

## 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+
<b>Austin, TX</b>	<b>H+</b>	<b>H+</b>	<b>H+</b>	<b>F+</b>	<b>F+</b>
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
<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 Austin, TX

<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)	855	850	840	825	800	770
Rank	49	48	48	47	49	49
Urban Area (square miles)	450	450	445	440	435	430
Popn Density (persons/sq mile)	1,900	1,889	1,888	1,875	1,839	1,791
Peak Travelers (1000s)	464	459	451	438	419	398
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	9,390	9,175	9,200	9,260	9,300	8,800
Lane Miles	585	585	585	585	580	575
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	7,115	7,000	6,800	6,550	6,350	6,200
Lane Miles	1,180	1,150	1,130	1,105	1,080	1,060
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	113	121	124	118	114	119
Annual Unlinked Psgr Trips (millions)	33	36	37	36	34	38
<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)	2.23	1.83	1.45	1.32	1.46	1.47
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	66	66	66	66	66	61
<b>Congested System</b> (% of lane-miles)	55	53	53	55	55	52
<b>Congested Time</b> (number of "Rush Hours")	7.2	7.2	7.2	7.2	7.2	7.2
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	34	50	59	69	74	79
Transit Riders or Carpoolers (millions)	11	16	19	22	24	25
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	15,505	14,033	13,472	12,875	12,932	11,062
Rank	32	34	33	31	31	33
Fuel per Peak Traveler (gallons)	33	31	30	29	31	28
Rank	15	16	15	15	13	15
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	22,580	20,239	19,465	18,657	18,721	16,504
Rank	31	36	33	31	31	33
Delay per Peak Traveler (person-hrs)	49	44	43	43	45	41
Rank	13	18	16	15	13	15
Delay due to Incidents (percent)	56	56	56	56	56	56
<b>Travel Time Index</b>						
Rank	1.31	1.29	1.28	1.27	1.27	1.24
Rank	15	18	19	17	16	20
<b>Congestion Cost</b>						
Total Cost (\$ millions)	422	360	333	310	308	264
Rank	31	36	35	33	31	33
Cost per Peak Traveler (\$)	909	785	739	709	735	662
Rank	13	22	19	17	14	18

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 Austin, TX, 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)	745	725	705	665	635	610
Rank	49	49	48	50	52	53
Urban Area (square miles)	425	420	415	410	400	390
Popn Density (persons/sq mile)	1,753	1,726	1,699	1,622	1,588	1,564
Peak Travelers (1000s)	381	366	351	327	309	293
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	8,250	7,850	7,500	7,275	6,875	6,600
Lane Miles	560	555	545	540	540	540
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	5,800	5,680	5,450	5,300	5,000	4,800
Lane Miles	1,050	1,035	1,020	1,000	990	975
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	108	107	118	110	102	90
Annual Unlinked Psgr Trips (millions)	36	30	33	31	28	27
<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)	1.07	1.01	1.12	1.21	1.14	1.03
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	58	56	54	49	45	41
<b>Congested System</b> (% of lane-miles)	52	52	50	45	45	43
<b>Congested Time</b> (number of "Rush Hours")	6.8	6.4	6.2	6.0	5.4	5.0
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	69	64	64	65	68	73
Transit Riders or Carpoolers (millions)	21	19	18	18	18	19
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	10,366	9,226	9,186	8,044	6,690	5,562
Rank	35	36	36	38	40	42
Fuel per Peak Traveler (gallons)	27	25	26	25	22	19
Rank	20	21	16	18	25	30
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	15,501	13,519	13,903	11,793	9,724	8,033
Rank	37	38	36	39	42	43
Delay per Peak Traveler (person-hrs)	41	37	40	36	32	27
Rank	18	21	14	20	28	31
Delay due to Incidents (percent)	56	56	57	57	57	56
<b>Travel Time Index</b>						
	1.24	1.22	1.23	1.20	1.18	1.15
Rank	23	25	19	22	29	35
<b>Congestion Cost</b>						
Total Cost (\$ millions)	235	200	205	171	137	109
Rank	36	38	36	39	42	43
Cost per Peak Traveler (\$)	618	546	584	524	443	371
Rank	18	22	15	20	28	32

