Project Report

How Important are Attitudes in Travel Behavior Models? A Comprehensive Review

Prepared for **Teaching Old Models New Tricks (TOMNET) Transportation Center**

By,

Matthew Wigginton Conway
Email: mwconway@asu.edu

Nathan Harness
Email: nharness@asu.edu

Laura Mirtich
Email: lmirtich@asu.edu

Alexis Ross
Email: Alexis.J.Ross@asu.edu

Shuyao Hong
Email: Shuyao.Hong@asu.edu

Deborah Salon
Email: dsalon@asu.edu

School of Geographical Sciences and Urban Planning
Arizona State University
Coor Hall, 5th floor
975 S. Myrtle Ave.
Tempe, AZ 85287

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16. Abstract This project is a review of the literature on the relationship between attitudes and transportation choices. The literature is clear that, at least for some transportation choices among some populations, attitudes have strong associations with behavior. This raises the question of whether attitudinal variables should be included in the travel models that inform transportation decision making. Measuring attitudes and including them in models of travel behavior, however, is both expensive and challenging. We contribute with a focus on the questions of which attitudes are most important, for which transportation-related choices and populations, and how much do attitudinal variables improve the predictive power of travel behavior models. We also shed light on the relative success of different analytical methods and data collection protocols in helping us to understand these relationships.			
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ABSTRACT

This project is a review of the literature on the relationship between attitudes and transportation choices. The literature is clear that, at least for some transportation choices among some populations, attitudes have strong associations with behavior. This raises the question of whether attitudinal variables should be included in the travel models that inform transportation decision making. Measuring attitudes and including them in models of travel behavior, however, is both expensive and challenging. We contribute with a focus on the questions of *which* attitudes are most important, for *which* transportation-related choices and populations, and *how much* do attitudinal variables improve the predictive power of travel behavior models. We also shed light on the relative success of different analytical methods and data collection protocols in helping us to understand these relationships.

INTRODUCTION

There is a large literature that aims to incorporate "attitudes" (which can also include habits, personality, and beliefs) into statistical models of transport and transport-related choices. Most of the papers in this literature find that attitudes are clearly associated with transport choices. Many also find that including attitudinal information substantially improves travel behavior prediction.

There is interest in transferring these insights to the realm of practical transportation planning and modeling. Measuring attitudes and including them in models of travel behavior, however, is both expensive and challenging. A major challenge is identifying the attitudes that should be measured, the best questions to measure them, and for which travel choices those attitudes are most likely to be important.

This paper reports on an ongoing review of the literature aiming to identify the relationship between attitudes and travel behavior. The first goal of this project is to extract from this literature the best answers we can to the questions of which attitudes are most important, for which transportation-related choices and populations, and how much do attitudinal variables improve the predictive power of travel behavior models. We also shed light on the relative success of different analytical methods and data collection protocols in helping us to understand these relationships.

A second practical goal in conducting this literature review is to identify a common set of attitudinal questions that could be asked across travel surveys, similar to the current common set of demographic and travel behavior questions. To this end, a companion product to this written literature review will be a public online database of all of the studies that we have included. The database that we are developing includes summary information about each paper, the survey questions used to create attitudinal variables and their factor loadings, and the results of the statistical models estimated. We hope that this database will become a useful resource for researchers working in this area, and that as researchers use this database to develop attitudinal survey questions, future research (both survey questions and factor analyses) will become more directly comparable.

Please note that this is a literature review in progress, rather than one that we consider fully completed. Therefore, there are certainly relevant papers from the literature that are not yet included in our reference list, and whose findings we have not yet incorporated into our narrative. That said, we do think that we have completed enough of a review of this literature to begin to draw conclusions about the questions we outlined above as the main goals of our study, which we present in this paper.

In reviewing this literature, our overwhelming finding thus far is that it is surprisingly heterogeneous along multiple dimensions. The attitudes measured and included in statistical analyses are heterogeneous across studies, even when the outcome of interest is similar. In

addition, the survey questions used to measure attitudes are heterogeneous, even when the attitude being measured is similar. This heterogeneity in both the underlying attitudinal data and the research approach makes direct comparison across studies somewhat challenging.

The motivation for including attitudes in travel behavior models is also varied. Some authors have focused on the importance of attitudes themselves to improve travel behavior predictions (e.g. Vredin Johansson, Heldt and Johansson, 2006; Popuri *et al.*, 2011). Others have included attitudinal variables to "control" for residential self-selection in models of the relationships between travel and the built environment (e.g. Handy, Cao and Mokhtarian, 2006). This is important because which attitudes are included in models of travel behavior will depend on the purpose of including those attitudes.

