



2020 Pilot Survey Results and Future Recommendations

May 8, 2021

NYMTC 2020 Smartphone Pilot Survey Objectives

1

Implement a proof-of-concept smartphone travel survey app methodology.

2

Conduct a small-scale pilot with the app in the New York metropolitan area to evaluate and understand the resulting data.

3

Provide recommendations for NYMTC's use of smartphone technology in the future Regional Household Travel Survey.

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Pilot Survey Methodology

NYMTC 2020 Smartphone Pilot Survey Overview

DATA COLLECTED



264

PARTICIPANTS



172

VEHICLES



1,848

TRAVEL DAYS



4,843

TRIPS



82,043

LOCATIONS

SUMMARY

- **Survey participants completed a 7-day travel diary via smartphone travel survey application**
- **Survey fielded from November 2, 2020 through November 30, 2020**

October 27: Survey soft launch and first invitations mailed
November 2: First travel date
November 29: Last travel date
December 5: All data collection concluded (final surveys expired)

Changes to Project Schedule

1

Original Project Schedule

Based on RFP and RFP Question/Response Document

- RFP issued: March 2019
- Project start: June 2019
- Data collection: Fall 2019 or Spring 2020

2

Project Schedule Options Given Contracting Delays and COVID-19

Contract issued March 2020

Field in Spring 2020

- Pros: Likely more cost effective and expedient
- Cons: COVID-19 landscape changing fast

Field in Fall 2020

- Pros: More time to prepare and consensus build
- Cons: November elections, tight budget stretched thinner

Final Project Schedule

Month	Task
Apr 2020	Task 1: Propose App & Approach
May – Sept 2020	Task 2: Design Questionnaire
Oct 2020	Task 3: Develop Sample Plan
Nov 2020	Task 4: Implement Outreach/Recruitment
Nov 2020	Task 5: Conduct Survey
Dec 2020 – Feb 2021	Task 6: Process Data
Apr 2021	Task 7: Final Report & Data

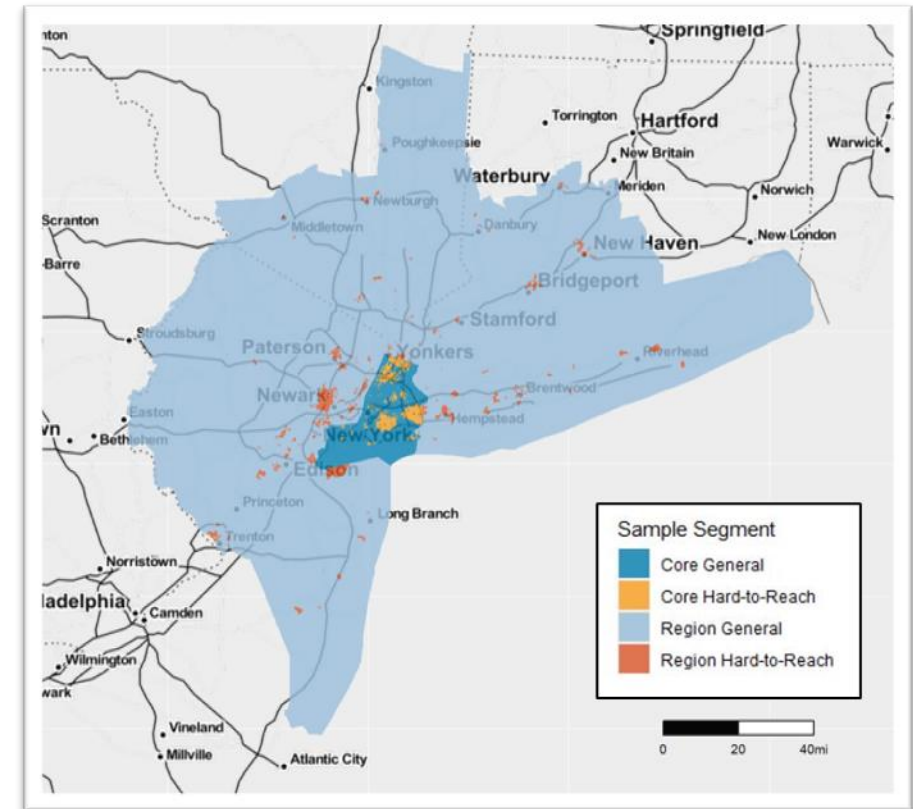
Field in Fall 2020

(Tasks 4 and 5)

- Pros: More time to prepare and consensus build
- Cons: November elections, tight budget stretched thinner

NYMTC Pilot Survey Region and Sampling

- The sampling frame was the list of all households in the 28-county NYMTC planning area.
- Address-based sampling (ABS) was used by drawing a random sample of addresses from all residential addresses in the survey region.
- 34,400 invitations were mailed to households across the region. This was the maximum number of invitations the expense budget allowed.
- The “core” counties included the five boroughs of New York City.
- The “region” counties included all other counties in the NYMTC planning area.
- The pilot sampling plan prioritized obtaining complete records over proportional response given the overall pilot goal was to evaluate GPS data collection feasibility.



NYMTC Pilot Survey Recruitment and Engagement

RECRUITMENT



Mailed Invitation Materials

- Address-based sampling was used by drawing a random sample of addresses from all residential addresses in the survey region.
- An invitation letter was sent to sample addresses followed by a reminder postcard.

ENGAGEMENT

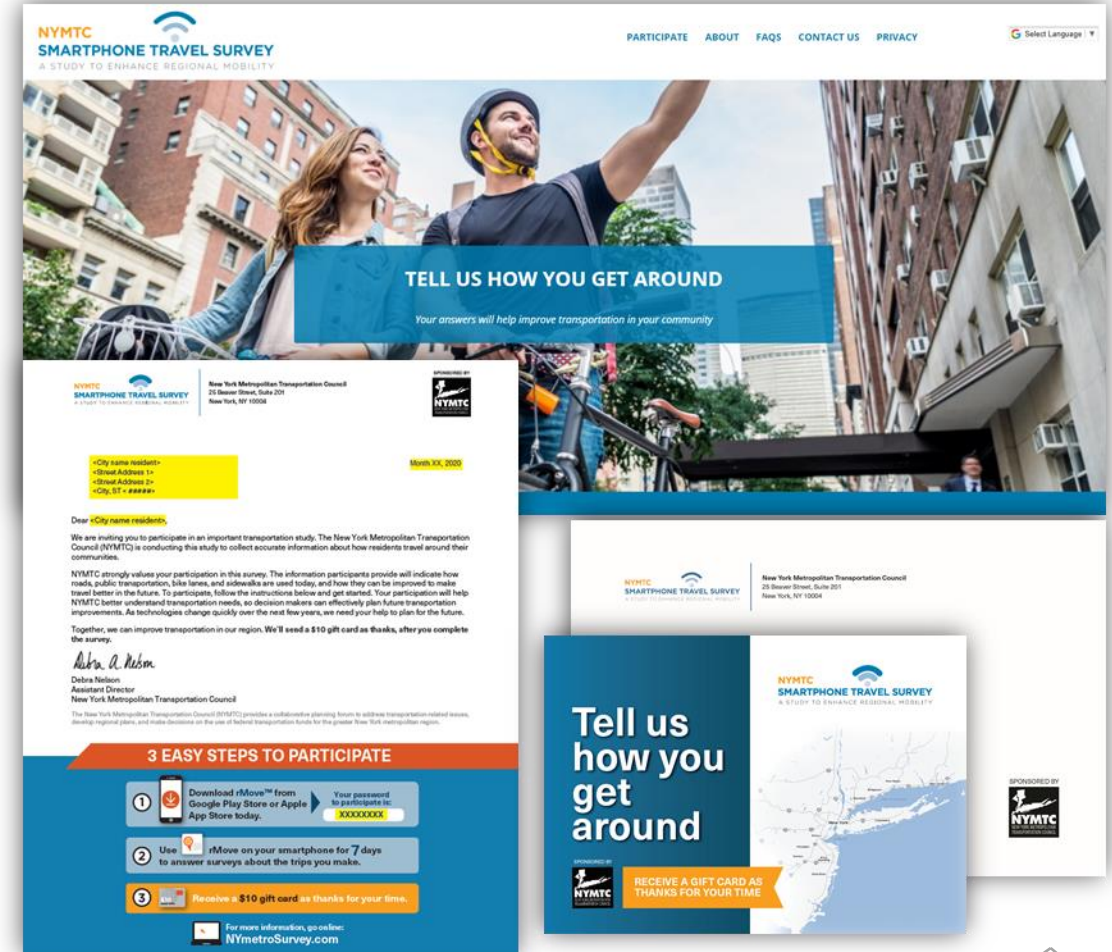
Informational Website

- Included links to download the smartphone survey app
- Answers to frequently asked questions
- Privacy documentation

Participant Support

- A support team was available to answer questions via email
- Send reminder emails to encourage response

Recruitment and Engagement Materials



NYMTC Pilot Participant Instructions

These instructions were provided to all invited households in the survey invitation letter. This is a snapshot of the base of the invitation letter.

3 EASY STEPS TO PARTICIPATE

-  Download **rMove™** from Google Play Store or Apple App Store today.  Your password to participate is: **XXXXXXXX**
-  Use **rMove** on your smartphone for **7** days to answer surveys about the trips you make.
-  Receive a **\$10 gift card** as thanks for your time.

