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for each 500 of population, while those in black have one representative for each 1,500 or more. These novel maps should correct several common misconceptions. For example: Figure 10 shows that most of the counties are well represented, in proportion to population, at Indiana University. The counties with the least representation are mostly on the borders of the state, nearer to other strong institutions. Other geographic factors are transportation facilities, wealth, and proportion of the population engaged in agriculture and in industries.

FURTHER STUDIES IN DEATH RATES IN INDIANA.

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In the Proceedings for the last meeting (Vol. 33, pp. 55-61) may be found a paper concerning the wide variation among Indiana counties in the average death rates from typhoid, tuberculosis, cancer and in total deaths with maps showing these variations, and also with eight maps



Fig. 1. Pneumonia: Deaths per 100,000 persons, average of four years, 1920-1923 (calculated from unpublished tables of State Board of Health). Legend: Black, over 115; wide lines, 100-115; diagonal lines, 90-100; light lines, 80-90; white, below 80.

Fig. 2. Deaths of infants under one year, average rate per 1,000 persons for the three years 1920-22 (from Reports of State Board of Health). Legend: Black, over 86; wide lines, 74-86; diagonal, 62-74; light, 50-62; white, 38-50.

showing the distribution of geographic conditions apparently causally related to the irregularities in the distribution of death rates. A study of these eight maps will be helpful in interpreting the present set.

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From unpublished tables gathered by the State Board of Health, the average number of deaths per county from measles, pneumonia and scarlet fever for the four years 1920-1923, inclusive, were obtained, and with the assistance of Lester H. Wise of Kokomo, the average death rates for these diseases in each county were calculated and mapped.

Figure 1 shows the regional variation in deaths from pneumonia, a disease which has caused an average of 3,000 deaths yearly in Indiana, during 1920-1923. The black counties have an average of 60 per cent more deaths than the white counties, the other shades being intermediate. Geographic causes for the distribution of these differences are not conspicuous but counties having large cities are mostly black or the next shade, and most of the sparsely settled counties are white or the next shade (see figure 12 of the former paper). Some of the poorest counties, however, are dark (see figures 4 and 7 of the former paper). The counties which increased notably in population between 1890 and



Fig. 3. Average variation (1920-1922) among the months in Indiana deaths from diphtheria (Dip.) (1,600 deaths); pneumonia (Pn.) (9,000 deaths); influenza (Inf.) (2,000 deaths); measles (M.) (400 deaths); pulmonary tuberculosis (P. T.) (7,500 deaths); scarlet fever (S. F.) (430 deaths).

1920 (figure 10 of the 1923 paper) average conspicuously darker than the counties which lost population or gained only a little. However, Dearborn and Jackson counties are exceptions to this rule. Most of the counties in which coal mining is carried on extensively (figure 3, 1923 paper) have a comparatively high death rate from pneumonia, that occupation apparently encouraging this disease. The two chief quarrying counties are likewise black or the next shade.

The variations among the counties in the death rate for infants under one year are shown on figure 2 in which the black counties had an average, 1920-1922, of 86 or more per 1,000 and the white counties about half that rate. Most of the counties with large cities are dark or black, as are also most of the coal mining counties. On the other hand, most of the rural counties are light. The lightness of the most sparsely settled counties (see figure 12 in the 1923 paper) is conspicuous as is that of most of the poorest counties. The low death rate of infants among many of the poorest rural people is probably related to the fact that most mothers in the areas nurse their infants, and that cow's milk is less likely to be contaminated.

The average variation among the months in the deaths in Indiana from these diseases and four others are shown graphically in figure 3. Pneumonia is strikingly a winter disease; influenza reaches its maximum in February (except during rare epidemics such as that of October, 1918, in which it may occur in any month). Pulmonary tuberculosis decreases less conspicuously in the summer than pneumonia or influenza, but nevertheless causes many more deaths in the first five months of the year than in the rest. These three diseases reflect rundown conditions, and are often made fatal by exposure to extreme changes of weather such as are common in late winter. The diphtheria curve shows a sharp maximum in October with a minimum from May to August. Typhoid is high from July to November, with the maximum in August and its minimum during March, April and May. This curve corresponds closely with that of the abundance of house flies, important carriers of typhoid, and also with the freshness of the water supply. In the late summer the water supply is lowered by the rapid evaporation, whereas in the early spring the abundant rainfall and small evaporation gives copious supply, with consequent dilution of any contaminated waters entering the supply. The curve for measles and scarlet fever are similar in being high in the spring but differ in that scarlet fever has a minor maximum in the fall, when there is, apparently, no danger from measles.