Potential Impact of Gasoline Price Increases on U.S. Public Transportation Ridership, 2011 -2012

March 14, 2011

APTA
1666 K St. NW
Washington, DC 20006
202-496-4800

POTENTIAL IMPACT OF GASOLINE PRICE INCREASES ON U.S. PUBLIC TRANSPORTATION RIDERSHIP, 2011 – 2012

Executive Summary

Experience over the past decade, backed by several notable research studies, shows that price increases in gasoline cause related increases in public transportation ridership. Based on that information, this report provides a model that projects future increases in public transit ridership that will accompany rising gasoline prices.

The analysis reveals if regular gas prices reach $4 a gallon across the nation, as many experts have forecasted, an additional 670 million passenger trips could be expected, resulting in more than 10.8 billion trips per year. If pump prices jump to $5 a gallon, the report predicts an additional 1.5 billion passenger trips can be expected, resulting in more than 11.6 billion trips per year. And if prices were to soar to $6 a gallon, expectations go as high as an additional 2.7 billion passenger trips, resulting in more than 12.9 billion trips per year.

Transit systems across America are working hard to address immediate capacity issues which would result. During the 2007 and 2008 gas price spike, 85 percent of transit agencies reported experiencing capacity constraints on parts of their systems. Over one-half of systems operated service crowded beyond their local service standards. This was despite 48 percent of agencies adding service. Thirty-nine percent reported that overcrowded conditions were such that they were turning away passengers.

With most states, municipalities and transit systems short of funds due to the recent economic recession, the Congress must act to fund public transportation investment needs: First in the FY 2011 final appropriations bills and second by enacting a well-funded, six year, multimodal surface transportation law such as has been proposed by President Obama in his FY 2012 budget.

POTENTIAL IMPACT OF GASOLINE PRICE INCREASES ON
U.S. PUBLIC TRANSPORTATION RIDERSHIP, 2011 – 2012

Introduction: $4 or Higher Prices at the Pump Predicted for This Year

This paper analyzes the anticipated demand for additional transit service that will coincide with the current rise in gasoline prices. The paper will report to the need for additional transit capacity to address those needs.

An actual increase in retail motor gasoline prices in early 2011 supports recent predictions of large gasoline price increases during 2011 and 2012. A prediction of a large growth in gasoline price was made by John Hofmeister, former president of the Shell Oil Company and current head of Citizens for Affordable Energy. Hofmeister expects a retail price per gallon for gasoline of over $5 by 2012.[1] Oil billionaire T. Boone Pickens also expects an increase in the price of crude oil to result in the retail price of gasoline breaking the $4 per gallon mark this year. Although he did not expect gasoline to exceed $5 per gallon in the next two years, he did find such an increase to be possible.[2] Both of these predictions were made before revolutionary activities in Libya began.

Gasoline prices during the first two months of 2011 have risen quickly. The Energy Information Administration reported the average price per gallon for regular grade gasoline on December 27, 2010 to be $3.052. By March 7, 2011, the per gallon price of regular grade gasoline had risen to $3.520. This is the highest reported price for regular gasoline except during the price spike of 2008 when the cost of regular gasoline reached an all time high of $4.114 per gallon on July 7, 2008. During the price spike of 2008, the per gallon price of regular gasoline exceeded $3.520 for a period of 23 weeks from late-April to late-September.[3]

Does Gasoline Price Change Affect Driving?

Years ago, in the era of low-priced gasoline, the price elasticity of gasoline had been believed to be at or near zero.[4] A change in the price of gasoline was not expected to change the amount of gasoline that a driver would purchase. Recent research has found this not to be the case and has shown that increases in the price of gasoline result in decreased driving.

