York Blvd

THE ECONOMICS OF A ROAD DIET

By Cullen McCormick

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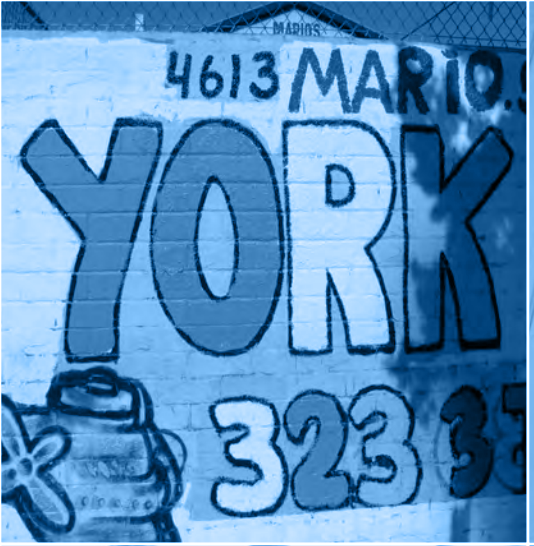
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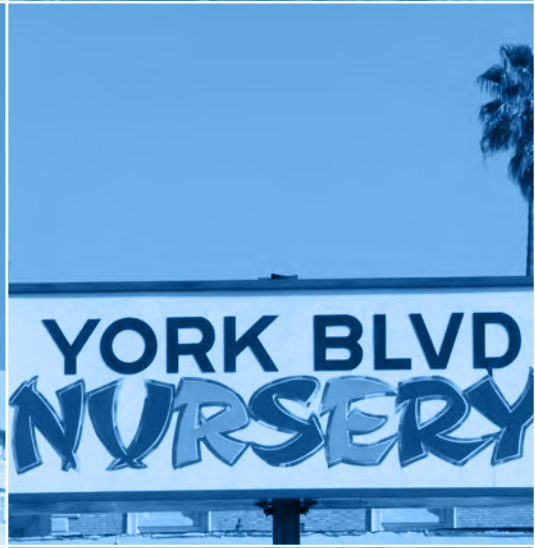
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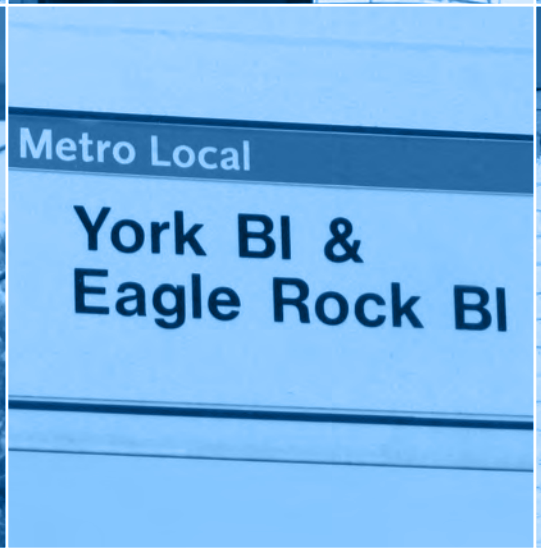
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The businesses and patrons of York Boulevard

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ES. Executive Summary

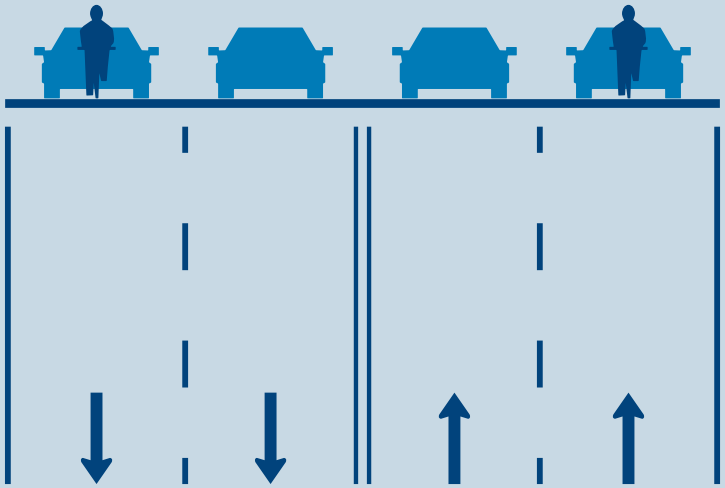
Premise

Cities throughout the United States are increasingly implementing bicycle infrastructure and related roadway modifications as a unified approach to mounting environmental, public health, and traffic safety concerns. Among the most ubiquitous modifications are “road diets,” which reapportion auto lanes used for through-moving traffic to center turn lanes, bike lanes, widened sidewalks, and/or on-street parking. Figure ES1 depicts a typical road diet conversion. While road diets have gained support in many communities, they are also a source of controversy among some merchants and residents. These constituents feel that reducing auto lanes or replacing them with bike lanes creates traffic congestion, makes it more challenging for customers to access businesses, and may negatively impact property values.

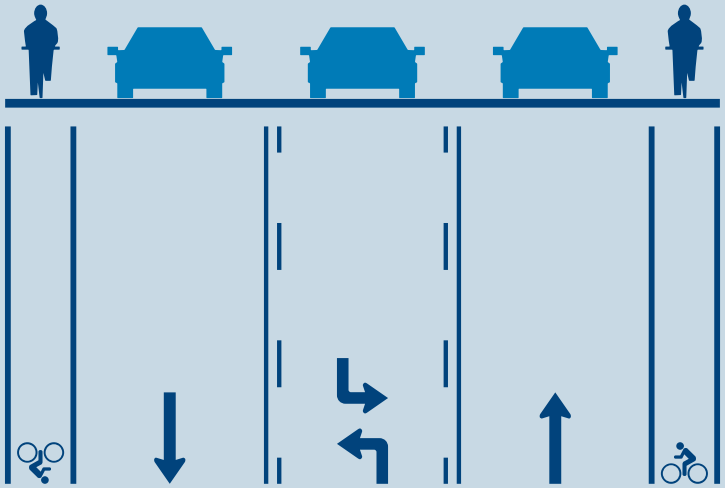
Traffic studies have consistently shown that road diets will not worsen congestion under the appropriate conditions—streets with less than about 20,000 daily vehicle trips, or roughly what one might expect on the main street of a small to medium downtown. Yet there are remarkably fewer data on how road diets affect components of surrounding

Figure ES1
Typical road diet conversion

Pre-Road Diet
Two auto lanes in each direction, shared with bicycles



Post-Road Diet
One auto lane and one bike lane in each direction, plus a center turn lane



local economies, such as property values or business revenues. In other words, while there are myriad voices linking road diets to both positive and negative economic outcomes, there is very little concrete evidence to support either claim. York Boulevard: The Economics of a Road Diet explores this relationship through case research in the Highland Park neighborhood of northeast Los Angeles, California.

The backbone of a low- to moderate-density, mixed residential and commercial neighborhood, York Boulevard is an ideal corridor for studying the economic effects of road diets because it creates a natural experiment. Land uses, socioeconomic characteristics, and the quantity and types of businesses remain fairly comparable over the entire the study corridor, but half of the corridor has a road diet and bicycle lanes and the other half does not. As Figure ES2 illustrates, the western portion of the corridor—between Eagle Rock Boulevard and Avenue 55—received a road diet in 2006 and bike lanes in 2010. The eastern half of the York Boulevard corridor, from Avenue 55 to Figueroa Street, retains its original,

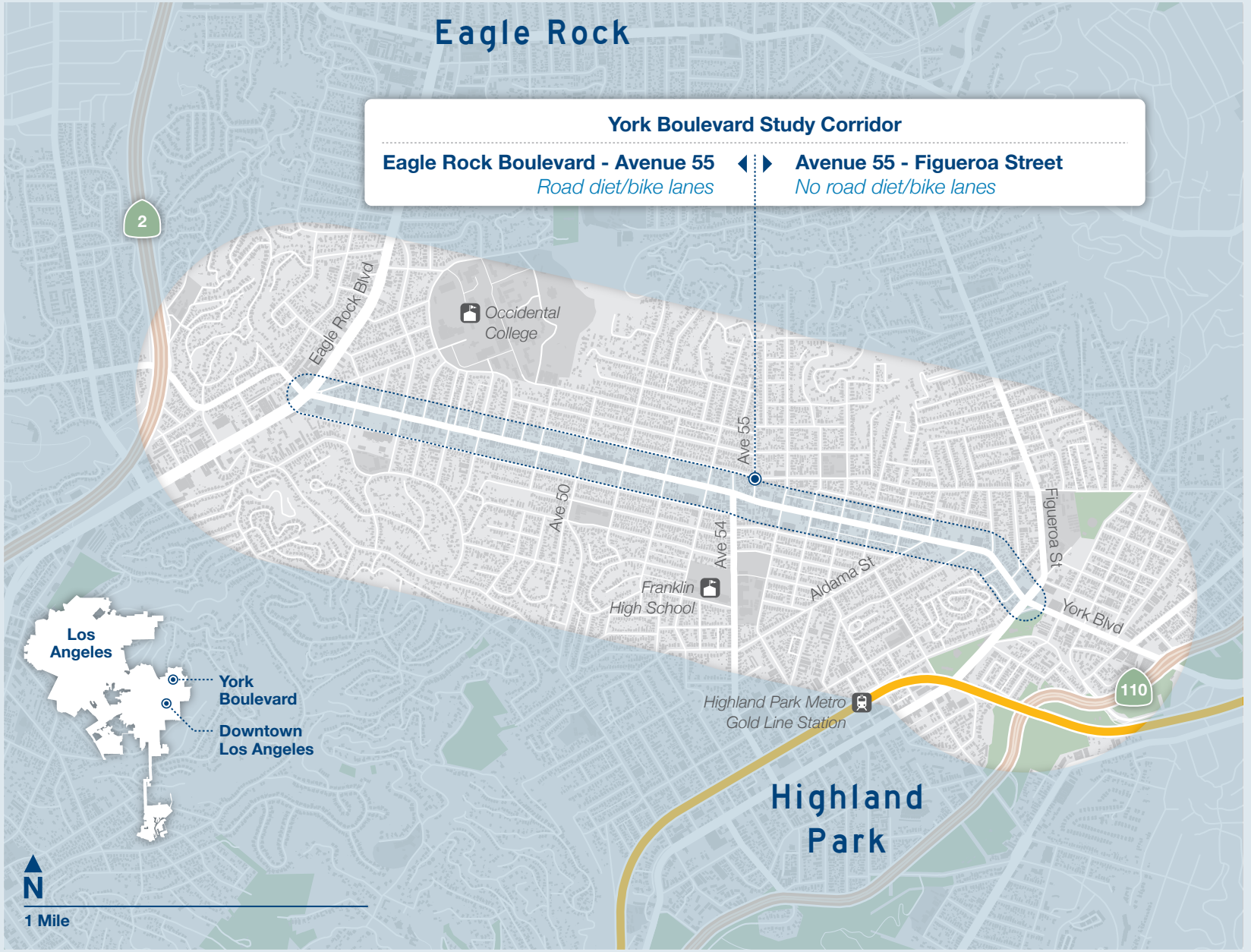


Figure ES2 York Boulevard study corridor

non-road diet configuration. These conditions present the unique opportunity to evaluate the economic effects of a road diet both temporally (before and after the road diet implementation) and spatially (how similar settings fare with and without a road diet). By controlling for differences over time and place, such an arrangement may produce more accurate findings than a comparable analysis in a less ideal setting.

Before launching into my analysis, I complete a review of the existing, albeit narrow literature on the interactions between road diets, bicycle facilities (such as bike lanes, bike routes, and bike paths), and local economies, which, for the most part, include property values, sales tax revenues, and stakeholder perceptions. This literature review yields the following overarching observations, which help inform my research approach:

Off-street bicycle paths generally have neutral or positive impacts on surrounding property values, yet findings related to off-street paths have little transferability to on-street bicycle infrastructure.

On-street bicycle facilities demonstrate no consistent effect on economic metrics such as business revenues, yet they remain contentious among adjacent businesses.

Research on road diets and economic activity is significantly limited. While existing research suggests that road diets can boost economic performance, negative perceptions of road diets persist among some segments of the public.

Methodology and Key Findings

This project seeks to determine whether the York Boulevard road diet has helped, hindered, or had no effect on economic activity in the surrounding community. Specifically, I ask, since the York Boulevard road diet implementation in 2006, has there been any change in local economic activity between the sections of York Boulevard with and without a road diet/bicycle lanes? I define local economic activity to comprise quantitative metrics of economic performance, such as property values, as well as qualitative perceptions, namely whether local

merchants and customers believe bicycle facilities have a generally positive or negative impact on their businesses and shopping patterns, respectively. I evaluate my hypothesis using the following resources:

- Qualitative merchant and customer surveys
- Quantitative data on property sale price, business turnover and new businesses openings, sales tax revenues, and a hedonic price model integrating multiple data sources

Table ES1 summarizes my research approach and principal findings. From these findings I posit the following key takeaways:

Road diets have little effect on surrounding businesses, property values, and customer shopping patterns. Therefore, opposition to road diets on economic grounds appears unfounded.

The majority of surveyed merchants do not feel that bike lanes hurt their businesses, and similarly large percentages of customers believe bike lanes are important roadway additions. Still, opinions about removing on-street parking and auto lanes for bike lanes/road diets are divided.

On-street parking is clearly an important asset to both local merchants and customers.

Merchants' perceptions about their customers' travel patterns do not align with customers' stated patterns. Merchants assume more customers drive than reflected in customer survey responses.

Businesses and customers alike seem to prefer slower vehicle speeds or feel that speed is unimportant.

Recommendations

Quantitative data do not support the notion that road diets lower surrounding local businesses and property values. Opposition to road diets on economic grounds therefore appears unfounded. Still, popular support for converting auto lanes and on-street parking to bike lanes remains lukewarm.

	Metric	Analysis	Findings
Qualitative	Business owner/ manager surveys	Assesses merchants' perceptions of road diets and bike lanes on business performance and customer shopping patterns	Survey responses are generally similar between merchants and customers and between both corridor halves. A noteworthy exception is that merchants' perceptions about their customers' travel patterns do not align with customers' stated travel modes; merchants assume more customers drive to their businesses than reflected in customers' responses
	Customer intercept surveys	Assesses customers' perceptions of road diets and bike lanes on shopping patterns	
Quantitative	Property sale price	Compares commercial and residential property sale price per square foot between the corridor halves and before/after the road diet implementation	No significant differences in property sale price exist between the corridor halves or before/after the road diet implementation
	Bradley-Burns sales tax	Compares sales tax revenues, collected as a proxy for business sales, between the corridor halves and before/after the road diet implementation	Sales tax revenues are higher on the road diet section of York Boulevard; although, since the data are provided in aggregate terms, it is not possible to conduct statistical tests or attribute the higher sales tax revenues to the presence of the road diet
	New business openings	Compares the number of new businesses that have opened on each corridor half since the road diet implementation	No significant differences exist in the number of new business openings between the two corridor halves
	Business turnover	Compares the number of businesses on each corridor half that have closed over the 2001-2011 period	No significant differences exist in business turnover between two the corridor halves
	Hedonic price model	Gauges how much the presence or absence of a road diet influences property sale price	The presence or absence of road diet is not a significant determinant of property sale price

Given pressing safety concerns for people riding bicycles—if not broader concerns for public health and the environment—simply not building bikeways in controversial situations is an untenable solution. In light of these conditions, I propose the following recommendations and potential avenues for future research.

The design of road diets and bicycle facilities must carefully involve local community members—especially those whose businesses and homes flank proposed road diets and bicycle facilities—and any roadway modifications must be sensitive to the needs of people who bicycle as well as those who do not.

Multilingual, multifaceted outreach efforts are essential to successful bikeway projects.

When faced with the decision between removing an auto travel lane or on-street parking for a bike lane installation, cities should favor removing the travel lane or defer to local preferences.

Cities and bicycle advocacy organizations should integrate localized economic impact studies into bikeway planning and conduct follow-up studies after bikeway implementation. Such studies may help rectify the dissonance between economic data on road diets, which suggest these treatments have little economic impact on surrounding communities, and community perceptions, which reflect a greater hesitance to convert travel lanes or on-street parking to bike lanes for economic reasons.

Given the stated importance of on-street parking among community members, future economic research should examine how converting on-street parking to bike lanes affects adjacent businesses.

