

Performance Measure Summary

There are several inventory and performance measures listed in the pages of this Urban Area Report for the years from 1982 to 2005. There is no single performance measure that experts agree “says it all.” The best comparison of congestion levels and trends is done between regions of similar size, over several years, and with a few measures of congestion aspects. Examining a few measures over many years reduces the chance that data variations or the estimating procedures may have caused a “spike” in any single year. A few key points should be recognized by users of the Urban Mobility Report data.

Use the Trends – The multi-year performance measures are better indicators, in most cases, than any single year. (*5 years is 5 times better than 1 year*).

Use several measures – Each performance measure illustrates a different element of congestion. (*The view is more interesting from the top of a few measures*).

Compare to similar regions – Congestion analyses that compare areas with similar characteristics (for example population, growth rate, road and public transportation system design) are usually more insightful than comparisons of different regions. (*Los Angeles is not Peoria*).

Compare ranking changes and performance measure values – In some performance measures a small change in the value may cause a significant change in rank from one year to the next. This is the case when there are several regions with nearly the same value. (*15 hours is only 1 hour more than 14 hours*).

Consider the scope of improvement options – Any improvement project in a corridor within most of the regions will only have a modest effect on the regional congestion level. (*To have an effect on areawide congestion, there must be significant change in the system or service*).

Comparison of Several Key Mobility Performance Measures Medium Group – 500,000 to 1 million population urban areas

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	1982 to 2005	
				Delay per Traveler	Total Delay
Jacksonville, FL	H+	H+	H+	F	F+
Nashville-Davidson, TN	H+	0	H+	0	F+
Salt Lake City, UT	0	H	H	0	F+
Raleigh-Durham, NC	H+	H	H+	F+	F+
Richmond, VA	L-	L-	0	S-	S
Louisville, KY-IN	H+	H+	H+	F+	F+
Hartford, CT	L-	L-	L	S	S-
Bridgeport-Stamford, CT-NY	H	H+	H+	F	F+
Charlotte, NC-SC	H+	H+	H+	F+	F+
Austin, TX	H+	H+	H+	F+	F+
Oklahoma City, OK	L-	L-	L	S	S-
Tulsa, OK	L-	L-	L	S-	S-
Tucson, AZ	H+	H+	H+	0	F+
Dayton, OH	L-	L-	L-	S-	S-
Honolulu, HI	L	H+	L	S-	S-
Birmingham, AL	H+	0	H	F+	F+
El Paso, TX-NM	L	0	L	F	S-
Rochester, NY	L-	L-	L-	S-	S-
Springfield, MA-CT	L-	L-	L-	S-	S-
Omaha, NE-IA	L	0	L	0	S-
Sarasota-Bradenton, FL	L	H	L	S-	S-
Allentown-Bethlehem, PA-NJ	L-	L	L-	S-	S-
Akron, OH	L-	L-	L-	S-	S-
Fresno, CA	L-	L	L-	S-	S-
Grand Rapids, MI	L	L-	L-	0	S-
Oxnard-Ventura, CA	H+	H+	0	F+	F+
Albuquerque, NM	H+	0	0	F	S
New Haven, CT	L-	L-	L-	S-	S-
Albany-Schenectady, NY	L-	L-	L-	S-	S-
Toledo, OH-MI	L-	L-	L-	S-	S-

0 – Average congestion levels or average congestion growth

H Higher congestion; H+ Much higher congestion; F Faster congestion growth; F+ Much faster growth

L Lower congestion; L- Much lower congestion; S Slower congestion growth; S- Much slower growth

Performance Measures and Definition of Terms

Travel Time Index – A measure of congestion that focuses on each trip and each mile of travel. The ratio of travel time in the peak period to travel time in free-flow. A value of 1.30 indicates a 20-minute free-flow trip takes 26 minutes in the peak.

Peak Travelers – Number of travelers (using any travel mode) who begin a trip during the morning or evening peak travel periods (6 to 9 a.m. and 4 to 7 p.m.).

