

Installation of Bicycle Lanes and Increased Ridership in an Urban, Mixed-Income Setting in New Orleans, Louisiana

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Background: People are more physically active in neighborhoods that are well designed for walking and bicycling. Building infrastructure for safer cycling is one way to promote physical activity. On-road bike lanes are one type of infrastructure hypothesized to positively impact levels of cycling. The first on-street bike lane was painted in New Orleans, LA during the spring of 2008. **Methods:** In November of 2007 and again in November 2008, trained observers conducted manual counts of cyclists riding on St. Claude Avenue in New Orleans, LA. The data collected included the number of men, women, adults, and children riding a bicycle with traffic, against traffic, and on sidewalks. **Results:** Data showed a 57% increase in the average number of riders per day ($P < .001$). There was a 133% increase among adult female riders ($P < .001$) and a 44% increase among adult male riders ($P < .001$). The percentage of cyclists riding in the correct direction, with the flow of traffic, increased from 73% to 82% ($P < .001$). **Conclusions:** Bike lanes can have a positive impact in creating a healthy physical environment. Future research should include other streets for comparison purposes and surveys to determine whether riders are substituting biking for nonactive forms of transportation.

Keywords: before and after studies, physical activity, built environment

Obesity is a significant and widespread problem in the United States, and particularly in New Orleans, LA, where 33% of adults are obese compared with 24% nationally.^{1,2} According to the 2007 Youth Risk Behavior Survey (YRBS), 17% of New Orleans youth were overweight, compared with 14% nationally.² Moreover, both children and adults in New Orleans were less likely to be physically active than people in the rest of the country: Forty-five percent of New Orleans youth reported participating in at least 20 minutes of vigorous physical activity on 3 or more of the past 7 days compared with 69% nationally. For adults, 38% in New Orleans met the recommended levels of physical activity compared with 49% nationally. These disparities were more pronounced among low- and moderate-income African-Americans. A lack of physical activity is one of the main factors contributing to obesity.

People are more physically active in neighborhoods that are well designed for walking and cycling.³ Building infrastructure for safer cycling is one way to promote physical activity.⁴ Children rarely bike or walk

for transportation, often because of safety concerns of their parents.⁵ Improving the infrastructure for cycling may increase the proportion of adults and children biking for transportation and/or recreation. On-road bike lanes are one type of infrastructure hypothesized to positively impact levels of cycling.

Researchers comparing the presence of bike lanes and levels of bike commuting have found that bike lanes are associated with increased proportions of people who cycle, particularly in cities well known for cycling, such as Minneapolis, MN; Portland, OR; and Sacramento, CA.⁶ A longitudinal study of bike commuter mode share using census data also found an increase in the number of cyclists after bike lanes are striped.⁷ Transportation officials in San Francisco, California, a city with an established network of shared and exclusive bike lanes, conducted count studies before and after lane treatments, and saw an increase in the number of cyclists observed.⁸ Overall, there are few studies that examine cycling levels through objective counts before and after new bike lanes are installed, and none that feature extended counts over more than a few days and hours and that identify gender and age group.⁹

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Methods

Setting

This study took place in New Orleans, LA, a city well suited for nonmotorized transportation. It is flat and has a temperate climate, and most neighborhoods are located

within 10 miles of the city center. Observations took place at one specific location along St. Claude Avenue, a state highway and urban principal arterial street that connects the French Quarter and downtown to several neighborhoods. The observation area is between Elysian Fields and Franklin Avenue, 2 other urban principal streets (Figure 1). The observation area is between 2 neighborhoods that differ sociodemographically. The proportion of African-American residents is 87% above and 18% below St. Claude Avenue, with 45% below the poverty line above St. Claude and 19% below.¹⁰ There are an average of 1.0 cars per household above St. Claude and 1.3 cars below.¹¹

The city of New Orleans Department of Public Works worked with the Louisiana Department of Transportation and Development to build bike facilities (shared and exclusive bike lanes) on streets that were submerged by water during the hurricanes of 2005. Before 2008, there were no on-street bike lanes in the city.

The Bike Lane

The 3.1 mile dedicated bike lane on St. Claude Avenue, also known as Louisiana Highway 46, is located between the outside travel lanes and the parking lane and was completed in the spring of 2008 (see Figure 2). Bike lanes were striped on both sides of the road and are 5

feet wide. The speed limit on St. Claude is 35 mph and the average daily traffic reported by the metropolitan planning organization was 23,216 vehicles in 2008. It is also a truck route with heavy traffic that connects parts of downtown New Orleans to St Bernard Parish, where several oil refineries are located. There are 2 11-foot-wide traffic lanes on either side of the road, separated by a 30-foot median. There are multiple bus stops along St. Claude Avenue, and the street includes a mix of schools, businesses, a police station, and private residences.

