Measurement of Travel Behavior in a Trip-Based Survey Versus a Time Use Survey:

A Comparative Analysis of Travel Estimates Using the 2001 National Household Travel Survey and the 2003 American Time Use Survey

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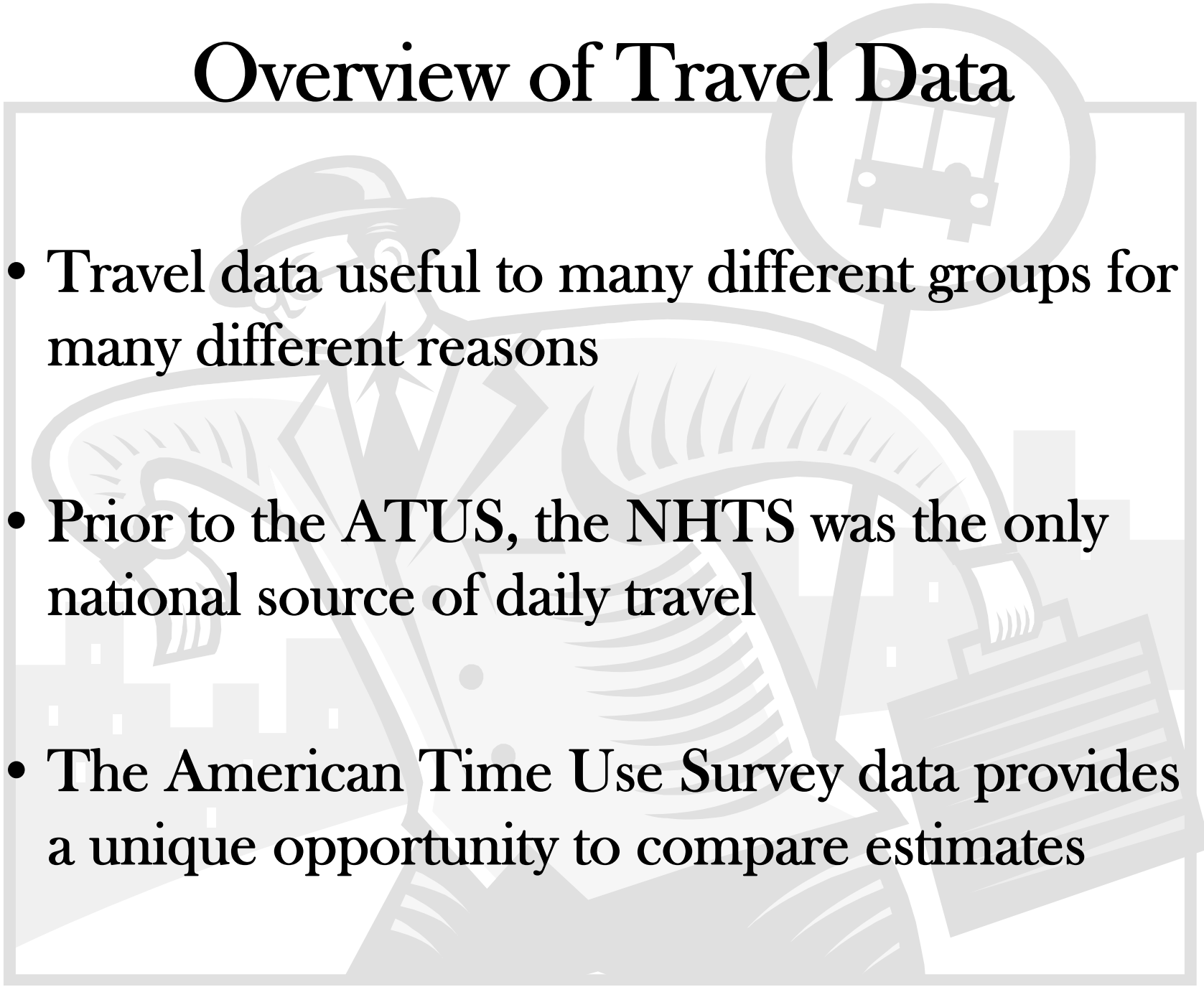
Overview of Travel Data



- Travel data useful to many different groups for many different reasons
- Prior to the ATUS, the NHTS was the only national source of daily travel
- The American Time Use Survey data provides a unique opportunity to compare estimates

Motivation

- Interest in time use surveys to better understand travel behavior
  - Context
  - Substitution of travel & non travel activities
- Debate on best way to capture travel data
  - By trips
  - By activities
- Not many actual comparisons of two types of surveys
- Posited that an activity survey would collect 'better' data, i.e., more trips, longer trip times
- Also expected less rounding effects in trip duration measures from an activity survey.