Annual Delay per Traveler – A yearly sum of all the per-trip delays. This measure illustrates the effect of the per-mile congestion as well as the length of each trip. The extra time required to travel in the peak period is divided by the number of travelers who begin a trip during the peak period (6 to 9 a.m. and 4 to 7 p.m.).

Total Delay – The overall size of the congestion problem. Measured by the total travel time above that needed to complete a trip at free-flow speeds. The ranking of total delay usually follows the population ranking (larger regions usually have more delay).

Free-Flow Speeds (60 mph on freeways and 35 mph on arterials) – These values are used as the national comparison thresholds. Other speed values may be appropriate for urban areas or sub-regions.

Excess Fuel Consumed – Increased fuel consumption due to travel in congested conditions rather than free-flow conditions.

Public Transportation – Regular route service from all public transportation providers in an urban area.

Operations Treatments – Freeway incident management, freeway ramp metering, arterial street signal coordination and arterial street access management.

Congestion Cost – Value of travel delay for 2005 (estimated at \$14.60 per hour of person travel and \$77.10 per hour of truck time) and excess fuel consumption (estimated using state average cost per gallon).

Annual Increase Needed to Maintain Constant Congestion Level – Number of lane-miles that must be added to the road system each year – or – the number of new transit riders or carpoolers that must be added to keep congestion levels the same as the previous year.

Urban Area – The developed area (population density more than 1,000 persons per square mile) within a metropolitan region. The urban area boundaries change frequently (every year for most growing areas). The annual change in miles traveled, therefore, includes both new travel due to growth and travel that previously occurred in areas designated as rural.

Number of Rush Hours – Time when system might have congestion

Key Mobility Performance Measure Labels

Note: Designation of an urban area congestion problem as “Much higher”, “Much faster growth”, etc. is determined using a general indicator of the accuracy of the congestion estimates. For regions with the same indicator label, there may be no difference in congestion levels. Different values are used for the indicators in regions over 1 million population and below 1 million population.

Measures	Differences Within These Values May Not Indicate a Difference in Congestion Level	
	Above 1M Population	Below 1M Population
2005 Values Delay per Traveler - Travel Time Index - Total Delay -	5 Hours 5 Index Points 5 Hours x Average Population	3 Hours 3 Index Points 3 Hours x Average Population
1982 to 2005 Trends Delay per Traveler - Total Delay -	5 Hours 5 Hours x Average Population	3 Hours 3 Hours x Average Population

The Mobility Data for Birmingham, AL

Inventory Measures	2005	2004	2003	2002	2001	2000
Urban Area Information						
Population (1000s)	690	685	680	675	670	670
Rank	55	55	55	55	55	55
Urban Area (square miles)	615	615	610	610	605	605
Popn Density (persons/sq mile)	1,122	1,114	1,115	1,107	1,107	1,107
Peak Travelers (1000s)	375	370	365	358	351	346
Freeway						
Daily Vehicle-Miles of Travel (1000s)	9,550	9,270	9,020	8,760	8,685	8,685
Lane Miles	680	675	675	675	675	675
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	7,600	7,435	7,535	7,590	7,415	7,295
Lane Miles	1,525	1,505	1,505	1,505	1,475	1,455
Public Transportation						
Annual Psgr-Miles of Travel (millions)	20	21	18	15	13	14
Annual Unlinked Psgr Trips (millions)	4	4	4	3	3	3
Cost Components						
Value of Time (\$/hour)	14.60	14.10	13.75	13.45	13.25	12.85
Commercial Cost (\$/hour)	77.10	74.60	72.65	71.05	69.95	68.00
Fuel Cost (\$/gallon)	2.24	1.87	1.46	1.32	1.43	1.49
System Performance						
Congested Travel (% of peak VMT)	44	45	42	39	36	36
Congested System (% of lane-miles)	37	37	35	33	32	32
Congested Time (number of "Rush Hours")	6.2	6.0	5.8	5.6	5.4	5.4
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	32	26	29	38	45	54
Transit Riders or Carpoolers (millions)	8	7	8	10	12	14
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	8,210	8,126	7,583	7,022	6,634	6,486
Rank	48	47	47	47	47	48
Fuel per Peak Traveler (gallons)	22	22	21	20	19	19
Rank	38	37	37	39	41	36
Annual Delay						
Total Delay (1000s of person-hours)	12,416	12,224	11,615	11,058	10,567	10,148
Rank	47	47	47	47	47	48
Delay per Peak Traveler (person-hrs)	33	33	32	31	30	29
Rank	36	37	36	40	39	40
Delay due to Incidents (percent)	56	56	56	56	56	56
Travel Time Index						
Rank	1.15	1.15	1.14	1.13	1.13	1.13
Rank	49	49	48	54	53	52
Congestion Cost						
Total Cost (\$ millions)	234	221	201	186	175	165
Rank	47	47	47	47	48	48
Cost per Peak Traveler (\$)	625	597	552	518	499	476
Rank	37	37	36	39	39	38

