Children's Bicycling to After-School Activities: The Case of the Davis AYSO Bike to Soccer Program

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Table of Contents

1. Introduction

In recent years, transportation planners have devoted more attention to the goal of increasing the non-motorized trips of children and adults. Non-motorized trips are considered important as a mean of reducing motorized trips as well increasing physical activity. Indeed, lack of physical activity has been identified as a major public health problem for both adults and younger people (Center of Disease control (CDC), 2005; Sallis, et al., 2004). A CDC report from 2002, for example, reports that about a third of the teenagers are not physically active enough (CDC, 2002). The lack of physical activity among children is, in part, associated with travel behavior and urban form (Ewing et al, 2003, Handy et al, 2002; Martin-Diener et al, 2005): children living in auto-oriented areas in the U.S. use walking and biking as modes of transportation to nearby destinations to a limited extent and less than in the past (Sallis et al, 1993; Sallis et al 2000). Their high level of auto use is, of course, tied to a high level of auto use among their parents, particularly their mothers (McMillan, 2007).

For children, much discussion has focused on the journey to school, though researchers are now addressing non-school travel as well. According to McDonald (2006), who studied children's travel patterns based on the National Household Travel Survey, only 12% of the trips to sport activities are made by bike. The NHTS data do not allow a full estimate of non-motorized trips taken alone, versus trips taken with a parent, but it is reasonable to assume that use of bikes is even lower when parents are involved in the trip. Copperman and Bhat (2007) analyzed the determinants of children's weekend physical activity participation using data from the 2000 Bay Area travel survey. Their models correlate socio-demographic and land use variables with active and passive travel (i.e. non-motorized and motorized) and with physically active and passive activities. Their findings suggest that children (ages 5 to 17) rarely use non-motorized modes to get to places where they engage in physical activities, and that individual and household demographics, along with environmental factors, affect the level of physical activity.

One place where children might be expected to use non-motorized modes to get to after-school activities is Davis, CA, well-known as a bicycle-friendly community. In Fall 2006, the Davis chapter of the American Youth Soccer Organization (Davis AYSO) set out to increase bicycling to soccer games through a two-pronged approach. First, the organization adopted a new approach to scheduling games, spreading them to fields throughout Davis rather than scheduling as many games as possible at three centralized fields. For most games, at least one team (and often both) was scheduled for a field within their neighborhood. In addition, Davis AYSO undertook a promotional program to encourage families to bike to games, including distribution of "Bike to AYSO" bike stickers, the creation of a special web site that included a Davis Bike Map, and e-mail announcements to almost all families about the "Bike to AYSO" effort. To evaluate the effectiveness of this program in encouraging players and their families to bike more frequently, Davis AYSO worked with researchers at the University of California, Davis. This report describes the methods used in that effort and summarizes the results.

2. Research Methods

Ideally, interventions like the bike-to-soccer program that are designed to change behavior are evaluated based on before- and after-surveys of the targeted behavior. For the bike-to-soccer program, no before survey was conducted. Thus, the evaluation relies on reported changes in behavior from one year to the next, rather than direct measures of these changes.

2.1 The Survey

In October and November 2006, a group of four UC Davis students and several community volunteers administered a 2-page survey to AYSO parents. With the help of coaches and team parents, the survey takers approached parents at Saturday morning soccer games on three successive weekends. Survey takers focused on selected AYSO divisions (defined by age and gender) each weekend and attempted to collect one survey for each player in the league. Survey takers covered 76 games over the three weekends. The students and several paid assistants entered the data into an Excel spreadsheet. The data were then checked for accuracy and consistency. The final database includes surveys for 1,084 players, nearly half of all players in the league.

The survey included questions on mode of transportation to that day's game for both the parent and the player (see Appendix A). To measure change in transportation mode from the prior year, parents were asked to estimate the number of games out of a season of 10 for which each transportation mode was used, both this season and the previous season. In addition, parents were asked to provide information about each child in the household, including age, whether or not the child was playing AYSO, and the child's bicycling abilities. The survey also included questions about the parent, including his or her bicycling frequency. Open-ended questions also asked about the most significant barriers to bicycling to soccer games, and another question gave parents a chance to express whether they felt the program should be continued next year.

2.2 The Sample

A total of 1,084 surveys were completed. This total represents 49% of the 2210 players participating in the U6 (under 6 years old) through U19 Divisions of Davis AYSO in 2006. The distribution across division (defined by age and gender) is shown in Table 2-1. About 55% of surveys were from boys divisions, and 45% from girls divisions. Nearly 55% were from U8 and U10 divisions. This distribution is similar to but does not perfectly match the actual distribution of players, as shown in Table 2-2.

Because the response rate is not consistent across divisions and because mode choice is likely to vary with both age and gender, we calculate weights based on age/gender division (weight = (actual division share)/(sample division share)), as shown in Table B-1 in Appendix B. These weights were applied to the data for the descriptive analysis reported in Sections 3 and 4, but omitted in the multivariate analysis.

Table 2-1. Surveys by Division

	Boys	Girls	Total	Percent
U6	111	63	174	16.1%
U8	156	107	263	24.3%
U10	170	155	325	30.0%
U12	54	58	112	10.3%
U14	60	54	114	10.5%
U19	44	52	96	8.9%
Total	595	489	1,084	
Percent	54.9%	45.1%		

Table 2-2. Players by Division

	Boys	Girls	Total	Percent
U6	147	97	244	11.0%
U8	299	204	503	22.8%
U10	305	231	536	24.3%
U12	215	194	409	18.5%
U14	151	113	264	11.9%
U19	129	125	254	11.5%
Total	1246	964	2210	
Percent	56.4%	43.6%		

2.3 Calculating Non-Motorized Travel Distances

Travel distance is a potentially importance influence on mode choice for soccer games, as it is for mode choice for other trip types. To estimate distances, we first geo-coded home addresses for respondents. Street addresses in Davis were reported for 920 of the 1048 completed surveys. About 60 respondents lived out of town or did not provide a valid address, precluding geo-coding. Because Davis has an extensive system of off-street bicycle and pedestrian facilities, we used a network that includes all of the minor and primary roads in the city plus pedestrian and bike ways to estimate travel distance (Figure 2-1). This network includes 60 miles of off-street facilities and excludes freeways that are not open to bicyclists and pedestrians. The potential travel distance by bicycle for each player to his or her game, to Community Park fields, and to his or her home field was calculated using the Network Analyst function of ArcGIS. The route was calculated based on the shortest way from the player home address to the field.

