Gender Differences in Youth Bicycling:

Do Girls Ride Less than Boys?

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Contents

Introduction

Research has demonstrated a consistent difference in cycling rates between men and women in the United States. Despite this difference, little is known about when or why these differences begin to occur. With demonstrated benefits for health, reducing traffic congestion, and improving the environment, it is encouraging to see bicycling's popularity continue to grow. To increase cycling rates across all groups and to ensure that the benefits of bicycling are experienced equally throughout the population, it is important to understand when and why differences in cycling between genders occur. By better understanding when bicycling habits become established and how youth ride their bicycles on a day-to-day basis, researchers and advocates may be able to better inform infrastructure design, policy development, training, and educational and encouragement programs.

Studies show that men's total bicycle trips in the United States outnumber women's by a ratio of at least 2:1 though little is known about when or why these gender differences and preferences begin to occur (Krizek, Johnson, & Tilahun, 2005). Although research explaining the rationale behind this gender difference is limited, studies demonstrate that female cyclists' concern for road safety is a main factor discouraging them from riding (Garrard, 2003; Garrard, Rose, & Lo, 2008). Women appear to be more risk averse than men when considering sharing the road with vehicular traffic (Byrnes, Miller, & Schafer, 1999; Harris, Jenkins, & Glaser, 2006) and prefer more dedicated bicycle infrastructure (Dill, 2009; Garrard et al., 2008). In an online survey of 2,403 cyclists in Melbourne Australia, females were more likely than men to report that "concerns about cycling in traffic" and "aggression from motorists" constrained their cycling (Garrard, Crawford, & Hakman, 2011). Another study from Melbourne has shown that the availability of bicycle facilities is more important to women than men when determining route choice (DeGruyter, 2003). Other perceived barriers to cycling identified by women are the inability to carry daily use items, impact on appearance, darkness, and dangerous road conditions (Broache, 2012; Szczepanski, 2013; Twaddle, Hall, & Bracic, 2010; van Bekkum, Williams, & Graham Morris, 2011). Although gender differences related to cycling rates are common throughout English-speaking nations such as the United States, Australia, and Canada, these gender differences are not a factor in many Western European countries such as Denmark, Germany, or the Netherlands where there are higher rates of bicycling for both transportation and recreation (Emond, Tang, & Handy, 2009).

Equally as important as examining what is known about gender differences and cycling is gaining an understanding of how people change their transportation habits throughout their lifespan. Several studies demonstrate that bicycling habits change over the course of one's life (Bonham & Wilson, 2012; McDonald, 2007). Although studies are limited, two studies show that parents who bicycle serve as role models for bicycling, fostering a culture of cycling that carries forward to their children (Emond & Handy, 2012; Kerr et al., 2006) and possibly leads to more consistent bicycling throughout the children's lives. Many children grow up cycling. Young people tend to ride until they receive their driver's license, when bicycling tends to decline. In college, some young adults reconsider bicycling, in all likelihood because bicycling is more affordable than driving. Recent attention has focused on the falling rates of automobile use among young people (Davis, Dutzik, & Baxandall, 2012), which may simultaneously lead to recon-

