DRIVEN APART

HOW SPRAWL IS LENGTHENING OUR COMMUTES AND WHY MISLEADING MOBILITY MEASURES ARE MAKING THINGS WORSE.

EXECUTIVE SUMMARY

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CEOs FOR CITIES

The secret to reducing the amount of time Americans spend in peak hour traffic has more to do with how we build our cities than how we build our roads.

While peak hour travel is a perennial headache for many Americans – peak hour travel times average 200 hours a year in large metropolitan areas – some cities have managed to achieve shorter travel times and actually reduce the peak hour travel times. The key is that some metropolitan areas have land use patterns and transportation systems that enable their residents to take shorter trips and minimize the burden of peak hour travel.

That's not the conclusion promoted by years of highway-oriented transportation research. The Urban Mobility Report (UMR) produced annually by the Texas Transportation Institute and widely used to gauge metropolitan traffic problems has completely overlooked the role that variations in travel distances play in driving urban transportation problems.

This report offers a new view of urban transportation performance. It explores the key role that land use and variations in travel distances play in determining how long Americans spend in peak hour travel. It shows how the key tool contained in the Urban Mobility Report – the Travel Time Index – actually penalizes cities that have shorter travel distances and conceals the additional burden caused by longer trips in sprawling metropolitan areas. Finally, it critically examines the reliability and usefulness of the methodology used in the Urban Mobility Report, finding it does not accurately estimate travel speeds, it exaggerates travel delays, and it overestimates the fuel consumption associated with urban travel. How we measure transportation systems matters, and the nation needs a better set of measures than it has today.

HOW LAND USE PATTERNS AND TRAVEL DISTANCE AFFECT PEAK TRAFFIC

- Travelers in some cities – those with more compact development patterns – tend to spend less time in peak hour traffic because they don't have to travel as far.

- IF EVERY ONE OF THE TOP 50 METRO AREAS ACHIEVED THE SAME LEVEL OF PEAK HOUR TRAVEL DISTANCES AS THE BEST PERFORMING CITIES, THEIR RESIDENTS WOULD DRIVE ABOUT **40 BILLION FEWER MILES** PER YEAR AND USE **TWO BILLION FEWER GALLONS OF FUEL,** AT A SAVINGS OF **$31 BILLION ANNUALLY.**

- In the best performing cities the typical traveler spends 40 fewer hours per year in peak hour travel than the average American because of the shorter distances they have to travel.

In the best performing cities – those that have achieved the shortest peak hour travel distances – such as Chicago, Portland and Sacramento, the typical traveler spends 40 fewer hours per year in peak hour travel than the average American. In contrast, in the most sprawling metropolitan areas, such as Nashville, Indianapolis and Raleigh, the average resident spends as much as 240 hours per year in peak period travel because travel distances are so much greater. These data suggest that reducing average trip lengths is a key to reducing the burden of peak period travel. Over the past two decades, for example, Portland, Oregon, which has smart land use planning and has invested in alternative transportation, has seen its average trip lengths decline by 20 percent.

RANKING METROPOLITAN AREAS ON PEAK PERIOD TRAVEL TIMES

The following chart shows the nation's 51 largest metropolitan areas, all with a population of one million or more, and the average amount of peak period travel per traveler in hours per year. The dark-shaded portion of each bar illustrates the number of additional hours of travel that are associated with longer travel distances, compared to the most compact metropolitan areas.