Cities should continue their efforts to install road diets, bike lanes, and similar infrastructure.

In summary, road diets appear unlikely to harm local economies. Cities, employing proper outreach, should therefore continue to install road diets to improve safety and encourage bicycling.


Snap-on

1. Introduction

Los Angeles at a Crossroads

As Los Angeles progresses into the second decade of the twenty-first century, the city is increasingly experiencing the pressures of interwoven public health, environmental, and economic concerns. Rates of obesity and diabetes have climbed to epidemic proportions throughout the city and are highest among economically disadvantaged populations (County of Los Angeles, 2011; County of Los Angeles, 2007). On many days of the year, regional air quality remains among the worst in the country, which has spurred rising incidences of asthma and other respiratory ailments (South Coast Air Quality Management District, n.d.). Moreover, an expanding body of research suggests that exposure to ultrafine particles emitted from diesel exhaust may adversely affect the brain and heart in previously unforeseen ways (Li et al., 2010; McAuley et al., 2010; Schmid et al., 2009). These findings generate particular concern in Los Angeles given the region's numerous ports, rail terminals, and highways, many of which abut low-income communities. Los Angeles' highways, as well as local streets, also rank among the most congested in America—burning fuel and time, and fueling growing concern about global climate change (Texas Transportation Institute, 2011). Finally, and shockingly, 99 Californians lost their lives while bicycling in 2009, the second highest number of such fatalities in the country (National Highway Traffic Safety Administration, 2011). Almost a quarter of these fatalities, 22, occurred in Los Angeles County (Biking in LA, 2012).

At the same time as these traffic safety, environmental, and health issues come to a head, transportation infrastructure is crumbling. Today's municipalities operate in an increasingly constrained budgetary environment, limiting cities' abilities to upkeep infrastructure (Yglesias, 2011). The dearth of revenues has resulted in transportation maintenance needs that have largely eclipsed stagnating available funds (Taylor, 1995). Even worse, and as nearly every American is aware, national recession and sweeping home foreclosures have put countless individuals out

of work or otherwise in economic distress.

Amidst these staggering concerns, cities throughout the country are embracing strategies to promote bicycling and walking, which have emerged as a unified response to public health and environmental issues (Klein, Reiskin, and Sadik-Kahn, 2012). These travel modes afford inexpensive, healthy transportation choices; moreover, because they are human-powered, they have minimal environmental consequences (Dannenberg, Frumkin, and Jackson, 2011). The comparatively inexpensive construction costs, low maintenance costs, and generally high job creation rates of bicycle and pedestrian construction projects also resonate well with cash-strapped municipalities (Garrett-Peltier, 2010).

Trends toward bicycling and walking are nascent, yet some signs are emerging of their benefits to health (Pucher et al., 2010; De Hartog et al., 2010), traffic safety (Reynolds et al., 2009), and the environment (Frank et al., 2006). As efforts to promote bicycling have gained popularity in other major US cities, the City of Los Angeles has begun transforming the physical configurations of its streets—adding bicycle lanes, paths, and related infrastructure to accommodate the needs of people riding bicycles as well as drivers (City of Los Angeles, 2010). These actions embrace a view that streets can be more than purely corridors for cars, but shared public spaces supporting a variety transportation options.

Opposition and Need for Additional Research

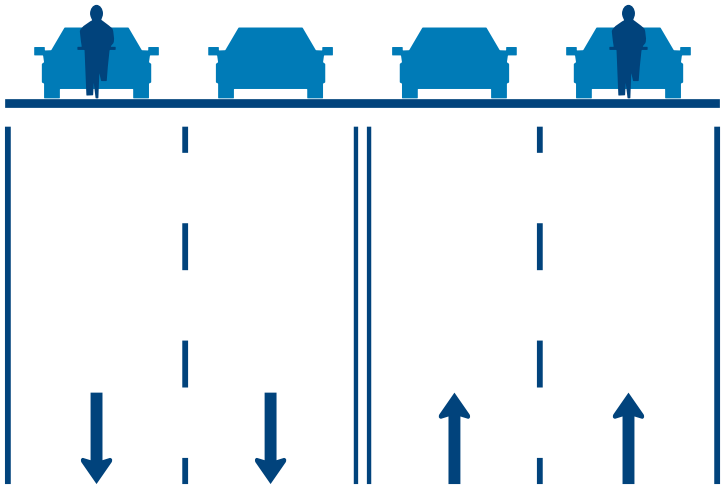
The changing landscapes of urban roadways are far from universally popular. Indeed, two modifications in particular oftentimes remain a contentious issue among some business owners, residents, and drivers. These modifications are bike lanes—street space reserved only for people bicycling—and "road diets." Road diets convert auto lanes used for through traffic into center turn lanes, bike lanes, widened sidewalks, and/or on-street parking. (See The Mechanics of a Road Diet sidebar for additional information about these treatments.) Individuals who oppose these modifications perceive that reducing auto travel

lanes or replacing them with bike lanes creates traffic congestion, makes it more challenging for customers to access businesses, and may negatively impact property values (Aldous, 2011; Banks, 2010; Bowen, 2011; Grynbaum, 2011; Lee, 2011; Scott, 2011). Indeed, road diets remain a particularly controversial subject in Los Angeles, where debates of their merit soldier on passionately in community meetings and public discourse (Banks, 2010).

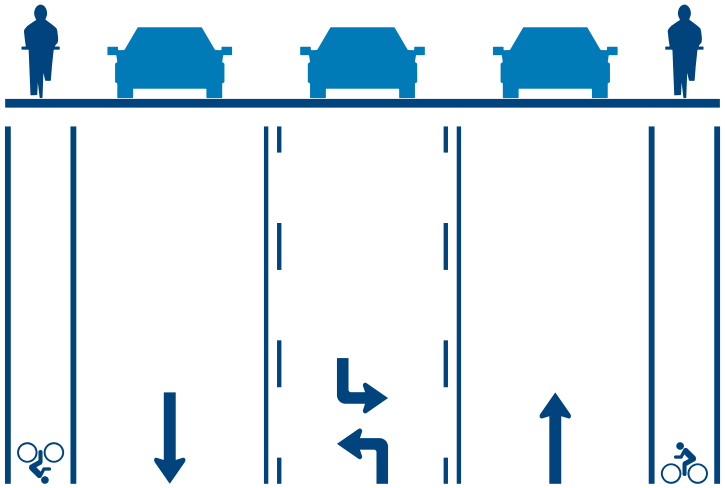
At the same time, traffic analyses have consistently found that road diets on streets that carry roughly 20,000 autos per day will generally not worsen traffic congestion (Huang, Stewart, and Zegeer, 2004; see The Mechanics of a Road Diet sidebar for additional explanation). Twenty thousand trips per day is approximately the amount of traffic York Boulevard carries, or what one might expect on the main street of a small to medium downtown. Without significantly altering auto capacity, road diets expand space for people to bicycle. This unique harmony may help allay concerns over road diets reducing auto capacity. Yet planners and economists have

Figure 1
Typical road diet conversion

Pre-Road Diet
Two auto lanes in each direction, shared with bicycles



Post-Road Diet
One auto lane and one bike lane in each direction, plus a center turn lane



The Mechanics of a Road Diet

Road diets re-purpose auto lanes on a street from serving through auto traffic to accommodating other uses, including center turn lanes, bicycle lanes, and sidewalks. Figure 1 portrays a typical road diet conversion. Here, a street with four auto lanes (two in each direction) is converted to three auto lanes (one in each direction plus a center turn lane) and bike lanes (one in each direction).

Road diets have been shown in many traffic studies to significantly "increase safety for pedestrians, bicyclists, and motorists while improving the quality of life in downtowns" (Tan, 2011). Road diets improve safety by allocating dedicated space to bicycles, reducing the number of auto lanes pedestrians must traverse when crossing the street, and reducing the number of lanes a left-turning vehicle must cross (Tan, 2011).

Although they reduce the number of lanes for through traffic, road diets on streets with less than roughly 20,000 daily auto trips will generally not worsen traffic congestion (Huang, Stewart, and Zegeer, 2004). Road diets do not worsen congestion under these conditions because adding center turn lanes allows traffic to flow more efficiently at intersections (Tan, 2011). Specifically, left-turning vehicles may wait in the center turn lane and not impede the flow of through traffic. Without the added center turn lane, left-turning vehicles would wait in a through travel lane, delaying through-moving traffic behind them. In other words, on streets that carry less than roughly 20,000 autos per day, the efficiency gained by the additional center turn lane counteracts the loss of through travel lanes.

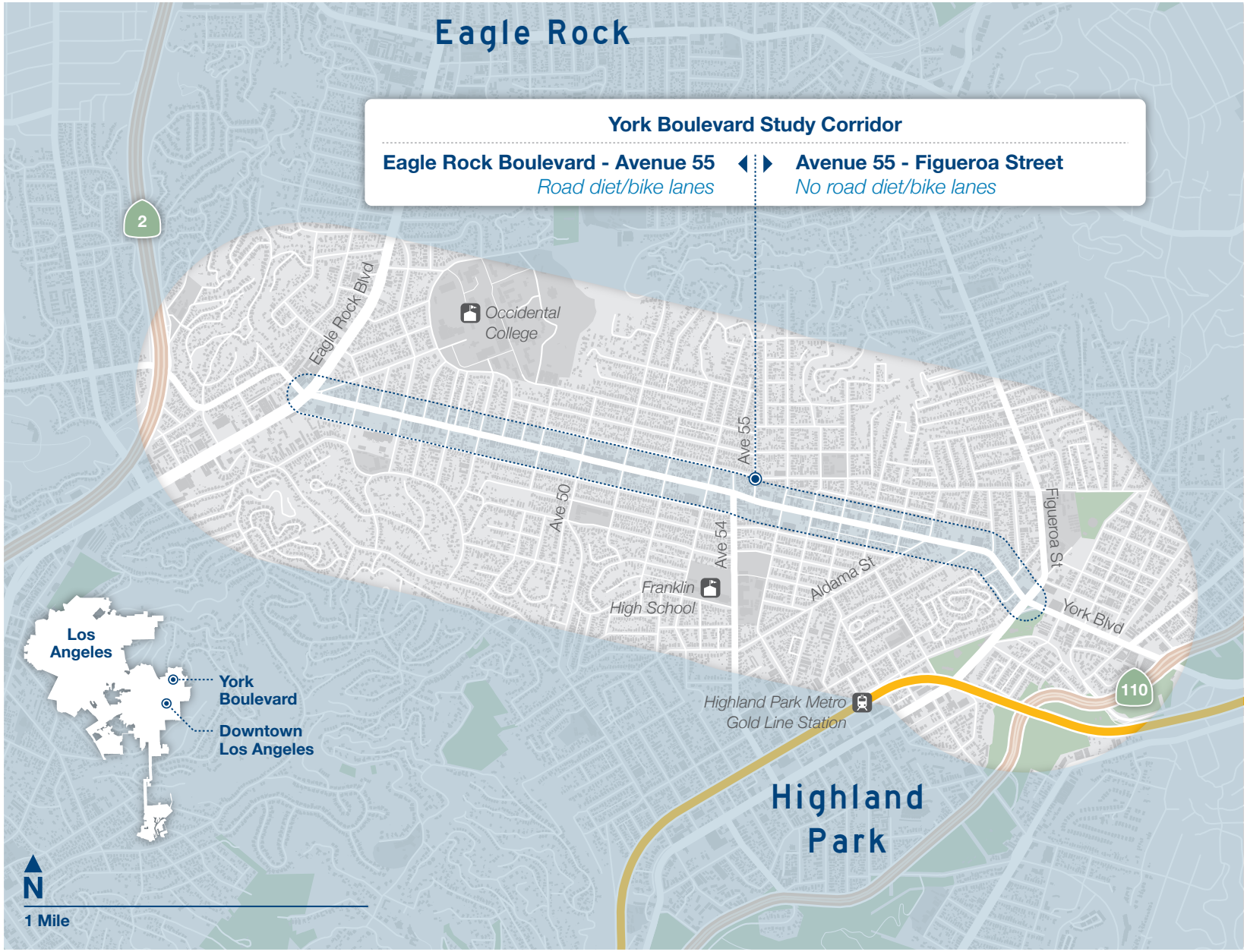


Figure 2 York Boulevard study corridor

only a limited understanding of the impacts of road diets and bicycle lanes on the economic health of adjacent communities (Krizek, 2007a). Furthermore, there is very little research into how merchants are likely to react to bike lanes/road diets and how business owners may perceive these modifications to affect their businesses. Indeed, the heads of city transportation departments in Chicago, New York, San Francisco, and other major US cities consistently call for additional research into the economic implications of bicycle infrastructure and road diets (Klein, Reiskin, and Sadik-Kahn, 2012).

This information gap detracts from arguments both favoring and opposing road diets on economic grounds since factual data to support either claim are scarce. The need for information of this nature is particularly relevant given that economic vitality remains a prevalent concern among road diet opponents, if not all Americans. York Boulevard: The Economics of a Road Diet helps close the knowledge gap by providing a definitive illustration of exactly how road diets and bike lanes interact with community economic activity. My hope is that planners, community members, and other decision-makers can apply the body of information this research generates to enhance the planning, design, and outreach efforts of future road diet and bicycle infrastructure projects.

Why York Boulevard?

This project examines the community lining the roughly two-mile section of York Boulevard between Eagle Rock Boulevard and Figueroa Street in the Highland Park neighborhood of northeast Los Angeles, California. This section of York Boulevard is the backbone of a low- to moderate-density, mixed residential and commercial neighborhood. As Figure 2 illustrates, the western portion of the corridor—between Eagle Rock Boulevard and Avenue 55—received a road diet in 2006. The road diet reconfigured the street from two travel lanes in each direction with on-street parking to one travel lane in each direction with a center turn lane and on-street parking. The Los Angeles Department of Transportation (LADOT) later added bike lanes to

About York Boulevard

Socioeconomics

Race/Ethnicity *Pie Chart*

- Asian
- Black
- Latino
- White
- Other

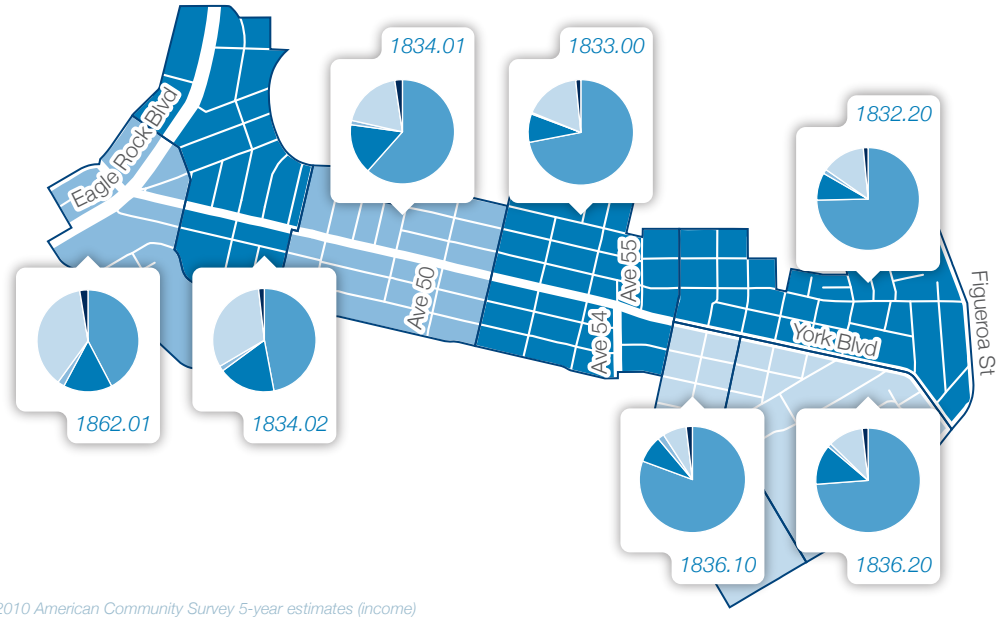
1832.20 **Census tract**

Median Income *Map*

- $40,000 - $45,000
- $45,000 - $50,000
- $50,000 - $55,000

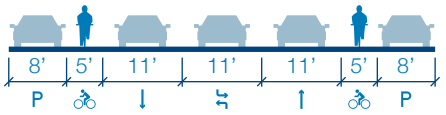
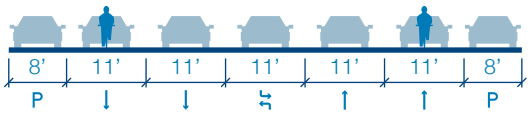
N

