Demographic Characteristics

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ACRP Project 03-36 *Using Disaggregated Socioeconomic Data in Air Passenger Demand Studies*

- Source of the material in this presentation

- Objective
  - Evaluate the feasibility and potential benefit of using disaggregated socioeconomic data (e.g., income distributions, age cohorts, ethnicity, trip purpose) to improve local air passenger demand studies (e.g., airport planning, forecasting, marketing, air service development, passenger leakage)

- Research team
  - GRA, Inc. – David Ballard, Principal Investigator
  - Atlanta Analytics, LLC – Laurie Garrow, Co-PI
  - Aviation System Consulting, LLC – Geoff Gosling, Co-PI

- Final report anticipated later this summer
  - Currently under final revision following Project Panel review

Outline of Presentation

- Defining terms – examples of demographic and socioeconomic characteristics and trends
- How do these characteristics and trends matter?
- Modeling air passenger demand
- New sources of data about air passengers
- The other side of passenger activity – airline service choices and business models
- How can airports use demographic characteristics and trends to better anticipate future air passenger demand?
- Conclusions

Examples of Demographic or Socioeconomic Characteristics and Trends

- *Demographic characteristics* identify features of a population – averages and distributions for characteristics such as age, gender, household size and composition, and so forth.

- *Socioeconomic characteristics* include features related to economic means and status, such as average or per capita incomes, household income distributions, and so forth.

- Demographic and socioeconomic characteristics can easily be combined or cross-tabulated to create more complex population cohorts.

- Some examples for the U.S. follow.

Mean Household Income for U.S. Household Income Quintiles 1967–2016 (2016 dollars)
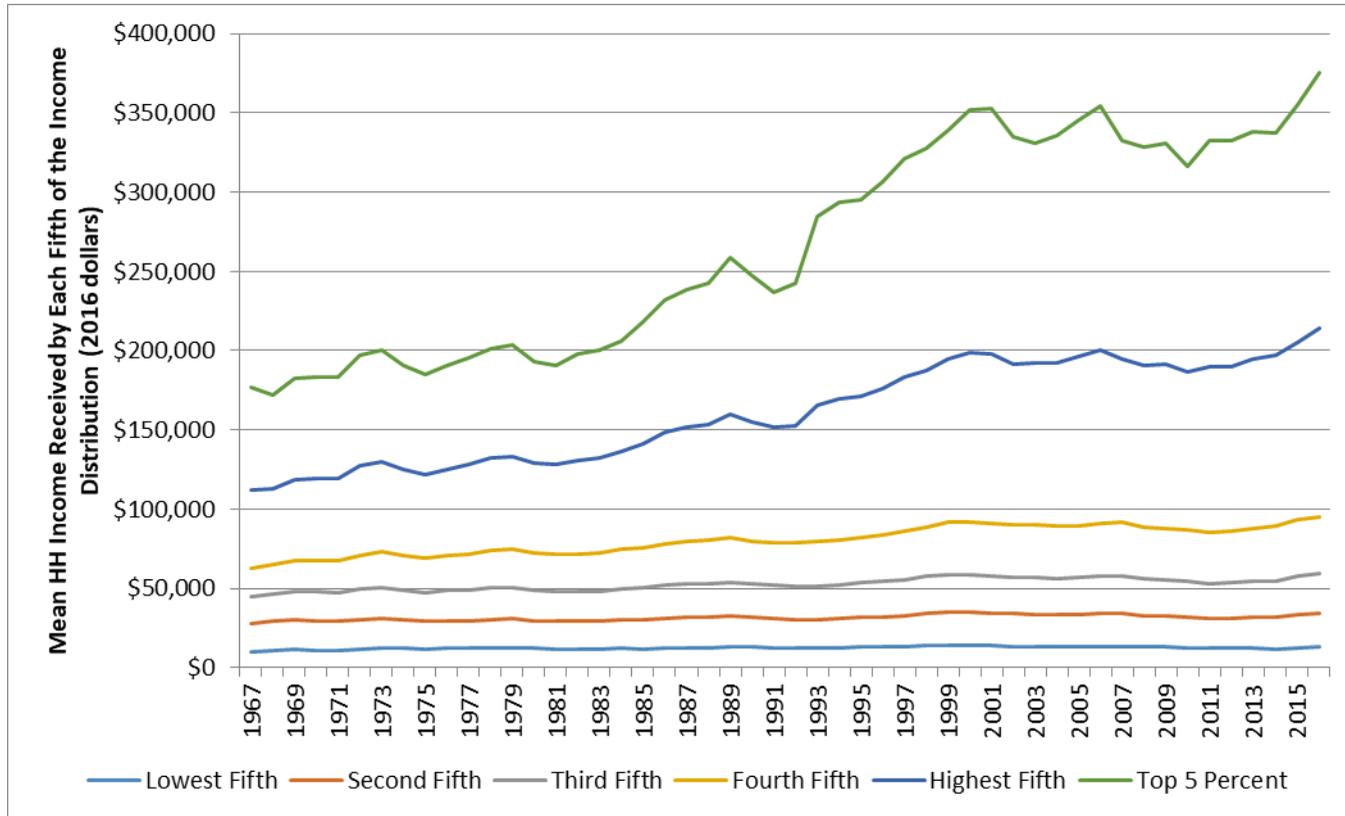
- Since 1967, and especially since the 1980s, the strongest household income growth has occurred among the top quintile of households, and especially among the upper 5% of households.

