



Bicycle Helmet Use Among Winnipeg Cyclists: 2012 Observational Study

Prepared by
IMPACT, the Injury Prevention Program of the
Winnipeg Regional Health Authority
490 Hargrave Street, 2nd Floor
Winnipeg, Manitoba, Canada
R3A 0X7
Phone: 204-940-8300
Fax: 204-940-2690

22 April 2012

Table of Contents

Executive Summary	3
Introduction	4
Method	4
Results	5
<i>Overall Bicycle Helmet Use</i>	6
<i>Incorrect Bicycle Helmet Use</i>	6
<i>Bicycle Helmet Use by Age</i>	7
<i>Bicycle Helmet Use by Community Area</i>	8
<i>Bicycle Helmet Use and Socioeconomic Status</i>	9
<i>Bicycle Helmet Use by Gender</i>	12
<i>Bicycle Helmet Use and Riding Companions</i>	13
<i>Helmet Use by Site Type</i>	14
<i>Helmet Use and Use of Headphones</i>	15
Discussion	15
References	16

Executive Summary

This report summarizes research on bicycle helmet use among Winnipeg cyclists observed during the spring and summer of 2012, as well as trends in helmet use from 1996 to 2012. In 2012, 1682 cyclists were observed across 203 sites. Data indicate that the rate of helmet use among Winnipeg cyclists has increased from 23% in 1996 to 41.9% in 2011 and 40.0% in 2012. In 2012, helmet use varied considerably by Community Area with the lowest rate of helmet use in Point Douglas and Transcona (24.1% and 33.9% respectively) and the highest rate of helmet use in River Heights and Fort Garry (50.5% and 46.3% respectively). Helmet use is consistently lower in communities with lower Median Total Family Income and a higher percentage of individuals living below the low income cut-off (LICO). From 1996 to 2012 helmet use increased by 22.9% in the lowest income areas and 16.4% in the highest income areas. This suggests that helmet use is increasing in all populations irrespective of income but the difference in helmet use by socioeconomic status is narrowing. Helmet use also differed by gender and age. More females were observed wearing helmets than males (45.5% compared to 38.7%), and helmet use was highest among children under 12 years of age (62.1%) and lowest among youth between 12 and 19 years of age (22.2%). Data indicate that 29.9% of cyclists do not wear their helmets correctly, and incorrect helmet use is most common in children (48.2%) and least common in adults (26.3%). Interestingly, helmet choices of riding companions strongly influence whether or not a cyclist is likely to wear a helmet. When cyclists are helmeted, they are most often accompanied by other helmeted riders; whereas, if cyclists are unhelmeted, they are most often accompanied by unhelmeted companions. There was no difference in helmet use based on type of observation site (i.e., cycle path, major intersection, park, residential street, or school) or headphone use.

Introduction

Cycling is a popular summer-time activity among people of all ages, especially for children 5 to 12 years of age, with 90% of individuals in this age group participating.¹ Considering this, it may not be surprising that cycling injuries are the most common injury of summer sports and recreational activities. According to the Canadian Institute for Health Information, half of all hospital admissions are comprised of cycling injuries.² The most common types of injuries sustained during cycling are fractures (32%) and (14%) head injuries.³ Data from the Children's Hospital Injury Reporting and Prevention Program (CHIRPP) for the Winnipeg Children's Hospital Emergency Department show that from 2007-2009 an average of 103 cyclists were seen each year due to cycling injuries.⁴ As CHIRPP only includes a portion of individuals who present to the Children's Emergency Department, and does not include information from the other Emergency Departments throughout Winnipeg, this likely greatly under-represents the number of cyclists seen in Winnipeg Emergency Departments each year. According to the Office of the Chief Medical Examiner, between 2001 and 2010, an average of three Manitobans died as a result of cycling injuries every year.⁵ Head injuries are the cause of 80-90% of bicycle-related deaths^{6,7} and there is considerable evidence to suggest that helmet use reduces the risk of head injury by 85-88%.⁸ Studies have shown that helmet use can be improved by bike helmet legislation^{9,10} and community-based interventions involving education, promotion, and/or the distribution of free helmets.^{11,12}

One of the priority areas of the Injury Prevention Program (IMPACT) of the Winnipeg Regional Health Authority (WRHA) is to prevent injuries to cyclists. We aim to achieve this through public education, advocacy for safe active transportation policies and legislation, improvements in active transportation infrastructure, promotion of safety equipment and behaviours, and integrated data collection, research, and program evaluation. To determine the rate of bicycle helmet use in Winnipeg and the changes in helmet use over time, IMPACT conducts regular observational research on helmet use among cyclists across Winnipeg community areas.

Method

Bicycle helmet use has been observed and documented in the following years: 1996 through 1998, 2003, 2004, 2006, 2008, 2010, 2011, and 2012. Repetition of these observations using consistent methodology sites has allowed for the tracking of helmet use trends over time. Originally the dataset included 190 Winnipeg sites; however, in 2010, 13 new sites were added to capture helmet use at elementary schools located in low-income areas. Therefore, in 2012, bicycle helmet observations were conducted at 203 sites. Data collection in 2012 began in late April and was completed by the end of June. Observation sites included parks, schools, residential streets, major intersections, and cycling paths. One-sixth of the observations were conducted on weekends, one-sixth were conducted on weekday evenings, and the remaining two-thirds were conducted during the day on weekdays. Helmet use was evaluated with consideration of a number of factors including age (<8, 8-11, 12-15, 16-19, adult), gender, correct helmet use, number of riding companions, and headphone use.

