

## 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-
<b>Rochester, NY</b>	<b>L-</b>	<b>L-</b>	<b>L-</b>	<b>S-</b>	<b>S-</b>
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
<b>2005 Values</b> 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
<b>1982 to 2005 Trends</b> Delay per Traveler - Total Delay -	5 Hours 5 Hours x Average Population	3 Hours 3 Hours x Average Population

### The Mobility Data for Rochester, NY

<b>Inventory Measures</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>	<b>2001</b>	<b>2000</b>
<b>Urban Area Information</b>						
Population (1000s)	665	665	660	660	655	650
Rank	57	57	57	57	57	57
Urban Area (square miles)	350	350	350	350	345	345
Popn Density (persons/sq mile)	1,900	1,900	1,886	1,886	1,899	1,884
Peak Travelers (1000s)	361	359	354	350	343	336
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	5,875	5,875	5,540	5,460	5,490	5,510
Lane Miles	500	500	500	500	500	500
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	3,790	3,790	3,760	3,675	3,640	3,610
Lane Miles	1,390	1,390	1,390	1,390	1,390	1,390
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	44	46	51	51	42	41
Annual Unlinked Psgr Trips (millions)	13	13	14	14	13	13
<b>Cost Components</b>						
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)	2.40	2.14	1.62	1.49	1.72	1.64
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	24	24	22	20	20	19
<b>Congested System</b> (% of lane-miles)	25	25	25	24	24	24
<b>Congested Time</b> (number of "Rush Hours")	3.6	3.6	3.0	3.0	3.0	3.0
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	22	35	24	23	26	28
Transit Riders or Carpoolers (millions)	4	6	4	4	4	5
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	2,351	2,351	2,044	1,776	1,775	1,751
Rank	73	73	74	74	75	74
Fuel per Peak Traveler (gallons)	7	7	6	5	5	5
Rank	76	76	77	82	83	80
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	3,527	3,527	3,117	2,709	2,699	2,745
Rank	73	74	74	74	74	74
Delay per Peak Traveler (person-hrs)	10	10	9	8	8	8
Rank	80	80	82	84	83	82
Delay due to Incidents (percent)	59	59	59	58	58	58
<b>Travel Time Index</b>						
Rank	1.07	1.07	1.07	1.06	1.06	1.06
Rank	76	77	74	77	78	75
<b>Congestion Cost</b>						
Total Cost (\$ millions)	64	61	52	44	43	43
Rank	74	74	74	74	74	74
Cost per Peak Traveler (\$)	176	170	146	125	126	127
Rank	82	82	83	84	84	83

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 Rochester, NY, Continued**

<b>Inventory Measures</b>	<b>1999</b>	<b>1998</b>	<b>1997</b>	<b>1996</b>	<b>1995</b>	<b>1994</b>
<b>Urban Area Information</b>						
Population (1000s)	640	635	630	625	625	620
Rank	58	56	55	55	53	51
Urban Area (square miles)	340	340	335	335	330	330
Popn Density (persons/sq mile)	1,882	1,868	1,881	1,866	1,894	1,879
Peak Travelers (1000s)	327	321	314	308	304	298
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	5,365	5,260	5,235	5,325	5,265	5,020
Lane Miles	500	500	500	500	495	495
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	3,445	3,465	3,350	3,205	3,205	3,245
Lane Miles	1,380	1,380	1,370	1,370	1,360	1,340
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	43	43	41	41	40	43
Annual Unlinked Psgr Trips (millions)	13	14	13	13	14	14
<b>Cost Components</b>						
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)	1.19	1.15	1.31	1.37	1.27	1.15
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	18	17	18	17	17	15
<b>Congested System</b> (% of lane-miles)	24	20	21	20	20	19
<b>Congested Time</b> (number of "Rush Hours")	2.9	2.9	2.9	2.9	2.9	2.8
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	24	30	26	49	63	82
Transit Riders or Carpoolers (millions)	4	5	4	8	10	13
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	1,687	1,484	1,669	1,513	1,484	1,274
Rank	72	72	72	70	70	70
Fuel per Peak Traveler (gallons)	5	5	5	5	5	4
Rank	83	83	76	78	77	78
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	2,724	2,294	2,560	2,294	2,242	1,966
Rank	73	74	72	72	71	70
Delay per Peak Traveler (person-hrs)	8	7	8	7	7	7
Rank	84	84	80	80	78	81
Delay due to Incidents (percent)	59	58	60	60	60	58
<b>Travel Time Index</b>						
Rank	79	81	74	75	75	75
<b>Congestion Cost</b>						
Total Cost (\$ millions)	40	33	37	33	31	26
Rank	74	74	72	72	71	71
Cost per Peak Traveler (\$)	123	104	118	106	102	87
Rank	84	84	80	80	78	82

