TECHNICAL GUIDANCE ON ACCESSIBILITY PLANNING IN LOCAL TRANSPORT PLANS

CONTENTS

This is the Technical Annex referred to in Guidance on Accessibility Planning in Local Transport Plans.

This annex should be read in conjunction with the Technical Annex Appendices on the accessibility planning website (www.accessibilityplanning.gov.uk) and the main guidance document - in particular alongside the following chapters:

- Chapter 4: Accessibility Assessments - Identifying & Analysing Accessibility Problems

- Chapter 7: Measuring Success - Performance Monitoring Framework

The Technical Appendices cover:

Appendix 1	Technical information on alternative forms of quantitative and qualitative indicators.
Appendix 2	The treatment of local accessibility indicators in Accession.
Appendix 3	SMART targets.
Appendix 4	Accessibility planning software tool functionality work specification.
Appendix 5	The treatment of flexibly routed transport services in Accession.
Appendix 6	Information on deterrence parameters.

PART A: ACCESSIBILITY MODELLING AND INDICATORS

SUMMARY

- Mapping audits can help local authorities and their partners to:
  - develop a clearer picture of the accessibility issues within their area;
  - identify priority areas, groups and issues on which resources and action should be targeted;
  - develop a package of actions to improve accessibility and address priority areas and issues.
- Mapping audits involve a two-stage, 'hierarchical' approach to assessment encompassing:
  - a strategic mapping audit used to identify target areas, issues and priorities through use of composite, core, local and comparative indicators, analysis of IMD, the census and local evidence;
  - local, more detailed, mapping audits of access to jobs and services in targeted priority areas, groups and issues.
- DfT, together with CLWGAP and other government departments, has identified six core accessibility indicators, based on total journey time to jobs and services, which will be calculated centrally for all LTP authorities.
- DfT has also developed a composite indicator, which combines the core indicators, to help authorities prioritise and target action. This will also be calculated centrally, and made available to authorities.
- Local authorities are encouraged to establish their own local accessibility indicators to supplement the core indicators and monitor performance at the strategic level. These should be focussed on locally identified priority issues, groups and areas.
- Local authorities are expected to identify and set at least one locally appropriate accessibility target, based on the core or local accessibility indicators, or both and provide evidence in support of their choice of local accessibility indicators and targets in their accessibility strategy.
- Authorities are encouraged to use core and local indicators to assess the distribution of accessibility impacts of transport schemes on different areas or communities and to monitor the effectiveness of funding streams in meeting accessibility objectives.
- Accessibility planning partnerships are encouraged to use core and local indicators in option appraisal and performance monitoring in transport and non-transport sectors, including in planning and locational decision making.

1. Definition of Accessibility

Accessibility is the ease with which an individual can access services and facilities that he or she needs or desires. It encompasses the entire journey chain from the origin to the destination and reflects the ability of individuals to reach and use transport services and infrastructure as well as life enhancing facilities and services.

Accessibility also describes the catchment characteristics of a given location. A range of factors impact upon accessibility. These include:

- travel time;
- cost of travel;
- location of facilities and services;
- method and timing of service delivery;
- safe routes of travel;
- fear of crime;
- knowledge of available travel and service choices;
- travel horizons; and
- characteristics, needs and perceptions of the individual

Accessibility indicators are used to quantify accessibility and assess the ease with which a given population, population segment or community can access one or more services from a residential or other location using one or more modes of transport[1].

2. Introduction: Mapping Audits

Mapping audits are undertaken to provide accessibility planning partners with some of the supporting evidence required to a) quantify accessibility levels; b) identify priorities and areas with different levels of accessibility; c) target further analysis and action; and d) develop policies and initiatives to improve accessibility.

For accessibility planning, it is recommended that mapping audits involve two distinct phases: a) a strategic mapping audit (the first phase of accessibility planning) assisting in prioritisation of areas; followed by b) more detailed local mapping audits for the resulting targeted areas, groups or issues. Both should feed into the overall accessibility assessment, described in chapter 4 of the main guidance document and summarised below.

2.1 Introduction: Strategic Accessibility Assessments

Strategic accessibility assessments entail:

a) strategic mapping audit (refer to section 6.1);
b) analysis of existing available evidence from authorities and other partners; and
c) prioritisation of areas, groups and issues for further action (refer to section 6.1).

It is recommended that the prioritisation process should involve the identification of areas where:

- deprivation and unemployment is greatest and where there are concentrations of people at risk of social exclusion; and
- the accessibility of a single service or combination of services is poorest.

This will help authorities and their partners to i) make best use of available staff, financial and other resources; and ii) deliver early improvements in accessibility.

[1] Accessibility of services in the above context does not specifically refer to, but does include, the physical accessibility of transport services and the transport environment. Accessibility indicators if suitably structured and with appropriate accompanying data can be used to assess the accessibility of services for people with mobility and sensory impairments. Examples of data include information on low floor buses, talking buses and bus stops, safe walk and wheelchair environments, drop kerbs, ramps, lifts/escalators, tactile and audible pedestrian crossings, street furniture etc.

2.2 Introduction: Local Accessibility Assessments

Once authorities and their partners have undertaken a strategic assessment it is likely that they will need to undertake local accessibility assessments to examine the priority areas, groups or issues identified in more detail and to inform the development of schemes or interventions to address these priorities. As outlined in chapter 4 of the main guidance document, they can involve some or all of the following:

a) undertaking more detailed local mapping audits, for small areas or defined destinations (refer to section 6.2);
b) the review of existing local studies, surveys, best value reviews, reports and research encompassing lessons learnt;
c) undertaking (where appropriate) targeted surveys and public consultations to obtain a better understanding of the local significance of particular problems and potential solutions; and / or
d) collating data on local facilities and services and local factors not covered by existing data sources.

3. Accessibility Measures (or Indicators)

Accessibility measures are used to quantify accessibility and assess the ease with which an individual, population segment or community can access one or more services from a residential or other location using available modes of transport.

Accessibility measures (or indicators as they can also be known) form an important component of the process of evidence based planning. They have a valuable role to play in helping to:

- identify priorities;
- target, rank and prioritise potential actions, policies and solutions; and
- monitor performance and outcomes.

3.1 The Need for Accessibility Indicators

Without accessibility indicators the identification, quantification and ranking of areas with differing levels of accessibility can be difficult and often subjective. This can potentially result in the development of policies and schemes that produce unexpected outcomes. In the absence of indicators it is more difficult to undertake comparisons and to identify the extent of the scope for improvements.

One of the principal benefits of accessibility indicators is that they enable all parts of a study area to be compared and evaluated using a consistent methodology at relatively little cost. Any limitations in the methodology underpinning the indicator are equally applicable to all parts of the area.

Accessibility indicators also support the development of an evidence-based culture of scheme/policy development, service delivery and evaluation. Their utilisation should lead to more transparent and arguably better decisions being made.

Accessibility indicators in accessibility planning have a range of uses:

- *"strategic performance"* indicators to assess authorities performance in improving accessibility at the LTP level or for groups / areas identified as priorities (**Authorities should report these in their accessibility strategies)**
- *"identifier"* indicators used to assess accessibility and target where accessibility problems exist at the strategic or local level. (**Authorities need not report these in their accessibility strategies**)
- *"project level monitoring"* indicators to assess the effectiveness of specific local actions (**Authorities need not report these in their accessibility strategies**)

3.2 Types of Accessibility Measure

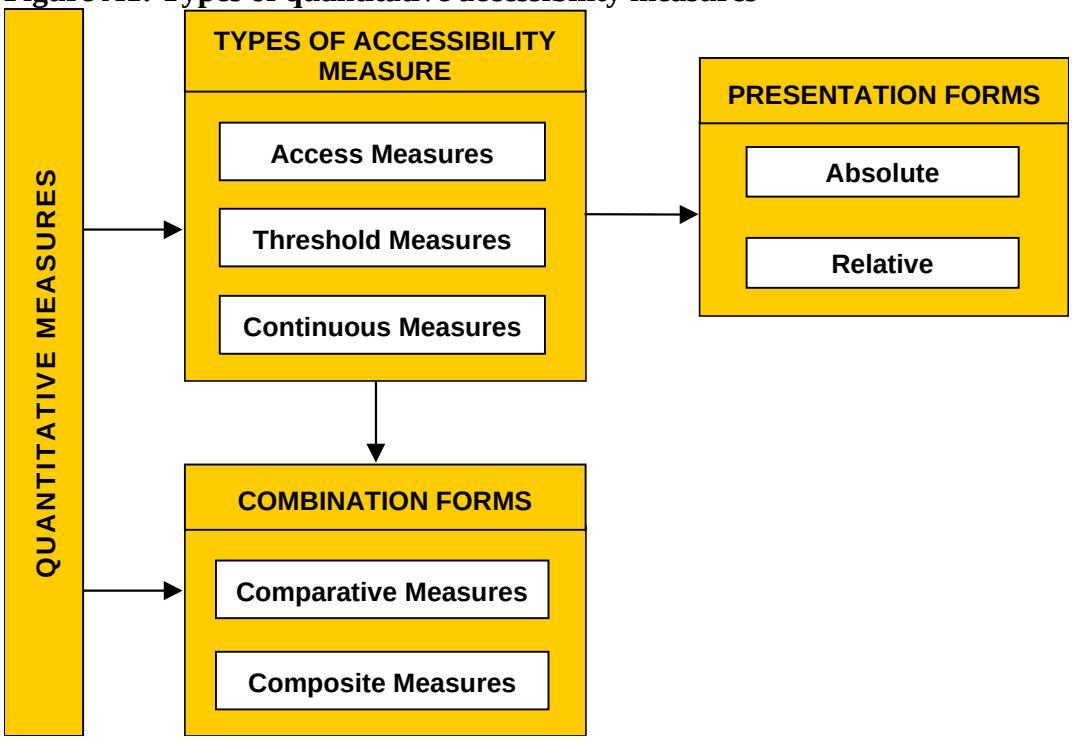
There are three main types of quantitative accessibility measure (refer to figure A1). These are:

- Access measures (section 3.2.1)
- Threshold measures (section 3.2.2)
- Continuous measures (section 3.2.3)

These measures can be presented in absolute form e.g. *"the total number of individuals or households"* or in or relative form e.g. *"the proportion or percentage of households or individuals"*. They can also be used in combination, to generate two additional forms of quantitative measure:

- Composite measures (section 3.2.4)
- Comparative measures (section 3.2.5)

Figure A1: Types of quantitative accessibility measures



All of these measures share a common theme; they are concerned with quantifying the ease of, or potential for, travel rather than with predicting actual travel behaviour

itself. However, while the ease of travel has an important role to play it is just one of a number of factors which can affect accessibility. Other potentially important influences on individual accessibility include - safety, fear of crime, awareness of available travel and service choices and travel horizons - which cannot be easily reflected within the accessibility indicators listed above. Instead, a qualitative measure has to be utilised (refer to section 3.2.6).

Table A1 highlights the key strengths and weaknesses of each of the measures discussed below. Technical Appendix 1 on the accessibility planning website (www.accessibilityplanning.gov.uk) provides additional information on their properties and provides examples of their use.

Table A1: Principal properties of quantitative measures

	Quantitative Measures				
	Accessibility Measure		Combination Forms		
Properties of Measure	**Access**	**Threshold**	**Continuous**	**Composite**	**Comparative**
Can quantify ease of access to the public transport network	✓	✓	✓	✓	✓
Can quantify ease of access from origin to destination	+	✓	✓	✓	✓
Require minimal public transport data	✓	+	+	+	+
Calculations can be performed using a calculator or simple spreadsheet	✓	+	+	+	+
Can be used to build up the picture of accessibility	✓	✓	✓	✓	✓
Can be used to assess the effectiveness of a scheme/policy	✓	✓	✓	+	✓
Can be applied to flexible forms of transport (e.g. DRT)	+	✓	✓	✓	✓
Can be used to identify problem areas and target action	✓	✓	✓	✓	✓
Can be used in preparing economic impact reports	+	✓	✓	+	+
Can be used to evaluate effects of land use changes	✓	✓	✓	+	✓
Intuitive and understood by non-transport planners	✓	✓	+	+	✓
Can identify all the accessibility (dis)benefits of a scheme/policy	+	+	✓	+	+
Can be applied to all modes of travel	+	✓	✓	✓	✓
Can be presented in map (contour, theme), table and chart form	✓	✓	✓	✓	✓
Enable the level of available choice to be determined	+	+	✓	+	+
Can be expressed as a origin and destination measure	+	✓	✓	✓	✓
Can be used to show change over time	✓	✓	✓	+	✓
Can be applied at the output area, ward, authority & transport authority level	✓	✓	✓	✓	✓
Able to reflect differences in attractiveness of facilities and services	+	✓	✓	✓	✓
Can be used to combine indicators for different types of facility or service	+	+	✓	✓	+
Can be used for performance monitoring	✓	✓	✓	+	✓

Can be used to evaluate benefits of alternative forms of service delivery	+			+	
Are able to identify disparities between alternate population groupings	+	+	+	+	
Minimise the effects of errors or inaccuracies present within accessibility measures	+	+	+	+	

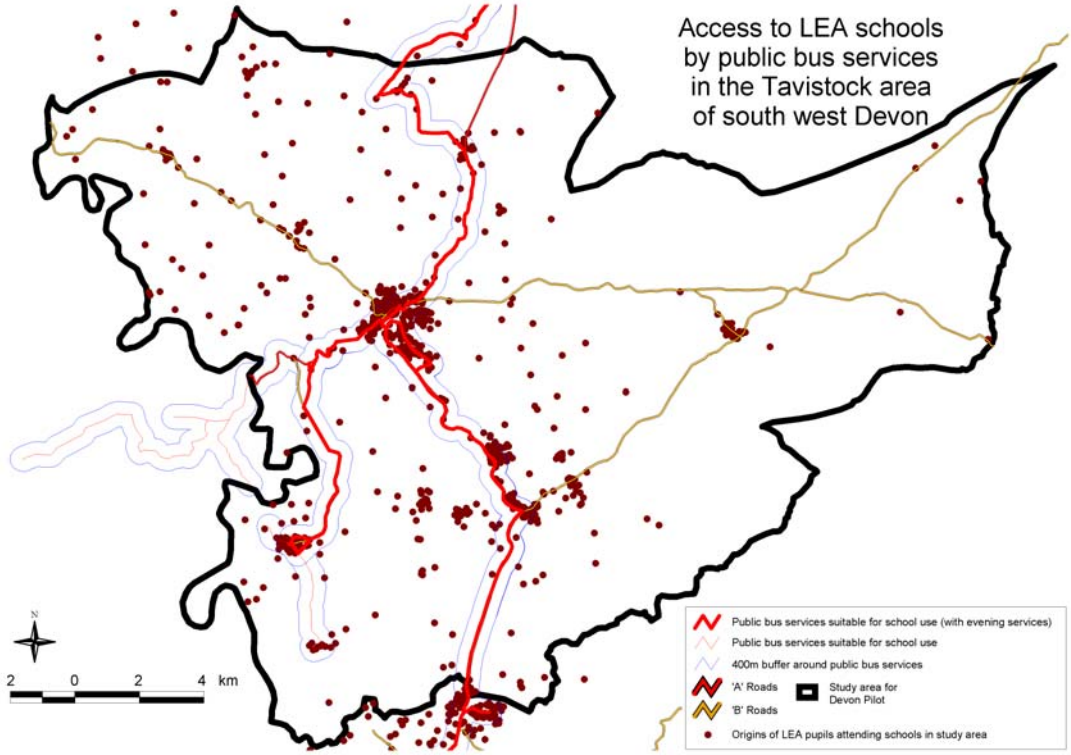
3.2.1 Access Measures

Access measures are one of the simplest forms of measures to calculate and interpret. They assess the ease of access to the public transport network i.e. from the home to the nearest appropriate bus stop or railway station (they do not incorporate details of the public transport journey time, distance or cost). An example of this type of indicator is *"the proportion of the population having access to a bus service with a minimum frequency of four or more services per hour, from a bus stop situated within a 10-minute walk of their home"*. Another example is the PTALs index[2], defined in detail in Technical Appendix 2 on the accessibility planning website, which has, in the absence of more robust measures, been used for development control, land-use planning and development of car parking standards by a number of transport and planning authorities.

Figure A2 shows an example of the use of this form of accessibility measure during Devon County Council's access to education pilot. 400m geographic buffers were created around the route and bus stops served by services exceeding a minimum frequency of 1 departure per hour and operating at times suitable for use by students travelling to college. Information on the spatial coverage of the bus services and on the residential location of pupils were overlaid on these buffers. Devon County Council was then able to identify locations where pupils may experience difficulties in accessing bus services to Tavistock College. They were also able to calculate the proportion of pupils living outside of the 400m buffer.

[2] The PTALs index is most applicable to urban areas with good public transport provision. It is not particularly sensitive or reliable in rural areas or in regions with poor public transport provision.

Figure A2: Application of access measures in the Devon access to learning pilot



Source: Devon County Council. © Crown copyright Ordnance Survey.

3.2.2 Threshold Measures

Threshold measures are the most commonly used accessibility measure. They are intuitive and easily understood by transport and non-transport professionals alike, and the use of thresholds can aid in the interpretation of the results of mapping audits. They are applicable to all modes of transport including multi-modal travel, and incorporate details of the total door-to-door (or through the network) journey time, distance or cost from the home location (origin) to the location of the facility or service (destination).

They combine:

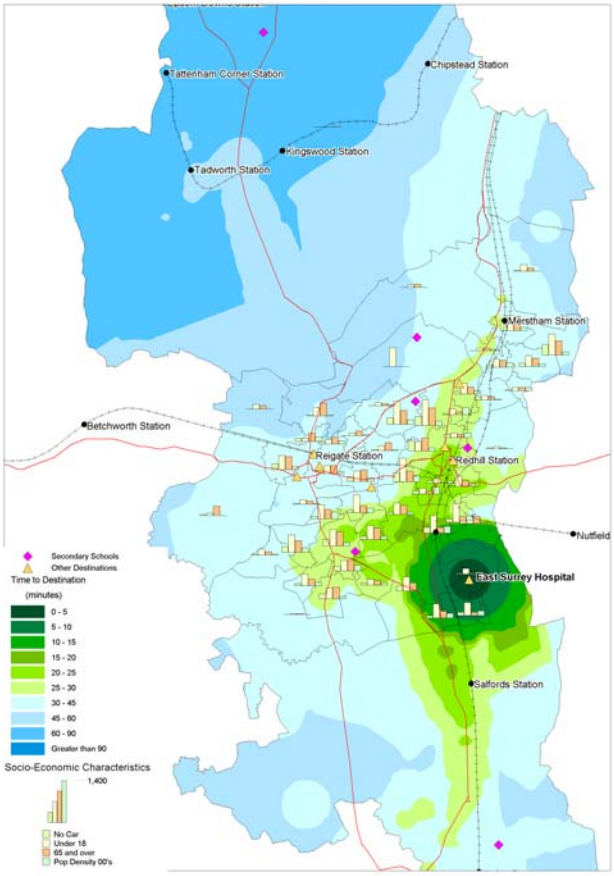
- travel characteristics such as journey time, distance, cost or generalised cost
- socio-demographic information: and
- characteristics of facilities and services.

Examples of a threshold based indicator are *"the proportion or number of older people within a 10 minute walk of the nearest GP"* or *"the proportion or number of households with no access to car within £1.00 travel cost of their nearest hospital"*.

The travel component (e.g. journey time, distance, cost or generalised cost) (occasionally referred to as network accessibility) can be plotted in map form as a isochrone or contour by defining a series of thresholds and assigning a colour or pattern to each interval or band. Transport, socio-demographic and local data can be overlaid on these maps. Figure A3 demonstrates Surrey County Council's use of data on deprivation and car availability with public transport journey time isochrones to East Surrey Hospital. Overlaying socio-demographic and deprivation data can assist

in the identification of the locations of at-risk groups and communities; in this instance concentrations of older people, younger people, and households with no car located in areas with poor public transport access to the local hospital.

Figure A3: Public transport journey times to East Surrey Hospital in combination with socio-demographic data



Source: Surrey County Council. © Crown copyright Ordnance Survey.

3.2.3 Continuous Measures

Continuous measures are the most robust form of accessibility measure and provide an indication of the level of attractiveness of a residential location in terms of accessibility to a service or series of services. They incorporate:

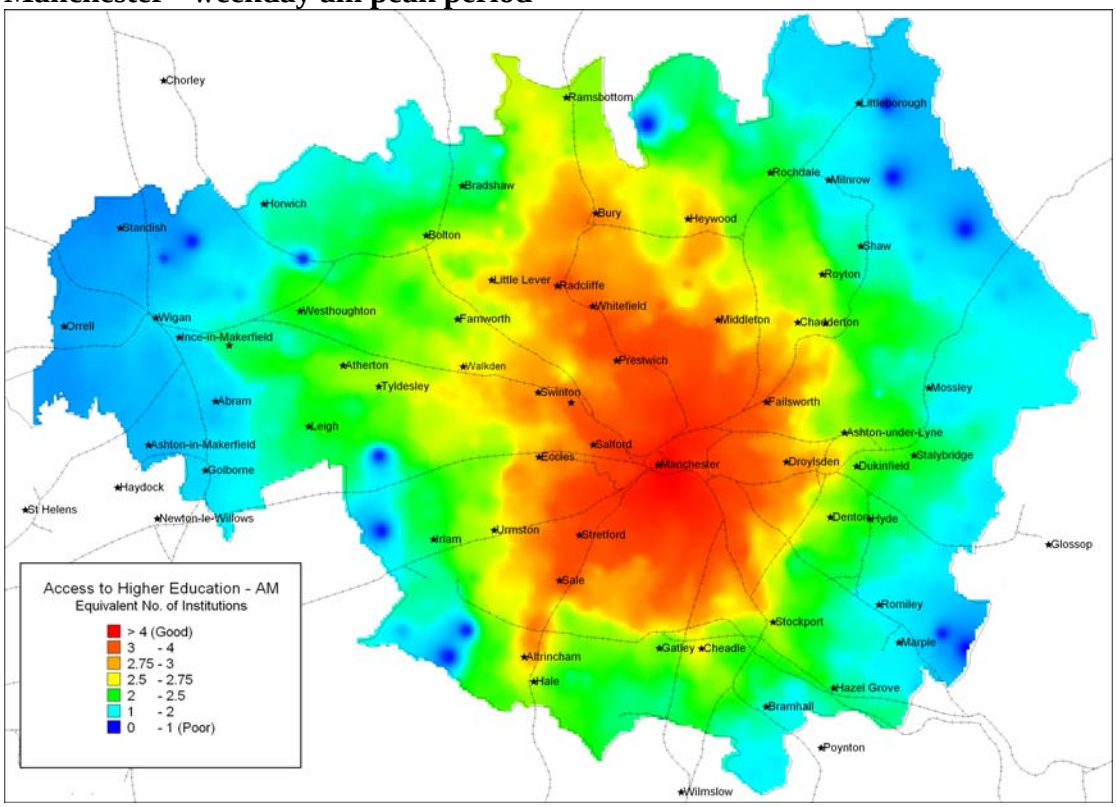
- characteristics of the travel (e.g. total door-to-door travel time, distance, cost or generalised cost);
- characteristics of facilities and services (e.g. the total number of jobs available at an employment location or the total number of shops available in a local centre); together with
- a continuous deterrence function to reflect the deterrent effect on likely travel of increasing time, cost or distance. For example, an employment opportunity located 5km away will appear less attractive to an individual than the same destination located 500m away.