Bicycle helmet use was evaluated with a consideration of socioeconomic status. In 2008, the technique for assigning socioeconomic status levels to observation sites was restructured using more recent data on neighborhood income. The Winnipeg Health Region is divided into 12 Winnipeg Community Areas and 25 Neighborhood Clusters.

The 203 bicycle observation sites were assigned to these 25 Neighbourhood Clusters and 12 Community Areas using Community Area maps. This was done to align the bicycle observation sites into geographic areas that have published socioeconomic indicators such as income, education levels, and measures of poverty.

The 2004 Winnipeg Community Health Assessment reported a number of socioeconomic indicators for each Neighbourhood Cluster in Winnipeg.¹³ Median Total Family Income was determined by finding the median value for family income in the 25 Neighbourhood Clusters in Winnipeg. Clusters in Community Areas were grouped together and categorized in one of four Median Total Family Income brackets: \$26,583-42,556, \$42,557-54,726, \$54,727-64,944 and \$64,945-83,654. The LICO is derived from Statistics Canada and represents the income threshold below which a family or individual will spend a larger proportion of their after-tax income on necessities such as food, shelter, and clothing relative to an average family or individual.¹⁴ Thus, the LICO represents the income level at which a family or individual may have financial difficulties. The percentage of people in a Community Area that fell below the LICO was also divided into four categories: 4-11% (i.e., low poverty), 11.1-22%, 22.1-34% and 34.1-58% (i.e., high poverty).

All of the observation sites were recoded allowing for the comparison of helmet use by socioeconomic indicators over time. Median family income and LICO are both included, as they measure different aspects of neighborhood socioeconomic status. Neighborhoods can be heterogeneous, having a mix of high and low income households (for example, downtown Winnipeg). In such cases, one may identify an average median family income, even though a relatively high proportion of families are living below the poverty line. For neighborhoods that are more homogenous, the median family income and LICO may be more closely correlated measures of neighborhood socioeconomic status.

Results

In total 19,533 Winnipeg cyclists have been observed between 1996 and 2012. Table 1 outlines the number of cyclists observed each year. In 2012, 1682 cyclists were observed across 203 sites. No cyclists were observed at seven sites, leaving a total of 196 sites with cycling observations.

Table 1. Cyclist Observations by Year, 1996-2012

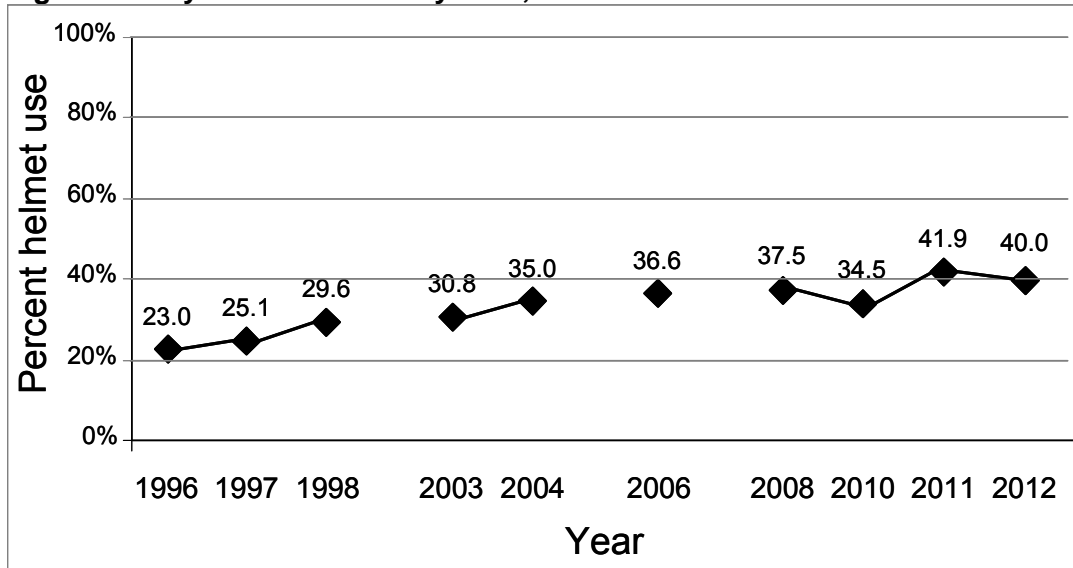
Year	Number of cyclists
1996	2314
1997	1886
1998	1593
2003	1648
2004	1936
2006	2976
2008	1393
2010	2870
2011	1235
2012	1682

Overall Bicycle Helmet Use

In 2012, overall bicycle helmet use for all ages combined was 40.6% for all 203 sites where observations occurred.

