FTA RESEARCH

FEDERAL TRANSIT ADMINISTRATION

Mobility on Demand (MOD) Sandbox: Vermont Agency of Transportation (VTrans) Flexible Trip Planner

Final Report

JANUARY 2020

FTA Report No. 0150
Federal Transit Administration

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U.S. Department of Transportation
Federal Transit Administration

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DISCLAIMER

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Metric Conversion Table

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: volumes greater than 1000 L shall be shown in m^3				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC

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13. ABSTRACT

When the Vermont Agency of Transportation (VTrans) embarked on its MOD Sandbox project in early 2017, "flexible multimodal transit trip planning" (software for trip planning that seamlessly integrates demand-responsive modes of transit with fixed-route transit) was an idea that had never been implemented. Two years later, there is an emerging marketplace of providers that support routing similar to the routing that Vermont first launched. Most of the players in that market are directly engaged in working with the technologies developed through the VTrans MOD Sandbox project, and other transportation providers are researching how to collaborate with the open data approach pursued by VTrans. The VTrans MOD Sandbox started from the problem statement "Trip planning software on the market does not work for residents of Vermont, because it is focuses on the needs of urban transit riders." To address that problem, the project team leveraged and augmented two existing technologies—GTFS-flex, an open data extension of the widely-used General Transit Feed Specification that describes demand-responsive transit services, and OpenTripPlanner (OTP), an open source software application used by more than 30 transit agencies around the world to provide automated itineraries for transit trips. Together, this data and software combination provided a uniform way to describe flexible transit services around Vermont and an application ready to be adapted to leverage that data, which already included most of the features VTrans sought. Thus, VTrans was able to create a system wholly owned by the State of Vermont without ongoing license fees. The outcomes of this project—GTFS-flex data sets, lessons for flex data contributed to a revised GTFS-flex v2, and the OTP adaptations—were contributed back to the community and are available for use by any party.

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Acknowledgments

VTrans' MOD Sandbox project was intentionally community oriented, leveraging resources already developed by community members, and seeking to contribute back to those communal resources. Collaboration and support of mutual goals is critical to the mission of public transit, and VTrans is honored to have had the opportunity to participate in the work of moving forward those goals. At the outset of the project, VTrans received more than 10 letters of support from developers, agencies, and companies who wished to see these efforts move forward. These included letters from the Vermont Public Transit Association, the Oregon Department of Transportation, the Massachusetts Department of Transportation, the AARP, Denver RTD, Cherriots, Anaheim Transportation Network, Gridworks, Bridj, and Brian Ferris, many of whom have continued to contribute through the project their feedback and support. Special thanks are due to the consulting team, Trillium and Cambridge Systematics, and collaborating MOD partners and OTP community members TriMet, University of South Florida, Conveyal, IBI Group, and Entur who have provided technical assistance, guidance and many invaluable contributions to open data and open source tools for transit agencies.

Abstract

When the Vermont Agency of Transportation (VTrans) embarked on its MOD Sandbox project in early 2017, "flexible multimodal transit trip planning" (software for trip planning that seamlessly integrates demand-responsive modes of transit with fixed-route transit) was an idea that had never been implemented. Two years later, there is an emerging marketplace of providers that supporting routing similar to the routing that Vermont first launched. Most of the players in that market are directly engaged in working with the technologies developed through the VTrans MOD Sandbox project, and other transportation providers are researching how to collaborate with the open data approach pursued by VTrans.

The VTrans MOD Sandbox started from the problem statement "Trip planning software on the market does not work for residents of Vermont, because it is focuses on the needs of urban transit riders." To address that problem, the project team leveraged and augmented two existing technologies:

- GTFS-flex – an open data extension of the widely used General Transit Feed Specification, describes demand-responsive transit services (https://gtfsflex.com)
- OpenTripPlanner (OTP) – an open source software application utilized by more than 30 transit agencies around the world to provide automated itineraries for transit trips (https://opentripplanner.org)

Together, this data and software combination provided a uniform way to describe flexible transit services around Vermont and an application ready to be adapted

to leverage that data, which already included most of the features VTrans sought. Thus, VTrans was able to create a system wholly owned by the State of Vermont without ongoing license fees. The outcomes of this project—GTFS-flex data sets, lessons for flex data contributed to a revised "GTFS-flex v2," and the OTP adaptations—were contributed back to the community and are available for use by any party.

EXECUTIVE SUMMARY

VTrans (Vermont Agency of Transportation) was awarded a $480,000 FTA Mobility on Demand (MOD) Sandbox grant to develop foundational data and software tools that would enable rural and demand-responsive transportation to be discovered in trip planners, similar to how fixed-route transit providers could already be discovered.

The project succeeded in this goal through three innovations:

- **Specified and developed "GTFS-flex" data for all public transit providers in Vermont**—the data stored at vermont-gtfs.org contains descriptions of all possible trips that could be served by Vermont public transit, including flexible services. Small adaptations were made to the GTFS-flex data specification during the scope of the project to address needed use cases discovered during research.
- **Adapted OpenTripPlanner (OTP) to search and visualize flexible trip plans based on GTFS-flex data**—this includes the discovery of any possible future demand-responsive trip. "Discovery" means the indication that a trip is possible, with the expectation that the end-user books the desired trip in coordination with the agency.
- **Worked with the community of open source and open data transit developers to refine the above work**—the project team presented the GTFS change proposals incorporating GTFS-flex data concepts in partnership with MobilityData IO, constituting the GTFS-flex v2 specification now under consideration for adoption by various parties. The project team also successfully merged OTP code enhancements into OTP 1.4 in partnership with the OTP Project Leadership Committee and reviews by developers at Entur in Oslo and Conveyal in Washington, DC.

VTrans introduced the Go! Vermont Flexible Trip Planner Project in February 2018. The trip planner, accessible to the public at https://plan.govermont.org/, is the first trip planner capable of presenting all public transit services in Vermont, connecting users in multimodal journeys that offer viable transit solutions, even in rural regions without fixed-route networks. These new features include routing for Dial-a-Ride, Hail and Ride, and Deviated Fixed services, all especially common in rural areas that other trip planner technologies have failed to serve effectively.

The combined effect of the results of this project is a demonstration that flexible transit trip planning is possible and practical in production trip planners. Since the launch of the VTrans Trip Planner, three for-profit companies (Transit App,[1] DemandTrans, Kyyti in collaboration with project partner Trillium Solutions, Inc., Lyft, and Uber,) have begun offering a similar trip planning experience, and other private industry and public entities have connected with VTrans and its partners to consider adopting the developed technological solutions. Contemporaneous

[1] https://medium.com/transit-app/finally-a-real-solution-to-first-and-last-mile-trips-adedbdcd8bb9.

with the VTrans project, the TriMet MOD Sandbox project also developed and published a flexible trip planner showing similar routing, built using the same technology stack with different use cases in mind.

Google and other large technology firms are investigating and interacting with GTFS-flex data through the MobilityData program, and future implementations of flexible trip planning like that demonstrated in Vermont seem likely. New features and use cases are being designed and included on top of existing VTrans features, such as payment integration, vehicle location, automated reservations, and more. Flexible transit trip planning—integrated with the entire fixed route network for optimized trip efficiency—is no longer an idea, but a reality. That is the result of the VTrans MOD Sandbox project.

SECTION 1

Introduction

MOD Program

FTA's Mobility on Demand (MOD) Sandbox is a demonstration effort to explore approaches to integrating promising new mobility concepts, technologies, and solutions with transit to enhance the personal mobility of individuals. New and innovative shared-use mobility concepts and solutions, from bike- and car-sharing systems to ridesharing services summoned though a smart phone app, are providing travelers with new options to plan, pay for, and take trips. By weaving together public transit with these new mobility options, the efficiency and effectiveness of existing transit options can flourish while expanding mobility options available to travelers. The MOD Sandbox investigates, through real-world demonstration efforts, how these new mobility solutions can be effectively integrated with existing transit systems to achieve the vision of MOD for an integrated network of safe and reliable transportation options available to all.

The MOD Sandbox is part of FTA's broader MOD research, demonstration, and deployment efforts. Its goals are to 1) explore emerging technology solutions and new business approaches that have the potential to transform mobility services, 2) prepare the transportation industry to deliver these innovative mobility solutions, and 3) enable the widespread deployment of integrated mobility solutions. MOD research projects are also aligned with USDOT's strategic goal to lead in the development and deployment of innovative practices and technologies that improve the performance of the nation's transportation system.

The MOD Sandbox consists of 11 pilot projects selected in late 2016 to demonstrate different approaches and technologies. Transit organizations lead project efforts in partnership with mobility providers, research organizations, or state and local governments. All project teams are now working to launch demonstration efforts, several of which are already operational, including the Go! Vermont Trip Planner described in this report.

Project Overview

The Vermont Agency of Transportation (VTrans) introduced the Go! Vermont Trip Planner Project in February 2018. The trip planner, accessible to the public at https://plan.govermont.org/, is the first trip planner capable of presenting all public transit services in Vermont and connecting users in multimodal journeys that offer viable transit solutions, even in rural regions without fixed-route networks. These new features include routing for Dial-a-Ride, Hail and Ride, and Deviated Fixed services, all especially common in rural areas that other trip planner technologies have failed to serve effectively.

SECTION 2

Project Description

VTrans was awarded an FTA MOD Sandbox grant for $480,000 to develop foundational data and software tools that would allow rural and demand-responsive transportation to be discovered in trip planners, similar to how fixed-route transit providers could already be discovered using the General Transit Feed Specification (GTFS), a data specification that allows public transit agencies to publish their transit data in a format that can be consumed by a wide variety of software applications. The GTFS data format is used by thousands of public transport providers worldwide.

Section 5312 as amended by the Fixing America's Surface Transportation (FAST) Act requires technology demonstration projects to fulfill one of three requirements, including "the implementation of research and technology development to advance the interests of public transportation." Public transit agencies in the United states provide many of the same services across the country but lack effective technological tools to share innovations collaboratively. Each agency often is left to develop systems internally or procure software and hardware from a marketplace that is not adapting quickly to new technologies. The Go! Vermont Trip Planner project focused its activities on creating technologies that can easily be adapted by other agencies to solve current needs and made significant contributions both to the GTFS data specification effort and to an open source software application in use by dozens of cities and regions worldwide.

As more agencies and transit passengers turn to GTFS and GTFS-based apps for information on fixed-route, scheduled service, the lack of accommodation for flexible-route, demand-responsive service has become an issue for paratransit services and providers in non-urban areas. GTFS-flex is a proposed extension to GTFS that allows agencies to describe demand-responsive transit or paratransit within a data model directly related to GTFS or even within the same GTFS data feed that already exists (when flexible services are merged operationally with fixed-route services). As a result of the VTrans Trip Planner project, there is a complete and maintained GTFS-flex data set for the state of Vermont at https://vermont-gtfs.org. VTrans intends that its work on GTFS-flex eventually allows rural transit and paratransit operators to publish their services in commonly-used apps such as Google Maps. The project made substantive changes to the GTFS-flex data specification proposal itself to clarify ambiguities and make the specification more attractive to Google and other potential users of GTFS-flex.

To demonstrate how a software application could potentially provide users with information about demand-responsive trips, the VTrans project included

the development of a software application ready to ingest and use GTFS-flex. OpenTripPlanner (OTP) provided the right platform to implement the demonstration of GTFS-flex trip planning, both because it already ingested GTFS data and because the open source nature of the project allowed VTrans free use to design a project using the code without strict limitations on approaches or budget lost to license fees. The resulting trip planner code is now live at https://plan.govermont.org, allowing an ongoing public demonstration of the flexible-transit trips accessible through these technologies, and is available for download and use by any public or private party.[2]

These resources created by the VTrans project (GTFS-flex specification enhancements and data, and OTP enhancements) are real tools available from which public transit agencies can leverage and benefit, and the return on investment from the FTA funding of this initiative has been both immediate and has promoted additional longer-term investments. At least four regions, including dozens of agencies, have implemented beta or production trip planners using the technologies developed in Vermont. Additionally, three other state DOTs have initiated plans to develop GTFS-flex data for statewide transportation providers. Industry, planning, and academic organizations have funded projects to further develop the GTFS-flex specification and research its applications in other contexts. The VTrans Flexible Trip Planner Project was funded to create technologies that other transit agencies would adopt and benefit from, and achieving that goal was as valuable as bringing a new tool to Vermont transit riders.

Project Goals

The project had the following goals:

1. Specify and develop "GTFS-flex" data for all public transit providers in Vermont.
2. Adapt OpenTripPlanner to search and visualize flexible trip plans based on GTFS-flex data.
3. Work with the community of open source and open data transit developers to refine the above work.
4. Deploy a statewide trip planner demonstrating accomplishment of the above and provide a new tool for Vermont public transit riders, showing them all available services in the state.

Each goal was accomplished, along with ancillary successes:

- The data stored at vermont-gtfs.org contains descriptions of all the possible trips that could be served by Vermont public transit, including flexible services.

[2] https://github.com/opentripplanner/OpenTripPlanner.

- Small adaptations were made to the GTFS-flex data specification during the scope of the project to address needed use cases discovered during research
- The launched trip planner allows the discovery of any possible future demand-responsive trip. "Discovery" means that a trip is possible, with the expectation that the end-user books the desired trip in coordination with the agency.
- Proposals for the long-term development of GTFS-flex were proposed in partnership with MobilityData, constituting a "GTFS-flex v2" specification now under consideration for adoption by various parties.
- OpenTripPlanner code enhancements were merged into OTP 1.4 in partnership with the OTP Project Leadership Committee and reviews by developers at Entur in Oslo and Conveyal in Washington, DC.

The combined effect of this project is a demonstration that flexible transit trip planning is possible and practical in production trip planners. Since the launch of the VTrans Trip Planner, three for-profit companies (Transit App, DemandTrans, and Kyyti in collaboration with project partner Trillium Solutions, Inc.) have begun offering a similar trip planning experience, and other private industry and public entities have connected with VTrans and its partners to consider adopting the developed technological solutions. Flexible transit trip planning—integrated with the entire fixed-route network for optimized trip efficiency—is no longer an idea, but an approaching reality as a result of the VTrans MOD Sandbox project.

Project Participants

Participants in the project included the following:

- Vermont Agency of Transportation (VTrans) – Project Manager Ross MacDonald led outreach and collaboration with local Vermont agencies and collection of feedback from agencies and support staff and coordinated with FTA and project partners.
- Trillium Solutions, Inc. – Thomas Craig managed the GTFS-flex data development process, consulting, and adaptation of the GTFS-flex specification and provided overall project management of the OTP software development.
- Cambridge Systematics – Paul Sorenson led technical management of the software development process and contributed to system architecture decision-making.

SECTION 3

Project Evolution

Major activities undertaken as part of the project are described in the following subsections.

Project Kick-off Activities

Trillium presented initial concept sketches in a mix of venues in early 2017 to obtain feedback from project stakeholders and parties outside Vermont with an interest in the technology:

- Transportation Camp, Washington, DC, January 2017
- TriMet MOD Sandbox Kick-Off, Portland, OR, January 2017
- VTrans MOD Sandbox Kick-Off, Barre, VT, March 2017
- CalACT, Olympic Valley, CA, April 2017

The presentation of these materials led to substantive reorganizations of design concepts, in line with a wider community of input.

Cambridge Systematics (CS) developed an initial approach to software development presented to leading OpenTripPlanner developers at the TriMet MOD Sandbox Kick-Off in Portland in January 2017, and coordination with other MOD Sandbox projects continued through the project timeframe, including participating in MOD Sandbox meetings hosted by FTA and two OTP-specific workshops hosted by TriMet in Portland as part of its MOD Sandbox project.

An on-site kick-off was conducted with the Vermont Public Transit Association (VPTA) in March 2017, with members of the project team and stakeholders attending in person or present via phone. A user and agency needs memo was presented as a series of specification documents aggregating research, including presentation of public documents and notes to the project stakeholder list.

In May 2017, VTrans proceeded with a design and development approach after reviewing feedback from initial research, and updated design mockups were developed to guide future development. Trillium maintained a communications list of parties expressing interest in the project that, to date, has reached 60 names. VTrans and Trillium have access to the contact list.

VTrans led project reporting, providing requested reports to FTA and its partners through the two-year duration of the project.

User Needs and Software Design Research

System research yielded the needed inventory of flex services but also resulted in unexpected deficiencies in current public information regarding flexible services. The project team discovered that some service parameters were not correctly or fully described within agency materials and that services needed to be more carefully specified through direct phone or in-person conversation with agency staff. For that reason, some finalization of the system inventory was delayed until the agency site visits conducted in November 2017. A transit system feature inventory was created and maintained throughout the project and later developed into a checklist for the data creation process.[3]

Due the public information difficulties in attaining information about flexible services, part of the user and agency needs memo process was delayed, when the project team tested the developed software on location with agency staff and members of the public. A sampling of design documents from various stages of the project can be found at https://drive.google.com/drive/folders/0B_rpWuXXJQs6RWpMZDlEZFVOZDA?usp=sharing.

Trillium maintained updates on the technology for the community[4] in blog posts and provided updates to the GTFS-flex Github repository.[5]

Initial technical work proceeded from the outcomes of earlier work, pursuant to some technical decisions that were delayed until after testing by agencies and users. Due to the focus on developing a beta for testing, the project team reallocated resources to specifications review and development. The testing plan included a round of Town Hall meetings at each individual agency in Vermont, advertised publicly to include riders and agency representatives.

Development and Collection of GTFS-flex Data

Following the inventory of services, Trillium identified all resources needed to create GTFS-flex data for those services and request necessary information from the agencies. Some information could not be collected until the testing of the software. Trillium documented the creation of GTFS-flex data for Vermont through the Github repository for GTFS-flex (available at gtfsflex.com). As the GTFS flex data specification underwent revisions during the course of the project, resources were allocated to the development of the data specification

[3] Example of GTFS-checklist process at https://docs.google.com/spreadsheets/d/1DaQ0hOulP-XXfiXT2T2rhIBlkQ_6XuqFfYVsfUDXJKs/edit?usp=sharing.

[4] Blog posts at https://trilliumtransit.com/tag/gtfs-flex/.

[5] https://github.com/MobilityData/gtfs-flex.

and definitions of services rather than the development of tools to create additional data.

Research found that the primary barrier to the creation of GTFS-flex data, which is relatively simpler than GTFS data for services of similar scope, was not lack of GTFS-flex tools but, rather, unclear definitions of service rules at agencies and lack of familiarity with the concept of trip "discovery" in the context of demand responsive services.

As expected during the project, the first at-scale development of GTFS-flex data yielded some required changes to the data specification and new service formats were discovered that required discussion with the wider community of individuals engaged in the development of GTFS-flex data.

Some changes were made and implemented during the course of the project into the finalized GTFS-flex "v1" specification. The discussion continued through the project in partnership with MobilityData, resulting in the release of a proposed "v2" GTFS-flex specification. This adapted form of GTFS-flex, with minor and significant alterations to ease both future production and consumption of the data, was released in November 2018 and is moving towards incorporation into the main GTFS data specification.[6]

The project development team met with the project management and user advocacy team on a weekly or bi-weekly basis throughout the development period to maintain alignment throughout the project. Specific code was developed to ingest GTFS-flex data elements into the OTP graph search without fundamentally altering the core graph itself to ease later acceptance into the primary OTP code repository. The GTFS-flex data created reside at vermont-gtfs.org and are available to all members of the public. The data are updated through a separate ongoing contract maintained by VTrans and are provided to the live Go! Vermont Trip Planner. VTrans contributed additional local resources to updating state inventories related to taxi services and integrated a basic form of taxi trip planning within the Go! Vermont Trip Planner. Agile Mile, a prospective provider of vanpool services in Vermont, has committed to developing GTFS-flex data for the services it will administer in the state.

Application Hosting, Testing, and Launch

The application testing task was substantially expanded from the originally intended scope using resources reallocated from earlier stages of the project to include a two-week site visit to Vermont by project staff, including multiple meetings with VTrans and local meetings with every transit agency in the state. The local meetings were publicized electronically and through posted advertisements, and each was attended by agency staff, VTrans employees, project consultants, and members of the public.

[6] http://bit.ly/gtfs-flex-v2.

Members of the public were provided with a brief training on the purpose and capabilities of the trip planner before testing the trip planner live on laptop and mobile devices. General feedback was collected from each consenting participant, as were issues noted related to particular trip plans or features in need of review.

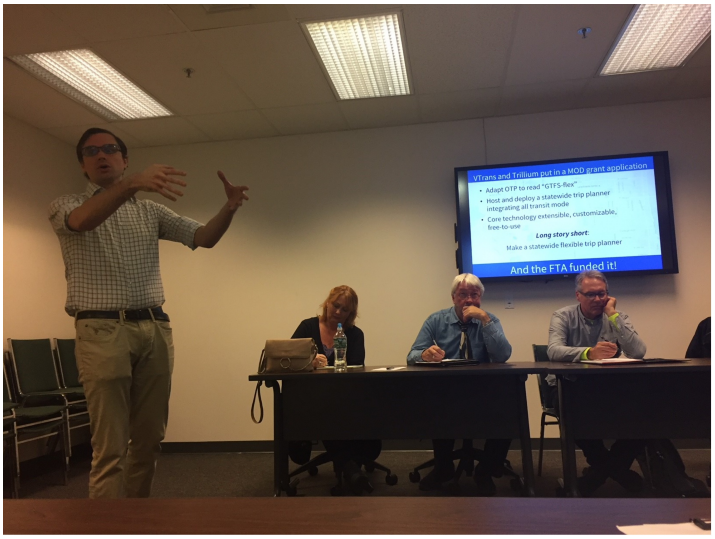
During the site visits, the project team met separately with members of each public agency to ensure complete understanding of the local demand-responsive services. The project team also held nine public workshops throughout the state, collecting feedback and following the designated testing process, including:

- Roll call of attendants and understanding of current system usage
- Description of project and planned outcomes
- Demonstration of existing trip planner technology
- Presentation of beta website based on new technology
- Solicitation of feedback

All attendees were invited to participate remotely in continued testing before the launch of the system as changes based on initial feedback were made.

Figure 3-1

Thomas Craig presents to Burlington region community members



Additional testing was performed by staff of the Go! Vermont call center, which integrated the trip planner into its toolbox for helping members of the public. Final review of the trip planner was orchestrated by the project management team in coordination with agency stakeholders, who received a survey reviewing their planned use of the trip planner contemporaneously with launch.

In the launch of plan.govermont.org, VTrans used additional local funding to promote the Flexible Trip Planner. The Go! Vermont Trip Planner has been hosted continuously at plan.govermont.org since February 2018.

Example Trip Plans and Flexible Service Types

The Go! Vermont Trip Planner provides multimodal trip planning including demand-responsive services integrated with the fixed-route transit network. Dial-a-Ride, Hail-and-Ride, and Deviated fixed modes are the primary types of service available in Vermont that are featured in the trip planner. Dial-a-ride services provide curb-to-curb or door-to-door service with no fixed schedules. By connecting these services to fixed routes, efficient trips can be made at fast speeds (see example trip in Figure 3-1). Hail-and-ride trips include those in which the rider can begin a trip anywhere along a route by hailing a bus as it approaches (see example trip in Figure 3-2). Deviated fixed services follow a schedule and have designated stops, but in between those stops may deviate to pick up or drop off riders at requested locations (see example trip in Figure 3-3).

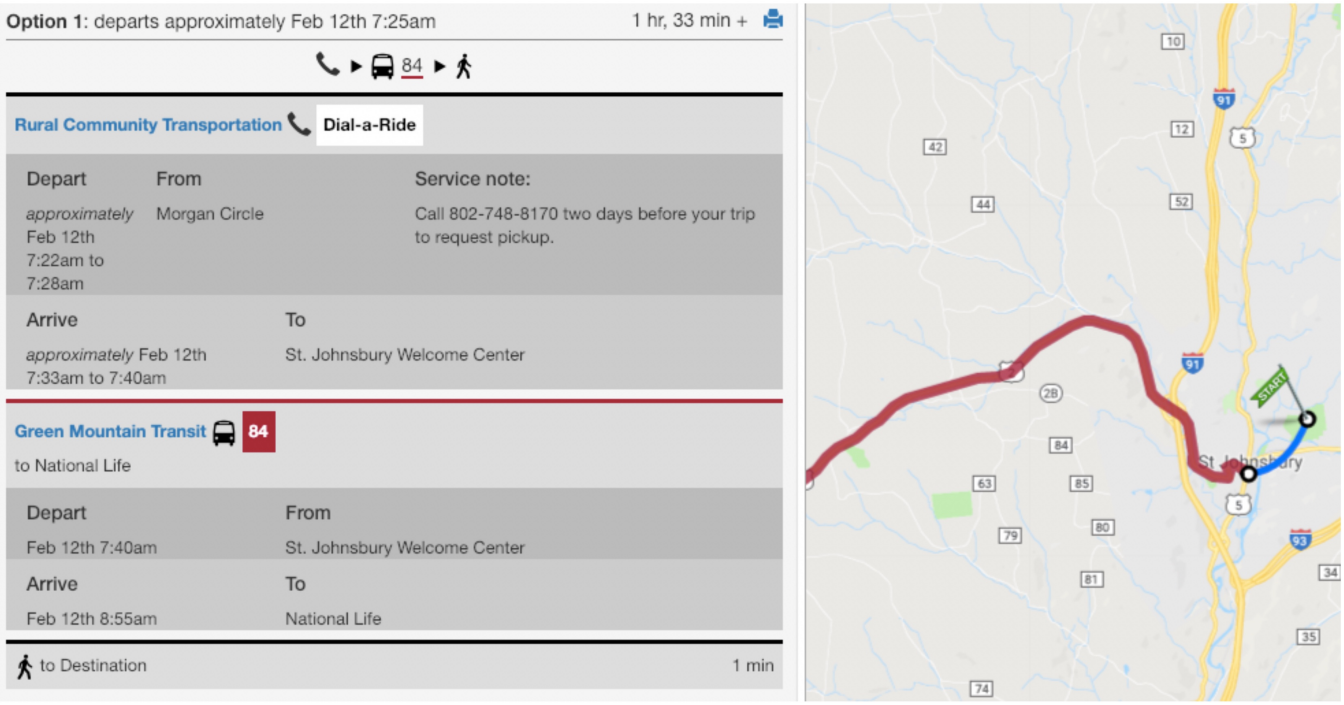


Figure 3-2 *Screenshot of Trip Planner Dial-A-Ride link*

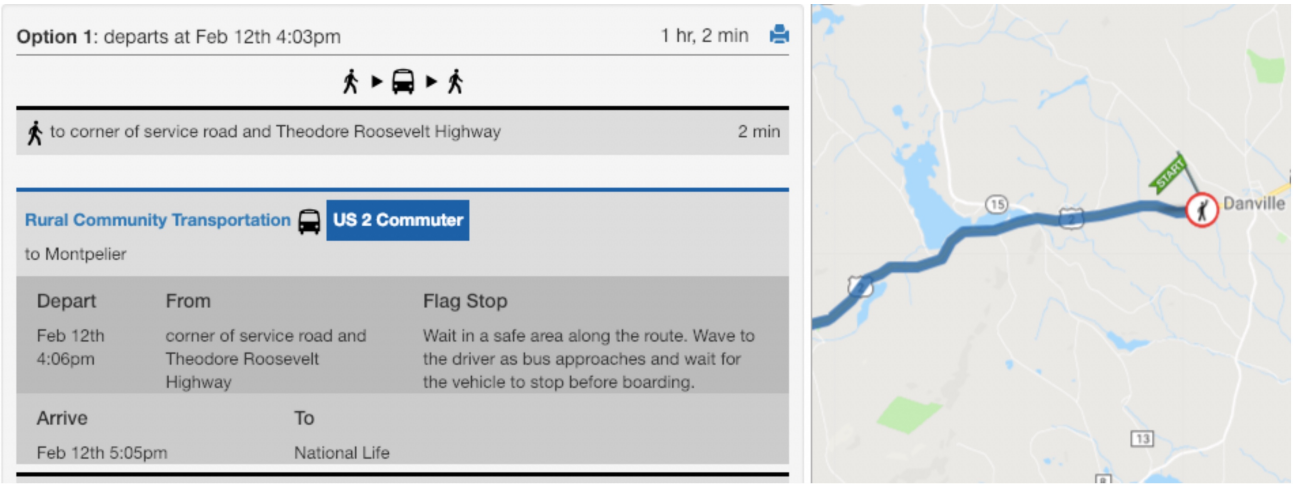


Figure 3-3 *Screenshot of Trip Planner Hail-and-Ride link*

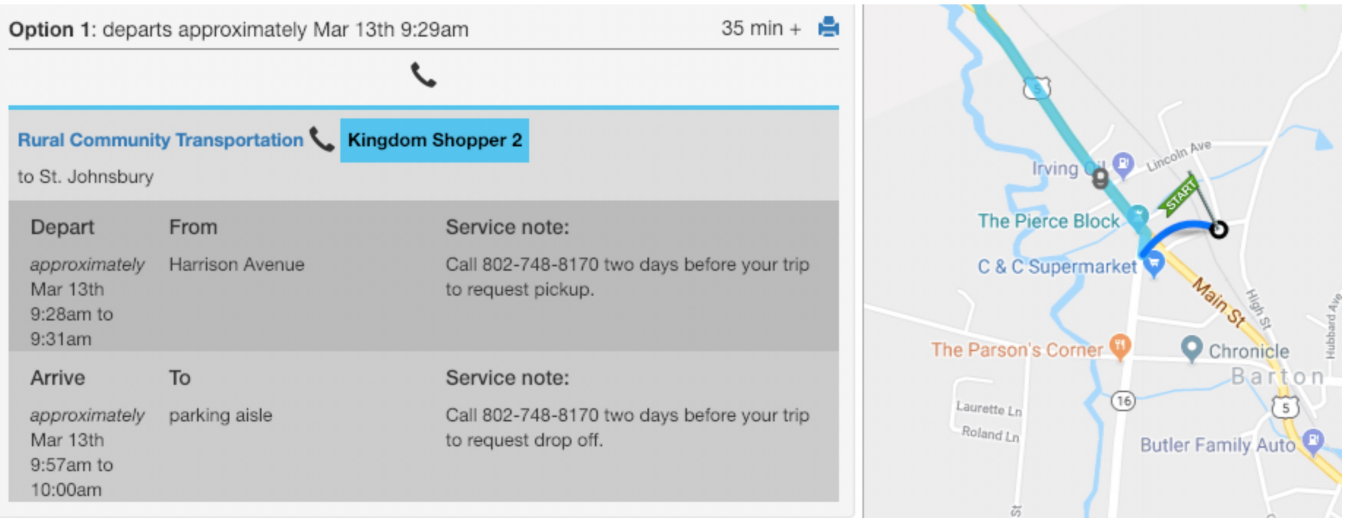


Figure 3-4 *Screenshot of Trip Planner Deviated Fixed Services link*

Outreach, Equity, and Accessibility

VTrans conducted the following outreach and efforts to ensure equity and accessibility:

- Upgraded the Go! Vermont site and Flexible Trip Planner to meet Americans with Disabilities Act (ADA) "AA" standards
- Introduced the Go! Vermont Trip Planner to the following organizations:
  - Vermont Association of the Blind and Visually Impaired (VABVI)
  - Vermont Center for Independent Living (VCIL)

- Vermont Department of Disabilities, Aging, and Independent Living (DAIL)
- Brain Injury Association of Vermont
- Vocational Rehabilitation (Voc Rehab)

For those who need additional assistance, the Go! Vermont Trip Planner provides information for the specific service entity in the region. All transit provider call centers have staff trained to provide effective assistance to persons with disabilities. As planned, all regions and citizens have equal access to the Go! Vermont Trip Planner throughout the state.

