How Far Are "Ordinary" Cyclists Happy to Cycle As Part Of An "Ordinary" Journey?

Where to Spend the Money?

Alex Sully, County Cycling Officer
Somerset County Council
C/O WS Atkins Consultancy, The Crescent, Taunton TA3 5LB, UK
E-mail: alexsully@aol.com

Summary

The paper seeks to set out an hypothesis about cyclists' behaviour which can be used as a tool to aid understanding of how far "ordinary" cyclists are happy to use their bikes before considering transferring to another form of transport. Whilst the conclusions reached require the acceptance of a number of assumptions, if accepted as valid, it may serve as a useful guide to behaviour when responding to claims about the distances cyclists will travel for utility purposes. It is also suggested that it will help justify decisions made about expenditure on cycle facilities when faced with conflicting demands and a limited budget.

Background

The author has spent over ten years in the programme and project management of local authority highway improvements. When this involvement started most of the schemes were proposed to achieve safety and capacity improvements to meet the needs of motorised traffic. More recently this has changed to improving the network to both meet the needs of existing cyclists and to encourage greater use of bicycles as an alternative to unnecessary car use. At present the total value of the cycle programme being managed totals in excess of Euro 2.5 million.

As the range and number of cycle facilities provided has expanded so too have the expectations of users and those who lobby for even greater expenditure. This has lead to many differing, and sometimes conflicting, claims being made on behalf of cyclists, about what they need and how far they are happy to cycle. In particular, lobbyists and transport professionals alike appear to believe that since half of the trips in our cities and towns are less than 7.5 km and such a distance is no challenge to the cycling enthusiast, this has become the target distance for encouraging a modal shift from car to bike.

But what of this magical figure of 7.5 km, is it the average, the extreme or simply a target based on a desire to reduce car use? To answer these questions it is necessary to look briefly at where the highest number of journeys, which might be undertaken by bicycle at the expense of the motorcar, occurs.

Cycling in Urban Areas – The Home of Utility Cycling

Many European countries appear to match the experience of the UK where roughly 75% of all journeys are less than 5 miles (8 km) and 50% are less than 2 miles (3 km) [1]. Even in predominantly rural areas, such as the County of Somerset in the UK, 50 % of the population live in the towns. It is therefore safe to assume that most short journeys will be concentrated in our towns and cities. On this basis, it is also reasonable to assume that it is in these short trips, primarily for utility purposes, that the greatest potential exists to achieve a transfer from car to cycle use.

From the final report of the ADONIS project [2] it is evident that even in cities with high levels of cycle facilities and use, such as Amsterdam and Copenhagen, the average distance cycled in both is only 2.6 km (1.6 miles). The choice of the bicycle as a mode of transport is reported as being for reasons of speed and convenience compared to car travel. Referring to the report "Evaluation of the Delft Bicycle Network Plan" [3] revealed that this city also experienced average cycle journeys shorter than expected at 3.9 km (2.9 miles). This went against the author's perception that cyclists were happy to cycle on average more than twice that distance when provided with high quality networks.

Clearly distances cycled will depend upon a whole range of factors. These will include: the size of the city, the quality of the cycle facilities, climate, topography, severance by major obstacles such as railways, rivers and roads, the cost of car use and the cost/availability of public transport etc.

The same reports, however, confirm that level of cycle use is high in all three cities for all types of journey (Amsterdam 34%, Copenhagen 51%, Delft 40%). Given these levels of use it is suggested that it is reasonable to assume that these distances directly reflect an "ordinary" individual's potential willingness to cycle as an "ordinary" activity in response to the city's "cycle culture", its cycle facilities and the cost and convenience of available alternatives.

The latter conclusion was strengthened when it was revealed that the introduction of subsidised public transport for students in the Netherlands in 1994 resulted in a shift of 34.6% away from bicycle use for trips for educational purposes [4], with a corresponding increase in public transport use. Perhaps this gives example to the old saying, "Why walk when you can ride. Why stand when you can sit?" as a guide to behaviour when modal choice is made.

If these assumptions about "ordinary" behaviour are accepted, then it is suggested that the pattern of use can be loosely compared with accepted statistical theory and a hypothetical "working" maximum cycling distance established for any town or city based upon the average distance cycled within it.