Mean HH Incomes for U.S. Income Quintiles, with Overall Median and Mean HH Income 1967–2016 (2016 dollars)
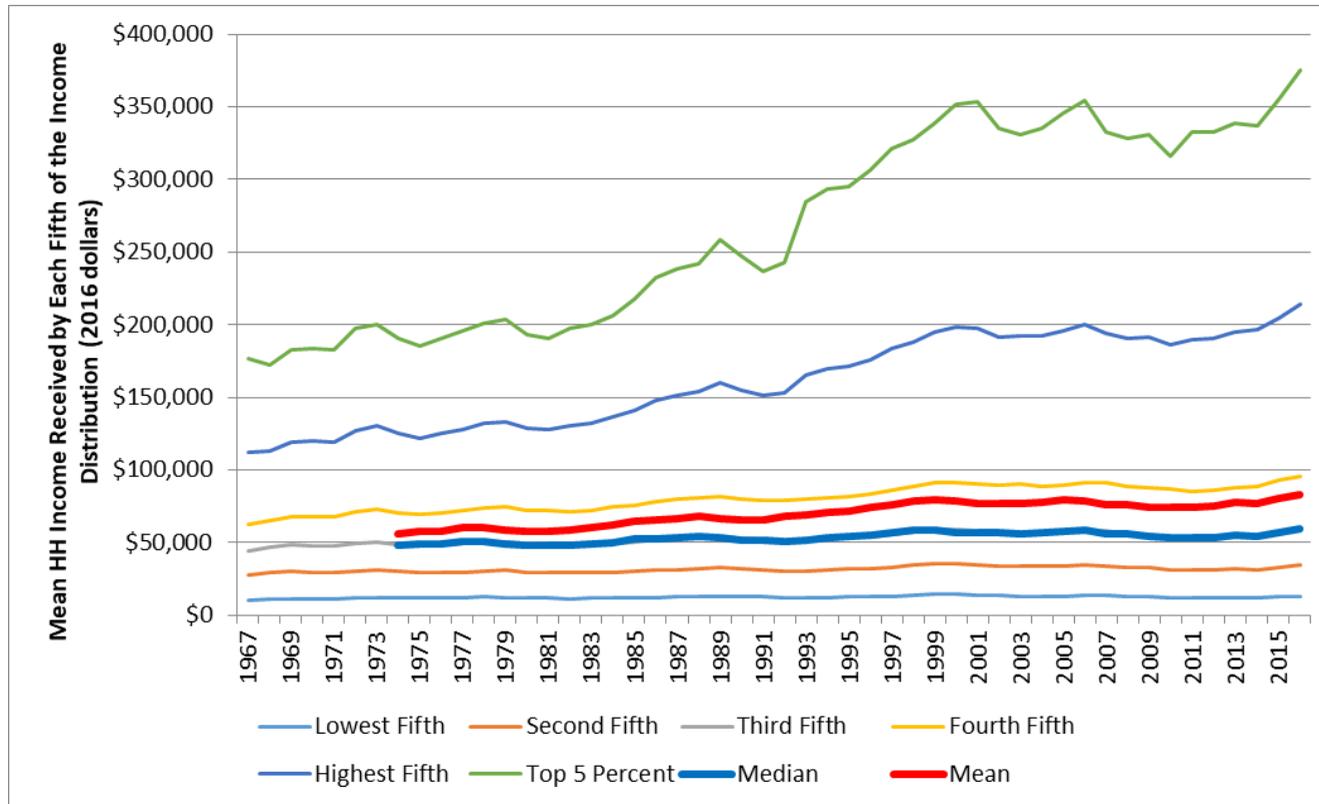
- This is the same chart, with the addition of the overall **mean** and **median** U.S. household incomes. Much of the growth in these aggregate measures can be attributed to the income growth experienced by the subset of higher income households

Mean HH Incomes for U.S. Income Quintiles, with Overall Median and Mean HH Income 1967–2016, Indexed (1974=100)
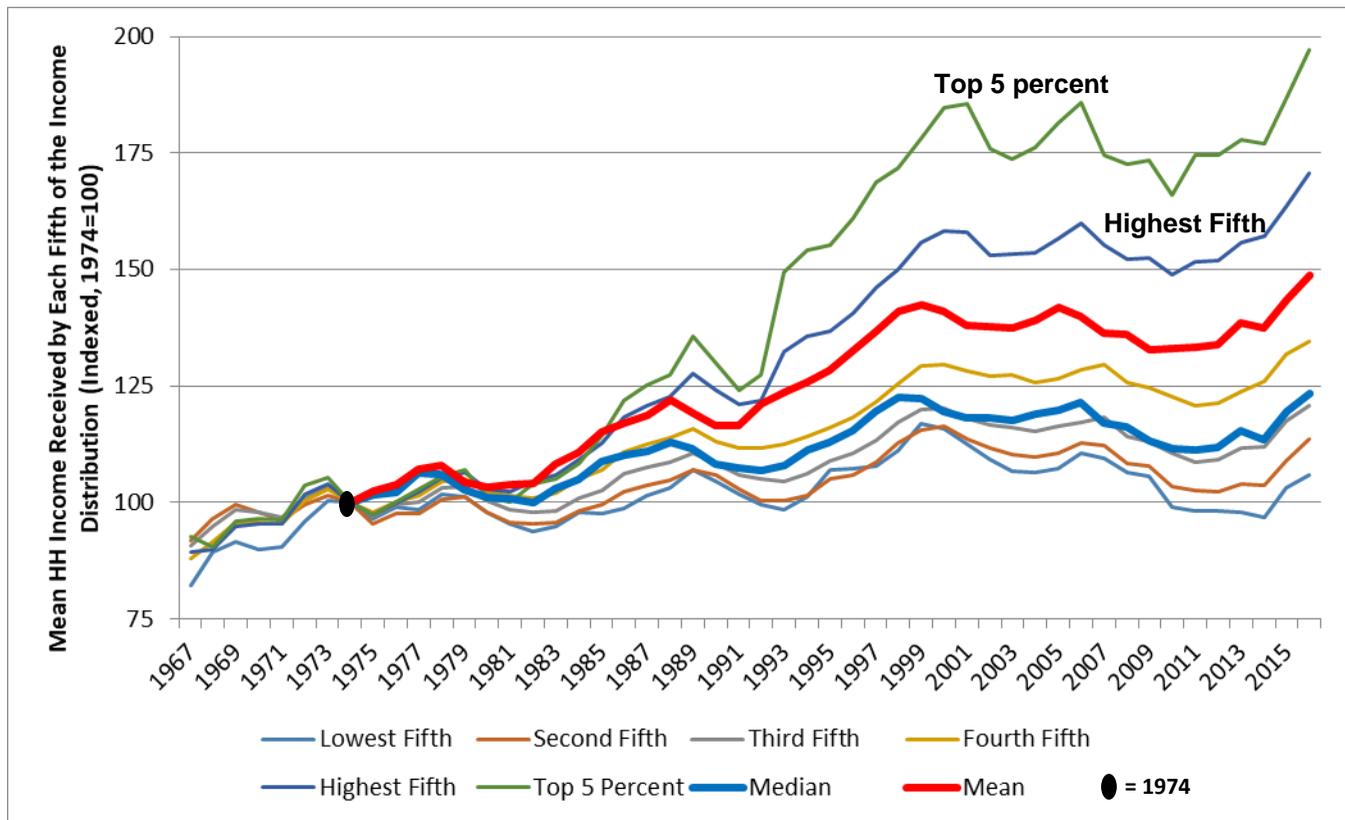
- This chart reports these household income data as an index, with the 1974 value for each series set to 100 (when the **mean** and **median** income series begin). Since 1974, the mean incomes of the top five percent of households have nearly doubled, while the mean incomes of the bottom three quintiles (and the overall median) have grown less than 25 percent.

