



Sustainable school commuting – understanding choices and identifying opportunities

A case study in Dublin, Ireland



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ABSTRACT

Travel to primary or secondary school during term constitutes a significant portion of the early morning flows of people on a transport network within all developed nations. Where school commutes are made by private cars there can be a significant contribution to early morning traffic congestion and associated externalities, as well as missed opportunities in regards to benefits that would accrue from higher occupancy and non-motorised modes of travel. This paper considers the challenge of shifting primary school students away from private car drop offs (PCDOs) in a case study area where over 60% of primary school children are driven to school. The paper engages and analyses an array of recent census and transport specific data through econometric and GIS-based methodologies to update and understand the modal choice decision factors involved, and to identify appropriate opportunities for change which may thereafter be trialled, supported and developed. The authors identify distance to travel as the most significant determinant of mode choice, and furthermore, by utilising a blend of GIS and census data, identify 2 km as a guiding 'splitting line' or threshold between the alternative modes of walking and using transit or other motorised modes. This guidance on a distance splitting line is not a rule, but can inform the tailoring of modal shift intervention strategies appropriate to the specific circumstances and current behavioural trends. Above 2 km the paper finds that students rarely walk to school and offers an evidence based recommendation for specific school bus services or coordinated carpooling as part of the solution. Below 2 km, a walking school bus can serve as a functional substitute to PCDOs and is identified as feasible for certain areas given the student densities and school locations. In both cases recent technological innovations can support change. The research further finds that low car ownership rates, students having siblings and living in safe areas encourage the use of substitutive modes over PCDOs. The analytical approach of the paper can be replicated and the full detail of the analysis can offer guidance for community coordinated actions and local authority interventions to support sustainable school travel outcomes.

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1. Introduction

Travel to school represents a regular, estimable flow of persons to a defined location generally within a narrow window of time. Where a large share of these trips is made by private car, there will be an obvious impact upon traffic in associated areas. These trip choices thereby create pressures and impacts such as increased levels of traffic, time and productivity loss, as well as damage to human health and the environment. However, the pattern and predictability of such trips should lend itself well to the evaluation and design of policies, services or infrastructure focused interventions that can influence the choices made by these individuals and

reduce the associated negative impacts. This paper is concerned with mode choice for primary school students and established a detailed evidence base in regards to primary school commuting in the catchment. It then identifies those factors which have a significant bearing on the decisions of their parents in regards to getting them to school. Thereafter the paper illustrates how the evidence could be used to identify and tailor appropriate policy options that can reduce the levels of private car drop offs (PCDOs) by shifting more school commuters into higher occupancy motorised modes (e.g. carpooling, school buses, coordinated public transport commutes), or other non-motorised mode options (e.g. walking, walking buses, cycling). The paper blends a contemporary review of the literature with a detailed analysis of a case study region of Dublin, Ireland drawing upon recent census data, econometric analysis and spatially referenced GIS driven evaluations.

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The paper is structured into the following sections. Section 2 presents a collated review of the international literature relevant to each aspect of the stated objective of reducing PCDOs for primary school children. Section 3 offers an outline of the methodology employed and includes an overview of the region selected for the case analysis. Section 4 extracts and presents the relevant descriptive data from the census, as well as the results of the econometric analysis to determine the significant factors influencing school commute mode choices. Section 5 then assimilates the findings in order to propose appropriate policy and community led interventions and options. Section 6 offers further discussion and concludes.

2. Literature

At the level of the child, the decision, where feasible, of walking or cycling to school should offer a predictable departure and arrival schedule, health benefits (Cooper et al., 2003) and potential improvements in social and academic performance (Roberts et al., 2010; Spitzer and Hollman, 2013; Westman et al., 2013). For the parents, the matter of mode choice other than a PCDO can introduce questions of perceived safety and security for their child, but may also yield benefits in terms of freeing up their own time, and reducing associated travel demands and travel costs. At a societal level, the traffic volumes that can be associated with peak hour school travel from PCDOs can generate a variety of well researched externalities (Button, 1990; Button and Verhoef, 1998; Wilson et al., 2007; Santos et al., 2010) ranging from local congestion and noise, to broader environmental impact contributions in the form of climate change and air pollution. The topic of travelling to school has therefore, unsurprisingly, been the subject of a good deal of analysis and discussion in the literature.

