



Contents lists available at ScienceDirect

Journal of Transport &amp; Health

journal homepage: [www.elsevier.com/locate/jth](http://www.elsevier.com/locate/jth)

# Intergenerational change in children's independent mobility and active transport in New Zealand children and parents

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## ARTICLE INFO

### Keywords:

Independent mobility  
unsupervised travel  
active transport  
prevalence

## ABSTRACT

**Background:** Previous research has indicated a decline in children's independent mobility; however, comparisons between directly-related generations are scarce. This study sought to determine the direct generational change in children's independent mobility and active transport in a large sample of New Zealanders.

**Methods:** 544 children (mean age  $12.2 \pm 0.6$  years) and 500 parents ( $43.9 \pm 5.8$  years) participated in the study. Independent mobility (IM) was measured with IM Licences (parental permission to travel unsupervised) and IM Index (summed score from a questionnaire of destinations independently travelled). Questions on active transport, organised activities, bicycle and vehicle ownership were also included. Parents recalled their behaviour retrospectively as 10–12-year-olds.

**Results:** Generalised linear modelling indicated that the proportion of parents who actively transported to and from school was significantly higher than in children (91.8% vs. 49.3% to school; 93.2% vs. 56.9% from school). The IM Index dropped generationally for both males (2.05 to 1.53) and females (1.77 to 1.40). Significant differences in IM Licences were also observed: parents being allowed to travel to school (OR 2.18 95% CI: 1.31, 3.63), cross main roads (OR 2.26 95% CI: 1.34, 3.71.), cycle main roads (OR 4.99 95% CI: 3.62, 6.87), and be out after dark (OR 3.05 95% CI: 2.12, 4.38) compared to children today. Bike ownership increased generationally with adults having an average of 2.5 bikes (95% CI: 2.37, 2.64) and children having 3.3 (95% CI: 3.05, 3.54). The average number of organised activities for adults was 1.8 (95% CI: 1.62, 1.89), which increased in children to an average number of 4.1 activities (95% CI: 3.89, 4.25).

**Conclusion:** These findings demonstrate a clear generational decline in children's independent mobility and active transport. Greater promotion of active modes of travel and unstructured roaming in the neighbourhood may be an important step in reversing the reduction in this fundamental behaviour.

## 1. Introduction

Physical inactivity is inextricably linked with lifestyle disease (Archer and Blair, 2011, World Health Organisation, 2010). The global prevalence of physical inactivity in youth (World Health Organisation, 2010, Currie et al., 2012) has prompted investigation into behaviours that may promote physical activity during this important developmental period. Recently, children's independent mobility and its apparent decline in recent years (Marquez et al., 2014, Stone et al., 2014) has gained interest as a potential contributor to low levels of physical activity. Independent mobility (IM) is defined as the ability to play and roam in the neighbourhood

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<http://dx.doi.org/10.1016/j.jth.2017.09.004>

Received 7 June 2016; Received in revised form 5 September 2017; Accepted 7 September 2017  
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without adult supervision, either alone or accompanied by peers (Badland et al., 2015). It has been posited that IM provides an important opportunity for physical activity accumulation through spontaneous outdoor play and the use of active modes of transportation, both of which have been linked to a greater probability of achieving recommended levels of physical activity (Duncan et al., 2008, Cooper et al., 2005, Loucaides and Jago, 2008, Cleland et al., 2008, Stone and Faulkner, 2014).

It is widely acknowledged that a number of psycho-social and environmental factors have contributed to the reduction in children's opportunities for independent exploration of the neighbourhood. Potential influences which have been suggested, include increased screen time (Stone et al., 2014), increased media coverage of crime (Miller et al., 2008) and changes in suburban form including a reduction in green spaces (Witten et al., 2013) and urban sprawl with limited public transport (Freeman and Quigg, 2009). In addition, a preferred focus on academic and sporting achievement has potentially lead to an increase in structured afterschool activities (Witten et al., 2013, Badland et al., 2015, Schoeppe et al., 2015a). Parental concerns for their child's safety from fast-moving traffic and the presence of strangers in the streets have consistently been reported as the most significant influences on children's IM (Schoeppe et al., 2015a, Prezza and Pacilli, 2007, Prezza et al., 2001, Tranter and Pawson, 2001). It has also been regularly reported that parents allow boys greater freedom for autonomous roaming than girls (Mackett et al., 2007, Hillman et al., 1990, Tranter and Pawson, 2001, Badland et al., 2011), although emerging research suggests that the overall decline in children's IM is reducing this gender disparity (Shaw et al., 2013, Bhosale et al., 2015). Other potential influencing factors, such as car ownership, bicycle ownership, and the frequency of organised activities has yet to be explored with reference to IM licenses and practices.