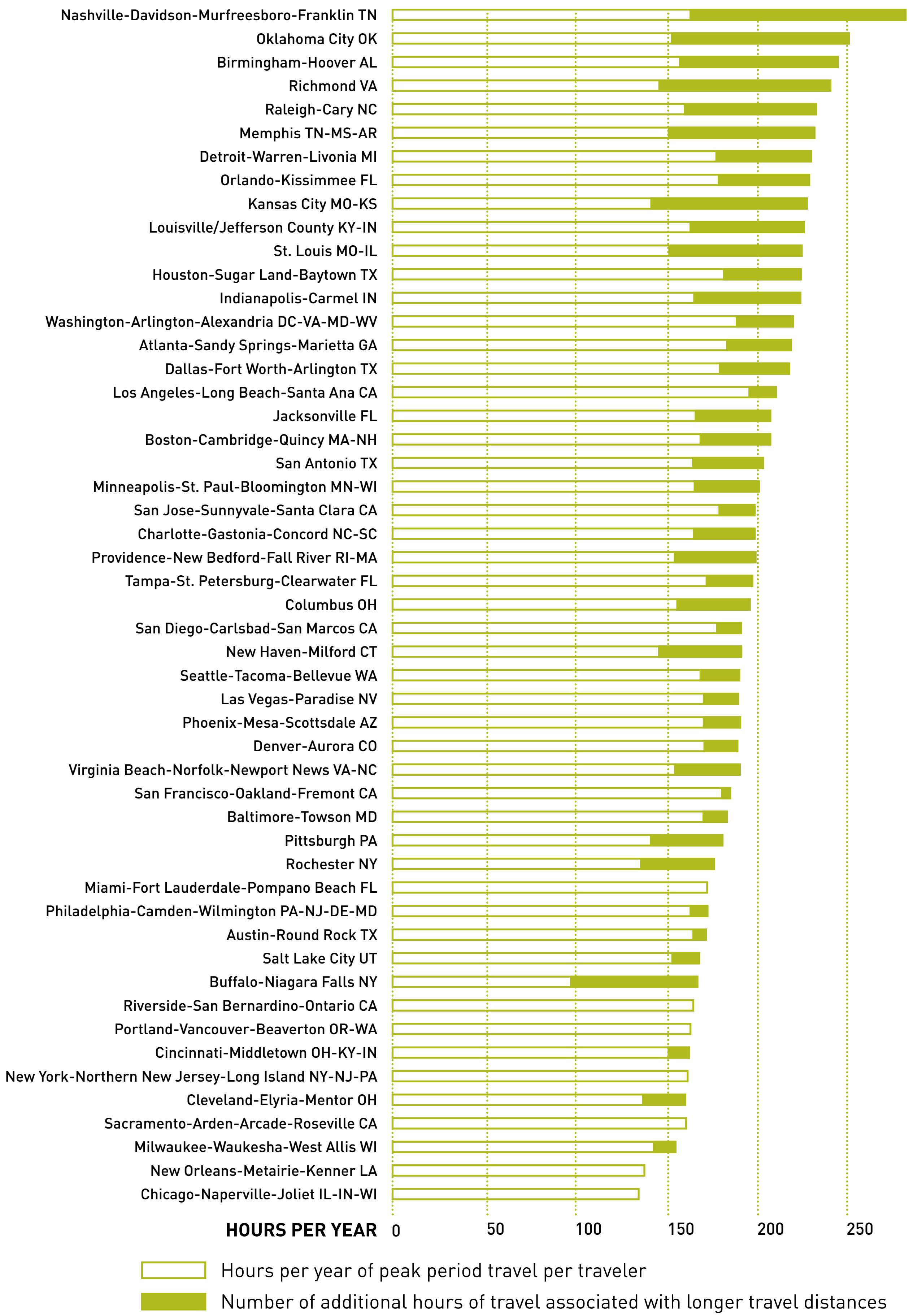
The additional travel time associated with longer average trip distances is the chief determinant of which metropolitan areas have the longest travel times. Longer trip distances add 80 hours a year or more to peak travel times in Nashville, Oklahoma City, Richmond, and Birmingham. Areas with the shortest average travel distances, including Chicago, New Orleans, Sacramento and New York, have among the lowest total hours of peak period travel.

These results are a stark contrast to the picture of urban transportation painted by the UMR, which has long been used to measure traffic problems and compare cities. **A close examination shows that the UMR has a number of key flaws that misstate and exaggerate the effects of congestion, and it ignores the critical role that sprawl and travel distances play in aggravating peak period travel.**

$$\text{TRAVEL TIME INDEX} = \left(\frac{\text{CONGESTION TRAVEL TIME}}{\text{FREE FLOW TRAVEL TIME}} \right)$$

THE TRAVEL TIME INDEX MAKES NO ALLOWANCE FOR THE EFFECTS OF LONGER TRAVEL DISTANCES ON TRAVEL TIMES.