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 Austin, TX, 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)	600	590	575	550	520	525
Rank	53	52	52	54	55	54
Urban Area (square miles)	380	375	370	350	345	345
Popn Density (persons/sq mile)	1,579	1,573	1,554	1,571	1,507	1,522
Peak Travelers (1000s)	284	276	266	251	235	236
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	6,500	6,100	5,830	5,320	4,900	4,555
Lane Miles	540	510	470	430	400	400
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	4,600	4,500	4,400	4,250	4,100	3,950
Lane Miles	960	940	920	900	885	860
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	90	91	80	77	60	47
Annual Unlinked Psgr Trips (millions)	26	26	23	21	14	11
<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)	1.10	1.09	1.12	1.04	1.07	0.99
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	38	36	35	34	34	31
<b>Congested System</b> (% of lane-miles)	40	38	33	33	33	33
<b>Congested Time</b> (number of "Rush Hours")	4.8	4.8	5.2	5.0	5.0	4.2
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	83	77	63	59	61	57
Transit Riders or Carpoolers (millions)	21	20	16	15	15	13
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	4,595	4,066	4,173	3,653	3,117	2,554
Rank	44	42	41	43	44	44
Fuel per Peak Traveler (gallons)	16	15	16	15	13	11
Rank	32	35	27	31	30	36
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	6,567	5,901	6,288	5,409	4,655	3,866
Rank	44	47	42	45	45	48
Delay per Peak Traveler (person-hrs)	23	21	24	22	20	16
Rank	38	36	32	34	34	40
Delay due to Incidents (percent)	57	56	57	56	56	55
<b>Travel Time Index</b>						
Rank	1.13	1.12	1.13	1.12	1.11	1.09
Rank	42	41	34	34	36	39
<b>Congestion Cost</b>						
Total Cost (\$ millions)	87	76	79	66	52	41
Rank	46	47	41	45	45	48
Cost per Peak Traveler (\$)	304	274	297	261	223	175
Rank	39	36	32	34	34	39

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 Austin, TX, 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)	480	470	465	455	430	410
Rank	61	62	59	58	63	63
Urban Area (square miles)	340	330	325	320	300	300
Popn Density (persons/sq mile)	1,412	1,424	1,431	1,422	1,433	1,367
Peak Travelers (1000s)	214	208	204	198	186	175
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	4,375	4,550	4,200	3,730	3,615	3,000
Lane Miles	400	400	380	355	330	300
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	3,800	3,650	3,500	3,400	3,200	3,000
Lane Miles	840	815	800	760	750	730
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	35	30	23	16	16	16
Annual Unlinked Psgr Trips (millions)	10	10	8	5	5	5
<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)	0.99	0.97	1.27	1.28	1.31	1.37
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	30	32	29	23	24	20
<b>Congested System</b> (% of lane-miles)	35	33	32	25	25	21
<b>Congested Time</b> (number of "Rush Hours")	4.0	4.2	3.8	3.6	3.8	3.0
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	80	--	--	--	--	--
Transit Riders or Carpoolers (millions)	18	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	2,519	2,749	2,444	2,083	1,974	1,382
Rank	40	37	39	39	37	40
Fuel per Peak Traveler (gallons)	12	13	12	11	11	8
Rank	30	21	18	23	17	29
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	3,782	4,037	3,862	3,479	3,100	2,101
Rank	40	38	37	37	36	41
Delay per Peak Traveler (person-hrs)	18	19	19	18	17	12
Rank	32	24	24	20	18	31
Delay due to Incidents (percent)	56	57	58	59	59	58
<b>Travel Time Index</b>						
Rank	35	27	28	28	24	32
<b>Congestion Cost</b>						
Total Cost (\$ millions)	39	41	39	34	29	19
Rank	41	38	37	37	36	40
Cost per Peak Traveler (\$)	184	196	190	172	158	111
Rank	33	24	24	21	18	31

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

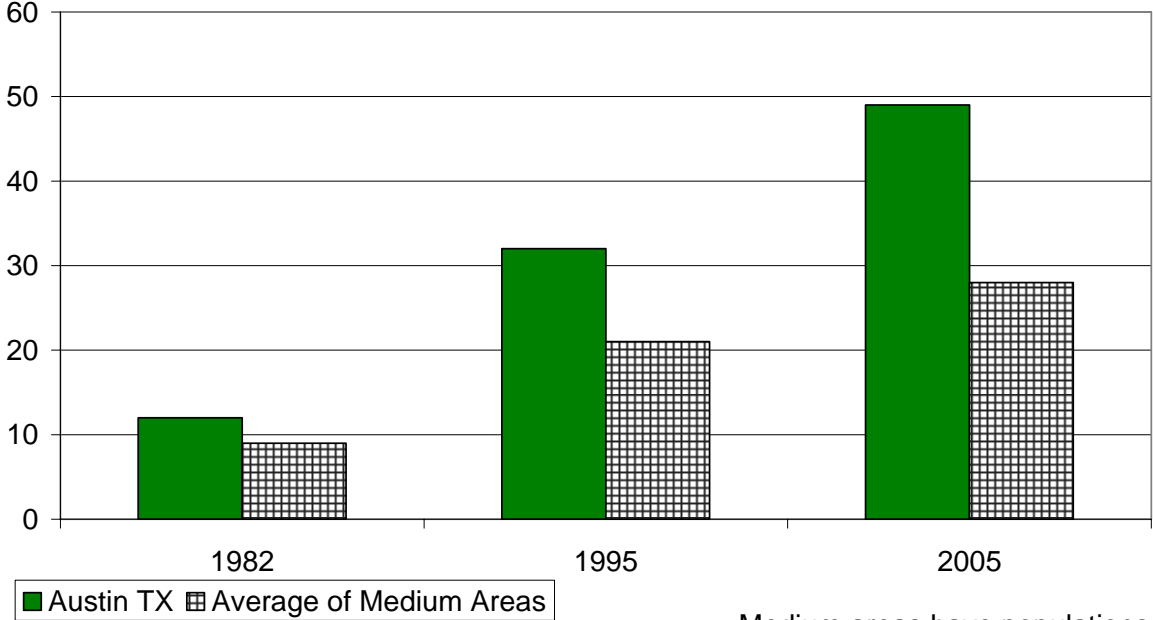
Note: Zeroes in the table reflect values less than 0.5.