Figure 3-5

Ross MacDonald presents to Tri-Valley Transit on the Flexible Trip Planner

Knowledge Transfer

VTrans' MOD Sandbox project developed the following shared resources available to the public:

- Presentations provided as early as January 2017 at Transportation Camp in Arlington, Virginia, at the outset of the project drew on the feedback of participants to make core design decisions.[7]
- The plan.govermont.org website includes a walkthrough for first-time users and an overview of type of trips presented through the trip planner.[8]
- GTFS-flex data were released as vermont-gtfs.org.

[7] Presentation from TransportationCamp 2016, https://drive.google.com/file/d/0B_rpWuXXJQs6eldlR2lNM0QyNnM/view?usp=sharing.

[8] Overview for public at https://www.connectingcommuters.org/go-vermont-trip-planner/.

- The adapted OTP code was released through Github.[9] The code also recently was accepted into the master branch of OTP development for inclusion in the coming Version 1.4 release.[10]

The project team developed a customer interface on the govermont.org using VTrans branding. The website also includes customized features to educate new users and collect feedback:

- Introductory pop-up showing easy guide on use
- Explanatory videos showing Trip Planner features
- Feedback form
- Link to other trip planning alternatives when selecting destinations out of state

The project team continuously communicated the ongoing status of the project to partners around the world and participated in forums to discuss the technologies in use to educate agencies and transportation technologists regarding the enhancements to GTFS and OpenTripPlanner and the information gained about how riders expect to interact with information about flexible transit services. The Trillium blog was used as one manner to promote the ongoing work of the project, and there was also a project contact list of 60 individuals who received key updates regarding project milestones.

Numerous presentations at conferences around the U.S. by all three key project team members ensured that a variety of audiences were exposed to the technologies under development and the possible future uses of those technologies in other applications. Presentations such as the following were made:

- Rural Intercity Bus Transportation Conference, Asheville, North Carolina, October 2016—30 participants (rural transit managers and consultants), presented on technical foundation of project, prior to funding by FTA
- Transportation Camp, DC, January 2017—30–40 participants (technologists, transit geeks, programmers, TRB attendants)
- TriMet MOD workshop, Portland, January 2017—30–40 participants (MOD practitioners from TriMet, LA Metro, Denver RTD, consultants, IT managers, agency leaders)
- Onsite agency kick-off presentation, Barre, Vermont, March 2017—12 participants (Vermont public transit agency managers)

[9] Frontend code available at https://github.com/camsys/otp-vtrans-ui/tree/vtrans-dev. Backend code available at https://github.com/camsys/OpenTripPlanner/tree/vtrans-master.

[10] See github confirmation of developer approval on January 21, 2019, https://github.com/opentripplanner/OpenTripPlanner/pull/2603.

- Onsite FTA/VTrans kick off presentation, Vermont, March 2017—8 participants (FTA/Independent Evaluation/VTrans staff)
- SUMC Innovation and Knowledge Accelerator project, DC, April 2017—40–50 participants (MOD program awardees and partners_
- CTAA Expo, Detroit, Michigan, June 2017—100 participants (Mobility Managers, consultants, technologists, agency leaders)
- National RTAP, Omaha, Nebraska, October 2017—25–35 participants (transit agency contacts, mobility managers, DOT representatives nationwide)
- Onsite agency and public presentations, Vermont, November 2017—8 separate meetings with 4–15 participants per meeting (members of the public, case managers, marketers, board members, agency staff)
- SUMC Summit, Chicago, March 2018—practitioners
- TriMet MOD workshop, Portland, April 2018—30–40 participants (MOD practitioners including TriMet, VTA, Denver RTD, consultants, IT managers, agency leaders)
- CalACT, Newport Beach, April 2018—25–30 people (agency representatives, technology vendors)
- APTA TransiTech Conference, Jacksonville, Florida, April 2018—50 participants (agency and regional transit system managers, technology contractors and leaders)
- RIBTC, Breckenridge, Colorado, October 2018—40 participants (rural transit managers and consultants)
- Entur OpenTripPlanner Summit, Oslo, Norway, April 2019—30 participants (current and prospective OTP developers and technology leaders primarily from Northern Europe)

Additionally, the project team fielded dozens of communications from external parties seeking to understand more about GTFS-flex and OpenTripPlanner in relation to flexible transit services. State DOTs such as Iowa, Oregon, Illinois, and Massachusetts and regional governments in New York, Florida, and California and other states, as well as individual agencies and industry partners, sought information and discussed how to implement flexible trip planning technologies. Many of these projects have been initiated and resulted in further investments in the work initiated by VTrans with the help of FTA.

Replication, Reproduction, and Enhancements

The VTrans Flexible Trip Planner project produced a statewide trip planner that enabled a new trip planning capability for all Vermont residents and increased access to trip planning from less than half of the geographical area of the rural

state to nearly 100%. However, this tangible outcome of the project is of relatively little importance compared to the foundation laid by the project for future work and research.

GTFS-flex and the enhancements made to OpenTripPlanner by VTrans kicked off a global movement towards a standardized approach to Mobility-as-a-Service ("MaaS"). While MaaS as a concept was developed prior to the beginning of the VTrans Flexible Trip Planner project, all MaaS applications previously developed or conceived were closed, proprietary systems with little reach or replicability. By focusing on GTFS-flex and OpenTripPlanner, VTrans developed foundational technologies available to everyone worldwide for further development and enhancement.

The potential for further investment has proven to be not theoretical but actual. During the course of the project and immediately thereafter, multiple agencies and organizations have used the technologies developed by VTrans and taken them further. The investment made by FTA has allowed agencies to launch platforms that were otherwise unthinkable and been followed by additional investments greater in magnitude than the funds contributed by FTA:

- Tulare County Area Transit, CA
  - $53,000 local investment to deploy the technologies created in Vermont, with the production of a new WordPress website including a trip planner interface usable by other transit agencies
  - Trillium sole contractor
- Valley Flex, CA
  - $100,000 local and State investment to deploy the technologies created in Vermont and develop a new integration with a proprietary frontend mobile application capable of including trip transaction
  - Trillium, DemandTrans, and Kyyti collaborative contract team
- Pomona Valley Transportation Authority, CA
  - $32,000 local investment to deploy a website with a backend integrating GTFS-flex data
  - Trillium sole contractor
- MassDOT, MA
  - $95,000 State investment for websites incorporating GTFS-flex data, including development of new technique for displaying flag stop information
  - Planned State investment of larger magnitude to add additional features, currently being planned; possibly to be included in future grant applications for Federal funds with local match

  - Trillium sole contractor for website development, though longer-term investments being made in collaboration with Cambridge Systematics
- Denver RTD
  - Unknown local investment of staff hours and developer time, likely in excess of $100,000, to develop GTFS-flex data and incorporate into local instance of OTP
  - Potential future enhancements including collaboration with Colorado DOT to incorporate additional GTFS-flex feeds
  - IBI Group and Cambridge Systematics involved in local project implementation and planning
- Oregon DOT
  - $40,000 investment in development of statewide GTFS-flex data set
  - $130,000 prospective investment in development of new front-end trip planner interface for nwconnector.net website and regional plan for the maintenance of OSM data to support OTP
  - Unknown investment in stateside OTP instance with intention to integrate GTFS-flex data in future phases
  - Planned future investment in statewide analysis tools to track and understand flexible transit capacity
  - Trillium and RideAmigos among partners on individual projects
- Entur
  - Ongoing investment of substantial staff and contractor development time to incorporate flex concepts into OTP2, a new version of OTP in development
  - Total scope of flex-related work likely valued at $100,000 or more
- Google/MobilityData
  - Portion of $1.5+ million investment over two years in the MobilityData program by Google and others to enhance transit open data specifications, including GTFS-flex
  - Drafting of GTFS-flex v2 extension proposal, including development of potential transactional data specification
  - Trillium, University of South Florida Center for Urban Transportation Research, and Leo Frachet included among contracting team for MobilityData
- RideConnection and Metro
  - $35,000 local investment to create GTFS-flex data sets for community transportation agencies in the Portland, OR region.
  - Trillium and Full Path LLC contractors to RideConnection

To date, $400,000–$1,000,000 in known funding has already directly followed the investment made by FTA in GTFS-flex and OTP. Some of these investments have been aimed directly at implementation, whereby agencies have demonstrated the replicability that this project sought to create. Tulare County and the Valley Flex project, for example, with budgets a fraction of the size of the VTrans budget, have been able to release platforms as advanced as the Go! Vermont Trip Planner or even more advanced. Alternatively, other investments have sought to focus on the same long-term foundations on which the original FTA grant focused. Oregon DOT and MobilityData have focused their efforts and investments on tools to be used on a larger scale or for more advanced functionality than demonstrated in Vermont.

These investments are the most fundamental measure of success of the Vermont MOD Sandbox Demonstration project. By creating technology that was innovative and replicable, FTA and VTrans worked together to establish a foundation on which others could build. As more agencies and technology companies integrate GTFS-flex and OpenTripPlanner into their business models, the project team expects this investment to continue and for VTrans and Vermont residents to benefit from the ongoing enhancements to that technology foundation that others pursue.

SECTION
4

Evaluation

The VTrans MOD Sandbox demonstration project determined a number of evaluation hypotheses and metrics, as noted below with preliminary outcomes of the project work. The full results of the evaluation will be presented by the independent evaluation process, but data sources and the project team interpretation of the results are outlined below.

Hypothesis: The Go! Vermont Trip Planner application will allow users to define an origin and destination within the state and receive transit itineraries, flag stops, deviated fixed routes, and dial-a-ride services.

- **Evaluation Metric**: For a series of pre-defined searches that number 30 or more, the number of transit operators and services reported on the planner that are not presentable on Google Maps with standard GTFS data.
- **Preliminary Data Sources and Results**: The Go! Vermont Trip Planner greatly expanded the geographical reach of trip planning in Vermont. Fixed-route trip planners, which typically have a walking or drive-to-transit radius of 1–2 miles, cover less than 10% of the geographic area of Vermont. The Go! Vermont Trip Planner provides responses in well over 80% of the state.

Hypothesis: Transit agencies will consider the State planner to be an improvement.

- **Evaluation Metric**: Transit operator survey responses.

  Preliminary Data Sources and Results: Operators were overall positive on the Go! Vermont Trip Planner platform, rating it generally higher than the much more highly-funded Google Maps platform. Operators realized particular value in the presence of flexible services in trip planning and the improvement of transit options when compared to Google Transit results and are supportive of adding more modes and services to augment traditional transit options. Call centers noted that some callers are better prepared to discuss options, as they are already identifying route options before they call for final guidance/assurance. See Appendix A for Operator Survey and Appendix B for survey results.

Hypothesis: Riders will consider the new planner to be an improvement over existing planning tools.

- **Evaluation Metric**: User survey responses to product perception questions.

  Preliminary Data Sources and Results: Initial feedback has been positive, especially from case managers and persons with disabilities, but the

number of respondents to fully assess the impact on users is not available at this time. This survey will continue to be distributed to gain additional responses and confirm user improvements over traditional search methods and trip planners. See Appendix C for User Survey.

Hypothesis: The new planner will improve rider mobility among planner users.

- **Evaluation Metric**: User survey responses to mobility perception questions.
- **Preliminary Data Sources and Results**: The launch of additional modes to the planner is expected soon. Carpools and vanpools currently captured by Agile Mile's automated carpool matching service will use an interface to produce the necessary GTFS-flex data and will be revealed through the regular search process.

Hypothesis: Due to improved information, the new planner will increase transit ridership among users in Vermont.

- **Evaluation Metric:** User survey responses to mobility perception questions; several general public trips have been arranged using scheduled demand-response trips.
- **Preliminary Data Sources and Results**: After two years with decreasing ridership, overall ridership throughout the state grew by roughly 1% in FY 2018, attributable partly to better information and tools.

Hypothesis: Web traffic to the Go! Vermont Trip Planner will experience, on average, at least 10 queries per day that constitute actual users searching the platform.

- **Evaluation Metric**: Web traffic data (e.g., count of IP addresses in Vermont, distribution at local level, basic query count data),
- **Preliminary Data Sources and Results**: Soon after launch, the Go! Vermont Trip Planner was accessed by roughly 10% of all visitors to the Go! Vermont site. Google Analytics reports providing total user overviews in 2018 can be found at https://drive.google.com/drive/folders/1UwP_ob-2MeJPZCMKJfkP7orH9_JjqnK1?usp=sharing.

Hypothesis: The Go! Vermont Trip Planner will lead to a reduced call/response time on relevant inquiries pertaining to route info and travel options.

- **Evaluation Metric**: Call/response time on relevant inquiries pertaining to route info and travel options, before and after planner implementation.
- **Preliminary Data Sources and Results**: The Go! Vermont call center operationalized the Go! Vermont Trip Planner soon after launch and consistently uses it to help call center representatives direct riders to the

appropriate services for their needs. Both transit providers and Go! Vermont call center staff have communicated that potential riders are actively on the trip planner as they call them. This has allowed riders to quickly get to the specific option and accommodations needed and/or issues to be assuaged.

Hypothesis: Lessons from project implementation can inform future project and system designs and implementation.

- **Evaluation Metric**: Qualitative documentation from stakeholder interviews.
- **Preliminary Data Sources and Results**: Qualitative project results are discussed in the next section.

SECTION 5

Conclusions and Recommendations

VTrans and the project team consider the MOD Sandbox Demonstration project to be a success. The data, application, and user interface were produced according to desired specifications. Agencies and users reported support for the resulting website and the long-term goals of the project. Most important, substantial advancement was made in the global conversation regarding flexible transit discovery data.

Trip Planning in Vermont

Trip planning in Vermont took a significant step forward with the launch of the Go! Vermont Trip Planner, but some major features still are needed to provide users with the level of service they deserve.

The first and most important feature needed is to provide real-time information about flexible transit services in Vermont. The Go! Vermont Trip planner has provided an easy way for riders to discover the transit services to reach their destinations; however, without real-time information, trips can be discovered only a day or more prior to the trip. Real-time information, likely through the GTFS-Booking specification extension or a similar transactional standard, could provide information through an API about services available in the very near term (next few minutes or hours.)

The entire booking process or reservation of trips could also be performed through the GTFS-Booking extension, along with user interface advancements to OTP and other apps. Real-time information will be of limited use if the booking process continues to require a phone call and interaction with a system outside of the trip planner. VTrans envisions that, in the future, customers will be able to plan a trip and then immediately book the flexible leg of that trip by clicking a "Book Now" button using an account-based system that would integrate not only direct payment from the user but also subsidy sources.

Finally, it will be critical that the overall cost of providing trips be reduced by increasing the use of vehicles already on the road. This would be possible through searching for user trips that have already been planned; these trips could be prioritized or provided at a reduced cost to encourage users of flexible transit to use vehicles already in operation. This would require further investment both in data format specification and software development.

GTFS-flex and Flexible Trip Planning around the World

Perhaps the most important outcome of the Vermont MOD Sandbox project was igniting a global conversation regarding demand-responsive transit data and software. Since the launch of the Go! Vermont Trip Planner, organizations ranging from independent researchers to worldwide corporations have dedicated substantial resources to understanding, interfacing with, promoting, and leveraging the Vermont MOD Sandbox Demonstration work.

In July 2018, the MobilityData project launched, with funding from Google and other large technology companies, which promotes advancements in transit data specifications. GTFS-flex has been a particular consideration of MobilityData; the project completed the drafting of a revision of the GTFS-flex specification, maintaining consistency with the previous specification where possible but leveraging the lessons of the MOD Demonstration to refine certain data elements for the long-term health of the specification.

Additionally, flexible trip planning was launched within at least one commercial application in late 2018 after the launch of the Go! Vermont Trip Planner. In selected cities in the US, users of the Transit mobile application can plan trips connecting Transportation Network Companies (TNCs) such as Uber and Lyft to bus and rail, much like the trip planning developed by the project team.

Future Investment Opportunities and Strategies

Flexible trip planning has momentum, and the further development of flexible trip planning apps is no longer a prospect but an eventuality. However, that momentum should not be compromised. Vermont and the project team are actively seeking sources outside the MOD Sandbox program to provide further resources for the continued development of the technologies developed to date. As noted, other funding sources are already contributing to that end, and other resources are being recruited to provide resources locally to advance the Vermont technology stack, for which the project team believes there is an efficient and unique setting for the further advancement of flexible trip planning. VTrans will keep FTA and the evaluation team abreast of such discussions and highlight the important role the MOD Sandbox Demonstration project played in the foundation of future mobility-as-a-service technology.

Follow-ups and future work will be dedicated to the advancement of the trip planning interfaces in Vermont and to continuing the push towards the standardization of GTFS-flex data and access to flexible trip planning around the world.

APPENDIX

A

Transit Operator Survey

Go! Vermont Trip Planner Transit Agency Survey

This survey is about your experience reviewing and using the Go! Vermont Trip Planner. If you did not get a chance to review the Go! Vermont Trip Planner yet, feel free to do so now. We suggest planning 5-10 different trips in the Go! Vermont Trip Planner and comparing them to Google Maps. Review and use of it should take about 5 to 10 minutes. Then please proceed to take this survey.

Link to Trip Planner: https://plan.govermont.org/.

1. Please tell us your organization.
2. Please indicate your position within that organization.
3. In 2–5 sentences, please describe what your role is in the agency.
4. We would like to get your travel patterns. Which of the following modes of transportation have you used within Vermont within the last two years? Please check all that apply.
   - ☐ Drive alone
   - ☐ Drive/ride with family/friend (non-commute)
   - ☐ Walk (to a destination)
   - ☐ Fixed route public bus
   - ☐ Deviated-fixed public bus
   - ☐ Hail-and-ride bus
   - ☐ Dial-a-ride
   - ☐ Amtrak
   - ☐ Green Mountain Railroad
   - ☐ Uber/Lyft or other ride-hail service
   - ☐ UberPOOL/Lyft Line or other shared-ride service
   - ☐ Taxi
   - ☐ Bicycle
   - ☐ Motorcycle or scooter Carpool (for commuting)
   - ☐ Vanpool
   - ☐ Employer shuttle (for commuting)
   - ☐ Car rental within Vermont
   - ☐ Other (please specify)

5. Please indicate about how frequently you CURRENTLY use the following modes. Your response to this question should be solely about your personal use of these modes.

	Not available to me or not in my area	Never in the last year	Less than once a month	Once a month	Every other week	1 to 3 days per week	4 to 6 days per week	Once a day	2 to 4 times a day	More than 4 times a day
Drive alone										
Drive/ride with family friend										
Walk (to a destination)										
Fixed route public bus										
Deviated fixed public bus										
Hail-and-ride bus										
Dial-a-ride										
Amtrak										
Green Mountain Railroad										
Uber/Lyft or other ride-hail service										
UberPOOL/Lyft Line or other shared-ride service										
Taxi										
Bicycle										
Motorcycle or scooter										
Carpool (for commuting)										
Vanpool										
Employer shuttle (for commuting)										
Car rental (within Vermont)										
[Insert text from Other]										

6. How essential are flexible transit services (e.g., Hail-and-ride, deviated-fixed, dial-a-ride) to meeting your personal transportation needs? Your response to this question should be solely about your personal use of these modes.

   ☐ Very important

   ☐ Important

   ☐ Somewhat important

   ☐ Not so important

   ☐ Not at all important

7. When you travel by public transit, which trip planning platforms have you used in the last year? Your response to this question should be solely about your personal use of these modes. (Please check all that apply)

   ☐ Google Maps

   ☐ Waze

   ☐ Bing Maps

   ☐ Apple Maps

   ☐ Go! Vermont Trip Planner

   ☐ Other (please specify)

8. When you travel by public transit, which trip planning platform do you find to be the most useful? Your response to this question should be solely about your personal use of these modes. (Please select the best response)

   ☐ Google Maps

   ☐ Waze

   ☐ Bing Maps

   ☐ Apple Maps

   ☐ Go! Vermont Trip Planner

   ☐ Other (please specify)

9. Have you used the latest version of the Go! Vermont Trip Planner?

   ☐ Yes ☐ No

10. How many times have you used Go! Vermont Trip Planner?

    ☐ 1 time

    ☐ 2 to 3 times

    ☐ 4 to 5 times

    ☐ 6 to 10 times

    ☐ 11 to 20 times

    ☐ More than 20 times

11. What is your impression of the Go! Vermont Trip Planner?

    ☐ Excellent

    ☐ Very Good

    ☐ Good

    ☐ Fair

    ☐ Poor

12. How would you say Go! Vermont Trip Planner compares to Google Maps overall <u>for trip planning</u>?

    ☐ Much better

    ☐ Better

    ☐ About the same

    ☐ Worse

    ☐ Much worse

13. How would you say Go! Vermont Trip Planner compares to Google Maps overall <u>for appearance</u>?

    ☐ Much better

    ☐ Better

    ☐ About the same

    ☐ Worse

    ☐ Much worse

14. How would you say Go!Vermont Trip Planner compares to Google Maps overall for the format and display of information?

    ☐ Better

    ☐ About the same

    ☐ Worse

    ☐ Much worse

15. How would you say Go! Vermont Trip Planner compares to Google Maps overall for the quality of travel options presented?

    ☐ Better

    ☐ About the same

    ☐ Worse

    ☐ Much worse

16. Have you used Go! Vermont Trip Planner for planning flex-transit trips?

    ☐ Yes ☐ No

17. Relative to Google Maps, how useful do you think OpenTripPlanner is for planning transit trips in Vermont?

    ☐ Much more useful

    ☐ More useful

    ☐ About as useful

    ☐ Less useful

    ☐ Much less useful

18. How important do you consider flex-transit services to be within your agency?

    ☐ Very important

    ☐ Important

    ☐ Somewhat important

    ☐ Not too important

    ☐ Not at all important

19. Do you think that Go! Vermont Trip Planner is an improvement for flex-transit planning?

    ☐ Yes, a significant improvement

    ☐ Yes, a modest improvement

    ☐ Yes, a slight improvement

    ☐ No, not an improvement

20. Do you think that Go! Vermont Trip Planner is an improvement for travel planning in Vermont overall?

    ☐ Yes, a significant improvement

    ☐ Yes, a modest improvement

    ☐ Yes, a slight improvement

    ☐ No, not an improvement

21. Have you noticed any operational improvements within your transit agency as a result of the Go! Vermont Trip Planner? This could be anything from an improvement in vehicle occupancy, vehicle timing, forecasted outcomes, etc.

    ☐ Yes, significant improvements

    ☐ Yes, modest improvements

    ☐ Yes, slight improvements

    ☐ No improvements

22. If you answered yes to the above question, please explain these improvements below and, if possible, why you attribute them to the Go! Vermont Trip Planner. If there are multiple improvements that you've noticed, please describe each of them.

23. In your personal opinion, due to the Go! Vermont Trip Planner, ridership probably has...

- ☐ Greatly increased
- ☐ Modestly increased
- ☐ Slightly increased
- ☐ Slightly decreased
- ☐ Modestly decreased
- ☐ Significantly decreased
- ☐ Not changed

24. In your personal opinion, due to the Go! Vermont Trip Planner, the information available to your customers on your agency's services probably has ...

- ☐ Greatly increased
- ☐ Modestly increased
- ☐ Slightly increased
- ☐ Slightly decreased
- ☐ Modestly decreased
- ☐ Significantly decreased
- ☐ Not changed

25. In your personal opinion, due to the Go! Vermont Trip Planner, the operational efficiency of your agency probably has …

- ☐ Greatly increased
- ☐ Modestly increased
- ☐ Slightly increased
- ☐ Slightly decreased
- ☐ Modestly decreased
- ☐ Significantly decreased
- ☐ Not changed

26. If you have any comments to improve Go! Vermont Trip Planner, please feel free to provide them here. Please offer any open-ended comments that are polite, constructive, and helpful to the development team. Your comments will be read by evaluators and system developers. Please do not include any information that identifies you personally.

APPENDIX

B

Transit Operator Survey Results

Go! Vermont Trip Planner Transit Provider Survey Results

Summary

The Vermont Agency of Transportation tasked VEIC with surveying transit agencies in Vermont on their experience using the new Go! Vermont Trip Planner.

Background and Objectives

The FTA designed a 26-question survey for transit providers. The objective of the survey was to understand from a transit provider's perspective how the Trip Planner tool is working: the ease of use, impact on ridership, and what can be improved.

Seven transit agencies completed the survey, with 14 responses from across these 7. Their positions included: Dispatcher, Medicaid Broker, Executive Director, Driver Supervisor, General Manager, Community Relations Manager, Regional Director, and Marketing and Public Affairs Manager.

Results

Overall, the feedback received was quite positive.

General Impressions - High Level Data Points

When traveling by public transit,

> **50%** of respondents found **Google Maps** to be the most useful trip planning platform.
>
> 35% found the **Go! Vermont Trip Planner** to be the most useful trip planning platform.
>
> 14% found **Waze** to be the most useful trip planning platform.

Use of Trip Planner tool:

> Most respondents have used the Go! Vermont Trip Planner 2-5 times, 1 person has used the Trip Planner more than 20 times.