The remainder of this paper begins by describing how we chose the papers that included in this review, and then continues with sections devoted to each of our main research questions:

1. How much do attitudes improve the predictive power of travel behavior models?
2. Which attitudes are most important?
3. How does the attitudes-travel behavior research vary by geography?

We then discuss important methodological themes in this literature and promising lines of research, and conclude with a summary and proposed future research agenda.

HOW WE CHOSE THE PAPERS

To identify papers to include in this literature review, we began by performing a set of searches using the Scopus research database. All searches included a requirement that the word "attitudes", "beliefs", or "perceptions" was mentioned in the title, abstract, or keywords. All searches also included a requirement that the words "factor analysis" or "principal component analysis" appeared somewhere in the full text of the article. The searches differed, then, by the travel-related keywords, which are listed in the Appendix.

These searches identified hundreds of candidate journal articles for inclusion in this review. To select articles for inclusion in this review, we used the following additional criteria:

- The sample size must be 300 or greater.
- The analysis must include at least 2 sociodemographic controls.
- The analysis must include either factor analysis or principal component analysis *and* a model to estimate the relationship between attitudes and travel choices.
- The paper must not be primarily focused on long distance travel and evacuation travel, autonomous vehicles, or children's travel.

We chose to only include papers that used factor analysis or principal components analysis because we feel these are the appropriate methods to analyze attitudinal data. Generally, attitudes are collected through surveys where respondents rate their agreement or disagreement with a battery of Likert-scaled questions. These questions are not the attitudes themselves, but rather indicators of the attitudes, while the underlying attitudes are some less tangible such as "pro-environment." Factor analysis uses these indicators to recover the underlying, latent, intangible attitudes, which can then be used in models of travel behavior.

HOW MUCH DO ATTITUDINAL VARIABLES IMPROVE THE PREDICTIVE POWER OF TRAVEL BEHAVIOR MODELS?

Almost all studies reviewed identified at least one statistically significant association between an attitudinal variable and a travel behavior outcome. As modern planners call upon large capital expenditures and labor mobilizations it is necessary to prioritize certain public investments over others. Planners make these choices based off of the results of travel demand models to maximize the utility provided for the public. Improved statistical models of demand thus increase the efficiency by which transport projects contribute to society, and attitudinal factors and the analysis thereof represent a possible avenue by which to improve demand models and thus planning effectiveness.

Some researchers perform their analyses twice, once with attitudes and once without (Kitamura, Mokhtarian and Laidet, 1997; Kuppam, Pendyala and Rahman, 1999; Akar and Clifton, 2009; Cao, Mokhtarian and Handy, 2009; Popuri *et al.*, 2011; Maldonado-Hinarejos, Sivakumar and Polak, 2014; Ettema and Nieuwenhuis, 2017; Park and Akar, 2019). This allows us to directly evaluate how much attitudes improve predictive power. Of these studies, all found significantly improved predictive power with the addition of attitudinal factors. This practice is the most important tool we have to identify the importance of attitudinal factors, as it allows us to directly evaluate how much attitudes improve predictive power. Presently, there is an insufficient body of research using this method that enables direct measurement of attitudinal predictive power for strong conclusions. Going forward the addition of literature including otherwise-identical models with and without attitudes will be paramount to continuing research on this topic.

While we cannot directly evaluate the improvement in model fit in papers where authors did not fit a model without attitudes, we can evaluate whether attitudinal variables were statistically significant in models also controlling for sociodemographics. Our review of the literature suggests that attitudinal factors are more often a significant determinant of travel behaviour than not.

Unfortunately, much of the literature is insufficient to make strong conclusions. Many models fail to control for at least one important demographic factor (age, gender, income, household size, etc.). Others use analytical methods which enlarge significance. In particular, stepwise regression is common in this literature, but is known to lead to findings attributable to sampling error and which cannot be replicated (Thompson, 1995). Thus, we cannot say with certainty that attitudes would improve predictive power if added to an existing model with a full complement of sociodemographics. However, the fact that attitudes were almost universally significant suggests they would.

In order to better evaluate whether attitudes improve model predictive power, researchers should always include models both with and without attitudes, but with the same control variables, and compare their goodness of fit. Furthermore, researchers should include a broad array of sociodemographic control variables in their models, to evaluate whether attitudes make a separate contribution to predictive power.

