

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 Columbus, OH

Inventory Measures	2005	2004	2003	2002	2001	2000
Urban Area Information						
Population (1000s)	1,195	1,195	1,190	1,165	1,140	1,110
Rank	35	35	35	35	35	35
Urban Area (square miles)	605	605	600	580	555	530
Popn Density (persons/sq mile)	1,975	1,975	1,983	2,009	2,054	2,094
Peak Travelers (1000s)	660	656	650	627	603	578
Freeway						
Daily Vehicle-Miles of Travel (1000s)	14,960	15,045	14,665	13,900	13,400	12,000
Lane Miles	955	955	955	930	895	860
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	10,440	10,110	9,870	9,690	9,510	9,300
Lane Miles	2,120	2,020	1,910	1,835	1,750	1,685
Public Transportation						
Annual Psgr-Miles of Travel (millions)	60	60	60	68	75	76
Annual Unlinked Psgr Trips (millions)	15	15	16	16	19	19
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	1.81	1.52	1.38	1.30	1.55
System Performance						
Congested Travel (% of peak VMT)	59	59	56	52	48	43
Congested System (% of lane-miles)	46	46	45	43	38	37
Congested Time (number of "Rush Hours")	7.0	7.2	7.0	6.8	6.8	6.2
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	110	115	105	88	91	76
Transit Riders or Carpoolers (millions)	32	34	31	26	27	22
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	15,513	15,656	13,855	12,685	12,015	10,677
Rank	31	31	31	32	32	34
Fuel per Peak Traveler (gallons)	24	24	21	20	20	18
Rank	34	33	37	39	37	42
Annual Delay						
Total Delay (1000s of person-hours)	21,958	22,123	19,749	18,487	17,730	16,543
Rank	32	31	32	32	32	32
Delay per Peak Traveler (person-hrs)	33	34	30	29	29	29
Rank	36	36	41	42	41	40
Delay due to Incidents (percent)	54	54	54	54	55	55
Travel Time Index						
Rank	1.19	1.20	1.18	1.17	1.17	1.16
Rank	36	36	38	41	40	40
Congestion Cost						
Total Cost (\$ millions)	409	393	336	306	290	266
Rank	32	31	33	34	32	32
Cost per Peak Traveler (\$)	620	599	518	488	481	461
Rank	38	36	41	42	42	42

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 Columbus, OH, Continued

Inventory Measures	1999	1998	1997	1996	1995	1994
Urban Area Information						
Population (1000s)	1,090	1,065	1,045	1,025	1,010	995
Rank	36	37	37	36	36	35
Urban Area (square miles)	515	500	485	475	470	440
Popn Density (persons/sq mile)	2,117	2,130	2,155	2,158	2,149	2,261
Peak Travelers (1000s)	558	537	518	500	485	471
Freeway						
Daily Vehicle-Miles of Travel (1000s)	11,650	11,500	11,315	10,980	10,650	10,330
Lane Miles	830	820	815	810	810	805
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	9,150	9,005	8,850	8,375	7,735	7,215
Lane Miles	1,620	1,550	1,475	1,405	1,365	1,330
Public Transportation						
Annual Psgr-Miles of Travel (millions)	79	75	71	73	75	85
Annual Unlinked Psgr Trips (millions)	19	18	18	18	18	18
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)	1.14	1.11	1.13	1.28	1.12	1.08
System Performance						
Congested Travel (% of peak VMT)	44	44	44	43	43	39
Congested System (% of lane-miles)	33	33	34	34	37	35
Congested Time (number of "Rush Hours")	6.4	6.4	6.4	6.2	5.8	5.6
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	85	93	112	106	95	107
Transit Riders or Carpoolers (millions)	25	28	34	32	28	31
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	11,033	10,867	10,615	9,667	8,938	7,873
Rank	34	32	32	33	32	32
Fuel per Peak Traveler (gallons)	20	20	20	19	18	17
Rank	37	36	33	33	32	34
Annual Delay						
Total Delay (1000s of person-hours)	16,958	16,651	16,195	14,724	13,277	11,788
Rank	32	32	32	33	35	35
Delay per Peak Traveler (person-hrs)	30	31	31	29	27	25
Rank	37	36	32	34	35	37
Delay due to Incidents (percent)	54	54	53	53	52	52
Travel Time Index						
Rank	41	41	39	37	39	41
Congestion Cost						
Total Cost (\$ millions)	262	252	242	216	188	162
Rank	32	31	31	33	33	33
Cost per Peak Traveler (\$)	469	469	467	432	389	344
Rank	37	36	33	33	34	37

