 1.63 | 77 | 1.03 | 41 | .55 |
| 40–44 | 55 | 170 | 3.09 | 5.55 | .75 | 100 | 1.82 | 32 | .58 | 38 | .69 |
| All ages | 385 | 634 | 1.65 | ------ | ------ | 399 | 1.04 | 113 | .29 | 122 | .32 |

Since two-thirds of the Boulder group were college people and two-thirds of the Colorado Springs group were noncollege people, it is clear that tooth mortality rates must be adjusted for this factor if direct comparisons between the two groups are to be considered valid.

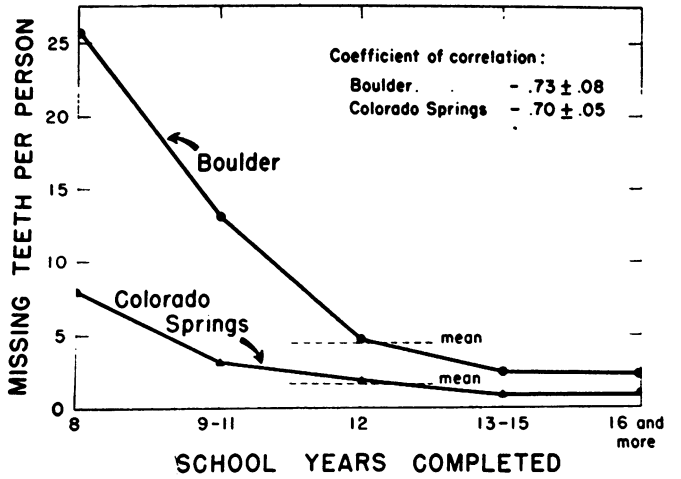


Figure 3. Tooth mortality rates in the two groups of Boulder and of Colorado Springs, Colo., natives, by number of school years completed.

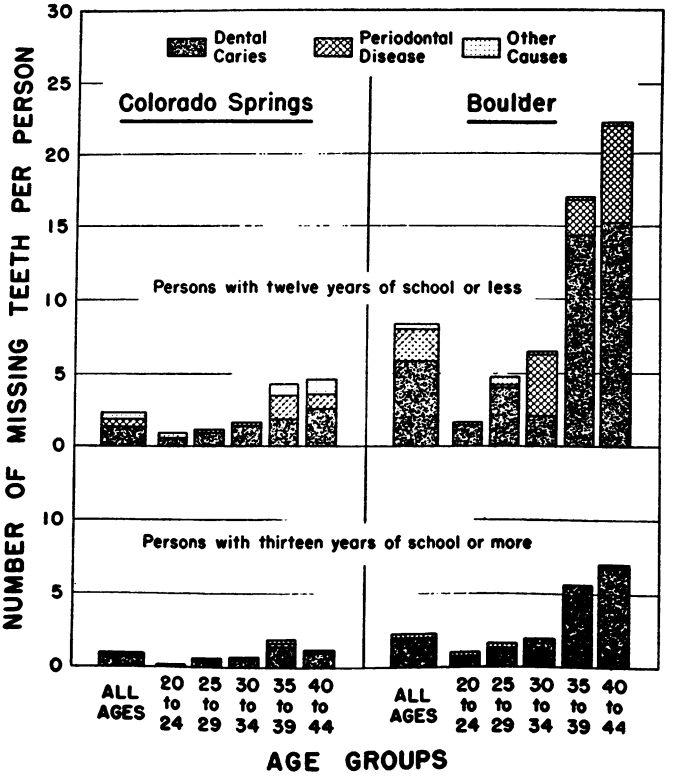


Figure 4. Tooth mortality rates in Boulder and in Colorado Springs, Colo., natives with 12 years of school or less and with 13 years of school or more, third molars omitted.

Tooth mortality rates so adjusted are listed in table 5 and portrayed in figure 5. The effect of this adjustment is to raise Boulder tooth mortality rates as compared with Colorado Springs. On this basis Boulder natives have lost about four times as many teeth from dental caries as have natives of Colorado Springs.

*Third Molars*

Third molars have been excluded in all of the data so far presented. In both populations the percentages of third molars in eruption which were decayed, missing, or filled was high, rising with age from 70 to nearly 100 percent at Boulder and from 50 to over 90 percent at Colorado Springs. About three-quarters of all DMF third molars were missing in both groups. At Boulder 94 percent of third molar loss was reported as due to dental caries and about three percent as due to malposition of the teeth. At Colorado Springs about 36 percent of third molar loss was reportedly due to dental caries and about 62 percent to malposition of the teeth.

## Discussion

The most reliable measure of the difference in the dental caries experience of these two groups is the difference between their total DMF rates (table 3 and fig. 1). These rates were not disturbed by differences in sex, education, or economic status, and so far as they are concerned the two groups seem to be directly comparable in every respect except use of a fluoride-free water on the one hand and use of a fluoride-bearing water on the other. They support the findings

Table 5. *Tooth mortality rates in natives of Boulder and of Colorado Springs, Colo., adjusted for numbers of school years completed*

| Age group | Total mortality rate | Fraction of rate due to | | |
|---|---|---|---|---|
| | | Caries | Periodontal disease | Other |
| **Boulder** | | | | |
| 20–24 | 1.38 | 1.19 | | 0.19 |
| 25–29 | 3.27 | 2.83 | 0.05 | .39 |
| 30–34 | 4.25 | 2.04 | 2.17 | .04 |
| 35–39 | 11.41 | 10.08 | 1.28 | .05 |
| 40–44 | 14.68 | 11.09 | 3.40 | .19 |
| All ages | 5.33 | 4.07 | 1.06 | .19 |
| **Colorado Springs** | | | | |
| 20–24 | 0.48 | 0.33 | 0.02 | 0.13 |
| 25–29 | .84 | .69 | .01 | .14 |
| 30–34 | 1.09 | .86 | .01 | .22 |
| 35–39 | 3.10 | 1.61 | .96 | .52 |
| 40–44 | 2.94 | 1.76 | .54 | .65 |
| All ages | 1.55 | .99 | .27 | .30 |

