

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 Large Group – 1 million to 3 million population urban areas

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	1982 to 2005	
				Delay per Traveler	Total Delay
San Diego, CA	H+	H+	H+	F+	F+
Minneapolis-St. Paul, MN	H	0	H+	F+	F+
Baltimore, MD	H	H	H+	F	F+
Tampa-St. Petersburg, FL	H+	H	H+	S	F+
St. Louis, MO-IL	L	L-	0	S	0
Denver-Aurora, CO	H+	H+	H+	F+	F+
Pittsburgh, PA	L-	L-	L-	S-	S-
Riverside-San Bernardino, CA	H+	H+	H+	F+	F+
Cleveland, OH	L-	L-	L-	S-	S-
Sacramento, CA	H	H+	H	0	F+
Portland, OR-WA	0	H	0	0	0
San Jose, CA	H+	H+	H+	F	F+
Cincinnati, OH-KY-IN	L-	L	L	S	S-
Virginia Beach, VA	L	L	L	S-	S-
Kansas City, MO-KS	L-	L-	L-	S-	S-
Milwaukee, WI	L-	L-	L-	S-	S-
Las Vegas, NV	0	H	L	F	0
Orlando, FL	H+	H	H	F+	F+
San Antonio, TX	0	0	L	F	S
Providence, RI-MA	L-	L-	L-	0	S-
Columbus, OH	L	L	L	F	S-
Buffalo, NY	L-	L-	L-	S-	S-
New Orleans, LA	L-	L-	L-	S-	S-
Indianapolis, IN	H	0	L	0	S-
Memphis, TN-MS-AR	L	L-	L-	0	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 St. Louis, MO-IL

Inventory Measures	2005	2004	2003	2002	2001	2000
Urban Area Information						
Population (1000s)	2,105	2,090	2,075	2,065	2,055	2,040
Rank	19	19	18	18	18	18
Urban Area (square miles)	1,175	1,155	1,145	1,140	1,135	1,130
Popn Density (persons/sq mile)	1,791	1,810	1,812	1,811	1,811	1,805
Peak Travelers (1000s)	1,162	1,147	1,133	1,111	1,087	1,063
Freeway						
Daily Vehicle-Miles of Travel (1000s)	27,200	27,665	27,200	26,900	26,400	25,900
Lane Miles	2,140	2,100	2,020	1,930	1,880	1,840
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	17,500	17,390	17,565	17,560	17,540	17,425
Lane Miles	3,800	3,710	3,660	3,500	3,390	3,260
Public Transportation						
Annual Psgr-Miles of Travel (millions)	286	284	272	284	251	271
Annual Unlinked Psgr Trips (millions)	49	48	48	50	53	54
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)	2.20	1.78	1.43	1.30	1.33	1.48
System Performance						
Congested Travel (% of peak VMT)	42	46	51	53	54	55
Congested System (% of lane-miles)	37	39	40	44	44	44
Congested Time (number of "Rush Hours")	5.2	5.6	5.8	6.0	6.2	6.2
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	37	55	65	63	64	58
Transit Riders or Carpoolers (millions)	10	15	18	18	18	17
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	23,342	23,433	24,186	25,663	25,406	27,722
Rank	25	24	24	22	22	19
Fuel per Peak Traveler (gallons)	20	20	21	23	23	26
Rank	40	39	37	32	28	22
Annual Delay						
Total Delay (1000s of person-hours)	37,772	36,049	35,663	37,859	37,656	41,009
Rank	24	24	22	22	22	19
Delay per Peak Traveler (person-hrs)	33	31	31	34	35	39
Rank	36	39	38	33	25	20
Delay due to Incidents (percent)	53	53	53	53	54	54
Travel Time Index						
Rank	1.16	1.16	1.17	1.18	1.18	1.20
Rank	46	45	41	37	34	33
Congestion Cost						
Total Cost (\$ millions)	711	647	615	638	624	667
Rank	24	24	23	22	22	19
Cost per Peak Traveler (\$)	612	564	543	574	574	628
Rank	39	39	38	34	29	20