PEAK PERIOD TRAVEL TIMES



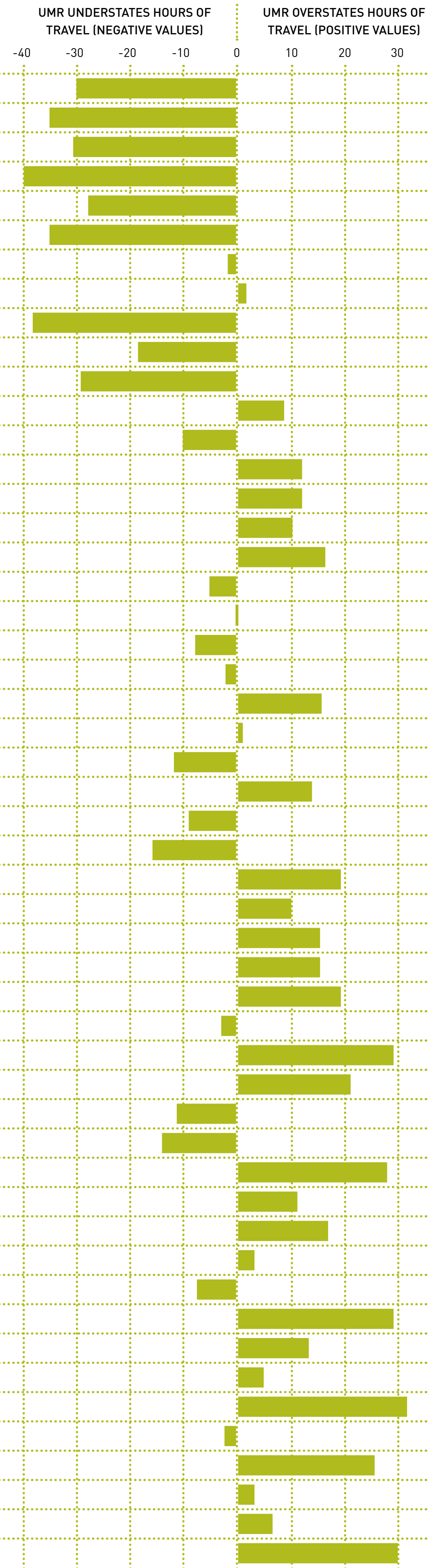
COMPARISONS IN CITY RANKINGS

Using total hours of peak travel to measure urban transportation performance produces an entirely different ranking of metropolitan areas with the worst performing transportation systems. Five of the areas with the longest total travel times - Nashville, Oklahoma City, Birmingham, Richmond and Memphis - were rated by the UMR to have among the least severe congestion problems. Conversely, several of the cities that UMR ranked high for congestion - including Chicago, New York, and Sacramento - have among the lowest peak period travel times. This table compares the rankings of metropolitan areas in the severity of traffic problems based on the analysis presented here and in the Urban Mobility Report.

This table shows how each of the 51 largest metropolitan areas ranks in terms of the severity of traffic problems based on this analysis and from the data contained in the 2009 Urban Mobility Report. The metropolitan areas are ranked according to the average peak period travel times, expressed in hours per year, with the areas having the longest travel times ranked highest. The second column of the table shows the ranking of congestion-related delays, according to the Urban Mobility Report, again with the metropolitan areas with the highest levels of delays ranked highest. The third column shows the difference in ranks between the two measures. Positive numbers show metropolitan areas whose performance improved, compared to their UMR ranking, negative numbers show those metropolitan areas whose performance declined compared to their UMR ranking. The bar chart to the right of the table illustrates the difference in ranks between the two measures.