Share of U.S. National Income Received by Household Income Quintiles 1967-2016
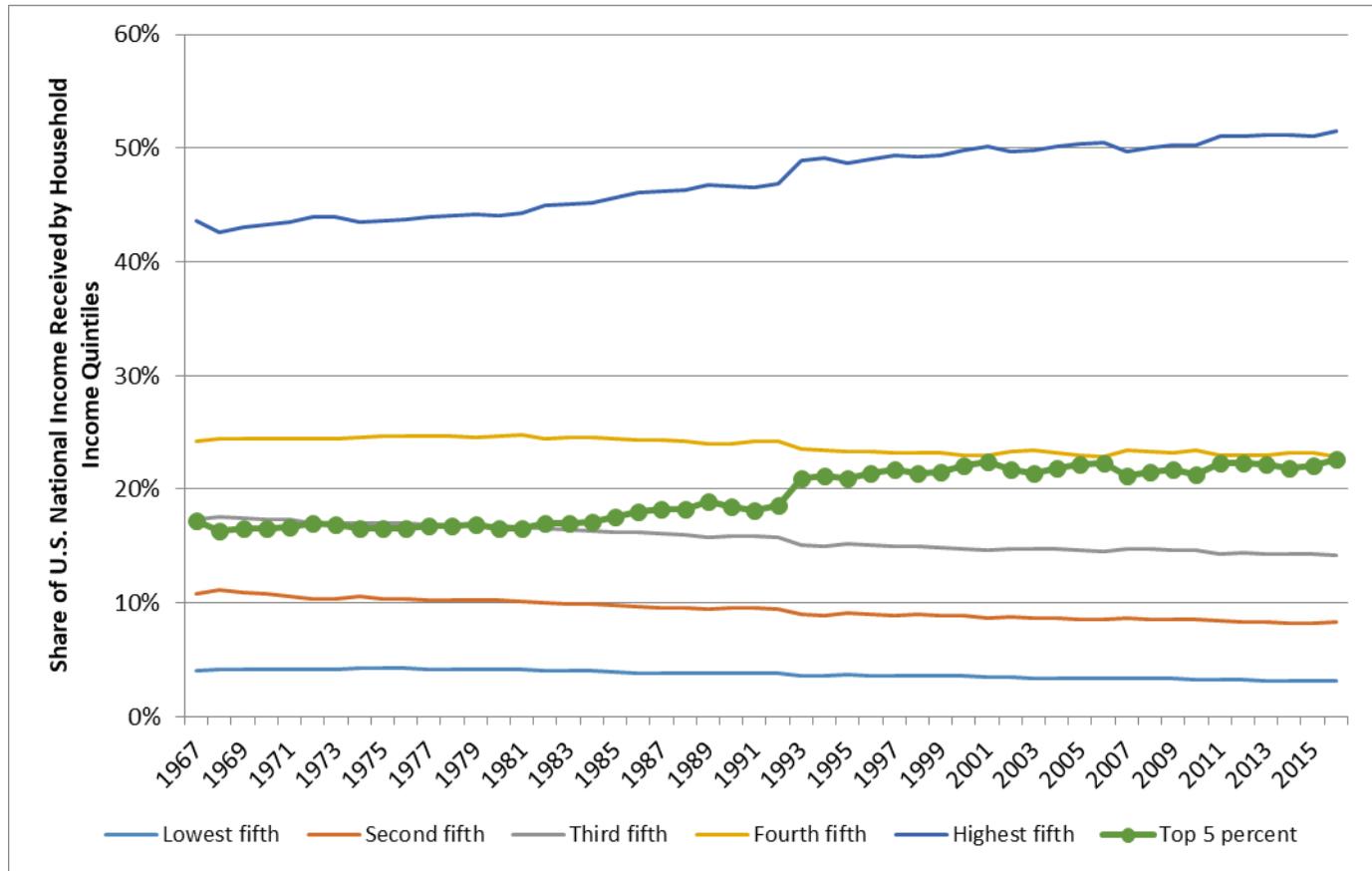
- Similar trends can be seen in the shares of national income received by the income quintiles. The highest income quintile, and the top 5 percent of households, have increased their shares of national income since 1967, while the shares of other quintiles have declined.