For their impression of the Go! Vermont Trip Planner:

> 8% of respondents said **excellent**
>
> **39%** of respondents said **very good**
>
> 30% of respondents said **good**
>
> 15% of respondents said **fair**
>
> 7% of respondents said **poor**

For trip planning OVERALL, compared to Google Maps:

> 17% of respondents said the Go! Vermont Trip Planner is **much better.**

17% of respondents said the Go! Vermont Trip Planner is **better.**

66% of respondents said the Go! Vermont Trip Planner is **about the same.**

For interface appearance overall, compared to Google Maps:

25% of respondents said the Go! Vermont Trip Planner is **much better.**

17% of respondents said the Go! Vermont Trip Planner is **better.**

50% of respondents said the Go! Vermont Trip Planner is **about the same.**

8% of respondents said the Go! Vermont Trip Planner is **worse**.

For overall format and display of information, compared to Google Maps:

25% of respondents said the Go! Vermont Trip Planner is **much better.**

8% of respondents said the Go! Vermont Trip Planner is **better.**

67% of respondents said the Go! Vermont Trip Planner is **about the same.**

For overall quality of travel options presented, compared to Google Maps:

17% of respondents said the Go! Vermont Trip Planner is **much better.**

17% of respondents said the Go! Vermont Trip Planner is **better.**

66% of respondents said the Go! Vermont Trip Planner is **about the same.**

Flex-transit trip planning – High Level Data Points

For planning flex-transit trips, relative to Google Maps:

23% of respondents said the Go! Vermont Trip Planner will be **much more useful.**

31% of respondents said the Go! Vermont Trip Planner is **more useful.**

46% of respondents said the Go! Vermont Trip Planner is **about as useful.**

39% of respondents said the Go! Vermont Trip Planner is a **significant improvement** for flex-transit planning.

16% of respondents said the Go! Vermont Trip Planner is a **modest improvement.**

31% of respondents said the Go! Vermont Trip Planner is a **slight improvement.**

15% of respondents said the Go! Vermont Trip Planner is **not an improvement.**

Due to the Go! Vermont Trip Planner:

27% of respondents saw **slight operational improvements** within their transit agency

73% of respondents **have not yet seen operational improvements** within their transit agencies.

Due to the Go! Vermont Trip Planner:

9% of respondents said ridership has probably **modestly increased**

18% of respondents said ridership has probably **slightly increased**

72% of respondents said ridership has probably **not changed**.

Reactions/Impressions

The overall impression of the Go! Vermont Trip Planner is very positive. Respondents indicated a desire for the Go! Vermont Trip Planner to be more broadly marketed to bring more awareness around its existence.

Users who are disinclined to use technology to plan their trips might still call transit providers, and this tool might prove to be most useful to people who are answering those calls. There appears to be confusion about how this might impact a dispatch system and how the tool is intended to be used (response indicated ride requests are made online through the Trip Planner).

Respondent comments:

“Not enough folks are yet aware of [the Go! Vermont Trip Planner]. We have however heard positive public comments about the new version of the trip planner.”

“DAR should be available to take me from my home to the nearest park & ride to catch the fixed-route bus to work. Instead it takes me two towns north for a flex service whose times are not accurately listed”.

“I believe ridership on some routes has gone up because the public has used the [Go! Vermont Trip Planner]”

Conclusion and Recommendations

As a nascent trip planning tool intended to supplement the existing tools on the market, the Go! Vermont Trip Planner has received very positive feedback. Respondents approve of the overall **look and feel** of the tool; if they did not rate the Go! Vermont Trip Planner as better than Google Maps, it was rated “as good as.” No respondents indicated that the Go! Vermont Trip Planning tool is worse than Google Maps in any way. Overall, the Go! Vermont Trip Planner tool is an improvement for flex-transit trip planning in Vermont.

Opportunities moving forward include clarifying the intended use of the Trip Planner for transit providers, ironing out some of the flex-transit options available, encouraging feedback on the Trip Planner interface, and marketing the tool with the public. VEIC is happy to be involved in further discussions. The detailed survey results from the transit provider responses are provided below.

Q1 Please tell us your organization

Answered: 14 Skipped: 0

#	RESPONSES	DATE
1	Marble Valley Regional Transit	9/4/2018 5:08 PM
2	the bus	9/4/2018 2:51 PM
3	Marble Valley Regional Transit District	9/4/2018 2:50 PM
4	Green Mtn Community Network Inc.	9/4/2018 1:46 PM
5	Marble Valley Regional Transit District	9/4/2018 10:02 AM
6	MVRTD	9/4/2018 9:24 AM
7	Marble Valley Regional Transit District	9/4/2018 7:13 AM
8	SEVT MOOver	8/31/2018 2:50 PM
9	Stagecoach	8/13/2018 9:52 AM
10	Stagecoach Transportation	8/13/2018 9:41 AM
11	SEVT The Current	8/10/2018 7:10 AM
12	SEVT, The Current	8/9/2018 3:55 PM
13	GMT	8/9/2018 1:24 PM
14	VTrans	8/1/2018 2:55 PM

Q2 Please indicate your position within that organization

Answered: 14 Skipped: 0

#	RESPONSES	DATE
1	Dispatcher	9/4/2018 5:08 PM
2	medicaid broker	9/4/2018 2:51 PM
3	Medicaid Broker	9/4/2018 2:50 PM
4	ED	9/4/2018 1:46 PM
5	Driver Supervisor	9/4/2018 10:02 AM
6	Driver Supervisor	9/4/2018 9:24 AM
7	Executive Director	9/4/2018 7:13 AM
8	General Manager	8/31/2018 2:50 PM
9	Community Relations Manager	8/13/2018 9:52 AM
10	Regional Director	8/13/2018 9:41 AM
11	Dispatcher	8/10/2018 7:10 AM
12	General Manager	8/9/2018 3:55 PM
13	Marketing and Public Affairs Manager	8/9/2018 1:24 PM
14	Public Transit Coordinator	8/1/2018 2:55 PM

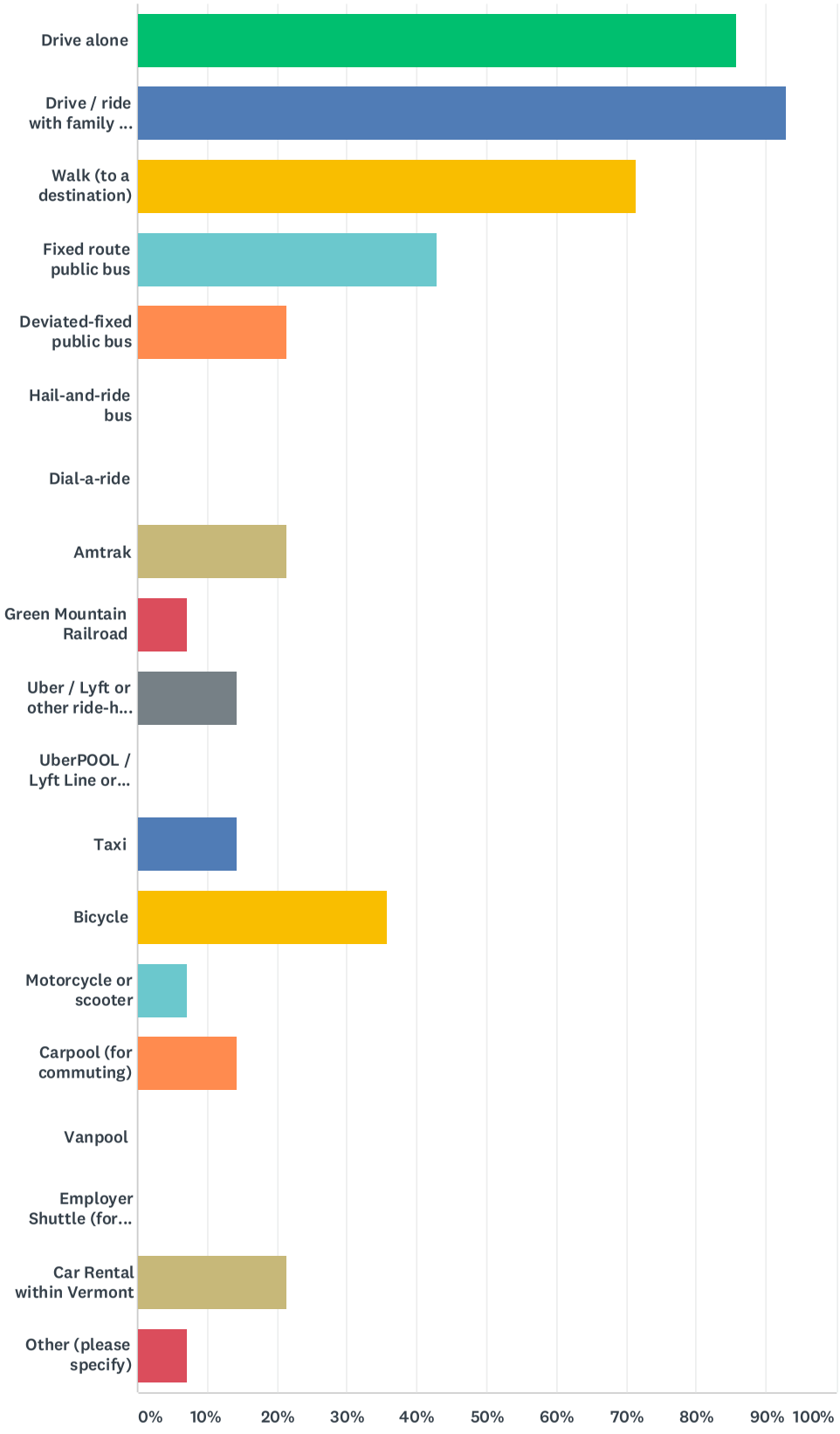
Q3 In 2-5 sentences please describe what your role is in the agency

Answered: 14 Skipped: 0

#	RESPONSES	DATE
1	I am a Para Transit Dispatcher	9/4/2018 5:08 PM
2	I book transportation rides for Medicaid riders to Medicaid appointments. Also aid and assist in scheduling. Another daily responsibility is filling out DVHA forms for Medicaid riders and following thru for approval/denials.	9/4/2018 2:51 PM
3	In the Medicaid Brokerage office we take information from the customers as to where their appts. are, confirm their information and then put the trips into the computer so that they can be scheduled. We also schedule trips for Hardship customers and assist with scheduling when needed. We are responsible for physician referrals for all trips over 60 miles.	9/4/2018 2:50 PM
4	Overall management	9/4/2018 1:46 PM
5	Oversee drivers responsibilities and scheduling	9/4/2018 10:02 AM
6	Keep drivers moving ahead, Make sure the day to day task are moving forward as well.	9/4/2018 9:24 AM
7	I work with our management team to ensure that we provide practical and safe transportation. I work with Vtrans and our Board to make sure we are in compliance with all State and Federal guidelines.	9/4/2018 7:13 AM
8	Overall management of day to day operations, budget management, quarterly reports required from the state.	8/31/2018 2:50 PM
9	Public relations, fundraising and marketing.	8/13/2018 9:52 AM
10	Overall management of Tri-Valley Transit's Stagecoach division including management of operations, dispatch, Medicaid/E&D transportation, facilities, etc.	8/13/2018 9:41 AM
11	I take phone calls, book trips, make volunteer and bus driver schedules. and I answer a lot of fix route bus schedule questions.	8/10/2018 7:10 AM
12	A General Manager is responsible for all aspects of the organization (division) including it's employees. GM's provide oversight, training, education and direction to the companies employees. The GM's reports to the CEO.	8/9/2018 3:55 PM
13	All marketing and public affairs related tasks: outreach, website, print media, social media, etc	8/9/2018 1:24 PM
14	Make transit great again!	8/1/2018 2:55 PM

Q4 We would like to get your travel patterns. Which of the following modes of transportation have you used within Vermont within the last two years? Please check all that apply.

Answered: 14 Skipped: 0



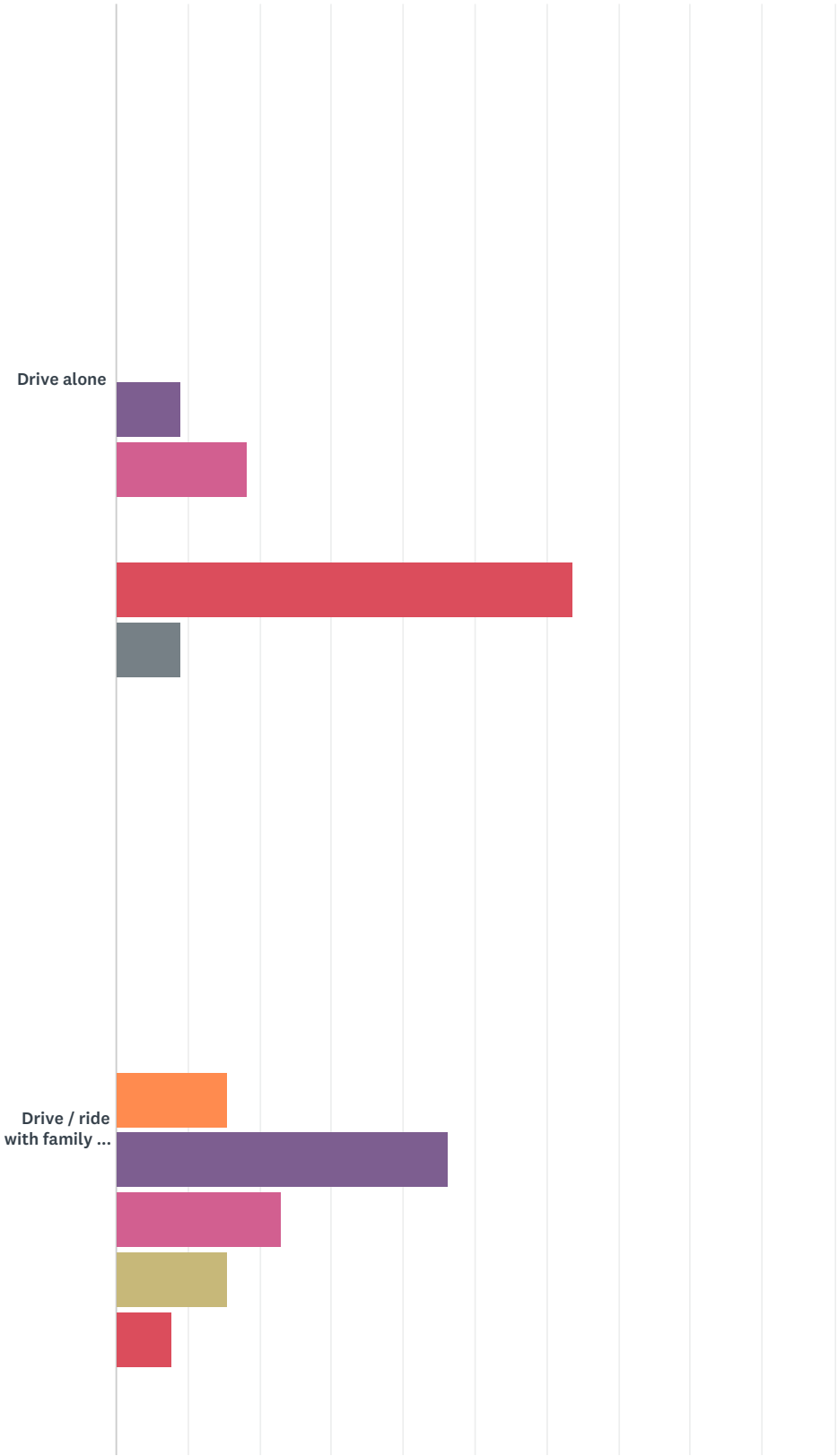
ANSWER CHOICES	RESPONSES	
Drive alone	85.71%	12
Drive / ride with family / friend (non-commute)	92.86%	13
Walk (to a destination)	71.43%	10

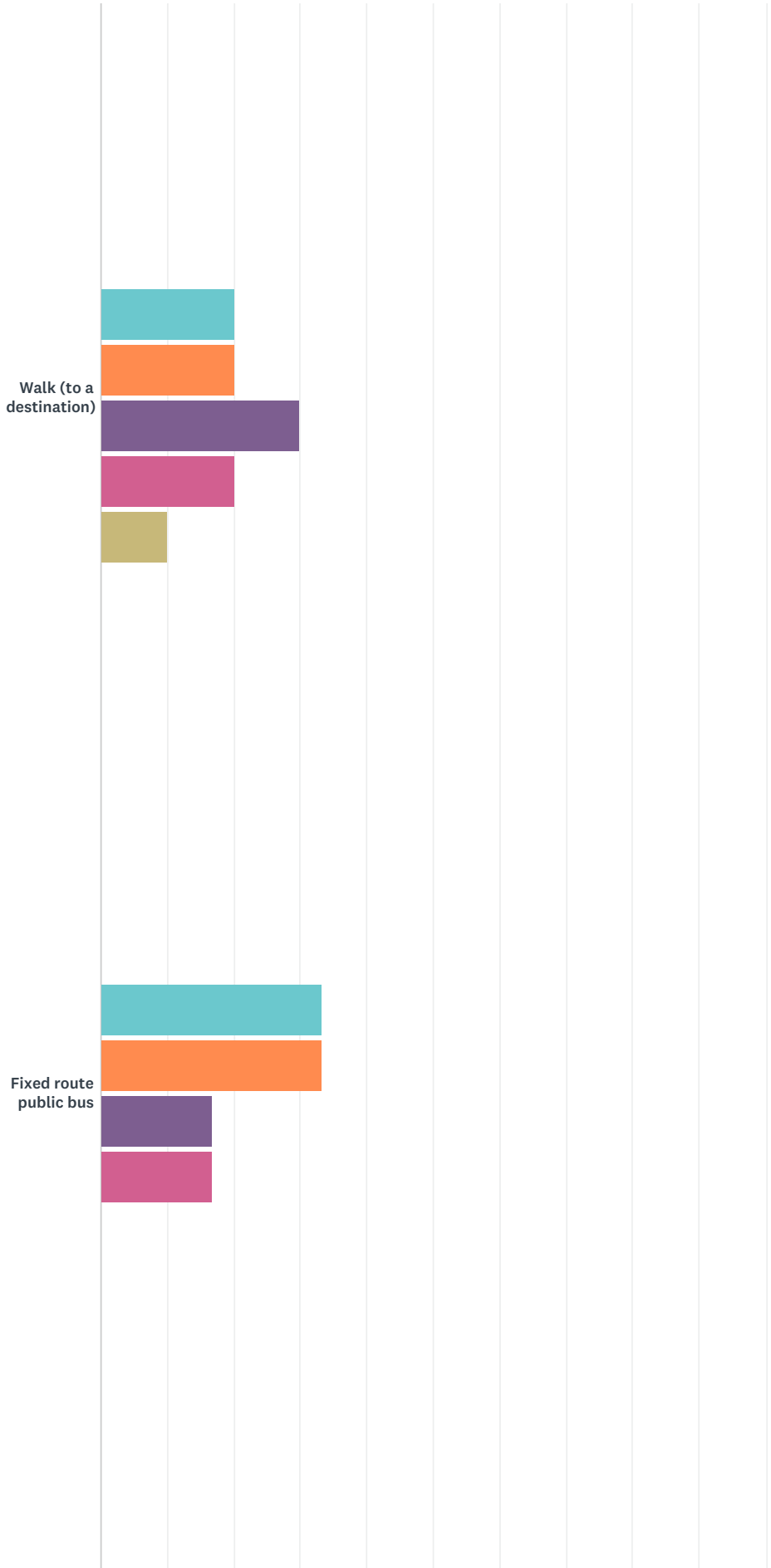
Fixed route public bus	42.86%	6
Deviated-fixed public bus	21.43%	3
Hail-and-ride bus	0.00%	0
Dial-a-ride	0.00%	0
Amtrak	21.43%	3
Green Mountain Railroad	7.14%	1
Uber / Lyft or other ride-hail service	14.29%	2
UberPOOL / Lyft Line or other shared-ride service	0.00%	0
Taxi	14.29%	2
Bicycle	35.71%	5
Motorcycle or scooter	7.14%	1
Carpool (for commuting)	14.29%	2
Vanpool	0.00%	0
Employer Shuttle (for commuting)	0.00%	0
Car Rental within Vermont	21.43%	3
Other (please specify)	7.14%	1
Total Respondents: 14		

#	OTHER (PLEASE SPECIFY)	DATE
1	Commercial airline	8/13/2018 9:42 AM

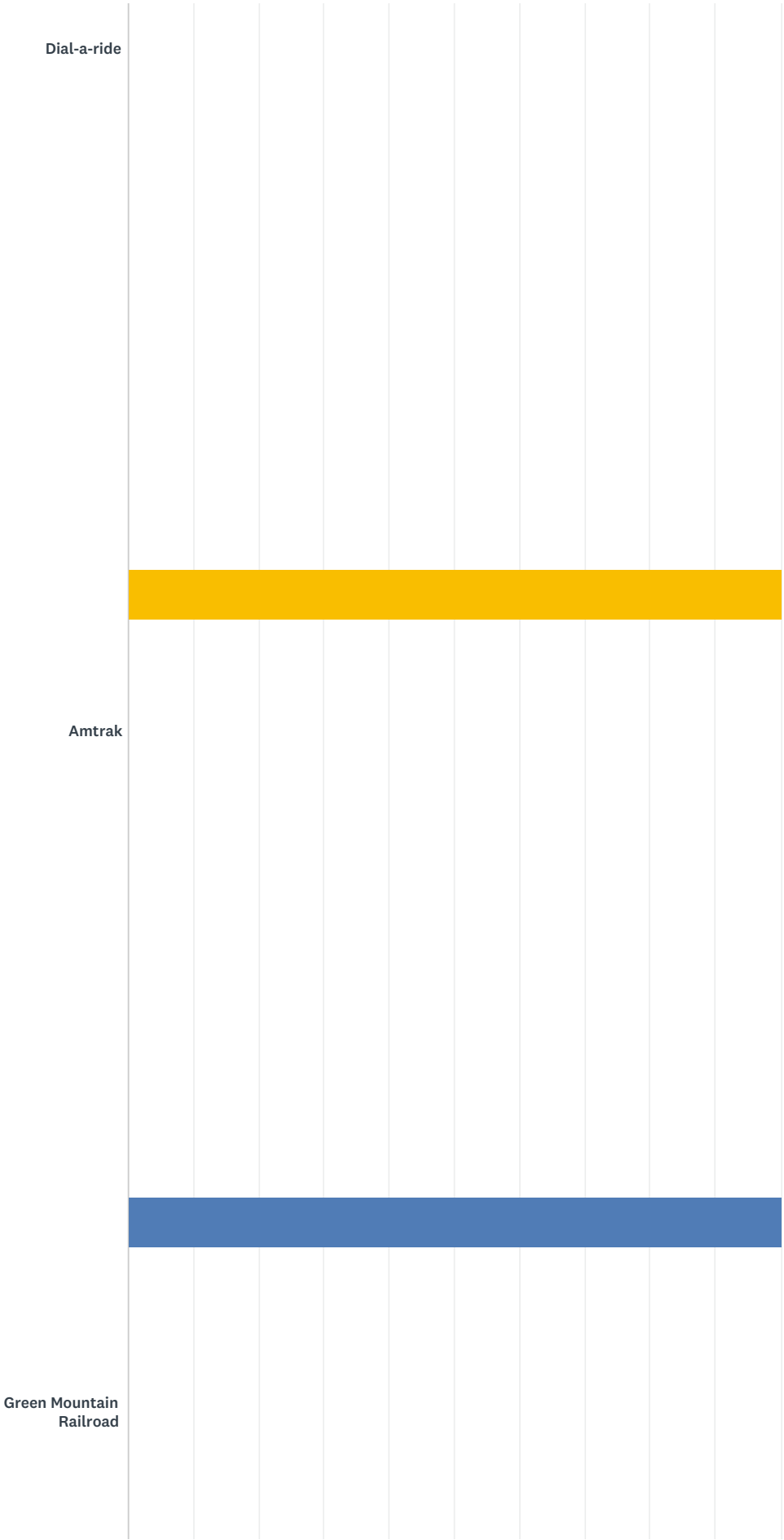
Q5 Please indicate about how frequently you CURRENTLY use the following modes. Your response to this question should be solely about your personal use of these modes.

