



# APPLICATION OF LEHD DATA IN SPATIAL MISMATCH AND ACCESSIBILITY ANALYSIS

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LED Annual Workshop

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# Outlines

Integrated land use and transportation system

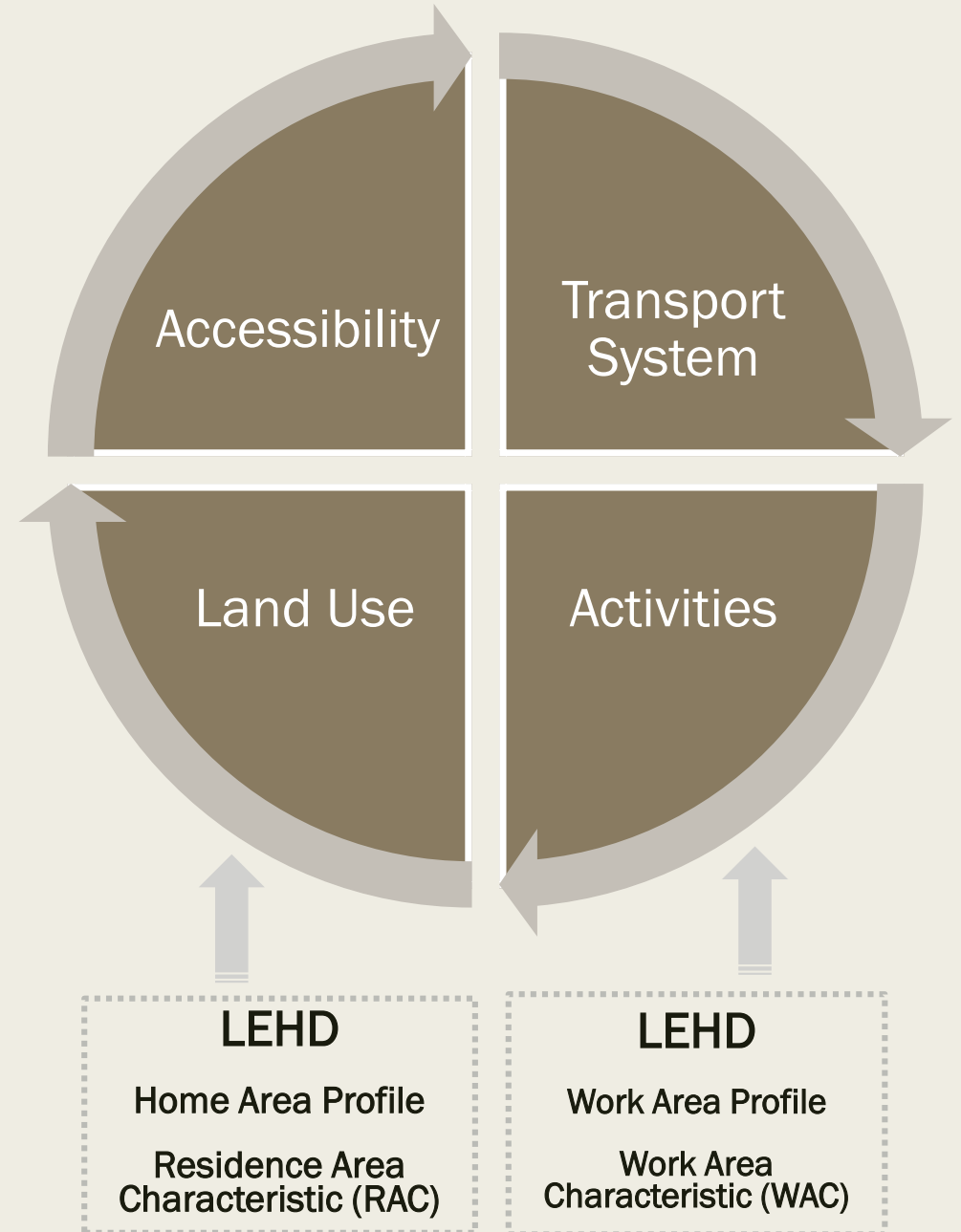
- The connection between jobs and home

The benefits of applying LEHD Data

- Accessibility
- Proximity
- Connectivity

Job sprawl and spatial mismatch

- Housing conditions



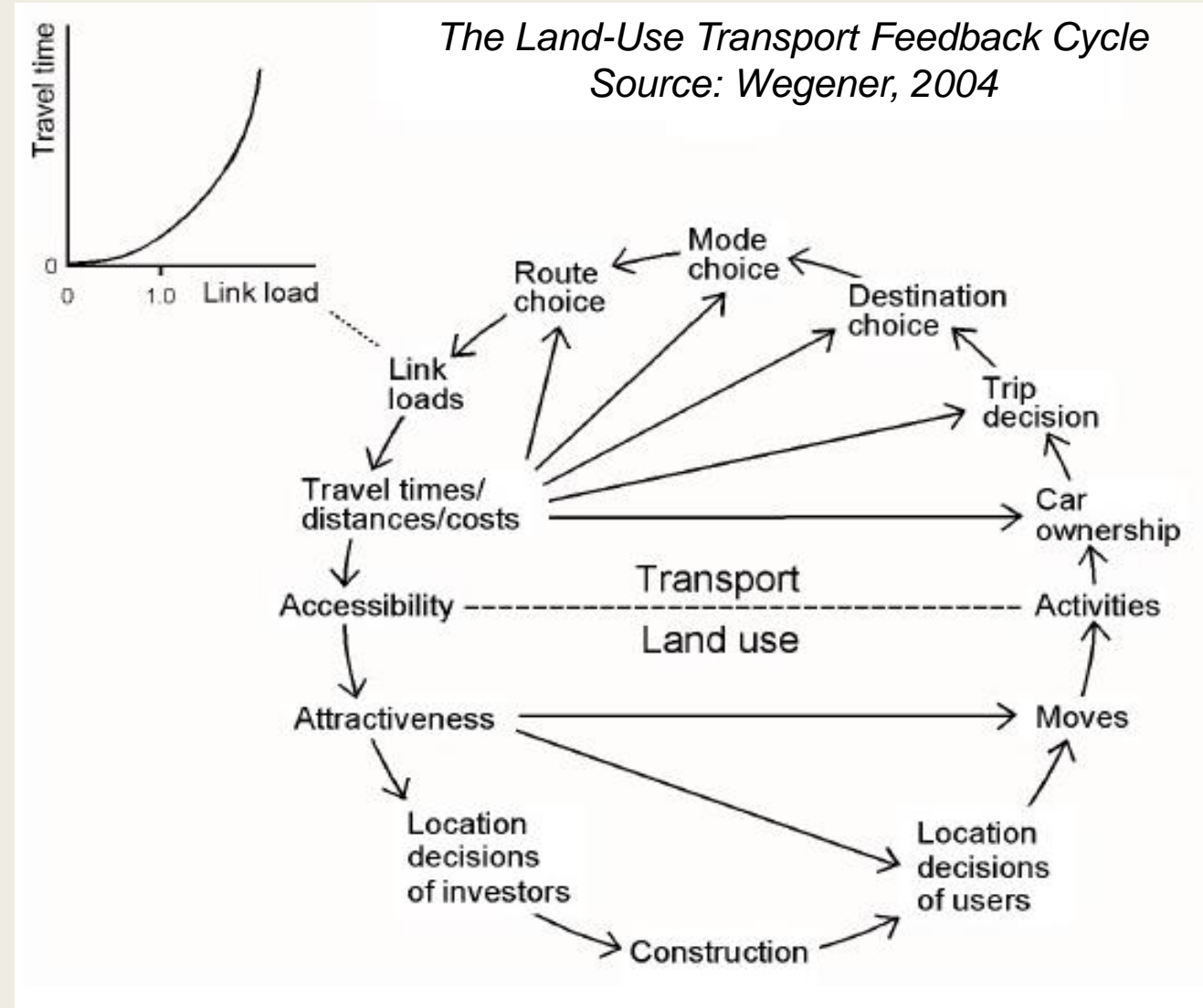
# Integrated Transportation and Land Use System

## ■ Transportation

- *Decisions :*
  - Trip
  - Choice: Destination, Mode, Route
- *Travel Time, Distance & Cost*
- *Accessibility*

## ■ Land Use

- *Activities*
- *Attractiveness*
- *Location decisions of investors*







Activities

Attractiveness

Destination  
Choice

Route  
Choice

Travel  
Time



# Job & Population Growth: Congestion Growth Continues.

## URBAN MOBILITY REPORT 2019

### Dallas--Fort Worth--Arlington, TX



Year:

2017



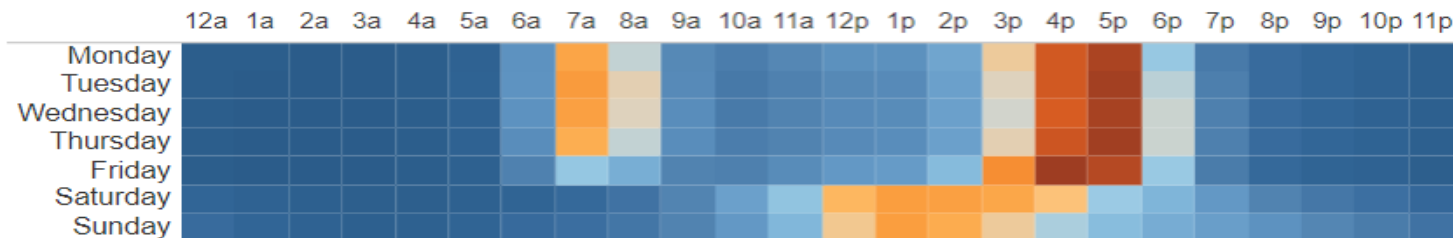
Measure: Delay per Commuter



#### Delay per Commuter



#### When Does Congestion Happen?

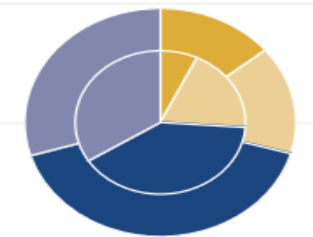


#### 2017 Congestion

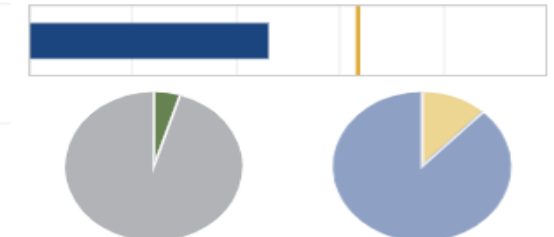
Annual Total Delay:	224,883,000 Hours
Delay National Rank:	9
Annual Delay per Auto Commuter:	67 Hours
Delay per Auto Commuter National Rank:	13
Congested Weekday Hours:	4.5

Planning Time Index (PTI):	1.79
PTI National Rank:	26
Travel Time Index (TTI):	1.26
TTI National Rank:	23

#### Delay Split



#### Cost Comparisons



#### Truck-Based

Annual Truck Delay:	9,445,000 Truck Hours
Annual Truck Delay National Rank:	9
Annual Congestion Cost (Trucks):	\$494M
Congestion Cost (Truck) National Rank:	9

# Inflow/Outflow Analysis

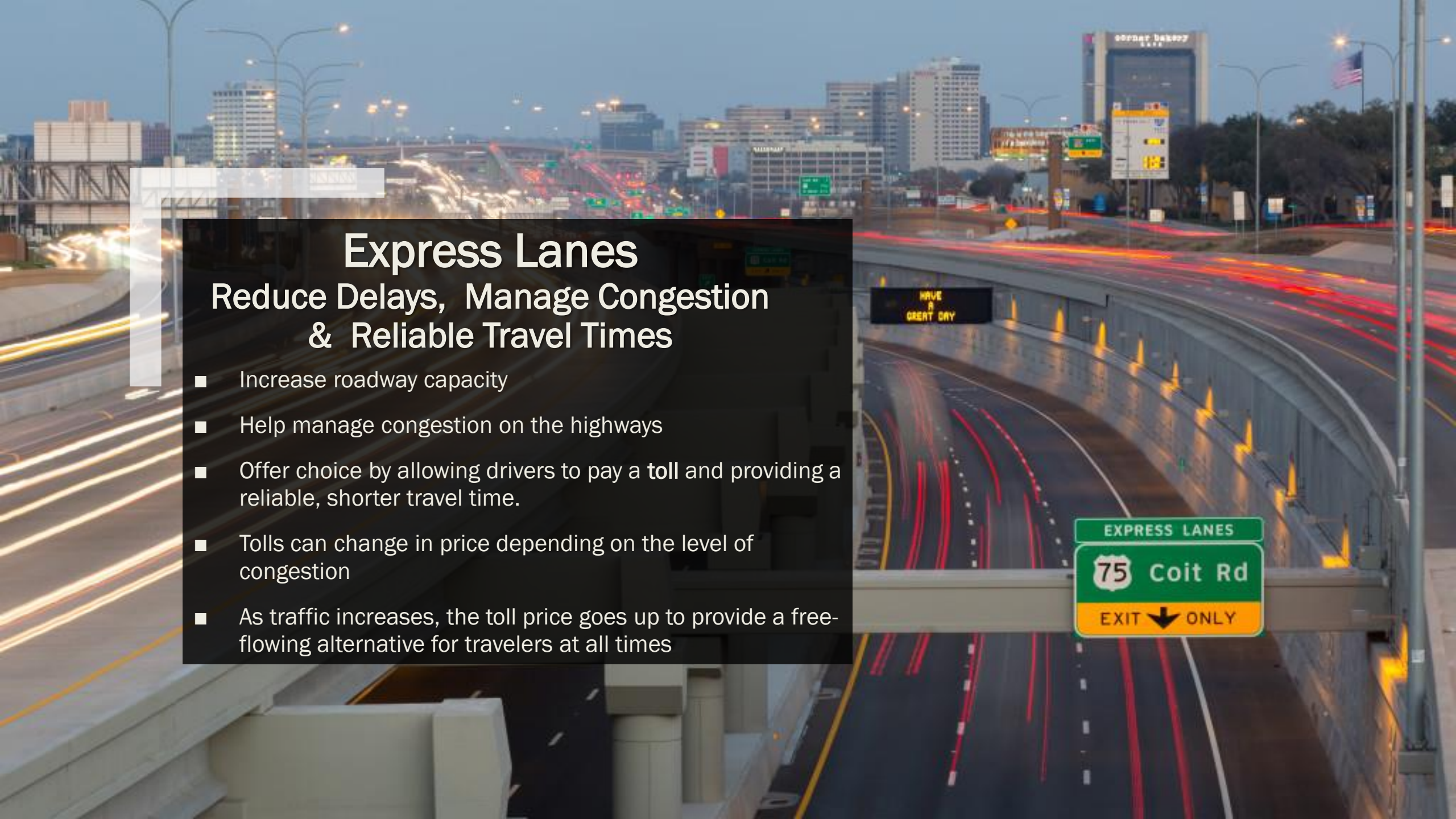
2002



2015







# Express Lanes

## Reduce Delays, Manage Congestion & Reliable Travel Times

- Increase roadway capacity
- Help manage congestion on the highways
- Offer choice by allowing drivers to pay a **toll** and providing a reliable, shorter travel time.
- Tolls can change in price depending on the level of congestion
- As traffic increases, the toll price goes up to provide a free-flowing alternative for travelers at all times



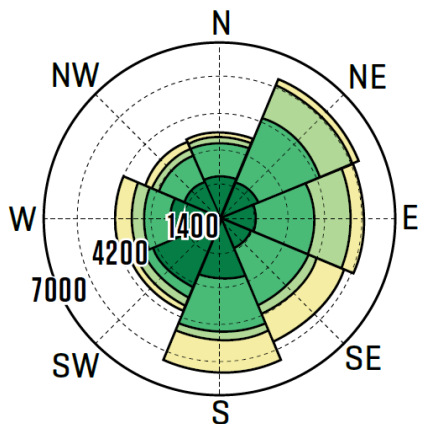
# TEXpress Lanes System Map

- **Eight** major Dallas-Fort Worth corridors feature TEXpress Lanes and HOV/Express Lanes : **120 miles.**
- They connect throughout the area to form a continuous system and offer drivers more choice in their daily commutes, as well as predictable travel speeds.