Indexed Shares of U.S. National Income Received by Household Income Quintiles 1967–2016 (1967=100)
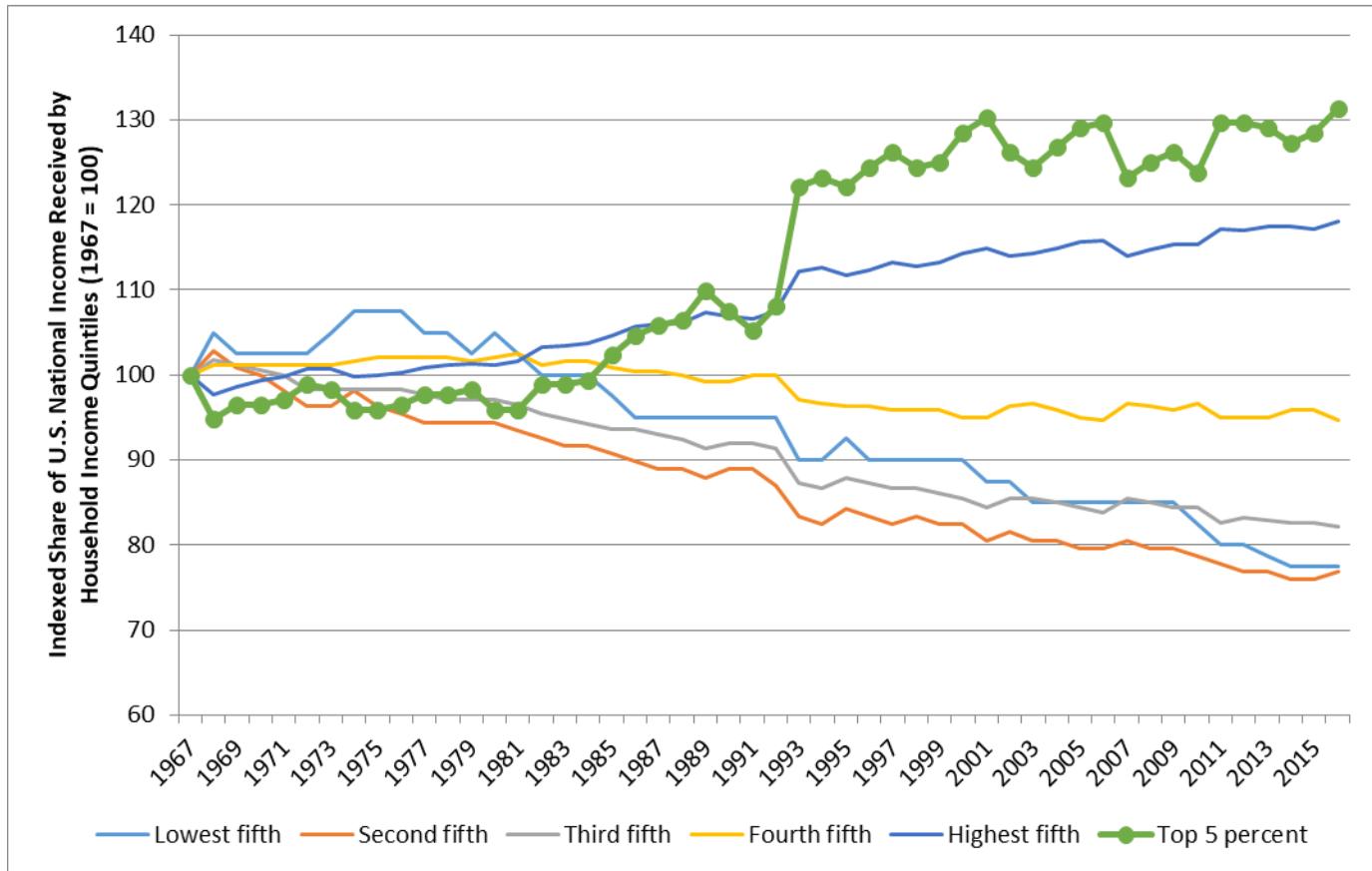
- Differences in these income share trends for different household income cohorts can be seen more clearly when the data is presented as an index, with the share received by each quintile in 1967 set at 100.