Continuous measures enable accessibility to a range of opportunities to be encompassed within a single application of the measure in contrast to the threshold

measures, which tend to consider the nearest opportunity. They are thus better able to reflect the degree of choice available to an individual or household.

Continuous measures were used in all eight accessibility planning pilots, to quantify accessibility and to identify potential problem areas. Figure A4 shows accessibility by bus to higher education institutions within Greater Manchester during a weekday am peak period. This shows that the central regions of Greater Manchester have higher levels of accessibility to higher education establishments in contrast to the outer regions of Greater Manchester.

Figure A4: Bus accessibility to higher education institutions within Greater Manchester - weekday am peak period



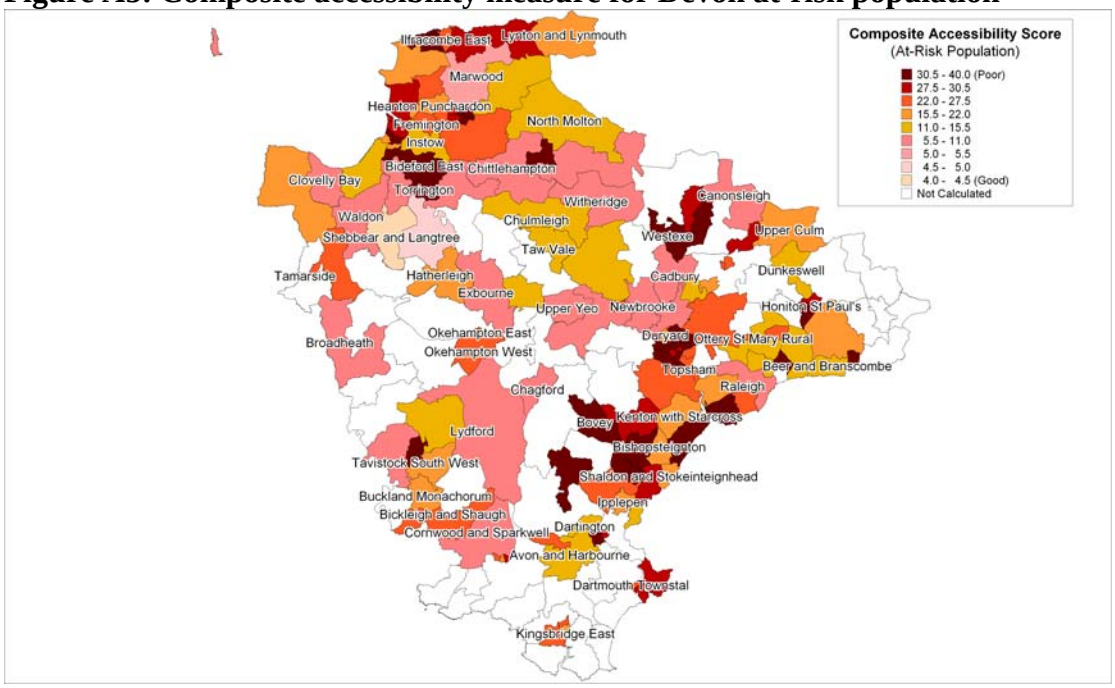
3.2.4 Composite Measures

Composite measures provide a means of using two or more accessibility measures in combination, and provide a way of identifying locations and areas within an authority with the greatest combination of accessibility problems.

Composite measures are most robust when produced from the continuous measures. They are ideally suited for use in targeting action and identifying local priorities. However they are unlikely to be sufficiently sensitive to highlight changes in the overall pattern of accessibility over short timescales, and as a result are of limited use for monitoring or performance management purposes. Section 10.3 provides detailed information on the formulation of composite measures developed from the core indicators outlined in section 4 and provides a guide for how authorities and their partners can produce composite measures based upon local indicators.

Figure A5 shows a ward based thematic map, showing the variation in the composite accessibility measure for Devon for potentially excluded groups[3]. It reveals that, within Devon, at-risk populations[4] located in the south-eastern part of the county, in particular in Exeter, Exmouth, Dawlish and Kingsteignton experience a combination of accessibility problems by bus to important local services (i.e. education, employment, healthcare services and major centres). The figure also reveals that at-risk populations in the northern part of the county and in the Tavistock area of West Devon also experience a significant combination of accessibility problems, suggesting that these areas might be subject to more detailed local accessibility audits.

Figure A5: Composite accessibility measure for Devon at-risk population



Sections 6.1 and 10.3 provides additional information on composite measures and targeting action.

3.2.5 Comparative Measures

Comparative measures are a means of using accessibility measures in combination. They offer a potentially powerful way of analysing the accessibility of particular population groups in comparison to others, or in comparison with the local or regional average. This can be undertaken at an individual location level, small area level, district/borough or local transport authority area level.

They are usually expressed as accessibility ratios using pairs of access, threshold, continuous or composite measures, e.g. *"the proportion of the pupils of compulsory school age in receipt of free school meals able to access their nearest school within*

[3] The composite maps for Devon have not incorporated travel by rail or cycle. Partial datasets have been utilised where available and the composite indicator in a number of regions has not been computed where data is incomplete.

[4] At-risk population groups incorporated in the composite indicator include pupils of compulsory school age in receipt of free school meals; people of working age (16-74) in receipt of Jobseeker's Allowance and households without access to a car.

15 minutes, compared to the equivalent value for all pupils of compulsory school age". Analysis of the resulting figures can involve identifying the reasons for disparities between locations. They can also be used to assess change over time to highlight where the differential between groups is reducing or increasing.

Comparative accessibility measures are particularly useful for investigating distributive impacts. They can aid the development and evaluation of policy options that focus on reducing the accessibility related disparity between socially excluded, or potentially excluded groups, and the general population. Comparative measures can also be used to assess how rural areas compare against urban areas, how an area performs against a regional average, or how a particular population group or household type compares against another population group or household type. It is important to note that none of the other accessibility measures on their own enable such policies or factors to be directly evaluated in this way.

Figure A6 details the use of comparative accessibility measures during the Merseyside access to health pilot. The figure depicts the ratio of the composite accessibility measures (refer to sections 3.2.4 and 10.3) for the at-risk population to the corresponding score for the entire population. Where the resulting value is high the measure highlights where the at-risk population experience worse levels of accessibility than the entire population. Where the resulting value is low this indicates where the at-risk population on average experiences better overall accessibility than the entire population. Where the measure is in the vicinity of unity this indicates where accessibility for the at-risk and entire population are approximately equivalent.

Figure A6 for instance reveals that at-risk populations in the Cantril Farm, Northwood, Princess and Longview parts of Knowsley experience a greater combination of accessibility problems than the entire population when accessing local services by bus[5] (i.e. education, employment, healthcare services and major centres). The figure also reveals a similar disparity in accessibility between the at-risk population and the entire population in Liverpool in particular within Vauxhall and Everton. These findings can be used to focus more detailed local mapping audits in these areas and to develop policies and strategies to alleviate the disparities in accessibility. Regions where the at-risk population on average experience better levels of accessibility than the entire population can be subject of additional analysis to determine whether there are any lessons, policies or strategies in operation in these areas which can potentially be applied to other areas.

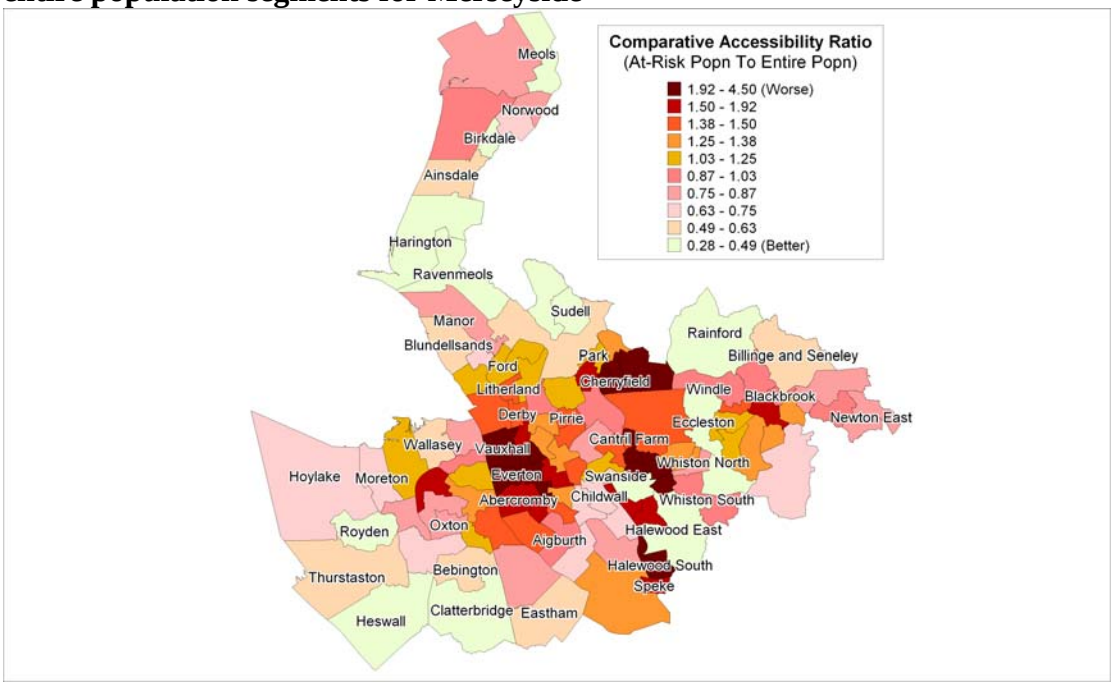
However, care is required in interpreting or in base-lining comparative measures. For instance, it is possible for the disparity between potentially excluded and non-excluded population groupings to reduce whilst, at the same time, overall levels of accessibility for both groups to deteriorate. It is likely that a combined strategy of absolute improvement over time together with relative improvement between population groupings will offer the best approach.

No accessibility measures are one hundred percent free of data or methodological limitations. They are most reliable when they are used to analyse

[5] The composite accessibility map for Merseyside has not incorporated travel by rail or cycle.

differentials i.e. the changes in accessibility arising over time, or differences between groups. This is one of the principal advantages of comparative measures.

Figure A6: Comparative application of composite measures for the at-risk and entire population segments for Merseyside



3.2.6 Qualitative Measures

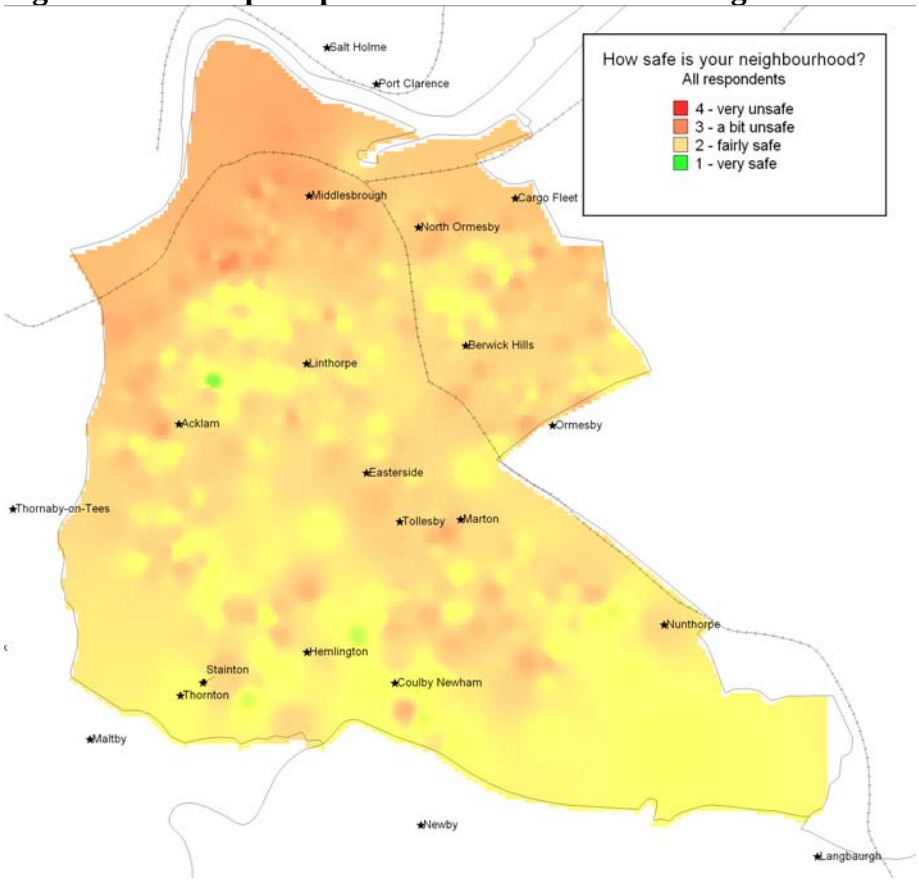
Qualitative surveys have a valuable role to play in informing an accessibility assessment and in the development of potential solutions for the action plan. They allow for aspects such as the fear of crime, travel horizons, awareness of the availability of travel information, and individual perceptions about the quality of services and transport to be captured. Depending on the sample size, the results of such surveys may be mapped; with smaller sample sizes being best presented in tabular or graphical format.

For example, the Middlesborough household survey utilised qualitative responses of the wider population to a perception of crime question (e.g. very safe, fairly safe, a bit unsafe and very unsafe safe) to map qualitative responses by region as shown in figure A7. Alternative aspects of such qualitative surveys can be utilised to map or analyse the responses of specific communities or individual groupings.

Qualitative surveys can be used to understand the local significance of particular problems and obtain valuable data on services and facilities not covered by existing data sources. Qualitative surveys, and their subsequent analysis, may encompass consultation with population groups at risk of social exclusion or "hard to reach" groups within the local community. Such surveys may incorporate issues such as awareness of local transport and service options, and local/national policy initiatives, willingness to travel, the ability and willingness to pay for use of public transport services, barriers faced by disadvantaged groups in accessing local services, and fear

of crime. They can also have a valuable role to play in the development and evaluation of potential solutions. Technical Appendix 1 on the accessibility planning website provides additional information on the use of qualitative surveys.

Figure A7: Local perception of crime in Middlesbrough



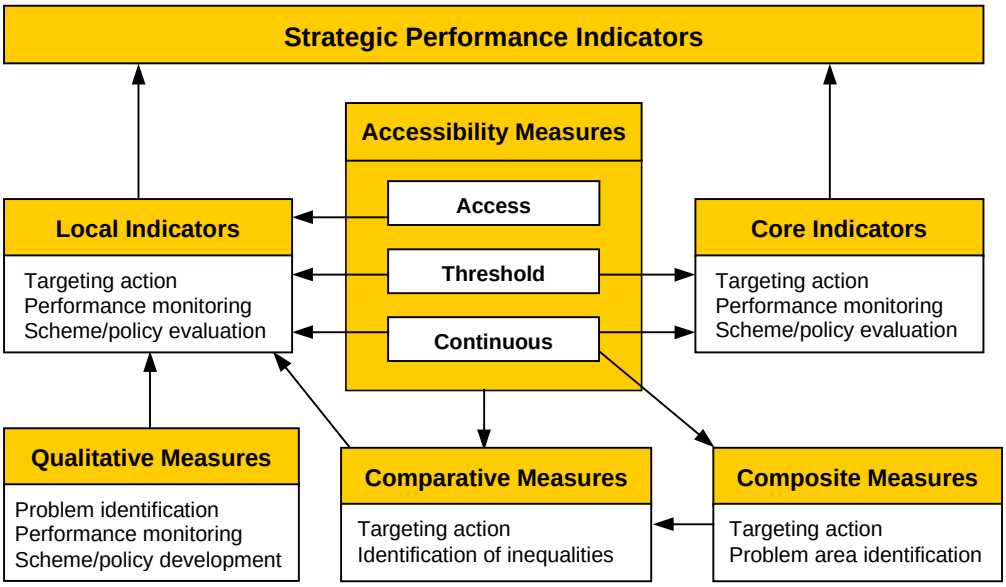
3.2.7 Use of the Measures

Composite and comparative measures can be termed "targeting (or identifier) measures" - that is they can be used to identify areas with accessibility problems or large disparities in accessibility between groups at risk of social exclusion and others. Equally, these measures can be used to identify areas with good levels of accessibility and areas with no or minimal disparity between potentially excluded groups and others[6].

Access, threshold and continuous measures can also be used to target action. However threshold and continuous measures also have a valuable role to play at a **strategic level in monitoring changes in accessibility and the performance of authorities** as well as in assessing the accessibility benefits of potential actions. Figure A8 depicts the relationship between these various forms of indicator.

[6] Locations with good levels of accessibility can be a potential resource of particular value for siting new land use developments and locations of new facilities and services. In addition, areas with little or no disparity between population groups may provide local partnerships with valuable information on how disparities in other areas may be reduced.

Figure A8: Interrelationship between quantitative, qualitative & performance measures



4. Core Indicators

This section may be subject to amendment. Whilst the core indicators set out below will not change, the Department is currently considering the most efficient way to calculate a full national set. Full details of the methodology used to calculate the core indicators will be made available to authorities when the core indicators are published and this section will be updated as necessary.

Core accessibility indicators are to be calculated for each LTP area using multiple threshold based accessibility measures. The use of thresholds may make these indicators more suitable for monitoring changes than for planning interventions. In addition, threshold based measures which consider the nearest opportunity do not fully reflect the degree of choice available to an individual. As a result, continuous measures will also be calculated for the same indicator set. The core indicators to be used are:

- % of a) pupils of compulsory school age[7]; b) pupils of compulsory school age in receipt of free school meals within 15 and 30 minutes of a primary school and 20 and 40 minutes of a secondary school by public transport;
- % of 16-19 year olds within 30 and 60 minutes of a further education establishment by public transport;
- % of a) people of working age (16-74); b) people in receipt of Jobseekers' Allowance within 20 and 40 minutes of work by public transport;

[7] Separate calculations will be performed and published for primary and secondary schools for the relevant pupil segments.

- % of a) households b) households without access to a car within 30 and 60 minutes of a hospital by public transport;
- % of a) households b) households without access to a car within 15 and 30 minutes of a GP by public transport; and
- % of a) households; b) households without access to a car within 15 and 30 minutes of a major centre by public transport.

The core indicators will be reported at a ward level for each English local authority outside London and will be published in numerical form on the Neighbourhood Statistics website.

4.2 Derivation of Thresholds for Core Indicators

The thresholds used within the core indicators have been developed from an analysis of observed travel behaviour from the 1996-2001 National Travel Survey (NTS). Analysis was undertaken of the distribution by time bands of total travel time for actual trips, where the purpose of the journey corresponded as closely as possible with those used in the core indicators. Separate distributions were undertaken for urban and rural areas. However, as there was little difference between these the "all areas" figure was used. For each journey purpose, the lower threshold is approximately equal to the median time (that is the time in which half of the trips take less than this time). In the case of each core indicator doubling this lower threshold gives the upper threshold, which includes approximately 80-90% of all trips. Journeys to hospitals cannot be identified separately within the NTS, so the thresholds of 30 and 60 minutes are estimates based on informed opinion

Calculation of the core indicators will be undertaken for public transport and walk modes jointly - referred to as public transport/walk accessibility assessment - and separately for cycle travel.

The results from these calculations will be combined into a single indicator using the public transport/walk and cycle modal split proportions derived from the National Travel Survey (NTS).. The individual threshold modal indicators and the aggregated results will be provided to local transport authorities together with the absolute values of the population, or population segment, affected. Table A2 demonstrates the method of aggregating the threshold based core indicators across modes.

Table A2: Example of combining individual threshold modal indicators

Access to/from the nearest secondary school for all pupils	
Mode: Public transport/walk Proportion of students within 20min threshold (P1): 45% Proportion of students within 40min threshold (P2): 90% Modal split public transport/walk (P): 31%	Mode: Cycle Proportion of students within 20min threshold (C1): 60% Proportion of students within 40min threshold (C2): 80% Modal split cycle (C): 3%
Combined threshold indicator: 20 minute threshold $= \frac{(P1 \text{ x } P) + (C1 \text{ x } C)}{(P + C)} = \frac{(45 \text{ x } 31) + (60 \text{ x } 3)}{(31 + 3)} = 46.3\%$	Combined threshold indicator : 40 minute threshold $= \frac{(P2 \text{ x } P) + (C2 \text{ x } C)}{(P + C)} = \frac{(90 \text{ x } 31) + (80 \text{ x } 3)}{(31 + 3)} = 89.1\%$

Within the combined public transport/walk assessment, no maximum walk time or walk distance thresholds will be defined. For the core indicators, public transport/walk assessments will not incorporate specific interchange or wait penalties within the journey time calculations. Interchange and wait penalties will be calculated based on the actual scheduled clock arrival times of connecting public transport services for the relevant journey. The reliability of individual public transport services will not be incorporated within the core indicators. Walk thresholds, interchange/wait penalty factors, public transport reliability and public transport overcrowding can be incorporated within local indicators where supporting local data exists.

The frequency of individual public transport services will not be directly reflected within the indicator due to the use of the full scheduled timetable for the service in question. However, to overcome the potential unrepresentative optimised journey time possible with timetable based routing algorithms, (i.e. the routing between an origin and destination may utilise a service with a low service frequency but with the shortest overall journey time within a single time period) multiple time periods will be used. Research undertaken in Devon, one of England's most rural counties, revealed that the use of six time periods gives a realistic interpretation of accessibility. Refer to table A3 for a definition of the six time periods associated with the core indicators.

Scheduled public transport includes buses, trams, light rail, heavy rail, metros and ferries and river buses. Demand-responsive transport available to the general public is also to be included within the core indicators. Non-scheduled taxis and minicabs are excluded. Subject to further work by DfES and DfT, it is anticipated that school contract services should be included in calculations of the access to learning indicators before the end of 2005.

