Sector will be allocated. Similarly, Block #11 is designated as a primary sampling unit since the cumulative total of housing units, 368, at this point exceeds 307.0, the second number in the series of Table 17. Two primary sampling units are allocated to Block #15 since the cumulative total of 639 exceeds the next two numbers, 465.2 and 623.4, in Table 17, and the smaller of these, 465.2 exceeds the cumulative total of 415, opposite Block #14. The final Interview Sector in Census Tract 04 was assigned to a primary sampling unit including two blocks, Numbers 22 and 23.

Since the final cumulative block total, 809, does not exceed 939.8, the 6th entry on Table 17, the cumulation would continue with the housing units of Census Tract 08, the next in order in Table 16, and progress similarly through the remaining census tracts in the area. The assignment of Interview Sectors to primary sampling units is recorded as shown in column (3) of Table 17. The decimal digits added to Block 04-15 indicate that two Interview Sectors are assigned to this primary sampling unit.

It is recommended that a table of cumulative totals of the number of housing units in the list of census tracts (or census block areas) be made and kept at hand for reference during the cumulation of housing units by block. As the final block total in a census tract is entered in the calculator a check with the reference table will indicate whether any errors have been made in cumulation within each census tract. If this is not done, errors are carried through the cumulation, and the entire operation will have to be repeated.

Procedure B. Stratified Random Sampling

In contrast to Procedure A, the method of Procedure B is to form 50 segments of 158.2 housing units each (calculated as above by dividing the total number of housing units in the area
[7910] by the required number [50] of Interview Sectors, and then randomly selecting a primary sampling unit within each segment.

A list of cumulative totals of segments is prepared as illustrated in column (2) of Table 19. Note that in this procedure, the randomly chosen starting point of Procedure A (Table 17) is not used.

<table>
<thead>
<tr>
<th>Segment Number</th>
<th>Cumulative Total of Segments</th>
<th>Random Number Within Segment</th>
<th>Primary Sampling Unit Numbers (Census Tract-Block Number)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>158.2</td>
<td>79.7</td>
<td>04-3</td>
</tr>
<tr>
<td>2</td>
<td>316.4</td>
<td>223.2</td>
<td>04-8</td>
</tr>
<tr>
<td>3</td>
<td>474.5</td>
<td>433.9</td>
<td>04-15.1</td>
</tr>
<tr>
<td>4</td>
<td>632.8</td>
<td>498.8</td>
<td>04-15.2</td>
</tr>
<tr>
<td>5</td>
<td>791.0</td>
<td>687.7</td>
<td>04-18</td>
</tr>
<tr>
<td>6</td>
<td>948.2</td>
<td>821.5</td>
<td>08-12</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>48</td>
<td>7593.6</td>
<td>7502.1</td>
<td>06-4</td>
</tr>
<tr>
<td>49</td>
<td>7751.8</td>
<td>7630.0</td>
<td>06-12</td>
</tr>
<tr>
<td>50</td>
<td>7910.0</td>
<td>7805.4</td>
<td>06-34</td>
</tr>
</tbody>
</table>

A random number from Appendix A is then chosen within the range of each segment, the first within the range 0.1 – 158.2, the second within the range 158.3 – 316.4, the third within the range 316.5 – 474.6, and so on, as shown in column (3) of Table 19.

The list of random numbers within segments in column (3) serves the same purpose as the systematic random list of selection intervals in column (2) of Table 17.

Again using the data of Table 19 for illustration, the number of housing units in each block is cumulated in the calculator as in Procedure A, but in the present procedure, column (3) of Table 19 determines the assignment of Interview Sectors.
The first Interview Sector assigned by Procedure B is to Block 03, (shown under Procedure B in Table 18) as the cumulative total in the calculator (108 in the 4th column) exceeds 79.7, the first random number in column (3) of Table 19. This is indicated by the broken line in Table 18. Similarly, Interview Sectors are assigned to the primary sampling unit formed of Blocks #7 and #8, of Block #15 (2 Interview Sectors) and Block #18.

These are recorded as shown in column (4) of Table 19. The decimal digits indicate that two Interview Sectors are assigned to Block #15. As described in the last paragraph of Procedure A, a cumulative list of census tract totals is used to check for errors as the work progresses.

For some stratified sampling designs the use of two primary sampling units in each stratum is desirable. Procedure B is easily adapted to this design by doubling the segment length and then selecting two random numbers within the range of each doubled segment.

2. Cities with No Published Block Statistics

In cities for which no city block statistics are published information on the number of housing units by block must be obtained from some other source. Maps or aerial photographs showing the location of housing units may be available through municipal governments, state highway departments or planning commissions. In one form—such maps consist of bound volumes of small sections keyed to a master map. In smaller cities a direct field count can be made. If this is done, a map drawn to a sufficiently large scale to permit recording of the number of housing units on each side of each block is required. Photographic enlargement of an available map may be necessary.

The actual count can be made from a slowly moving automobile. This work will progress much faster with use of a driver and two recorders, so that one person need count only one side of the street. Time will be saved by driving the full length of one street, recording counts
for the sides of blocks facing that street, and obtaining the number of housing units on the remaining sides of the blocks on successive runs.