Median HH Income by Age of Head of Household 1967-2016 (2016 dollars)
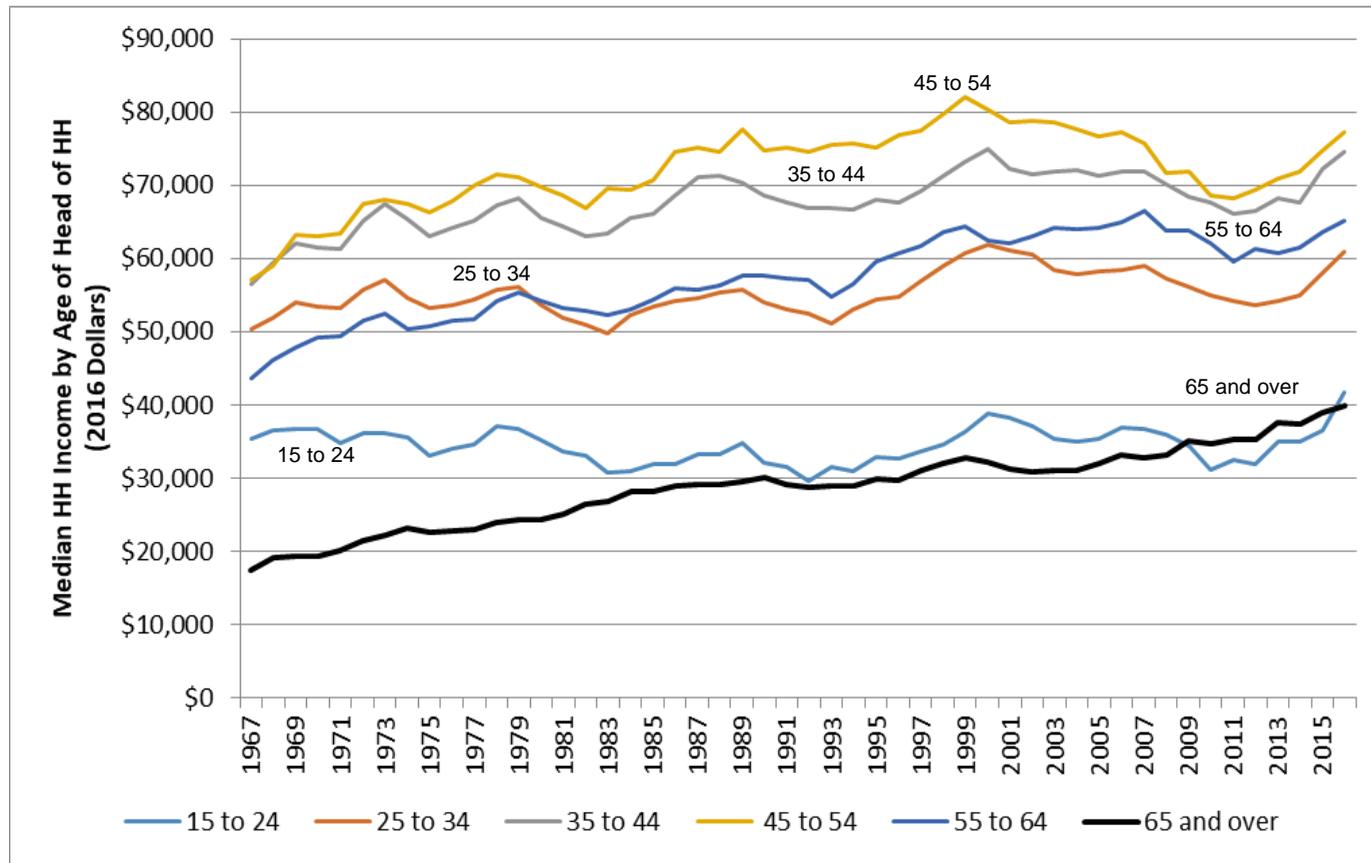
- This chart shows another way to disaggregate the HH income aggregates, reporting median HH incomes by the age of the head of household. Median HH income rises with age until the later years of the householder's working career.
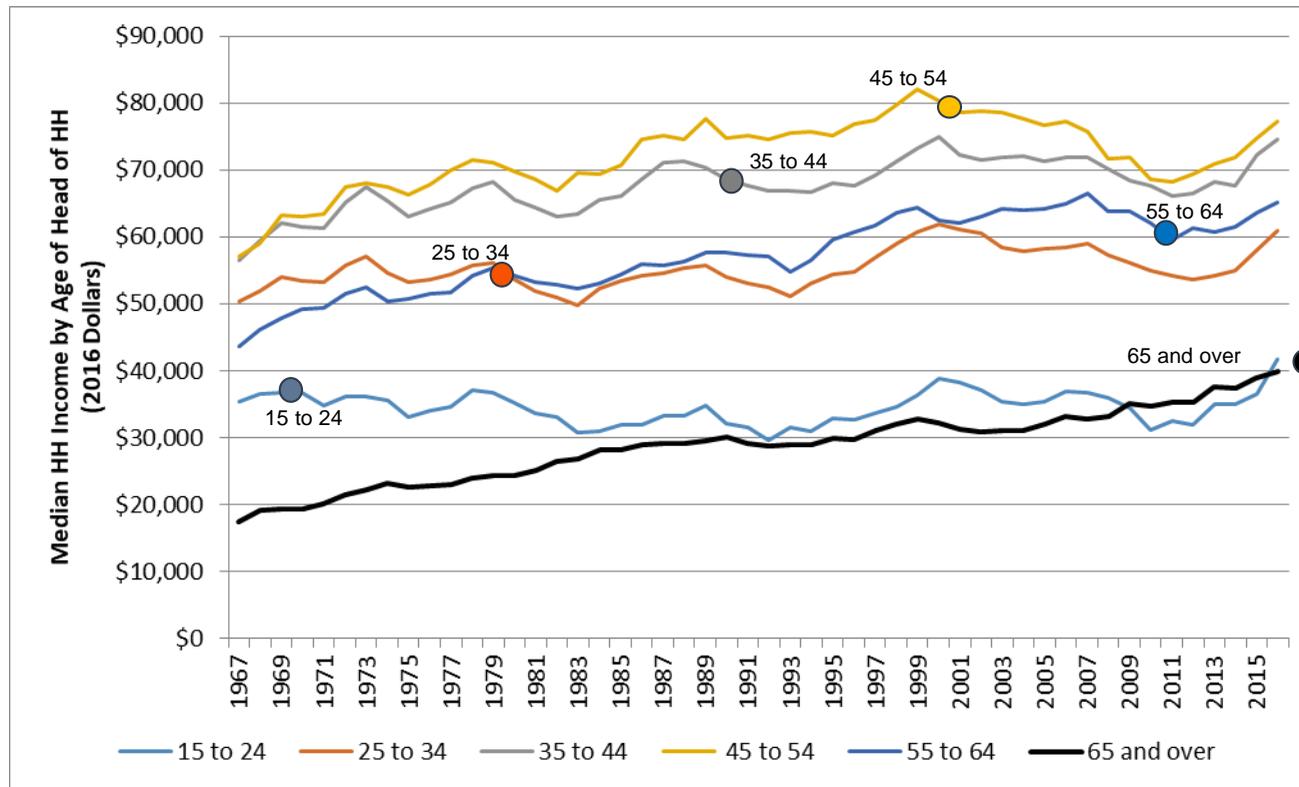
- Median career income profiles can be roughly read from this sort of cross tabulation, since a 20 year old 1970 householder would be a 30 year old in 1980, a 40 year old in 1990, and so on.

