TRANSPORTATION TRENDS OF MILLENNIALS IN RURAL CONTEXTS: A SYNTHESIS & A
NATIONAL HOUSEHOLD TRAVEL SURVEY MODEL

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The Millennial generation, those born between 1983 and 2000, are now the largest generation, surpassing the Baby Boomer generation in 2010. Considering their significant representation within the United States population, and knowing that the Millennials are moving into the most productive period of their life, many entities, including departments of transportation, are trying to better understand this generation. Literature thus far has shown that Millennials are different than generations of the past. They reportedly have a preference for urban areas, travel by multiple means of transportation, have a higher level of education, are marrying later, and are choosing to rent or stay with friends and family instead of owning. However, much of the current literature on Millennials is focused on those living in large, urban areas. Therefore, this study also developed a model on rural data from the National Household Travel Survey to understand what factors influenced vehicle-miles traveled, including variables that represented generational cohorts. Findings show that even in rural areas, the vehicle-miles traveled of Millennials are less than other generational cohorts. They also show that as income levels in rural areas increase, so do VMT. In addition, it was found that more dense rural areas correlate with less VMT. Finally, there were two unexpected variables. The first, gender, found that women contribute less to VMT in rural areas as compared with men. The second, which represented the number of trips by walking, contributes to more VMT in rural areas.
1. INTRODUCTION

In 2010, Millennials became the new largest generation, surpassing the previous largest generation in the United States, the Baby Boomers (1 & 2). The definition of the birth years of a Millennial varies, depending on the source. Herein, a Millennial will typically be discussed as being born between 1983 and 2000 (2). As a result of their dominant size, there is now an interest to better understand the Millennial mindset, particularly from a consumer standpoint. In addition, as entities tasked with providing the best and most relevant transportation possible, departments of transportation are also becoming interested in this generational cohort. Some of this interest stems from the fact that what is known about Millennials thus far from a transportation perspective is in stark contrast with what the Baby Boomer generation wanted from its transportation system. Millennials are said to have a greater interest in living in urban environments and in public transportation.

This paper presents findings from a review of available literature on the Millennial generation on the topic of transportation. In addition, considering the lack of information available regarding Millennials in rural areas, it presents a model, developed using National Household Travel Survey (NHTS) data (3), which allows a macro-level understanding of the influence of generational cohorts on vehicle miles traveled in rural areas.

This paper is divided into three sections:

1) Literature Review
   - Mode Choice
   - Vehicle Miles Traveled
   - Behavioral, Economic, and Demographic Factors
   - Location Choice
   - Technology Preference

2) Rural Model

3) Conclusions and Future Work

2. LITERATURE REVIEW

This section presents a summary of findings regarding Millennial preferences as they relate to transportation. A more in-depth discussion can be found in the draft Literature Review (4). First, a short discussion of Millennials and mainstream media is presented followed by international findings on the topic of Millennials. Finally, five sections summarize knowledge to date about Millennials in the United States regarding 1) mode choice, 2) vehicle miles traveled, 3) behavioral, economic, and demographic factors, 4) location choice, and 5) technology preferences.

Recent mainstream media seems to have “jumped on the Millennial bandwagon.” There are many articles (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (17), & (18)) that discuss each author’s perspective of what they interpret as Millennial preferences. However, most often, the articles are based on only a few research reports (19), (20), & (21)).

The authors found three international studies specifically focused on Millennials: two out of Germany and one out of Greece. The two German studies (22 & 23)) highlighted the multimodality of Millennials. In addition, they found a more significant decrease in automobile use by men as compared with women. Finally, a study that looked at the interest of high school students in walking to school in Greece was based on surveys of the youngest of the Millennial generation (24).