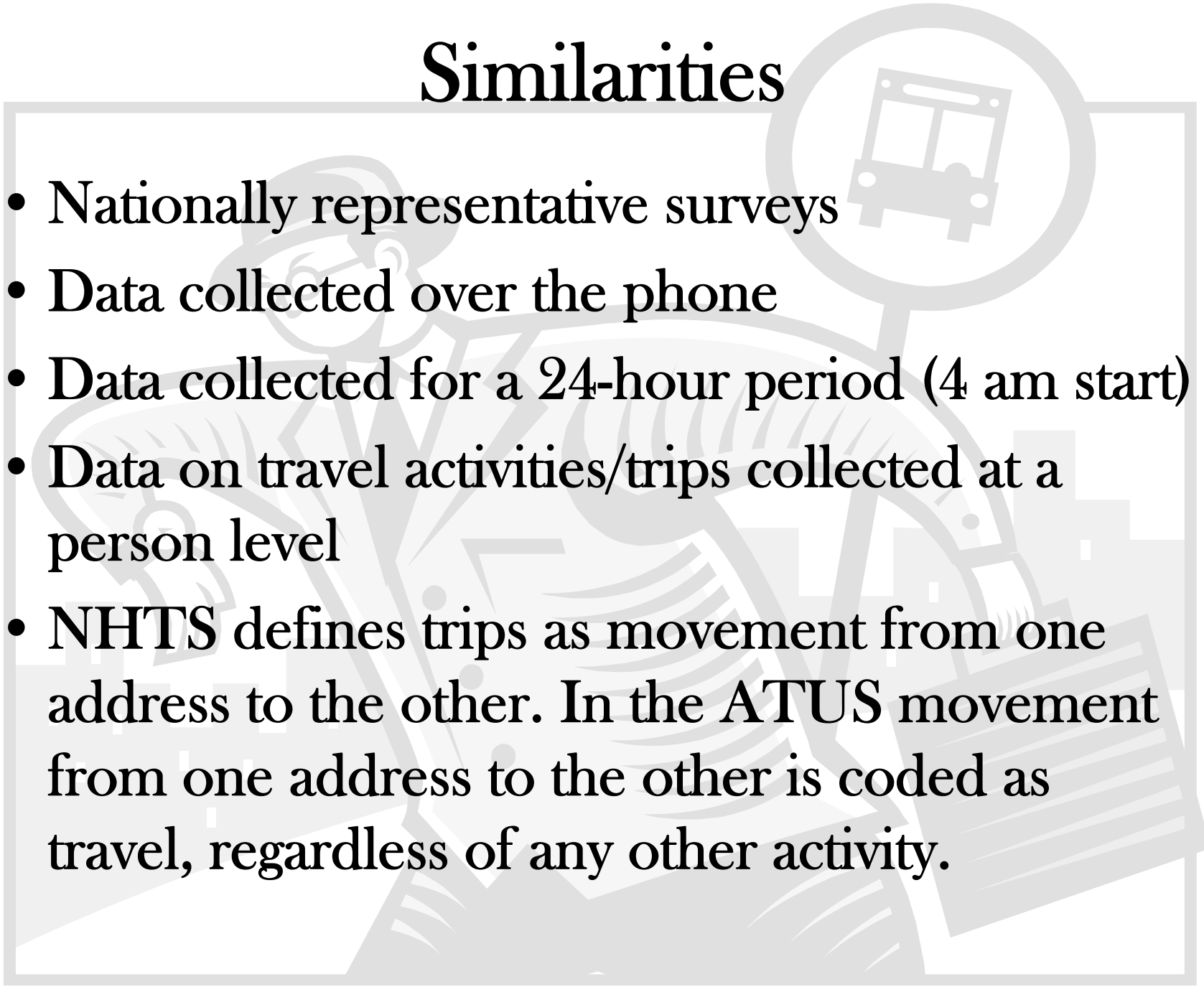
National Household Travel Survey

- Initiated in 1969; conducted every 5-7 years
- Nationally representative RDD survey
- 26K households, 62K persons (including children)
- Data collection March 2001 to April 2002
- Data on household and personal characteristics & daily and long distance trips
- Details such as start and end time, distance, mode, purpose and accompanying persons
- Daily trip defined as movement from one address to another address.