1 Mile



Source: US Census Bureau. 2010 US Census (race/ethnicity); 2010 American Community Survey 5-year estimates (income)

Configuration/Usage

Section	Street cross-section	Daily auto trips	Daily bicycle trips
Road Diet *Eagle Rock Blvd - Ave 55* *Length: 1.3 miles*		**22,199** **York Blvd at Ave 54** *6/25/2009* *24-hour period*	**168** **York Blvd at Ave 50** *9/13/2011* *Total of 2-hr a.m., 2hr-midday, and 2-hr p.m. counts*
Non-Road Diet *Ave 55 - Figueroa St* *Length: 0.88 miles*		**23,646** **York Blvd at Figueroa St** *10/12/2010* *24-hour period*	**No data**
Measurements: Google Earth	*Measurements: Google Earth*	*Source: LADOT*	*Source: LACBC*

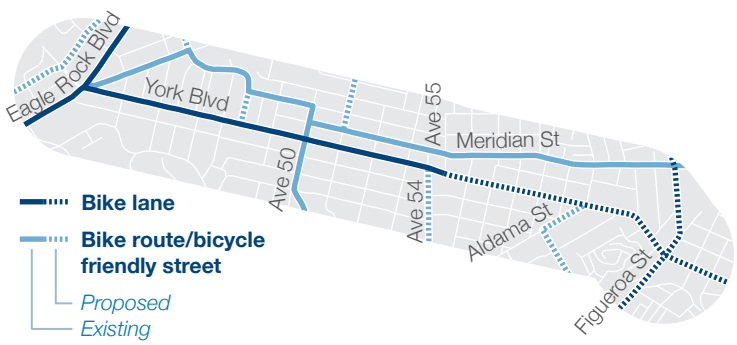
About York Boulevard (Continued)

Zoning/Bikeways

Zoning

Source: Los Angeles County Assessor's Office

Bikeways



Source: Los Angeles Department of City Planning

Timeline

2006 — *LADOT implements York Blvd road diet*

2010 — *LADOT adds bike lanes to road diet section of York Blvd*

2012 — *York Boulevard: The Economics of a Road Diet study completed*

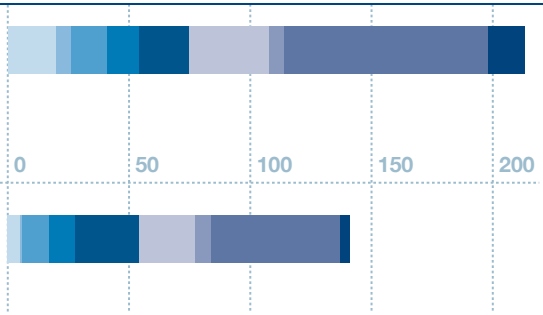
2012 — *York Blvd bike lanes planned for eastward extension to Figueroa St*

Land Uses

Section	Total businesses
Road Diet *Eagle Rock Blvd - Ave 55*	153
Non-Road Diet *Ave 55 - Figueroa St*	97

Source: Author

Distribution of uses



Source: Los Angeles County Assessor's Office

- **Automotive**
- **Industrial**
- **Office** (bank, commercial, office, medical)
- **Other** (religious, government, parking)
- **Residential** (multi family)
- **Residential** (single family)
- **Restaurant**
- **Retail**
- **Vacant**

this segment in December, 2010. The slightly wider eastern half of York Boulevard, from Avenue 55 to Figueroa Street, retains its original configuration of two travel lanes in each direction, a center turn lane, and on-street parking. Pending community support, LADOT plans to implement a road diet for this segment of York Boulevard as well, which would remove one travel lane and add bike lanes.

York Boulevard is an ideal corridor in which to study how road diets interact with surrounding economies because it creates a natural experiment. As the About York Boulevard sidebar displays, land uses, socioeconomic characteristics, and the quantity and types of businesses remain fairly comparable over the entire the study corridor, but half of the corridor has a road diet and bicycle lanes and the other half does not. This arrangement affords the unique opportunity to evaluate the economic effects of a road diet both temporally (before and after the road diet implementation) and spatially (how similar settings fare with and without a road diet). By controlling for differences over time and place, such an arrangement may produce more accurate findings than a comparable analysis in a less ideal setting.

Project Goals and Structure

This project seeks to determine whether the York Boulevard road diet has helped, hindered, or had no effect on economic activity in the surrounding community. Specifically, I ask, since the York Boulevard road diet implementation in 2006, has there been any change in local economic activity between the sections of York Boulevard with and without a road diet/bicycle lanes? I define local economic activity to comprise quantitative metrics of economic performance, such as property values, as well as qualitative perceptions, namely whether local merchants and customers believe bicycle facilities have a generally positive or negative impact on their businesses and shopping patterns, respectively. As a point of departure, I assume that there is no difference in economic activity between the road diet and non-road diet sections of York Boulevard. I evaluate my hypothesis using the following resources:

- Qualitative merchant and customer surveys
- Quantitative comparisons of property sale price data, data on business turnover and new businesses openings, sales tax data, and a hedonic price model integrating multiple data sources

I begin this investigation in Chapter 2, Abridged Literature Review, with a summary of existing research into the economic implications of bicycle infrastructure and road diets. This limited body of research yields no consistent relationship between bike lanes and economic activity but does suggest that road diets may boost economic performance based on property values, sales taxes, and stakeholder perceptions. The abridged literature review presents only major research themes and their applicability to the York Boulevard study. Appendix A contains the complete literature review.

Chapter 3, Methodology, outlines the research strategy for analyzing the economic impacts of the bike lanes and road diet along York Boulevard. As noted above, this two-pronged approach relies upon qualitative surveys of businesspersons and customers as well as quantitative property sale price, sales tax, and new business/business turnover data analyses, as well as a hedonic price model. I also address considerations and known weaknesses to my research strategy, which generally stem from the inability to obtain completely random samples in my surveying efforts.

Chapter 4, Findings, presents the results of my analyses. I first analyze the survey data and find minimal differences in survey responses between the two sections of York Boulevard. I then turn to the quantitative data sources, which likewise exhibit statistically insignificant differences in economic metrics between the road diet and non-road diet segments. I contrast and draw conclusions from the qualitative and quantitative sources, revealing that road diets and bike lanes are not likely to adversely affect surrounding local economies.

Chapter 5, Recommendations, concludes the study. Based on the quantitative analyses, opposition to road diets on economic grounds appears to be unfounded. Furthermore, under the proper conditions, there is little basis in traffic engineering for road diet opposition (Tan, 2011; Huang, Stewart, and Zegeer, 2004). Still, popular support for converting auto lanes and on-street parking to bike lanes remains lukewarm. I therefore recommend a bikeway outreach, planning, and design process that carefully involves local community members. Finally, cities and bicycle advocacy organizations should integrate studies similar to this investigation into bikeway planning and post-implementation evaluation.

2. Abridged Literature Review

Key Literature Findings

Before launching into my analysis, I complete a review of the existing, albeit narrow literature on the interactions between road diets, bicycle facilities (such as bike lanes, bike routes, and bike paths), and local economies, which, for the most part, include property values, sales tax revenues, and stakeholder perceptions. Appendix A contains a complete literature review. Here, I summarize the overarching findings of the review and discuss the literature's applicability to the York Boulevard study.

Off-street bicycle paths generally have neutral or positive impacts on surrounding property values, yet findings related to off-street paths have little transferability to on-street bicycle infrastructure.

On-street bicycle facilities demonstrate no consistent effect on economic metrics such as business revenues, yet they remain contentious among adjacent businesses.

Research on road diets and economic activity is significantly limited. While existing research suggests that road diets can boost economic performance, negative perceptions of road diets persist among some segments of the public.

Takeaway From Literature

The majority of existing research into road diets, bicycle infrastructure, and economic activity pertains to the economic impacts of off-street bike paths, which have little transferability to their on-street counterparts (Racca and Dhanju, 2006). Moreover, the limited research addressing road diets and on-street bicycle facilities in an economic light—and the even further constrained body of peer-reviewed work—produces a wide spectrum of conclusions (Krizek, 2007a). These findings vary immensely by region and perhaps even by methodology (Krizek, 2007a). Stantec's report, for example, identifies that merchants tended to overestimate losses in surveys when compared to recorded sales data (2011). Finally, the dearth of economic research on road diets makes it nearly impossible to develop meaningful

conclusions about their economic impact.

Skepticism toward on-street bicycle facilities and road diets clearly persists—particularly among merchants when such facilities come at the expense of on-street parking (Grynbaum, 2011; Lee, 2011; Scott, 2011). Although the opinions of proponents and opponents are essential to framing discussions, they alone should not guide on-street bikeway decision-making. Yet, excepting hedonic price analyses, much existing research draws upon "anecdote rather than actual market data" while existing, readily available sources, such as sales tax revenues and property values, go largely untapped (Nicholls and Crompton, 2005, 321). This incongruence calls to a need for research that balances surveys—an excellent mechanism for assessing stakeholder perceptions—with numeric sales and property data, which minimize bias in the conditions they portray. My research fuses surveys with numeric data in just this manner.

The York Boulevard study proffers recommendations to create bicycle facilities that are economically harmonious with their context. Stantec's report offers a relevant framework for such facilities, including, for example, "allocating scare [road] space to different uses according to the demand at different times" and moving "quickly to meet with the businesses that have been particularly impacted...in order to mitigate sales losses" (2011, vi).

Although Krizek (2006) and Racca and Dhanju (2006) show on-street bikeways to have little effect on property values, these studies investigate only residential environments. Examining property sale prices along a mixed commercial and residential corridor such as York Boulevard may yield differing results. Additionally, the socioeconomic contexts of Krizek (2006) and Racca and Dhanju's (2006) studies—Minneapolis-Saint Paul and Delaware, respectively—may very well be irrelevant to Los Angeles.

Perhaps the most cohesive criteria for future economic studies of road diets and bikeways comes from Krizek et al. (2007b), which establishes that research should:

1. Measure effects at a neighborhood, municipal, or regional scale
2. Inform bikeway policy decisions and implementation
3. Utilize stakeholder surveys and existing data
4. Employ units that are comparable within the individual study as well as among related studies
5. Quantify effects both for cyclists and the broader community

The methodology I employ, described in the next section, builds explicitly upon Krizek's (2007b) five recommendations.

3. Methodology

Research Question

This research asks the following question: since the York Boulevard road diet implementation in 2006, has there been any change in local economic activity between the sections of York Boulevard with and without a road diet/bicycle lanes? I define local economic activity to comprise quantitative metrics of economic performance, such as property sale prices—a close approximation of overall property value—and sales taxes—a proxy for retail sales revenues. My definition also includes qualitative perceptions, namely whether local merchants believe road diets/bike lanes to improve or hurt their businesses and whether these pieces of road infrastructure affect customers' shopping patterns.

Research Design

To determine what changes in local economic activity, if any, have occurred since the York Boulevard road diet procedure, this research utilizes the methods and resources outlined in Table 1.

Using these sources stems directly from the economic impact research framework that Krizek et al. (2007b) develops to assess bicycle infrastructure.

I use the above data sources to evaluate a number of key variables. In all instances, the independent variable is the presence or absence of a road diet. I attempt to determine how this independent variable interacts with several dependent variables that together represent economic activity. For the surveys, the dependent variable is perceptions of how bike lanes and a road diet may affect shopping patterns and business performance. The quantitative data sources all attempt to measure a dependent variable I refer to as economic performance—whether property values and sales tax revenues are higher and whether there are more new businesses in either the road diet or non-road diet section of York Boulevard.

The unit of analysis for measuring the above variables is York Boulevard between Eagle Rock Boulevard and Figueroa Street (as displayed previously in Figure 2). Specifically, my research compares the section of

	Metric	Purpose	Statistical Test	Source	Date Acquired
Qualitative	Business owner/ manager surveys	Assesses merchants' perceptions of road diets and bike lanes on business performance and customer shopping patterns	Not possible due to less-than-random sample	Collected firsthand	August, 2011
	Customer intercept surveys	Assesses customers' perceptions of road diets and bike lanes on shopping patterns	Not possible due to less-than-random sample	Collected firsthand	February, 2012
Quantitative	Property sale price	Compares commercial and residential property sale price per square foot between the corridor halves and before/after the road diet implementation	T-test	Los Angeles County Assessor's Office	February, 2012
	Bradley-Burns sales tax	Compares sales tax revenues, collected as a proxy for business sales, between the corridor halves and before/after the road diet implementation	Not possible due to aggregated data	California State Board of Equalization	March, 2012
	New business openings	Compares the number of new businesses that have opened on each corridor half since the road diet implementation	Chi-square test	Collected firsthand	August, 2011
	Business turnover	Compares the number of businesses on each corridor half that have closed over the 2001-2011 period	Chi-square test	California State Board of Equalization	March, 2012
	Hedonic price model	Gauges how much the presence or absence of a road diet influences property sale price	Multiple regression model	Los Angeles County Assessor's Office; Los Angeles Police Department; US Census	February, 2012

York Boulevard with bike lanes and a road diet—from Eagle Rock Boulevard to Avenue 55—to the section between Avenue 55 and Figueroa Street without these features.

Study populations vary depending on the given analysis. For the business surveys and new business data, the population includes all businesses directly abutting York Boulevard between Eagle Rock Boulevard and Figueroa Street. The sales tax and business turnover data include all non-chain businesses with taxable sales, which is explained in greater detail below, over this same geography. For property sale price information and the hedonic price model, the population includes all commercial and residential parcels with available data directly abutting York Boulevard. The intercept surveys target any individual shopping, dining, or walking along York Boulevard.

All surveys reflect attitudes, opinions, and other conditions present from August, 2011, until February, 2012, the period during which surveys were collected. Unfortunately, the inception of this research project in 2011 bars me from having collected surveys before the road diet and bike lane implementations. The quantitative analyses all compare conditions before and after the road diet implementation in 2006. The Los Angeles Department of Transportation (LADOT) added bike lanes to the road diet section of York Boulevard in 2010. With this narrow time frame, there are insufficient data to measure whether the bike lanes are associated with any additional change in economic conditions above and beyond those that might be linked to the road diet. Accordingly, the quantitative sources principally address the potential economic impacts associated with the road diet procedure.

Survey Methodology and Analysis Procedures

Survey Overview

I survey a sample of more than 50 businesses from each section of the York Boulevard study corridor. Additionally, I complete a patron intercept survey with 25 customers from each corridor half. The

business surveys investigate whether interviewees—comprising business owners and managers—feel that bike lanes, vehicle travel speeds, and roadway width, as well as trade-offs between vehicle travel lanes, on-street parking, and bike lanes, have any effect on business performance. The patron intercept surveys ask whether customers feel these same variables affect where they choose to shop.

Survey Question Development

I develop the businessperson and customer survey instruments, shown in Appendix C, through an iterative process with Los Angeles County Bicycle Coalition staff, Los Angeles Department of Transportation Bicycle Program staff, and UCLA Luskin School of Public Affairs faculty. For ease and speed of implementation, I primarily utilize yes/no and multiple choice question formats. I create both English and Spanish versions of the surveys, as well as an oral consent document, and administer the surveys in both languages. I administer the surveys in person and record participants' responses. Survey response rates, which I expand upon in the Considerations and Survey Results sections below, are generally about 50 percent.

The business surveys contain 11 yes/no, multiple choice, and short answer questions. The questions inquire about the following subjects:

- Business tenure
- Perceived customer modes of transport used to access York Boulevard
- Attitudes toward road width and vehicle travel speed—as proxies representing road diet/non-road diet conditions—and whether these factors have any impact on business performance
- Attitudes toward bike lanes—whether businesspersons feel that bike lanes have hurt their business and whether they would be willing to trade an auto travel lane or on-street parking for a bike lane

The customer intercept surveys comprise a shorter, six-question survey including yes/no, multiple choice, and short answer questions. This instrument asks for the following information:

- Mode of transport used to access York Boulevard
- Attitudes toward road width and vehicle travel speed—again as proxies representing road diet/non-road diet conditions—and whether these factors influence where customers choose to shop
- Attitudes toward bike lanes—whether customers feel that bike lanes are necessary infrastructure and whether they would be willing to trade an auto travel lane or on-street parking for a bike lane

Sample Development

To complete the business surveys, I first develop an accurate, comprehensive list of active businesses along the study corridor. I use the City of Los Angeles' Zone Information and Map Access System (ZIMAS) online mapping database to develop the population of businesses from which to draw a sample. Specifically, I retrieve Assessor's information for each parcel abutting York Boulevard. I note all parcels containing at least partial commercial activity on the site as determined by the parcel's Use Code. I then conduct a field visit of the York Boulevard study corridor. I cross-reference the list of commercial parcels obtained through the ZIMAS database with the observed businesses directly abutting York Boulevard.