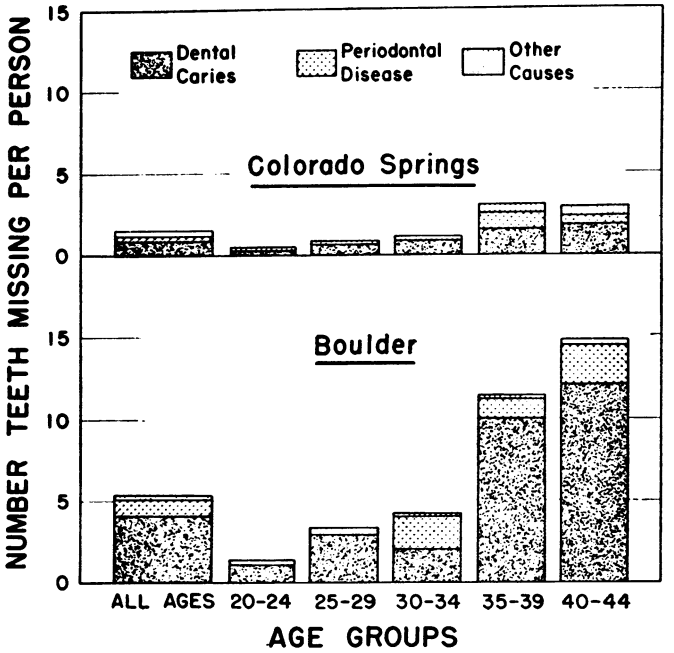


Figure 5. Tooth mortality rates in natives of Boulder and of Colorado Springs, Colo., adjusted for the common number of school years completed.

of Deatherage (*3*, *4*) in all respects and, although somewhat higher than those reported from a less representative group, are in accord with the principal conclusions of McKay (*5*).[5]

Direct comparisons with Weaver's data are not valid since he presents essentially tooth mortality rates; in his nonfluoride and fluoride groups 86.2 percent and 82.4 percent, respectively, of all DMF teeth were missing or indicated for extraction. His sample was highly selected—"mothers attending maternity and child welfare centers," of whom the great majority "had not well-cared-for mouths" (*2*). The present findings (fig. 4) indicate that tooth mortality may be affected by factors other than the severity of dental caries per se. For example, a considerable tooth loss from periodontal disease may occur in Colorado citizens with less than average schooling at the ages considered by Weaver in his study. None of the data for the Colorado groups suggest that Colorado Springs caries rates will "catch up" with those for Boulder natives inside a normal human life span.

## Summary and Conclusions

1. Objective lists of natives 20–44 years old with verified histories of residence and water usage were prepared in Boulder, Colo., where

[5] Since this report was prepared for publication a personal communication describing a comparable study has been received from Peter Adler. Adler found that female natives of Kunszemarton, Hungary, where the water contains from 0.8 to 1.6 ppm of fluorides, showed lower dental caries rates through the age range of 21 to 45 years than did newcomers to Kunszemarton or comparable natives of Nagybaracska, Debrecen, and vicinity who had used waters which were low in fluoride.

the communal water is virtually fluoride-free, and in Colorado Springs, Colo., where the communal water contains about 2.5 ppm of fluorides. The cities are otherwise similar and the two groups are comparable in race and occupation. Persons on the lists were given dental examinations with mouth mirror and explorer.

2. The prevalence of fluorosis was uniform through the age range at Colorado Springs. No fluorosis was seen in natives of Boulder.

3. Total rates for decayed, missing, or filled permanent teeth were about 60 percent lower in Colorado Springs than in Boulder for each age group. The phenomenon of caries inhibition continued undiminished through the age of 44 years.

4. Boulder natives had lost three or four times as many teeth from dental caries as had natives of Colorado Springs.

5. The observed caries-inhibitory effect was essentially similar in pattern and in magnitude to that seen in children native to fluoride areas.

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# The Viability *of Brucella melitensis* in Naturally Infected Cured Hams

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The fate of *Brucella* in the carcasses of naturally infected hogs subjected to packing plant processing is of considerable interest and importance. The lack of adequate data in this area is somewhat surprising. Huddleson et al. (*1*) studied the viability of *Brucella suis* in the spleens of naturally infected swine immersed in brine and held at a temperature of 40° F. Cultures were made periodically up to 45 days. They found a considerable reduction in the number of organisms recovered after 5 days in brine as compared to fresh specimens, but in some instances positive cultures were obtained after 40 days. The distribution of *Br. suis* in fresh hog carcasses and the viability under refrigeration were reported in previous studies (*2*). *Br. suis* was found to be widely disseminated throughout the carcass and to remain viable under refrigeration for as long as 21 days.

The present study was undertaken primarily to determine the effect of curing and smoking on the viability of *Brucella* in naturally infected hams. Limited data are also presented on the survival of *Brucella* in cured shoulders and on the distribution of *Brucella melitensis* in the fresh hog carcass.

## Materials and Methods

Eleven yearling hogs weighing from 300 to 400 pounds were purchased in May 1949 from a herd in southern Indiana which was exhibiting marked clinical evidence of brucellosis. Numerous abortions prompted the owner to dispose of the herd. The purchased hogs all had positive *Brucella* agglutination tests as determined by the standard test tube method. All cultures obtained from these hogs were identified as *Br. melitensis* by the usual procedures. Identification of the *Brucella* species was accomplished by determination of $CO_2$ requirement, $H_2S$ production, growth on differential dye plates, and by the use of specific absorbed typing sera.

