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	
2005 Values	**Above 1M Population**	**Below 1M Population**
Delay per Traveler -	5 Hours	3 Hours
Travel Time Index -	5 Index Points	3 Index Points
Total Delay -	5 Hours x Average Population	3 Hours x Average Population
1982 to 2005 Trends		
Delay per Traveler -	5 Hours	3 Hours
Total Delay -	5 Hours x Average Population	3 Hours x Average Population

The Mobility Data for Louisville, KY-IN

Inventory Measures	2005	2004	2003	2002	2001	2000
Urban Area Information						
Population (1000s)	905	900	890	875	860	850
Rank	45	45	44	43	43	43
Urban Area (square miles)	470	470	465	450	435	420
Popn Density (persons/sq mile)	1,926	1,915	1,914	1,944	1,977	2,024
Peak Travelers (1000s)	491	486	478	465	451	439
Freeway						
Daily Vehicle-Miles of Travel (1000s)	11,585	11,730	11,500	11,000	10,400	10,200
Lane Miles	720	720	720	705	690	680
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	8,545	8,705	8,495	8,140	8,095	8,445
Lane Miles	1,515	1,505	1,480	1,450	1,435	1,420
Public Transportation						
Annual Psgr-Miles of Travel (millions)	57	57	49	51	58	59
Annual Unlinked Psgr Trips (millions)	15	16	13	15	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 ($/gallon)	2.24	1.83	1.44	1.33	1.40	1.48
System Performance						
Congested Travel (% of peak VMT)	59	60	57	54	50	53
Congested System (% of lane-miles)	52	52	50	48	47	48
Congested Time (number of "Rush Hours")	7.2	7.4	7.2	7.2	7.0	7.0
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	34	47	44	37	34	56
Transit Riders or Carpoolers (millions)	11	15	14	11	10	17
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	14,415	14,827	13,475	12,602	11,123	12,159
Rank	33	32	32	33	33	31
Fuel per Peak Traveler (gallons)	29	31	28	27	25	28
Rank	23	14	21	22	22	15
Annual Delay						
Total Delay (1000s of person-hours)	20,558	21,209	19,338	18,244	16,370	18,144
Rank	36	34	34	34	33	31
Delay per Peak Traveler (person-hrs)	42	44	40	39	36	41
Rank	25	18	22	23	22	15
Delay due to Incidents (percent)	57	57	56	56	55	55
Travel Time Index	1.23	1.23	1.22	1.21	1.19	1.21
Rank	28	28	31	31	32	29
Congestion Cost						
Total Cost ($ millions)	395	388	340	314	276	298
Rank	35	33	32	32	33	31
Cost per Peak Traveler ($)	804	799	711	675	612	678
Rank	25	19	23	22	22	15

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 Louisville, KY-IN, Continued

Inventory Measures	1999	1998	1997	1996	1995	1994
Urban Area Information						
Population (1000s)	840	830	830	825	825	825
Rank	43	43	42	42	42	41
Urban Area (square miles)	410	400	400	395	395	390
Popn Density (persons/sq mile)	2,049	2,075	2,075	2,089	2,089	2,115
Peak Travelers (1000s)	429	419	413	406	401	396
Freeway						
Daily Vehicle-Miles of Travel (1000s)	10,035	9,900	9,600	9,210	8,665	8,175
Lane Miles	670	665	665	665	645	625
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	8,350	8,210	7,985	7,855	7,690	7,770
Lane Miles	1,415	1,375	1,330	1,300	1,275	1,250
Public Transportation						
Annual Psgr-Miles of Travel (millions)	67	63	68	58	58	81
Annual Unlinked Psgr Trips (millions)	17	17	16	18	20	25
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 ($/gallon)	1.09	1.06	1.12	1.25	1.14	1.01
System Performance						
Congested Travel (% of peak VMT)	53	53	49	48	45	44
Congested System (% of lane-miles)	48	48	45	45	43	43
Congested Time (number of "Rush Hours")	7.0	7.0	6.8	6.6	6.2	6.2
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	60	68	84	98	104	105
Transit Riders or Carpoolers (millions)	18	21	26	30	31	31
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	12,184	11,626	10,768	9,963	8,685	8,579
Rank	31	31	31	31	35	30
Fuel per Peak Traveler (gallons)	28	28	26	25	22	22
Rank	15	14	17	19	26	17
Annual Delay						
Total Delay (1000s of person-hours)	18,438	17,357	16,485	15,372	13,509	13,609
Rank	31	31	31	32	33	31
Delay per Peak Traveler (person-hrs)	43	41	40	38	34	34
Rank	14	13	13	16	20	17
Delay due to Incidents (percent)	55	55	55	55	55	55
Travel Time Index	1.21	1.20	1.19	1.18	1.17	1.17
Rank	27	26	28	30	31	28
Congestion Cost						
Total Cost ($ millions)	288	266	250	228	194	188
Rank	31	30	30	31	32	30
Cost per Peak Traveler ($)	671	634	604	563	483	475
Rank	15	12	13	14	20	15

