PHYSICAL ACTIVITY

Introduction

Participation in physical activity is important for children and young people's growth and development. It has been linked to the prevention of type 2 diabetes and improvements in skeletal health, self-esteem and depression [1]. Physical activity also plays an important role in preventing overweight and obesity, and the decline in physical activity in recent decades is thought to have contributed to rising obesity levels [2].

Worldwide, a range of environmental factors have been associated with the decline in physical activity, including reductions in active transport such as walking and cycling, and increases in sedentary leisure behaviours such as television watching [2,3,4]. Physical activity also appears to decline as children transition through adolescence [5].

The New Zealand Physical Activity Guidelines developed in 2007 by the Ministries of Health and Education, and Sport New Zealand, recommend that children and young people aged five to 18 years do sixty minutes or more of moderate to vigorous physical activity each day [6]. This should consist of a variety of activities, and it is recommended that less than two hours each day (out of school hours) should be spent in front of television, computers, and game consoles.

The following section reviews a range of physical and sedentary activities in children and young people using data from two sources: The Youth'12 Survey of secondary school students and the 2011/12 NZ Health Survey.

Youth'12 Survey

Youth'12 was the third national survey of Year 9–15 students (Years 14 and 15 are those students who are repeating Years 12 and 13) in New Zealand, with previous surveys having been undertaken in 2001 and 2007. The Youth'12 sample included 8,500 students aged 13–17+ years, which was approximately 3% of the 2012 New Zealand secondary school roll. In the survey, students were asked a range of questions about their level of physical activity and how they spent their leisure [7].

Data Sources and Methods

Definitions

1. *Proportion of secondary school students aged 13–17+ years who engaged in more than 20 minutes of vigorous physical activity on three or more occasions in the past 7 days*
2. *Proportion of secondary school students aged 13–17+ years who did 60+ minutes physical activity daily*
3. *Proportion of secondary school students aged 13–17+ years who participated in sports teams and clubs outside of school and the reasons given by those not participating, for non-participation*
4. *Time spent on selected sedentary leisure activities in secondary school students aged 13–17+ years*

Data Sources

The Youth'12 Survey

The data in this section are derived from *The Youth'12 Overview: The Health and Wellbeing of New Zealand Secondary School Students in 2012* [7], and its companion document the *Youth'12 Prevalence Tables* [8].

Notes on Interpretation

Survey Methodology and Sample: Youth'12 is the third national health and wellbeing survey of secondary school students in New Zealand, produced by the Adolescent Health Research Group (AHRG), with previous surveys being undertaken in 2001 and 2007. For composite and secondary schools with more than 150 Year 9–15 students, a random sample of 20% of the roll were invited to participate, while for schools with a roll of less than 150, 30 students were randomly asked to participate. Overall, 73% of invited schools took part, with 68% of students who were invited to participate agreeing to do so. This resulted in total sample of 8,500 students (3% of the 2012 New Zealand secondary school roll). Students were asked to provide their address to determine their census meshblock (NZDep 2006) [7].

Ethnicity Reporting: The Youth'12 ethnicity question was based on the NZ Census 2001/2006 ethnicity question, which asked students which ethnic group they belonged to, with multiple responses being possible. Students who had selected more than one ethnic group were also asked "Which is your main ethnic group (the one you identify with the most)?" Possible options also included the option "I can't choose only one ethnic group". For the purposes of comparing ethnic groups, Statistics NZ's ethnicity prioritisation methods were used [9], which reported five ethnic groups: Māori, Pacific, Asian, European and Other.

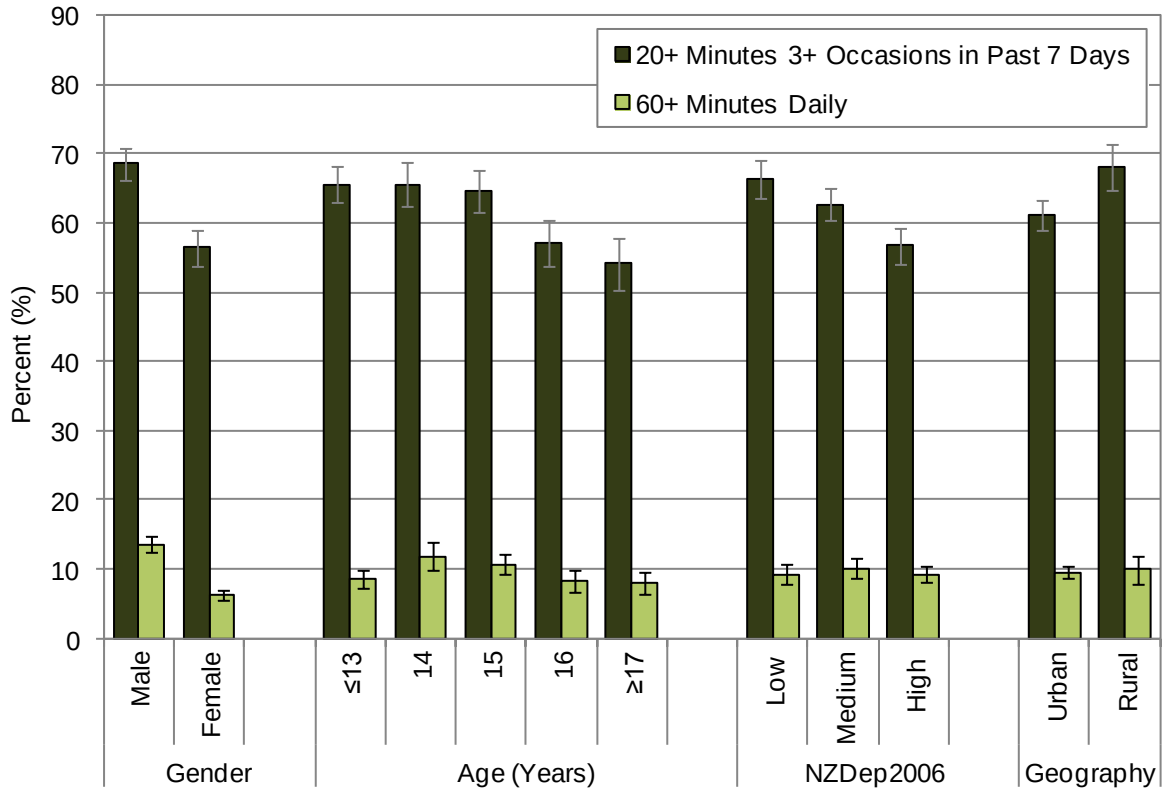
Students Participation in Physical Activity

In the Youth'12 survey, while 61.9% (95% CI 59.9–64.0) of students had participated in more than 20 minutes vigorous physical activity on three or more occasions in the past seven days, only 9.6% (95% CI 8.7–10.5) reported achieving the recommended 60+ minutes of physical activity daily.