From these sources, I create one master list of businesses fronting the York Boulevard corridor. As Figure 3 displays, I then create two sub-lists of businesses, one for each half of the corridor. To obtain random samples, I alphabetize the businesses

Figure 3
Business survey sample development

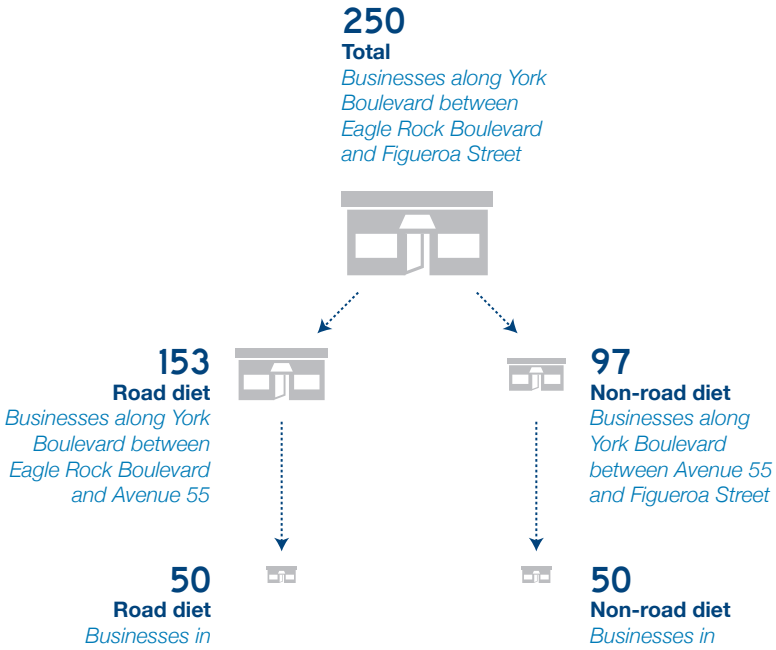
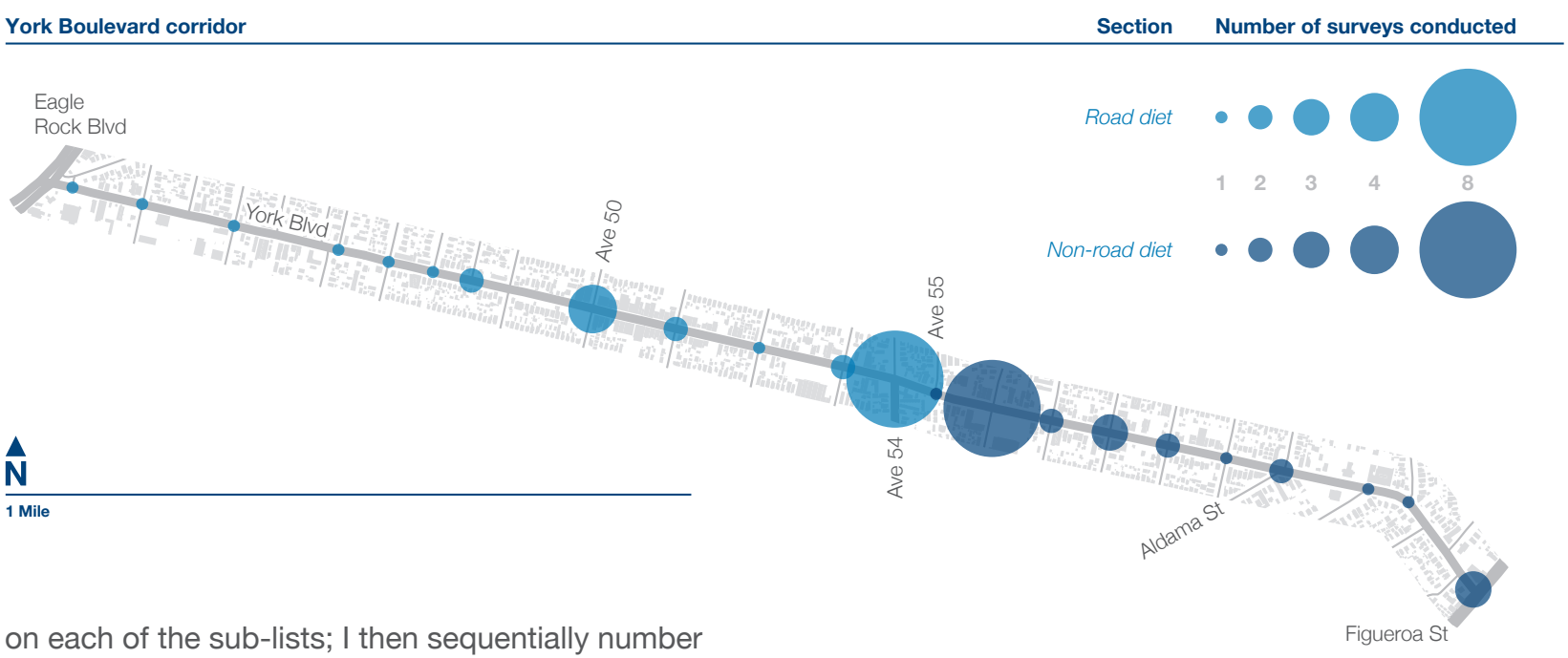


Figure 4 Customer intercept survey locations



on each of the sub-lists; I then sequentially number the businesses on each list. I use a random number generator to select 50 businesses from each list. The generator is run twice, once for each half of the corridor.

The customer intercept surveys involve a more straightforward procedure. I collect 25 survey responses for each half of the York Boulevard corridor for a total of 50 surveys. I survey any willing participant who I observe shopping, dining, or walking along York Boulevard. (Walking includes trips to/from a car or bicycle.) Figure 4 shows the locations of these surveys.

My data analysis compares merchant and customer survey responses between the two halves of the York Boulevard corridor. I examine whether opinions differ between sections with and without bike lanes/ road diets and between customers and patrons. To

protect confidentiality, I aggregate responses to the half-corridor level (i.e. road diet and non-road diet sections) and compare responses as percentages.

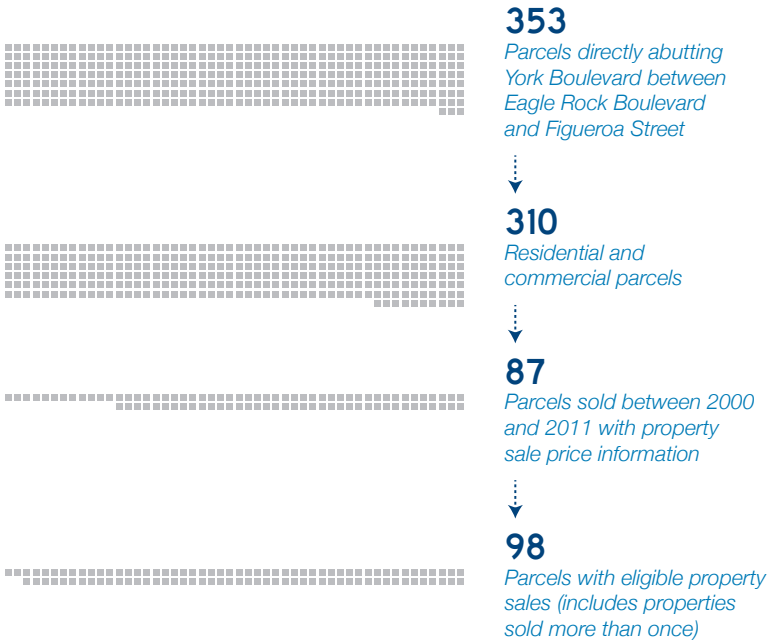
Quantitative Data Methodology and Analysis Procedures

Property Sale Price Analysis

This research component begins by acquiring Los Angeles County Assessor's Office parcel data from the Los Angeles Department of City Planning. To protect confidentiality, I only discuss parcel data in aggregate terms. I collect Secured Basic File Abstract data for all 353 parcels directly abutting York Boulevard between Eagle Rock Boulevard and Figueroa Street. These data provide recent, albeit incomplete information about the last three sale prices and dates of sale for most parcels. Since economic objections to road diets and bike lanes most commonly hinge on residential property values and impacts to businesses, I narrow my scope to only include residential and commercial parcels. Filtering the data in this manner excludes all parcels with religious, governmental, parking, and vacant uses, and narrows the number of parcels studied to 310. I then exclude all parcels that were not sold during my study period of 2000 to 2011 or that lack property sale price information. This narrows the eligible parcels to only 87 for the entire study area. However, since it is property sales I am concerned with, and not necessarily the parcels themselves, I double count any parcels that were sold more than once during either the pre- (2000-2005) or post-road diet (2006-2011) periods. Duplication increases the number of parcels with eligible property sales to 98. Figure 5 shows the parcel selection process. Since property sales can occur at any time and for a multitude of reasons, I assume this selection of parcels to be a close approximation of a random sample.

Using geographic information system (GIS) software, I display parcels spatially and classify them based on whether a parcel is located within the road diet or non-road diet section of York Boulevard. For both sections, I categorize data based on whether the property was last sold between 2000 and 2005 or

Figure 5 Sales tax analysis parcel selection process



2006 and 2011. As mentioned above, this analysis excludes parcels not sold during either of these periods and parcels with no sale information.

To account for inflation, I convert all sales values to 2011 dollars. Once prices have been adjusted for inflation, I divide a property's sale price by the square footage of the building located on the parcel. This calculation determines the property sale price per square foot. I use price per square foot to control for building size. From here, I calculate the average price per square foot for each of the two halves of the corridor and for both time periods (2000-2005 and 2006-2011). I use a T-test statistical procedure to test for significant differences both spatially and temporally.

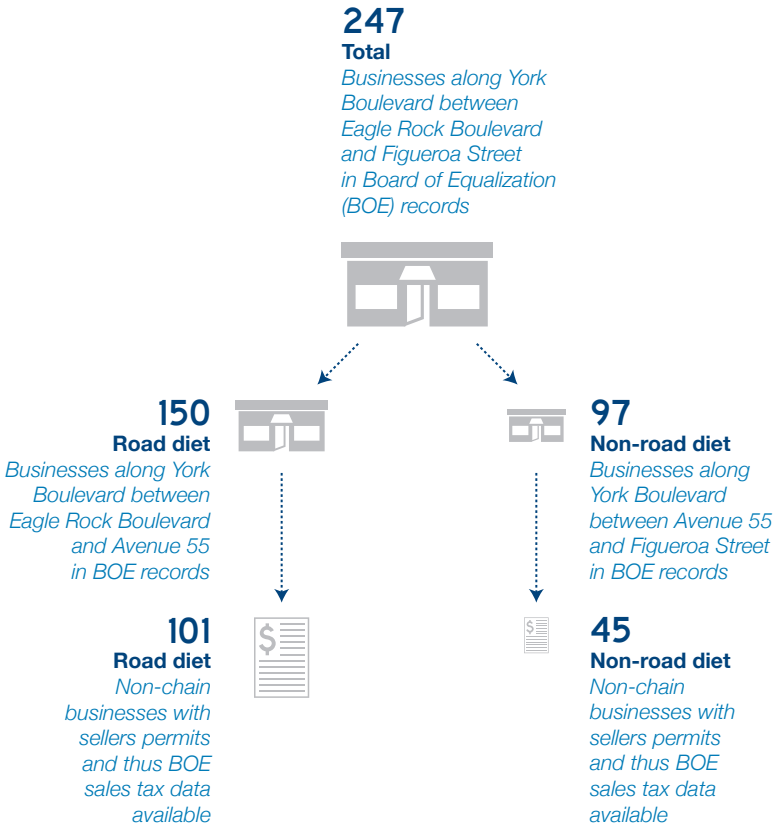
Bradley-Burns Sales Tax Analysis

Bradley-Burns sales tax data administered by the California State Board of Equalization (BOE) provide the basis for this analysis. These taxes are a percentage of a business' total sales; thus, higher sales tax revenues correlate directly with higher sales revenues. To preserve confidentiality, the Board provides aggregated sales tax data for the road diet and non-road diet halves of the York Boulevard corridor and for the 2001-2005 (pre-road diet) and 2006-2011 (post-road diet) time periods.

The Board of Equalization collects data only for businesses with sellers permits—those businesses, such as convenience stores, restaurants, and retailers, for whom the bulk of transactions are

taxable sales. The BOE data exclude service businesses—such as medical offices, financial service providers, and hair salons—which have few or no taxable sales and do not require sellers permits. Additionally, the Board of Equalization cannot isolate sales tax revenues from individual stores within a retail chain. Thus, the BOE data also exclude chain stores. Figure 6 shows that of the 150 businesses listed in the BOE records for the road diet portion of the corridor (a number that differs only slightly from the 153 businesses I observed in my field visit), 101 are non-service, non-chain businesses with available sales tax data. Similarly, 45 of the 97 businesses on the non-road diet portion of the corridor have available sales tax data. In other words, sales tax data are available for half to two-thirds of all corridor businesses.

Figure 6
Board of Equalization sales tax data availability



I compare the BOE data both in their raw form and as sales tax revenue per square foot per year. In both instances, I convert the data to 2011 dollars to control for inflation. For the latter comparison, I divide data from the five-year (2001-2005), pre-road diet period by five and the six-year (2006-2001), post-road diet period by six to produce standardized one-year figures. To compensate for differences in business size and the number of businesses on the two corridor halves, I divide sales tax data for each half-corridor by the total commercial square footage

present on each half-corridor. This square footage includes all parcels with commercial, restaurant, retail sales, and shopping center use codes; it omits all parcels with service business use codes (i.e. medical buildings, offices, and similar businesses with no taxable sales).

Since the data are only available in aggregate form, I cannot ascertain adequate information (namely the standard deviation of the data) to perform statistical tests. Instead, I complete non-statistical temporal and spatial comparisons of the sales tax data.

New Business and Business Turnover Analyses

I obtain information about new businesses that have opened along the York Boulevard corridor through my survey questionnaire, in which I ask business owners/managers how long their businesses have been located on York Boulevard (see Appendix C). From this information, I create two classes of businesses: those which have opened since the road diet implementation in 2006 and those which had been in operation prior to 2006. I use a Chi-square statistical procedure to compare the number of businesses that have opened on each section of York Boulevard since the road diet implementation in 2006. To protect confidentiality, I aggregate responses to the half-corridor level (i.e. road diet and non-road diet sections).

The California State Board of Equalization provides aggregated data on the number of businesses that have gone out of business and been replaced with a new business—referred to as business turnover—for each half of the York Boulevard corridor. As with sales tax data, turnover information is available only for non-chain businesses with taxable sales. These turnover data are not disaggregated to the pre- and post-road diet periods; they are provided only for the entire 2001-2011 timespan. Therefore, I compare the total number of properties that have had at least one turnover between the road diet and non-road diet corridor halves. Similar to the new business analysis, I use a Chi-square statistical test to compare business turnover. Contrasting the turnover data with the information on new businesses provides a more

holistic examination; it shows not just how many new businesses are opening, but the degree to which businesses are succeeding or failing along York Boulevard.

Hedonic Price Model

As a final metric of the impact of road diets on economic activity, I develop a hedonic price model. A hedonic price model is a form of regression analysis. It assumes that property sale prices are the sum of a variety of tributary components (Nicholls and Crompton, 2005). These components include both characteristics of the property itself, including building size, amenities, and upkeep, as well as neighborhood factors such as crime and transportation infrastructure (Franklin and Waddell, 2002). With the hedonic model, the degree to which a tributary component is present directly influences a property's sale price (Nicholls and Crompton, 2005). The hedonic model I develop therefore attempts to control for various property and neighborhood factors and determine how much of a property's sale price is attributable to the presence or absence of the road diet. Necessarily then, this model compares the road diet and non-road diet sections of the York Boulevard corridor during the post-road diet implementation period of 2006 to 2011.