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 Columbus, OH, Continued

Inventory Measures	1993	1992	1991	1990	1989	1988
Urban Area Information						
Population (1000s)	985	950	920	870	855	840
Rank	35	36	36	36	36	36
Urban Area (square miles)	400	350	315	310	305	305
Popn Density (persons/sq mile)	2,463	2,714	2,921	2,806	2,803	2,754
Peak Travelers (1000s)	458	435	414	385	376	366
Freeway						
Daily Vehicle-Miles of Travel (1000s)	10,060	9,460	9,200	9,030	8,350	8,155
Lane Miles	800	780	775	770	760	760
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	6,825	6,435	6,140	5,810	5,380	5,105
Lane Miles	1,305	1,280	1,260	1,245	1,220	1,185
Public Transportation						
Annual Psgr-Miles of Travel (millions)	88	86	89	94	84	94
Annual Unlinked Psgr Trips (millions)	17	18	18	20	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)	1.09	1.11	1.13	1.06	1.08	1.00
System Performance						
Congested Travel (% of peak VMT)	38	35	31	30	25	22
Congested System (% of lane-miles)	35	32	30	30	28	28
Congested Time (number of "Rush Hours")	5.4	5.0	4.8	4.6	3.8	3.6
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	105	93	100	120	104	115
Transit Riders or Carpoolers (millions)	29	25	26	30	25	27
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	6,985	5,801	5,014	4,752	3,610	2,916
Rank	34	35	35	34	37	40
Fuel per Peak Traveler (gallons)	15	13	12	12	10	8
Rank	38	39	42	39	42	47
Annual Delay						
Total Delay (1000s of person-hours)	10,413	8,721	7,555	7,166	5,374	4,385
Rank	34	35	35	36	41	42
Delay per Peak Traveler (person-hrs)	23	20	18	19	14	12
Rank	40	38	43	40	48	49
Delay due to Incidents (percent)	52	53	53	54	54	54
Travel Time Index						
Rank	41	42	44	44	49	52
Congestion Cost						
Total Cost (\$ millions)	139	114	96	89	62	47
Rank	34	35	35	35	41	42
Cost per Peak Traveler (\$)	304	262	232	230	164	129
Rank	40	38	39	40	46	50

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 Columbus, OH, Continued

Inventory Measures	1987	1986	1985	1984	1983	1982
Urban Area Information						
Population (1000s)	840	835	835	835	835	835
Rank	36	36	36	35	35	35
Urban Area (square miles)	305	305	305	305	305	305
Popn Density (persons/sq mile)	2,754	2,738	2,738	2,738	2,738	2,738
Peak Travelers (1000s)	364	358	356	353	351	347
Freeway						
Daily Vehicle-Miles of Travel (1000s)	7,915	7,565	6,960	6,805	6,550	6,200
Lane Miles	755	750	750	740	735	735
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	4,825	4,515	4,175	3,835	3,420	3,010
Lane Miles	1,155	1,110	1,085	1,065	1,030	1,005
Public Transportation						
Annual Psgr-Miles of Travel (millions)	88	113	122	125	125	125
Annual Unlinked Psgr Trips (millions)	19	24	26	26	26	26
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)	1.00	0.98	1.28	1.29	1.32	1.38
System Performance						
Congested Travel (% of peak VMT)	19	16	14	13	12	10
Congested System (% of lane-miles)	23	21	18	15	15	13
Congested Time (number of "Rush Hours")	3.2	3.0	2.8	2.8	2.7	2.6
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	128	--	--	--	--	--
Transit Riders or Carpoolers (millions)	30	--	--	--	--	--
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	2,290	1,850	1,490	1,284	1,095	963
Rank	41	44	51	51	51	52
Fuel per Peak Traveler (gallons)	6	5	4	4	3	3
Rank	53	57	61	62	63	66
Annual Delay						
Total Delay (1000s of person-hours)	3,428	2,826	2,291	1,944	1,647	1,500
Rank	46	48	52	55	57	55
Delay per Peak Traveler (person-hrs)	9	8	6	6	5	4
Rank	58	59	64	67	66	66
Delay due to Incidents (percent)	54	54	54	55	55	55
Travel Time Index						
Rank	55	59	62	62	60	60
Congestion Cost						
Total Cost (\$ millions)	36	28	23	19	16	14
Rank	46	48	51	55	55	55
Cost per Peak Traveler (\$)	98	79	65	54	45	40
Rank	56	58	63	66	64	66

