

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 Kansas City, MO-KS

Inventory Measures	2005	2004	2003	2002	2001	2000
Urban Area Information						
Population (1000s)	1,500	1,500	1,500	1,475	1,425	1,420
Rank	29	29	29	29	29	29
Urban Area (square miles)	1,045	1,045	1,045	1,035	1,030	1,000
Popn Density (persons/sq mile)	1,435	1,435	1,435	1,425	1,383	1,420
Peak Travelers (1000s)	828	824	819	794	754	740
Freeway						
Daily Vehicle-Miles of Travel (1000s)	20,675	20,185	20,185	20,070	19,350	19,310
Lane Miles	1,870	1,850	1,800	1,770	1,720	1,720
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	12,970	12,970	12,980	12,890	12,840	12,725
Lane Miles	3,125	3,090	3,020	2,940	2,890	2,810
Public Transportation						
Annual Psgr-Miles of Travel (millions)	60	56	58	61	69	67
Annual Unlinked Psgr Trips (millions)	15	14	14	16	17	16
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)	22	25	29	28	28	28
Congested System (% of lane-miles)	25	27	32	30	30	30
Congested Time (number of "Rush Hours")	3.8	3.6	4.0	4.0	4.0	4.0
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	49	51	70	93	80	108
Transit Riders or Carpoolers (millions)	12	12	17	22	19	27
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	8,637	8,826	10,187	9,681	9,729	9,695
Rank	46	46	41	41	40	38
Fuel per Peak Traveler (gallons)	10	11	12	12	13	13
Rank	66	64	59	59	56	58
Annual Delay						
Total Delay (1000s of person-hours)	13,737	12,896	14,874	14,186	14,302	14,425
Rank	45	46	44	43	41	40
Delay per Peak Traveler (person-hrs)	17	16	18	18	19	19
Rank	64	68	61	61	60	60
Delay due to Incidents (percent)	62	62	61	60	60	60
Travel Time Index	1.08	1.08	1.09	1.09	1.09	1.09
Rank	73	71	64	67	69	65
Congestion Cost						
Total Cost (\$ millions)	256	231	256	238	237	234
Rank	44	46	42	43	40	36
Cost per Peak Traveler (\$)	309	281	313	300	315	316
Rank	65	70	62	62	60	59

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 Kansas City, MO-KS, Continued

Inventory Measures	1999	1998	1997	1996	1995	1994
Urban Area Information						
Population (1000s)	1,390	1,375	1,355	1,340	1,330	1,320
Rank	28	28	28	28	26	26
Urban Area (square miles)	975	900	840	800	770	750
Popn Density (persons/sq mile)	1,426	1,528	1,613	1,675	1,727	1,760
Peak Travelers (1000s)	712	693	672	654	638	624
Freeway						
Daily Vehicle-Miles of Travel (1000s)	18,790	18,225	17,310	16,940	15,960	15,260
Lane Miles	1,720	1,720	1,685	1,675	1,655	1,625
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	12,705	12,610	12,600	12,585	12,510	12,365
Lane Miles	2,625	2,410	2,265	2,000	1,955	1,945
Public Transportation						
Annual Psgr-Miles of Travel (millions)	64	63	55	51	52	54
Annual Unlinked Psgr Trips (millions)	16	15	15	15	15	15
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)	28	25	25	23	22	20
Congested System (% of lane-miles)	30	25	25	23	23	20
Congested Time (number of "Rush Hours")	4.0	4.0	4.0	4.2	4.0	3.8
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	116	113	145	165	152	151
Transit Riders or Carpoolers (millions)	29	29	38	46	42	40
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	10,345	8,728	8,473	7,645	6,644	6,454
Rank	36	37	38	39	41	38
Fuel per Peak Traveler (gallons)	15	13	13	12	10	10
Rank	53	57	56	57	59	55
Annual Delay						
Total Delay (1000s of person-hours)	16,050	13,619	13,300	12,219	10,596	10,902
Rank	35	37	37	38	40	36
Delay per Peak Traveler (person-hrs)	23	20	20	19	17	17
Rank	54	58	58	58	59	55
Delay due to Incidents (percent)	61	61	60	60	59	60
Travel Time Index						
Rank	63	66	65	64	67	64
Congestion Cost						
Total Cost (\$ millions)	246	205	198	178	149	148
Rank	33	37	37	37	39	37
Cost per Peak Traveler (\$)	345	295	294	272	234	237
Rank	53	57	57	57	58	55