# FORT WORTH DOWNTOWN



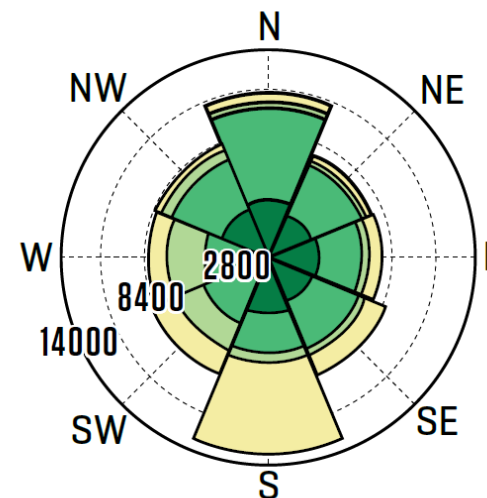
## DISTANCE TO JOB

- Less than 10 miles
- 10 to 24 miles
- 25 to 50 miles
- Greater than 50 miles

## % OF WORKERS

- 40.0%
- 36.4%
- 13.1%
- 10.4%

# LBJ CORRIDOR

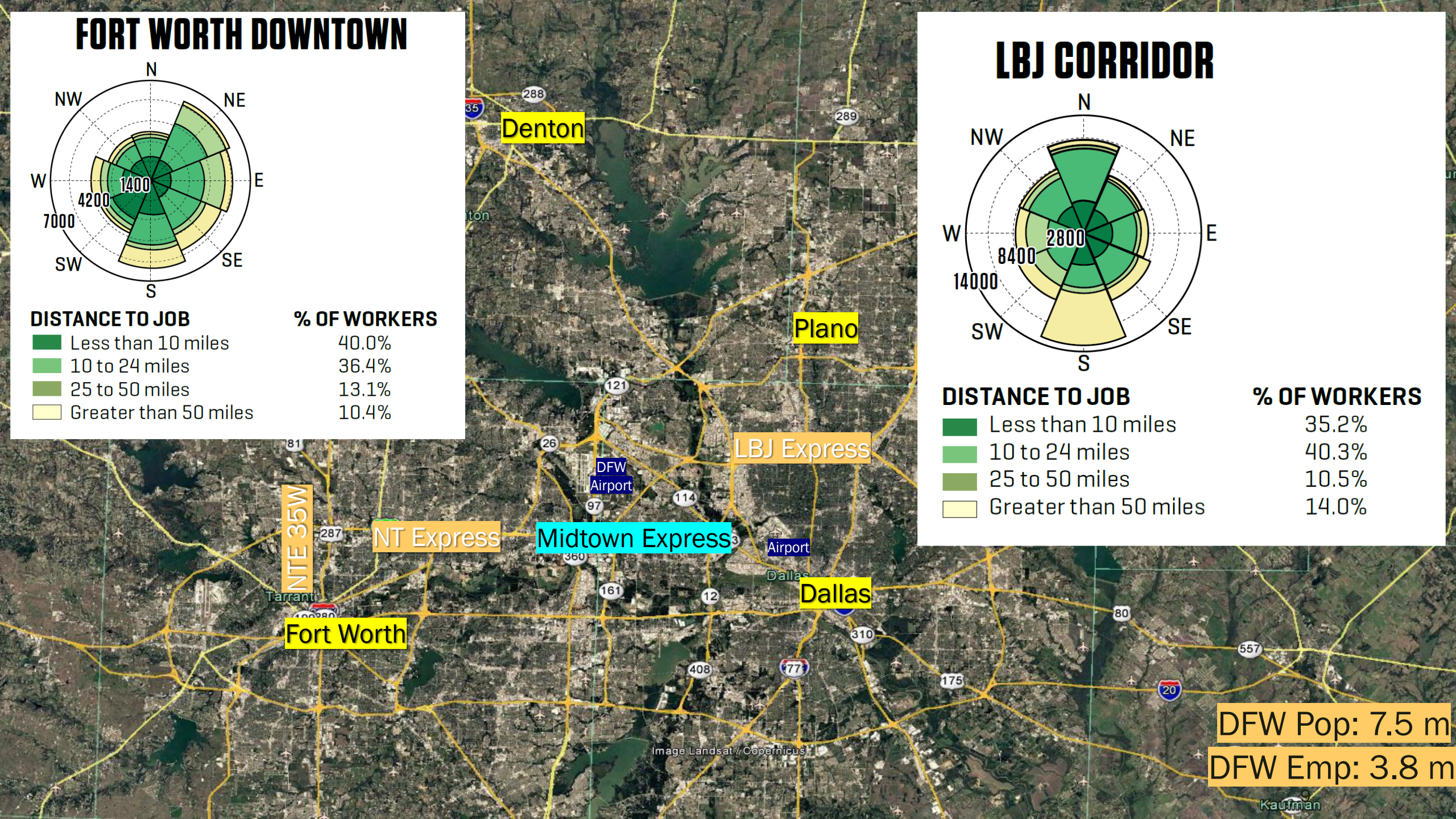


## DISTANCE TO JOB

- Less than 10 miles
- 10 to 24 miles
- 25 to 50 miles
- Greater than 50 miles

## % OF WORKERS

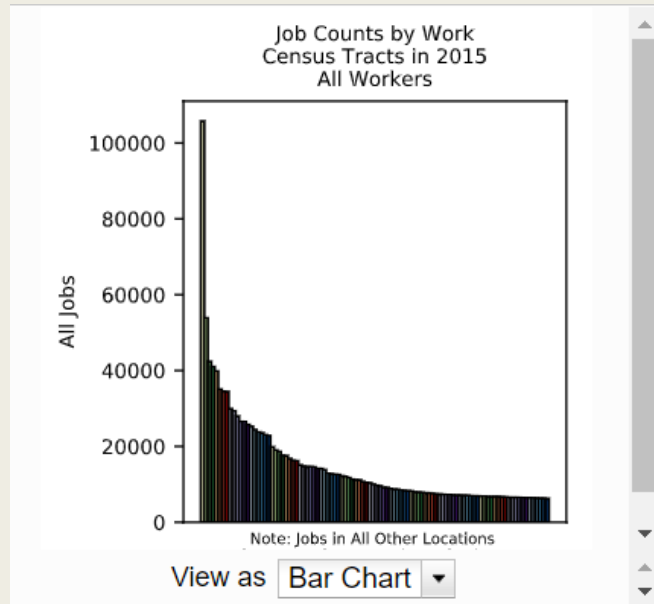
- 35.2%
- 40.3%
- 10.5%
- 14.0%



DFW Pop: 7.5 m  
DFW Emp: 3.8 m

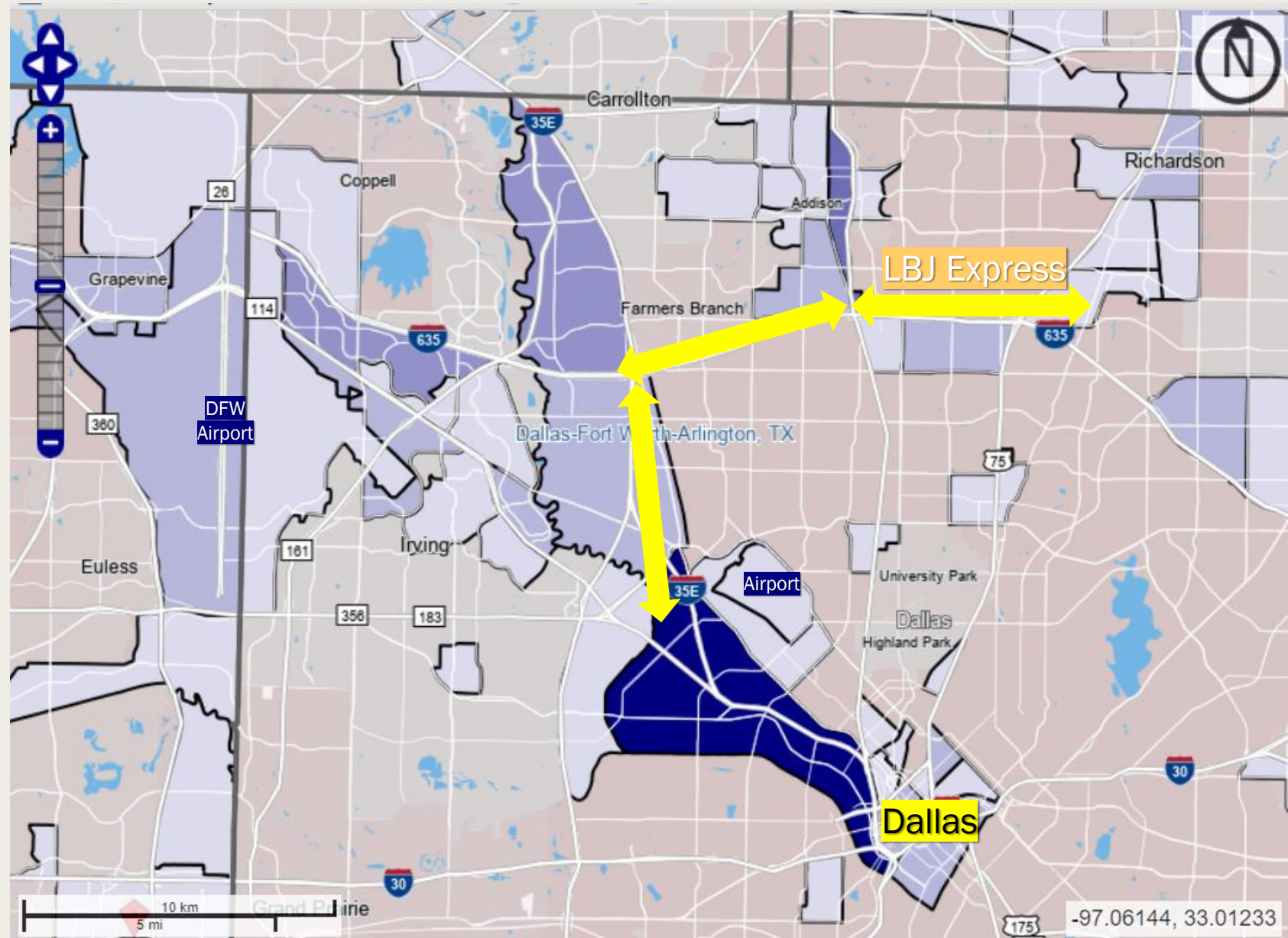


# LEHD Work Destination Analysis



Jobs Counts by Census Tracts Where Workers are Employed - All Jobs  
2015

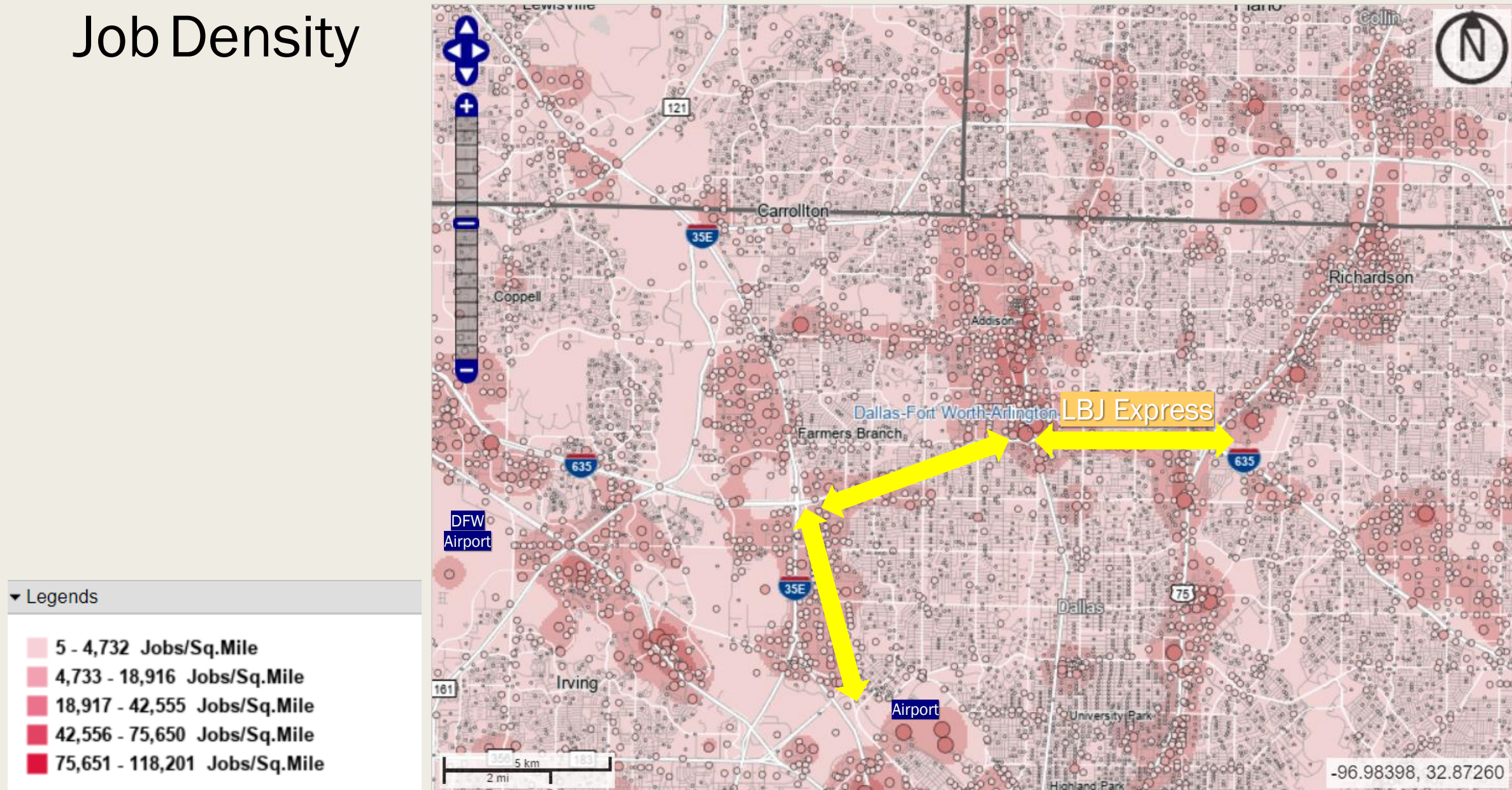
	Count	Share
<a href="#">All Census Tracts</a>	3,230,614	100.0%
<a href="#">100 (Dallas, TX)</a>	105,731	3.3%
<a href="#">136.16 (Dallas, TX)</a>	53,838	1.7%
<a href="#">1233 (Tarrant, TX)</a>	42,353	1.3%
<a href="#">31.01 (Dallas, TX)</a>	40,975	1.3%
<a href="#">141.24 (Dallas, TX)</a>	39,810	1.2%
<a href="#">140.02 (Dallas, TX)</a>	35,039	1.1%
<a href="#">99 (Dallas, TX)</a>	34,489	1.1%
<a href="#">9800 (Tarrant, TX)</a>	34,420	1.1%
<a href="#">21 (Dallas, TX)</a>	29,902	0.9%
<a href="#">16 (Dallas, TX)</a>	29,305	0.9%
<a href="#">138.06 (Dallas, TX)</a>	27,924	0.9%
<a href="#">204 (Dallas, TX)</a>	26,501	0.8%
<a href="#">185.06 (Dallas, TX)</a>	26,487	0.8%