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Birmingham, AL, Continued

Inventory Measures	1999	1998	1997	1996	1995	1994
Urban Area Information						
Population (1000s)	665	660	660	655	650	645
Rank	54	53	52	52	50	49
Urban Area (square miles)	590	585	580	575	570	565
Popn Density (persons/sq mile)	1,127	1,128	1,138	1,139	1,140	1,142
Peak Travelers (1000s)	340	333	329	322	316	310
Freeway						
Daily Vehicle-Miles of Travel (1000s)	8,595	8,325	8,025	7,710	7,310	7,095
Lane Miles	675	675	675	675	670	670
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	7,140	7,165	6,995	6,820	6,805	6,710
Lane Miles	1,440	1,440	1,435	1,425	1,420	1,420
Public Transportation						
Annual Psgr-Miles of Travel (millions)	15	14	14	14	30	29
Annual Unlinked Psgr Trips (millions)	3	3	3	3	6	5
Cost Components						
Value of Time (\$/hour)	12.40	12.15	12.00	11.70	11.40	11.05
Commercial Cost (\$/hour)	65.80	64.35	63.40	61.95	60.20	58.50
Fuel Cost (\$/gallon)	1.08	1.06	1.15	1.21	1.14	1.02
System Performance						
Congested Travel (% of peak VMT)	36	35	30	28	25	24
Congested System (% of lane-miles)	32	32	32	28	27	27
Congested Time (number of "Rush Hours")	5.4	5.2	4.8	4.4	4.0	3.8
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	56	67	71	75	80	98
Transit Riders or Carpoolers (millions)	15	17	18	18	19	22
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	6,498	6,229	5,087	4,595	4,085	3,783
Rank	47	46	51	50	50	50
Fuel per Peak Traveler (gallons)	19	19	15	14	13	12
Rank	39	39	44	47	49	49
Annual Delay						
Total Delay (1000s of person-hours)	10,097	9,778	8,105	7,327	6,668	6,194
Rank	49	49	49	51	51	50
Delay per Peak Traveler (person-hrs)	30	29	25	23	21	20
Rank	41	39	44	47	49	49
Delay due to Incidents (percent)	56	56	56	56	56	56
Travel Time Index						
Rank	53	50	56	58	59	56
Congestion Cost						
Total Cost (\$ millions)	157	148	122	108	95	87
Rank	49	49	49	50	50	48
Cost per Peak Traveler (\$)	461	446	370	336	302	281
Rank	40	37	43	45	47	47