The core indicators will also be calculated using continuous measures which, as outlined in section 3.2.3, can better reflect the degree of choice available at a particular location. Section 10.2 provides detailed information on the formulation of the continuous forms of the core indicators.

The DfT will use the results of the core indicators developed using continuous measures (outlined in section 10.2) to produce a composite measure (refer section 10.3) at ward level to help authorities identify and rank areas with a multitude of accessibility problems.

The results of both the threshold and continuous methods of calculating the core accessibility indicators, together with the composite accessibility indicator, will be made available to local authorities and their partners through the Neighbourhood Statistics (NeSS) website and will be updated annually.

The core indicators will be measured centrally by the DfT using the accessibility planning software tool, 'Accession', outlined in section 9. Core accessibility indicators will be calculated at local transport authority level and, in metropolitan areas and counties, at district level, and at ward level to inform authorities' accessibility assessments and development of accessibility strategies.

The formal baseline for accessibility indicators will be for 2005/06, corresponding to the next Local Transport Plan period of 2006/07 - 2010/11.

5. Local Indicators

5.1 The Role of Local Indicators

Local indicators can supplement the core indicators and have three distinct roles to play in the accessibility planning process. They can be used as:

- targeting indicators where they assist in the identification and ranking of target areas, regions, communities or priorities;
- strategic performance monitoring indicators to assess the level of performance of the authority against its key priorities and objectives; and
- project based indicators where they are used internally by authorities to monitor the performance of individual projects within local accessibility action plans.

DfT will only expect authorities to report progress against the core indicators and any strategic local performance indicators that they develop; the latter should be relatively few in number and should ideally complement the core indicators. Strategic local performance monitoring indicators should be well defined, outcome-based and should focus on the identified key priorities and objectives of authorities and their partners and should be reported on in Annual Progress Reports (APR).

A specific local indicator can satisfy all three roles listed above. However, it is likely that authorities may require a combination of different types of local indicators to adequately address these three aspects.

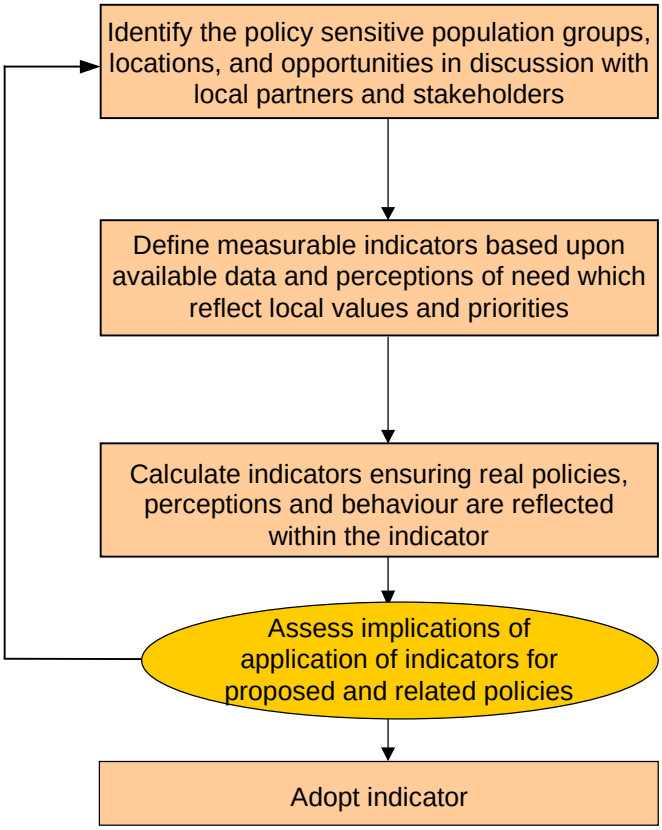
Accessibility problems and solutions may vary significantly within and between local authorities. In some areas, journey time may not be the most appropriate or important influence on local accessibility. Many factors influencing accessibility cannot be incorporated in the core indicators due to lack of consistent nationally available data and the need to keep the number of national indicators to a manageable level. However, at a local level, data may exist among the accessibility planning partners or may easily be obtained by undertaking specifically targeted surveys.

In developing local indicators, authorities and their partners are encouraged to consider the needs of vulnerable or at-risk population groups as well as the general population at large, as accessibility planning seeks to improve access to services for all, most especially for those at risk of social exclusion. Those at risk or most in need should include not only those without access to a car, but also older people, younger people, individuals with mobility, and sensory and other impairments, individuals or households with low incomes, the unemployed, lone parent households, people with illnesses, women, ethnic minorities etc.
The process involved in the development of local indicators is partly iterative in nature, as shown by figure A9, and can also serve to assist in the clarification of local policies.

Local authorities are encouraged a) to develop local accessibility indicators in consultation with their partners and stakeholders and b) to ensure that these local partnerships take ownership of them. This process can be aided by ensuring that the chosen indicators reflect the aims, objectives and, possibly, performance management criteria of partners. Local authorities, their partners and stakeholders are likely to find

the process of developing local indicators to be valuable and rewarding. This should lead to a greater appreciation by all involved of the importance of the diverse factors influencing local accessibility.

Figure A9: Process of the development of local indicators



The production and maintenance of local indicators should not be an end in itself. As with all indicators, they are an aid to the decision making process - they support the development of, and monitoring of progress towards, local objectives, they facilitate partnership working and provide an element of public accountability.

Depending on local accessibility priorities and problems, local accessibility indicators might include some of the following:

- Characteristics of specific, defined areas, neighbourhoods or communities, e.g. regeneration areas, deprived communities and the differing needs of rural and urban communities.
- Other accessibility influences, such as: the cost of travel; safe and comfortable routes of travel, severance and the continuity and quality of travel routes, crime and the fear of crime; the timing and mode of service delivery[8]; the opening/closing times of services; the reliability of public transport routes or services; overcrowding of public transport services; travel horizons; travel and service information provision and awareness etc.

[8] An example of where the cost of travel and the timing of a service are important is the case of a person over sixty years of age who for instance has been allocated an early morning general practitioner's or hospital appointment. Attendance at the appointment may require the individual to commence his/her public transport journey before the start of the concessionary fare scheme.

- Additional person groups or household types, such as: older people; those with mobility, sensory and other impairments; those with limiting illnesses; lone parents; low-income households; young adults; ethnic minorities; women. It should be noted that none of these population groups are homogenous and variability will arise in respect of individual characteristics, needs and perceptions.
- Access to alternative types of opportunities or services, such as: food shops; places of worship; community centres; day care facilities; cultural facilities; extra-curricular activities; dentists offering NHS treatment; leisure/recreational facilities; tourist facilities; pharmacies; post offices; retail outlets; adult learning facilities, libraries; information etc.
- Alternative transport modes, such as: school transport; community/voluntary transport; patient transport services; social service transport; taxi services; car share schemes, the degree of integration between transport modes and the facilities available at interchange points for individuals.
- Alternative time periods and days of the week (for instance early mornings or late nights for access to employment by shift workers). Consideration of specific days of the week for access to weekly markets, places of worship, leisure facilities and the time of the year e.g. winter or summer.
- The attractiveness or quality of a service or facility, e.g. the quality of education, health treatment, employment, or food etc.
- The form of service delivery, e.g. home visits by general practitioners, home delivery, mobile services, neighbourhood visits.

In developing local indicators, authorities and their partners should consider:

a) what the intended uses of the local indicators are;
b) how they are to be presented;
c) how frequently they are to be updated.

Local indicators can be calculated for a range of levels, such as small area level (output areas or super output areas, wards) district level and the whole local transport authority.

Local accessibility indicators should be relatively cost effective to produce and update. If being used to assess and measure local performance, the indicator and its supporting datasets must be capable of being calculated and collated throughout the lifetime of the LTP. They should also be capable of quantifying and measuring the achievement of the desired outcomes.

Chapter 7 of the main guidance document provides further information on the use of performance indicators and project level monitoring indicators.

Local authorities are encouraged to identify local performance indicators to be included with their accessibility strategies, and to keep them under review to ensure that they reflect the accessibility changes being implemented in the LTP area.

5.2 Cost of Travel

The threshold, continuous and comparative measures discussed in section 3 can all be used to produce travel cost based accessibility indicators. Authorities and their partners may have readily available information on the cost of public transport that can be incorporated within local indicators. This local public transport cost data encompassing for example absolute cost or cost per bus or train kilometre for various user groups may be maintained directly by the authority in respect of supported local bus services, or can be obtained from local public transport operators.

Cost based indicators can be used to assist in prioritising where to allocate funds for the support of local buses. For instance, prioritising the allocation of tendered bus services funds to locations and associated bus routes where the greatest disparity in accessibility between potentially excluded and other population groups exists (e.g. through use of comparative measures outlined in section 3.2.5).

An example of a cost based threshold indicator might include *"the proportion or number of households with no access to car within £1.00 travel cost of their nearest hospital"*. Similarly, accessibility maps could show the cost of public transport to/from a specific type of opportunity. Cost based local indicators can be used to highlight areas where the relative cost of public transport is high in comparison to other similar locations.

Part B of this annex provides further details on sources of public transport cost data.

5.3 Data and Indicator Accuracy

Local indicators need to be robust and accurate, which is dictated by the quality of the supporting data used in their calculation. The methods, systems and processes used by local authorities and their partners during the collation, and calculation, of local indicators should be clearly documented, for internal quality assurance purposes.

Whenever possible, local indicators should use existing information systems maintained by local authorities and their partners when collating and exchanging data[9]. This helps to minimise both data inaccuracies, and preparation and maintenance costs. Automatic transfer of data between partners is the most efficient solution; however, this requires IT systems operated by partners to be linked. If the information to be exchanged is expected to be disclosive in nature then particular care is required (refer to section 8 of Part B).

As a general rule, data obtained from any organisation should undergo a basic audit to ascertain its general quality, accuracy and suitability for use within local indicators. Ideally, local authorities should establish a simple audit control process to monitor the receipt of data, and the auditing and (re)processing of data used in local indicators. However, authorities are encouraged to avoid setting up complex systems for validating such data and resultant indicators. As a general rule, the more often data is

[9] Local authorities may subsidise local bus services and other transport services and as a condition of ensuring value for money is obtained may request receipt of data from transport operators. Such data may be useful in developing local indicators and according authorities are encouraged to consider standardising the form, type and quality of information that they request from transport operators.

used, the more accurate it tends to be. Thus data used for day-to-day performance management is likely to be more accurate than data used only once a year, as it is more likely to have been subject to frequent checks and subsequent correction of errors.

For additional technical information on local accessibility indicators refer to Technical Appendix 2 on the accessibility planning website.

6. Using Indicators in Mapping Audits

As outlined in section 2, accessibility planning comprises two types of mapping audit: strategic mapping audits and local mapping audits. The strategic and local mapping audits involve a two-step process:

- calculation of accessibility indicators and production of related accessibility maps); and
- interpretation/analysis of the results produced by accessibility indicators/maps.

The former is of little value unless undertaken in conjunction with the latter.

Section 9.3 outlines how mapping audits can be undertaken using little or no data or software.

6.1 Strategic Mapping Audits

The spatial detail and zoning level for strategic mapping audits should be at an output area level[10] and reported at a ward level. In preparing data at an output area level it may in certain instances be necessary to disaggregate ward level data to output area level e.g. Jobseekers' Allowance data. Section 3.5 of Part B of this annex outlines how output area level data, in this case Jobseekers' Allowance data, can be derived from joint use of census data and ward level data. Finer levels of resolution across the study area (e.g. analysis at 250m level) yield potentially more accurate results. However, a balance must be struck between the potential improvements in accuracy of a mapping audit undertaken at finer levels of resolution and the increased length of time such analyses will take. Mapping audits are not an end in themselves, but have an important supporting role to play in the broader process of accessibility planning. They should be undertaken within a reasonable timeframe whilst being done sufficiently thoroughly to provide robust and reliable results.

6.1.1 Accessibility Maps

Accessibility maps help to highlight the spatial or geographical variation in accessibility. The pilots have demonstrated that the most useful strategic accessibility analyses are likely to be those incorporating:

a) **Transport maps**: These maps show the highway network, public transport routes, catchment areas of demand responsive services, availability of community transport, cycle and walk routes and severance barriers within and adjacent to an authority in relation to existing opportunities and services. These are particularly useful for partners from non-transport sectors who may be unfamiliar with the

[10] The core and composite indicators, to be calculated centrally by the DfT, will be calculated using population-weighted output area centroids as the origins of journeys and will be reported at ward level for each English transport authority outside London.

geographic distribution of the transport network. In the transport maps, local authorities may find it beneficial to show variations in public transport service frequency through use of different colours or graphical symbols to aid interpretation of the maps by partners and stakeholders or highlight roads with high traffic volumes and speed in different colours. These maps can be presented separately or overlaid on the accessibility maps discussed below. Figure A10 shows an example of this form of map used during the Tyne & Wear access to employment pilot where the spatial coverage of the highway and public transport networks are shown together with the variation in frequency of the bus network.

b) **Accessibility maps**: Calculation of accessibility by census output area to the key destinations (e.g. work, education, health care, and major centres) and any other locally important destinations. Threshold or continuous measures should be used rather than access measures as they incorporate full details of the journey characteristics from the origin to the destination. Network accessibility (journey time, distance, cost or generalised cost) or continuous contour/isochrone maps can be presented overlain by the spatial coverage of the public transport network of a defined frequency, with key locations, destinations and facilities within the authority. Figure A11 shows an example of the use of an origin based continuous measure utilised during the Nottinghamshire access to employment pilot. The figure shows access to jobs during the inter-peak period by bus. The units presented are in equivalent numbers of jobs and the higher the figure the greater is both accessibility and the level of choice available at a particular residential location given the distribution of jobs and the bus network linking residential and employment locations. These types of maps can be used to identify regions with both good and poor accessibility.

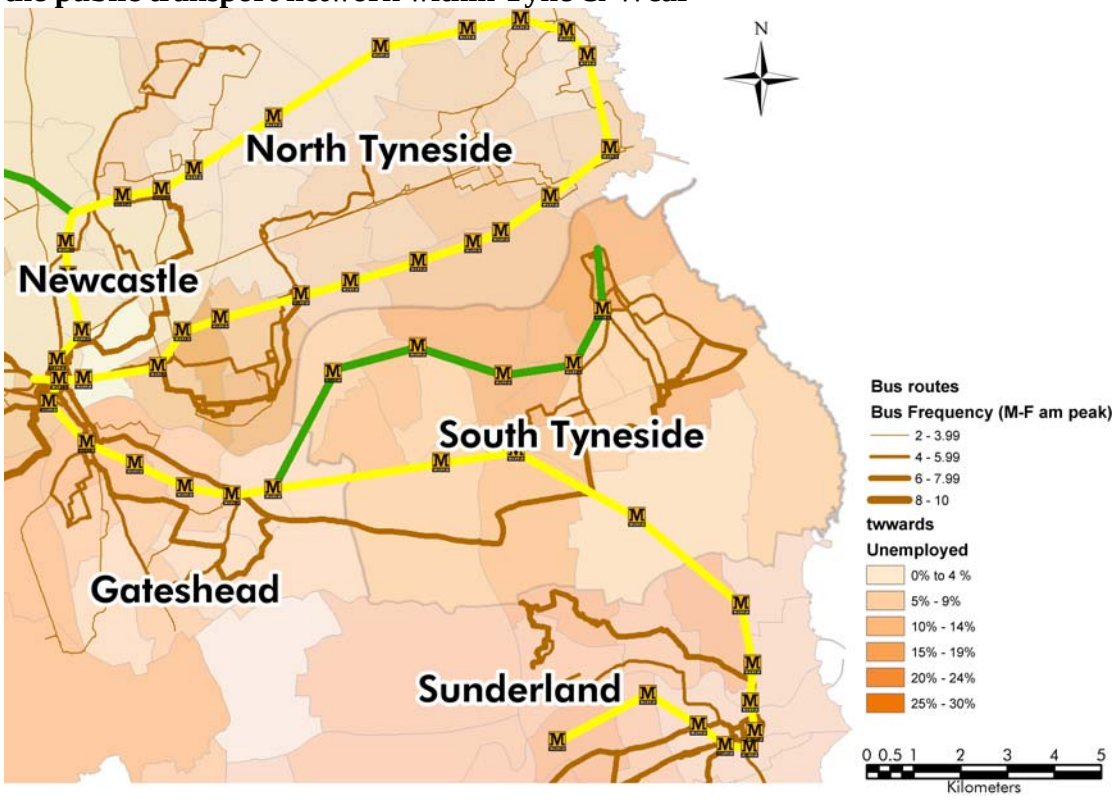
c) **Weighted maps**: If an origin based continuous measure (as in case b above) or a origin based threshold measure is utilised then these indicators should be weighted by the resident population or households to better reflect the number of people or households affected. The larger the resultant magnitude of the indicator the greater is the overall accessibility for the resident population. Population weighted indicators showing low values should be handled with care as they can either indicate no accessibility problems or very poor accessibility. For example, a low value can arise from either poor accessibility to services caused by poor transport provision, or from a small resident population/households located within an area with very good public transport provision, or by a combination of the two. Figure A12 shows an example of this form of weighted origin accessibility map utilised during the Nottinghamshire access to employment pilot. Weighted maps can be presented using contours as depicted in figure A12 or can be aggregated and presented using thematic maps to aid interpretation.

d) **Catchment analysis**: Analysing the catchment populations for key destinations. This can also be used to compare access for different groups in society e.g. *"the percentage or the number of jobseekers within 20 minutes public transport travel time of a place of employment"* or *"the percentage or the number of households with no car within 30 minutes public transport travel time of a hospital or major centre"*. These headline catchment characteristics can provide a good summary overview of accessibility within an authority or area.

e) **Ranking of areas**: When using accessibility maps, authorities are encouraged to rank the values produced by the accessibility indicators at a ward and district/borough level to identify the areas with poor and good levels of

accessibility. This may entail tabulation in bar chart, tabular or thematic map form and partners are able, at a glance, to identify areas with the greatest potential accessibility problems. Figure A13 depicts an example of this form of presentation during the Merseyside access to health pilot. The figure shows the ranking for a selection of Merseyside wards of the accessibility indicator for access to the Royal Liverpool Hospital.

Figure A10: Transport map showing bus frequency and the spatial coverage of the public transport network within Tyne & Wear



Source: Nexus PTE. © Crown copyright Ordnance Survey.

Figure A11: Nottinghamshire origin accessibility by bus to all jobs (inter-peak)

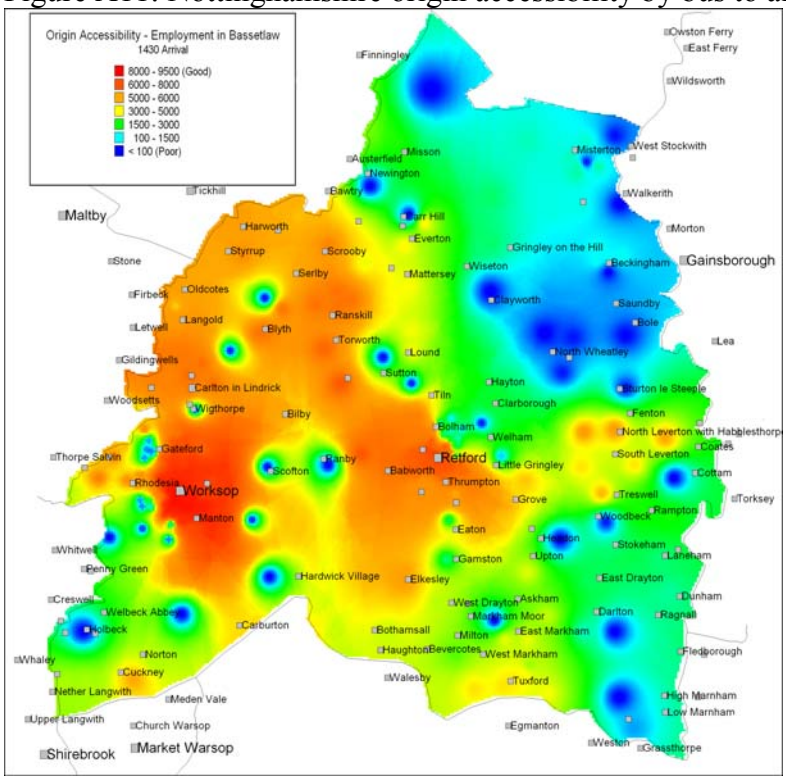


Figure A12: Nottinghamshire population weighted origin accessibility by bus to all jobs (am-peak)

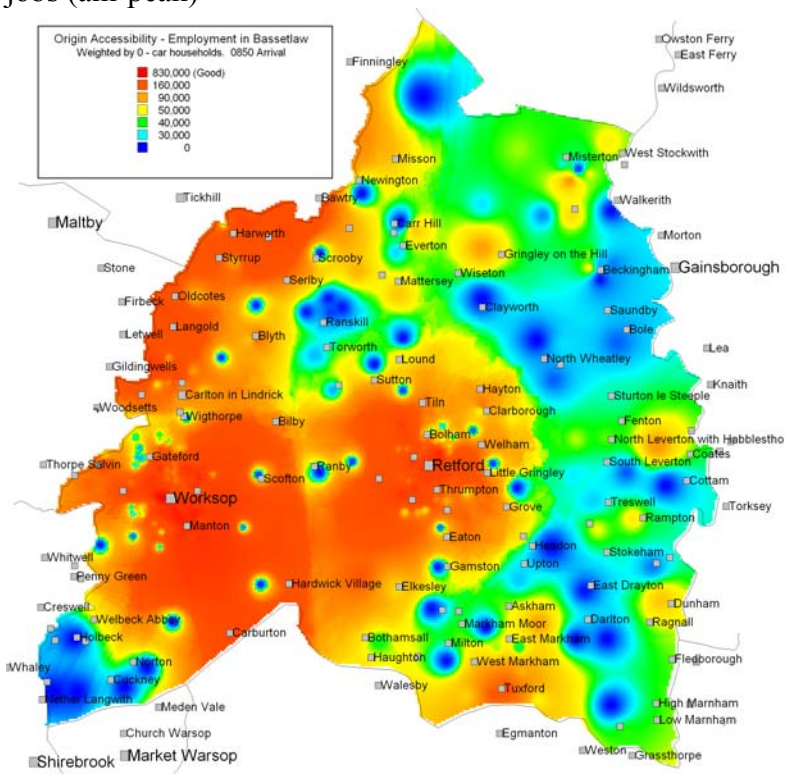
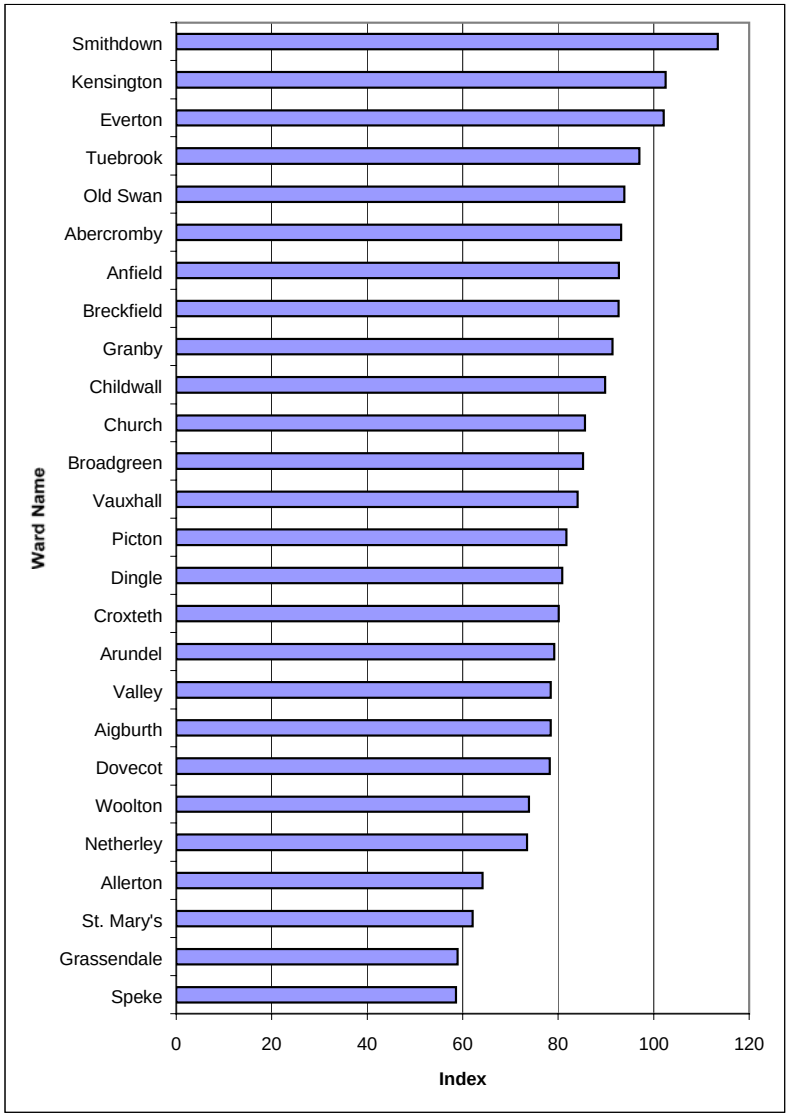


Figure A13: Chart showing ward level accessibility indicator for access to the Royal Liverpool Hospital



6.1.2 Targeting Action

Authorities and their partners should use their strategic assessments to help them to target further analysis, action, schemes, and resources. The process of targeting action can be aided by ranking all areas within the authority according to consistent, transparent and easily understood criteria. Such targeting and ranking is well suited to the development of area specific initiatives and local solutions. Local authorities are, however, encouraged not to lose sight of wider initiatives - such as co-ordinated delivery of services or integration of accessibility considerations in mainstream policy and funding - which go wider than specific accessibility schemes and may provide commensurately wide benefits.

