

**DECISION GUIDE TO SELECTING A METHOD OF  
ILLUSTRATING EPIDEMIOLOGIC DATA**

## DECISION GUIDE TO SELECTING A METHOD OF ILLUSTRATING EPIDEMIOLOGIC DATA

The assumptions at this point are that you have prepared various summary tables of epidemiologic data and that the data contain several important points that you wish to illustrate so that other persons will also recognize them--with the least time and difficulty. The choices to be made now are between graphs and charts and among the various kinds of each that are presented in this reference. Using the following guide will lead to your identifying a recommended method of illustrating a particular set of data. The way to use the guide is to answer question #1, and the indicated subsequent ones, with a Yes or a No answer. You eventually will arrive at a recommended method of illustrating your data. This is not to say that there is no other way of properly illustrating your data, only that the method you identified will be a good one.

<u>Question</u>	<u>Answer</u>	<u>Do or go to, as indicated</u>
1. Data to be illustrated are either continuous or time series	Yes No	5 2
2. If comparisons are to be made among magnitudes of:		
a. Component parts of a total, then:		Bar Chart
b. Different categories of things, people, conditions, etc., then:		Bar Chart
c. Things, conditions, etc., in different places, then:		3
3. Places to be compared are readily identifiable on a map.	Yes No	4 Bar Chart
4. Specific site of occurrence is important.	Yes No	Spot map Area map
5. Data are time series.	Yes No	6 7
6. Data are cases of disease in an outbreak.	Yes No	7 8

Do or go to,  
as indicated

7. Not more than 2 sets of data are to be compared (e.g., males and females; cases and deaths).

Yes

Histogram or  
Frequency polygon  
Frequency polygon

No

8. Intent is to show variation in frequency of one or more sets.

Yes

9  
Semi-logarithmic  
scale line-graph

No

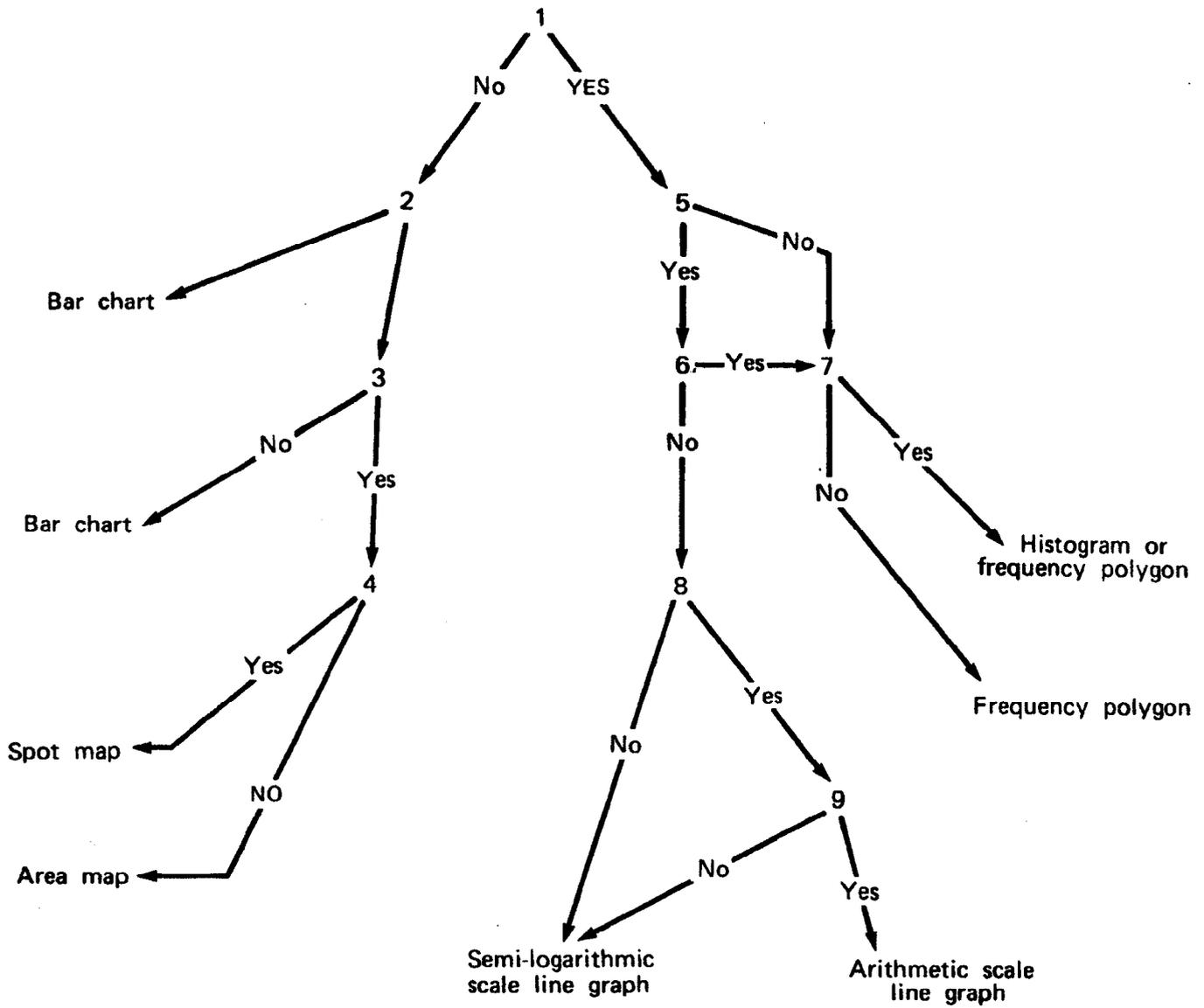
9. Range from minimum to maximum values to be illustrated does not exceed 2 orders of magnitude

Yes

Arithmetic scale  
line graph  
Semi-logarithmic  
scale line-graph

No

# DIAGRAM OF THE DECISION GUIDE



## EXERCISE ON THE ORGANIZATION OF EPIDEMIOLOGIC DATA

This exercise is intended to provide you with the opportunity to practice the organizing of epidemiologic data. The various methods previously discussed in this reference will be used. This exercise has two parts: part I, organizing disease surveillance data, and part II, organizing case information obtained during the investigation of an outbreak of St. Louis encephalitis.

In each of the two parts, selected information is provided and you are asked to prepare specific tables, graphs and/or charts from that data. In doing so, particular attention should be given to the accuracy and completeness of the work done, including the numbering of sets of organized data, the titles, row and column labels, legends, the body of data itself, footnotes used, and the reference to the source of the data. All of the graph paper needed is included. A set of answers is provided at the end of the exercise, to which you may compare your work when it is completed. This exercise will not be graded and is not to be returned to CDC. When you have completed the exercise and feel comfortable with the subject you should then take the multiple choice test which is enclosed as a separate item.

## EXERCISE INSTRUCTIONS

### Part I: Organization of disease surveillance data.

Using the information provided in Tables 1 and 2 construct the following:

- A. A histogram that shows the 1974 monthly incidence of tularemia.
- B. A frequency polygon of the 1974 monthly incidence of tularemia.
- C. A bar chart comparing the annual incidence for each of 10 years of selected vaccine-preventable diseases: measles, mumps, and rubella.
- D. An arithmetic scale line graph of salmonellosis (excluding typhoid fever), shigellosis and typhoid fever in the United States, 1965-1974.
- E. A semi-logarithmic scale line graph of the annual incidence per 100,000, for the years for which data are available, of selected foodborne and waterborne diseases: salmonellosis (excluding typhoid fever), shigellosis, trichinosis and typhoid fever.

### Part II: Organization of data from the investigation of an epidemic of St. Louis encephalitis.

Using the information provided in Tables 3 through 7 and the blank maps, construct the following:

- A. A table showing the number of cases by laboratory classification.
- B. A table showing the number of cases by age, race and sex (using same class intervals as shown in table 6).
- C. A table showing the attack rates by age and sex (using the data in the preceding table).
- D. A histogram of cases by date or other period of onset of illness, identifying those cases that terminate fatally.
- E. A spot map by city block of residence of the cases residing in Census Tracts 4 and 103.
- F. A coded area map of the incidence rates by census tract.

**Table 1**  
**Reported Cases of Tularemia by Month,**  
**United States, 1974**

<b>Month of Report</b>	<b>Number of Cases</b>
J	7
F	9
M	13
A	7
M	15
J	23
J	16
A	20
S	9
O	12
N	7
D	6
<b>TOTAL</b>	<b>144</b>

*Source: Adapted from (1).*

TABLE 2 Reported Cases of Specified Notifiable Diseases per 100,000 Population, United States, 1965-1974

