

USE AND NON-USE BENEFITS OF PUBLIC TRANSPORT SYSTEMS – WHAT IS THEIR RELEVANCE, CAN THEY BE VALUED?

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ABSTRACT

Following bus deregulation in Britain, there has been an increased need to assess the case for maintaining unprofitable bus services, and for ranking priorities for subsidy. This paper considers the benefits which may be provided by maintaining a public transport service. Obviously, consumers' surplus to existing users is a major benefit; however, in the context of lightly used unprofitable services benefits in terms of reduced congestion, environmental effects and accident savings are likely to be less relevant. On the other hand, non-use benefits such as benefits arising from the provision of public transport to friends and relatives, option values and altruistic benefits from the provision of transport for the community at large may exist.

We consider the problems with alternative survey methods to identify these benefits, paying particular attention to risks of bias, before describing the method adopted in our own surveys. These relied on an in-depth discussion of actual journeys recorded in a travel diary, to identify the alternatives to the bus which were available and the fare level at which these would be taken up, followed by a contingent valuation type question on non-use benefits in the context of a discussion of priorities in terms of the use of subsidies.

Surveys were undertaken in two very different types of community; a city housing estate and a rural village. It was found that users received an average consumers' surplus of the order of 100% on their trips, whilst inhabitants of the city housing estate were on average willing to pay some 50p per week for the non-use benefits of public transport; those of the rural village were willing to pay considerably more. Priorities were generally unsurprising; in terms of journey purposes work was followed by shops, schools and medical facilities; in terms of time of day, weekday peak, weekday daytime, Saturdays, evenings, Sundays was the ordering. In terms of priority groups, pensioners were always ranked first; however there was disagreement between the two surveys over the ranking of children and the unemployed.

It is considered that, although more extensive survey work is needed, the results provide some guidance on the absolute level of subsidy justified and on the priorities to be adopted. Work on making these results operational is continuing.

1. INTRODUCTION

When the British bus industry was deregulated in 1986, it was argued that one of the benefits would be the necessity to approach bus subsidies in a more systematic way. Prior to deregulation, it was common to subsidize services on a network basis, without any very clear information on what parts of the network were subsidized or at what cost. Following deregulation, this form of subsidy was made illegal. What local authorities now have the power to do is to go out to competitive tender to secure the provision of specific services, where these are not provided by operators on a purely commercial basis. The tender could cover a specific route, or additional services over a route at times (e.g. early morning, evening, Sundays) when a commercial service is not operated.

Initially, the reaction of most authorities was to seek to restore the pattern of services which existed before deregulation by filling the gaps perceived after commercial services had been registered. However, over time - and as financial constraints on subsidy levels tightened - interest has grown in developing a more systematic approach to ranking services for subsidy and to determining the cutoff level of subsidy per passenger or passenger kilometer at which it is preferable to withdraw the service. Broadly two approaches have been taken to this problem. The first is a 'needs' based approach, in which the number of people without access to a car served by a particular bus route is established, and then the degree to which that service enables given needs (journey to work, shops, doctors, hospital visiting etc) to be satisfied is worked out. This is undoubtedly a useful starting point, but has two major problems. The first is that the 'needs' as worked out by the public transport planner may not coincide with those perceived by the user, and the anticipated traffic may not materialize. The second is the lack of relative values attached to different needs. For instance, is a bus which enables 10 pensioners to get to the shops more or less important than one which enables 6 teenagers to get to work?

One possible solution to this problem is to seek to develop a full cost-benefit analysis of alternative bus routes, in which all the benefits they confer are measured in money terms. This paper reports on a project designed to contribute to the development of such a method.

We consider first the nature of the benefits to be measured. We then examine alternative survey methods to identify and value these benefits, and the problems that may arise with them. In the following section we present the results of some exploratory surveys undertaken with these methods; finally we draw our conclusions.

2. BENEFITS OF LOCAL PUBLIC TRANSPORT SERVICES

As a first step in undertaking a cost-benefit analysis of a local public transport service, it is necessary to identify the benefits and costs which need to be measured, and which would not be reflected in a purely financial appraisal of the service (i.e. in the revenue and cost figures).

There are four obvious items to consider:

- (i) Consumers' surplus to users
- (ii) Relief of congestion
- (iii) Improvement of the environment by diverting traffic from more polluting modes of transport.
- (iv) Reduction in accidents.

Of these (i) is typically the most important. However, there was a major problem in this case. Usually we measure benefits to users by looking at the methods of transport they divert to and assessing the change in generalized cost resulting. Where there are some trips which are suppressed altogether, we may apply the 'rule of a half' i.e. value those trips at half the level of benefit assigned to the trips which still pass by the alternative mode. But this approach is only valid where the change in generalized cost is marginal. In the current context, it is frequent for the next best mode to be either getting a lift (for which the generalized cost is difficult to assess as it involves a loss of independence and a feeling of imposing on friends or relatives) or taxi, which may be far more expensive than bus. (It should also be pointed out that in many parts of Britain, pensioners receive free or half fare travel paid for by the local authority). Thus this mode of assessment is inadequate, and it becomes necessary to know the shape of the demand curve through to the point at which trips cease to be made.