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

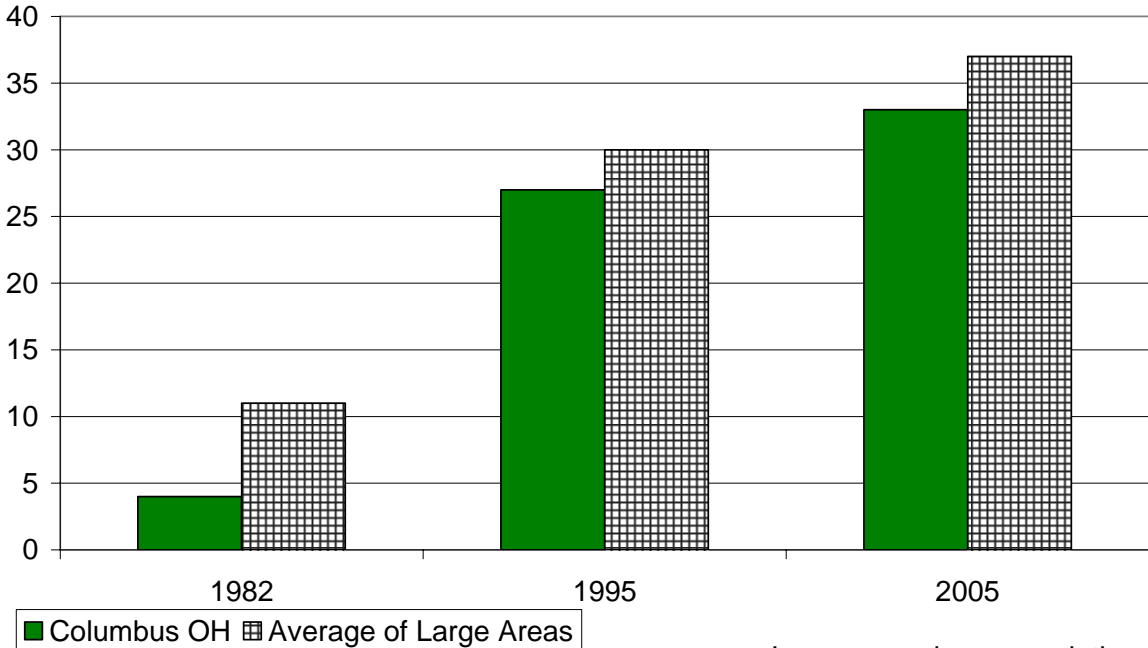
Note: Zeroes in the table reflect values less than 0.5.

Benefits From Public Transportation Service and Operations Strategies for Columbus, OH