DISEASE	1974	1973	1972	1971	1970	1969	1968	1967	1966	1965
Amebiasis	1.30	1.07	1.06	1.33	1.42	1.44	1.50	1.60	1.49	1.43
Anthrax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aseptic meningitis	1.53	2.33	2.23	2.51	3.18	1.82	2.25	1.56	1.56	1.20
Botulism	0.01	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01
Brucellosis (undulant fever)	0.11	0.10	0.09	0.09	0.10	0.12	0.11	0.13	0.13	0.14
Chickenpox	72.20	97.68	87.34	.....	.....	.....	Not previously reportable nationally	.....	.....	.....
Diphtheria	0.13	0.11	0.07	0.10	0.21	0.12	0.13	0.11	0.11	0.08
Encephalitis, primary	—	0.77	0.51	0.74	0.78	0.80	0.89	0.75	1.08	0.89
Encephalitis, post-infectious	—	0.17	0.12	0.21	0.18	0.15	0.25	0.54	0.49	0.51
Hepatitis A	19.54	24.18	25.97	28.90	27.87	23.98	22.96	19.67	16.77	17.47
Hepatitis B	5.15	4.03	4.52	4.74	4.08	3.02	2.49	1.28	1.79	.....
Hepatitis, Unspecified	3.95	.....	.....	.....	.....	.....	Not previously reportable nationally	.....	.....	.....
Leprosy	0.06	0.07	0.06	0.06	0.06	0.05	0.06	0.04	0.06	0.05
Leptospirosis	0.03	0.03	0.02	0.03	0.02	0.04	0.03	0.03	0.04	0.04
Malaria	0.14	0.11	0.36	1.15	1.50	1.54	1.16	1.02	0.29	0.08
Measles (rubeola)	10.45	12.72	15.50	36.50	23.23	12.79	11.12	31.69	105.42	136.73
Meningococcal infections	0.64	0.66	0.64	1.10	1.23	1.46	1.31	1.09	1.73	1.57
Mumps	29.00	36.23	38.42	65.33	55.55	48.65	87.87	Not previously reportable nationally	.....	.....
Pertussis (whooping cough)	1.15	0.84	1.58	1.47	2.08	1.63	2.41	4.91	3.98	3.55
Poliomyelitis, total	0.00	0.00	0.01	0.01	0.02	0.01	0.03	0.02	0.06	0.04
Paralytic	0.00	0.00	0.01	0.01	0.02	0.01	0.03	0.02	0.05	0.03
Psittacosis	0.08	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.03
Rabies in man	—	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rheumatic fever, acute	1.79	0.92	2.01	2.16	2.45	2.48	2.67	3.12	3.63	4.25
Rubella (German measles)	5.64	13.25	12.25	21.86	27.75	28.91	25.67	25.74	24.57	.....
Rubella congenital syndrome	0.02	0.02	0.02	0.03	0.04	0.02	0.01	0.01	0.01	.....
Salmoneellosis, excluding typhoid fever	10.40	11.35	10.64	10.63	10.84	9.12	8.26	9.15	8.60	8.86
Shigellosis	10.69	10.79	9.70	7.83	6.79	5.92	6.09	6.81	6.07	5.69
Tetanus	0.05	0.05	0.06	0.06	0.07	0.09	0.09	0.13	0.12	0.15
Trichinosis	0.06	0.05	0.04	0.05	0.05	0.11	0.04	0.03	0.06	0.10
Tuberculosis (newly reported active cases)	14.29	14.77	15.79	17.07	18.22	19.37	21.33	23.07	24.38	25.29
Tularemia	0.07	0.08	0.07	0.09	0.08	0.07	0.09	0.11	0.11	0.14
Typhoid fever	0.21	0.32	0.19	0.20	0.17	0.18	0.20	0.20	0.19	0.23
Typhus fever, flea-borne (murine)	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.03	0.02	0.02
Typhus fever, tick-borne (Rocky Mountain spotted)	0.36	0.32	0.25	0.21	0.19	0.25	0.15	0.15	0.14	0.14
Veneral diseases (newly reported civilian cases)	39.95	42.03	44.15	47.00	45.30	46.28	48.84	52.53	54.37	58.89
Syphilis	428.70	404.92	371.61	328.16	297.47	268.58	235.67	207.33	181.85	169.58
Gonorrhea	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other specified venereal disease:	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chancroid, granuloma inguinale, and lymphogranuloma venereum	0.66	0.79	1.09	1.03	1.07	0.89	0.75	0.67	0.67	1.05

Source: HEW, PHS, CDC. Reported Morbidity and Mortality in the United States, 1974. Weekly Report for the Year Ending December 28, 1974. Vol. 23 No. 53.

Total resident population used to calculate all rates except venereal diseases for which civilian resident population was used.

Table 3

Line Listing of Cases of St. Louis Encephalitis  
City of Dixon, July and August, 1975

Case No.	Age	Race/ Sex*	Onset Date Mo-Day	Laboratory Classifi- cation*	Death Date Mo-Day	Census Tract and Block of Residence	
						CT	Block
1	67	3	07-13	1	-	103	- 925
2	44	4	07-24	1	-	103	- 919
3	29	4	07-26	1	-	16	- 47
4	27	3	07-28	4	-	4	- 301
5	56	3	07-31	1	-	4	- 303
6	44	4	07-29	1	-	103	- 919
7	67	3	07-31	1	-	26	- 312
8	87	3	08-04	1	-	15	- 209
9	91	4	08-03	1	-	16	- 176
10	49	4	08-06	1	08-12	16	- 196
11	35	4	08-05	1	-	103	- 917
12	68	4	08-05	1	-	103	- 925
13	56	4	08-06	1	-	103	- 919
14	43	1	08-05	1	-	14	- 201
15	57	2	08-01	1	-	4	- 303
16	44	1	08-04	1	-	13	- 306
17	5	3	08-05	1	-	16	- 86
18	25	4	08-02	1	-	4	- 302
19	87	3	07-15	2	08-15	103	- 918
20	78	4	08-09	1	-	16	- 86
21	58	1	08-02	1	-	4	- 301
22	20	1	07-29	3	-	1	- 37
23	18	1	08-04	3	-	26	- 101
24	40	3	08-07	1	-	1	- 76
25	64	1	08-05	1	-	105	- 49
26	36	2	08-09	1	-	105	- 53
27	67	2	08-08	1	08-20	16	- 140
28	63	1	08-12	1	08-19	4	- 301
29	5	1	08-08	1	-	4	- 302
30	1	1	08-13	1	-	103	- 918

\* See Table 4 for explanation of codes.

**Table 4**

**Interpretation of Codes Used in Table 3**

<b>Race/Sex</b>	<b>Laboratory Classification</b>
1 – White Male	1 – Confirmed
2 – White Female	2 – Presumptive
3 – Black Male	3 – Inconclusive
4 – Black Female	4 – Negative
9 – Unknown Race or Sex	Blank – Pending

**Table 5**

**Calendar Months of July and August, 1975**

<b>July</b>						
<b>S</b>	<b>M</b>	<b>T</b>	<b>W</b>	<b>T</b>	<b>F</b>	<b>S</b>
		1	→	→	→	5
6	→	→	→	→	→	12
13	→	→	→	→	→	19
20	→	→	→	→	→	26
27	→	→	→	→	→	31

<b>August</b>						
<b>S</b>	<b>M</b>	<b>T</b>	<b>W</b>	<b>T</b>	<b>F</b>	<b>S</b>
					1	→ 2
3	→	→	→	→	→	9
10	→	→	→	→	→	16
17	→	→	→	→	→	23
24	→	→	→	→	→	30
31						

**Table 6****Population, by Age, Race, and Sex,  
City of Dixon, 1970**

Age Group (yrs)	Population								
	Black			White			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
0 - 9	8,556	8,724	17,280	18,155	17,581	35,736	26,711	26,305	53,016
10 - 19	6,625	6,208	12,833	14,755	12,276	27,031	21,380	18,484	39,864
20 - 29	4,724	4,547	9,271	17,539	12,077	29,616	22,263	16,624	38,887
30 - 39	3,587	4,309	7,896	11,439	11,420	22,859	15,026	15,729	30,755
40 - 49	3,110	3,819	6,929	8,927	8,244	17,181	12,047	12,063	24,110
50 - 59	2,058	2,664	4,722	5,081	5,786	10,867	7,139	8,450	15,589
60 - 69	1,211	1,811	3,022	2,843	3,650	6,493	4,054	5,463	9,517
70+	737	1,166	1,903	1,595	2,749	4,344	2,332	3,915	6,247
<b>TOTAL</b>	<b>30,608</b>	<b>33,248</b>	<b>63,856</b>	<b>80,344</b>	<b>73,783</b>	<b>154,127</b>	<b>110,952</b>	<b>107,033</b>	<b>217,985</b>

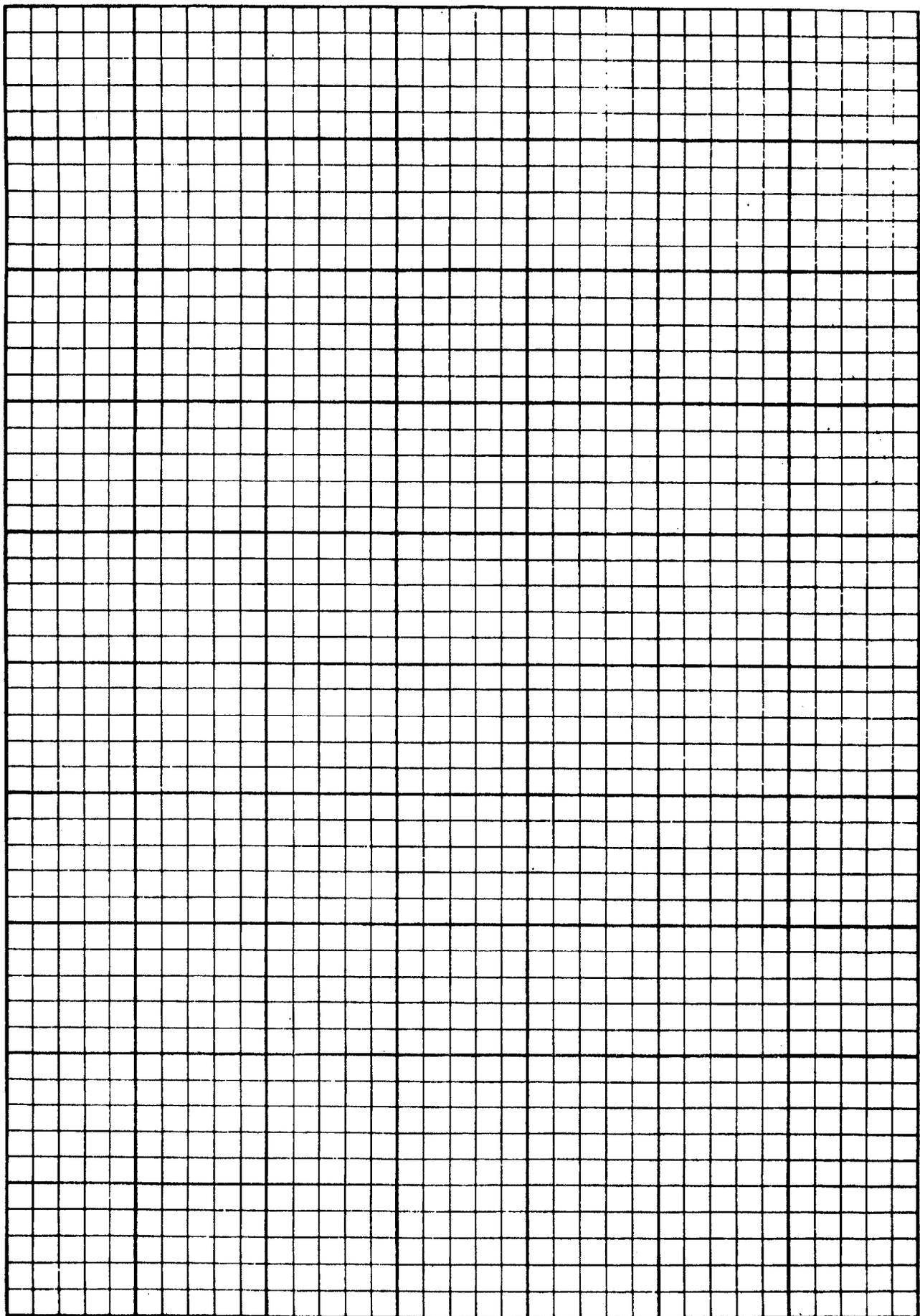
Source: Department of Commerce, Bureau of the Census, General Population Characteristics (sample state): 1970 Census of Population. Issued July 1971.

