NATIONAL STREET IMPROVEMENT STUDY ///////////////////

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//////////////////////////////// FINDINGS FROM
MINNEAPOLIS

Across the country, policymakers and planning departments are making cities more livable by better accommodating people who walk and bike. Improving streets and upgrading transportation infrastructure often requires reducing on-street parking or traffic lanes. While studies have shown how such upgrades improve traffic safety and mobility for city residents, the question remains how such infrastructure improvements affect economic outcomes.

This study will attempt to answer to what extent these types of corridor-level street improvements impact economic activity and business vitality in the immediate vicinity. In particular, how do street improvements impact retail sales and employment?

Minneapolis has conducted many street improvement projects in past years, including new bike lanes and road diets. This report explores five recent street improvement corridors—Riverside Avenue, Franklin Avenue, Central Avenue, Lyndale Avenue South and North Second Street—to understand the economic and business impact of these active transportation infrastructure investments.

Assessing the impact of street improvements and the accompanying reduction of on-street parking or travel lanes on a neighborhood's economic activity and vibrancy is a new field of research. In 2013, the New York City

Department of Transportation commissioned a first-of-its-kind study, using sales tax data to evaluate how businesses on improved corridors have been affected. This current study builds on past work by examining additional cities and incorporating new research methods and data sources.
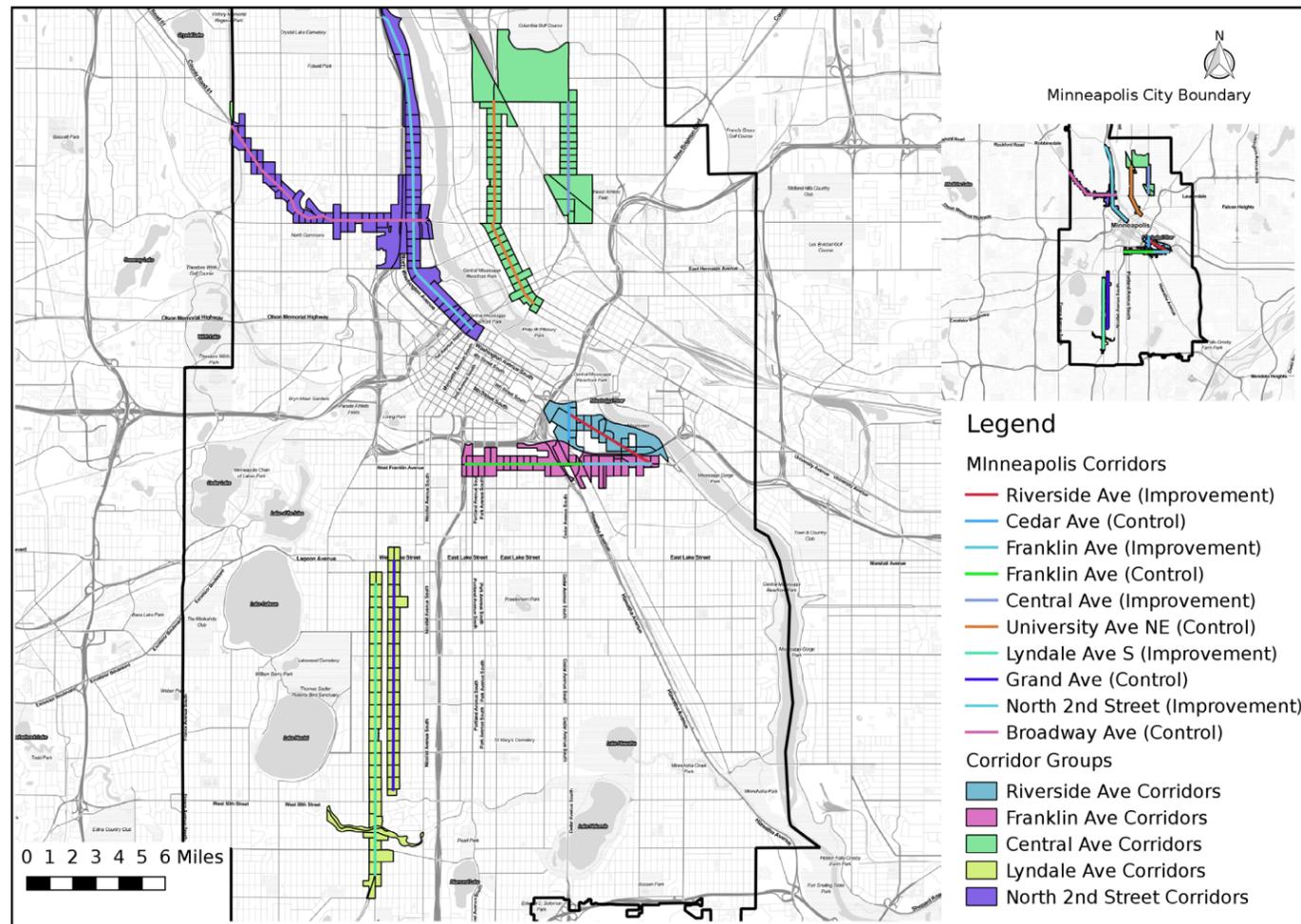
KEY FINDINGS