 For more information, go online: **NYmetroSurvey.com**

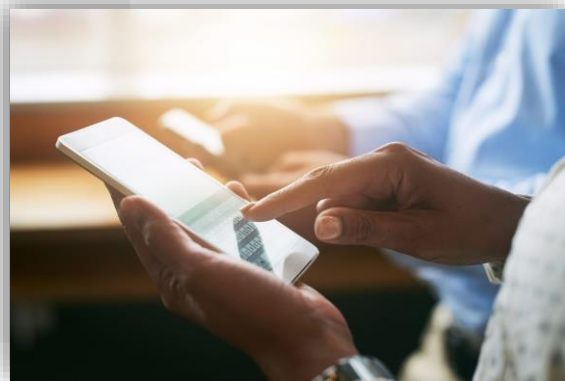
NYMTC Pilot Smartphone App Participation Info



STEP 1

Download rMove

Mailed invitation materials instructed participants to download the rMove app and complete a brief signup survey.



STEP 2

Go about daily life

Recruits were then prompted to participate in a 7-day travel diary. rMove passively logged their travel in the background.



STEP 3

Answer trip surveys

Participants were prompted to complete in-app trip surveys after each trip they made.



STEP 4

Answer daily surveys

Each day, participants were asked to complete a daily survey about their travel habits and trip replacement behaviors.



NYMTC Pilot Survey Response

Pilot Target: 1,000 completed person records

Pilot Response Achieved: 264 completed person records

- **External Factors:** Given the ongoing COVID-19 outbreak and overlap of the fielding period with the fall 2020 election cycle, there was a higher level of uncertainty in response rates than would be present in a typical survey.
- **Constraints:** The project team utilized all available expense budget for recruitment and incentives but could not guarantee the final number of complete survey records given the unknown impacts of these external factors.
- **Tradeoffs:** Despite these external factors and constraints the project team proceeded with data collection in order to obtain valuable information in advance of and with necessary time before the future large-scale Regional Household Travel Survey effort.

Impacts of External Factors and Actions Taken

Given the ongoing COVID-19 outbreak, overlap of the fielding period with the fall 2020 election cycle, and significant United States Postal Service (USPS) mailing delays response rates were significantly impacted.

- NYMTC Smartphone Pilot Response Rate was 0.8%
- For comparison, the NYC DOT 2019 Citywide Mobility Survey response rate was 2.8%
 - *Note that the NYC DOT study, had 75% smartphone participation with the remaining 25% of the sample participating online (20%) or by call center (5%). The NYMTC pilot only offered smartphone participation. Additionally, the NYC DOT study included a \$25 incentive offering in the mailed invitation.*

The project team took additional measures to combat the challenges of these external factors including:

- Offering participants that had recruited a \$25 incentive (instead of the initial \$10 offering in the mailed materials).
- Extending the survey fielding/recruitment period to accommodate USPS mailing delays.



Pilot Sample Profile

Reviewing Pilot Results

Pilot Goal

Implement a small-scale proof-of-concept smartphone travel survey using a smartphone app for NYMTC to evaluate and understand the resulting data.

- Given that the goals of the pilot were to test methods and evaluate the smartphone GPS data, this results section only covers high-level information.
- Reviewers should account for the small sample size and should not use these results for regional analysis.
- A few key household travel survey metrics have been included as an overview to provide context on study participants and their trip behavior.

Sample Profile

Demographic Breakdown		Valid Sample % (Valid N)
Age	17 and under	25% (66)
	18 – 34	24% (62)
	35 – 44	18% (49)
	45 – 64	24% (64)
	65 and older	9% (23)
Gender	Female	51% (126)
	Male	47% (117)
	Non-binary	0.4% (1)
	Other/Prefer to self-describe	1% (3)
Race	American Indian or Alaska Native	0.6% (1)
	Asian	25% (41)
	Black or African American	14% (23)
	Native Hawaiian or other Pacific Islander	0% (0)
	White	57% (93)
	Other	6% (9)
Ethnicity	Hispanic, Latino, or Spanish Origin	10% (17)
	Not of Hispanic, Latino, or Spanish Origin	90% (147)
Income	Under \$25,000	13% (21)
	\$25,000-\$49,999	18% (30)
	\$50,000-\$100,000	25% (40)
	\$100,000-\$199,999	29% (47)
	\$200,000 or more	15% (25)
Employment Status	Employed	70% (142)
	Not employed	30% (62)

Note: For variables where “Prefer not the answer” was an option or item non-response was allowed, respondents who selected that answer or did not respond have been excluded from these calculations.

Trip Behavior

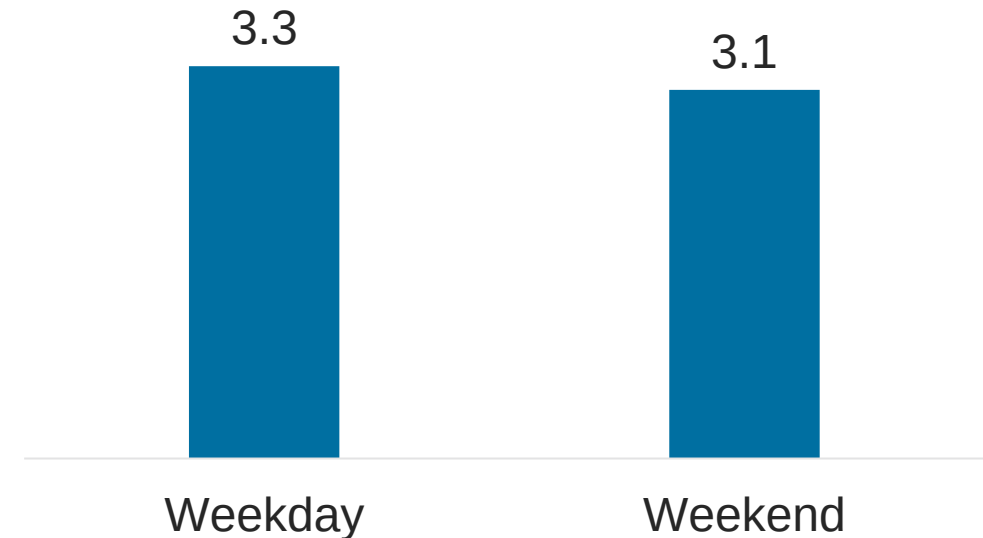
AVERAGE ADULT DAILY TRIP RATE

3.2

Smartphone travel survey trip rates are typically higher in comparison to previous more traditional diary surveys. However, this survey was conducted during the COVID-19 outbreak and thus lower trip rates are observed here.

More incidental trips are typically captured by transitioning to smartphone data collection.

AVERAGE ADULT DAILY TRIP RATE BY DAY OF WEEK

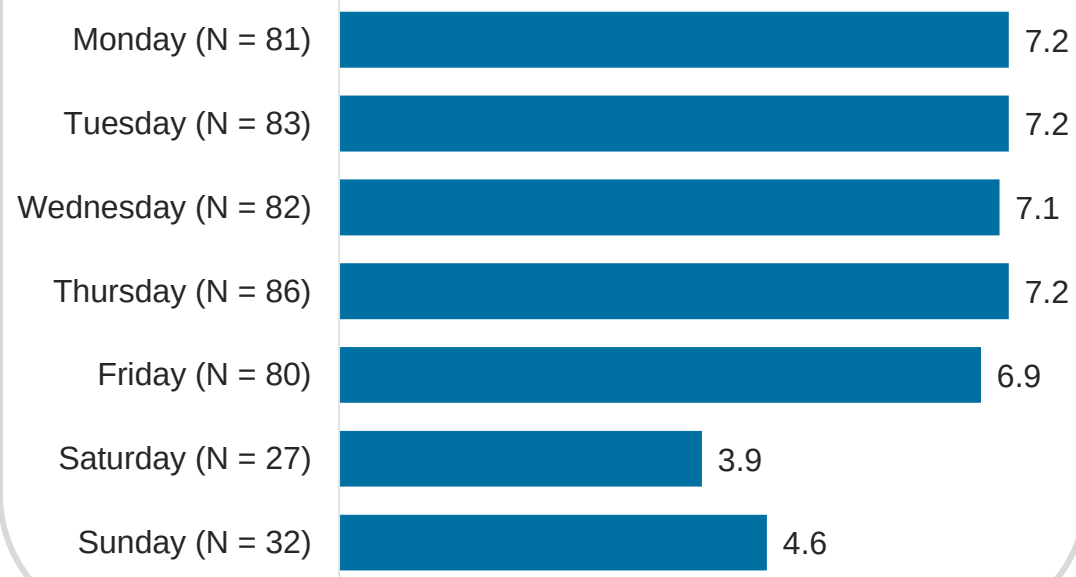


Trip Replacement Behaviors

Multi-day smartphone data collection provides the ability to ask participants how much time they spend teleworking each day of their travel week.

Collecting the day-to-day variation in teleworking and other trip replacement behaviors can provide valuable info on days of the week when trip replacement is more frequent.

AVERAGE HOURS SPENT TELEWORKING



Note: Average hours spent teleworking was calculated only for persons who reported working remotely on their travel day. Those who did not work remotely on their travel day are not included in this graph.