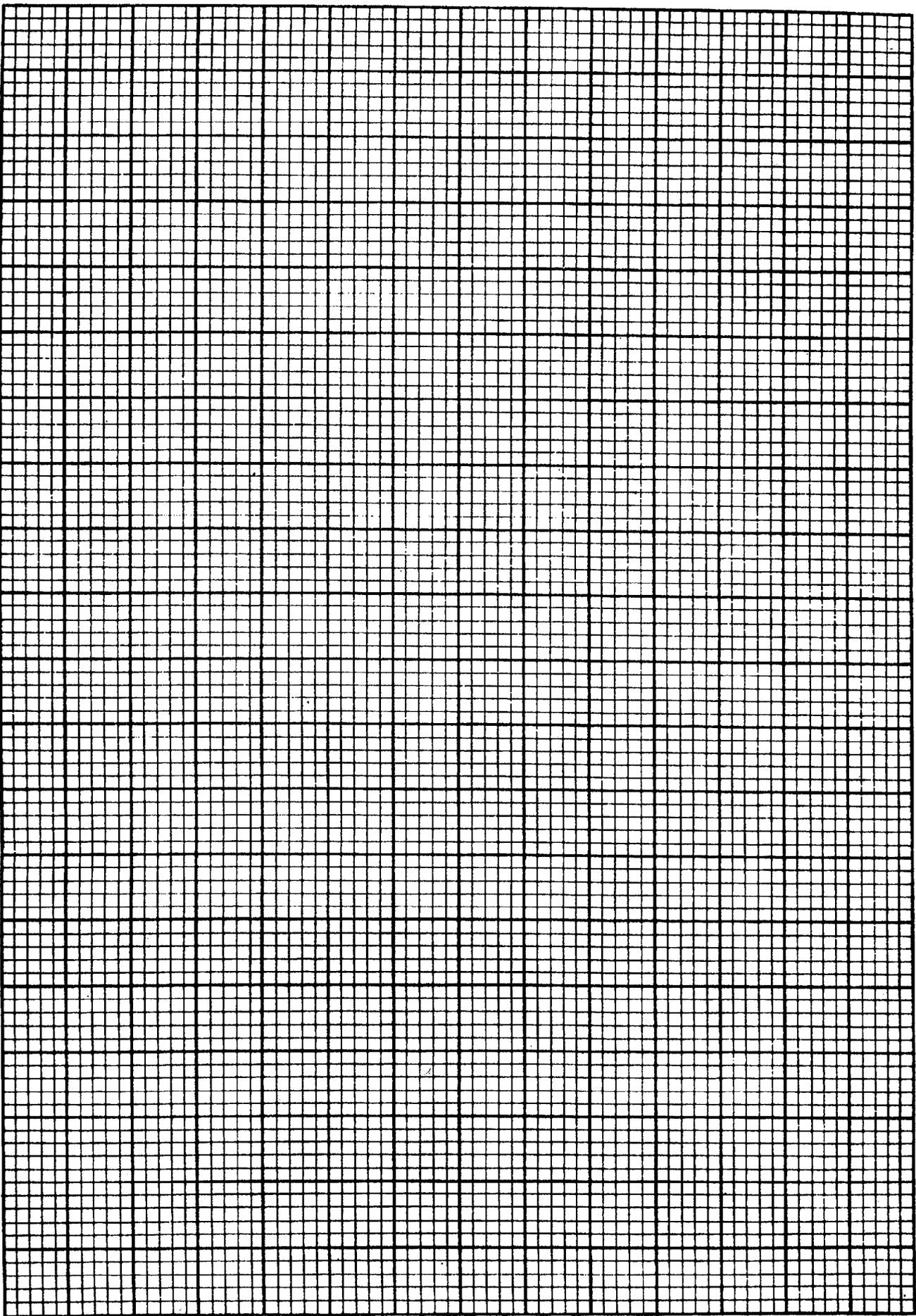
Table 7

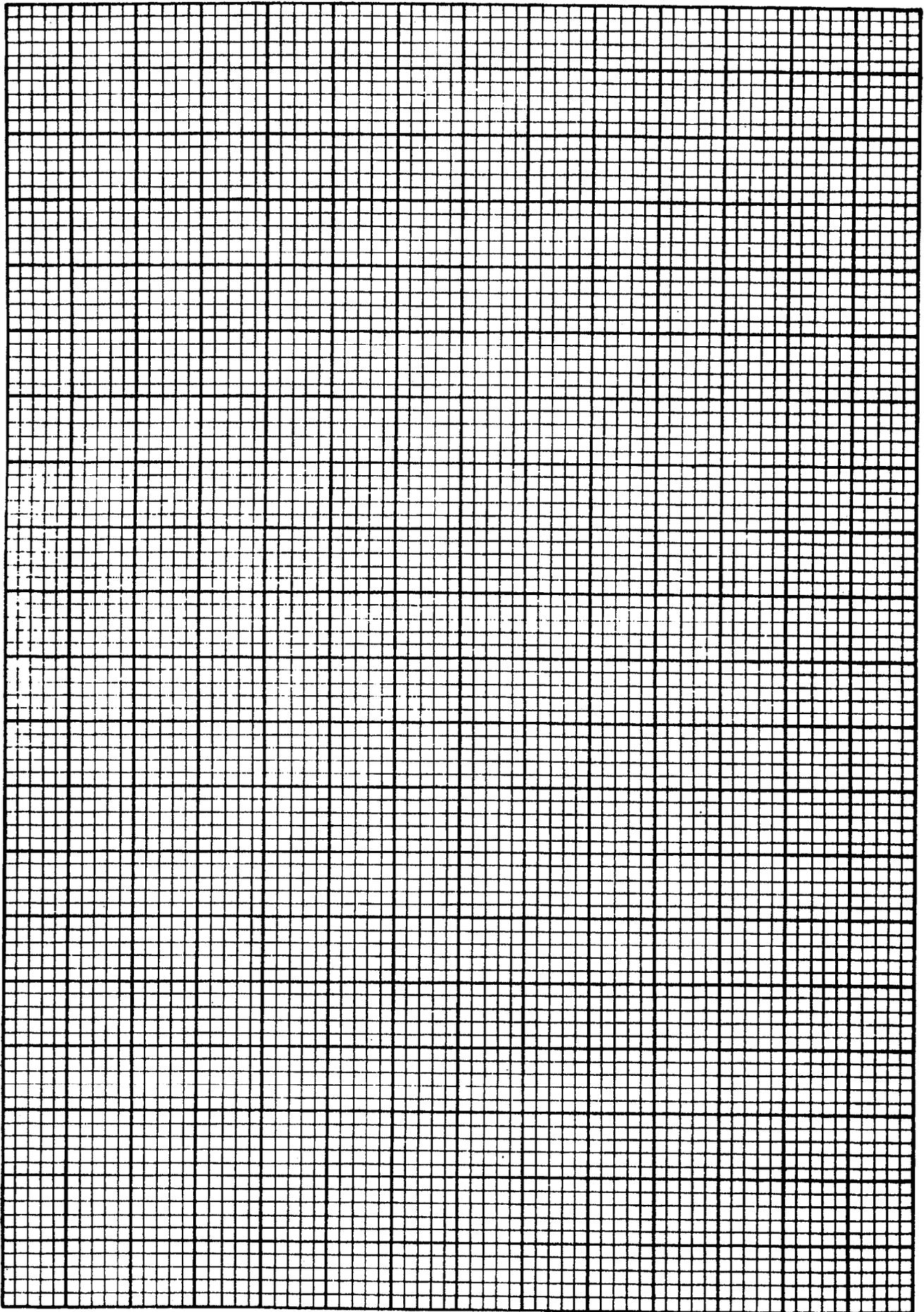
Population, by Census Tract,  
City of Dixon, 1970