DRIVEN APART VS. UMR

	DRIVEN APART: RANK BY TOTAL PEAK TRAVEL TIME	UMR: RANK BY ESTIMATED HOURS OF CONGESTION	DIFFERENCE IN RANKS
Nashville-Davidson-Murfreesboro-Franklin TN	1	31	-30
Oklahoma City OK	2	38	-36
Birmingham-Hoover AL	3	34	-31
Richmond VA	4	44	-40
Raleigh-Cary NC	5	33	-28
Memphis TN-MS-AR	6	41	-35
Detroit-Warren-Livonia MI	7	9	-2
Orlando-Kissimmee FL	8	6	2
Kansas City MO-KS	9	47	-38
Louisville/Jefferson County KY-IN	10	28	-18
St. Louis MO-IL	11	40	-29
Houston-Sugar Land-Baytown TX	12	4	8
Indianapolis-Carmel IN	13	23	-10
Washington-Arlington-Alexandria DC-VA-MD-WV	14	2	12
Atlanta-Sandy Springs-Marietta GA	15	3	12
Dallas-Fort Worth-Arlington TX	16	6	10
Los Angeles-Long Beach-Santa Ana CA	17	1	16
Jacksonville FL	18	23	-5
Boston-Cambridge-Quincy MA-NH	19	19	0
San Antonio TX	20	28	-8
Minneapolis-St. Paul-Bloomington MN-WI	21	23	-2
San Jose-Sunnyvale-Santa Clara CA	22	6	16
Charlotte-Gastonia-Concord NC-SC	23	22	1
Providence-New Bedford-Fall River RI-MA	24	36	-12
Tampa-St. Petersburg-Clearwater FL	25	11	14
Columbus OH	26	35	-9
San Diego-Carlsbad-San Marcos CA	27	43	-16
New Haven-Milford CT	28	9	19
Seattle-Tacoma-Bellevue WA	29	19	10
Las Vegas-Paradise NV	30	14	16
Phoenix-Mesa-Scottsdale AZ	30	14	16
Denver-Aurora CO	32	13	19
Virginia Beach-Norfolk-Newport News VA-NC	33	36	-3
San Francisco-Oakland-Fremont CA	34	5	29
Baltimore-Towson MD	35	14	21
Pittsburgh PA	36	47	-11
Rochester NY	37	51	-14
Miami-Fort Lauderdale-Pompano Beach FL	38	11	27
Philadelphia-Camden-Wilmington PA-NJ-DE-MD	39	28	11
Austin-Round Rock TX	40	23	17
Salt Lake City UT	41	38	3
Buffalo-Niagara Falls NY	42	50	-8
Riverside-San Bernardino-Ontario CA	43	14	29
Portland-Vancouver-Beaverton OR-WA	44	31	13
Cincinnati-Middletown OH-KY-IN	45	41	4
New York-Northern New Jersey-Long Island NY-NJ-PA	46	14	32
Cleveland-Elyria-Mentor OH	47	49	-2
Sacramento-Arden-Arcade-Roseville CA	48	23	25
Milwaukee-Waukesha-West Allis WI	49	46	3
New Orleans-Metairie-Kenner LA	50	44	6
Chicago-Naperville-Joliet IL-IN-WI	51	21	30



THE TRAVEL TIME INDEX:

A FLAWED TOOL FOR DIAGNOSING TRANSPORTATION PROBLEMS

The central analytical tool in the Urban Mobility Report is the Travel Time Index (TTI), which is the ratio of average peak hour travel times to average free flow travel times. For large metropolitan areas, the average Travel Time Index was 1.25 in 2007 according to the UMR. This means, for example, that a trip that takes 20 minutes in free flow conditions is estimated to require, on average, 25 minutes during peak travel times (25/20 = 1.25).