6.1.3 Examples of Targeting Action

A number of methods and indicators can be used to target further analysis and future action. For example:

a) **The Composite Accessibility Indicators** (discussed in sections 3.2.4 and 10.3). Based on a similar concept to the Index of Multiple Deprivation (IMD) but focussed on accessibility. The composite indicator is to be calculated by DfT and is developed from the continuous formulation of the core indicators and incorporates access to education, employment, healthcare and major centres. The composite indicators will be reported at a ward level for each English local authority outside London and will be published in numerical form on the Neighbourhood Statistics website. It can be used to identify wards with the greatest combination of accessibility problems. Figures A14 and A15 show ward based thematic maps of the variation in the composite accessibility indicator for Merseyside and Devon for potentially excluded groups and the population as a whole. Figure A14 reveals that within Merseyside at-risk population segments located in Knowsley, Liverpool and the Wirral, are experiencing a greater combination of accessibility problems than similar at-risk populations situated in other parts of Merseyside. The figure also shows that for the entire population the Wirral and Liverpool have the greatest combination of accessibility problems in comparison to other parts of Merseyside[11]. Figures A6 and A14 reveal that the at-risk population located in Knowsley and Liverpool on average experiences a greater combination of accessibility problems than the population as a whole, suggesting that these areas may be subject to more detailed local accessibility audits and the development of actions aimed at reducing the disparity between the population groupings. Figure A15 reveals that within Devon, the at-risk and entire populations located in the south-eastern, northern and western parts of the county, experience the greatest combination of accessibility problems by bus to local services, suggesting that these areas might be subject to more detailed local accessibility audits.
b) **The Core Accessibility Indicators** (discussed in sections 4 and 10). The threshold and continuous formulations of the core indicators can be used individually to target action or priorities. This can be achieved by use of accessibility maps showing the spatial variation in the core indicator in question or by ranking of wards in descending order of accessibility. Figure A16 depicts the use of the core indicator to identify potential problem areas. In this case the core accessibility indicator for access to hospital outpatient departments, produced during the Merseyside access to healthcare pilot shows that the Wirral, Liverpool, north Sefton have poor accessibility to hospital outpatient departments. Core indicators can be presented in bar chart form and used to target action as demonstrated in figure A13 for access to the Royal Liverpool Hospital.
c) **The Index of Multiple Deprivation** (IMD). For example, in the access to health care pilot, Lincolnshire County Council used the IMD 2000 health domain to identify wards with potentially the greatest need for healthcare services. Figure A17 shows a thematic map of the IMD 2000 health domain produced at ward

[11] The composite indicators reflect both the level of accessibility in a location and the number of people or households affected. The size and spatial distribution of the entire population and the at-risk population groupings may differ from region to region and will affect the overall composite indicator for the region.

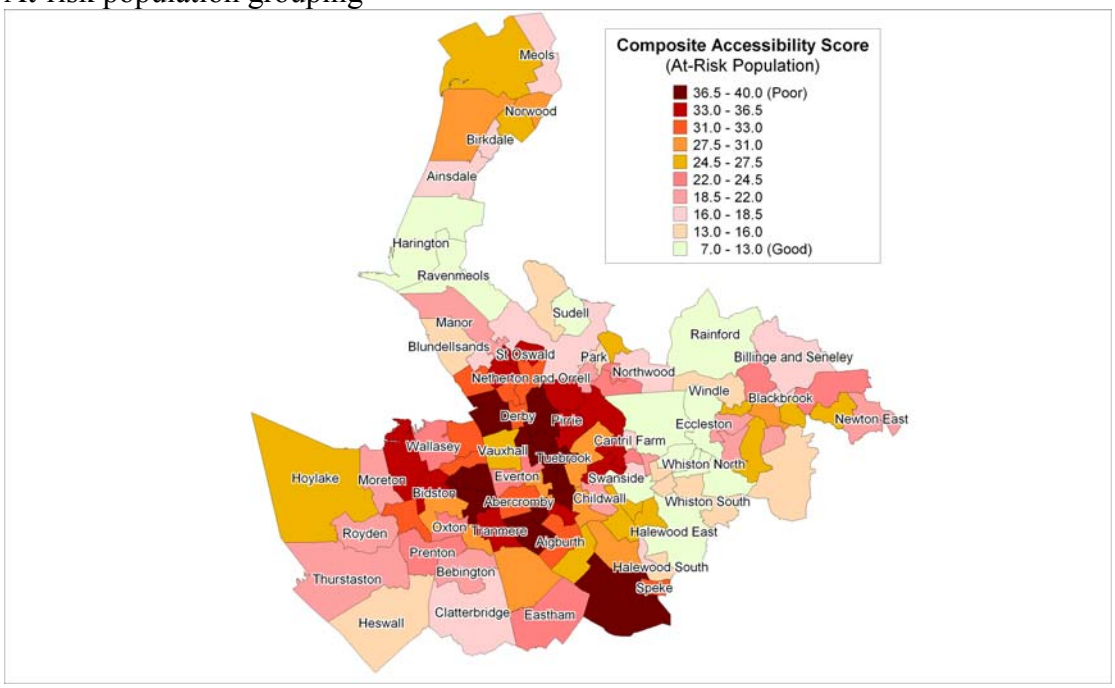
level[12]. The figure reveals that the eastern coastal wards of Lincolnshire have the greatest health related problems of any part of the county. Similarly, the other individual or overall IMD domains can also be used to target action during the accessibility planning process. Figure A18 shows the overall IMD for all domains, which highlights both the coastal region and the central parts of the county. The IMD 2004 includes seven domains (income deprivation, employment deprivation, health deprivation and disability, education skills and training deprivation, barriers to housing and services, crime and living environment deprivation); they can be used individually or collectively to identify localised need and target action. Although the IMD 2004 is useful for targeting action, the component indices do not directly reflect the accessibility of services, with the exception of the geographical barriers sub-domain of the barriers to housing and services domain. , This utilises road travel distance to GP premises, supermarket/convenience stores, primary schools and post offices as a proxy for accessibility.

d) **The Census**. Its primary strength is its comprehensiveness, which enables analysis of a range of issues influencing individual accessibility of services of specific relevance to local population groups and communities. However the census does not contain any single variable that directly relates to the accessibility of services. Strategic accessibility audits undertaken by Nexus PTE as part of the Tyne & Wear access to employment pilot used data from the 2001 Census to produce an average index of employment deprivation shown in figure A19. This index revealed that South Tyneside had the highest index of employment deprivation of any Tyne & Wear district and the eighth highest in England and Wales. Nexus PTE also used the census to analyse the geographical variation within Tyne & Wear in the proportion of households with no access to a car, as shown in figure A20. The figure reveals that South Tyneside has a high incidence of households with no access to a car. Lincolnshire County Council, during their access to health care pilot, also used the census to analyse the spatial variation in the proportion of the population with a limiting long-term illness. Figure A21 contains the results of this analysis and, in conjunction with the IMD health domain, reveals that the eastern coastal areas of the county have a higher percentage of the population with a limiting illness, a population grouping with a potential need for access to healthcare services.

[12] The 2004 IMD has been calculated using super output areas in contrast to earlier versions of the index, which were produced at a ward level. In order to produce ward level IMD 2004 data, authorities may elect to calculate the average IMD domain ranking for all super output areas within the ward in question.

Figure A14: Composite accessibility indicator for Merseyside

At-risk population grouping



Entire population

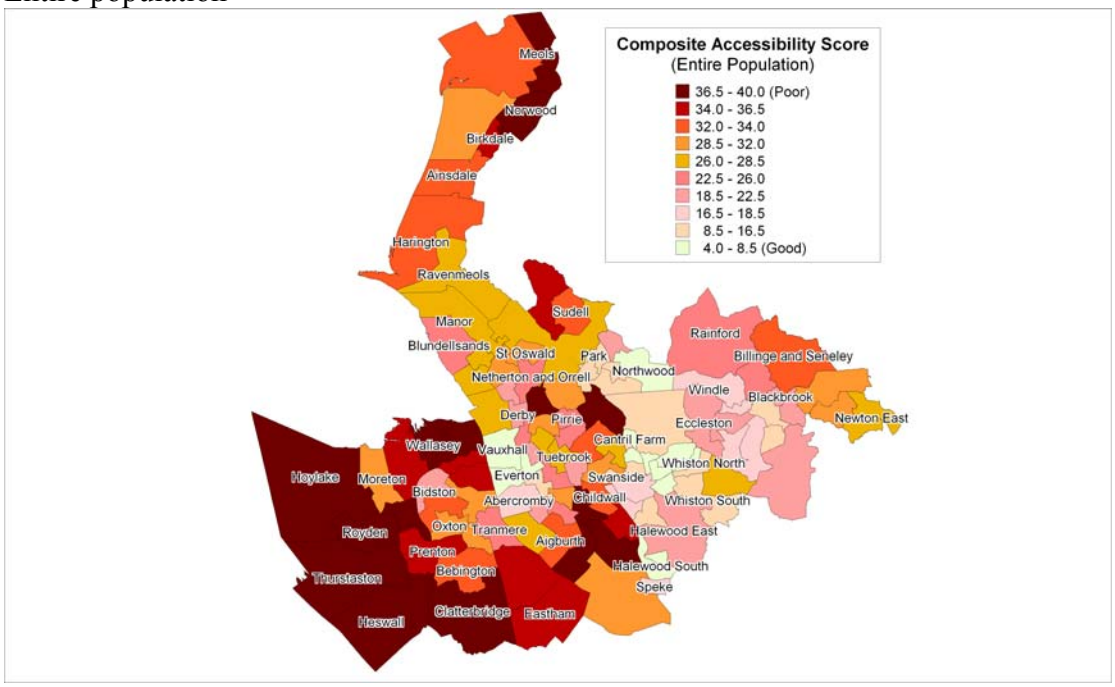
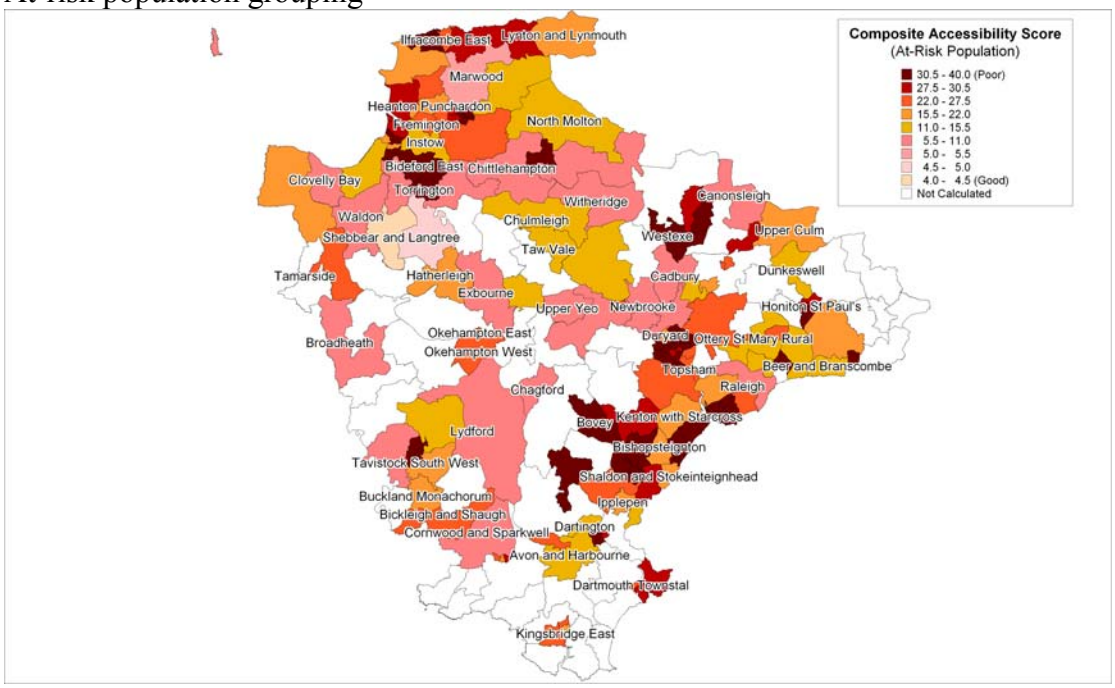


Figure A15: Composite accessibility indicator for Devon

At-risk population grouping



Entire population

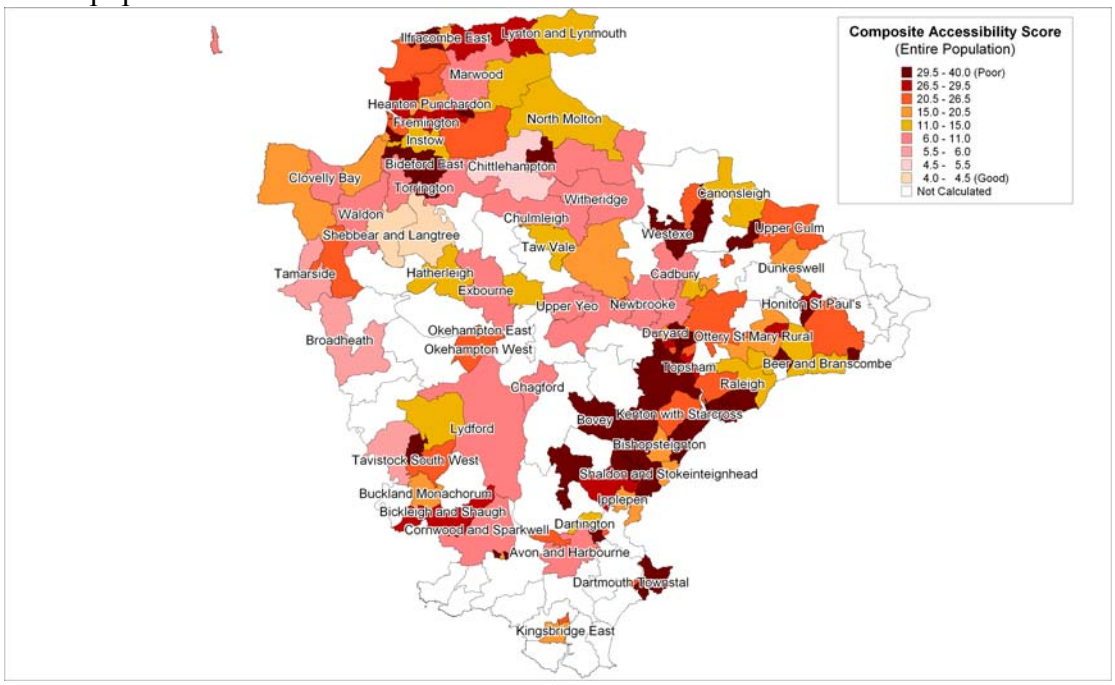


Figure A16: Core accessibility indicator for Merseyside access to hospital outpatient departments - at-risk population group

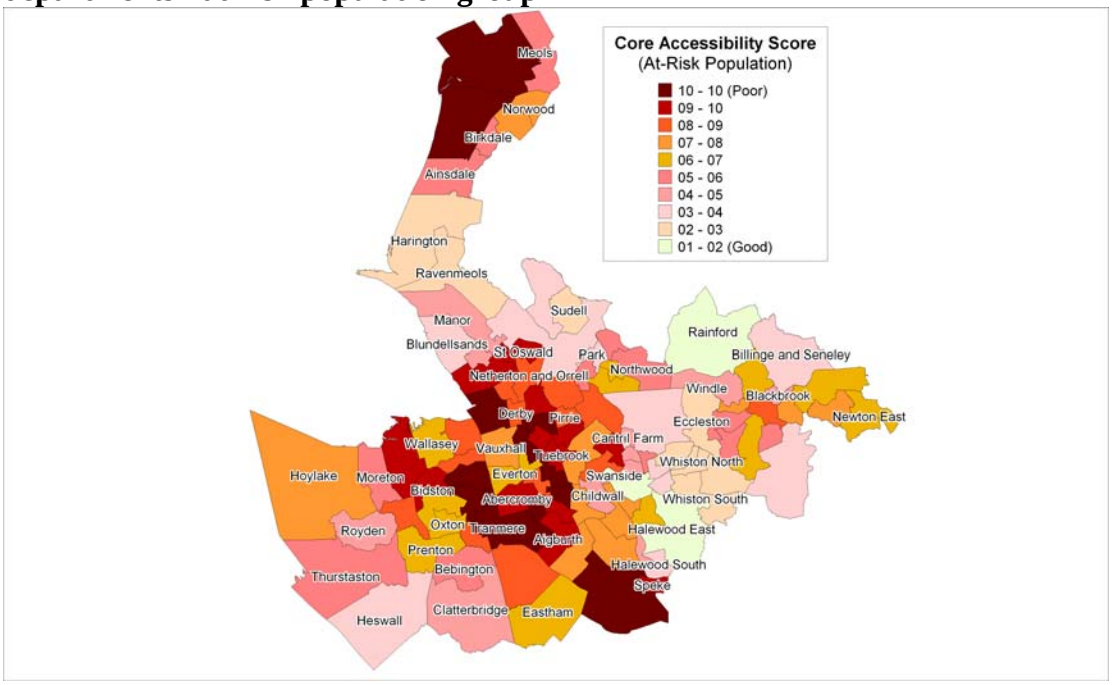
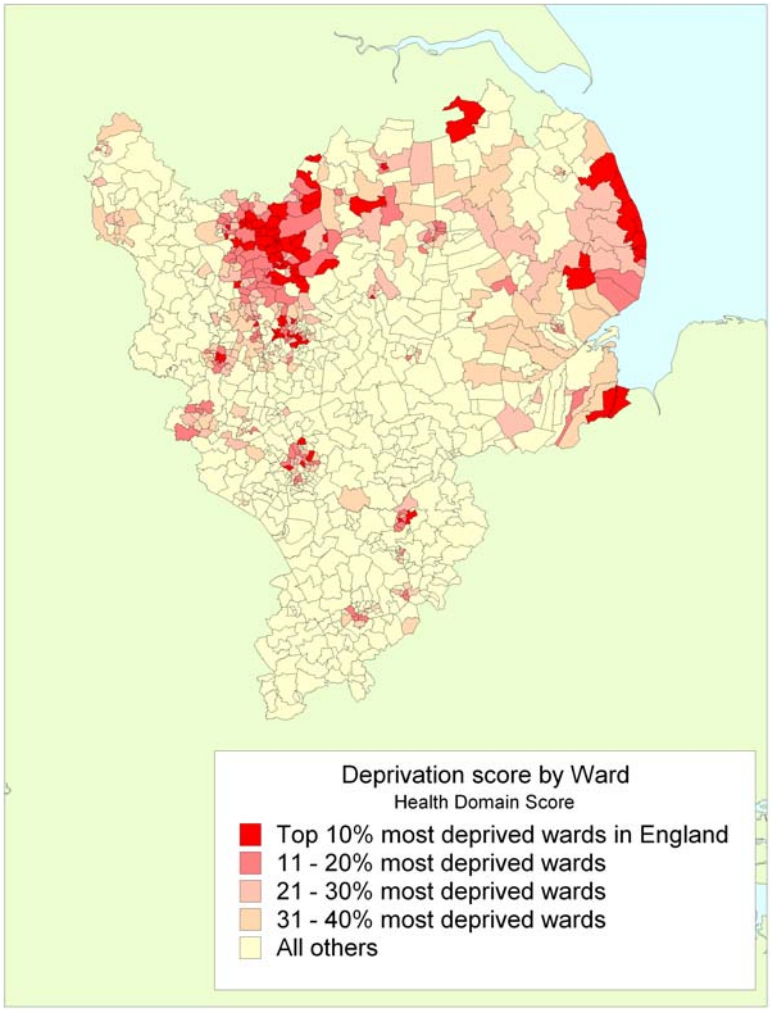
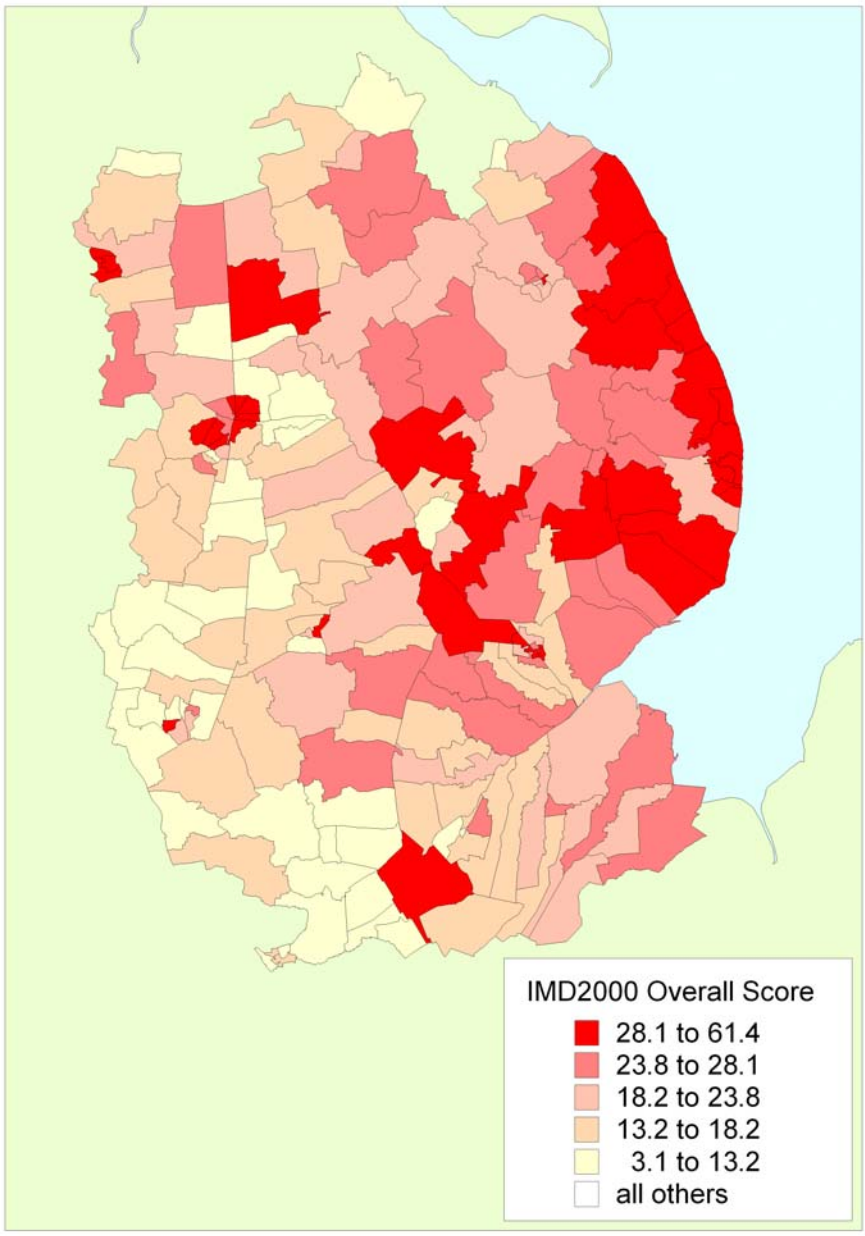