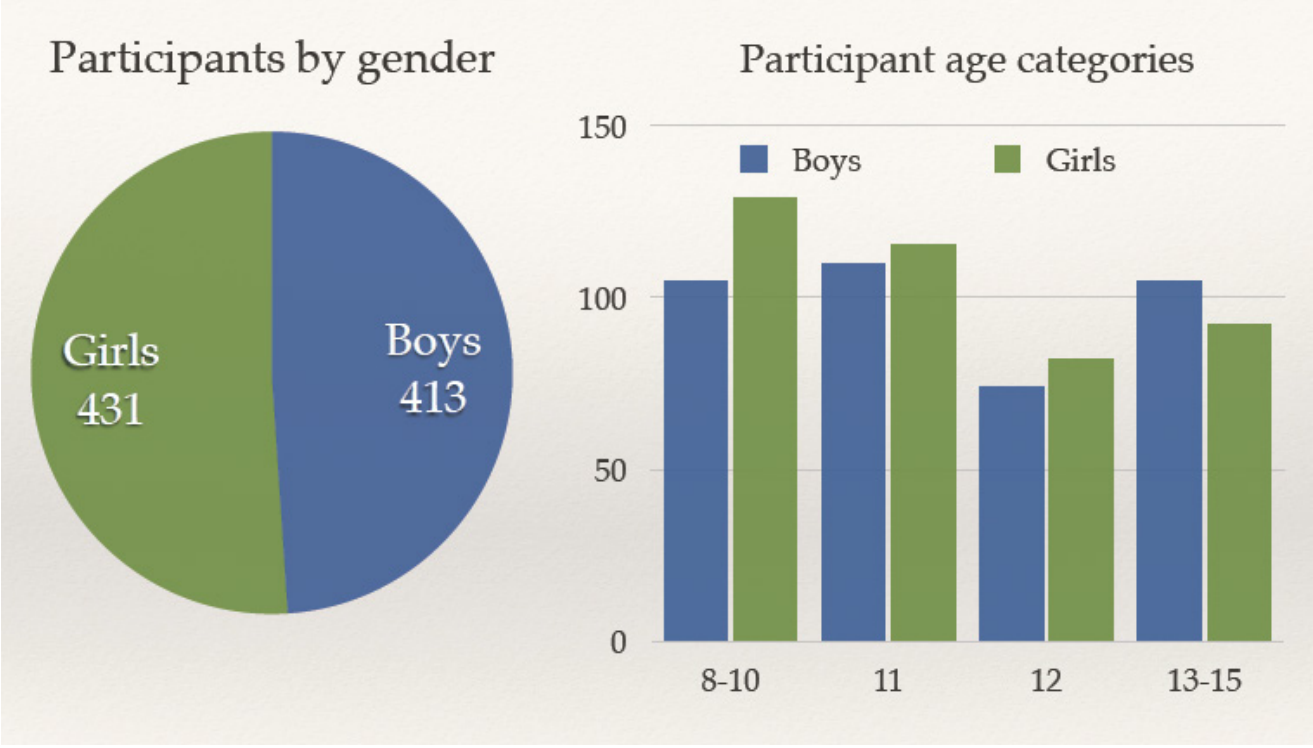
sideration of bicycling. Despite this resurgence, as young adults begin families, bicycling use in both men and women declines. Bicycling often increases again when parents teach their children to bicycle and begin to cycle with their children as a family activity. Finally, some adults bicycle as a hobby later in life (Bonham & Wilson, 2012). As life situations change, people's bicycling behavior appears to change as well.

An examination of the National Household Travel Survey data reveals that children are bicycling less, and shows a consistent decline in bicycling among cohorts of children as they age towards adulthood. For children ages 5-15, bicycling 30 minutes or more declined from 2.4 percent in 2001 to just 1.6 percent in 2009, despite efforts from programs such as Safe Routes to School to promote active travel (Pucher, Buehler, Merom, & Bauman, 2011). In addition to this overall decline, differences in youth bicycling behavior may also exist. This research seeks to examine reported youth bicycling behavior to help determine when the gender gap in bicycling emerges.

Data and Methods

As part of a bicycle skills training course in three New Jersey schools, 844 third through eighth grade students (aged 8-14) completed a fifteen-item survey about the experience of bicycling at school and at home. The gender of the participants was nearly split with 413 boys and 431 girls. Almost 84 percent of the respondents were 10 to 13 years old (See Figure 1). The median age of both boys and girls was 11 years old, though girls' mean age was slightly younger than boys'. The purpose of the survey was to gather information about how children ride their bicycles on a day-to-day basis. The survey instrument included questions about bicycle availability, the journey to school, non-school trips, safety-related habits, bicycle crashes, where students ride, and who they ride with. The survey also asked demographic questions on self-reported gender and age.

Figure 1: Distribution of Participants Age and Gender



The surveys were conducted in three locations: Ocean Township (pilot study), Bayonne, and Jersey City, New Jersey (See Figure 2). The data were collected between Spring 2011 and Fall 2012. After the pilot study in Ocean Township, the survey instrument was reevaluated. To keep the data consistent, all data presented here are from students from three schools in Bayonne and Jersey City who completed the training course using the reevaluated survey.

