

Appendix A: Data & Methodology

We used three distinct datasets as a basis for this report. First, data on the location and characteristics of existing jobs was obtained from the Origin-Destination Employment Statistics provided in the 2013 Longitudinal Employer-Household Dynamics (LEHD) data, published by the U.S. Census Bureau. Originally provided at the Census Block level, the data was aggregated at the group block level to facilitate the analysis.

Second, population-weighted centroids for each block group were generated using data from the 2009-2013 American Community Survey (ACS). Centroids farther than $\frac{3}{4}$ mile from the nearest bus stop were defined as transit-inaccessible,¹ and removed from the dataset. We also used 2009-2013 ACS block group estimates of the working age population 16 years of age and older to compute the labor force accessibility rates.

The third dataset we used was a set of General Transit Feed Specification (GTFS) files for all transit agencies that provide fixed-route transit lines within the eight counties included in this study: Brunswick Transit Alternative (Medina), GCRTA (Cuyahoga), Laketrans (Lake), Lorain County Transit (Lorain), METRO (Summit), Medina County Public Transit (Medina), and Stark Area Regional Transit Authority (Stark); Geauga County has no fixed-route transit lines. We were able to obtain data in GTFS format from Laketrans, METRO, GCRTA, and SARTA. For BTA, LCT and MCPT, we created GTFS files either from existing shapefiles of bus stops, or directly from bus schedules and route maps. Additionally, for agencies with ‘flag stop’ lines—i.e., lines with no fixed stops that allow passengers to stop buses at any point along the route—GTFS files were created by manually placing ‘artificial’ stops every two blocks or within a maximum distance of 0.5 mile of each other.

Once completed, the GTFS files were converted into a network dataset in ArcGIS through the *Add GTFS Data to a Network Dataset* tool developed by Melinda Morang, a product engineer at ESRI. Commutes were then modeled using this network dataset to create Origin Destination (OD) matrices, which recorded a list of all block groups reachable via transit from each block group centroid, i.e., within a maximum door-to-door commute time of 90 minutes. Door-to-door commute time includes time to walk to and from the bus stop, boarding and transfer time (if applicable), and actual time riding the bus or train. OD matrices were created to model peak-hour commutes, recording commutes between 6:00 and 9:00 AM on a weekday. Only peak-time commutes were analyzed in the main body of this report (see full tables in Appendix B).

This model was first implemented for a single county (Lorain), using varying time intervals as a way of testing the methodology. Lorain has a fairly typical transit schedule, with four lines departing at regular intervals starting at or around 6:00 AM. This initial test revealed that commute lengths tend to follow a cyclical pattern, with the longest commutes originating at around 40 minutes past the hour and the shortest around 10 to 15 minutes past the hour. Based on this finding, we decided against using randomized departure times (as was done in Tomer et al., 2011), opting instead for fixed 15-minute intervals that would more accurately capture the variation within each hour.

Commute lengths were then averaged across the three-hour period for each set of matrices, and then aggregated across geographies according to various demographic (poverty rate, minority status) and employment categorizations (industry, educational level of worker, wage, minority status of worker), to produce the tables and graphs used in our analysis.

ⁱ See Tomer et al. 2011 for a discussion of this definition, as well as commute-time thresholds used in this report.

Appendix B: Tables A1 - A3

Table A1: Number and share of regional jobs reached via transit in 90 minutes, by skill and neighborhood type