The proportion of males (68.5% (95% CI 66.2–70.8) undertaking more than 20 minutes vigorous physical activity on three or more occasions in the past seven days was *significantly* higher than for females (56.6% (95% CI 53.9–59.1). Rates were also *significantly* higher for younger students (aged 15 years and younger) than for older students (16 years and over), and for students from less deprived (NZDep06 decile1–3) areas, than for students from more deprived (NZDep06 deciles 8–10) areas (66.3% (95% CI 63.5–69.1). vs. 56.7% (95% CI 54.2–59.3)). Rates were also *significantly* higher for students from rural (68.0% (95% CI 64.6–71.3) than urban (61.0% (95% CI 58.9–63.2) areas (**Figure 1**).

The proportion of males (13.6% (95% CI 12.4–14.7)) achieving the recommended 60+ minutes of physical activity a day was also *significantly* higher than for females (6.3% (95% CI 5.6–7.0). No *significant* differences were evident however, by NZDep06 decile or rural/urban area of residence (**Figure 1**).

Figure 1. Proportion of Secondary School Students Aged 13–17+ Years Who Engaged in More than 20 Minutes of Vigorous Physical Activity on 3+ Occasions in Past 7 Days, or Who Did 60+ Minutes Physical Activity Daily, New Zealand Youth'12 Survey



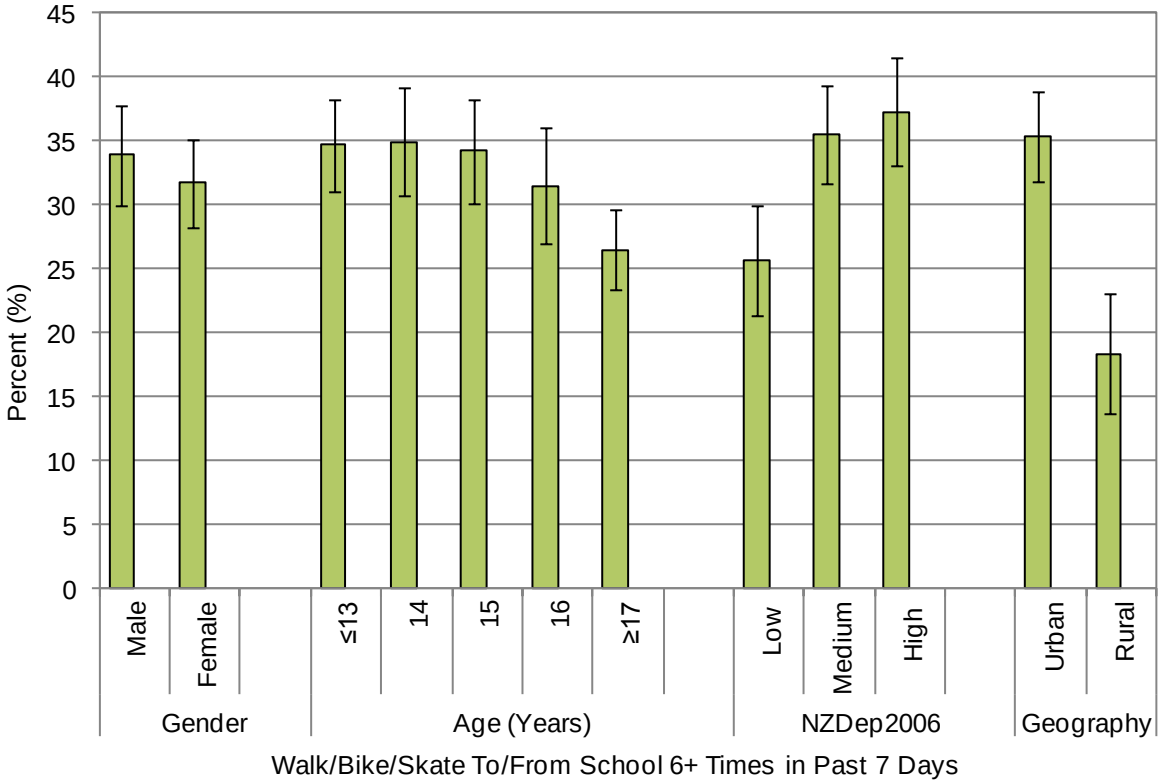
Source: Youth'12 Survey; Note: NZDep2006: Low = Deciles 1–3; Medium = Deciles 4–7; High = Deciles 8–10

Travel to School by Active Means

In the Youth'12 survey, 32.7% (95% CI 29.5–35.9) of students usually travelled to school by active means (walk, bike or skate) six or more times in the past seven days. Note: walking to school and home again on one day was counted as two times; walking to school and driving home was counted as one time.

While there were no *significant* gender differences in the proportion of students who usually travelled to school by active means, rates were *significantly* higher for students aged 15 years or less, than for those aged 17 years or older. In addition, a *significantly* higher proportion of students from more deprived (NZDep06 deciles 8–10) areas (37.2% (95% CI 33.0–41.5) usually travelled to school by active means, than did students from less deprived (NZDep06 decile1–3) areas (25.7% (95% CI 21.4–30.0). Rates were also *significantly* higher for students from urban (35.3% (95% CI 31.9–38.8) than rural (18.3 (95% CI 13.6–23.0)) areas (**Figure 2**).

Figure 2. Proportion of Secondary School Students Aged 13–17+ Years Who Walked, Biked or Skated To/From School 6+ Times in Past 7 Days, New Zealand Youth'12 Survey



Source: Youth'12 Survey; Note: Walking to school and home again on one day is counted two times; walking to school and driving home is counted once

Participation in Sports Teams and Clubs

In the Youth'12 Survey, 58.7% (95% CI 55.9–61.4) of students participated in sports teams or clubs outside of school hours, with participation rates being lowest for older students (17 or more years), those from more deprived (NZDep06 deciles 8–10) areas, and for students from urban areas. A range of reasons were given for non-participation amongst those who did not belong to a sports team or club, with the most frequent being not being interested, having other responsibilities, not being good enough at sport, and feeling shy, nervous or embarrassed (**Table 1**).