Setting:

Both Bayonne and Jersey City are urban communities in Hudson County located across the Hudson River from Manhattan. Jersey City is a densely populated urban environment with over 247,000 residents and 16,000 people per square mile. The city has a mix of high and low-income residents, including a substantial middle class. The median household income is $58,308, compared to $71,637 for the state of New Jersey as a whole (American Community Survey, 2008-2012). Jersey City is also very diverse; whites account for 33% of the population, African-Americans, 26%, and Asians, 24% (US Census Bureau, 2010). Bayonne is just south of Jersey City and has a more suburban feel. It is a smaller, less dense city with just over 63,000 residents in 11 square miles: a density of just over 10,800 people per square mile. The racial makeup is predominantly white (69%). An additional 9% of residents are African-American and 8% are Asian (US Census Bureau, 2010). Bayonne has a median household income of $56,744, slightly lower than Jersey City and substantially lower than the New Jersey median (American Community Survey, 2008-2012).

Analysis:

Data was analyzed using descriptive statistics to correlate age, gender, and variables of interest from the survey. First, ridership was examined to determine if any differences between genders and age existed within the cohort. Second, safety was examined to assess any differences found in the first analysis.

Results:

Four key questions, shown in Table 1, were asked of students in the sample regarding their bicycling behavior. The overall survey results show that both boys and girls "grow out" of bicycling, with older students riding with less frequency (See

Figure 2: Map of Study Sites

Table 1: Key Questions from Behavior Survey

Q1: Do you know how to ride a bicycle without training wheels? (YES/NO)
Q2: Do you have a bicycle that you can use? (YES/NO)
Q6: How often do you ride a bicycle? (Several categories)
Q10: Do you enjoy riding a bicycle? (Several categories)