	Total jobs in region	All region jobs		Less than high school		High school/equivalent		Associates/some college		Bachelor's or more	
		Average number	Average share (%)	Average number	Average share (%)	Average number	Average share (%)	Average number	Average share (%)	Average number	Average share (%)
County: Cuyahoga											
Poverty areas (49%)	1,478,967	556,489	38	36,841	38	117,784	34	144,940	38	140,551	42
Black (44%)	1,478,967	540,523	37	35,836	37	114,150	33	141,190	37	137,464	42
Hispanic (8%)	1,478,967	552,593	37	36,466	37	116,909	34	143,240	38	138,468	42
All block groups (100%)	1,478,967	504,408	34	33,369	34	106,272	31	131,569	35	128,438	39
County: Lake											
Poverty areas (2%)	1,478,967	28,333	2	1,807	2	6,610	2	6,934	2	5,520	2
Black (4%)	1,478,967	420,009	28	27,165	28	85,626	25	109,793	29	111,425	34
Hispanic (2%)	1,478,967	27,850	2	1,773	2	6,490	2	6,811	2	5,445	2
All block groups (100%)	1,478,967	302,099	20	19,505	20	62,089	18	79,333	21	80,399	24
County: Lorain											
Poverty areas (56%)	1,478,967	32,311	2	2,277	2	7,993	2	8,834	2	6,558	2
Black (11%)	1,478,967	31,928	2	2,252	2	7,903	2	8,733	2	6,486	2
Hispanic (32%)	1,478,967	32,857	2	2,320	2	8,112	2	8,969	2	6,660	2
All block groups (100%)	1,478,967	32,158	2	2,253	2	7,911	2	8,749	2	6,558	2
County: Medina											
Black (< 1%)	1,478,967	15,525	1	867	1	3,959	1	4,086	1	3,030	1
All block groups (100%)	1,478,967	99,488	7	6,038	6	20,837	6	25,348	7	25,757	8
County: Portage											
Poverty areas (89%)	1,478,967	145,236	10	9,287	9	33,142	10	37,708	10	33,566	10
Black (< 1%)	1,478,967	25,652	2	1,453	1	5,692	2	6,373	2	5,892	2
All block groups (100%)	1,478,967	139,335	9	8,876	9	31,671	9	36,204	9	32,505	10
County: Stark											
Poverty areas (37%)	1,478,967	48,532	3	3,221	3	12,591	4	13,171	3	9,340	3
Black (9%)	1,478,967	51,080	3	3,393	3	13,255	4	13,987	4	9,949	3
All block groups (100%)	1,478,967	47,457	3	3,085	3	11,950	3	12,559	3	9,059	3
County: Summit											
Poverty areas (41%)	1,478,967	244,549	17	15,571	16	54,634	16	62,513	16	57,435	17
Black (23%)	1,478,967	250,295	17	15,930	16	55,854	16	63,977	17	58,974	18
Hispanic (< 1%)	1,478,967	201,674	14	12,923	13	46,250	14	51,354	13	44,755	14
All block groups (100%)	1,478,967	219,186	15	13,942	14	48,849	14	56,222	15	51,778	16
Region	1,478,967	451,879	31	29,808	30	95,537	28	117,765	31	114,594	35

Source: LEHD Origin-Destination Employment Statistics, US Census Bureau 2013

A Look Behind the Numbers

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Table A2: Number and share of county jobs reached via transit in 90 minutes, by skill and neighborhood type

	Total jobs in county	All county jobs		Less than high school		High school/equivalent		Associates/some college		Bachelor's or more	
		Average number	Average share (%)	Average number	Average share (%)	Average number	Average share (%)	Average number	Average share (%)	Average number	Average share (%)
County: Cuyahoga											
Poverty areas	730,150	531,478	73	35,349	74	112,154	71	138,608	73	134,929	75
Black	730,150	514,114	70	34,254	72	108,220	69	134,541	71	131,569	73
Hispanic	730,150	532,766	73	35,275	74	112,394	72	138,196	73	134,024	74
All block groups	730,150	485,473	66	32,233	67	102,008	65	126,764	67	124,159	69
County: Lake											
Poverty areas	92,876	28,333	31	1,807	30	6,610	30	6,934	29	5,520	29
Black	92,876	26,668	29	1,681	28	6,326	28	6,532	27	5,350	28
Hispanic	92,876	27,850	30	1,773	29	6,490	29	6,811	29	5,445	28
All block groups	92,876	33,361	36	2,088	34	7,797	35	8,222	35	6,692	35
County: Lorain											
Poverty areas	94,678	32,311	34	2,277	33	7,993	34	8,834	35	6,558	36
Black	94,678	31,928	34	2,252	33	7,903	33	8,733	35	6,486	36
Hispanic	94,678	32,857	35	2,320	34	8,112	34	8,969	36	6,660	37
All block groups	94,678	31,761	34	2,236	33	7,865	33	8,685	34	6,447	35
County: Medina											
Black	57,177	15,525	27	867	25	3,959	27	4,086	28	3,030	28
All block groups	57,177	10,549	18	604	17	2,559	18	2,633	18	1,955	18
County: Portage											
Poverty areas	52,839	19,697	37	1,104	33	4,307	33	4,997	38	4,798	45
Black	52,839	20,358	39	1,155	34	4,469	34	5,147	39	4,910	46
All block groups	52,839	18,901	36	1,057	31	4,129	32	4,795	37	4,625	43
County: Stark											
Poverty areas	157,900	48,532	31	3,221	29	12,591	30	13,171	33	9,340	34
Black	157,900	51,080	32	3,393	31	13,255	32	13,987	35	9,949	36
All block groups	157,900	47,498	30	3,089	28	11,973	29	12,573	31	9,039	33
County: Summit											
Poverty areas	262,585	196,510	75	12,636	74	45,031	73	50,058	75	43,484	76
Black	262,585	198,284	76	12,743	75	45,429	74	50,490	75	43,885	77
Hispanic	262,585	201,674	77	12,923	76	46,250	75	51,354	77	44,755	78
All block groups	262,585	176,140	67	11,276	66	40,199	66	45,032	67	39,433	69

