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UNDERSTANDING THE CAR DEPENDENCY IMPACTS OF CHILDREN'S CAR USE

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ABSTRACT

This paper describes some results from a project investigating the effects of car use on children's health and potential car dependency. The paper commences by describing the whole project in terms of its objectives and work packages. The paper focuses on the results from two linked surveys: one completed by children about their travel behaviour and experience, and the other completed by their parents about their use of the car and attitudes to its use. A total of 549 children are included in the analysis. The analysis shows that a majority of these children never, or hardly ever, use public transport. It is discovered that there are some children who are taken to school by car, travel to out-of-school activities by car and never, or almost never, use public transport. The effects of household car ownership, parental use of the car, and environmental education on the children's use of public transport is investigated. Whilst the results presented in this paper are all very preliminary, they suggest that there is reason to be concerned about the levels of car use by some children.

1 INTRODUCTION

Car use by children is growing. This reflects the increasing availability of cars and the adoption of lifestyles by many households which can only continue if they are able to use the car. This situation is likely to become worse (Mackett, 2002). It is likely to lead to a number of problems: for example, children taken almost everywhere by car are likely to have less physical activity than children who walk and cycle, which may have serious implications for their health. In the long run, they may grow into adults who have no experience of forms of transport other than the car, and so will not consider alternatives, such as public transport or walking. This could have very serious policy implications because it means that they are unlikely to consider switching to alternatives if restrictions are placed on car use for, say, environmental reasons. The British Government takes these issues seriously. For example in the White Paper on Transport issued in the Summer of 1998 it stated: "Not walking or cycling to school means that children get much less exercise and builds in car dependency at an early age" (Department of the Environment, Transport and the Regions, 1998, paragraph 5.29).

These important issues are being studied in a project entitled 'Reducing children's car use: the health and potential car dependency impacts', which is being carried out over a period of three

years at the Centre for Transport Studies at University College London with funding from the Engineering and Physical Sciences Research Council under its Future Integrated Transport programme. The work started in January 2001. The project is described in more detail in the next section.

One part of the project is the collection of data from children and their parents, and carrying out anthropometric measurements on the children. This paper is based upon some of these data. It focuses on a set of children who have little or no experience of public transport, implying that they are taken by car for their longer distance travel. The paper examines whether they behave differently from children who do use public transport, and tries to shed some light on why they are in this situation. This is an exploratory analysis, to help identify further avenues for exploring the data, so the conclusions drawn are tentative at this stage.

2 THE PROJECT

The objectives of the project entitled 'Reducing children's car use: the health and potential car dependency impacts' are as follows:

a) To examine the effects of car use on children's physical activity and health;

b) To examine the effects of car use by children on their potential long-term car dependency;

c) To develop a framework to evaluate the impacts of travel to school initiatives systematically.

The Principal Investigator and Project Manager is Roger Mackett, Professor of Transport Studies at UCL. The research team at UCL consists of Lindsey Lucas, James Paskins and Dr Jill Turbin. Professor Neil Armstrong of the Children's Health and Exercise Research Centre at the University of Exeter and Dr Laurel Edmunds of the Department of Public Health at the University of Oxford are providing expertise on measuring children's physical activity patterns and relating these to health issues. Expertise on children's health and its relationship with transport is being provided by Professor Mark McCarthy of the Department of Epidemiology and Public Health Medicine at UCL. Information about the journey to school initiatives and their implementation and potential impacts is being provided by the Environment Department of Hertfordshire County Council. Dissemination of the research findings to health professionals and subsequent recommendations on how research in this area can inform evaluation of local healthy transport initiatives is being assisted by Adrian Coggins, a Health Promotion Adviser based in Hertfordshire. The fieldwork is all based in Hertfordshire, an area to the north of London.

In order to achieve these objectives the project has been divided into a set of work packages. These are described below.

a) The schools surveys

This part of the project has involved the carrying out of three linked surveys of school children aged 7-13 in ten schools in Hertfordshire in association with Hertfordshire County Council's consultants, Mouchel. This work is described in more detail in Section 3 below.

b) Activity monitoring

The objective of this part of the project is to collect data on the quantity and intensity of activity by children over a period of time which can then be linked with data about their travel patterns, lifestyles, and amounts of car use. In order to do this, activity monitors (RT3s) are worn by the children for a period of four days. They keep a diary of their activities over this period, which consists of two school days and two weekend days. It is intended to monitor the activity patterns of over 100 children. The patterns will be analysed to identify relationships between the quantity of activity and their characteristics and travel patterns (these children will all have completed the questionnaires referred to in Section 3). The data will be analysed to see whether children who use the car a lot do less exercise than other children, or whether there are cases where children are being taken by car to activities where they use a lot of energy. It will also be possible to establish the relative contributions to the expenditure of energy of walking to school, informal exercise at playtime and formal exercise in PE lessons. This will help to establish where the emphasis should be put in terms of encouraging exercise by children, and to establish the role that the car plays in reducing the amount of exercise.