Data Collection

Using a specifically designed tally form, pairs of trained observers counted the number of cyclists in November 2007 (baseline) and November 2008 (follow-up). Follow-up observations were conducted 6 months after the bike lane was completed. In November 2007, data were collected for 10 days: 8 weekdays and 2 weekend days. In November 2008, data were collected for 14 days: 10 weekdays and 4 weekend days. The average temperature over data collection was 65 and 60 degrees Fahrenheit in 2007 and 2008, respectively. Data collected included the number of men, women, adults, and children riding a bicycle with traffic, against traffic and on sidewalks. Observers counted cyclists over a 9-hour period from 8



Figure 1 — Observation location and land uses within one-half mile of St. Claude Avenue and Spain Street, New Orleans, LA.



Figure 2 — The St. Claude Avenue bike lane, New Orleans, LA. *Photo credit: Isobel Healy, student at Tulane University School of Public Health.*

AM to 5 PM using standardized forms. Observers counted cyclists as they crossed an imaginary plane that ran from the sidewalk into the street on both sides of the road.

Procedures for observation of human subjects were followed according to guidelines established by the institutional review board of Tulane University.

Data Analysis

Counts of male, female, adult, and child cyclists were totaled for each hour and day. Means and standard deviations were calculated for the number of people observed cycling before and after the bike lanes were installed. We tested 3 hypotheses: 1) that the number of people observed cycling would increase from baseline to follow-up, 2) that the proportion of cyclists riding with traffic increased, and 3) that the proportion of people riding on the street instead of the sidewalk increased. We used negative binomial regression to test the first hypothesis and binary logistic regression to test the second and third. The outcome for first hypothesis was the number of people observed cycling. For the second and third, the outcome was binary indicating appropriate versus inappropriate behavior (eg, riding on the street or sidewalk and with or against traffic). We considered a P -value of 0.05 or less to be statistically significant. For all models time (pre/post) was the predictor. The unit of analysis was day for the first hypothesis and individual cyclists for the second and third hypotheses.

Results

Table 1 shows the number of cyclists observed riding on St. Claude Avenue during both weekdays and weekends, before and after the bike lanes were striped. There was an increase in the mean number of cyclists observed per day from pre- to post-installation (90.0 versus 142.5, respectively; $P < .001$).

There was a 133% increase in the average daily number of women riders observed in the street (12.6 versus 29.4; $P < .001$) and a 44% increase in the average number of male riders observed (77 versus 111.2; $P < .001$). There were very few children observed at both times.

Table 1 also shows the proportion of cyclists riding with and against traffic on the street, as well as whether they are riding on the street or sidewalk before and after the bike lanes were installed. The proportion of cyclists riding with traffic increased (73.3% versus 81.8%; $P < .001$). The proportion of cyclists riding on the sidewalk did not change after the intervention ($P = .90$).

Discussion

We found that after bike lanes were installed in an urban, low-income, predominantly African-American area in New Orleans, there were more adult cyclists observed riding their bicycles on the street and riding with traffic. These differences were evident among both males

Table 1 Location and Direction of Cyclists Observed Riding Before and After Installation of St. Claude Bike Lane, New Orleans, LA, 2007–2008

	November 2007		November 2008		% change	P-value
	Daily mean	(SD)	Daily mean	(SD)		
Location: street						
Total	90.9	21.7	142.5	18.5	56.8	< 0.001
Women	12.6	5.5	29.4	9.5	133.3	< 0.001
Men	77	17.1	111.2	14.1	44.4	< 0.001
Location: sidewalk						
Total	29.6	7.4	45.9	17.1	55.2	0.010
	November 2007		November 2008	Z	P-value	
Direction: cyclists riding w/traffic	73.3%		81.8%	5.22	0.001	
Location: cyclists riding on sidewalk	24.6%		24.4%	0.13	0.9	

and females. The differences were more striking among females, where there was a 133% increase in the number of female cyclists observed cycling after the lanes were constructed. This is consistent with other studies that point out that women have an inclination for biking facilities that are separated from traffic.¹²

Unexpectedly, the proportion of sidewalk riders did not change after the installation of the bike lanes. One possible reason is that the speed limit on St. Claude Avenue is 35 mph and it is a major thoroughfare for large trucks carrying petroleum. Inexperienced cyclists may feel safer on the sidewalk in this environment. Another possibility is that the location of the parking lane may make it difficult for cyclists to easily access destinations on a particular block without either dismounting their bicycles and walking or riding on the sidewalk. Future research to help explain this finding should include intercept surveys asking sidewalk riders why they choose to ride on the sidewalk instead of the street where a bike lane is present.

This study contributes to a small body of research evaluating the use of bike lanes.^{7,8,9} There have been few observations of cyclists before and after bike lanes have been installed, and none that take place in New Orleans, a Southern city not known for its cycling infrastructure and that has a high proportion of residents who are overweight or obese. In addition, this study is the first we know of that uses objective measures to count not only the number of riders, but the direction they are riding and the riders on the sidewalk by gender in a before and after study using counts longer than 2 hours.