On its face, the Travel Time Index seems like a reasonable way to compare city transportation systems. And if all cities had similar land use patterns and densities and had the same average trip lengths, then the TTI would be a fair measure. But city land use patterns vary substantially, and as a result the Travel Time Index conceals major differences in urban transportation between different cities. To illustrate this, we examine the UMR data for Charlotte and Chicago. Chicago has a TTI of 1.43 (the second highest overall, behind only Los Angeles), while Charlotte has a TTI of 1.25 (just about equal to the average for all large metropolitan areas). This would appear to indicate that urban travel conditions are far worse in Chicago. But the traffic delays in the two regions are almost identical (40 and 41 hours per year, or about 10 minutes per day). Chicago has average travel distances (for peak hour trips) of 13.5 miles, while Charlotte has average travel distances of 19 miles. Because they travel nearly 50 percent farther then their counterparts in Chicago, Charlotte travelers end up spending a lot more time in traffic, about 48 minutes per day, rather than 33 minutes per day.

According to the UMR, the worst traffic was in Los Angeles, Washington and Atlanta. But a re-analysis of the data shows that residents in at least ten other metropolitan areas, including Richmond, Raleigh-Durham, Detroit and Kansas City, spent the most time traveling in peak hours. Again, the key reason for the difference is the much longer-than-average peak period travel distances in those cities.

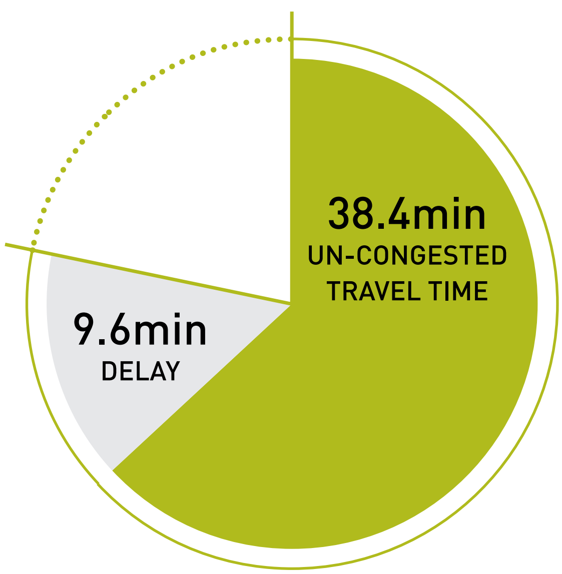
ACCORDING TO THE UMR, THINGS ARE MUCH WORSE IN CHICAGO THAN IN CHARLOTTE.

A COMPARISON OF CHARLOTTE AND CHICAGO

AVERAGE TRIP

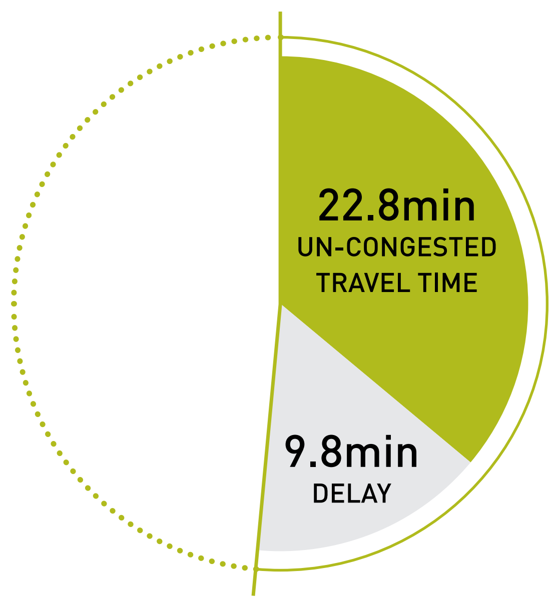
TRAVEL TIME

CHARLOTTE



48.0min
Total Travel Time

CHICAGO



32.6min
Total Travel Time

TRAVEL TIME INDEX

CHARLOTTE
1.25

CHICAGO
1.43

LIMITATIONS OF THE URBAN MOBILITY REPORT'S METHODOLOGY

Our detailed analysis of the methodology of the Urban Mobility Report suggests that it is an unreliable guide to understanding the nature and extent of transportation problems in the nation's metropolitan areas.