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 St. Louis, MO-IL, Continued

Inventory Measures	1999	1998	1997	1996	1995	1994
Urban Area Information						
Population (1000s)	2,005	2,000	2,000	1,995	1,995	1,990
Rank	18	18	18	18	18	18
Urban Area (square miles)	1,130	1,125	1,070	1,030	1,000	940
Popn Density (persons/sq mile)	1,774	1,778	1,869	1,937	1,995	2,117
Peak Travelers (1000s)	1,027	1,008	992	974	958	941
Freeway						
Daily Vehicle-Miles of Travel (1000s)	25,600	24,960	24,195	23,765	23,310	22,460
Lane Miles	1,800	1,760	1,690	1,670	1,665	1,635
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	17,380	17,315	17,775	17,635	17,645	15,100
Lane Miles	3,185	3,115	3,075	3,030	3,005	2,980
Public Transportation						
Annual Psgr-Miles of Travel (millions)	274	263	256	234	211	222
Annual Unlinked Psgr Trips (millions)	56	56	55	52	53	49
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)	1.02	1.01	1.06	1.22	1.04	0.95
System Performance						
Congested Travel (% of peak VMT)	56	54	53	50	50	44
Congested System (% of lane-miles)	44	44	44	42	42	37
Congested Time (number of "Rush Hours")	6.4	6.4	6.6	6.6	6.4	6.0
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	136	196	267	315	311	251
Transit Riders or Carpoolers (millions)	41	59	82	97	95	71
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	27,915	26,284	25,966	24,294	23,739	19,603
Rank	19	19	18	18	16	20
Fuel per Peak Traveler (gallons)	27	26	26	25	25	21
Rank	21	17	15	15	12	25
Annual Delay						
Total Delay (1000s of person-hours)	41,184	38,828	39,119	37,494	36,849	30,596
Rank	19	19	18	17	16	20
Delay per Peak Traveler (person-hrs)	40	39	39	39	38	33
Rank	20	16	15	14	12	21
Delay due to Incidents (percent)	54	54	54	54	54	54
Travel Time Index						
Rank	29	30	27	29	26	31
Congestion Cost						
Total Cost (\$ millions)	634	587	584	548	520	419
Rank	19	19	18	16	16	20
Cost per Peak Traveler (\$)	618	582	589	563	543	445
Rank	19	16	14	13	12	19

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 St. Louis, MO-IL, Continued

Inventory Measures	1993	1992	1991	1990	1989	1988
Urban Area Information						
Population (1000s)	1,980	1,970	1,965	1,960	1,955	1,950
Rank	18	18	17	17	16	14
Urban Area (square miles)	870	820	780	760	740	720
Popn Density (persons/sq mile)	2,276	2,402	2,519	2,579	2,642	2,708
Peak Travelers (1000s)	921	902	884	868	860	850
Freeway						
Daily Vehicle-Miles of Travel (1000s)	20,730	18,700	17,500	17,670	17,085	16,835
Lane Miles	1,620	1,545	1,500	1,500	1,480	1,470
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	14,000	13,250	12,415	12,000	11,750	11,480
Lane Miles	2,950	2,860	2,815	2,625	2,570	2,450
Public Transportation						
Annual Psgr-Miles of Travel (millions)	184	181	187	194	176	183
Annual Unlinked Psgr Trips (millions)	42	43	47	45	45	45
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)	0.98	0.96	1.01	0.98	1.11	1.02
System Performance						
Congested Travel (% of peak VMT)	38	32	30	29	28	27
Congested System (% of lane-miles)	35	30	30	28	28	25
Congested Time (number of "Rush Hours")	5.4	4.8	4.4	4.6	4.4	4.4
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	191	150	84	110	131	137
Transit Riders or Carpoolers (millions)	50	38	20	28	32	34
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	14,976	10,865	8,977	9,187	8,470	7,962
Rank	21	24	24	24	24	24
Fuel per Peak Traveler (gallons)	16	12	10	11	10	9
Rank	31	44	47	46	40	40
Annual Delay						
Total Delay (1000s of person-hours)	23,491	17,194	13,937	14,550	13,541	12,406
Rank	21	24	25	24	22	22
Delay per Peak Traveler (person-hrs)	26	19	16	17	16	15
Rank	30	43	48	46	42	44
Delay due to Incidents (percent)	53	53	53	53	53	53
Travel Time Index						
Rank	38	44	46	46	44	41
Congestion Cost						
Total Cost (\$ millions)	314	223	177	180	157	137
Rank	21	24	24	24	22	22
Cost per Peak Traveler (\$)	341	247	200	207	182	161
Rank	31	43	48	45	41	43