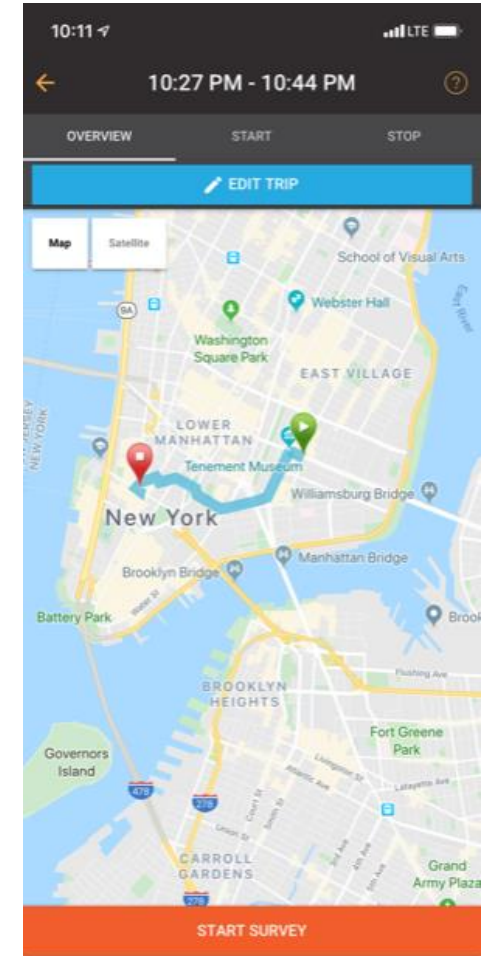
Smartphone Data Insights

New Data Types Captured with Smartphone Data Collection

- **Trip route collection** rather than solely trip origins and destinations
- **Multi-day data collection** for the travel diary provides the following:
 - Weekend travel behavior
 - Data on variation in trip types across the week
 - Data on variation in trip replacement behaviors across the week (e.g., household deliveries, teleworking – for more on trip replacement see slide 22)

Opportunities for New Analysis with Trip Route Data

- **More accurate VMT/PMT estimates** given that trip route data has been collected as opposed to using google driving directions
- **Better measures of economic costs** of trips
- **More analysis on the environmental impacts of travel** can be conducted
- **Better collection of walk and bike trips** and therefore health impacts of travel as well as info on corridors where active modes are used heavily
- Trip route data allows for **comparisons with other LBS/passive datasets** like transit systems, GTFS datasets



Benefits of Multi-Day Data Collection

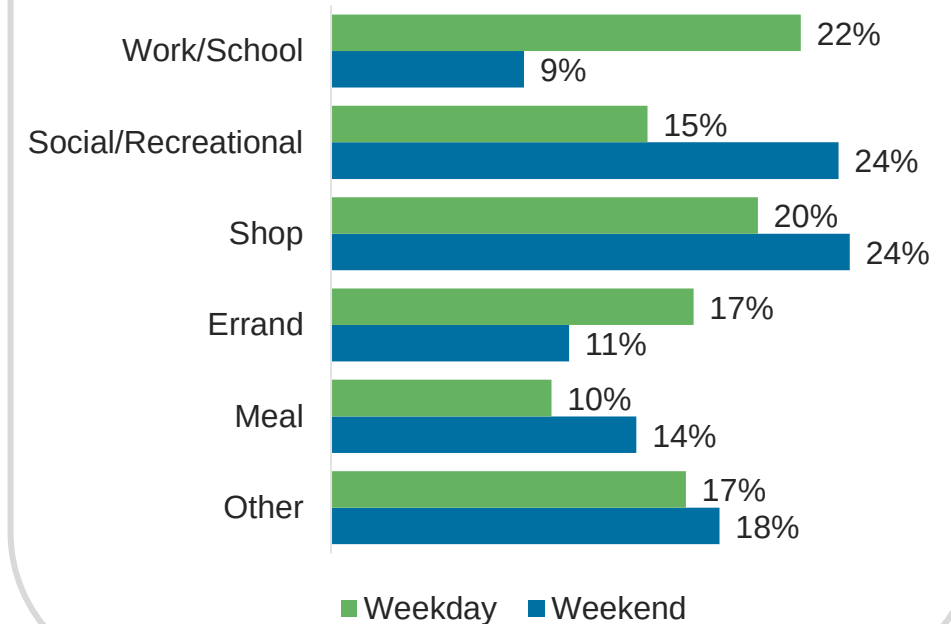
In comparison to weekday travel, weekend travel has:

- Significantly less work and school trips
- Higher share of social and recreation trips

Capturing weekend travel means a higher incidence of modes of interest that are sometimes exclusively used on weekends are now included in the dataset.

Trip replacement behaviors may vary across days of the week. Weekly teleworking, grocery ordering, and package deliveries will now be captured in the travel period.

TRIP PURPOSE SHARE
Weekday vs. Weekend



In comparison to traditional methods, smartphone data is:

MORE ACCURATE

Information can be collected passively (e.g., trip times, trips routes) and questions can be asked in real-time reducing incidences of misreporting

LOWER BURDEN

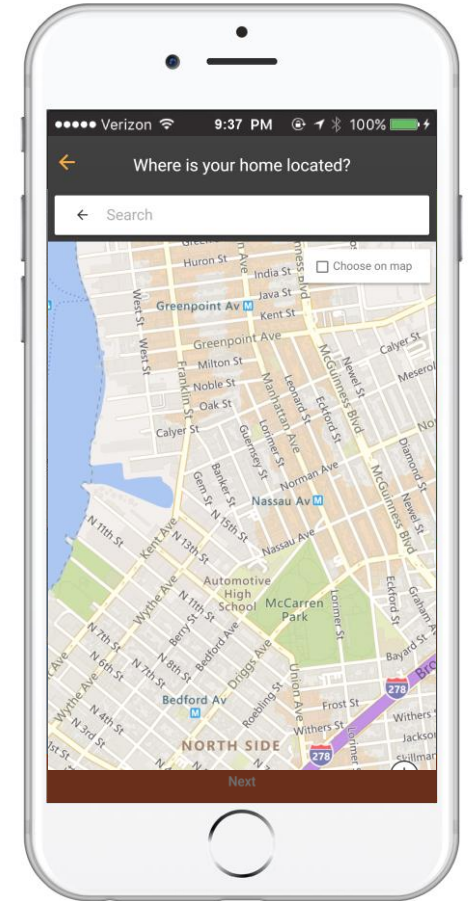
Passive trip collection means participants don't have to actively provide addresses and times for each trip they make

MORE ROBUST

Lower burden means participants accept longer data collection periods (e.g., a week-long travel diary)

COST EFFECTIVE

Longer data collection periods means a lower cost per day of data collected





Lessons Learned and Future Considerations

Lessons Learned from the Smartphone Pilot

NYMTC will be able to obtain high quality travel behavioral with spatial accuracy:

- Smartphone technologies have few, if any, detectable “canyon effects” (previously an issue with GPS in dense urban environments).
- Subway trips can be imputed through the use of supplementary transit data (e.g., GTFS schedule and routing) if the GPS trace is interrupted.

Recommendations for a Large-scale Regional HTS Survey based on pilot results:

- **Offer a mixed mode survey** allowing most adults to provide travel data via a smartphone app and the remaining share through traditional online or call center methods.
- **Offer higher differential incentives** based on participation mode and demographics.
- **Incorporate an outreach budget** to increase participation from historically underrepresented populations.

Future Considerations – Sampling

Response rates for address-based sampling (ABS) continue to decline

- Non-response biases by in ABS must be addressed and supplemental recruitment methods may need to be used to improve representation for historically underrepresented groups
- Increasing likelihood of supplementing with survey panels (probability and/or non-probability), convenience methods and/or to accommodate data from incomplete household-days
- More complete, accurate info (e.g., income estimates) provided with address data will allow more efficient and targeted ABS (to supplement geographic oversampling) – this is likely to evolve quickly

Future Considerations – Data Privacy

Data privacy concerns and regulations will continue to grow

- Surveys are already opt-in, so travel surveys will remain viable (but privacy concerns contribute to declining survey response rates in general)
- Evolution of data privacy regulations
 - California privacy law has already changed once (2018 CCPA to CA Privacy Rights Act of 2020)
 - Highly relevant for passive data and its future
- Concerns most problematic for children's unaccompanied trips
 - Option to only ask participants to provide a full diary for children on a single weekday.
 - Option to only ask less "intrusive" info (e.g., ask number of trips children make without household adults by purpose, but not specific times and locations).

Future Considerations – Equity and Representation

Importance of equity and representative data continues to grow

- Outreach methods to better reach hard-to-survey segments of the population are evolving but require investment.
 - Differential incentives and oversampling techniques are important and effective
 - Shifting away from social media recruitment toward recruitment via panels or other means (e.g., community-based organizations) to improve representation and supplement ABS sample
 - Outreach methods moving to at least some virtual (in reaction to COVID-19), not just in-person
 - If survey data is the “ground truth” compared to passive data or other data sources, it needs to be representative

Future Considerations – Pace of Change in Transportation

A lot of things are changing out there (shared modes/MaaS; electric and autonomous vehicles; climate concern & VMT-based regulation; new types of TDM policies; COVID-accelerated trends in working from home & remote offices, online shopping, active travel, etc.; the evolution of the “new normal”)

- A trend toward doing smaller travel surveys more often (annually or biennially) to capture new trends, and then combining data for modeling
- Use of targeted questions on specific topics of interest. (Don't need to ask about everything in one survey.)
- HTS data can be used to explain changes observed in passive LBS data (which tends to be updated more often)