In the case of the sort of services we are interested in, it may be expected that the congestion, environmental and accident benefits will be rather limited, and indeed may not even be positive. This is because we are concerned with those routes and times of day when there is insufficient bus traffic to sustain a commercial service. These motives for subsidy generally lead to a case for reduced fares and improved services on the busier parts of the network, but such a use of subsidies is no longer permitted in Britain.

On the other hand, we did identify a number of benefits from maintaining bus services which are less often considered in a cost-benefit analysis. These are as follows:

(i) Option Value

The option value of a good or service represents the amount a user or potential user is willing to pay over and above their expected value of benefits to maintain the availability of that good. There has been a long debate as to whether option values exist, and if so whether they can be shown to be always positive. The American literature now contains a number of studies which claim to have identified option values for environmental goods.¹² However, the application of the concept to public transport is rather more controversial. The argument for its inclusion rests on the fact that future public transport use may be uncertain, and that there may be circumstances in which its nonavailability could impose severe costs on those wishing to make a trip (for instance for car owners, when the car is out of action, or for non car owners faced with the urgent need to make an irregular trip). On the other hand, it has been argued that if one included option values for public transport in an appraisal for public transport, then surely one should do so for all goods and services? The answer to this must be yes, whenever they are of a magnitude such as to be significant. It is hard to imagine a high option value for a good for which there are plenty of close substitutes, such as a can of baked beans. It may be argued that public transport is of particular importance because of the lack of substitutes for a non-car owner, and of the importance of travel as a way of accessing many of the facilities needed for a reasonable standard of living. Nevertheless, the availability of taxis puts a strict limit on the size of this benefit.

(ii) Indirect benefits.

People may derive benefits from the availability of public transport for their family and friends. For example, drivers in car owning households in areas of poor public transport spend a considerable amount of time chauffeuring children and others around. Old people may benefit from the availability of public transport enabling their friends to come and visit them even if they are unable to make use of the services themselves.

(iii) Altruistic benefits.

A benefit may be derived from the knowledge that public transport is available for the use of others. This may stem from a concern for the community in general or for specific groups e.g. pensioners, the unemployed. Again, this is a controversial issue. The question may reasonably be asked as to why, given a concern for others, this should be expressed through a desire to provide them with a specific good - i.e. public transport - rather than

an increased income. This would only make sense if public transport was seen as a merit good - i.e. a good which it was specifically desired to encourage these people to consume, perhaps because of the effect access to travel is seen as having on their quality of life.

Whilst it might have been possible to obtain data from which one could estimate the complete shape of the demand function for public transport, this would almost certainly have required cross section data on locations with very different fare levels, and it is difficult to ensure in such circumstances that parameters are not biased by the omission of factors influencing traffic levels which concern the nature of the areas in question and are correlated with fares. Regarding the other benefits, it is difficult to see how these could be estimated from market data. Consumers' surplus and option values might conceivably be reflected in house prices, but it is highly doubtful whether the effect would be great enough to distinguish. In short, we felt that the only practicable method of identifying these effects was through some form of survey asking hypothetical questions. The way in which we designed this survey and the difficulties encountered are the subject of the next section.

3. SURVEY METHODS

3.1 Alternative Approaches

As explained in the previous section, we considered the only way of identifying the relevant benefits to be by asking hypothetical questions regarding how much people are prepared to pay to maintain a public transport service. We can distinguish two methods of approaching the question; contingent valuation and stated preferences.

Contingent valuation involves asking direct questions about an individual's maximum willingness to pay (WTP) to maintain public transport or minimum acceptable compensation (MAC) for removal of the service. This technique has been widely used in the USA for obtaining both use and non-use valuations of environmental resources. A survey question in a contingent valuation study might take the following form.

"What is the most you would be willing to pay to preserve your local bus service if it was threatened with withdrawal?"

In comparison Stated Preferences (SP) are deduced by presenting the respondent with a series of scenarios, each characterized by different trade-offs between money (in some form) and public transport provision. A survey question in a stated preference experiment might take the following form.

"Suppose your local bus service was unprofitable and was to be withdrawn unless people in your area paid something towards keeping them (for example, in higher taxes). Which of the following options would you favor?"

- (a) Keep the service at a cost to you of £1 a year more (4p/week)
- (b) Withdraw service.

A large range of choice options are presented to a respondent, with varying monetary amounts to yield the maximum willingness to pay for preserving the bus service. The technique can then be extended to include comparisons of morning versus peak buses, evening buses versus weekend buses and so on. The range of comparisons is only limited by the inventiveness of the researcher and the capacity or willingness of the respondent to respond.

The preferences expressed yield information on the money value of the services in question. This technique, which has been extensively applied to attributes which influence people's travel behavior, does not seem to have been widely used to obtain valuations of public goods and services. Questions to a potential respondent can be posed by a questionnaire or an interview.

