

# Environmental Factors and Enteric Disease

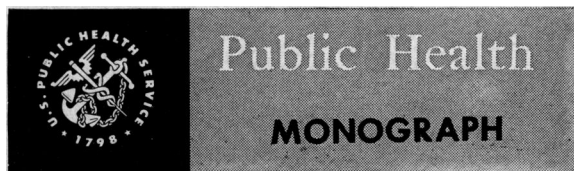
COAL MINING communities with diversely housed population groups in eastern Kentucky were the locales of a field study to provide basic information for development of specific control measures against diarrheal diseases by determining seasonal and annual prevalence of diarrheal diseases among human populations of areas differing from one another in one or more environmental characteristics, identifying contributory factors in diarrheal disease in the different communities, and evaluating levels of sanitation in households and in the communities studied.

The study was conducted by the Communicable Disease Center of the Public Health Service with the cooperation of the Kentucky State Department of Health. During the period of study, observers determined diarrheal disease morbidity rates, *Shigella* infections in preschool children, and percentage of population infected with *Ascaris*, in 11 communities. Marked seasonal trends in reported morbidity were recorded, the highest incidence occurring during August and September. The ratio of "summer" diarrhea to "winter" diarrhea for the years 1955 and 1956 was approximately 2 to 1. Diarrheal disease prevalence increased earlier in the spring and persisted at a high level longer in the fall in areas where sanitation was least observed. Severe diarrhea was more frequently reported from the less sanitary areas.

*Shigella* prevalence rates obtained by rectal swabbing of preschool children ranged between 0.7 percent and 10.2 percent in individual study areas. The highest prevalence for all study populations combined occurred in the 4-year age group; in the least sanitary areas children were found to be infected at an earlier age, and the highest prevalence was in the 2-year age group. Variations in *Shigella* prevalence did not correspond to seasonal variations in reported diarrheal morbidity. Shigellosis was responsible for the majority of acute diarrheal

disease experiences observed in areas lacking sanitation, but was not a primary cause in the best sanitated area. *Salmonella* and the enteropathogenic *Escherichia coli* evidently did not contribute substantially to diarrheal disease morbidity reported in the study areas.

One of every four of the 2,798 individuals of all ages examined had stools positive for *Ascaris lumbricoides*. In the particular region



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The accompanying summary covers the principal findings presented in Public Health Monograph No. 54, published concurrently with this issue of Public Health Reports. The authors are with the Communicable Disease Center, Public Health Service, Atlanta, Ga., and the Hammond City Health Department, Hammond, Ind.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available on specific request to the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Schliessmann, D. J., Atchley, F. O., Wilcomb, M. J., Jr., and Welch, S. F.: Relation of environmental factors to the occurrence of enteric diseases in areas of eastern Kentucky. Public Health Monograph No. 54 (PHS Pub. No. 591). 35 pages; illustrated. U. S. Government Printing Office, Washington, D. C., 1958. Price 30 cents

studied, *Ascaris* infection rates were found to be at least as suitable an index of enteric disease prevalence and of environmental sanitation as *Shigella* infection rates. In the group 2 to 12 years of age, *Ascaris* infection rates ranged from 12 to 70 percent among the study populations. Rates of *Trichuris trichiura* approximated those of roundworm, although the whipworm infections, as judged by egg counts, were almost invariably much lighter. *Strongyloides stercoralis* infections were occasionally recorded and hookworm infections were rare. Prevalence of *Entamoeba histolytica* did not exceed 3.3 percent; *Giardia lamblia* and the remaining intestinal protozoa recorded prevailed at rates corresponding to ranges reported elsewhere in the United States.

Comparatively low levels of fly abundance, including houseflies, were evident in the areas under study. While it may logically be assumed that flies as mechanical vectors contributed to the reported morbidity rates and *Shigella* prevalence, the level of fly-transmitted diarrhea during the period of study was too low to be measured by the indexes available. Similar conclusions were reached with respect to studies of the role of water in enteric disease transmission. With the exception of one public supply and a very few properly constructed drilled wells, water sources in use by the study populations were subject to possible fecal contamination and may have been responsible for some cases of diarrheal disease. There were, however, no instances in which water quality could be implicated in localized outbreaks or correlated with seasonal differences in morbidity rates or *Shigella* prevalence.

Lowest rates of reported diarrheal disease, *Shigella*-positive cultures, and *Ascaris*-positive stools were recorded among study families

served by complete community sanitary facilities; markedly higher rates of all three enteric disease indexes were experienced by households served by some but not all public sanitary services; and the highest levels of the three indexes were reported from populations living where community sanitary facilities were entirely lacking. Individuals living in homes provided with inside piped water and privy excreta disposal experienced approximately twice the diarrhea, twice the *Shigella* prevalence, and four times the *Ascaris* prevalence experienced by individuals using inside piped water and flush toilets. Where water was not piped inside the house, persons having access to water on the premises experienced approximately a third less diarrhea than individuals obtaining water away from the premises. Where the water source was outside the dwelling unit, *Shigella* prevalence and *Ascaris* infection rates were comparable regardless of the location of the water source in relation to the premises.

Of several socioeconomic factors analyzed for possible influence upon enteric disease rates, only crowding, family size, and education of the mother appeared to affect rates appreciably. High person-per-room ratios, large families, and low educational levels of the mother all generally accompanied high *Ascaris* and *Shigella* prevalence. The combined effect of these factors on observed prevalence of diarrheal disease was not, however, as great as the lack of adequate sanitary facilities.

Results of these studies strongly support the premise that incidence of acute infectious diarrheal disease may be significantly reduced through selective modification of specific environmental factors within communities without regard to etiological or sociological differences.