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Prior to slaughter, blood for culture was obtained from each animal. The hogs were slaughtered and processed in an improvised abbatoir closely simulating packing plant conditions. The animals were killed by sticking in the fashion usually employed commercially. Bleeding, scalding, dehairing, cutting of the carcass, chilling, and injection and curing of the hams and shoulders were all done by experienced specialized personnel from one of the Chicago packing plants. All operations were closely controlled according to the specifications used commercially.[1]

Immediately after slaughter, cultures for *Brucella* were made from the following areas of the carcass: mandibular, suprapharyngeal, cervical, prescapular, bronchial, gastrohepatic, mesenteric, superficial inguinal, internal iliac, prefemoral and uterine lymph nodes, liver, spleen, loin muscle, ovaries, uterus, and mammary glands.

Twenty-four hours after slaughter, immediately after pumping of the hams and before placing them in cover solution, cultures were made of the ham muscle, prefemoral and popliteal lymph nodes, and any other nodes which had not been removed in the trimming process. The specimens were divided into two equal groups, each group comprised of one ham from each hog. One group of specimens was studied at the Purdue University Department of Veterinary Science Laboratories; the other group was studied at the Brucellosis Laboratory of the University of Chicago and the National Institutes of Health. The cultural methods employed were those in routine use in the respective laboratories and have been described previously (*2–4*). The hams were held in cover solution in refrigerators at 32° to 36° F. for 20 or 21 days.

During the period that the hams were held in cover solution, cultures from lymph nodes and muscles were made at intervals as detailed in table 3. Parallel guinea pig inoculations were also done in most instances.

After 20 days some of the hams previously yielding positive cultures were subjected to "smoking." This process was carried out in the usual manner in a commercial packing plant.[2] The smoked hams were then returned to the respective laboratories and thoroughly examined. All available lymph nodes and samples of the ham muscle were cultured, and tissue suspensions were injected into guinea pigs. The main vascular trees were dissected and ground up for culture and animal inoculation.

The pickled shoulders were similarly divided into two groups, held

[1] The pumping solutions and cover pickle regularly used commercially were provided by a Chicago packing plant. The salt content of the solutions was as follows: ham pumping, 21.8 percent; ham cover pickle, 14.8 percent; shoulder pumping, 16.7 percent; shoulder cover pickle, 11.8 percent. Information on the other ingredients of the solutions is not available to us.

[2] The smoking operations specified a 21-hour period at 148°–150° F. which is sufficient to establish a minimum internal temperature of 137° F.

Table 1. Brucella *agglutination titers of 11 hogs naturally infected with* Brucella melitensis

| Hog No. | Serum dilution | | | | |
|---|---|---|---|---|---|
| | 1/25 | 1/50 | 1/100 | 1/200 | 1/400 |
| 1 | + | + | + | + | P |
| 2 | + | + | + | P | T |
| 3 | + | + | + | + | T |
| 4 | + | + | P | T | |
| 5 | + | + | + | + | P |
| 6 | + | P | T | | |
| 7 | + | + | + | + | P |
| 8 | + | + | P | T | |
| 9 | + | + | P | T | |
| 10 | P | T | | | |
| 11 | P | P | T | | |

+=complete agglutination.
P=partial agglutination.
T=trace agglutination.

in cover solution at refrigeration, and cultured periodically. But the sparsity of available attached lymph nodes made this part of the study less satisfactory. None of the shoulders were subjected to the smoking process.

## Results

The agglutination titers of the slaughtered hogs are presented in table 1. Tests were positive in some degree in all 11 hogs, but as would be expected, the variation was considerable. In 4 animals agglutination was complete at a dilution of 1/200, while for 2 other animals agglutination was only partial at the lowest dilution, 1/25. In 5, agglutination was complete at a dilution of 1/100, with complete or partial agglutination at one or more higher dilutions. Of the blood cultures made the day before slaughter, only one was positive, that of hog No. 2.

Data on the distribution of *Br. melitensis* in the carcasses of the 11 slaughtered hogs are presented in table 2. When possible, bacteriologic examinations were made of 27 areas, 19 lymph nodes, and 8 other tissues or organs, but in some animals all areas were not available for culture. *Brucella* organisms were recovered from widely scattered tissues throughout the body. *Brucella* was recovered in one or more animals from every area cultured with the exception of loin muscle. Of the 272 cultures of the fresh carcasses which were made, 100, or 36.8 percent, yielded *Brucella*.

Data are presented in table 3 on the survival of *Br. melitensis* in hams at varying periods after pumping and submersion in cover pickle. Only the 15 hams are included from which *Brucella* was recovered on one or more occasions. These represent specimens from 10 of the 11 hogs. Failure to recover *Brucella* from either ham occurred only with hog No. 6. However, 12 of the 26 fresh carcass cultures in this animal (table 2) yielded *Brucella*.

In 9 of the 15 hams, *Br. melitensis* was recovered from the ham muscle or from the lymph nodes normally present in market hams for as long as 14 to 21 days after pumping and submersion in cover pickle. In the initial culturing immediately after pumping but prior to submersion in the cover pickle, *Brucella* was recovered in only 9 of the 22 hams, but positive cultures were obtained in subsequent samplings from 6 additional hams. In 6 hams (3L, 5R, 7L, 7R, 10R, 11L) individual lymph nodes which had been negative to culture on the first two or three attempts eventually yielded the organism on subsequent reculturing. In the 15 hams, a total of 21 different areas yielded *Brucella*, positive cultures being obtained from two or three different areas in 5 hams.

In the 11 hams subjected to the smoking process after 20 days in cover pickle, *Brucella* was not recovered in any instance.