Figure A17: Lincolnshire index of multiple deprivation - health domain



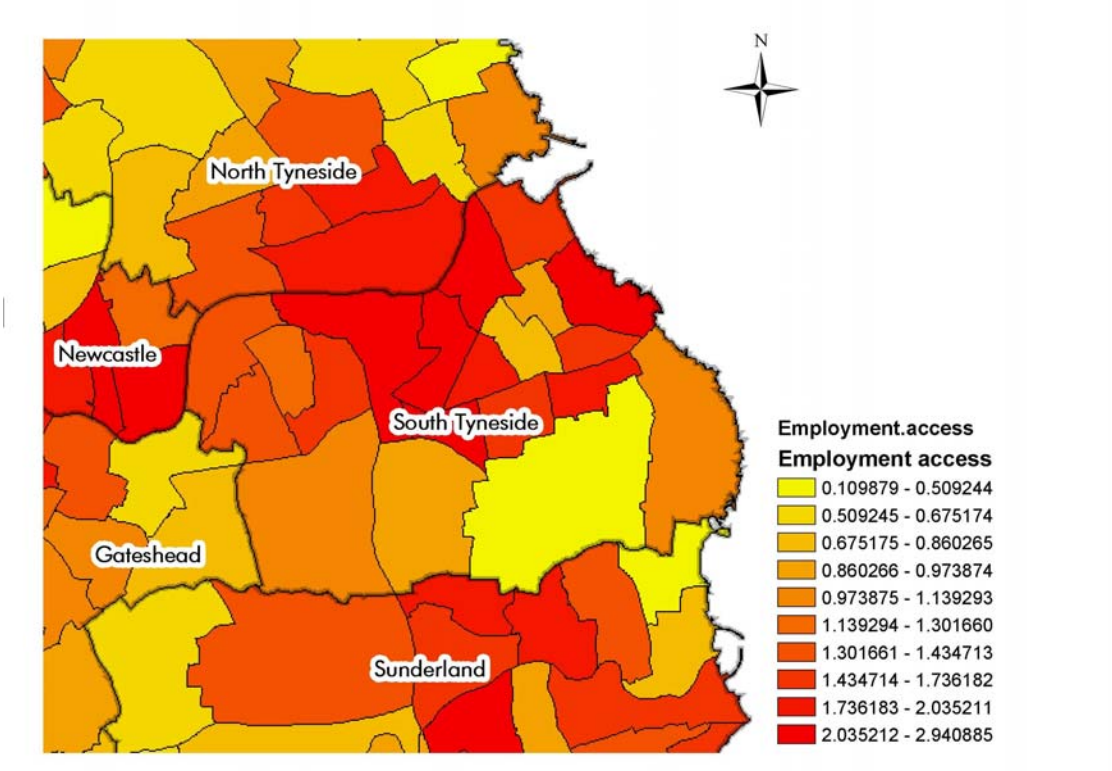
Source: Lincolnshire County Council. © Crown copyright Ordnance Survey.

Figure A18: Lincolnshire index of multiple deprivation - all domains



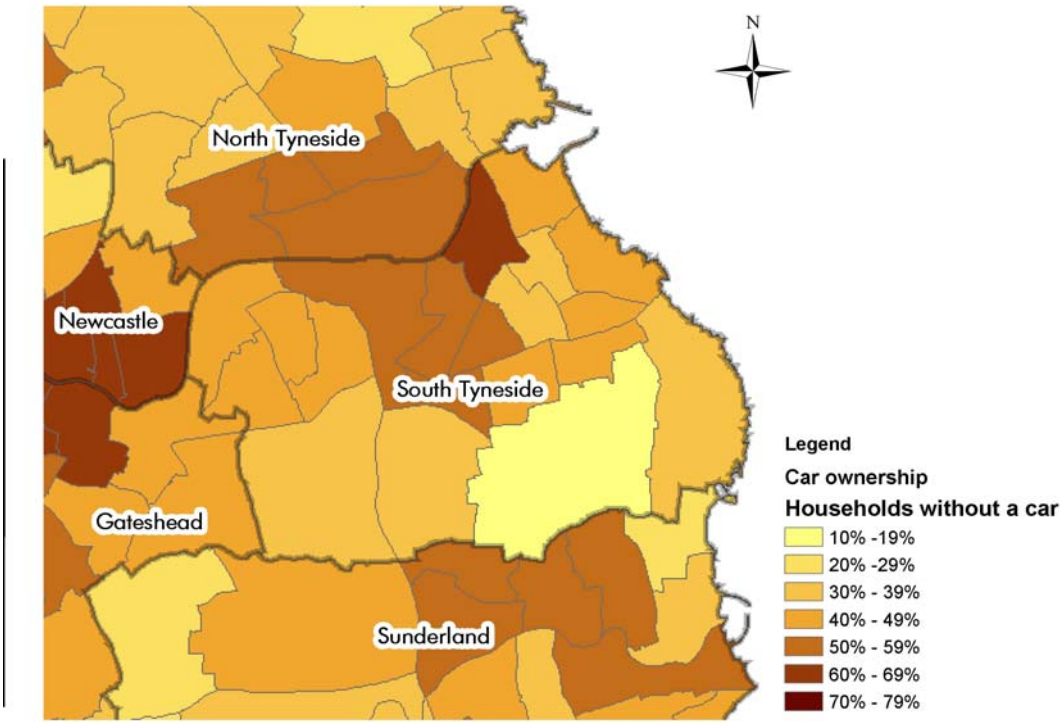
Source: Lincolnshire County Council. © Crown copyright Ordnance Survey.

Figure A19: Tyne & Wear average index of employment deprivation



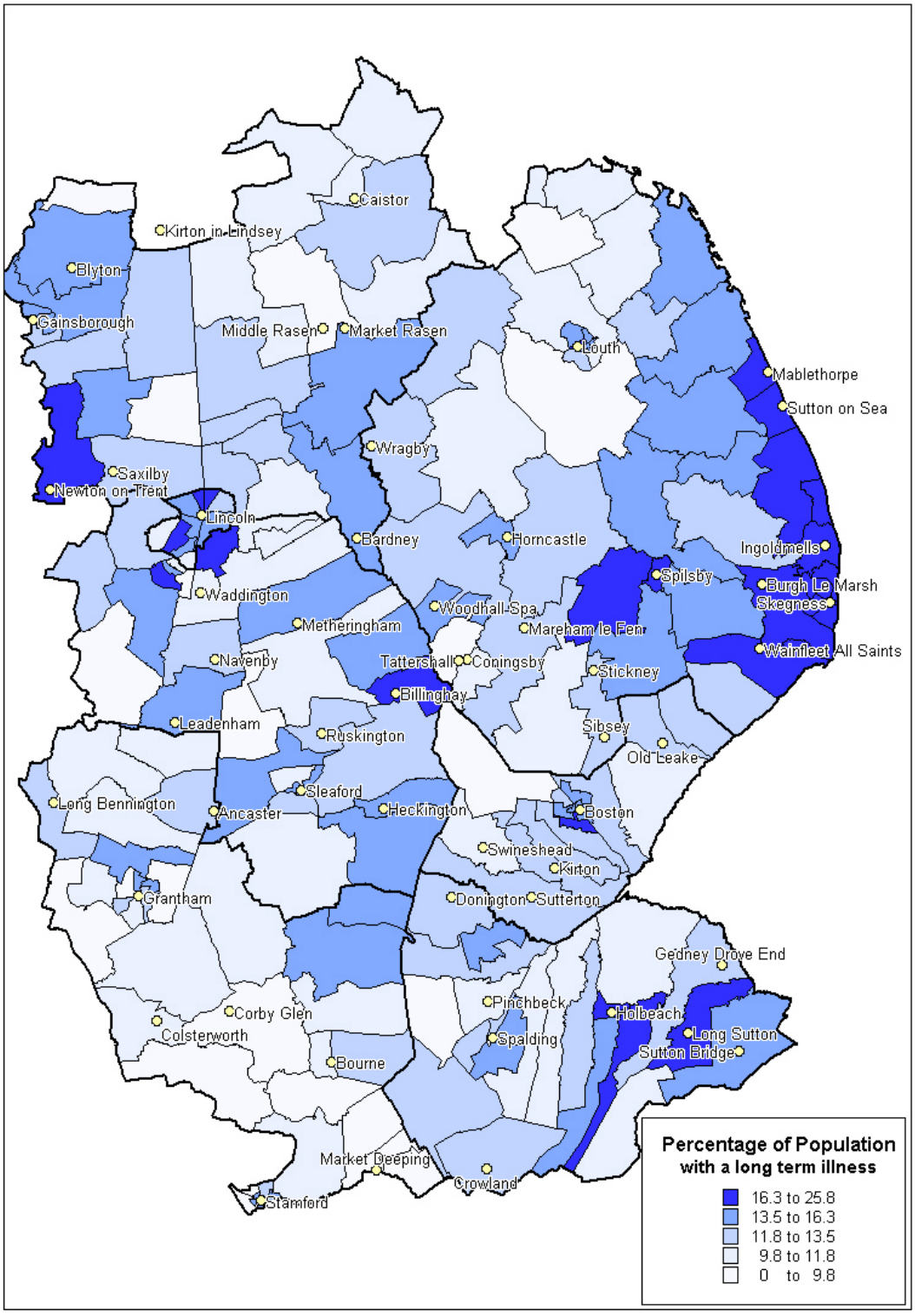
Source: Nexus PTE. © Crown copyright Ordnance Survey.

Figure A20: Tyne & Wear proportion of households with no access to a car



Source: Nexus PTE. © Crown copyright Ordnance Survey.

Figure A21: Lincolnshire proportion of population with a limiting long-term illness



Source: Lincolnshire County Council. © Crown copyright Ordnance Survey.

It should be noted that the composite, IMD and census approaches are only suitable for undertaking a one-off snapshot, aiding an initial identification of target areas, and

are not suitable for monitoring changes within these target areas. The core and local indicators should be utilised for such a task.

6.2 Local Mapping Audits

Local assessments should be undertaken for the areas, issues or groups identified as priorities in the strategic assessment. They are intended to provide authorities and their partners with more detailed supporting evidence with which to develop a possible package of solutions to improve accessibility. Consequently any local mapping audits will need to utilise more specific local indicators, reflecting the local priorities. Local mapping audits tend to take longer than strategic mapping audits, owing to the greater detail of analysis undertaken, the greater level of disaggregation and their implicit overlap and inter-linkage with the development of local action plans.

Local mapping audits can be undertaken at a more disaggregate level, both in terms of sections of the community and spatial resolution, which may be reduced from output or super output area level, in the case of strategic audits, to as little as 100m resolution in urban areas.

6.3 Hierarchical Analysis

Authorities and their partners are encouraged to undertake mapping audits in a hierarchical manner e.g. strategic mapping audits followed by more detailed and comprehensive local mapping audits. In addition, these strategic and local audits must be individually undertaken in a hierarchical fashion. For instance, this may involve initial consideration of a summary or overview of accessibility information and evidence, followed by the analysis of progressively more detailed information around the identified priorities.

For example, the use of composite accessibility indicators to provide a summary picture or to describe the overall pattern of accessibility within an area is very useful. However, to obtain a fuller understanding of the individual factors contributing to the combination of accessibility problems, it is necessary to undertake an analysis of the individual core indicators, or to use additional local indicators that take account of different aspects of accessibility which are of local importance and that are not fully represented within the core indicators.

Akin to the use of the overall and individual domains within the IMD, this represents a practical means of analysing results as well as highlighting possible linkages between corresponding indicators for other services. The development of specific solutions during the action-planning phase should be preceded by, and make direct reference to, the hierarchical analysis at the lowest or most detailed level. At its most detailed level, a hierarchical analysis is likely to involve the analysis of the effect of an initiative on a single identified destination or facility rather than a series of destinations as utilised within the core indicators.

Other forms of hierarchical analysis involve the progressive use of more detailed accessibility measures, the analysis of alternative time periods, days of the week,

thresholds, locations, the use of more disaggregate population groups, the progressive use and display of more detailed transport, opportunity or person type data.

6.4 Checking the Accuracy of Mapping Audits

Accessibility assessment does not seek to produce the perfect indicator but rather to develop indicators that, in conjunction with local partners' knowledge, enable robust evidence based decisions to be made. **Accessibility mapping is therefore of little value unless underpinned by careful analysis of the results**.

Partners are encouraged to consider whether poor quality or inappropriate data, or the choice of accessibility indicator have contributed to any apparent poor levels of accessibility identified. This can be achieved by checking whether the results obtained from mapping audits are supported by the local experiences of partners, by alternative qualitative and quantitative data sources, and by the existing body of evidence.

6.5 Interlinkages with Economic Impact Report Audits

Economic Impact Reports (EIRs) are prepared by promoters of transport schemes requiring funding from DfT for the development of the scheme. The EIR is used in the DfT's appraisal of wider economic impacts and focuses on the employment impacts of transport interventions in regeneration areas. EIRs form part of the New Approach to Transport Appraisal (NATA) appraisal framework and fall under the category Economy: Wider Economic Impacts. They are restricted to regeneration areas (areas with specific regeneration priorities requiring assistance in achieving the Regional Economic Strategy). EIRs seek to highlight the processes linking transport to the vitality of the local economy and demonstrate how a proposed transport scheme either i) improves access to existing jobs, or ii) reduces unemployment by generating new jobs. Two of the ways it approaches this is to utilise origin based accessibility measures, analysing changes in accessibility to existing jobs, and destination based accessibility measures, analysing changes in the pool of labour/customers which employers have access to.

The EIR has a number of direct synergies with the process of accessibility planning:

- regeneration areas may feature prominently in the composite indicator, or the IMD and its employment deprivation domain, as areas where action should be targeted;
- the core access to employment indicators are likely to show that regeneration areas have poor access, as well as potentially suffering from poor access to education, healthcare and major centres;
- they place emphasis on transport schemes demonstrating clear benefits for unemployed residents; and
- support an evidence-based approach to scheme evaluation based on the use of accessibility indicators and quantitative and qualitative surveys.

Work undertaken by local authorities during the development of an EIR can form part of the body of local evidence reviewed during the strategic and local accessibility assessments. In addition work undertaken by authorities and their partners using generalised cost based continuous measures, during i) strategic and local mapping audits; and ii) during the development and evaluation of potential transport schemes can be utilised as part of the supporting evidence prepared as part of an EIR.

Guidance on the EIR can be accessed from www.webtag.org.uk. Unit 3.5.8 provides general guidance on EIRs and unit 3.5.11 provides information on accessibility indicators whilst unit 3.5.13 provides information on data sources.

6.6 Scenario Testing and Option Appraisal

Quantitative accessibility indicators have an important role to play in identifying the potential impacts of actions proposed by partners for improving accessibility.

By varying the data underpinning accessibility models it is possible to model the potential advantages and disadvantages of proposed accessibility schemes/policies and changes to facilities and services. Such actions might include:

- new and improved bus services;
- new and improved cycling and walking infrastructure;
- demand responsive services;
- bus priority measures;
- physical accessibility improvements;
- new transport schemes;
- changes to the location, opening/closing times, quality and method of delivery of facilities and services; and
- changes in the patterns of land use development.

These actions can be modelled individually or collectively depending upon the resources available and the likely effect of the proposed action on local accessibility. Where resources are limited, and a choice has to be made between alternative actions, or where a list of potential schemes/policies have to be rationalised for more detailed analysis, partnerships are encouraged to consider prioritising potential actions according to those that offer the greatest accessibility benefit or improvement per unit of financial investment - the best value for money. In such instances, the core or local accessibility indicators can be utilised as a measure of the benefit associated with the proposed action. As an example, local authorities may elect to prioritise the funding of local bus services by supporting those bus services offering the greatest potential accessibility benefit per unit investment. However this represents a very simple approach to scheme/policy evaluation. Authorities should follow the principles of the more robust NATA approach, simplifying it when applying it to transport schemes or policies with a small monetary value. For major transport schemes authorities must follow the NATA.

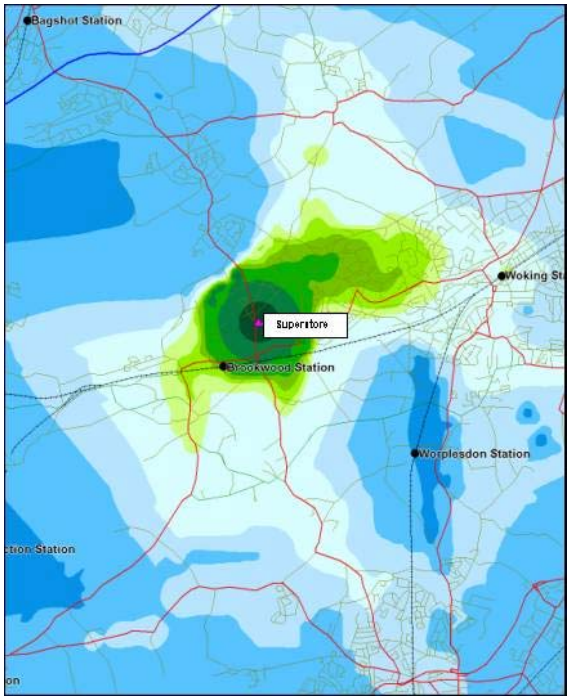
NATA provides a detailed integrated framework against which impacts of transport strategies and schemes can be evaluated under five objectives - accessibility, economy, environment, integration and safety. The concept that lies at the heart of NATA is that 21 aspects of the scheme/policy are analysed, each of which is allocated a weighting dependent upon its impact. An assessment is then undertaken to assess the overall value for money of the scheme/strategy. In arriving at a decision concerning a particular strategy, scheme or policy, NATA requires that sufficient account is taken of the equity, fairness and distributional impacts of the scheme/strategy. Detailed information on NATA can be found at www.webtag.org.uk. Unit 1.1 provides an introduction to transport analysis. Unit 2.1 outlines steps in the process, whilst unit 2.5 provides information on the appraisal process.

It is important to appreciate that the advantages and disadvantages of a proposed action may vary spatially within the area, and may have impacts beyond the local area under consideration. Authorities and their partners are thus encouraged to analyse the spatial variation in accessibility across the study area, to assess which communities are affected by the proposed actions, and to develop alternative actions or supporting mitigation actions if other areas are likely to be detrimentally affected.

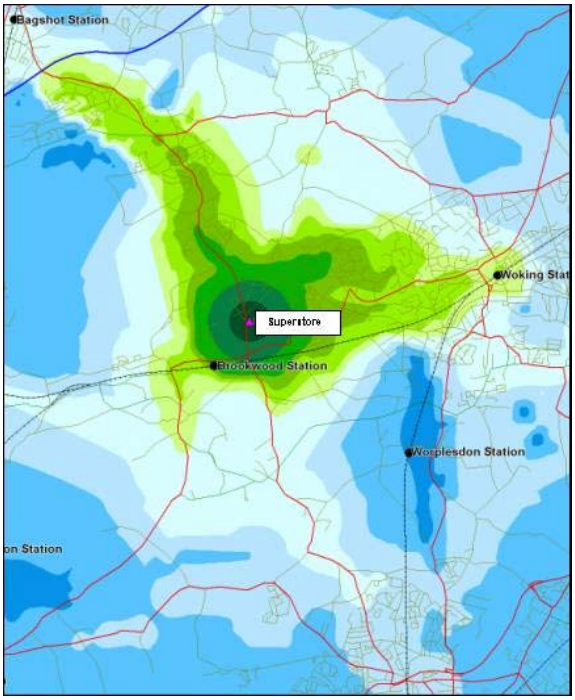
Figure A22 highlights the spatial accessibility benefits in terms of journey time, of improving the journey time and the frequency of a bus service to a proposed food retail supermarket in Surrey.