Based on our analysis, we found the street improvement projects in Minneapolis did not impede economic vitality, and may have contributed to positive growth. In particular, we can conclude that:

1 THE BIKE LANE ON FRANKLIN AVENUE TRIGGERED A SIGNIFICANT EMPLOYMENT INCREASE IN THE FOOD SERVICES INDUSTRY APPROXIMATELY TWO YEARS AFTER INSTALLATION.

2 ON CENTRAL AVENUE, WE FOUND A SIGNIFICANT POSITIVE IMPACT ON RESTAURANT SALES FOLLOWING BIKE LANE CONSTRUCTION.

3 THE ROAD DIET ON LYNDALE AVENUE GREATLY IMPROVED RETAIL SALES IN THE CORRIDOR.

In the other analyzed corridors and industry sectors, we found either mixed results or insignificant results. However, the insignificant results may be significant in this context. Importantly, there is no evidence of a negative economic impact from right-of-way or parking lane removal.

Minneapolis City Boundary

Legend

MInneapolis Corridors
— Riverside Ave (Improvement)
— Cedar Ave (Control)
— Franklin Ave (Improvement)
— Franklin Ave (Control)
— Central Ave (Improvement)
— University Ave NE (Control)
— Lyndale Ave S (Improvement)
— Grand Ave (Control)
— North 2nd Street (Improvement)
— Broadway Ave (Control)

Corridor Groups
Riverside Ave Corridors
Franklin Ave Corridors
Central Ave Corridors
Lyndale Ave Corridors
North 2nd Street Corridors

0 1 2 3 4 5 6 Miles

DATA SOURCES //////

For this study we used multiple data sources to estimate the effect of new bike lane infrastructure investment, each with its pros and cons. As such, the analysis results using the three data sources should be viewed as complementary to each other.

First, we used the Longitudinal Origin-Destination Employment Statistics (LODES) data set from the **Longitudinal Employer-Household Dynamics Dataset** (LEHD). LEHD provides geographically granular detail about jobs, workers and local economies, allowing us to examine employment by broad industry sector, wage and educational attainment. One major disadvantage of the LEHD data set is that in order to guarantee confidentiality, block level data is "fuzzed" so the numbers do not reflect the exact number of jobs at this geographical level. Additionally, though employment is disaggregated by industry, it is only provided at the most general level (the equivalent of two digit NAICS codes) so we are unable to isolate restaurant workers from hotel service workers, for example. That being said, the LEHD data set is comprehensive, offers unprecedented geographic detail, and is longitudinal, allowing for consistent comparisons over time.

SALES TAX DATA

Sales tax data is collected as the primary data source to allow us to estimate a more sensitive measure of economic activity than employment (as the decision to hire or fire employees for a firm is often an expensive one, and thus we would expect employment to be a delayed response to changes in economic activities). Some drawbacks of sales tax data are that some states do not have a sales tax or, in states or cities that do have one, the sales tax data is not broken down by specific industry and it is difficult to accurately parse out accurate figures. But the benefits of sales tax data largely outweigh these issues and do offer a more sensitive metric than employment. Minneapolis sales tax is, at minimum, 8.025% up to 14.025%.

The minimal 8.025% rate includes the 6.875% state sales tax, a 0.5% transit tax for Hennepin County, an additional 0.15% Hennepin County tax, and a 0.5% city sales/use tax. Additional entertainment and accommodations taxes may also be included. However, general clothing, legal drugs, and unprepared food are exempted from tax collection, which may hamper the ability of sales tax data to accurately reflect all retail business vitality.