Mode Choice

In 2012, Davis et al. compared 2001 and 2009 National Household Travel Survey data on 16 to 34 year old respondents to find that they 1) traveled 117 more miles by active transportation (i.e. biking, walking, transit), 2) took 24% more bike trips, 3) chose walking as a mode 16% more often, and 4) took public transit 40% more often (25). More importantly, Davis et al. asserts that this age group’s changes in their mode choice is not reflective of the recession because there was a decrease in miles driven per capita three years prior. Furthermore, those Millennials earning $70,000 or more, in other words those households that are not financially strapped, are taking public transit, biking and walking 100%, 122% and 37% more often, respectively.

While the aforementioned study focused on data at a national level, states concerned with staying economically competitive by ensuring that they have the best and the brightest of the largest generation have performed studies to better understand what Millennials want from their transportation systems. The State of Vermont, which had seen a decrease in population by 20% from 1990 to 2010, conducted eight public forums throughout the state, obtaining input from 235 college students, faculty, and young professionals (26). Those participating indicated that they are frustrated that a car seems to be a necessity, not a choice. They expressed interest in having the opportunity to live in “smart growth” communities where there are several transportation options and a mix of commercial and residential buildings. Furthermore, they indicated that the lack of
transportation options in rural areas makes them feel confined. In addition, respondents provided feedback that buses are not appealing because of their lack of convenience as a result of short service hours and limited rural and urban connections. Finally, while the respondents expressed an interest in car sharing, they indicated that they hoped opportunities would expand beyond the urban areas.

Like Vermont, Ohio is concerned with the younger generations, but in their case, the growth is stagnating, not declining (27). The Ohio Public Interest Research Group (PIRG) conducted a survey like the State of Vermont; however, they obtained input via surveys distributed to university students (it did not include young professionals). They received 493 responses. Forty-six percent of respondents said that it was “very important” to live in a place, post-graduation, that would allow them to get around without driving (27). Considering that in 2014 Ohio ranked 38 out of 51 states (including the District of Columbia) in providing funding for public transit, the authors of the study concluded that the state should look at opportunities to provide more public transit service.

The third state that conducted a study to better understand the transportation preferences of the younger generation was Wisconsin. The Wisconsin PIRG gained input from 530 college students throughout the state using the same survey as that in Ohio (28). One of the driving forces behind the study is a concern that the state is experiencing “brain drain” – young adults graduating from Wisconsin colleges are not being retained in the Wisconsin work force. Forty-seven percent of respondents, therefore a similar percentage to that found in Ohio, indicated that they want to live in a location post-graduation that will allow them to choose other mode choices besides driving (28). In areas where active transportation options, like bicycling, are provided, there have been significant increases in their use. From 2000 to 2011, the number of people bicycling to work in Milwaukee and Madison, the two largest cities in the state (29), increased by 227% and 147%, respectively (28).

In Millennials & Mobility: Understanding the Millennial Mindset, Sakaria and Stehfest obtained input from 1,011 Millennials in six urban areas: Boston, MA; Chicago, IL; San Francisco, CA; Seattle, WA; Portland, OR; and Washington DC (30). They concluded that Millennial mode choice is most significantly influenced by efficiency and convenience.

Dutzik and Inglis (2014) conducted a study and found that 69% of Millennials use multiple modes of transportation to reach a destination at least a few times a week (31). Therefore, similar to the findings by Kuhminhof et al. (22) when looking at travel habits of Millennials in Germany, Millennials are using driving as one of many options to get around. In fact, 20% of Millennials as compared with 7% of Generation X take public transportation at least once per week (31). As found by Sakaria and Stehfest (30), Millennials are choosing the option that is most efficient and convenient. Therefore, it seems that unlike previous generations who became very accustomed to use the car for any trip (likely because it was the most efficient and convenient choice), the Millennial generation is choosing the mode that works best for a specific travel destination.