Multiple housing units can be recognized by mailboxes, electric light meters, or multiple entrances. Apartment houses usually require a visit, but the number of apartments can often be determined from mailboxes near the entrance. The work should be done carefully but exact counts are not necessary since minor fluctuations will introduce no serious disturbance in the proportional allocation of Interview Sectors.

A count of housing units on every block, either from maps or by field reconnaissance, should be made for all cities up to a size of 100-150 blocks and is recommended for cities of larger size if time permits. After counts of housing units on all blocks are obtained, the procedures described above for cities with published block statistics are followed, substituting the housing unit counts for the Bureau of the Census City Blocks data.

In large cities, if time and resources are not sufficient to carry out a count of housing units on every block, the following method can be used. In this procedure blocks of the survey area are combined into groups, a primary sampling unit of one or more blocks is selected from each group by simple random sampling and a housing unit count is then made on the selected primary sampling units. This method should be used only if the survey area is large enough to be divided into approximately 25 groups of at least 6-8 blocks each. Details of the modified procedure will be illustrated by a Preschool Immunization Index Survey in "Silers City," a town of 12,500 population in 1960. The same method is used in surveys of individual socioeconomic areas of larger cities, if census block statistics are lacking.

Step 1. Sample Size. Determined in accordance with the objectives of the survey. A minimum sample size of 50 children in the 1-4 year-old age group is used in the example.
Step 2. Calculation of $\bar{c}$, the average number of children under 5 per housing unit. The number of house-
hold heads and children under 5 is obtained from the census source data listed in Table 7 (page 29). At the time of the 1960 census, Silers City had a population of 2,358 children under 5, and 4,120 heads of households. The latter number, multiplied by 1.05 as an allowance for vacant housing units, becomes 4,326 and

$$\bar{c} = \frac{2358}{4326} = 0.545.$$  

(For socioeconomic areas of large cities, $\bar{c}$ may be estimated from the average ranges given in Table 32, page 127)

Step 3. Estimation of $n$, the required number of housing units. Using $F_1 = 103.6$, from Table 6, (page 28),

$$n = \frac{F_1}{\bar{c}} = \frac{103.6}{0.545} = 190.1.$$  

Step 4. Number of Interview Sectors. In a Preschool Immunization Index Survey, 8 housing units are included in the sample cluster. In this example the number of Interview Sectors thus equals

$$\frac{190.1}{8} = 23.8,$$

which is rounded to 24 Interview Sectors.

Step 5. Location of Primary Sampling Units. Using a street map showing city blocks as a sampling frame, the work proceeds in 5 stages.

(1) Rough Count of Blocks. All blocks which are known not to contain any housing units are marked on the map and excluded from the count. These are blocks containing exclusively such structures as office buildings, stores, industrial plants, schools, churches, hospitals, parks, prisons, etc. With these
blocks removed from consideration, a rough count is made of the number of blocks remaining. As the rough count proceeds, difficulties may arise in deciding whether large or irregularly shaped areas should be counted as one or more blocks. When such problems occur, each such area is counted as one block at this stage but is marked for a subsequent field examination. The rough count of blocks on the map, Figure 5, of Silers City gave an estimated total of 306 blocks.

(2) Field Check
A field check to determine whether the large or irregularly shaped blocks include any housing units is then made. In Figure 5 these are designated as "Field Check." The location and number of housing units are recorded on the map. In an area designated as one "block" during the rough count, housing units may be found at more than one location during the field check. If so, the number of blocks in the rough count must be increased correspondingly. Similarly, the total is reduced by one for each vacant block. The revised rough count for Silers City was 305 blocks.

(3) Formation of Primary Sampling Units
Using a second map, the city is divided into groups of equal numbers of blocks, the number of groups being equal to the required number of Interview Sectors. In this example, 24 groups are required so that the average number of blocks per group will be

\[
\frac{305 \text{ Blocks}}{24 \text{ Interview Sectors}} = 12.7 \pm 13.
\]
Figure 5. Silers City
In order to form the 24 groups of 13 blocks, begin at any point on the margin of the city map and count out a compact group of 13 blocks, omitting those blocks which were found not to contain housing units at the time of the field check. In Figure 5, the first group formed is marked "1", the second "2", etc. As the work progresses, care should be taken to avoid being left with a group of less than 13 blocks. For example, in Figure 5 it will be noted that after completing group number 8, counting was shifted to a projecting group of blocks on the western side of the city. Group 9 was demarked at the extremity of the projection and counting of subsequent areas moved toward the central part of the city. The final group, number 24, included only 10 blocks but was retained as a group. If it had included 6 or less blocks these would have been combined with the blocks in Group 23.

(4) **Number of Blocks in a Primary Sampling Unit.**

The average number of blocks needed in a primary sampling unit is estimated from the average number of housing units per block. The block by block count of the preceding section gave a total of \((23 \times 13) + (1 \times 10)\) = 309 blocks. The average number of housing units per block in Silers City is thus

\[
\frac{4326 \text{ Housing Units}}{309 \text{ Blocks}} = 14.0
\]

housing units per block.

Since an Interview Sector includes 16 housing units, more than one block, on the average, will be needed for a primary sampling unit and in this case two blocks were used.

(5) **Random Selection of Primary Sampling Units.**

To choose the two blocks for each primary sampling unit, the blocks in a group are numbered from 1-13. A random number is then drawn within this range. The random number determines one of the two blocks