Helmet use in 2012 was 40% for the 190 sites that have been included in the dataset since 1996. Figure 1 illustrates the percentage of helmet use by year for all ages combined from 1996 to 2012 using data from 190 sites. Helmet use rates have increased from 23% in 1996 to 40% in 2012.

Figure 1. Bicycle Helmet Use by Year, 1996-2012



Incorrect Bicycle Helmet Use

Correct helmet use was observed for 70.1% of bicycle helmet users (Table 2). Data was missing for four cyclists.

Table 2. Correct and Incorrect Bicycle Helmet Use, 2012

Correct or Incorrect Use	Proportion Correct Helmet Use (n)
Correct use	70.1% (476)
Incorrect use	29.9% (203)
Total	100% (679)

The reason for incorrect helmet use was documented in 202 cases (Table 3). The most common reasons for incorrect use were wearing the helmet too far back (i.e., greater than two finger widths above the eyebrows, 75%) or wearing the helmet too far forward (i.e., less than two finger widths above the eyebrows, 15%).

Table 3. Type of Incorrect Helmet Use, 2012

Reason	Number (%)
Back	151 (74.8)
Forward	30 (14.8)
Straps	19 (9.4)
Size	1 (0.50)
Sideways	1 (0.50)
Total	202 (100)

When correct helmet use was examined by age, data indicate that younger riders were more likely to wear their helmet incorrectly. Incorrect use was highest for children less than eight years of age (48.2%) and lowest for adults (26.3%). Rate of incorrect helmet use was 45.5% among children 8-11 years of age, 35.5 % for those 12-15 years of age and 37.5% for youth 16-19 years of age. Data suggest that the ability to properly wear a bicycle helmet increases as the child ages. Although incorrect helmet use is still a problem, there has been a substantial decrease in incorrect use over time from 79% in 1996 to 29.9% in 2012.

Bicycle Helmet Use by Age

Helmet use data by age was collected for the five age categories listed in Table 4. Across the 203 sties, the majority of cyclists observed were adults (65.5%). Bicycle helmet use was highest in children less than eight years of age (66.7%), and lowest in teens 16 – 19 years of age at 14.9%. The rate of helmet use by age group relationship was significant which suggests that bike helmet use decreases with age, progressing from child to youth categories then rising for adults ($X^2=117.37$, $p<.001$).

Table 4. Bicycle Helmet Use by Age, 2012

Age Group	Helmet Use % (n)	Cyclists Observed % (n)
Less than 8 years	66.7 (28)	2.5 (42)
8-11 years	59.5 (44)	4.4 (74)
12-15 years	32.8 (62)	11.2 (189)
16-19 years	14.9 (41)	16.4 (276)
Adults	46.1 (508)	65.5 (1101)
Total	100 (683)	100 (1682)

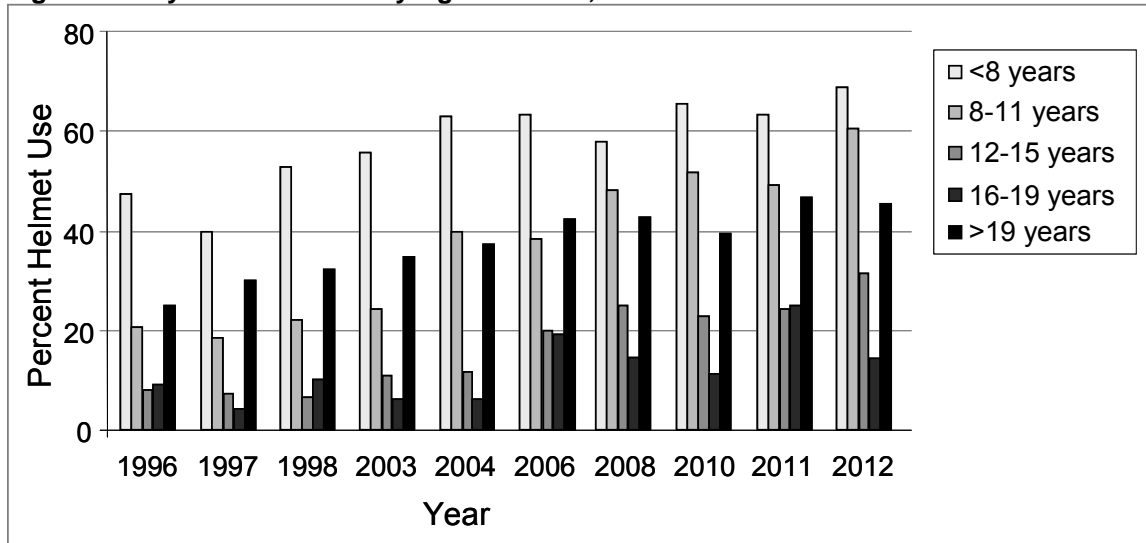
Data were also combined into three age groups to represent children, youth, and adults (Table 5). Consistent with the data presented above, helmet use was highest among children and lowest among youth. Differences among the three categories were statistically significant ($X^2= 101.81$, $p<.000$).