WHICH ATTITUDES ARE MOST IMPORTANT?

Most literature gauged individual attitudes by asking survey respondents to evaluate various statements; these statements are then grouped and/or labelled as an attitude for modeling a transport behavioral outcome. Because of the lack of a universal way of asking attitudinal statements and conducting factor analysis, it is challenging to generalize the effects of attitudes. However, there are some common attitudes that have been frequently included in the literature.

When predicting mode choice behaviour in general, the most important attitudinal factor is the attitude towards the mode of interest. Positive attitudes towards a travel mode increase the likelihood of using the chosen mode and decrease the likelihood of choosing other modes. For instance, pro-automobile/pro-driving attitudes are negatively associated with the use of non-motorized modes (De Vos, Ettema and Witlox, 2018; Zhao *et al.*, 2018) and public transportation (Ettema and Nieuwenhuis, 2017), while positively associated with driving and VMT (Handy, Cao and Mokhtarian, 2005; Ettema and Nieuwenhuis, 2017). Attitudes such as "pro-bike" or "pro-walk" are positively associated with biking and walking (Cao, Mokhtarian and Handy, 2007; Maldonado-Hinarejos, Sivakumar and Polak, 2014; De Vos, Ettema and Witlox, 2018; Park and Akar, 2019) and negatively associated with driving (e.g. Handy, Cao and Mokhtarian, 2005).

A wide variety of attitudinal constructs that are not simple mode preferences also appear in this literature. The most common of these include environmental awareness/concern (Kitamura, Mokhtarian and Laidet, 1997; de Abreu e Silva, 2014; Jomnonkwao *et al.*, 2016; Kim, Rasouli and Timmermans, 2017; Mohamed *et al.*, 2018), the importance and perceptions of safety (Handy, Cao and Mokhtarian, 2005; Cao, Mokhtarian and Handy, 2007; Aditjandra, Mulley and Nelson, 2010; Jomnonkwao *et al.*, 2016; Park and Akar, 2019), the importance and perceptions of convenience (Barajas, 2019; Kuppam, Pendyala and Rahman, 1999; Jomnonkwao *et al.*, 2016), and preferences about neighborhood/built environment factors (Frank *et al.*, 2007; Park and Akar, 2019; Kitamura, Mokhtarian and Laidet, 1997). Non-motorized mode choices are generally positively associated with environmental awareness/concern, and driving choices are often negatively associated with this attitudinal construct.

Attitudinal constructs about the safety and convenience of travel are sometimes specific to a particular mode of travel and represent perceptions of safety and convenience of a particular mode. Other times, attitudinal constructs about safety and convenience are not mode-specific, and instead represent survey respondents' attitudes about the importance of these factors in their travel decisionmaking. These different attitudinal constructs of safety and convenience naturally have different relationships with mode choices. Interestingly, the studies included in this review tend to use only one of these constructs, when conceptually both might be independently important in predicting travel behavior.

Studies that include attitudinal constructs that measure preferences about neighborhood type or built environment characteristics usually do so with the goal of controlling for residential self selection in their analysis of travel behavior. The goal of these studies, then, is not to estimate the extent to which attitudes generally predict travel choices, but rather to reduce bias in estimates of travel choices. There are a few studies—notably one seminal study in this literature by Kitamura, Mokhtarian, and Laidet (1997)—that aim to do both.

HOW DOES THE ATTITUDE-TRAVEL BEHAVIOR RESEARCH VARY BY GEOGRAPHY?

Research on how attitudes affect travel behavior spans the globe. Given different historical, cultural, and transport contexts, we expect that there may be some differences in research in different locations. We found that the focus of the research differs by region. The following section describes the different foci of research in Asia, Europe, and North America. We have not yet reviewed sufficient studies from Africa, South America, or Australia to make specific conclusions about research in these regions.

In research on Asia, there are two main foci. The first one is car use and future car ownership. While one of the largest predictors of mode choice is whether or not a person currently

owns a car, He and Thøgersen (2017) found that if they do not currently own a car but have a positive attitude towards cars then they are more likely to intend to purchase a car in the future. Guan and Wang (2019) found that a male head of household holds more power in the choice of residential location and car ownership, but that wives exert more influence on both their own and their husbands' commute distance. Kim et al. (2015) found that attitudes were predominantly relevant in predicting the use of using an shared electric vehicle, but not when it came to owning an electric vehicle. In Japan the desire to buy a car is low but the attitudes towards cars is positively related to the intention to commute by car (Van, Choocharukul and Fujii, 2014). This focus on car ownership, sharing, and usage may initially seem surprising since traffic congestion is generally high and car ownership relatively lower than elsewhere in the world. However, Asia is motorizing rapidly—China is now the world's largest auto market, for example (Wang, Liao and Hein, 2012)—explaining this focus. Many people in Asia are now making the decision to purchase a vehicle for the first time.