American Time Use Survey

- Continuous survey; 2003 data used
- Nationally representative telephone survey; retired CPS panel
- 21K people 15 years old and above
- Data for one household member
- Data on household and personal characteristics, as well as on all activities
- For each activity data collected on start and end times, detailed nature of activity, who else was part of the activity
- Travel was considered a primary activity.

Similarities



- Nationally representative surveys
- Data collected over the phone
- Data collected for a 24-hour period (4 am start)
- Data on travel activities/trips collected at a person level
- NHTS defines trips as movement from one address to the other. In the ATUS movement from one address to the other is coded as travel, regardless of any other activity.

Differences

- Trip-based (NHTS) vs. activity-based (ATUS)
- NHTS data collected for 2001 compared to 2003 for ATUS
- NHTS allowed proxies; ATUS did not
- NHTS used a travel diary; ATUS used recall
- Assigned reporting day constant in NHTS; could rotate to other weeks in ATUS
- 6-day collection period for the NHTS; 1 day for ATUS
- NHTS collected data for *ALL* household members including children; One person 15+ for ATUS
- More transportation-related details collected for NHTS; more contextual activities in ATUS.

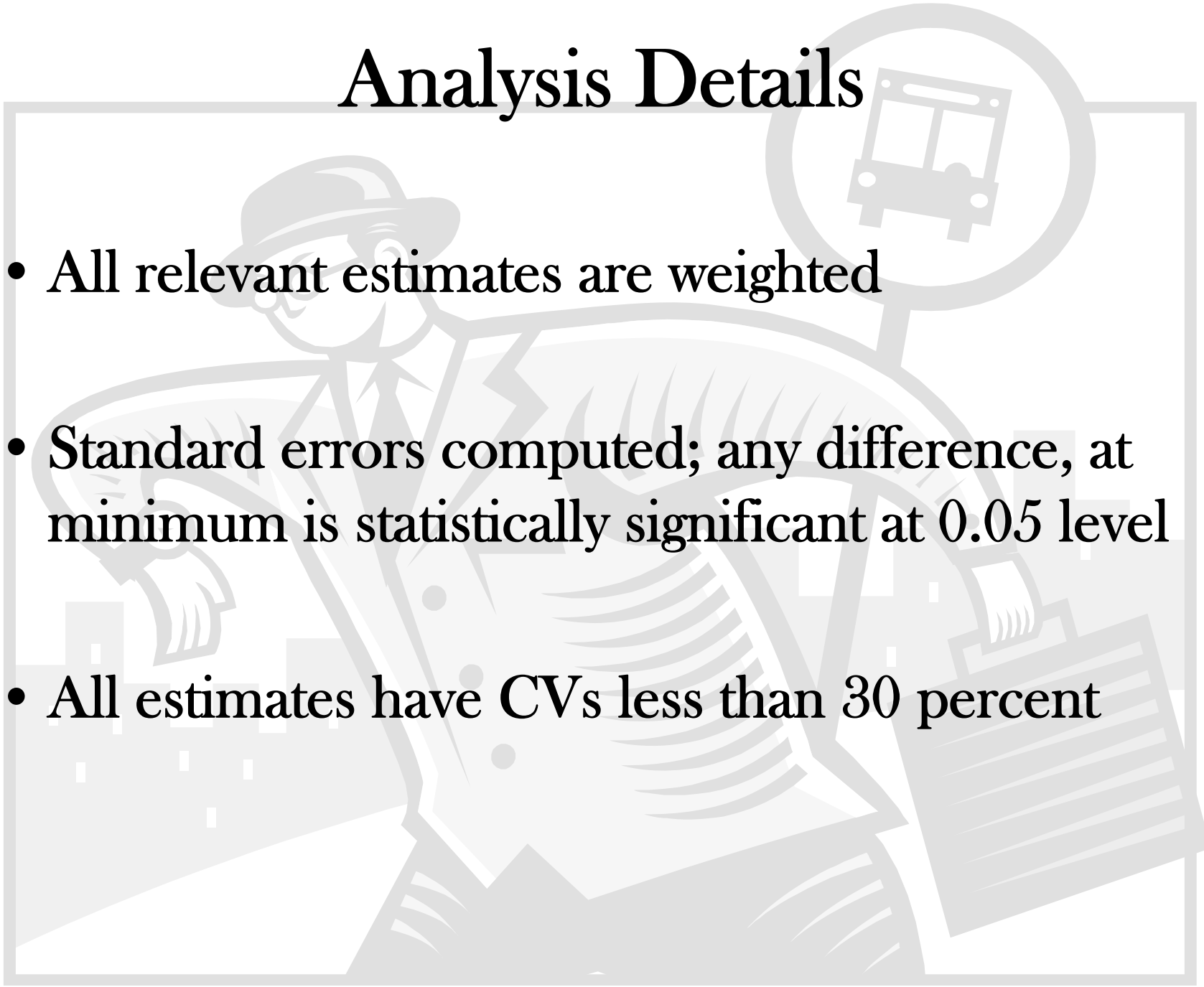
Research Questions

1. Creation of comparable trips
2. Comparing mean minutes spent traveling, total trips taken annually, and percent of persons not taking any trips on a given day
3. For each ATUS 'trip' can we accurately identify a mode of transportation and are these mode categories comparable to the NHTS? If we are able to establish relatively similar mode categories—how do total numbers of annual trips and the distributions of trips by mode differ between the surveys?
4. Similar issue for trip purpose/reason

Research Questions (cont.)

5. Are similar subgroup trends, for demographic characteristics such as sex, age, and worker status, visible for both surveys?
6. Are trip distributions by time of day and day of week comparable across surveys?
7. How do vehicle occupancy rates differ across the surveys?
8. Where differences exist, what are the potential causes for these differences? Do these differences suggest a potential preference in survey design or data collection methodology?

Analysis Details



- All relevant estimates are weighted
- Standard errors computed; any difference, at minimum is statistically significant at 0.05 level