Indexed Median HH Income by Age of Head of Household 1967-2016 (1967=100)
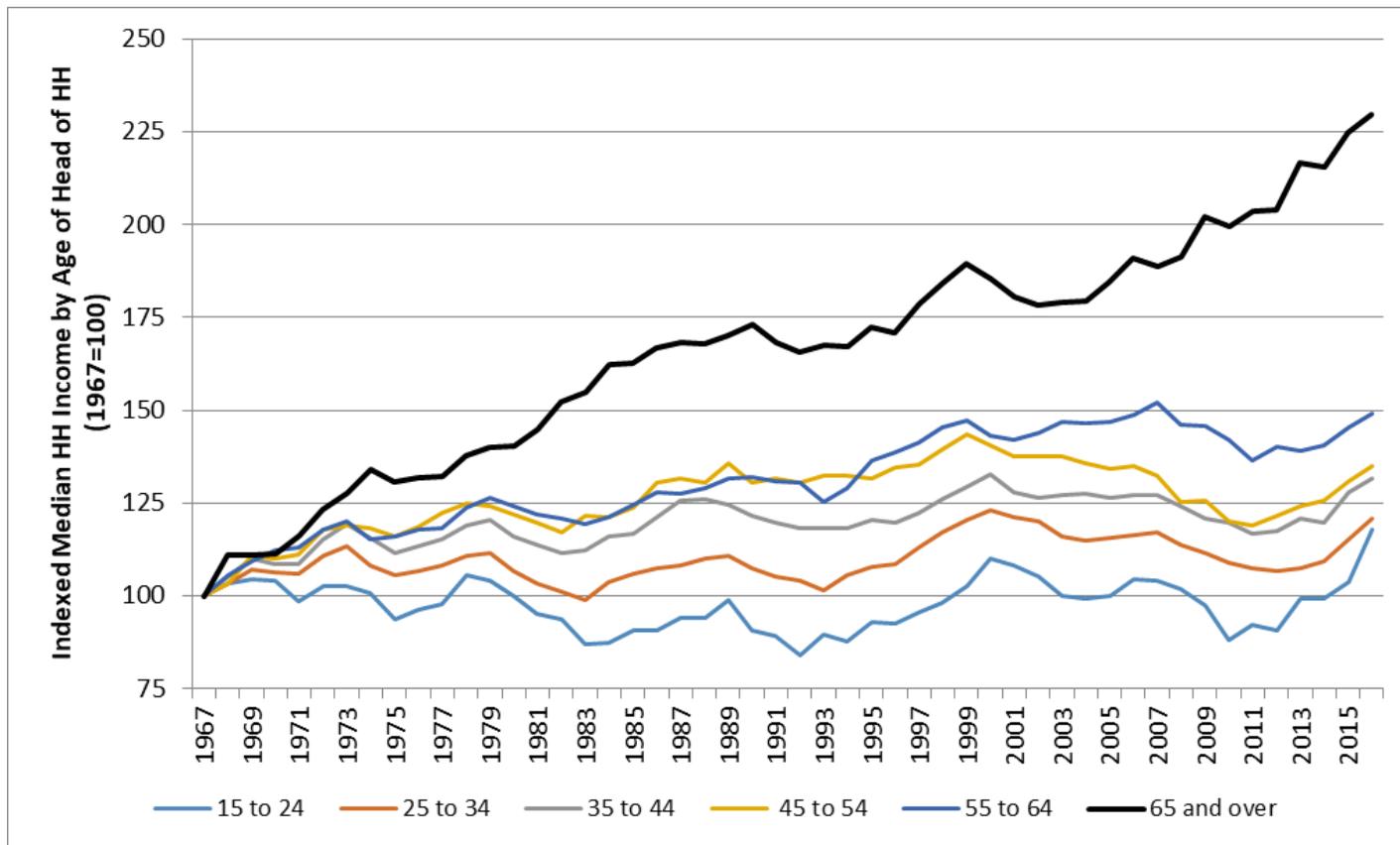
- Indexing can be used to clarify which age groups have received the greatest percentage increases in real HH income since 1967 – clearly those 65 and older. Younger HHs have experienced at best only modest improvements.

Household Income by Educational Attainment of the Head of Household 1991–2016 (2016 dollars)
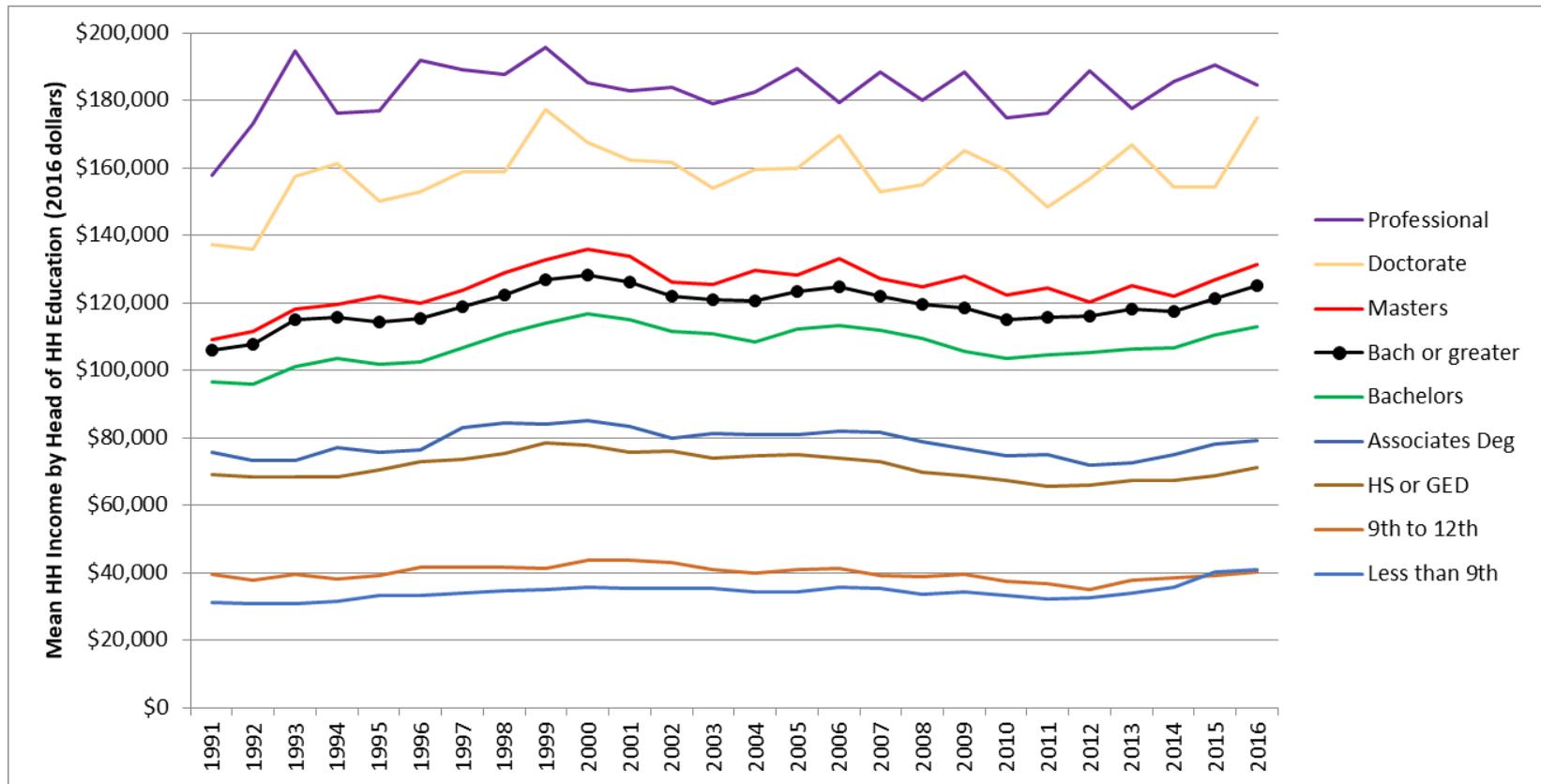
- A final example looks at HH incomes by the educational attainment of the HH head. After adjusting for inflation, these are remarkably stable over time. Not surprisingly, greater educational attainment is consistently associated with higher household income.