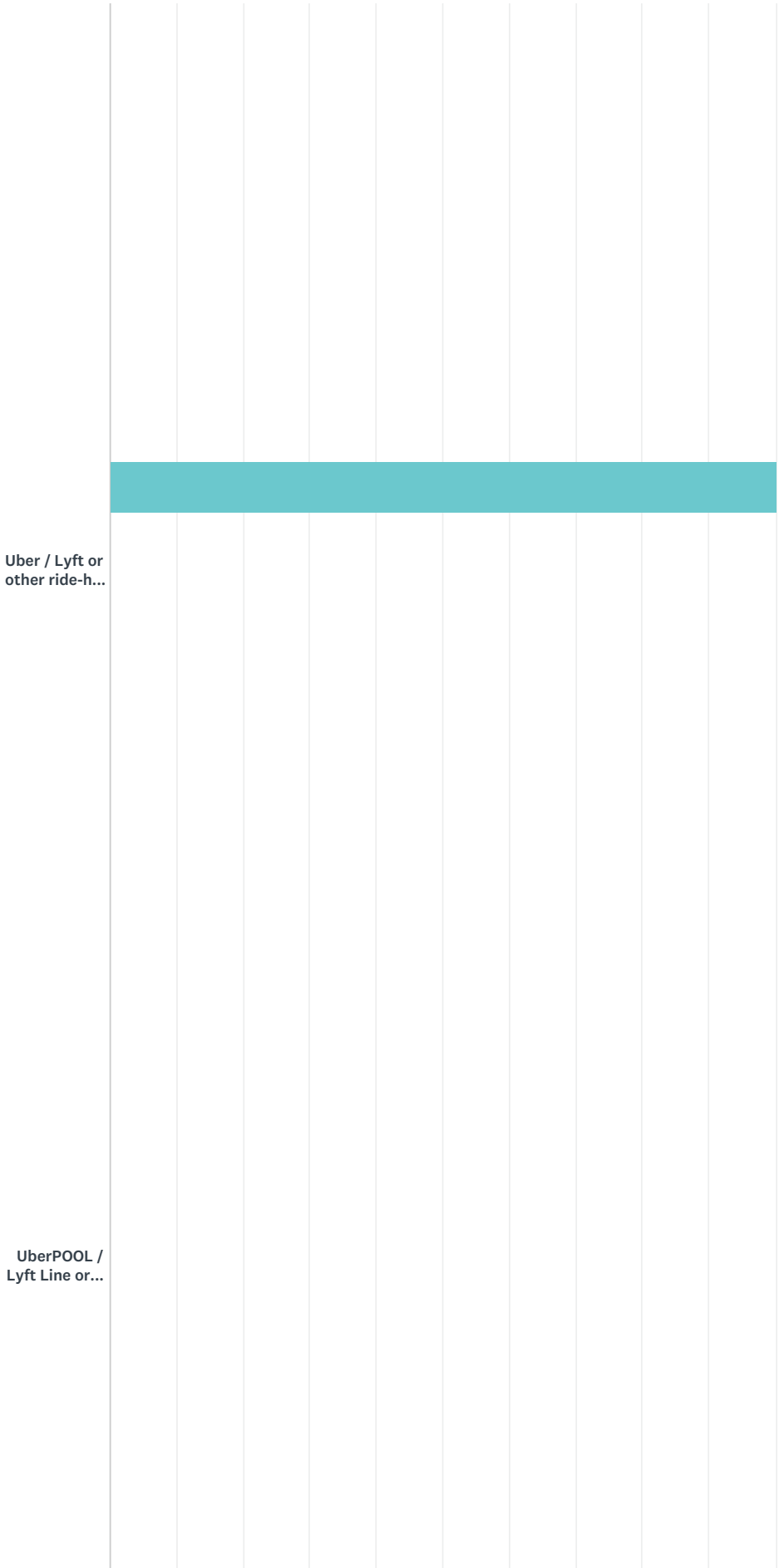
Answered: 14 Skipped: 0

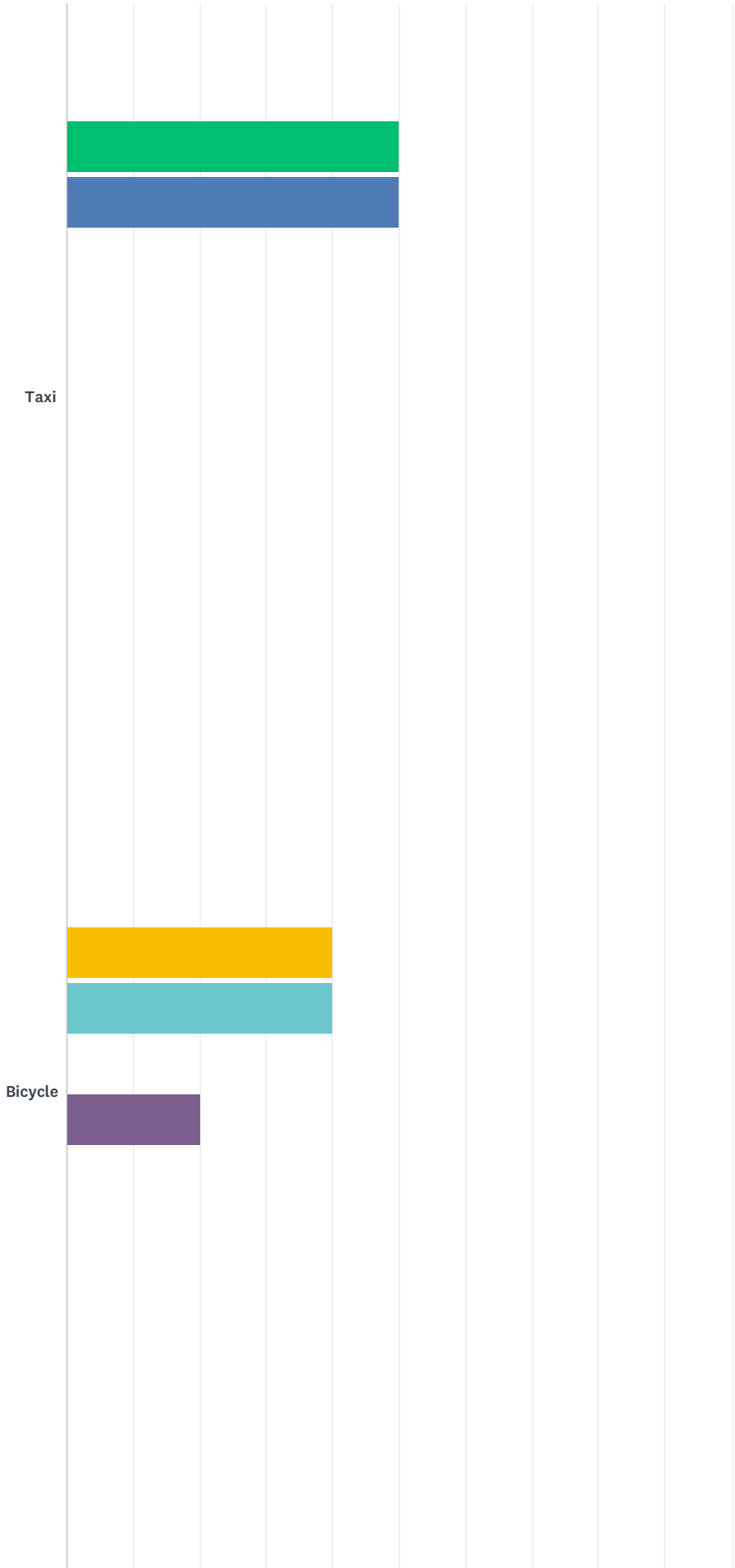


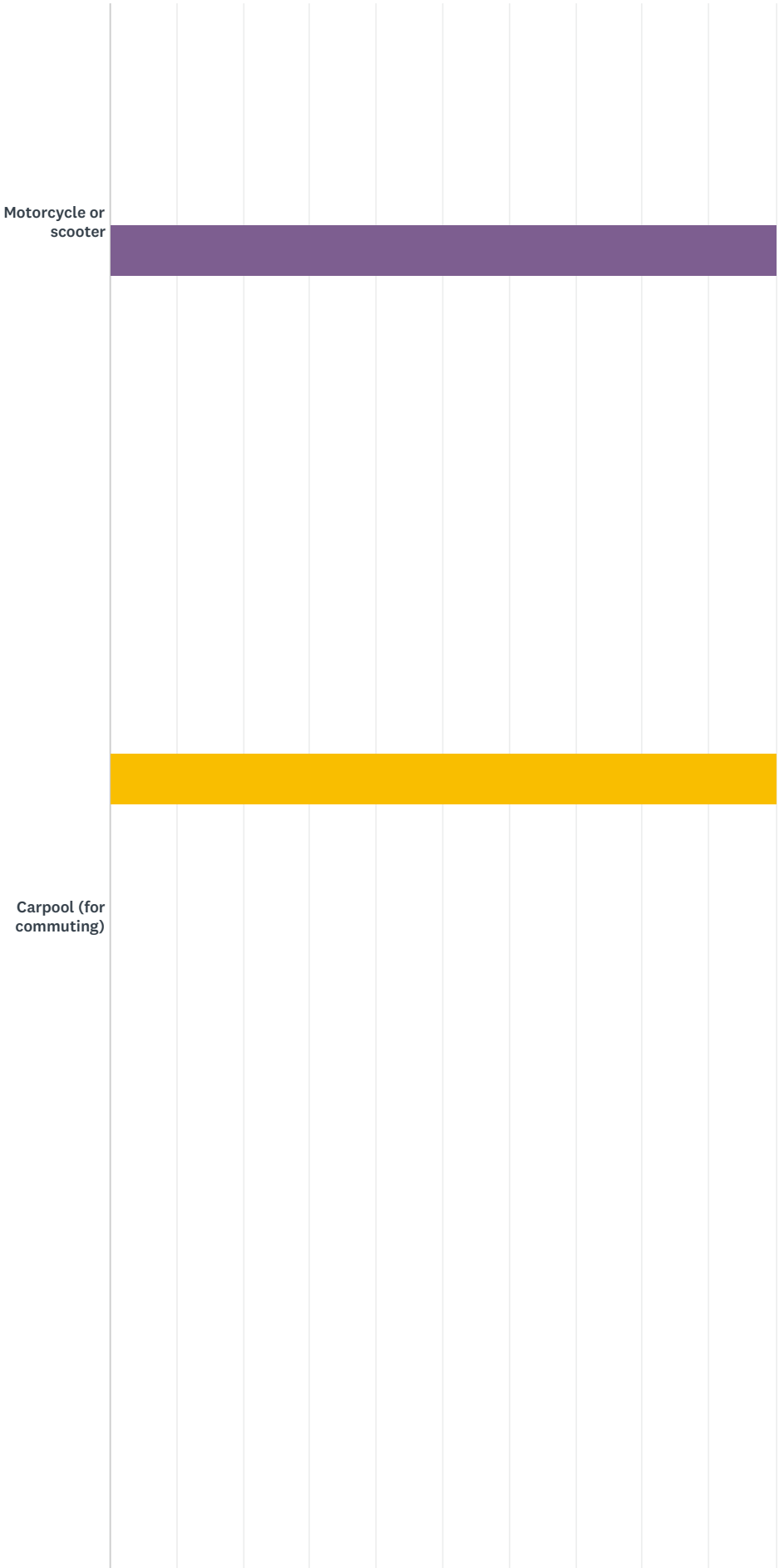

Walk (to a destination)
Fixed route public bus


Deviated-fixed public bus
Hail-and-ride bus

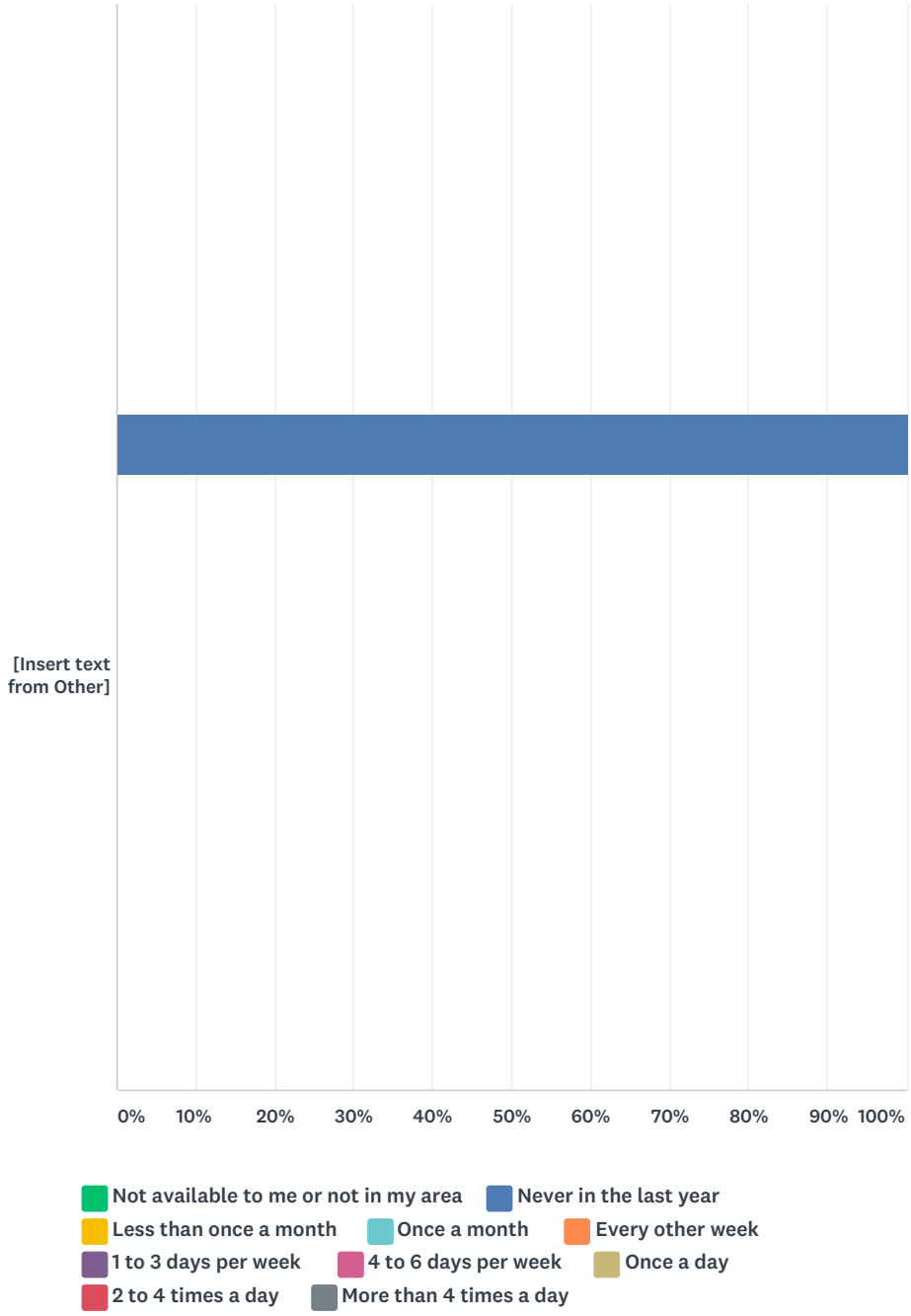

Dial-a-ride
Amtrak
Green Mountain Railroad


Uber / Lyft or other ride-h...
UberPOOL / Lyft Line or...


Taxi
Bicycle


Motorcycle or scooter
Carpool (for commuting)


Vanpool
Employer Shuttle (for...
Car Rental within Vermont



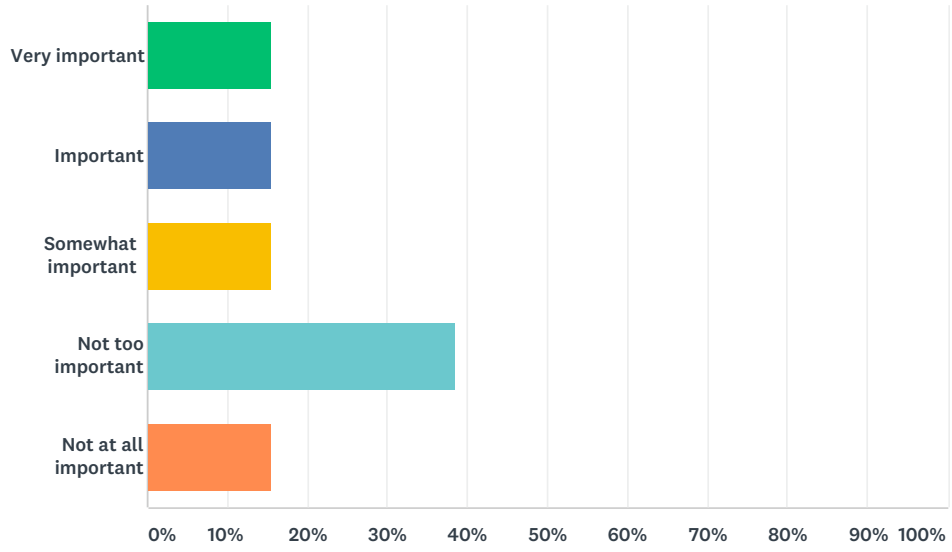
	NOT AVAILABLE TO ME OR NOT IN MY AREA	NEVER IN THE LAST YEAR	LESS THAN ONCE A MONTH	ONCE A MONTH	EVERY OTHER WEEK	1 TO 3 DAYS PER WEEK	4 TO 6 DAYS PER WEEK	ONCE A DAY	2 TO 4 TIMES A DAY	MORE THAN 4 TIMES A DAY	TOTAL RESPONDE
Drive alone	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	9.09% 1	18.18% 2	0.00% 0	63.64% 7	9.09% 1	
Drive / ride with family / friend (non-commute)	0.00% 0	0.00% 0	0.00% 0	0.00% 0	15.38% 2	46.15% 6	23.08% 3	15.38% 2	7.69% 1	0.00% 0	
Walk (to a destination)	0.00% 0	0.00% 0	0.00% 0	20.00% 2	20.00% 2	30.00% 3	20.00% 2	10.00% 1	0.00% 0	0.00% 0	
Fixed route public bus	0.00% 0	0.00% 0	0.00% 0	33.33% 2	33.33% 2	16.67% 1	16.67% 1	0.00% 0	0.00% 0	0.00% 0	

Deviated-fixed public bus	0.00% 0	0.00% 0	33.33% 1	33.33% 1	33.33% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Hail-and-ride bus	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Dial-a-ride	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Amtrak	0.00% 0	0.00% 0	100.00% 3	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Green Mountain Railroad	0.00% 0	100.00% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Uber / Lyft or other ride-hail service	0.00% 0	0.00% 0	0.00% 0	100.00% 2	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
UberPOOL / Lyft Line or other shared-ride service	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Taxi	50.00% 1	50.00% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Bicycle	0.00% 0	0.00% 0	40.00% 2	40.00% 2	0.00% 0	20.00% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Motorcycle or scooter	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	100.00% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Carpool (for commuting)	0.00% 0	0.00% 0	100.00% 2	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Vanpool	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Employer Shuttle (for commuting)	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Car Rental within Vermont	0.00% 0	33.33% 1	66.67% 2	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
[Insert text from Other]	0.00% 0	100.00% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0

#	OTHER (PLEASE SPECIFY)	DATE
	There are no responses.	

Q6 How essential are flexible transit services (e.g., Hail-and-ride, deviated-fixed, dial-a-ride) to meeting your personal transportation needs? Your response to this question should be solely about your personal use of these modes.

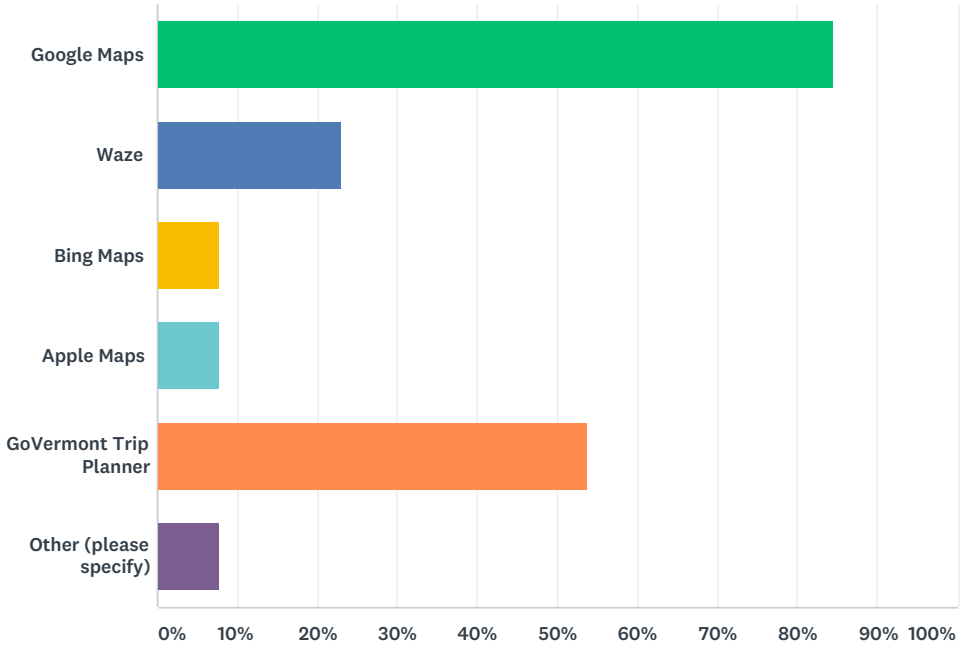
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
Very important	15.38%	2
Important	15.38%	2
Somewhat important	15.38%	2
Not too important	38.46%	5
Not at all important	15.38%	2
TOTAL		13

Q7 When you travel by public transit, which trip planning platforms have you used in the last year? Your response to this question should be solely about your personal use of these modes. (please check all that apply)

Answered: 13 Skipped: 1

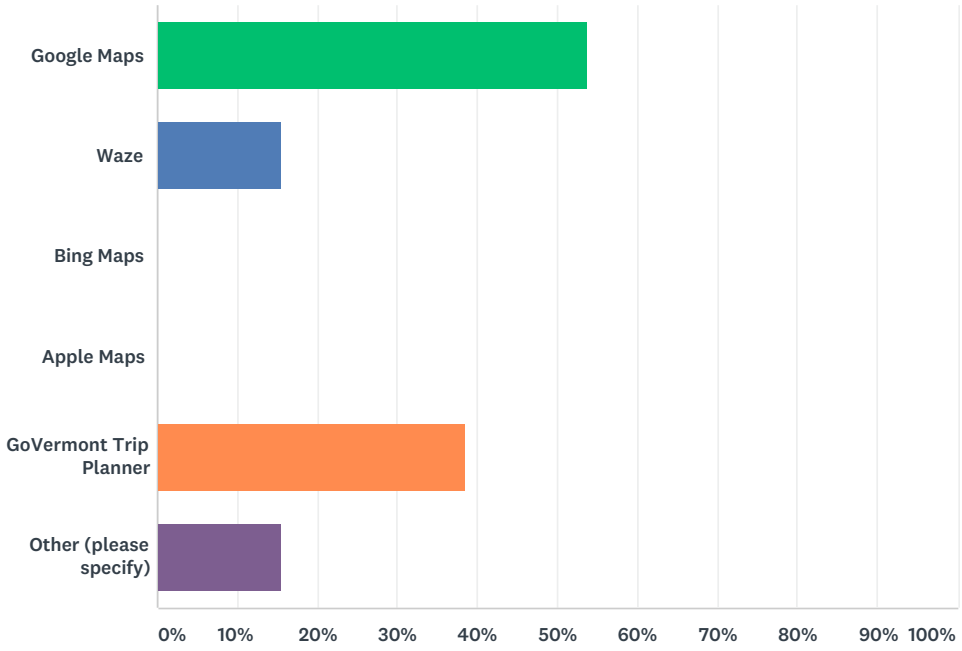


ANSWER CHOICES	RESPONSES	
Google Maps	84.62%	11
Waze	23.08%	3
Bing Maps	7.69%	1
Apple Maps	7.69%	1
GoVermont Trip Planner	53.85%	7
Other (please specify)	7.69%	1
Total Respondents: 13		

#	OTHER (PLEASE SPECIFY)	DATE
1	i just know the scheduler	9/4/2018 9:39 AM

Q8 When you travel by public transit, which trip planning platform do you find to be the most useful? Your response to this question should be solely about your personal use of these modes. (please select the best response)

Answered: 13 Skipped: 1

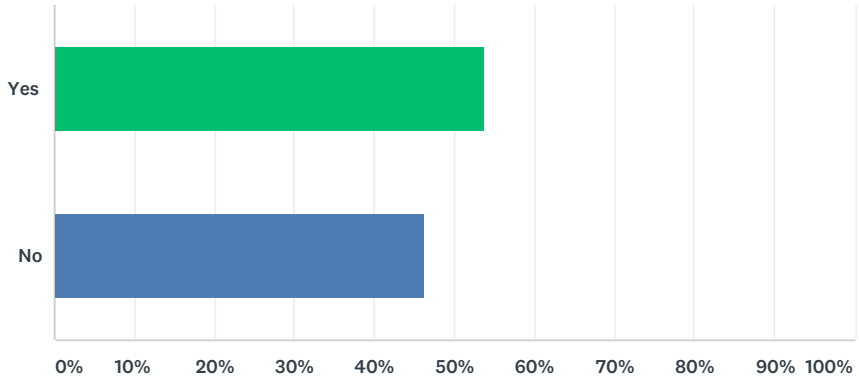


ANSWER CHOICES	RESPONSES	
Google Maps	53.85%	7
Waze	15.38%	2
Bing Maps	0.00%	0
Apple Maps	0.00%	0
GoVermont Trip Planner	38.46%	5
Other (please specify)	15.38%	2
Total Respondents: 13		

#	OTHER (PLEASE SPECIFY)	DATE
1	i know the schedule	9/4/2018 9:39 AM
2	None - neither GoVT nor Google accurately display options.	8/13/2018 9:59 AM

Q9 Have you used the latest version of the GoVermont Trip Planner?

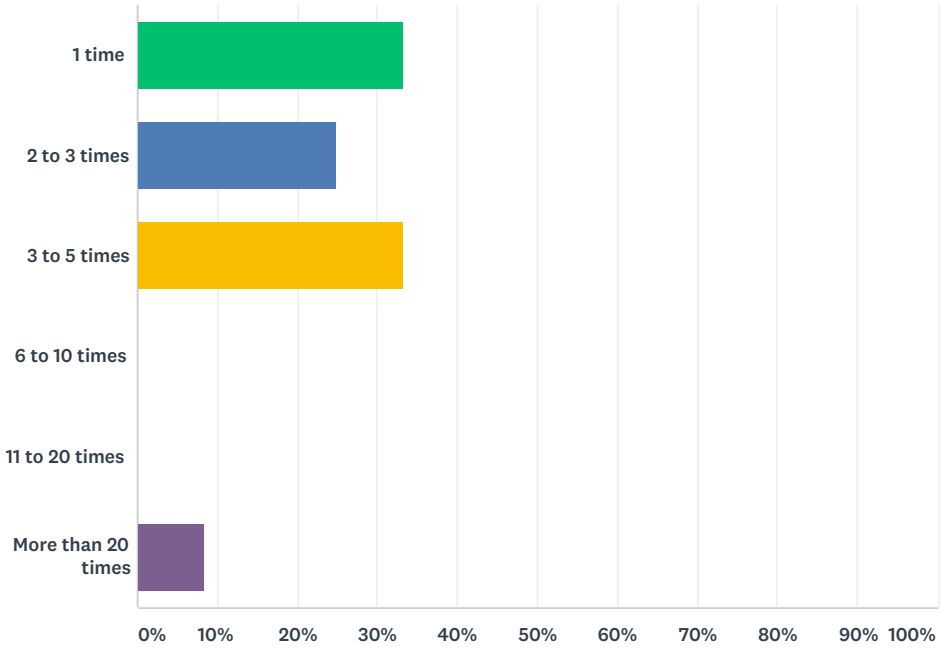
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	53.85%	7
No	46.15%	6
TOTAL		13

Q10 How many times have you used GoVermont Trip Planner?

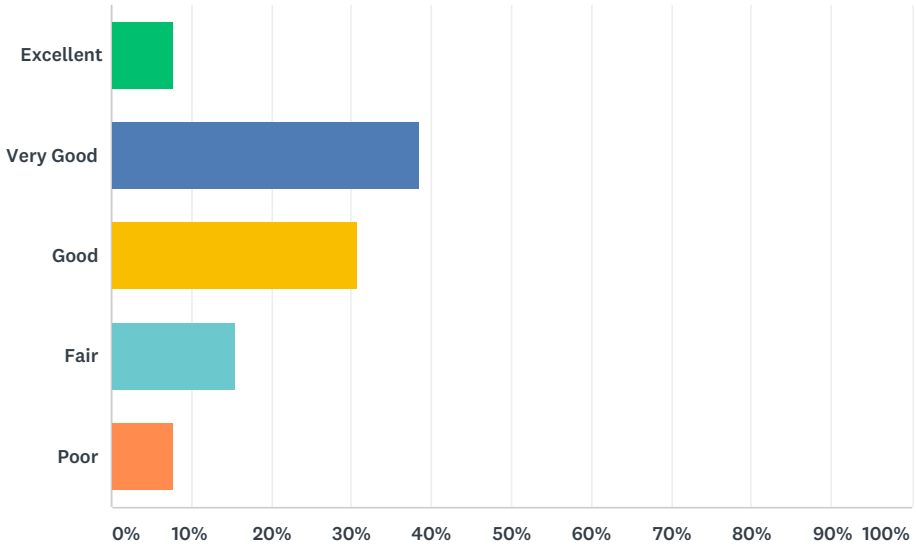
Answered: 12 Skipped: 2



ANSWER CHOICES	RESPONSES	
1 time	33.33%	4
2 to 3 times	25.00%	3
3 to 5 times	33.33%	4
6 to 10 times	0.00%	0
11 to 20 times	0.00%	0
More than 20 times	8.33%	1
TOTAL		12

Q11 What is your impression of the GoVermont Trip Planner?

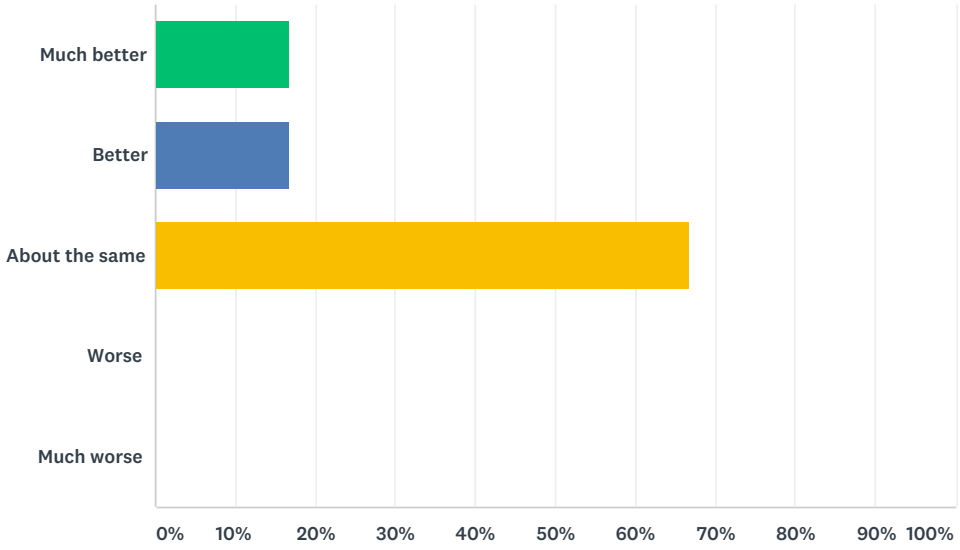
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
Excellent	7.69%	1
Very Good	38.46%	5
Good	30.77%	4
Fair	15.38%	2
Poor	7.69%	1
TOTAL		13

Q12 How would you say GoVermont Trip Planner compares to Google Maps overall for trip planning?