3.2 Problems of Bias

The main criticism levelled at all methods based on hypothetical questions is that what individuals say they will do or pay does not necessarily correspond with what they would actually do or pay if the hypothetical circumstances under consideration were to occur in practice (Freeman, 1979). Whilst random error in responses is not a serious problem since it will tend to offset in the process of averaging across individuals, systematic measurement problems could be very serious.

The literature identifies a number of measurement problems. We considered the following to be potentially significant for our work: strategic bias; starting point bias; social norm bias and information bias.

3.2.1 Strategic bias: For the stated response to be classified as containing strategic bias (rather than other types of bias or inaccuracies), the individuals must be motivated to state a strategic payment in the hope of influencing policy to their advantage and must deliberately distort their valuations to this end. This is distinct from the motivation to pay a sum of money in the hope of affecting policy.

A number of studies have examined the issue of strategic bias. The findings from these surveys show varied evidence. Some studies suggest that strategic bias is not a serious problem^{4,5,6} although others, particularly those in transport, suggest that it is.^{7,8,9,10} One way of detecting strategic bias has been to compare the values obtained from direct questioning with those obtained from either hedonic pricing or the alternative cost approach.¹¹ However, discrepancies may be due to the fact that the different methods are measuring different benefits - "selfish" versus "altruistic" benefits, for instance.

A further possible means of detecting strategic bias is to compare the maximum willingness to pay to preserve a service with the minimum acceptable compensation required to forego the service. These are the compensating and equivalent variation measures of consumer surplus and the conventional economic theory asserts that they should, in the absence of income effects, be reported to be approximately equal. The evidence overwhelmingly indicates that the two are not reported as being equal and, in particular, that the maximum willingness to pay generally falls short of the minimum acceptable compensation.^{7,12,13} This may be due to strategic bias, in that there is an incentive to overstate the required compensation and understate the willingness to pay, but we cannot be entirely sure since income effects or decision processes other than the conventional economic form may be influencing matters. For instance, people may simply be resistant to change.

3.2.2 Starting Point Bias: There is some evidence^{6,14} that the values obtained from the iterative bidding process which is usually used in the contingent valuation methods, as opposed to asking for a direct willingness to pay, are influenced by the starting point. Here an individual might fix on the initial payment introduced and interpret it as a reasonable value. Alternatively it could also stem from boredom, fatigue or irritation. Although other studies have failed to find any significant effect^{12,15,16} it is a problem which we must be aware of and try to avoid.

3.2.3 Information Bias: There has been some discussion as to whether this category of bias is a bias at all.¹¹ The argument runs that the type and form of information presented to people will "bias" their responses. We feel that there is an important distinction to be made between information that biases a response and information that educates or makes people aware of issues. Where information is presented during the course of an interview then there is a possibility of interviewer bias whereby the interviewer leads the respondent towards particular responses or uses information in such a way as to hint at the appropriate types of response. This has often been used as an argument in favor of questionnaires over interviews, where the questionnaire permits a standardized presentation of information.

3.2.4 Social Norm Bias: Social norm bias is a general term to describe the possible pressures exerted knowingly or unknowingly by other people on a respondent in such a way as to affect his values and valuations. Such pressure may arise from people who are important to him (e.g. friends or family) or, in an interview, from the interviewer. The interviewer or the questionnaire may suggest acceptable views and affirmation bias represents the case where the respondent answers to affirm these views. Such pressure may cause an individual to pretend to certain values and thereby raise or lower his valuations. The nature of any bias will depend upon the nature of the survey (questionnaire or interview), the number of persons involved (face to face or group discussions) and the way in which the survey is carried out.

It is important that we distinguish between the effects of other people on an individual's valuation processes that are unwanted and those that are a legitimate cause of concern to an individual (altruism). It is the former that we must consider as bias although in practice it may be difficult to separate social norm biases from altruism. In practice social norm bias will be detected where a respondent alters his or her valuations in line with comments or perceived pressure from other group members or an interviewer. The wife who lowers her valuation as a result of comments from her husband or the respondent who when asked to take into account certain social groups such as the elderly or the young raises his valuation may be demonstrating social norm bias.

Social norm bias is likely to be most serious in situations involving interviews or group discussions where there is the pressure to present a particular self-image or affect one's responses to meet the perceived goals of the study. Such problems are kept to a minimum using a questionnaire approach at the expense of more detailed exploration of group concerns and values.

3.3 Other Issues in the Survey Development

A number of issues were given detailed consideration in the development process. These are discussed briefly below, further information may be found in other papers relating to this project.^{17,18}

3.3.1 Choice of Payment Mechanism

A key consideration in the valuation experiment is the choice of payment mechanism by which the respondent can express their valuation of a good or service. Empirical evidence suggests that the values obtained can be influenced by the payment-mechanism used.^{15,19,1,6}

The chosen mechanism needs to be meaningful and acceptable to the respondent whilst it would be desirable if the mechanism could be universally applied to all respondents.