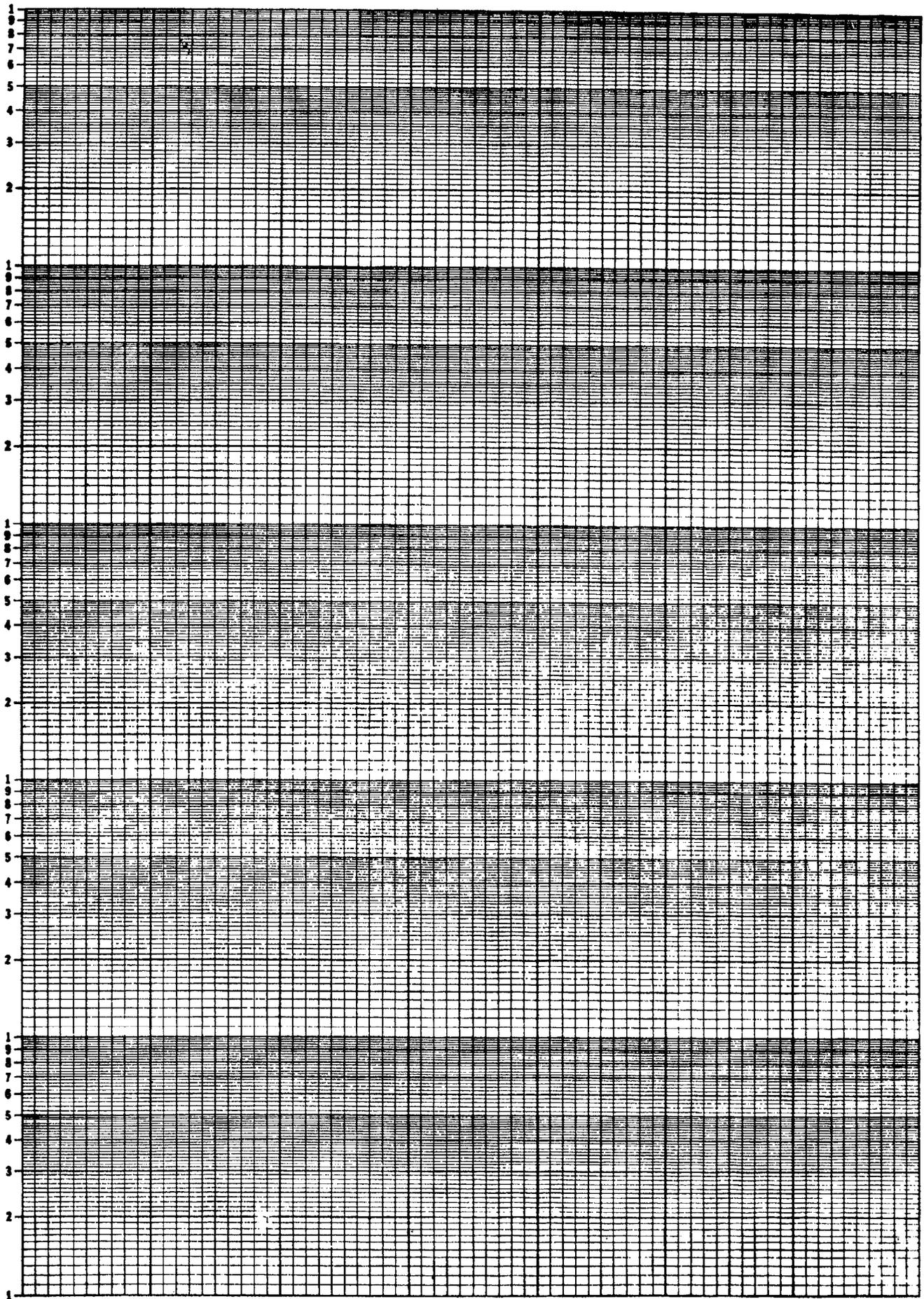
Census Tract	Population	Census Tract	Population
1	802	26	1105
2	3347	27	5053
3	2507	28	6019
4	3864	29.01	2335
5	2547	29.02	4930
6	1846	30	3217
7	605	31	6078
8	2555	32	4036
9	2791	33	5696
10	4076	34	3633
11	3386	35	521
12	3463	101	1148
13	2061	102	2010
14	3043	103	1740
15	2825	104.01	5178
16	4426	104.02	3522
18	2433	105	4827
19	1390	106.01	7862
20	2965	106.02	5768
21	2952	107.01	4554
22	4522	107.02	4050
23	2024	107.03	4170
24	2434	109	656
25	3196		
		TOTAL	217,985

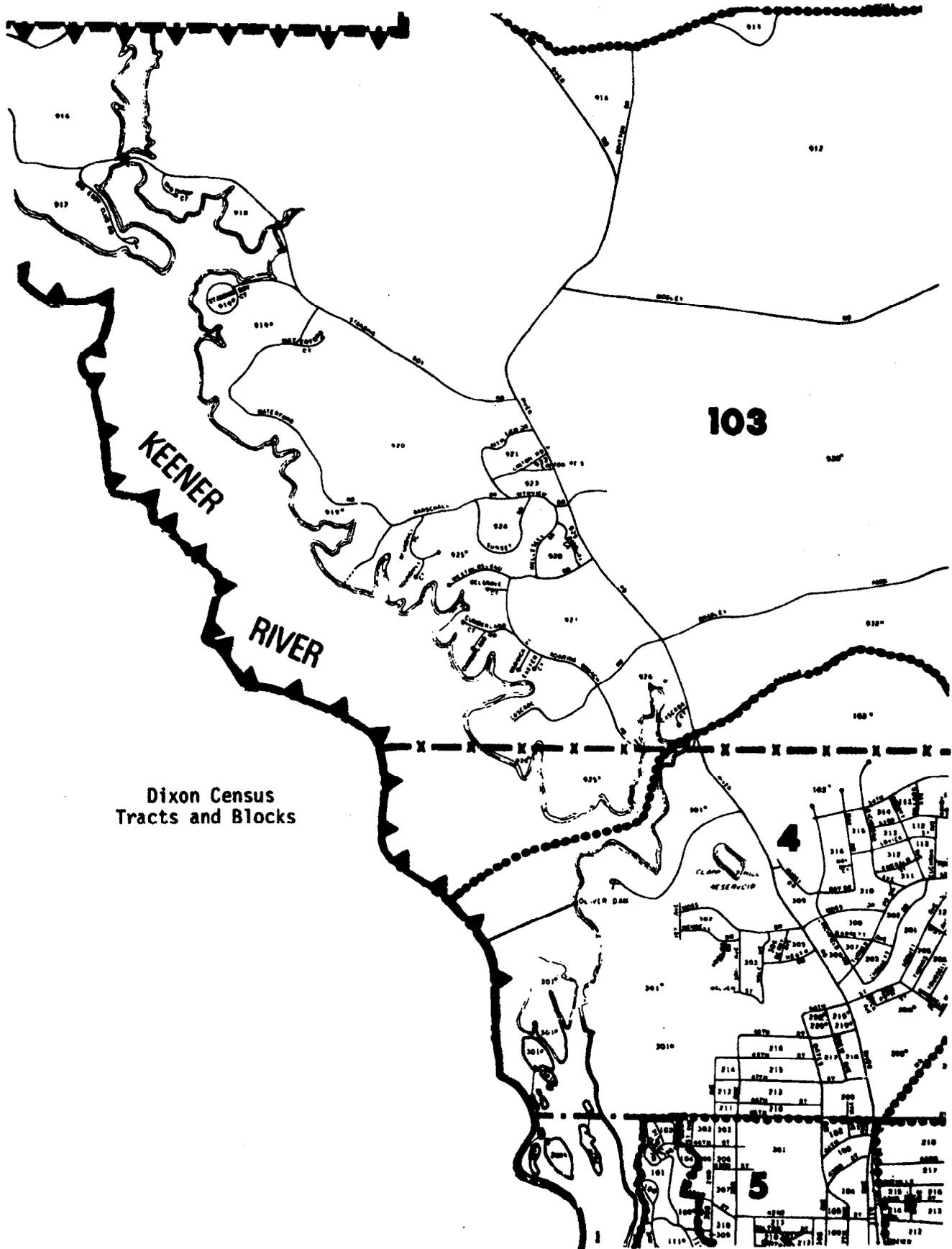
Source: Department of Commerce, Op. cit.



