2023 WASHINGTON-BALTIMORE REGIONAL AIR PASSENGER SURVEY (APS) SAMPLING PLAN

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Aviation Technical Subcommittee
November 17, 2022

National Capital Region
Transportation Planning Board

Background

- The APS Response Rate and Quality Study was conducted to address methodological concerns such as a decline in the overall response rate and the quality of survey responses

- The APS Response Rate and Quality Study provided 25 actionable recommendations for the TPB to consider for future APS efforts, including revising the sampling plan

- Considerations for the 2023 APS Sampling Plan

  - Recommendations from APS Response Rate and Quality Study

  - Sampling plans from other airport surveys

  - Sampling plans from previous APS

  - Descriptive analysis of the potential strata using the 2019 APS

APS Response Rate and Quality Study Sampling Plan Recommendations

3.1. Determine optimal cluster size: To minimize the impact of ICC, the number of passengers per flight should be limited.

3.2. Sample flights with probability proportional to size (PPS): Select flights with probability proportional to size (e.g., seats) will result in a passenger sample that is approximately equally-weighted.

3.3. Reduce the number of explicit strata: Simplify sampling process with equal weights within explicit strata.

3.4. "Flood the gate" to increase legitimacy and quickness of meeting yield: Structure the staffing plan to allow for additional personnel to survey boarding lounges for large flights.

3.5. Consider alternative sampling units: Adopt an alternative sampling framework based on area, day, and time. This framework would be constructed by dividing the airport flight concourses into defined zones (e.g., groups of gates).

Gate-Based vs. Zone-Based Sampling

- One of ICF's recommendations in the APS Response Rate and Quality Study was to explore alternative sampling units such as clusters of gates or zones

- This approach would require that airports provide gate schedules a month in advance for planning purposes

- Since then, we learned that gate information is managed by several different entities, changes by date, is communicated in different formats, and varies in accuracy and timeframe

- This approach also makes response rates more difficult to measure

- Therefore, the gate-based approach used in previous APS will be used for the 2023 APS

Sampling Plan in Previous APS (2011 – 2019)

- The APS sample has traditionally been a stratified cluster of flights

- Since 2011, the APS has been stratified by airport, international/domestic flight, airline, and destination

- Within each airport and domestic/international stratum, the flight sample was allocated based on the cumulative number of seats on the flights in the airline/destination strata

- The 2019 APS included nearly 400 domestic and international flight strata, where flights were sampled

Review of Recent Airport Ground Access Surveys

- In addition to reviewing the sampling plan of previous APS efforts, we reviewed the sampling plans and survey methodology for other airport surveys

    - Minneapolis-St. Paul Airport (MSP)

    - Boston Logan International Airport (BOS)

    - Los Angeles International Airport (LAX)

    - San Francisco International Airport (SFO) and Oakland International Airport (OAK)

    - Dallas/Fort Worth International Airport (DFW)

Key Takeaways from Reviewing Other Airport Survey Sampling Plans

- Most airport surveys used a two-stage stratified or cluster sampling approach with probability proportional to seating capacity

- Airline, destination, time period, flight distance/time, and seating capacity were considered in the sampling plan approaches

2019 APS Sampling Documentation and Strata

- Sampling Documentation

  - Washington-Baltimore Regional Air Passenger Survey 2019: General Findings (pp. 42 – 44)

  - COG CASP APS Sampling Framework Development Process Documentation for 2019 APS

  - 2019 APS Sampling Framework Guidance Technical Memo (December 6, 2019)

- Strata

  - Airport, international/domestic flight, airline, destination, number of seats in flight (based on size classes)

Developing the 2023 APS Survey Strata

- TPB staff conducted descriptive analysis of the APS 2019 data files to evaluate potential stratifications, including

  - Strata from 2019 sampling plan

  - Flight distance categories (e.g., < 500 miles, 500-1,000 miles, 1,000-1,500 miles, 1,500-3,000 miles, > 3,000 miles)

  - Airline type (e.g., legacy carriers, low cost carriers, international carriers)

  - Geographic region (e.g., New England, Mid-Atlantic, etc.)