Figure A22: Public transport accessibility improvements to a new food supermarket in Surrey

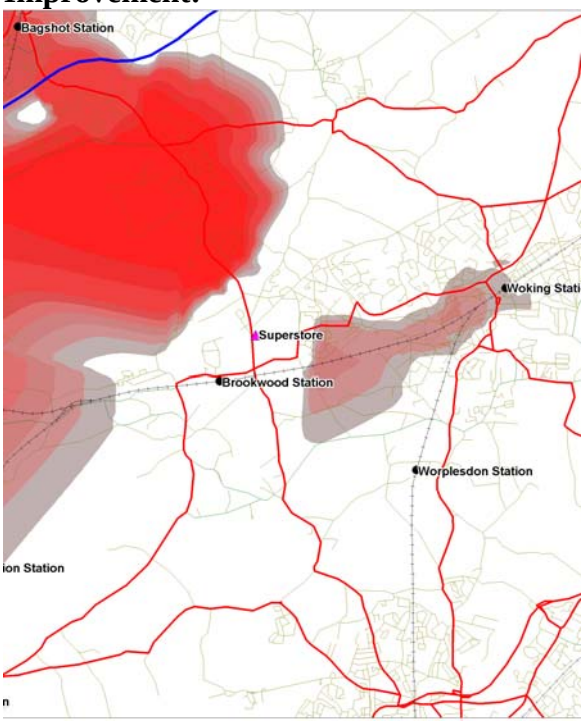
Before:



After:



Improvement:



Source: Surrey County Council. © Crown copyright Ordnance Survey.

Figure A23 highlights how Merseytravel used a continuous measure during the Mersyside access to health pilot to evaluate the effects on accessibility of relocating the Royal Liverpool Hospital. The indicator is expressed as changes in the *"equivalent number of people"* affected and takes into account the absolute number of

people affected by the proposed change and the relative importance to them based on the deterrent effect of travel to the hospital. The blue areas are those where accessibility would decline as result of the proposed change in hospital location, whilst the yellow areas experience little change and the orange/ amber areas are those that benefit the most from the proposed relocation.

These figure shows that a number of areas in Central and South Liverpool would experience a deterioration in accessibility through increased bus travel time. In particular, residents situated close to the existing location and in areas to the north and south are likely to suffer greatest from the proposed relocation. Such maps can be used to propose alternative locational policies or propose remedial measures such as the provision of improved public transport services.

Figure A23: The variation in bus accessibility to the Royal Liverpool Hospital as a result of the proposed relocation of the hospital

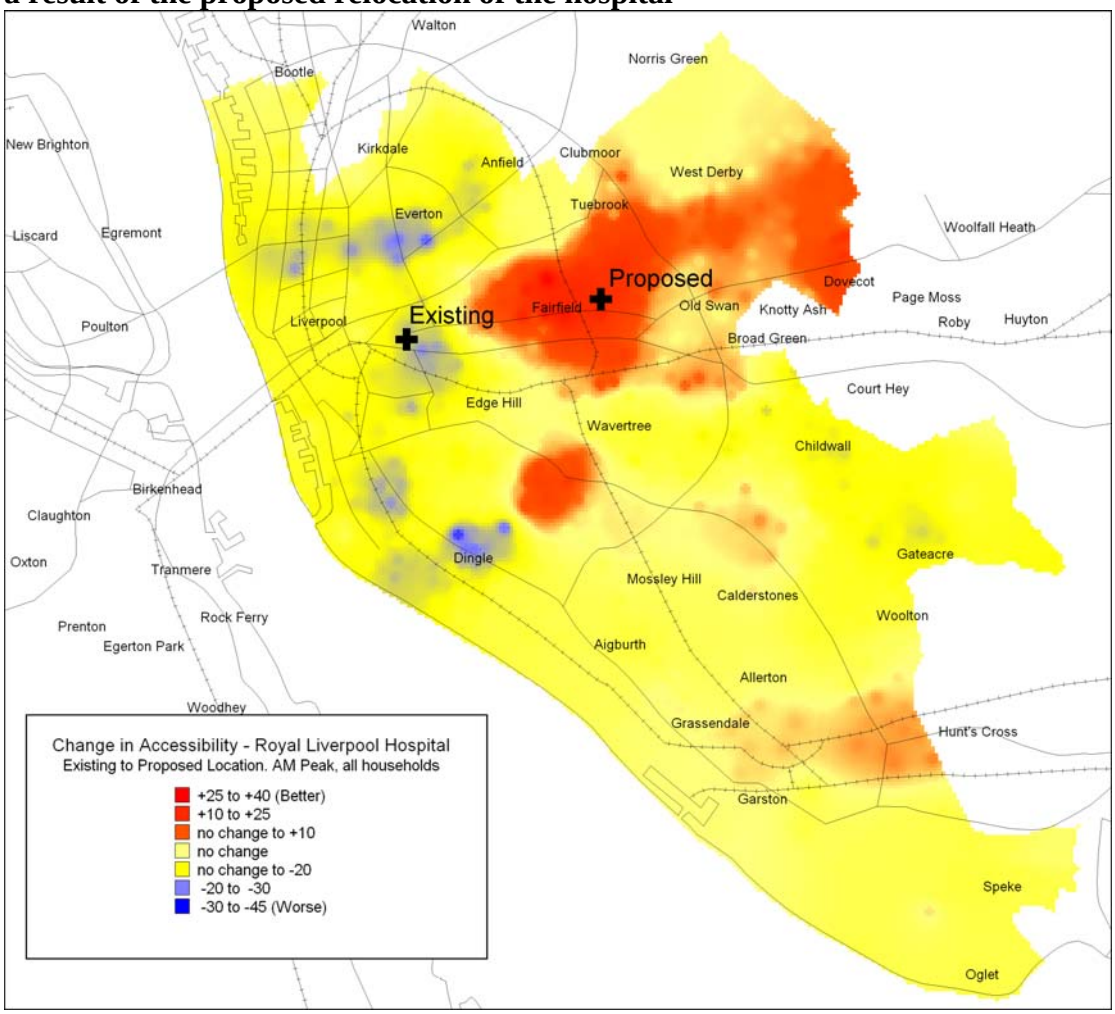
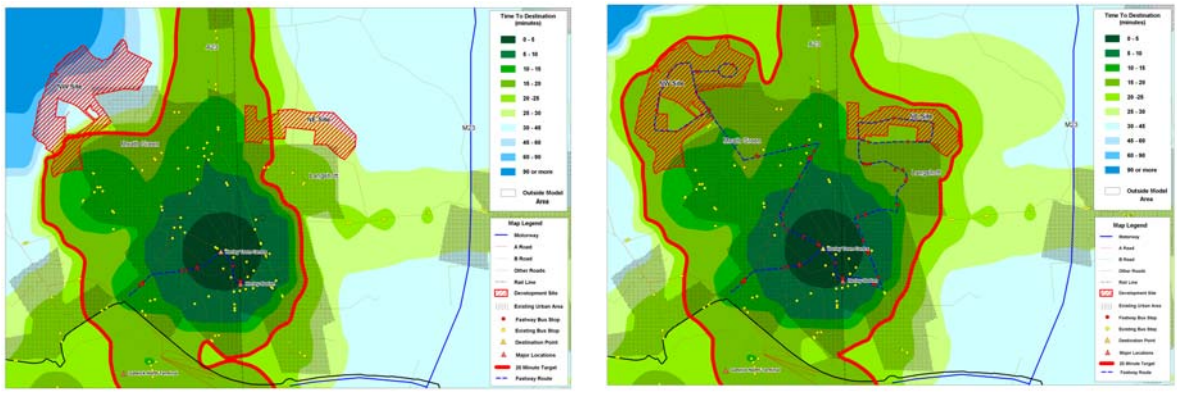


Figure A24 highlights the spatial accessibility benefits in form of journey time, of improving bus journey times and frequencies to proposed residential developments in Surrey. Here public transport services have been improved to ensure that a journey time threshold of 20 minutes (depicted in red) to the nearest major centre encompasses the proposed residential development.

Figure A24: Public transport accessibility improvements to proposed residential developments in Surrey

Before: **After:**



Source: Surrey County Council. © Crown copyright Ordnance Survey.

7. Targets and Trajectories

As discussed in chapter 7 of the main guidance, authorities will be expected to set at least one local target for improving accessibility, based on the core indicators, their locally defined performance indicators or both. A target is a goal to be reached on a definite date, such as 20% improvement in a defined measure by 2010. A trajectory is the path to be taken in order to meet that target, such as (in this example) 5% improvement by 2006, 10% by 2008 and 20% by 2010.

Trajectories that assume a constant improvement over time (a linear trajectory) are likely to be the easiest to set. However, their use is inappropriate if much of the improvement can be achieved rapidly by "quick wins" in the early years of the action plan leaving a proportion of more difficult improvements to be made in later years. If this is likely, a careful assessment is needed of the likely magnitude of the effect of these quick wins, and the time scale within which they can be achieved. Conversely, the improvement may rely on a long-term project that shows little or no benefits in the early years.

Targets could be established reflecting i) year on year improvements in accessibility; ii) a prioritisation of the areas or wards within a local authority which are experiencing the poorest accessibility, e.g. *"to ensure that 20% of a local authority's least accessible wards to/from secondary schools experience a 10% improvement in accessibility by 2008"*. However, it should be noted that targets that focus on specific local areas run the risk of neglecting changes that occur within other areas or encouraging the inappropriate transfer of resources and possible unanticipated deterioration in accessibility in other areas. They may therefore be most usefully considered in combination with more general targets for improving accessibility for the entire area/population.

If an authority and its partners wish to establish a target for a threshold based indicator, then they should consider use of multiple thresholds, which reflect

progressive or relative improvements in accessibility. A threshold-based target might read as:

To secure *"a 20% increase by year 2010 in the percentage of secondary school age children WITHIN 20 minutes travel time of their nearest secondary school and a 30% increase by year 2010 in the percentage of secondary school age children WITHIN 40 minutes travel time of their nearest secondary school"*.

Information on the setting of SMART targets is included in Technical Appendix 3 on the accessibility planning website.

Authorities and their partners are encouraged to foster a culture of continuous improvement in accessibility by establishing challenging, but realistic, targets. Continuous, sustained and significant improvements in accessibility are only likely to arise if authorities and their partners mainstream accessibility issues and objectives into their key decision making processes.

Targets should be reviewed regularly, not only to assess the extent of progress towards achieving targets but also to assess the reasons for lack of progress and to re-prioritise resources and actions towards the delivery of the target in under-performing areas.

8. Monitoring Performance

8.1 Monitoring Change

This should be read in conjunction with chapter 7 of the main guidance document. Core and local accessibility indicators can be used to monitor performance in respect of accessibility outcomes delivered by the accessibility strategy and local action plans. The difference over time can, depending on the indicator in question, be presented as an absolute change e.g.:

- *"an increase of 200 in the number of households with no access to a car able to access the nearest major centre within 30 minutes by public transport"*; or
- *"an increase of 5,000 equivalent jobs that individuals in receipt of Jobseeker's Allowance are able to access, since the start of the second LTP"*.

Alternatively, these indicators can be expressed in percentage terms e.g. *"a 5% increase since the start of the LTP"*, or *"a 1% increase year-on-year since the start of the second LTP"*. As before, these changes can be calculated at a variety of levels, such as small area level, ward, district, authority or the local transport authority level.

The changes over time should be investigated and related to measures, steps and actions that the authority, its partners or others have taken to improve accessibility. Consideration, where appropriate, should also be given to actions taken by the authority, its partners or others that have contributed to a deterioration in accessibility will provide a fuller picture of the reasons for the current pattern of accessibility within the region. Presenting any such changes in the form of an accessibility map can help to identify where the principal changes have occurred. Where proposed or actual actions by other organisations are likely to have, or have had, a detrimental effect on accessibility, maps showing the changes that are likely, or have occurred,

can be used to demonstrate to these organisations the effect that such policies can have, or have had on accessibility. This may prove to be beneficial in influencing the decision making of other organisations and potentially preventing or reversing the particular action/policy.

9. Accessibility Planning Assessment Tools

9.1 DfT Accessibility Planning Software Tool - Accession

Software tools currently being used by some authorities include bespoke local software applications (either developed internally by the local authority or on their behalf by consultants), off the shelf commercial software packages, traditional transportation planning software packages, and simple spreadsheet based systems.

These different accessibility modelling tools have a number of limitations. They assess accessibility differently, cannot identify the full range of accessibility barriers, only support the development of a limited range of solutions, can be difficult and expensive to use and maintain and do not always have totally transparent underlying methodologies. A decision was consequently taken by CLWGAP that the DfT should commission the development of a bespoke accessibility planning tool to overcome these various barriers and problems.

9.1.1 Purpose of Accession

Accession is intended to assist authorities and their partners in:

- undertaking strategic and local mapping audits;
- the prioritisation of resources;
- the development and evaluation of proposed actions; and
- monitoring accessibility strategies and action plans.

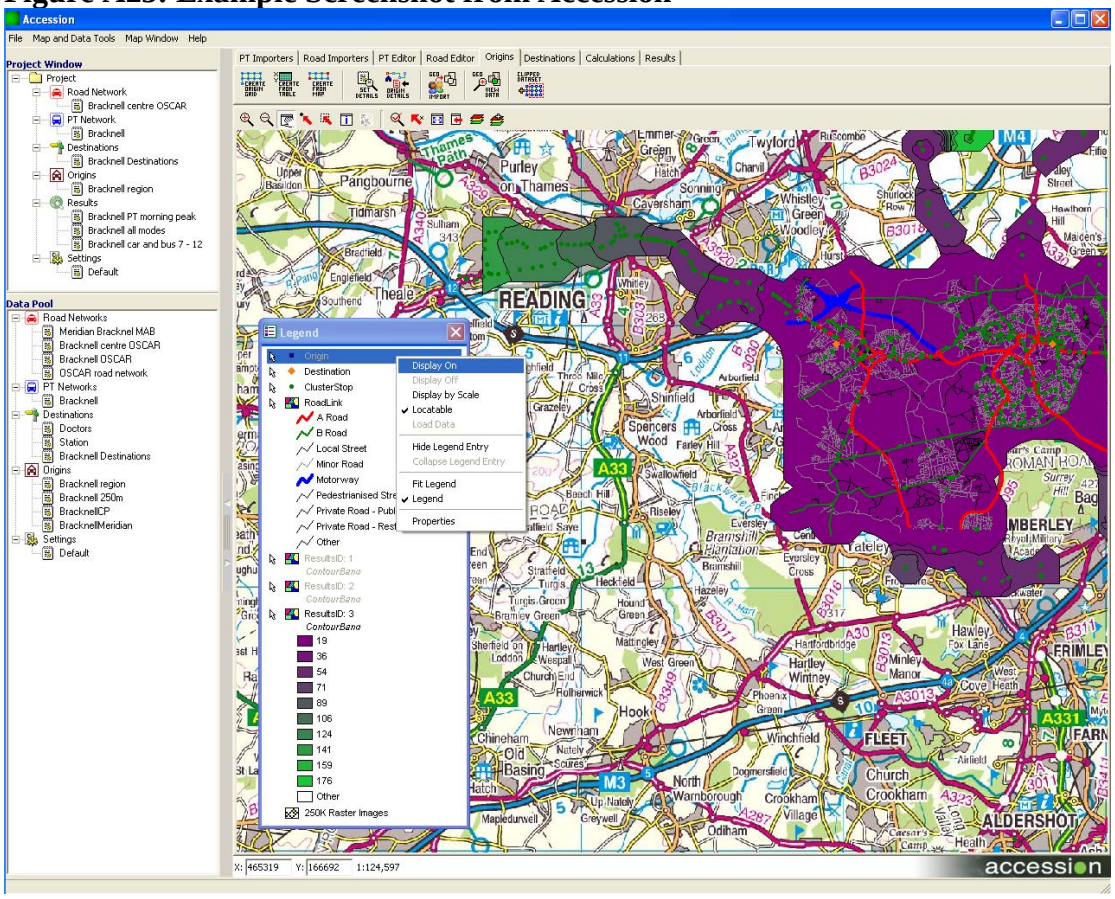
9.1.2 Features of the Software Tool

In order to minimise the data requirements on all users of the software tool it has been developed to minimise the effort involved in importing data e.g. transport, service/opportunity, census and local partners' data. It includes a geographical information system that is capable of reading vector and raster mapping and other data in MapInfo tab format and ESRI Shape files format, minimising the need for users to translate data between alternative GIS formats, as well as a selection of CAD formats. In general the software tool will aid easy import of authority and partner specific data in a range of forms and can be used by users of all abilities.

The software tool will be accompanied by simple operating instructions, a clear electronic user guide and support materials, a menu of origin and destination based quantitative local accessibility indicators outlined in section 3 and analytical, presentational facilities and metadata for auditing and quality control.

A key feature of the software tool is that it supports multi-modal travel (e.g. public transport, cycle, walk, car) and flexible routed and demand responsive transport modes. Figure A25 contains a sample screenshot from Accession.

Figure A25: Example Screenshot from Accession



9.1.3 Obtaining a Copy of Accession

One free licence for the standard version is available on application to MVA to each Local Transport Authority and Metropolitan District in England, outside London. It is essential to pay for a maintenance contract when a licence is procured, even for free licences. Local authorities may wish to consider forming consortia to make bulk purchases of extra licences. Information on the price of the software tool for central and local government is available at http://www.accession-gis.com/.

9.2 Alternative Accessibility Modelling Software

Authorities and their partners are encouraged to use suitable software during the accessibility planning process. **Use of the DfT software tool is recommended, but not mandatory**. Some local authorities may wish to utilise alternative software tools or alternatively may have expended significant staff time, financial and other resources in the development of local accessibility modelling software tools and may have established internal systems and processes for the use of such tools. Where authorities wish to use such tools, they are encouraged to either upgrade the methodologies underpinning their existing tools or ensure that any alternative software tools that they utilise reflect the methodologies, indicators and approaches contained within Accession. For those wishing to upgrade their existing accessibility software, additional information on the methods, techniques and indicators underpinning Accession can be found on the accessibility planning website in:

a) Technical Appendix 2 on local accessibility indicators

b) Technical Appendix 4 on the software tool's specification
c) Technical Appendix 5 on flexibly-routed transport

9.3 What to do in the Absence of Software or Data

In the absence of accessibility planning software, detailed transport datasets, or information on opportunities and services, it is still possible to undertake assessments in a systematic and consistent manner. In such instances, authorities and their partners are encouraged to make greater use of use of the centrally provided core and composite indicators discussed in sections 4 and 10 as well as the IMD and the census. This information can be used alongside discussions with partners, and existing local sources of evidence, to aid prioritisation of accessibility problems and identification of areas in which to undertake local accessibility assessments and action planning (see chapter 4 of the main guidance).

Qualitative surveys (discussed in section 3.2.6 and within Technical Appendix 1 on the accessibility planning website) may also take on a greater significance for those authorities lacking transport and facility/service data. In such instances, it is important that existing sources of qualitative data are analysed during the accessibility assessment stages to ensure that the lack of quantitative accessibility indicators does not result in poor decisions being taken.

However, authorities and their partners are encouraged wherever possible to utilise quantitative accessibility indicators when undertaking strategic and local mapping audits. If a partnership does not have the available tools, skills or resources to perform these audits, they are encouraged to consider either the use of consultants or joint working with a neighbouring authority in order that the analysis is undertaken.

10. Detailed Definitions & Mathematical Formulations

10.1 Core Indicators

The following sections list the time periods and days of the week associated with each of the services in the threshold based and continuous forms of the core indicators outlined in section 4. Threshold and continuous measures will be calculated using average door to door journey times calculated across all six time periods.

Table A3: Time periods to be utilised with the core indicators

Access to/from Primary & Secondary Schools:
Days of Week: Typical weekday (e.g. Tuesday or Thursday)

Pre-AM Peak	= 07:00-08:00	AM Peak	= 08:00-09:00
Pre-IP Hour	= 14:00-15:00	IP Hour	= 15:00-16:00
Pre-PM Peak	= 16:00-17:00	PM Peak	= 17:00-18:00

Access to/from Further Education:
Days of Week: Typical weekday (e.g. Tuesday or Thursday)

Pre-AM Peak	= 07:00-08:00	AM Peak	= 08:00-09:00
Pre-IP Hour	= 12:00-13:00	IP Hour	= 13:00-14:00
Pre-PM Peak	= 16:00-17:00	PM Peak	= 17:00-18:00

Access to/from Employment:
Days of Week: Typical weekday (e.g. Tuesday or Thursday)

Pre-AM Peak	= 08:00-09:00	AM Peak	= 09:00-10:00
Pre-IP Hour	= 12:00-13:00	IP Hour	= 13:00-14:00
Pre-PM Peak	= 17:00-18:00	PM Peak	= 18:00-19:00

Access to/from General Practitioners:
Days of Week: Typical weekday (e.g. Tuesday or Thursday)

Pre-AM Peak	= 08:00-09:00	AM Peak	= 09:00-10:00
Pre-IP Hour	= 12:00-13:00	IP Hour	= 13:00-14:00
Pre-PM Peak	= 16:00-17:00	PM Peak	= 17:00-18:00

Access to/from Hospitals:
Days of Week: Typical weekday (e.g. Tuesday or Thursday)

Pre-AM Peak	= 08:00-09:00	AM Peak	= 09:00-10:00
Pre-IP Hour	= 13:00-14:00	IP Hour	= 14:00-15:00
Pre-PM Peak	= 16:00-17:00	PM Peak	= 17:00-18:00

Access to/from Major Centres:
Days of Week: Typical weekday (e.g. Tuesday or Thursday)

Pre-AM Peak	= 08:00-09:00	AM Peak	= 09:00-10:00
Pre-IP Hour	= 12:00-13:00	IP Hour	= 13:00-14:00
Pre-PM Peak	= 17:00-18:00	PM Peak	= 18:00-19:00

10.2 Continuous Indicators

As well as being calculated as threshold indicators, the core accessibility indicators are to be calculated by the DfT by applying the following procedure.