c) Evaluation of travel to school initiatives

As implied above, a key element in this research is to establish the effect of the car on children's quantity of physical activity and consequently on their health. An interesting question is whether specific interventions designed to encourage children to use alternatives to the car actually have significant effects. The initiative that attention is being focused on is the 'Walking bus'. This is a group of children who walk to school along a set route, collecting other children along the way at 'bus stops', escorted by several adult volunteers, one of whom is at the front ('the driver') and one is at the back ('the conductor'). All the children using the bus are registered with it and all the volunteers have undergone police checks.

The purpose of the evaluation is to establish what the effects of a walking bus are, and, as far as possible, establish a methodology to examine such initiatives in a systematic manner. There are two strands to the evaluation. Data are being collected on five walking buses in Hertfordshire over a period of twelve months. At the initial stage, being carried out now, data are collected from the headteacher, the walking bus co-ordinator, the volunteers, the parents (who are often the volunteers), and the children. A schema has been designed to collect both quantitative and qualitative data. The former includes the distance walked by the children when using the walking bus for comparison with the distance travelled to school prior to using it, and the number of car trips and the distanced travelled by car when using the walking bus and previously. The qualitative data includes the views of the various participants, including the children, and the objectives of the headteacher and the co-ordinator in setting it up. Follow-up discussions will be held with the co-ordinators every three months, mainly to see how many children have joined or left the walking bus. After twelve months the impacts of the walking buses will be evaluated

The second strand to the walking bus evaluation is a postal survey of all the schools of Hertfordshire who could have a walking bus. Those schools who have, or have had, a walking bus will be asked about their objectives in setting it up and the extent to which they have been achieved. Those schools which have not set up a walking bus will be asked about the barriers

which they would need to overcome in order to do so. The postal survey will provide data about attitudes to, and the degree of success of, walking buses across a wide range of schools.

d) Interviews with young adults

Interviews will be held with groups of young adults aged about 16 to 18. This is the age at which they will be considering learning to drive, and first obtaining cars. The discussions will revolve around their awareness of environmental issues and the extent to which previous experience such as walking to school rather than being taken there by car influences their attitudes to the car. If such factors play a long-lasting role in their thinking, this suggests that initiatives to encourage walking and cycling may have long-term effects, which means that they may be worth the investment of large amounts of money.

e) The effects of car use on children's cognitive and mental development

There is some evidence that walking and cycling to school can enhance children's cognitive development, by encouraging them to make decisions for themselves, and giving them the opportunity to explore their local environment from an early age (Department of Transport, Local Government and the Regions, 2001a). It permits them to increase their social skills by letting them interact with a greater range of people outside the household. There is also some evidence that children who walk to school are more mentally alert than children who travel by car. These themes will be investigated to see whether there is a relationship between car use and children's cognitive and mental development.

f) The role of women in children's travel decisions

Many people have adopted complex lifestyles which rely on the use of the car. A related factor is the way in which the roles of women have changed. Many of them are employed at the same time as bringing up children, which requires them to carry out many functions at different locations which have to be scheduled over the day. This is against a background of increasing expectations of parents and children in terms of the range of activities that the children participate in. Often, use of the car is essential if all the children's obligations and expectations are to be met. The overall objective of this part of the project is to unravel some of this complexity, to see if there are ways in which the children's needs can be met without so much reliance on the car.

3 THE SCHOOLS SURVEYS

Surveys have been carried out in ten schools in Hertfordshire. All the schools are involved in Hertfordshire County Council's Safe Routes to Schools initiative. For a number of years, the transport consultancy Mouchel has carried out questionnaire surveys of children in schools and their parents on behalf of the County Council. It was agreed that there would be active co-operation between that work and the research on the project described in the previous section. This meant increasing the range of topics covered to include questions on children's physical activity, and parents' use of the car and their attitudes about their children's travel behaviour. Staff from the UCL project put effort into increasing the response rates, and ensuring that the questionnaires completed by the children could be linked with those from the parents at the individual level. Also, measurements were made of the children's weight, height and body-fat

level. This means that there are now available the results from a questionnaire survey of the children about their travel and physical activity patterns, a questionnaire survey of their parents covering issues such as household characteristics and use of the car, and anthropometric measurements of the children from which their body composition can be calculated.