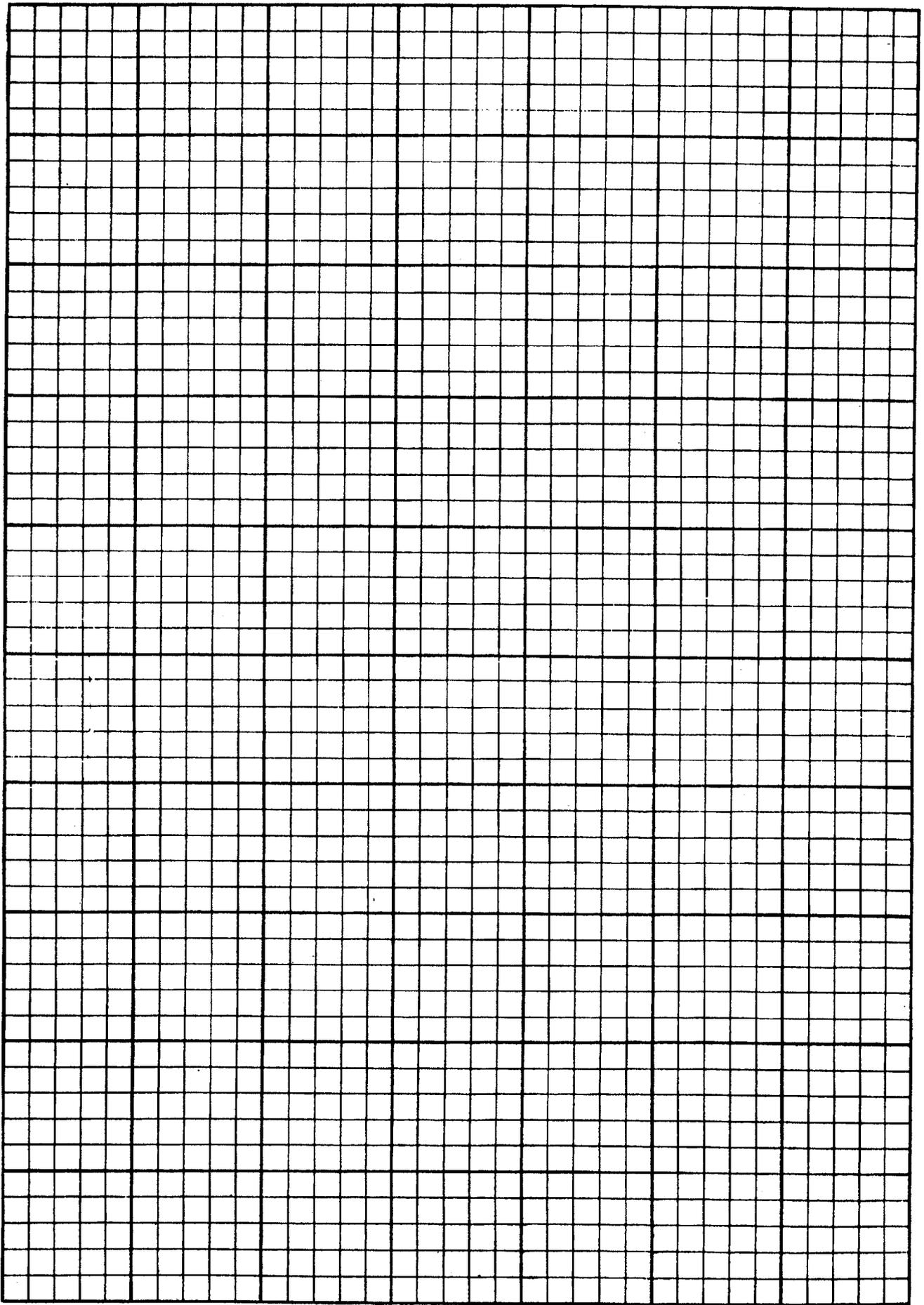






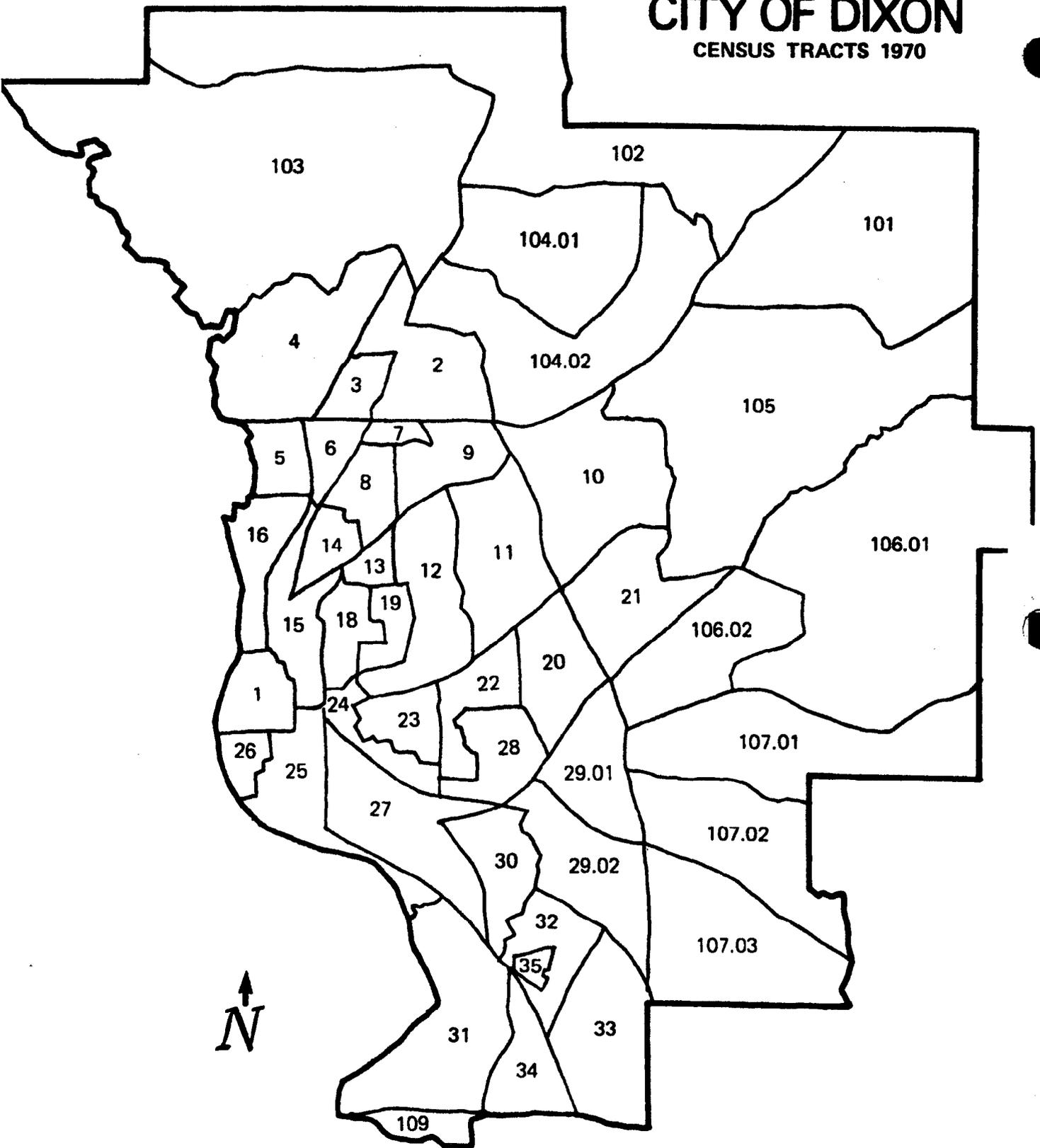


Dixon Census Tracts and Blocks



# CITY OF DIXON

CENSUS TRACTS 1970



ANSWERS TO THE EXERCISE PROBLEMS

Part I: Surveillance Data

- A. Histogram. Examining the data it can be seen that the highest value for any month is 23 cases in June. So the y-axis must be high enough to provide for this number. The x-axis must, of course, provide for 12 months. See Figure A (p. 55) for the completed histogram.
- B. Frequency polygon. The same data and basic layout is used for the frequency polygon as is used for the histogram. Only the x-axis is lengthened to accommodate the closures, and the mid-points of the intervals are connected. See Figure B.
- C. Bar Chart. The highest value to be charted is 136.73 (measles, 1965); and the lowest is 5.64 (rubella, 1974). Regarding the x-axis, the number of spaces needed is:

$$\text{spaces} = [(\# \text{ of diseases}) \times (\# \text{ of years})] + 1 \text{ or } 2 \text{ extra spaces per group of } 3.$$

$$\text{spaces} = (3 \times 10) + 10 \text{ or } 20.$$

$$\text{spaces} = 30 + 10 \text{ or } 20 = 40 \text{ or } 50 \text{ spaces. The choice between these two figures depends on how much space is needed for clarity. See Figure C.}$$

- D. Arithmetic scale line graph. The range of values to be graphed is:

Salmonellosis:	8.26 (minimum)	-	11.35 (maximum)
Shigellosis:	5.69	-	10.79
Typhoid fever:	0.17	-	0.32

Assuming that we will not use a scale break on the y-axis, the range of values to be provided for on the y-axis is from 0.0 to 12.0. On the x-axis 10 spaces, one for each year, are needed. See Figure D.

- E. Semi-logarithmic scale line graph. The highest value to be graphed is 11.35 (salmonellosis, 1973); and the lowest is 0.03 (trichinosis, 1967). Therefore, the number of log cycles needed is:

$$\begin{array}{ccccccc} 0.01 & - & 0.1 & - & 1.0 & - & 10.0 & - & 100.0 \\ & \downarrow & & \downarrow & & \downarrow & & \downarrow & \\ & 1 & & 2 & & 3 & & 4 & \end{array} \quad = \underline{4 \text{ cycles.}} \quad \text{See Figure E.}$$

**Part II: Disease Outbreak Data**

- A. Table. First identify the various laboratory classifications and then count the number of cases on the list in each classification. See Table 1.
- B. Table. First identify the age groups to be used, which, in this instance is suggested by the age groups for which population data are available. Then set up the various columns to be used and enter the data from the line list. See Table 2. The sequence of the columns shown is not particularly important as long as each is clearly labeled.
- C. Table. The necessary rates must be calculated--using the information in the preceding table and the population data provided. See Table 3.
- D. Histogram. The length of the x- and y-axes is the first problem to solve. It often is helpful to sketch out a tentative solution or two before starting to draw the final version. Such a sketch would include selecting a short time interval and tabulating the number of cases that occurred in each:

<u>Date of onset</u>					July							
<u>(2-day intervals):</u>	1	3	5	7	9	11	13	15	17	19	21	23
<u>Number of Cases</u>	:						/	/				/
<u>Date of onset</u>	:	July						August				
		25	27	29	31	2	4	6	8	10	12	
<u>Number of Cases</u>		/	/	//	///	///	///	///	///		//	

Knowing the number of time intervals to be shown (at least those during the period July 1 - August 13) and the maximum number of cases on any one date (8, on August 4-5), appropriate scales can be selected. See Figure F.

- E. Spot Map. First identify on the line listing of cases those that live in either census tract 4 or 103. Adopt a symbol to represent a case, locate the appropriate tract and block on the map, and put the symbol for a case next to the block on the map. See Figure G.