# Work Area Profile Analysis

## Job Density

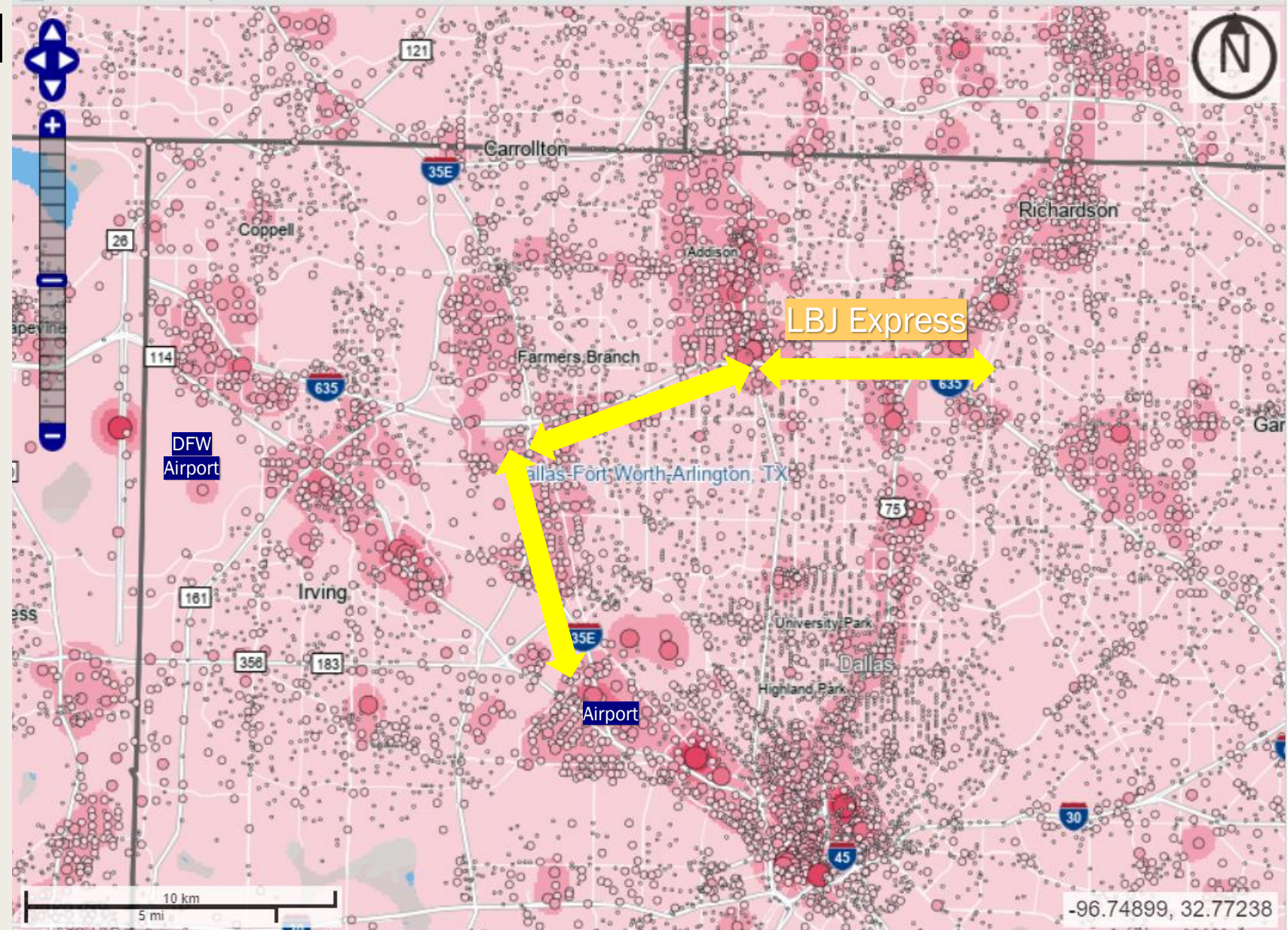




# Work Area Profile Analysis

## Identify Potential Toll Road Users

Workers Aged 30 to 54

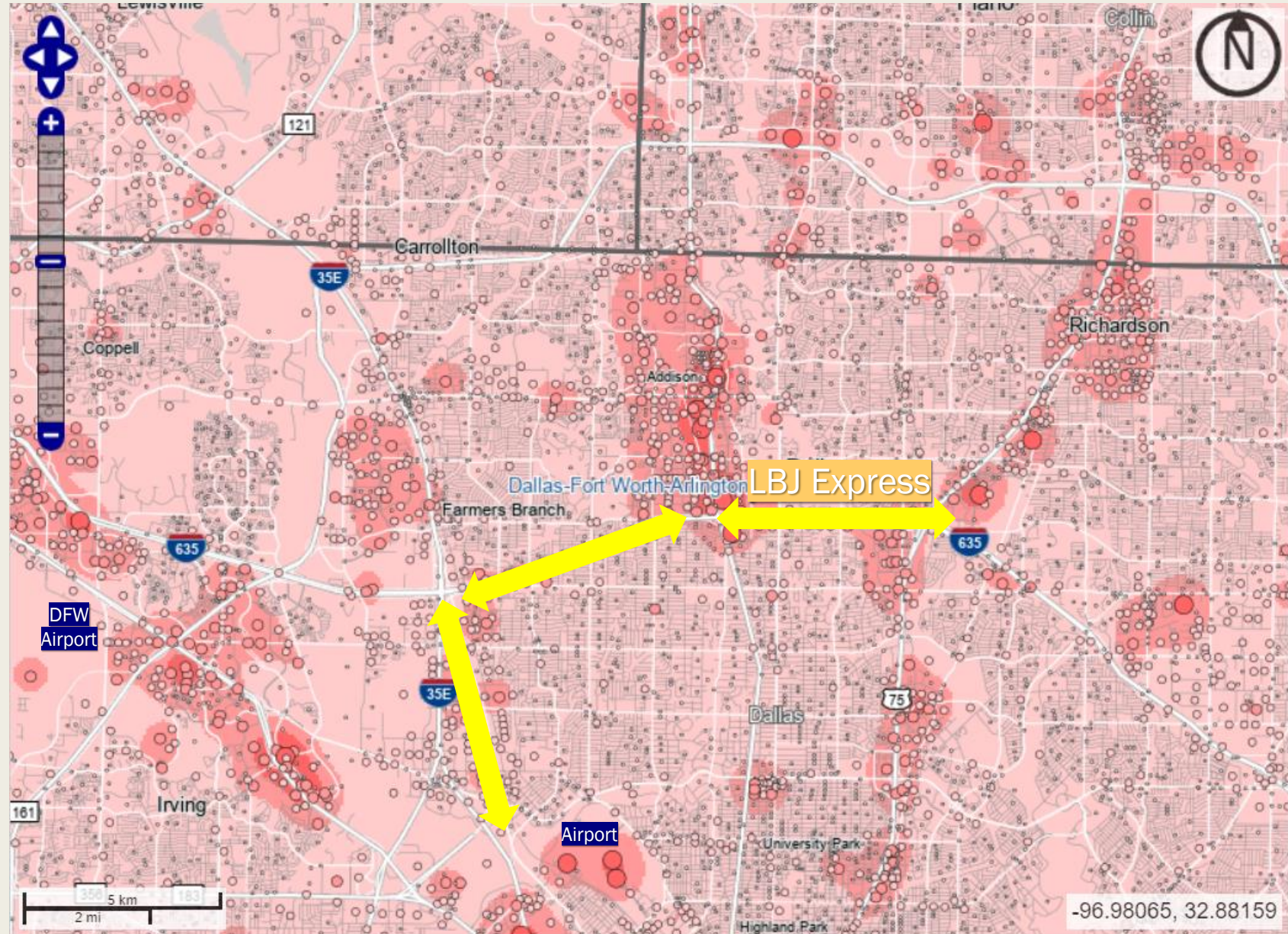




# Work Area Profile Analysis: Income

## Identify Potential Toll Road Users

Workers Earning More than  
\$3,333 per month



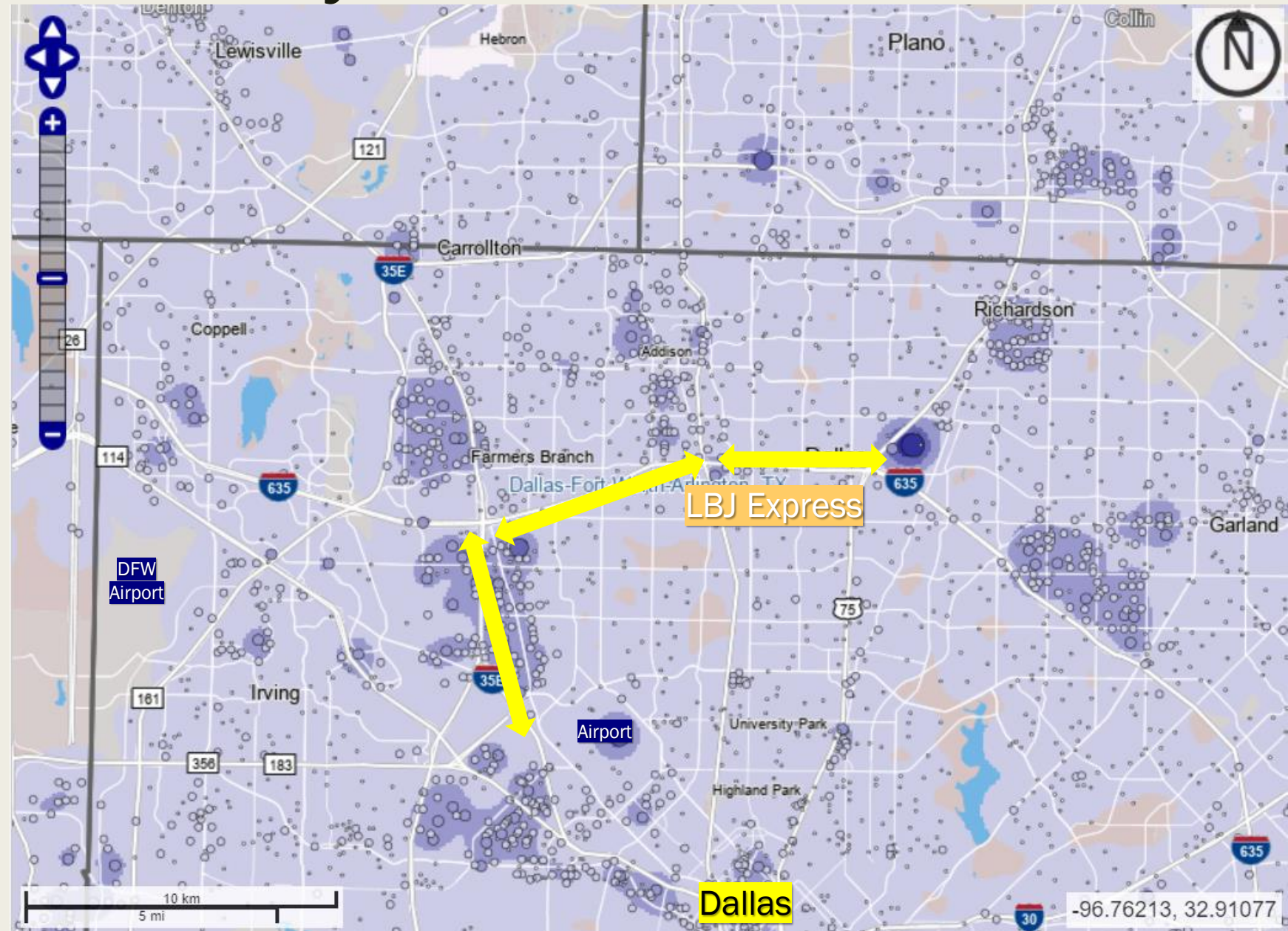


# Work Area Profile Analysis

Workers in the  
"Goods  
Producing"  
Industry

## Legends

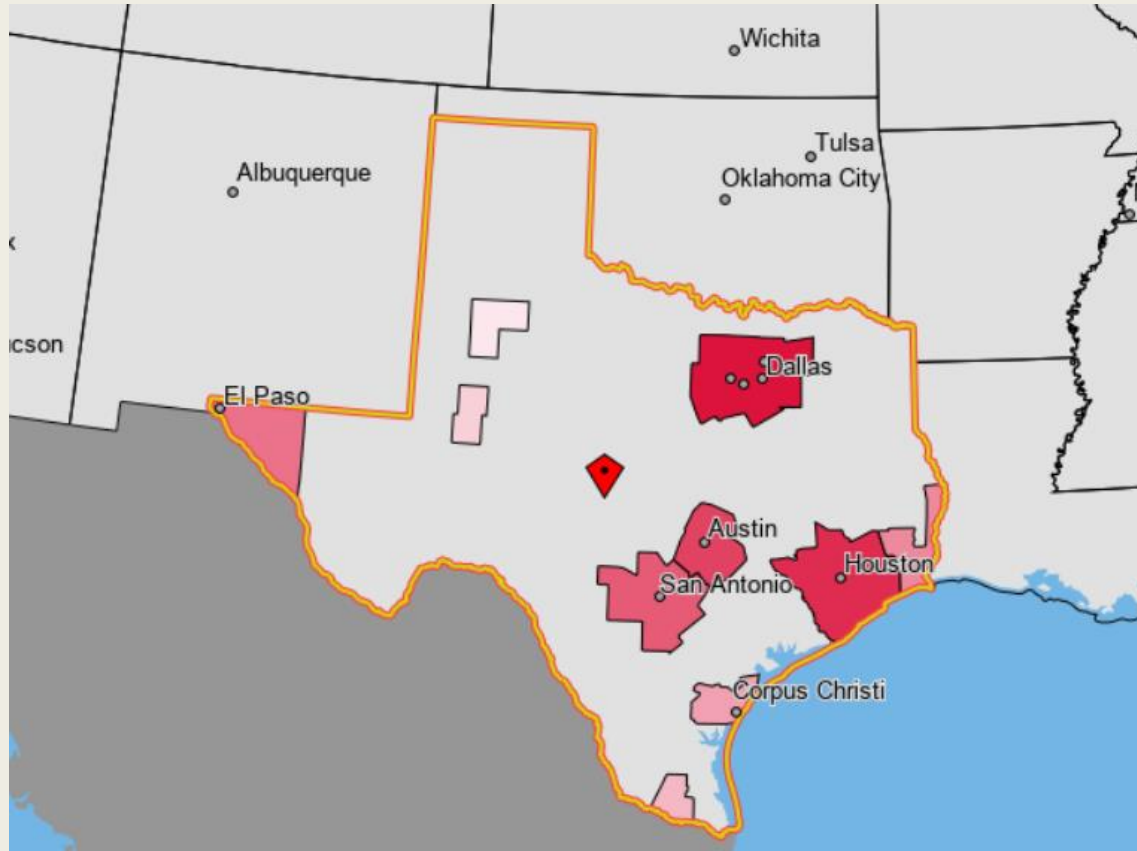
- 5 - 1,421 Jobs/Sq.Mile
- 1,422 - 5,670 Jobs/Sq.Mile
- 5,671 - 12,751 Jobs/Sq.Mile
- 12,752 - 22,666 Jobs/Sq.Mile
- 22,667 - 35,413 Jobs/Sq.Mile
- 1 - 25 Jobs
- 26 - 388 Jobs
- 389 - 1,961 Jobs
- 1,962 - 6,197 Jobs
- 6,198 - 15,128 Jobs



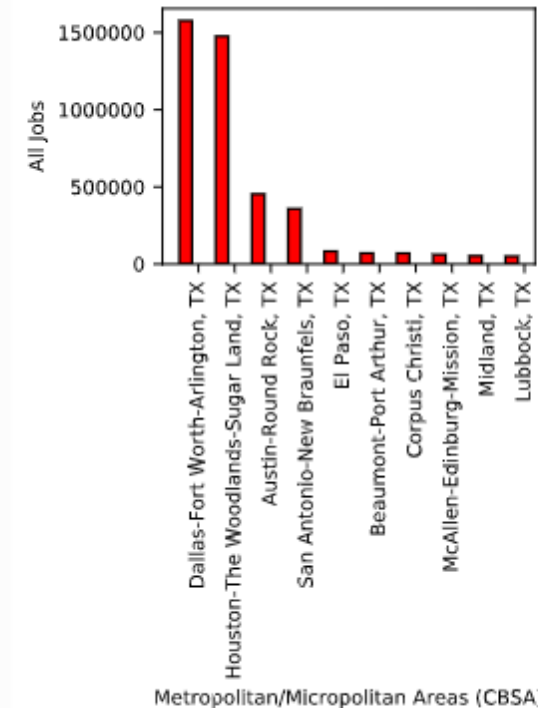
# Workers Earnings: Regional Data

Work Area Comparison Analysis by  
Metropolitan/Micropolitan Areas (CBSA)

Workers Earning More than \$3,333 per month



Job Counts by Metropolitan/Micropolitan Areas (CBSA) in 2015  
Workers Earning More than \$3,333 per month



Job Counts by Metropolitan/Micropolitan  
Areas (CBSA) in 2015 - All Jobs

	Total
All Metropolitan/Micropolitan Areas (CBSA)	4,863,192
Dallas-Fort Worth-Arlington, TX	1,576,805
Houston-The Woodlands-Sugar Land, TX	1,475,786
Austin-Round Rock, TX	453,450
San Antonio-New Braunfels, TX	357,835
El Paso, TX	82,596





# JOB SPRAWL & SUBURBAN JOB OPPORTUNITIES FOR LOW-WAGE WORKERS

## Legend

Low Income Housing Tax Credit Properties (LIHTC)



DFW: Low-Wage Jobs Growth

Relationship



High - High





# Motivations

- Mapping Job growth & spatial inequality
  - *Where new jobs are added*
  - *Where low-jobs are located*
  - *Where low-wage workers live*
- Data availability
  - *Home & Work Locations*
  - *Affordability*
  - *Accessibility*
- Data Integration
  - *Overlapping datasets and Creating interactive maps*







**JOB OPPORTUNITIES**



1990

Pop: 3.8 m

Emp: 2 m

Denton

Frisco

Plano

DFW  
Airport

Fort Worth

Dallas

2018

Pop: 7.5 m

Emp: 3.8 m

Google Earth

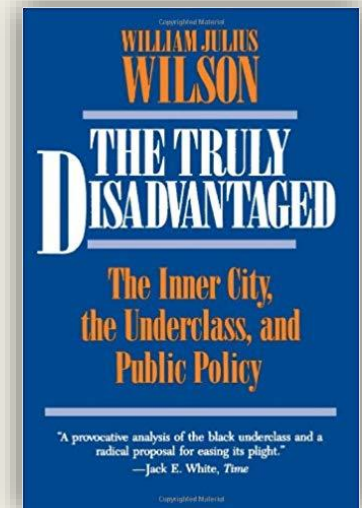
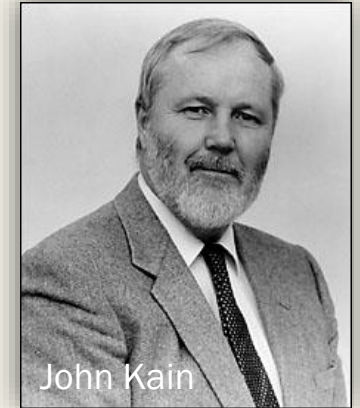
Kaufman

19



# Spatial Mismatch Hypothesis (SMH)

- First introduced by John Kain (1965, 1968)
  - *Jobs/housing mismatch—job decentralization and housing segregation*
  - *Most new employment opportunities are created in suburbs.*
  - *The difficulty people have in getting to jobs makes unemployment unnecessarily high.*
- William Julius Wilson (1987): “The Truly Disadvantaged”
  - *An urban underclass population has grown rapidly within the inner city, and the movement of jobs from the city to suburbs is one of the causal factors.*



More Info:

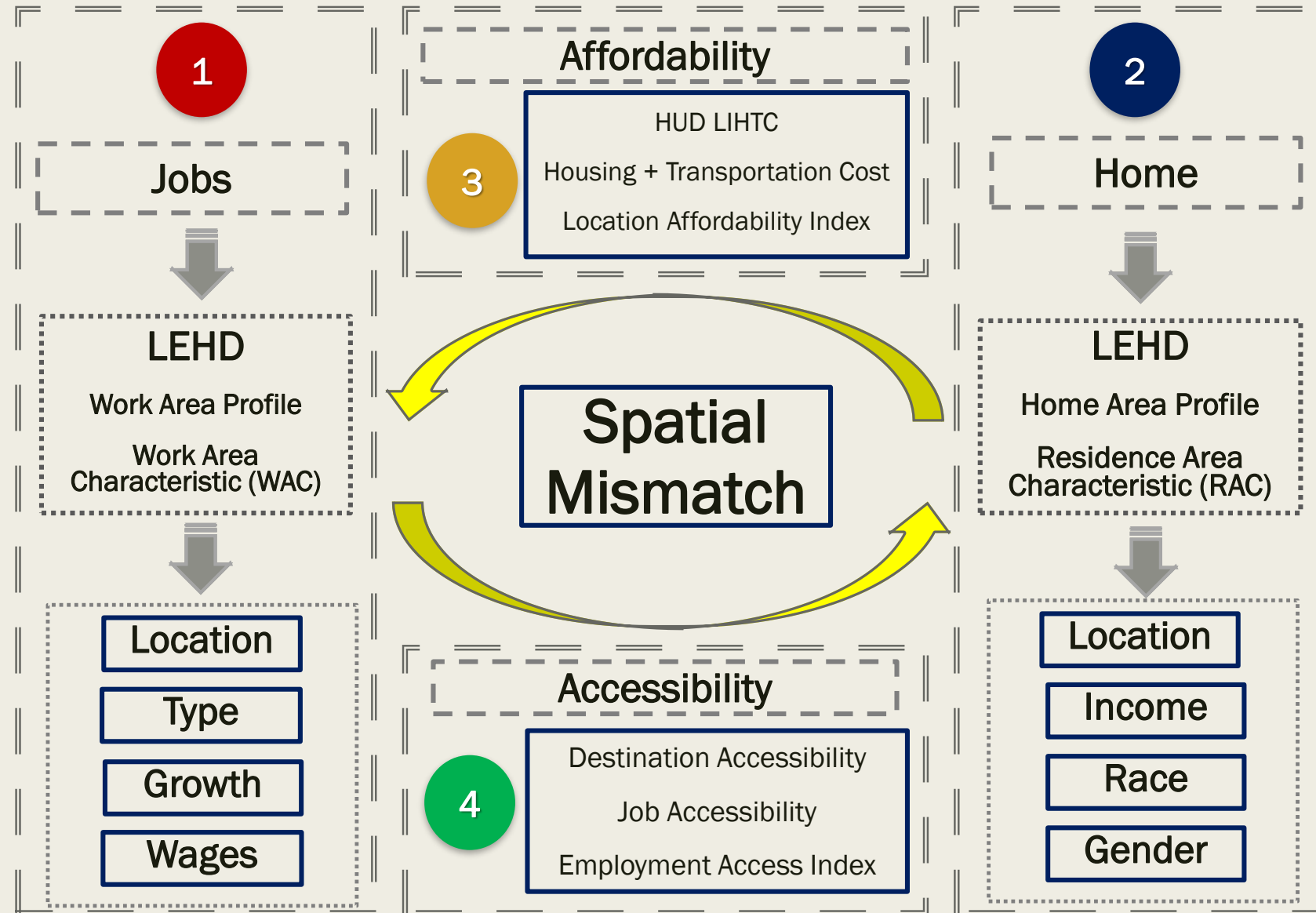
<https://news.harvard.edu/gazette/story/2005/04/john-forrest-kain/>

[https://inequality.stanford.edu/sites/default/files/media/\\_media/pdf/Reference%20Media/Kain\\_1992\\_Transportation.pdf](https://inequality.stanford.edu/sites/default/files/media/_media/pdf/Reference%20Media/Kain_1992_Transportation.pdf)