Over the last three decades, the proportion of children walking to school has declined significantly with accompanying evidence of a sharp increase in driving children to school (Mackett, 2013; McDonald et al., 2011; Hillman, 2002; O'Fallon et al., 2002; Cottam, 2001). As compared with other countries, Ireland now has an extremely high proportion of car transport in school commuting, likely connected with an increasing distance between homes and schools, increasing ownership of cars and the challenges of providing a comprehensive and reliable public transport system for a low density spread of origins and destinations. In 2011, just under 60% of primary school students in Ireland were driven to schools by the adults, in contrast with 42% in the UK (Mackett, 2013) and 47.5% in the U.S. (McDonald et al., 2011).¹ This preference towards car transport for primary school commuting can generate a substantial number of car trips during the morning peak. Indeed, anecdotally, one may often observe that during the summer months in Dublin (notwithstanding a couple of weeks holiday for the adults) traffic is consistently lighter, suggesting that a considerable number of parents may reduce trips or use other modes where there is no need to drive the children to school in the morning peak.

The costs and challenges posed by PCDOs have prompted many researchers to explore alternative social innovations in regards to school commuting such as non-motorised walking variants of school buses (Kingham and Ussher, 2005, 2007; Collins and Kearns, 2010). These 'walking school bus' studies demonstrate potential, but in certain cases flagged the lack of volunteers and subsequent loss in routes as a major problem. Certainly the presence of safe travel routes (Jensen, 2008) is also an important aspect of encouraging walking and cycling choices. A related option which also requires strong local cooperation and coordination is the somewhat

underutilised possibility of car-pooling. In a study examining the Greater Toronto and Hamilton area, Arbour-Nicitopoulos et al. (2012) indicated that just 1.7% of their sample used carpooling as the primary school travel mode though 25% had participated in a carpool for school travel. Thereby suggesting an option with some potential but clearly facing certain difficulties in terms of securing a regular user base. Neither walking school buses, nor car-pooling are new concepts, and certainly for such approaches to work there is a need for local scale knowledge, initiative, coordination and cooperation. However, advancements in technology (e.g. smart phone penetration) and tailored applications may now be in a position to support more effective implementations than in the past, and this point is revisited in Section 5.

Of course, actual school buses are another important option and have been widely covered in the literature. Analysis of school bus services has shown the operational challenges of routing services to multiple collection points (Bowerman et al., 1995; Park and Kim, 2010), scheduling their arrival subject to the constraints of service provision and school timetabling (Kim et al., 2012), and evaluating and managing the cost of such services in larger school district areas (Hanley, 2007; Hine, 2009). The School Choice Taskforce (2005) study in the USA finds that the running costs of school buses decreases significantly with the number of runs per day, their study showing the first run costs \$264.11, the second \$5.17 and the fourth \$3.26. School bus services have also been the subject of detailed regional case studies. For example in the case of the city of Lisbon, Portugal, Martínez and Viegas (2011) criticize the unreliability of public bus services used for the commuting of primary school students and suggest a new and optimised school bus system. Indeed designing and choosing a school bus service entails many considerations that have been considered in the literature with Moreira da Cruz et al. (2010) establishing very specific guidelines for schools in terms of outsourcing the contracts for such services. This school bus research is also complemented by more generic bus service research dealing with matters such as the placement and removal of bus stops (Delmelle et al., 2012) and the impacts of innovations such as real time information on modal choice relevant factors such as perceived wait times (Watkins et al., 2011).

As distinct from this research into alternative modes, the perceived factors that influence modal choices and potential shifts away from PCDOs for school children have also been assessed in the literature. Yeung et al. (2008) and Su et al. (2013) both report a number of common factors, e.g., distance, the age and gender of the child, provision of walking paths and adult supervision but find that commute distance is the principal factor influencing the choice of active commuting modes (i.e. non-motorised). Jensen (2008) places a particular emphasis on the provision of safe routes to school and hails this as a key factor in the success of related Danish programmes. Muller et al. (2008) incorporate spatial analysis to study the school travel mode choice of students and present a seasonally filtered mean travel distance by mode as part of the work, offering useful insight with regards to modal travel distances which is similarly explored in this paper.

Comparable research by Zuniga (2012) highlights similar barriers to active modes, explores the variation in parental attitudes and inclinations towards these modes and raises an important distinction between the notion of removing barriers and managing barriers. Zwerts et al. (2010) emphasized the effects of weather, safety, practicability, speed and comfort on the take-up of car driving in school commuting, whilst Lang et al. (2011) considers the parents transport decisions through focus groups and finds significant impacts of perceived distance, time constraints, concerns about children's health, fitness and competence, road safety, congestion and social norms. Thereafter recommending that a multifaceted approach is necessary where interventions seek to

¹ Both studies are from 2009. Mackett indicates that this share has not changed much since 1995.

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