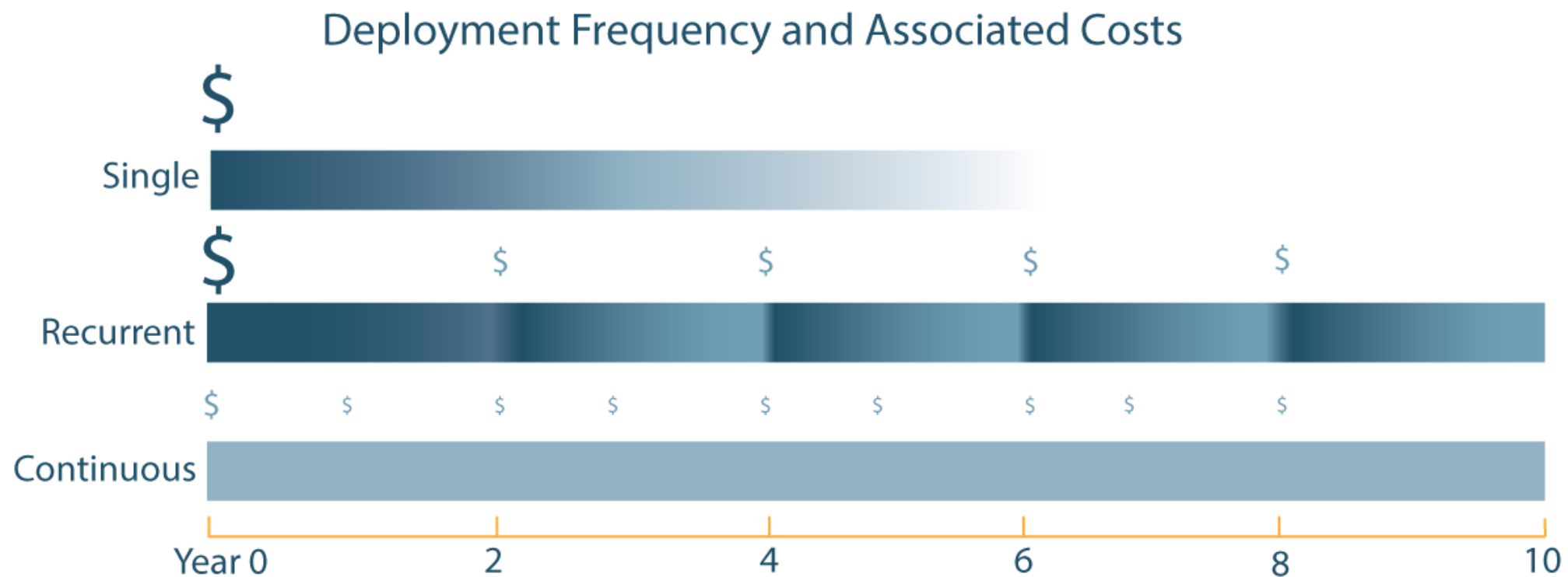


Review of Recent Travel Survey Programs

Survey Deployments of Interest

Survey	Technology
• Regional Household Travel Survey (NYMTC 2010-2011)	Computer Assisted Telephone Interviewing (CATI)
• Maryland Statewide Travel Survey (MTS) (Baltimore Metro 2018-2019)	CATI and Smartphone
• Metropolitan Washington Council of Governments (MWCOC) Regional Travel Survey (Washington DC Mega-Region 2017-2018)	Web using rSurvey- panel survey using rMove in Fall 2019 using Smartphones
• Ohio Moves Travel Study (Ohio Statewide 2015- Present -Annual) • Puget Sound Regional Council Household Travel Survey Program (Seattle Region 2014-Present - Biennial) • Travel Behavior Inventory (TBI) (Minneapolis/St. Paul Region 2014-Present – Biennial) • Sacramento Regional Transportation Study (2018) • San Diego Regional Transportation Study (2016-2017) • Binghamton Metropolitan Transportation Study (BMTS) (2018) • Research Triangle Travel Survey (Raleigh, Durham, Chapel Hill 2016-2022 – Biennial) • Tampa Regional Travel Survey (2018-2019) • Citywide Mobility Survey (New York City 2019) • Capital Region Transportation Survey (Baton Rouge 2019) • Whatcom Regional Transportation Study (Bellingham WA 2018)	Smartphone Web/Phone
• MAG Travel Survey (Maricopa County Arizona – 2017)	Smartphone/GPS logger
• North Florida Travel Survey (Jacksonville - 2017)	Web/Phone
• Kansas City HTS • Billings HTS • My Daily Travel Survey (Northwestern Indiana 2018)	Westat Mixed-Methodology

Deployment Strategies



Partnering Strategies - Survey Efforts

Standalone
Survey Efforts

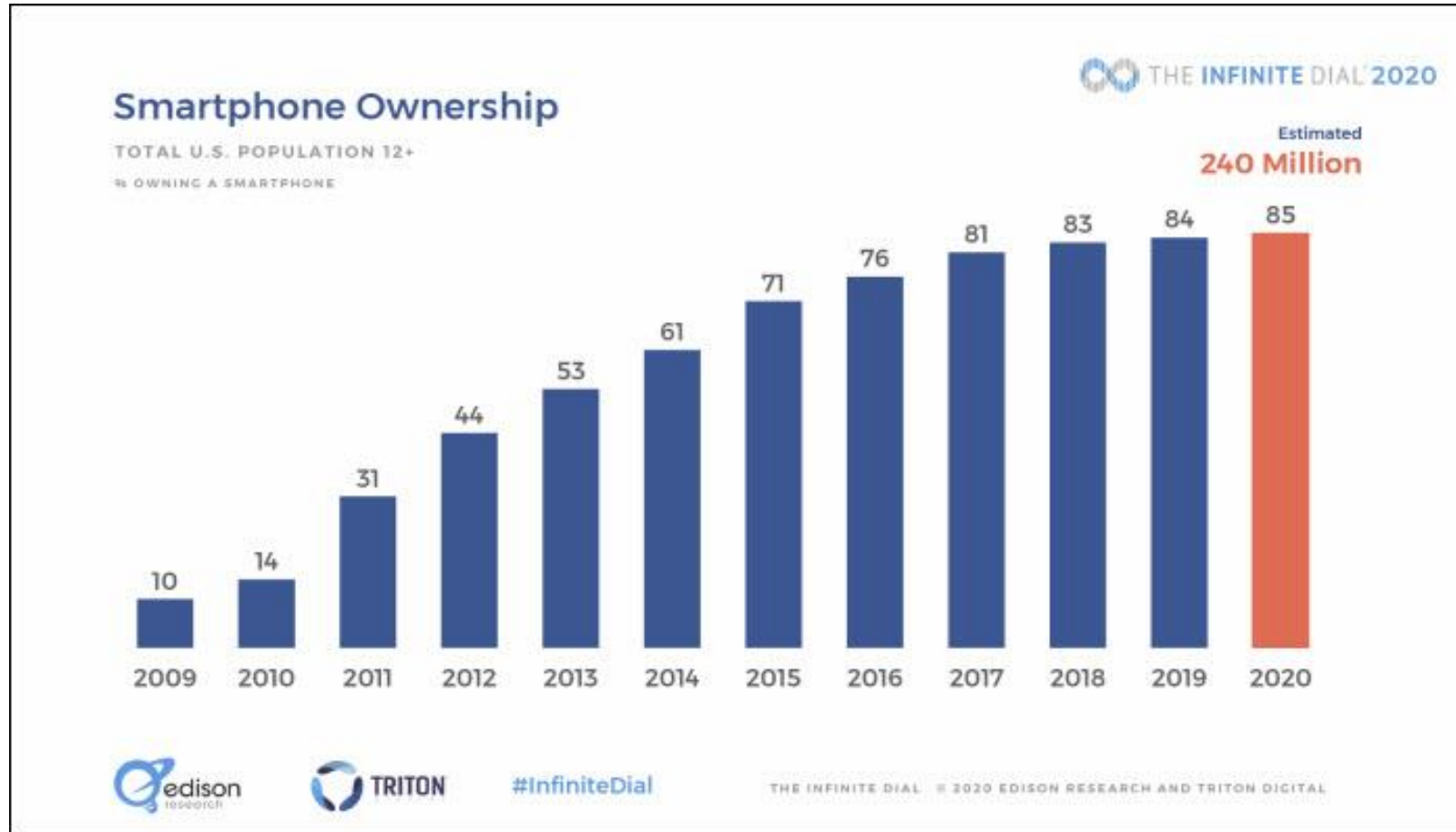


Affiliated Survey
Efforts

Consolidated
Survey Effort



Smartphone Ownership Trend



Smartphone and Web-based Deployments



Lessons Learned

- ✓ NYMTC/NYCDOT and Baltimore/Washington DC provide examples of latent opportunity for coordination among partner agencies
- ✓ Consolidated strategies result from identifying partners and funding for long-term coordination of surveying efforts
- ✓ Smartphone is the superior technology due to ubiquity, trip tracking, mode inference, ability to do localized survey modifications, multi-day surveys, and the behavioral and spatial accuracy due to the combination of demographic information, trip cataloging and GPS tracing
- ✓ Frequency of deployment scheduling is needed to respond to the rapidly changing travel behavior environment, provides consistency of data, and can reduce costs by utilizing start-up efforts across multiple deployments
- ✓ Smartphone and Web-survey provide capacity for continuous deployment