Researchers at the University of California at Davis found a short range price elasticity of -0.034 to -0.077 for gasoline price to the amount of gasoline purchased for the 2001 to 2006 period. For each 10 percent the price of gasoline increased, the amount of gasoline purchased decreased 0.34 percent to 0.77 percent. This is a decrease in elasticity from earlier periods. For the 1975 to 1980 period the authors found that for each 10 percent rise in the price of gasoline, the amount purchased dropped between 2.1 percent and 3.4 percent.[5]

The Congressional Budget Office studied the effects of gasoline price changes in 2007, which ranged for average regular grade gasoline from a low of $2.165 in January to a high of $3.218 in May. They also found a low price elasticity for gasoline price and vehicle miles of travel. The report stated that: "Recent empirical research suggests that total driving, or vehicle miles traveled (VMT), is not currently very responsive to the price of gasoline. A 10 percent increase in gasoline prices is estimated to reduce VMT by as little as 0.2 percent to 0.3 percent in the short run and by 1.1 percent to 1.5 percent eventually."[6]

Although the elasticities between an increase in gasoline prices and the amount of gasoline purchased and vehicle miles driven appears small, they result in the reduction of large amounts of travel. In 2008 the price of gasoline per gallon increased 38.3 percent, from 3.011 in February to 4.165 in July. According to the research described above, VMT should have decreased between 0.8 percent and 5.7 percent. In 2007, VMT had been 3.03 trillion miles and person miles of travel 4.96 trillion miles.[7]

The elasticities therefore predict that the reduction in VMT for an entire year would be between 23 billion and 174 billion and the reduction in person miles of travel for an entire year would be between 38 billion and 285 billion. In fact, the actual drop in VMT between 2007 and 2008 was 56 billion or 1.9 percent and the drop in person miles of travel was 91 billion or 1.8 percent.[7,8] Although behavior was generally consistent with the models, many observed what seems to be a "tipping point" as gasoline prices approached and exceeded $4 per gallon. The dynamic relationship was explored further in the Maley and Weinberger research explained below.

Do Gasoline Price Increases Result in Increased Transit Ridership?

As gas prices cause a shift from automobiles to transit, the percentage growth in transit use will be much greater than the percentage decline in VMT. This is because the base of transit trips is much smaller than the base of automobile trips. In other words, a modest decrease in driving translates into a potential travel demand that could represent a significant increase in demand for transit service.

Only 54 percent of American households have transit service, so transit is not an alternative mode for all miles of reduced roadway travel in response to increased gasoline costs.[9] Nevertheless, research since the fuel price spikes of 2005 through 2008 has consistently shown larger elasticities between gas price increases and transit ridership than between gas price and roadway travel.

APTA-member transit systems have first-hand experience in knowing the relationship between rising gas prices and transit use. In 2008, the price of regular grade gasoline per gallon went from $3.053 on December 31, 2007 to a peak of $4.114 on July 7, 2008 and then plummeted to $1.613 on December 27, 2008; the lowest price recorded since the 2008 peak.[10] The price increase from December 31, 2007 to July 7, 2008 was $1.061 or 35 percent. The drop in price in the second half of the year was $2.501 per gallon for regular grade gasoline or 61 percent.

Transit ridership responded to the fluctuations. In the first quarter of 2008, transit ridership increased 3.42 percent compared to the prior year. As motor gasoline prices increased during the second quarter of 2008, transit ridership rose 5.19 percent compared to the prior year. As gasoline prices started to fall in the third quarter, the lag between price change and transit ridership change was apparent as transit ridership increased 6.52 percent, its greatest quarterly increase during the year. Increases were present among all modes of public transportation and in regions of all sizes.[11]

In July of 2008 APTA surveyed its transit agency members to gather data to help understand the changes in ridership. Overall, 86 percent of survey respondents reported that they had experienced ridership increases over the prior year. Among agencies experiencing increases, 62 percent had experienced increased ridership during both the peak and off-peak periods, 20 percent had experienced most of the increase during the peak period, and 18 percent had experienced most of the increase during off-peak periods.[12]

Among agencies that experienced ridership growth, 42 percent of agencies increased the frequency of service on existing routes, 29 percent expanded service into new areas, and 15 percent reallocated service to higher ridership routes.

