

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 Springfield, MA-CT

Inventory Measures	2005	2004	2003	2002	2001	2000
Urban Area Information						
Population (1000s)	660	660	655	650	630	615
Rank	58	58	58	58	58	59
Urban Area (square miles)	470	470	460	460	455	450
Popn Density (persons/sq mile)	1,404	1,404	1,424	1,413	1,385	1,367
Peak Travelers (1000s)	358	356	352	345	330	318
Freeway						
Daily Vehicle-Miles of Travel (1000s)	5,490	5,310	5,030	4,805	4,215	4,250
Lane Miles	460	455	445	430	400	395
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	5,960	5,960	6,020	6,095	5,825	5,890
Lane Miles	1,485	1,475	1,460	1,440	1,410	1,405
Public Transportation						
Annual Psgr-Miles of Travel (millions)	34	41	39	34	33	38
Annual Unlinked Psgr Trips (millions)	10	11	11	11	11	12
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)	2.28	2.02	1.53	1.40	1.70	1.58
System Performance						
Congested Travel (% of peak VMT)	22	20	20	20	19	20
Congested System (% of lane-miles)	23	23	23	23	26	26
Congested Time (number of "Rush Hours")	4.2	4.2	4.0	4.0	3.4	3.6
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	48	47	52	61	33	37
Transit Riders or Carpoolers (millions)	10	10	11	12	7	7
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	2,475	2,225	2,133	2,171	1,986	2,108
Rank	71	75	73	70	70	69
Fuel per Peak Traveler (gallons)	7	6	6	6	6	7
Rank	76	79	77	76	76	75
Annual Delay						
Total Delay (1000s of person-hours)	4,053	3,711	3,627	3,732	3,473	3,689
Rank	71	71	71	70	70	68
Delay per Peak Traveler (person-hrs)	11	10	10	11	11	12
Rank	77	80	77	75	75	75
Delay due to Incidents (percent)	54	54	53	53	53	53
Travel Time Index						
Rank	1.06	1.06	1.06	1.06	1.06	1.06
Rank	81	82	80	77	78	75
Congestion Cost						
Total Cost (\$ millions)	71	62	58	58	54	55
Rank	72	73	72	72	71	69
Cost per Peak Traveler (\$)	198	174	165	169	163	174
Rank	79	81	80	79	79	76

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 Springfield, MA-CT, Continued

Inventory Measures	1999	1998	1997	1996	1995	1994
Urban Area Information						
Population (1000s)	605	600	600	595	595	590
Rank	59	58	57	57	56	55
Urban Area (square miles)	445	440	435	430	425	425
Popn Density (persons/sq mile)	1,360	1,364	1,379	1,384	1,400	1,388
Peak Travelers (1000s)	309	303	299	293	289	283
Freeway						
Daily Vehicle-Miles of Travel (1000s)	4,140	3,980	3,845	3,720	3,715	3,660
Lane Miles	390	390	390	390	385	385
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	5,835	5,675	5,430	5,435	5,425	5,325
Lane Miles	1,385	1,340	1,305	1,295	1,280	1,275
Public Transportation						
Annual Psgr-Miles of Travel (millions)	33	36	34	34	32	29
Annual Unlinked Psgr Trips (millions)	12	13	13	13	11	11
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)	1.13	1.08	1.28	1.31	1.22	1.07
System Performance						
Congested Travel (% of peak VMT)	19	18	17	17	17	16
Congested System (% of lane-miles)	26	24	24	24	24	24
Congested Time (number of "Rush Hours")	3.6	3.4	3.0	3.0	3.0	3.0
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	37	28	21	29	39	34
Transit Riders or Carpoolers (millions)	7	6	4	5	7	6
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	2,095	1,927	1,738	1,678	1,724	1,645
Rank	69	69	71	69	68	67
Fuel per Peak Traveler (gallons)	7	6	6	6	6	6
Rank	75	75	75	75	74	74
Annual Delay						
Total Delay (1000s of person-hours)	3,630	3,416	3,045	2,928	3,035	2,885
Rank	69	70	71	68	65	64
Delay per Peak Traveler (person-hrs)	12	11	10	10	10	10
Rank	75	73	73	73	71	73
Delay due to Incidents (percent)	53	53	53	53	53	53
Travel Time Index						
Rank	75	75	77	74	74	73
Congestion Cost						
Total Cost (\$ millions)	52	48	42	40	40	37
Rank	70	70	71	69	68	68
Cost per Peak Traveler (\$)	168	157	142	137	139	130
Rank	76	75	75	75	72	74