Table 1. Participation in Sports Teams and Clubs Outside of School and Reasons for Non-Participation, Secondary School Students Aged 13–17+ Years, New Zealand Youth'12 Survey

Participation or Reasons Given for non-Participation	Percent (%)	95% CI
Participates in a Sports Team or Club Outside of School	58.7	55.9–61.4
Reasons For Not Participating in Sports Teams or Clubs Outside School*		
It costs too much	14.3	12.6–16.1
I'm not good enough at sport	20.8	19.2–22.4
I'm not interested	39.4	37.2–41.6
It takes too much time	15	13.1–16.8
None of my friends are in sports	9.1	8.0–10.3
The sports I'm interested in aren't available	11.3	10.1–12.4
Can't get there	12.1	10.9–13.4
I would feel shy, nervous or embarrassed	17.5	16.0–19.0
I have other responsibilities	23.2	21.6–24.7
My parents wouldn't let me	4.7	3.5–5.8
I don't know	10.8	9.5–12.1
There are no sports facilities in my area	14.6	13.3–16.0
Other	3.9	3.1–4.6

Source: Youth'12 Survey; Note: *Reasons given are for students not involved in sports teams or clubs; students could choose more than one response so numbers do not sum to 100%

Time Spent in Sedentary Leisure

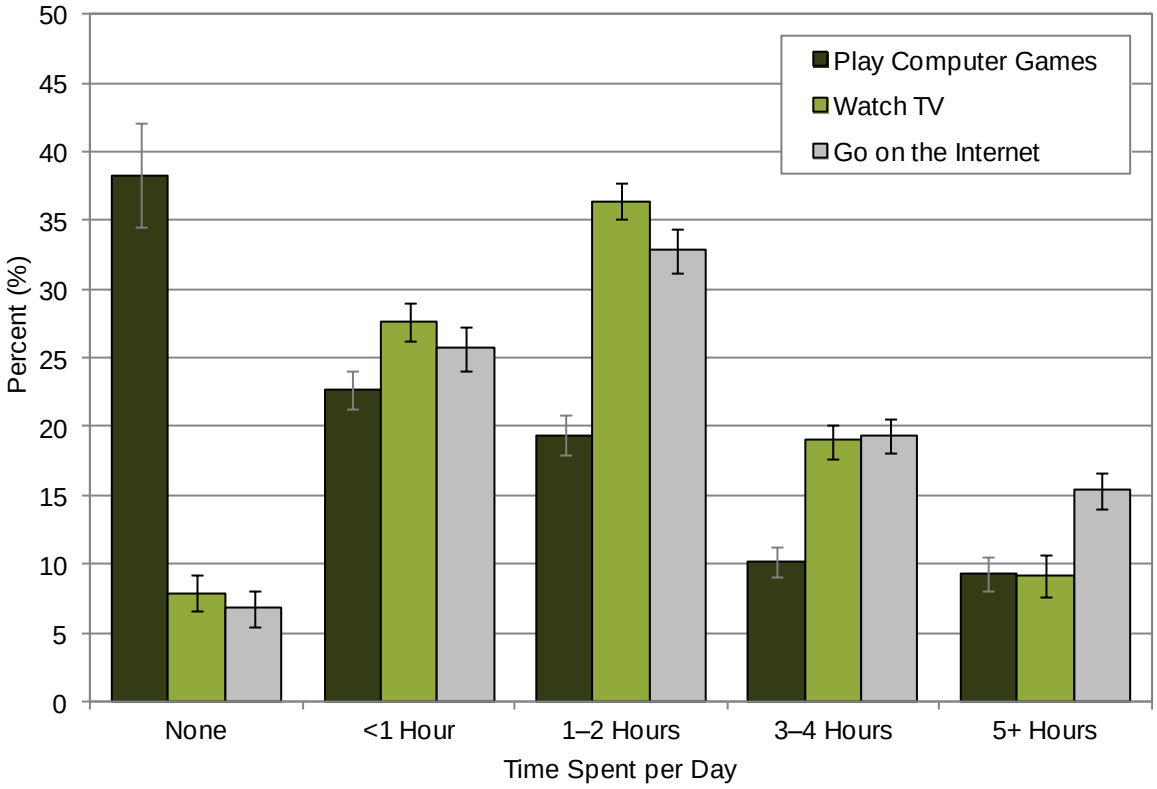
In the Youth'12 Survey 28.2% (95% CI 25.9–30.4) of students spent three or more hours each day watching TV, while 19.5% (95% CI 17.4–21.7) spent three or more hours playing computer games, and 34.8% (95% CI 33.2–36.4) spent three or more hours on the internet.

While there were no *significant* gender differences in the proportion of students who spent three or more hours watching TV, or going on the internet, the proportion of males (31.9% (95% CI 29.6–34.2)) who spent three or more hours playing computer games was *significantly* higher than for females (9.4% (95% CI 7.6–11.3)) (**Figure 3**, **Figure 4**).

When broken down by age, a *significantly* higher proportion of students 14 years or less spent three or more hours playing computer games than did those 17 years or older. In contrast, a *significantly* lower proportion of students aged 13 years or less spent three hours or more hours on the internet, than did those age 16 years or older. There were no *significant* age differences however, in the proportion that spent three or more hours watching TV (**Figure 3**, **Figure 4**).