# Key Factors

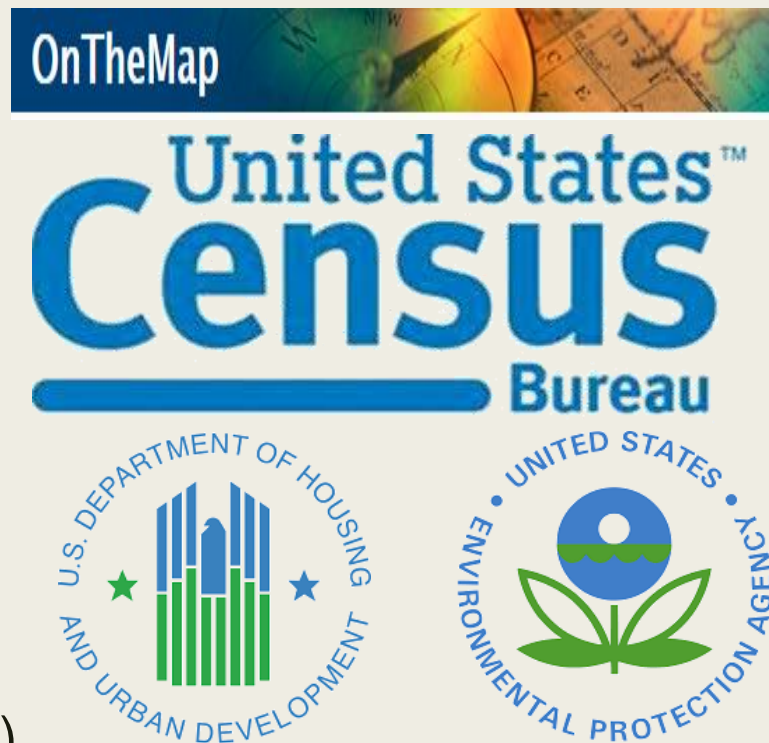
- 1** Job Locations
- 2** Home Locations
- 3** Location Affordability
- 4** Job Accessibility



# Datasets & Tools

## Data

- LEHD
- U.S Census, American Community Survey
- HUD Low-Income Housing Tax Credits (LIHTC) Properties (U.S Dept. Housing & Urban Development)
- The Place Database, Lincoln Institute of Land Policy
- Transit Data: General Transit Feed Specification (GTFS)



## Tools

- LEHD “OnTheMap” Web Tool
- American Fact Finder
- EPA EJSCREEN
- ArcGIS Desktop; ArcGIS Online





# Longitudinal Employer-Household Dynamics (LEHD)

Provides statistics on employment, including information on:

- Resident workers
- Jobs
- Commute flows
- Origin-Destination Employment Statistics (LODES)

## Applications

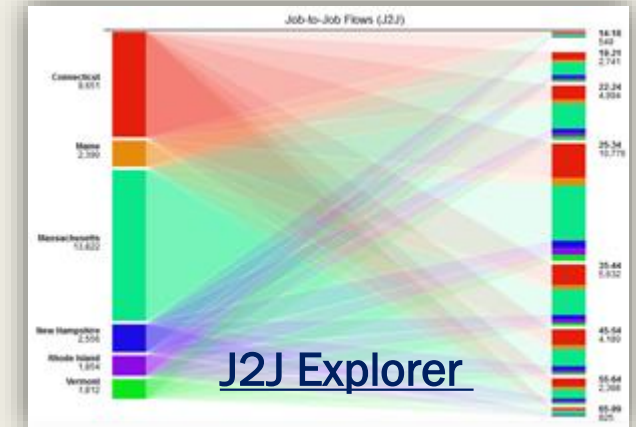
- [J2J Explorer](#): Job-to-Job Flows
- [QWI Explorer](#): Quarterly Workforce Indicators (QWI)

## ■ [OnTheMap](#)

- [LED Extraction Tool](#)

## Sources:

- <https://lehd.ces.census.gov/data/>





# 1 Work Area Profile Analysis

OnTheMap

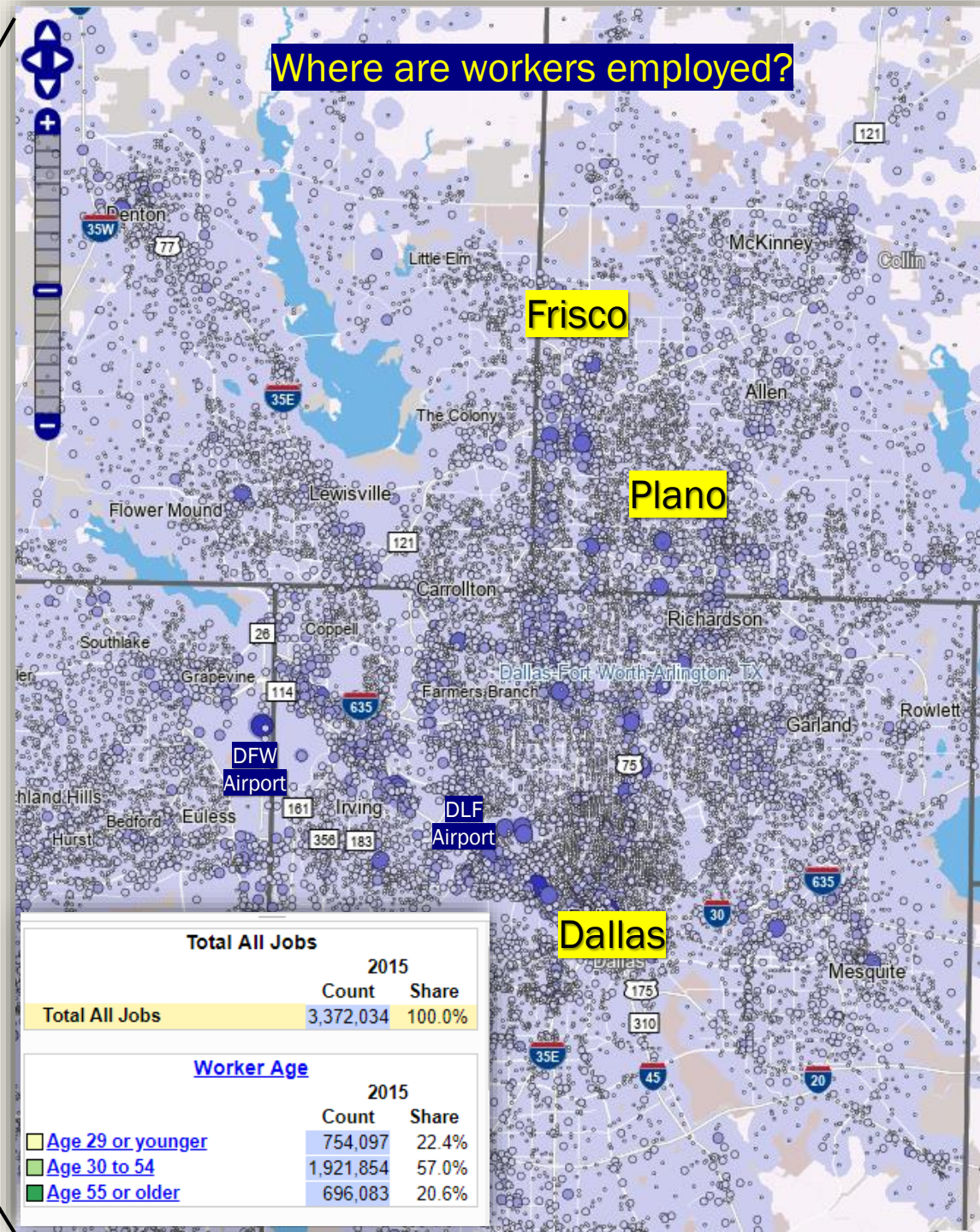
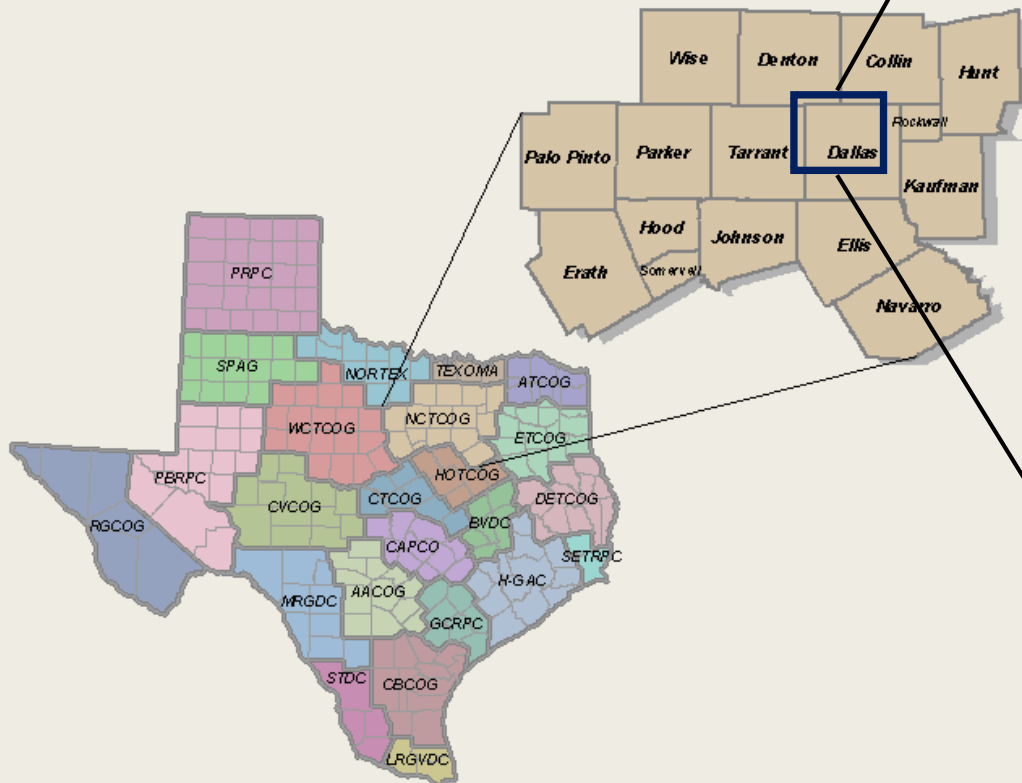
Start

Base Map

Selection

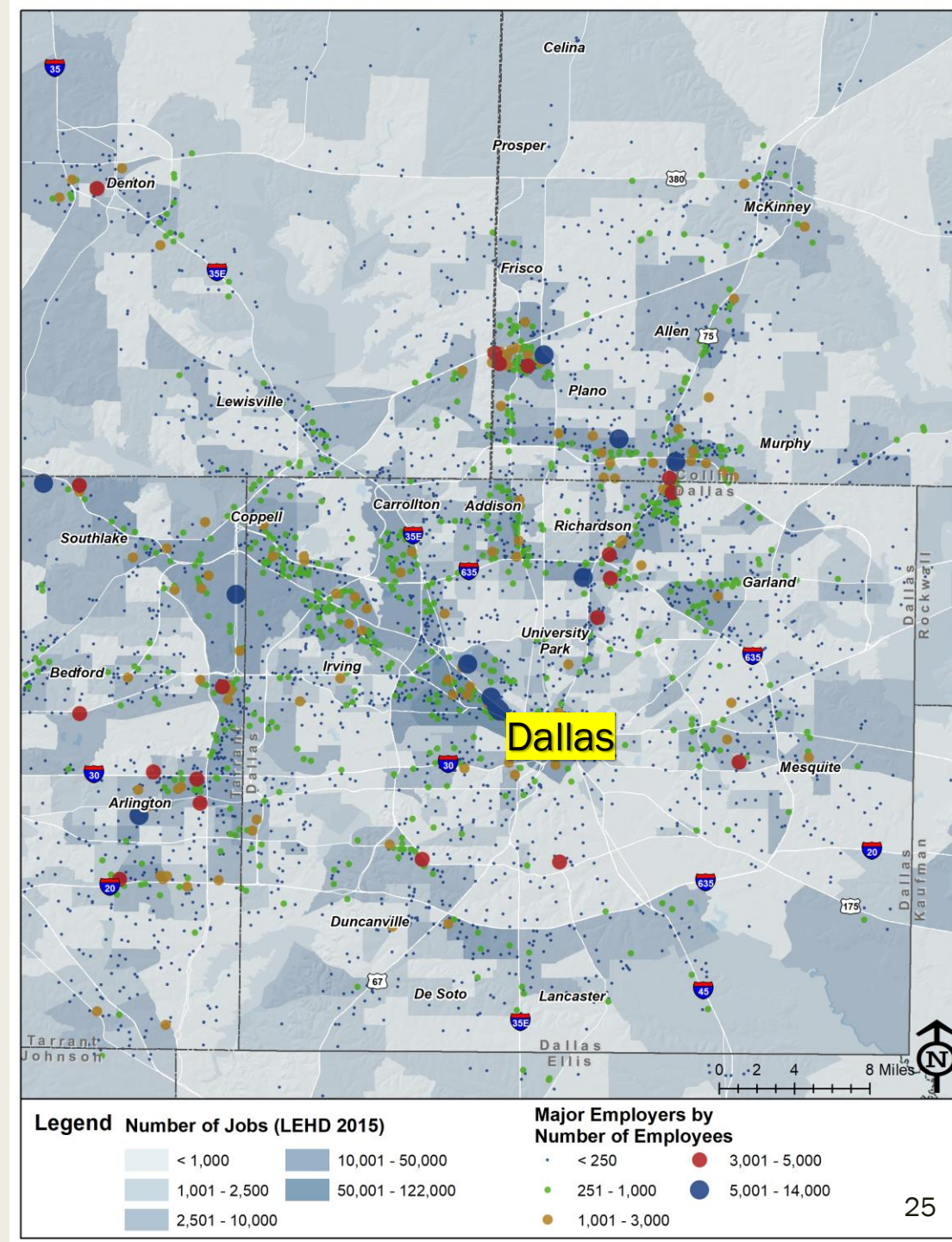
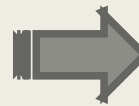
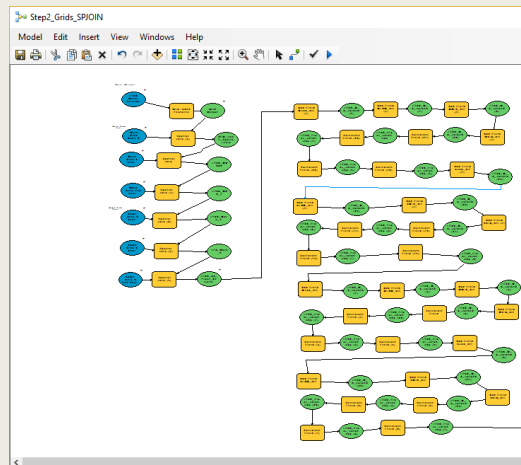
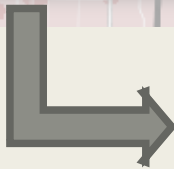
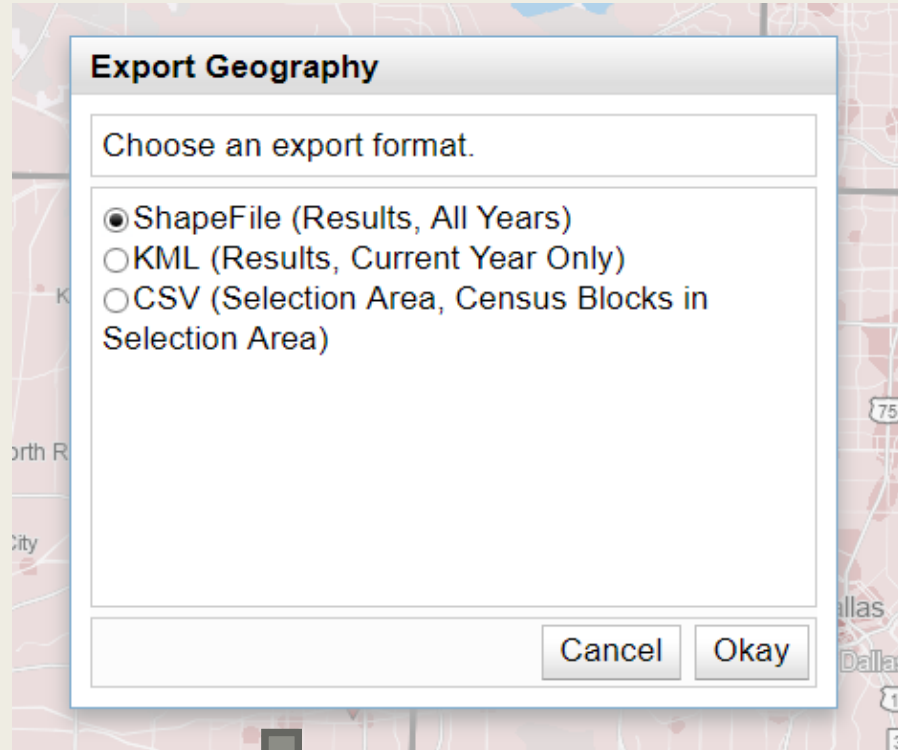
Results