Table 2 displays the initial variables considered for use in the hedonic pricing model. Property sale price is the dependent variable; property and neighborhood characteristics comprise the independent variables. I employ a stepwise regression, which automatically generates an optimized model employing only those variables with the strongest influence on sale price. Accordingly, not all of the variables listed in Table 2 are ultimately used in the hedonic model. The model ensuing from the stepwise regression, along with an analysis of my modeling results, is located in the Findings section below.

Considerations

Strengths and Weaknesses of Approach

In designing this research, I have attempted to build upon prior approaches, findings, and recommendations; my goal: to develop

Table 2
Initial hedonic price model variables

		Variable	Description
Independent		Property sale price	Property sale price per square foot for all parcels along the study corridor sold during the 2006-2011, post-road diet period (in 2011 dollars); a way of representing property value
Dependent	Neighborhood characteristics	Presence/absence of road diet	Dummy variable measuring whether a property is located along the road diet or non-road diet section of the corridor; the key determinant of how/whether road diets influence property sale price
		Location in commercial core	Dummy variable measuring whether a property is located along the two-block commercial core between Avenue 50 and Avenue 52; a way of controlling for walkability and gentrification, as, within the York Boulevard corridor, this section has generally been the epicenter of investment from abroad
		Crime per mile	Total number of crimes per linear mile reported along each half of the York Boulevard study corridor for the six-month period between August, 2011, and February, 2012; a means of controlling for neighborhood safety. Source: Los Angeles Police Department (http://www.crimemapping.com)
		Median income	Household median income for the census tract in which a property is located; a way of controlling for income. Source: 2010 American Community Survey 5-year estimates.
	Property characteristics	Lot square footage	Measurement of the size of a parcel; a way of controlling for parcel size
		Building size/livable area	Measurement of the size of the structure located on a parcel; a way of controlling for building size
		Land value	Assessed parcel value; a way of controlling for the value of land
		Improvement value	Assessed value of improvements made to the parcel, including buildings, landscaping, etc.; a way of controlling for the amount of investment on a given property
		Year built	The year that the structure on the parcel was constructed; a way of controlling for building age

Unless noted otherwise, the source for all variables in the above table is the Los Angeles County Assessor's Office.

a comprehensive tool for understanding the connections between bike lanes, road diets, and economic activity. I believe the model I have developed represents a sound approach for analyzing the research question. It takes into account a multitude of quantitative and qualitative factors to enhance the robustness of the findings. Despite these advantages, the research approach is not without constraints, and I attempt to enumerate known limitations in this section.

Limitations of Data Sources

The data I employ come from pre-published sources and stakeholder opinions, both of which carry implications for data accuracy and reliability. The Bradley-Burns sales tax applies only to "sales of tangible personal property" (California State Board of Equalization, 2009). Thus, businesses with minimal taxable sales, such as York Boulevard's numerous auto repair shops and hair salons, may be underrepresented in the sales tax analysis.

For all quantitative sources, it is difficult to draw correlation, and almost impossible to prove causality, between road diets/bike lanes and changes in economic metrics such as property sale prices. A host of factors independent from road diets and bike lanes certainly contribute to variation in economic performance. These influences range from broad, macroeconomic forces, namely the national economic downturn, to the localized variables of neighborhood and property characteristics. The hedonic price model attempts to control for these factors and determine how much of a property's sale price is attributable exclusively to the road diet.

Using the road diet conversion in 2006 as the threshold with which to assess economic changes places a stronger emphasis on the road diet implementation than the later bike lane addition. Nonetheless, I feel that the road diet installation warrants this emphasis. The diet's fundamental reconfiguration of York Boulevard appears more

plausible to affect surrounding conditions than the later bike lane installation, which added the lanes without modifying other elements of the road cross-section. I envision the bike lanes playing a more critical role among the perceptions of York Boulevard merchants, customers, and other community stakeholders as their addition creates a noticeable visual presence.

All survey responses represent opinions of the impacts of road diets and bike lanes on business performance and shopping patterns. By definition, individuals' subjective preferences and values frame the context for these responses. Additionally, individuals may not be able to understand all questions, or may choose to respond to questions dishonestly, both of which could potentially degrade the survey data reliability (Alwin and Krosnick, 1991).

Business owners/managers self report the number of years that their businesses have been located on York Boulevard. Although most business owners appeared knowledgeable, if not proud, of the number of years their business had been in operation, these accounts are subject to inaccurate or deceptive responses as well.

Although these inescapable potentialities exist, gaining an understanding of the support or opposition of local merchants and community members is clearly an important factor in evaluating road diets and bike lanes. Still, opinions are not a surrogate for numeric data, or vise versa. The design of this research therefore strives to blend qualitative and quantitative sources and, in doing so, maximize the objectivity of the research findings.

Nonresponses Preclude Statistical Analyses of Survey Data

The limitations of my survey implementation generally preclude statistical comparisons. For reasons of convenience, privacy, or disinterest, many patrons of the York Boulevard corridor may understandably refuse to participate in intercept surveys. This nonresponse bias represents a significant, yet unavoidable limitation of the intercept surveying

approach. It makes it difficult to obtain large volumes of survey responses. Moreover, it precludes obtaining a random sample of patrons and thereby drawing broader conclusions about York Boulevard customers in general. Figure 4 displays that survey responses tend to fall into geographic clusters. Clustered survey responses may create a locational bias; customers of businesses located near activity centers may be over-represented in survey responses.

Several randomly sampled businesses remained consistently closed after multiple survey attempts at different times on different days. I was therefore unable to survey these businesses. An additional five businesses refused to participate in surveys; individuals at these businesses cited not supporting solicitors, privacy, and being too busy as their rationales for not participating. In total, and coincidentally, I was unable to survey 23 of the 50 randomly sampled businesses on each half of the corridor.

To compensate for nonresponses yet still obtain at least 50 business surveys from each half of the corridor, I surveyed some business that were not included in my initial random sample. While I deviated from the initial random sample, I made sure to maintain a representative balance of the types of businesses I surveyed. Figure 7 shows the types of all businesses located along the York Boulevard corridor and juxtaposes them with the businesses in my survey. The figure reveals that the distribution of surveyed businesses aligns closely with the proportions of all businesses along the corridor. Still, this substitution precludes a statistical comparison of business survey responses because it results in a sample that is not purely random. While not completely random, the business and intercept surveys do afford an incredibly useful portrayal of a diverse segment of stakeholders, whose attitudes and perceptions play an important role in drawing conclusions about the interactions between road diets, bike lanes, and economic activity.

Figure 7 Business composition comparison

Business type	All businesses *Outside circle*	Surveyed businesses *Inside circle*
Automotive	12%	11%
Hair salon	8%	7%
Hotel	1%	1%
Industrial	1%	0%
Medical	7%	7%
Office	18%	22%
Restaurant	15%	14%
Retail	26%	28%
Service	13%	10%
Total	100%	100%

Considerations from the Literature

Although the literature on the economic impacts of bikeways advises that on-street bike lanes may have little effect on property values, these studies investigate only residential environments (Krizek, 2006; Racca and Dhanju, 2006). Moreover, the literature also evidences a great degree of variability in study results from different geographic locations, which suggests that findings may have limited transferability between regions (Krizek et al., 2007b; Krizek, 2006). Thus, examining property sale prices along a mixed commercial and residential corridor such as York Boulevard may yield differing results from prior studies in other contexts.

As noted above, the literature suggests it is inadvisable to generalize findings to other regions, and recommends instead repeating studies in various localities to obtain the most accurate information (Krizek et al., 2007b; Krizek, 2006). While my findings may not be directly transferable to other localities, I believe this research is valuable for designing future studies, and, at a broader level, in framing policy decisions and economic perceptions of road diets and bike lanes.

Findings

Survey Results

Figure 8 summarizes the business owner/manger survey responses. (Note: To facilitate comparison, I present Figure 8 and Figure 9, which displays customer intercept survey responses, on facing pages after Figure 10.) In total, 40 percent of businesses (60 out of 153) on the road diet section of York Boulevard (between Eagle Rock Boulevard and Avenue 55) and just under 60 percent of businesses (55 out of 97) on the non-road diet section (from Avenue 55 to Figueroa Street) participated in surveys. As explained in the Considerations section above, I was unable to survey 23 of the 50 randomly sampled businesses on each half of the corridor.

For the intercept surveys, I received 25 customer responses on each half of the York Boulevard corridor. Figure 9 shows the results of the customer intercept surveys; Figure 4, the locations of these surveys. When surveyed, three individuals indicated that they had not shopped along the York Boulevard study corridor that day. Each individual indicated that he or she lived in the neighborhood, and I chose to survey these individuals nonetheless.

Figures 8 and 9 display that responses are fairly harmonious between the two halves of the study corridor and between the businessperson and customer surveys. Most response pairs (i.e. road diet/non road diet, or merchant/customer) fall within ten percentage points of one another. Significantly, the overwhelming majority of merchants on both halves of the corridor—85 percent on the non-road diet section and 95 percent on the road diet section—feel that bike lanes have not hurt their businesses. Similarly, over 95 percent of customers surveyed on the road diet section and 80 percent of customers along the non-road diet portion feel that bike lanes are important roadway additions. Still, merchants and customers alike are divided in their feelings about removing a car lane or on-street parking for bike lanes; support for removing auto lanes or parking in favor of bike lanes waivers from roughly 40 to 60 percent.

The most noticeable dissonance in survey responses is that between merchants' perceptions of their customers' travel choices and customers' actual travel patterns. Merchants on both halves of the corridor presume the majority of their customers arrive by car, when in fact no more than about a quarter of customers indicated that they drove to York Boulevard. Figure 10 illustrates the most common responses merchants and customers offered when asked *why* they chose to support or not support removing on-street parking for bike lanes. Large numbers of merchants and customers alike voiced that on-street parking is critical to the health of businesses.

Quantitative Data Results

Table 3 summarizes the quantitative research findings.

Property Sale Price and Sales Tax

Figure 11 displays the results of the property sale price and sales tax analyses. The figure presents these results for both the road diet and non-road diet sections of York Boulevard and the pre- and

Source: Wordle

Figure 10 Reasons for supporting or not supporting bike lanes that replace on-street parking

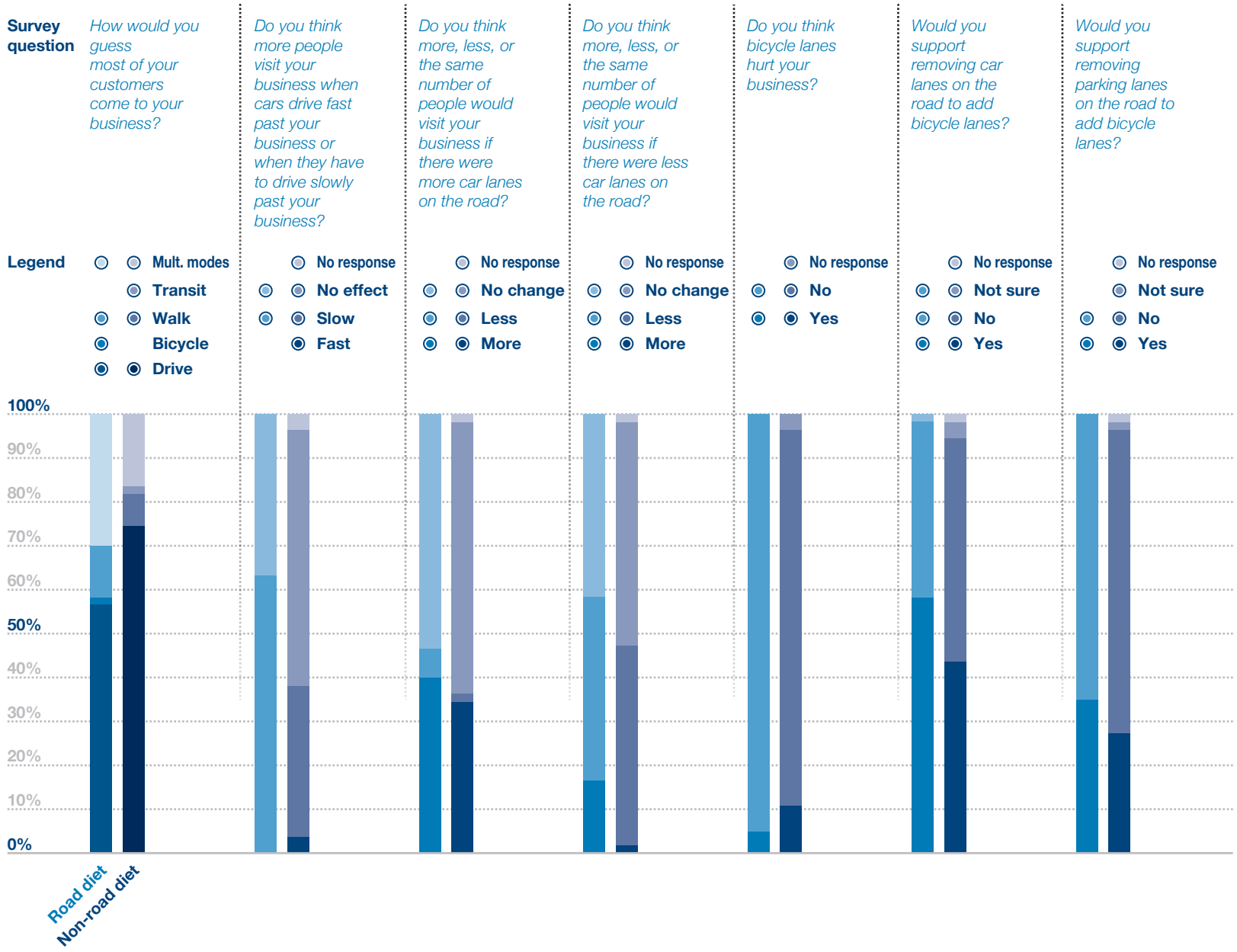
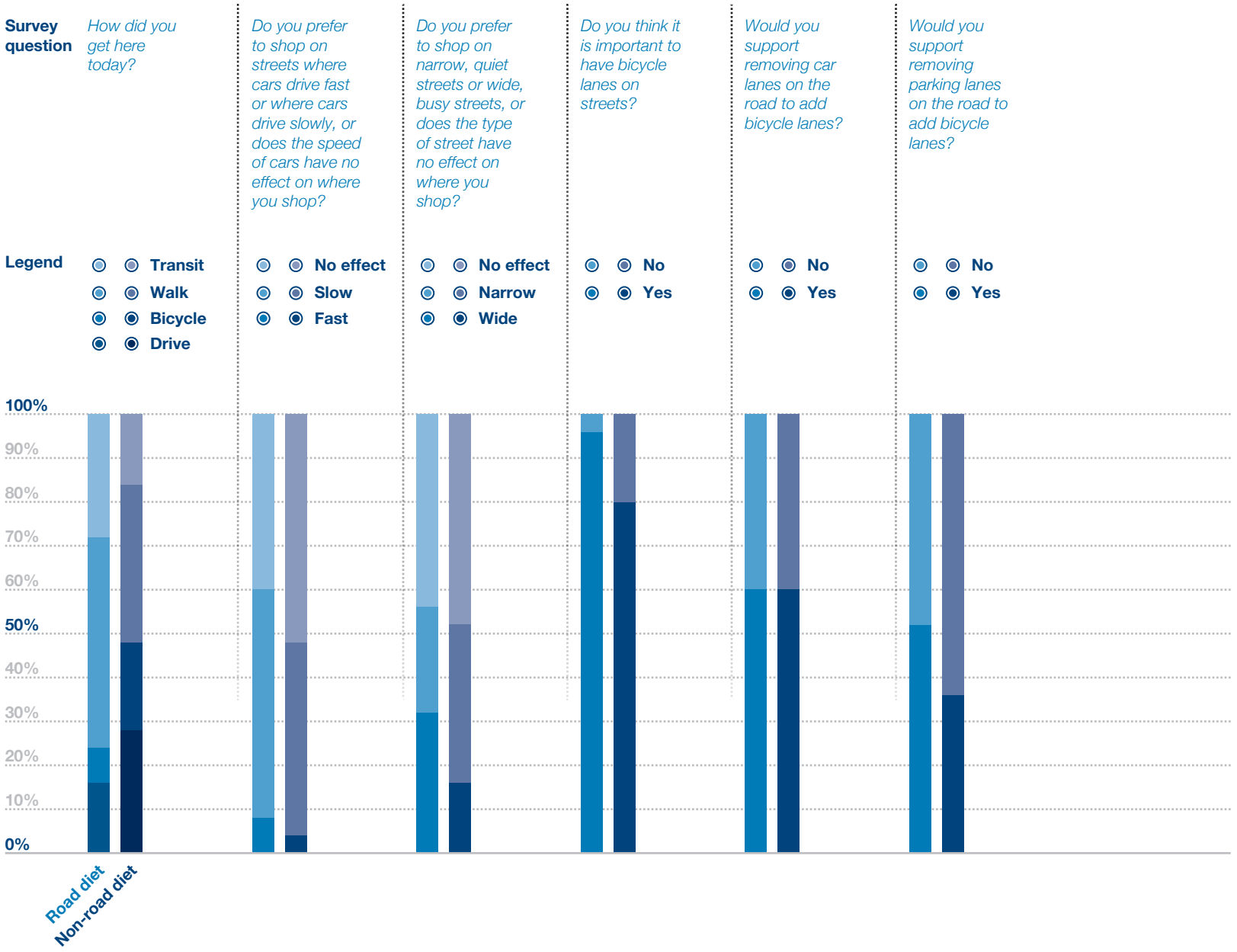