The Urban Mobility Report's key measure – the Travel Time Index – is a poor guide to policy, and its speed and fuel economy estimates are flawed. In the aggregate, the analysis appears to overstate the costs of traffic congestion three-fold and ignores the larger transportation costs associated with sprawl. Specifically:

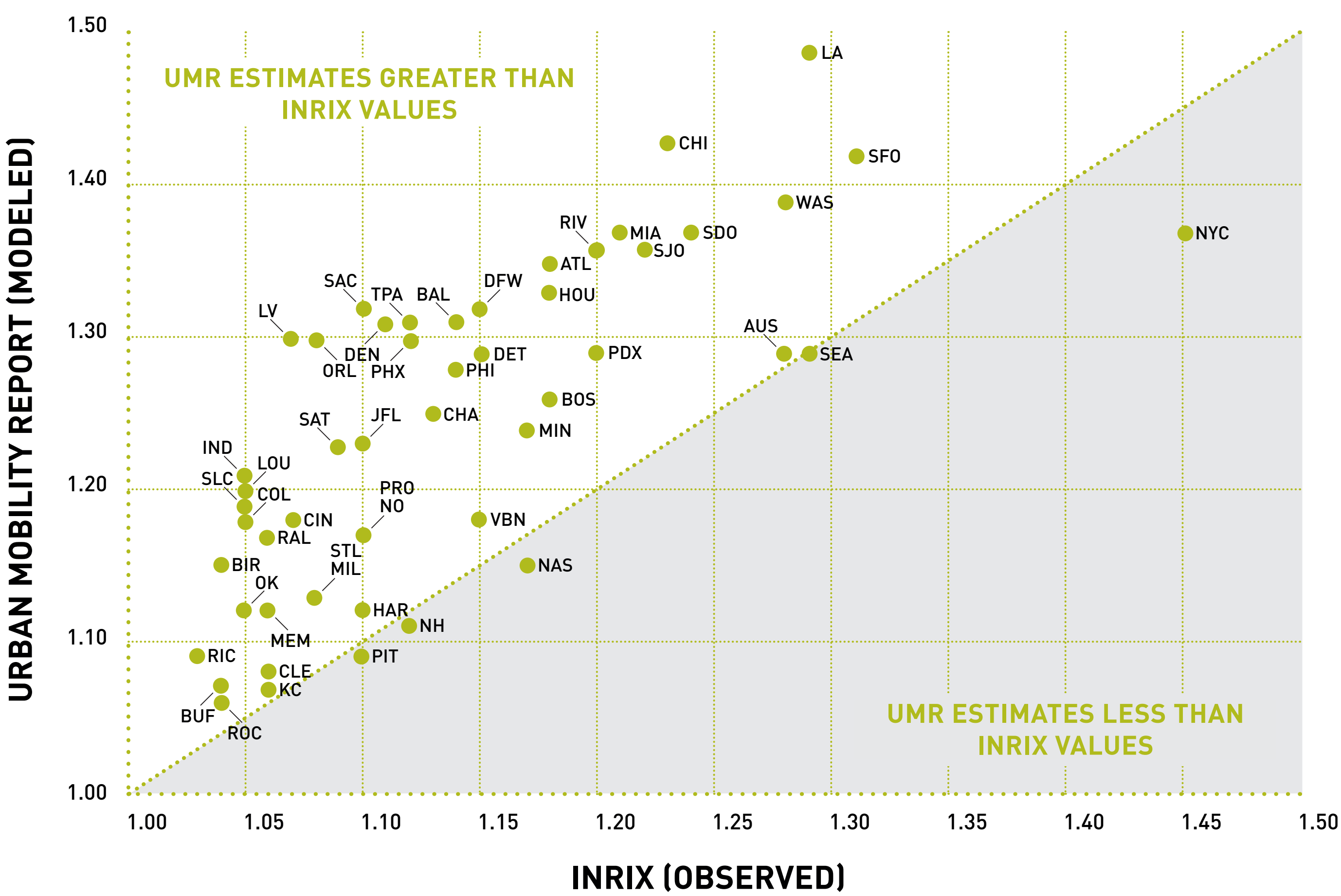
- The Travel Time Index used in the UMR is based on a questionable model of how traffic volumes affect traffic speeds, and it uses an unrealistic and unattainable baseline of zero delay computing congestion costs. The structure of the Travel Time Index inherently conceals the effect of sprawl and travel distance on travel time.