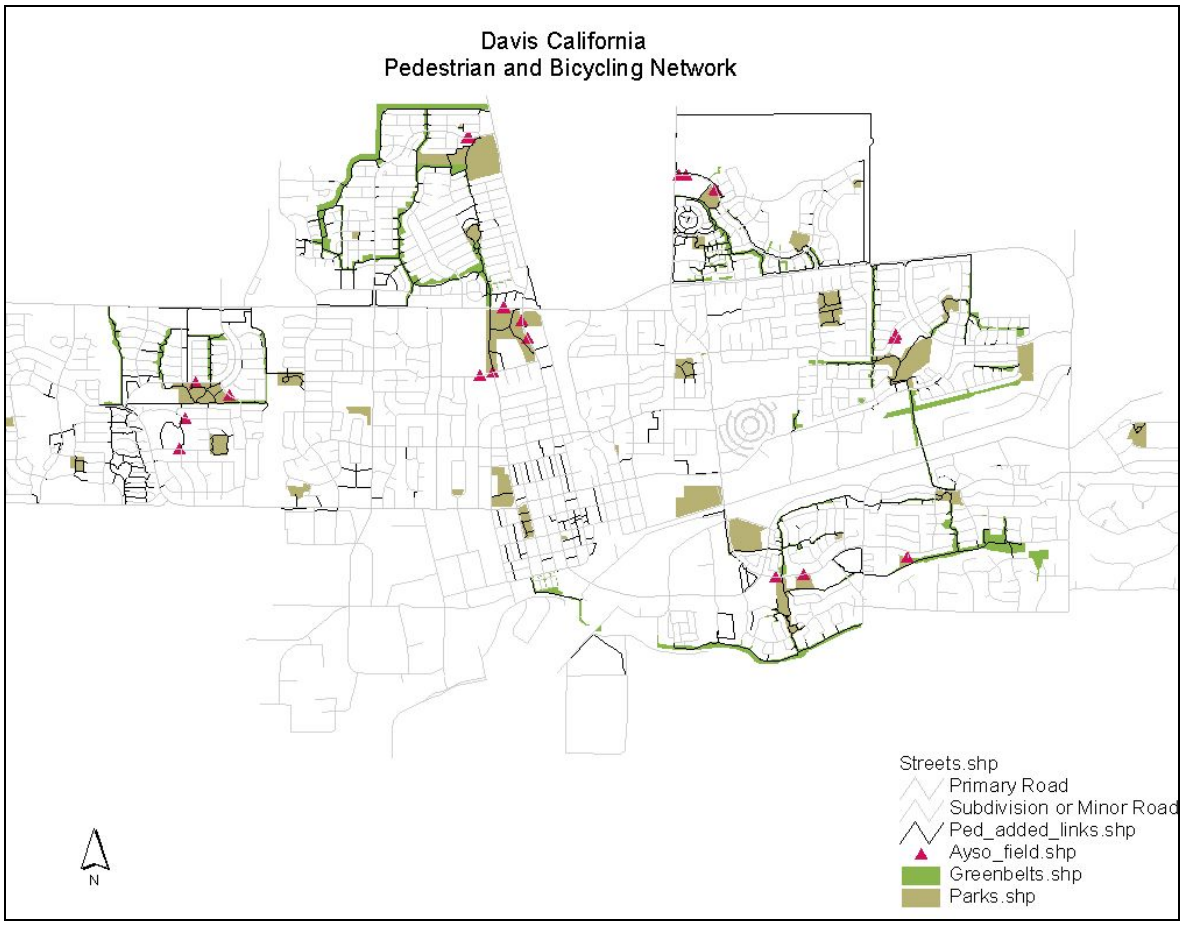

Figure 2-1: Davis biking Network

2.4 Limitations

One limitation of this method is the use of a single game to establish travel patterns. However, the relatively large sample helps to ensure that the survey is representative of the overall pattern of travel for the season, even if that particular day was not typical for all individual players. The weather was nice (e.g. sunny with temperatures ranging from the 60s to the 80s) all three weekends of the surveys.

A second limitation is the reliance on parent surveys. This approach leaves out children who came to their games without their parents, a group that might be more inclined to bicycle. Anecdotal evidence suggests that for most children, parents attend their games, however. In addition, counts of the number of bikes at games were largely consistent with the reported number of players and parents biking to games.

The lack of data about travel behavior for previous years is a significant methodological limitation. Parents where asked about their and their children's travel mode last year, but their responses depend on recall of behavior one year prior to the survey. Furthermore, the survey did not include questions about the factors that affected their travel mode choices in the previous year. In addition, families who had a player in 2005 but not in 2006 were not included in the survey population.

3. Analysis of Player's Mode

The survey collected data on biking both to games (i.e. the mode of travel to the game that day) and practices (i.e. whether the play usually bikes to practices). In analyzing biking levels, we considered a variety of factors that might explain why some players bike and some don't. In looking at these factors, we compared the share of players biking in different categories. We tested the statistical difference between categories using the chi-square statistic. The total values may vary for the different analyses because of missing data for some survey questions.

3.1 Mode of Travel to the Game

Driving dominates travel to games for both players and parents: 76.8% of players drove to the game the day of the survey, versus 18.4% biking and 4.8% walking; 78.1% of parents drove, versus 14.6% biking and 7.3% walking. However, these shares vary by a number of factors, including location, travel distance, age and gender, and family characteristics.

Location

Mode to that day's game varies by location within the city (Figure 3-1). Most notably, players living in North Davis are more likely to bike than players in other parts of the city. In addition to distance, as discussed below, the extensive off-street bicycle network in this part of Davis might contribute to the higher bicycling share.

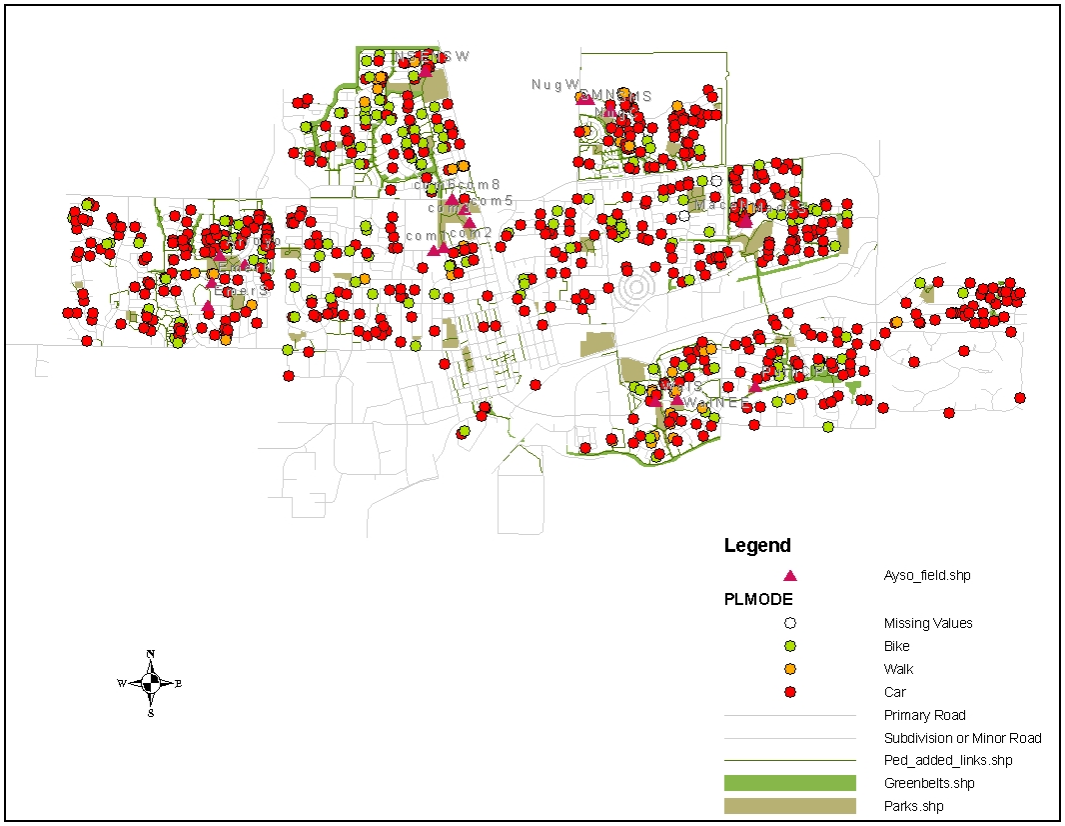

Figure 3-1: Travel Mode

Travel Distance

The average distance from home to today's game via the bicycle network for players who live within the city of Davis was 1.82 miles with a range from 0.06 miles to 5.93 miles. The average distance for players who walked to the game (5.8% of the sample with valid addresses) was 0.73 miles. The average distance for players who biked (20% of the sample with valid addresses) was 1.21 miles. The potential biking or walking distance for players who were driven (or drove) to their games (84.2% of the sample with valid addresses) was 2.09 miles. Note that players from the west and east ends of towns have longer distances to their games than other players (Figure 3-2).