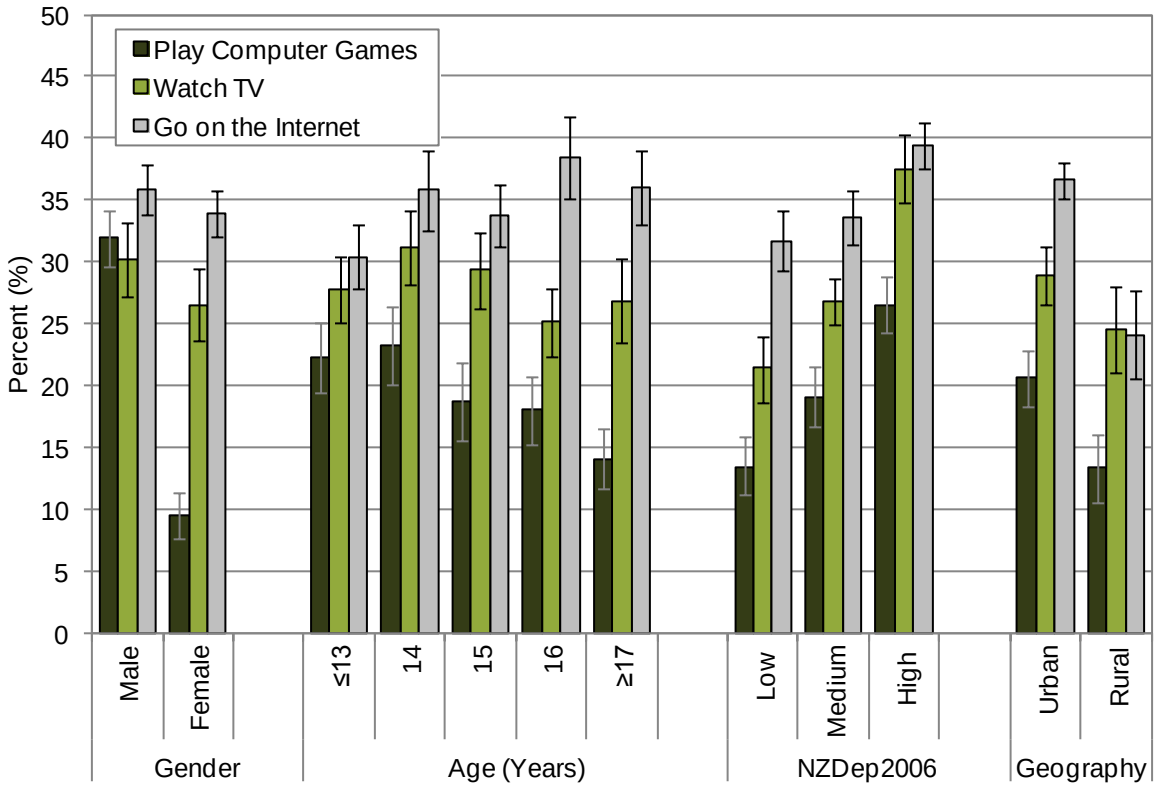
A *significantly* higher proportion of students from more deprived (NZDep06 deciles 8–10) areas spent three or more hours playing computer games, watching TV and going on the internet, than did those from less deprived ((NZDep06 deciles 1–3) areas. Similarly a *significantly* higher proportion of students from urban areas spent three or more hours playing computer games and going on the internet, than did students from rural areas (**Figure 3**, **Figure 4**).

Figure 3. Time Spent Per Day on Selected Sedentary Leisure Activities, Secondary School Students Aged 13–17+ Years, New Zealand Youth'12 Survey



Source: Youth'12 Survey; Note: Computer games excludes physically interactive computer games like Wii

Figure 4. Proportion of Secondary School Students Aged 13–17+ Years who Spend 3+ Hours Each Day on Selected Sedentary Leisure Activities, New Zealand Youth'12 Survey



Source: Youth'12 Survey; Note: Computer games excludes physically interactive computer games like Wii

The 2011/12 NZ Health Survey

In the 2011/12 NZ Health Survey [10], the parents of children aged under 15 years were asked about their child's television viewing habits, as well as whether they travelled to school (if aged five and over) by active means. Information on school transport was collected in a similar way to the 2006/07 NZ Health Survey, making it possible to compare changes over time. The following section briefly reviews changes in the proportion of children travelling to school by active means between the 2006/07 and 2011/12 NZ Health Surveys, as well as the proportion of children who usually watched two or more hours of television per day in the most recent 2011/12 NZHS.

Data Sources and Methods

Definitions

The proportion of children aged 5–14 years who usually use active transport to and from school

The proportion of children aged 2–14 years who usually watch two or more hours of television per day

Data Sources

The 2011/12 New Zealand Health Survey (NZHS)

In this section, the data on children aged 2–14 years were derived from *The Health of New Zealand Children 2011/12: Key Findings of the New Zealand Health Survey*, with data tables from this report being downloadable at http://www.health.govt.nz/publication/health-new-zealand-children-2011-12

Notes on Interpretation

Sample Size and Weighting: The 2011/12 NZHS [10] was a cross sectional survey carried out between July 2011 and August 2012, which collected information on 4,478 children aged from birth to 14 years, and 12,370 adults aged 15 years and over. The child survey included 2,968 European/Other, 1,592 Māori, 730 Pacific and 432 Asian children, with the data being weighted (e.g. to take into account response rates and individual item non-responses) to ensure that the results were representative of the total New Zealand child population. The weighted response rate for the child questionnaire was 85%, with the primary caregiver answering the questionnaire on their child's behalf.

Ethnicity: In the Survey, four ethnic groups were reported: Māori, Pacific, Asian and European/Other. Total response ethnicity was used throughout, with an individual being included in the analysis for each ethnic group to which they affiliated. As a result, ethnic groups cannot be directly compared with each other, with adjusted rate ratios which compare children by ethnicity comparing those in a particular group (e.g. Pacific) with those who are not in that ethnic group (e.g. non-Pacific) [10].

Age Standardisation: Age is an important determinant of health status. In the NZHS, all time trend results have been age-standardised, so that populations can be compared over time, and so that any differences reported are not due to changes in the population age structure. Similarly all rate ratio comparisons by gender, ethnicity and NZ Deprivation Index (NZDep) decile have been age adjusted, so that any differences identified cannot be attributed to differing age structures between the different population groups. The method of age standardisation used was the direct method using the World Health Organization (WHO) world population age distribution [10].

Other Standardisation and the Relative Index of Inequality: In addition to age standardisation, any ethnic comparisons have also been adjusted for gender. For neighbourhood deprivation comparisons (i.e. by NZDep) rate ratios refer to the relative index of inequality [10]. This compares neighbourhood deprivation after adjusting for age, sex and ethnic differences. The relative index of inequality can be interpreted in the same way as adjusted rate ratios, although it is calculated in a slightly different way.

Differences between estimates are said to be statistically significant when the confidence intervals for each rate do not overlap. Sometimes, however, even when there are overlapping confidence intervals, the difference between the groups can be statistically significant. Any differences between two variables where the confidence intervals overlap are tested using a t-test. The significance of a t-test is represented by the p-value. If a p-value is below 0.05, then we are 95 percent confident the difference between the two estimates is statistically significant [11].

