REGIONAL CONTRASTS IN DEATH RATES IN INDIANA (STUDY No. 3)

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In the Proceedings of the Indiana Academy of Science for 1923 (pp. 55-61) the present writer discussed "Geographic variations in Indiana in typhoid, tuberculosis, cancer, and in total deaths," using data for 1917-1921. In the Proceedings for 1924 (pp. 154-156) the deaths from pneumonia and of infants were studied and mapped by counties. The contrasts among the months in the number of deaths from each of six diseases were also graphed.

In the present study especial attention is paid to (a) the regional contrasts in deaths from various important causes of death, (b) contrasts in death rates in rural and urban centers, and (c) negro mortality compared with white mortality. The data used are those of the State Board of Health for 1925-1932. Some changes in the death rates between 1917-1921 and 1925-1932 are pointed out.

The marked regional contrasts in death rates for the six years 1927-32, inclusive, for the main regions of Indiana are revealed by Table 1. The limits of the six regions are shown in Fig. 1, which also shows the county death rates for typhoid. Briefly, northern Indiana includes the northern 18 counties, north of the upper stretches of the Wabash River, and also north of the 41° parallel. Central Indiana includes the 40 central counties, down to approximately the latitude of 39°30′. Southern Indiana includes 34 counties, subdivided into the Wabash lowland (10 counties), south-central Indiana (12 counties), and southeastern Indiana (12 counties).

These figures show that in deaths from three important causes, tuberculosis, typhoid, and of children less than a year old, there is a regular increase from northern to central to southern Indiana. On the other hand, there is a decline southward in the number of deaths from cancer. In deaths from all causes, including accidents, the rate is

TABLE 1. Indiana—Average Annual Death Rates (1927-1932)

	Tuberculosis, Typhoid, Cancer (Per 100,000 population)			Infant Mortality (Per 1,000 births)	Death Rate (all causes) (Per 1,000 pop. 1925-32
Northern Indiana	45.3	1.4	116.9	52.1	11.8
Central Indiana	57.5	2.2	106.5	57.5	12.2
Southern Indiana	70.0	7.0	97.1	60.8	12.1
Wabash Lowland	64.0	4.4	90.5	64.1	11.5
South Central Indiana	70.5	10.6	88.4	60.0	11.8
South Eastern Indiana	73.8	6.0	112.3	58.3	13.0

lowest at the north, but is slightly lower in southern than in central Indiana.

Among the three subregions of southern Indiana, there is a regular increase eastward with respect to tuberculosis, and for deaths from all causes, but just as regular a decrease with respect to deaths of infants. South central, unglaciated, Indiana has most deaths from typhoid, but fewest from cancer, in which disease southeastern Indiana is higher than any other part of the state except northern Indiana.

Tuberculosis

Tuberculosis displays such sharp geographic contracts that the map of death rates from this cause is reproduced as Fig. 2. In addition to the steady regional increase southward, and in southern Indiana eastward, shown in Table 1, this map shows the average death rates in each county. The rate is highest in Jefferson county (152 per year per 100,000 population) and is over 100 per 100,000 in four other southern counties—Crawford, Scott, Monroe, and Perry. On the other hand, the rate is less than 27 per 100,000 in five northern counties. The average of these best counties is less than one-fourth the rate in the five counties with most deaths.

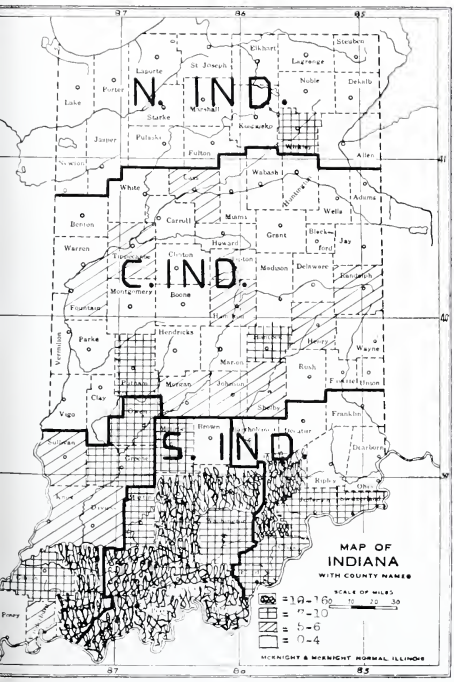

Fig. 1. Regions used in this study. Northern, entral, and Southern Indiana. Southern Indiana b-divided into Southwestern, South Central, and outheastern. Shading shows typhoid death rates, nnual average 1927-1932. Darkest is greatest.