A total of 849 pupils in three year-group cohorts were covered by the surveys. As shown in Table 1, the children are in Years 4, 5 and 7, with typical ages of 9, 10 and 12. Response rates of 95% were obtained in the pupil survey, 70% in the parent survey, and 88% for the anthropometric data exercise. Complete data from all three surveys were obtained for 65% of the children. The data have been checked for inconsistencies and missing values. All the data in this paper are based on the 549 pupils who were covered by all three surveys, in order to ensure consistency between the tables.

Table 1 The schools survey

Cohort	Typical age	Children's questionnaire		Parents' questionnaire		Anthropometric measurements		All surveys	
		No	Response rate	No	Response rate	No	Response rate	No	Response rate
A (Y4)	9	321	98	229	70	297	91	213	65
B (Y5)	10	324	96	241	72	304	90	227	68
C (Y7)	12	162	87	123	66	148	79	109	58
Total		807	95	593	70	749	88	549	65

4 THE USE OF PUBLIC TRANSPORT BY CHILDREN

As discussed above, one area of interest in the project is examining whether there are children who have experience of only travelling by car, because they may well grow up into adults with no experience of the alternatives. The children were asked about their use of bus and train other than for travelling to school. This was to see if their parents are giving them the experience of the alternatives to the car. Table 2 shows the results. It can be seen that 81% of the children never or hardly ever go by bus, and 75% never or hardly ever go by train. It is interesting to compare these with figures for the whole population from the National Travel Survey (NTS) for 1998/2000 (Department of Transport, Local Government and the Regions, 2001b). According to NTS, in the period 1998 to 2000, 43% of the population used a local bus less than once a year or never, and 52% said the same about surface rail. Assuming that the two definitions are equivalent, it seems that more children have little or no experience of public transport than the rest of the population. It is interesting that fewer children have little experience of the train than the bus which is the opposite to the whole population. This may be because the children all live in Hertfordshire which has very good rail access to London.

Table 2 Use of the bus or train for trips other than to school

		At least once a week	At least once a month	Never or hardly ever	No response	Total
Bus	No	21	34	443	51	549
	%	4	6	81	9	100
Train	No	9	92	413	35	549
	%	2	17	75	6	100

It is interesting to see how much the two sets of children overlap. Table 3 shows that 373 out of the 549 (68%) never or hardly ever use public transport for non-educational trips. Only 29 of the children (5%) use both bus and rail at least occasionally. From this table it can be seen that 127 children (23%) use one or both public transport modes occasionally. On the basis of these figures, the children will be divided into two sets, the 127 who use one or both bus and rail, and the 373 who never or hardly ever use either of them. The other 49 children who did not respond to either question, or did not respond to one, and never or hardly ever use the other, will not be used, except when the total population is being considered. The 127 who use one or both will be labelled 'Bus or train users', and the 373 who do not use either will be labelled 'Non-bus or train users'.

Table 3 Numbers of children using bus or train

	Use bus	Do not use bus	No response	Total
Use train	29	68	4	101
Do not use train	26	373	14	413
No response	0	2	33	35
Total	55	443	51	549

5 THE TRAVEL BEHAVIOUR OF THE TWO GROUPS OF CHILDREN

It is interesting to see if there are differences in the travel behaviour between the two groups of children. Table 4 shows the mode of travel used to school. It can be seen that the children who do not use public transport outside school, are more likely to travel to school by car (40% compared with 32% of children who do use public transport). Their use of the car to reach school may be related to the location of their homes relative to the school, which may also make it more difficult to reach public transport, but, as indicated here, their households do have a car available which could be used to reach the railway station. Perhaps the most important point is that 150 out of the 549 children, are taken to school by car and never, or hardly ever, travel on a bus or train. These children are in danger of growing up with little experience of travel except by car. (Of course, some of them may walk or cycle a lot: this needs to be investigated).

It can be seen that about 12% of the children who never, or hardly ever, go by public transport for non-school journeys, travel to school by bus, only slightly less than the 15% of public transport users.