The correlation between gasoline prices and the use of transit has been further affirmed by independent studies. Currie and Phung calculated elasticities using U.S. transit ridership data and fuel price data from January 1998 through October 2005.[13] They found an aggregate elasticity of 0.12 for all transit modes; ridership increased 1.2% for every 10% increase in gas prices. Light rail had higher than average elasticities of 0.27 to 0.38, the bus elasticity was low at 0.04, and the heavy rail elasticity was 0.17. The authors found their results to be consistent with most international evidence.

Haire and Machemehl compared ridership change and fuel prices for transit systems in five cities from January 1999 through June 2006.[14] Comparisons with statistical significant correlation coefficients showed an elasticity of transit ridership to fuel price change to be 0.2439 for motorbus, 0.0665 for light rail, 0.2653 for heavy rail, 0.2726 for commuter rail, and 0.2379 for all transit modes combined.

Jeremy Mattson studied the effect of gas prices on ridership in small urban and rural areas. Using a lag model to get cumulative elasticity he found results ranging from 0.081 to 0.164. Using panel data for 11 agencies from 1997 to 2006, he obtained an aggregate value of 0.12. He found that the elasticity varied somewhat by city size: "The longer-run elasticities are 0.12, 0.13, 0.16, and 0.08 for the large, medium-large, medium-small, and small cities, respectively."[15]

Maley and Weinberger examined the relationship of gasoline prices to transit ridership in the Philadelphia area.[16] The data are from Southeastern Pennsylvania Transportation Authority (SEPTA) services with analyses made of Regional Rail Services, which are commuter railroad, and City Transit Division Services, which include bus, heavy rail, and light rail operations. The period covered was January 2001 through June 2008.

They found the relationship between ridership and gasoline prices to be non-linear. From this they projected elasticities for higher than actually recorded gasoline per gallon prices. Their results show an increasing elasticity as gasoline prices increased. For Regional Rail the elasticity in a per gallon gas price range of $3 to $4 was 0.27, from $4 to $5 was 0.33, and from $5 to $6 was 0.38. For City Transit the elasticity in a per gallon gas price range of $3 to $4 was 0.15, from $4 to $5 was 0.19, and from $5 to $6 was 0.23. As shown on Table 1, the gas price elasticities within the $4 to $5 per gallon gas price range are 22 percent or 15 percent more than they are for the $3 to $4 range. If per gallon gasoline prices were to reach the $5 to $6 range, the elasticities would increase an additional 27 percent or 21 percent.

Table 1: Maley and Weinberger: Projected Transit Ridership Elasticities for Increasing Gas Prices

System	Measurement	Projected per Gallon Gas Price Range		
		from $3 to $4	from $4 to $5	from $5 to $6
SEPTA Regional Rail	Transit Ridership Elasticity	0.27	0.33	0.38
	Increase from Lower Range	---	22%	27%
SEPTA City Transit	Transit Ridership Elasticity	0.15	0.19	0.23
	Increase from Lower Range	---	15%	21%

.
Yanmaz-Tuzel and Ozbay studied ridership on New Jersey Transit from 1998 through 2008 looking at gas price increases in 2005 and 2008. Their results show a several month lag in the response of travelers to gasoline price increases. They find a short-term elasticity of gasoline prices to ridership of 0.12 to 0.22 and a medium-term elasticity of 0.028 to 0.176. The modes included are not specified indicating the data are system totals.[17]

Stover and Bae use regression methods to compare gasoline prices and transit ridership for 11 counties in the state of Washington from 2004 through 2008. Data from all agencies in a panel model resulted in an elasticity of 0.17.[18]

Litman surveyed available literature on transit price elasticities and cross-elasticities in 2011.[19] Based on his research he recommended generic values. For the short-term elasticity between transit ridership and auto operating costs he recommends 0.05 to 0.15 and for the long-term elasticity he recommends 0.2 to 0.4.