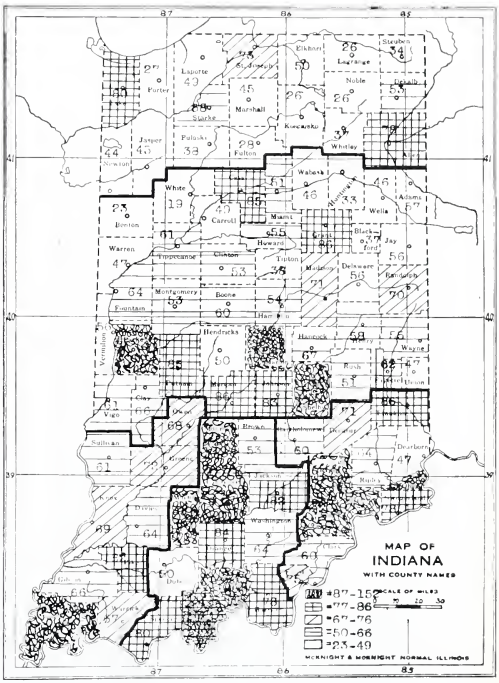

Fig. 2. Tuberculosis death rate, annual average 1927-1932.

The southward increase in deaths from tuberculosis is not correlated with average sunshine, as southern Indiana receives more sunshine than northern Indiana in every month in the year, and in the winter it receives an average of nearly one-fourth more hours as well as more intense sunlight when the sun does shine. Within southern Indiana, however, the amount of sunshine is somewhat greater at the west where there are fewest deaths from tuberculosis, than it is at the east where the death rate from tuberculosis is the highest.

The variation in tuberculosis death rates appears to be related most closely to variations in the general well-being of the people, together with variations in the number of elderly people. The percentage of negroes also plays a part, although none of the highest five counties contain many negroes. The counties which have many negroes all have higher death rates from tuberculosis, however, than do other counties in their region. In northern and central Indiana the death rates from tuberculosis are higher in counties having large cities than in rural counties. In southern Indiana this relationship is not evident.

A comparison between Fig. 2 and the map showing tuberculosis death rates for an earlier period (1917-21) reveals that the rate for tuberculosis has declined, but that there has been only minor changes in geographic distribution.

Typhoid Fever

Typhoid death rates have fallen sharply during the last two decades, but the average rates remain much higher in southern Indiana than in northern. As Table 1 shows, the average rate for the 12 counties of south-central Indiana is over seven times that in the 18 counties of northern Indiana. The counties with the highest rates are Crawford, Spencer, Dubois, and Scott. The limestone counties, Monroe, Lawrence, and Orange which were among the very worst counties in the earlier study, are no longer all in this worst group; the Monroe County rate has fallen, but nevertheless it, too, has death rates over three times the state average.

Typhoid, largely a disease of dirty water, reflects poverty and lack of proper sanitation and water supply. It is also spread by flies, and is most abundant following the season of most flies, and in regions where screens are little used. Its abundance in the limestone region is partly due to the fact, because of the cavernous openings, there is little filtration of water which flows through the ground, and almost all springs and wells are dangerous.

Infant Mortality

The death rate for infants under one year is expressed in deaths per 1,000 births. As revealed in Table 1, the rates increase southward, being about one-sixth greater in southern than in northern Indiana, despite the fact that Lake County with 64.4 has a relatively high rate, notably exceeded by only some 12 counties in the state. The worst county in infant deaths is one of the poorest counties, Martin, with a rate of 80, twice the rate of Marshall, Wells, and Boone counties. Other bad counties are Pike, 77; Vigo, 76; Knox, 73; Clay, 71; Henry, 71; Posey, 71; and Brown, 70.

Among the three sub-regions of southern Indiana, relatively most infants die in the western section and fewest in the eastern section. The best southern counties in this respect are Ripley and Crawford, both with rates of about 47. Ripley County is relatively important in the production of milk, and this fact may help explain its fewer infant deaths.

The rates in the more densely populated counties are usually higher than in neighboring counties. Exceptions are that Allen County's rate is less than that of two adjacent counties, which is true also of St. Joseph County, while one county adjacent exceeds the rates of Lake, Marion, and Vanderburgh counties.

Between 1920-22 and 1927-32 the death rate of infants generally declined in the poorer counties more than in those already having low rates in the earlier period. The poor record of several counties in the southwestern quarter of the state is made increasingly evident, however, by improvement in various northern counties which had relatively high rates in the earlier period.

Cancer

The regional contrast in death from cancer reveal opposite trends from those for various other diseases, decreasing southward instead of increasing. In southern Indiana, the rates vary irregularly, southeastern Indiana having more deaths than any other section except northern Indiana, while south-central Indiana has fewer than any other large part of the state.