Source: LEHD Origin-Destination Employment Statistics, US Census Bureau 2013

Table A3: Number and share of county jobs reached via transit in 90 minutes, by industry

Top 5 industries in each county	All county jobs		Most accessible industries in each county	All county jobs	
	Average number	Average share (%)		Average number	Average share (%)
County: Cuyahoga					
Finance/Insurance	24,766	63	Health Care	110,475	75
Real Estate	7,991	58	Arts/Entertainment	10,669	73
Information	11,096	67	Educational Svc	38,684	72
Professional Svc	35,306	71	Management	16,196	71
Arts/Entertainment	10,669	73	Professional Svc	35,306	71
All industries	485,473	66	All industries	485,473	66
County: Lake					
Manufacturing	6,288	31	Retail Trade	5,844	50
Construction	833	22	Accommodation/Food Svc	4,308	49
Retail Trade	5,844	50	Finance/Insurance	664	48
Accommodation/Food Svc	4,308	49	Real Estate	358	45
Educational Svc	3,446	41	Transport/Warehousing	512	41
All industries	33,361	36	All industries	33,361	36
County: Lorain					
Manufacturing	5,829	34	Management	936	63
Educational Svc	3,690	35	Information	512	60
Retail Trade	4,174	35	Finance/Insurance	989	45
Construction	662	19	Health Care	5,815	40
Accommodation/Food Svc	2,561	32	Real Estate	304	39
All industries	31,761	34	All industries	31,761	34
County: Medina					
Transport/Warehousing	309	10	Information	109	26
Construction	406	12	Accommodation/Food Svc	1,211	24
Management	42	2	Retail Trade	1,903	23
Retail Trade	1,903	23	Finance/Insurance	231	22
Wholesale Trade	564	17	Health Care	1,575	22
All industries	10,549	18	All industries	10,549	18
County: Portage					
Educational Svc	5,443	61	Health Care	3,800	63
Manufacturing	1,600	16	Educational Svc	5,443	61
Wholesale Trade	236	7	Management	603	60
Accommodation/Food Svc	1,929	39	Information	210	55
Retail Trade	1,663	28	Finance/Insurance	310	48
All industries	18,901	36	All industries	18,901	36
County: Stark					
Manufacturing	6,501	25	Management	654	40
Construction	1,764	27	Finance/Insurance	2,115	40
Retail Trade	5,420	28	Health Care	11,918	39
Educational Svc	3,663	25	Information	802	36
Accommodation/Food Svc	4,312	31	Real Estate	475	31
All industries	47,498	30	All industries	47,498	30
County: Summit					
Management	11,322	71	Health Care	34,087	78
Transport/Warehousing	4,868	53	Information	3,193	75
Wholesale Trade	7,804	51	Management	11,322	71
Retail Trade	20,831	67	Educational Svc	13,382	71
Administrative/Waste Svc	11,299	65	Real Estate	1,731	70
All industries	176,140	67	All industries	176,140	67

Source: LEHD Origin-Destination Employment Statistics, US Census Bureau 2013