The elasticities reported in these studies are listed and reported on Table 2 with an average value calculated from them. They can be used to estimate the amount ridership could increase at specific gas price levels.

Table 2: Summary of Transit Ridership to Gas Price Elasticities in Recent Research

Study	Elasticity				
	Commuter Rail	Heavy Rail	Light Rail	Bus	All Modes
Currie and Phung, 2007	---	0.17	0.27 to 0.38	0.04	0.12
Haire and Machemehl, 2007	0.2726	0.2653	0.0665	0.2439	0.2379
Mattson, 2008	---	---	---	0.12	---
Maley and Weinberger, 2009	0.27	0.15	0.15	0.15	---
Yanmaz-Tuzel and Ozbay, 2010	---	---	---	---	0.12 to 0.22
Stover and Bae, 2011	---	---	---	---	0.17
Litman, 2011	---	---	---	---	0.05 to 0.40
Average Value	0.271	0.195	0.181	0.138	0.185

Note that each of these studies is based on the actual ridership change during periods of price change in the past decade. The results are based on elasticities that are constrained, i.e. the amount that ridership could grow in response to actual gasoline price changes was constrained by the amount of transit service available and the excess capacity of that service. Since a large portion of growth in demand was for trips during the peak hour when transit vehicles are most crowded, that excess capacity was not large. Similarly, there was demand for service in areas where there currently no public transportation services are available. Data shows that 46% of Americans do not have the option of public transportation available to them.[20]

Thus, these studies, measure actual experience and fall considerably short of measuring potential demand during times of rising gas prices. There are no available studies that have modeled how to account for unmet demand for transit service. During past gasoline price spikes, capacity constraints at many transit systems resulted in many persons being left at bus stops or on rail station platforms because demand exceeded the capacity of transit vehicles during peak travel periods.

A New Model for Predicting Transit Ridership Increases

So how can we apply the experience of 2008, combined with research over the past decade, to create a model for projecting future increases?

The baseline for our calculation is the annual transit ridership for 2010 reported in APTA's Public Transportation Ridership Report.[21] The annual ridership for 2010 is increased by three scenarios of low, average, and high growth calculated from elasticities reported for all transit service in the studies shown on Table 2. The low scenario elasticity based on those studies is 0.14, the average scenario elasticity is 0.185, and the high scenario elasticity is 0.23. To calculate the ridership growth at a given increase above the gasoline average price for the last report by the Energy Information Administration in 2010, $3.052 on December 27. The estimates for $3.50 and $4.00 are estimated by multiplying the elasticity value by the percentage price change and the “Baseline” ridership. At each price level the "Additional" ridership is the ridership above the “Baseline” level.

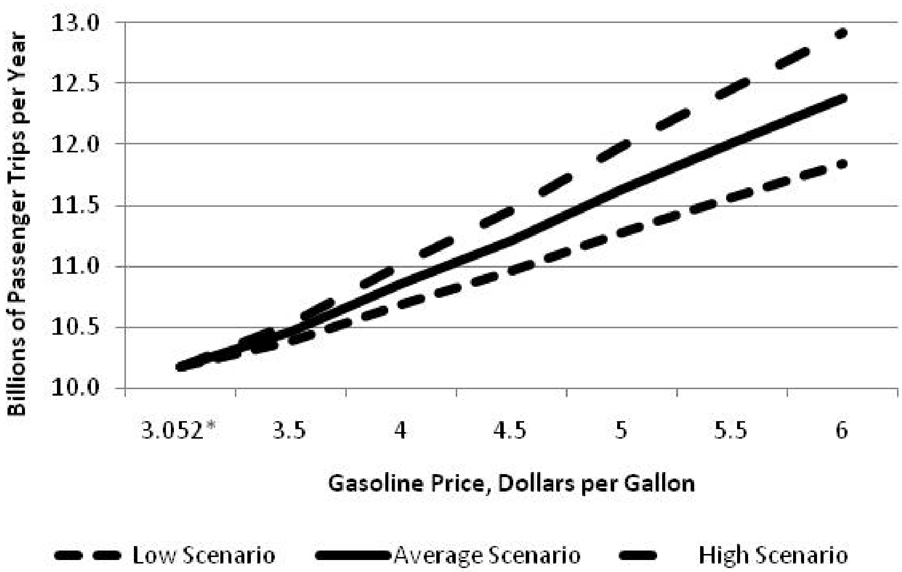
For example, the increase in the cost per gallon from $3.052 to $3.50 is $0.448, which is a 14.7 percent increase. The average elasticity for all modes reported on Table 3 is 0.185. Eighteen and one-half percent of the 14.7 percent gasoline price increase is 2.72 percent. The 2010 all transit modes ridership is multiplied by 2.72 percent to obtain an additional ridership in the average scenario of 280 million unlinked trips. Those 280 million unlinked trips are added to the base number of 10,180 million trips to obtain a projected ridership level of 10,460 million unlinked trips at a $3.50 per gallon gasoline price. Based of the research of Maley and Weinberger, the elasticity above $4 and above $5 are increased by the proportions they determined as reported on Table 1. These increased elasticities are based on "shock" levels, round dollar amounts that appear to be plateaus that "shock" consumers into changing travel behavior.

