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**Title:** Family Structure and the Impact of Home-Delivery on Household Shopping Trips

**Abstract:** E-commerce and on-demand delivery is a quickly growing industry in the United States and across the world. According to the U.S. Census Bureau, online retail in the U.S. consisted of over \$450 billion (9% of all U.S. retail) in sales in 2017, an amount that has been roughly doubling every 5 years. In the U.S., as of June 2018, there were over 95 million people paying for Amazon Prime subscriptions, that's roughly a quarter of the U.S. population, or close to 40% of those over 18. It is inevitable that this online retail will impact travel patterns of U.S. consumers. According to the National Household Travel Survey (NHTS) person-trips per household with the purpose of shopping have decreased from 21% in 2009 to 18% in 2017, and the per-person vehicle miles traveled (VMT) associated with shopping activities has also decreased from 14% to 12%. However, the degree of substitution versus complementarity of e-commerce and shopping travel is still not well understood, especially how mediating factors such as family structure influence these patterns. Indeed, according to the U.S. Census Bureau, 41% of U.S. households in 2017 had children in the household, and nearly a third of households with children had only one parent. Shopping and purchase needs, constraints on energy and time, and flexibility in shopping travel mode choice are all highly impacted by these aspects of household structure. We collected data as part of the innovative WholeTraveler Transportation Behavior Study survey to better understand e-commerce behavior and impacts on shopping travel (differentiating vehicle versus non-vehicle modes) for four different categories of goods (groceries, household items, prepared meals, and clothing). Using these data we undertake analyses to answer the following questions. First, what is the distribution of substitution and complementarity behavior across the population for these four categories of goods? Which types of shopping travel modes are being substituted for, or not, by delivery for these four categories of goods? What are the implications of family structure (single-person households, single parent households, non-single person households without children, and non-single parent households) for e-commerce activity and substitution patterns? These results will provide valuable insights into the degree to which e-commerce delivery is increasing VMT associated with shopping overall or not, and if so, what needs are deliveries addressing in the population.