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Birmingham, AL, Continued

Inventory Measures	1993	1992	1991	1990	1989	1988
Urban Area Information						
Population (1000s)	645	640	635	630	630	625
Rank	49	49	49	49	48	47
Urban Area (square miles)	560	555	550	545	540	535
Popn Density (persons/sq mile)	1,152	1,153	1,155	1,156	1,167	1,168
Peak Travelers (1000s)	306	300	293	287	285	281
Freeway						
Daily Vehicle-Miles of Travel (1000s)	6,750	6,360	6,100	5,900	5,400	5,170
Lane Miles	670	650	620	600	585	565
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	6,505	6,375	6,095	5,800	5,580	5,505
Lane Miles	1,410	1,410	1,410	1,380	1,375	1,375
Public Transportation						
Annual Psgr-Miles of Travel (millions)	32	35	33	25	21	29
Annual Unlinked Psgr Trips (millions)	6	7	6	6	5	6
Cost Components						
Value of Time (\$/hour)	10.75	10.50	10.25	10.00	9.25	8.80
Commercial Cost (\$/hour)	57.05	55.40	53.80	51.60	48.95	46.70
Fuel Cost (\$/gallon)	1.08	1.20	1.07	1.06	1.10	1.02
System Performance						
Congested Travel (% of peak VMT)	21	19	19	17	15	16
Congested System (% of lane-miles)	25	25	25	22	21	22
Congested Time (number of "Rush Hours")	3.4	3.2	3.0	3.0	2.9	2.9
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	92	88	83	83	98	107
Transit Riders or Carpoolers (millions)	20	19	17	17	19	21
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	3,071	2,565	2,342	2,120	1,910	1,938
Rank	52	55	54	54	55	53
Fuel per Peak Traveler (gallons)	10	9	8	7	7	7
Rank	55	58	53	55	57	54
Annual Delay						
Total Delay (1000s of person-hours)	5,077	4,224	3,870	3,594	3,386	3,336
Rank	52	56	54	53	53	53
Delay per Peak Traveler (person-hrs)	17	14	13	13	12	12
Rank	55	56	54	55	53	51
Delay due to Incidents (percent)	55	55	55	54	54	55
Travel Time Index						
Rank	61	66	61	65	63	60
Congestion Cost						
Total Cost (\$ millions)	68	56	49	44	39	36
Rank	52	54	53	53	53	52
Cost per Peak Traveler (\$)	223	186	168	154	136	130
Rank	52	55	54	55	53	49

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Birmingham, AL, Continued

Inventory Measures	1987	1986	1985	1984	1983	1982
Urban Area Information						
Population (1000s)	620	615	615	610	605	600
Rank	46	46	46	46	47	46
Urban Area (square miles)	530	525	525	520	515	510
Popn Density (persons/sq mile)	1,170	1,171	1,171	1,173	1,175	1,176
Peak Travelers (1000s)	276	272	270	265	261	256
Freeway						
Daily Vehicle-Miles of Travel (1000s)	4,950	4,675	4,350	3,750	3,350	3,000
Lane Miles	550	530	510	480	440	400
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	5,400	5,295	5,170	4,845	4,805	4,720
Lane Miles	1,370	1,365	1,360	1,355	1,350	1,350
Public Transportation						
Annual Psgr-Miles of Travel (millions)	25	29	31	22	22	22
Annual Unlinked Psgr Trips (millions)	6	7	7	5	5	5
Cost Components						
Value of Time (\$/hour)	8.50	8.20	8.00	7.75	7.45	7.20
Commercial Cost (\$/hour)	44.85	43.30	42.50	41.05	39.35	38.10
Fuel Cost (\$/gallon)	1.02	0.99	1.30	1.31	1.34	1.41
System Performance						
Congested Travel (% of peak VMT)	17	17	16	14	13	14
Congested System (% of lane-miles)	22	22	22	21	20	20
Congested Time (number of "Rush Hours")	2.8	2.8	2.7	2.6	2.6	2.5
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	116	--	--	--	--	--
Transit Riders or Carpoolers (millions)	22	--	--	--	--	--
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	2,055	1,962	1,687	1,280	1,212	1,157
Rank	46	42	46	52	48	45
Fuel per Peak Traveler (gallons)	7	7	6	5	5	5
Rank	47	44	48	52	50	47
Annual Delay						
Total Delay (1000s of person-hours)	3,538	3,391	2,913	2,175	2,094	2,002
Rank	45	41	47	51	48	45
Delay per Peak Traveler (person-hrs)	13	12	11	8	8	8
Rank	44	44	48	51	49	47
Delay due to Incidents (percent)	56	56	55	54	53	53
Travel Time Index						
Rank	52	51	50	53	50	47
Congestion Cost						
Total Cost (\$ millions)	38	35	30	21	20	18
Rank	45	41	46	51	48	44
Cost per Peak Traveler (\$)	136	128	110	81	76	72
Rank	43	45	46	52	49	45