In the UK many of the claims made about cycling and the potential for modal shift are based upon the encouragement of cycling through the promotion of traffic-free paths and long-distance cycle networks, principally used for leisure and tourism. Before we go further, it is worthwhile examining what, if any, contribution leisure cycling, and the distances cycled, makes to modal shift.

Leisure Cycling – Healthy and Fun

It is generally recognised that leisure cycling is increasing as sections of the community turn to more active lifestyles. It is also evident that tourism based on cycling can have measurably beneficial effects on the regeneration of the economies of rural areas. What is not yet clear is whether this form of tourism is focusing the existing market for the use of bicycles as a leisure activity in places with a marketable identity or product, or it is stimulating an increase in cycle use itself. Clearly there needs to be more research in this area.

Even if cycle use is indeed stimulated by these activities, does it have a beneficial impact on encouraging utility cycle use for trips that would otherwise be made by car? For countries with relatively low levels of cycle use recent research [5] in the UK would suggest not, indeed the following conclusions were reached (amongst others):

"The most important contribution that leisure cycling is thought to make is to increase the enjoyment of cycling."

"Leisure cyclists consider the bicycle to be a perfectly logical choice for an afternoon in the country. These same people think…. that the car is a logical choice for all of their utility trips and see no compelling reason to change this arrangement" (author's italics).

Another recent UK study [6] found "Leisure cycling, particularly in traffic-free conditions, was a pleasant experience. However there was little evidence of this leading to cycling for utility purposes" (author's italics).

These studies do not imply that effort spent in providing leisure opportunities is wasted and the author shares this view. In their recommendations, these studies suggest that leisure cycling should be encouraged in a consistent and strategic manner for a range of reasons. They are, however, consistent in their conclusion that there is no direct link between leisure cycling and increased utility cycling. On the basis of this evidence, it is suggested that claims made about distances recreational cyclists are prepared to cycle for pleasure being related to utility cycling distances should be viewed with caution

Other Factors

At this point it is also worth considering not just the distance cycled but the time taken to do so. For example a cycle journey of 2.5 km takes 7.5 minutes at 20 km /hr and 5 km takes 15 minutes [7]. It is suggested that these times are acceptable as walking or cycling trips because they represent “comfortable” times beyond which other modes such as private cars or public transport start to become attractive.

It is considered that this issue is particularly important when looking at journey length and modal choice. For example, there comes a point in developing an integrated transport strategy when decisions have to be made about whether it is better to continue to spend money on extending a cycle route or network or to promote the use of public transport as an alternative to car use. This applies as much encouraging modal choice as part of the development of travel/commuter plans, as cycle infrastructure projects.

The Hypothesis

The distance most “ordinary” people are happy to cycle as part of an “ordinary” journey is may be taken as one and one third times the average distance cycled within a city (or within the trip purpose).

In response to the need to identify priorities for limited funds and as a way of identifying the “point of diminishing returns” (the point at which additional expenditure will no longer reap worthwhile reward) the author has sought to establish a simple tool that enables an approximate “cut off point” to be determined. This is achieved by comparing the average distance cycled by the inhabitants of a town or city (or specific journey purpose) with accepted statistical theory. It may also serve a guide to what distances would be acceptable to potential cyclists newly faced with car restraint measures as part of an integrated transport strategy or a travel plan. This guide is also useful in deciding at what point to promote public transport as an alternative to cycling as part of a transport strategy or travel plan.

It is important to point out that this is only an hypothesis. However, once the principle has been accepted (however crudely generated) it can be used as another simple tool in the decision making process.

Statistical Theory And Assumptions

In order to demonstrate the validity of the hypothesis the following assumptions are made [8]:

i) Within a typical sample the pattern of distances cycled gives rise to a symmetrical normal distribution curve and the arithmetic mean and median coincide at the mid point (see Figure 1);

ii) One standard deviation either side of the mean equals 66% of the sample and the range 0 to +1 standard deviation equals 85% of the sample;

iii) Since 3 standard deviations either side of the mean covers 99.73 % of the sample the normal distribution curve may be considered to start at a value of zero and extend over a range of + or – 3 standard deviation units (A-C);

iv) The x-axis of the resulting graph, with a range of + or – 3 standard deviation units, may also represent the distances cycled up to a value of twice the arithmetic mean (A-C = 2x[A-B]).