Another recent issue which has the potential to significantly influence children's IM has been the drastic increase in car ownership worldwide. Global rates have risen from approximately 500 million in 1986 to 1.015 billion motor vehicles in 2010, and are predicted to reach 2 billion worldwide by 2030 (Sperling and Gordon, 2009). Congruently, there has been a severe decrease in the use of walking and cycling as transport (active transport). In children, this has been most apparent in the decreased use of active transport to and from school. Many countries have reported findings that the majority of youth are driven to school including, Australia (van der Ploeg et al., 2007), Canada (Buliung et al., 2009), England and Norway (Fyhri et al., 2011). New Zealand is not immune; more than half of children's transport to and from school is by car (Auckland Regional Transport Authority, 2007), and overall walking in children aged 5–14 has decreased from an average of two hours and ten minutes per week in 1989/1990 to just under an hour and ten minutes per week in 2006/2009 (Ministry of Transport, 2010). It is likely there is a relationship between active transport and children's IM, with emerging evidence to indicate this (Villanueva et al., 2013), however further investigations with clear definitions of these terms are required to comprehensively understand this empirical relationship, especially across generations.

A number of investigations have attempted to quantify the decrease in children's IM. In England considerable decreases in children's IM licences (parental permission to be on their own) have been noted over last 40 years (Shaw et al., 2013). Specifically, the proportion of children aged 7–11 years travelling home from school without adult supervision was found to have dropped from 86% in 1971 to 25% in 2010 (Shaw et al., 2013). Similarly, a recent Australian study investigating children's mobility over a 20-year period found the proportion of 8–13-year-olds travelling home from school alone dropped from 68% to 31% (Schoeppe et al., 2015b). Research conducted in Norway (Hjorhol, 2002), Italy (Prezza, 2007), Finland (Kytta et al., 2015) and in other regions of England (Pooley et al., 2005) have shown comparable results.

Despite the accumulating research in this area, there remains a paucity of research exploring differences between IM across generations with directly related participants. Exploring intergenerational change in IM is crucial to accurately assess the extent of the decline, particularly given the influence of parental perceptions. A recent pilot study assessed differences in IM across three related generations (children, parents and grandparents). IM was measured through parental licences, allowances to go to certain locations (IM Index), and maximum independent roaming distance. Substantial intergenerational decreases were observed in all measures; however, this study was limited by very small sample size that lacked generalisability (Bhosale et al., 2015). In fact, the primary purpose of the pilot was to investigate the use of three distinct measures of IM to examine intergenerational change, but clearly a greater number of participants would be required to formulate generalizable conclusions. Similarly, in England a small study involving three generations from two families explored intergenerational changes in home range and found significant declines across each generation (Woolley and Griffin, 2015). In Australia, changes in neighbourhood use have been assessed between children aged 5–12 years old and their parents (Tandy, 1999). While this investigation did not specifically explore changes in IM, the difference in play-based activities was clearly seen, with children pursuing considerably more television- and computer-based interests than their parents.

In addition to a lack of direct intergenerational comparisons, there have been inconsistencies in the conceptual definition and measurement of IM, limiting comparisons between countries even further. While parental licences are a traditional measure of IM (Hillman et al., 1990, Shaw et al., 2013, Tranter and Pawson, 2001, Stone et al., 2014, Shaw et al., 2015), there are disparities in the precise distinction of a parental IM licence, and further elucidation around the level of supervision is required (Bhosale et al., 2015). Similarly, while active transport to and from school has been a popular measure (Mammen et al., 2012, Mackett, 2013, Yang et al., 2014, Schoeppe et al., 2014), it is possible that this journey is not undertaken independently and may not be a sufficient measure of IM on its own (Schoeppe et al., 2015b). Nonetheless, as a potential influencer of children's IM, knowledge of how active transport has declined generationally may offer further insight into the extent of this issue. Emergent investigations using location-based parental licences to form an IM Index have also been used; this has been shown to be correlated with more geographical IM measures via online mapping (Bhosale et al., 2015). It has lately been suggested that a mixed methods approach may provide a more in-depth assessment of IM (Bates and Stone, 2014). Thus, the primary aim of this study was to compare differences in a number of current and historical IM indicators in a large sample of children and their parents. A secondary aim was to explore generational changes in other potential predictors of IM: car ownership, bicycle ownership, and organised activities.

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