Survey question
How would you guess most of your customers come to your business?
Do you think more people visit your business when cars drive fast past your business or when they have to drive slowly past your business?
Do you think more, less, or the same number of people would visit your business if there were more car lanes on the road?
Do you think more, less, or the same number of people would visit your business if there were less car lanes on the road?
Do you think bicycle lanes hurt your business?
Would you support removing car lanes on the road to add bicycle lanes?
Would you support removing parking lanes on the road to add bicycle lanes?
Legend
Mult. modes
Transit
Walk
Bicycle
Drive
No response
No effect
Slow
Fast
No response
No change
Less
More
No response
No change
Less
More
No response
No
Yes
No response
Not sure
No
Yes
No response
Not sure
No
Yes
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Road diet
Non-road diet

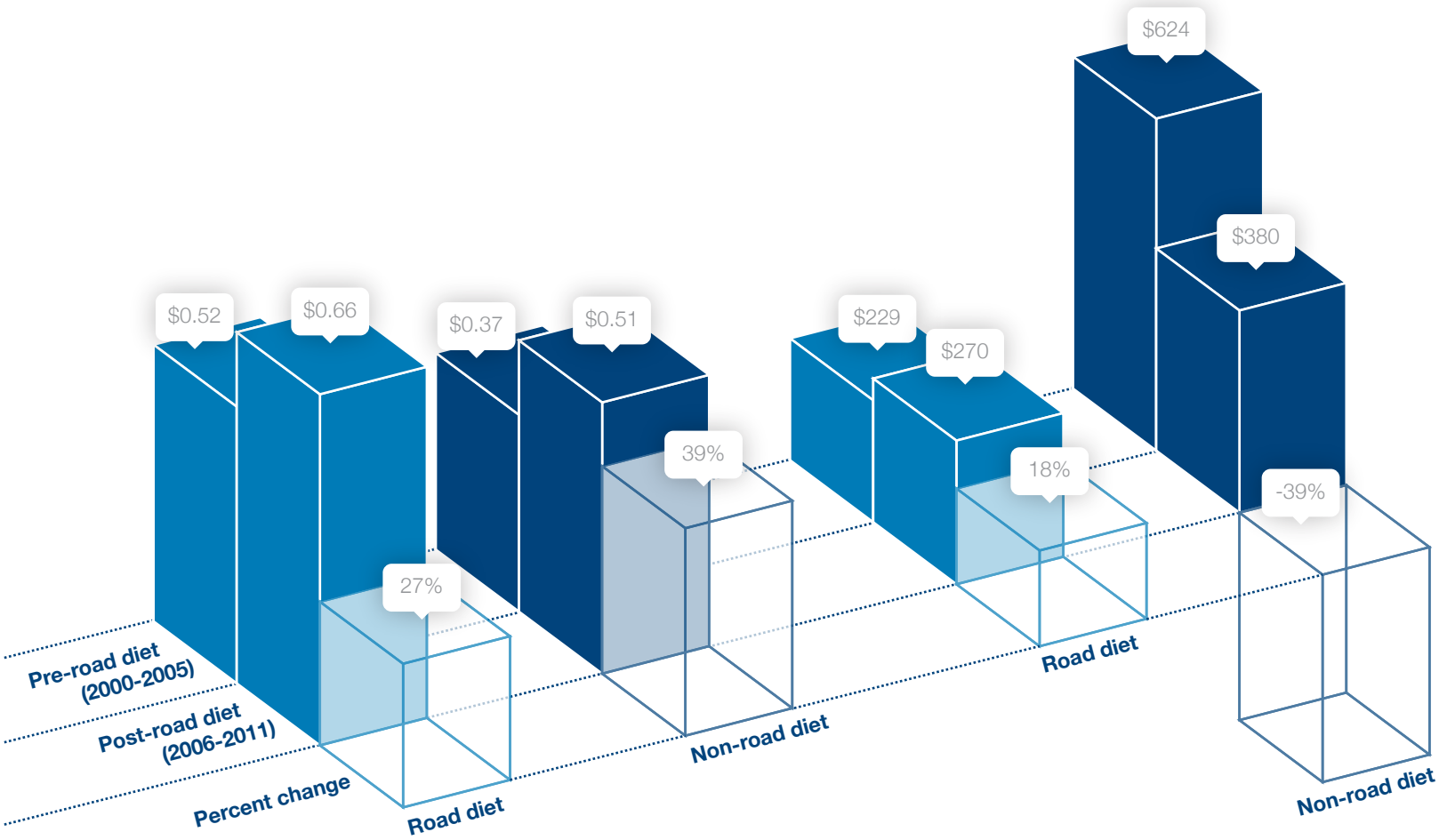
Figure 9
Customer survey responses



Metric	Analysis	Findings	Road Diet	Non-Road Diet
Property sale price	Compares commercial and residential property sale price per square foot between the corridor halves and before/after the 2006 road diet implementation	No significant differences in property sale price exist between the corridor halves or before/after the road diet implementation	**$229** *Pre-road diet implementation* **$270** *Post-road diet implementation*	**$624** *Pre-road diet implementation* **$380** *Post-road diet implementation*
Bradley-Burns sales tax	Compares sales tax revenues, collected as a proxy for business sales, between the corridor halves and before/after the road diet implementation	Sales tax revenues are higher on the road diet section of York Boulevard; although, since the data are provided in aggregate terms, it is not possible to conduct statistical tests or attribute the higher sales tax revenues to the presence of the road diet	**$727,937** *Pre-road diet implementation* **$1,116,745** *Post-road diet implementation*	**$344,623** *Pre-road diet implementation* **$574,778** *Post-road diet implementation*
New business openings	Compares the number of new businesses that have opened on each corridor half since the road diet implementation	No significant differences exist in the number of new business openings between the two corridor halves	**21** *New business openings*	**19** *New business openings*
Business turnover	Compares the number of businesses on each corridor half that have closed over the 2001-2011 period	No significant differences exist in business turnover between two the corridor halves	**55%** *Percent of businesses that have turned over at least once*	**62%** *Percent of businesses that have turned over at least once*
Hedonic price model	Gauges how much the presence or absence of a road diet influences property sale price	The presence or absence of road diet is not a significant determinant of property sale price		

Figure 11

Average property sale price per square foot and sales tax revenues in 2011 dollars



Average sales tax revenue per square foot per year

Average property sale price per square foot

post-road diet implementation periods. Additionally, Figure 12 shows the spatial distribution of property sales and sale values. What is less apparent from the two figures is that there is a high degree of sale price variation within each corridor half and time period. These extreme variations make it difficult to conclude statistically that there is a meaningful difference in property sale prices either spatially or temporally. Indeed, although Figure 11 illustrates that sale prices vary—in some cases markedly—between the road diet and non-road diet sections and over time, none of these differences are statistically significant. Therefore, adding the road diet does not appear to have meaningfully altered property values. Variations in property values are instead the result of other factors, which the Hedonic Price Model section below further discusses.

Table 4
Sales tax revenues in 2011 dollars

	Road Diet	Non-Road Diet
Pre-road diet implementation	$727,937	$344,623
Post-road diet implementation	$1,116,745	$574,778
Absolute growth	$388,808	$230,155
Percent change	53%	67%

Referencing Table 4 reveals that sales tax revenues along the road diet portion of York Boulevard are roughly double those of the non-road diet section. While tax revenues exhibit a higher growth *rate* along the non-road diet section, the *absolute* growth in revenues is higher on the road diet portion. Thus, in this instance, the growth rate is somewhat deceptive. Since sales tax data are only available in an aggregated form, it is not possible to complete more precise statistical comparisons.

New Businesses and Business Turnover

Since the 2006 road diet installation, 21 new businesses opened on the road diet section of the York Boulevard corridor, which constitutes 14 percent of the businesses on this corridor half. Nineteen new businesses opened on the non-road diet section, or

Figure 12

Property sale locations and sale values per square foot in 2011 dollars

Price per square foot

Low
$40 - $250

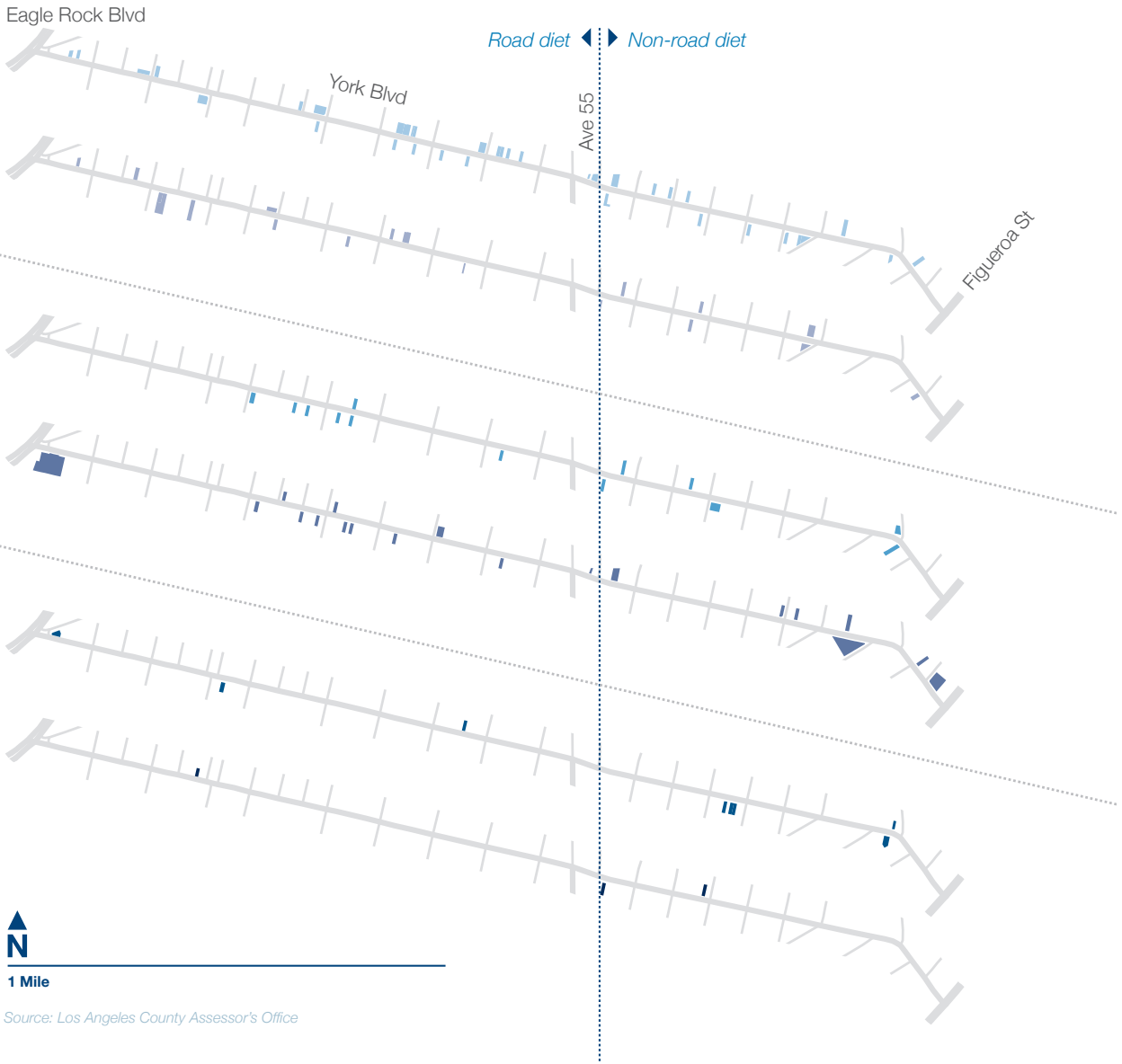
Medium
$250 - $500

High
$500 - $5,000

Property sales along York Boulevard corridor

Top: Pre-road diet (2000 - 2005)

Bottom: Post-road diet (2006 - 2011)



Source: Los Angeles County Assessor's Office

twenty percent of the businesses on this half. Neither of these changes is statistically significant.

One hundred and one business sites on the road diet section of York Boulevard have Bradley-Burns sales tax data, and thus property turnover information, available. Fifty six of these locations, or fifty five percent, had gone out of business at least once in the period between 2001 and 2011. On the non-road diet segment, 28 of 45 businesses with data, or 62 percent, turned over during the same period. These changes are not statistically significant. From these findings, the presence or absence of a road diet does not appear to influence either new business openings or business turnover.

Hedonic Price Model

Based on the results of the stepwise regression described previously in the Methodology section, the final hedonic price model employs three variables and takes the following form:

POST-ROAD DIET PROPERTY SALE PRICE PER SQUARE FOOT = -135,316.31 + 63,413.51*PRESENCE OR ABSENCE OF ROAD DIET + 109.44*BUILDING AREA + 1.28*PARCEL LAND VALUE

The host of variables initially considered for this model exhibit a strong amount of multicollinearity, or interference with one another. To minimize double counting among unique variables that measure closely related phenomena, I have employed only the variables with the highest significance, or ability to explain the dependent variable of property sale price.

The model's r-square value of 0.959 means that, in total, the model explains roughly 96 percent of variation in property sale prices. Although the model as a whole explains a substantial portion of property sale price variation, the presence or absence of a road diet is not a statistically significant variable. In other words, the model's other two variables pertaining to property characteristics have the strongest bearing on property sale price. Thus, as

with the previous analyses, the hedonic price model shows that road diets have a negligible effect on surrounding property values.

Key Takeaways

This section synthesizes the primary findings from the above data. I organize this discussion into the following major themes.

Road diets have little effect on surrounding businesses, property values, and customer shopping patterns. Therefore, opposition to road diets on economic grounds appears unfounded.

The quantitative analyses in this report do not reveal meaningful linkages between the presence of a road diet and changes in economic conditions. For example, the property sale price research demonstrates that spatial and temporal fluctuations in sale prices are statistically insignificant. Further, as the hedonic price model shows, these variations are mostly the result of factors independent from road diets.

Additionally, the data on new business starts and turnover show that there are no significant differences in these metrics between the sections of York Boulevard with and without a road diet. One could conceivably link the road diet section's slower tax revenue growth rate to the presence of the road diet. Following this logic, one would also have to attribute the higher sales tax revenues and absolute growth found on the road diet portion to the presence of the road diet. In this case, road diets would have an indeterminate effect on sales tax revenues. However, taken in context with the other business analyses and the hedonic price model, what seems more plausible is that variations in sales tax revenues stem not from road diets, but from factors related to business type, location, and broader economic forces.

Survey results also point to a weak connection between road diets and customer shopping habits. Surveyed customers exhibit no prevailing preference for shopping on wider or narrower streets (a proxy for road diet street reconfigurations used in the survey questions). These responses suggest that road diets

are not likely to alter customer shopping patterns. Convenience and availability of needed products or services are likely larger determinants affecting where customers choose to shop.

From the above findings, implementing a road diet along York Boulevard has not lowered property values or degraded business performance. Thus, the data do not support arguments that implementing road diets—reducing the number of car travel lanes on a road—hurts the surrounding local economy. While road diets are unlikely to harm surrounding economies, it is important to note that the addition of these facilities alone does not appear to improve surrounding economic conditions either.