Travel to School by Active Means

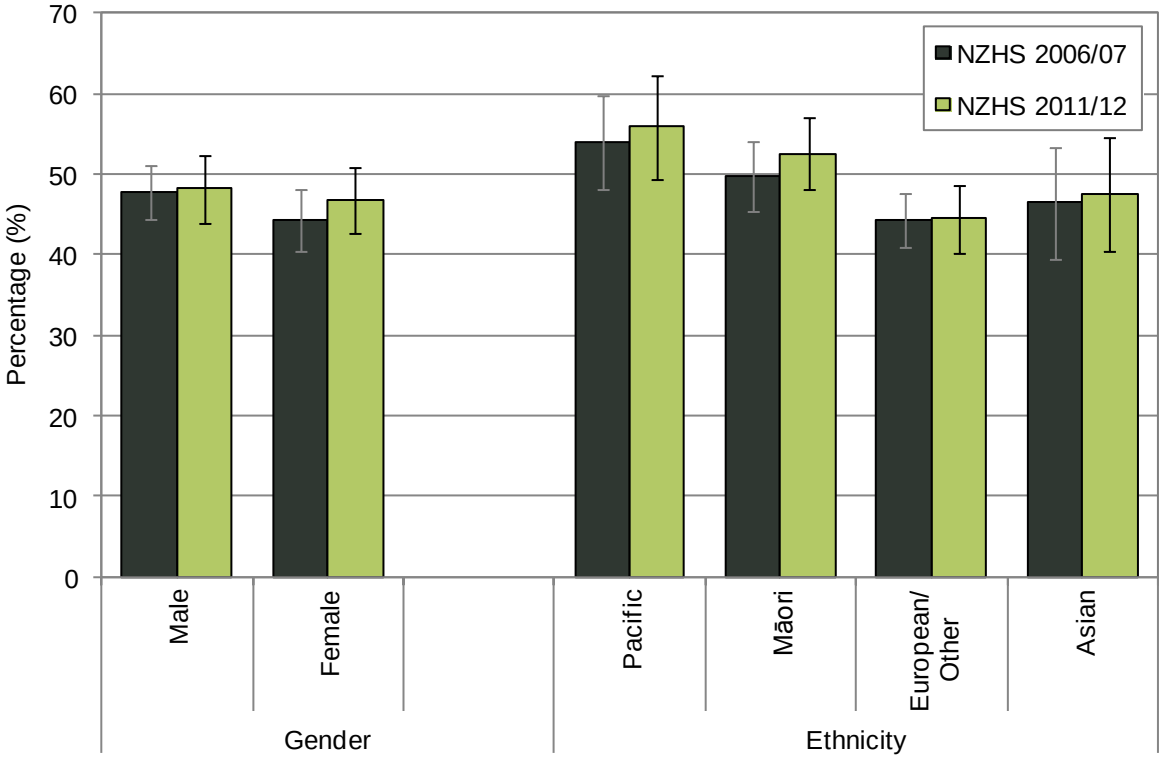
Trends in Proportion of Children Travelling to School by Active Means

Overall: The proportion of children aged 5–14 years who usually travelled to school by active means did not change *significantly* (p=0.51) between NZ Health Surveys, with rates being 46.1% (95% CI 43.3–48.8) in 2006/07 and 47.5% (95% CI 44.2–50.7) in 2011/12.

By Gender: When broken down by gender, the proportion of boys and girls aged 5–14 years who usually travelled to school by active means did not change *significantly* between the 2006/07 and 2011/12 Surveys (**Figure 5**). In the 2011/12 NZHS, once adjusted for age, there were also no *significant* gender differences in the proportion of children aged 5–

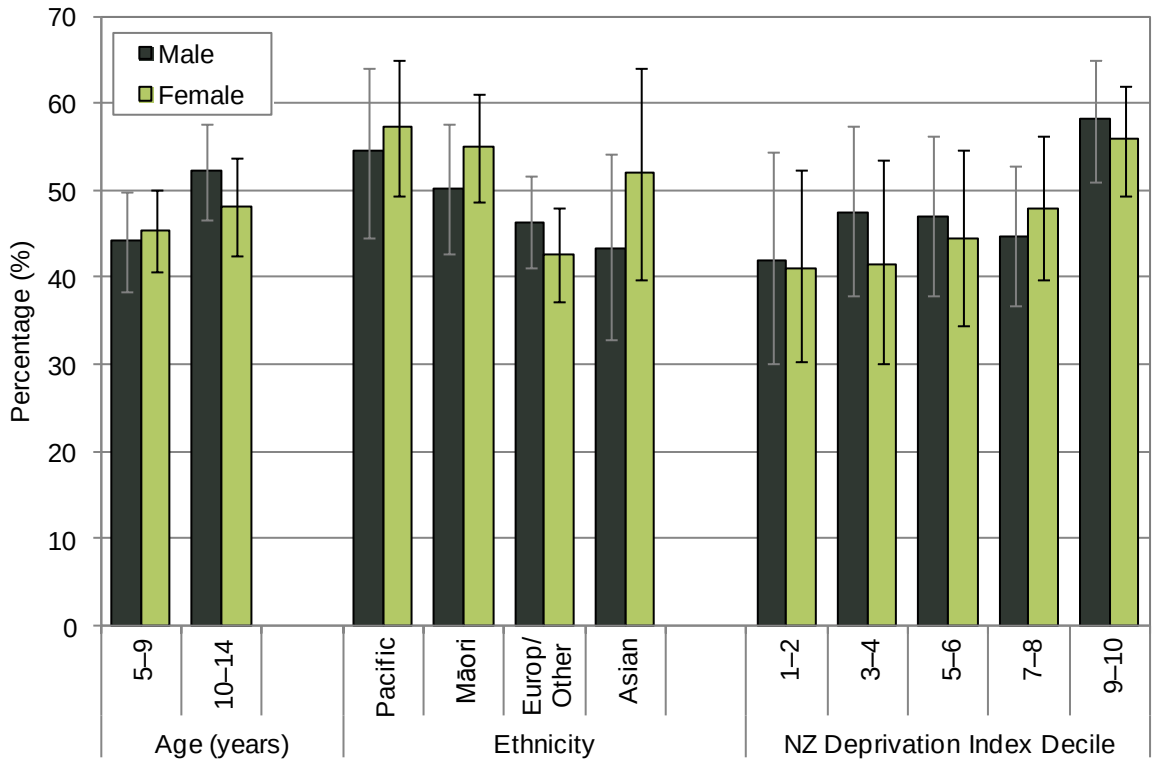
14 years who usually travelled to school by active means, with rates being 48.2% (95% CI 43.9–52.5) for boys and 46.7% (95% CI 42.7–50.8) for girls.