Table 5. Bicycle Helmet Use by Age Category, 2012

Category	Age Group	Helmet Use % (n)	Cyclists Observed % (n)
Child	< 12 years	62.1 (72)	6.9 (116)
Youth	12-19 years	22.2 (103)	27.6 (465)
Adult	>19 years	46.1 (508)	65.5 (1101)
Total		100 (683)	100 (1682)

Figure 2 shows the change in helmet use over time by age group for the 190 sites where data has been collected since 1996.

Figure 2. Bicycle Helmet Use by Age and Year, 1996-2012

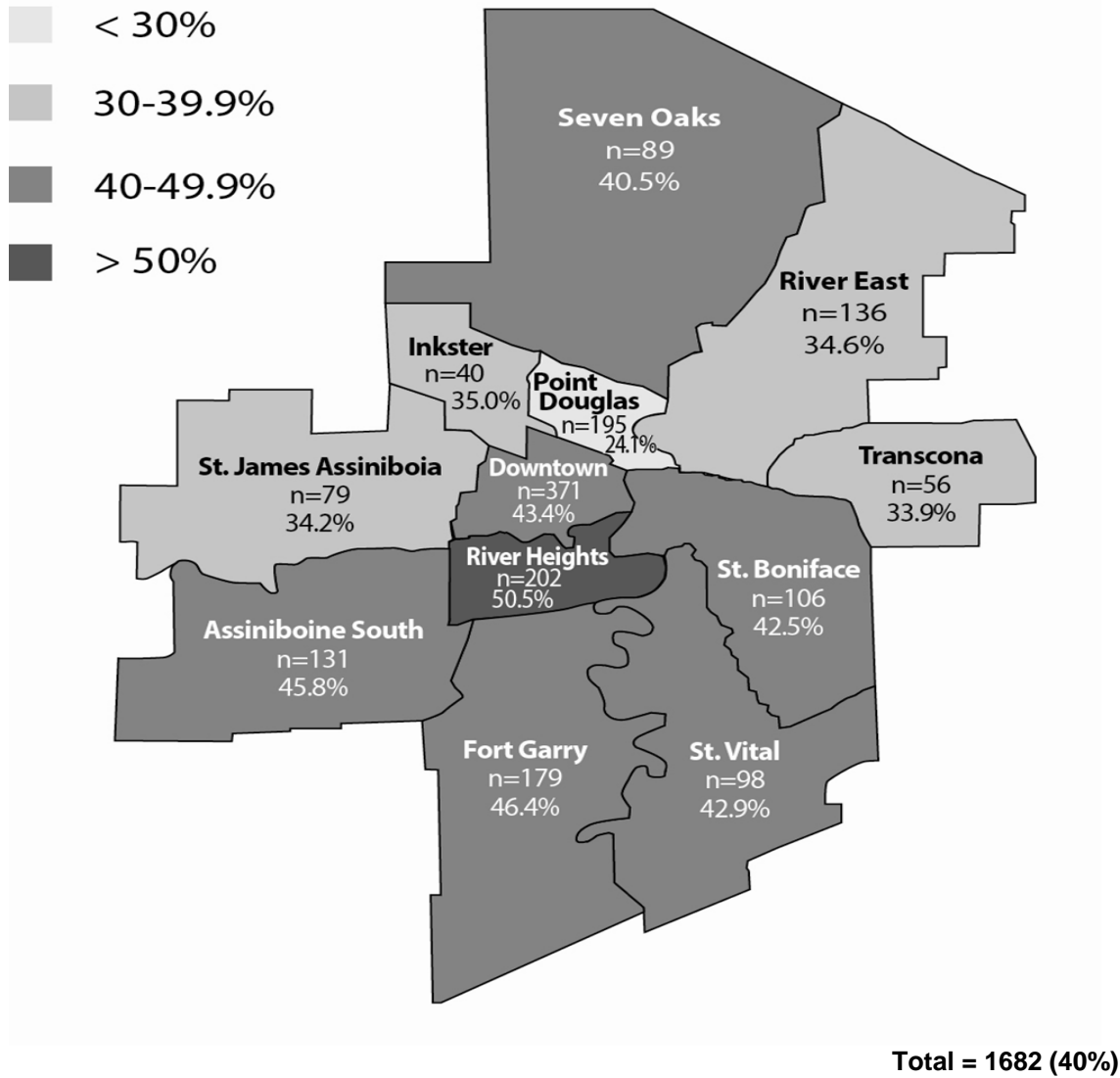


The figure shows that helmet use is consistently highest for children less than eight years of age, with increases until 2004 when rates remain between 58% and 69%. For children 8-11 years of age there has been a steady increase in helmet use with the lowest rates at 20-21% (1996) and the highest rate at 61% (2012). A trend for increased helmet use has also been observed for teens 12-15 years of age with substantial increases since 2004. Older teens, however, have experienced considerable fluctuations in bicycle helmet use rates: the lowest rate was 5% in 1997 and the highest rate was 25% in 2011. Adults have shown steady increases in helmet use from approximately 29% in 1996 to 45% in 2012.