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 St. Louis, MO-IL, Continued

Inventory Measures	1987	1986	1985	1984	1983	1982
Urban Area Information						
Population (1000s)	1,940	1,930	1,910	1,890	1,875	1,870
Rank	14	14	13	13	13	12
Urban Area (square miles)	710	700	700	700	700	650
Popn Density (persons/sq mile)	2,732	2,757	2,729	2,700	2,679	2,877
Peak Travelers (1000s)	840	828	814	799	788	776
Freeway						
Daily Vehicle-Miles of Travel (1000s)	15,860	16,255	15,590	14,620	14,000	13,365
Lane Miles	1,400	1,300	1,270	1,220	1,200	1,190
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	11,170	10,900	10,400	10,000	9,850	9,700
Lane Miles	2,380	2,315	2,190	2,075	2,020	1,955
Public Transportation						
Annual Psgr-Miles of Travel (millions)	180	190	207	183	183	183
Annual Unlinked Psgr Trips (millions)	48	52	51	51	51	51
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)	1.03	1.00	1.31	1.33	1.36	1.42
System Performance						
Congested Travel (% of peak VMT)	25	28	28	29	26	23
Congested System (% of lane-miles)	23	23	23	25	23	21
Congested Time (number of "Rush Hours")	4.2	5.2	5.0	4.8	4.6	4.4
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	122	--	--	--	--	--
Transit Riders or Carpoolers (millions)	30	--	--	--	--	--
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	7,179	7,819	7,492	7,195	6,085	5,528
Rank	21	20	20	20	19	19
Fuel per Peak Traveler (gallons)	9	9	9	9	8	7
Rank	41	36	34	31	31	31
Annual Delay						
Total Delay (1000s of person-hours)	11,271	12,267	11,803	11,188	9,596	9,066
Rank	22	19	20	20	19	19
Delay per Peak Traveler (person-hrs)	13	15	15	14	12	12
Rank	42	38	35	33	33	33
Delay due to Incidents (percent)	53	53	53	53	53	53
Travel Time Index						
Rank	41	35	31	27	30	29
Congestion Cost						
Total Cost (\$ millions)	120	126	121	112	92	85
Rank	21	19	19	20	19	17
Cost per Peak Traveler (\$)	143	153	149	140	117	109
Rank	42	36	34	33	34	34