## Benefits From Public Transportation Service and Operations Strategies for Austin, TX

<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	32	32	31	31	31	32
<b>Service Patrols</b>						
Percent of Roadway Miles	66	66	66	66	66	67
Annual Delay Reduction (1000 hours)	818	668	636	580	593	517
<b>Arterial Signal Coordination</b>						
Percent of Roadway Miles	68	64	62	63	65	66
Annual Delay Reduction (1000 hours)	125	116	130	116	112	96
<b>Arterial Access Management</b>						
Percent of Roadway Miles	31	31	31	30	30	29
Annual Delay Reduction (1000 hours)	136	169	177	149	164	174
<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)	1,080	953	942	844	869	786
Annual Delay Saved per Peak Traveler (hours)	2	2	2	2	2	2
Annual Congestion Cost Savings (\$million)	20.3	17.1	16.3	14.2	14.5	12.7
Travel Time Index with Strategies	1.312	1.285	1.276	1.266	1.271	1.239
Travel Time Index (Base)	1.325	1.297	1.288	1.277	1.282	1.248
<b>Public Transportation Service</b>						
<b>Existing Service</b>						
Annual Passenger-miles of Travel (million)	113	121	124	118	114	119
Unlinked Passenger Trips (million)	33	36	37	36	34	38
Travel Time Index (combined road and transit)	1.302	1.276	1.267	1.257	1.262	1.230
<b>Condition if Public Transportation Service were Discontinued</b>						
Travel Time Index	1.341	1.313	1.302	1.291	1.295	1.259
Annual Delay Increase (1000 hours)	1,709	1,636	1,555	1,447	1,411	1,166
Annual Delay Increase per Peak Traveler (hours)	4	4	3	3	3	3
Annual Congestion Cost Increase (\$million)	32.2	29.5	27.0	24.5	23.5	18.8

### Growth in Delay per Peak Traveler

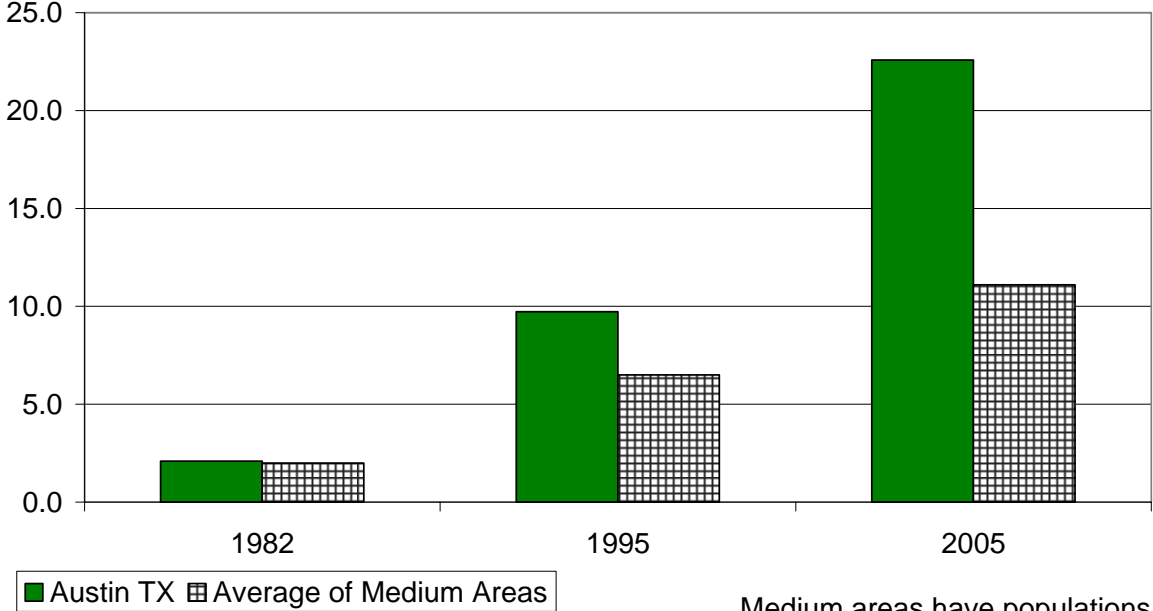
Hours of Delay



Medium areas have populations between 0.5 and 1 million

### Growth in Total Delay

Annual Hours of Delay (million)



Medium areas have populations between 0.5 and 1 million