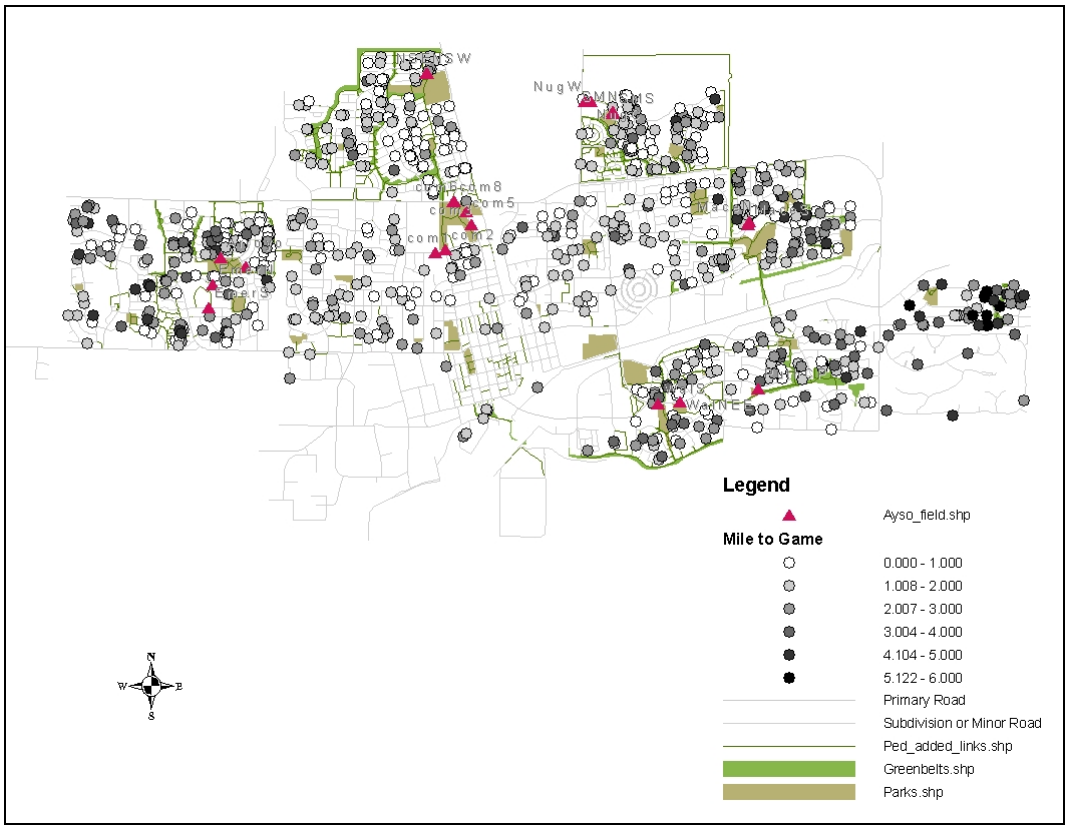

Figure 3-2: Travel Distance to the Survey Day Game

Driving is the dominant mode even at short distances. Among players who lived less than 1.5 miles from the field (38% of the sample), more than 50% of the players were driven (or drove) to their games. Only a few players walked more than half of a mile and none beyond 2.5 miles. At less than half a mile from the field, about 40% of players bicycled and 20% walked, with just under 40% driving. The combined share of players walking and bicycling shows a steep drop off between 0.5 and 2.0 miles but remains relatively steady up to 4.0 miles (Figure 3-3 and Figure 3-4).

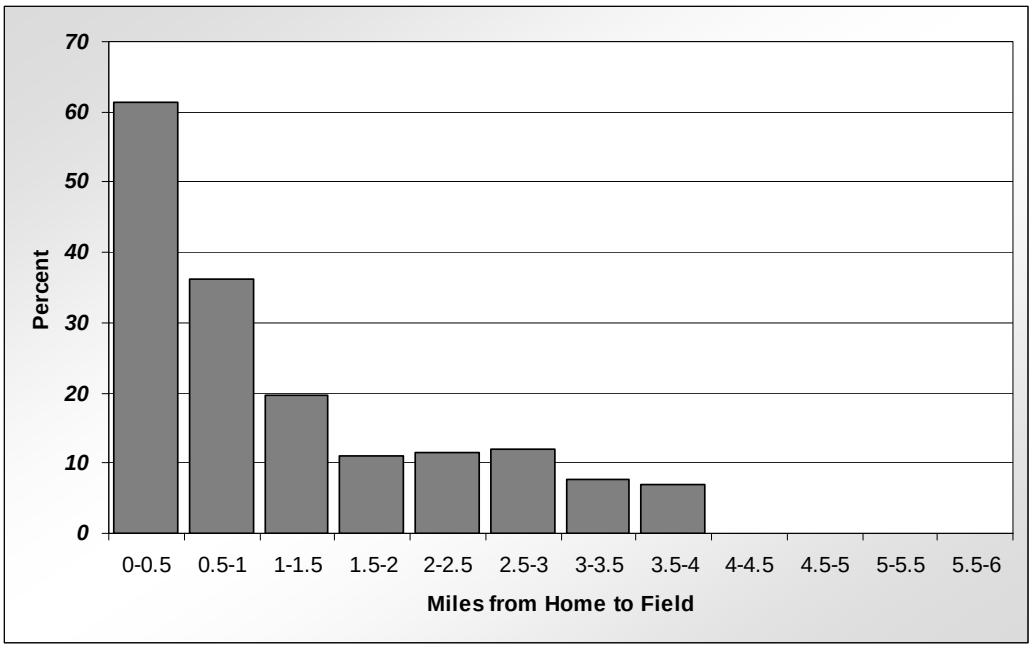

Figure 3-3. Share of Players Using Non-Motorized Modes by Distance to Field

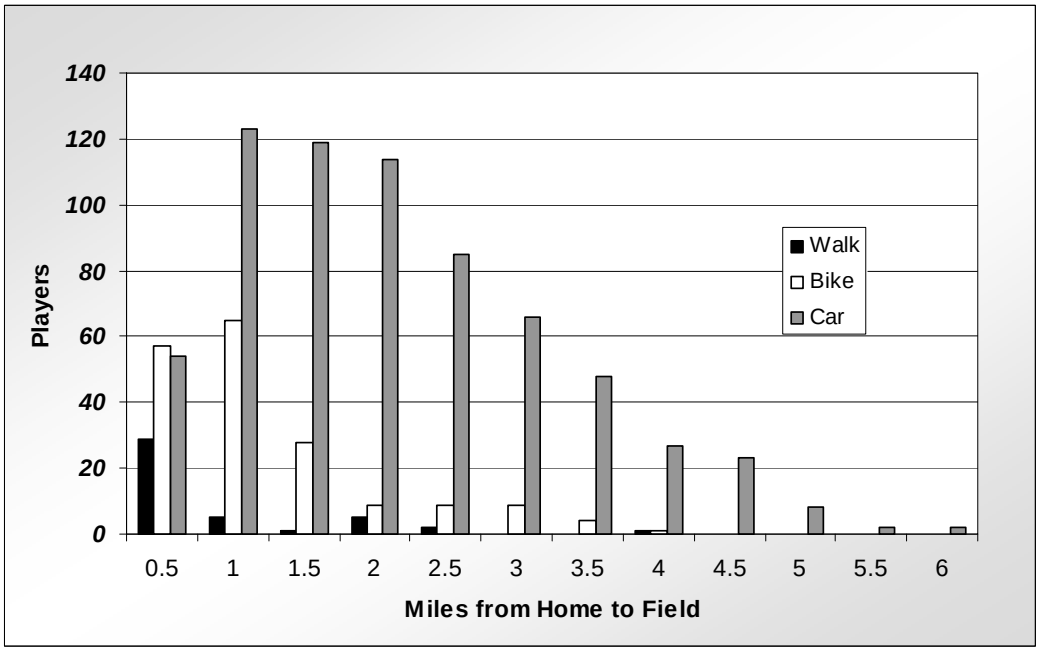

Figure 3-4. Number of Players Using Non-Motorized Modes by Distance to Field

Age and Gender

The general pattern of modes to today's game holds across divisions for both players (Table 3-1) and parents (not shown), but with notable differences. Over 33% of the players in the Under-10 Boys (U10B) division biked, the highest compared to the other

divisions. Gender of the player was associated with biking to the game, with 21.4% of boys in all divisions biking to the game, in contrast to 14.4% of girls. This pattern does not hold across all divisions, however: in the U6 division, girls were more likely to bike to the game that day than boys. Players were equally distributed across the city by age (Figure 3-5).