Table 2. *Distribution of* Brucella melitensis *in the tissues of 11 naturally infected hogs at the time of slaughter*

| Tissue | Hog No. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| Lymph nodes: | | | | | | | | | | | |
| Right prefemoral | − | + | − | − | − | + | + | + | − | + | − |
| Left prefemoral | − | + | − | − | − | + | + | − | + | + | − |
| Right superficial inguinal | + | + | − | − | − | + | + | − | + | − | − |
| Left superficial inguinal | − | + | − | − | − | + | + | − | + | − | − |
| Right internal iliac | − | − | + | − | − | + | − | + | + | + | − |
| Left internal iliac | + | + | − | − | − | + | − | + | + | − | − |
| Mesenteric | − | + | − | − | + | − | − | + | + | + | − |
| Bronchial | + | + | − | + | − | + | + | + | + | + | − |
| Gastrohepatic | + | + | − | + | + | − | + | + | + | + | − |
| Right mandibular | − | + | − | − | − | + | − | + | + | + | − |
| Left mandibular | + | + | − | + | + | + | − | + | + | + | + |
| Right suprapharyngeal | − | − | ---- | + | − | − | − | − | + | − | ---- |
| Left suprapharyngeal | − | − | ---- | + | − | ---- | + | − | − | − | ---- |
| Right prescapular | − | − | ---- | − | − | − | − | + | − | − | − |
| Left prescapular | − | + | ---- | − | − | − | − | − | − | − | − |
| Right uterine | ---- | + | ---- | ---- | − | − | ---- | − | ---- | ---- | ---- |
| Left uterine | ---- | + | ---- | ---- | − | − | ---- | − | ---- | ---- | ---- |
| Right cervical | ---- | + | − | ---- | − | + | + | − | − | − | + |
| Left cervical | + | + | − | ---- | − | − | − | − | − | − | − |
| Liver | − | − | + | − | + | + | − | − | + | − | − |
| Spleen | − | + | + | + | − | + | − | − | + | − | − |
| Loin muscle | − | − | − | − | − | − | − | − | − | − | − |
| Right ovary | − | + | − | − | + | − | − | − | − | − | − |
| Left ovary | − | + | − | − | + | − | − | − | − | − | − |
| Uterus, right horn | − | + | + | − | + | − | − | + | − | − | − |
| Uterus, left horn | − | + | + | − | − | − | − | + | − | − | − |
| Mammary glands | − | − | − | ---- | + | − | + | − | − | − | − |

+ = *Brucella melitensis* recovered by culture.
− = *Brucella* not recovered.

Due to the lack of available lymph nodes, the studies on the cured shoulders were unsatisfactory and not comparable to those with the hams. *Brucella* was isolated in seven instances only. Of the cultures taken immediately after pumping and before the shoulders were placed in the cover pickle, those from five of the shoulders yielded *Br. melitensis*, the organism being recovered from cultures of muscle from all five and from attached lymph nodes of two of them. One of these

Table 3. *Survival of* Brucella melitensis *in hams from naturally infected hogs during the curing process*

| Ham No. | Lymph node or tissue | Days in cover pickle | | | | | | | After smoking [2] |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 [1] | 6 | 7 | 14 | 17 | 19 | 21 | |
| 1L | Ham | − | | − | − | | − | | − |
| | Iliac | + | | | | | | | |
| | Prefemoral | | | | − | | | | − |
| | Popliteal | + | | − | − | | − | | − |
| 2L | Ham | − | | − | − | | − | | − |
| | Iliac | | | − | − | | | | |
| | Prefemoral | − | | − | − | | − | | − |
| | Popliteal | + | | + | + | | | | − |
| 2R | Ham | + | + | | − | − | | | − |
| | Prefemoral | + | − | | − | − | | | − |
| | Popliteal | + | − | | − | − | | | − |
| 3L | Ham | − | | − | | | | − | |
| | Inguinal | | | | − | | | | |
| | Prefemoral | − | | − | − | | | − | |
| | Popliteal | − | | − | + | | | − | |
| 4R | Ham | − | + | | − | − | | | − |
| | Popliteal | − | − | | − | − | | | − |
| 5R | Ham | − | − | | + | − | | | − |
| | Prefemoral | − | − | | − | | − | | − |
| | Popliteal | − | − | | | | − | | − |
| 7L | Ham | − | | − | − | | | − | |
| | Inguinal | − | | − | − | | | − | |
| | Prefemoral | − | | − | − | | | − | |
| | Popliteal | − | | − | − | | | + | |
| 7R | Ham | − | − | | − | + | | | − |
| | Prefemoral | − | − | | | | | | − |
| | Popliteal | + | − | | − | − | | | − |
| 8L | Ham | − | | − | − | | − | | − |
| | Inguinal | + | | − | − | | − | | − |
| | Prefemoral | − | | − | − | | | | |
| | Popliteal | + | | + | + | | | | − |
| 8R | Ham | − | − | | − | − | | | |
| | Prefemoral | | − | | − | − | | | |
| | Popliteal | + | − | | − | − | | | |
| 9L | Ham | − | | − | − | | − | | − |
| | Prefemoral | + | | + | − | | + | | − |
| | Popliteal | | | | − | | | | − |
| 9R | Ham | − | − | | − | − | | | − |
| | Popliteal | + | − | | − | − | | | − |
| 10R | Ham | − | − | | − | + | | | − |
| | Prefemoral | | − | | − | | | | |
| | Popliteal | | | | − | | | | − |
| 11L | Ham | − | | − | − | | | − | |
| | Popliteal | − | | − | − | | | + | |
| 11R | Ham | + | − | | − | − | | | − |
| | Iliac | | + | | − | − | | | − |
| | Prefemoral | − | − | | | − | | | − |
| | Popliteal | − | − | | − | − | | | − |

[1] Examinations done immediately after arterial injection and prior to immersion in cover pickle.
[2] Examinations after smoking, in addition to those noted, included culture and guinea pig inoculation of ground suspensions of the main vascular tree as well as of ham muscle.

gave a positive culture from muscle after 7 days in cover pickle. *Br. melitensis* was recovered from a muscle culture of an additional shoulder, which had not yielded a culture initially, after 2 weeks in cover pickle.