QCEW

This report also takes advantage of establishment level **Quarterly Census of Employment and Wages (QCEW)** data. The QCEW gives us address level-data on individual establishments as well as detailed employment information, allowing for more accurate pinpointing of the geographic location of businesses and industrial classifications. In addition, the research team is able to use employment and wages as additional indicators of economic performance in the corridors. However, the individual QCEW data is confidential, requires special permission from the state to use, and has additional data use restrictions. In Minnesota, we were unable to get disaggregated

individual three-digit NAICS employment figures for the Minneapolis corridors. As a compromise, Minnesota's Department of Employment and Economic Development (DEED) aggregated QCEW data at the three-digit NAICS level (NAICS 442-453), which only includes the retail sectors, but not food and restaurant services. The aggregated employment numbers correspond closely to the LEHD data used in our analysis, but with the advantage that the numbers are not "fuzzed" for confidentiality concerns. And all of this data is available quarterly and goes back to the year 2000, dramatically increasing our sample size.

1. The National Street Improvements Study is a research project by Portland State University, Bennett Midland, and PeopleForBikes. An accompanying report with more detailed information on methodology can be accessed at https://peopleforbikes.org/placesforbikes/ resources/

2. This is typically due to either an insufficient number of data points after the completion of the street improvement (for ITS analysis) or control corridors that may not be fully comparable (for DID analysis), methods explained further in Section 3 ("Methodology").

3. Because this project makes use of a variety of different data sources, it required collaboration between the research team and representatives from multiple agencies/departments. Our principal contact was with the Minneapolis Department of Public Works. Sales tax data was provided by the Minneapolis Community Planning and Economic Development (CPED) department; QCEW data was provided by the Minnesota Department of Employment and Economic Development; and LEHD data was publicly available at United State Census Bureau.

4. North American Industry Classification System (NAICS) - https://www.census. gov/eos/www/naics/

METHODOLOGY

Three analytical methods were applied in order to isolate the impact of street improvements while controlling for other economic and regional factors. The methods are an aggregated trend analysis (following the 2013 NYC Department of Transportation study), a difference-in-difference approach, and an interrupted time series analysis. The time frame used in the analysis for LEHD data is 2004-2015, the period is 2004-2016 for sales data, and 2000-2017 for QCEW data.

In order to properly isolate the effect of the street improvements we must identify treatment corridors (corridors that actually were improved) and control corridors (corridors that are similar to the treatment corridors except they remain unimproved). Treatment corridors are corridors where new bike or pedestrian related improvements were installed, ideally made up of a minimum of 10 adjacent, or intersecting, census blocks with a minimal number of retail and food service jobs. Additionally, we chose street improvement corridors installed between 2008 and 2013 in order to guarantee we have sufficient data (at least 3 data points pre- and post-treatment) to track pre- and post-treatment economic trends. Once corridors are selected based on these criteria, further testing is conducted to discern the level of similarity between treatment and control corridors. The tests include quintile comparisons of corridor-level employment to city-wide employment, and statistical tests of average block level employment that compare control corridors to the treatment corridors.

AGGREGATED TREND ANALYSIS

This first analytical method, aggregated trend analysis, follows a previous NYC Department of Transportation study (NYCDOT, 2013), examining whether the treatment corridors tend to have better business performance than comparison corridors after street improvements. The approach compares the trends of treatment and control corridors in addition to city-wide trends over the full time period covered by the data. If treatment corridors show greater increases in employment or sales tax receipts, then that would represent a positive impact of street improvement on business activities. This method is easy to follow and represents the aggregated trend of business activities. However, it lacks the rigor of econometric estimates and statistical tests that explicitly test whether the street improvement caused the change.

DIFFERENCE-IN-DIFFERENCE APPROACH

The second method aims to estimate the difference in business vitality of pre- and post-improvement periods between treatment and control corridors within the same time period. This is known as a difference-in-difference (DID) approach. The approach looks at the change in the variable of interest—employment levels or sales revenues in our case—in the treatment corridor before and after the street improvement. Meanwhile, the control group has not been treated in either time period. The difference in growth trajectories between the two periods should provide us with an unbiased estimate of the effect of the street improvement.