Vehicle Miles Traveled
While the population from 2004 to 2013 increased by 7.7%, the vehicle miles traveled (VMT) only increased by 0.33% (32). It is possible that the Millennial generation, whose travel characteristics are different than those of older generational cohorts, may help to explain the lack of increase in VMT. For example, a large proportion of Millennials, 32%, live in urban areas (32). Those in urban areas drive less than those in rural areas. In fact, the 2009 NHTS data shows that 20-39 year olds traveled 24.3 daily vehicle miles per capita as compared with 35.2 in rural areas (32). Many Millennials are renting or staying with their parents as compared with owning their own home. The data shows that young adults who rent travel 20.3 vehicle miles compared with the 30.5 vehicle miles traveled by those that own a house (32).

In 2012, Shinkle et al. recommended an increase in the amount of funding for transit-oriented development (TOD) (33). In transit-oriented development, housing, commercial uses and other amenities are within walking distance of transit lines.

Polzin et al. (32) found that 1) living in a rural location, 2) pursuing a higher level of education, 3) owning a vehicle/home, 4) being of white ethnicity, 5) having kids, and 6) having a high annual income are all factors associated with a greater VMT.

Unemployment is often associated with a reduction in VMT. However, Dutzik and Inglis (31) found that VMT even fell by 16% for 16 to 34 year olds with jobs between 2001 and 2009. Therefore, the reductions in VMT noted at the beginning of this section cannot only be attributed to the typical characteristics that result in a reduction in VMT. There is something else different about how Millennials travel.

Behavioral, Economic, and Demographic Factors
Sakaria and Stehfest’s (30) study also provided some insight regarding why Millennials are moving to urban areas: “ease of getting around.”
The Pew Research Center conducted a study via a phone survey of 2,020 people throughout the nation, 61% of whom were Millennials (34). Researchers wanted to better understand life choices of Millennials as compared with other generations. Like other studies, they found that Millennials are the most educated generation and are more likely to live in cities (only 14% reported living in rural areas) (34).

A study by Pucher and Renne using the 2001 NHTS data investigated differences between transportation in urban and rural locations (35); these results are not necessarily specific to Millennials. Rural residents were found to make 5% fewer personal vehicle trips per day. The effect was even more pronounced when considering household income – wealthier households made more trips. However, while rural households made fewer trips, they traveled more miles per day – 38% more. Only 0.1% of rural trips were made using public transit, compared with 4% of urban trips.

There have been many assertions that economics, working from home, and growth of urban populations are the reasons behind the reduction in VMT. Therefore, in 2013, Baxandall (36) took a closer look using NHTS and Federal Highway Administration data. Knowing that unemployment is often associated with a decline in VMT, he found that there is not a correlation between states with the highest unemployment and the largest declines in driving. Instead, only two states with the highest levels of unemployment were also in the top 10 with the largest decreases in driving. In addition, four states that had an increase in rural population saw a decrease in driving. In addition, seven states that had an increased level in urbanization showed an increase in driving. Again, this is opposite of what is typically found with a higher level of urbanization. Therefore, Baxandall concluded that the Millennial generation is a leading cause of the changes in driving trends, particularly because the average Millennial drives 23% less.

The White House’s Council of Economic Advisers (37) concludes that Millennials typically:

- Continue their education longer,
- Marry and start families later,
- Stay with their early-career employers longer,
- Experience slower wage growth, and
- Are reluctant to commit to homeownership.

The Nielsen Company (9) conducted a study of Millennials. They concluded that Millennials are the “melting pot of generations” because 19% and 14% of them are Hispanic and African American, respectively. They also found that 23% of Millennials hold a bachelor’s degree, making them the most educated generation. This finding coincides with other studies (32, 34 & 37).

Twenge (2006) (38) made many of her conclusions regarding Generation Me (those born in the 1970’s, 1980’s, and 1990’s) by comparing data of each generation at the same age. This is different than many studies that compare generations when they are different ages. While her discussion of characteristics of Generation Me spans a greater age range that that of the typical Millennial definition (i.e. 1983 to 2000), three of her conclusions are consistent with many other studies:

- Generation Me marries later than previous generations.
- Generation Me is living with their parents longer.
- Generation Me takes longer to finish college.

These results are consistent with those of other studies discussed previously (9, 32, 34, & 37).