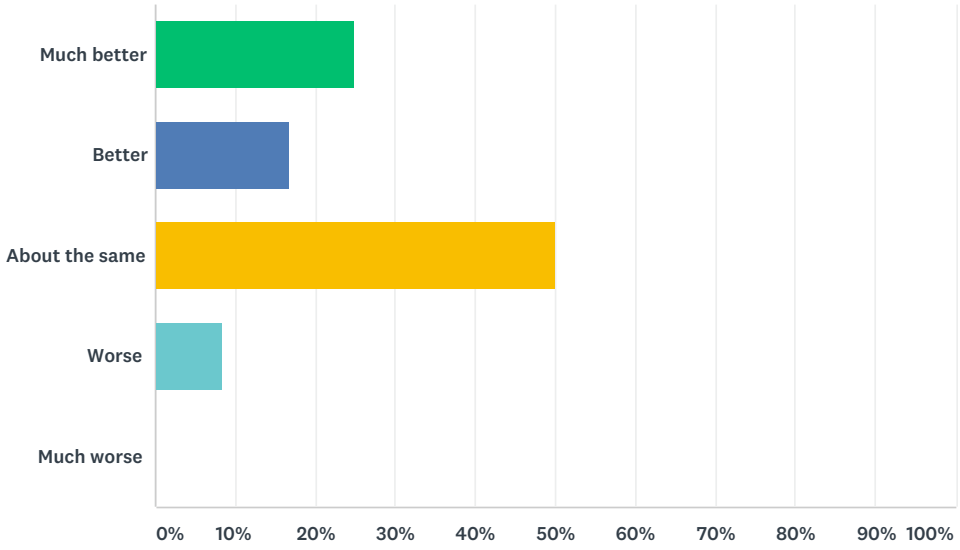
Answered: 12 Skipped: 2



ANSWER CHOICES	RESPONSES	
Much better	16.67%	2
Better	16.67%	2
About the same	66.67%	8
Worse	0.00%	0
Much worse	0.00%	0
TOTAL		12

Q13 How would you say GoVermont Trip Planner compares to Google Maps overall for appearance?

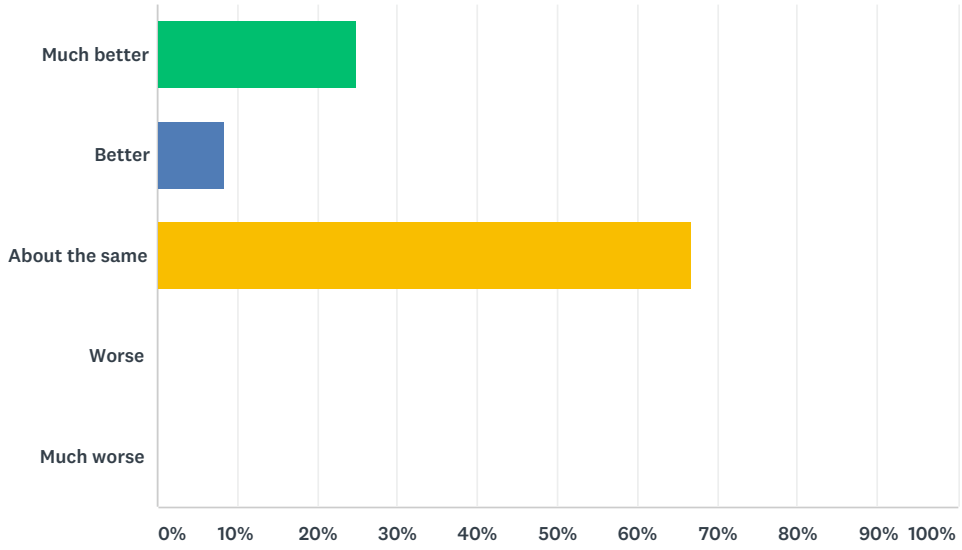
Answered: 12 Skipped: 2



ANSWER CHOICES	RESPONSES	
Much better	25.00%	3
Better	16.67%	2
About the same	50.00%	6
Worse	8.33%	1
Much worse	0.00%	0
TOTAL		12

Q14 How would you say GoVermont Trip Planner compares to Google Maps overall for the format and display of information?

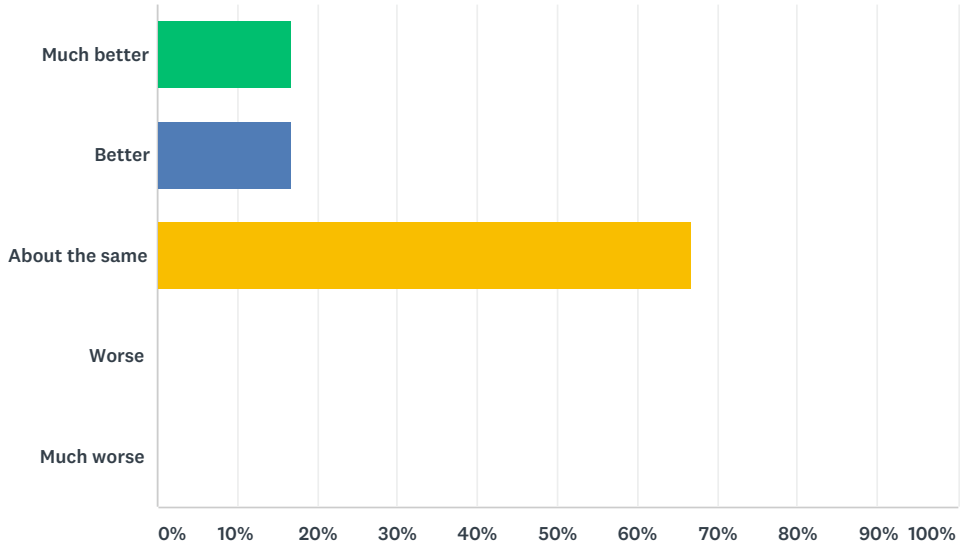
Answered: 12 Skipped: 2



ANSWER CHOICES	RESPONSES	
Much better	25.00%	3
Better	8.33%	1
About the same	66.67%	8
Worse	0.00%	0
Much worse	0.00%	0
TOTAL		12

Q15 How would you say GoVermont Trip Planner compares to Google Maps overall for the quality of travel options presented?

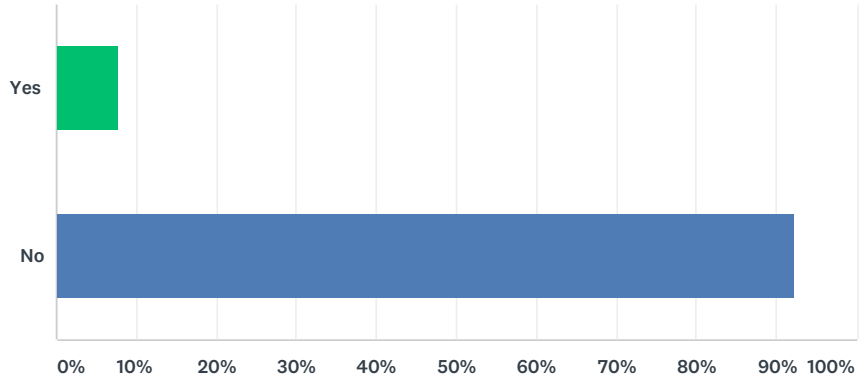
Answered: 12 Skipped: 2



ANSWER CHOICES	RESPONSES	
Much better	16.67%	2
Better	16.67%	2
About the same	66.67%	8
Worse	0.00%	0
Much worse	0.00%	0
TOTAL		12

Q16 Have you used GoVermont Trip Planner for planning flex-transit trips?

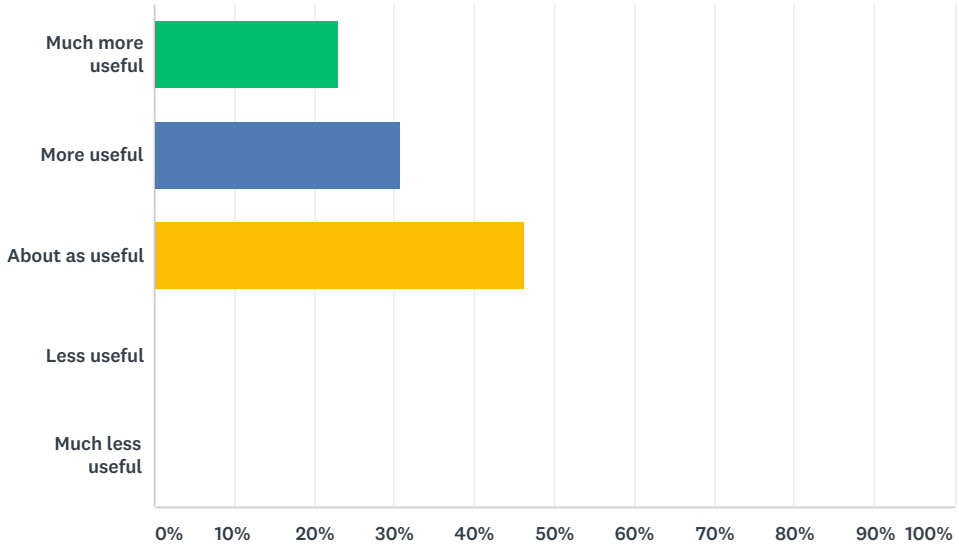
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	7.69%	1
No	92.31%	12
TOTAL		13

Q17 Relative to Google Maps, how useful do you think OpenTripPlanner is for planning transit trips in Vermont?

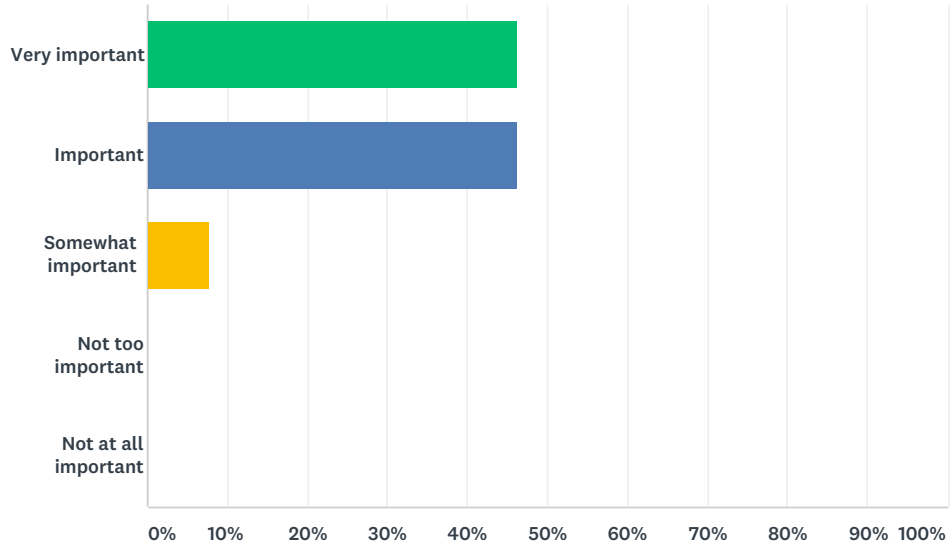
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
Much more useful	23.08%	3
More useful	30.77%	4
About as useful	46.15%	6
Less useful	0.00%	0
Much less useful	0.00%	0
TOTAL		13

Q18 How important do you consider flex-transit services to be within your agency?

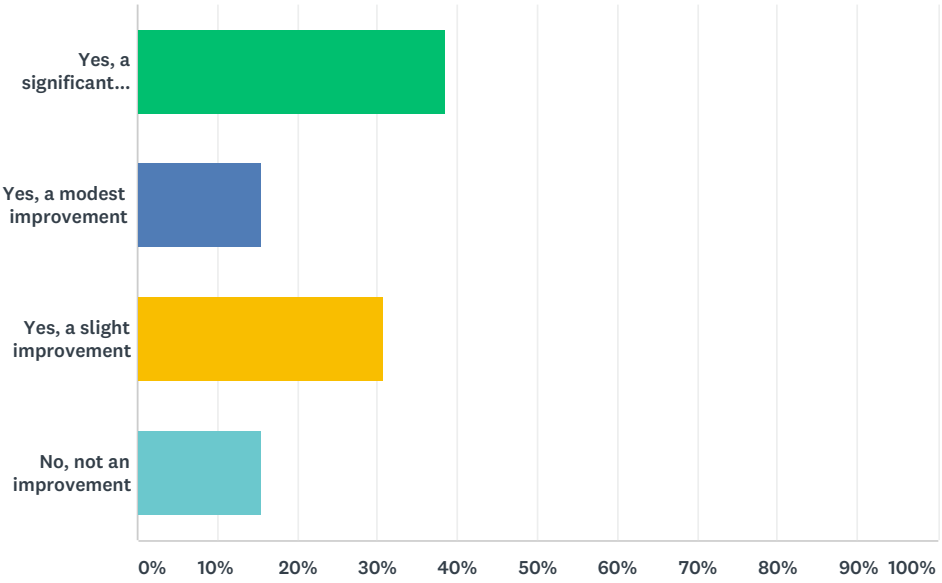
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
Very important	46.15%	6
Important	46.15%	6
Somewhat important	7.69%	1
Not too important	0.00%	0
Not at all important	0.00%	0
TOTAL		13

Q19 Do you think that GoVermont Trip Planner is an improvement for flex-transit planning?

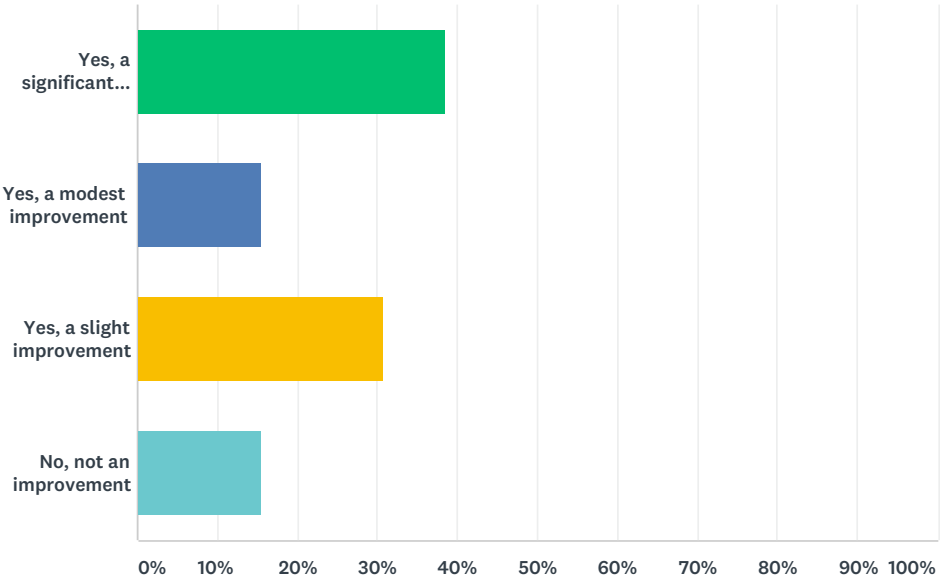
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes, a significant improvement	38.46%	5
Yes, a modest improvement	15.38%	2
Yes, a slight improvement	30.77%	4
No, not an improvement	15.38%	2
TOTAL		13

Q20 Do you think that GoVermont Trip Planner is an improvement for travel planning in Vermont overall?

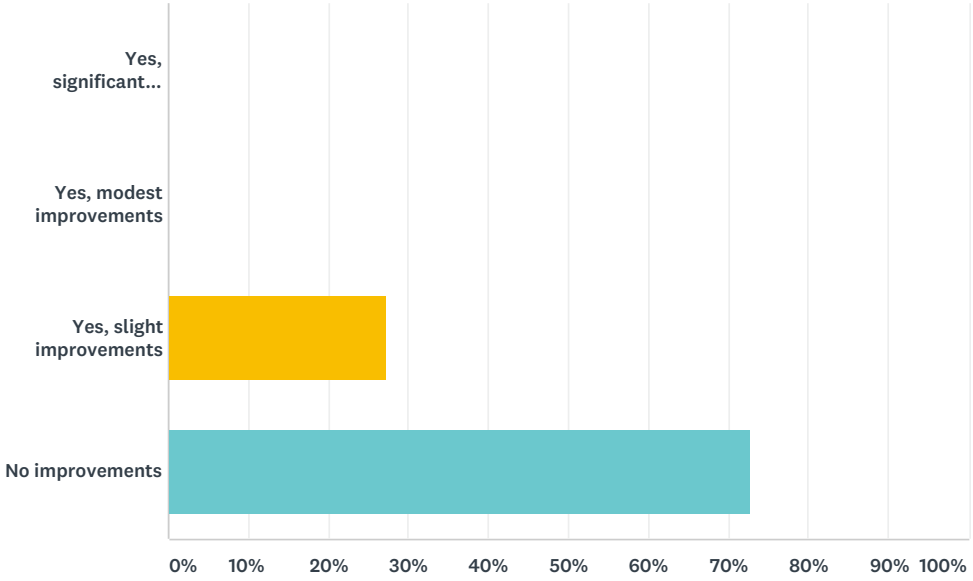
Answered: 13 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes, a significant improvement	38.46%	5
Yes, a modest improvement	15.38%	2
Yes, a slight improvement	30.77%	4
No, not an improvement	15.38%	2
TOTAL		13

Q21 Have you noticed any operational improvements within your transit agency as a result of the GoVermont Trip Planner? This could be anything from an improvement in vehicle occupancy, vehicle timing, forecasted outcomes, etc.?

Answered: 11 Skipped: 3



ANSWER CHOICES	RESPONSES	
Yes, significant improvements	0.00%	0
Yes, modest improvements	0.00%	0
Yes, slight improvements	27.27%	3
No improvements	72.73%	8
TOTAL		11

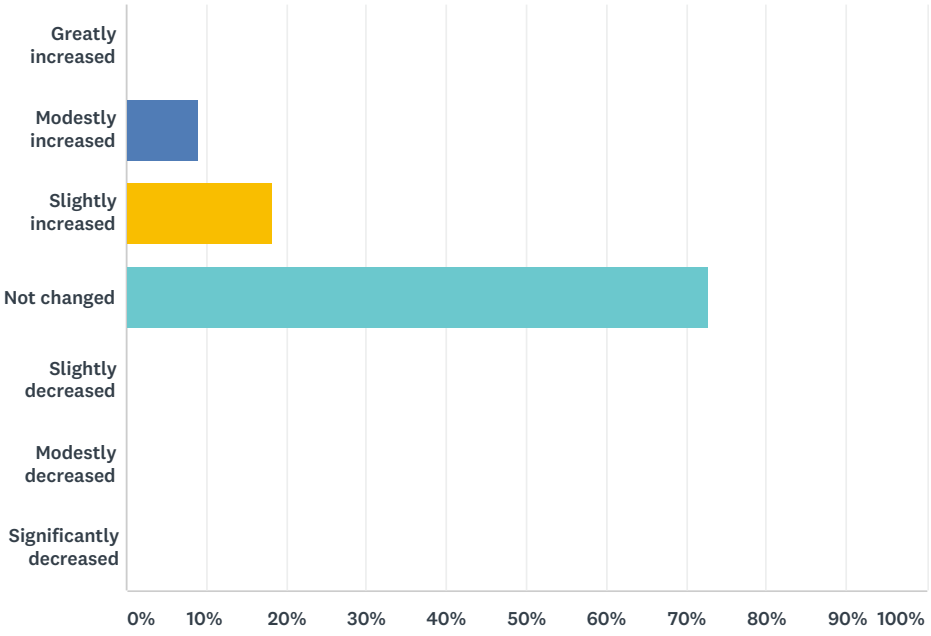
Q22 If you answered yes to the above question, please explain these improvements below and, if possible, why you attribute them to the GoVermont Trip Planner. If there are multiple improvements that you've noticed, please describe each of them.

Answered: 3 Skipped: 11

#	RESPONSES	DATE
1	The main problem to date is that not enough folks are yet aware of it. We have however heard positive public comments about the new version of the trip planner.	9/4/2018 1:53 PM
2	I believe ridership on some routes have gone up because the general public has used the planner.	9/4/2018 10:08 AM
3	We have received phone inquiries due to passenger's use of the Trip Planner.	8/13/2018 9:47 AM

Q23 In your personal opinion, due to the GoVermont TripPlanner, ridership probably has...

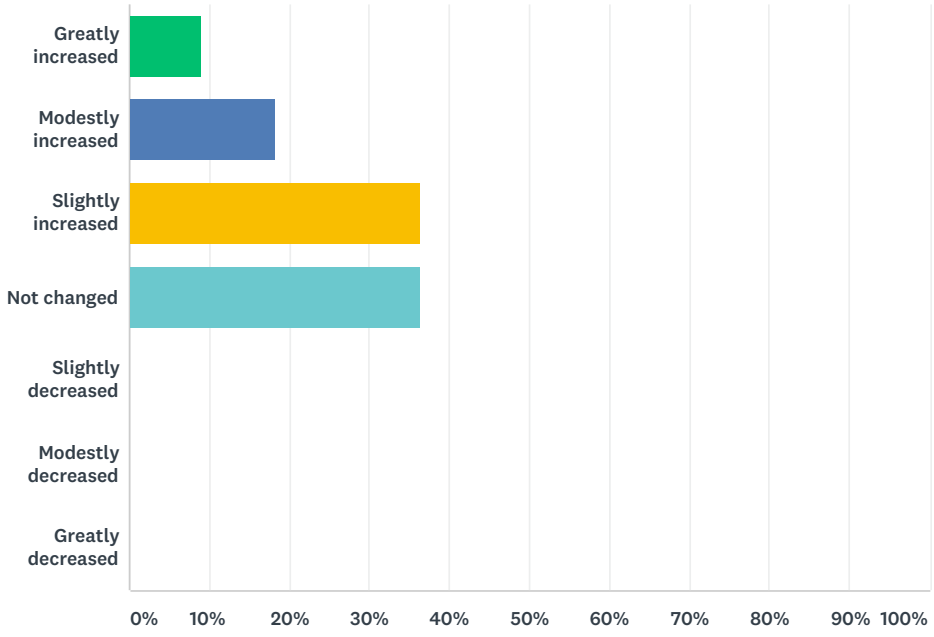
Answered: 11 Skipped: 3



ANSWER CHOICES	RESPONSES	
Greatly increased	0.00%	0
Modestly increased	9.09%	1
Slightly increased	18.18%	2
Not changed	72.73%	8
Slightly decreased	0.00%	0
Modestly decreased	0.00%	0
Significantly decreased	0.00%	0
TOTAL		11

Q24 In your personal opinion, due to the GoVermont Trip Planner, the information available to your customers on your agency's services probably has...

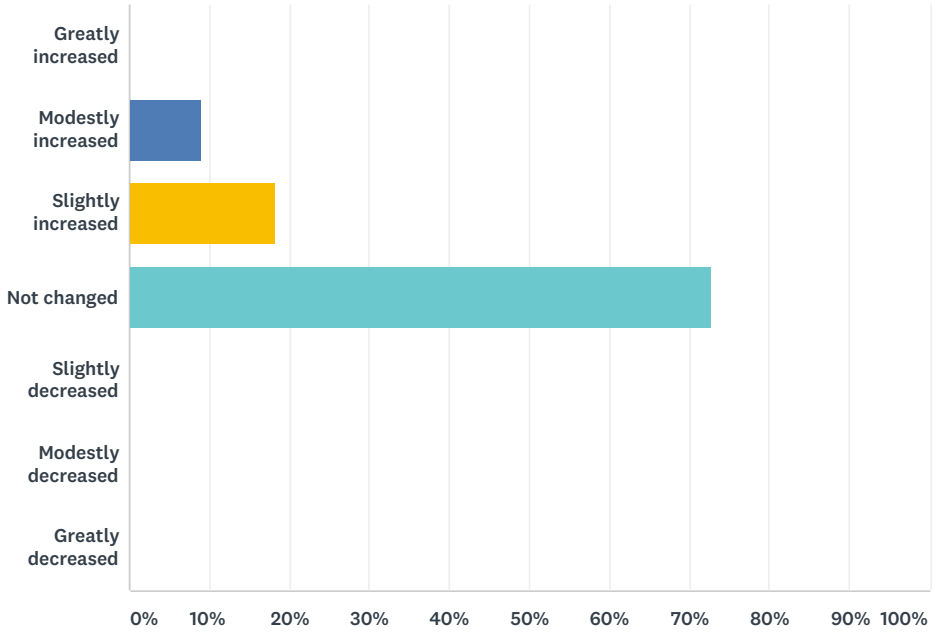
Answered: 11 Skipped: 3



ANSWER CHOICES	RESPONSES	
Greatly increased	9.09%	1
Modestly increased	18.18%	2
Slightly increased	36.36%	4
Not changed	36.36%	4
Slightly decreased	0.00%	0
Modestly decreased	0.00%	0
Greatly decreased	0.00%	0
TOTAL		11

Q25 In your personal opinion, due to the GoVermont Trip Planner, the operational efficiency of your agency probably has…

Answered: 11 Skipped: 3



ANSWER CHOICES	RESPONSES	
Greatly increased	0.00%	0
Modestly increased	9.09%	1
Slightly increased	18.18%	2
Not changed	72.73%	8
Slightly decreased	0.00%	0
Modestly decreased	0.00%	0
Greatly decreased	0.00%	0
TOTAL		11

Q26 If you have any comments to improve GoVermont Trip Planner, please feel free to provide them here. Please offer any open ended comments that are polite, constructive, and helpful to the development team. Your comments will be read by evaluators and system developers. Please do not include any information that identifies you personally.

Answered: 4 Skipped: 10

#	RESPONSES	DATE
1	We are off to a great start.....well done!	9/4/2018 1:53 PM
2	Some of the problem may be due to not having accurate bus schedule information. For example, DAR should be able to take me from my home to the nearest park & ride to catch the fixed-route bus to work. Instead it takes me two towns north for a flex service whose times are not accurately listed. A user must also have a working knowledge of using trip planning software online; it may not be intuitive for someone who is disinclined towards using tech. Of course, such people may call in anyway. For our agency, this may have the greatest potential impact with case managers, but rides still need to be called into our dispatch center to be scheduled. We would need to completely overhaul our dispatch system to accommodate ride requests made online.	8/13/2018 9:59 AM
3	This is a great tool, but we need to market it better.	8/9/2018 4:05 PM
4	Thanks, r	8/1/2018 2:59 PM

APPENDIX

C

Public User Survey

Go! Vermont Public Trip Planner Survey

This survey is about your experience reviewing and using the Go! Vermont Trip Planner. If you did not get a chance to review the Go! Vermont Trip Planner yet, feel free to do so now. We suggest planning 5-10 different trips in the Go! Vermont Trip Planner and comparing them to Google Maps. Review and use of it should take about 5 to 10 minutes. Then please proceed to take this survey.

Link to Trip Planner: https://plan.govermont.org/.

1. Including yourself, how many people live in your current household?

   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ More than 6

2. What best describes your relation to the other people in your current household? (Please check all that apply)

   ☐ Parent/Guardian(s)

   ☐ Relatives (e.g., siblings, etc.)

   ☐ Housemates/Roommates

   ☐ Partner/Significant other

   ☐ Children (who are under your guardianship)

   ☐ Other (please specify)

3. Please list the year, make, and model or your household's CURRENT vehicles, those that are owned or leased (e.g., 2014 Ford Fusion)

   ☐ Vehicle 1

   ☐ Vehicle 2

   ☐ Vehicle 3

   ☐ Vehicle 4

   ☐ Vehicle 5

4. In the last year, approximately how many miles have you driven on these vehicles? (not cumulative odometer reading)

   ☐ Vehicle 1

   ☐ Vehicle 2

   ☐ Vehicle 3

   ☐ Vehicle 4

   ☐ Vehicle 5

5. Which of the following modes of transportation have you used within Vermont in the last two years? (Please check all that apply)

- ☐ Drive alone
- ☐ Drive/ride with family/friend (non-commute)
- ☐ Walk (to a destination)
- ☐ Fixed route public bus
- ☐ Deviated-fixed public bus
- ☐ Hail-and-ride bus
- ☐ Dial-a-ride
- ☐ Amtrak
- ☐ Green Mountain Railroad
- ☐ Uber/Lyft or other ride-hail service
- ☐ UberPOOL/Lyft Line or other shared-ride service
- ☐ Taxi
- ☐ Bicycle
- ☐ Motorcycle or scooter
- ☐ Carpool (for commuting)
- ☐ Vanpool
- ☐ Employer shuttle (for commuting)
- ☐ Car rental within Vermont
- ☐ Other (please specify)

6. Please indicate about how frequently you CURRENTLY use the following modes.

	Not available to me or not in my area	Never in the last year	Less than once a month	Once a month	Every other week	1 to 3 days per week	4 to 6 days per week	Once a day	2 to 4 times a day	More than 4 times a day
Drive alone										
Drive/ride with family friend										
Walk (to a destination)										
Fixed route public bus										
Deviated fixed public bus										
Hail-and-ride bus										
Dial-a-ride										
Amtrak										
Green Mountain Railroad										
Uber/Lyft or other ride-hail service										
UberPOOL/Lyft Line or other shared-ride service										
Taxi										
Bicycle										
Motorcycle or scooter										
Carpool (for commuting)										
Vanpool										
Employer shuttle (for commuting)										
Car rental (within Vermont)										
[Insert text from Other]										

7. How essential are the flexible transit services (e.g., services that are on-demand or use non-fixed pickup/ drop-off locations) to meeting your personal transportation needs?