The majority of surveyed merchants do not feel that bike lanes hurt their businesses, and similarly large percentages of customers believe bike lanes are important roadway additions. Still, opinions about removing on-street parking and auto lanes for bike lanes/road diets are divided.

Eighty five to ninety five percent of all business survey respondents do not feel that bike lanes have hurt their businesses. Eighty to ninety five percent of surveyed customers on both corridor halves also view bike lanes beneficially. Moreover, the proportions of merchants and customers who respond in these favorable manners are higher on the road diet section of the corridor. These higher percentages suggest that opposition to road diets and bike lanes may wane after the bikeway implementation.

At the same time, the above opinions assume no tradeoffs between bicycle infrastructure and other uses of road space, such as on-street parking or auto travel lanes. When presented with a tradeoff between bike lanes and auto lanes or on-street parking, only about half of all survey respondents appear willing to divert road space to bicyclists. Still, since most merchants do not perceive bike lanes to have negative business impacts, and since most customers view bike lanes favorably, building additional support for converting auto lanes or on street parking to bike lanes may be possible.

On-street parking is clearly an important asset to both local merchants and customers.

A common theme among survey responses is the perceived importance of parking to business performance. To many businesspersons and customers, removing parking translates directly to lost business revenues. This study demonstrates that road diets removing auto travel lanes do not adversely affect businesses or property values; however, the study does not directly address parking loss as parking was not removed with the York Boulevard road diet. As discussed in the following Recommendations section, future bikeway projects should be sensitive to community needs such as preserving parking. Further, since it is not possible to quantitatively evaluate the effects of parking removal on business performance with this research, the topic should be a priority for future research.

Merchants' perceptions about their customers' travel patterns do not align with customers' stated patterns.

On both halves of the study corridor, merchants indicate that they believe most customers drive to their businesses. These speculations generally do not align with customers' stated travel patterns. Almost 60 percent and 75 percent of merchants on the road diet and non-road diet sections of York Boulevard, respectively, state that customers drive to their businesses. However, only about 15 and 30 percent of customers on the same respective corridor halves indicate that they drive. The majority of customers,

56 percent on each half of the corridor, either walk or bicycle to businesses. This disconnect speaks to a need for additional outreach efforts to merchants about the importance of walking and bicycling—and appropriate infrastructure for both—on businesses. It also justifies the extension of bike lanes along the non-road diet section of York Boulevard.

Businesses and customers alike seem to prefer slower vehicle speeds or feel that speed is unimportant.

Many surveyed merchants perceive that slower traffic makes their businesses more noticeable to passing motorists, which may increase the likelihood of motorists patronizing their establishments. Those customers who favor slower traffic indicate that it creates safer conditions in which to shop. Based on these anecdotes from merchants and customers, slower traffic speeds may represent a common ground between merchant needs, customer preferences, and traffic safety goals. Assuming these anecdotes hold true among the broader population of area merchants and customers, slower travel speeds might be used to justify traffic calming projects, which employ a variety of engineering treatments, such as widened sidewalks at intersections or traffic circles, as a means of improving traffic safety (Project for Public Spaces, n.d.).

Recommendations

As the previous Findings section demonstrates, quantitative data do not support the notion that road diets negatively affect surrounding local businesses and property values. Opposition to road diets on economic grounds therefore appears unfounded. Furthermore, on streets such as York Boulevard with roughly 20,000 daily auto trips, there is little basis in traffic engineering for road diet opposition (Tan, 2011; Huang, Stewart, and Zegeer, 2004). With the majority of surveyed business customers bicycling and walking to businesses, there is a clear need for infrastructure facilitating safe travel by these modes. Still, popular support for converting auto lanes and on-street parking to bike lanes remains lukewarm. In light of these conditions, I propose the following recommendations, which aim to reshape bikeway planning, design, and outreach to include broader community input. Finally, I conclude with potential avenues for future research.

The design of road diets and bicycle facilities must carefully involve local community members—especially those whose businesses and homes flank proposed road diets and bicycle facilities—and any roadway modifications must be sensitive to the needs of people who bicycle as well as those who do not.

Most surveyed merchants indicate that they do not feel bike lanes will hurt their businesses. When surveyed, most customers also believe that bike lanes are important roadway additions. These responses suggest that there is at least some latent community support for bikeway improvements. Yet, large percentages of merchants and customers also remain hesitant to support road diets that convert on-street parking and auto lanes to bike lanes. Given pressing safety concerns for people riding bicycles—if not broader concerns for public health and the environment—simply not building bikeways in controversial situations is an untenable solution. Instead, I put forth a twofold implementation approach.

First, public agencies must enlist support for bikeway projects from bicycling advocacy organizations, supportive merchants, and sympathetic members of the public. Merchant and community member surveys, discussions with business and neighborhood leaders, and public meetings are all viable tools for assessing this support. Cities and bicycle advocacy organizations must then encourage proponents to be vocal in their support for specific bikeway projects—both in their communities and to elected officials. Some potential venues for supporting bikeway projects include:

- Advocacy campaigns
- Calls and letters to city councilmembers
- Promotional internet videos
- Social media outlets
- Window signs for homes and businesses

Second, public agencies need to work directly with community members to design bikeway projects. Neighborhood walking tours, booths at public festivals, social media, and bikeway design workshops represent opportunities for gathering stakeholder input and partnering with community members. At a minimum, government agencies must not present pre-designed bicycle facilities to the community. Municipal staff should instead listen to community members' preferences and concerns and earnestly incorporate this input into designs. In some instances it may be beneficial for planners and engineers, calling on their professional experience, to explain the benefits or tradeoffs of various bikeway designs better inform community-based decision-making.

Ideally, neighbors, merchants, bicyclists, and other stakeholders would collaborate alongside planners and engineers to first identify which corridors should be prioritized for bikeways. Likely these will be routes contained in the city's bike plan. Then, the same actors should partner to design bikeways that satisfy the needs of bicyclists, members of the general public, and opponents as best as possible. Narrowing auto lane widths while preserving the number of auto lanes, retaining some on-street parking, designing bicycle facilities on parallel routes, and employing innovative bicycle facilities (such as protected bike lanes, colored pavement along bikeways, and cycletracks) are examples of potential strategies for satisfying competing needs.

Numerous planning scholars have noted that, to be acceptable, "a change must benefit many interests, which consequently would decide to support the change" (Wachs, 2004; Altshuler, 1965). Therefore, to build support for bikeway projects, if not more broadly encourage participation in planning efforts, cities may consider incorporating additional neighborhood amenities with widespread appeal into bikeway projects. These amenities include street trees, outdoor seating, and widened sidewalks among other examples. Cities may consider partnerships with business improvement districts, if such districts exist, to help finance these additional improvements.

The above demonstrates that, although more complex and time-intensive than traditional planning efforts, a collaborative process embracing flexibility and compromise offers the most promise for designing bikeways that are suitable for a variety of stakeholders, even in controversial situations.

Multilingual, multifaceted outreach efforts are essential to successful bikeway projects.

Cities, bicycle advocates, and other supporters must outreach to neighbors and businesses at two stages during bikeway planning and implementation—particularly for substantial or controversial projects. First, outreach must announce bicycle planning

events and encourage community attendance. A second wave of outreach needs to occur prior to bikeway installation to alert neighbors and businesses of the impending roadway change. Outreach should occur in multiple languages and utilize a variety of techniques, including:

- Blog and social media posts
- Flyers
- Signs in homes and businesses, at bus stops, and in other publicly visible areas
- Stories in local newspapers

Finally, outreach efforts should cite the findings of this York Boulevard study and similar research to show that road diets can be implemented in ways that do not impact surrounding economies.

When faced with the decision between removing an auto travel lane or on-street parking for a bike lane installation, cities should favor removing the travel lane or defer to local preferences.

The loss of on-street parking appears less popular among surveyed merchants and customers than the loss of an auto travel lane. Therefore, preserving parking may represent a way to minimize opposition when designing new bike lane projects.

Furthermore, on-street parking creates a buffer between passing cars and pedestrians on the sidewalk, thereby improving pedestrian comfort and safety (Institute of Transportation Engineers, 2010). In the event that replacing an auto lane with a bike lane results in slower traffic speeds, business survey responses suggest that merchants may respond favorably to slower speeds or have no opinion of this change. Slower traffic speeds would also likely improve traffic safety (Aarts and Van Schagen, 2006).

Cities and bicycle advocacy organizations should integrate localized economic impact studies into bikeway planning and conduct follow-up studies after bikeway implementation. Such studies may help rectify the dissonance between economic data on road diets, which suggest these treatments have little economic impact on surrounding communities, and community perceptions, which reflect a greater

hesitance to convert travel lanes or on-street parking to bike lanes for economic reasons.

Among the some sectors of the public, uncertainties persist about the neighborhood-level economic impacts of road diets and bike lanes. The York Boulevard research illustrates that road diets and bike lanes insignificantly affect surrounding local economies. Yet, these results may not necessarily be transferable to other settings. Further, community members in other neighborhoods or other cities may be incredulous of findings from outside their local context. Therefore, when economic impacts are at question, cities and advocacy organizations should implement localized economic studies similar to this York Boulevard research.

Understanding constraints on municipal and advocacy organization budgets, these economic studies need not be complex undertakings. At their core, studies should strive to (1) comparatively analyze quantitative data and (2) poll local community members. I deliberately provide a detailed methodology in hopes that my approach can be duplicated and enhanced.

Economic studies should occur at two stages. Researchers should first collect baseline data along a proposed bikeway corridor during early planning stages for the bikeway. Researchers must also collect data after the bikeway project implementation. Studies during planning stages should preferably occur before community workshops so that data are available for these meetings. Studies conducted in the months, if not years, after a bikeway project

implementation can help to identify trends in economic activity over time.

Given the stated importance of on-street parking among community members, future economic research should examine how converting on-street parking to bike lanes affects adjacent businesses.

In quantitative terms, the York Boulevard study examines the economic impacts that transpire when a bike lane replaces an auto lane. The more broadly focused qualitative component of the research asks stakeholders to consider a host of factors, including on-street parking. Given the stated importance of on-street parking to businesspersons and customers, it would be helpful to study whether removing on-street parking for a bike lane has dissimilar economic outcomes to removing an auto travel lane. If disaggregated data can be obtained, a hedonic model that uses sales tax revenues as the dependent variable could be a powerful tool to understand potential effects of lost parking on adjacent businesses. With a growing body of research, the once-nebulous interactions between road diets, bicycle facilities, and local economic health will come increasingly into focus.

Cities should continue their efforts to install road diets, bike lanes, and similar infrastructure.

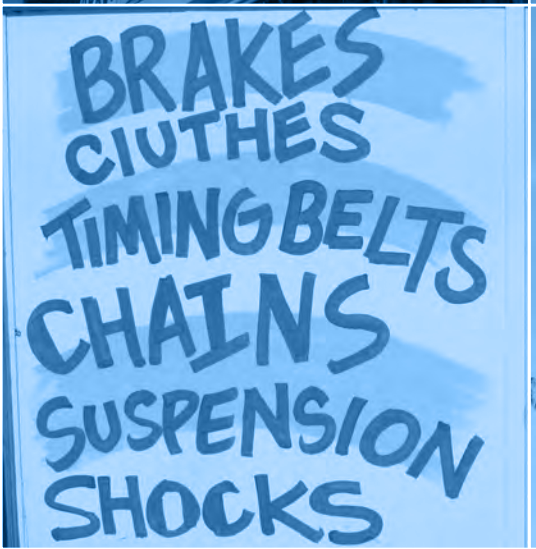
As shown throughout this research, road diets appear unlikely to harm local economies. Cities, employing proper outreach, should therefore continue to install road diets and related infrastructure, which improves safety, encourages bicycling, and thereby contributes to improved public health and environmental outcomes.


SPARKLETTS


TROY
CHARBROILED
BURGERS
BREAKFAST
TACOS
BURRITOS
PASTRAMI
CHICKEN


LIQUOR
BERT'S


DONDE
HAY SABOR
hay FIESTA


BRAKES
CLUTHES
TIMING BELTS
CHAINS
SUSPENSION
SHOCKS


Sale

A. Complete Literature Review

Objectives and Structure

This literature review examines existing research into the relationship between bicycle infrastructure, road diets, and economic activity. The review asks what role existing literature may play in informing my research, and how the York Boulevard research may fill gaps in the current knowledge base.

While various studies have attempted to assess the impact of bicycle infrastructure on regional employment and job creation (Garrett-Peltier, 2010; Governor's Bicycle Coordinating Council, 2005), the goal of this review is instead to determine whether any notable trends exist between bicycle infrastructure/road diets and local-level economic activity. In other words, does the literature suggest that bicycle facilities and road diets generally improve or harm local economic activity? I define local economic activity to include property values, business performance, and attitudes of merchants and patrons toward road diets and bicycle infrastructure. For the purposes of this review, I divide bicycle infrastructure into two categories: on-street bicycle lanes and off-street bicycle paths. Although less relevant to York Boulevard, I include the latter because researchers have paid the most attention to their influence on economic activity.

There is a generally narrow body of research pertaining to the interactions between bicycle facilities/road diets and economic activity. To quote one author on the subject, "existing literature can be described as 'spotty' at best" (Krizek, 2007a). Striving to balance objectivity with comprehensiveness, I include in this review a selection of non-peer-reviewed professional reports and works of advocacy organizations.

I structure this review first by investigating the effects of off-street bicycle paths on economic activity. I digest a comparatively abundant volume of research that finds these facilities to have neutral or positive impacts on property values. At the same

time, research on off-street bicycle paths appears to have little transferability to on-street bicycle lanes, such as those lining the western half of the York Boulevard study corridor. Accordingly, I turn next to the relationship between on-street bicycle facilities and local economic activity. This body of work is less cohesive in its findings; it yields no consistent relationship between bike lanes and economic activity. Finally, I focus on the thin literature surrounding road diets and economic vitality. I find that, while road diets possibly boost economic performance, negative perceptions of these street reconfigurations persist among some segments of the public. In general, I conclude that additional, localized research into the economic impacts of bicycle lanes and road diets is essential to framing bikeway decision-making.

Literature Findings

Off-street bicycle paths generally have neutral or positive impacts on surrounding property values, yet findings related to off-street paths have little transferability to on-street bicycle infrastructure.

Researchers have employed a combination of resident, merchant, and bicyclist surveys (Krizek, 2006; Lawrie et al., 2004; Macy and MacDonald, 2005) as well as hedonic price models (Karadeniz, 2008; Krizek, 2006; Lindsey et al., 2004; Nicholls and Crompton, 2005; Racca and Dhanju, 2006) to assess the local economic impacts of off-street bicycle paths. Hedonic price models assume that one can disaggregate property sale prices, a proxy for property value, into tributary components (Nicholls and Crompton, 2005). Further, the presence or absence of these various components, such as bicycle infrastructure, influences property price (Nicholls and Crompton, 2005). Research applying surveys and hedonic models in an assortment of locations consistently finds "that the presence of a bike path/trail either increases property values and ease of sale slightly or has no effect" (Racca and Dhanju, 2006, 22). Lawrie et al.'s 2004 surveys also conclude that merchants and customers of the Outer Banks in North Carolina perceive bicycle paths to positively influence to retail sales and property values. Perhaps the only dissenting voice is Krizek

Author	Location	Bicycle Facility Studied	Methods	Economic Metric	Peer Review	Economic impact of bicycle facility
Campbell and Wittgens (2004)	Canada	All bicycle facilities	Case studies	Stakeholder preferences	No	Positive
Clean Air Partnership (2009)	Toronto, Ontario	Bike lane	Merchant and patron surveys	Stakeholder preferences	No	Positive
Drennen (2003)	San Francisco, California	Road diet/bike lane	Merchant and patron surveys	Stakeholder preferences	Yes	Positive
Hoffman and Mallavarapu (2011)	Long Beach, California	Bike lane	Sales tax data analysis	Business performance	No	Neutral
Karadeniz (2008)	Southwestern Ohio	Off-street bike path	Hedonic pricing model	Property sale prices	Yes	Positive
Krizek (2006)	Minneapolis–Saint Paul, Minnesota	Off-street bike path	Hedonic pricing model	Property sale prices	Yes	Negative
Lawrie et al. (2004)	Outer Banks, North Carolina	Off-street bike path	Merchant and patron surveys	Stakeholder preferences	No	Positive
Lindsey et al. (2004)	Indianapolis, Indiana	Off-street bike path	Hedonic pricing model	Property sale prices	Yes	Positive
Macy and MacDonald (2005)	Denver, Colorado	Off-street bike path	Resident surveys	Property value	No	Positive
Nicholls and Crompton (2005)	Austin, Texas	Off-street bike path	Hedonic pricing model	Property sale prices	Yes	Positive

Racca and Dhanju (2006)	Delaware	Off-street bike path	Hedonic pricing model	Property sale prices	Yes	Neutral to positive
Ryan, A.	Vancouver, Washington	Road diet	Sales tax data analysis	Business performance	No	Positive
Stantec Consulting Ltd. (2011)	Vancouver, British Columbia	Cycletrack	Merchant and patron surveys; some sales data analysis	Business performance	No	Neutral to negative
VanZerr (2009)	Portland, Oregon	Bicycle boulevard	Resident surveys	Stakeholder preferences	Yes	Neutral to positive

(2006), who finds that proximity to an off-street bicycle path reduces home values in the Minneapolis-Saint Paul metropolitan region.