Bicycle Helmet Use by Community Area

Helmet use in 2012 is summarized by Community Area to show the variation in helmet use across regions of Winnipeg for the 203 sites (Figure 3). Point Douglas is the community area with the lowest rate of helmet use in Winnipeg at 24%, however, this rate has increased by 20% since 2011. River Heights and Fort Garry have the highest rates of helmet use at 51% and 46%, respectively. Helmet use has increased in many Community Areas since 2011, with the most notable increases in Seven Oaks (from 26% to 41%) and River East (from 19% to 35%). Four Community Areas had helmet use rates lower than 30% in 2011 whereas there is currently only one area in this category. Overall, helmet use has slightly lowered in some community areas with historically high helmet use (i.e., Inkster, Fort Garry and St. Vital) and risen in some community areas with historically low helmet use. Therefore, the differences between helmet use community areas has narrowed. Note that some of the sample sizes for Community Areas are small, therefore these results should be interpreted with caution.

Figure 3. Bicycle Helmet Use by Winnipeg Community Area, 2012



Bicycle Helmet Use and Socioeconomic Status

To evaluate the relationship between helmet use and socioeconomic status, the 203 sites were coded by Median Total Family Income and the percentage of the population living below the LICO. In 2012, helmet use increased with increasing neighborhood Median Total Family Income (Table 6). This difference was statistically significant ($X^2 = 10.82, p < .013$).

Table 6. Bicycle Helmet Use by Median Total Family Income

Income Range	Helmet Use % (n)	Cyclists Observed % (n)
\$26,583-42,556	36.4 (227)	37.0 (623)
\$42,557-54,726	39.5 (156)	23.5 (395)
\$54,727-64,944	44.3 (182)	24.4 (411)
\$64,945-83,654	46.6 (118)	15.0 (253)
Total	40.6 (683)	100 (1682)

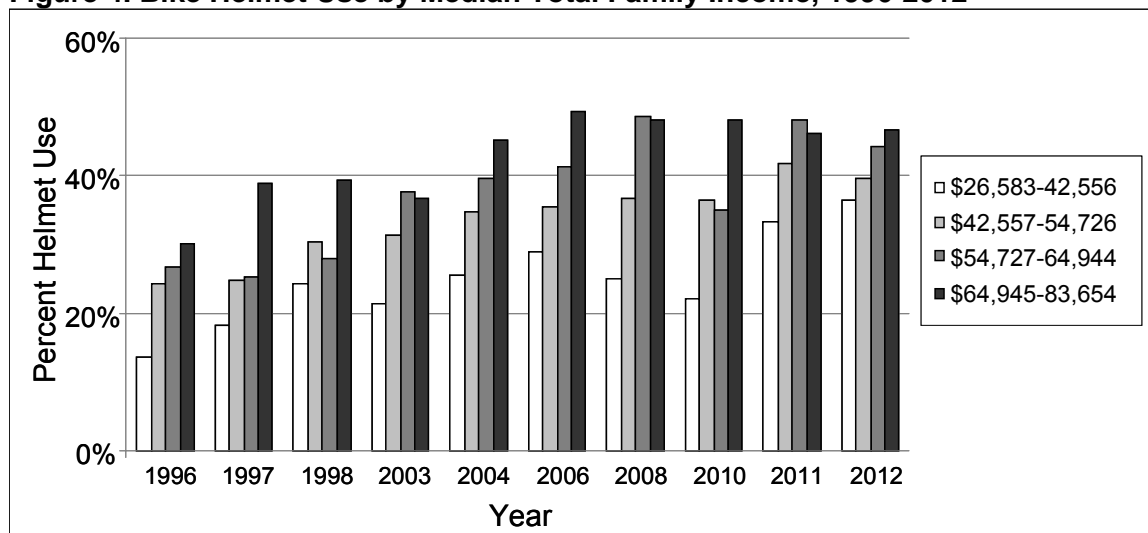
When looking at the percentage of families/individuals in the Community Area that fall below the LICO (Table 7), data indicate that there is a trend for lower helmet use in communities with higher poverty levels, but this did not reach statistical significance ($p=0.11$). The difference in the rate of helmet use between those in with the highest (higher poverty) and lowest (lower poverty) LICO categories in 2012 was 6.7%

Table 7. Bicycle Helmet Use by the Proportion of People Living Below the Low Income Cut-Off, 2012

LICO Category	Helmet Use % (n)	Cyclists Observed % (n)
4-11% (low poverty)	43.9 (172)	23.3 (392)
11.1-22%	42.6 (244)	34.1 (573)
22.1-34%	37.3 (128)	20.4 (343)
34.1-58% (high poverty)	37.2 (139)	22.2 (374)
Total	40.6 (683)	100 (1682)

There is a relatively consistent correlation between socioeconomic status and helmet use across all years of data collection in that the higher the socioeconomic status, the higher the rate of helmet use. From 1996 to 2012, there was a 22.9% increase in helmet use in the lowest income areas and a 16.4% increase in helmet use in the highest income areas. The difference in helmet use between the lowest and highest Median Total Family Income areas decreased from 16.7% in 1996 to 10.2% in 2012.