- ☐ Very important
- ☐ Important
- ☐ Somewhat important
- ☐ Not so important
- ☐ Not at all important

8. When you travel by public transit, which trip planning platforms have you used in the last year? (Please check all that apply)

- ☐ Google Maps
- ☐ Waze
- ☐ Bing Maps
- ☐ Apple Maps
- ☐ Go! Vermont Trip Planner
- ☐ Other (please specify)

9. When you travel by public transit, which trip planning platform do you find to be the most useful? (please select the best response)

- ☐ Google Maps
- ☐ Waze
- ☐ Bing Maps
- ☐ Apple Maps
- ☐ Go! Vermont Trip Planner
- ☐ Other (please specify)

10. Have you used the latest version of Go! Vermont Trip Planner?

- ☐ Yes ☐ No

11. How many times have you used Go! Vermont Trip Planner?

- ☐ 1 time
- ☐ 1 to 3 times
- ☐ 4 to 5 times
- ☐ 6 to 10 times
- ☐ 11 to 20 times
- ☐ More than 20 times

12. What is your general impression of Go! Vermont Trip Planner?

- ☐ Excellent
- ☐ Very Good
- ☐ Good
- ☐ Fair
- ☐ Poor

13. How would you say Go! Vermont Trip Planner compares to Google Maps <u>for trip planning</u>?

- ☐ Much better
- ☐ Better
- ☐ About the same
- ☐ Worse
- ☐ Much worse

14. How would you say Go! Vermont Trip Planner compares to Google Maps <u>for appearance</u>?

- ☐ Much better
- ☐ Better
- ☐ About the same
- ☐ Worse
- ☐ Much worse

15. How would you say the Go! Vermont Trip Planner compares to Google Maps for the format and display of information?

    ☐ Much better

    ☐ Better

    ☐ About the same

    ☐ Worse

    ☐ Much worse

16. How would you say Go! Vermont Trip Planner compares to Google Maps overall for the quality of travel options presented?

    ☐ Much better

    ☐ Better

    ☐ About the same

    ☐ Worse

    ☐ Much worse

17. Have you used Go! Vermont Trip Planner for planning flex-transit trips?

    ☐ Yes ☐ No

18. Relative to Google Maps, how useful do you think the Go! Vermont Trip Planner is for planning transit trips in Vermont?

    ☐ Much more useful

    ☐ More useful

    ☐ About as useful

    ☐ Much less useful

19. Do you think that Go! Vermont Trip Planner is an improvement for flex transit planning relative to other options available?

    ☐ Yes, a significant improvement

    ☐ Yes, a modest improvement

    ☐ Yes, a slight improvement

    ☐ No, not an improvement

20. Do you think Go! Vermont Trip Planner is an improvement for travel planning in Vermont overall?

    ☐ Yes, a significant improvement

    ☐ Yes, a modest improvement

    ☐ Yes, a slight improvement

    ☐ No, not an improvement

21. Has Go! Vermont Trip Planner influenced how you have traveled to date?

    ☐ Yes, significantly

    ☐ Yes, modestly

    ☐ Yes, slightly

    ☐ No, not at all

22. Do you think Go! Vermont Trip Planner could influence how you travel in Vermont?
    - ☐ Yes, it could significantly
    - ☐ Yes, it could modestly
    - ☐ Yes, it could slightly
    - ☐ No, I do not think it really could
23. As a result of the information in Go! Vermont Trip Planner I have...
    - ☐ Much greater mobility
    - ☐ Somewhat greater mobility
    - ☐ My mobility has not changed
    - ☐ Somewhat less mobility
    - ☐ Much less mobility
24. As a result of the information in Go! Vermont Trip Planner I use public transit...
    - ☐ Much more
    - ☐ Somewhat more
    - ☐ About the same
    - ☐ Somewhat less
    - ☐ Much less
25. What is your gender?

    ☐ Female ☐ Male ☐ Other (please specify)
26. In what year were you born?
27. Do you use a wheelchair?

    ☐ Yes ☐ No
28. Do you have other disabilities that require specialized accommodations for transportation?

    ☐ Yes ☐ No
29. Do you require transportation vehicles and infrastructure that are ADA compliant to get around?

    ☐ Yes ☐ No
30. What is the highest level of education you have completed?
    - ☐ Less than high school
    - ☐ Currently in high school
    - ☐ High school/GED
    - ☐ Currently in 2-year college
    - ☐ 2-year college degree
    - ☐ Currently in 4-year college
    - ☐ 4-year college degree
    - ☐ Currently in post-graduate degree
    - ☐ Post-graduate degree (MA, MS, PhD, MD, JD, etc.)
    - ☐ Prefer not to answer

31. What is your race or ethnicity? (Please check all that apply)

- ☐ African American
- ☐ American Indian or Alaskan Native
- ☐ Asian
- ☐ Caucasian/White
- ☐ Hispanic or Latino
- ☐ Middle-Eastern
- ☐ Native Hawaiian or Pacific Islander
- ☐ South Asian (e.g., Indian, Pakistani, etc.)
- ☐ Southeast Asian
- ☐ Prefer not to answer

32. What kind of housing do you currently live in?

- ☐ Detached single-family home
- ☐ Attached single-family home
- ☐ Building with more than 100 units
- ☐ Building with between 10 and 100 units
- ☐ Building/house with fewer than 10 units
- ☐ Mobile home/RV/Trailer

33. Approximately what was your gross (pre-tax) household income in 2017? (Your household includes the people who live with you with whom you share income)

- ☐ Less than $10,000
- ☐ $10,000 to $14,999
- ☐ $15,000 to $24,999
- ☐ $25,000 to $34,999
- ☐ $35,000 to $49,999
- ☐ $50,000 to $74,999
- ☐ $75,000 to $99,999
- ☐ $100,000 to $149,999
- ☐ $150,000 to $199,999
- ☐ $200,000 or more
- ☐ Prefer not to answer

34. Please indicate two streets that cross near your HOME location as well as the city.

City _____

Street #1 _____

Street #2 _____

APPENDIX

D

Public User Survey Results

Go! Vermont
Selected Survey Question Response Distributions
Preliminary Results

DRAFT Final

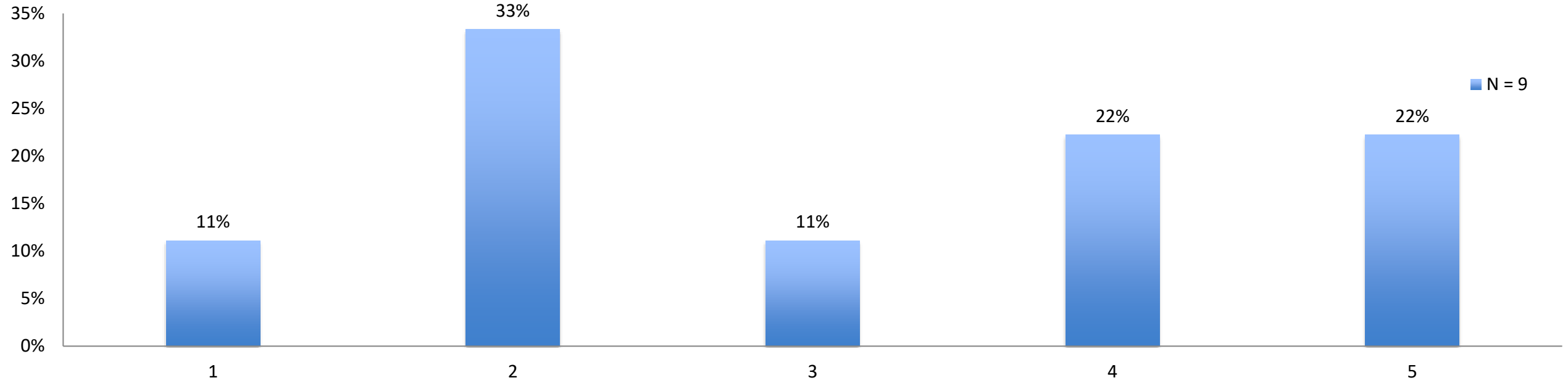
Transportation Sustainability Research Center, UC Berkeley

August 2019

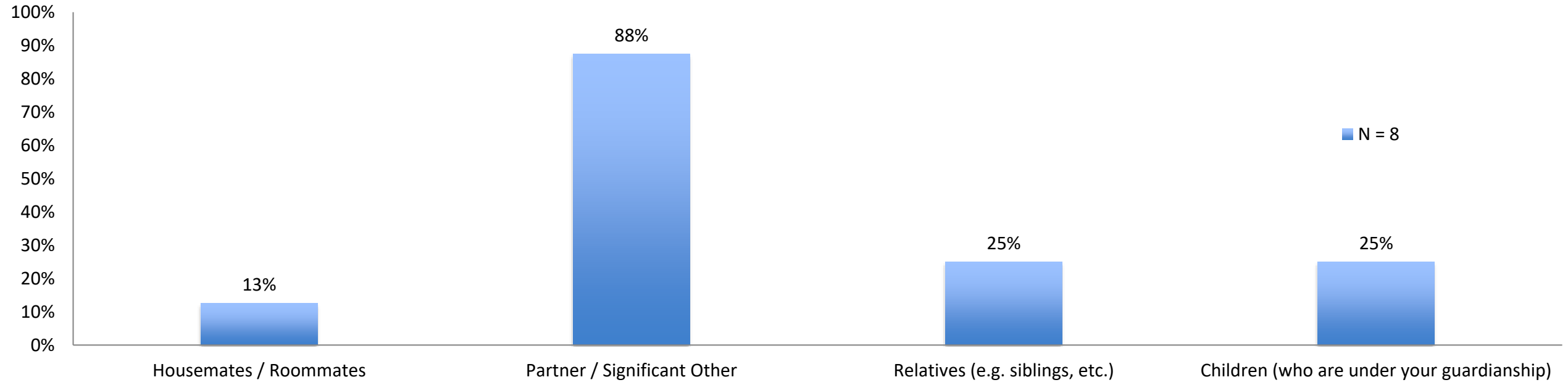
Introduction

- Results summarize responses from **Go! Vermont User Survey**.
- Valid responses, N = 9
  - Note that the survey implemented display logic, where respondents did not see every option or every question, if previous responses indicated such options or questions were irrelevant.
- Results are preliminary, and provided to present an overview of the general distribution of responses. The results are subject to review.

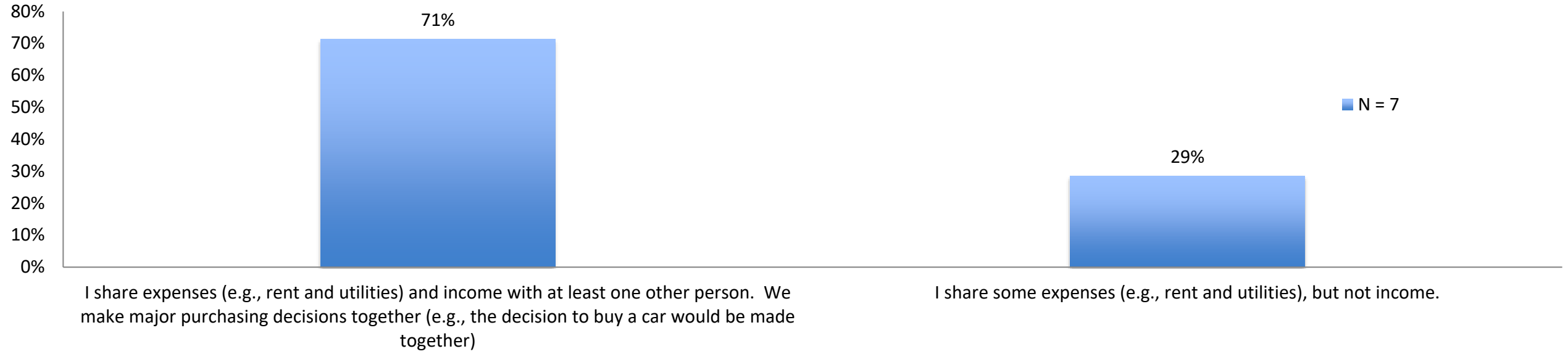
Including yourself, how many people live in your current household?



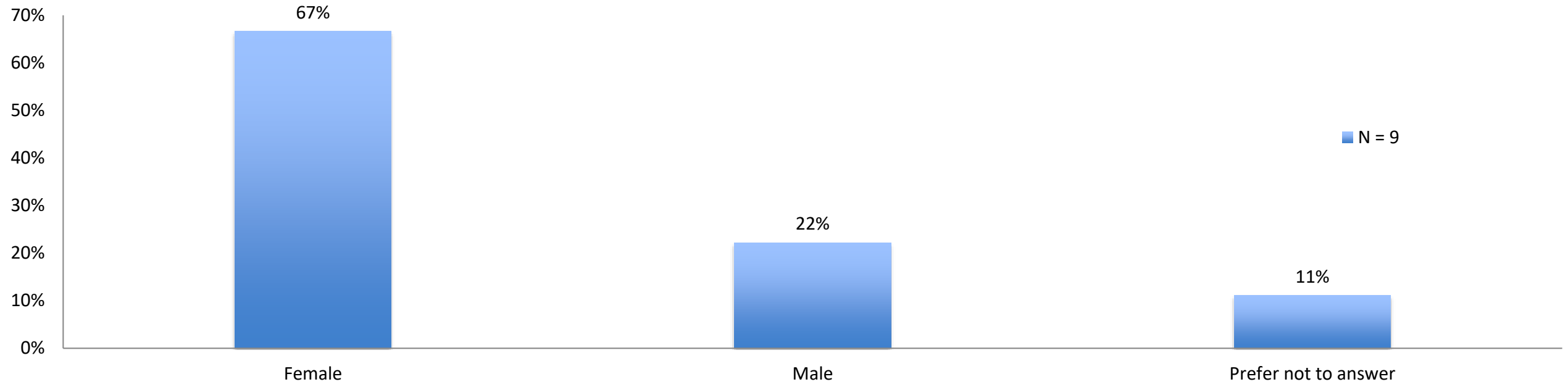
What best describes your relation to the other people in your current household?



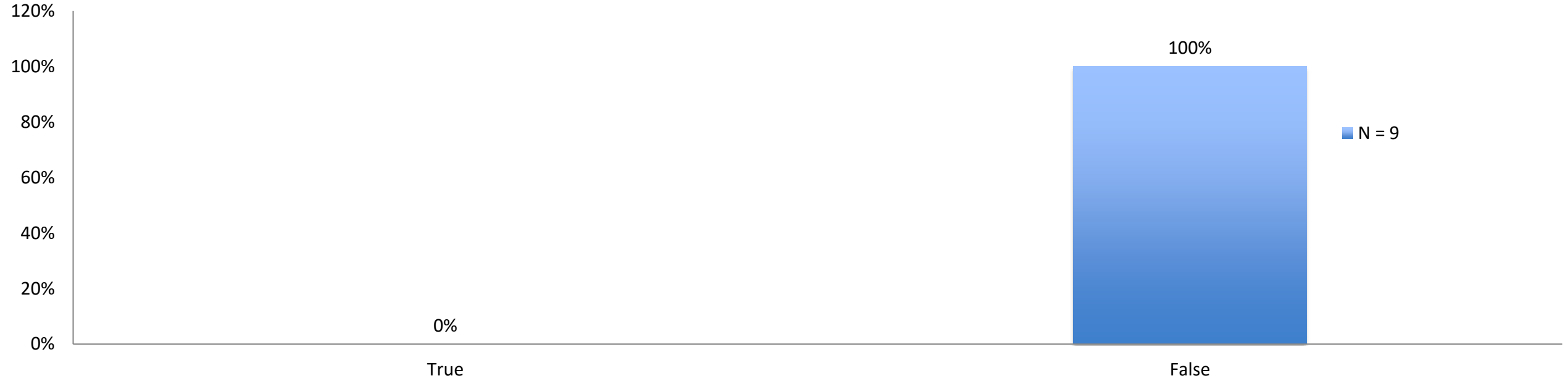
Please select the option that best describes your household. This question helps us frame survey questions that follow in the appropriate household or individual context



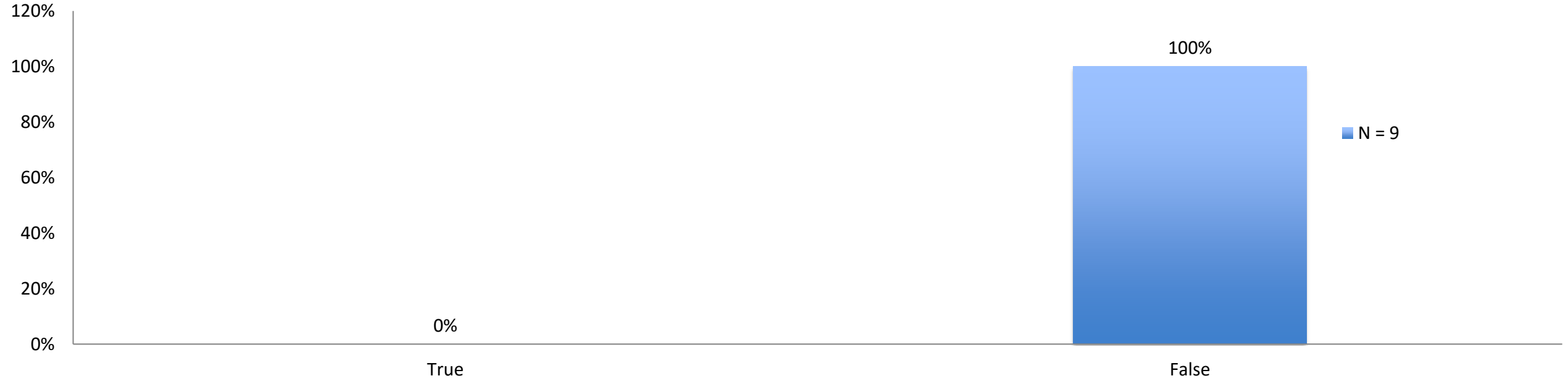
What is your gender?



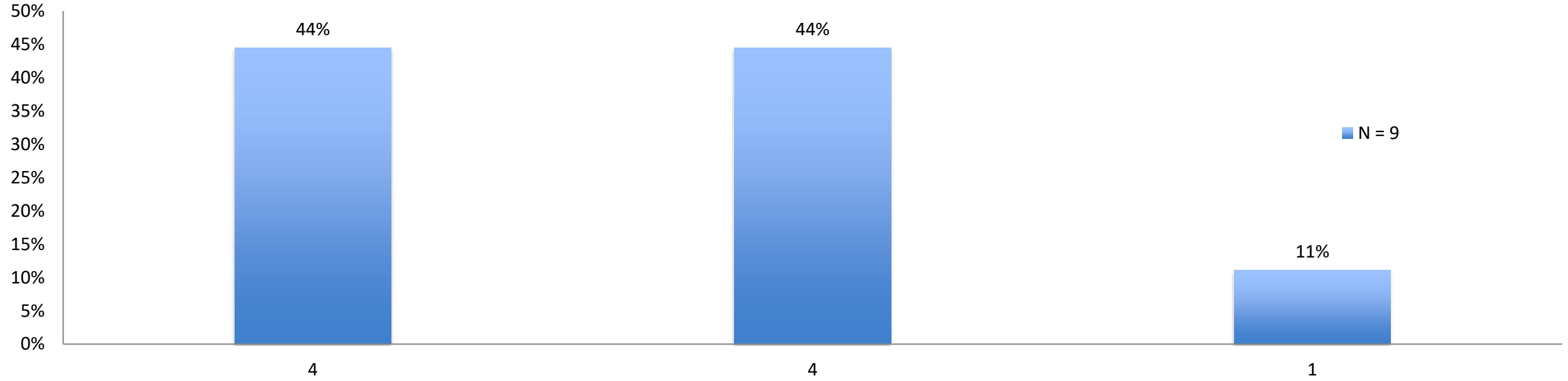
I use a wheelchair



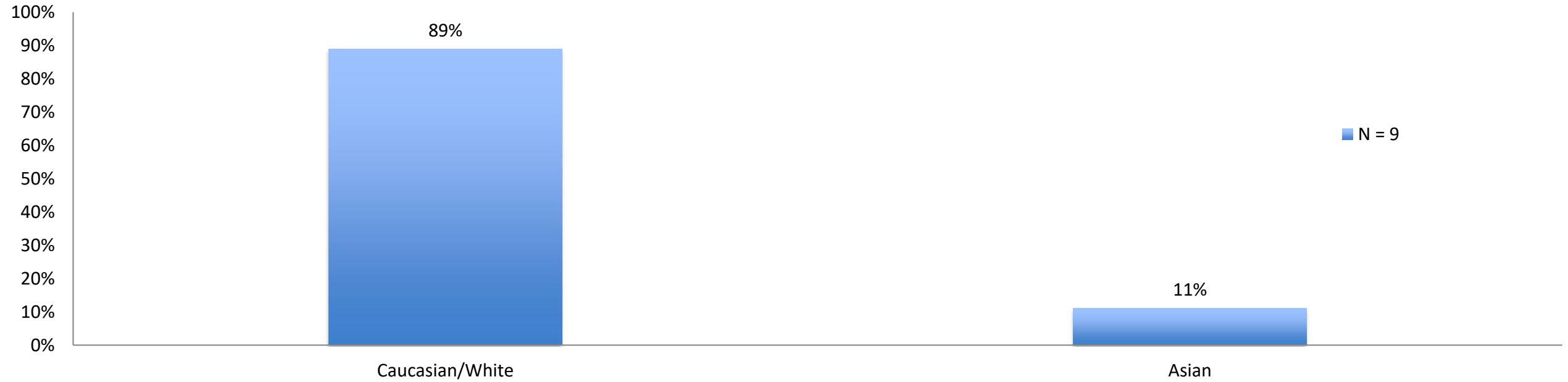
I have other disabilities that require specialized accommodations for transportation



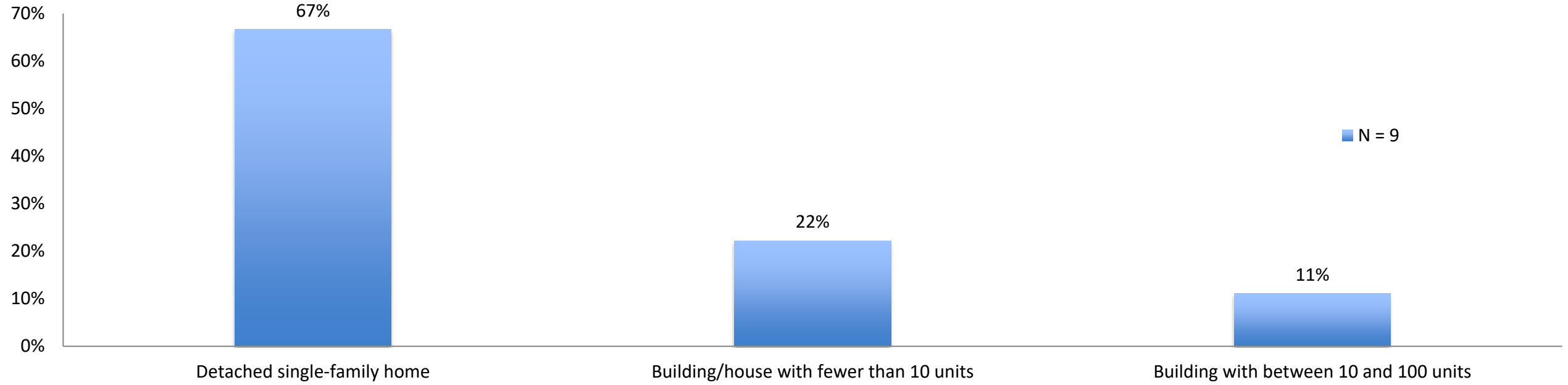
What is the highest level of education you have completed?



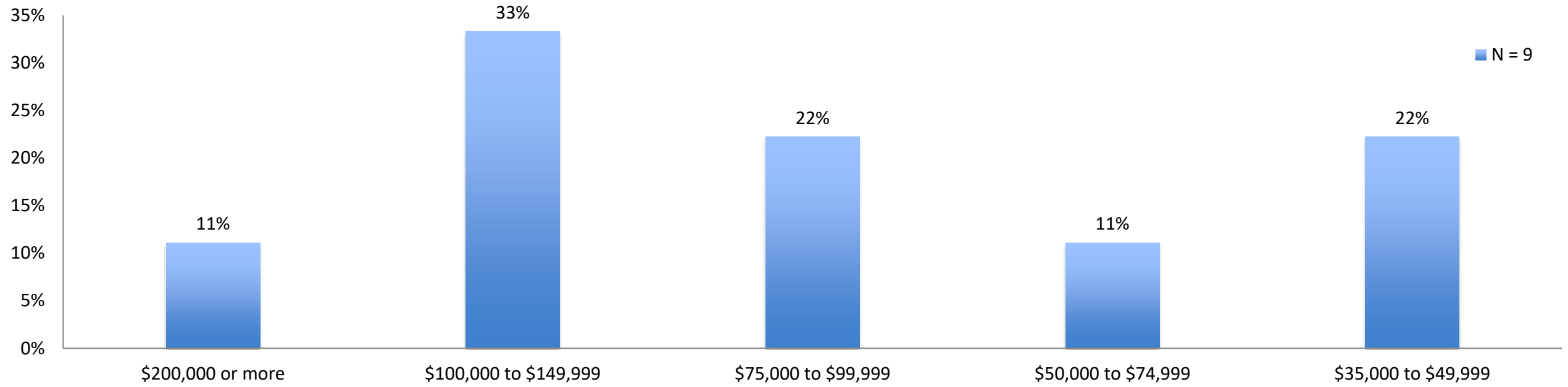
What is your race or ethnicity?



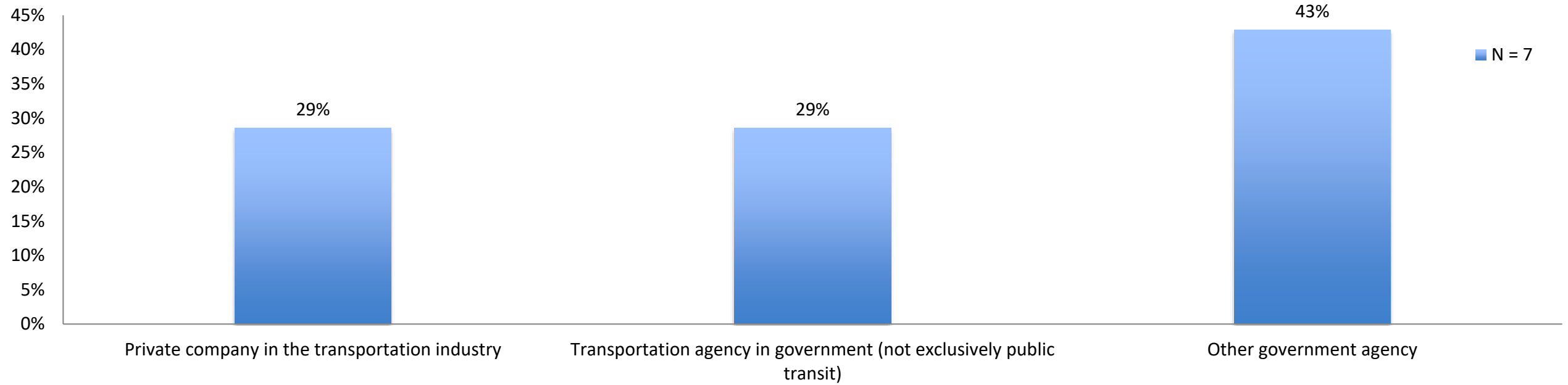
What kind of housing do you currently live in?