INTERRUPTED TIME SERIES

The third method, interrupted time series (ITS), is an econometric technique that estimates how street improvements impact corridor economic vitality from a longitudinal perspective. This approach treats the street improvement as the "interruption" and estimates the change in the level and the growth trend of business activities in the corridor after the street improvement. If the street improvement treatment has a causal impact, the post-intervention sales revenue or employment should show a different level or slope compared to the pre-intervention data.[5]

CONCLUSION

In conclusion, aggregated trend analysis and DID analysis both utilize control corridors to determine the impacts of the street improvement corridor, while the ITS analysis uses multiple time points on the street improvement corridor itself to pinpoint economic outcomes. In general, the ITS analysis provides more robust results than the other two methods, since it is less likely to be affected by the selection of control corridors. However, this method generally requires more data points post-intervention to achieve meaningful and valid impact estimations. The DID approach is heavily dependent on finding comparable control corridors (which may not always exist), so the analytical results may be weakened when appropriate corridors cannot be identified.
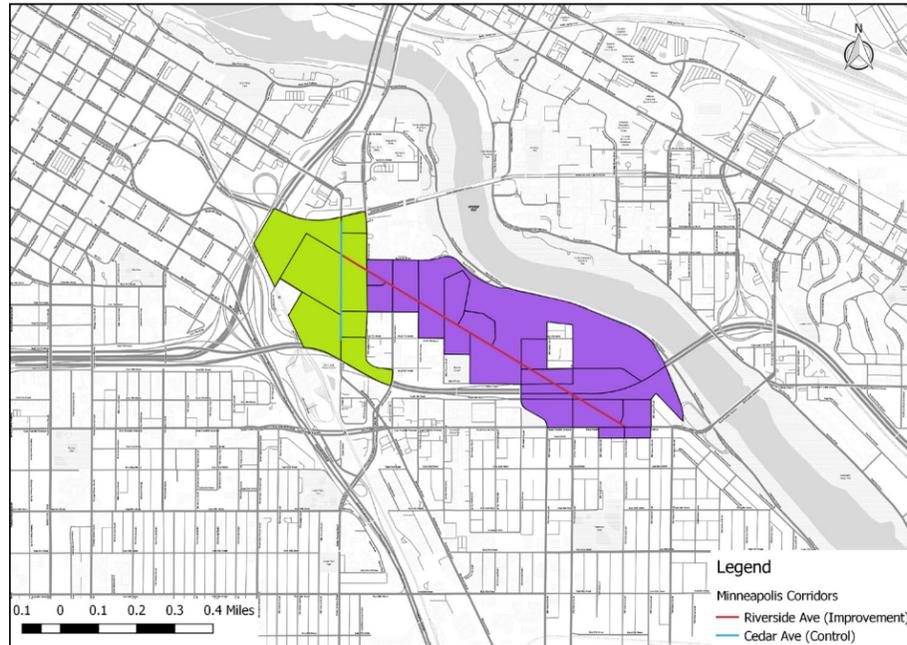
Additional data points after the completion of street improvements may help to provide further validity and rigor to the analysis of resulting economic outcomes. Moreover, further contextual information about the street improvement corridor, such as quality or level of the improvement, number of parking spots eliminated, and subsequent bicycle ridership or pedestrian increases, would help to better understand the linkages between the improvements and potential economic impacts. Extending this research to more closely examine the changes and shifts in industrial patterns will be valuable as well.