3.3.2 To whom should our questions be addressed?

Our survey is concerned with individuals (adults and children) but also with household groups in as much as some of the benefits of public transport provision fall on the household as a whole and some of the possible payment mechanisms would similarly impact at a household level.

3.3.3 Estimating Disaggregated Values

Where people value public transport for a variety of reasons, which may include a combination of use, option and non-use benefits, it is desirable that these can be distinguished. Two possible approaches are termed "compositional" and "decompositional". The former requires the respondent to give a separate value to each category of interest whereupon the overall value is the sum of the constituent parts.¹ The latter elicits a response denoting an overall value and then the respondent is required to apportion this between its various components.^{2,14}

Even if it is not possible in practice to obtain values disaggregated into all the components of interest, the most important distinction is between use and non-use values. People who do not currently use or expect to use public transport will by definition only provide non-use valuations. Those who currently use or expect to use public transport need to be asked separate use and non-use valuations.

3.3.4 Service or Network

A public transport service may have value by giving the individual access to locations and activities but it also forms part of a wider public transport network. One route may be used to give access to other parts of a network. This raises the question of whether we should be asking people to value a specific service or route or the network as a whole. We would expect there to be differences between the valuation of a specific service and that for the network as a whole. Ideally people should be asked to value both. This has the advantage of ensuring that any value given to a specific service is for that service only and is not confused with valuation of the network.

3.3.5 Non-Response Bias

This represents the distortion introduced as a result of some people not participating in a survey. For example, a questionnaire concerned with public transport may well be deemed irrelevant by a large proportion of those who do not use public transport. To ignore non-respondents completely implicitly assigns them the same values as the average for those who did respond. Since users probably put a higher value on maintaining public transport service than do non-users, the net effect would be to inflate the community valuation.

3.4 The Adopted Method

After extensive piloting, we reached the conclusion that this was a subject of such complexity that it was impossible to rely on self-completion questionnaires. There were two major problems; firstly poor response rates with clear evidence of non-response bias, and secondly a misunderstanding or failure to answer some of the detailed valuation questions. These problems led to considerable efforts being put into contacting the selected households, and into explaining the context and purpose of the survey. For users, it seemed clear that the best way of asking the questions was in the context of a travel diary, in which people would be asked how they would adjust their travel patterns in the case of higher fares. For both users and non-users, it was necessary to cast the questions on willingness-to-pay for non-use benefits in the context of a discussion of the sorts of benefits bus services give. It was not sensible to try to apportion non-use values to individual motivations; instead, ranking and point scoring exercises were used to try to understand the strength of the various motives for subsidy. Obviously the risk remains that the responses are subject to many of the biases listed above. All we can say is that our impression was that, in the context of a detailed discussion of what alternative courses of action would be available if fares rose or services were withdrawn, we believe that respondents were making considerable efforts to give realistic answers. The method as developed may be briefly described as follows:

- (a) Introductory letter, designed to allay the fears caused particularly to old people when a stranger appears on the doorstep.
- (b) Initial Personal Contact - the main objective is to persuade the household to take part in the survey. Where they agree, a seven day travel diary is left for each member of the household to complete. This includes children of an age to make independent trips.

The other objective at this stage is to obtain some basic data on the household, eg numbers of people, children, and cars that make up the household; also whether anyone in the household is a regular user of public transport. This data is gathered -if possible - whether the household agrees to take part or not. This allows later testing for non-response bias to take place.

- (c) Collection of the diaries - in most cases by hand - and an interview with all household members is arranged for a future date. Collection by hand can also function as a prompt to those who may have

forgotten to complete the diaries.

- (d) Interview with all household members, where feasible. This is based in part on information extracted from the diaries. The interview is structured around the household and its behavior. The interview covers the following areas:
 - (i) Establish that all members of the household are present
 - (ii) Distribute charts to each person; these display the diary information on one page
 - (iii) Establish whether the travel reported in the diaries represented a normal week - insofar as there is a "normal" week.
 - (iv) Go through each person's trips, asking what they would have done if their current mode (or modes) of travel had been unavailable, and covering questions such as:
 - whether the trip would be made at all
 - any change in destination
 - alternative mode(s)
 - cost of chosen alternative
 - any time penalty.

Responses are recorded on a chart.

- (v) Where a respondent has reported any use of local public transport, these trips are discussed in detail to establish the willingness to pay for each trip made. Respondents are asked for a reaction to fare increases of up to 100% above current fare levels; if they still would use the service at this fare, then an open-ended question on the fare at which they would stop using it was asked. Again responses are recorded on a chart and include:
 - fare level at which each trip would cease
 - details of alternative action.
- (vi) Opinions on local public transport and use by relatives and visitors.
- (vii) What kind of impact service withdrawals might have.
- (viii) Ranking exercise in which the respondent is asked to assess priorities for public transport funding in terms of access to facilities, concessionary fares and periods of operation.
- (ix) Discussion of non-use impacts of public transport, followed by an exercise in which points are allocated between five classes of non-use benefits.
- (x) Willingness to pay for non-use benefits asked in the context of a threat of service withdrawal. This is first asked as an open willingness to pay question. If no response values are suggested, an iterative bidding process is used instead.