Operations Strategies	2005	2004	2003	2002	2001	2000
Freeway Ramp Metering						
Percent of Roadway Miles	8	8	8	8	3	1
Annual Delay Reduction (1000 hours)	41	43	36	32	33	8
Freeway Incident Management						
Cameras						
Percent of Roadway Miles	19	19	17	17	17	17
Service Patrols						
Percent of Roadway Miles	94	94	94	96	--	--
Annual Delay Reduction (1000 hours)	781	807	628	577	15	14
Arterial Signal Coordination						
Percent of Roadway Miles	42	33	31	32	33	35
Annual Delay Reduction (1000 hours)	63	48	45	32	40	44
Arterial Access Management						
Percent of Roadway Miles	11	11	11	10	10	10
Annual Delay Reduction (1000 hours)	246	272	325	236	212	110
HOV Lanes						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
Total Effect of Operations Treatments						
Annual Delay Reduction (1000 hours)	1,130	1,170	1,034	877	301	176
Annual Delay Saved per Peak Traveler (hours)	2	2	2	1	0	0
Annual Congestion Cost Savings (\$million)	21.7	21.4	18.1	15.1	4.8	2.8
Travel Time Index with Strategies	1.195	1.199	1.179	1.170	1.165	1.157
Travel Time Index (Base)	1.204	1.208	1.188	1.177	1.168	1.159
Public Transportation Service						
Existing Service						
Annual Passenger-miles of Travel (million)	60	60	60	68	75	76
Unlinked Passenger Trips (million)	15	15	16	16	19	19
Travel Time Index (combined road and transit)	1.192	1.196	1.177	1.168	1.163	1.155
Condition if Public Transportation Service were Discontinued						
Travel Time Index	1.209	1.212	1.191	1.181	1.172	1.163
Annual Delay Increase (1000 hours)	616	491	510	506	582	591
Annual Delay Increase per Peak Traveler (hours)	1	1	1	1	1	1
Annual Congestion Cost Increase (\$million)	11.8	9.0	9.0	8.7	9.8	9.8

Growth in Delay per Peak Traveler

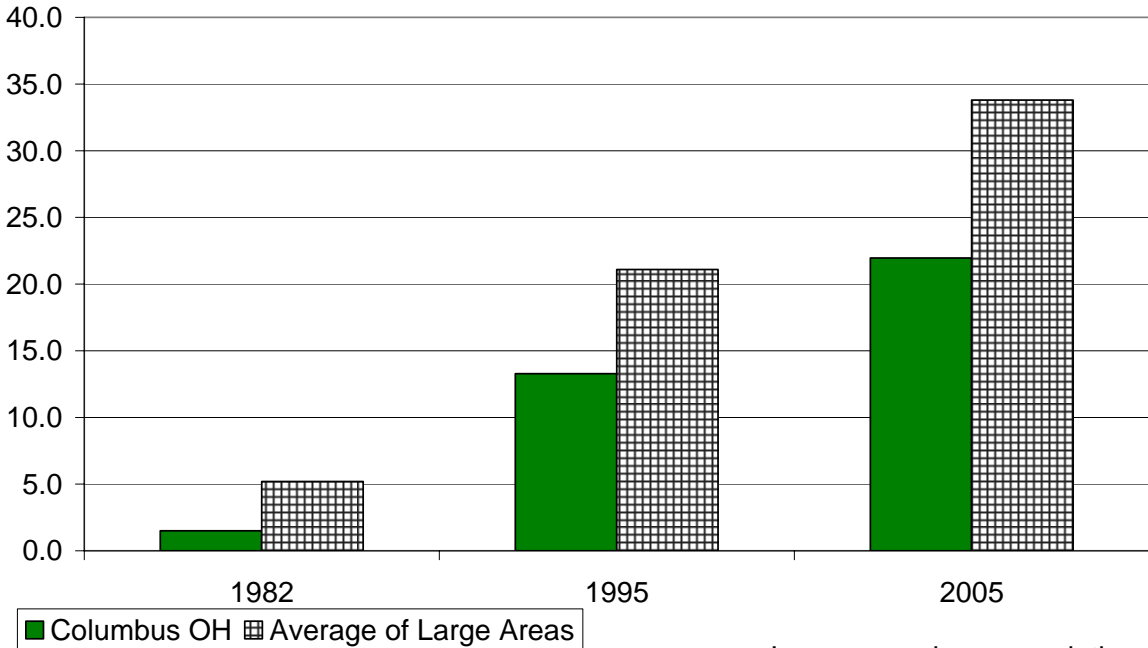
Hours of Delay



Large areas have populations between 1 and 3 million

Annual Hours of Delay (million)

Growth in Total Delay



Large areas have populations between 1 and 3 million