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 Kansas City, MO-KS, Continued

Inventory Measures	1993	1992	1991	1990	1989	1988
Urban Area Information						
Population (1000s)	1,300	1,200	1,160	1,160	1,155	1,145
Rank	26	29	31	29	28	28
Urban Area (square miles)	720	635	610	610	610	600
Popn Density (persons/sq mile)	1,806	1,890	1,902	1,902	1,893	1,908
Peak Travelers (1000s)	605	550	522	514	508	499
Freeway						
Daily Vehicle-Miles of Travel (1000s)	14,900	13,240	12,520	12,555	12,370	12,220
Lane Miles	1,605	1,570	1,520	1,470	1,420	1,380
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	12,050	11,730	11,185	10,615	10,100	9,535
Lane Miles	1,915	1,890	1,870	1,840	1,825	1,795
Public Transportation						
Annual Psgr-Miles of Travel (millions)	74	57	71	71	72	57
Annual Unlinked Psgr Trips (millions)	16	16	19	19	19	19
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)	19	15	13	13	13	13
Congested System (% of lane-miles)	20	18	16	16	16	16
Congested Time (number of "Rush Hours")	3.8	3.2	3.0	3.0	3.0	3.0
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	154	130	149	182	224	246
Transit Riders or Carpoolers (millions)	41	33	36	44	54	58
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	6,078	3,984	3,331	3,354	3,281	3,211
Rank	37	43	46	45	41	38
Fuel per Peak Traveler (gallons)	10	7	6	7	6	6
Rank	54	63	60	59	58	56
Annual Delay						
Total Delay (1000s of person-hours)	10,111	6,451	5,468	5,580	5,553	5,302
Rank	36	44	46	44	39	37
Delay per Peak Traveler (person-hrs)	17	12	10	11	11	11
Rank	54	62	62	60	58	57
Delay due to Incidents (percent)	59	58	57	58	58	58
Travel Time Index						
Rank	64	69	73	70	68	65
Congestion Cost						
Total Cost (\$ millions)	134	84	69	69	64	58
Rank	35	44	47	43	39	37
Cost per Peak Traveler (\$)	222	152	133	134	126	116
Rank	53	62	60	60	56	56

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 Kansas City, MO-KS, Continued

Inventory Measures	1987	1986	1985	1984	1983	1982
Urban Area Information						
Population (1000s)	1,140	1,135	1,130	1,100	1,095	1,090
Rank	27	27	27	28	28	28
Urban Area (square miles)	590	580	570	560	555	550
Popn Density (persons/sq mile)	1,932	1,957	1,982	1,964	1,973	1,982
Peak Travelers (1000s)	494	487	481	465	460	452
Freeway						
Daily Vehicle-Miles of Travel (1000s)	11,920	10,905	10,190	9,380	8,985	8,425
Lane Miles	1,340	1,300	1,280	1,250	1,250	1,225
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	8,820	8,215	7,530	6,720	6,010	5,520
Lane Miles	1,755	1,725	1,680	1,645	1,600	1,570
Public Transportation						
Annual Psgr-Miles of Travel (millions)	55	56	54	55	55	55
Annual Unlinked Psgr Trips (millions)	18	18	18	18	18	18
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)	10	10	8	7	7	6
Congested System (% of lane-miles)	16	16	14	14	13	13
Congested Time (number of "Rush Hours")	2.9	2.8	2.7	2.5	2.4	2.3
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	256	--	--	--	--	--
Transit Riders or Carpoolers (millions)	60	--	--	--	--	--
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	2,242	1,908	1,554	1,261	1,015	884
Rank	42	43	48	53	54	58
Fuel per Peak Traveler (gallons)	5	4	3	3	2	2
Rank	65	67	68	68	71	74
Annual Delay						
Total Delay (1000s of person-hours)	3,695	3,102	2,682	2,075	1,665	1,465
Rank	43	44	49	52	56	56
Delay per Peak Traveler (person-hrs)	7	6	6	4	4	3
Rank	65	67	67	69	71	75
Delay due to Incidents (percent)	57	57	57	56	55	55
Travel Time Index						
Rank	71	71	75	75	80	80
Congestion Cost						
Total Cost (\$ millions)	39	32	27	21	16	14
Rank	42	44	48	52	54	56
Cost per Peak Traveler (\$)	79	65	56	44	35	30
Rank	65	66	67	69	71	75