F. Area Map. Again, it is usually helpful to sketch out the available information before mapping it. This would involve (a) identifying on the list of cases those census tracts which have cases, (b) tabulating the number of cases in each, and (c) calculating an appropriate incidence rate:

<u>C.T.'s Involved</u>	<u># Cases</u>	<u>Rate (per 100,000)</u>
1	// = 2	249.4
4	<del>///</del> // = 7	181.2
13	/ = 1	48.5
14	/ = 1	32.9
15	/ = 1	35.4
16	<del>///</del> / = 6	135.6
26	// = 2	181.0
103	<del>///</del> /// = 8	459.8
105	// = 2	41.4
<hr/>		<hr/>
TOTAL	30	13.8

Rank-ordering the rates, you get:

<u>Rate</u>	<u>C.T. #</u>
32.9	14
35.4	15
41.4	105
48.5	13
135.6	16
181.0	26
181.2	4
249.4	1
459.8	103

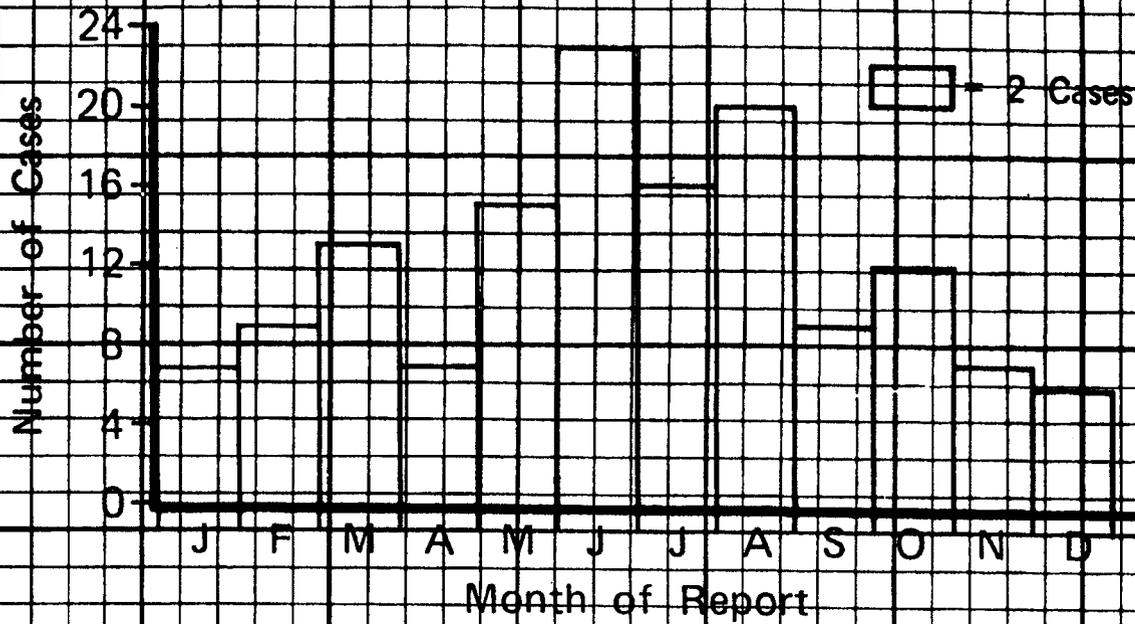
Now you can select the ranges of rates you wish to use and assign a code to each. In this instance, four ranges were selected. Since so many census tracts had no cases, methods 1 and 2 in the reference for selecting ranges in rates would not produce helpful results. Using method 3 the following ranges were obtained:

<u>Range of Rates</u>	<u>Code</u>
0	
0.1 - 153.3	
153.4 - 306.8	
306.9 - 459.9	

Now you can proceed to mark the census tracts appropriately. See Figure H.

Figure A

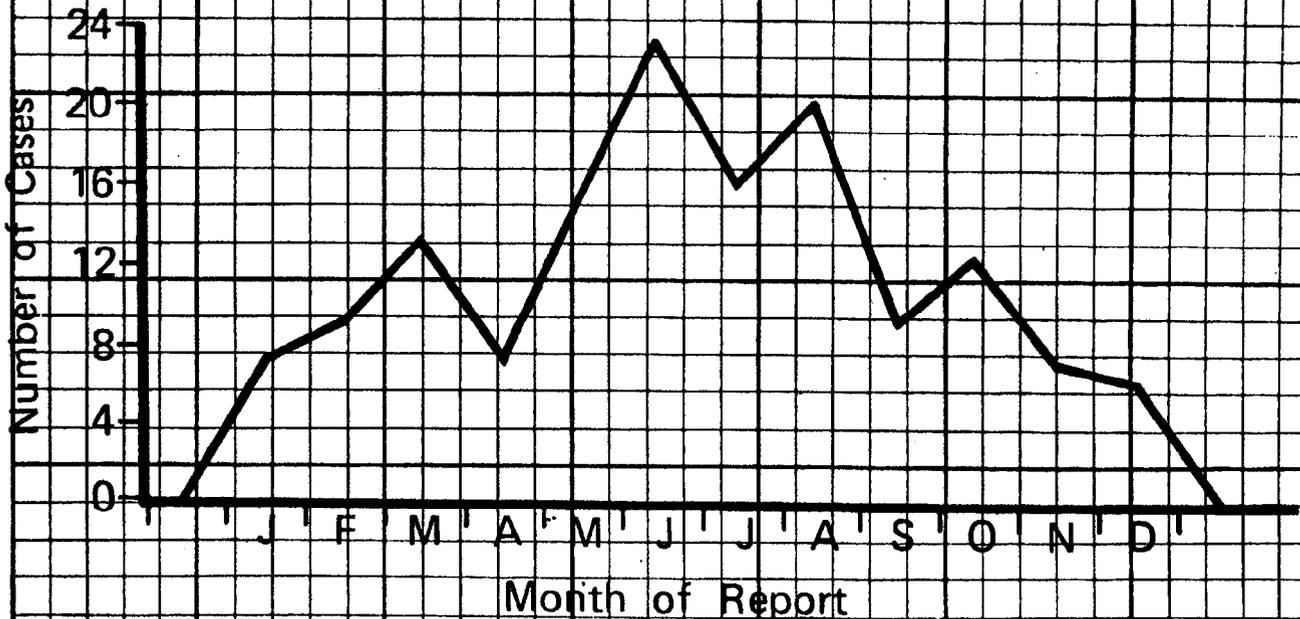
Reported Cases of Tularemia by Month of Report,  
United States, 1974.



Source: Tables 1 and 2

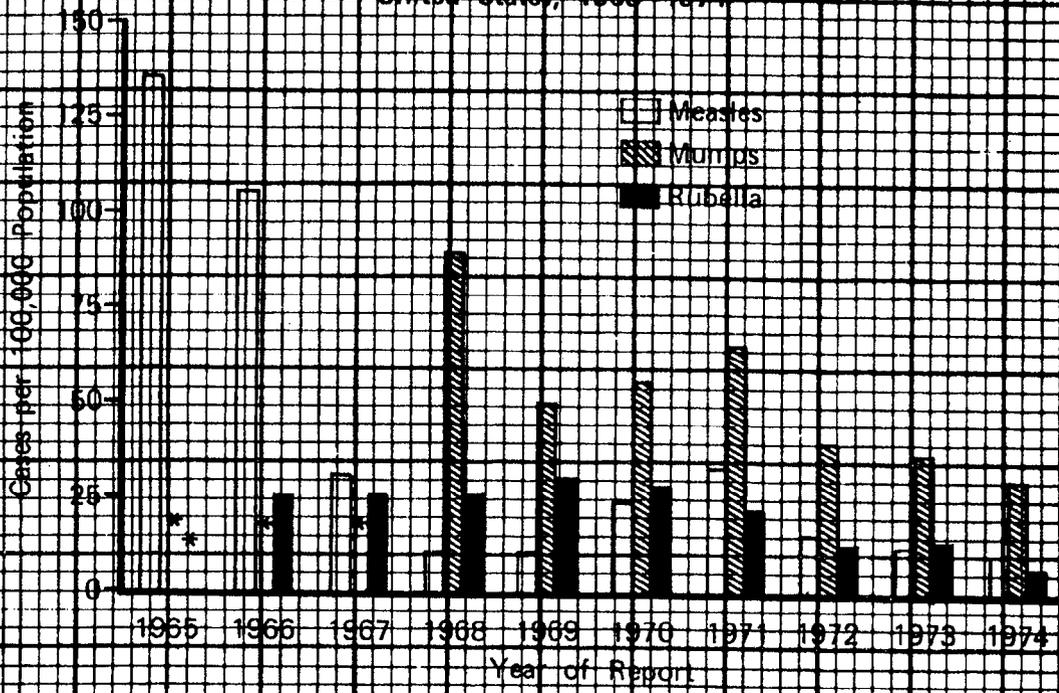
Figure B

Reported Cases of Tularemia by Month of Report,  
United States, 1974.



