

## APPENDIX C : CALCULATION OF THE MEASURE OF SOCIAL NEED

### Calculation of 'Z-Scores'

A single measure of social need was calculated from the 22 individual indicators used in the Study. It is not possible to simply add the percentage rates for each of the indicators together, because where indicators have a low incidence these would be hidden by indicators with higher percentage rates. For example, 'households that are overcrowded' has a minimum zone rate of 0%, a maximum rate of 5.06% and a mean of 1.07%, while 'households with no car' has a range of 4.13% to 71.42% and a mean of 27.86%. It is necessary, therefore, to convert the percentages or rates of all of the indicators into a common form, in order to give them equal importance.

This 'normalisation' of the data was achieved using Z-scores. Z-scores are calculated for each zone on each indicator using the mean and standard deviation of the indicator. The formula is:

$$Z = \frac{X - \bar{X}}{S}$$

where: Z = Z-score

X = the percentage rate of a zone for a given indicator

$\bar{X}$  = the mean of rates for all zones for a given indicator

S = the standard deviation for a given indicator.

The formula converts the mean of the indicator to zero and the standard deviation to one. For instance, a zone with a percentage rate for an indicator of 60%, where the mean for all zones is 50% and the standard deviation is 10%, will have a Z-score of +1.00. Similarly, a zone with a percentage rate on the same indicator of 40% will have a Z-score of -1.00.

Once all of the indicators have been normalised in this way, they can be added together and each indicator carries equal weight. However, where a zone scores above the mean on several indicators and below the mean on others, the social need in this zone is obscured, as the positive and negative scores will tend to cancel each other out. In order to avoid this situation, the negative Z-scores (i.e. those indicators where the zone is below the mean) have been removed, and only the positive Z-scores summed.

Adding together the positive Z-scores creates a single index of social need, producing a single score for each zone. The maximum and minimum scores on this index are 46.04 and 0.00.

## Definition of Levels of Social Need

Having calculated the measure of social need for each zone, these scores were added together and divided by the total number of zones to give a mean score for all zones of 8.68. All 134 zones with scores above this level can, therefore, be considered as having relatively high social need.

With a range of scores varying from 8.79 (the lowest score above the mean) to 46.04, it is clear that there are great differences in the degree of social need between these 134 zones. Consequently, they have been split into groups by putting the zones in rank order and looking at where the difference between the total score of a zone and the one below it is greatest. When this was done, it was found that the distribution of the scores lent itself well to dividing zones above the mean into three categories, as in the two previous studies.

Although there are some wide gaps between the scores of the zones with the very highest scores, including the widest gap of all (5.88) between the 1<sup>st</sup> and 2<sup>nd</sup> ranked zones, there is a gap of 1.00 between the 19<sup>th</sup> and 20<sup>th</sup> ranked. This makes a good break to take, giving a reasonable number of zones in the highest category. These top 19 zones have been classified as being in 'extreme' social need.

The next gap of over 1.00 (1.19) is between the 69<sup>th</sup> and 70<sup>th</sup> ranked zones. This has been taken as the next break of category, with the 50 zones in this category being classified as being in **serious** social need.

The remaining 65 zones with scores above the mean have been classified as having **moderate** social need.

The greater number of zones used than in the two previous studies makes direct comparison of the distribution of scores and the categories difficult. The proportion of zones in the **extreme** category is smaller this time, but it is thought that the gaps in the distribution justify what has been done.