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

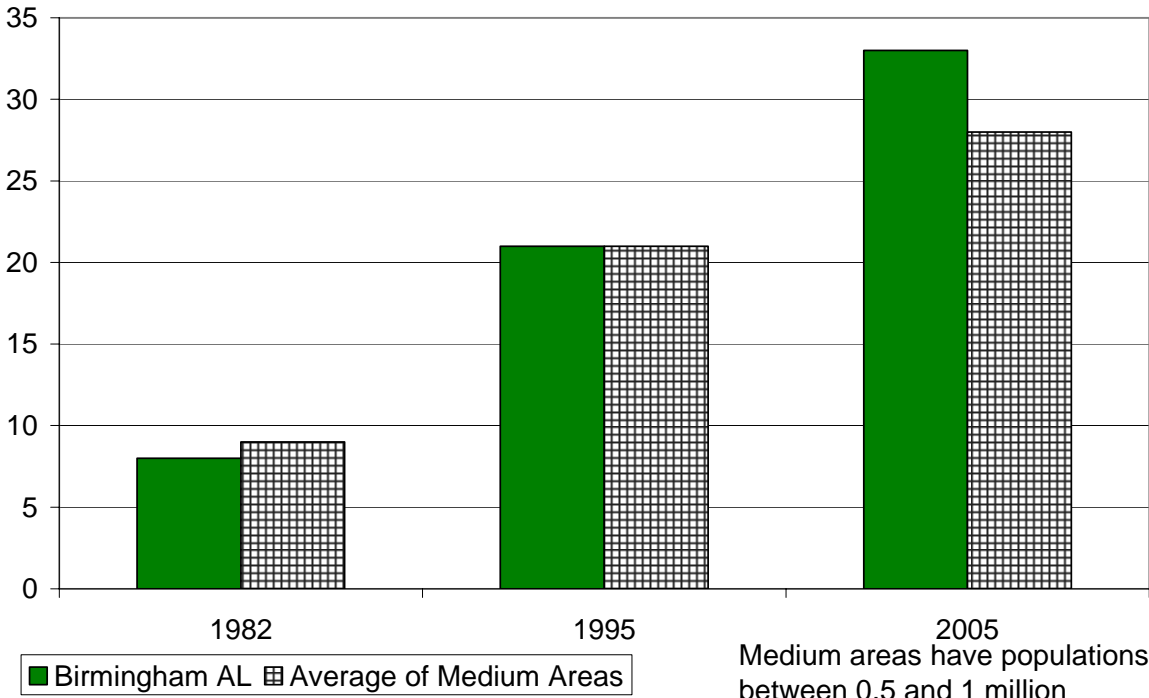
Note: Zeroes in the table reflect values less than 0.5.

Benefits From Public Transportation Service and Operations Strategies for Birmingham, AL