  - Average annual employment of leisure/hospitality workers for MSA or County

- Response rates and ground access mode shares were examined for all three airports from the 2019 APS

2023 APS Survey Strata

- Latest proposed strata: 1) Origin airport; 2) Airline; 3) Region; 4) Leisure/Hospitality Sector

  - DCA-AA-D01-L1 (DCA originating flights on American Airlines departing to destinations in New England with a low leisure/hospitality location quotient)

- Data Sources:

  - OAG flight data: origin/destination airport codes, airline, flight number, departure time, seat counts, operating days of a week, effective date, and discontinued date

  - Bureau of Labor Statistics - Quarterly Census of Employment and Wages: Leisure/hospitality annual employment market share - measured by location quotients

Destination Regions for 2023 APS - Domestic

Destination Region	Region Code	States
New England	D01	CT, MA, ME, NH, RI, VT
Mid-Atlantic	D02	DE, MD, NJ, NY, PA, VA, WV
South	D03	GA, NC, SC
Florida	D04	FL
Midwest	D05	IL, IN, IA, KS, MI, MN, MO, NE, ND, OH, SD, WI
Southeast	D06	AL, KY, MS, TN
South Central	D07	AR, LA, OK, TX
Mountain	D08	AZ, CO, ID, MT, NV, NM, UT, WY
West	D09	AK, CA, HI, OR, WA

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Destination Regions for 2023 APS - International

Destination Region	Region Code	States
North America	I11	All destinations in North America except for the United States
Europe	I12	All destinations in Europe
Asia	I13	All destinations in Asia (including Middle East)
Other	I14	All destinations in Africa, Australia/Oceania, and South America

Leisure/Hospitality Sector Outliers for 2023 APS

Leisure/Hospitality Sector Category Outliers	Example Destinations
Low leisure/hospitality employment market share (L1)	Hartford, CT Manchester, NH Memphis, TN
Moderate leisure/hospitality employment market share (L2)	New York, NY Los Angeles, CA Chicago, IL
High leisure/hospitality employment market share (L3)	Myrtle Beach, SC Las Vegas, NV Orlando, FL

Leisure/Hospitality Sector Outliers for 2023 APS Descriptive Analysis of 2019 APS Results

	Leisure/Hospitality Employment Market Share		
	Low	Moderate	High
Private Car	42%	41%	52%
Dropoff	22%	21%	30%
Park	12%	11%	14%
No Response	7%	9%	9%
Rented Car	13%	10%	7%
Transportation Network (UBER, LYFT)	17%	24%	20%
Taxi	5%	7%	8%
Metrorail (Ronald Reagan National)	8%	5%	3%
Other	4%	4%	4%
Hotel/Motel Courtesy Bus	6%	4%	2%
Airport Bus/Limo	3%	2%	2%
Metrobus/MTA Bus	1%	1%	1%
AMTRAK/MARC (BWI), VRE (DCA)	0.7%	1%	0.3%
Light Rail (BWI)	0.3%	0.2%	0.2%
Walked	0.1%	0.2%	0.1%
Biked	0.0%	0.0%	0.0%

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Calculating Sampled Flights Within Each Stratum

- To calculate the sample flights within each stratum, the sampling process summarizes the total seat counts by stratum, as well as the total seats by origin airport

- Then for each stratum, seats rates can be calculated by dividing the stratum seat counts by the seat counts of each airport

- Proportional flights can be calculated by multiplying the flight counts by seat rates

$$\text{flight count} = \text{flight\_count}_{\text{stratum}} \frac{\text{seat counts}_{\text{stratum}}}{\text{seat counts}_{\text{origin}}}$$

Advantages of Revised Sampling Approach

- Based on reviewing the 2019 APS survey responses, we found that flights within the stratified groups have similar characteristics in terms of response rates and ground access mode share

- By collapsing flights from the same origin airport, from the same airline, to destinations in the same region with similar leisure/hospitality market shares, the number of survey strata would be reduced significantly from the 2019 APS

- The reduction in survey strata would result in fewer flights needed to be sampled, increasing efficiency while maintaining statistical rigor, representativeness, and longitudinal comparisons with previous APS

Status on Applying Recommendations from APS Response Rate and Quality Study

3.1. Determine optimal cluster size	To be evaluated during pretest.
3.2. Sample flights with probability proportional to size (PPS):	Considered but did not observe significant changes for mode share or response rate.
3.3. Reduce the number of explicit strata	✓ (399 in 2019; 170 proposed for 2023, may be further collapsed)
3.4. "Flood the gate" to increase legitimacy and quickness of meeting yield:	To be evaluated during pretest
3.5. Consider alternative sampling units (zone-based sampling)	Not feasible

Next Steps

- Run sample draws using the revised survey strata

- Complete sampling plan and sample pull for pretest

    - The pretest will be conducted at one airport for a two week period in Spring 2023

- Revise sampling plan and survey methodology based on the results from the pretest

- Perform sample draw for the full-scale survey

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