As mentioned previously, Millennials are one of the most educated of the generations. However, this comes at a cost. While the provision of student loans has enabled Millennials to obtain education beyond high school, many have large student loans post-graduation that are in many cases larger than their annual salaries. Twenge (2006) (38) indicates that 66% of college graduates owe more than $10,000 in school loans, with a small proportion, 5% owing more than $100,000 in student loans (38). To put this level of debt into perspective, $100,000 is more than many people borrow to purchase a house in parts of the United States, loans which typically are for 30 years. A more recent online survey found that 47% of respondents have $37,000 in student loans, and the median loan debt is $28,000 (39). Therefore, it is not surprising that many Millennials may be renting instead of owning. This is only compounded by the fact that 75% of Millennial respondents in one survey earn less than $50,000 annually – less than twice the median loan debt (39). Even more surprising, the majority of the 75% earn less than $25,000 annually (39). The author of this particular survey recommended to readers (most likely those with student debt and limited incomes) that they live with their parents if possible, put off owning a vehicle and instead take public transportation (39). These are the very behaviors that a growing body of literature is associating with Millennials.
Location Choice

This section summarizes literature that discusses the Millennial preferences related to housing choices, as where one lives has a significant effect on how one chooses to travel.

Millennials are choosing to live in more urbanized areas; only about fourteen percent are choosing to live in rural areas (1) & (34)). These urban areas provide exciting creative hubs with tightly spaced environments that Millennials prefer (9). It might be that the transportation choices available in these urbanized areas are the reasons for the Millennial preference, as 54% of Millennials would consider moving to a location with better transportation choices, and 66% agree that access to efficient transportation choices is the number one factor considered when choosing where to live (14). (Note: It is unclear if the study controlled for income and vehicle ownership.)

While a majority of Millennials are choosing to live in urban areas, a study conducted by Lachman and Brett (1) reported Millennials that were living in small communities were also working in the same community. This shows that if the resources are available, Millennials will live in a smaller community. When asked to identify what neighborhood attributes were important, respondents identified community character, proximity to work, and safety as three of the top five important attributes.

A study conducted by the Nielsen Company states that two-thirds of Millennials live in rental homes which allow them the flexibility to move to areas that better suit their needs (i.e. they are not limited by needing to buy and sell a house) (9). This preference for renting could be a result of Millennials being more financially strapped.

Lachman and Brett’s (1) study found that many of these renters reported receiving assistance from family to pay for monthly expenses. The same study reported finding a larger number of homeowners than what was originally expected; they indicated that this finding could be tied to (40) the first-time homeowner tax credit. This finding does not necessarily mean that there are a large number of Millennial homeowners; rather, there is a larger number identified than what they hypothesized. It is worth noting that those Millennials who owned homes were found to have higher levels of education.

Millennials prefer to live in walkable communities. Lachman and Brett (1) found that the walkability of a community is important to Millennials with around forty-eight percent of Millennials stating walking was preferable. Walkability was reported as a necessity to Hispanics and blacks with twenty-four percent and twenty-one percent respectively stating it was essential as compared to only twelve percent of whites. Furthermore, many Millennials are dealing with financial constraints that prevent them from owning a car or they live in a household where a car is shared among several people, making walking a necessity (not a preference).

Technology Preferences

Schwieterman (40) investigated how Millennials’ travel choices were influenced by the provision of technology. He found there was an increase in transit usage, when traveling via transit allowed for Millennials to stay connected to their electronic devices during their commute.

Several public entities have employed Twitter to disseminate and obtain information regarding transportation. The Arizona Department of Transportation used Twitter to distribute traffic updates and obtain feedback on highways and services (41). The Metropolitan Transportation Authority, New Jersey Transit, and Port Authority Trans-Hudson provided information to their customers via Twitter regarding shutdowns, damages, and restoration efforts following Hurricane Sandy (42). All three entities Tweeted 15 times more per day during Hurricane Sandy (42).