Figure 5. Proportion of Children Aged 5–14 Years Who Usually Use Active Transport to and From School by Gender and Ethnicity, 2006/07 and 2011/12 NZ Health Surveys



Source: 2011/12 New Zealand Health Survey

Figure 6. Proportion of Children Aged 5–14 Years Who Usually Use Active Transport to and From School by Gender, Age, Ethnicity and NZ Deprivation Index Decile, 2011/12 NZ Health Survey



Source: 2011/12 New Zealand Health Survey

By Ethnicity: When broken down by ethnicity, there were no *significant* changes in the proportion of Māori, Pacific, Asian and European/Other children who usually travelled to school by active means, between the 2006/07 and 2011/12 Surveys. In the 2011/12 NZHS, 52.6% (95% CI 48.1–57.0) of Māori, 55.9% (95% CI 49.4–62.2) of Pacific, 47.5% (95% CI 40.5–54.6) of Asian and 44.5% (95% CI 40.3–48.7) of European/Other children usually travelled to school by active means (**Figure 5**).

Current Distribution of Children Travelling to School by Active Means

Distribution by Age

In the 2011/12 NZ Health Survey, there were no *significant* differences in the proportion of younger (5–9 years (44.7% (95% CI 40.8–48.7))) and older (10–14 years (50.2% (95% CI 46.2–54.3))) children who usually travelled to school by active means. Similarly, no age-related differences were evident when rates were broken down by gender (**Figure 6**).

Distribution by Ethnicity

In the 2011/12 NZ Health Survey, once adjusted for age and gender, Māori children were *significantly* more likely (aRR 1.15 (95% CI 1.03–1.27)) than non-Māori children to travel to school by active means, with rates also being *significantly* higher for Pacific children (aRR 1.22 (95% CI 1.09–1.38)) than for non-Pacific children. No *significant* differences however were evident between Asian and non-Asian children.

Distribution by NZ Deprivation Index Decile

In the 2011/12 NZ Health Survey, once adjusted for age, ethnicity and gender, children from the most deprived (NZDep06 deciles 9–10) areas were *significantly* more likely to travel to school by active means than children in the least deprived (NZDep06 deciles 1–2) areas (aRR 1.26 (95% CI 1.04–1.52)).

Current Distribution of Children Watching 2+ Hours of Television per Day

Distribution by Age

In the 2011/12 NZ Health Survey, children aged 5–9 years (49.1% (95% CI 45.2–53.1)) were *significantly* less likely to watch two or more hours of television per day than children aged 10–14 years (57.8% (95% CI 54.5–60.9)). While still evident, these differences were no longer statistically significant when rates were broken down by gender (**Figure 7**).

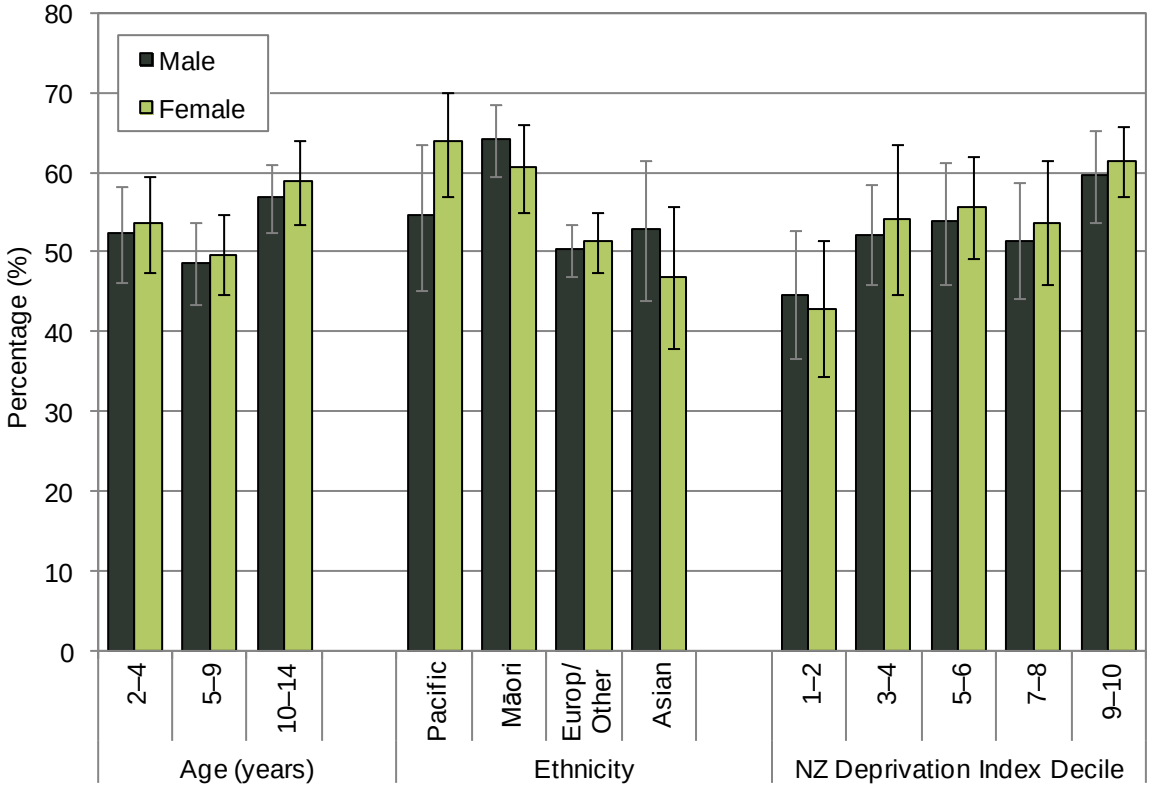
Distribution by Ethnicity

In the 2011/12 NZ Health Survey, once adjusted for age and gender, Māori children were *significantly* more likely (aRR 1.24 (95% CI 1.15–1.34)) than non-Māori children to watch two or more hours of television per day, with rates also being *significantly* higher for Pacific children (aRR 1.14 (95% CI 1.03–1.25)) than for non-Pacific children. No *significant* differences however were evident between Asian and non-Asian children.

Distribution by NZ Deprivation Index Decile

In the 2011/12 NZ Health Survey, once adjusted for age, ethnicity and gender, children from the most deprived (NZDep06 deciles 9–10) areas were *significantly* more likely to watch two or more hours of television per day than children in the least deprived (NZDep06 deciles 1–2) areas (aRR 1.19 (95% CI 1.03–1.39)).

Figure 7. Proportion of Children Aged 2–14 Years Who Usually Watch 2+ Hours of Television per Day by Gender, Age, Ethnicity and NZ Deprivation Index Decile, 2011/12 New Zealand Health Survey



Source: 2011/12 New Zealand Health Survey

Local Policy Documents and Evidence-Based Reviews Relevant to Physical Activity in Children and Young People

In New Zealand a number of local policy documents relate to physical activity in children and young people, and these are briefly summarised in **Table 2**, along with a range of systematic and other reviews which consider these issues in the overseas context.

