

Trash and sheds in this yard not only constitute fire hazards but also leave little space for children to play.

explored for the possibility of adding to our knowledge of healthful housing.

The effect of housing upon health is, to many, confusing and for good reason. Upon re-examination of what we know and what we are looking for, we are sure that adequate housing is one of the roads we can travel and reach our objective, good health a state of complete mental and social well-being and not merely the absence of disease or infirmity.

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Reported Brucellosis in the United States

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Brucellosis in both domestic animals and man has been reported annually from each State, with few exceptions, for more than a decade. The attacks in man reported by the National Office of

Vital Statistics and the percentage of reactors found in cattle by the Bureau of Animal Industry followed a markedly parallel course from 1938 through 1949, as seen in figure 1, with about an

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18-month lag in the human cycle. It is fair to assume that cattle sampling was more biased in the first years of the program, becoming more stable by 1938. Also, human reporting may have been influenced by the cattle program and the improvement of reporting systems as well in the years immediately preceding 1938. Unfortunately, no figures worthy of presentation are available for brucellosis in swine, goats, and other animals. Many answers would appear simple from this time relation, but no significant correlation existed between human attacks or attack rates and cattle reactors when considered State by State.

Attack rates for humans by States are depicted in the upper map of figure 2. Attack rates are so low for urban inhabitants, with the exception of packing-house workers, veterinarians, and a few other workers with habitual animal contacts, that the inclusion of urban populations distorts the picture of the calculated attack rates much more than their exclusion. Therefore, the rates are based on all reported cases and the Bureau of the Census figures for rural population. It also seemed more appropriate that cattle, insofar as they are the source of human brucellosis, are more liable to be transmitters as a herd group than as individuals. This may be illustrated by considering one State which had 4.5 percent of cattle reactors, distri-

buted among 22.3 percent of herds tested. Obviously, either the direct or indirect potential human contacts are to be expected roughly among one-fifth rather than one-twentieth of the population open to exposure, even though the average risk of each individual may be less. Accordingly, the distribution of bovine brucellosis is shown by percentage of tested herds containing reactors, State by State, in the lower map of figure 2. A logarithmic expansion of class sizes which agreed with observed frequency groupings was used to define the numerical limits of each map shading. The areas with the highest reported rates in humans are fairly well coincident with those with the highest percentage of positive herds. A few States, however, show unusual relations between bovine and human rates. Illinois, Colorado, and Utah have higher rates by two classes in

humans than in animals. Illinois may simply have the most effective reporting system. Nine States, mostly in the Mississippi Basin, have low human rates with high bovine rates. There are many factors such as diagnosis, reporting systems, other species of susceptible animals, and transportation of animals which could be affecting these reported figures. The interrelations of such factors may be very complex and difficult to evaluate. It is not the purpose of this article to consider them.

Seasonal variations constitute a third major break-down of these data. Seasonal variations in the reports on cattle have not been considered because of possible influences of the manner in which the testing is done.

An ebb and flow of major and minor seasonal peaks, which defy immediate explanation, occurred over this series of years from 1935 through 1949. A summer peak which varies from June to August has appeared consistently. There are also fairly definite spring and fall peaks, but these may be missing or modified in certain years and exaggerated in others. The rise and fall of the yearly totals are controlled considerably by the size of the spring and fall peaks, the slope of yearly changes being much greater than the changes in summer peaks. Preliminary examination of data by States indicates that there are regional differences;



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but again, these do not appear amenable to a simple explanation. Weather, numbers and species of animals, economics, and other factors undoubtedly influence the differences between States. National Office of Vital Statistics' reports of human cases through September 1950 show low peaks in March and June, but have the least fluctuations of any year and indicate a yearly total which should be around 3,300, the lowest year since 1942.

Estimates of the True Number of Human Brucellosis Cases in the United States, 1949

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The reported morbidity figures for brucellosis do not represent the true incidence of the disease because they are not exclusively new cases. Due to the chronic nature of the disease, a significant portion of the reported attacks are either relapses, chronic exacerbations, or reinfections. The reported figures are then more closely akin to prevalence. In addition, it has been the opinion of a number of reliable workers with the disease that the reported figures are gross underestimates of the true ones.

While no reliable measures of the actual number of unreported cases are available, there are data available which will provide some estimates of the number of attacks to be expected under certain specified conditions.

The first method which will be considered is the application of epidemiologic observations. Jordan and Borts (1) and Magoffin, *et al.*, (2) as well as others, have presented figures to show the high attack rates in packing-house and rendering-plant workers, veterinarians, and animal production farmers. Intermediate attack rates were found for butchers, processors, stock buyers, and stock handlers and relatively low rates for housewives, children, and the remainder of the population.

Brucellosis in cattle is known in every State. Bang's tests conducted by the Bureau of Animal Industry for the fiscal year 1949 showed reactors in every State except California, where no tests were made. The percentage of reactors found varied from 0.8 in North Carolina to 11.1 in Louisiana, with three-fourths of the States lying between 2.0 and 7.0 percent. No figures are available for swine on an official basis, but local surveys indicate somewhat similar levels of reactors. The percentage of reactors in cattle was not related to the numbers of reported human attacks by States. If, therefore, it is assumed that the specific occupational risks are fairly constant from State to State and reliable in certain States as far as reporting methods are concerned, then specific occupation attack rates can be calculated for a number of reference States and these rates applied to United States population figures to estimate the totals for the Nation.

Maximum accuracy in specific occupation attack rates will be provided if populations are selected to most nearly represent the source of cases. The available data for attacks of brucellosis by occupation in Minnesota, Iowa, Illinois, and Wisconsin during 1949 are presented in table 1. Bureau of the Census figures were available for packinghouse workers, farmers, children, housewives, and the remainder of the population. The number of veterinarians in the United States was obtained from the American Veterinary Medical Association National Directory. Farmers were defined as those engaged in animal husbandry, including dairy and livestock farms, plus subsistence farms and general farming. Undoubtedly, farms are not perfectly split this way. Many farmers will have a few animals

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