CORRIDOR ANALYSIS

Riverside Avenue was reconstructed in 2009. The reconstruction involved redesigning Riverside Avenue from a street with four vehicular travel lanes to three vehicular travel lanes. The project also included the addition of curb extensions and bike lanes. The control corridor is Cedar Avenue, which is near the treatment corridor.
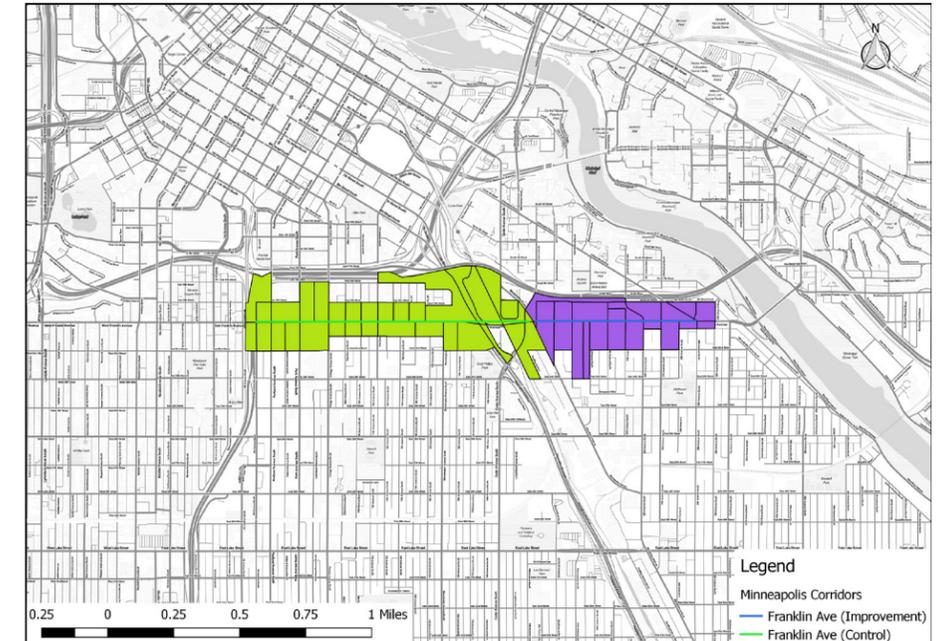
Franklin Avenue's bike lane was installed in 2011 and involved the removal of a parking lane. The control corridor is designated as another segment of Franklin Ave, where the street improvement project was not constructed.[6]

Legend
Minneapolis Corridors
— Riverside Ave (Improvement)
— Cedar Ave (Control)
0.1 0 0.1 0.2 0.3 0.4 Miles

Legend
Minneapolis Corridors
— Franklin Ave (Improvement)
— Franklin Ave (Control)
0.25 0 0.25 0.5 0.75 1 Miles

KEY TAKEAWAYS

» The LEHD data analysis shows the positive impact of the bike lane installation on retail service employment on the treatment corridor, based on trend analysis and DID approach. The ITS approach shows that the rapid increase of retail service employment is largely attributed to overall economic growth in the region, as opposed to impacts from street improvement.

» LEHD data shows food service employment grew more gradually after the bike lane installation. However, the two rigorous econometric approaches, DID and ITS, both indicate that the food service employment increase may not be caused directly by the street improvement on this corridor.

» Sales tax data reflects some different trends: retail service related sales significantly dropped after bike lane installation, while restaurants sales increased greatly. This was

also seen in the ITS analysis. We suspect a shift from retail businesses towards more food service businesses on Riverside Avenue after the street improvement.

» The divergence between employment data and retail sales data performances might be due to different industry sectors the two datasets captured. In terms of retail service, some categories, such as clothing and unprepared food, are tax exempted in Minnesota, which would not be collected in sales tax data, but LEHD data covers all the retail sectors employment. In terms of food service, LEHD covers both food service and accommodation employment, where sales tax only capture restaurant sales.

Given these mixed results, our analysis was inconclusive for Riverside Avenue.
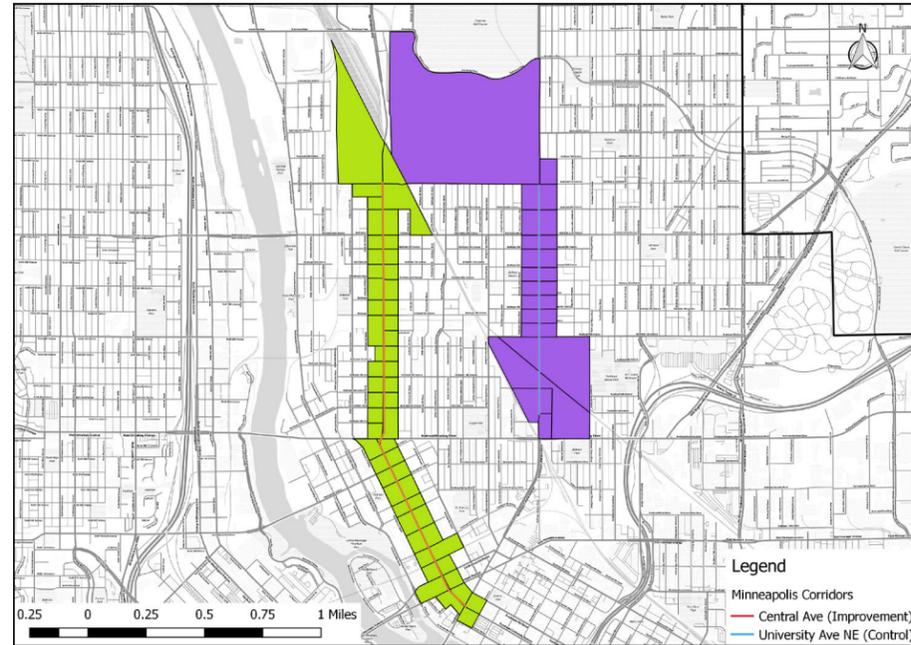
KEY TAKEAWAYS