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 Rochester, NY, Continued**

<b>Inventory Measures</b>	<b>1993</b>	<b>1992</b>	<b>1991</b>	<b>1990</b>	<b>1989</b>	<b>1988</b>
<b>Urban Area Information</b>						
Population (1000s)	620	620	615	615	615	610
Rank	50	50	50	50	50	48
Urban Area (square miles)	325	325	320	320	315	315
Popn Density (persons/sq mile)	1,908	1,908	1,922	1,922	1,952	1,937
Peak Travelers (1000s)	294	290	284	280	278	274
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	4,900	4,765	4,480	4,355	4,005	3,705
Lane Miles	495	485	470	460	460	450
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	3,155	3,235	3,010	2,805	2,645	2,520
Lane Miles	1,325	1,315	1,280	1,245	1,220	1,200
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	47	51	46	48	56	50
Annual Unlinked Psgr Trips (millions)	14	15	15	15	16	16
<b>Cost Components</b>						
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)	1.21	1.24	1.21	1.07	1.13	1.04
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	15	15	15	13	12	10
<b>Congested System</b> (% of lane-miles)	19	19	19	17	17	17
<b>Congested Time</b> (number of "Rush Hours")	2.8	2.8	2.7	2.7	2.5	2.4
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	96	99	83	71	63	59
Transit Riders or Carpoolers (millions)	15	15	12	10	9	8
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	1,191	1,192	1,123	1,030	906	645
Rank	69	68	67	66	66	72
Fuel per Peak Traveler (gallons)	4	4	4	4	3	2
Rank	79	79	78	78	77	81
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	1,824	1,822	1,736	1,672	1,461	1,048
Rank	69	69	67	66	67	72
Delay per Peak Traveler (person-hrs)	6	6	6	6	5	4
Rank	80	79	79	78	78	81
Delay due to Incidents (percent)	58	58	57	57	57	56
<b>Travel Time Index</b>						
Rank	74	74	69	71	70	75
<b>Congestion Cost</b>						
Total Cost (\$ millions)	24	23	22	20	16	11
Rank	71	70	67	66	66	73
Cost per Peak Traveler (\$)	81	80	76	72	59	41
Rank	81	79	79	80	79	81

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 Rochester, NY, Continued**

<b>Inventory Measures</b>	<b>1987</b>	<b>1986</b>	<b>1985</b>	<b>1984</b>	<b>1983</b>	<b>1982</b>
<b>Urban Area Information</b>						
Population (1000s)	605	600	600	600	620	640
Rank	48	47	47	47	44	42
Urban Area (square miles)	310	310	310	305	300	290
Popn Density (persons/sq mile)	1,952	1,935	1,935	1,967	2,067	2,207
Peak Travelers (1000s)	269	265	263	261	268	273
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	3,600	3,425	3,265	3,120	2,870	2,760
Lane Miles	440	435	430	425	415	405
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	2,520	2,520	2,570	2,400	2,350	2,415
Lane Miles	1,175	1,155	1,120	1,085	1,075	1,050
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	57	54	55	58	58	58
Annual Unlinked Psgr Trips (millions)	18	18	17	18	18	18
<b>Cost Components</b>						
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)	1.05	1.02	1.34	1.35	1.38	1.44
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	10	10	9	8	8	8
<b>Congested System</b> (% of lane-miles)	17	17	17	16	16	16
<b>Congested Time</b> (number of "Rush Hours")	2.4	2.3	2.3	2.2	2.2	2.2
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	55	--	--	--	--	--
Transit Riders or Carpoolers (millions)	7	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	660	616	550	446	403	411
Rank	68	66	68	68	68	67
Fuel per Peak Traveler (gallons)	2	2	2	2	2	2
Rank	77	77	78	80	79	79
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	1,097	1,028	892	737	689	703
Rank	68	67	69	69	68	68
Delay per Peak Traveler (person-hrs)	4	4	3	3	3	3
Rank	77	77	78	81	79	80
Delay due to Incidents (percent)	55	55	56	55	54	54
<b>Travel Time Index</b>						
Rank	72	68	71	74	73	71
<b>Congestion Cost</b>						
Total Cost (\$ millions)	11	10	9	7	6	6
Rank	68	68	68	69	69	69
Cost per Peak Traveler (\$)	42	38	34	27	24	23
Rank	77	77	78	81	80	80