Much of the research on the link between attitudes and travel is based in Europe. While the breadth of European research covers most topics of travel analysis, in particular many studies of relocation were conducted here. These studies examine people who have recently changed their residential location to try to separate the effects of the built environment from the effects of attitudes—assuming that their attitudes have remained relatively constant over time, while a change in their built environment has been observed due to relocation. These studies find that people moving to more urban areas, with more street life, use the car less (Aditjandra, Mulley and Nelson, 2010; De Vos, Ettema and Witlox, 2018; Klinger and Lanzendorf, 2016). Wolday, Cao, and Næss (2018) found that other factors often trump travel attitudes when making a residential location choice, suggesting that residential relocations are not excessively conditioned on travel attitudes and therefore these studies likely are somewhat successful at isolating the effects of attitudes and the built environment on travel behavior. Ettema and Niewenhuis (2017) confirm that travel-related attitudes and travel-related reasons for residential location choice are only weakly correlated.

Relocation studies can also allow evaluating the bidirectional relationship between attitudes and travel. De Vos, Ettema, and Witlox (2018) found that attitudes as well as travel behavior changed in response to a change in the residential location. These relocation studies are promising because they help isolate the effects of the built environment from travel attitudes, although self-selection is still a concern. The approach of Ettema and Niewenhuis (2017) of directly asking respondents whether they considered different travel options when making their residential location choice is a good one that should be replicated in other studies of relocation.

Another significant area of research in Europe is bicycling, and what attitudes and built environment characteristics influence a person's decision to bike over driving or public transit. This focus is unsurprising, given the high bicycle mode share in many western European countries (Buehler and Pucher, 2012). Attitudes are significant determinants of cycling in many studies, though not all attitudinal statements were significant in all studies (Barberan, de Abreu e Silva and Monzon, 2017; Klinger and Lanzendorf, 2016; Curto *et al.*, 2016; Lois, Moriano and Rondinella, 2015). Perception of safety when cycling is a key predictor of cycling, significant in three of the four papers (Barberan, de Abreu e Silva and Monzon, 2017; Lois, Moriano and Rondinella, 2015; Curto *et al.*, 2016). In contrast, Klinger and Lanzendorf (2016) found that a perception of a cycling culture in a city was the most important attitudinal factor predicting cycling use, and note that the uptick in German cycling has been relatively independent of infrastructure investment. Unlike other modes, they found that residential preference and self-selection strongly have little impact

on cycling behavior. In summary, safety and cycling culture seem to be important determinants of cycling usage in Europe, a finding unlikely to differ in other contexts.

North American research has focused on the mode choice decision. This makes sense in a North American context, as car ownership is near-ubiquitous unlike in Asia, and the landscape is largely suburban leaving less opportunity for people to move between suburban and urban locations as in European relocation studies. In general attitudes are a significant predictor of the way a person travels (e.g. Kitamura, Mokhtarian and Laidet, 1997; Kuppam, Pendyala and Rahman, 1999; Barajas, 2019). Neighborhoods and their built environment characteristics also have an impact, with traditional neighborhoods associated with increased walking and bicycle use and less driving (Handy, Cao and Mokhtarian, 2005; Frank *et al.*, 2007). These studies all strongly suggest that including attitudinal factors in mode choice models improves their predictive power.

A key focus in the North American literature on mode choice has been the question of self-selection: does the built environment actually matter for travel behavior, or is it just that people who travel by non-auto modes prefer certain built environments? Cao, Mokhtarian, and Handy (2009) review many studies on this effect, including many from North America, and conclude that while the self-selection effect is real, the built environment has effects as well.

After a brief review of research done in the three largest regions, we can conclude that research in these regions differs in primary focus. Asia has a lot of focus on car use, car ownership, and willingness to buy a car in the future. In Europe, much research focuses on exploiting residential relocation to understand self-selection effects. How attitudes affect mode choice and neighborhood type is the focus of much North American research. Attitudes were found to be important in all of the regions, though the type or topic of the attitudes did vary.