Figure 4. Bike Helmet Use by Median Total Family Income, 1996-2012



As seen in the above figure there has been considerable improvement in bicycle helmet use across all Median Total Family Income categories. The lowest income category increased steadily until 2006, with declining use in 2008 and 2010, followed by significant increases. The second category evidenced a steady progression with helmet use rates ranging from 24-42%. For the third category rates increased fairly steadily until 2008, declined in 2010, and stabilized in 2011-2012. The highest income group demonstrated some increases until 2006 followed by a general plateau between 46-49% from 2008-2012. Specifically, 2006, 2008, 2010 saw percentages in the highest group from 48-49% and in 2011-2012 there was a slight dip to 46-47% in helmet use.

Figure 5. Bicycle Helmet Use Rates by Median Income Categories, 2010-2012

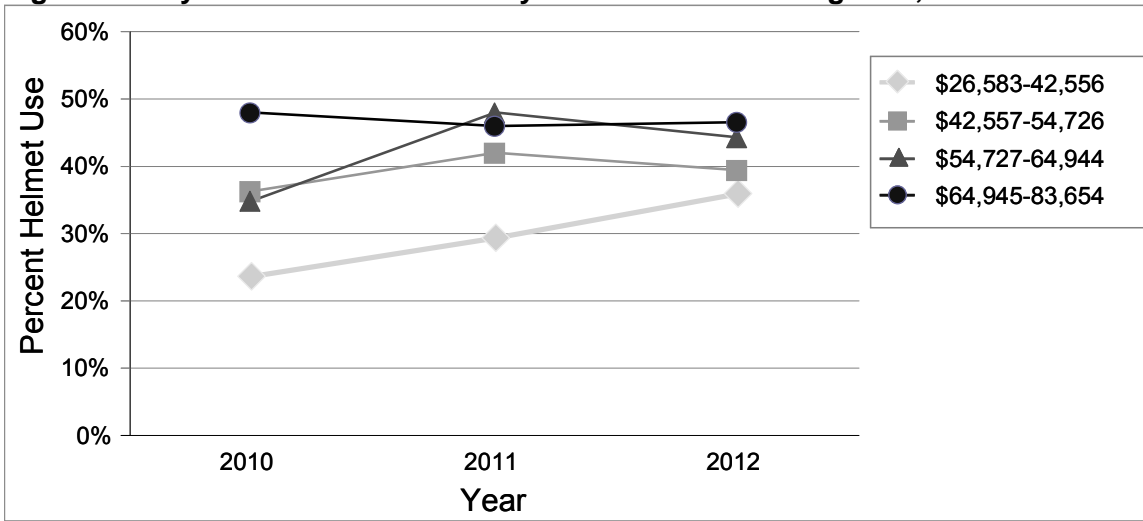


Figure 5 illustrates how helmet use by Median Total Family Income has changed over the past three years. The four income levels are presented along with overall helmet use rates from 2010 to 2012. Data indicate that helmet use increased from 2010 to 2011 for the three lower income brackets, but not for the highest income bracket. The change in rate of helmet use from 2011 to 2012 was mixed with helmet use increasing in the lowest and highest income brackets but decreasing in the middle two brackets. This suggests that the income disparity gap in helmet use has been decreasing over the past three years.

Table 8 presents bicycle helmet use rates for youth between 2010 and 2012. Youth tend to have the lowest helmet use, therefore, the changes in helmet use are shown here for this age group. Helmet use increased from 2010 to 2012 among those 12-15 years of age, but varied among older youth 16-19 years of age.

Table 8. Helmet Use Among Youth 12-19 Years of Age, 2010-2012

Youth	2010 Helmet Use		2011 Helmet Use		2012 Helmet Use
12-15 years	21.6%	↑	24.4%	↑	32.8%
16-19 years	11.4%	↑	22.4%	↓	14.9%

From 1996 to 2012, helmet use increased by 20.1% in the highest poverty areas and 17.6% in the lowest poverty areas. The gap in helmet use between the lowest and highest poverty areas has decreased over time from 9.2% in 1996 and 6.7% in 2012.

Figure 6. Bicycle Helmet Use by Percentage of Population Below the Low Income Cut-Off, 1996-2012