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 Springfield, MA-CT, Continued

Inventory Measures	1993	1992	1991	1990	1989	1988
Urban Area Information						
Population (1000s)	590	580	575	560	560	560
Rank	54	54	52	53	52	52
Urban Area (square miles)	420	400	385	380	375	365
Popn Density (persons/sq mile)	1,405	1,450	1,494	1,474	1,493	1,534
Peak Travelers (1000s)	280	271	266	255	253	251
Freeway						
Daily Vehicle-Miles of Travel (1000s)	3,530	3,455	3,330	3,335	3,465	3,330
Lane Miles	380	380	375	375	370	370
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	5,365	5,265	5,080	4,810	4,650	4,545
Lane Miles	1,250	1,235	1,220	1,215	1,210	1,210
Public Transportation						
Annual Psgr-Miles of Travel (millions)	34	33	36	32	39	37
Annual Unlinked Psgr Trips (millions)	12	11	11	10	15	12
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)	1.15	1.14	1.23	1.04	1.06	0.98
System Performance						
Congested Travel (% of peak VMT)	17	16	15	14	14	14
Congested System (% of lane-miles)	24	24	20	20	20	20
Congested Time (number of "Rush Hours")	3.0	3.0	2.9	2.8	2.9	2.8
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	40	43	42	35	35	36
Transit Riders or Carpoolers (millions)	8	8	8	6	6	6
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	1,677	1,638	1,384	1,305	1,298	1,200
Rank	65	64	64	64	63	63
Fuel per Peak Traveler (gallons)	6	6	5	5	5	5
Rank	71	68	69	69	67	66
Annual Delay						
Total Delay (1000s of person-hours)	2,959	2,872	2,422	2,277	2,248	2,094
Rank	63	63	63	64	63	63
Delay per Peak Traveler (person-hrs)	11	11	9	9	9	8
Rank	70	66	66	66	66	64
Delay due to Incidents (percent)	53	53	53	53	53	53
Travel Time Index						
Rank	1.06	1.06	1.05	1.05	1.05	1.04
Rank	70	68	68	66	66	64
Congestion Cost						
Total Cost (\$ millions)	37	35	29	26	24	22
Rank	63	63	63	64	63	63
Cost per Peak Traveler (\$)	132	130	110	104	96	86
Rank	70	67	66	67	66	65

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 Springfield, MA-CT, Continued

Inventory Measures	1987	1986	1985	1984	1983	1982
Urban Area Information						
Population (1000s)	555	550	545	540	535	530
Rank	52	51	51	50	50	50
Urban Area (square miles)	360	355	350	340	335	330
Popn Density (persons/sq mile)	1,542	1,549	1,557	1,588	1,597	1,606
Peak Travelers (1000s)	247	243	239	235	231	226
Freeway						
Daily Vehicle-Miles of Travel (1000s)	3,130	2,985	2,795	2,815	2,605	2,625
Lane Miles	365	360	360	360	360	360
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	4,525	4,390	4,490	4,465	4,425	4,340
Lane Miles	1,205	1,200	1,190	1,190	1,185	1,180
Public Transportation						
Annual Psgr-Miles of Travel (millions)	30	30	30	33	33	33
Annual Unlinked Psgr Trips (millions)	11	12	12	12	12	12
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)	0.98	0.96	1.25	1.27	1.30	1.35
System Performance						
Congested Travel (% of peak VMT)	13	13	13	13	13	13
Congested System (% of lane-miles)	20	20	20	20	20	20
Congested Time (number of "Rush Hours")	2.7	2.7	2.6	2.6	2.6	2.6
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	30	--	--	--	--	--
Transit Riders or Carpoolers (millions)	5	--	--	--	--	--
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	1,138	1,051	1,033	1,029	967	931
Rank	62	63	61	60	58	55
Fuel per Peak Traveler (gallons)	5	4	4	4	4	4
Rank	64	62	59	55	52	51
Annual Delay						
Total Delay (1000s of person-hours)	1,988	1,820	1,810	1,800	1,692	1,601
Rank	62	62	60	57	55	54
Delay per Peak Traveler (person-hrs)	8	7	8	8	7	7
Rank	62	61	57	56	52	50
Delay due to Incidents (percent)	53	53	53	53	53	53
Travel Time Index						
Rank	63	62	58	56	54	49
Congestion Cost						
Total Cost (\$ millions)	20	17	17	17	15	14
Rank	62	63	60	58	57	54
Cost per Peak Traveler (\$)	80	72	72	71	66	62
Rank	63	62	60	56	54	51