A continuous measure (in this case an origin based relative-Hansen/gravity type measure) is utilised. The basic origin based relative-Hansen/gravity measure takes the form outlined in equation 1. A particular property of the indicator is that it incorporates inbound and outbound travel characteristics across six time intervals - pre-AM, AM, pre-inter, inter, pre-PM and PM peak periods.

$$h(A^k, s, m)_i = \frac{\sum_{j=1}^{J} A_j^k \times \exp\left(-\lambda_m^s . \left(\frac{\sum_{l=1}^{L} \left(t_{ijm}^{ls} + t_{jim}^{ls} \right)}{2L} \right) \right)}{\sum_{j=1}^{J} A_j^k} \qquad (1)$$

Where

$h(A^k, s, m)_i$ The proportion of relevant facilities or services (e.g. primary schools) k for population in segment s (e.g. primary school children in receipt of free school meals) relative to the origin zone location i using transport mode m.
Indicator range 0 - 1 inclusive. (0 = Poor accessibility, 1 = Good accessibility)

A_j^k The total number or attractiveness of the opportunities in destination zone j. For example, for access to education this term equals 1 for

each primary, secondary or further education establishment. For access to employment this figure equals the number of jobs.

l — The time period under consideration, e.g. l = 1 = pre-AM peak hour, l = 2 = AM peak hour, l = 3 = pre-Inter peak hour, l = 4 = Inter peak hour, l = 5 = pre-PM peak hour, l = 6 = PM peak hour. For cycle and walk travel, it is assumed that there is no variation in travel speeds by time of day.

L — The total number of time periods under consideration. For public transport L = 6. For cycle only travel L = 1.

t_{ijm}^{ls} — The total door to door travel time from *i* to *j* for persons of segment *s* during time period *l* using transport mode *m*. Outbound journey times required for public transport, cycle and walk travel.

t_{jim}^{ls} — The total door to door travel time from *j* to *i* for persons of segment *s* during time period *l* using transport mode *m*. Inbound journey required for public transport travel only. For cycle and walk travel the accessibility planning software tool does not allocate speed by direction to a link. Link travel assumes that the speed allocated to a link applies to both directions of travel except for one way links.

λ_m^s — A positive coefficient which defines the influence of travel time on travel for persons of type *s* using transport mode *m*. (refer to section 10.4)

The above indicator has a larger value the more accessible a particular residential location is (tending to unity for very accessible locations) and a smaller value for regions with poor accessibility (tending to zero for locations with poor accessibility). As the focus of accessibility planning is on identifying areas and regions where individuals are experiencing or are at risk of experiencing transport related social exclusion, the above expression must be reformulated. To place more emphasis on regions with poor accessibility, the following simple transformation can be used.

$$h'(A^k, s, m)_i = 1 - h(A^k, s, m)_i \qquad (2)$$

Where

$h'(A^k, s, m)_i$ — The corrected proportion of relevant facilities or services *k* for population in segment *s* relative to the origin zone location *i* using transport mode *m*.
Indicator range 0 - 1 inclusive. (0 = Good accessibility, 1 = Poor accessibility)

Having introduced this transformation, a weighting can be applied to the origin based relative-Hansen/gravity measure to reflect the population segment resident at the origin location experiencing the particular level of accessibility (e.g. the total primary school age population or the primary school age population in receipt of free school meals). The larger this figure is, the greater is the accessibility problem. The lower this figure is, the lesser is the problem. This form of indicator can reflect changes over time in the transportation network, changes in the location and numbers of opportunities e.g. schools and hospitals as well as changes in the number and distribution of the population segment being considered e.g. all pupils or pupils in receipt of free school meals etc.

The corresponding weighted-Hansen/gravity measure takes the following form.

$$w(A^k, R_i^s, s, m)_i = R_i^s \left(1 - h(A^k, s, m)_i\right) \qquad (3)$$

Where

$w(A^k, R_i^s, s, m)_i$	The corrected proportion of relevant facilities or services *k* for population in segment *s* relative to the origin zone location *i* weighted by the total resident population in segment s using transport mode *m*. Indicator range 0 - R_i^s inclusive.
R_i^s	The number of residents in segment *s* living in zone *i* (e.g. the total number of pupils living in zone *i* in receipt of free school meals. For access to employment this is the number of people in receipt of Jobseeker's Allowance).

Please note that the use of weightings can make the interpretation of contours derived from such weighted indicators difficult. However, the aim here is not to generate contours but to help identify and rank wards with the greatest accessibility problem and produce thematic maps; weighted measures are very well suited for this.

The resulting aggregate index formed by considering all relevant transport modes, e.g. public transport/walk and cycling, takes the following form[13]:

$$w(A^k, R_i^s, s)_i = \frac{w(A^k, R_i^s, s, PTwalk)_i \times N(R^s, PT, walk) + w(A^k, R_i^s, s, cycle)_i \times N(R^s, cycle)}{N(R^s, PT, walk, cycle)} \quad (4)$$

Where

$w(A^k, R_i^s, s, PTwalk)_i$	The proportion of relevant facilities or services *k* for the population in segment *s* relative to the origin zone location *i* weighted by total resident population in segment *s* using the sustainable transport modes public transport and/or walk.
$w(A^k, R_i^s, s, cycle)_i$	The proportion of relevant facilities or services *k* for population in segment *s* relative to the origin zone location *i* weighted by total resident population in segment *s* using the sustainable transport mode cycle.
$w(A^k, R_i^s, s)_i$	The proportion of relevant facilities or services *k* for population in segment *s* relative to the origin zone location *i* weighted by total resident population in segment *s* using all sustainable transport modes (i.e. PT/walk, cycle).
$N(R^s, PT, walk)$	The total number of National Travel Survey (NTS) trips for the population segment *s* who use public transport and/or walk transport modes in accessing the opportunity type in question *k*.
$N(R^s, cycle)$	The total number of NTS trips for the population segment *s* who use the cycle mode in accessing the opportunity type in question *k*.
$N(R^s, PT, walk, cycle)$	The total number of NTS trips for the population segment *s* who use public transport and/or walk transport modes and/or the cycle mode in accessing the opportunity type in question *k*.

The mode split of PT/walk and cycle with respect to PT, walk and cycle transport modes is used in deriving $w(A^k, R_i^s, s)_i$. This resulting accessibility measure covers all sustainable transport modes. The mode-split factor is calculated from the National Travel Survey (NTS) using data encompassing the period from 1999 to the year in question. The advantage of this approach is that it allows for changes in mode split of

[13] In addition to calculating an aggregated continuous measure for the public transport/walk and cycle modes, the continuous formulation of the core indicators will also be separately presented on the Neighbourhood Statistics website for each transport mode combination i.e. public transport/walk and cycle.

sustainable transport modes to be reflected within the resulting sector specific accessibility indicator as well as within the composite indicator discussed in section 10.3. The resulting overall sub-indicator can be considered to represent the combination of accessibility problems associated with the accessibility indicator in question for the transport modes and population segment in question. In practice, the latest available NTS data may be for one or two years earlier.

10.2.1 Presentation of Continuous Measures

The interpretation of continuous measures can be aided by presenting the indicators in the form of percentiles, by utilising the following process:

a) Sum the results of equation 4 across all origin points within a ward for the sub-service indicator and repeat for all wards located with the transport authority (e.g. for access to/from education the 5-15 sub-service indicator and the 16-19 sub-service indicator are used).

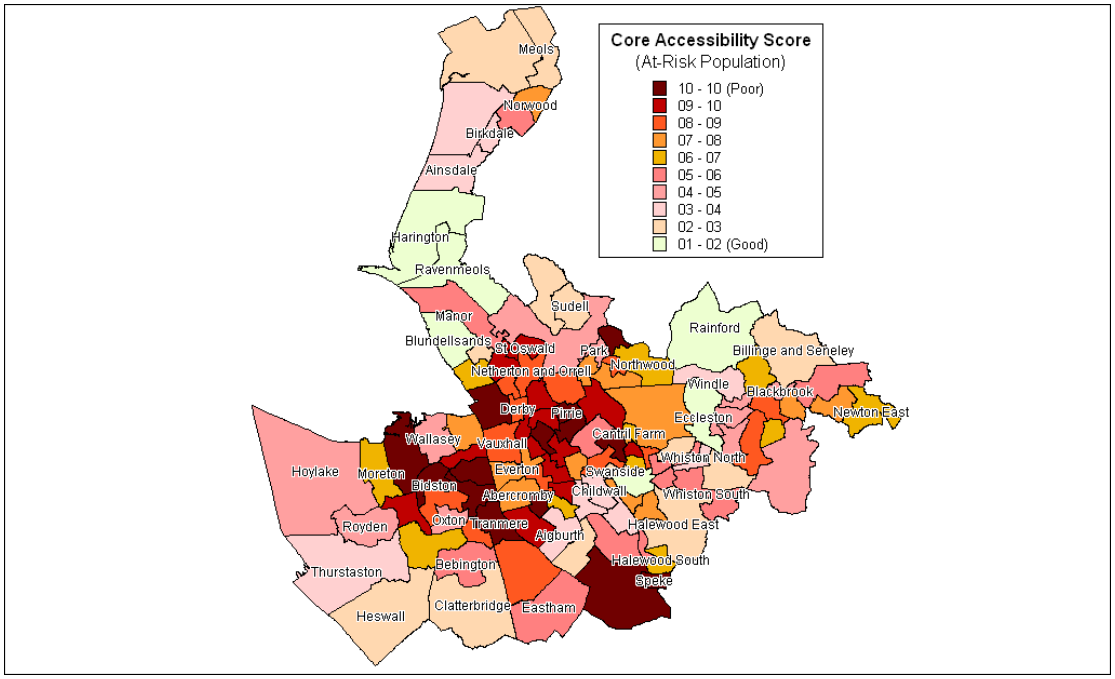
b) Wards are then ranked in descending order in decile bands with 10 bands being produced, each containing 10% of the wards in the local transport authority. (Please note that for locally derived composite measures it is possible for authorities to apply an alternative scoring system to the respective decile bandings representing the weighting allocated to the bands in question as well as using an alternative banding size.)

c) Wards located within each of the decile bands are allocated the following decile related scores:
   - 1st decile band - Score 10 (poor accessibility)
   - 2nd decile band - Score 9
   - 3rd decile band - Score 8
   - 4th decile band - Score 7
   - 5th decile band - Score 6
   - 6th decile band - Score 5
   - 7th decile band - Score 4
   - 8th decile band - Score 3
   - 9th decile band - Score 2
   - 10th decile band - Score 1 (good accessibility)

d) The process is repeated for each sub-service indicator.

Figures A16 and A26 respectively show the application of this presentation process for continuous measures to the core indicators, access to hospitals with an outpatient department for Merseyside and the access to compulsory education in Merseyside. By presenting the continuous formulations of the core indicators in this format rather than as equivalent number of opportunities, it is possible to identify the areas with poor levels of accessibility shown depicted in red.

Figure A26: Continuous formulation of the access to compulsory education (5-16) core indicator for Merseyside



10.3 Composite Indicators

The DfT will combine the continuous formulations of the various core accessibility indicators to produce a composite or overall measure of accessibility.

In the following procedure the composite indicator is first produced for defined at-risk population segments and household types, followed by all population segments and household types. In order to combine the indicators associated with all service specific indicators, a normalisation process is introduced and applied to each sub-sector indicator to produce four equally weighted indicators, one for each service sector. The following procedure is to be utilised when combining the modal combined corrected weighted relative-Hansen/gravity indicators $w(A^k,R_i^s,s)_i$, for access to education for 5-15 year olds (please note that the corresponding indicators for 5-10 and 11-15 year olds have been summed) and 16-19 year olds respectively.

a) It is necessary to sum the results of applying the procedure outlined in a-d inclusive of section 10.2.1 across all sub-service indicators associated with a specific service, applying an appropriate weighting factor as necessary. For example the 5-15 sub-service indicator and the 16-19 sub-service indicator presented in percentile form using decile based scores, are each allocated an equal weighting of 0.5 i.e. are multiplied by 0.5 before being summed together. A similar process is applied to the healthcare related indicators of access to hospitals and access to general practitioners, each of which are multiplied by 0.5 before being summed together. The access to employment and access to major centres equivalent indicators are not factored, effectively allocating a weighting of unity to each.

b) Having undertaken the weighting process and summing the weighted scores for the four services, the resulting four indicators are summed by ward and then ranked in descending order according to the methodology outlined previously in section 10.2.1.

The resulting composite indicator can be mapped spatially within geographical information systems, can be tabulated or presented in bar chart form. Section 6.1.3 and figures A14 and A15 outline four composite indicators developed during the Merseyside and Devon pilots for at-risk and non at-risk population groupings.

The methodology outlined in sections 10.2, 10.3 for the development of continuous and composite indicators can be used by authorities wishing to develop their own local composite indicators based upon continuous formulations of their local indicators.

10.4 Deterrence Parameters

Continuous measures are grounded in their innate ability to reflect aspects of actual travel behaviour. However, in order to use continuous accessibility indicators in a robust manner, it is important that the associated deterrence parameters have been derived from an analysis of actual travel behaviour and relate to the measure of disutility, time, distance or cost applicable to the population segment and trip purpose in question. If used inappropriately, inaccurate findings may emerge from the strategic and local mapping audits. When selecting deterrence parameters, local authorities must ensure that the parameter selected or used is relevant for:

- the population group being considered;
- the service or facility under consideration;

and must ensure that

- the nature of the impedance term (i.e. time, distance or cost) is consistent with that used in the calculation of the deterrence parameter.

If all these three conditions are not satisfied then the results obtained from application of the deterrence parameter to a continuous measure will be incorrect.

10.4.1 Deriving Deterrence Parameters

Existing survey data on individuals' trip behaviour, namely the duration or length of a journey that is acceptable, by people group and trip purpose can be used to derive values for the deterrence parameter (λ, the sensitivity to journey time), for use in continuous accessibility measures.

Although observed behaviour will not reflect accessibility perceptions by all groups for all trip purposes, e.g. people who do not currently travel at all due to cost or time barriers, the use of surveys of existing behaviour provide a suitable approximation for the majority of travellers.

There are a range of combinations of people groups and trip purposes that need to be considered separately. Key variables affecting the propensity to travel that need to be considered when deriving such parameters are the age, gender, income, mobility/ vehicle ownership journey purpose and mode of travel. An example of variation by trip purpose for all respondents is shown below in table A4 which contains an extract of data from the 1999/2001 National Travel Survey.

Table A4: Average journey length by journey purpose, 1999/2001 National Travel Survey

Journey Purpose	Average Time Taken/ mins
Commuting	25
Business	40
Education	19
Shopping	17
Other escort	16
Other pers. business	17
Visiting friends at private home	23
Visiting friends elsewhere	18
Entertainment/ public activity	24
Sport: participate	18
All purposes	21.2

Other variables such as geographical location and local cultural factors may also be expected to have some influence on trip characteristics, and hence local calibration of deterrence parameters is encouraged for incorporating such factors within local accessibility assessments.

The trip data to be used can be manipulated in a database to create sub-groupings based on people groups and journey purposes. The characteristics of these sub-groups are analysed to establish any statistically significant differences between sub-groups. For example, there may be a statistically significant difference between acceptable journey times for travel to work for male and female travellers, but no significant difference in the case of journey to healthcare facilities. The statistical tests used for comparing groups should be appropriate to the data that is used, its statistical distribution and the likely variance of results across different groups.

Once a set of statistically distinct sub-groups has been established from the data, the relationship in each sub-group between trip duration and number of trips is explored using a simple negative exponential function of the type $e^{-\lambda t}$. This function is hypothesised to describe the relationship between travel duration and the likelihood of travel. An estimated value for the deterrence parameter (λ) can be established through use of statistical packages such as SPSS or from spreadsheet analysis, which are capable of fitting hypothesised relationship curves to experimental data.

The outcome is a table of deterrence parameters for different journey purposes and people groups that can be applied in calculating journey time-based accessibility measures for public transport, cycle, walk and car journeys.

Data Sources

The National Travel Survey (NTS) is a series of household surveys designed to provide a databank of personal travel information for Great Britain. Information is captured on all journeys made by householders during one week in a travel diary, and therefore captures information on many journey purposes and people groups. The most useful data from the NTS will be that collected through the 7-day travel record, under which each individual in a participating household is issued with a seven day travel diary, in which they recorded details of their travel activity.

The 2001 census collected information on travel to work and this data, may be used locally to estimate deterrence parameters for work related trips journeys. The UK Labour Force Survey may also yield information on duration and mode for work journeys.

In the preparation of Development Plans, Local Transport Plans and the development of transport models local travel surveys are often undertaken by local authorities. These may be for the whole area or specific areas. Surveys by other agencies may also be of assistance on more detailed aspects of travel, for example; neighbouring authorities, rail and bus operators, port and airport authorities, local businesses, schools, colleges or universities as part of travel plan activities, walking and cycling groups, and organisation representing specific sectors of the population such as individuals with mobility impairments. Other sources of travel data on specific journey types include the labour force survey for considering journeys to work, or surveys carried out by health trusts and authorities on journeys to healthcare facilities. Provided information on travel time is recorded by journey purpose the data can be used to calibrate parameters for use in accessibility modelling. Where travel time is not recorded (or is done so with lower certainty) distance or geocoded origin and destination information (e.g. postcodes) can be used to estimate travel time by modelling the travel time from the origin to the destination using an accessibility or transport model.

Further guidance on personal travel surveys for LTPs can be downloaded at the website below[14].

Information on travel time related deterrence parameters estimated for various trip purposes, travel modes, population groups and region types, from the NTS are available in Technical Appendix 6 on the accessibility planning website.

[14] http://www.dft.gov.uk/stellent/groups/dft_transstats/documents/page/dft_transstats_505582.pdf

PART B: DATA ISSUES FOR CORE AND LOCAL ACCESIBILITY INDICATORS

1. Introduction

Part B explains the data to be used for the core indicators, and lists the sort of data sets that local authorities are likely to find useful when undertaking accessibility planning and producing their own local indicators.[15] . It lists the centrally available data sets, noting how and where local authorities and their partners may need to collect extra information for these sets and additional data sets. As much data as possible will be supplied centrally. This will generally be done via the Neighbourhood Statistics (NeSS) web site[16], but personal, commercially sensitive or disclosive data will require other means.

To measure a time-based accessibility indicator, such as the core indicators, three types of data are needed: origins, transport and destinations. Such data can also be useful for non-time-based indicators, but other information may also be needed for these, such as data on cost, safety or other factors (section 8.15). Origins and destinations should be geocoded (Ordnance Survey eastings and northings). This can be done approximately via the postcode, especially as many destinations will be buildings with their own postcodes.

- **Origins:** whose accessibility are you trying to measure (all population or some defined subset) and where do they live? For example:
  - Total population
  - Children of compulsory school age
  - Children of compulsory school age getting free school meals
  - Unemployed
  - Older people (on any suitable definition, such as retirement age, 75+, 85+)
- **Transport:** how do people get from home to a destination and back? For example:
  - Walking - where can people walk? This includes details of pedestrianised roads, footpaths, barriers such as railways and dual carriageways and crossing points of these barriers.
  - Public transport - need details of bus stops, routes and timetables.
  - Cars - where can people drive, and how many do not have a car?
- **Destinations:** where do they want to go? For example:
  - Schools (for education)
  - GPs' surgeries (for health)

2. National Data Sources

These are sources that are available on a consistent national basis, so that uniform accessibility measures can be calculated for all areas. Suitable data sets are discussed below. Many of these will be provided to local transport authorities that produce

[15] For more on core and local indicators, see Technical Annex Part A. For core and local strategic performance management indicators, and what should be reported to DfT, see chapter 7 of the main guidance.

[16] neighbourhood.statistics.gov.uk

Local Transport Plans and Metropolitan Borough Councils in England outside London on a CD available from DfT. The data CD should be validated by local authorities from their own knowledge and information. Details of any identified inaccuracies should be forwarded by e-mail to the DfT together with corrected or amended data to data@accessibilityplanning.gov.uk in a format identical to that contained in the original data CD.

The main source is the 2001 Census. This provides sociodemographic data for the whole country as at April 2001. Many tables have been released for wards (as at 2003) and output areas (OAs); this is the case for all Census data discussed below. OAs are very small (typically 125 households) and nest within wards. The geocodes of the population-weighted centroids of OAs are available. Boundaries of wards and OAs are available as GIS files. The Ordnance Survey has licence restrictions on the use of OA boundaries, which can be found on the web site below[17].

Measures have been applied to Census output to prevent the inadvertent disclosure of information about identifiable individuals:

- a small count appearing in a table cell is adjusted - information on what constitutes a small cell count cannot be provided as this may compromise confidentiality protection;
- totals and subtotals in tables are calculated as the sum of the adjusted data so that all tables are internally additive; within tables, totals and subtotals are the sum of the adjusted constituent counts;
- tables are independently adjusted; this means that counts of the same population in two different tables may not necessarily be the same;
- tables for higher geographical levels are independently adjusted, and, therefore, will not necessarily be the sum of the lower geographical component units;
- **Record swapping:** The individual records on the output database are slightly modified by record swapping in which a sample of records is 'swapped' with similar records in other geographical areas. The proportion of records swapped is confidential.

This will cause some distortion of the Census data, but it should be too small to cause any problems. Some detailed tabulations are only available by ward and (in due course) by Super-Output Area (typically 1250 households).

The All Fields Postcode Directory (AFPD), available from ONS, is a useful tool. It lists all postcodes in the UK and relates them to OAs, wards and a range of administrative, health, and other geographies. Grid references are given and also counts of the number of addresses, delivery points etc. Postcode headcounts (the number of people living in each postcode, but with no details about them) can also be supplied. As well as the full version, ONS can produce tailored extracts for specific areas of the country or for specific fields only. Cost: For the standard version with 100m grid references, prices vary from £1,138 + VAT for a single user up to £8,804 + VAT for corporate use (20+ users). Higher resolution grid references are more expensive. Extracts: Depends on which fields are required and for how many postcodes. All prices are annual charges covering the supply and use of 4 quarterly

[17] www.statistics.gov.uk/census2001/terms_and_conditions.asp

issues. There is no reduction for fewer issues. Enquiries: ONS Geography Services, 01329 813477/ 813243.

Information on **land use** may be available from a number of sources. The Generalised Land Use Database (GLUD), to be released by ODPM for England at the end of 2004, is based on Ordnance Survey's MasterMap. It will show land use at the land parcel level according to a nine-category classification. Commercial organisations have produced land use maps for some areas based on aerial photography. These tend to show land cover rather than land use, not showing the uses of buildings. A further source is ODPM's Land Use Change Statistics (LUCS), a geographically referenced database of sites that have changed their land use (24 categories). This is based on information provided by Ordnance Survey linked to their map revision work and goes back to 1985. It could be used to study changes in accessibility.