Few researchers have made direct comparisons of the effect of attitudes on travel between regions. Post hoc comparisons are difficult because the questions and methodology used in different studies is highly variable, so it is impossible to know whether differences in results between studies of different regions are due to methodological differences or true regional differences. Aditjandra, Mulley and Nelson (2010) is an exception. They used the same survey instrument as Handy, Cao, and Mokhtarian (2005), but deployed it in Britain, and compared the results to Handy, Cao, and Mokhtarian's US results. They found that the underlying attitudinal factors differed in the US and Britain, with British respondents having an underlying attitude towards public transport that was not seen in the US. Furthermore, British respondents rated the attractiveness of suburban neighborhoods higher than traditional neighborhoods, while in the US the opposite effect was observed. Finally, several built-environment factors were significant in the British study, while none were in the Handy, Cao, and Mokhtarian's US study.

Van, Choocharukul, and Fujii (2014) deployed a survey across six Asian countries and compared the results. They found that attitudes towards car usage were strongly predictive of car commuting in countries where there is relatively low intention to use the car, but that in countries where more people intend to use cars these attitudes are less important—suggesting that local context matters in this decision. In the US, Moody and Zhao (2019) compared New York and Houston, and found that attitudes towards being proud of one's car or seeing it as a status symbol were higher in New York than in Houston.

Comparisons between regions are important for travel modelers who may wish to transfer a survey or model from one region to another. Thus, it is important that more studies be done to facilitate this comparison—either replication studies using the methods and survey questions of previous studies in new locations, or studies where the same methods and survey are deployed in multiple locations.

LONGITUDINAL VS. CROSS-SECTIONAL DESIGNS

When examining methodological trends in travel behavior literature, one tendency becomes immediately apparent even before inspecting the effects of methodology on study findings. This is the notable lack of longitudinal studies. Of the literature reviewed, only 3 studies were longitudinal (Barberan, de Abreu e Silva and Monzon, 2017; Kamruzzaman *et al.*, 2013; Wang and Chen, 2012). This imbalance may lead to skewed results in the body of literature as a whole, since longitudinal studies may produce different findings than cross-sectional ones.

Among the few longitudinal studies we have read, all found attitudes to be more important predictors of travel behavior than sociodemographics and/or the built environment for some, if not all, of their outcome variables. A review by Cao, Mokhtarian, and Handy (2009) found a contrasting result: longitudinal studies generally find the built environment to be significant, but often find attitudes to be insignificant. Cross-sectional studies gave rise to a variety of results: attitudes could be more significant (de Abreu e Silva, 2014; Barajas, 2019; Cao, Handy and Mokhtarian, 2006; Jomnonkwao *et al.*, 2016) or less significant (Akar and Clifton, 2009; Ao *et al.*, 2019; Mokhtarian and Salomon, 1997) than other explanatory variables in models of travel behavior. In any case, it seems likely the results of longitudinal studies may differ from those of cross-sectional studies. Since longitudinal studies allow for robust investigation of change in attitudes and behavior over time, and may produce different results than cross-sectional studies, their rarity in this literature is a concern.

Not all survey methods are neatly classified as longitudinal or cross-sectional. There is a substantial body of literature that is "quasi-longitudinal." Here, we define this term to refer to a survey in which data is only collected at one point in time, but respondents are asked to recall previous attitudes or behavior. For example, a quasi-longitudinal study may ask residents of a neighborhood with recently improved transit access about how their travel behavior has changed since transit access increased. Quasi-longitudinal studies are about as common as longitudinal studies in the literature, with 4 instances found in the studies surveyed here (De Vos, Ettema and Witlox, 2018; Cao, Mokhtarian and Handy, 2007; Handy, Cao and Mokhtarian, 2005; Klinger and Lanzendorf, 2016). Like cross-sectional studies, these papers did not collectively display conclusive trends about the importance of attitudes in travel behavior models. One of the more notable papers from this group is a survey in which a quasi-longitudinal method and a cross-sectional method are used to investigate the same research question, and the results are compared (Handy, Cao and Mokhtarian, 2005). The authors concluded that both methods found attitudes to be significant, but only the quasi-longitudinal methods found the built environment to be significant as well. Studies of this nature are a valuable addition to the literature, since they allow two analysis methods to be compared while controlling for possible confounding variables in the experimental design such as survey instrument, population studied, and outcome variable. More papers that employ this method of comparison, as well as more longitudinal and quasi-longitudinal studies in general, could potentially clarify the effect of survey method on findings.