While most of the above studies report a neutral-to-positive relationship between bike paths and economic prosperity, the nature of bike paths, which possess a strong recreational component and serve in many cases as linear parks, may have little transferability to on-street bikeways (Racca and Dhanju, 2006). Bike lanes "are for the most part indistinguishable from the road corridor itself and are more a feature of the existing road rather than the neighboring properties" (Racca and Dhanju, 2006, 1). Krizek's 2006 research confirms that only off-street bicycle paths are likely to affect property values. Additionally, nearly all of the off-street bike path studies address predominately residential, suburban or rural locations. These studies may be less applicable to the mixed commercial and residential land use makeup of York Boulevard.

On-street bicycle facilities demonstrate no consistent effect on economic metrics such as business revenues, yet they remain contentious among adjacent businesses.

Perhaps stemming from the conclusions of Racca and Dhanju (2006) and Krizek (2006) that on-street bicycle facilities seldom influence surrounding

property values, there is little academic literature on this topic. VanZerr (2009) conducted a survey of residents along a bicycle-priority street, commonly known as a bicycle boulevard, in Portland, Oregon. She finds that most respondents favorably view the bicycle boulevard and believe it to positively influence property values (VanZerr, 2009). As with the aforementioned studies of off-street bicycle paths, the purely residential nature of VanZerr's investigation may limit its applicability to the mixed commercial and residential York Boulevard corridor.

The remainder of the research concerning on-street bicycle facilities and economic performance relies on non-peer-reviewed "grey literature" and yields contrasting findings. A frequently referenced study from researchers in Toronto, Ontario, which surveyed merchants and patrons along one of the city's principal commercial corridors, finds converting on-street parking to a bike lane unlikely to harm businesses (Clean Air Partnership, 2009). The researchers find that patrons "arriving by foot and bicycle visit [stores] the most often and spend the most money per month" (Clean Air Partnership, 2009, 1). Moreover, the majority of merchants surveyed believe that bike lanes would improve business (Clean Air Partnership, 2009).

The Toronto study's positive findings are far from unanimous. From New York to San Francisco, numerous instances in the press indicate vociferous, negative reactions from merchants toward bike lanes that come at the expense of parking (Grynbaum, 2011; Lee, 2011; Scott, 2011). Interestingly, one such bike lane backlash currently transpiring in Vancouver, British Columbia, offers some of the most pertinent findings for research along York Boulevard. In Vancouver, the municipal government has installed bicycle lanes with a physical barrier between the lanes and auto traffic—known as a "cycletrack"—along two major downtown arterials. After complaints from merchants that the cycletracks stymied business, the City hired Stantec Consulting Ltd. (2011) to survey merchants along the cycletrack corridors as well as on parallel streets without bicycle infrastructure.

Stantec concludes that "the financial impact of the bike lanes has been a loss of sales and a loss of profit;" however, the loss, which is difficult to isolate from a broader economic downturn, "is relatively moderate based on industry standards and, in general, insufficient to create persistent vacancies" (2011, 54). The consultants clarify that their study is a short-term economic analysis, and that the impact of the cycletracks is likely to dissipate over time (Stantec Consulting Ltd., 2011).

Merchant disapproval of bike lanes remains an undeniably important issue; nonetheless, Stantec finds little difference in merchants' stated losses between the cycletrack corridors and comparison streets without bike lanes (2011). Furthermore, 80 percent of surveyed customers did not change their shopping patterns as a result of the bike lane introduction (Stantec Consulting Ltd., 2011). In a similar study of commercial districts with and without bicycle facilities in Long Beach, California, Hoffman and Mallavarapu (2011) observe that the presence of bike lanes does not appear to hinder retail activity.

Research on road diets and economic activity is significantly limited. While existing research suggests that road diets can boost economic performance, negative perceptions of road diets persist among some segments of the public.

One of the few studies directly addressing road diets' impacts to adjacent businesses occurred in San Francisco, California (Drennen, 2003). This collection of merchant surveys occurred four years after San Francisco narrowed Valencia Street from four to three auto lanes to include bike lanes and a center turn lane. Most merchants surveyed believe the road diet has a beneficial effect on business or no effect at all (Drennen, 2003). Another study in Vancouver, Washington, utilizing sales tax data, demonstrates that businesses along the road dieted Fourth Plain Boulevard experienced sales increases "while sales at all other comparable sites in the city during the same period went down" (Ryan, 2005, para. 17).

Campbell and Wittgens (2004) put forth a similarly positive prognosis for road diets and broader

measures to calm traffic. The authors cite case examples from a variety of commercial districts, some of similar scale to York Boulevard, to show that bicycle and "pedestrian improvements can greatly improve retail sales and generate increased sales and property tax revenues" (Campbell and Wittgens, 2004, 31). Arguably, the authors select ideal examples to build their case and do not include instances where improvements have failed to enhance economic activity. While Campbell and Wittgens (2004), Drennen (2003), and Ryan (2005) present economically successful examples of road diets, news coverage from a range of sources indicates that road diets are not without strong-willed opposition from merchants and the general public (Aldous, 2011; Banks, 2010; Bowen, 2011).

Takeaway From Literature

The majority of existing research into road diets, bicycle infrastructure, and economic activity pertains to the economic impacts of off-street bike paths, which have little transferability to their on-street counterparts (Racca and Dhanju, 2006). Moreover, the limited research addressing road diets and on-street bicycle facilities in an economic light—and the even further constrained body of peer-reviewed work—produces a wide spectrum of conclusions (Krizek, 2007a). These findings vary immensely by region and perhaps even by methodology (Krizek, 2007a). Stantec's report, for example, identifies that merchants tended to overestimate losses in surveys when compared to recorded sales data (2011). Finally, the dearth of economic research on road diets makes it nearly impossible to develop meaningful conclusions about their economic impact.

Skepticism toward on-street bicycle facilities and road diets clearly persists—particularly among merchants when such facilities come at the expense of on-street parking (Grynbaum, 2011; Lee, 2011; Scott, 2011). Although the opinions of proponents and opponents are essential to framing discussions, they alone should not guide on-street bikeway decision-making. Yet, excepting hedonic price analyses, much existing research draws upon "anecdote rather than actual market data"

while existing, readily available sources, such as sales tax revenues and property values, go largely untapped (Nicholls and Crompton, 2005, 321). This incongruence calls to a need for research that balances surveys—an excellent mechanism for assessing stakeholder perceptions—with numeric sales and property data, which minimize bias in the conditions they portray. My research fuses surveys with numeric data in just this manner.

The York Boulevard study proffers recommendations to create bicycle facilities that are economically harmonious with their context. Stantec's report offers a relevant framework for such facilities, including, for example, "allocating scare [road] space to different uses according to the demand at different times" and moving "quickly to meet with the businesses that have been particularly impacted...in order to mitigate sales losses" (2011, vi).

Although Krizek (2006) and Racca and Dhanju (2006) show on-street bikeways to have little effect on property values, these studies investigate only residential environments. Examining property sale prices along a mixed commercial and residential corridor such as York Boulevard may yield differing results. Additionally, the contexts of Krizek (2006) and Racca and Dhanju's (2006) studies—Minneapolis-Saint Paul and Delaware, respectively—may very well be irrelevant to Los Angeles.

Perhaps the most cohesive criteria for future economic studies of road diets and bikeways comes from Krizek et al. (2007b), which establishes that research should:

1. Measure effects at a neighborhood, municipal, or regional scale
2. Inform bikeway policy decisions and implementation
3. Utilize stakeholder surveys and existing data
4. Employ units that are comparable within the individual study as well as among related studies
5. Quantify effects both for cyclists and the broader community

The methodology I employ builds explicitly upon Krizek's (2007b) five recommendations.

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C. Survey Instruments

1. Oral consent script - English
2. Oral consent script - Spanish
3. Business owner/manager survey - English
4. Business owner/manager survey - Spanish
5. Customer intercept survey - English
6. Customer intercept survey - Spanish

York Boulevard business interview survey: Oral consent script

Thank you for your interest in the York Boulevard Road Diet Economic Impact Study. Your participation in this research study is voluntary, and there is no penalty if you refuse to participate or choose to end the survey at any point. The purpose of this survey is to learn about your feelings toward traffic, road size, and bicycle lanes, and how these items may affect the number of people who shop in this neighborhood. Your responses are very important as they will help us gain a better understanding of how businesses feel about traffic and bicycle lanes.

You have been selected to participate because you were observed shopping or dining or because your business is located along York Boulevard between Eagle Rock Boulevard and Figueroa Street, which is the study area for this project. If you agree to participate, we will ask you 6 to 8 short questions and we will write down your responses. Your participation should take no more than 15 minutes. We will record no personal or identifiable information about you and will not mention your name or your business' name in any reports. Further, your responses will be held confidentially, and only a small group of researchers will have access to your responses. For these reasons, we believe that there is minimal risk in your participation in this study.

Thank you again. If you have any questions, please feel free to contact:

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Encuesta de negocios en York Boulevard: Consentimiento oral guión

Gracias por su interés en el estudio investigando el impacto económico del dieta en la Boulevard de York. Su participación en este estudio de investigación es voluntaria y no hay ninguna pena si se niegan a participar o elegir poner fin a la encuesta en cualquier momento. El propósito de esta encuesta es conocer sus sentimientos hacia el tráfico, tamaño de la calle y carriles de bicicleta y cómo estos elementos pueden afectar el número de personas que hacen compras en este barrio. Sus respuestas son muy importantes por que nos van a ayudar a obtener una mejor comprensión de cómo los negocios se sienten sobre carriles de tráfico y bicicleta.

Has sido seleccionado para participar porque fue visto comprando o comiendo o porque tu negocio se encuentra por el Boulevard de York entre Eagle Rock Boulevard y Figueroa, que es el área de estudio para este proyecto. Si usted acepta participar, le pediremos 6 o 8 preguntas brevementes y anotamos sus respuestas. Su participación debe durar no más que15 minutos. No registramos ninguna información personal o identificable acerca de usted y no mencionar su nombre o su negocio en los reportes. Además, sus respuestas se realizará de forma confidencial, y sólo un pequeño grupo de investigadores tendrán acceso a sus respuestas. Por estas razones, creemos que hay un riesgo mínimo en su participación en este estudio.

Gracias de nuevo. Si tiene alguna pregunta, no dude en ponerse en contacto con:

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York Boulevard business interview survey

Business information

1. Business name _____
2. Business address _____
3. What type of business is this? _____

Business tenure

4. How many years (or months if less than a year) has the business been at this current location?
   _____ YEARS / MONTHS (circle whether the number entered on the line represents months or years)
5. Does your business own or rent the building? OWN / RENT (circle one)
6. How many employees work here? _____

Business access

7. How would you guess most of your customers come to your business? Do they DRIVE, take PUBLIC TRANSIT, BICYCLE, or WALK? (circle one)
8. Do you think more people visit your business when cars drive fast past your business or when they have to drive slowly past your business? Or do you think the speed of vehicles has no effect on your business? FAST / SLOW / NO EFFECT (circle one)
9. Do you think more, less, or the same number of people would visit your business if there were more car lanes on the road?
   MORE / LESS / NO CHANGE (circle one)
   What about if there were fewer lanes?
   MORE / LESS / NO CHANGE (circle one)
10. Do you think bicycle lanes hurt your business? YES / NO (circle one)
    Why or why not? _____
    _____
    _____
11. Would you support removing car lanes on the road to add bicycle lanes? YES / NO (circle one)
    What about removing parking to add bicycle lanes? YES / NO (circle one)
    Why or why not? _____
    _____
    _____

Entrevista encuesta de negocios York Boulevard

Información del negocio

1. ¿Nombre de Negocio?_____
2. ¿Dirección del Negocio? _____
3. ¿Qué tipo de negocio es este? _____

Tenencia de negocio

4. ¿Cuántos años tiene (o meses si menos de un año) este negocio aquí en el mismo ubicación? _____ AÑOS / MESES (círculo si el número especificado en la línea representa meses o años)
5. ¿Su negocio posea o renta el edificio? POSEA / RENTA (círculo uno)
6. ¿Cuántos empleados trabajan aquí? _____

Acceso empresarial

7. ¿Cómo diría la mayoría de los clientes vienen para su negocio? MANEJAN, usan TRANSITO PÚBLICO, BICICLETA, o A PIE? (círculo uno)
8. ¿Crees que más gente visite su negocio cuando coches pasan su negocio rápido o cuando tienen que pasar su negocio lentamente ? O ¿crees que la velocidad de los vehículos no tiene ningún efecto en su negocio? RÁPIDO / LENTO / SIN EFECTO (círculo uno)
9. ¿Crees que más, menos o el mismo número de personas visitará a su negocio si hubiera más carriles de automóviles en la calle?
   MÁS / MENOS / NO CAMBIO (círculo uno)
   ¿Qué tal si hubiera menos carriles?
   MÁS / MENOS / NO CAMBIO (círculo uno)
10. ¿Crees que carriles para bicicletas dañan su negocio? SÍ / NO (círculo uno)
    ¿Por qué o por qué no? _____
    _____
    _____
11. ¿Usted soporta quitar carriles de automóviles en la calle para poner carriles de bicicleta? SÍ / NO (círculo)
    ¿ Qué tal quitando espacios de estacionamiento para poner carriles de bicicleta? SÍ / NO (círculo)
    ¿Por qué o por qué no? _____
    _____
    _____

York Boulevard customer intercept survey

1. Do you shop at businesses along York Boulevard? YES / NO (circle one)
2. How did you get here today? Did you DRIVE, take PUBLIC TRANSIT, BICYCLE, or WALK? (circle one)
3. Do you prefer to shop on streets where cars drive fast or where cars drive slowly, or does the speed of cars have no effect on where you shop? FAST / SLOW / NO EFFECT (circle one)
4. Do you prefer to shop on narrow, quiet streets or wide, busy streets, or does the type of street have no effect on where you shop? NARROW / WIDE / NO EFFECT (circle one)
5. Do you think it is important to have bicycle lanes on streets? YES / NO (circle one)
   Why or why not? _____
   _____
   _____
6. Would you support removing car lanes on the road to add bicycle lanes? YES / NO (circle one)
   What about removing parking to add bicycle lanes? YES / NO (circle one)
   Why or why not? _____
   _____
   _____

Estudio de clientes de York Boulevard

1. ¿Haces compras en las tiendas a lo largo del Boulevard de York? SÍ / NO (círculo uno)
2. ¿Cómo llegaste hoy? ¿CONDUJISTE, tomaste TRANSPORTE PÚBLICO, BICICLETA o A PIE? (círculo uno)
3. ¿Prefieres comprar en las calles donde coches conducen rápido, donde coches conducen lentamente o la velocidad de los automóviles no tiene ningún efecto en donde compras? RÁPIDO / LENTO / SIN EFECTO (círculo uno)
4. ¿Prefieres tiendas en calles estrechas, tranquilas o calles amplia, ocupadas, o ¿el tipo de la calle no tienen ningún efecto sobre donde comprar? ESTRECHO / AMPLIO / SIN EFECTO (círculo uno)
5. ¿Crees que es importante tener carriles de bicicletas en las calles? SÍ / NO (círculo uno)
   ¿Por qué o por qué no? _____
   _____
   _____
6. ¿Soportaras quitar carriles de automóviles en la carretera para agregar carriles de bicicleta? SÍ / NO (círculo uno)
   ¿Cómo quitar parking para agregar carriles de bicicleta? SÍ / NO (círculo uno)
   ¿Por qué o por qué no? _____
   _____
   _____