Figure 3: Participants Who Know How to Ride a Bicycle Without Training Wheels

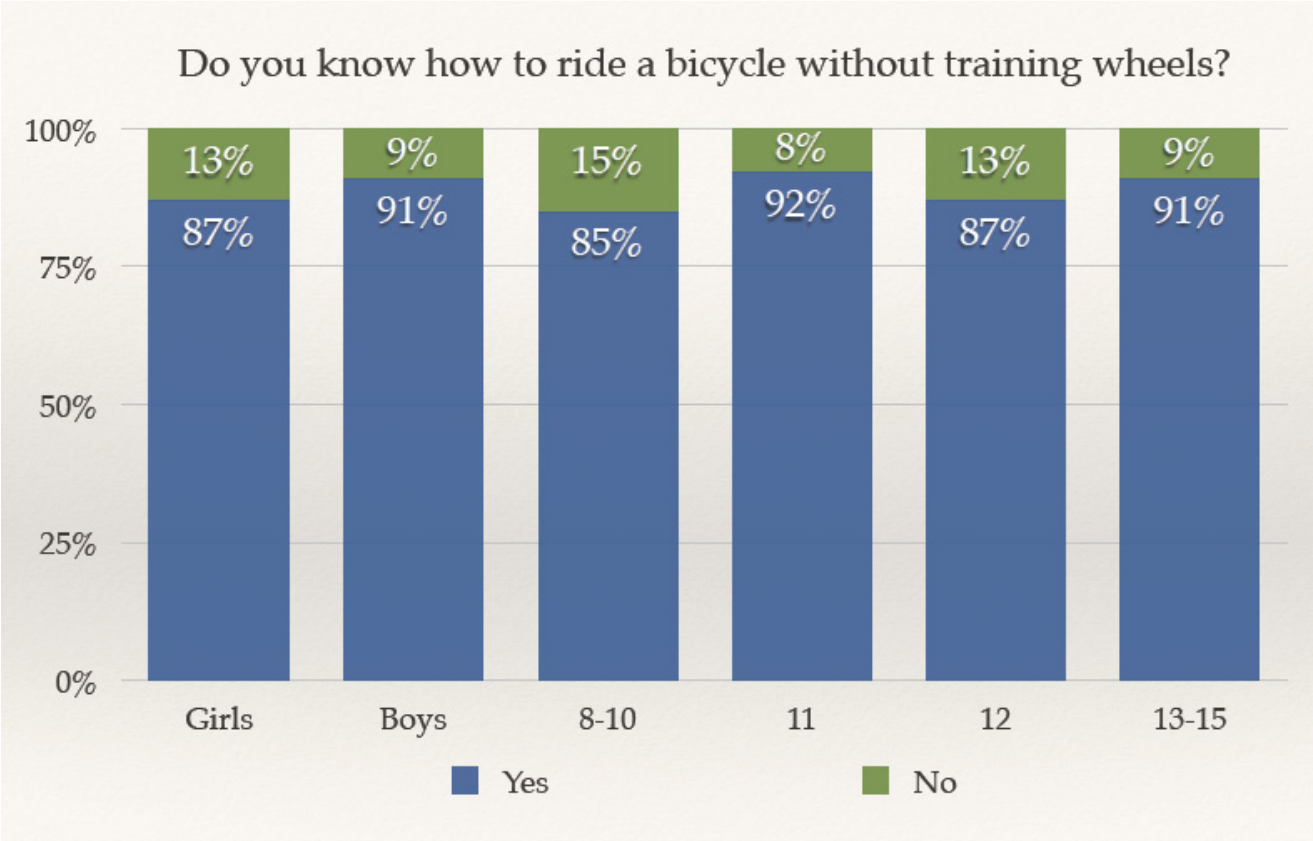


Figure 4). However, there is a notable difference between the boys and girls in this sample with girls reporting that they cycle less often than boys. Though girls report cycling less than boys, the analysis between boys and girls surveyed shows no statistical difference between their ability to ride a bicycle without training wheels (Q1), with 87% of girls reporting this ability compared to 91% of boys (See Figure 3).

There was no statistically significant difference between girls' and boys' bicycle ownership rates (Q2), though age differences do account for a small difference in access. Younger children of both genders have fewer bicycles available to them compared to older children, but by age 12, 70% of children reported having access to a bicycle for riding

Frequency of bicycle riding varied both by gender and by age (See Figure 4). Younger children tend to ride more often than older children regardless of gender. Over 55% of children 10 or younger reported riding "often." That percent declined with each age group until only 33% of those 13 and older reported riding "often." Girls were also less likely to report they rode "every day," "almost every day," or "often."