Operations Strategies	2005	2004	2003	2002	2001	2000
Freeway Ramp Metering						
Percent of Roadway Miles	--	--	--	--	--	--
Annual Delay Reduction (1000 hours)	--	--	--	--	--	--
Freeway Incident Management						
Cameras						
Percent of Roadway Miles	18	18	18	18	18	18
Service Patrols						
Percent of Roadway Miles	100	100	91	91	91	91
Annual Delay Reduction (1000 hours)	368	381	306	244	233	241
Arterial Signal Coordination						
Percent of Roadway Miles	24	21	21	17	17	17
Annual Delay Reduction (1000 hours)	38	39	28	37	40	23
Arterial Access Management						
Percent of Roadway Miles	7	7	7	7	7	7
Annual Delay Reduction (1000 hours)	78	70	111	126	116	136
HOV Lanes						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
Total Effect of Operations Treatments						
Annual Delay Reduction (1000 hours)	484	490	445	406	389	400
Annual Delay Saved per Peak Traveler (hours)	1	1	1	1	1	1
Annual Congestion Cost Savings (\$million)	9.8	9.5	8.2	7.2	6.8	6.9
Travel Time Index with Strategies	1.150	1.152	1.143	1.133	1.128	1.126
Travel Time Index (Base)	1.156	1.159	1.148	1.138	1.132	1.131
Public Transportation Service						
Existing Service						
Annual Passenger-miles of Travel (million)	20	21	18	15	13	14
Unlinked Passenger Trips (million)	4	4	4	3	3	3
Travel Time Index (combined road and transit)	1.149	1.151	1.141	1.132	1.127	1.125
Condition if Public Transportation Service were Discontinued						
Travel Time Index	1.158	1.161	1.150	1.139	1.133	1.131
Annual Delay Increase (1000 hours)	242	241	173	125	69	90
Annual Delay Increase per Peak Traveler (hours)	1	1	0	0	0	0
Annual Congestion Cost Increase (\$million)	4.7	4.5	3.1	2.2	1.2	1.5

Growth in Delay per Peak Traveler

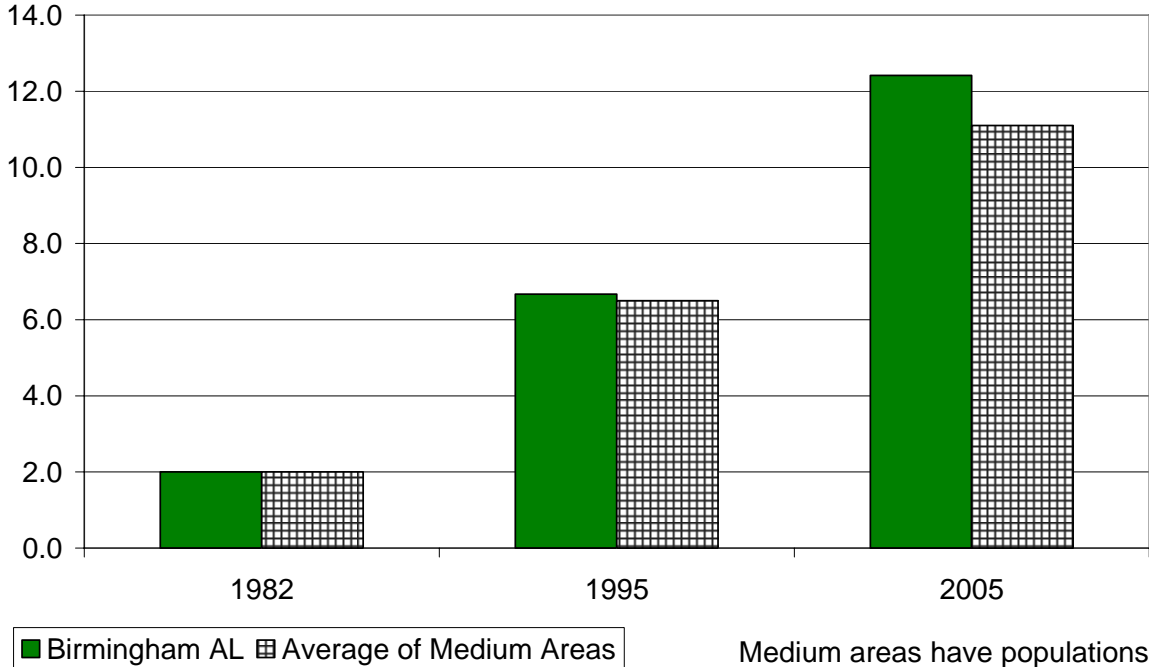
Hours of Delay



Medium areas have populations between 0.5 and 1 million

Growth in Total Delay

Annual Hours of Delay (million)



Medium areas have populations between 0.5 and 1 million