Indexed HH Income by Householder Educational Attainment 1991-2016 (1991=100)
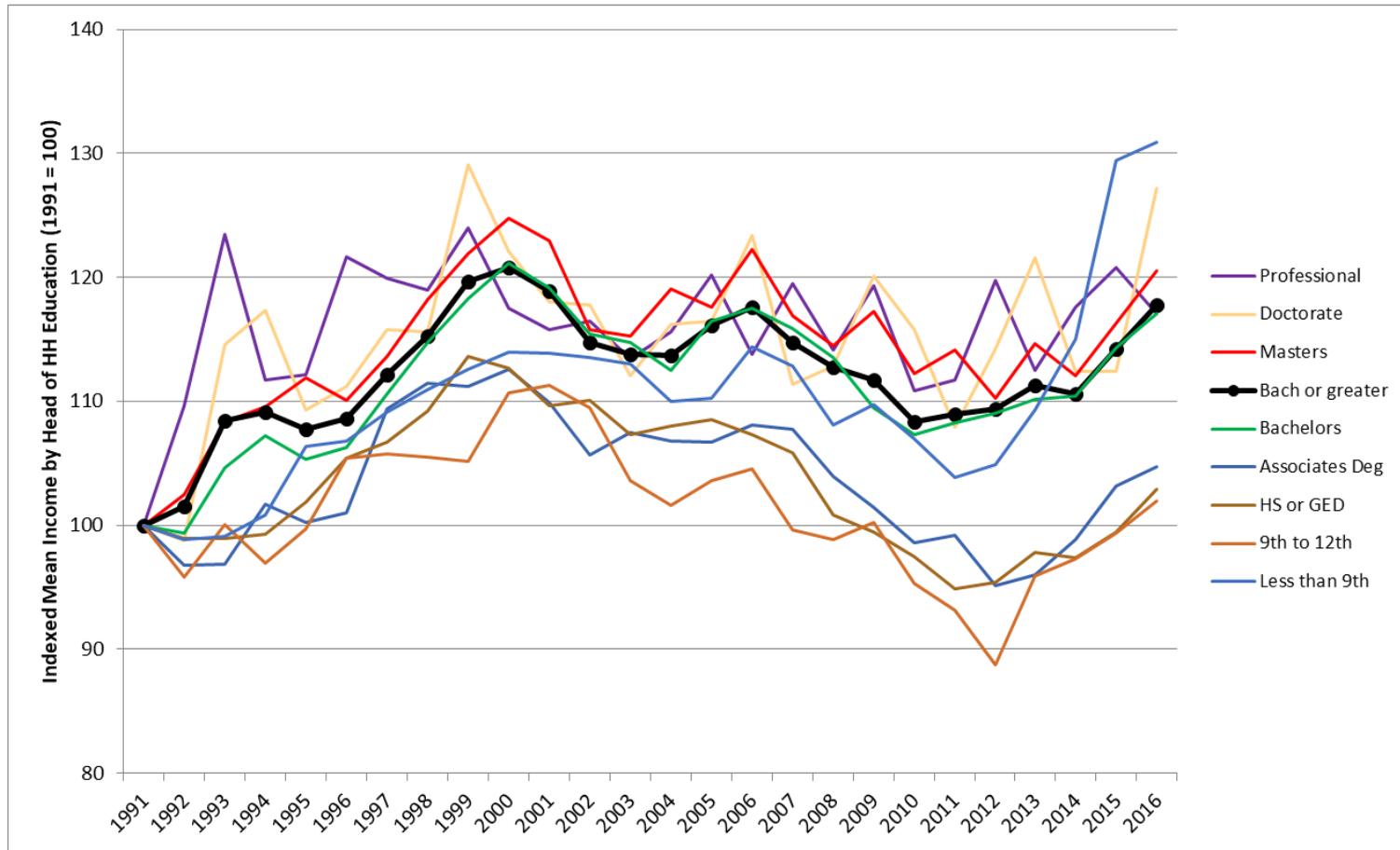
- The indexed view of HH income by educational status highlights the increases in household income that were experienced by all educational cohorts until the turn of the century, followed by relative stagnation or actual decline for the less well educated.

Demographic/Socioeconomic Characteristics and Air Travel

- What do these disaggregated characteristics and trends mean for commercial aviation and air passenger demand?

Not much, *if* the subgroups – by age, HH income, educational attainment – all have similar propensities to use air travel over the course of a year

- However, we have airport specific sources of data with which to test the hypothesis that these demographic and socioeconomic cohorts are similar in their propensities to travel by air -- air passenger and household travel surveys that have queried air travelers about their household's annual air trips and other air travel behaviors.

- If the distribution of these demographic and socioeconomic characteristics among those who travel by air differs from their distribution within the general population, then accounting for demographic and socioeconomic trends – which indicate how these population characteristics will change over time – can improve our understanding of the size and composition of the future air traveling public.