Table 3: Potential Increase in Transit Ridership as Gasoline Prices Rise Based on Published Elasticities

Price of Gasoline per Gallon	Trip Measurement	Calculated Number of Annual Unlinked Trips, Millions		
		Low	Average	High
Baseline $3.052 on Dec. 27, 2010	2010 Total Annual Trips	10,180	10,180	10,180
$3.50 per gallon gasoline price (a 14.7% increase)	Additional Trips	210	280	340
	Total Annual Trips	10,390	10,460	10,520
$4.00 per gallon gasoline price (a 31.1% increase)	Additional Trips	510	670	840
	Total Annual Trips	10,690	10,850	11,020
$4.50 per gallon gasoline price (a 47.4% increase)	Additional Trips	780	1,030	1,280
	Total Annual Trips	10,960	11,210	11,460
$5.00 per gallon gasoline price (a 63.3% increase)	Additional Trips	1,100	1,460	1,810
	Total Annual Trips	11,280	11,640	11,990
$5.50 per gallon gasoline price (an 80.2% increase)	Additional Trips	1,380	1,830	2,280
	Total Annual Trips	11,560	12,010	12,460
$6.00 per gallon gasoline price (a 96.6% increase)	Additional Trips	1,670	2,200	2,740
	Total Annual Trips	11,850	12,380	12,920

The columns on Table 3 are scenarios calculated from the low, average, and high elasticities reported in the studies on Table 2. Figure 1 illustrates that an increase in transit ridership is related to an increase in the price of gasoline. As the per gallon price of gasoline increases, transit ridership is expected to increase within the depicted range based on the experience reported in studies of recent gasoline price increases.

Figure 1: Projected Range of Annualized Transit Ridership as Gasoline Prices Change, Based on Published Elasticities



* Average price of regular grade gasoline as of December 27, 2010.

If gasoline prices reach $4 per gallon, transit ridership is predicted by this model to increase in the average scenario by 680 million annual unlinked trips – over 2 million riders each weekday; if gasoline prices reach $5 per gallon transit, ridership is predicted by this model to increase by 1.46 billion annual unlinked trips – over 4 million riders each weekday, and if gasoline prices reach $6 per gallon, transit ridership would increase by 2.20 billion annual unlinked passenger trips – over 6 million each weekday. In the high scenario, a $6 dollar per gallon gasoline price is expected to result in 2.74 billion more transit trips for an annual total of 12.92 billion trips.

As significant as these numbers are, the limitations of the model lead to numbers that are quite a bit under the expected demand for additional service. Factoring in the additional riders that would ride transit should adequate service be in place to meet demand will need to be the product of future research.