- The key statistic underpinning the UMR's findings is based on the difference in travel times between peak and non-peak periods, but the study's travel time estimates are based on volume data, not on actually observed travel speeds.

- The model used to convert volume data to estimated speeds was calibrated by "visual inspection" of the data, and the line chosen to reflect the data isn't based on statistical analysis; a line fit with a simple quadratic equation would produce much higher estimates of peak hour speeds and consequently lower levels of peak hour delay.

- The UMR speed/volume model relies on daily, rather than hourly (or minute–by–minute) traffic volumes, meaning that the authors must make strong assumptions about the distribution of traffic between peak and non-peak hours.

- The claims the UMR makes about trends in travel times over time and across cities do not correlate with other independent measures of travel times. Survey data on observed speeds from Inrix, a private aggregator of travel time data gathered from commercial vehicles, and self-reported travel times from the Census and National Travel Survey are not consistent with the conclusions of the Urban Mobility Report. Neither the total change in travel time, measured nationally, nor the pattern of changes in travel time across metropolitan areas is consistent with the estimates of increased delay presented in the Urban Mobility Report.
    - Data from speed measurements monitored by Inrix suggest that the UMR methodology overstates the Travel Time Index by about 70 percent.
    - This chart shows the Travel Time Index as estimated by the Urban Mobility Report with that computed by Inrix. For almost all metropolitan areas, the Travel Time Index estimated by the UMR is higher than that computed by Inrix.



LIMITATIONS OF THE URBAN MOBILITY REPORT'S METHODOLOGY (CONT.)

    - Data from the National Household Travel Survey show that nearly all of the increase in peak commuting times was due to longer trips rather that slower travel speeds.
    - The pattern of changes in reported commuting times between 1990 and 2000 Census shows that there is no correlation between changes in travel delays estimated in the UMR and changes in commute times reported in the Census.

→ The UMR claim that travel times have increased is a product not of direct observations but is an artifact of the structure of the UMR's speed/volume equations, for which there is no independent confirmation. As long as volume increases more than capacity, the UMR model mechanically predicts slower speeds and travel times.

→ There are strong reasons to doubt the UMR claim that slower speeds associated with congestion wastes billions of gallons of fuel.

- The UMR estimates of fuel consumption are based on a 29 year-old study of low-speed driving using 1970s era General Motors cars, which is of questionable applicability to today's vehicles and to highway speeds.
- The UMR extrapolates these data outside of the speeds for which they were intended and changes the functional form estimated from the original study in a way that exaggerates fuel consumption associated with speed changes.
- The UMR fuel consumption results are not consistent with other, more recent estimates of fuel economy patterns and ignore the savings in fuel consumption associated with modest reductions in travel speeds.
- The UMR ignores the fuel consumption associated with longer trips in sprawling metropolitan areas.

INDEPENDENT MEASURES OF COMMUTING TRENDS DON'T CORROBORATE THE UMR CLAIMS ABOUT CONGESTION-RELATED DELAYS.

Adjusting the UMR estimates to account for each of these issues produces a significantly lower estimate of the cost of congestion. Adopting a more reasonable baseline for congestion-related delays, using the Inrix Travel Time Index, adopting a lower value of travel time, and adjusting fuel consumption estimates would imply that the cost of congestion in monetary terms is perhaps less than 70 percent lower than the figure claimed in the UMR. For the 51 metropolitan areas analyzed here, this means that the **UMR OVERSTATES THE COST OF CONGESTION BY ABOUT $49 BILLION**.

A re-analysis of the data in the UMR paints a very different picture of transportation problems. Trip distances grew rapidly in the 1980s and 1990s, but have stopped growing since then. Between 1982 and 2001, average commute trips nationally got three miles longer. Our calculations, based on data from the UMR, suggest that average travel distances increased in three-quarters of the 50 largest metropolitan areas over this time period. Since 2001, however, peak period travel distances have been shrinking in most metropolitan areas, and the average travel distance has declined about 1.0 percent.