Figure 4: How Often Participants Ride a Bicycle

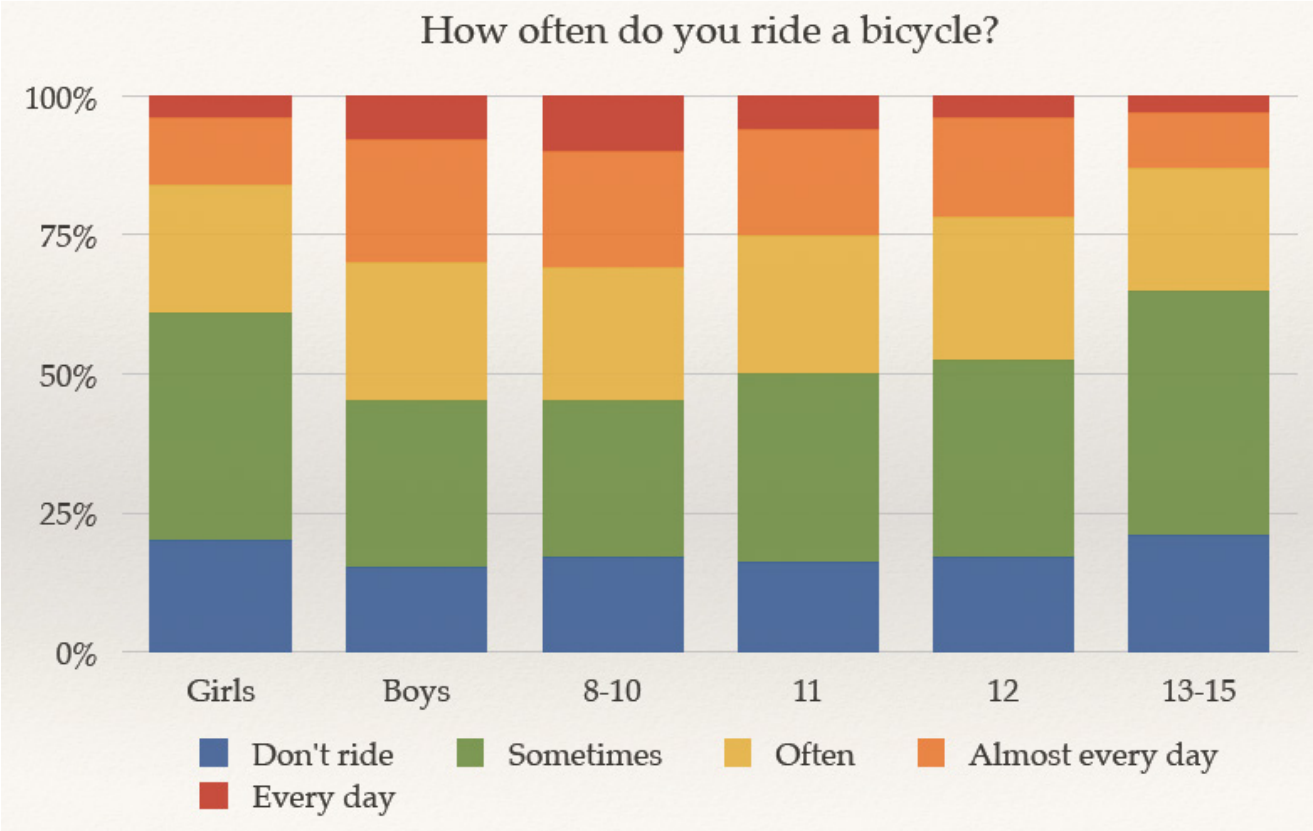


Table 2: Survey Questions Addressing Safety and Risk

Q2: Do you have a bicycle that you can use?
Q6: How often do you ride a bicycle? (coded as Often+/Sometimes-)
Q12: Where do you ride your bicycle most often?
Q9: How often do you wear your helmet when riding your bicycle?
Q15: Have you ever fallen or crashed while riding a bicycle?
Q15a: If yes, were you wearing a helmet when you fell or crashed?
Q15b: If yes, was a car or truck involved?

Among those children who do ride, girls and boys were equally as likely to ride with friends.

Safety:

One possible explanation to describe the variation in ridership between boys and girls is differences in perceptions of safety. Several questions addressing safety and risk were asked of participants in the self-administered questionnaire (See Table 2). In adults, the literature cites perceptions of safety as a determinant of bicycling that varies by gender (Byrnes et al., 1999; Garrard et al., 2011; Harris et al., 2006). Studies have demonstrated that women are less comfortable riding on streets without the protection of segregated bicycle paths or other dedicated facilities. The results of

this study support these findings, though they are not statistically significant. Only 14% of girls most commonly ride on the street (Q12), where over 26% of boys do (See Figure 5). Girls instead report being more likely to ride on sidewalks or driveways where they are more separated from moving traffic. Although the sidewalk may be perceived to be the safer place to ride, New Jersey's Plan4Safety crash data shows that because of the presence of driveways, sidewalks may not necessarily be safer. Though girls appear to be more cautious than boys, girls did not report a lower rate of falls or fewer crashes than boys (Q15), though boys did report being involved in more vehicular crashes (Q15b).

Though further research is needed to determine why girls ride less than boys, one hypothesis was that girls may receive permission to cycle less often than boys. The researchers hypothesized that helmet wearing might be a useful proxy for parental permission. If girls wore helmets more often than boys, perhaps they were also more often told not to ride out of concern for safety. Although we may expect boys to take more risks and disregard their helmets more often than girls, the data showed no statistically significant difference between helmet usage for girls and boys. Alarmingly, nearly half of all the children in the study who bicycled reported not wearing a helmet when riding (See Figure 6). Only about 34% of boys and 30% of girls reported always wearing a helmet, while nearly 43% of boys and 46% of girls reported that they never wore a helmet or did not have one. This statistic demonstrates the need for educational programming around the importance of helmet use in conjunction with other approaches to make wearing helmets "cool."