Table 3-1. Player's Mode to Today's Game by Division

	%Bike	%Walk	%Drive	N
U6B	14.6	5.5	80.0	71
U6G	15.9	4.8	79.4	48
U8B	18.1	6.5	75.5	146
U8G	11.2	5.6	83.2	100
U10B	33.1	7.8	59.0	146
U10G	21.4	5.2	73.4	113
U12B	18.9	1.9	79.3	104
U12G	10.3	1.7	87.9	95
U14B	18.3	5.0	76.7	74
U14G	14.8	7.4	77.8	55
U19B	18.2	0.0	81.8	63
U19G	11.5	3.9	84.6	61
Total Girls	14.4	4.6	81.0	472
Total Boys	21.5	5.0	73.5	603
Total	**18.4**	**4.8**	**76.8**	**1076**
Chi-square = 49.4; p=0.0007; N=1076				

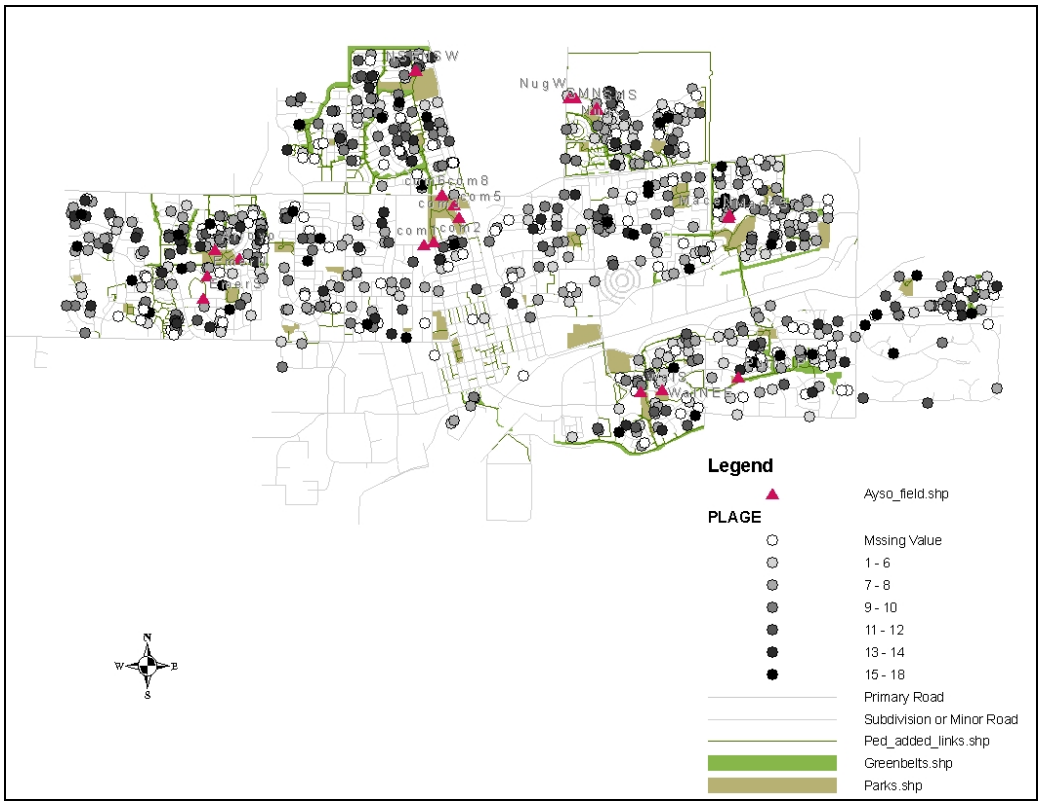

Figure 3-5: Age Distribution

Family Characteristics

Families with more than one child were more likely to bike to games than families with only one child (Table 3-2). Interestingly, as discussed below, one of the most frequent challenges to biking to games mentioned by parents was having more than one player in the family.

Table 3-2. Player's Mode to Today's Game by Number of Children in Family

	%Bike	%Walk	%Drive	N
One child in family	10.9	1.9	87.7	172
More than one child	20.1	5.1	74.8	876
Total	18.6	4.6	76.8	1047

Chi-square = 14.08; p=0.0009; N=1047

The player's mode of travel to the game is also associated with the frequency with which their parents bike as a mode of transportation: of players whose parents bike daily, 34.1% biked to their game; of players whose parents never bike, only 2% bike to their games (Table 3-3). Not surprisingly, players who bike to practice are more likely to bike to games, as are players who bike to school (results not shown).

Table 3-3. Player's Mode to Today's Game by Parent's Biking Frequency

	%Bike	%Walk	%Drive	N
Never	2.0	6.0	92.0	207
Less than once per month	6.8	6.8	86.4	276
Between once per week and once per month	12.6	4.7	82.7	250
More than once a week but less than daily	25.2	4.1	70.6	166
Daily	34.1	4.4	61.4	115
Total	18.3	5.0	76.7	

Chi-square = 93.66; p<0.0001; N=1013

3.2 Biking to Practice

Parents were also asked if their player usually bikes to practice. Overall, 57.4% of players usually bike to practice. The differences by division are significant, however. Biking increases steadily with age until peaking for the U12 and U14 divisions then declines for the U19 divisions (Table 3-4). The differences by sex are not significant, however.

There are several reasons why the travel mode to practice may differ from the travel mode to the weekend game. First, the average travel distance to practice is shorter, as practices are generally located on fields or at parks within the team's home neighborhood. Second, time and activity restrictions may be different for the player on weekdays and for parents as well. Third, players may be more likely to travel to practices on their own, while weekend games are traditionally a family event to which player, parents, and siblings travel together.

Table 3-4. Player's Biking to Practice by Division

	%Drive	%Bike	N
U6B	72.6	27.4	69
U6G	70.5	29.5	46
U8B	61.2	38.8	143
U8G	68.6	31.4	95
U10B	51.2	48.8	148
U10G	61.6	38.4	110
U12B	48.0	52.0	98
U12G	36.8	63.2	94
U14B	43.1	56.9	72
U14G	60.0	40.0	51
U19B	58.1	41.9	62
U19G	71.1	38.9	61
Total	**57.4**	**42.6**	**1049**

Chi-square = 49.4; p=0.0007; N=1076

3.3 Multivariate Analysis of Travel Mode to the Game

Family members often travel to games together. Even so, the factors influencing mode choice may be different between the parent and the child for a several reasons. First, parents and children may choose the same travel mode for different reasons, such as time constraints after the game, the need to carry equipment, etc. Second, in the case where one parent has two or more children playing simultaneously in different divisions, his or her mode choice may be constrained by the need to travel between games at different locations. Finally, at least for older children, parents may travel via a different mode than the children, usually driving while the player is biking.