It is important to ensure that both central and local data files are up to date. The Census is at April 2001 and is unlikely to be updated before 2011. However, other centrally supplied data files will be updated more often. Updated CDs will be sent to anyone who received the original one when significantly revised data sets are available, but for data from web sites, local authorities should check whether there is a later data set.

3. Origin Data for Core Indicators

3.1 Census Population Data

Population is available by age; the age breakdown is 0-4, 5-7, 8-9, 10-14, 15, 16-17, 18-19, 20-24, 25-29, 30-44, 45-59, 60-64, 65-74, 75-84, 85-89, 90+. Data by age will be supplied on a CD with the software package, or can be downloaded from the NeSS web site. A male/female split is available from that site if needed, but is not on the CD. Population gives information on where people live, so provides weights for journey origins. Age is relevant for estimates of numbers of people of school age, to support the access to education indicator, and of working age to support the access to work indicator. It will also be useful for other local indicators.

3.2 Population Estimates

These are based on the Census and produced annually, and are currently available down to local authority. They are published by five-year age group and sex, and for some uses they can be made available by single years of age on request. It is intended that ward level estimates by age and sex for mid-2002 will be released shortly as experimental statistics and will be available on the NeSS web site. No decision has yet been made on what age detail will be available. It is intended that further ward estimates will be produced annually, and consideration given to producing estimates for Census Super OAs.

3.3 Household access to cars

The CD also includes census data relating to the number of households, showing how many have access to 0, 1, 2, 3, 4+ cars or vans and total number of cars/vans (see section 6.2).This information supports the core access to health care and access to major centres indicators.

3.4 PLASC (Pupil Level Annual School Census)

This records pupils of school age or in further education. Information includes age, postcode of usual residence, school attended, ethnic minority status, whether the pupil gets free school meals or has special education needs. (It does not show if they are eligible for free school meals but do not claim them.) It excludes private schools. The data are confidential, so cannot be included on the data CD, but local education authorities (LEAs) should already have the data for their own areas. Note that the LEA database will include pupils being educated in the LEA but living outside, and will exclude pupils living in the LEA but being educated outside. Thus for completeness, neighbouring LEAs should also be asked for PLASC data.

PLASC will assist with the core access to education indicator and a wide variety of potential indicators on access to schools. Examples include

- Accessibility of school actually attended, as opposed to nearest
- Accessibility for ethnic minorities
- Accessibility for those getting free meals (as in the core indicator)
- Accessibility for those with special educational needs.

In requesting data from LEAs, authorities are encouraged not to request potentially disclosive data such as pupil date of birth, exact age, pupil addresses, school of attendance etc. For example authorities may request that a file is provided by the LEA at a postcode or output area level detailing the total number of pupils aged 5-10 and 11-15 (as of the 31st August) and the total number of pupils aged 5-10 and 11-15 in receipt of free school meals.

3.5 Jobseekers' Allowance

The number of those in receipt of this allowance is available by ward, annually, from DWP[18]. Data for 2001 and 2003 are already on that site. Data for 2002 are unreliable and will not be released. Census data may be used to estimate data for OAs; such estimates are included on the data CD described in section 2. The procedure is to take data by OA on the number of people shown in the Census as unemployed. The proportion of the unemployed people in the whole ward who are in that OA can be found, and this proportion is then applied to the Jobseekers' Allowance data.

This will be used for the core access to work indicator and will allow studies of accessibility for those in receipt of Jobseekers' Allowance, which is a proxy for the socially excluded.

An alternative data set is the claimant count; this is available via NOMIS (see section 7.2). It is more up to date, but is not considered such a good indicator of social exclusion.

4. Other Origin Data

As well as the data that will be used for calculating the core indicators, other national origin data could prove of use for local authorities in calculating local accessibility indicators.

[18] www.dwp.gov.uk/asd/asd1/neighbourhood/neighbourhood.asp

4.1 Other Census Data

Some other data, available by Ward and OA, are supplied on the data CD.

- People 16-74 by economic activity, e.g. employed full time, student, unemployed, retired. This indicates whether people are working or actively looking for work, which may help to identify areas where access to employment is of particular importance. (Although data are available up to the age of 74, access to work will not in general be relevant above retirement age.)
- People 16-74 by socio-economic status, e.g. senior manager, routine occupation.

Many other Census tables are available by OA from the NeSS web site[19], e.g.

- Country of Birth
- Ethnic Group
- Disability: this is measured by two questions ("Do you have any long-term illness, health problem or disability which limits your daily activities or the work you can do?"; if not working last week, were you permanently sick/disabled?); this will indicate where disabled people live, which is needed for indicators of the particular accessibility problems that disabled people may experience.

4.2 Legal Services

NeSS lists organisations that have been awarded a contract to provide publicly funded advice either through the Community Legal Service (CLS) or Criminal Defence Service scheme, and those that have received a CLS Quality Mark in recognition of the level and quality of the service provided. This is not needed for core indicators, but may be used for local ones of accessibility of free legal advice.

5. Transport Data for Core Indicators

5.1 NaPTAN and Regional Traveline Data

Together, these supply the comprehensive data on the routes and frequency of public transport that will be used to support the core indicators.

- NaPTAN (National Public Transport Access Nodes) database gives the locations of bus stops, railway stations and other access points for public transport; this provides information on where passengers may board or alight.
- The relevant regional **Traveline** service provides data on public transport routes and timetables (from which travel times and frequencies can be calculated). It will include a limited representation of any demand-responsive services available to the general public. Local transport authorities should notify DfT of the number and details of demand-responsive services in their areas, so that DfT can collate data on the boundaries of the areas covered by each relevant demand responsive service and the operating conditions.

Information about dedicated school contract services is not available from regional **Traveline** services, but local transport authorities can supply data on them to DfT. Any such data provided to DfT will be used when calculating the access to education core indicators. It also excludes Community Transport, NHS Patient Transport Services and other specialist transport.

[19] neighbourhood.statistics.gov.uk/

Data on bus services are available at individual stop level for most parts of the country. A few authorities are still completing the work necessary to provide timetable data with this level of detail, and it is urgent that this work is completed quickly. This information is needed not just for their own areas, but also for neighbouring areas to allow for cross-border journeys. Traveline generally does not yet hold information on ease of access of vehicles for disabled people, and local authorities should consider incorporating such information where possible by checking with local bus operators what vehicles they are using. DfT will collate a 'snapshot' of public transport data (from the NaPTAN database and the regional **Traveline** services) twice a year, in May and October (respectively representing a summer and winter week). DfT will make the data available to local authorities each year. The October snapshot will be utilised by the DfT when undertaking central calculation of the core indicators. Local authorities are encouraged to continue to maintain their **Traveline** databases, as the data will be used by the public in planning public transport journeys, as well as in the modelling work underpinning accessibility planning and in transportation planning in general.

5.2 Road/Cycle/Walk Networks

OSCAR, a database of roads for geographic information systems, is available from the Ordnance Survey. It is being superseded by Ordnance Survey Mastermap ITN (Integrated transport network) layer, probably during 2005. A road network is needed to assess accessibility by car, on foot and by bicycle. Local authorities may be able to correct and supplement the data from local knowledge, for example on cycle paths.

The road network shows where people may drive, cycle or walk, including one way and pedestrianised streets. It thus allows estimates of the time that it will take to drive, cycle or walk between any two points; drive time is not used in the core indicators (though it may be useful for local indicators), but cycle and walk time are.

6 Other Transport Data

6.1 Census Data: Journey to Work

For each OA, the data CD gives the number of people usually resident who are in work and aged 16-74, by distance travelled to work and usual mode of travel to work:

- Underground, metro, light rail, tram
- Train
- Bus, minibus or coach
- Motorcycle, scooter, moped
- Driving car/van
- Passenger in car/van
- Taxi/Minicab
- Bicycle
- On foot
- Other
- Work mainly at or from home

When assessing ease of travel to work, this shows people's existing travel behaviour. This can be used to assess existing travel horizons for journeys to work in an area and

this could be useful in setting appropriate thresholds for local accessibility calculations. Travel to work horizons might vary by area (e.g. difference between travel to work times in urban and rural areas), and skill level, e.g. people in higher managerial type jobs would be prepared to travel further than those in routine jobs.

6.2 Census Data: Household Data and Car Ownership

As noted in section 3.3, data are included on the data CD on number of households by access to cars or vans. Firstly, this gives number of households; it may be useful to compare analyses by number of households with those by number of people. Secondly, it identifies households with no car or van or with more than one. Areas with very high or low car ownership, hence with relatively low or high dependence on public transport, can be identified. If a household has only one car, it may be that not all members of the household who can drive have access to it at all times. No data are available for small areas on numbers of people with driving licences.

6.3 DVLA data

From DVLA data on stocks, numbers of cars and vans may be obtained annually by ward or OA (or even postcode). Data for end 2001, end 2002 and end 2003 are available. This can be used to update the Census data in section 6.2, though care is needed in interpreting the data (potential users should see the metadata on NeSS, or contact DfT). DVLA data also include motorcycles (not recorded in the Census), though data on motorcycles are of limited value in assessing ease of travel, since the proportion of households with a motorcycle is higher among those with a car (and especially more than one car) than those with no car. The data are included on the data CD.

7. Destination Data for Core Indicators

7.1 Destination: Learning

EduBASE is compiled by DfES. It lists primary schools, secondary schools (showing which have 6th forms) and FE Colleges. It may be accessed through the EduBASE web site[20]. Private schools are not covered.

7.2 Destination: Employment

No reliable national data are available on vacancies or type of jobs, so total jobs must be used instead.

For each OA, its attractiveness as a destination is the total number of people who work within it. Census data are available on workplace population by OA. Other local data sources are also available (see section 8.1).

The ONS NOMIS database provides (annually updated) information on the location of places of employment. For each ward, it gives the number of employees and some information about employers. Some data are available to 'guest' users, but to access the full details users will need a Chancellor's Licence[21] if they do not already have one. NOMIS data are subject to many confidentiality restrictions, but there should be no problem in getting total number of jobs by ward. Smaller areas have problems of

[20] http://www.edubase.gov.uk/EstablishmentFind.aspx
[21] support@nomisweb.co.uk

both confidentiality and accuracy, but Census data may be used to interpolate ward data to OA by the method outlined in section 3.5, and this interpolated data set will be used to calculate the core indicators. Annual Business Inquiry data are on 1991 wards, which may not coincide with 2003 wards, so care is needed.

7.3 Destination: Health Care

There are two types of destination for national indicators: GPs' surgeries and hospitals. Lists of both have been supplied by the Department of Health and are included in the data CD, together with lists of dentists.

7.4 Destination: Food

There is no comprehensive national list of food shops, so there is no core indicator for them. Some local authorities may have, or may wish to develop, their own lists and may use them for local indicators incorporating possible factors such as cost of food, food choice, type of food etc; possible data sources are noted in sections 8.1 and 8.9.

7.5 Destination: Major Shopping Centres

ONS has produced a list of 1100 major clusters of shops. It is based on the Interdepartmental Business Register (IDBR) as at 1999. The list includes the number of shops listed in the IDBR for each cluster; this is a good proxy for the size of the shopping centre.

Within the next few years, a revised list of clusters will be produced. Also, ODPM is currently undertaking work to produce boundaries and statistics for town centres; this would supplement the RPI list, but will not include out-of-town shopping centres.

8. Local Data Sources and Issues

As discussed in Part A, to supplement the core indicators being produced by DfT, local authorities are encouraged to produce local indicators. These may include locally available information that cannot be replicated on a uniform national basis. Authorities may supplement the journey time related core indicators with ones focused on local priorities.

8.1 Local Data Sources

Data for local indicators should be obtained from departments within the authority or from adjoining authorities, from local partners or from service delivery agents that gather data as part of their day-to-day activities. This may include data that partners use for delivering and prioritising their services or for internal day-to-day perform-ance management. Data that may be available from partners include:

Traffic and Pedestrian Surveys: Local Authorities may survey traffic to estimate numbers of cars driving in various places (possibly also estimating numbers of passengers per car), taxis, bicycles and pedestrians.

Social Services Dept: Location of disabled people, children at risk or in care and other disadvantaged groups; availability of social services transport.

Education Dept: PLASC (section 3.4); more details on schools than EduBase; availability of school transport; nurseries, registered childminders and play groups.

Planning Dept: Shops.

Environmental Health Officers: Food shops (section 7.4).

Trading Standards Officers: Shops.

Jobcentre Plus: very detailed information on those on Jobseekers' Allowance and possibly other benefits; local information on the labour market, including the location of employers; vacancies (though it is known that such data are unreliable).

Primary Care Trusts and Hospitals: Location of hospitals and other health facilities; services available at each facility; whether GPs' lists are closed; opening hours; reasons for missing health appointments (often transport related), availability of health transport; food through their responsibility for promoting healthy eating.

Police: Crime and fear of crime.

Bus Companies: Fares and the cost of travel, availability of travel information, patronage, types of vehicle used (e.g. wheelchair accessible), reliability, passenger satisfaction, results of their passenger surveys.

Organisers of Community Buses: Details of services.

Supermarkets: Price of food and range offered (healthy and affordable aspects), other shopping, opening hours, employment (including shift patterns for assessing time of travel to and from work), special supermarket bus services, home delivery services. However, analysis of access to food should not be restricted to supermarkets, as this would ignore the effect of smaller shops.

Chambers of Commerce, Industry and Retail Forums and Major Employers: Location of jobs and vacancies; patterns of shift work; location and opening hours of food and other shops; price of food and range offered.

Residents' Associations, Citizens' Panels and Public Consultation: Fear of crime, satisfaction and other issues from a user's perspective.

8.2 Specific Areas or Communities

As Census data are available for small areas, these can be aggregated to other areas of interest. For example, an analysis could be done for a large village, a town centre, a travel to work area or a large housing estate.

The core indicators are concerned with where people and households (either total population or a defined subset) live. No account is taken of the characteristics of the area (e.g. whether it is particularly deprived or a regeneration area) as distinct from those of the people living there. However, local authorities may wish to consider these characteristics, both when defining priorities for action and when formulating solutions. They may also wish to calculate indicators for certain types of area. Any information available by area may be used for this purpose, but especially useful data sources available from NeSS include:

- **Census data:** available by ward and OA; there is a classification of local authorities and one of wards using Census data. (There is also a classification of wards as urban/rural.)
- **Births and deaths:** available by ward.
- **Index of Multiple Deprivation:** the new index is only available by Super OA, but these can be aggregated to wards.

8.3 Additional Person Groups or Household Types

The Census provides data on many different types of person or household. Beyond what is in the Census, it is virtually impossible to identify reliable sources for small-area data, and local authorities would have to rely on local knowledge.

8.4 Alternative Transport Modes

Again, local authorities would have to rely on local knowledge of what modes of transport may be significant in their own areas. For example, community transport is likely to be of particular importance for accessibility planning but there is no central data source, so, if community transport is to be included in any local indicators the local organisers must be consulted. Ferries may also be relevant in some areas.

8.5 Alternative Time Periods and Days of the Week

Calculating indicators for various times and days should require no extra information. However, local knowledge and advice would be needed to decide on appropriate times. For example, if certain bus services only operate on one or two days a week, separate calculations would be needed for days when they run and other days. Also certain times of the day or days might be of particular local importance for certain areas/groups and generate large numbers of potential travellers. For example people are more likely to travel to a nearby town (for shopping and possibly work) on market days; they may travel to and from church on Sundays (at times depending on the services). If there is a lot of shift work in an area, calculations would be needed for people going to or coming from work at times when shifts change to enable this to be incorporated in accessibility audits.

8.6 Local Authority Surveys

It is beyond the scope of this guidance to offer detailed advice on the conduct of surveys. However, if special surveys are undertaken, it should be borne in mind that standard household surveys are often less successful in more deprived areas. Socially excluded people are hard to reach and many consultation exercises, such as public meetings and household surveys, can miss this sector of the population. Special methods may be needed. There are three basic approaches to practical research.

Quantitative research is usually used to get information on patterns of behaviour and general attitudes. Sample sizes are usually large and approaches include counts, structured questionnaire surveys and public consultation exercises. This approach should focus predominantly on conducting targeted surveys at 'attracting centres' in and around the local area (e.g. at health centres and GP surgeries, the local school, job centres, drop-in centres, youth clubs, the post office or local shopping centre). On-bus and footfall surveys can be useful for collecting count information on use of different modes of transport, such as how many people use a bus to/from an area per day, how many people park their cars at a particular site, and how many vehicles or people pass a particular point during a day.

Qualitative research is usually designed to find out how people really think and the preconceptions and experiences that underlie attitudes, beliefs and consequent behaviour. This is particularly important for socially excluded groups, where travel horizons might be low and expectations minimal. Sample sizes are small and approaches include focus groups (typically around 8 people), one to one in-depth interviews, group interviews (e.g. families, peer groups). Qualitative research can be used initially to explore issues and the range of opinions, underlying motivations and so forth. Observation and quantitative research can then follow to provide numeric data about the population. Subsequently, qualitative research can be used to explore findings from quantitative research further and test options for change.

Observation and variants of this such as 'participant observation'. This technique involves professionals observing how people behave in 'real-life' situations.

Any approach to transport research for socially excluded groups must be specifically designed to provide the opportunity to collect information about travel and activity patterns of this particular population, their attitudes to current provision and aspirations for better provision once they have been told about opportunities that exist.

Participants in consultation need to feel that they have been listened to and that their opinions have been given due consideration in the decision-making process. Ultimately, this can only be achieved through concrete and visible improvements in transport service delivery. However, ongoing transport forums, which bring communities (especially socially excluded people) together with transport planners and operators, can contribute greatly in this respect.

The web sites below may provide useful case studies on hard to reach groups[22].

8.7 Other Influences

These could include:

- the cost of transport,
- availability and awareness of travel information,
- safety of travel routes,
- crime and the fear of crime,
- fear of traffic,
- timing and mode of service delivery,
- opening and closing times of services,
- reliability of public transport services,
- continuity, quality of travel routes and severance,
- travel horizons etc.

For further discussion on local indicators, see Part A. In general, it is very difficult to suggest suitable data sources for these factors, and local authorities must again rely on local knowledge.

8.8 Alternative types of destination.

The SEU report covered four destination types (health, learning, employment, food shops). While these were identified as priorities, they were not meant to be an

[22] www.jrf.org.uk and www.wmin.ac.uk/transport/

exhaustive list and local authorities may wish to consider other destination types that are of local importance. They will need to obtain data on them. A list of other possible destinations is given below.

8.8.1 Childcare

Easy access to childcare may be important in assessing people's abilities to take up employment, as lack of childcare is often cited as a reason for inability to work. If childcare is deemed a priority, local authorities may wish to assemble available data on registered childminders and play groups.

8.8.2 Libraries

As nearly all public libraries are local authorities' responsibilities, it is assumed that data will be available. Opening hours will be important. Mobile libraries should be included; they may be treated as a series of branches, each only open while the mobile library is at that stop.

8.8.3 Places of Worship

No comprehensive central source has been found. ONS has a list of places of worship licensed for marriage, but this will not include all places. See 8.9 for alternative sources. It may also be worth approaching local clergy and the central bodies of religious organisations.

8.8.4 Food Shops

Local authorities should try to assemble their own lists of food shops. See 8.9; also, Environmental Health Officer records should list all shops where unwrapped food is handled, though not shops that sell only tinned and packaged food. The list should include a broad indication of the type of food stocked and opening hours. Price is also useful (since the SEU report refers to healthy, affordable shops); this can be found through consultation with shops and others (see section 8.1) and visits to shops. Farmers' and street markets should if possible be included.

8.8.5 Other Retail

No central source has been found; see 8.1 and 8.9 for alternative sources. The lists of major retail centres referred to in 7.5 should be useful.

8.8.6 Leisure (such as Cinemas and Sports Centres)

No central source has been found. Authorities should consider using local knowledge or surveys.

8.8.7 Post Offices

ONS is seeking to get data centrally from Royal Mail; if this is not possible, authorities might consider using local knowledge or surveys.

8.8.8 Hospitals

Until a central list of hospitals with outpatient facilities is available, probably in late 2005 or early 2006, local authorities may wish to consider whether to consult Primary Care Trusts and use local knowledge to produce lists of hospitals in or near their areas, and to check whether they have outpatients' facilities (to measure accessibility of these facilities) and other specialist departments.

8.8.9 Places of Employment

Local authorities may also wish to assemble information on places of employment. These should be available from the sources in 8.1. Also, local authorities could undertake local surveys of employers.

8.8.10 Pharmacies

Local authorities may also wish to assemble information on pharmacies. The sources in 8.9 should be used; it is important to check with supermarkets whether they have pharmacy counters. Primary care trusts should have lists of pharmacies that dispense NHS prescriptions.

8.8.11 Leisure & Recreation

Local authorities may also wish to assemble information on leisure and recreational facilities. They will be aware of local authority facilities, and the sources in 8.9 may be used for commercial ones.[23] Sport England has produced various lists of facilities.

8.9 Commercial sources for destinations

While DfT does not recommend any particular sources, possibilities include Yellow Pages[24], Thomson's Directories[25] and InfoDisk[26].

9 Confidentiality and Data Protection

Some accessibility indicators will require use of sensitive personal information obtained from partners or other sources. Possible examples include individual records from PLASC, road accidents and hospitals. This section summarises the legal situation with regard to sharing such information and what steps can be taken to minimise problems.

The main piece of legislation is the Data Protection Act 1998[27]. The storing of information that could provide information about identifiable individuals should always be undertaken in accordance with the provisions of the Data Protection Act.

It is essential to preserve individual anonymity. This means that it would take a disproportionate amount of time, effort and expertise for a third party to identify a statistical unit (other than himself or herself), or to reveal information about that unit not already in the public domain.

One possibility, if it proves impossible for the transport authority to have free access to data, is that the holder of the data performs the necessary calculations. This requires the holder to have the necessary software and other data sets (such as Traveline). This will not work if two different confidential data sets belonging to different people are needed, but this should be rare. The holder must also report the results back to the transport authority in a non-disclosive way.

The benefit of this approach is that the resulting accessibility indicators and any associated maps will gain in accuracy from the use of individual information.

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[23] www.sportengland.org and www.activeplaces.com
[24] www.search.yell.com/
[25] www.infospace.com/uk.thomw
[26] www.192.com/
[27] www.hmso.gov.uk/acts/acts1998/19980029.htm

However, the display of individual identifying information such as home address or place of employment in an accessibility map may prejudice the anonymity of the individual. If it is essential to produce such maps for accessibility planning, the individuals with access to these maps must be restricted.

Further Information

For additional information on accessibility, core and composite indicators, accessibility software and accompanying data issues outlined in the technical annex please contact:

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