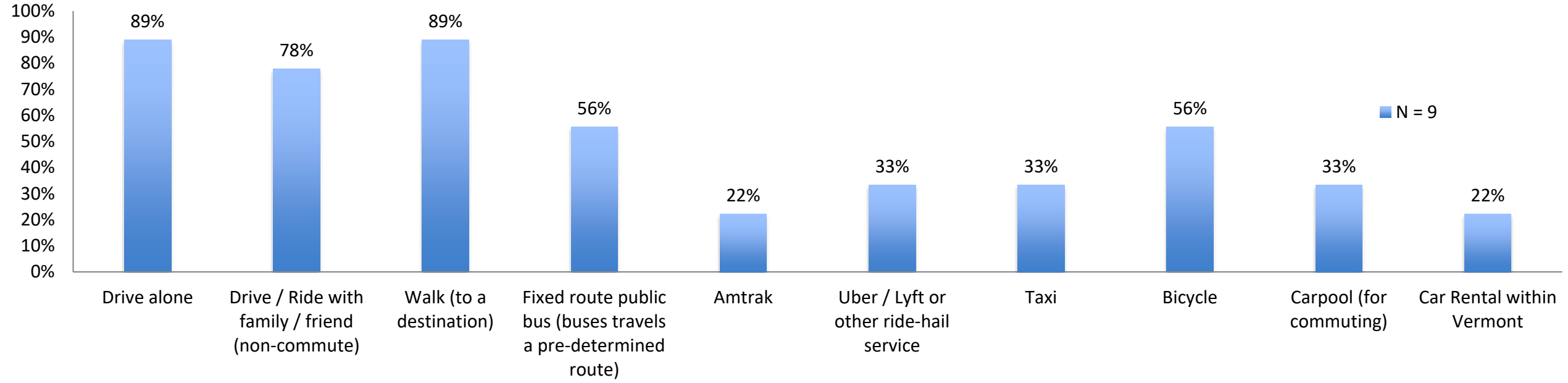
Approximately what was your gross (pre-tax) household income last year?



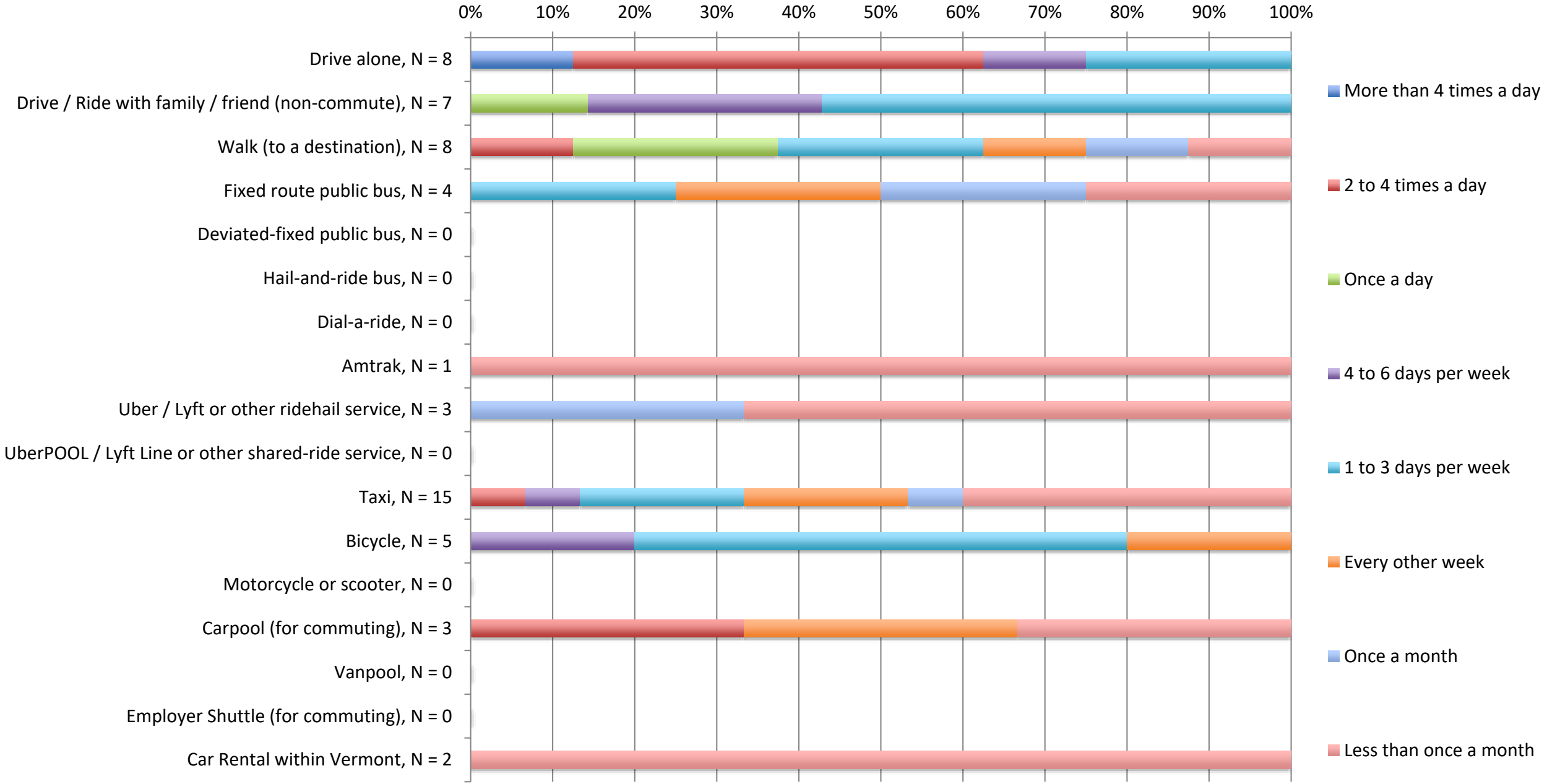
Could you classify your present employment?



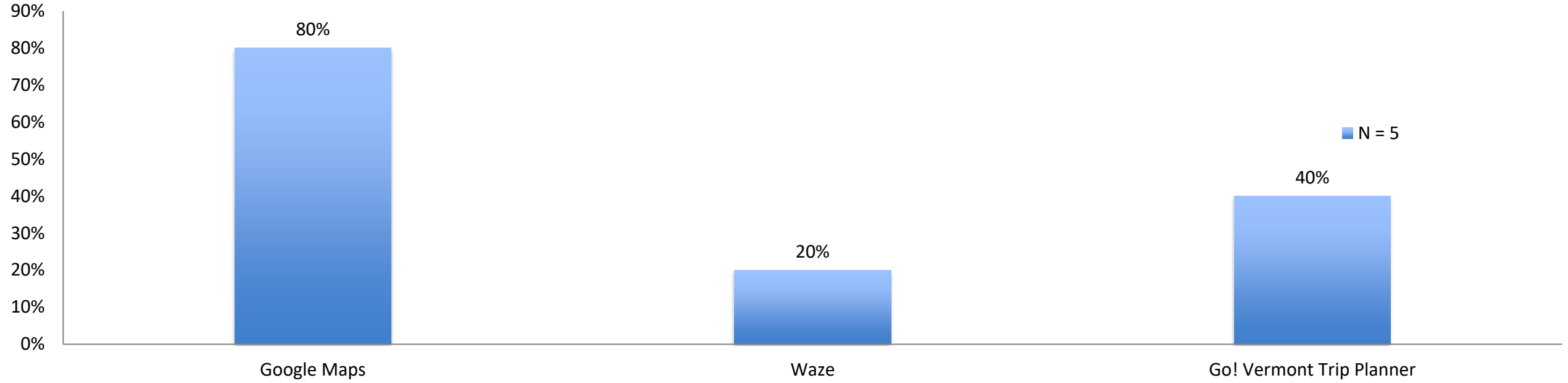
Which of the following modes of transportation have you used within Vermont in the last two years?



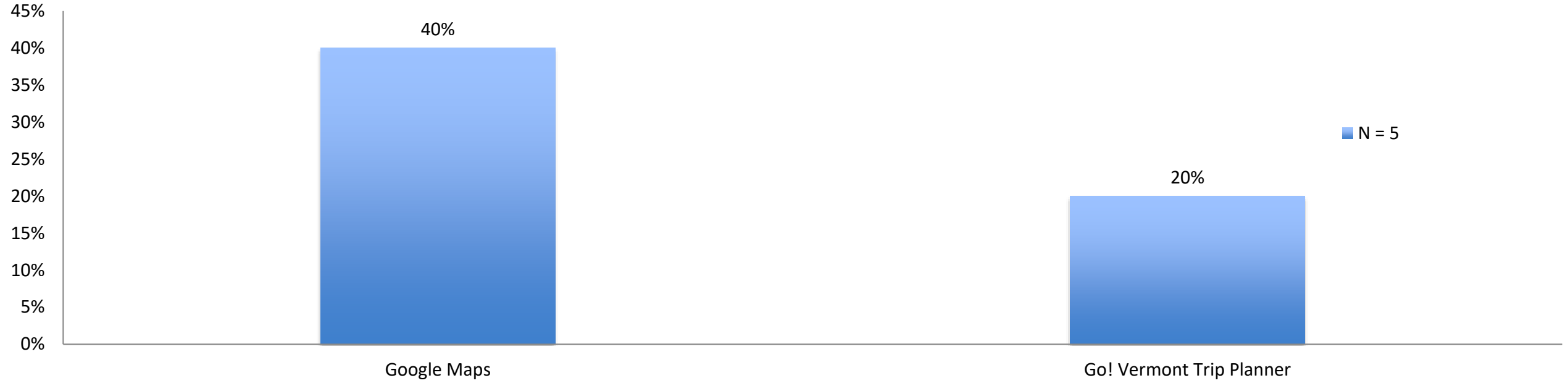
Please indicate about how frequently you CURRENTLY use the following modes



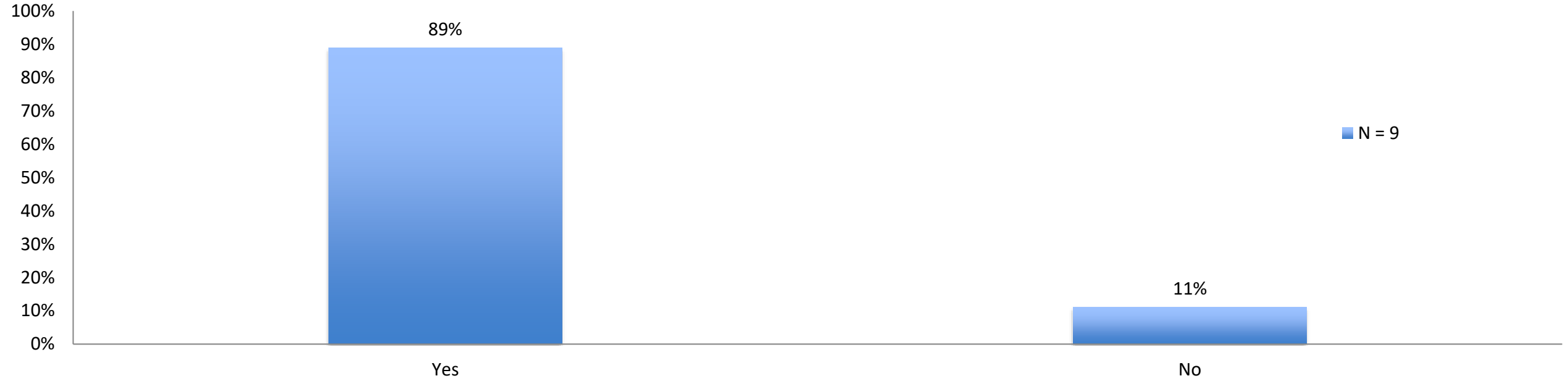
When you travel by public transit, which trip planning platforms have you used in the last year?



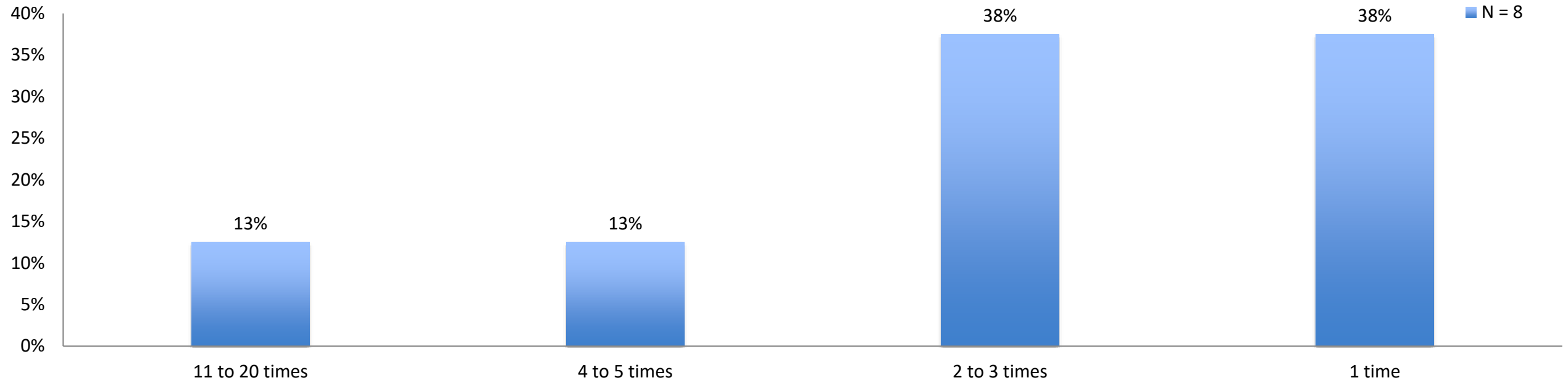
When you travel by public transit, which trip planning platform do you find to be the most useful?



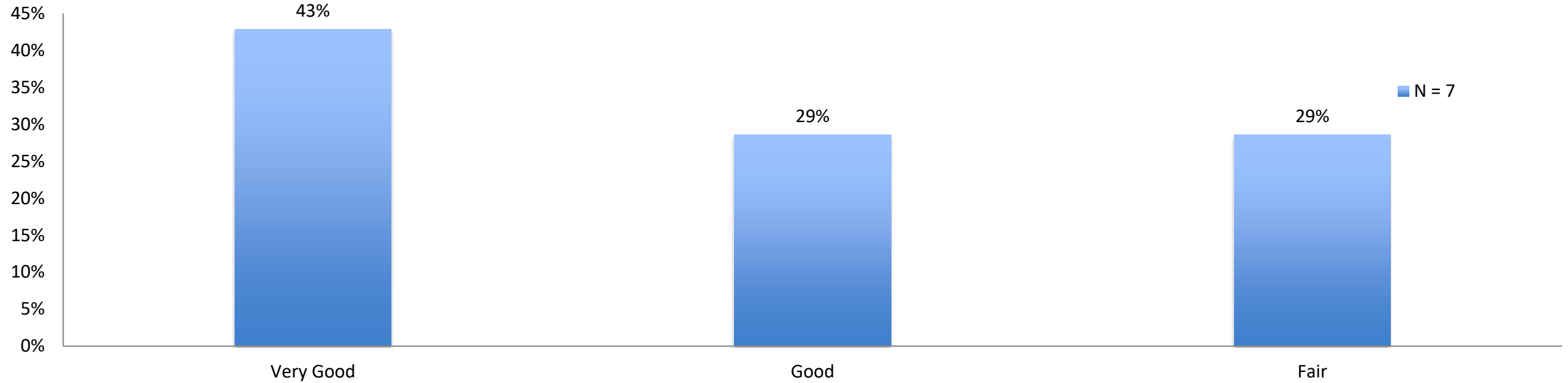
Have you used the latest version of Go! Vermont Trip Planner?



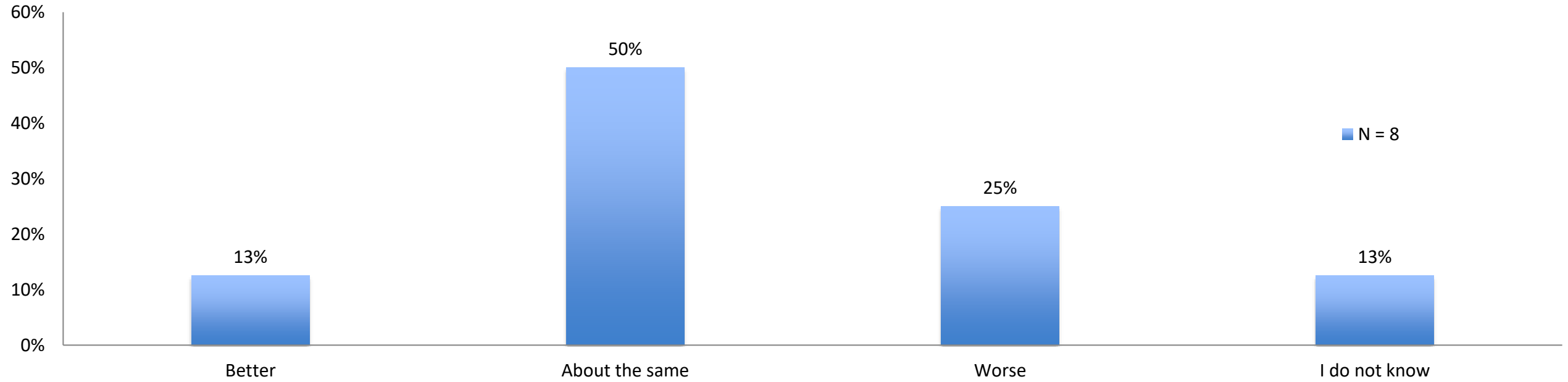
How many times have you used Go! Vermont Trip Planner?



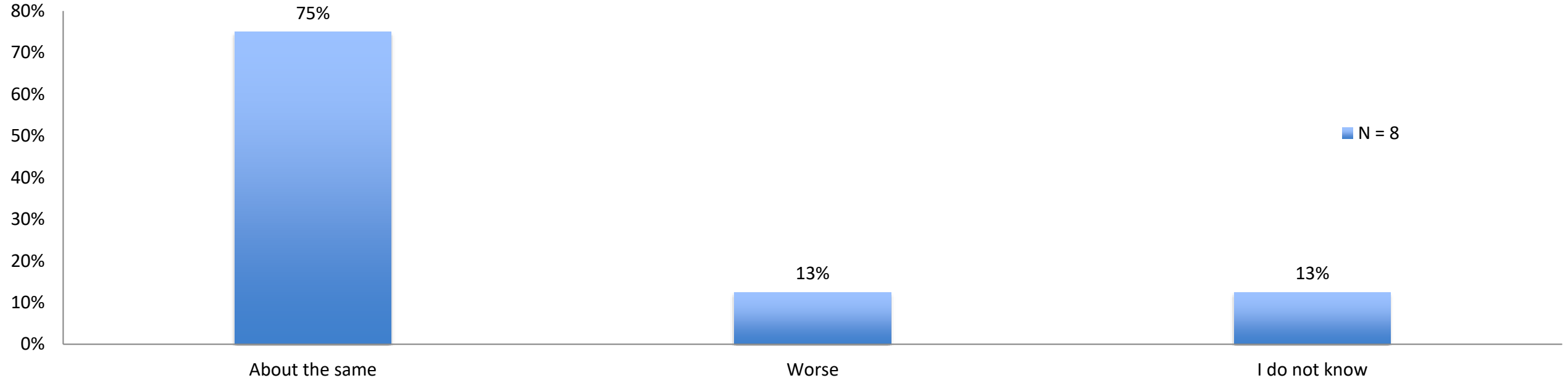
What is your general impression of Go! Vermont Trip Planner?



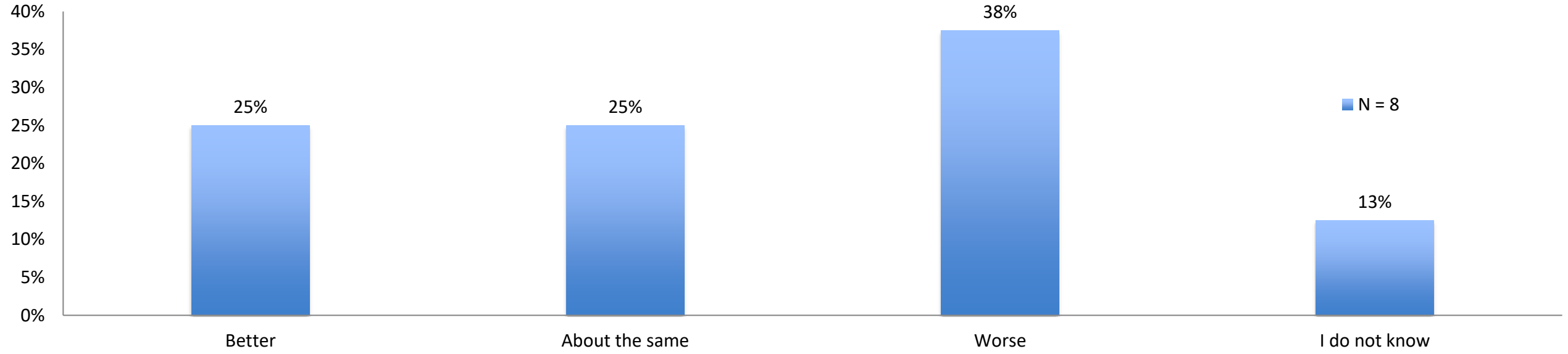
How would you say Go! Vermont Trip Planner compares to Google Maps for trip planning?



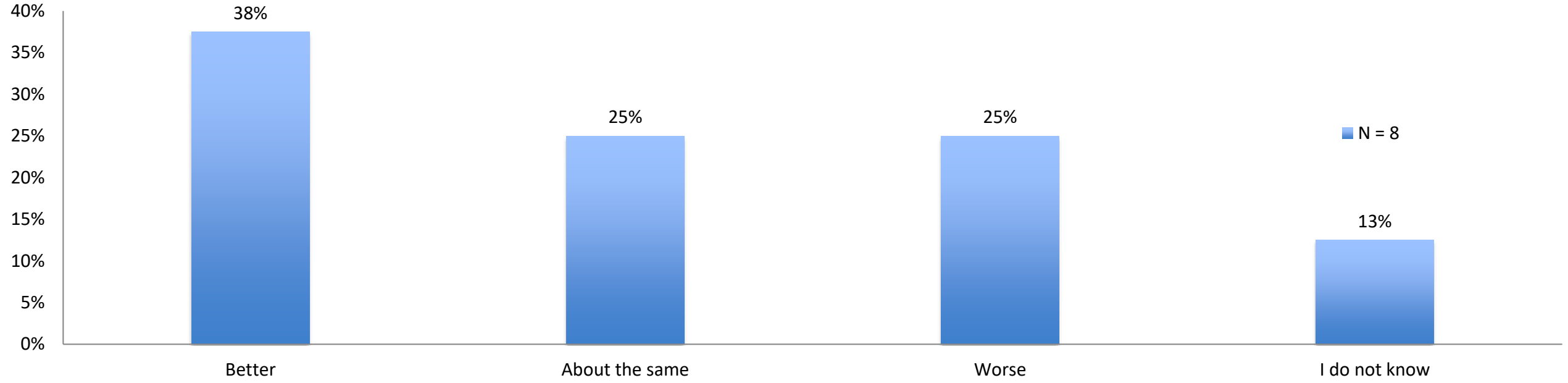
How would you say Go! Vermont Trip Planner compares to Google Maps for appearance?



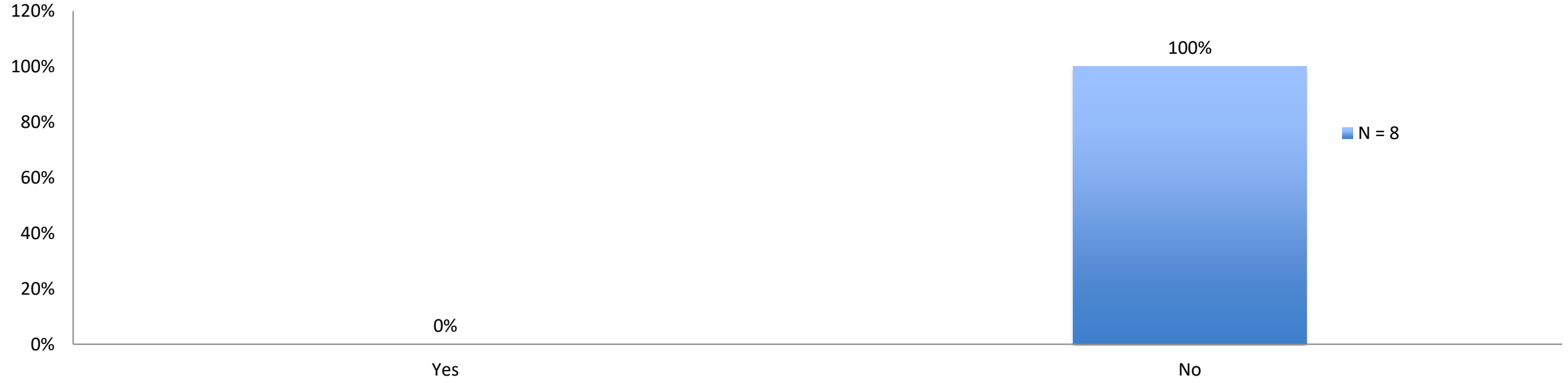
How would you say Go! Vermont Trip Planner compares to Google Maps for the format and display of information?



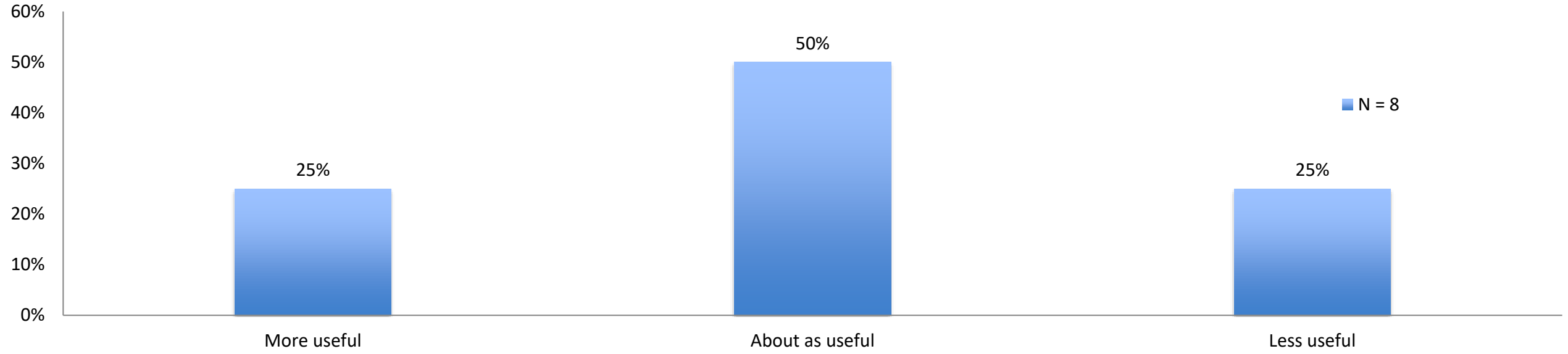
How would you say Go! Vermont Trip Planner compares to Google Maps overall for the quality of travel?



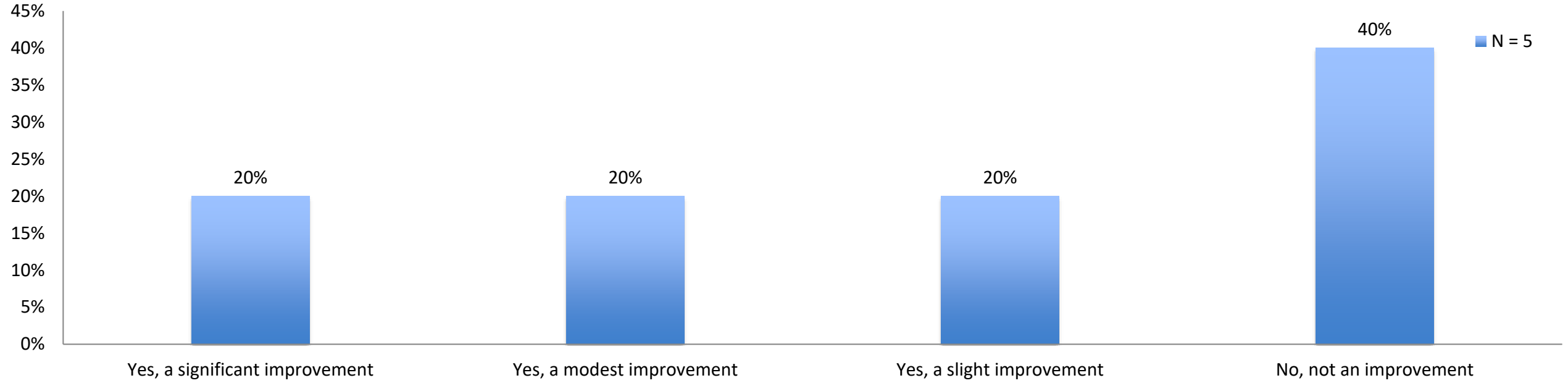
Have you used Go! Vermont Trip Planner for planning flex-transit trips?