We estimated two binary logistic regression models for driving relative to not driving (i.e. biking or walking), one for the mode choice of the player, and one for the mode choice of the parent. These models use as explanatory variables (1) socio-demographic indicators such as age and sex of both the parent and the child, and the number of children in the household, (2) estimated trip distance, (3) a dummy variable indicating whether the player can bike, and dummy variables indicating whether the player bikes to school and to soccer practice, and (4) an indicator of parent biking frequency in the form of a dummy variable for biking at least once a week. These models are not conventional mode choice models as they do not include mode specific variables.

The player travel mode model (Table 3-5) shows that only three variables are significant predictors of driving rather than biking or walking to games: trip distance, with a positive effect on driving; player bikes to school, with a negative effect on driving; and parent's biking at least once per week, with a negative effect on driving. The odds ratios show the magnitude of the effect. For each additional mile to the field, the odds of driving increase by a factor of 3.4. For players who bike to school the odds of driving are 0.6 times the odds of driving for those who don't bike to school. If the player's parent bikes at least once per week, the odds of driving are 0.4 times the odds for those whose parents don't bike. The child's age, gender, and ability to use a bike were not significant, nor were parent's age or gender or the number of children in the household. The model for parent's mode of travel (Table 3-6) is similar to the model for the child's mode of travel. The small differences between the models likely result from the reasons noted above.

Confirmation of these results and insights into additional factors that influence mode choice come from responses to an open-ended question about barriers to biking to the game that will be discussed in Section 5.

Table 3-5. Model for Player Driving versus Biking or Walking

	Coefficient	Odds Ratio
Intercept	2.260 **	9.650
Trip distance (miles)	1.214 **	3.368
Game is not at home field	0.224	1.251
Player age	-0.052	0.949
Player sex (female = 1)	-0.171	0.843
Player can bike	-0.753	0.471
Player bikes to school	-0.528 *	0.590
Number of children in the household (1 to 4+)	-0.286	0.751
Parent sex (female = 1)	.0.037	1.037
Parent age	-0.008	0.992
Parent bikes more than once per week	-0.889 **	0.411
Adjusted $R^2 = 0.23$		
N = 705		

** P value <0.05; * P value <0.1

Table 3-6. Model for Parent Driving versus Biking or Walking

	Coefficient	Odds Ratio
Intercept	-1.106	3.210
Trip distance (miles)	1.295 **	3.650
Game is not at home field	0.298	1.347
Player age	-0.011	0.990
Player sex (female = 1)	-0.029	0.972
Player can bike	-0.819 *	0.441
Player bikes to school	-0.575 **	0.563
Number of children in the household (1 to 4+)	-0.161	0.851
Parent sex (female = 1)	-0.056	0.946
Parent age	0.002	1.002
Parent bikes more than once per week	-0.951 **	0.386
Adjusted $R^2 = 0.23$		
N = 706		

** P value <0.05; * P value <0.1

4. Change in Travel Mode from 2005 to 2006

In the survey, parents were asked to estimate how many games out of a 10-game season they would bike, walk, or drive to this year. For players who also played in 2005, parents were asked to make the same estimation for the previous year. The difference in the number of games to which the player biked is used as an indicator of change in biking.

Reported biking, walking, and driving trips did not sum to 10 for all respondents. In many cases, respondents left blank the modes that they did not use. Before analyzing these data, we filled in missing values using three rules: (1) If the total number of trips reported for 2005 or 2006 was less than five we excluded it from the analysis; (2) if only one travel mode was reported (between 5 to 10 trips of the same mode) but the other modes were left blank, we assumed that this was the only travel mode in use; (3) if the total number of trips reported was higher than 5 but lower than 10, we inflated the number to 10 trips while preserving the reported ratio between the modes.

For players who also played in 2005, the number of games to which a player biked over a 10 game season increased by an average of 1.53 games, from an average of 1.65 trips in 2005 to an average of 3.18 trips in 2006 (Table 4-1). Note that these changes reflect not only the effect of the neighborhood fields program, but also the aging of players by one year. Despite the average increase in biking, 49% of players did not bike to any games in 2006, and 64% of players did not increase their biking in 2006.

Table 4-1. Change in Number of Trips by Mode for Continuing Players, 2005 to 2006

	Drive Trips	Bike Trips	Walk Trips
Players			
2006	6.20	3.08	0.72
2005	8.14	1.65	0.18
Change	*-1.94*	*1.43*	*0.54*
Parents			
2006	6.41	2.76	0.83
2005	8.19	1.59	0.21
Change	*-1.78*	*1.17*	*0.62*
N=680			

Table 4-2 compares 2005 AYSO participants, parents and players, with the 2006 participants. The 2006 numbers include players who didn't play in 2005, including all of the youngest players. This comparison thus reduces the effect of aging. Driving trips to games declined between 2005 and 2006 by 2.2 for players and nearly 2 for parents, while both biking and walking trips increased. Additional analysis shows that the small group that had a higher number of driving trips in 2006 biked to almost half of their games in 2005 on average but very few in 2006.

Table 4-2. Change in Number of Trips by Mode, , 2005 to 2006

	Drive Trips	Bike Trips	Walk Trips
Players			
2006	5.81	3.39	0.79
2005	7.99	1.80	0.21
Change	*-2.18*	*1.59*	*0.58*
N=586			
Parents			
2006	6.11	2.98	0.91
2005	8.08	1.70	0.22
Change	*-1.97*	*1.28*	*0.69*
N=570			

We estimated binary logistic regression models for driving less in 2006 versus driving the same or more, for players who also played in 2005 (Table 4-3) and for their parents (Table 4-4). The models revealed possible correlations between current characteristics and change in travel behavior. We used similar variables as with the travel mode models, this time adding variables for biking to school and biking to practice and omitting trips specific variables.

Table 4-3. Model for Player Drives Less in 2006 versus Same/More

	Estimate		**Odds Ratio**
Intercept	1.744		
Player age	0.042	*	1.04
Player sex (female = 1)	0.091		1.10
Player cannot bike	-0.076		0.93
Player does not bike to practice	0.696	**	2.01
Player does not bike to school	-0.164		0.85
Parent age	-0.004		1.00
Parent sex (female = 1)	-2.695		0.07
Parent bikes more than once per week	0.305	**	1.36
Number of children in the household (1 to 4+)	-0.139		0.87
Adjusted R^2 = 0.12			
N = 473			

*** P value <0.05; * P value <0.1*

Table 4-4. Model for Parent Drives Less in 2006 versus Same/More

	Estimate		Odds Ratio
Intercept	1.185		
Player age	0.047	*	1.05
Player sex (female = 1)	0.056		1.06
Player cannot bike	-0.007		0.99
Player does not bike to practice	0.664	**	1.94
Player does not bike to school	-0.199	*	0.82
Parent age	0.002		1.00
Parent sex (female = 1)	-2.620		0.07
Parent bikes more than once per week	0.398	**	1.49
Number of children in the household (1 to 4+)	-0.085		0.92
Adjusted $R^2 = 0.13$			
N = 472			

** P value <0.05; ** P value <0.1*

These models suggest that the variables included in the model provide a limited explanation for change in driving from one year to the next (adjusted R-squares of 0.13 and 0.15). In both models, parent's biking frequency has a significant effect: if the parent bikes more than once per week, both the player and the parent are more likely to have driven less in 2006 than in 2005. The odds of driving less also increase with player age. The other statistically significant variable in both models has a counter-intuitive effect: if the player does not bike to practice, both the player and the parent are more likely to drive less. In the model for parents, if the player does not bike to school, the odds of driving less are lower.

5. Travel Distance Analysis

In this section we analyze travel distances from home to three locations: (1) the home field, (2) the Community Park fields and (3) the field for that day's game (i.e. where the survey was conducted).