Work Area Profile Analysis  
*Job Locations*





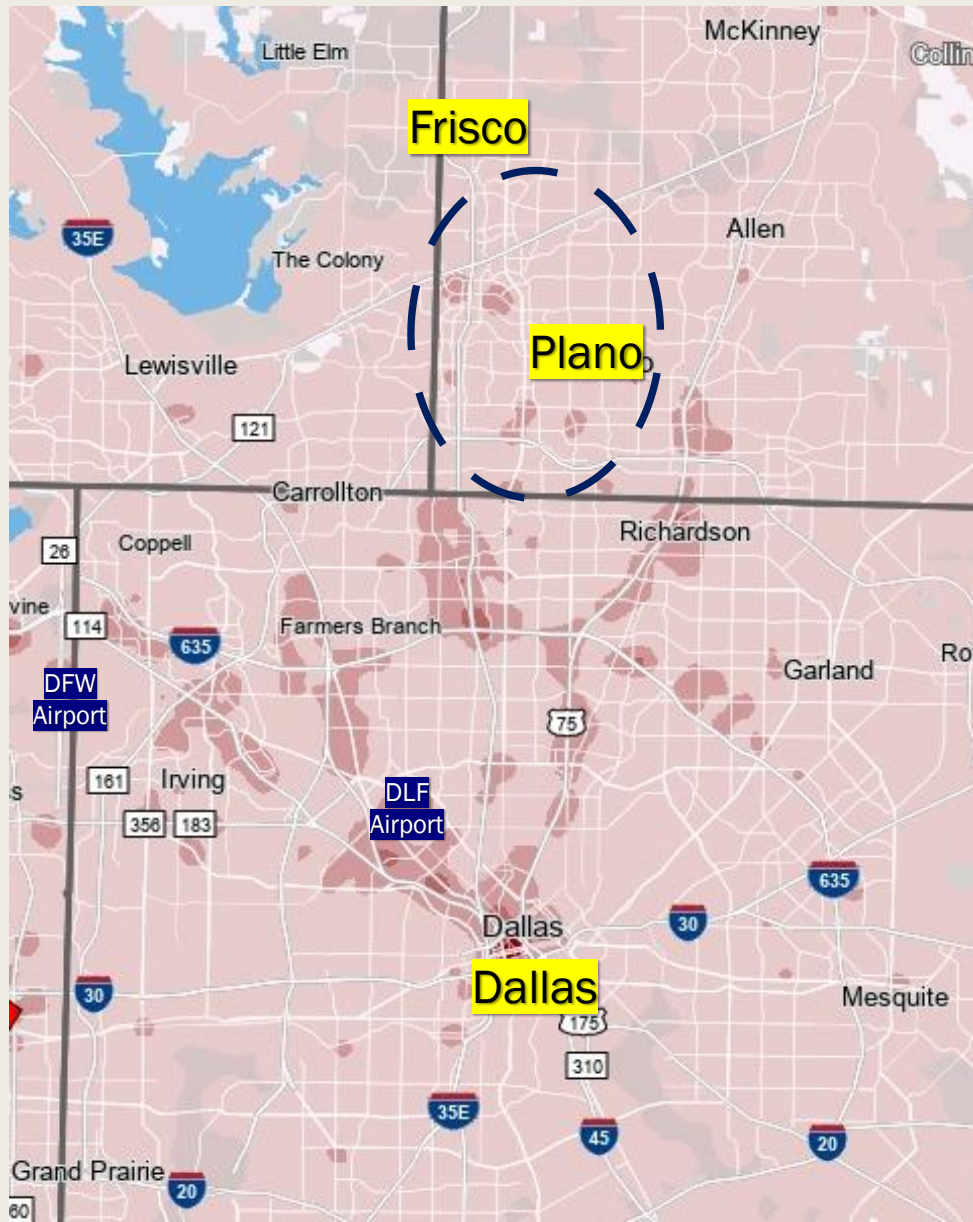
# Data Aggregation



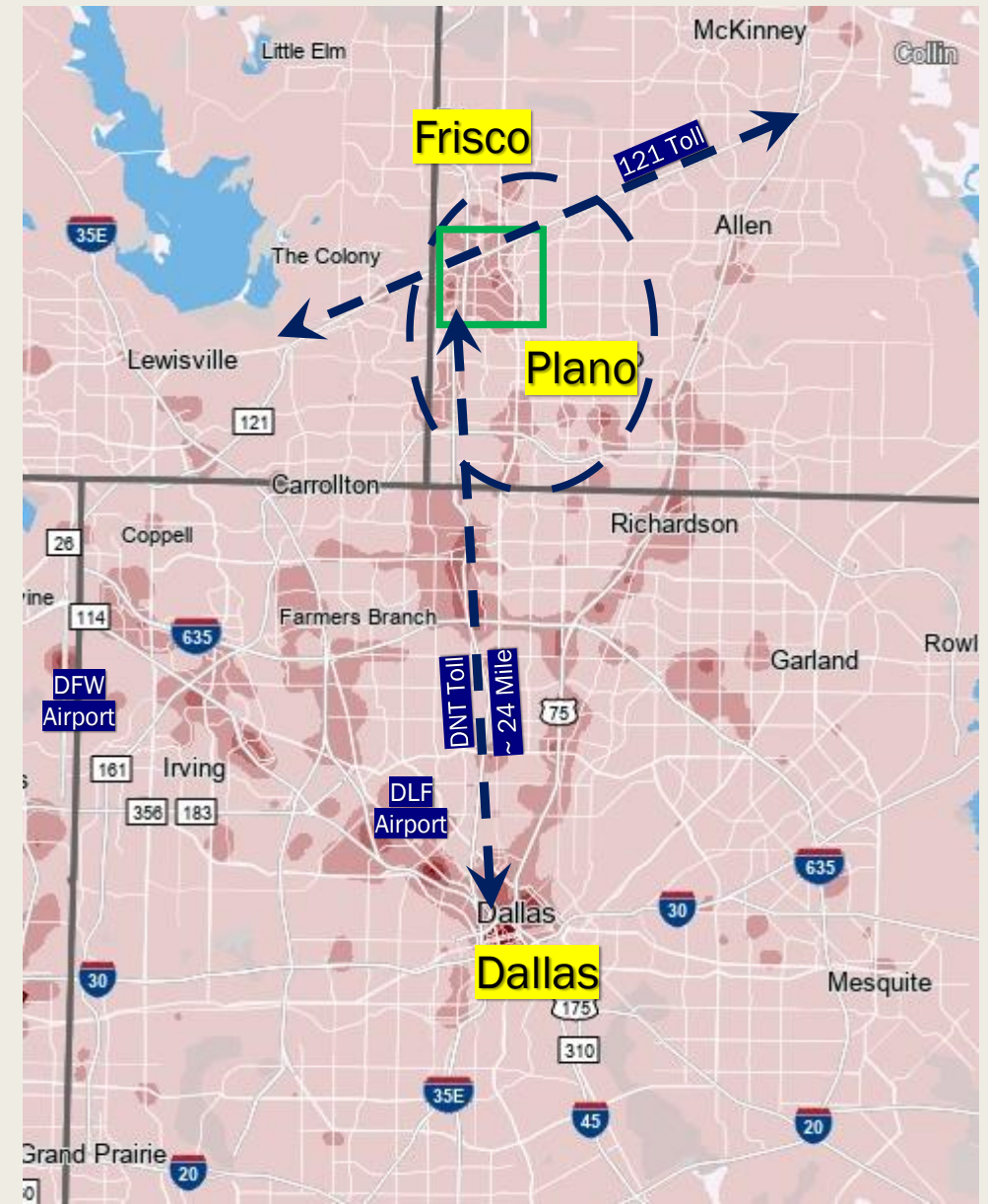


# LEHD Historical Data: 2002-2015

## Job Density: 2002



## Job Density: 2015



# LEHD Wage Classification Data

Earning \$1,250 or less per month

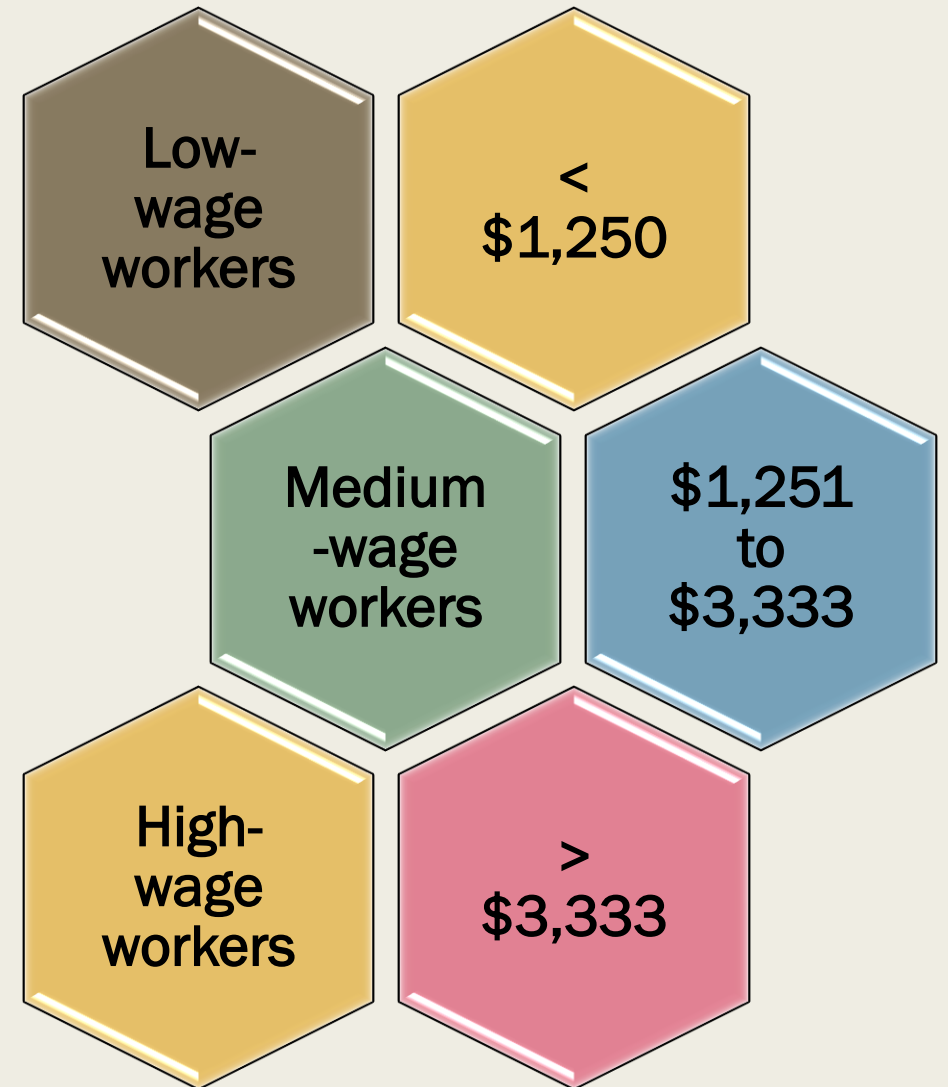
- *Low-wage workers*

Earning \$1,250 to \$3,333 per month

- *Medium-wage workers*

Earning more than \$3,333 per month

- *High-wage workers*

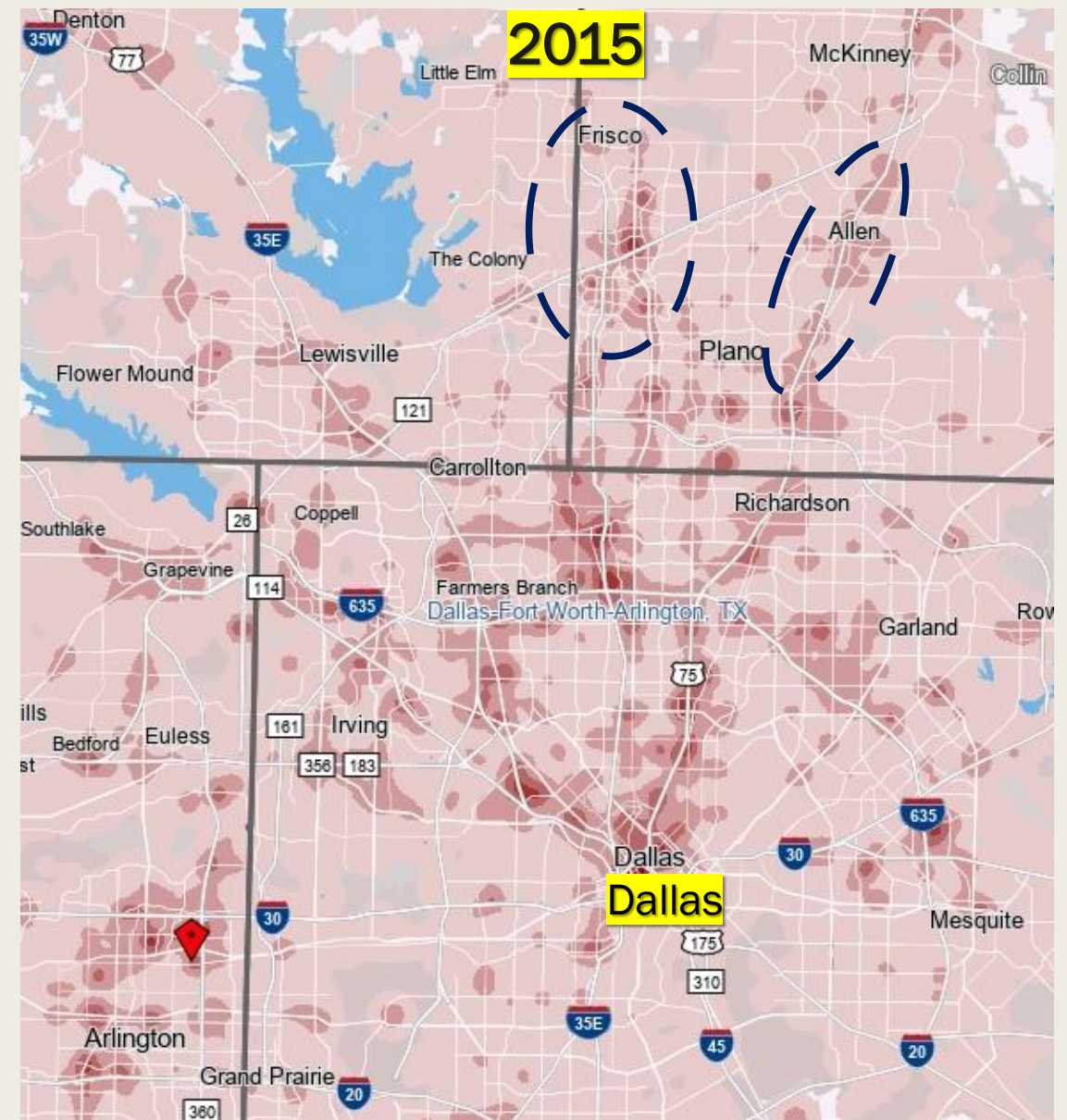
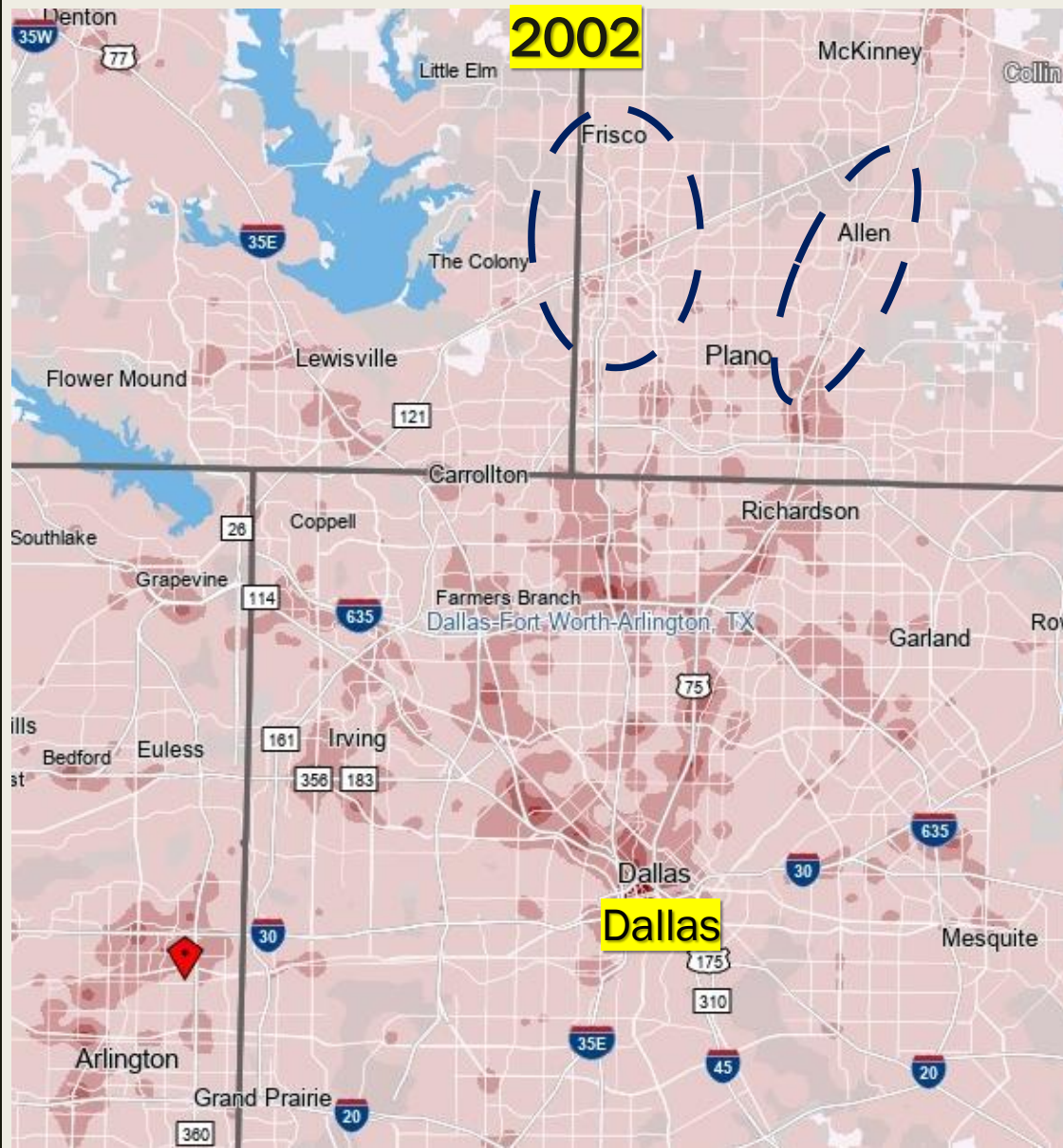


## Earnings

	2015	
	Count	Share
■ <u>\$1,250 per month or less</u>	707,179	21.0%
■ <u>\$1,251 to \$3,333 per month</u>	1,088,050	32.3%
■ <u>More than \$3,333 per month</u>	1,576,805	46.8%