## Discussion

A study of this nature presents numerous difficulties. It seemed mandatory to simulate the commercial processes as closely as possible in order to make the results applicable under practical conditions. This was accomplished by obtaining the services of trained personnel for all routine and specialized procedures, by employing a portable refrigerated unit for chilling the carcasses, and using commercially prepared solutions for the curing processes. All steps were done in strict accordance with the packing plant specifications. Finally, the smoking of the hams was carried out in the commercial plant. Thus, these results may be regarded as representing those which might be obtained by culture of material from infected carcasses actually handled in a commercial plant.

The difficulties encountered in isolating *Brucella* from mixed culture are well known. Even with the precautions taken in this study in making cultures, the growth of extraneous organisms was not eliminated and, in the latter part of the study, possibly was a factor in the failure to recover *Brucella* more consistently.

Since the infected lymph nodes comprised the best tissue for consistent isolation, the need of conserving portions of nodes for the later examinations is readily apparent. Accordingly, all available lymph nodes were not always cultured at every examination period. Mechanical factors during the preparation of the hams for smoking eliminated some of the attached lymph nodes so that they were not available for later study.

Even in culturing a known infected lymph node, one may not always recover the organism. Reference to table 3 reveals a number of such instances. This probably represents an unequal distribution of organisms through the node and failure to section an infected area in the sampling.

It is apparent from the data presented that *Br. melitensis* remained viable during curing in cover pickle for as long as 21 days. The organism was not recovered after the smoking process. Although the number of hams in this experiment consistently yielding positive cultures prior to smoking is small, the hams were subjected to such thorough examination afterward that the failure to recover *Brucella* after smoking is probably a significant finding. These data should not be interpreted to mean that all commercial smoking processes make *Brucella* nonviable, or that home-smoked meats are necessarily safe.

The significance of *Br. melitensis* infection in swine is becoming increasingly apparent. The proved presence of *Br. melitensis* in hogs in this country is established (*3–7*). In the culture of mandibular lymph nodes of 5,000 slaughtered hogs, *Brucella* was isolated in 35

instances. Eleven, or 31.4 percent, of the isolations were *Br. melitensis* (*4*).

The hogs used in this study were obtained from a herd exhibiting the usual manifestations of epidemic clinical brucellosis in swine. That *Br. melitensis* can be responsible for such herd infection is of considerable practical importance. Cultural studies should be made in other centers to determine more fully the extent of this problem in swine.

## Summary

Eleven yearling hogs naturally infected with *Br. melitensis* were slaughtered. Cultures made from many areas of the carcass demonstrated the organism to be widely distributed. The hams and shoulders were subjected to standard curing processes, 11 hams subsequently being smoked. Commercial procedures were followed throughout the experiment. *Brucella* was recovered from the hams for as long as 21 days in cover pickle. No isolations were made after smoking. The significance of *Br. melitensis* infection in swine is discussed.

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# Incidence of Disease

*No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring*

## UNITED STATES

### Reports From States for Week Ended October 6, 1951

*Malaria*

The numbers of cases of malaria both among civilians and from military establishments did not change significantly from the numbers reported during the previous 5 weeks. There were 14 cases reported in Georgia with the notation that all contracted their infection outside the United States. The 20 cases reported in Wisconsin were said not to have been contracted in the State. Two of the four civilian cases in California were reported to be in Mexican nationals with onsets 5 to 10 days after arrival in California. One case followed a vacation trip to Mexico with onset 2 days after return; the other case was a relapse in a person presumably infected in China.

*Poliomyelitis*

The incidence of poliomyelitis continued to decline during the current week, 1,272 cases being reported as compared with 1,405 cases for the week ended September 29, and 1,746 for the week ended September 22. For the same weeks last year there were 1,813, 1,990, and 2,169 cases, respectively.

The cumulative total cases of poliomyelitis for the calendar year is now 21,775 as compared with 23,341 for the same period last year. The cumulative total since the seasonal low week in March is 20,563 as compared with 22,210 last year. As the peak of incidence was reached earlier this year than last, and considering the marked reduction in number of cases in the last 2 weeks, present indications are that the total number for the year will be well below the 33,209 reported in 1950.

### Epidemiological Reports

*Gastroenteritis*

Dr. Dean Fisher, Maine health officer, has reported an outbreak of gastroenteritis among a group of State employees following a supper consisting of chicken pie, vegetables, salad, and strawberry shortcake. An investigation by Dr. C. F. Thomas disclosed the fact that 80 persons became ill out of a total of 90 to 100 who were present about 5 hours after the meal. Some of the persons who prepared or served

the meal were also ill. No specimens of food were available for laboratory examination.

Dr. C. P. Stevick, North Carolina State Board of Health, has reported an outbreak of gastroenteritis which occurred among 600 persons attending a convention. Two to three hours after eating barbecue, 200 persons became ill. An investigation by Dr. William Happer showed that all items served, except the barbecue, were prepared in private homes in small quantities and were served in separate containers. The barbecue was prepared the day before and was not refrigerated the night before it was served. No specimens of food were available for bacteriological examination.