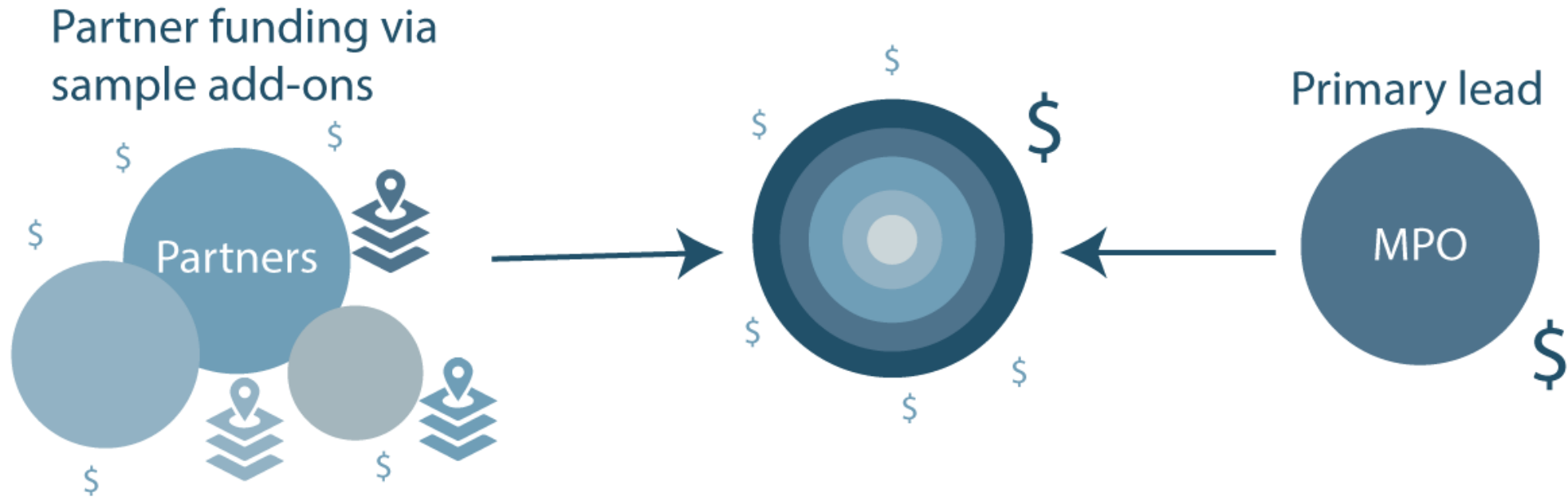
Travel Surveys State of the Practice

Best Practices

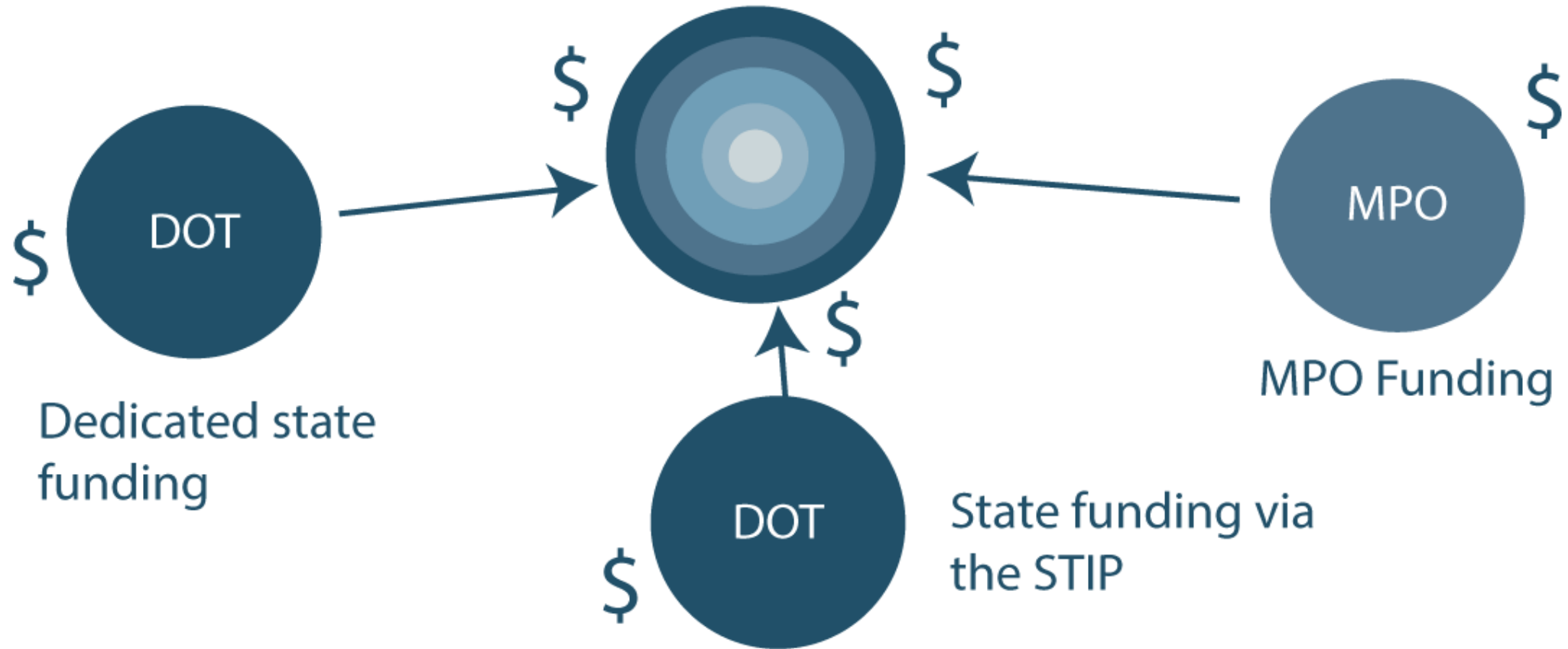


- ✓ Inter-Agency Cooperation
- ✓ Leveraging Proximity
- ✓ Use of Smartphone and Web-survey Deployment Technologies
- ✓ Community-based Marketing Strategies to Recruit Representative Samples
- ✓ Frequent Deployment Scheduling
- ✓ Adjusting Sample-size Based on Modeling Needs
- ✓ Pooled Funding Strategies





Best Practices – Pooled Funding – Twin Cities, Minnesota



Unanswered Questions



- ✓ How can passive data be used as a proxy for or as a supplement to the household travel survey?
- ✓ Can a person-level survey be combined with household-level survey?
- ✓ Are there opportunities for community-based marketing in NYC to boost recruitment and representative sample?
- ✓ Can the NYBPM be utilized at higher geo-spatial resolution (which reduces sample sizes)?





Review of Efforts to Utilize Passive Data in Travel Demand Modeling

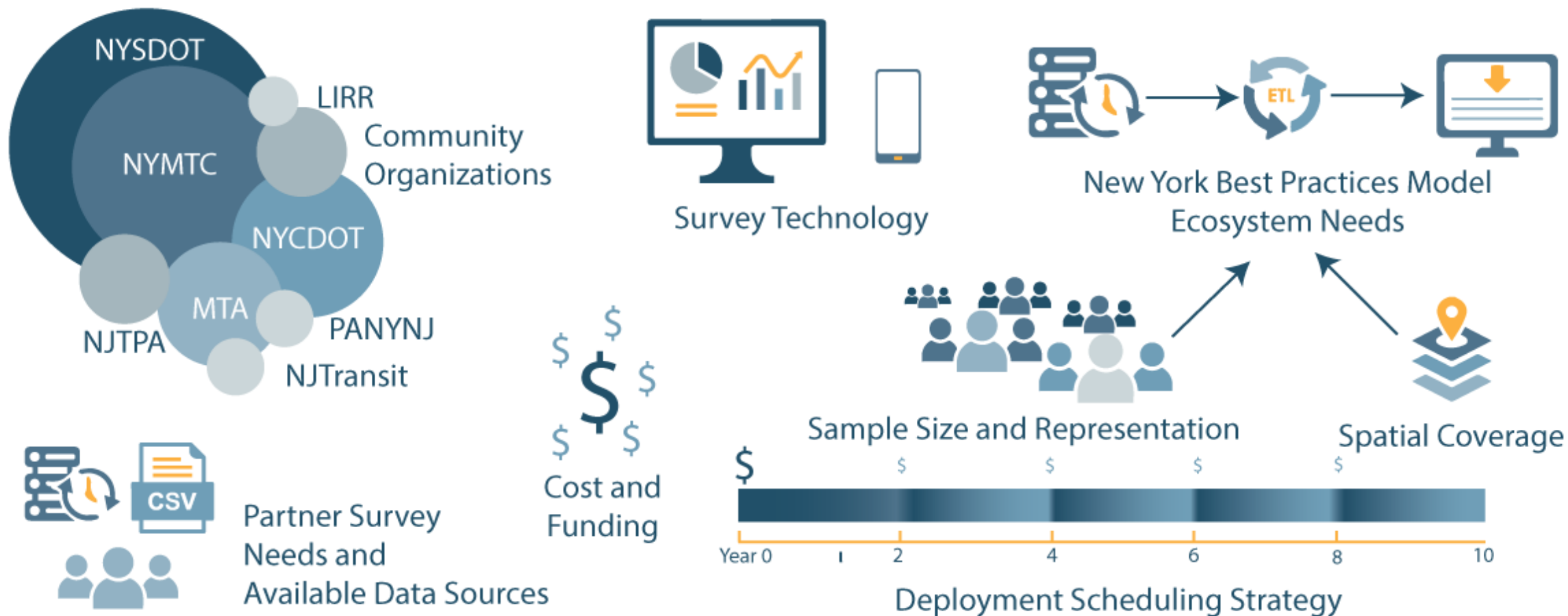
Lessons Learned – Passive Data Deployments

- ✓ Very little objective performance evaluation documentation (Kansas City MARC Report on Replica).
- ✓ No current documentation about utilizing passive data as O/D and travel behavior inputs in established regional models.
- ✓ Performance criteria are needed to show observed probe speed and volumes compared to modeled passive data.
- ✓ Best practices for passive data use in modeling need to be defined.
 - ✓ Consultant or research partnership to produce results analysis reports.
 - ✓ Passive data providers should provide pre-model O/D and behavior tables.
- ✓ Agencies and passive data providers should engage academic research to provide practitioners with objective research on the value of their data products.