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

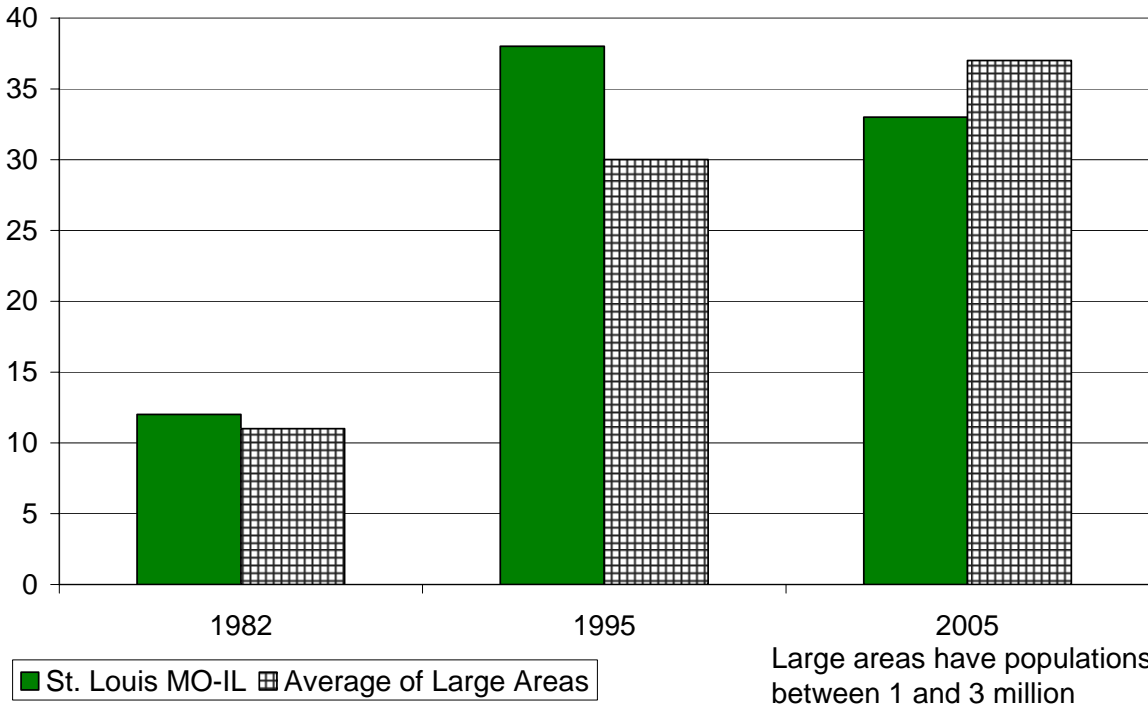
Note: Zeroes in the table reflect values less than 0.5.

Benefits From Public Transportation Service and Operations Strategies for St. Louis, MO-IL

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	10	10	3	3	3	3
Service Patrols						
Percent of Roadway Miles	54	55	54	56	51	46
Annual Delay Reduction (1000 hours)	809	653	490	550	504	610
Arterial Signal Coordination						
Percent of Roadway Miles	60	62	63	64	65	65
Annual Delay Reduction (1000 hours)	145	226	422	436	462	295
Arterial Access Management						
Percent of Roadway Miles	8	9	9	9	9	9
Annual Delay Reduction (1000 hours)	44	90	528	559	566	321
HOV Lanes						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
Total Effect of Operations Treatments						
Annual Delay Reduction (1000 hours)	998	969	1,441	1,545	1,532	1,226
Annual Delay Saved per Peak Traveler (hours)	1	1	1	1	1	1
Annual Congestion Cost Savings (\$million)	18.9	17.6	24.7	25.9	25.2	20.0
Travel Time Index with Strategies	1.164	1.164	1.171	1.183	1.184	1.205
Travel Time Index (Base)	1.168	1.168	1.177	1.190	1.190	1.210
Public Transportation Service						
Existing Service						
Annual Passenger-miles of Travel (million)	286	284	272	284	251	271
Unlinked Passenger Trips (million)	49	48	48	50	53	54
Travel Time Index (combined road and transit)	1.160	1.160	1.165	1.177	1.178	1.199
Condition if Public Transportation Service were Discontinued						
Travel Time Index	1.176	1.177	1.186	1.202	1.201	1.223
Annual Delay Increase (1000 hours)	2,293	2,420	2,506	2,943	2,562	3,211
Annual Delay Increase per Peak Traveler (hours)	2	2	2	3	2	3
Annual Congestion Cost Increase (\$million)	43.6	44.0	43.8	50.3	43.0	53.0

Growth in Delay per Peak Traveler

Hours of Delay



Annual Hours of Delay (million)

Growth in Total Delay