As expected, the home field is the closest to home with an average distance of less than a mile (Table 5-1)[1]. Average travel distances to the Community Park fields and to the field for that day's game are similar at 1.94 miles and 1.79 miles, respectively. Figure 5-1 shows that players who live in West Davis and South Davis tend to have longer travel distances to both home field and to Community Park fields than players living in other parts of the city.

Table 5-1. Travel Distance to Fields

	Home	Community	Game	N
U6B	0.88	1.89	0.94	39
U6G	0.94	1.97	2.01	55
U8B	0.94	1.36	1.94	137
U8G	0.85	1.65	1.99	92
U10	0.68	1.52	2.08	280
U12	0.88	2.42	2.04	85
U14	1.32	2.23	1.08	61
U19	1.16	2.48	2.22	81
Mean	0.96	1.94	1.79	Total 830

The home field for all divisions except U8B is half the distance and nearly a mile closer on average than the fields at Community Park (Table 5-2). The total estimated savings in driving distance, assuming the rate of driving for 2006 (Table 4-1), is 13, 428 miles (0.98 miles per player x 6.2 driving trips per player x 2210 players). Thus, the reduction in driving is substantial, even without accounting for the shift from driving to bicycling.

The difference in distance varies by area of the city (Figure 5-2). Although for most players, the home field was closer to home than the Community Park fields (green dots), many players had a longer distance to their home field than to Community Park (orange and red dots). Players in the latter category tended to live in Central and East Davis, including Wildhorse, with smaller concentrations of such players in West and North Davis and few in South Davis.

[1] In this section we aggregate age and sex groups that played in the same location.

Table 5-2. Comparison of Travel Distances to Fields

	Home/ Community	Home - Community	N
U6B	0.47	-1.01	39
U6G	0.48	-1.02	55
U8B	0.69	-0.42	137
U8G	0.52	-0.79	92
U10	0.45	-0.83	280
U12	0.37	-1.53	85
U14	0.59	-0.91	61
U19	0.47	-1.31	81
Mean	0.50	-0.98	Total 830

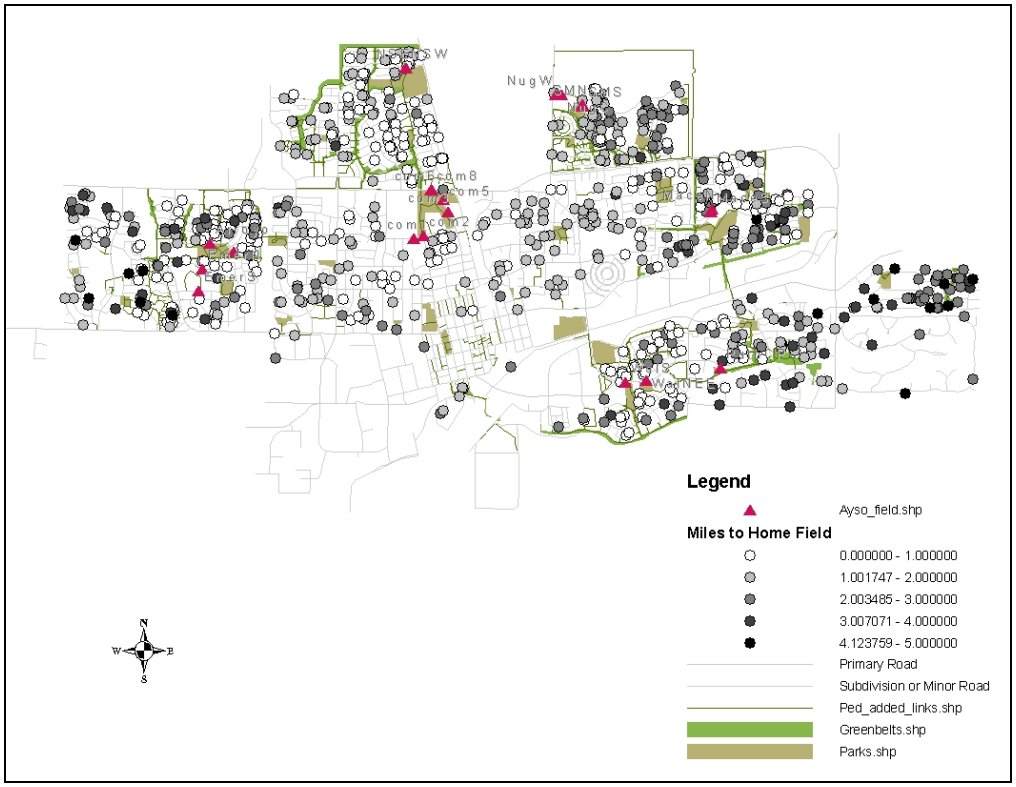

Figure 5-1: Travel Distance to Home Field

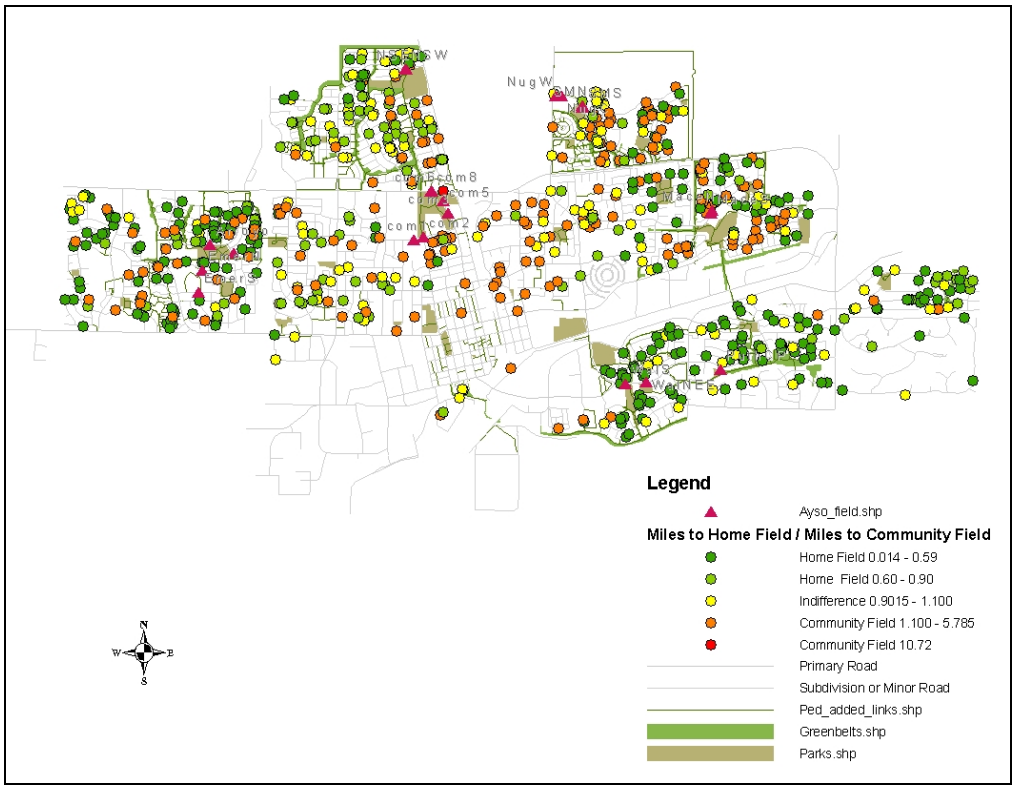

Figure 5-2: Travel Distance Ratio, Home Field vs. Community Park Field

As discussed in Section 3, travel distance has a significant effect on mode choice up to a range of 1.5 miles. Figure 5-3 shows actual travel distance to that day's game (categorized roughly as under 0.5 mile, 0.5 to 1 mile, 1 to 1.5 miles, and greater than 1.5 miles). The pattern of travel distances appears to be similar for all areas of the city, although players in the eastern areas of South Davis tend to have the longest distances, and players in North Davis tend to have shorter distances than players in other parts of the city.