Designing NYMTC's Regional Survey and Travel Demand Modeling Program

NYMTC Regional Survey Program Considerations

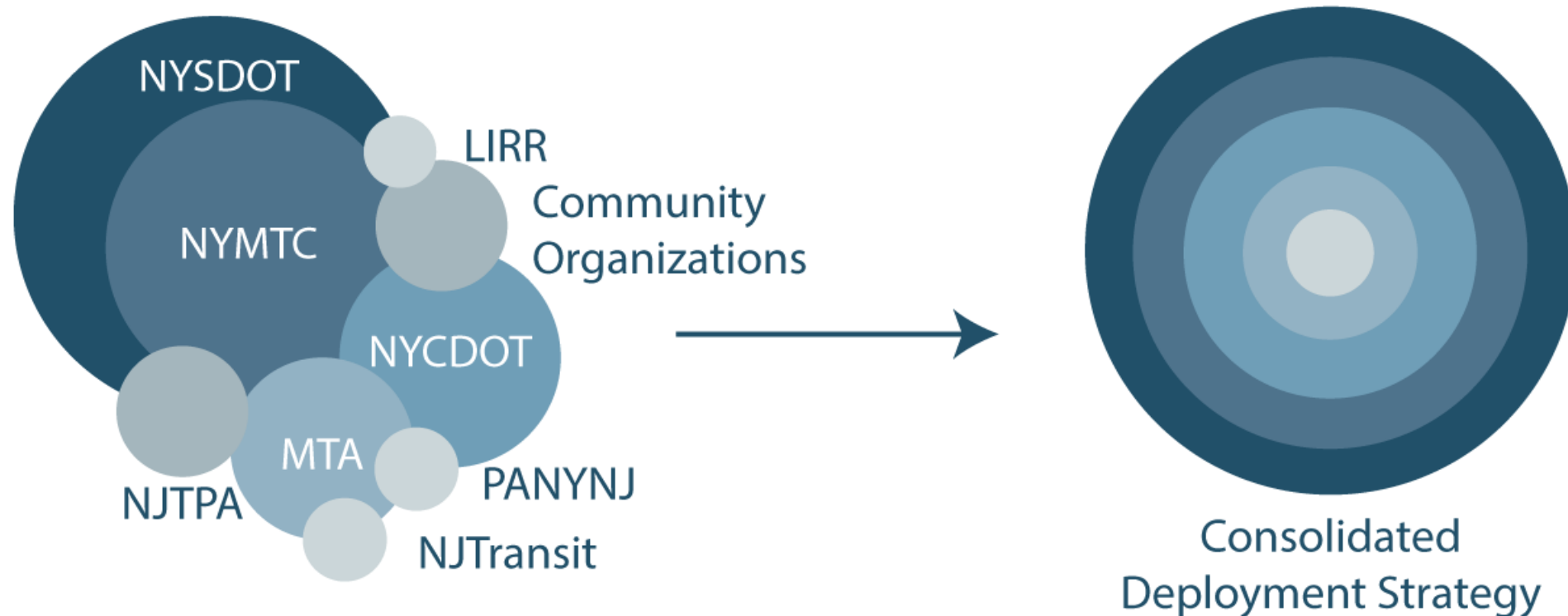




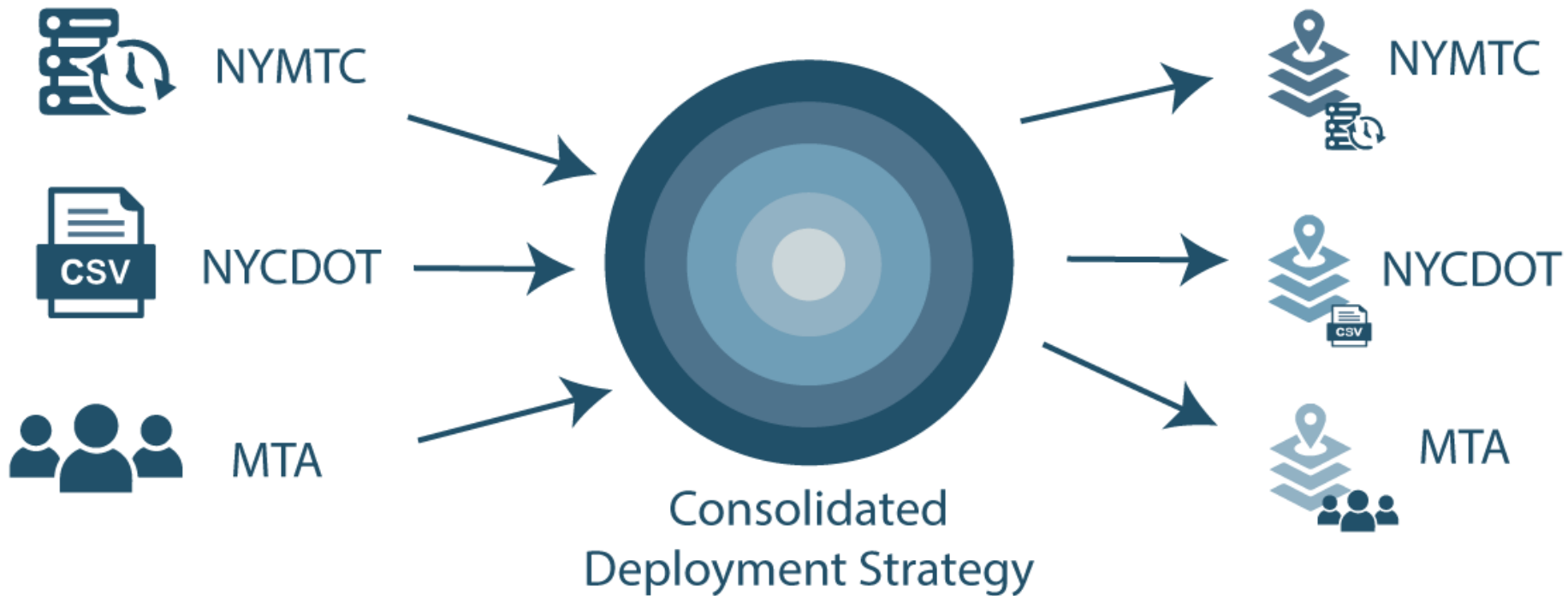
Recommendation #1

Data Sharing Program and Pooled Funding

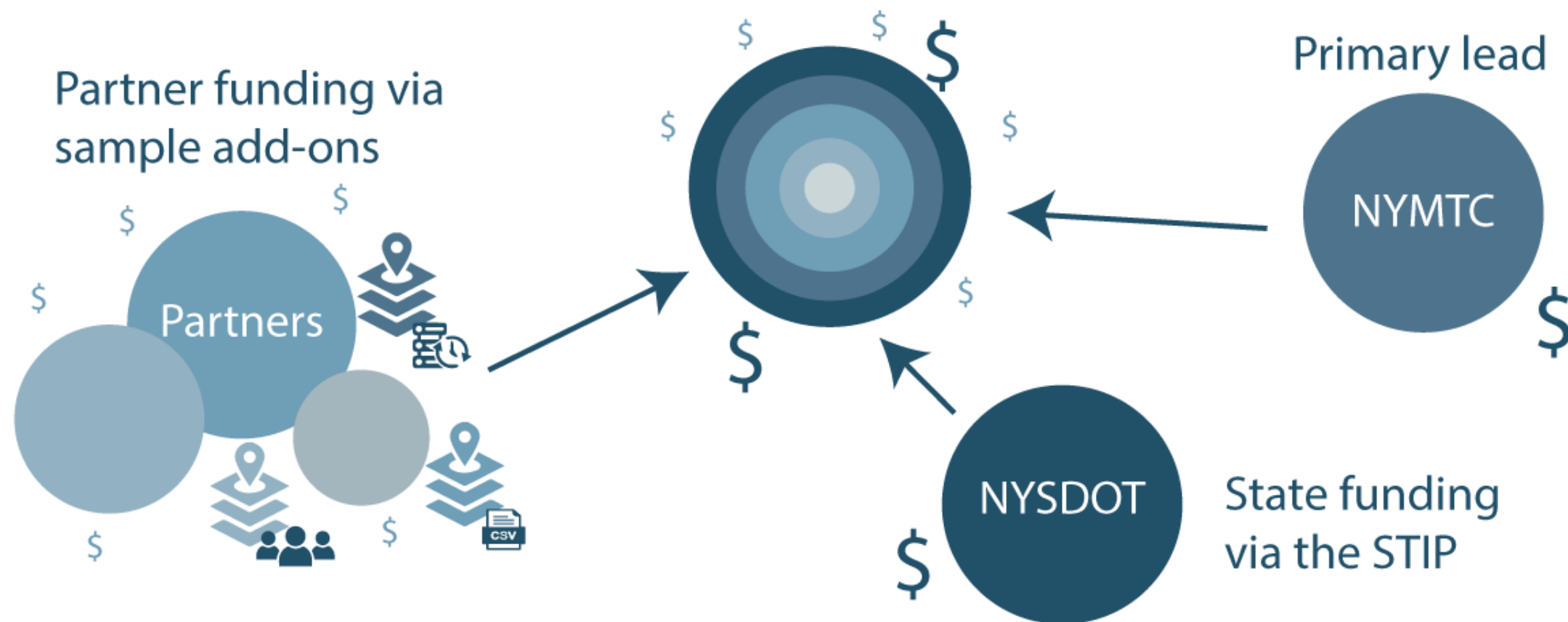
Consolidation of Data Collection Efforts in NYC Region