Table 2. Local Policy Documents and Evidence-Based Reviews Relevant to Physical Activity

Ministry of Health Policy Documents
Ministry of Health. **Be active every day: Physical activity for 5- to 18-year-olds**. Wellington: Ministry of Health. https://www.healthed.govt.nz/resource/be-active-every-day-physical-activity-5-18-year-olds This health information leaflet, based on Ministry of Health physical activity guidance (http://www.health.govt.nz/our-work/preventative-health-wellness/physical-activity), provides advice to parents and carers on physical activity for five to 18 year olds. At least 60 minutes of moderate to vigorous physical activity each day is recommended. Using a mixture of activities to encourage aerobic fitness, strength and flexibility is advised and examples of moderate and vigorous intensity activities are given. There are no specific guidelines for children under five years, but Sport New Zealand provides active movement guides for nought to five year olds (http://www.sportnz.org.nz/en-nz/young-people/Ages-0-5-Years/Active-Movement-Resources1/).
Other Government Publications
Sport and Recreation New Zealand. 2007. **It's All About Children and Young People: Implementing a child/young person centred philosophy in sport and recreation**. Wellington: Sport and Recreation New Zealand. http://www.sportnz.org.nz/en-nz/young-people/Guidelines--Resources/ This report provides guidelines for organisations and individuals that run sport and recreation programmes for children and young people (aged 0–24 years). The guidelines aim to encourage the development of a child/young person centred philosophy that ensures that children and young people receive the greatest possible value from their participation and are encouraged to continue to participate over time.
Cochrane Systematic Reviews
Dobbins M, et al. 2009. **School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6-18**. Cochrane Database of Systematic Reviews doi:10.1002/14651858.CD007651 http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD007651/abstract This review assessed the effectiveness of school-based interventions in promoting physical activity and fitness in children and adolescents. The review included 26 studies that were deemed of sufficient quality, most of which were conducted in the United States, with a smaller number from Europe and Australia. Participants ranged in age from six to 18 years. All the projects had a control group that represented either a school or group of schools from a different community, city or state that did not receive the intervention. Overall, school-based interventions had positive effects on duration of physical activity, television viewing, VO_2 max (maximal oxygen uptake or aerobic capacity, reflects the physical fitness level of an individual and generally increases as fitness levels improve), and blood cholesterol, but no effect on leisure time physical activity rates, systolic and diastolic blood pressure, body mass index, and pulse rate. There was no evidence of harmful effects and the authors recommend ongoing physical activity promotion in schools.
Ekeland E, et al. 2004. **Exercise to improve self-esteem in children and young people**. Cochrane Database of Systematic Reviews doi:10.1002/14651858.CD003683.pub2 http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD003683.pub2/abstract This review sought to determine whether exercise alone or exercise as part of a comprehensive intervention can improve self-esteem among children and young people. Twenty-three RCTs (1,821 participants, aged 3 to 20 years) were included in the review. The trials were mostly small in size and of low quality. Thirteen trials compared exercise alone with no intervention, eight of which were included in the meta-analysis, which found heterogeneous results. Twelve trials compared exercise as part of a comprehensive programme with no intervention, only four of which provided data sufficient to calculate overall effects, indicating a moderate short-term difference in self-esteem in favour of the intervention (SMD 0.51, 95% CI 0.15 to 0.88). The authors conclude that the evidence suggests that exercise has positive short-term effects on children's self-esteem, but further well-designed research is required.

Other Systematic Reviews
van Grieken A, et al. 2012. **Primary prevention of overweight in children and adolescents: a meta-analysis of the effectiveness of interventions aiming to decrease sedentary behaviour**. International Journal of Behavioral Nutrition and Physical Activity, 9(1), 61.
This meta-analysis assessed the effects of interventions, implemented in schools and the general population, aimed at preventing high levels of sedentary behaviour (e.g. television/DVD watching) on the amount of sedentary behaviour and BMI. Thirty-four studies (4 controlled trials and 30 RCTs) reporting 33 different interventions, from the USA, Europe and Australasia lasting seven days to four years, were included in the analysis. Follow-up was post-intervention in the majority of studies. Significant reductions in sedentary behaviour and BMI were identified. The post-intervention mean difference in sedentary behaviour was −17.95 min/day (95% CI -26.61 to -9.28) and the change-from-baseline mean difference was −20.44 min/day (95% CI -30.69 to -10.20). The post-intervention mean difference in BMI was −0.25 kg/m² (95%CI -0.40 to -0.09). No significant differences were found between single and multiple health behaviour interventions. The authors conclude that school and population based health behaviour intervention can lead to significant reductions in sedentary behaviour, although longer term follow-up is needed to assess the sustainability of such interventions.
Metcalf B, et al. 2012. **Effectiveness of intervention on physical activity of children: systematic review and meta-analysis of controlled trials with objectively measured outcomes (EarlyBird 54)**. BMJ, 345, e5888.
This review sought to determine whether, and to what extent, physical activity interventions affect the overall activity levels of children. Thirty studies, with 14,326 participants (range 18 to 2,840) were included in the review (27 RCTs and 3 controlled clinical trials); a subgroup of 6,153 children (range 18 to 1,138) was assessed using accelerometers across these studies. Sixteen studies were judged to be of high quality. Most interventions were school based or conducted in the family home and provided activity or exercise sessions. Meta-analysis across all 30 studies showed a statistically significant effect in favour of the intervention group for both total physical activity (SMD 0.12, 95% CI 0.04 to 0.20) and moderate or vigorous physical activity (SMD 0.16, 95% CI 0.08 to 0.24). These differences were considered to be small and of limited clinical significance. Meta-regression indicated that the pooled intervention effect did not differ significantly between any of the subgroups. The authors conclude that the review provides strong evidence that physical activity interventions have had only a small effect (approximately 4 minutes more walking or running per day) on children's overall activity levels. It is suggested that this may help to explain why such interventions have had limited success in reducing the body mass index or body fat of children, although these outcomes were not assessed in the review.
Demetriou Y & Höner O. 2012. **Physical activity interventions in the school setting: A systematic review**. Psychology of Sport and Exercise, 13(2), 186-96.
This review assessed the effectiveness of school-based interventions with a physical activity component on psychological determinants, physical activity, and health outcomes. The review included 129 studies, most of which included at least 250 children and were of between four and 12 months duration. Only ten studies were assessed to be of high quality. Meta-analysis was not possible due to heterogeneity of the studies and the review just presents numbers and/or percentages of studies with or without significant findings without an indication of effect sizes or confidence intervals. Seventy-five studies investigated BMI as a health and fitness outcome and 28% found a positive effect of the intervention, 2.7% found a negative effect and 69.3% found no effect. Seventy-four studies investigated physical activity and 56.8% found a positive effect, 6.8% found a negative effect and 36.4% found no effect. A positive intervention effect was found in 87.5% of 16 studies that investigated knowledge as a psychological determinant. Seven of 16 studies that investigated attitudes reported positive treatment effect and two reported a negative effect, and four of 14 studies that investigated motivation or enjoyment found a positive effect. Studies of adolescents more frequently reported significant differences in BMI between intervention and control group than did studies of children, and studies that combined a physical activity programme with a cognitive approach were more likely to report reduced BMI than studies that investigated an activity intervention only. Low quality studies reported significant results more frequently than studies of moderate or high methodological quality. It is difficult to draw conclusions from this review given the lack of effect sizes or confidence intervals.
Leung MM, et al. 2012. **Intervening to Reduce Sedentary Behaviors and Childhood Obesity among School-Age Youth: A Systematic Review of Randomized Trials**. Journal of Obesity, 2012.
This review assessed the effectiveness of interventions that focus on reducing sedentary behaviour (SB) among school-age children. Twelve randomised trials, which lasted at least 12 weeks, aimed at decreasing SB among children aged 6 to 19 years were included. Most of the studies were conducted in school settings. Heterogeneity of the studies meant that a quantitative analysis was not possible. Overall, interventions that focused on decreasing SB were associated with reduction in time spent on SB and/or improvements in anthropometric measurements related to childhood obesity. Several of the studies considered elements related to the potential for translation of the intervention into practice settings. However, only five of the studies incorporated post-intervention follow-up measures, which ranged from 5 to 12 months, so the long-term sustainability of these interventions is unknown.