Figure 5: Where Participants Ride Most Often

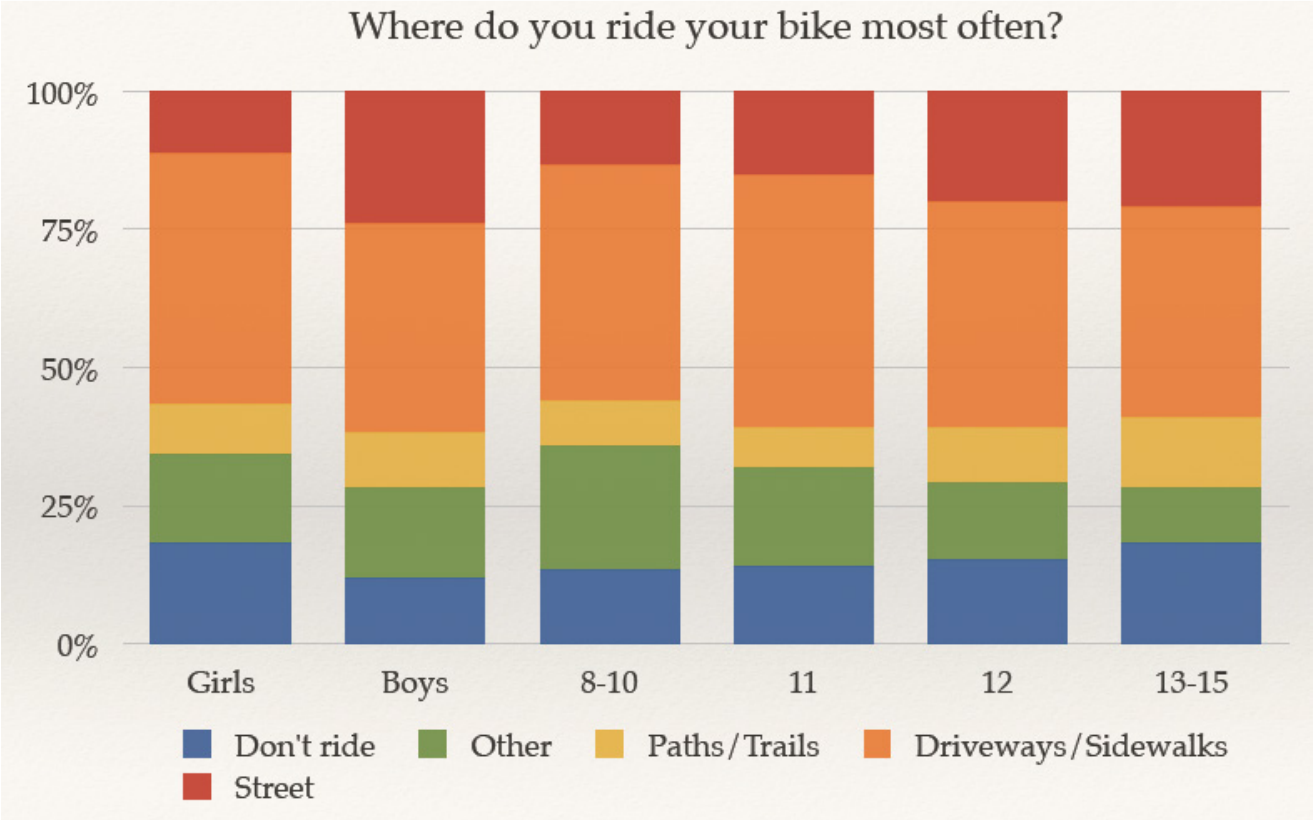
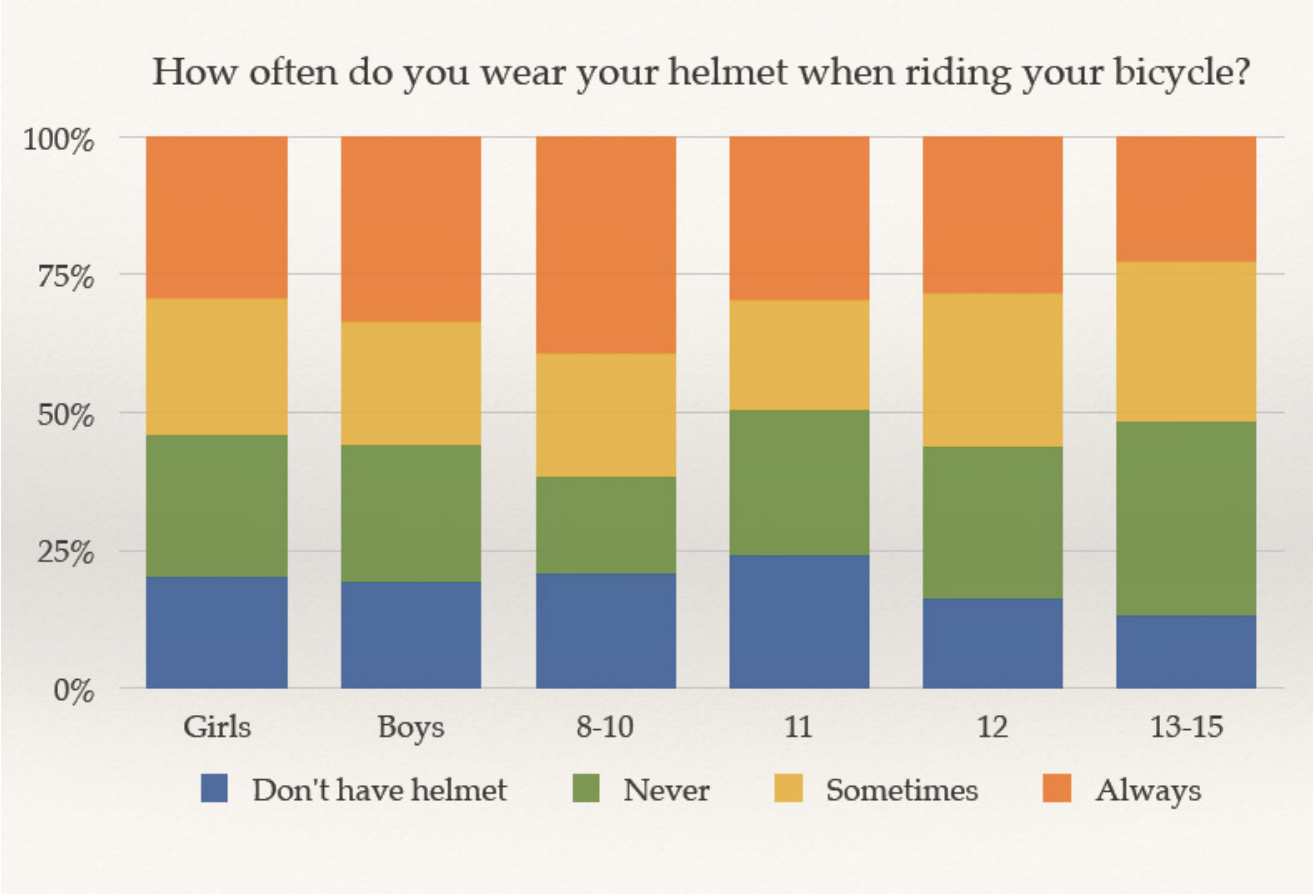