Possibly the southward decrease reflects less complete medical diagnosis. Also, possibly the people of southern Indiana, being, on the average, poorer, are more likely to die, if weakened by cancer, of some other disease before the cancer develops sufficiently itself to cause death. The relatively high death rate from cancer in southeastern Indiana and in the northeastern quarter of the state may be partly due to the large number of elderly people there. Both of these sections have declined in population notably during recent decades, and contain relatively large proportions of elderly people.

Vermillion County has the lowest cancer death rate (57) and Lake County the third lowest (66) in the state; less than two-thirds the rate in most counties. This low rate presumably is due partly to the fact that there are relatively few elderly people in these counties. Moreover, the cancer rate is relatively low among southern European stocks, and such people make up a large share of the people of Gary, Hammond, and East Chicago. Clinton, the chief city of Vermillion County, has so many Italians that it is sometimes spoken of as "Little Italy." They were largely attracted by opportunities afforded by the coal mines.

The counties with highest death rates from cancer are Tippecanoe (164), Steuben (156), Decatur (150), Kosciusko (147), Noble (146), and Floyd (144). Tippecanoe's high rate is partly due to the presence there of a cancer sanitarium.

The average death rate from cancer increased considerably between 1917-1920 and 1927-1932, but there was no conspicuous change in distribution.

Urban and Rural Death Rates Compared

During the seven years, 1925-1931, the average rural death rate in Indiana was 12.34, while the urban death rate was 12.74. The small advantage of the rural rate can easily be due, however, to the higher negro death rates, since most Indiana negroes are found in cities.

The rates for twelve leading cities, average 1925-1931, are as follows:

Anderson 12.2	Gary 11.9	Muncie 12.0
East Chicago... 9.7	Hammond 10.5	Richmond 10.4
Evansville 12.5	Indianapolis ...13.7	South Bend ...11.1
Ft. Wayne 12.0	Kokomo 10.5	Terre Haute ..14.2

Hence, of the twelve largest cities, nine have death rates lower than the average for rural districts. The three cities which have death rates higher than those in rural districts (Indianapolis, Evansville, and Terre Haute) all have many negroes. The exceptionally low death rates of East Chicago, Hammond, and even of Gary, when its considerable negro population is considered, are partly due to the large percentages of their population who are in the prime of life and physically strong.

Negro Mortality

The death rate of negroes in Indiana is nearly twice that of whites and is rising slightly, as their average age increases. (There was a large influx of young adult southern negroes during the World War period and for some years thereafter.) Their death rates from tuberculosis are nearly four times those of the whites (about 280 vs. about 70), fully three times as high for pneumonia (about 280 vs. about 90), twice as high for typhoid, about fifty per cent higher for infant mortality, and nearly twice as high for maternal deaths. On the other hand, negroes have lower death rates for cancer, only about three-fourths of the white rate.

Conclusion

In conclusion: The data made available by the State Board of Health on the causes of deaths have been averaged for a period of several recent years and plotted by counties. The maps of death rates from tuberculosis, typhoid, cancer, infant mortality, and all deaths reveal notable contrasts among the counties. For tuberculosis, typhoid, and cancer, some counties have more than three times the death rate of other counties. In infant deaths, some counties have twice the death rates that other counties have. Even in deaths from all causes, the better counties have less than two-thirds the death rates present in the counties with highest death rates. A geographical locating of these contrasted counties facilitates a discussion of possible causes for the contrasts. Comparisons are made with maps made in the same way for an earlier period and discussed eleven years ago. The recent maps show approximately the same contrasts that the older ones showed, indicating that the distribution is not accidental.

For the first time, the average death rates for large groups of counties, approximately the various natural regions of Indiana, have

been worked out. In general the 18 counties of northern Indiana have the lowest death rates, the 40 counties of central Indiana rank next, and the 34 counties of southern Indiana are least fortunate. In respect to deaths from cancer, however, the opposite condition prevails. Among the three subdivisions of southern Indiana, a rather regular contrast is disclosed, southeastern Indiana ranking poorest in tuberculosis, cancer and all deaths, but southwestern Indiana lowest in infant mortality and south-central Indiana poorest in typhoid but best in cancer.

Interesting contrasts in the death rates of rural and urban areas are pointed out, and especial attention is given to the contrasts between the death rates of negroes and whites. The fact that negroes have about twice the death rate of whites explains the relatively poor ranking of certain Indiana cities.

Such a geographic study as this one not only calls attention to significant conditions not shown in the tables of statistics supplied by the State Board of Health, but it raises thought-provoking questions as to the reasons for differences and what should be done to improve conditions in the areas seen to be least favored.