Interviews were tape recorded, as a back up to notes taken during the interview. This allowed verbatim transcription of a selection of interviews, as a check on the accuracy of the notes, and also to provide greater illumination of peoples views and comments.

4. SURVEY RESULTS

4.1 Survey Areas

The surveys were undertaken in the following two areas:

- (a) **Hawthorn, Leeds:** Hawthorn is a fairly deprived area in north west Leeds some 3 1/2 miles distant from the city center, comprising mainly council housing with owner occupied fringes. There are a number of small shops in the areas.

Two bus services run through the estate; the number 50 provides a 15 minute day time (30 minutes in the evenings) frequency into Leeds city center, the 73 providing two buses an hour at an uneven headway to Bramley. Generally fare levels in Leeds are reasonable; a ticket giving unlimited travel within West Yorkshire for a week was available at a cost of £6.40. The single fare from the estate to Leeds was 50p during the peak; 35p off-peak.

- (b) **Rainow, Cheshire:** A village some 3 miles from the nearest urban center, Macclesfield. It is an area of high home and car ownership. Rainow has few facilities, a shop cum post office, a primary school and three pubs providing the main features. The village has an attractive location on the edge of the Peak National Park.

The E23 bus service to Macclesfield operates on a 20 minute frequency during the day, reducing to an hourly headway in the evenings, with 5 buses running on a Sunday. There are also 2 buses a day that connect Rainow with New Mills, the E24. Fare levels are higher than in Leeds. A one way trip from Rainow to Macclesfield costing 70p; returns are available at a discount, £1.20. OAP's qualify for a pass (which must be purchased at a cost of £1) which entitles them to half price travel. There are no alternative bus routes to Macclesfield, a walk of 2 miles to Hurdsfield finds the nearest.

The two areas contrast in many ways:

- urban/rural
- car ownership levels
- fare levels and concessions
- local public transport network
- access to alternative bus routes
- income and socio economic indicators.

This gives an opportunity to test the technique in vastly differing circumstances.

4.2 Survey Samples

The samples were randomly drawn from household lists derived from the electoral register.

<u>Number of households</u>	<u>Hawthorn</u>	<u>Rainow</u>
Contact letters	88	52
Refusals	10	11
Non-contacts	32	8
Drop outs	16	9
Completions	27	24
Response rate - total	34%	46%
Response rate - contacts	53.5%	54.5%

The response rates are particularly satisfying when concentrating on those households where contact was made, at over 50% in both areas. The length of the survey process did not then prove to be an important deterrent to respondents. The Hawthorn estate was the more complex area to survey; 8 of the households in the sample proved to be derelict or empty properties. The non-contact rate is very high, despite a minimum of 3 calls at each address, due partly to a marked reluctance to open the door to strangers.

4.3 Sample Interview

As an illustration of how the method worked, the following interview was carried out with a 3 person household comprising a single parent female aged 33, and her son (11) and daughter (5). The household does not have access to a car. The respondent works part-time as a warden in sheltered accommodation. Her net monthly income is £400. Table 1 overleaf summarizes the information from the interview.

Table 1: Sample Interview Responses

Total bus trips in diary (4)	Fare paid (ret)	Serv N°	Journey purpose	Altern -ative to bus	Cost of Alt	Max WTP	Alternative
Trip 1	1.30	50	Dentist including son	Walk (15min)	-	1.80	Walk
Trip 2	1.40	50	Shopping city center	Taxi	7.40	2.00	Shop elsewhere eg Trip 3
Trip 3	0.80	50	Shopping local s/market	Walk/ (25 min) taxi	1.70	2.00	Walk, catch taxi back
Trip 4	2.40	743	Day out with 2 children	None	-	4.00	Go elsewhere
Total		5.90				9.10	9.80

The trips made during the diary period were typical, except the trip to the dentist which is made about four times a year. The respondent tries to go out "somewhere" with the children at weekends. The two shopping trips are routine. In the event of a bus being unavailable the trip to the dentist could have been made on foot. For the trip to the town center the only perceived alternative was an expensive taxi ride. The trip to the local supermarket has been made in the past by walking there and returning by taxi at a cost of £1.70. The respondent would not have taken a day out to the same location by bus but would have gone elsewhere if a bus had not been available.

The value of each trip in terms of the maximum willingness to pay (WTP) is shown in the penultimate column. The total "value" of the four trips amounts to £9.80, a consumer surplus (CS) of £2.90. If the fare level to town rose above £2.00, this trip would be dropped, and all shopping done at the local supermarket. The trip to the supermarket by bus would be susceptible to a switch to taxi or at the least, returning from the supermarket, with shopping bags, by taxi.