Some Findings from Recent Air Passenger Surveys

✈ **Boston Logan International Airport 2013 Air Passenger Ground Access Survey**

- Stronger increase in business trips with income than non-business trips

- Apparent decline in non-business trips with increasing income for incomes below about $100k

- More business trips by male than female

Average Air Trips in Past 12 Months by Annual Household Income and Respondent Gender – Boston Area Residents

Household Income	Business Trips			Non-business Trips		
	Total	Male	Female	Total	Male	Female
Less than $30,000	1.1	1.6	0.7	2.4	2.4	2.5
$30,000 - $59,999	1.1	1.5	0.8	2.3	2.1	2.4
$60,000 - $89,999	1.9	2.6	1.3	2.1	1.8	2.4
$90,000 - $119,999	3.2	3.4	2.9	2.1	1.9	2.2
$120,000 - $149,000	4.0	5.5	2.2	2.3	2.2	2.5
$150,000 - $179,999	5.8	7.2	3.9	2.2	2.0	2.5
$180,000 - $199,999	6.4	8.4	4.2	2.5	2.1	2.9
$200,000 or more	10.2	12.6	6.1	2.7	2.6	3.0
Total	5.0	7.0	2.9	2.4	2.2	2.5
Valid responses	3,379	1,744	1,635			

respondents but slightly more non-business trips by female respondents

- Although respondents reported more than twice as many business trips as non-business trips, only 36% of respondents were making a business trip

✈ **San Francisco International Airport 2014/15 Air Passenger Survey**

- Average annual air trips varies considerably by age of the respondent

- Male respondents aged 45 - 54 made the most air trips on average

- Female respondents aged 25 - 34 made the most air trips on average of all female respondents

- Male respondents made more air trips on average than female respondents in all age ranges

- Respondents aged 65 or over made fewer air trips on average than respondents in any other age ranges except for those aged under 25

Average Air Trips in Past 12 Months by Bay Area Residents by Respondent Age and Gender

Respondent Age	Percent Male Respondents	Average Annual Trips	
		Male Respondents	Female Respondents
18 - 24	47.1%	6.22	4.64
25 - 34	52.0%	9.79	8.86
35 - 44	57.3%	12.64	8.72
45 - 54	57.2%	13.88	8.67
55 - 64	55.8%	12.47	7.00
65 or over	53.1%	6.76	4.93
Total	54.0% *(1)*	10.96 *(1)*	7.70 *(1)*
Valid responses	6,610		

Note: 1) Percentage of male respondents and average annual trips include respondents who did not indicate their age range.

Implications for Modeling Air Passenger Demand

- Traditional econometric models of air passenger demand typically do not include variables that reflect the distribution of socioeconomic characteristics of the population

  - However, it is clear from the foregoing and other analyses performed during ACRP Project 03-36 that changes in these distributions will affect the demand for air travel

- Models were estimated in the project that included a variable reflecting changes in the distribution of household income

  - The estimated coefficient for this variable was highly statistically significant

  - Including this variable gave only a small improvement in the fit of the model to the historical data, but ***more important*** …

    - The implied elasticity of average household income changed dramatically (from 0.97 to 2.15)

Implications for Modeling Air Passenger Demand (cont.)

- This has important implications for the use of such models to account for past growth in air passenger traffic and to forecast future demand
  - First, it implies that the past growth in air passenger demand that has been attributed to growth in average household income does not account for two offsetting factors
    - A strong <u>increase</u> in demand from the increase in total household income
    - A partially offsetting <u>reduction</u> in demand from the shift in the percentage of the total household income that was received by the highest income households
  - If the trend in income distribution that has occurred over the past few decades slows down, ends, or reverses, then models that only include average household income will tend to under-predict future air passenger activity

New Sources of Data about Passengers

- Airport passenger surveying is done for a variety of purposes, and it is possible to design passenger survey instruments and techniques in ways that provide better information for understanding future passenger demand.
  - Collect data on respondent demographic/socioeconomic characteristics and number of air trips made in past year
  - Ensure that survey results are comparable over time through consistency in survey question formulation, the responses (answer choices) available, and survey methodology

- Emerging methods of tracking or sharing passenger data – social media, online financial records, cell phone data – could also provide new forms of passenger data that may improve understanding of passenger behaviors and choices.

A Complicating Factor – How Will Airlines Respond?

- The airline industry may also respond to changes in the demographic and socioeconomic characteristics of the population, and do so in ways that could partially confound extrapolations from past travel behavior patterns and population trends by airport planners.
    - "Ultra Low-Cost Carrier" growth and emerging "Basic Economy" travel accommodations on legacy carriers may in part be a response to the effects on passenger demand of recent trends in household incomes
    - Low-cost carriers offering less than daily service in some markets may be a response to network consolidation by legacy airlines
- As a consequence, airport efforts to use demographic and socioeconomic trends to anticipate future passenger volumes and characteristics should also consider how airlines will react to the same social changes.

How Can Airports Use Demographic Characteristics and Trends to Better Anticipate Future Air Passenger Demand?

- Account for effects of changing population characteristics in models and forecasts of total air passenger traffic
  - Direct incorporation of demographic factors and household income distribution in air passenger demand models
    - Requires further research into appropriate techniques
  - *Ex-post* adjustment of forecasts to reflect expected effects of demographic and household income distribution trends
    - Based on analysis of how past changes have affected air passenger traffic
- Anticipate future changes in the demographic and socioeconomic characteristics of air passengers at the airport
  - Increasing numbers of elderly travelers
  - Changes in ground access/egress mode use and concession spending patterns by different household income strata

Conclusions

- Air travel propensity varies widely across different segments of the population by demographic characteristics or income.

- Changes in the composition of the population and in the household income distribution partly account for past changes in air passenger activity.

- Future changes in the composition of the population and in the household income distribution will influence future growth in air travel demand and the future composition of the air passenger population at airports.

- Consequently, there needs to be a more explicit accounting for these effects in models of air passenger demand.

Additional materials from the ACRP 03-36 research will be presented in tomorrow's poster session.

Thank you for your attention.

Questions?