Dr. D. S. Fleming, Minnesota Department of Health, has reported an outbreak of food poisoning which followed a church supper attended by 230 to 240 persons. Four to five hours after eating chicken loaf sandwiches, approximately 110 persons became ill with severe abdominal cramps, profuse vomiting, and diarrhea. The chicken loaf was prepared on the day before serving. Eleven chickens were cooked, one at a time, in a pressure cooker. The meat was separated, ground, and placed in jars where it stood unrefrigerated overnight. The predominant organism found in leftover specimen of the loaf was a nonhemolytic streptococcus, but *Escherichia freundii* and *Aerobacter aerogenes* were also present.

***Comparative Data For Cases of Specified Reportable Diseases: United States***

**[Numbers after diseases are International List numbers, 1948 revision]**

| Disease | Total for week ended— | | 5-year median 1946–50 | Seasonal low week | Cumulative total since seasonal low week | | 5-year median 1945–46 through 1949–50 | Cumulative total for calendar year— | | 5-year median 1946–50 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Oct. 6, 1951 | Oct. 7, 1950 | | | 1950–51 | 1949–50 | | 1951 | 1950 | |
| Anthrax (062) | | | | [1] | [1] | [1] | [1] | 47 | 33 | 41 |
| Diphtheria (055) | 131 | 155 | 285 | 27th | 844 | 1,176 | 2,077 | 2,852 | 4,304 | 6,687 |
| Encephalitis, acute infectious (082) | 21 | 29 | 18 | [1] | [1] | [1] | [1] | 817 | 736 | 506 |
| Influenza (480–483) | 463 | 660 | 525 | 30th | 3,112 | 4,062 | 3,989 | 119,167 | 142,826 | 131,792 |
| Measles (085) | 1,192 | 683 | 683 | 35th | [2] 4,621 | 2,908 | 2,908 | [2] 473,532 | 291,079 | 555,310 |
| Meningitis, meningococcal (057.0) | 45 | 44 | 46 | 37th | 151 | 157 | 157 | 3,212 | 2,956 | 2,776 |
| Pneumonia (490–493) | 605 | 1,029 | [3] | [1] | [1] | [1] | [1] | 49,300 | 65,885 | [3] |
| Poliomyelitis, acute (080) | 1,272 | 1,813 | 1,207 | 11th | [4] 20,565 | 22,210 | 20,031 | [4] 21,775 | 23,341 | 20,381 |
| Rocky Mountain spotted fever (104) | 5 | 9 | 6 | [1] | [1] | [1] | [1] | 302 | 431 | 516 |
| Scarlet fever (050)[5] | 525 | 586 | 722 | 32d | 2,710 | 2,917 | 3,797 | 56,096 | 43,087 | 60,754 |
| Smallpox (084) | | 1 | 1 | 35th | | 1 | 3 | 11 | 27 | 51 |
| Tularemia (059) | 12 | 5 | 11 | [1] | [1] | [1] | [1] | 524 | 739 | 776 |
| Typhoid and paratyphoid fever (040, 041)[6] | 85 | 88 | 88 | 11th | 2,007 | 2,256 | 2,580 | 2,442 | 2,766 | 3,065 |
| Whooping cough (056) | 829 | 1,577 | 1,577 | 39th | 829 | 1,577 | 1,577 | 54,604 | 98,772 | 77,464 |

[1] Not computed. [2] Addition: West Virginia, week ended Sept. 29, 6 cases. [3] Data not available. [4] Deduction: Iowa, 2 cases—not allocated. [5] Including cases reported as streptococcal sore throat. [6] Including cases reported as salmonellosis.

## Reported Cases of Selected Communicable Diseases: United States, Week Ended Oct. 6, 1951

[Numbers under diseases are International List numbers, 1948 revision]