When the discussion turned to non-use benefits the respondent was aware that she contributed to the support of bus services via her household rates and through the new community charge. She expressed concern for other people, notably children, having access to public transport. Interestingly she felt that the elderly who currently have free travel, should be expected to contribute something (about 10p/trip) towards their travel. In the light of services being withdrawn totally she was willing to pay up to £1/week more to ensure the preservation of her local service for people other than herself.

4.4 Results from the Rainow survey

The 24 households where an interview took place reported on 29 one way bus journeys. Although the sample size is limited, it is interesting to examine the willingness to pay by journey purpose, see Table 2 below.

Table 2: Rainow - willingness to pay for bus trips by journey purpose

Purpose	Average fare	Average WTP	Average CS	CS as a % fare	No. trips
To/from work	50	150	100	200	4
To/from education	35	10	0	0	1
Shopping	47.14	90	42.9	96.4	14
Visits	35.8	62	26.2	70	6
Personal business	47.5	95	47.5	100	4
Mean	44.8	91.3	46.5	103.7	29

There are very few trips by bus reported by the Rainow sample. It is, therefore, interesting to discuss them almost on an individual basis. The four work trips were made by a man who runs a business on the Hurdfield Estate, at other times his wife gives him a lift to/from the office as he does not drive. The bus takes him, virtually, door to door and he views it almost as a taxi service and is willing to pay accordingly. Trips by children for education purposes are free - paid for by the education authority - a school bus service is provided: so this aspect of travel is not particularly relevant to this study. The shopping and visit trips are mainly made by female pensioners at the concessionary rate. The remainder are made by women paying the full fare.

Respondents were asked firstly to give a willingness to pay for evening trips. Only one such trip was recorded; and the person was willing to pay twice as much (70p to 140p) to secure that trip. When considering the trips made throughout the day, the average willingness to pay per trip was 91.3p, giving an average consumer surplus of 46.5p per trip.

Table 3 shows the ranking arising from the question "Bus services provide access to many facilities. Which do you consider it to be most important for buses to serve?".

Table 3: Priorities for facilities to be served by bus - Rainow

Rank	Mean score	Bus users	Mean score	Non users	Mean score	All
1	2.00	Shops	2.30	Work places	2.39	Work places
2 =	2.83	Work places	2.70	Shops	2.58	Shops
3		Doctors surgery	3.85	Schools	3.94	Doctors surgery
4	4.00	Hospitals	4.18	Doctors surgery	4.03	Schools
5	5.00	Schools	4.37	Hospitals	4.30	Hospitals
6 =	5.83	Leisure	5.52	Leisure	5.58	Leisure
7		Friends home	5.96	Relatives home	6.03	Relatives home
8	6.33	Relatives home	6.67	Friends home	6.51	Friends home
Cases		6		27		33

There is some variation in responses between users and non-users of bus services. Bus users place the highest priority on access to shopping facilities, perhaps reflecting the fact that nearly half the bus journeys reported were shopping trips. Non-users place a higher priority on access to work places possibly because this is the only journey they can imagine making by bus and so reflects their own travel priorities rather than actual usage of the service. The low ranking for friends and relatives homes' may reflect the fact that these are often either walkable or beyond the scope of the bus service. Respondents may have been thinking of their own service rather than in general. The E23 provides access to medical facilities which again may be reflected in the ranking.

Table 4: Priority groups for low fares - Rainow

Rank	Ave score	Bus users	Ave score	Non-users	Ave score	All
1	1.50	OAP	1.24	OAP	1.29	OAP
2	3.17	Unemployed	3.00	Unemployed	3.03	Unemployed
3	3.50	Teenagers	3.44	Children	3.52	Children
4	3.67	Housewives	3.84	Teenagers	3.77	Teenagers
5	3.83	Children	4.47	Housewives	4.26	Housewives
6	4.33	Working adults	4.72	Working adults	4.64	Working adults
Cases		6		25		31

There is greater agreement between users and non-users with respect to priority groups for low fares (Table 4); the exception being the greater priority given by non-users to cheap fares for children and young people. This may reflect the fact that - in this sample - non-users are more likely to reside in households containing children.

There appeared to be a general perception amongst those with neither cars nor children that children did not need the bus service as their parents ferried them around. In households with both children and cars this pattern of behavior could indeed be observed. However, parents wanted the bus service to be available for their children to use in the future, when older and more independent.

An interesting factor is the position of the unemployed people in second place. This suggests an element of altruism and also a priority not reflected in cheap fares schemes. The 1985 Transport Act excludes the unemployed from eligibility for concessionary fares schemes. However, commercial schemes are legitimate and exist in at least one area - Tyne and Wear.