Lockbridge performed a study to understand what types of technologies in private vehicles are appealing to Millennials (43). Interestingly, Millennials (those aged 18-24 and 25-34) as compared with other age cohorts indicated a preference for technology that makes a vehicle safer. The youngest of the Millennials, those 18-24, showed a greater preference for being connected in their vehicle. The study authors concluded that “Millennials want cars that know who they are.”

Millennials have been called “digital natives” because they have grown up with significant advances in technology. In fact, 25% of respondents to a survey indicated that technology is what makes the Millennial generation unique (34). The majority (ninety-four percent) of Millennials own a cell phone; few have landlines (44). In addition, Millennials indicated that being without their cell phone (30%) or computer (35%) would have a greater impact on their daily lives than losing their car (28%) (45). Approximately 75% of Millennials have a social media profile (i.e. Facebook, LinkedIn, MySpace, etc.) (41); the Pew Research Center developed a study that ranks how “Millennial” respondents are based on fifteen questions including one asking whether or not the respondent has a social media profile (34).
3. RURAL MODEL

The Literature Review identified that there was a limited amount of information regarding understanding Millennial travel in small urban and rural areas. Some of the findings on this topic as discussed above include: some Millennials say that transportation in rural areas can be confining, 20-39 year olds in rural areas travel more than their urban counterparts, approximately fourteen percent of Millennials live in rural areas, and smaller communities with employment can be appealing to Millennials (1), (26), (32), & (34). In addition, researchers have found that in general, while fewer trips are made by those (not necessarily Millennials) in rural areas, those in rural areas travel more miles (35). And there are fewer trips made by public transport in rural areas (again, not specific to Millennials) (35). However, there currently exists a data source that can shed light on the differences between rural Millennials and other generations: the National Household Travel Survey (NHTS) (3). The 2009 NHTS sample contains a total of 8,355 Millennials living in rural areas (out of 22,511 rural data points). (Note: The rural categorization was done based on a block group.) Studies reviewed in the previous section conclude that the majority of Millennials are living in urban areas. Therefore, it is not surprising that the total number of Millennials in the NHTS study in rural areas is about half as much as those in urban areas (FIGURE 1).

FIGURE 1 Age distribution of the NHTS sample in non-rural & rural areas.

The researchers employed a log-linear model to investigate what factors influence vehicle miles traveled (VMT). YEARMILE, as found in the NHTS sample, represents VMT. YEARMILE, as defined in the NHTS, are the miles that a “respondent drove in the last 12 months.” TABLE 1 presents the model, which is followed by a discussion of the model variables.
VMT by a rural respondent increases as the distance to work (DISTTOWK) increases. This result is as expected because work trips are typically those which are non-discretionary.

VMT decreases as the population per square mile (POP_DEN) increases, as expected. This variable is interesting because the model was created using only rural data; this result indicates that the more dense rural areas see a reduction in VMT as compared with the less dense rural areas. With increasing population density, often comes land development (e.g., shopping mall; grocery stores; and other amenities) near population clusters, which shortens the per-capita travel distance, as measured by the model.

Three variables were created for annual household income: Low-med Inc, Med Inc, and High Inc. Low-med Inc ranges from $15,000 to $50,000. Med Inc ranges from $50,000 to $80,000. High Inc. is greater than $80,000. Therefore, all of the resulting coefficients are being compared to households with annual income less than $15,000. The cut-off values for the income categories were based on national averages (46). The results showed that for each successively higher group of annual income earned, VMT increased. These results are expected, as an increase in income is typically correlated with an increase in VMT. However, these results are of interest because the data-set is rural. Therefore, the typical finding, where an increase in annual household income is correlated with an increase in VMT, holds for rural areas as well. However, note that the households with the greatest annual incomes are still in urban areas (FIGURE 2) (this chart includes both rural and urban data from the NHTS).
VEHperPerson represents the number of vehicles per household member. Bigger households are estimated to produce more VMT, everything else being equal.