Figure 6: Participant Helmet Use



Conclusions

This study provides evidence that gender differences in bicycling begin quite early in childhood. By about age 10, boys and girls have different bicycle riding behaviors and tendencies. Although both boys and girls are riding somewhat frequently at this age, boys are riding more and ride more on the streets, while girls prefer riding on sidewalks and driveways. Though neither gender reports more crashes, both genders forgo helmets frequently. These differences at an early age may account for some of the differences in bicycle use we see between men and women later in life. The extent to which parental influence plays a part and why these differences emerge is still unknown and provides a question for future research.

Implications

Policies and programs should be improved to teach children to ride safely. Safe Routes to School programs provide the opportunity to encourage safe bicycling habits through education and enforcement programs as well as through policy change. This study shows that more needs to be done to communicate the importance of wearing a bicycle helmet while riding. Students of both genders reported not wearing helmets, despite the demonstrated safety benefits. Statewide or national campaigns may be able to address this issue with celebrities and athletes encouraging helmet use. However, as an example of the effect of educational messaging, research on food choice

has shown that while incentives were successful in increasing healthy food choice, this messaging alone had little influence on behavior (List & Samek, 2015). Schools or municipalities may be able to guide children to adopt safe behavior by strengthening educational campaigns through the use of incentives and programming that market safe behavior as "cool." In some municipalities in New Jersey, crossing guards, school security guards, and police officers distribute prizes to randomly selected children for wearing helmets and exhibiting safe on-street behaviors. By rewarding good behavior, children are encouraged to be seen wearing a helmet and riding safely. Additionally, some schools and municipalities have had success in increased helmet use after children attend an after-school helmet decorating class. By providing opportunities for children to personalize their helmets, these programs help to make helmets "cool" and encourage children to wear their helmets to show off their creations. Communities have also had success bringing in professional or semi-professional bicyclists, such as BMX cyclists to discuss and demonstrate the importance of wearing helmets and safe-riding skills. Expansion of such programs with a focus on marketing safety could motivate more children to wear helmets and use safe on-street behaviors. Increasing educational programming on helmet use combined with incentives may be the best action to yield increased helmet use.