This study has several limitations. First, we did not include a comparison street in the area to address potential displacement from other streets without lanes to St. Claude. Second, it is possible that more people chose to ride a bicycle than drive because of the rising costs of car ownership, including gas prices, and not the lanes. This would imply that a decrease in gas prices would be

related to a decrease in the number of people cycling for transportation. During the observation period, the average price of gas in New Orleans was \$2.65 per gallon in November 2007;¹³ while in November 2008, the average price was \$1.67 per gallon.¹⁴ Although gas prices decreased in this period, we observed an overall 56.8% increase in the number of riders.

A third limitation is that these changes could be due to the increased proportion of people returning to the area after the hurricanes of 2005. It is difficult to measure the rate of population increase in New Orleans after the hurricanes without a full count of residents. However, the U.S. Census Bureau calculated population estimates based on building permits, estimates of construction, mobile home shipments, and estimates of housing loss for July 2007 and July 2008. These estimates indicate a population of 288,113 in 2007 and 336,644 in 2008, a 16.8% increase. It is unlikely that the increase in population was responsible for the 56.8% overall increase in the number of cyclists observed over the same time period.¹⁵ Additionally, in November 2007 there were 9,450 active residential addresses receiving mail in the 70117 zip code (which encompasses the study area), and in November 2008 there were 10,350 addresses receiving mail, roughly a 10% increase.¹⁶

Despite these limitations, this study has several strengths. Observations were conducted over a greater length of time per day (9 hours) and over more days (10 to 14 days) than other studies evaluating bicycle lanes. In addition, observations were made 6 months after the installation of the lanes, which reflected a real increase in cycling observed rather than a temporary one, due to the novelty of the new lanes. This is also the first study of bike lane usage conducted in New Orleans, Louisiana, a city with an African-American, low-income population.

Cycling for transportation or recreation is one way to increase physical activity, reduce sedentary behavior, and lose weight. Cycling also has other benefits such as

reducing congestion, air pollution and energy consumption.¹⁷ This research shows that bike lanes are well suited to New Orleans, and that perhaps if more bike lanes were built, more people would ride bicycles for fitness or fun. Additional lanes should be constructed in other low-income areas where the disease burden of obesity is highest. Public health practitioners and city engineers should consider installation of bike lanes as a means to improve health outcomes.

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References

1. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999-2008. *JAMA*. 2003;303(3):235-241.
2. *Youth Risk Behavior Surveillance—Selected Steps Communities, 2005*: Centers for Disease Control and Prevention.; February 23, 2007.
3. Troped PJ, Saunders RP, Pate RR, Reininger B, Addy CL. Correlates of recreational and transportation physical activity among adults in a New England community. *Prev Med*. 2003;37(4):304-310.
4. Dill J. Bicycling for transportation and health: the role of infrastructure. *J Public Health Policy*. 2009;30:S95-S110.
5. Kerr J, Rosenberg D, Sallis JF, Saelens BE, Frank LD, Conway TL. Active commuting to school: Associations with environment and parental concerns. *Med Sci Sports Exerc*. 2006;38(4):787-794.
6. Dill J, Carr T. Bicycle commuting and facilities in major U.S. cities: if you build them, commuters will use them. *Transp Res Rec*. 1828;2003:116-123.
7. Krizek KJ, Barnes G, Thompson K. Analyzing the effect of bicycle facilities on commute mode share over time. *J Urban Plann Dev*. 2009;135(2):66-73.
8. Fell SBL. (*Scott to Baker*) and *Tow Away Zone Proposal*. City Of San Francisco; 2004.
9. Pucher J, Dill J, Handy S. Infrastructure, programs, and policies to increase bicycling: an international review. *Prev Med*. 2010;50:S106-S125.
10. Census 2000 Full-Count Characteristics (SF 1) [Census Tracts 18, 19]: U.S. Census Bureau 2001.
11. Census 2000 Sample Characteristics (SF 4) [Census Tracts 18, 19]: U.S. Census Bureau 2001.
12. Emond CR, Tang W, Handy SL. Explaining gender difference in bicycling behavior. *Transp Res Rec*. 2009; (2125):16-25.
13. *Petroleum Marketing Annual 2007*. Washington D.C.: Energy Information Administration; 2008.
14. *Petroleum Marketing Annual 2008*. Washington D.C.: Energy Information Administration; 2009.
15. Annual Estimates of the Resident Population for Incorporated Places Over 100,000, Ranked by July 1, 2008 Population: April 1, 2000 to July 1, 2008: U.S. Census; 2009.
16. Zipcode repopulation. New Orleans: Greater New Orleans Community Data Center; 2010.
17. Litman T. Integrating public health objectives in transportation decision-making. *Am J Health Promot*. 2003;1(18):103-108.