The following findings are mainly based on the aggregated trend analysis and ITS approach using LEHD and QCEW data, due to data and methodological limitations.

» Retail employment growth is observed in the street improvement segment of Franklin Ave, at a faster rate than the control corridor, based on LEHD data. In addition, QCEW data indicates total wages in the retail sector also appear to be growing at a faster pace in the improvement corridor, possibly indicating a shift in the type of retail businesses that are located in this area.

» Although retail employment increased after bike lane installation, the evidence from the ITS approach from the two data sources shows a statistically non-significant causal relationship between the bike lane installation and employment growth.

» LEHD data shows food employment greatly increased two years after bike lane installation, exceeding the growth rate of both the control corridor and greater city trends. Both the trend analysis and ITS approach show a positive trend.

» The bike lane on Franklin Avenue triggered a significant employment increase in the food services industry approximately two years after installation, indicating an improvement in business vitality as a result.

Data	Area	Retail			Food		
		Baseline	Pre-Growth	Post-Growth	Baseline	Pre-Growth	Post-Growth
LEHD [Employment]	Treatment	293	6.17%	25.09%	150	-16.75%	6.48%
	Control: Cedar Ave	100	-5.38%	7.99%	77	-13.22%	18.86%
Sales [Sales revenue]	Treatment	$4,280,587	-4.10%	1.16%	$7,273,965	1.94%	7.94%
	Control: Cedar Ave	$5,619,758	0.90%	8.58%	$6,855,862	5.68%	16.43%
QCEW [Employment]	Treatment	198	16.40%	-1.13%	-	-	-
	Control: Cedar Ave	119	0.60%	7.11%	-	-	-

Data	Area	Retail			Food		
		Baseline	Pre-Growth	Post-Growth	Baseline	Pre-Growth	Post-Growth
LEHD [Employment]	Treatment	169	-3.24%	26.96%	130	1.73%	3.14%
	Control: Franklin Ave	31	2.86%	12.44%	107	17.20%	3.04%
QCEW [Employment]	Treatment	205	-3.81%	1.84%	-	-	-
	Control: Franklin Ave	123	5.64%	5.71%	-	-	-

In 2012, bike lanes were installed on Central Avenue by reducing the width of travel lane and removing parking lanes. University Avenue NE, which is parallel to the treatment corridor, serves as the control corridor.


Legend
Minneapolis Corridors
— Central Ave (Improvement)
— University Ave NE (Control)

KEY TAKEAWAYS

» Retail and food service employment on Central Avenue increased after bike lane construction. Both the trend analysis and the DID models show evidence that the growth in employment on Central Avenue is on par with the control corridor. In addition, the ITS approach shows a positive growth trend impact of bike construction using LEHD data.

» In terms of sales data, the aggregated trend analysis approach shows that retail sales in the treatment corridor increased faster than the control corridor. However, additional econometric approaches suggest the impact is not statistically significant.

» There is a very apparent trend that restaurant sales on Central Avenue increased dramatically following bike lane installation. Both trend analysis and the ITS approach confirm the positive impact of bike lane installation on restaurant sales on Central Avenue.

» On Central Avenue, we found a significant positive impact on restaurant sales on Central Avenue following bike lane construction, indicating an improvement in business vitality.