Clearly there are flaws in these assumptions. Firstly, the resulting curve would not be symmetrical, as there will be some cyclists who cycle longer, non-typical distances. It is suggested that these longer distances are not representative of “ordinary” activities and are cycled largely for reasons not purely connected with the use of a bicycle for transport such as cost, training for sporting activities or environmental concerns not shared by the population as a whole. Secondly, equating the x-axis with distance is merely an act of convenience.

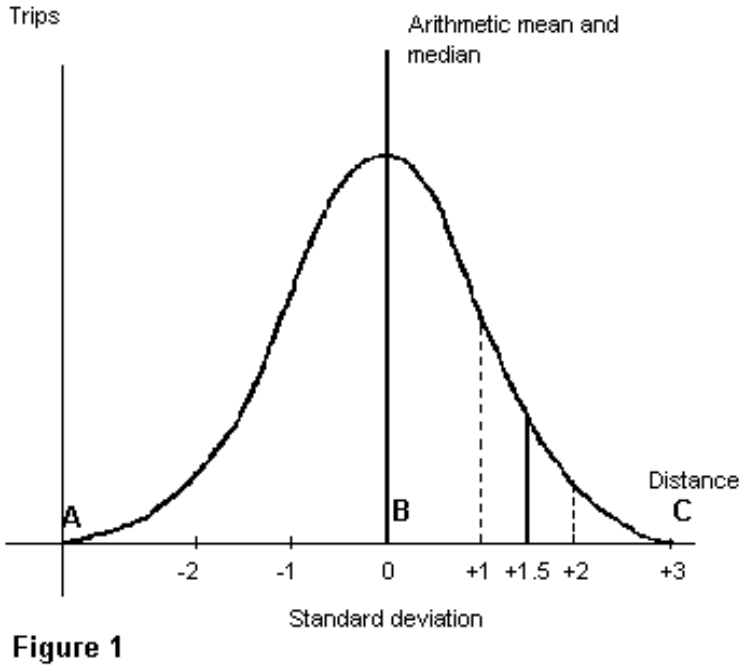

Figure 1

Figure 1

An Example

Testing the hypothesis against a sample of 71 employees who cycle to work to the same office everyday has shown that it can be used with reasonable confidence. Figure 2 shows a graph of the trips and the results of applying the hypothesis:

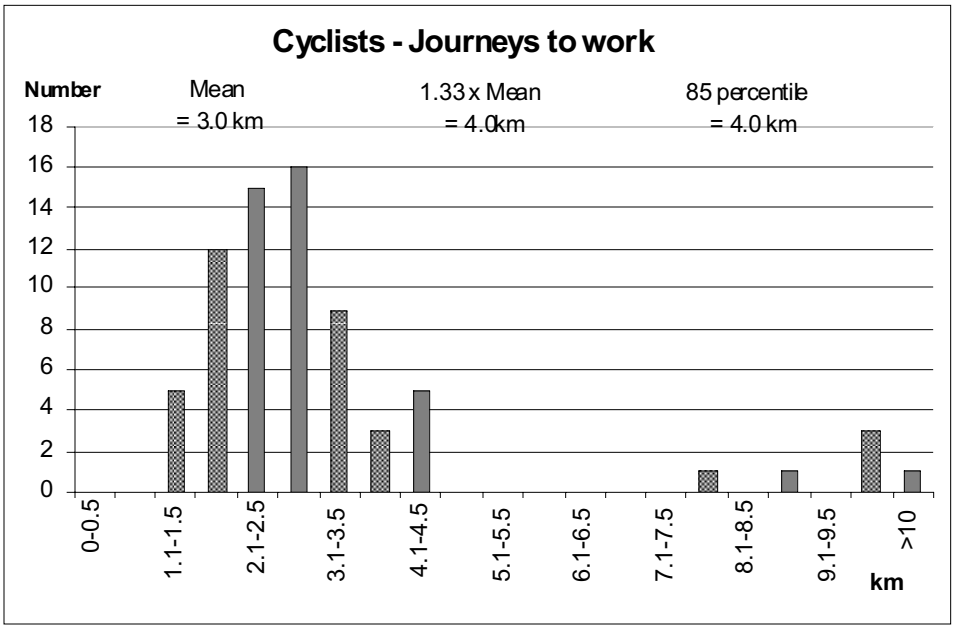

Figure 2

It is normal practice when seeking to establish a representative sample to exclude the 15% "extremes" at either end of a data set. An examination of the sample did indeed show that 15.5% of the cycle trips began outside of the town giving an 85th percentile of 4.0 km. It was not felt necessary to delete the lower 15% as the removal of the top "extremes" had resulted in a roughly

normal distribution. The arithmetic mean distance cycled for the whole sample of 71 was 3.0 km and 2.6 for the adjusted sample.