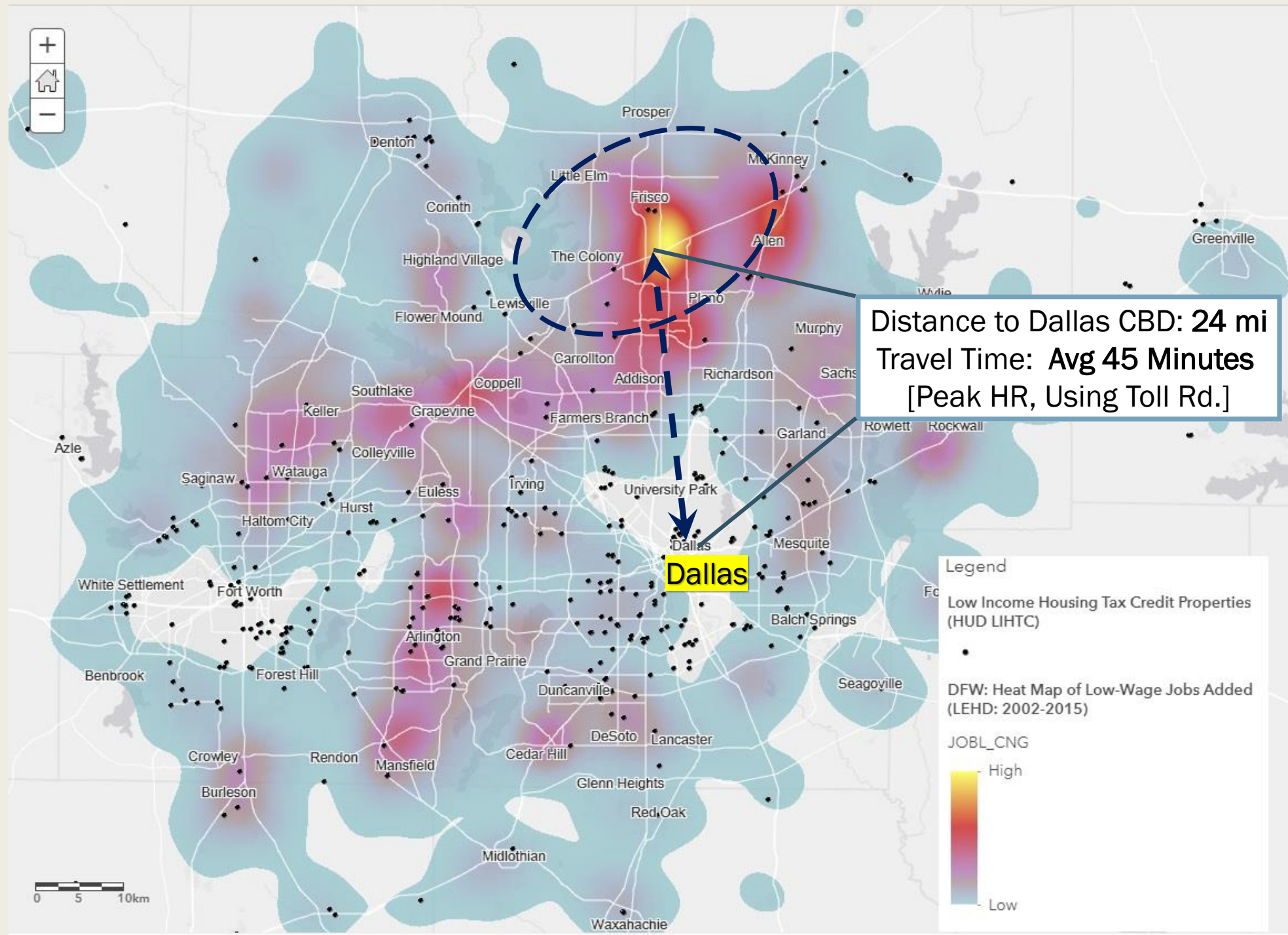
# LEHD Low-Wage Jobs: 2002-2015





LEHD:  
2002-2015

Heat Map of  
Low-Wage  
Jobs Added:  
2002-2015





# Home Location of Workers



### Worker Ethnicity

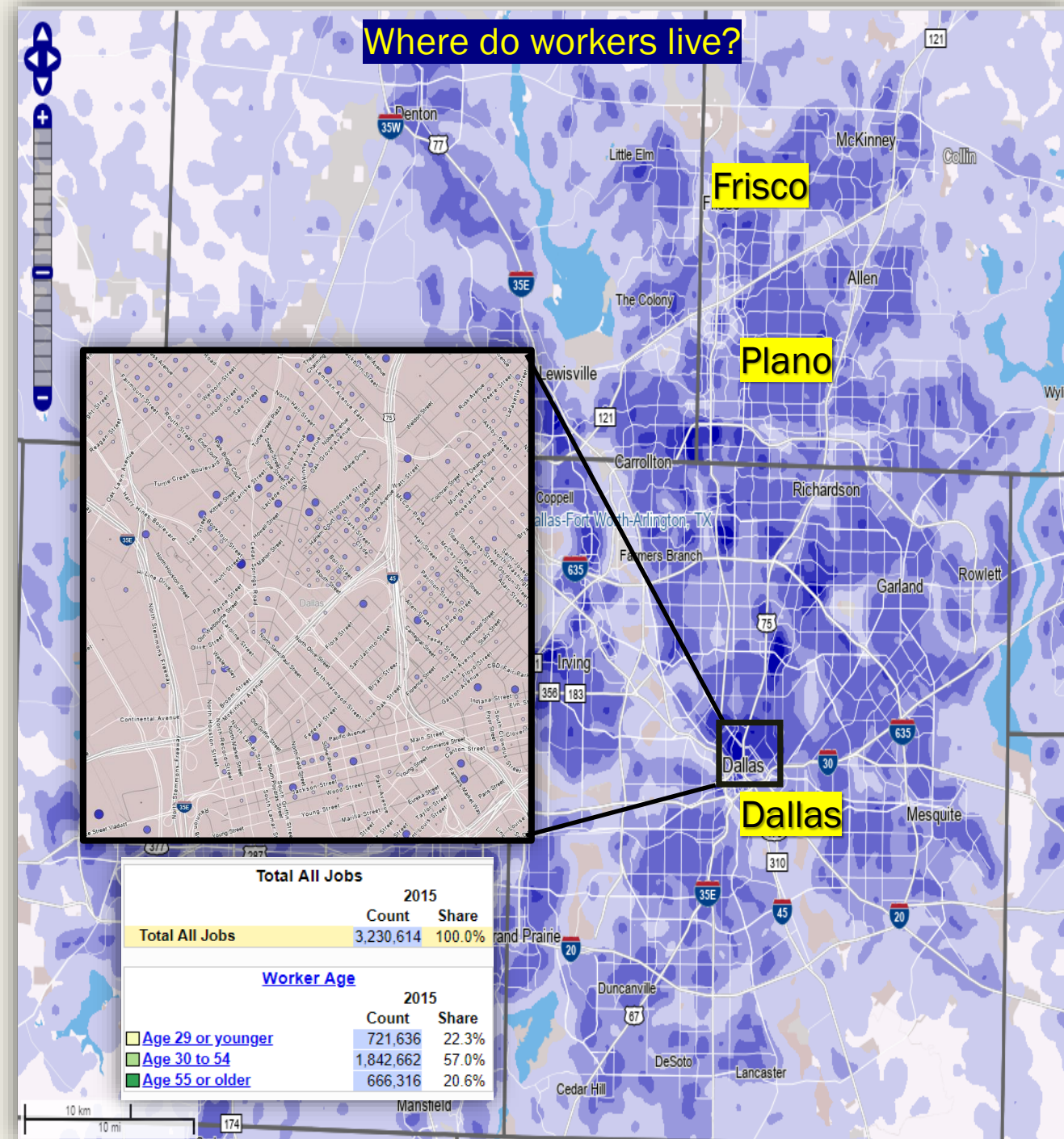
	2015	
	Count	Share
Not Hispanic or Latino	2,591,209	80.2%
Hispanic or Latino	639,405	19.8%

### Worker Educational Attainment

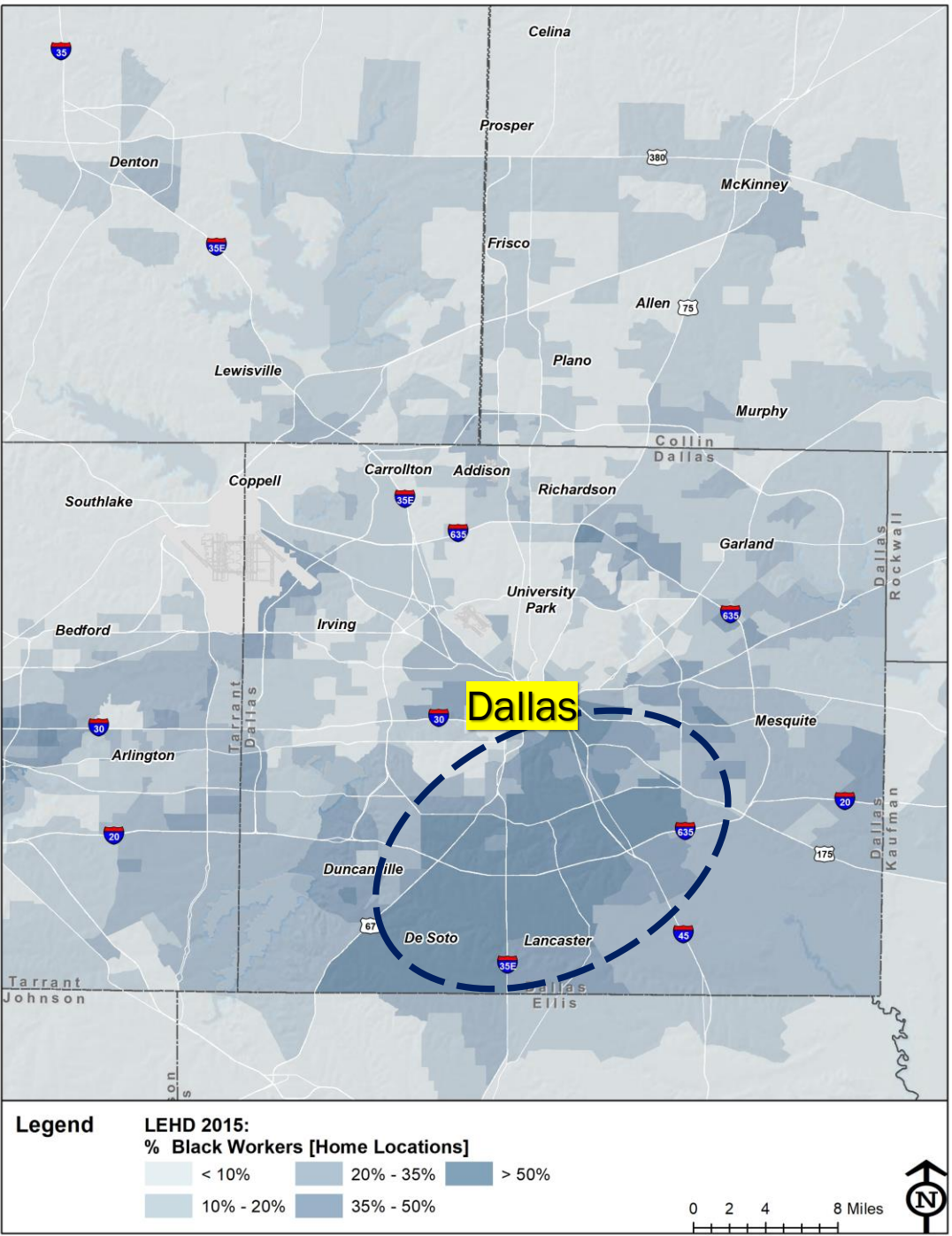
	2015	
	Count	Share
Less than high school	385,349	11.9%
High school or equivalent, no college	633,434	19.6%
Some college or Associate degree	797,550	24.7%
Bachelor's degree or advanced degree	692,645	21.4%