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 Louisville, KY-IN, Continued

Inventory Measures	1993	1992	1991	1990	1989	1988
Urban Area Information						
Population (1000s)	820	815	810	810	805	805
Rank	41	40	40	40	39	38
Urban Area (square miles)	390	385	380	380	375	375
Popn Density (persons/sq mile)	2,103	2,117	2,132	2,132	2,147	2,147
Peak Travelers (1000s)	389	381	374	369	364	361
Freeway						
Daily Vehicle-Miles of Travel (1000s)	7,850	7,110	6,560	6,265	6,130	5,980
Lane Miles	625	600	590	590	590	565
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	7,495	7,215	6,810	6,305	6,000	5,970
Lane Miles	1,220	1,210	1,205	1,205	1,150	1,125
Public Transportation						
Annual Psgr-Miles of Travel (millions)	73	72	82	77	97	90
Annual Unlinked Psgr Trips (millions)	22	25	23	22	28	25
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 ($/gallon)	1.05	1.03	1.04	1.06	1.10	1.02
System Performance						
Congested Travel (% of peak VMT)	43	39	34	31	28	29
Congested System (% of lane-miles)	40	38	37	37	35	35
Congested Time (number of "Rush Hours")	6.0	5.4	5.0	4.2	4.0	4.2
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	95	73	70	70	68	60
Transit Riders or Carpoolers (millions)	27	20	18	17	17	15
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	7,952	6,765	5,486	4,317	4,150	4,227
Rank	30	32	34	38	36	35
Fuel per Peak Traveler (gallons)	20	18	15	12	11	12
Rank	19	24	33	41	38	33
Annual Delay						
Total Delay (1000s of person-hours)	12,735	10,929	8,975	6,952	6,946	7,077
Rank	31	32	34	37	34	33
Delay per Peak Traveler (person-hrs)	33	29	24	19	19	20
Rank	17	23	30	39	35	30
Delay due to Incidents (percent)	55	55	55	55	55	55
Travel Time Index	1.16	1.15	1.13	1.10	1.10	1.11
Rank	28	29	33	41	38	34
Congestion Cost						
Total Cost ($ millions)	171	143	114	86	81	78
Rank	27	31	34	37	33	33
Cost per Peak Traveler ($)	441	374	305	233	222	216
Rank	14	21	30	39	35	30

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 Louisville, KY-IN, Continued

Inventory Measures	1987	1986	1985	1984	1983	1982
Urban Area Information						
Population (1000s)	790	785	785	780	780	770
Rank	39	39	37	37	37	38
Urban Area (square miles)	370	365	360	360	360	360
Popn Density (persons/sq mile)	2,135	2,151	2,181	2,167	2,167	2,139
Peak Travelers (1000s)	352	347	345	339	337	329
Freeway						
Daily Vehicle-Miles of Travel (1000s)	5,530	4,930	4,430	4,330	4,415	4,045
Lane Miles	540	505	455	455	445	420
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	6,200	6,105	5,950	5,670	5,610	5,845
Lane Miles	1,125	1,110	1,105	1,090	1,090	1,065
Public Transportation						
Annual Psgr-Miles of Travel (millions)	89	88	84	102	102	102
Annual Unlinked Psgr Trips (millions)	23	25	25	32	32	32
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 ($/gallon)	1.02	0.99	1.30	1.31	1.34	1.41
System Performance						
Congested Travel (% of peak VMT)	31	29	28	25	26	28
Congested System (% of lane-miles)	37	36	35	35	35	35
Congested Time (number of "Rush Hours")	4.2	4.0	4.0	3.6	3.8	4.2
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	58	- -	- -	- -	- -	- -
Transit Riders or Carpoolers (millions)	14	- -	- -	- -	- -	- -
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	4,440	3,941	3,654	3,123	3,195	3,470
Rank	30	32	29	30	29	25
Fuel per Peak Traveler (gallons)	13	11	11	9	9	11
Rank	26	28	30	30	23	12
Annual Delay						
Total Delay (1000s of person-hours)	7,403	6,615	6,153	5,314	5,411	5,958
Rank	29	30	28	30	30	25
Delay per Peak Traveler (person-hrs)	21	19	18	16	16	18
Rank	23	26	27	29	19	12
Delay due to Incidents (percent)	55	55	54	54	54	54
Travel Time Index	1.12	1.11	1.11	1.09	1.10	1.11
Rank	27	23	22	25	19	14
Congestion Cost						
Total Cost ($ millions)	79	68	63	52	51	55
Rank	29	29	29	30	28	25
Cost per Peak Traveler ($)	224	195	182	154	153	167
Rank	24	25	27	27	19	12