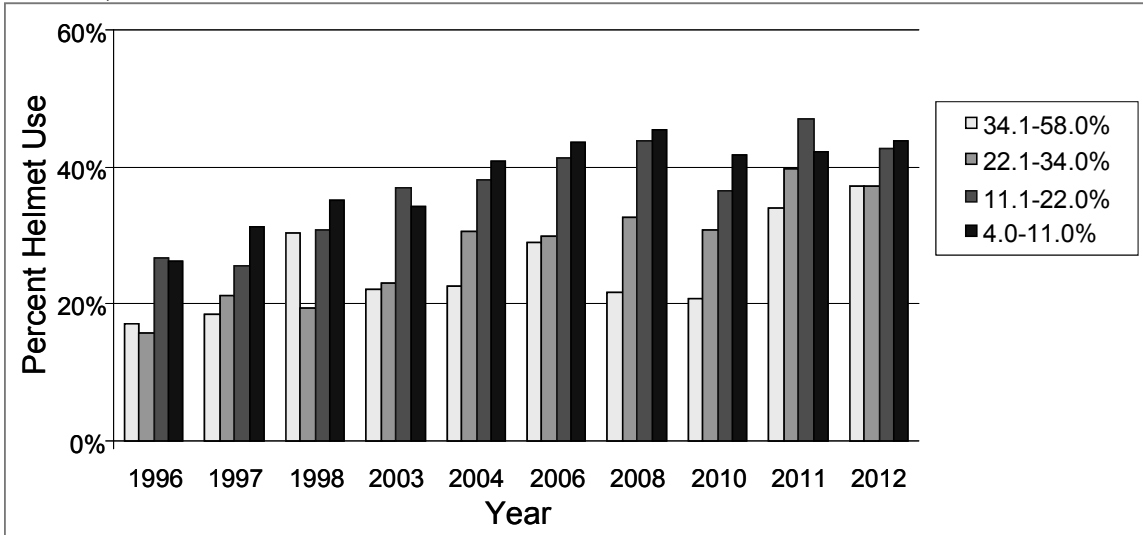
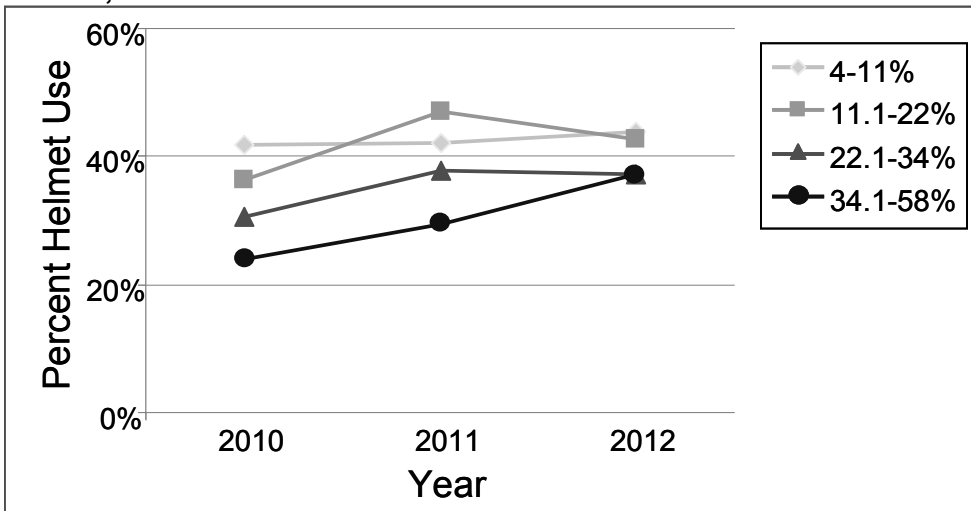


Figure 7 illustrates how helmet use has changed based on the percentage of the population living below the LICO over the past three years. Between 2010 and 2011, helmet use increased in all four LICO categories. However, changes in helmet use were variable between 2011 and 2012.

Figure 7. Helmet Use by the Proportion of People Living Below the Low Income Cut-Off, 2010-2012



Bicycle Helmet Use by Gender

There was a significant difference in bicycle helmet use between males and females ($\chi^2 = 6.68, p < .01$). Only 38.7% of males were observed wearing helmets compared to 45.5% of females (Table 9). However, it is also worth noting that more than twice as many male cyclists were observed than female cyclists.

Table 9. Bicycle Helmet Use by Gender, 2012

Gender	Helmet Use % (n)	Cyclists Observed % (n)
Female	45.5 (218)	28.5 (479)
Male	38.7 (465)	71.5 (1203)
Total	100 (683)	100 (1682)

Bicycle Helmet Use and Riding Companions

Bicycle helmet use was compared between cyclists riding alone and those riding with riding companions (Table 10). There was no significant difference between the 40.1% of cyclists who were alone and wearing a helmet and the 44.4% of cyclists riding with others who were wearing a helmet ($p=0.25$).

Table 10. Bicycle Helmet Use in Those Riding Alone and with Companions, 2012

Companions	Helmet Use % (n)	Cyclists Observed % (n)
Alone	40.1 (596)	88.3 (1486)
With companions	44.4 (87)	11.7 (196)
Total	40.6 (683)	100 (1682)

To further investigate differences in helmet use by age of companion, individuals observed riding with companions ($n = 196$) were divided into three groups: those riding with children and youth, those riding with adults, and those riding with both children/youth and adults. Although sample sizes in each category are small, data suggest that bicycle helmet use differs based on what type of riding companions are present (Table 11; $\chi^2 = 21.86$ $p < .001$). The rate of helmet use was highest among cyclists who were riding with both adults and children/youth (70.6%); however, these results must be interpreted with caution as there were only a very small number of individuals observed in this category ($n = 17$). Helmet use was lowest among those riding with children/youth at 28.4% ($n = 27$).

Table 11. Bicycle Helmet Use by Riding Companion, 2012

Riding Companion	Helmet Use % (n)	Cyclists Observed % (n)
Children/youth*	28.4 (27)	48.5 (95)
Adults	57.1 (48)	42.9 (84)
Both	70.6 (12)	8.7 (17)
Total	44.4 (87)	100 (196)

Note: Children/youth includes all individuals below 18 years of age.