### Worker Sex

	2015	
	Count	Share
Male	1,651,548	51.1%
Female	1,579,066	48.9%



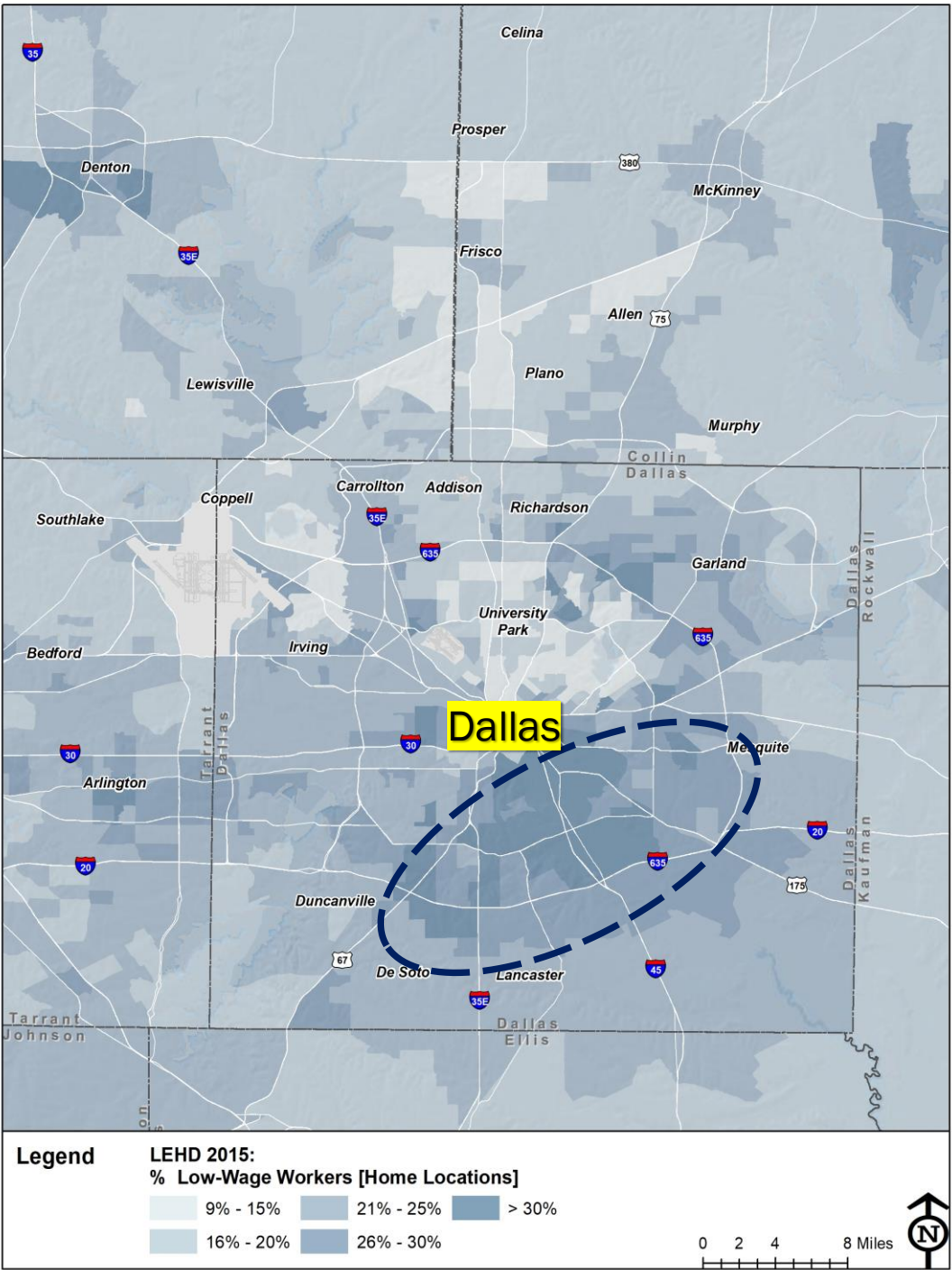




# LEHD HOME AREA PROFILE

## Where Do Black Workers Live?



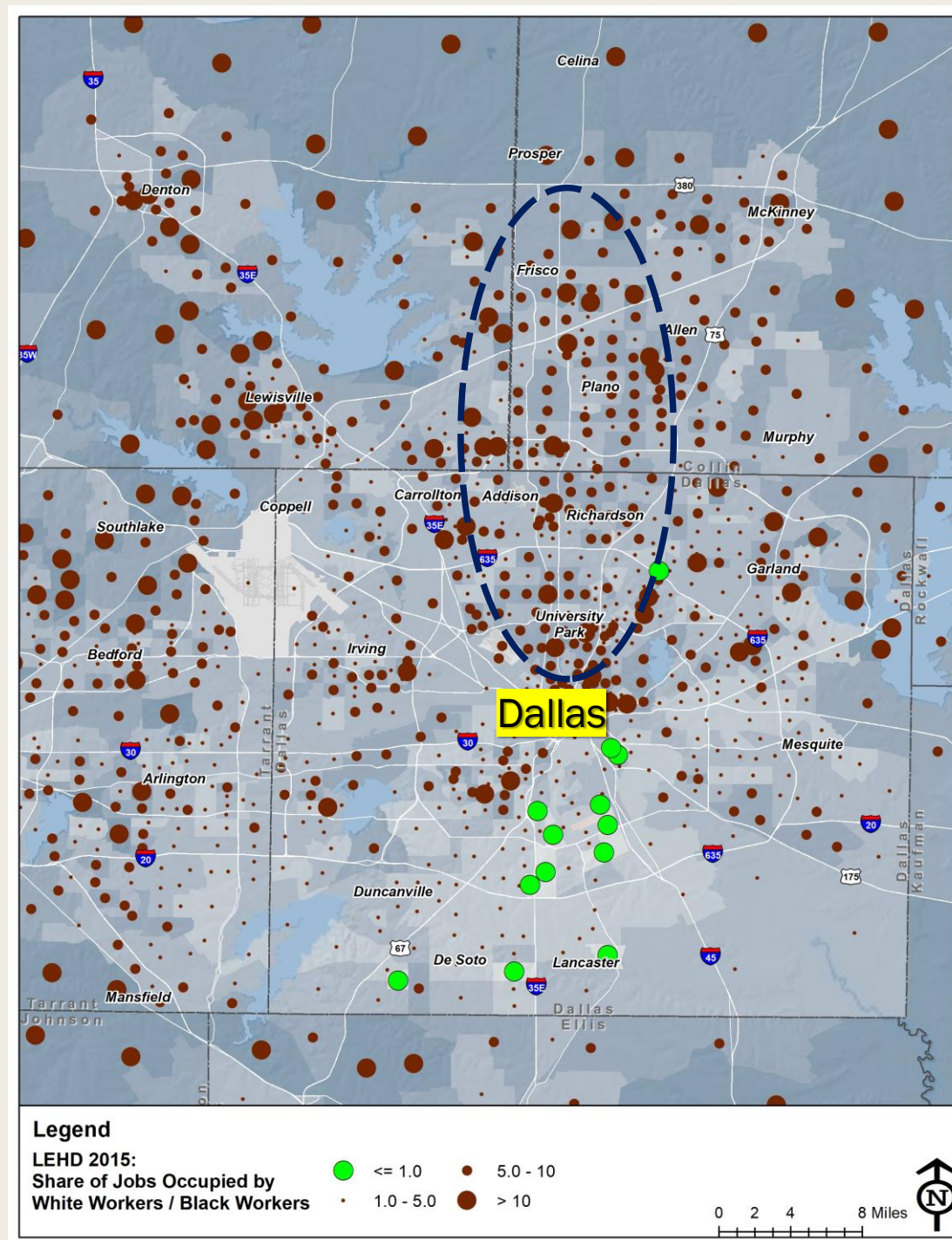


# LEHD HOME AREA PROFILE

## % Low-Wage Workers [Home Location]

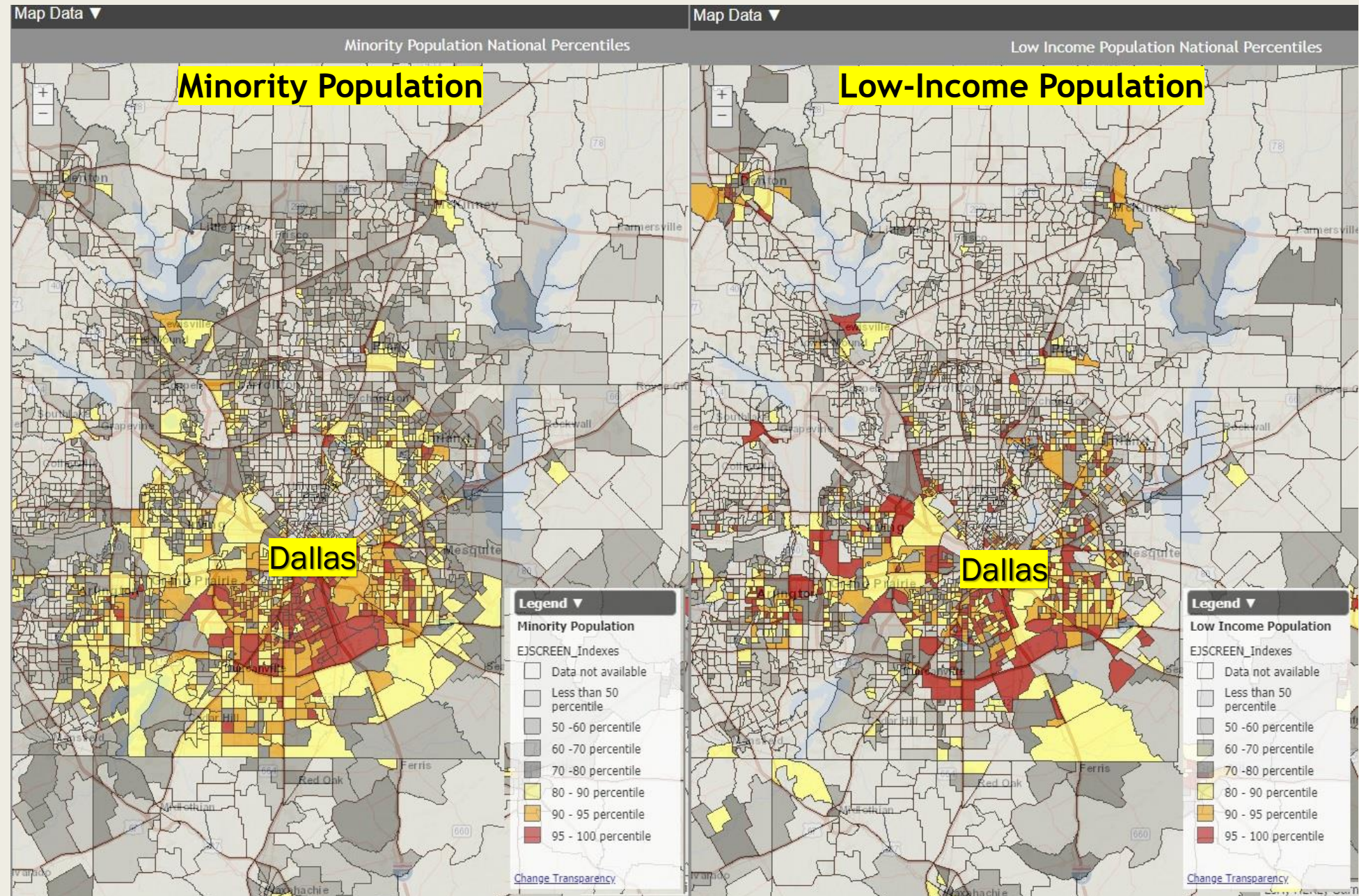


# Share of Jobs Occupied by White / Black Workers [LEHD 2015]





# EJSCREEN: Environmental Justice Screening and Mapping Tool



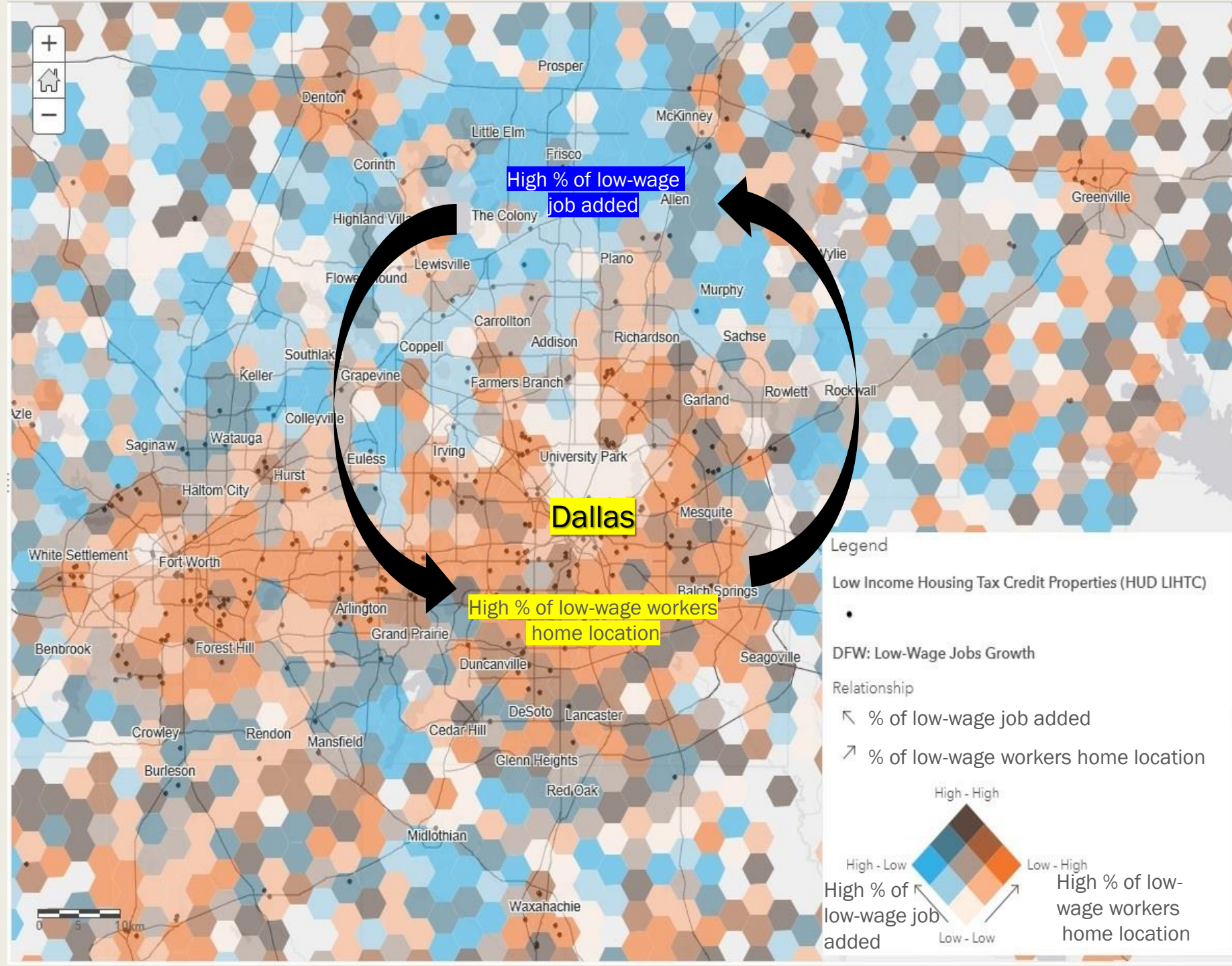


# LEHD 2015

Work Area Profile &  
Home Area Profile

## Relationship Map

Low-Wage Job  
Added (%)  
vs.  
Low-Wage  
Residents (%)





# Location Affordability

- Housing and Transportation Costs as % of Household Income

## Tools & Databases

### HUD Low-Income Housing Tax Credit (LIHTC) Properties

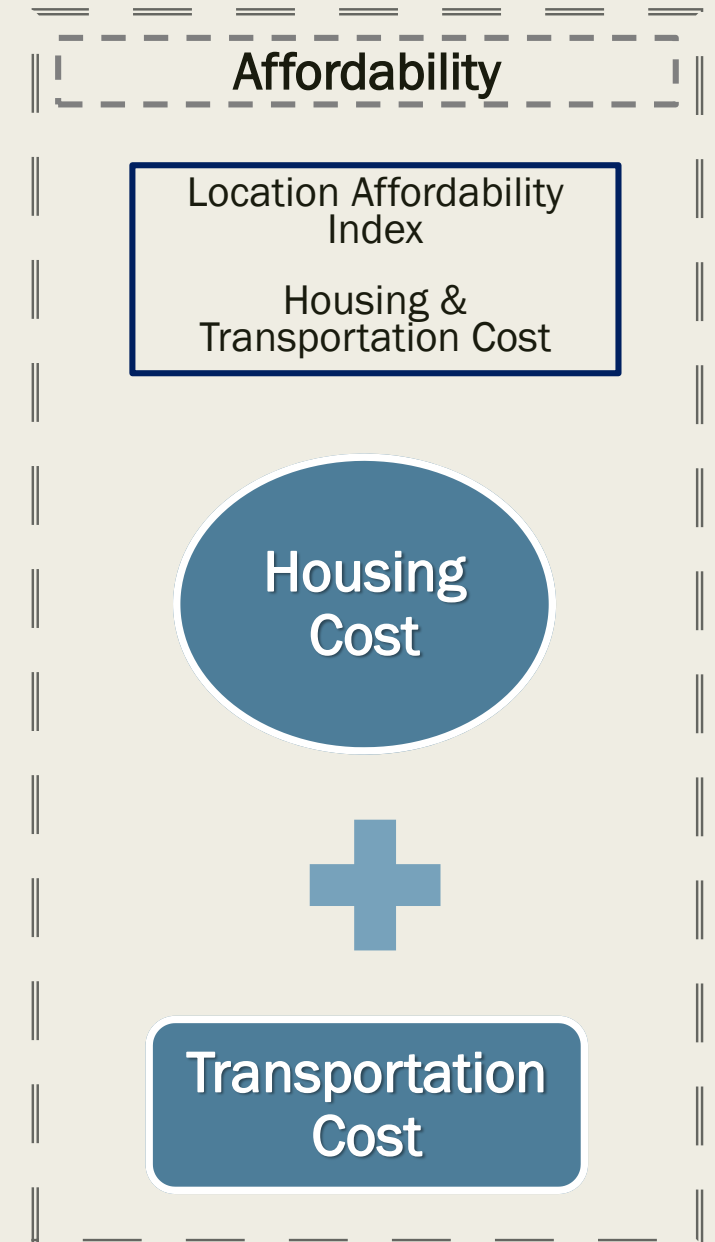
- [www.lihtc.huduser.gov/](http://www.lihtc.huduser.gov/)
- [www.huduser.gov/portal/datasets/lihtc.html](http://www.huduser.gov/portal/datasets/lihtc.html)
- <https://placedatabase.policymap.com/>

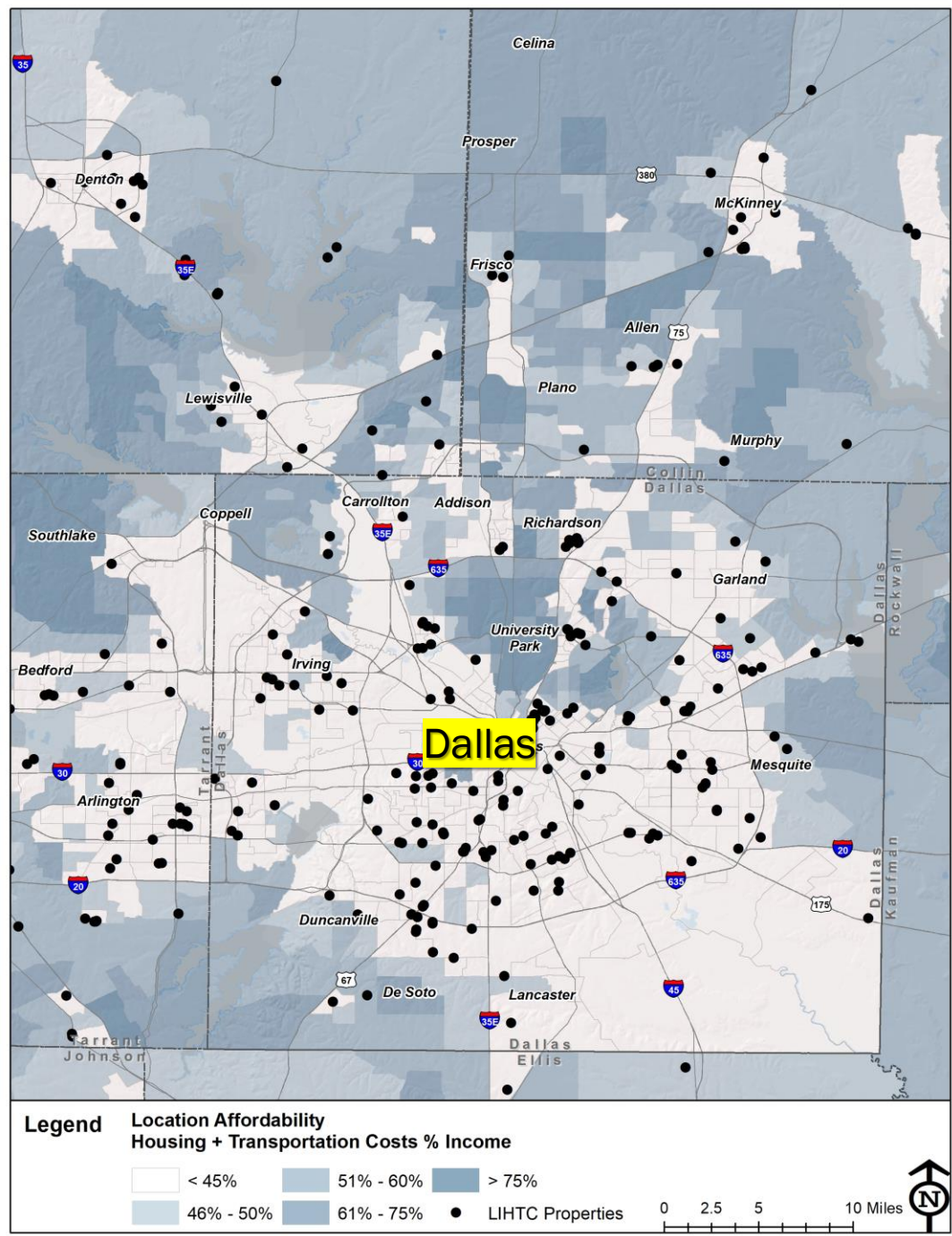
### HUD Location Affordability Index

- [www.hudexchange.info/programs/location-affordability-index/](http://www.hudexchange.info/programs/location-affordability-index/)
- <https://placedatabase.policymap.com/>

### H+T Index from the Center for Neighborhood Technology (CNT)

- [www.cnt.org/tools/housing-and-transportation-affordability-index](http://www.cnt.org/tools/housing-and-transportation-affordability-index)



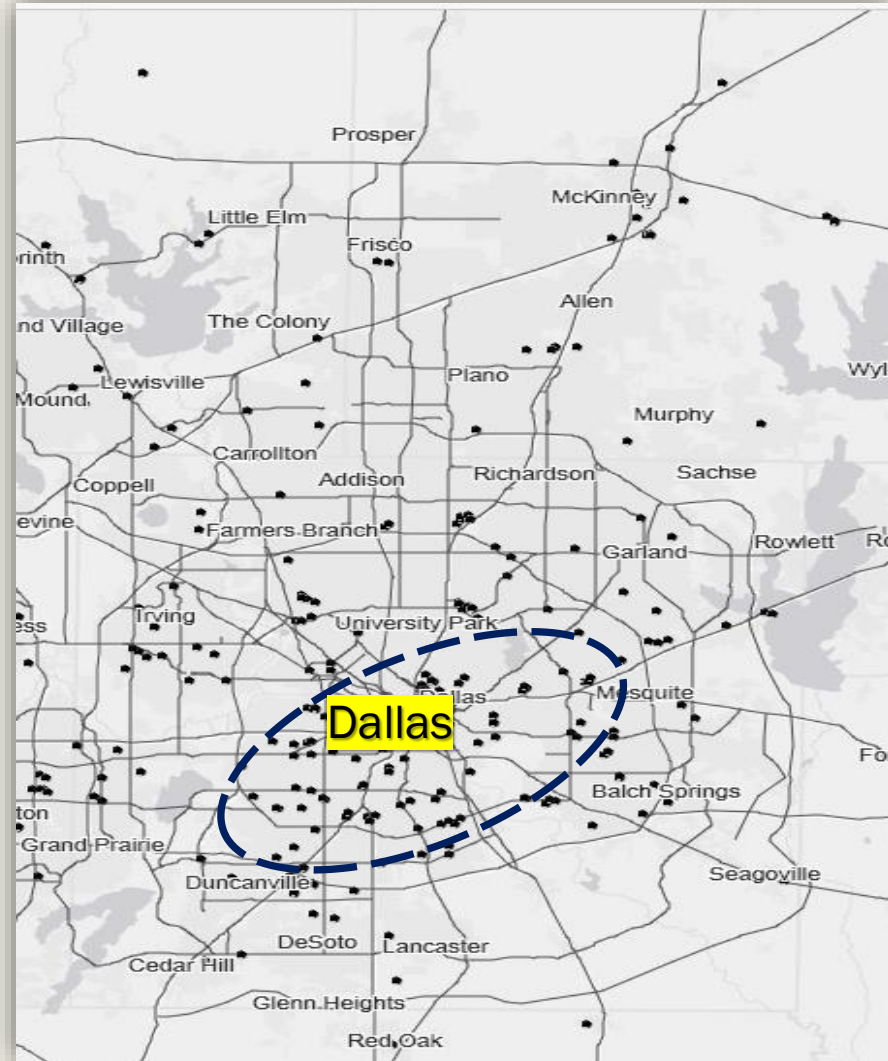


# Location Affordability Index H+T Index (CNT.org)

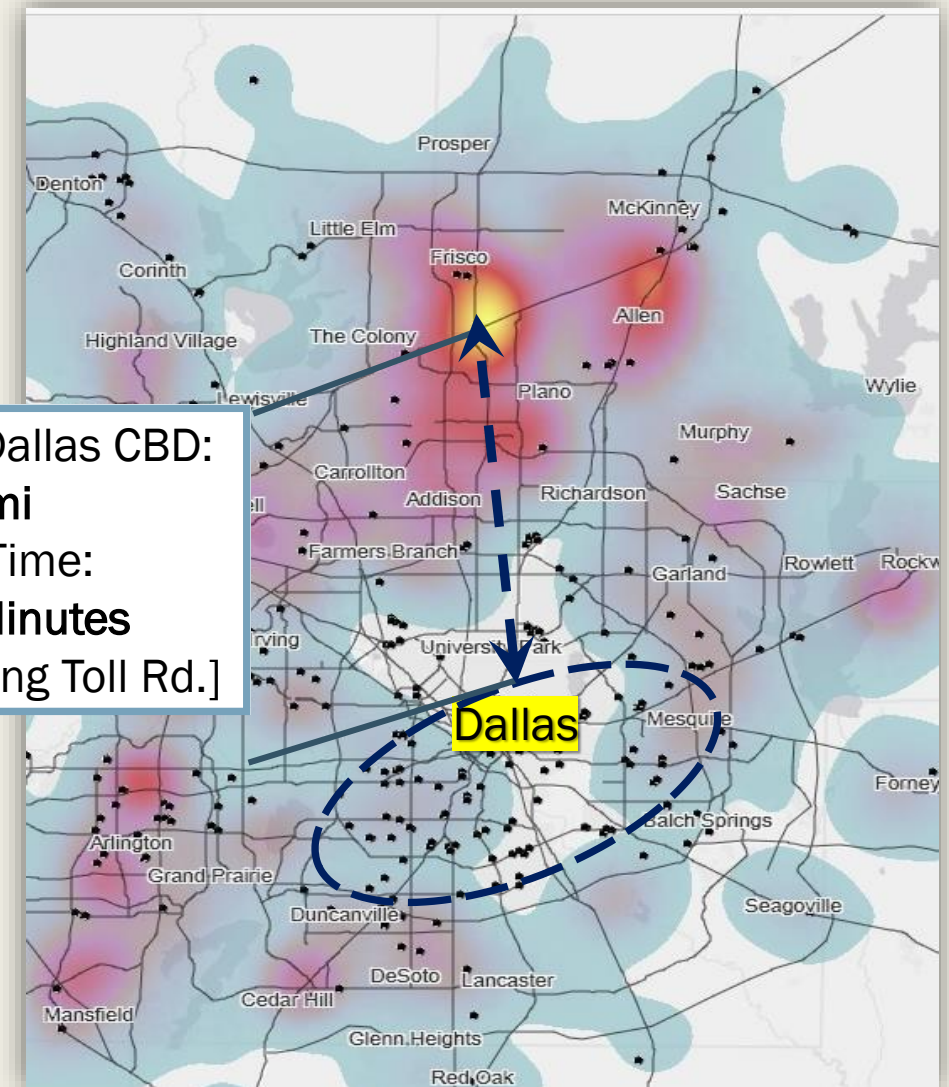


# Subsidized Housing

## Low-Income Housing Tax Credit (LIHTC) Properties



Distance to Dallas CBD:  
24 mi  
Travel Time:  
Avg 45 Minutes  
[Peak HR, Using Toll Rd.]