The final ranking exercise examined periods of operation and these results are presented in Table 5. The rank order is the same for users and non-users. Users put a slightly greater emphasis on peak period services while non-users consider evening services to be slightly more important. The low ranking for Sunday services is to be expected - no-one travelled by bus on a Sunday. Moreover, the Sunday service is perceived to be less useful now the first bus runs at midday, than when a morning service was available giving access to church services. This was

seen as important not just for people in Rainow wishing to attend services in Macclesfield but also for residents of Macclesfield and Hurdsfield who wished to come to the Rainow services. The Sunday service is perceived to be of use to visitors to the areas, especially walkers, but not to the local population.

Table 5: Priorities for subsidy by time period - Rainow

	Users	Non-users	All
Monday to Friday Peak <0930 1600-1800	1.48	1.67	1.52
Monday to Friday Daytime	2.11	2.17	2.12
Monday to Friday Evenings	3.40	3.17	3.35
Saturday	3.12	3.17	3.13
Sunday	4.76	4.83	4.77
Cases	25	6	31

Table 6 below shows the non-use values obtained; questions on willingness to pay were asked firstly in relation to evening services and secondly about the route as a whole. As expected users gave a high priority to their own use relative to non-use values; approximately 80% of their total value consists of consumers surplus.

Table 6: Average use and non-use values of individuals per week (p) - Rainow

	User values	Cases	Non-user values	Cases	All
<u>Use</u>					
Evening	70	1	-		
Route	138.75	6	-		
<u>Non-use</u>					
Evening	8.33	1(5)	71.15	26(17)	59.37
Route	41.67	6(3)	161.15	26(9)	138.75
Total Value	224.81		161.15		178.70

(Figures in parentheses indicate the number of respondents who gave a zero value).

More surprising is the relatively high value non-users give to the bus service when compared with the total value derived by users. This may be influenced by a number of factors.

- (i) Relatively low number of trips made each week by users; 4 one way trips, keeps the consumers surplus per week down.
- (ii) Relative wealth, bus users are generally less well off than the population as a whole; in this example three users were pensioners.

4.5 Results from the Hawksworth Survey

Respondents in Hawksworth gave willingness to pay data on a total of 133 bus trips. Table 7 shows willingness to pay broken down by journey purpose.

Table 7: Hawksworth - willingness to pay for bus trips by journey purpose

	Average Fare	Average WTP	Average CS	CS as a % Fare	No Cases
To/from work	44.9	81.1	36.2	86.2	24
To/from education	43.2	81.8	38.6	157.3	28
Shopping	23.7	60.7	36.4	98.2	42
Visit	0	40.0	40.0	-	1
Leisure	39.2	83.7	44.6	112.6	17
Other	29.1	52.1	23.0	56.3	21
Average	34.2	70.2	35.8	106.3	133

The consumer surplus figures reveal a high priority is given to trips to school, which might be thought a little strange where education authorities are obliged to provide transport for distances in excess of 3 miles. However, free travel is only obtained if the school attended is within a defined area. This sample contains 2 households where parents pay for travel to take their children to a school outside the catchment area; one of the mothers concerned was prepared to pay almost any amount to ensure that her children continued to travel to their current school by bus.

The next highest priority goes to leisure trips, again an unexpected result, perhaps indicating that leisure trips are made by people with higher levels of discretionary income than other types of bus trip. Moreover, the alternative mode is most likely to be a taxi at a higher cost. There is a considerable agreement on priorities between those who use bus services and those who did not in the week surveyed (Table 8). The main priority is given to access to work places and schools - the day's major activities. Bus users rate access to medical facilities slightly higher than access to shopping facilities; perhaps because there are some shops in the area while medical facilities are more distant. Those who use public transport, would then feel more dependent upon such services for medical trips which though rarer than shopping trips may be viewed as more important for bus access due to their relative inaccessibility. Non-users reverse these preferences perhaps because they are thinking of the most common trips made.

Table 8: Priorities for facilities to be served by bus - Hawksworth

Rank	Ave score	Bus users	Ave score	Non-users	Ave score	All
1	2.0	Work places	2.22	Work places	2.07	Work places
2	3.11	Schools	2.67	Schools	2.96	Schools
3	3.26	Hospitals	3.22	Shops	3.52	Shops
4	3.45	Doctors surgery	4.11	Hospital surgery	3.54	Hospital surgery
5	3.65	Shops	4.33	Doctors surgery	3.72	Doctors surgery
6	6.30	Relatives homes	5.67	Relatives homes	6.10	Relatives homes
7	6.79	Friends homes	6.89	Leisure	7.00	Leisure
8	7.05	Leisure	7.50	Friends homes	7.00	Friends homes
Cases	19		8		27	

There is a clear consensus on the need to provide elderly people with low cost bus travel (Table 9). There is however a great divergence of opinion between users and non-users on the status of the unemployed. Bus users give the unemployed a high priority, while non-users place them last. This suggests that views are highly polarized.