Provide Partners with a Base Survey and Customizable Add-ons



Consolidation – Pooled Funding Opportunities

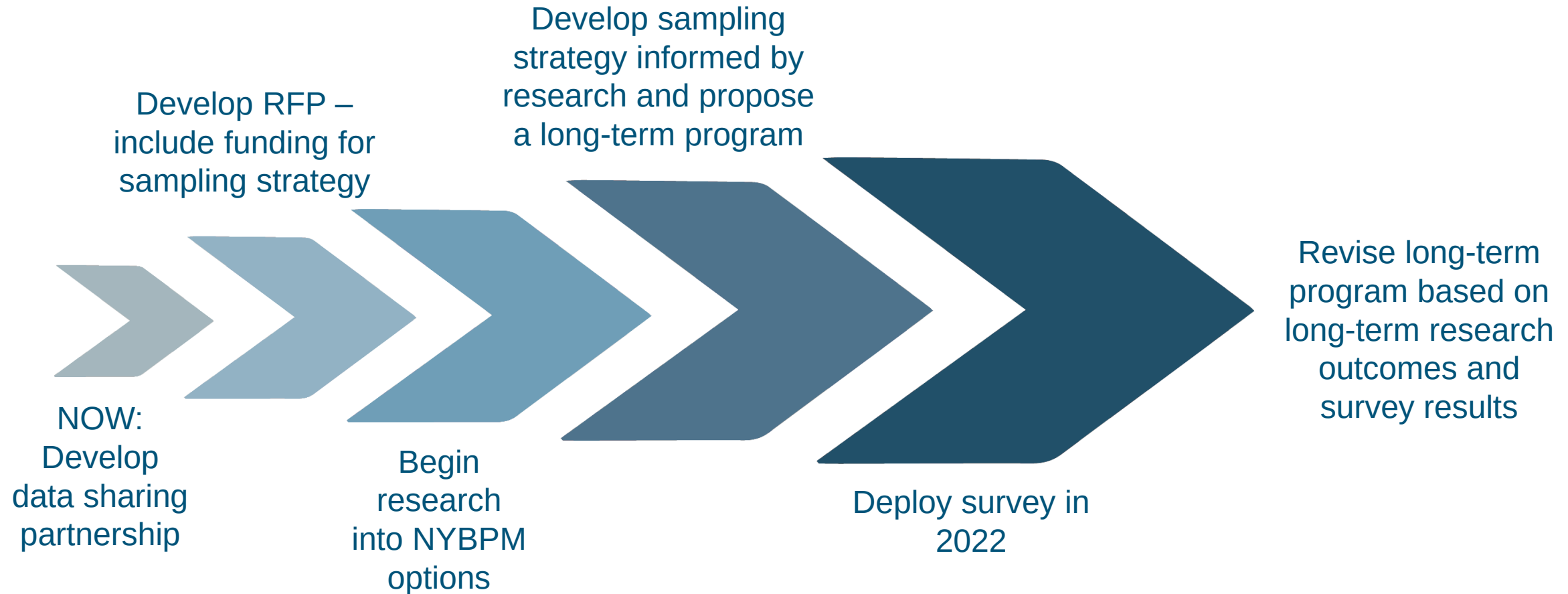




Recommendation #2

NYMTC RHTS Next Steps

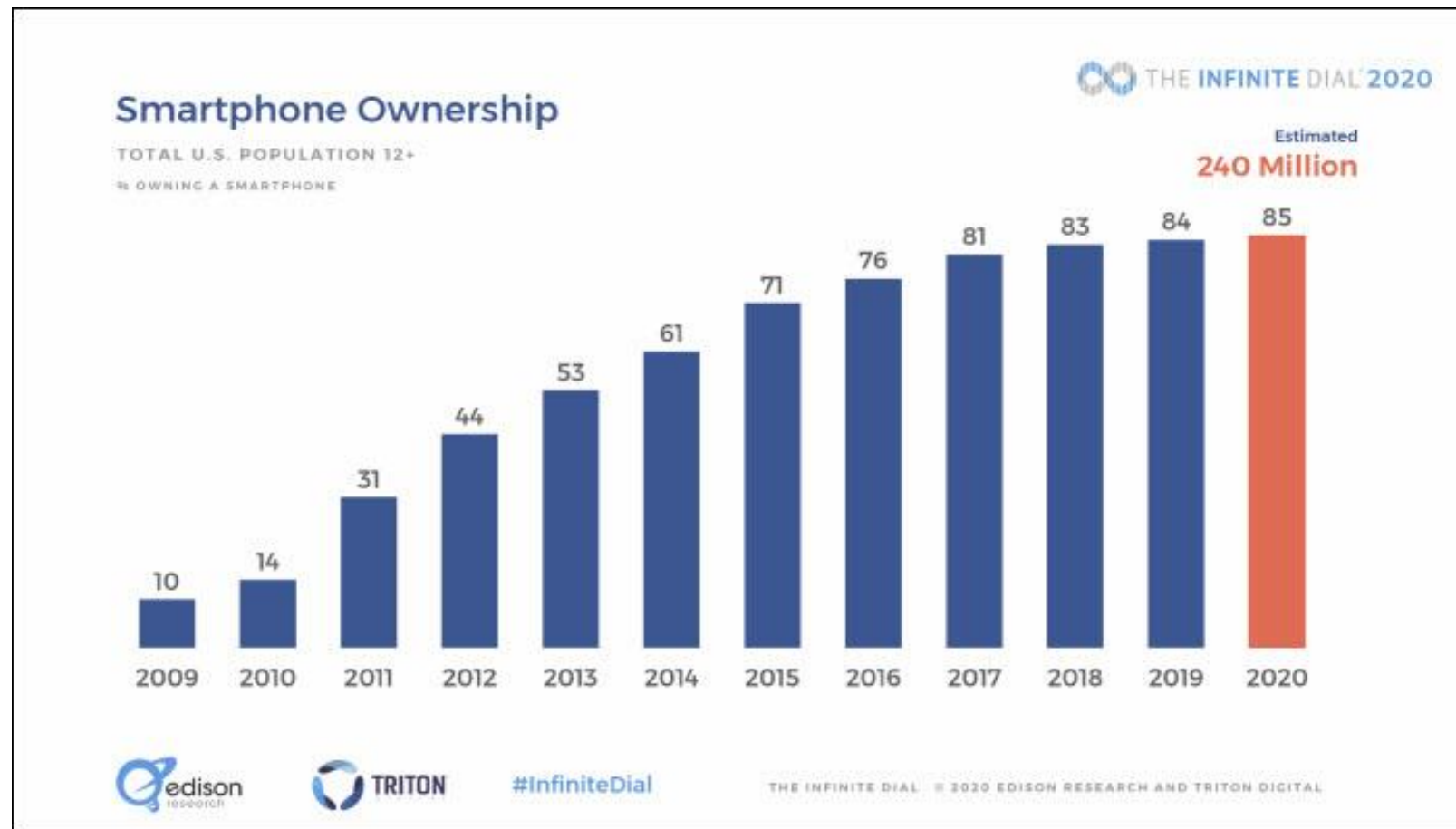
Deploy a Household Travel Survey in 2022