# Job Accessibility

- How close are low-wage workers to a transit stop?
- How far do they have to travel to get to the workplace?

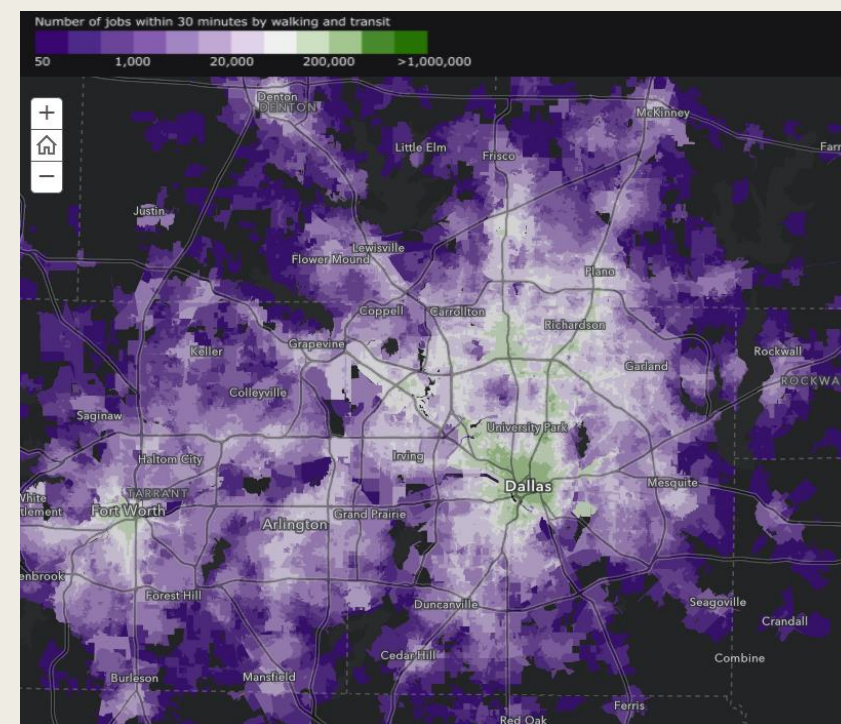
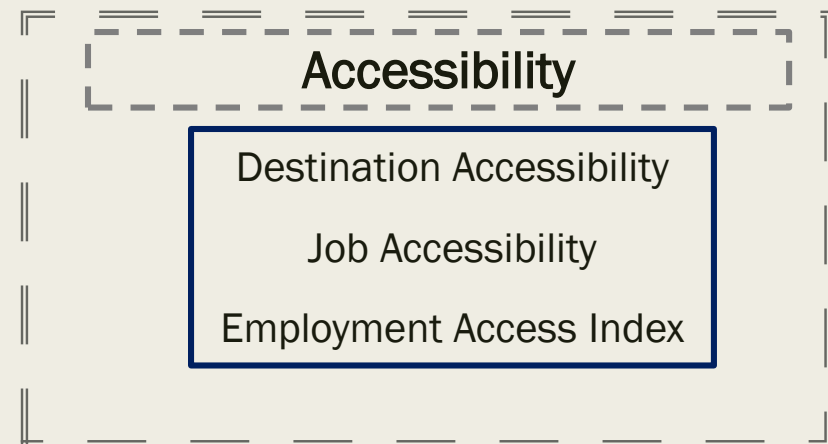
## Tools & Databases

The General Transit Feed Specification (GTFS)

- <https://transitfeeds.com/>

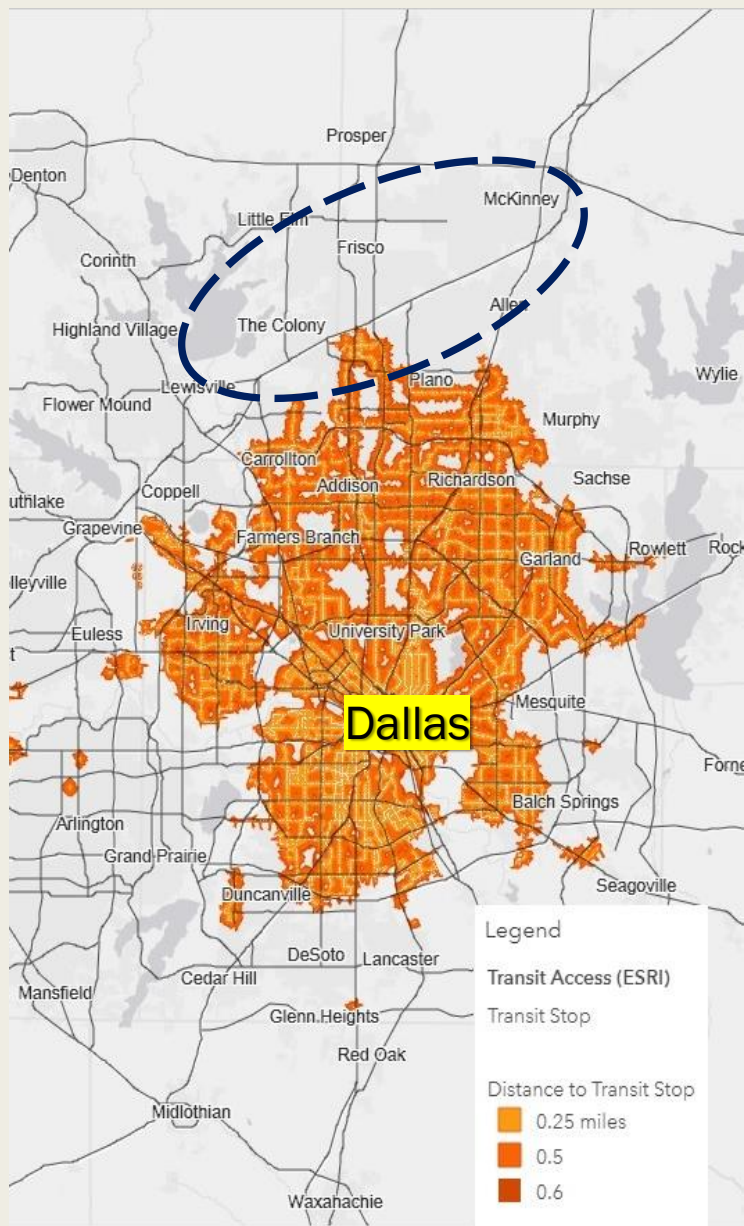
EPA Smart Location Database

- Access to Jobs and Workers Via Transit Tool
  - [www.epa.gov/smartgrowth/smart-location-mapping](http://www.epa.gov/smartgrowth/smart-location-mapping)
  - <https://epa.maps.arcgis.com>

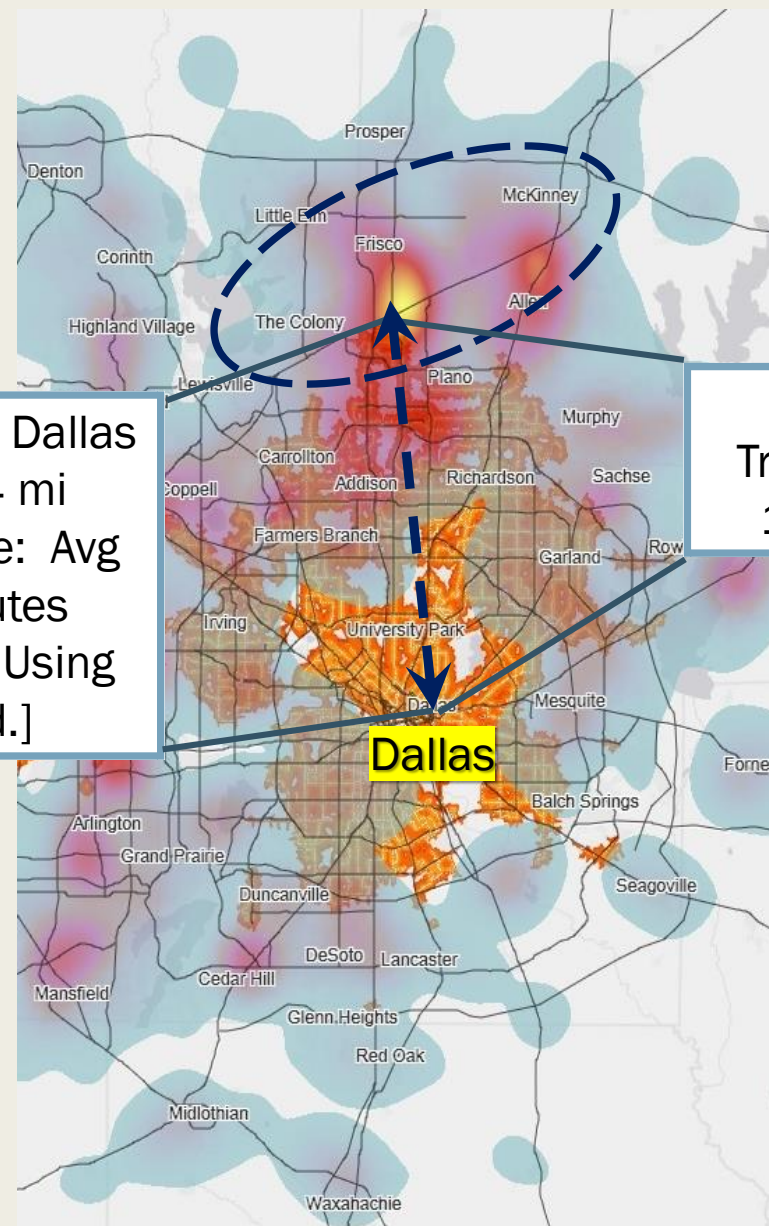




# Job Accessibility with Transit



Distance to Dallas  
CBD: 24 mi  
Travel Time: Avg  
45 Minutes  
[Peak HR, Using  
Toll Rd.]



Transit  
Travel Time: Avg .  
1 h 50 Minutes



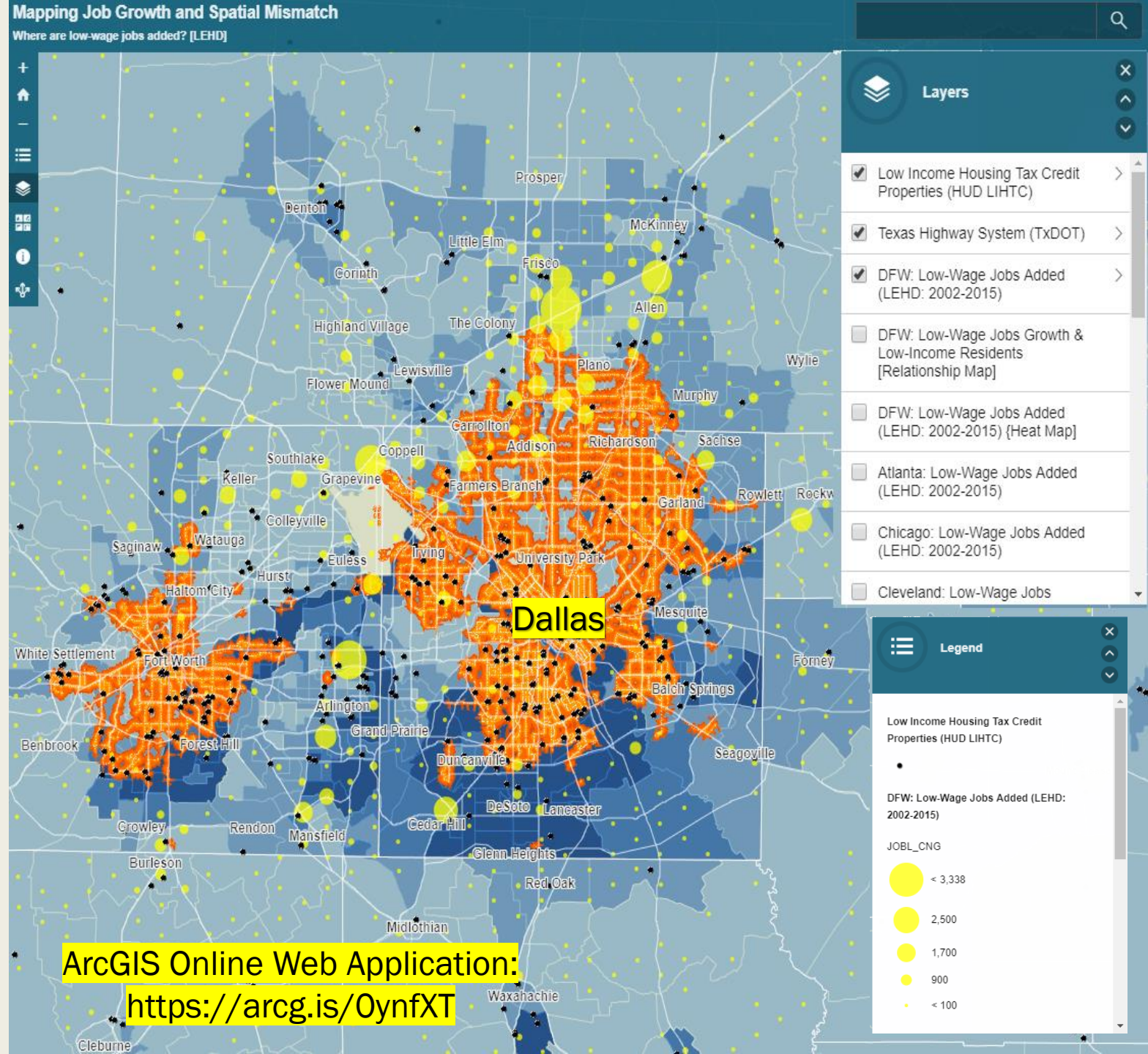
# Data Integration

- Overlapping and Integrating all factors

<https://arcg.is/0ynfXT>

- Investigating other indices:

- Low Poverty Index
- Labor Market Engagement Index
- Employment Access Index
- School Proficiency Index



# Conclusions

## Transportation & logistics

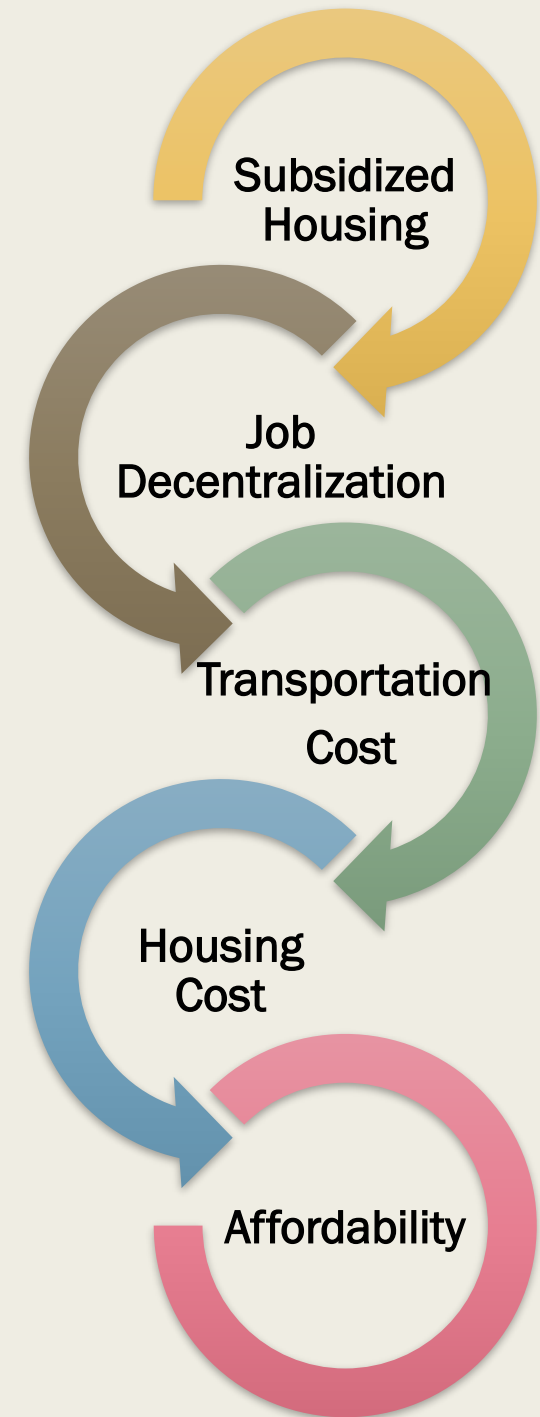
- *EHD Home & Work Area Profile Analysis*

## Job Sprawl and Spatial Mismatch

- *EHD Home & Work Area Profile Analysis*
- *Housing Affordability*
- *Accessibility*

## Mapping Job Growth

- *Historical Trends*







# Thank You

Reza Sardari, Ph.D., GISP  
Traffic & Revenue Analyst | Cintra | LBJ Express  
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[rsardari@lbjexpress.com](mailto:rsardari@lbjexpress.com)

LED Annual Workshop  
9.5.2019

United States™  
**Census**  
Bureau

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