Table 9: Priority groups for low fares - Hawskworth

Rank	Av. score	Users	Av. score	Non-users	Av. score	All
1	1.63	OAP	1.67	OAP	1.64	OAP
2	2.39	Unemployed	2.33	Children	3.08	Unemployed
3	3.72	Children	3.78	Housewives	3.26	Children
4	4.17	Housewives	3.89	Working adults	4.04	Housewives
5	4.33	Working adults	4.50	Teenagers	4.19	Working adults
6	4.53	Teenagers	4.62	Unemployed	4.52	Teenagers
Cases	20		8		28	

There is a high degree of agreement as to which periods of operation are most important - weekday peak and daytime services. Non-users then rank Saturdays while users consider evenings to be marginally more important. This could arise if non-users make occasional bus trips - as Saturday then becomes the most likely travel time as car parking in Leeds on Saturdays is perceived to be difficult.

Table 10: Priorities for subsidy by time period - Hawskworth

	Users	Non-users	All
Monday to Friday Peak <0930 1600-1800	1.53	1.56	1.54
Monday to Friday Daytime	2.16	1.67	2.0
Monday to Friday Evenings	3.37	2.89	3.21
Saturday	3.53	2.67	3.25
Sunday	4.22	4.00	4.15

Table 11 shows both use and non-use values.

Users report higher total values, almost 80% of which is made up of use value. Non-users do appear to be willing to pay for the service but the sample is very small compared to the users.

Table 11: Average use and non-use values per week (p) - Hawskworth

	Non-users values	Cases	Users values	Cases	All values
<u>Non-use</u>					
WTP route	58.3	6(3)	45	20(12)	48.1
WTP network	150.0	5(2)	57.5	20(9)	76.0
<u>Use</u>					
CS route			103.5	25(2)	73.1
CS network			199.6	25(0)	142.6
Total value (network)	150.0		257.1		218.6

4.6 Comparison of results

The two areas are markedly different in the levels of reported bus use; in Rainow only 22% respondents had travelled by bus in the week of the survey, while the corresponding figure in Hawskworth was 70%.

The Hawksworth sample provided the bulk of reported bus trips. Typically, it appears that bus users enjoy a consumer surplus on their journeys of the order of 100% of the fare paid. Users in Hawksworth derive a consumer surplus of £2.00 a week on average; the figure of £1.83 in Rainow is very similar. Non-use values appear to be significant. On average, residents were willing to pay some 60p per week to preserve the route as a whole. In Hawksworth the corresponding values were 48p for the specific route serving the estate and 76p for the network as a whole. These results would appear to indicate a significant difference in responses between the two samples; however Table 12 reveals a different interpretation.

Table 12 disaggregates the values to give non-use values for users and non-users separately. The major variation, it is now clear, occurs between users and non-users; with non-users reporting the higher values. As users have already expressed their willingness to pay in terms of fares for their own use, they may then be financially constrained when asked to give a non-use value. Moreover, non-users tend to have higher incomes than users and thus a greater ability to pay.

Table 12: Non-use values, pence per week

	Users	Cases	Non-users	Cases	All
<u>Rainow</u>					
evening route	8.3	6(5)	71.1	26(17)	59.4
route	41.7	6(3)	161.1	26(9)	138.7
<u>Hawksworth</u>					
route	45.0	20(12)	58.3	6(3)	48.1
network	57.5	20(9)	150.0	5(2)	76.0

Figures in parentheses represent the number of zero values. The large number of zero values may indeed reflect a true zero non-use value or may reflect the difficulty people have in placing a value on impacts that are not normally priced.

5. CONCLUSIONS

The survey method as developed was time consuming and expensive, and consequently the sample size was small. Moreover we must bear in mind the various risks of bias discussed above. Nevertheless, we believe the results are of considerable value. They suggest that users of bus services typically obtain a consumers' surplus of the order of 100% of the fare they pay. Furthermore, they suggest that residents in a relatively poor urban area may be willing to pay of the order of 50p per week to preserve their bus service over and above any consumer surplus they receive; in the case of an affluent village the figure is much higher. The 95 % confidence interval for the overall value attached to bus services is of the order of + or - 28%.

Regarding priorities, it appears that access to workplaces is ranked highest, followed (in order) by shops, schools and medical facilities. It is not surprising, therefore, that weekday peak services were ranked as most important, followed by weekday daytime services, Saturdays, evenings and Sundays. In terms of priority groups, pensioners were ranked first, followed in Rainow by the unemployed and then children; in Hawksworth, however, the unemployed were ranked last.

What of the broader policy issues raised by the study? Clearly the methodology would be too time consuming to be used every time a service is considered for withdrawal. However, further survey work in a variety of locations might establish a robust set of values that could be used in appraisal.

Results from this study suggest that support for services covering 50% of costs from fares may be justified solely by reference to the consumers surplus generated. The inclusion of non-use benefits in the appraisal of bus services suggests that acceptable levels of cost coverage may be lower than 50% for certain types of services. The priorities revealed here regarding types of person, journey and times of operation, suggest a multicriteria approach to the served, number of pensioners carried and journey purposes facilitated. The weights given to each indicator could be derived from surveys like this one, and so would be representative of the priorities/views of the population. Refinement of this approach is continuing as part of a further project.

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