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

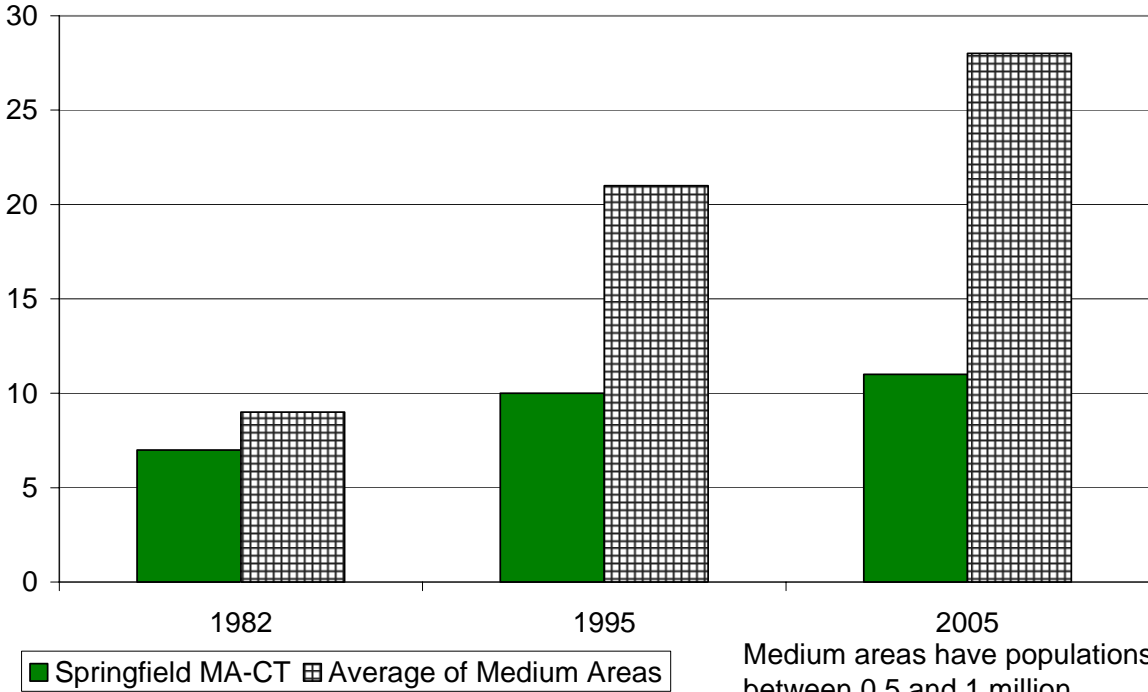
Note: Zeroes in the table reflect values less than 0.5.

Benefits From Public Transportation Service and Operations Strategies for Springfield, MA-CT

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	13	14	14	14	16	16
Service Patrols						
Percent of Roadway Miles	37	35	36	37	40	41
Annual Delay Reduction (1000 hours)	25	15	11	10	6	7
Arterial Signal Coordination						
Percent of Roadway Miles	46	42	41	40	41	39
Annual Delay Reduction (1000 hours)	19	20	17	17	18	11
Arterial Access Management						
Percent of Roadway Miles	5	5	3	3	4	4
Annual Delay Reduction (1000 hours)	13	19	13	18	18	20
HOV Lanes						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
Total Effect of Operations Treatments						
Annual Delay Reduction (1000 hours)	56	54	41	45	41	38
Annual Delay Saved per Peak Traveler (hours)	0	0	0	0	0	0
Annual Congestion Cost Savings (\$million)	1.0	1.0	0.7	0.7	0.7	0.6
Travel Time Index with Strategies	1.065	1.059	1.057	1.059	1.059	1.062
Travel Time Index (Base)	1.066	1.060	1.058	1.060	1.060	1.063
Public Transportation Service						
Existing Service						
Annual Passenger-miles of Travel (million)	34	41	39	34	33	38
Unlinked Passenger Trips (million)	10	11	11	11	11	12
Travel Time Index (combined road and transit)	1.064	1.058	1.057	1.059	1.058	1.061
Condition if Public Transportation Service were Discontinued						
Travel Time Index	1.068	1.062	1.060	1.061	1.060	1.064
Annual Delay Increase (1000 hours)	173	185	123	110	72	131
Annual Delay Increase per Peak Traveler (hours)	0	1	0	0	0	0
Annual Congestion Cost Increase (\$million)	3.0	3.1	2.0	1.7	1.1	2.0

Growth in Delay per Peak Traveler

Hours of Delay



Growth in Total Delay

Annual Hours of Delay (million)