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

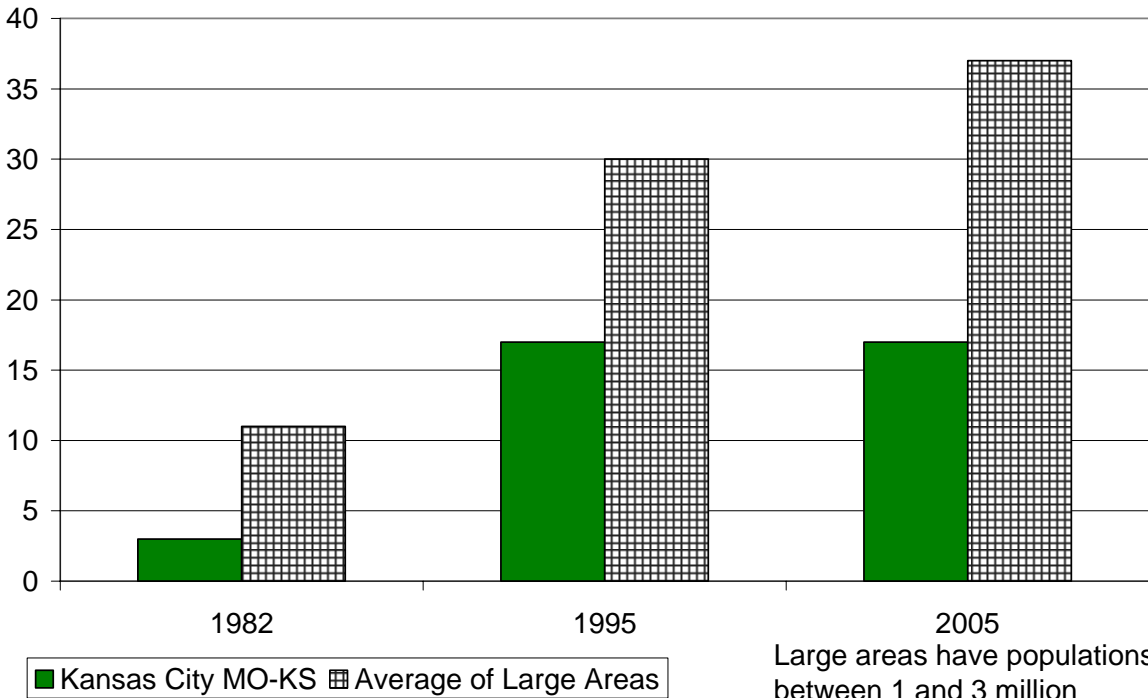
Note: Zeroes in the table reflect values less than 0.5.

Benefits From Public Transportation Service and Operations Strategies for Kansas City, MO-KS

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	16	16	--	--	--	--
Service Patrols						
Percent of Roadway Miles	43	44	45	46	47	47
Annual Delay Reduction (1000 hours)	438	383	398	342	354	364
Arterial Signal Coordination						
Percent of Roadway Miles	58	58	60	61	62	64
Annual Delay Reduction (1000 hours)	16	41	72	80	63	67
Arterial Access Management						
Percent of Roadway Miles	14	14	15	14	14	14
Annual Delay Reduction (1000 hours)	148	77	101	109	77	82
HOV Lanes						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
Total Effect of Operations Treatments						
Annual Delay Reduction (1000 hours)	602	501	571	531	494	513
Annual Delay Saved per Peak Traveler (hours)	1	1	1	1	1	1
Annual Congestion Cost Savings (\$million)	11.1	8.9	9.8	8.9	8.2	8.3
Travel Time Index with Strategies	1.078	1.081	1.094	1.090	1.092	1.092
Travel Time Index (Base)	1.080	1.084	1.097	1.092	1.095	1.095
Public Transportation Service						
Existing Service						
Annual Passenger-miles of Travel (million)	60	56	58	61	69	67
Unlinked Passenger Trips (million)	15	14	14	16	17	16
Travel Time Index (combined road and transit)	1.077	1.080	1.093	1.089	1.091	1.092
Condition if Public Transportation Service were Discontinued						
Travel Time Index	1.082	1.084	1.100	1.095	1.099	1.098
Annual Delay Increase (1000 hours)	309	206	540	489	628	550
Annual Delay Increase per Peak Traveler (hours)	0	0	1	1	1	1
Annual Congestion Cost Increase (\$million)	5.7	3.6	9.3	8.2	10.4	8.9

Growth in Delay per Peak Traveler

Hours of Delay



Growth in Total Delay

Annual Hours of Delay (million)