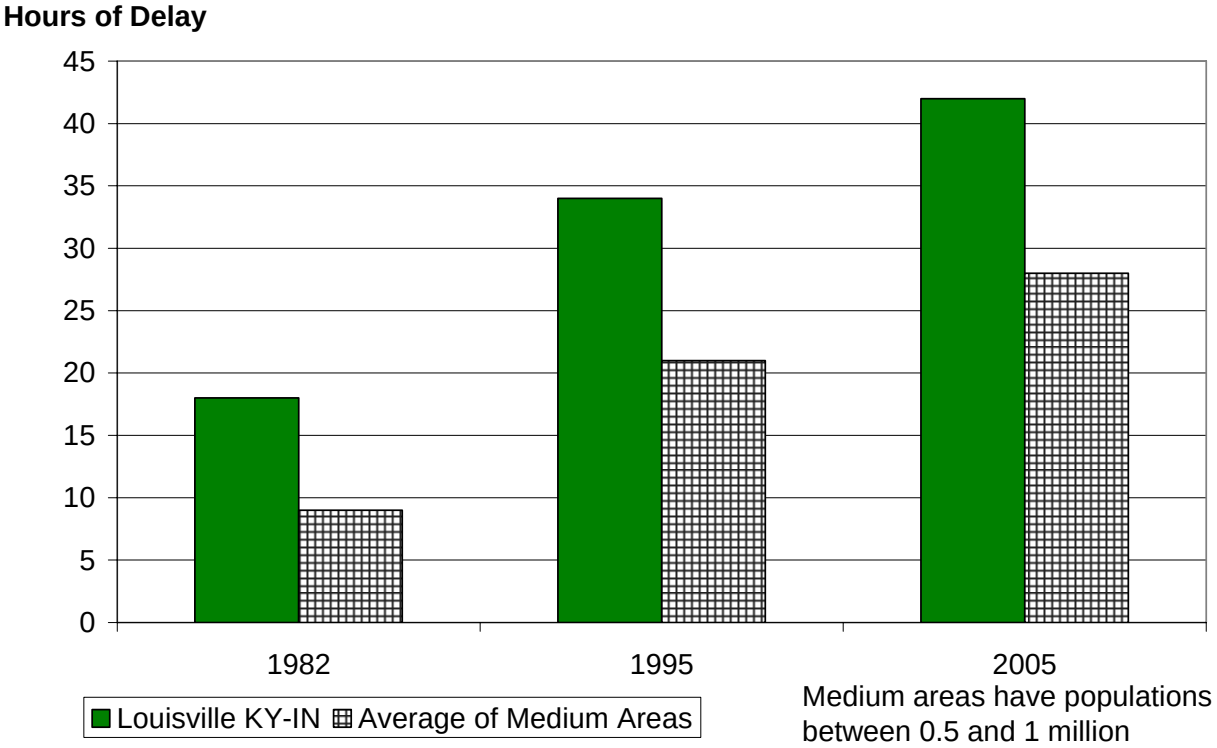
Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

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

Benefits From Public Transportation Service and Operations Strategies for Louisville, KY-IN

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	42	42	42	18	18	--
Service Patrols						
Percent of Roadway Miles	45	45	46	47	47	49
Annual Delay Reduction (1000 hours)	568	583	486	424	325	351
Arterial Signal Coordination						
Percent of Roadway Miles	66	66	68	69	70	70
Annual Delay Reduction (1000 hours)	114	112	126	109	98	120
Arterial Access Management						
Percent of Roadway Miles	9	9	9	9	9	9
Annual Delay Reduction (1000 hours)	108	142	90	92	91	99
HOV Lanes						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
Total Effect of Operations Treatments						
Annual Delay Reduction (1000 hours)	790	837	703	626	513	571
Annual Delay Saved per Peak Traveler (hours)	2	2	1	1	1	1
Annual Congestion Cost Savings ($million)	15.4	15.5	12.6	10.9	8.8	9.5
Travel Time Index with Strategies	1.231	1.234	1.216	1.211	1.191	1.208
Travel Time Index (Base)	1.239	1.242	1.223	1.217	1.197	1.214
Public Transportation Service						
Existing Service						
Annual Passenger-miles of Travel (million)	57	57	49	51	58	59
Unlinked Passenger Trips (million)	15	16	13	15	17	16
Travel Time Index (combined road and transit)	1.228	1.231	1.213	1.208	1.188	1.205
Condition if Public Transportation Service were Discontinued						
Travel Time Index	1.243	1.247	1.227	1.221	1.203	1.219
Annual Delay Increase (1000 hours)	558	655	472	517	689	615
Annual Delay Increase per Peak Traveler (hours)	1	1	1	1	2	1
Annual Congestion Cost Increase ($million)	10.9	12.2	8.4	9.0	11.8	10.3

Growth in Delay per Peak Traveler



Growth in Total Delay