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

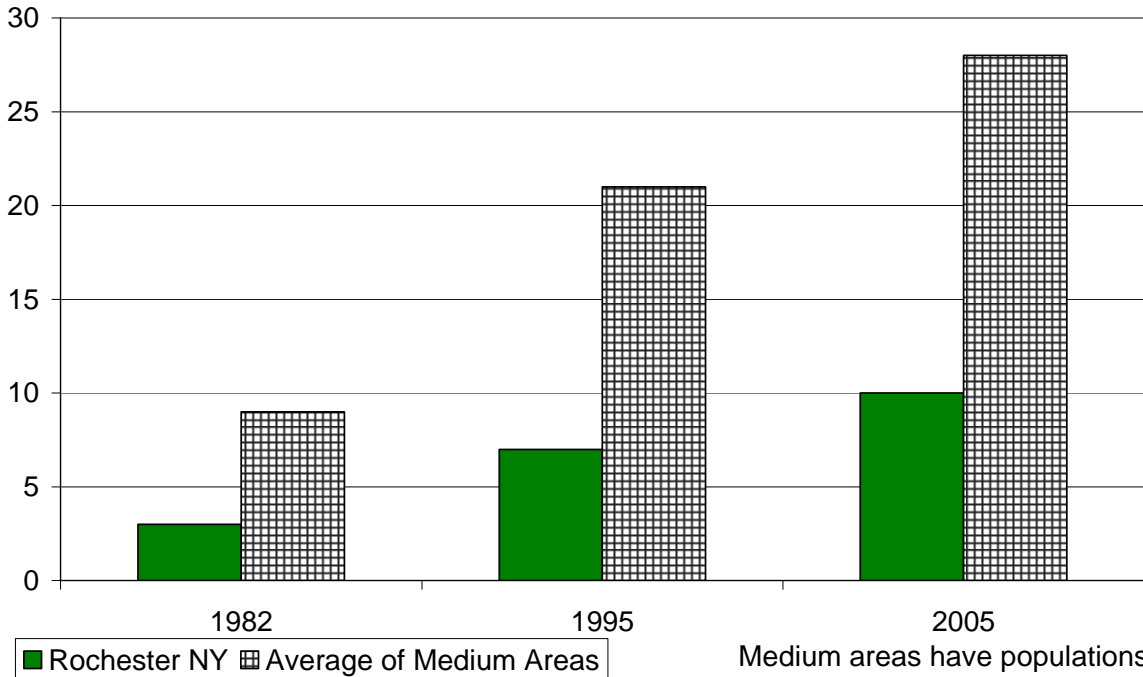
Note: Zeroes in the table reflect values less than 0.5.