Many metropolitan areas have seen reductions in average peak hour travel times because residents are now traveling shorter distances, reflecting land use patterns and personal choices about where to live and work. Consider the example of Portland, Oregon. Between 1982 and 2007 average peak period travel distances in Portland have fallen one-sixth, from 19.6 miles in 1982, to 16.0 miles in 2007. As a result, average peak period travel times have actually gone down, from 54 minutes per day to 43 minutes per day. So rather than getting three times worse (the UMR says Portland's Travel Time Index went from 1.07 in 1982 to 1.29 in 2007), the average peak period traveler in Portland actually experienced shorter travel times in 2007 than she did 25 years earlier.

THE NATION NEEDS BETTER MEASURES OF URBAN TRANSPORTATION PERFORMANCE

Focusing on trip distances and total travel times - two statistics not reported in the UMR - points to a broader and more powerful set of public policy options for dealing with urban transportation problems. Land use patterns, particularly mixed-use development, walkable and bike-able neighborhoods, higher densities, and good transit, can reduce vehicle miles traveled. Cities that pursue these strategies can reduce the total amount of time, money and fuel their citizens spend on transportation, in effect, earning a "green dividend" by being able to travel shorter distances.

POLICIES THAT ENABLE SHORTER TRIPS REDUCE PEAK PERIOD TRAVEL TIMES. MANY METROPOLITAN AREAS HAVE SEEN REDUCTIONS IN AVERAGE PEAK TRAVEL TIMES BECAUSE RESIDENTS ARE NOW TRAVELING SHORTER DISTANCES.

The key role of sprawling development patterns in driving peak period travel and the limitations of the Urban Mobility Report presented here underscore the need for a much improved system for measuring and comparing the performance of urban transportation systems. A new system for measuring urban transportation performance should embrace five important elements.

1. EMPHASIZE ACCESSIBILITY - THE PROXIMITY AND CONVENIENCE OF DESTINATIONS - NOT JUST MOBILITY.
2. INCLUDE COMPREHENSIVE MEASURES OF LAND USES, TRIP LENGTHS AND MODE CHOICES AS WELL AS TRAVEL SPEEDS.
3. INCORPORATE NEW AND BETTER DATA ON TRAVEL SPEEDS AND COMMUTING PATTERNS.
4. THE U.S. DEPARTMENT OF TRANSPORTATION SHOULD ADOPT AN OPEN, MULTI-DISCIPLINARY PROCESS TO SELECT, VALIDATE AND CONTINUOUSLY IMPROVE MEASURES.
5. PROVIDE MEASURES THAT CAN BE USED TO GUIDE POLICY AND EVALUATE INVESTMENTS RATHER THAN SIMPLY RAISE ALARM ABOUT TRAFFIC DELAYS.

The essential economic and social purpose of cities is bringing people together, taking advantage of opportunities for interaction and agglomeration economies. Cities perform this function in two principal ways, by providing accessibility (putting people close to one another and to common destinations), and through mobility, the ability to move easily from one point to another. National discussions of how to make cities work better have tended to focus on making it easier for people to move, which has had the paradoxical effect of leading cities to be less dense. And the measures we use to describe how well city transportation systems work have reflected this bias toward mobility. In that sense, the emphasis on mobility measures has driven us apart. Putting more emphasis on accessibility can bring us closer together.

This report was prepared by Joseph Cortright, an economist with Impresa, Inc., in Portland and senior policy advisor for CEOs for Cities. It was commissioned by CEOs for Cities, a national organization of urban leaders, and supported by the Rockefeller Foundation.

This publication summarizes the findings of a longer technical report: "Measuring Urban Transportation Performance." The technical report describes the methodology for the calculations presented in this publication as well as a more detailed examination of the Urban Mobility Report. Copies of the technical report are available at: www.ceosforcities.org