| Area | Diphtheria (055) | Encephalitis, infectious (082) | Influenza (480–483) | Measles (085) | Meningitis, meningococcal (057.0) | Pneumonia (490–493) | Poliomyelitis (080) |
|---|---|---|---|---|---|---|---|
| **United States** | **131** | **21** | **463** | **1,192** | **45** | **605** | **1,272** |
| **New England** | | | **1** | **138** | **4** | **24** | **44** |
| Maine | | | | 28 | | 2 | 4 |
| New Hampshire | | | | 3 | | 2 | 1 |
| Vermont | | | | 30 | | | |
| Massachusetts | | | | 56 | 3 | | 14 |
| Rhode Island | | | | 13 | | | 2 |
| Connecticut | | | 1 | 8 | 1 | 20 | 23 |
| **Middle Atlantic** | **7** | **2** | | **319** | **3** | **64** | **141** |
| New York | 6 | 2 | (1) | 199 | 2 | | 72 |
| New Jersey | | | | 43 | | 24 | 20 |
| Pennsylvania | 1 | | | 77 | 1 | 40 | 49 |
| **East North Central** | **6** | **4** | **9** | **272** | **4** | **46** | **343** |
| Ohio | | | | 76 | 2 | | 69 |
| Indiana | 3 | 2 | 8 | 11 | | 5 | 17 |
| Illinois | 2 | 2 | 1 | 61 | 2 | 33 | 87 |
| Michigan | 1 | | | 73 | | 8 | 68 |
| Wisconsin | | | | 51 | | | 102 |
| **West North Central** | **4** | **1** | **10** | **43** | **6** | **83** | **176** |
| Minnesota | | | 3 | 4 | 3 | 3 | 34 |
| Iowa | 1 | | | 4 | 2 | | 17 |
| Missouri | | | | | | | 51 |
| North Dakota | | 1 | 6 | 22 | | 69 | 6 |
| South Dakota | | | | 5 | | | 8 |
| Nebraska | | | | 5 | 1 | | 21 |
| Kansas | 3 | | 1 | 3 | | 11 | 39 |
| **South Atlantic** | **61** | **2** | **244** | **68** | **12** | **110** | **71** |
| Delaware | | | | | | | |
| Maryland | 1 | | | 30 | 2 | 14 | 5 |
| District of Columbia | | | | 2 | | 12 | 3 |
| Virginia | 9 | | 217 | 14 | 2 | 41 | 13 |
| West Virginia | 2 | | | 4 | 2 | | 16 |
| North Carolina | 30 | | | 3 | 1 | | 11 |
| South Carolina | 7 | | 4 | 1 | | 3 | 3 |
| Georgia | 6 | 2 | 23 | 13 | 5 | 40 | 16 |
| Florida | 6 | | | 1 | | | 4 |
| **East South Central** | **32** | | **2** | **38** | **5** | **34** | **93** |
| Kentucky | 5 | | | 22 | 2 | 6 | 17 |
| Tennessee | 6 | | | 1 | 1 | | 31 |
| Alabama | 20 | | | 9 | 1 | 21 | 16 |
| Mississippi | 1 | | 2 | 6 | 1 | 7 | 29 |
| **West South Central** | **17** | **4** | **71** | **64** | **2** | **171** | **107** |
| Arkansas | 2 | | 51 | 30 | | 11 | 9 |
| Louisiana | 3 | | 2 | 2 | | 9 | 27 |
| Oklahoma | 6 | | 18 | | | 12 | 16 |
| Texas | 6 | 4 | | 32 | 2 | 139 | 55 |
| **Mountain** | **1** | **1** | **92** | **120** | **4** | **29** | **114** |
| Montana | | | 15 | 83 | 1 | 1 | 7 |
| Idaho | | | | 9 | | | 1 |
| Wyoming | | | | | 1 | | 13 |
| Colorado | | | 6 | 5 | | 17 | 44 |
| New Mexico | | | 1 | 2 | 1 | 1 | 5 |
| Arizona | | 1 | 70 | 9 | | 10 | 8 |
| Utah | 1 | | | 12 | 1 | | 34 |
| Nevada | | | | | | | 2 |
| **Pacific** | **3** | **7** | **34** | **130** | **5** | **44** | **183** |
| Washington | 1 | | 17 | 24 | 1 | | 18 |
| Oregon | | 1 | 16 | 14 | | 17 | 20 |
| California | 2 | 6 | 1 | 92 | 4 | 27 | 145 |
| Alaska | | | | | | | 4 |
| Hawaii | | | | 103 | | | 2 |

[1] New York City only.

## Reported Cases of Selected Communicable Diseases: United States, Week Ended Oct. 6, 1951—Continued

[Numbers under diseases are International List numbers, 1948 revision]

| Area | Rocky Mountain spotted fever (104) | Scarlet fever [1] (050) | Smallpox (084) | Tularemia (059) | Typhoid and paratyphoid fever [2] (040, 041) | Whooping cough (056) | Rabies in animals |
|---|---|---|---|---|---|---|---|
| **United States** | **5** | **525** | | **12** | **85** | **831** | **116** |
| **New England** | | **26** | | | **6** | **71** | |
| Maine | | 2 | | | | 2 | |
| New Hampshire | | | | | | 1 | |
| Vermont | | | | | | 2 | |
| Massachusetts | | 19 | | | 3 | 53 | |
| Rhode Island | | 4 | | | 2 | | |
| Connecticut | | 1 | | | 1 | 13 | |
| **Middle Atlantic** | | **76** | | | **5** | **161** | **23** |
| New York | | 38 | | | 3 | 67 | 21 |
| New Jersey | | 9 | | | | 34 | |
| Pennsylvania | | 29 | | | 2 | 60 | 2 |
| **East North Central** | | **141** | | | **8** | **148** | **12** |
| Ohio | | 40 | | | 5 | 30 | 1 |
| Indiana | | 9 | | | 1 | 7 | 7 |
| Illinois | | 27 | | | 2 | 43 | 4 |
| Michigan | | 47 | | | | 68 | |
| Wisconsin | | 18 | | | | | |
| **West North Central** | **1** | **23** | | **1** | **6** | **39** | **15** |
| Minnesota | | 2 | | | 1 | 10 | 6 |
| Iowa | 1 | 5 | | | 1 | 2 | 6 |
| Missouri | | 7 | | 1 | 4 | 13 | 3 |
| North Dakota | | 1 | | | | 3 | |
| South Dakota | | | | | | 2 | |
| Nebraska | | 2 | | | | 1 | |
| Kansas | | 6 | | | | 8 | |
| **South Atlantic** | **4** | **78** | | | **8** | **91** | **9** |
| Delaware | | 1 | | | | | |
| Maryland | | 13 | | | | 7 | |
| District of Columbia | | 5 | | | | 8 | |
| Virginia | 1 | 10 | | | | 16 | 3 |
| West Virginia | | 6 | | | 2 | 17 | 3 |
| North Carolina | 2 | 30 | | | 1 | 18 | |
| South Carolina | | 4 | | | 1 | | 2 |
| Georgia | 1 | 8 | | | 2 | 21 | 1 |
| Florida | | 1 | | | 2 | 4 | |
| **East South Central** | | **48** | | **1** | **9** | **43** | **23** |
| Kentucky | | 13 | | | 3 | 10 | 6 |
| Tennessee | | 29 | | | 3 | 19 | 1 |
| Alabama | | 5 | | 1 | | 9 | 10 |
| Mississippi | | 1 | | | 3 | 5 | 6 |
| **West South Central** | | **17** | | **6** | **10** | **189** | **34** |
| Arkansas | | 5 | | 2 | | 9 | 1 |
| Louisiana | | 2 | | | | 2 | |
| Oklahoma | | 5 | | | | 5 | 2 |
| Texas | | 5 | | 4 | 10 | 173 | 31 |
| **Mountain** | | **15** | | **4** | **6** | **32** | |
| Montana | | 6 | | 1 | | 3 | |
| Idaho | | 3 | | | | 2 | |
| Wyoming | | | | | | | |
| Colorado | | 2 | | | 3 | 11 | |
| New Mexico | | 1 | | | 2 | | |
| Arizona | | | | | 1 | 12 | |
| Utah | | 3 | | 3 | | 4 | |
| Nevada | | | | | | | |
| **Pacific** | | **101** | | | **27** | **57** | |
| Washington | | 9 | | | 3 | 7 | |
| Oregon | | 6 | | | | 2 | |
| California | | 86 | | | 24 | 48 | |
| Alaska | | | | | | | |
| Hawaii | | | | | | 1 | |

[1] Including cases reported as streptococcal sore throat. [2] Including cases reported as salmonellosis.
*Rabies in man.* North Carolina, 1 case.