Indicator variables were created to represent each generational cohort (i.e. GenX, Boomer, GenGreat) that was to be compared to the Millennial generation. All generations, as compared to the Millennial generation, generate more VMT, even in the rural areas. Therefore, it seems that even in rural areas, Millennials are traveling less than other generational cohorts. But in contrast to the previous descriptive analysis, the correlation between generation bracket and travel behavior is built on a stronger theoretical ground, as social-economic and transportation network factors have been factored in.

DwellingMulti represents the type of dwelling unit of the respondents, with a value of one indicating that the person resides in higher-density housing (multi-family housing, including condos, apartments, dormitories, sororities, and mobile homes), as opposed to single family homes. Results indicate that VMT decreases with more dense housing. This variable could potentially show a correlation between dense housing enabling car sharing for trips (therefore a reduction in VMT because what would otherwise be two trips is instead one) or there is a possibility that such housing styles are closer to service areas (i.e. restaurants, shops, etc.).

The results of this model regarding gender are contrary to expectation: women correspond with fewer VMT. In the international study, findings indicate that women contributed to more VMT (23). One potential explanation is that rural settings enable more stay-at-home moms. However, there is often a correlation between household duties and an increase in the frequency of trips, which typically correlates with an increase in VMT. It could be that while there may be more trips, they may be in closer proximity than places of employment. This result is a drawback of looking at data from a macro-level. It is worth investigating in more detail why women in rural environments generate lower VMT.

Two variables were created related to employment: Full-Time and Part-Time. They are compared by the modeling process with variables for those who are unemployed/retired. As expected, respondents with full-time positions in rural environments generate more VMT. Those with part-time employment in rural areas generate more VMT as compared to unemployed/retired respondents, but less as compared with full-time respondents.

A variable was created to represent respondents who had multiple jobs (MultiJob). This variable was correlated with an increase in VMT. This result makes sense, as these respondents likely need to travel more to go to more jobs.
Variables were developed to represent trips by biking (NBIKETRP) and walking (NWALKTRP). While the result for biking makes sense, VMT decreases as the number of bike trips increases, the result for walking is unexpected. However, it is possible that some respondents drove to locations to walk, thereby resulting in an increase in VMT.

A variable representing trips by public transportation (PTUSED) was included in the model and as expected, it correlated with a reduction in VMT. The variable’s magnitude is small, indicating that its influence on VMT is small, which correlates with the findings by Pucher and Renne (35).

4. CONCLUSIONS & FUTURE WORK

Based on the information regarding Millennials found through the Literature Review, Millennials find transportation options in rural areas to be confining, they travel more than their urban counterparts (20-30 year olds), fourteen percent of Millennials live in rural areas, and Millennials may be drawn to smaller communities where there is work. Most of the information known about Millennials to-date has been drawn from data samples taken from urban areas. From these studies, they have found that Millennials have a higher level of education (and corresponding debt) as compared with other generational cohorts, they are multimodal, they prefer technology to a private vehicle, and they are living with their parents or friends rather than buying their own homes.

From the model developed using the rural sample of the National Household Travel Survey, two important findings from this study are that Millennials in rural environments still contribute to fewer vehicle-miles traveled as compared with other generational cohorts and women contribute less to the vehicle-miles traveled as compared with men (different than other findings).

A large gap in understanding is whether or not the Millennial mindset of small urban and rural areas is the same as that in urban areas. For example, do they desire more transportation options, or is a seemingly multi-modal desire only fueled by lack of vehicle ownership and financial constraints? What factors might prompt them to move to an urban area, and how much of that is motivated by transportation provisions and preferences? For those who stay in small urban and rural areas, do they prefer the rural environment because they can depend almost exclusively on a private automobile? Do Millennials in rural areas own their homes, or do they rent or stay with family and friends? Answering these question helps deliver insights for policy-makers interested in a spectrum of goals, ranging from invigorating the rural economy (e.g., retaining work force and creating jobs) to sustainability and social equity (e.g., promoting alternative transportation and improving access).

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