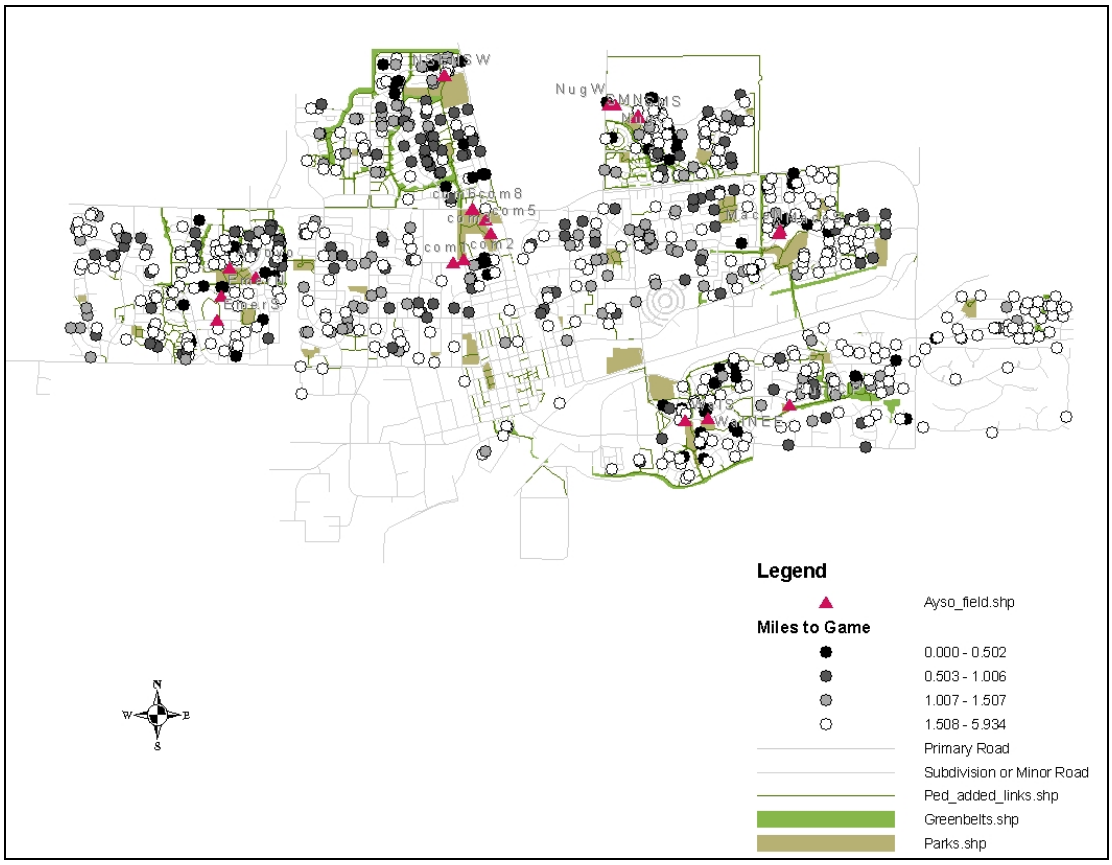

Figure 5-3: Travel Distance to Today's Game

6. Discussion

Our analysis suggests several factors that may explain why some players and parents bike and others do not. The most significant predictor of biking to games for both players and parents is the parent's frequency of biking for transportation purposes in general. If the parent bikes regularly, the probability of biking to the game is higher for the player and for the parent. As would be expected, travel distance also significantly affects whether players and parents bike to the game.

To shed further light on mode choice, the survey asked an open ended question about barriers to biking to the game (Table 6-1). Over three-quarters of parents reported one or more barriers to biking to games. At the top of the list was distance from home to the field. The second most frequently named barrier was having multiple children at different fields, and the third was carrying equipment and snacks. Only 1.9% of parents indicated that willingness prevented them from biking but 8.5% said that time to get organized is too long and 6.5% that travel time is too long. Combining these three as a willingness factor, and checking their reported ability to bike and the number of available bikes at home, we estimate that about 16% can bike but choose not to do so.

Table 6-1. Barriers to Biking to Games

Category	Count	Percent of Comments	Percent of Parents
Distance from house (Davis resident)	258	25.3	23.8
Multiple children at different fields/times	151	14.8	13.9
Carrying equipment/snacks	142	13.9	13.1
Time to get ready/organized	92	9.0	8.5
Time it takes to get to field	70	6.9	6.5
Schedule conflicts before/after game	63	6.2	5.8
Safety (dangerous route/traffic/poor bike access)	50	4.9	4.6
Age of certain child	33	3.2	3.0
Distance from house (non-resident)	27	2.7	2.5
Child not on neighborhood team	25	2.5	2.3
Willingness	21	2.1	1.9
Children's riding ability	21	2.1	1.9
Punctuality at game	21	2.1	1.9
Lack of or damaged bikes/equipment	16	1.6	1.5
Weather	13	1.3	1.2
Adult physical disability	8	0.8	0.7
Irrelevant response	5	0.5	0.5
No place to put bikes	2	0.2	0.2
No barrier mentioned	243		22.4

Parents were also asked whether they wanted Davis AYSO to continue the Bike to AYSO program next year. Over 92% of parents said that AYSO should continue the neighborhood fields program next year. Support was strong across all divisions, from 87% in U19G to 100% in U10B, and in all areas of the city, from 89.6% in east Davis to 95% in west Davis. Awareness of the program was high: over 78.2 percent of parents said they had heard of the program. Still, a sizable share of parents had not heard of the program before the survey. Increased awareness of the program (for example, through a challenge to teams as to which is doing the most biking) might itself lead to more biking.

Many parents offered comments on the program, including suggestions for improvements for the next year, other benefits from the program, and criticisms of various sorts. One quarter of parents offering comments said that the program worked well and that no improvements were needed next year. The next most frequent comment, at 17.3% of respondents, suggested moving games closer to the home field. Another major concern expressed by 6.4% of respondents is ensuring that practices are closer to home so that biking can be a viable option. Some suggestions were made that would enhance and expand the program including: small incentives for kids to bike ride, increasing communication and promotion of the program, installing bike racks at fields, and providing bike maps of Davis.

About 11% of respondents conveyed wishes for the neighborhood fields program to be eliminated, preferring all games to be at a central location like Community Park as in previous years. Of this group, many miss the community feel that is foregone by splitting up the fields. The major problem expressed by parents is the difficulty in managing to bike to multiple games due to multiple children participating in AYSO. For this reason, many prefer the convenience of one central playing location.

Table 6-2. Comments on Neighborhood Fields Program

Category	Number	Percent of Comments	Percent of Parents
Program worked great - needs no improvements	97	25.0%	8.9%
Move games closer to home field	67	17.3%	6.2%
All games at one field - community park	43	11.1%	4.0%
Practices closer to home	25	6.4%	2.3%
Divide teams based on neighborhood location	23	5.9%	2.1%
Hard to manage attending multiple games - conflict with multiple children	13	3.4%	1.2%
Need restroom facilities at some parks	13	3.4%	1.2%
Irrelevant	10	2.6%	0.9%
Games are too early	9	2.3%	0.8%
More communication and promotion of the program	8	2.1%	0.7%
Fields are not well maintained - safety hazard	8	2.1%	0.7%
Provide incentive for kids to bike ride	7	1.8%	0.6%
Need bike racks at some fields	7	1.8%	0.6%
Fields are too wet	6	1.5%	0.6%
Keep games in Davis - not Antelope, Esparto, or Winters	6	1.5%	0.6%
Better bike access	5	1.3%	0.5%

Note: Data are not weighted by division; only categories with 5 or more responses included in table.