Source: Tables 1 and 2

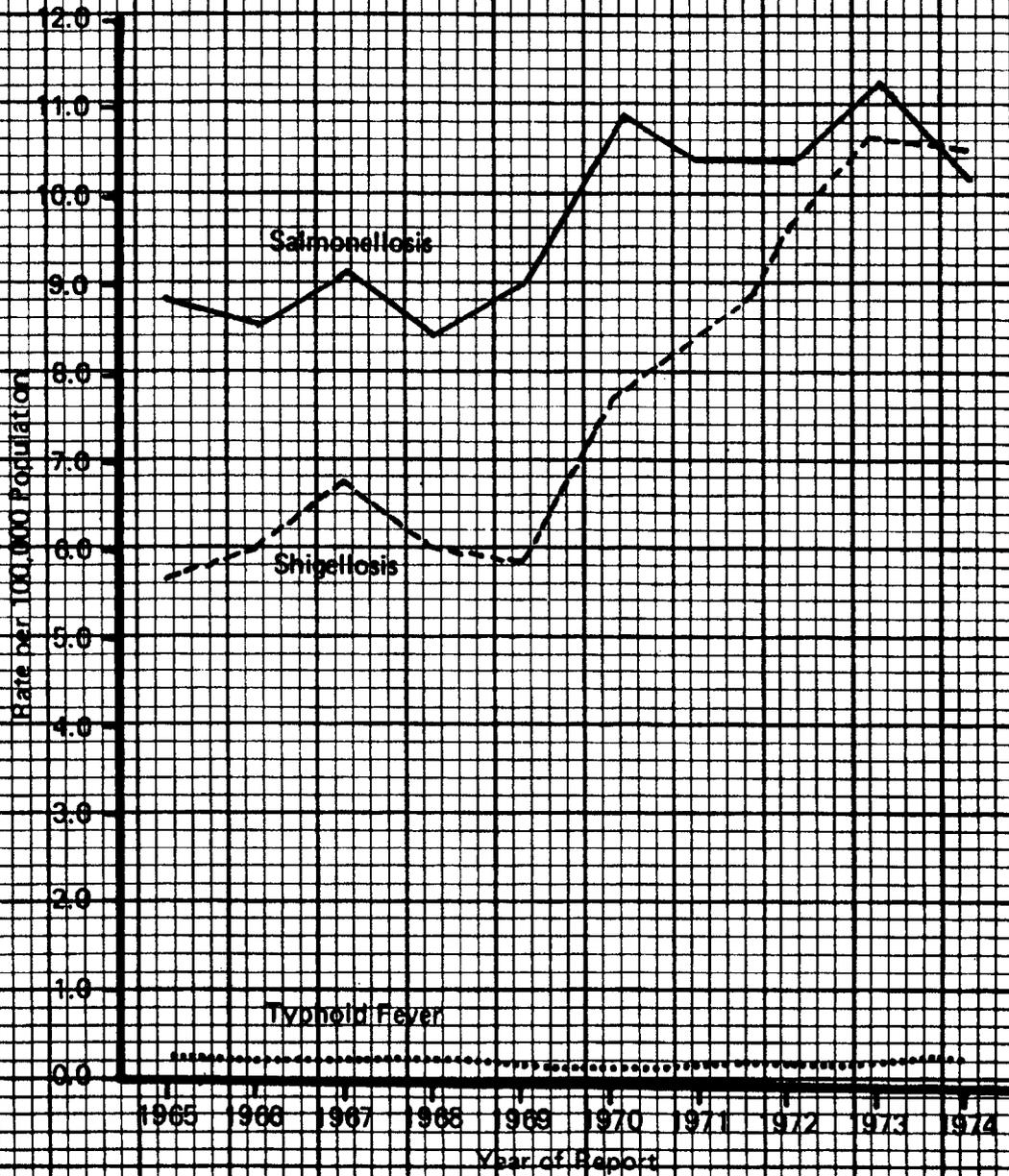
**Figure C**  
**Reported Cases of Measles, Mumps**  
**and Rubella per 100,000 Population,**  
**United States, 1965-1974**



Source: Table 2

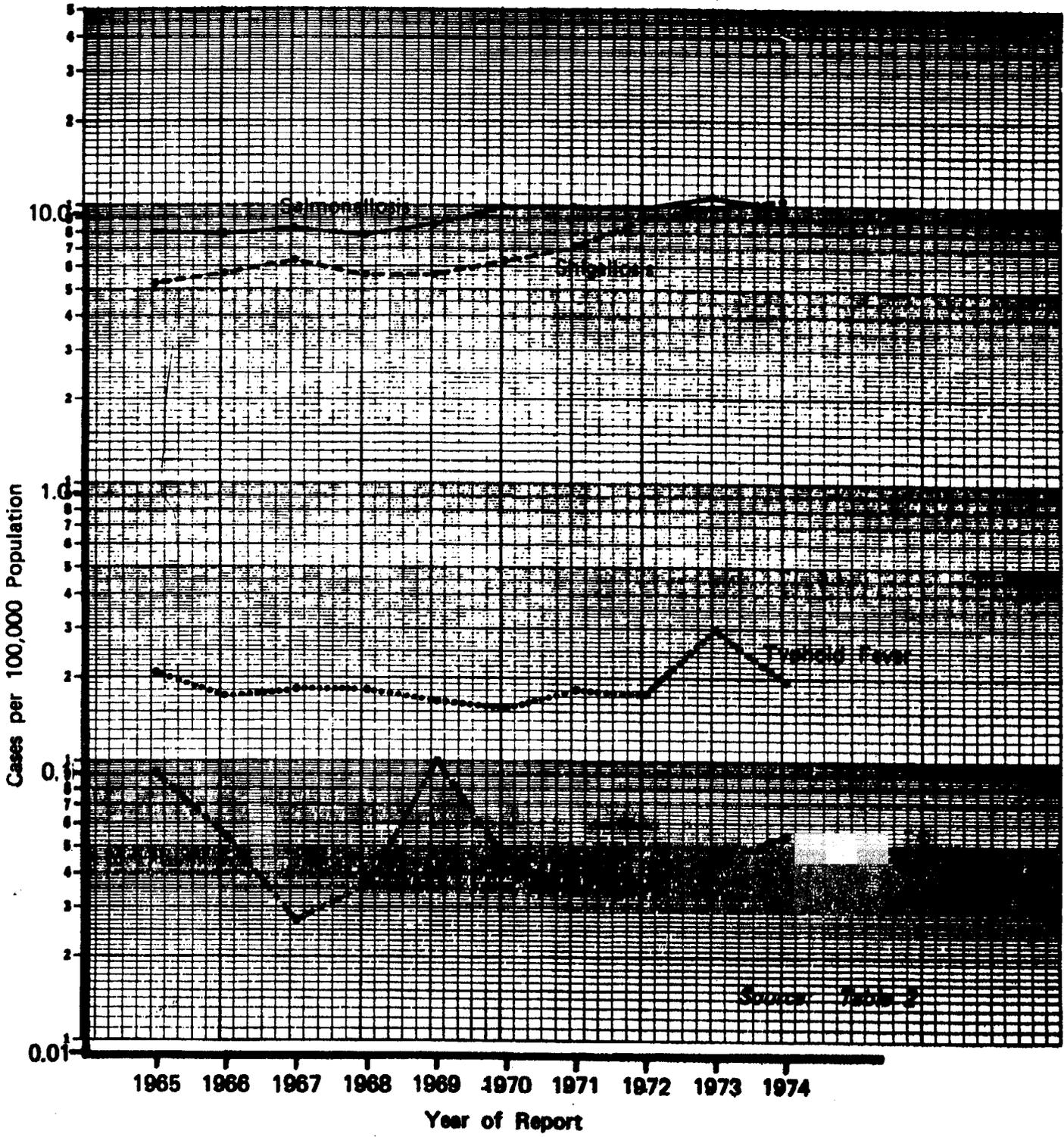
\* Indicates years during which the disease was not reportable nationally.

**Figure D**  
**Rate of Cases of Salmonellosis (excluding typhoid fever), Shigellosis, and Typhoid Fever per 100,000 Population Reported to the Center for Disease Control, for the United States, 1965-1974.**



Source: Table 2

**Figure E**  
**Reported Cases of Salmonellosis (excluding typhoid fever), Shigellosis, Typhoid Fever, and Trichinosis per 100,000 Population in the United States, 1965-1974**



Source: Table 2

**Table 1**  
**Number of Cases of St. Louis Encephalitis, by Laboratory**  
**Classification, City of Dixon, August 1975**

<b>Laboratory Classification</b>	<b>Number of Cases</b>
<b>Confirmed</b>	<b>26</b>
<b>Presumptive</b>	<b>1</b>
<b>Inconclusive</b>	<b>2</b>
<b>Negative</b>	<b>1</b>
<b>Pending</b>	<b>0</b>
<b>TOTAL</b>	<b>30</b>

*Source: Table 3*

**Table 2**  
**Number of Cases of St. Louis Encephalitis, by Age Group,**  
**Race and Sex, City of Dixon, July 13–August 13, 1975**

Age Group (years)	Number of Cases								
	Black			White			Total		
	M	F	T	M	F	T	M	F	T
0 – 9	1	0	1	2	0	2	3	0	3
10 – 19	0	0	0	1	0	1	1	0	1
20 – 29	1	2	3	1	0	1	2	2	4
30 – 39	0	1	1	0	1	1	0	2	2
40 – 49	1	3	4	2	0	2	3	3	5
50 – 59	1	1	2	1	1	2	2	2	4
60 – 69	2	1	3	2	1	3	4	2	6
70+	2	2	4	0	0	0	2	2	4
<b>TOTAL</b>	<b>8</b>	<b>10</b>	<b>18</b>	<b>9</b>	<b>3</b>	<b>12</b>	<b>17</b>	<b>13</b>	<b>30</b>

*Source: Outbreak investigation conducted by the City of Dixon Health Department.*

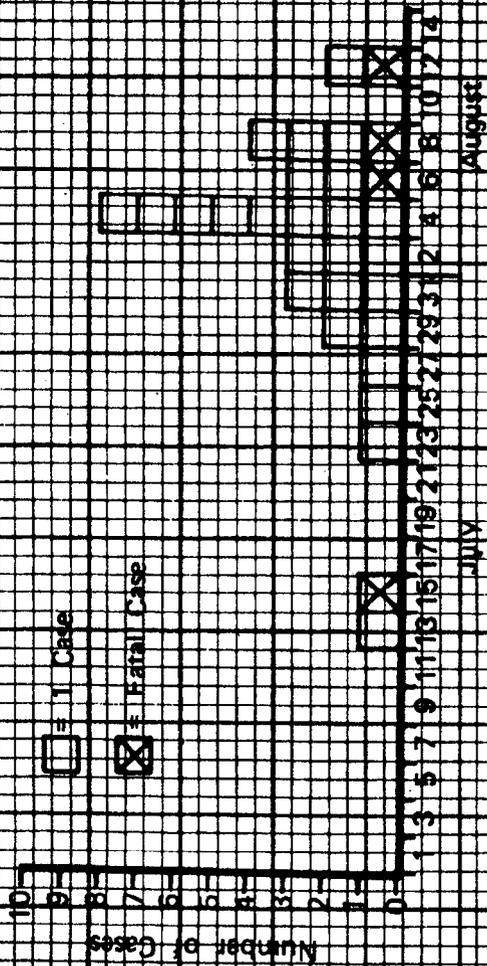
**M = Male**  
**F = Female**  
**T = Total**