Data	Area	Retail			Food		
		Baseline	Pre-Growth	Post-Growth	Baseline	Pre-Growth	Post-Growth
LEHD [Employment]	Treatment	189	8.96%	12.64%	103	5.44%	11.18%
	Control: University	222	5.79%	8.54%	393	17.11%	20.62%
Sales [Sales revenue]	Treatment	$13,406,600	0.18%	9.67%	$2,703,133	-5.64%	52.44%
	Control: University	$29,758,008	-1.19%	-3.85%	$13,767,338	6.83%	22.46%
QCEW [Employment]	Treatment	209	1.50%	2.20%	-	-	-
	Control: University	152	-20.28%	19.84%	-	-	-

A road diet project was completed on Lyndale Avenue in 2008. A motor vehicle travel lane was removed in each direction and a landscaped median, curb extensions, ADA upgrades, and pedestrian-scaled lighting were installed. Grand Avenue was selected as the control corridor, which is parallel to the treatment corridor.
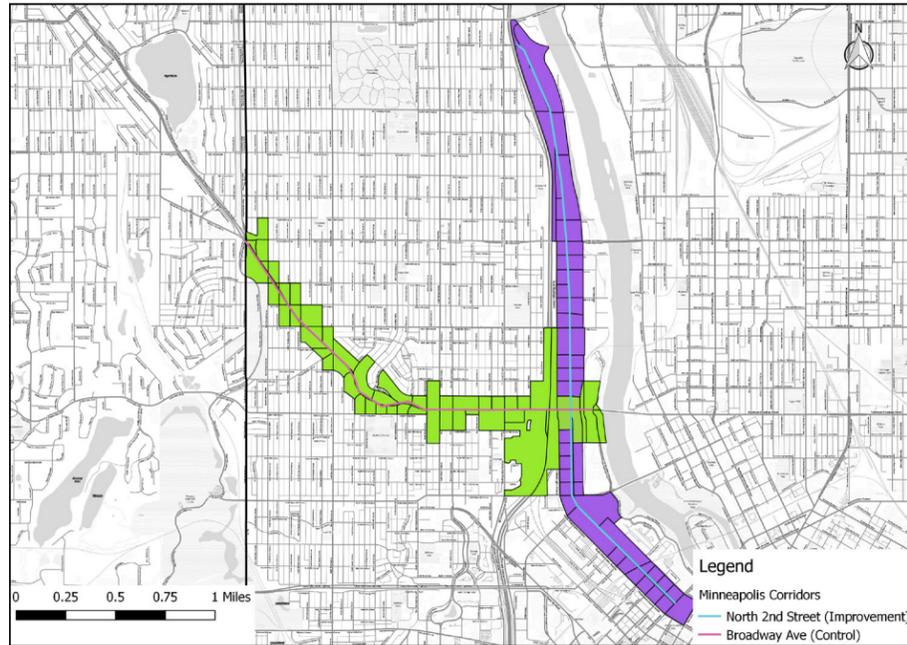

Legend
Minneapolis Corridors
— Lyndale Ave S (Improvement)
— Grand Ave (Control)
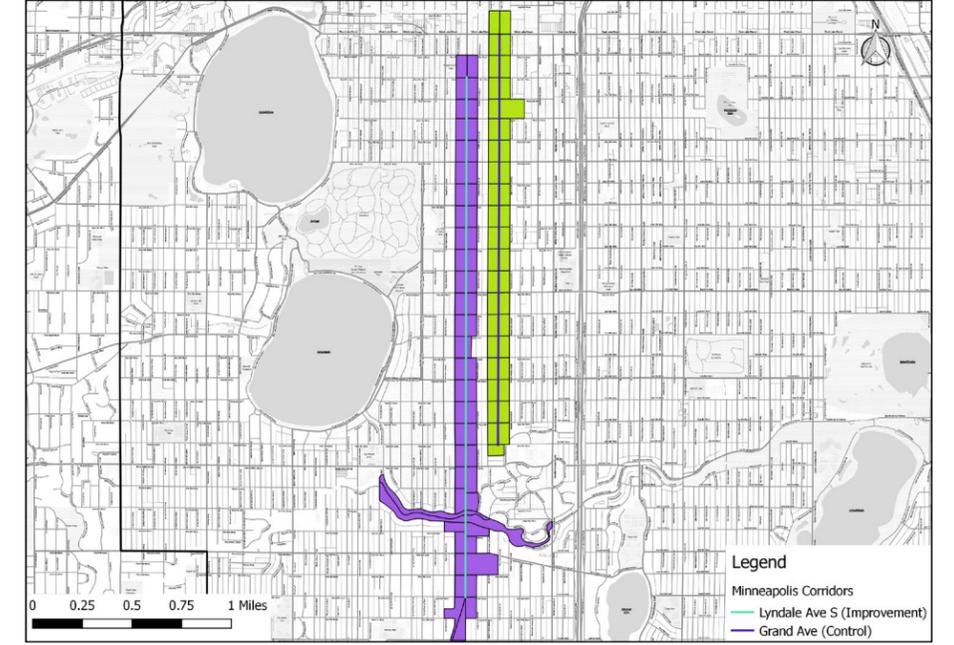
KEY TAKEAWAYS