Table 4 Mode of travel to school disaggregated by whether or not children use public transport

		Car	Walk	Bicycle	Bus	Total
Bus or train user	No	41	65	2	19	127
	%	32	51	2	15	100
Non-bus or train user	No	150	178	2	43	373
	%	40	48	1	12	101
All children	No	210	272	4	63	549
	%	38	50	1	12	100

Car dependency implies that not only is the car used for many activities, but that the activities could not be done without use of the car. An indicator of this is, whether the children have to be taken by car to go to their out-of-school activities. Table 5 shows this. It can be seen that 289 of all the children (53%) are always, or almost always, taken to such activities by car, with no obvious difference between the children classified by whether or not they use public transport in general. Interestingly, proportionately more of the children who do not use public transport for non-educational trips, are never taken to out-of-school activities by car (10% compared with 7%).

Table 5 Car use to go to out-of-school activities school disaggregated by whether or not children use public transport

		Car used always or most of the time	Car sometimes used	Car never used	No response	Total
Bus or train user	No	67	21	9	30	127
	%	53	17	7	24	100
Non-bus or train user	No	197	47	36	93	373
	%	53	13	10	25	100
All children	No	289	74	50	136	549
	%	53	14	9	25	100

Another alternative to the car is the bicycle. Over 95% of the children own a bicycle. As Table 6 shows, 60% had used their bicycles in the previous week. Rather more who use public transport had cycled recently than those who do not use public transport (65% compared to 59%), but the difference is not huge.

Table 6 Bicycle used in last seven days disaggregated by whether or not children use public transport

		Used bicycle	Did not use bicycle	No response	Total
Bus or train user	No	82	38	7	127
	%	65	30	6	100
Non-bus or train user	No	178	138	17	373
	%	59	37	5	100
All children	No	328	192	29	549
	%	60	35	5	100

Three indicators of car use by children have been identified: the mode of transport used to travel to school, the mode of transport used to travel to out-of-school activities, and the general use of public transport. Out of the 549 children being considered here, 78 children are taken to school by car, use the car to go to most (or all) out-of-school activities, and never, or hardly ever, travel by bus or train. These children can be regarded as leading lives in which the car plays a very dominant role. Of the 78, four do not own a bicycle and 29 had not used a bicycle in the previous week. This suggests that they may lack experience of the alternatives to the car.

6 FACTORS INFLUENCING CHILDREN'S CAR USE

One factor that is like to influence the children's use of the car is the level of car ownership in the household. Table 7 shows the number of cars available to the household. It can be seen that the overall level of car ownership is high with 66% of the children in households with two or more cars, and only 2% live in households with no car. This can be compared with national averages from the NTS (Department of Transport, Local Government and the Regions, 2001b), as shown in Table 8.

Table 7 Number of cars available to the household disaggregated by whether or not children use public transport

		0	1	2+	No response	Total
Bus or train user	No	9	46	68	4	127
	%	7	36	54	3	100
Non-bus or train user	No	3	92	265	2	373
	%	1	26	71	2	100
All children	No	13	160	363	13	549
	%	2	29	66	2	100

It can be seen that the children being examined here have much higher car availability than the national average, where 28% of households have no car, and only 26% have two or more cars. Of course, the national average includes many one-person households, but the difference is striking. Hertfordshire is in South-East England which is the wealthiest part of Britain, so it is relevant to compare the sample with the regional average (which excludes London). The car

ownership for the sample is well above the regional average, which has 32% of households owning 2 or more cars, and 20% without a car.

Table 8 Percentage household car availability

	0 cars	1 car	2+ car	Total
Sample of children in Hertfordshire	2	29	66	100
Great Britain	28	45	26	100
South-East England	20	48	32	100

Sources: Schools survey of children in Hertfordshire and 1998/2000 National Travel Survey.

Returning to Table 7, it can be seen that the children who do not use bus or train, have higher car ownership than those who do, with 71% of the former in households with two or more cars, compared with 54% of those who use public transport. Interestingly, 3 children who never or hardly ever use public transport, live in households with no car, but rather more of the children with no access to a car do public transport.

It seems that one reason why many children do not use public transport is that they have high level of access to cars. It is interesting to examine whether their parents use the car a lot. In order to try to establish this, the parents were asked whether or not the car was usually used to go to five activities: the main grocery shopping for the household, going swimming at the nearest pool, visiting the nearest town centre, visiting the nearest post office, and visiting the public library. The households were then classified into categories according to how many of the activities they used the car for. Table 9 shows the percentage of children in households where the answer was zero, where the car was used for some but not all activities, and where it was used for all five activities. It can be seen that only 3% of the children were in households where the car was not used, and 30% were in households where it was used for all of them. The children who do not use public transport are more likely to live in households where the car is used for all these journeys than the children who do use public transport (34% compared to 25%). Of the small number of children who live in households where the car is not used by their parents for these trips, they are more likely to be children who use public transport.