# FOREIGN REPORTS

## CANADA

*Reported Cases of Certain Diseases—Week Ended Sept. 22, 1951*

| Disease | Total | Newfoundland | Prince Edward Island | Nova Scotia | New Brunswick | Quebec | Ontario | Manitoba | Saskatchewan | Alberta | British Columbia |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Brucellosis | 6 | | | | | 3 | 1 | 2 | | | |
| Chickenpox | 259 | 1 | | 15 | | 35 | 97 | 27 | 20 | 50 | 14 |
| Diphtheria | 16 | | | | 1 | 15 | | | | | |
| Dysentery, bacillary | 13 | | | | | 3 | 2 | | | | 8 |
| Encephalitis, infectious | 5 | | | 4 | | | | | 1 | | |
| German measles | 83 | | | 23 | | 12 | 13 | | 5 | 23 | 7 |
| Influenza | 23 | | | 21 | | | | 1 | 1 | | |
| Measles | 240 | 10 | | 25 | 1 | 24 | 41 | 19 | 12 | 67 | 41 |
| Meningitis, meningococcal | 5 | 1 | | | | | 2 | | 1 | | 1 |
| Mumps | 193 | | | | | 23 | 78 | 15 | 33 | 20 | 24 |
| Poliomyelitis | 161 | | | 21 | 1 | 26 | 96 | 3 | 5 | 4 | 5 |
| Scarlet fever | 122 | 1 | | 1 | 2 | 12 | 20 | 11 | 17 | 16 | 42 |
| Tuberculosis (all forms) | 219 | 1 | | | 11 | 69 | 30 | 33 | 22 | 25 | 28 |
| Typhoid and paratyphoid fever | 10 | | | | | 9 | | | | 1 | |
| Venereal diseases: | | | | | | | | | | | |
| Gonorrhea | 331 | 4 | | 11 | 6 | 75 | 73 | 42 | 21 | 40 | 59 |
| Syphilis | 108 | 1 | | 5 | 5 | 45 | 16 | 15 | 3 | 10 | 8 |
| Primary | 6 | | | | | 3 | 2 | 1 | | | |
| Secondary | 8 | | | | | 3 | 2 | 1 | | 2 | |
| Other | 94 | 1 | | 5 | 5 | 39 | 12 | 13 | 3 | 8 | 8 |
| Whooping cough | 137 | | | 4 | | 30 | 46 | 7 | 23 | 18 | 9 |

## FINLAND

*Reported Cases of Certain Diseases—August 1951*

| Diseases | Cases | Diseases | Cases |
|---|---|---|---|
| Diphtheria | 32 | Typhoid fever | 5 |
| Dysentery | 2 | Venereal diseases: | |
| Meningitis, meningococcal | 3 | Gonorrhea | 654 |
| Paratyphoid fever | 119 | Syphilis | 20 |
| Poliomyelitis | 18 | Other forms | 1 |
| Scarlet fever | 737 | | |

## NEW ZEALAND

*Reported Cases of Certain Diseases and Deaths—4 Weeks Ended Aug. 25, 1951*

| Disease | Cases | Deaths | Disease | Cases | Deaths |
|---|---|---|---|---|---|
| Brucellosis | 6 | | Influenza | 1 | 1 |
| Diphtheria | 9 | 1 | Meningitis, meningococcal | 23 | 4 |
| Dysentery: | | | Poliomyelitis | 2 | |
| Amebic | 7 | | Scarlet fever | 67 | |
| Bacillary | 4 | | Tetanus | 2 | 1 |
| Erysipelas | 13 | | Tuberculosis (all forms) | 160 | 38 |
| Food poisoning | 214 | | Typhoid fever | 9 | |

## REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

**The following reports include only items of unusual incidence or of special interest and the occurrence of these diseases, except yellow fever, in localities which had not recently reported cases. All reports of yellow fever are published currently.**

### Smallpox

*Nigeria.* During the week ended August 25, 1951, the incidence of smallpox in the seaport of Calabar rose to 11 cases from 1 reported for the previous week. The incidence, however, for the whole country showed little change during this period, 124 and 120 cases, respectively.

*Togo (French).* For the period September 11–20, 21 cases of smallpox were reported in the region of Tsevie.

### Typhus Fever

*Germany.* During the week ended September 8, 1951, one case of typhus fever was reported in the seaport of Bremen.

*India.* For the week ended September 22, one case each of typhus fever was reported in Ahmedabad and Bombay.

*Indochina.* One case of typhus fever was reported in Cambodia for the week ended September 15.

*Spain.* For the week ended August 18, four cases of typhus fever were reported in Madrid as compared with one for the previous week.

*Yugoslavia.* Four cases of typhus fever were reported in Serbia during the period August 1–7.

### Yellow Fever

*Gold Coast.* Yellow fever was reported in the Gold Coast as follows: September 19, one fatal suspected case in Accra; September 18, one suspected case in the Oda area; and September 5, one case at Akwatia.