Dudley D, et al. 2011. **A systematic review of the effectiveness of physical education and school sport interventions targeting physical activity, movement skills and enjoyment of physical activity**. European Physical Education Review, 17(3), 353-78.

This review assessed the effectiveness of physical education in promoting participation in physical activity, enjoyment of physical activity and movement skill proficiency in children and adolescents. Twenty-three studies (13 RCTs and 10 controlled trials) were included in the review, 19 of which assessed physical activity participation, four assessed movement skill proficiency, and seven enjoyment of physical activity. Two (of the 10 controlled trials and six of the RCTs were judged to be of high methodological quality. Heterogeneity in interventions and outcomes precluded meta-analysis. The most effective strategies to increase children's levels of physical activity and improve movement skills in physical education were direct instruction teaching methods and providing teachers with sufficient and ongoing professional development in using these instruction methods. Interventions aimed at improved enjoyment lacked statistical power and were of insufficient quality to draw conclusion. Overall, the lack of effect size and confidence intervals makes it difficult to draw conclusion from the review and further research is needed.

Chillon P, et al. 2011. **A systematic review of interventions for promoting active transportation to school**. International Journal of Behavioral Nutrition and Physical Activity, 8(1), 10.

This review assessed active school transport intervention studies with the aim of guiding future research. Fourteen studies (3 RCTs and 11 quasi-experimental/observational design studies) involving at least 10.605 children, were included in the review. Most of the studies were conducted in elementary schools in urban settings in the USA, UK and Australia. The interventions included elements of preparation, promotion, programmes, projects and/or policy strategies. Quality was weak in all the included studies, including problems of confounding, representativeness and validity of outcome measures. Twelve studies reported a 3% to 64% increase in percentage of active transportation to school following the intervention and two studies showed no difference. Interventions with a specific goal seemed to be more effective than interventions with a broader focus. While intervention to increase active transport to school was deemed promising, the evidence base was limited and further research, including long term outcomes to assess sustainability, is needed.

Biddiss E & Irwin J. 2010. **Active video games to promote physical activity in children and youth: A systematic review**. Archives of Pediatrics & Adolescent Medicine, 164(7), 664-72.

This review assessed levels of metabolic expenditure and changes in activity patterns associated with active video game (AVG) play (e.g. Wii, Sony EyeToy) in children and young people (≤21 years) and to provide directions for future research. Seventeen small studies (11 to 60 participants), including three RCTs, were included in the review. Activity levels during AVG play were highly variable: percentage increases in energy expenditure from rest ranged from 100% to 400% (mean 222%); percentage increases in heart rate from 26% to 98% (mean 64%). Percentage increases in heart rate and energy expenditure were significantly lower for games that primarily used upper body movements compared with those that engaged the lower body (difference, −148%; 95% CI −231% to −66%; p=0.001). Drop-out rates after 12 weeks ranged from zero to 41%. The authors conclude that while AVGs appear to enable light to moderate physical activity, there is limited evidence to draw conclusions on their long-term efficacy for physical activity promotion.

Other Relevant Evidence

National Institute for Health and Clinical Excellence. 2009. **Promoting physical activity, active play and sport for pre-school and school-age children and young people in family, pre-school, school and community settings**. London: National Institute for Health and Clinical Excellence. http://www.nice.org.uk/PH17

These evidence-based guidelines are aimed at all those involved in promoting physical activity among children, including health and education providers, parents and carers. Recommendations are provided on: how to promote the benefits of physical activity and encourage participation; high level strategic planning; the importance of consultation with children and young people and how to set about it; planning and providing spaces, facilities and opportunities; training people to run programmes and activities; and how to promote physically active travel such as cycling and walking. The guidelines were reviewed in 2012 and it was concluded that no update was required.

National Institute for Health and Clinical Excellence. 2008. **Promoting and creating built or natural environments that encourage and support physical activity**. London: National Institute for Health and Clinical Excellence. http://www.nice.org.uk/PH8

These evidence-based guidelines (reviewed in 2011) provided recommendations on how to improve the physical environment to encourage physical activity, to all those with influence on or responsibility for the built or natural environment. Seven recommendations cover strategy, policy and plans, transport, public open spaces, buildings and schools, including: ensuring planning applications for new developments always prioritise the need for people (including those whose mobility is impaired) to be physically active as a routine part of their daily life; ensuring pedestrians, cyclists and users of other modes of transport that involve physical activity are given the highest priority when developing or maintaining streets and roads; planning and providing a comprehensive network of routes for walking, cycling and using other modes of transport involving physical activity; and ensuring public open spaces and public paths can be reached on foot, by bicycle and using other modes of transport involving physical activity.

Note: The publications listed were identified using the search methodology outlined in Appendix 1 (Search Methods for Policy Documents and Evidence-Based Reviews)

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