Of the 78 children who go to school and out-of-school activities by car, and never, or hardly ever, use public transport, 38 are members of households where the car is used by their parents for the five types of trip. This means that 49% of these children who seem to do most of their travelling by car, have parents who seem to use the car a lot. This compares with the overall average of 30% of the children.

This suggests that there may well be a link between parental use of the car and the children's experience on travel modes. One would expect children who live in households with several cars to make many of their trips by car. What is worrying is that they do not seem to have any, or only very little, experience of the alternatives.

Table 9 Parents use of the car for trips to all five activities disaggregated by whether or not children use public transport

		Car not used	Car used to some activities	Car used to all activities	Total
Bus or train user	No	8	87	32	127
	%	6	68	25	100
Non-bus or train user	No	8	239	126	373
	%	2	64	34	100
All children	No	18	365	166	549
	%	3	67	30	100

Note: the five activities are: main grocery shopping, going swimming at the nearest pool, visiting the nearest town centre, visiting the nearest post office, and visiting the library.

One way to make children aware of the alternatives is through education. Table 10 shows the number of children who have undertaken various types of environmental education at their previous school:

- class activities about how much exercise and activity people need;
- class activities about how people travel;
- road safety or pedestrian skills training;
- attended a cycle training course;
- use of a walking bus.

Table 10 Environmental education at first school disaggregated by whether or not children use public transport

		On exercise and activity	On how people travel	Pedestrian training	Cycle training	Used walking bus
Bus or train user	No	18	27	17	17	8
	%	45	68	43	43	20
Non-bus or train user	No	63	53	39	25	6
	%	50	42	31	20	5
All children	No	92	90	63	46	15
	%	48	47	33	24	8

This question was asked only of the 192 children who had moved onto a second school. It can be seen that nearly half the children had taken part in class activities about how people travel and about exercise and activity. About one third had undertaken pedestrian training and about one quarter had undergone cycle training. Only about 8% had used a walking bus, partly because walking buses are a fairly recent innovation in Hertfordshire.

Table 10 shows that the children who use public transport were more likely to have undertaken the particular activity than those who do not, in four out of five cases. It can be argued that the only one of the activities that is likely to have considered issues of public transport use in

preference to the car, is the class activities about how people travel. 68% of the children who use bus or train had undergone such education whereas only 42% of those who did not, had undertaken such activities. This suggests that such education has been successful, but it would need much more investigation before complete confidence could be placed upon such a finding.

Slightly more of the children who had undertaken activities about exercise tend not to use public transport than those who do. This may not be surprising because the link between modal use and exercise is complex. It all depends on the alternative. Using public transport usually requires some form of exercise prior to, and after, using the bus or train. If the alternative is to walk or cycle all the way, that implies obtaining more exercise. If the alternative is car, that implies little or no exercise on the journey. The other three types of environmental education are much more related to walking or cycling than to the use of public transport, but they could be indicative of environmental awareness; that is, children who have undertaken them may be more aware (or have parents who are more aware) of why a very high level of car user is not good. The children who use public transport are more likely to have undertaken the last three types of environmental education than those who do not.

7 CONCLUSIONS

This paper has described a project investigating the effects of car use on children's health and potential car dependency. The analysis has focused on the results from two linked surveys: one completed by children about their travel behaviour and experience and the other completed by their parents about their use of the car and attitudes to its use. A total of 549 children are included in the analysis.

It was found that a very high proportion (67%) of the children never, or hardly ever, use public transport. Of these 373 children, 150 (40%) travel to school by car. Out of the 549 children, 53% are always, or almost always, taken to out-of-school activities by car. 78 of the children (14%) are taken to school by car, always or almost always are taken to out-of-school activities by car and never, or almost never, travel by train or bus. The travel patterns of these children seems to be dominated by the car. Some of them do not appear to cycle very much.

A major factor that underlies the dominance of the car in the children's lives is the fact they tend to live in households with high levels of car ownership. Overall, the levels are well above both the national and regional averages. The children who do not use public transport are much more likely to live in multi-car households than those who do. The children who do not use public transport are also more likely to live in households where the parents use the car for local trips than children who do.

Environmental education seems to play a role in encouraging children to use alternatives to the car. Whilst such a conclusion must be regarded as tentative, it is, potentially, very important.

The results presented in this paper are all very preliminary, representing only the first set of many that will be produced. At this stage, they are being presented to promote discussion, not only about the findings, but also to aid in the identification of further areas for exploration, both using this data set, and in other parts of the project. There seems little doubt that the results will provide very useful findings on the important role that the car plays in the life of children.

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