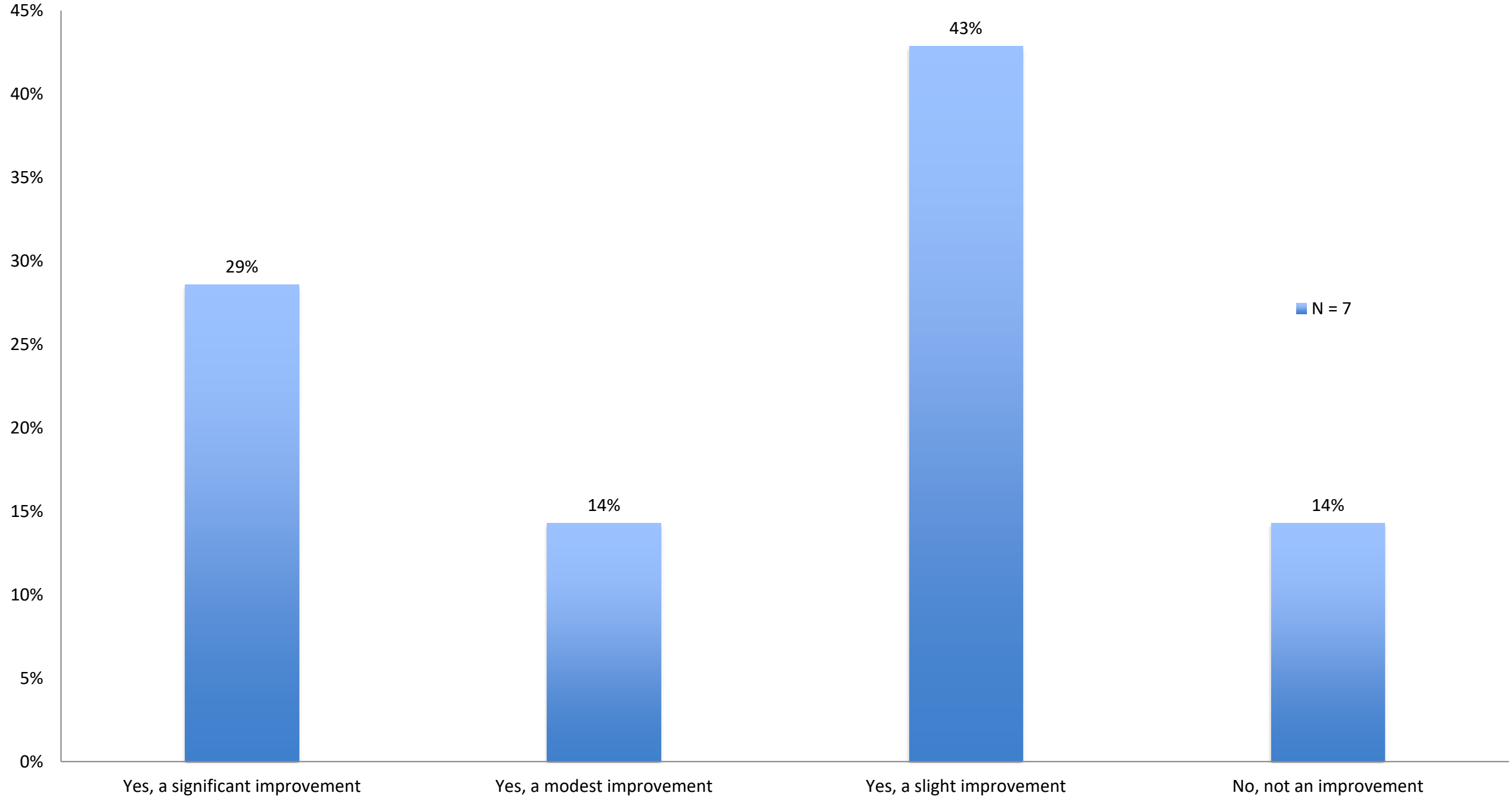
Relative to Google Maps, how useful do you think the Go! Vermont Trip Planner is for planning transit trips in Vermont?



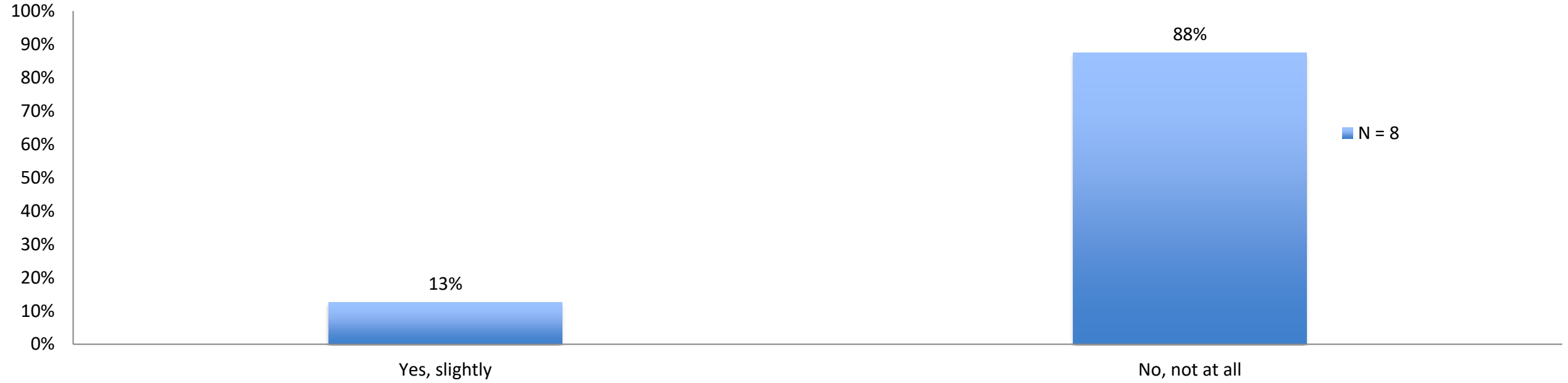
Do you think that Go! Vermont Trip Planner is an improvement for flex transit planning relative to others?



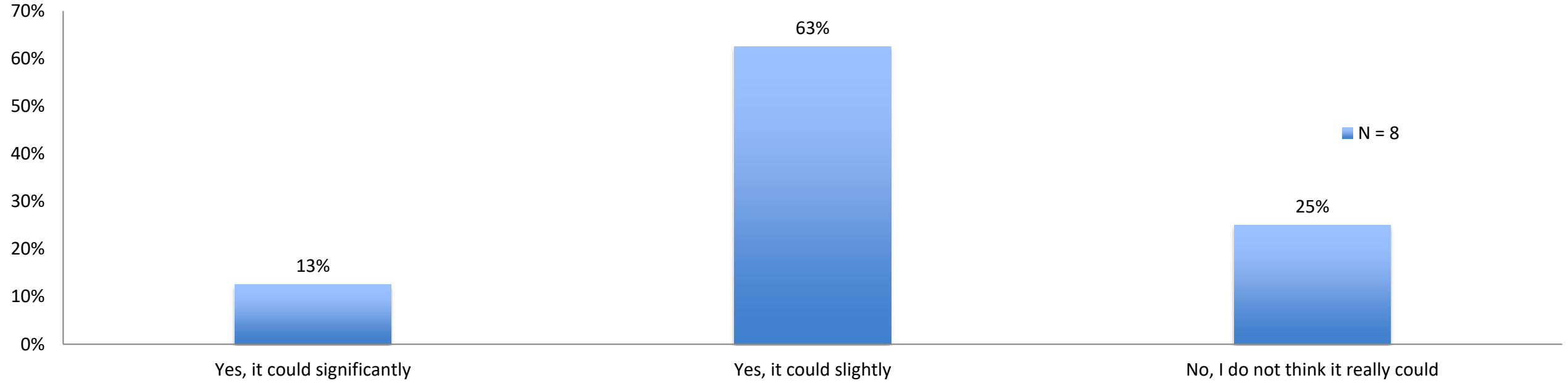
Do you think Go! Vermont Trip Planner is an improvement for travel planning in Vermont overall?



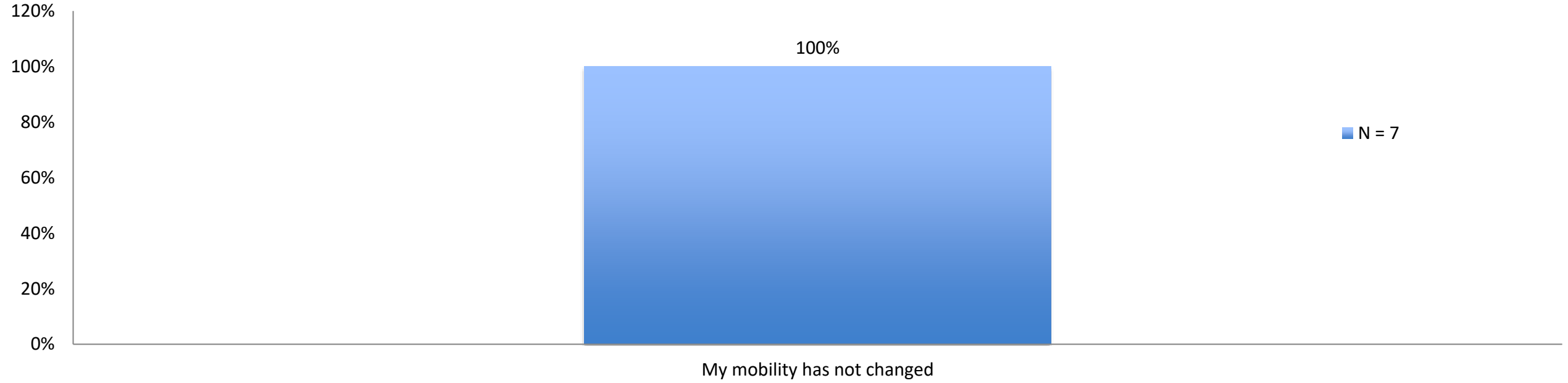
Has Go! Vermont Trip Planner influenced how you have traveled to date?



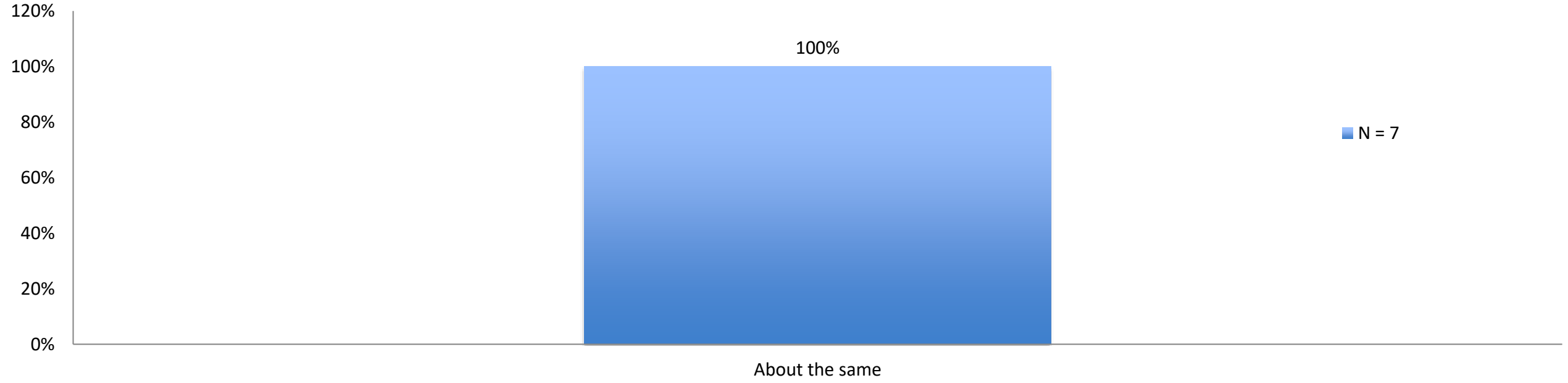
Do you think Go! Vermont Trip Planner could influence how you travel in Vermont?



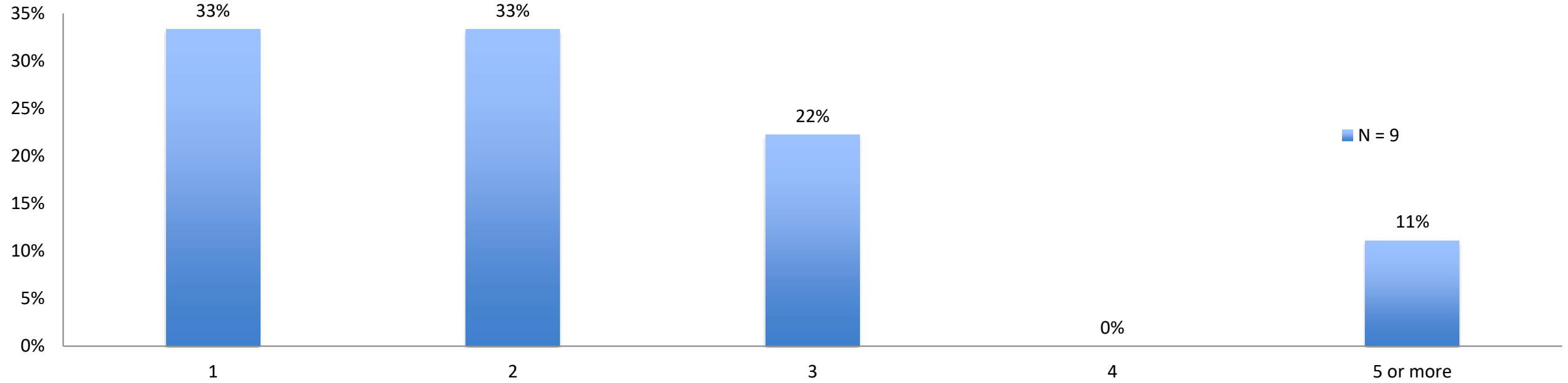
As a result of the information in Go! Vermont Trip Planner...



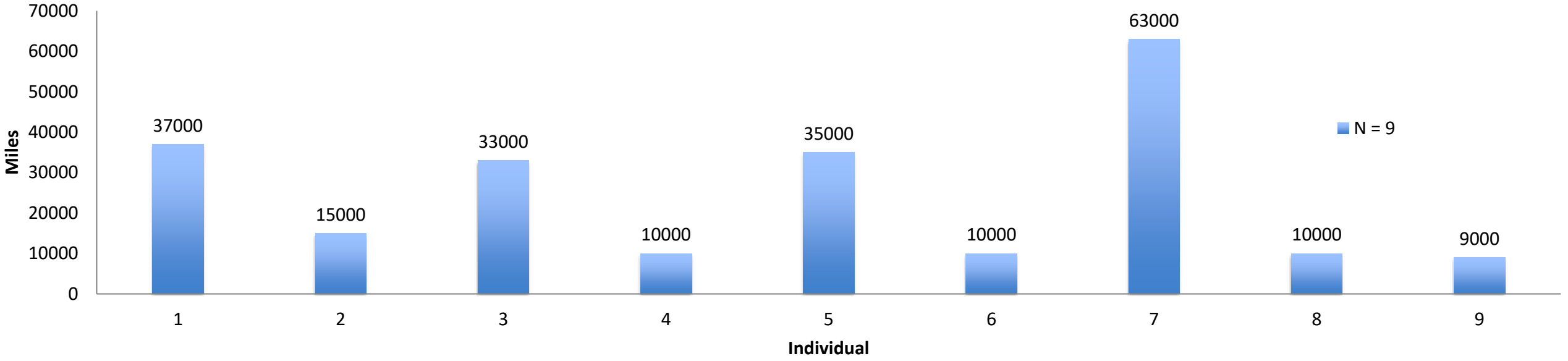
As a result of the information in Go! Vermont Trip Planner I use public transit…



How many vehicles do you currently own or lease?



Please estimate the amount of miles driven by on each of these vehicles in the last 12 months (Household Sum)



APPENDIX

E

Go! Vermont Call Center Report

128 Lakeside Avenue, Suite 401
Burlington, VT 05401
Toll-free: (800) 639-6069
veic.org

September 20, 2019

Call Center Activity Relating to the Go Vermont Trip Planner

- Number of times the call center has accessed this tool to help callers
    - Approximately 10 per month– it's helpful if someone has a question about a bus route, but not a ton of calls with only this question come in; usually a customer will want to know all the options available: driving, renting a car, taxi, etc. and call center staff will need to use google to tell the caller how long the drive would be, etc.
- Number of times the trip planner has been referred to a caller/emailer.
    - Between 45-55
- Fewer than 10 calls have come in regarding this tool - those have been sent VTrans for follow-up.
- Anything else?
    - Contact Center response: I don't often use it while on a call only because it only provides the bus options at this time (carpools and vanpools are being added in Jan. 2020). I like to be able to see how long the drive is if the only option is renting a car or taking a cab and need the information quickly.
    - Additional anecdotal feedback below:
        - It's very helpful that it shows how far in advance you need to reserve Demand Response rides (and the phone number)
        - I also like that it will offer "closest" options when you change the start or end flags
        - It is useful to have the fare information available to let callers know how much a ride will cost

APPENDIX

F

Feedback Responses from Trip Planner Website

Timestamp	Provide a description of the issue.	What is your suggested resolution?	Team response/action taken
2/28/18 17:27	1. Arrival address show as 11 E State St, Middlesex 2. I selected settings to show services with eligibility requirements. None displayed	1. Should be Montpelier 2, Should have shown E&D Program and given phone number for GMT Any questions contact peter@vcil.org	Geocoder later changed to Google for better user experience pending Pelias upgrades
3/27/18 12:14	Albany NY must be included... you only get "Albany, VT" options when you enter Albany into the destination.	Add/Capture service in and out of Albany, NY that serves any part of Vermont. Thanks, Ross	Trip planner service expanded to Albany
3/28/18 7:17	In typing in my specific destination address, 660 Elm Street, Montpelier, from Main Street Barre, the trip planner randomly puts in Middlesex, Why??	Need to know how to outsmart the trip planner, what am I doing wrong? Is it because I'm typing a specific destination address?	Same as line 2
3/30/18 11:09	When reversing trip the from trip continues to change to 16 Corse Street, Vermont	When reversing an existing trip that the address stays the same as entered in the field	unable to reproduce
3/30/18 11:23	Try putting in Elm st in Montpelier and it won't come up	Making sure all street names are in system?	limitation of geocoder technology
4/5/18 8:21	Tedious to click up and down arrows for changing arrival or departure times	When you click and hold on the up (or down) arrow, it should continue going up (or down) until you let go. Then you can fine tune with a few clicks. Better than clicking up to 30 times to get to the time you want.	Option exists to type in time

4/5/18 8:24	Cumbersome to plan return trip or multiple segment trips	Include a button to reverse the departure and destinations, so you don't have to re-enter them. Useful to plan return trip or to plan subsequent segment. (Google has this.)	feature already exists
4/5/18 9:49	Strange behavior! The planner displays routes, but keeps changing them.	Wait to show routes until it's made up its mind.	Bug fixed in later update
4/11/18 5:54	There was nothing to Montreal from here, and only a late afternoon bus, which takes 4 1/2 hrs. to Burlington, and not the airport.	More buses!!!	Unfortunately, adding buses to the roads was out of scope
4/16/18 14:05	The route gives me no information about bicycle riding.	It would be helpful if you included biking as a transportation option, let me know if the bus accommodates bikes, which routes are most suitable for bikes, and approximate time by bike.	Possible within OTP, but not preferred use case for this user interface
5/22/18 11:03	Windsor VT to Burlington VT - now showing any service. But isn't there an AMtrak?	Include other transportation options other than bus.	Amtrak declined to provide data for the project
5/24/18 7:51	I was just curious about how this search tool worked but after entering lots of different dates and times and locations (in Burlington), I could only get it to return results about 15% of the time. I think it's great idea, but I'm probably going to stick to google for now.	Not sure.	unable to reproduce

6/15/18 6:45	unable to plan trip to Brandon	It would be nice if the trip planner could show bus switches and therefore be able to plan longer trips	unable to reproduce
6/21/18 5:35	The trip planner says there are no buses from Gorham, NH to Montpelier but Greyhound has a bus that goes every day. http://locations.greyhound.com/bus-routes/destination/gorham-nh/montpelier-vt#fare-search	Not sure how you would make Greyhound options more accessible	service to NH out of project scope, other than Advance Transit service area
7/19/18 14:56	It kept changing my starting point and my destination with each other.	Get the website to work.	user seems to have been pressing button where this was intended functionality
10/11/18 7:25	why don't you have a pdf or html schedule?	Publish a pdf or html schedule	not intended use case of app
10/11/18 7:28	link to pdf schedule obscured	remove this -- let me know if you need a screen shot	report reflects website other than Go! Vermont Trip Planner
10/11/18 7:30	Is this weekdays only?	Print it on the PDF.	report reflects website other than Go! Vermont Trip Planner
11/12/18 9:00	Shows only option 9 hours and 32 minutes	Google shows options for 1hr and 32 minuts	indicative of frequent user concern with Depart after/Arrive by interface. To be fixed in later User Interface versions

2/5/19 13:04	When you first go to the site, a modal pops up -- but when I try to click in it to put in a start, or end, or date, or anything, it's unclickable. Not until I click on the green bar at the bottom does it disappear and provide the left-rail box for putting in start/end etc information. It's frustrating!	Ditch the modal, just go straight to the homepage. Or make the modal work.	modal determined to provide important context to new users
2/19/19 11:13	When the VEIC contact center is asked about travel to Montreal from Burlington the Trip Planner shows no options, but there is a greyhound bus that travels to Montreal daily from the Airport.	Please ensure that all travel options are incorporated in the trip planner	service to Montreal out of project scope
2/27/19 4:25	I want to plan a ferry trip from Newark international airport to Vermont. How do I do that ?		service to NJ out of project scope
3/13/19 18:47	1) I don't know why the route says I should transfer from the Link to GMT #6 at Shelburne Rd Shaw's, when the Link goes right to the DTC. 2) The route says I need to walk 12 minutes after getting off the #12 bus at White Street at Dumont Avenue at 11:40, but the GMT schedule for the #12 shows it reaches the airport at 11:40, which is where I am going -- no walk required.	It seems like there are some mix-ups in the location of the stops. Re-load?	unable to reproduce

5/20/19 16:54	I selected Max walk 1/4 mile. Per google maps the walk would be .8 mile - too far to walk. If I selected no walking, it said there were no results, yet Google Transit gave me a bus that I could take from the DTC to my destination.	Don' t know.	unable to reproduce

APPENDIX

G

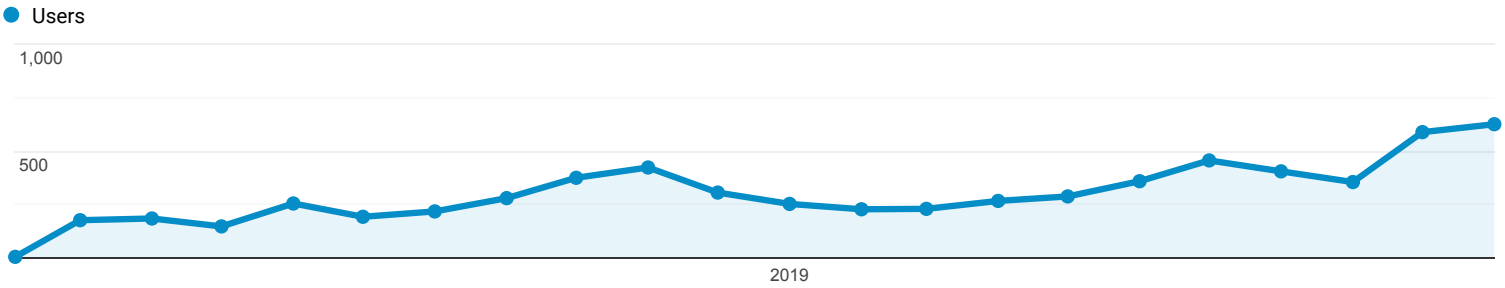
Go! Website Visitor Analytics from Trip Planner Website

Audience Overview

All Users
100.00% Users

Feb 1, 2018 - Nov 30, 2019

Overview



Users
6,309

New Users
6,267

Sessions
8,152

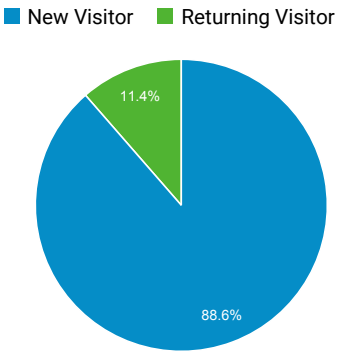
Number of Sessions per User
1.29

Pageviews
10,301

Pages / Session
1.26

Avg. Session Duration
00:00:56

Bounce Rate
83.76%



	Language	Users	% Users
1.	en-us	5,650	90.46%
2.	fr	273	4.37%
3.	en-gb	83	1.33%
4.	en-ca	35	0.56%
5.	fr-fr	33	0.53%
6.	zh-cn	18	0.29%
7.	en	15	0.24%
8.	es-es	15	0.24%
9.	pt-br	13	0.21%
10.	it-it	11	0.18%

GTFS – General Transit Feed Specification (or "GTFS") data is an open data specification utilized by thousands of agencies worldwide to describe fixed-route transit services in a machine-readable format. It has been in use for over 13 years and is now broadly accepted as the standard way to provide data to online transit information applications.

GTFS-FLEX – GTFS-flex is a proposed extension to the GTFS data specification, which adds the ability to describe "flexible" transit services through GTFS.

Flexible Transit – A flexible transit service includes any transit service that does not operate on a 'fixed' route basis. While fixed route transit provides service to specific stops with set times for timepoint stops, a flexible transit service may not have designated stops, may deviate from its route, or may not even operate unless a rider requests a trip.

OpenStreetMap – OpenStreetMap (or "OSM") is an open data specification that describes streets and other geographical features. There is a central OSM repository at www.openstreetmap.org, so OSM is also often used to refer to that repository as well as the data specification underlying it. The central data repository is updated by a community of geographers and developers around the world and is editable and reviewable by any member of the public who creates an account on the repository website.

Open Data Specification – An open data specification is a format or process for structuring data that is licensed under terms that allow anyone to build data according to that specification. Those licensing terms can vary widely however, and allow interaction with proprietary software and data sets, or can require that other data sets drawn from open data specification data sets maintain a license like the original data set.

Open Data – Open data is data that both is in the format of an open data specification and is available to members of the public on a non-restrictive license. For example, a GTFS data set published at a public fetch location for download and use by anyone for any purpose is open data. However, a GTFS data set stored on a private server and used only for internal purposes is not open data.

OpenTripPlanner – OpenTripPlanner (or "OTP") is an open source software application which ingests GTFS and OSM data to create trip itineraries. These trip itineraries are available through an Application Programming Interface (API) and can be used by mobile applications and web applications to display possible trips to riders.

Open Source Software – Open source software is software application with a license that allows access to the software source code. There are a variety of open source licenses, and unlimited custom licenses, that may be more or less restrictive on the party accessing the source code. Some licenses allow free commercial use without attribution, while others may require software that utilizes open source code to be open source itself.

Trip Discovery – Trip "discovery" refers to the process by which a potential rider identifies what trips are possible in order to fulfill a mobility need.

Trip Transaction – Trip "transaction" is the exchange of information and/or payment that facilitates a particular trip being chosen and utilized by a rider.

U.S. Department of Transportation

Federal Transit Administration

U.S. Department of Transportation
Federal Transit Administration
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https://www.transit.dot.gov/about/research-innovation