7. Conclusions

From a policy standpoint, two questions are of interest: (1) was the Bike to AYSO Program a success? (2) What lessons does this case offer for the goal of increasing biking in the future?

An increase in biking from 2005 to 2006 provides evidence, though not conclusive evidence, that the bike-to-soccer program had an impact on mode of travel to games, despite an already substantial level of biking to games (and even more to practices) in Davis. Nevertheless, it appears that there is still room for further increases. Some of the barriers to biking that parents mentioned reflect a lack of willingness to bike rather than insurmountable constraints on biking. In addition, even among players whose parents report that they bike daily, a majority is driven to games. A more aggressive promotional program might achieve additional increases in biking.

The first set of strategies addresses physical barriers. Distance to games is a critical factor in the decision to bike but its effect diminishes after 1.5 miles. Davis AYSO has already addressed this factor by scheduling games on fields within teams' neighborhoods, though the schedule includes many "away games" that necessitate travel across town (and to other towns, in many divisions). In future years, a scheme that maximizes the number of players within 1.5 miles of their home field (rather than minimizing average travel distance, for example) might help to increase bicycling further.

The city might also be able to reduce distances by adding new links in the bicycle network in key locations. A program to identify and implement such links could also increase bicycling to school, as many of the playing fields are located at elementary and junior high schools. The need to carry equipment and snacks was also cited as a barrier to bicycling. Many families use bicycle trailers to carry these items to games, and a program run by AYSO or the city to loan trailers to families for individual games or for the season could enable more families to bicycle.

The second set of strategies addresses attitudinal barriers. The significance of both biking to school for the player and the frequency of bicycling for the parent suggests that the more a family bikes for some purposes, the more they bike for other purposes. City programs to promote bicycling in general could thus lead to increases in bicycling to soccer games. Such programs might also push parents to overcome the challenge of getting out of the house early enough to bike to games and might counteract a lack of willingness on the part of players and/or parents to bike rather than drive. Programs that focus on increasing bicycling safety or that help children learn how to bicycle could also help. "Bike pooling" programs that help players get to their games by bicycle when parents have scheduling conflicts (e.g. other children playing games at the same time on other fields) might also increase bicycling, at least among players.

Although this study focuses on a unique case – the very specific trip to soccer games and the very special setting of Davis, CA – it points to the need for future research to explore in more depth the influence of physical, attitudinal, and logistical factors on the choice to bicycle. Issues highlighted in this study and deserving of further exploration include the relationship between the travel choices of parents and children and the connection between mode choice for trips of different purposes. Implementation of this survey in a sample of communities reflecting a range bicycling environments could yield further insights, as could the implementation of similar surveys targeting

other specific trip purposes. With active travel among children and their parents on the decline, such research could provide a basis for the formulation of policies that would reserve this trend and generate significant health benefits.

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Appendix A: Survey

For AYSO use only

Date: _____
Field: _____
Time: _____
Division: _____
Team: _____

2006 AYSO Parents Survey – Neighborhood Fields/Bike to AYSO

We are collecting data about how families are getting to soccer games this year to help in planning for next year. Please answer all questions related to **the player involved in this game**. All responses will be completely confidential.

1. What is the team name for your player involved in this game? (Include the AYSO team number if you know it.)

   _____

2. How did ***your player*** get to this soccer game today? (check one)
   - □ biked
   - □ walked
   - □ was driven

3. How did ***you*** get to this soccer game today? (check one)
   - □ biked
   - □ walked
   - □ drove or was driven

4. Assuming a fall season of 10 games in Davis (ignoring any games played outside of Davis), please answer these questions:

	…bike to?	**… walk to?**	**… drive to?**
a. How many games out of 10 in Davis do you estimate ***your player*** will…			
b. How many games out of 10 in Davis do you estimate ***you*** will…			

5. Did your child playing in this game also play AYSO soccer last year?
   □ yes – please answer questions below. □ no – please skip to question 6.

	…biked to?	**… walked to?**	**… drove to?**
a. How many games out of 10 in Davis do you estimate ***your player*** …			
b. How many games out of 10 in Davis do you estimate ***you***…			

6. How many children (age 18 or under) live in your household? _____

7. Please answer the following questions about the ***children in your household***, including the child playing this game, in the table below. Use only the number of lines needed.

	Age?	**Sex?**	**Can ride own bike?**	**Plays AYSO this year?**	**Regularly bikes to practice?**	**Regularly bikes to school?**
Player		□ f □ m	□ yes □ no	x yes	□ yes □ no	□ yes □ no □ n/a*
Child 2		□ f □ m	□ yes □ no	□ yes □ no	□ yes □ no □ n/a*	□ yes □ no □ n/a*
Child 3		□ f □ m	□ yes □ no	□ yes □ no	□ yes □ no □ n/a*	□ yes □ no □ n/a*
Child 4		□ f □ m	□ yes □ no	□ yes □ no	□ yes □ no □ n/a*	□ yes □ no □ n/a*
Child 5		□ f □ m	□ yes □ no	□ yes □ no	□ yes □ no □ n/a*	□ yes □ no □ n/a*

*n/a = not applicable, for children not playing AYSO soccer or not in school

ONE MORE SIDE TO GO ➡

8. How many adults live in your household? _____

9. How many functioning bikes does your household own? _____

   9a. Does your household own any of the following bike accessories? (check all that apply)
   □ Child bike seat □ Trail-a-bike □ Bike trailer

10. How often do ***you*** bike to places in Davis other than soccer games? (check one)
   □ Daily
   □ More than once per week, but less than daily
   □ Between once per week and once per month
   □ Less than once per month
   □ Never

11. In ten words or less, what is the biggest challenge in biking to AYSO games?

   _____

12. Before today, had you heard about the *Bike to AYSO* program? □ yes □ no

13. Would you like to see AYSO continue to schedule games on neighborhood fields next year? □ yes □ no

14. What improvements, if any, would you like to see to the neighborhood fields/Bike to AYSO program next year?

   _____

   _____

15. What area of Davis do you live in? □ I do not live in Davis
   □ South (south of I-80)
   □ West (west of Anderson and south of Covell)
   □ North (north of Covell between 113 and F Street)
   □ Central (south of Covell, between Anderson and L Street)
   □ East (east of L Street below Covell, east of Poleline above Covell)

   15a. What is your street address? We will use this information only to calculate distance from your home to the soccer field _____
   Number Street

16. What is your gender? □ male □ female

17. How old are you? _____

18. Did you play organized soccer as a child? □ yes □ no

   18a. If yes, did you usually bike to your games? □ yes □ no

THANK YOU FOR YOUR HELP!

Appendix B: Weights and Home Fields

Table B-1. Weights by Division

	Boys	Girls
U6	0.65	0.76
U8	0.94	0.94
U10	0.88	0.73
U12	1.95	1.64
U14	1.23	1.03
U19	1.44	1.18

Table B-2. Fields by Division and Home Teams

	Division	Home Teams
Arroyo	U6	W
Arroyo East	U12	W
Emerson North	U10	W
Emerson South	U8	W
Community 1	U19G	-
Community 2	U8	N,E
Community 3	U8	N,E
Community 5	U6	N,E
Community 6	U12	N,E
Community 8	U10	N,E
Northstar East	U12	N
Northstar West	U14	NW
Mace North	U10	E
Mace South	U10	E
Nugget Center	U19B	-
Nugget West	U14	SE
Putah Creek Park	U6	S
Sandy Motley North	U8	S
Sandy Motley South	U6	S
Walnut Northeast	U10	S
Walnut South	U8	S