Preparing for the Impending Increase in Travel Demand

Meeting the additional demands for public transportation service in the short term, as well as continuing demands long-term which will inevitably accompany the uncertainty of gasoline prices, will require an availability of public transportation choices, and an investment in new capacity. A comprehensive 2008 Cambridge Systematics report titled "State and National Public Transportation Needs Analysis" concluded that $59.2 billion annually is needed to address future public transportation capital needs.[22] And certain segments of the population will have special needs, as is documented in the report titled "Funding the Public Transportation Needs of an Aging Population" which: a) identifies the range of actions that will be needed to expand mobility options for older people, including accessible public transportation services; b) quantifies the demand for these public transportation services; and c) estimates the funding that will be needed to provide them.[23]

We must also be prepared to address immediate capacity issues. In 2008, 85 percent of transit agencies reported experiencing capacity constraints on parts of their systems. Of those agencies experiencing capacity constraints, 63 percent experienced capacity constraints during peak periods, 49 percent experienced capacity constraints on short segments of high ridership routes, 13 percent experienced capacity constraints on numerous routes, and 8 percent experienced capacity constraints during off-peak hours.[24]

Over one-half of systems operated service crowded beyond their local service standards. This was despite 48 percent of agencies adding service. Thirty-nine percent reported that overcrowded conditions were such that they were turning away passengers.

Congress is set to consider this year a long-term surface transportation authorization bill. The bill needs to recognize the trend that immediate and long-term transportation options are critical, and to provide necessary investments to add immediate capacity and to prepare for an energy-sensitive future.

Endnotes

[1] Segall, Laurie. "Ex-Shell President Sees $5 Gas in 2012." CNNMoney.com, December 27, 2010. at http://money.cnn.com/2010/12/27/markets/oil_commodities/index.htm

[2] Harder, Amy. "Pickens Says Oil Could Reach $120 per Barrel." Washington, National Journal, January 5, 2011. at http://nationaljournal.com/energy/pickens-says-oil-could-reach-120-per-barrel-20110105

[3] "Weekly Retail Gasoline and Diesel Prices." Washington: U.S. Department of Energy, Energy Information Administration, accessed March 5, 2011. at http://www.eia.gov/dnav/pet/pet_pri_gnd_a_epmr_pte_dpgal_w.htm

[4] Elasticity is the measurement in the relative change between two variables. A positive elasticity results when two variables both increase or both decrease as they change. A negative elasticity results when one variable increases and the other decreases. A relationship is said to be inelastic when one variable changes and the other has little or no change

[5] Hughes, Jonathan E., Christopher R. Knittel, and Daniel Sperling. "Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand." Davis, CA: UCDavis Department of Economics Working Papers, September 5, 2006. at http://www.econ.ucdavis.edu/working_paper_info.cfm?pid=377

[6] *Effects of Gasoline Prices on Driving Behavior and Vehicle Markets.* Washington: Congressional Budget Office, January 2008. at http://www.cbo.gov/ftpdocs/88xx/doc8893/01-14-GasolinePrices.pdf

[7] "Annual Vehicle Distance Traveled in Miles and Related Data By Highway Category and Vehicle Type, Table VM-1." *Highway Statistics.* Washington: Federal Highway Administration, annual. at http://www.fhwa.dot.gov/policy/ohpi/hss/hsspubs.cfm

[8] "Traffic Volume Trends." Washington: Federal Highway Administration, monthly. at http://www.fhwa.dot.gov/ohim/tvtw/tvtpage.cfm

[9] "Table 2-8 Neighborhood." *American Housing Survey National Tables: 2009.* Washington: U.S. Census Bureau, biennial. at http://www.census.gov/hhes/www/housing/ahs/ahs09/ahs09.html

[10] "Weekly Retail Gasoline and Diesel Prices." Washington: U.S. Department of Energy, Energy Information Administration, accessed March 5, 2011. at http://www.eia.gov/dnav/pet/pet_pri_gnd_a_epmr_pte_dpgal_w.htm