Recommended Survey Technology



Smartphone and Web-Based





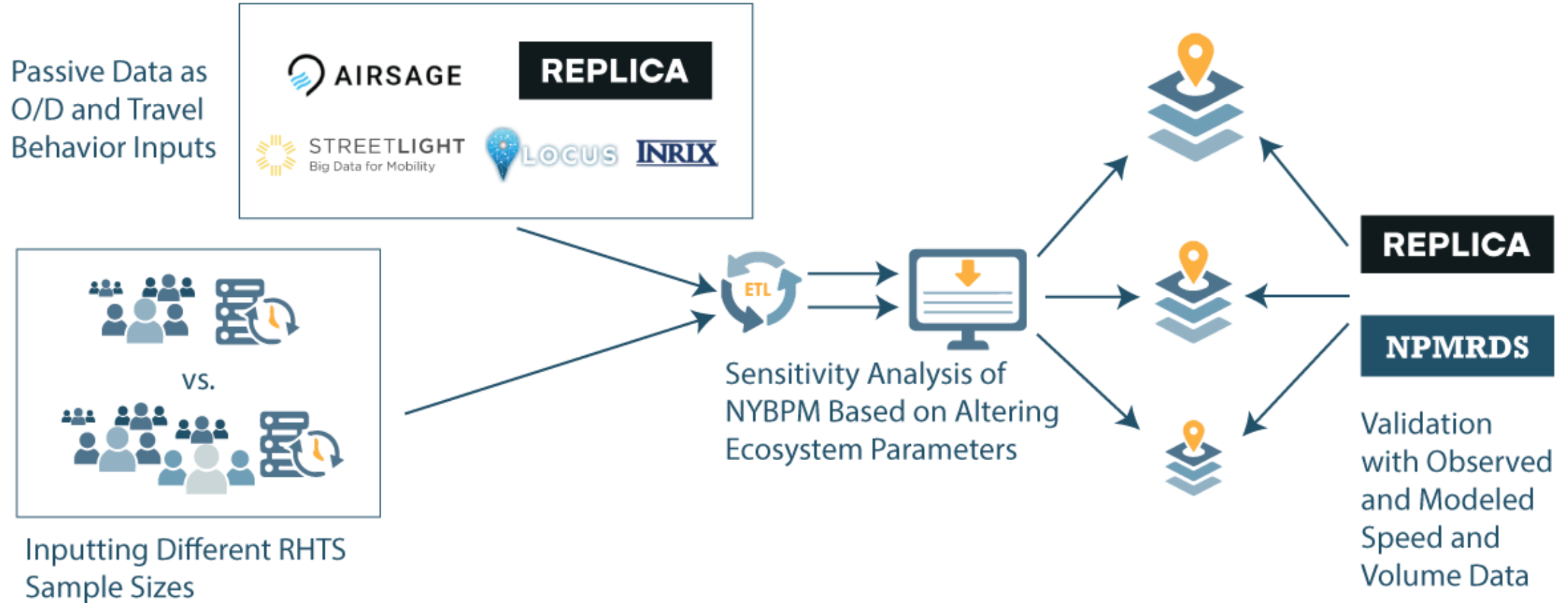
Recommendation #3

**Alternative Combinatory Design Research on
Leveraging Passive Data and Targeted Surveys**

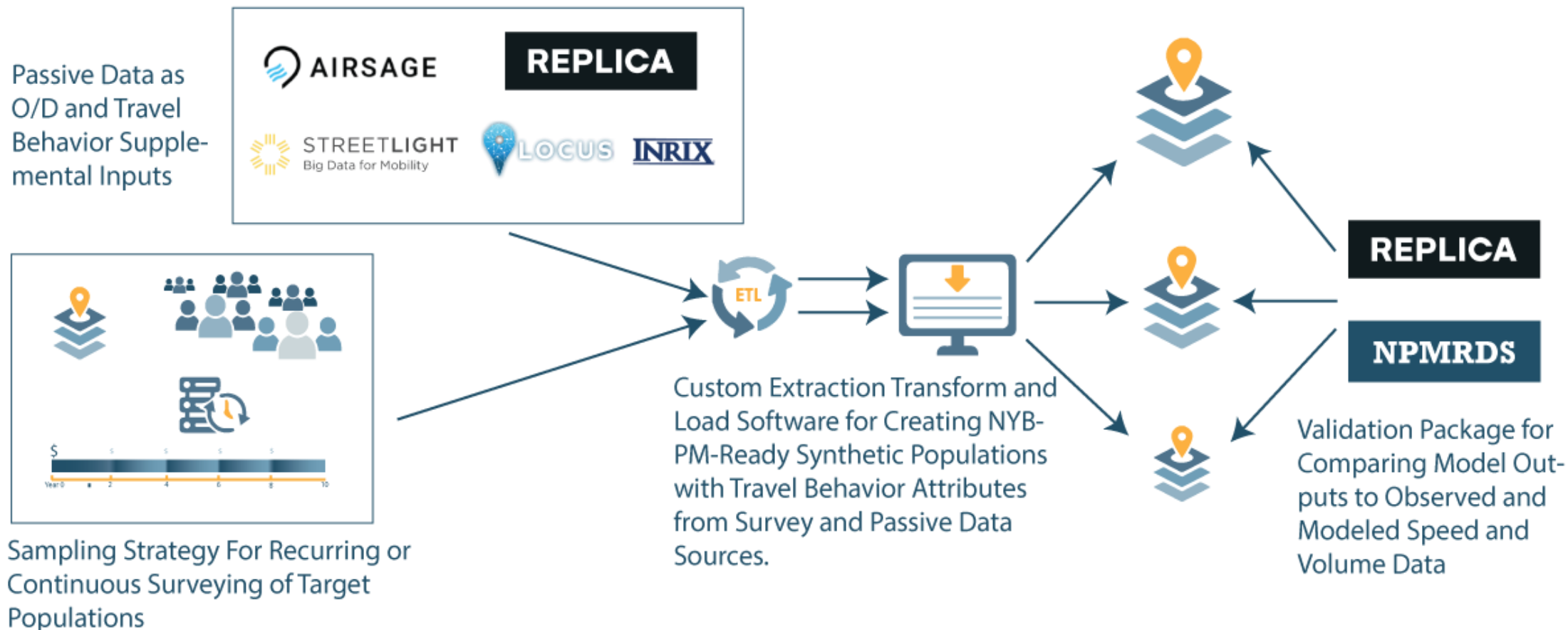
Immediate Research – Sensitivity Testing to Determine Target Survey Needs for NYBPM: Sample Size and Spatial Coverage Options



Long-Term Research – Sensitivity and Validation Testing of NYBPM with Various Inputs (Passive Data and Reduced RHTS Sample Sizes) Against Modeled and Observed Speed and Volume Data



Long-Term Research – Desired Research Products





Program Design Next Steps

Program Design Next Steps

1. Proceed Now

A. Form the data sharing group April/May 2021

B. Move the RHTS forward

1.) Start designing an RHTS RFP

2.) Develop the consolidated survey strategy with your data sharing group

3.) Include survey design phase in the RFP

C. Begin Research

1.) Immediate deliverable: NYBPM ecosystem needs – find out smallest possible sample size for regionwide model

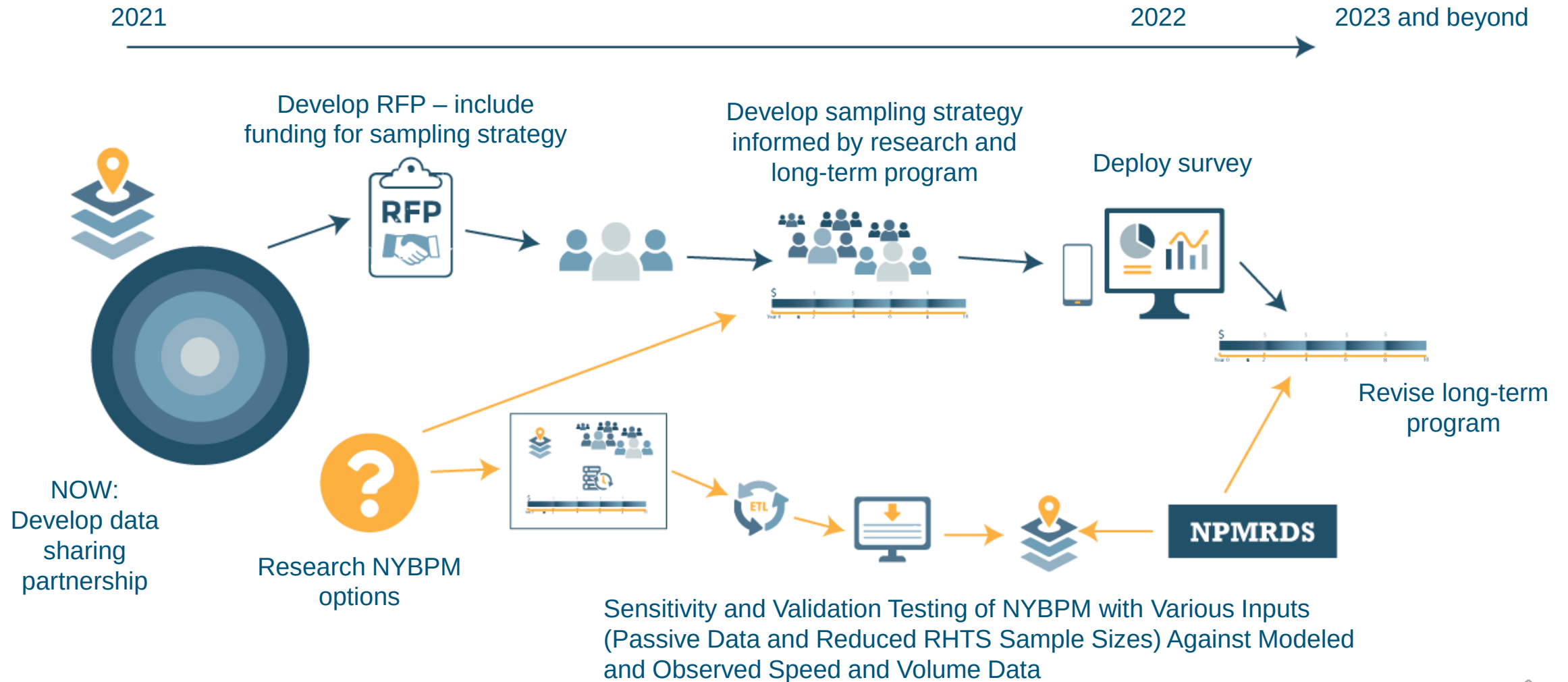
2.) Long-term: Research passive data supplements and proxies

2. Deploy RHTS in 2022

3. 2023 and beyond

A. Utilize results of the research and the survey deployment to design the long-term recurring strategy

Program Design



Program Management Schedule

Task	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
Develop data sharing partnership	■	■	■	■																					
Research NYBPM sampling options		■	■	■	■	■	■																		
Develop RFP – include funding for sampling strategy	■	■	■	■	■	■	■																		
Hire Survey Practitioner						■	■	■	■	■															
Develop sampling strategy informed by research and long-term program							■	■	■	■	■	■	■												
Sensitivity and Validation Testing of NYBPM					■	■	■	■	■	■	■	■	■	■											
Deploy survey																	■	■	■						
Revise long-term program													■	■	■	■					■	■	■	■	