The absence of a robust set of longitudinal studies, in addition to making methodological comparisons difficult, also prevents the exploration of an important avenue of investigation. One unanswered question within the literature is the directionality of causal relationships between behavior and attitudes. Attitudes are commonly assumed to cause behavior (Ajzen, 1985; Guan and Wang, 2019; Cao, Mokhtarian and Handy, 2007; He and Thøgersen, 2017; Mohamed *et al.*, 2018), but an increasing number of studies note the potential for a bidirectional relationship (de Abreu e Silva, 2014; Barajas, 2019; Moody and Zhao, 2019; Wang and Chen, 2012). Cross-

sectional studies are capable of showing correlations, but longitudinal studies are the best way to robustly examine causal relationships to clarify this area of ambiguity.

PROMISING LINES OF RESEARCH

This review identified a number of promising lines of research that should be continued. As mentioned above, longitudinal analyses are lacking. While these analyses are difficult to conduct, they are highly promising for a number of reasons. First of all, it remains unclear whether people's attitudes inform their behavior, or their behavior informs their attitudes. The dominant theoretical framework in this literature is the Theory of Planned Behavior, which suggests that attitudes inform and affect behavior (Ajzen, 1985). However, the competing Theory of Cognitive Dissonance predicts that people may adjust either their behavior or their attitudes to achieve consonance between them (Festinger, 1962). Longitudinal designs are the best method to uncover how attitudes and behaviors change over time.

Another promising line of research is studies of residential 'consonants' and 'dissonants'— people who do or do not live in a built environment matching their preferences. These studies are valuable because they allow us to separate the influence of attitudes and the built environment on travel behavior. Even when they live in low-density suburban neighborhoods, people who have a preference for higher-density environs already walk more than their neighbors who are happy with their low-density environment (Frank *et al.*, 2007). Transit-oriented development residents who dislike their environment are more likely to drive to work than residents of other environments who would prefer a transit-oriented development (Kamruzzaman, Baker and Turrell, 2015). These findings suggest that attitudes may be more important than built environment factors in determining travel. However, vehicle miles traveled is similar across consonants and dissonants in suburban locations, suggesting that attitudes may matter more for some travel outcomes than others (Schwanen and Mokhtarian, 2005; Frank *et al.*, 2007). This suggests that attitudes may matter more for certain travel choices than they do for others. Dissonance studies allow untangling attitudes and contextual variables; this valuable line of research should be continued.

CONCLUSION AND RESEARCH AGENDA

Attitudes show significant promise for improving predictions of travel behavior. When included in models, they are almost always statistically significant, and are often more important than sociodemographic or built-environment variables. When compared with models excluding attitudes, models including attitudes generally have better goodness of fit and predictive power. All of this suggests that collecting and including attitudinal variables in travel models has the potential to improve these models and the decisions made based on them.

However, many challenges and opportunities for future research remain. Few researchers have directly compared otherwise-identical models with and without attitudes, which is the best way to know for sure that attitudes significantly contribute to the predictive power of the model. Furthermore, many researchers do not include a full set of sociodemographic controls in their models, making it impossible to know whether the attitudes they include are serving as proxies for the sociodemographics they omitted. This is a critical question for transport modeling practitioners; to justify the time and expense of collecting, analyzing, and including attitudes in travel models, modellers must be sure that the results will improve their models. While the existing body of literature points strongly in this direction, future research should include a full set of sociodemographic controls and compare models with and without attitudes in order to directly address this question.

In addition, heterogeneity in the way that travel behavior researchers have measured attitudes and included them as predictors in their statistical models makes it difficult to compare across studies or draw broad conclusions from this literature that are useful for policymaking. Therefore, we suggest that future researchers endeavor to use attitudinal questions and constructs that have been developed and used by prior research teams, facilitating comparability of results across studies, geographical and cultural contexts, and analysis methods. The soon-to-be-public database of attitudinal survey questions and constructs that this research team is developing will serve as a resource to facilitate this practice.

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APPENDIX: LIST OF TRAVEL BEHAVIOR SEARCH TERMS USED

- mode AND choice

- residential AND location

- (vehicle OR car) AND ownership

- (vehicle OR car) AND type

- (vehicle OR car) AND purchase

- residential AND self-selection

- "vehicle miles traveled" OR "vehicle kilometers traveled" OR "vehicle kilometres traveled" OR "VMT" OR "VKT"

- bicycling OR biking OR bicycle OR bike

- transit OR "public transport" OR "public transportation"