This study noted that among those children who do ride, girls and boys were equally as likely to ride with friends. This finding suggests that there may be significant social effects from programs that focus on promoting bicycling in groups since so many children already bicycle with friends and siblings. Programs such as in-school bicycle education or the development of a bicycling club that encourages children to bicycle to and from school together could encourage children of both genders to bicycle. If some children begin bicycling regularly, others may take up the bicycle as well in order to fit in with the group.

Prior to middle school, most children rely on their parents to be present for all their activities, but by their early teens, children begin to gain trust and freedom necessary to be independent. With both boys and girls reporting that they do not ride their bicycles with parents or other adults in a majority of cases, the data supports the claim that children at this age are already seeking independence in riding their bicycles. Policies and programs developed at targeting young cyclists should be crafted to emphasize that mastery of the bicycle extends independence. The freedom to travel independently of their parents may be a key attractor to bicycling, especially for middle-school aged and older children.

The children in this study showed little interest in riding with their parents or other adults. However, this fact should not be interpreted to mean that programs focusing on encouraging families to bicycle together would have little impact on childrens bicycling habits. Parents may not be offering to ride with their children. Programs that aim to create a stronger connection between children and parents through bicycling, such as bike to school days, may have an encouraging effect on bicycling by children as they learn safe bicyling skills from respected adults.

While the results of this study have shown evidence that gender differences in bicycling begin quite early in childhood, the reasons girls ride less than boys remains an open question. While the reasons remain unclear, the responses of the girls who took part in this program do suggest that some measures can be taken when designing youth bicyling programs and policies to help bridge the gender gap. Studies have demonstrated that women are less comfortable riding on streets without the protection of segregated bicycle paths or other dedicated facilities. This study supports these findings with only 14% of girls reporting that they most commonly ride on the street as compared to over 26% of boys. To truly experience all the benefits of bicycling, girls need to feel comfortable leaving the sidewalk and entering the street. Infrastructure improvements, such as separated bicycle paths, bicycle lanes and bike boxes, which can make drivers more aware of cyclists, may give young female riders more confidence to ride more frequently and in various environments.

In addition, programs such as in-school bicycle education or a bicycling club that encourages children to bicycle to and from school together, should emphasize the development of bicycling skills for riding with traffic. Supervised on-bike

education that puts children on the street to learn about properly and safely riding with traffic may give girls the experience and education they need to confidently take to the street and bicycle more frequently.

While getting more children on bikes and ensuring that they develop the skills and gain the experience to cycle safely and independently is the principal goal of bicycling encouragement and education programs, many of these programs could benefit from an expanded focus on inclusiveness. The problem was stated clearly and concisely in an article in Bicycling Magazine, "Good news: American girls have plenty of female cycling role models to look up to. The bad news? Chances are, they don't know it" (See, 2014). In the article, Amber Pierce, a professional racing cyclist, notes "and you go into elementary and middle schools, and the girls, their eyes light up, and I can't tell you how many times they just look at me in awe like, I didn't know girls could do that" (See, 2014). To truly include and inspire girls, bicycling programs should seek to involve inspiring female role models wherever possible, and at a minimum, ensure that the achievements and stories of female cyclists are included in the program narrative.

Future Research

Although this survey gives insight into when gender difference in cycling rates may begin to occur, more research on youth bicycling habits is needed to better understand early life bicycling habits and to inform infrastructure design, policies, trainings, and programs. This study was limited to three New Jersey schools. Applying the survey instrument to a larger number of more diverse programs or schools would improve generalizability, particularly if programs were systematically or randomly selected. Additionally, information about the child's neighborhood and household would provide an opportunity to control for socio-economic or neighborhood characteristics. Future research should also consider using one-on-one interviews with both parents and students to more richly describe student bicycling patterns, perceptions of bicycling, and safety-related habits. Although this study examined an important question about when gender differences in bicycling behaviors in youth arise, the influence of parents on the students reported behaviors and perceptions remain difficult to determine. By conducting interviews, more detailed information can be obtained and an understanding of what may inform gender differences in bicycling may be unearthed. By talking to both parents and children individually, researchers can study similarities and differences in parents' and children's perceptions and the effect of parents' perceptions of bicycling habits on their children's perceptions. The more detailed information that can be gathered from individual interviews may better address the gender gap at a young age when gender patterns in bicycling seem to be established, with the goal of increasing cycling rates across all groups.

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