» There is an apparent drop in employment during the 2008-2010 recession period that coincides with the road diet construction period.

» Aside from the drop during the 2008-2010 recession, analysis of LEHD data shows that food service employment increased gradually after the road diet. This observation is confirmed by the ITS approach showing positive food service employment growth post-road diet. However, retail employment does not show a significant pattern after road diet improvement.

» The road diet boosted sales for both the retail and restaurant sectors. All three approaches indicate a positive impact of the road diet on retail sales on Lyndale Avenue. Restaurant sales are more ambiguous as only the ITS returns a positive and significant result, while the DID and trend approaches do not seem to show any particular impact.

» The road diet on Lyndale Avenue greatly improved retail sales in the corridor and had a positive effect on business vitality.

Data	Area	Retail			Food		
		Baseline	Pre-Growth	Post-Growth	Baseline	Pre-Growth	Post-Growth
LEHD [Employment]	Treatment	223	-2.18%	-2.38%	125	-13.45%	-2.84%
	Control: Grand Ave	29	8.88%	5.29%	24	-2.08%	88.14%
Sales [Sales revenue]	Treatment	$14,481,508	0.19%	2.83%	$3,864,204	-27.79%	-12.62%
	Control: Grand Ave	$1,862,745	-18.24%	-5.28%	$2,705,890	34.06%	24.72%
QCEW [Employment]	Treatment	171	0.86%	7.65%	-	-	-
	Control: Grand Ave	23	-8.70%	-0.71%	-	-	-

Bike lanes were installed on North Second Street in 2011, requiring the removal of a parking lane and width reduction of existing motor vehicle travel lanes. Broadway Avenue was selected as the control corridor.

Legend
Minneapolis Corridors
— North 2nd Street (Improvement)
— Broadway Ave (Control)

0 0.25 0.5 0.75 1 Miles

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KEY TAKEAWAYS

» LEHD data shows erratic retail employment growth on North Second and a peak employment level in 2015. However, QCEW data only shows a slight increase two years after the street improvement. Given the risks of applying LEHD data in smaller geographic areas, the QCEW data trend is likely more reliable. Ultimately, none of the three approaches show a causal impact of bike lane construction on retail employment.

» There is a positive and significant impact of bike lane installation on food employment that is supported by all three approaches using LEHD data. But because the corridors intersect, the DID estimates may be potentially biased due to possible spillover effects.

» There is a dramatic jump in retail sales right after bike lane installation, indicating a positive impact of bike lanes on retail sales. However, the great jump might also be related to other one-time changes, such as a large new store opening, which needs further investigation.

» The restaurant sales data is incomplete, and we did not run further analysis on it.[7]

» Further analysis is required to draw a conclusion about the impact of the bike lane installations on business vitality on North Second Street.

7. *The food sector sales tax data we received for North Second Street only included three data points (2006, 2015, and 2016), which was insufficient for analysis.*

Data	Area	Retail			Food		
		Baseline	**Pre-Growth**	**Post-Growth**	**Baseline**	**Pre-Growth**	**Post-Growth**
LEHD [Employment]	Treatment	117	-2.47%	13.20%	385	-4.49%	23.13%
	Control: Broadway Ave	104	6.00%	44.84%	233	9.59%	21.10%
Sales [Sales revenue]	Treatment	$4,580,133	4.84%	63.84%	-	-	-
	Control: Broadway Ave	$12,387,933	8.32%	10.14%	$11,050,000	-1.86%	8.54%
QCEW [Employment]	Treatment	171	0.86%	7.65%	-	-	-
	Control: Broadway Ave	23	-8.70%	-0.71%	-	-	-

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