[11] "Public Transportation Ridership Report." Washington: American Public Transportation Association, quarterly. at http://www.apta.com/RESOURCES/STATISTICS/Pages/ridershipreport.aspx

[12] "Rising Fuel Costs: Impacts on Transit Ridership and Agency Operations, Survey Results." Washington: American Public Transportation Association, September 2008. at http://www.apta.com/resources/reportsandpublications/Documents/fuel_survey_0809.pdf

[13] Currie, Graham and Justin Phung. "Transit Ridership, Auto Gas Prices, and World Events: New Drivers of Change?" *Transportation Research Record No. 1992*. p. 3-10. Washington: Transportation Research Board, 2007. at http://trb.metapress.com/content/g26h66l2564gt8u3/?p=c950e3dabdfd4b48bfde9f3cf58bff92&pi=0

[14] Haire, Ashley R. and Randy B. Machemehl. "Impact of Rising Fuel Prices on U.S. Transit Ridership." *Transportation Research Record No. 1992*. p. 11-19. Washington: Transportation Research Board, 2007. at http://trb.metapress.com/content/q4146786q437025n/?p=c950e3dabdfd4b48bfde9f3cf58bff92&pi=1

[15] Mattson, Jeremy. *Effects of Rising Gas Prices on Bus Ridership for Small Urban and Rural Transit Systems.* Fargo: Small Urban and Rural Transit Center, Upper Great Plains Transportation Institute, North Dakota State University, June 2008. at http://www.ugpti.org/pubs/pdf/DP201.pdf

[16] Maley, Donald W. and Rachel Weinberger. "Rising Gas Price and Transit Ridership: Case Study of Philadelphia, Pennsylvania." *Transportation Research Record No. 2139*. p. 183-188. Washington: Transportation Research Board, 2009. at http://trb.metapress.com/content/181618576j864149/?p=bbabb08bb85a44f8a5986df2e969552e&pi=20

[17] Yanmaz-Tuzel, Ozlem and Kaan Ozbay. "Impacts of Gasoline Prices on New Jersey Transit Ridership." *Transportation Research Record No. 2144*. p. 52-61. Washington: Transportation Research Board, 2010. at http://trb.metapress.com/content/y7m5w1n4161qxw68/?p=907536f7b85f4b2e8527d2b265418b83&pi=6

[18] Stover, Victor W. and C.-H. Christine Bae. "The Impact of Gasoline Prices on Transit Ridership in Washington State." Transportation Research Board Annual Meeting, 2011.

[19] Litman, Todd. "Transit Price Elasticities and Cross-Elasticities." Victoria, BC: Victoria Transport Policy Institute, March 1, 2011. at http://www.vtpi.org/tranelas.pdf

[20] "Table 2-8 Neighborhood." *American Housing Survey National Tables: 2009.* Washington: U.S. Census Bureau, biennial. at http://www.census.gov/hhes/www/housing/ahs/ahs09/ahs09.html

[21] "Public Transportation Ridership Report, Fourth Quarter 2009" Washington: American Public Transportation Association, March 2, 2010. at http://www.apta.com/RESOURCES/STATISTICS/Pages/ridershipreport.aspx

[22] Cambridge Systematics, Inc. *State and National Public Transportation Needs Analysis.* Washington: American Public Transportation Association and American Association of State Highway and Transportation Officials, September 9, 2008. at http://www.apta.com/gap/policyresearch/Documents/transit_needs_studies.pdf

[23] Nelson\Nygaard Consulting Associates. *Funding the Public Transportation Needs of an Aging Population.* Washington: American Public Transportation Association, March 2010. at http://www.apta.com/resources/reportsandpublications/Documents/TCRP_J11_Funding_Transit_Needs_of_Aging_Population.pdf

[24] "Rising Fuel Costs: Impacts on Transit Ridership and Agency Operations, Survey Results." Washington: American Public Transportation Association, September 2008. at http://www.apta.com/resources/reportsandpublications/Documents/fuel_survey_0809.pdf