**Benefits From Public Transportation Service and Operations Strategies for Rochester, NY**

<b>Operations Strategies</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>	<b>2001</b>	<b>2000</b>
<b>Freeway Ramp Metering</b>						
Percent of Roadway Miles	--	--	--	--	--	--
Annual Delay Reduction (1000 hours)	--	--	--	--	--	--
<b>Freeway Incident Management</b>						
<b>Cameras</b>						
Percent of Roadway Miles	18	18	18	18	--	--
<b>Service Patrols</b>						
Percent of Roadway Miles	36	36	12	12	12	12
Annual Delay Reduction (1000 hours)	65	65	23	17	14	15
<b>Arterial Signal Coordination</b>						
Percent of Roadway Miles	77	77	76	76	76	73
Annual Delay Reduction (1000 hours)	27	27	22	27	30	27
<b>Arterial Access Management</b>						
Percent of Roadway Miles	15	15	15	14	14	14
Annual Delay Reduction (1000 hours)	32	32	28	32	43	31
<b>HOV Lanes</b>						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
<b>Total Effect of Operations Treatments</b>						
Annual Delay Reduction (1000 hours)	124	124	73	75	87	73
Annual Delay Saved per Peak Traveler (hours)	0	0	0	0	0	0
Annual Congestion Cost Savings (\$million)	2.2	2.1	1.2	1.2	1.4	1.1
Travel Time Index with Strategies	1.074	1.074	1.066	1.058	1.058	1.058
Travel Time Index (Base)	1.076	1.076	1.068	1.060	1.060	1.059
<b>Public Transportation Service</b>						
<b>Existing Service</b>						
Annual Passenger-miles of Travel (million)	44	46	51	51	42	41
Unlinked Passenger Trips (million)	13	13	14	14	13	13
Travel Time Index (combined road and transit)	1.072	1.072	1.065	1.057	1.057	1.057
<b>Condition if Public Transportation Service were Discontinued</b>						
Travel Time Index	1.081	1.081	1.072	1.063	1.062	1.061
Annual Delay Increase (1000 hours)	283	290	259	187	154	141
Annual Delay Increase per Peak Traveler (hours)	1	1	1	1	0	0
Annual Congestion Cost Increase (\$million)	5.1	5.1	4.3	3.0	2.5	2.2

### Growth in Delay per Peak Traveler

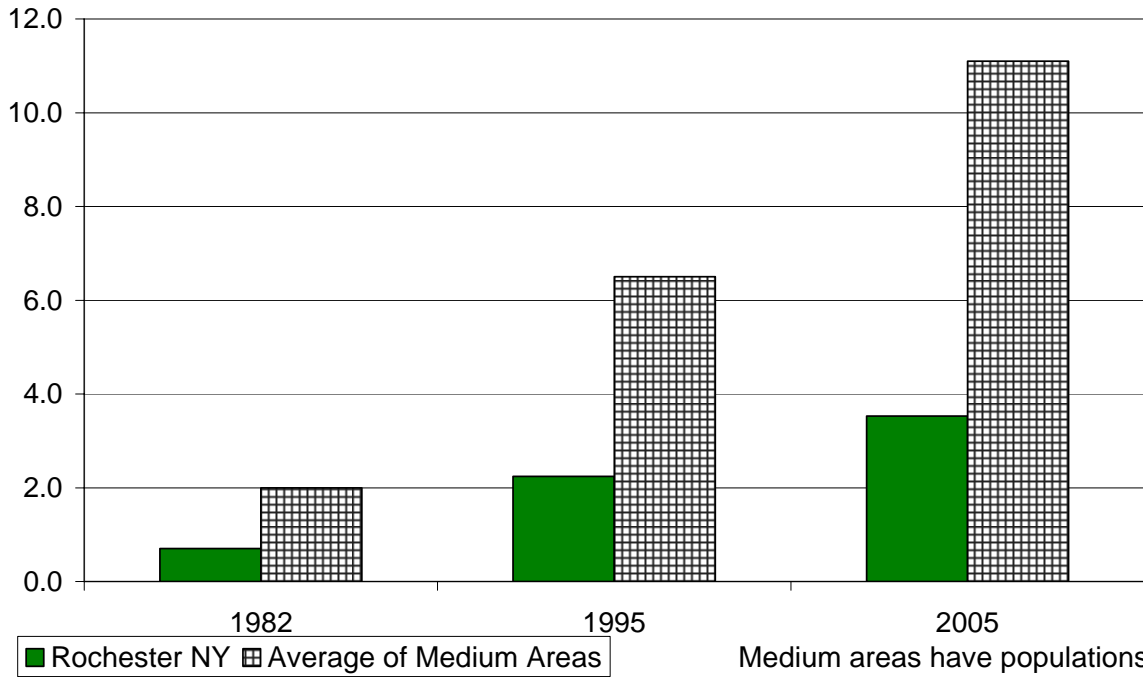
Hours of Delay



Medium areas have populations between 0.5 and 1 million

Annual Hours of Delay (million)

### Growth in Total Delay



Medium areas have populations between 0.5 and 1 million