The present investigation also sought to determine how rider helmet use relates to companion type and companion helmet use. Only riders recorded as being with a companion were included ($n = 196$). In the data below there are small sample sizes and should, therefore, be interpreted with caution (Table 12). It is interesting to note that when cyclists are helmeted they are most often accompanied by other helmeted riders; whereas, if cyclists are unhelmeted, they are most often accompanied by unhelmeted companions (Tables 12 and 13).

Table 12. Helmeted and Unhelmeted Riding Companions Based on Cyclist Helmet Use, 2012

Cyclist Helmet Use	Companions Helmet Use	% (n)
Helmeted Adult (n = 51)	Helmeted companion	76.5 (39)
	Unhelmeted companion	21.6 (11)
	Helmeted and unhelmeted companions	2.0 (1)
Helmeted Child (n = 29)	Helmeted companion	82.8 (24)
	Unhelmeted companion	13.8 (4)
	Helmeted and unhelmeted companions	3.4 (1)
Helmeted Youth (n = 7)	Helmeted companion	74.4 (5)
	Unhelmeted companion	14.3 (1)
	Helmeted and unhelmeted companions	14.3 (1)
Unhelmeted Adult (n = 44)	Helmeted companion	29.5 (13)
	Unhelmeted companion	70.5 (31)
	Helmeted and unhelmeted companions	0 (0)
Unhelmeted Child (n = 11)	Helmeted companion	9.1 (1)
	Unhelmeted companion	90.9 (10)
	Helmeted and unhelmeted companions	0 (0)
Unhelmeted Youth (n = 54)	Helmeted companion	5.6 (3)
	Unhelmeted companion	94.4 (51)
	Helmeted and unhelmeted companions	0 (0)

Table 13. Helmeted and Unhelmeted Riding Companions Based on Cyclist Helmet Use, 2012

Cyclist Helmet Use	Companions Helmet Use	% (n)
Helmeted Rider (n = 87)	Helmeted companion	83.9 (73)
	Unhelmeted companion	12.6 (11)
	Helmeted and unhelmeted companions	3.5 (3)
Unhelmeted Rider (n = 109)	Helmeted companion	15.6 (17)
	Unhelmeted companion	84.4 (92)
	Helmeted and unhelmeted companions	0 (0)

Helmet Use by Site Type

The rates of helmet use were similar across the different types of sites observed (Table 14). Helmet use varied from 37% (n = 186) at major intersections to 45% (n = 9) on cycle paths. There was no statistical differences between type of site ($p=.26$).

Table 14. Helmet Use by Site Type, 2012

Site Type	Helmet Use % (n)	Cyclists Observed % (n)
Cycle Path	45.0 (9)	1.2 (20)
Major Intersection	36.8 (186)	30.0 (505)
Park	42.4 (146)	20.4 (344)
Residential Street	39.8 (117)	17.5 (294)
School	43.4 (225)	30.9 (519)
Total	40.6 (683)	100 (1682)

Helmet Use and Use of Headphones

Helmet use was compared between cyclists riding with or without headphones (Table 15). The difference between groups was not statistically significant ($p=0.37$).

Table 15. Helmet Use in Cyclists by Headphone Use, 2012

Headphone Use	Helmet Use % (n)	Cyclists Observed % (n)
Headphones	47.1 (41)	5.2 (87)
No Headphones	40.3 (641)	94.6 (1591)
Unknown	25.0 (1)	0.2 (4)
Total	40.6 (683)	100 (1682)

Discussion

Bicycle helmet use in Winnipeg has increased since 1996; however, rates remain around 40% (2011-2012). Helmet use varies considerably by Community Area with the lowest rate of helmet use in Point Douglas at 24.1% and the highest rate of helmet use in River Heights at 50.5%. Winnipeg data suggest that helmet use also varies by socioeconomic status. Helmet use is consistently lower in communities with a low Median Total Family Income and a high percentage of people living below the low income cut-off line. Fortunately, however, the difference in helmet use between high and low income levels is narrowing. From 1996 to 2012 helmet use increased by 22.9% in the lowest income areas and 16.4% in the highest income areas. The greater increase in helmet use in lower socioeconomic areas may be due to the efforts made by many Winnipeg organizations, including the WRHA, that involve providing free and low cost helmets to families and individuals who are unable to afford them.

In 2012, helmet use differed by gender and age. More females were observed wearing helmets than males, and helmet use was highest among children under 12 years of age and lowest among youth aged 16 to 19 years. Although children are more likely to wear helmets than those in other age categories, they are also more likely to wear their helmets incorrectly.

One interesting finding of this observational study is that helmet use is higher when cyclists are riding with helmeted companions compared to when they are riding with unhelmeted companions. This suggests that cyclists are influenced by peer helmet choice. This observation is supported by previous research which found that 95% of children riding with helmeted adults wear a helmet; whereas, only 41% of children riding with unhelmeted adults wear a helmet.¹⁵

The Government of Manitoba is introducing bicycle helmet legislation in the Spring of 2013 that will require that a helmet be worn by cyclists less than 18 years of age. IMPACT will continue to undertake bicycle helmet observations in 2013 with the additional aim of investigating the effect of legislation on helmet use among Winnipeg cyclists.

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