From reference to Figure 1, and the assumptions made in its creation, it can be seen that 85% of the whole sample (+1 standard deviation from the mean) would equate to a maximum distance of 1.33 times the mean of 3.0 km. On this basis the "working" maximum distance for investment in and/or encouragement of cycle journeys (before considering say, promoting public transport) would be said to be 1.33 times the mean of 3.0 km giving the same answer of 4.0 km.

Extending these findings to the average distances cycled in Amsterdam, Copenhagen and Delft it is evident that the target distances for expenditure would be 3.9 km for the first two and 5.9 km for the latter. It can also be seen that both of these are less than the 7.5 km target distance for modal shift.

Comment

In real terms this paper has done little other than to demonstrate the accepted practice of taking the 85th percentile as being the upper limit of a representative sample. This being the case, it is suggested that this can easily be related to the analysis of cycle use within any city or cycle-journey purpose within that city. Once acknowledged, this practice can help in the decision making process when it proves necessary to prioritise both expenditure and promotion of different modes.

This, therefore, could very easily have been the substance of the hypothesis. Nevertheless, it is suggested that working through the process of establishing the hypothesis, even in this simplistic way, from identifying the need for an understanding to reaching the conclusion, helps demonstrate the need for lobbyists and practitioners alike to be aware that decisions about investment should be based upon sound reasoning rather than "heroic" statements or claims made out of a desire to promote cycling without concern for the need to prioritise spending.

It should be noted that this paper is most emphatically not setting out to prove that investment in distances greater than the 85th percentile distance is not justified. It is acknowledged that, as a cycle network expands to meet all the "ordinary" journey needs throughout the city from a host of different start and finish points, the opportunity to cycle further in safety and comfort will also grow.

This gives rise to the view that constant monitoring of cycle use and distances travelled will in turn demonstrate that as distances grow so too does the value from investment. On this basis, setting a target for cycle journeys of 7.5 km may well be a justified goal. However, when resources are limited the starting point for decisions must be focused investment that will meet the proven needs of cyclists.

Conclusion

It has been shown that there is a need to understand over what distances the best return for investment in cycle facilities will be obtained. It has also been shown that recreational cycling has no demonstrable bearing on the distances cycled by "ordinary" people as an "ordinary" activity.

Either from first principles or through the use of accepted statistical practice, it can be demonstrated that the greatest distance worthy of investment to meet the needs of "ordinary" cyclists within a city or journey purposes within that city is given by one and one third times the average distance or the upper 85th percentile of a representative sample. Based on examples his is distance likely to be shorter than the frequently used target of 7.5 km.

Constant investment in cycle facilities will no doubt increase distances cycled. This may be checked through regular monitoring and the target distance revised. However, whilst there are clear merits in encouraging use over greater distances, beyond the 85th percentile consideration should be given to establishing the value of encouraging public transport as a way of reducing unnecessary car journeys.

References

[1] “National Cycle Strategy”, Department of the Environment Transport and the Regions 1996

[2] “Analysis and Development Of New insight into Substitution of short car trips by cycling and walking” Danish Road Directorate et al 1998

[3] “Evaluation of the Delft Bicycle Network Project”, Ministry of Transport, Public works and water management, the Netherlands 1987

[4] “Cycle traffic: The bicycle is gaining ground in traffic over short distances” Ministry of Transport, Public works and water management, the Netherlands 1997 (taken from abstract circulated by “Cities for Cyclists”)

[5] “Transport Implications of leisure Cycling, TRL, 1998

[6] “Attitudes to Cycling: a qualitative study and conceptual framework”, TRL1997

[7] Design speed taken from” Sign up for the bike”, CROW 1996

[8] Statistical information taken from “Standard Statistical Analysis in Psychology and Education” by GA Ferguson