**Table 3**  
**Incidence (per 100,000 population) of St. Louis Encephalitis,**  
**by Age Group and Sex, City of Dixon, July 13–August 13, 1975**

Age Group (years)	Cases per 100,000 population		
	Male	Female	Total
0 – 9	11.2	0.0	5.7
10 – 19	4.7	0.0	2.5
20 – 29	9.0	12.0	10.3
30 – 39	0.0	12.7	6.5
40 – 49	24.9	24.9	24.9
50 – 59	28.0	23.7	25.7
60 – 69	98.7	36.6	63.0
70+	85.8	51.1	64.0
<b>TOTAL</b>	<b>15.3</b>	<b>121</b>	<b>13.8</b>

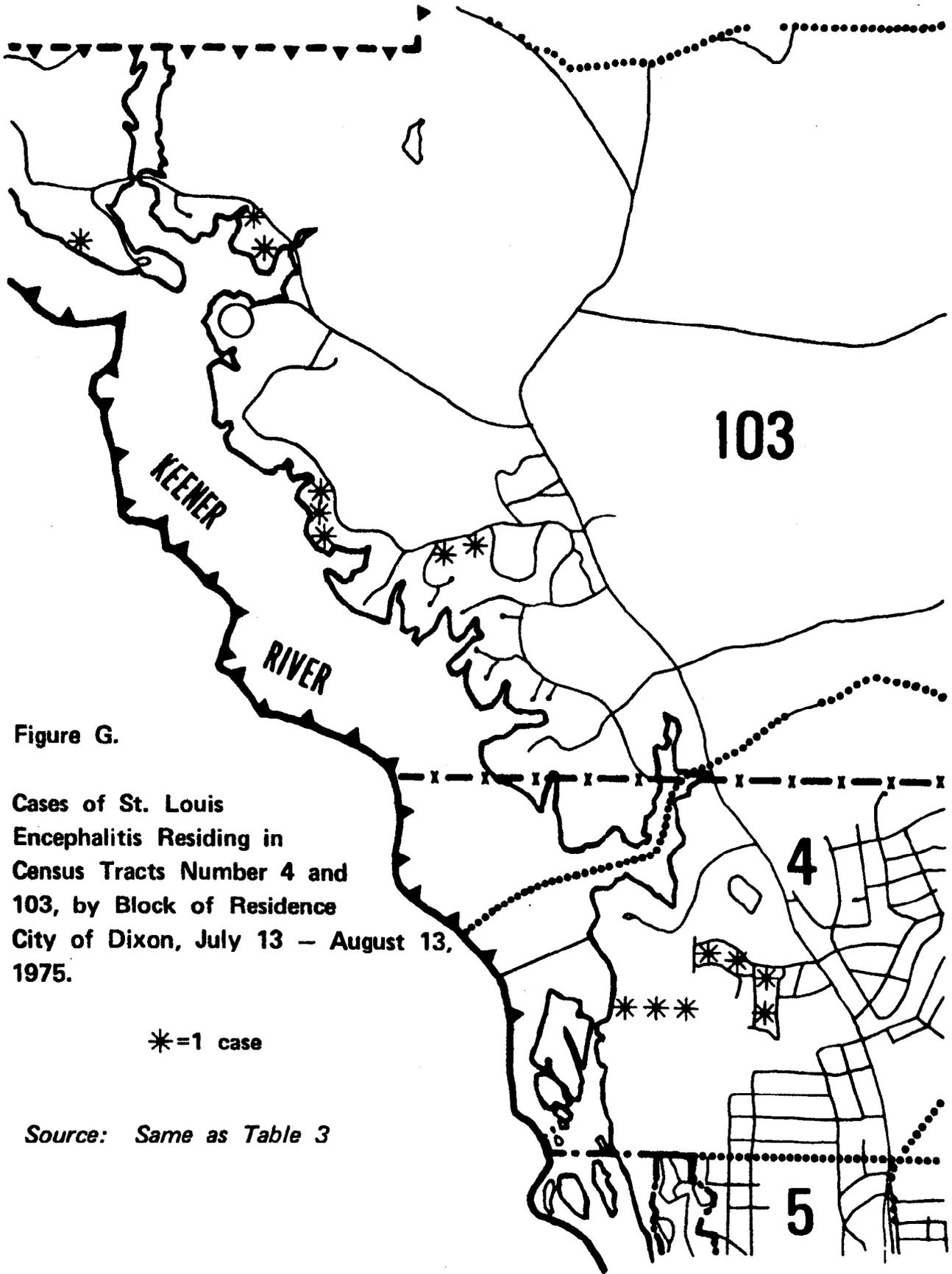
*Source: Same as Table 1.*

Figure 1  
 Cases of St. Louis Encephalitis, by Date  
 of Onset of Illness, City of Dixon, July 1 thru  
 August 13, 1975



Date of Onset of Illness (2-day intervals, starting on date shown)

Source: Same as Table 1



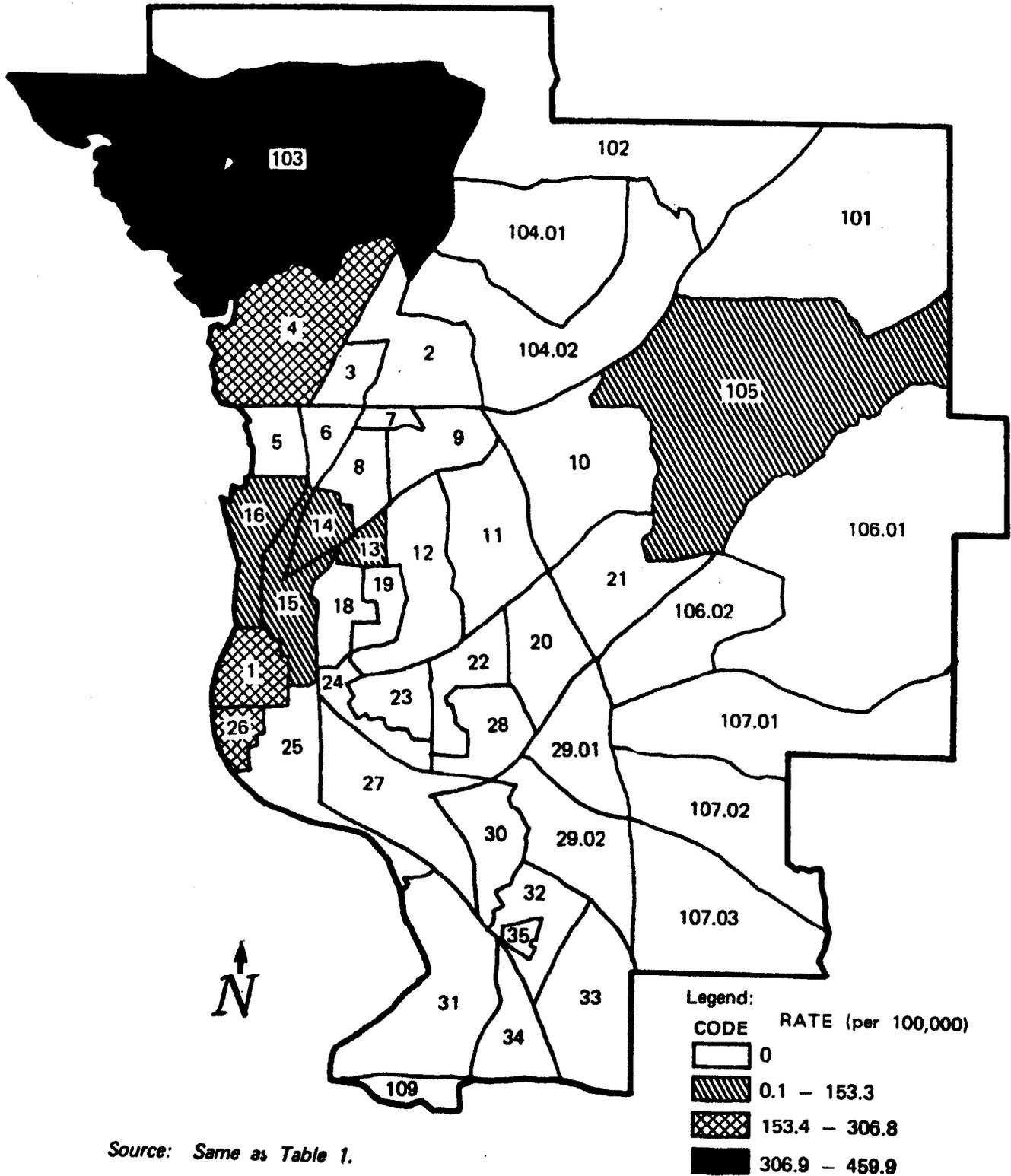
**Figure G.**

**Cases of St. Louis Encephalitis Residing in Census Tracts Number 4 and 103, by Block of Residence City of Dixon, July 13 – August 13, 1975.**

**\*=1 case**

*Source: Same as Table 3*

**Figure H**  
**Incidence of St. Louis Encephalitis (per 100,000 Population)**  
**by Census Tract of Residence, City of Dixon, United States,**  
**July 13 – August 13, 1975**



Source: Same as Table 1.

## SOURCES

- (1) Health, Education, and Welfare, Public Health Service, Center for Disease Control. Reported Morbidity and Mortality in the United States, 1974. Weekly Report for the Year ending December 28, 1974. Vol. 23, No. 53.
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