- All estimates have CVs less than 30 percent

Creating Comparable Trips

- Most trips comparable– go from one address to another with no stops. Travel always coded as primary activity in the ATUS.
- Potential sources of differences
  - Travel related activities with no valid mode code, only a place code
  - Transit trips
  - Walking, running and biking trips for exercise/recreation
  - Walking the dog

Mode of Travel Activity

- Most travel activities have a valid mode
- However, for some travel activities, there is no valid mode code; instead they have a ‘place’ code– i.e., where did the activity take place?
- Thus if some one is waiting for the bus or going through drive through banking, they would have a place code even though the activity would be coded as travel related.

Trip

- NHTS the following is one trip: Start at home, walk to bus stop, wait for bus, take bus to stop close to work, walk to work
- In the ATUS, this breaks down into four activities
  - Walk to bus stop
  - Wait for bus
  - Travel to work on bus
  - Walk to work from bus stop
- All four of the activity segments will indicate that it is a travel or travel related activity. All segments except for the second will have a valid mode.

Transit Trip Chaining

- Combined ATUS trips 'chains' that involved transit trips to make it comparable to NHTS.
- Previous example, would become one trip.
- Did not make adjustments for running/walking/biking for exercise
  - Running on tracks vs. running in neighborhood
- Did not make adjustment for dog walking

Total Annual Trips

Source	Trips (in billions)
NHTS	335.3
NHTS (pop. adjusted)	343.4
ATUS (a) - all	354.7
ATUS (b) - excluded place codes	339.5
ATUS (c) – transit trip chained, with place codes	346.0

Other Basic Statistics

Measures	NHTS	ATUS (c)
Mean Trips	4.3	4.2
Mean Minutes (min)	87	78
Homebound (%)	11.4	12.1

ATUS does not show greater number of trips per person or longer travel times.

Possible Reasons

- Use of travel diary in NHTS; specific probe for walk and bike trips
- Reconciliation of trips among household members
- Exclusion of exercise and dog walking trips from ATUS
- Substitution bias in ATUS– people might be more likely to respond when they are less busy
- Lack of other activities to bound trip times

Results- Mode Use

Looking at the top five modes. . .

Mode	NHTS (%)	ATUS (c) (%)
Personal vehicle	88.9	90.8
Walk	7.8	6.7
Bus	1.6	1.4
Train	0.6	0.5
Bicycle	0.5	0.3

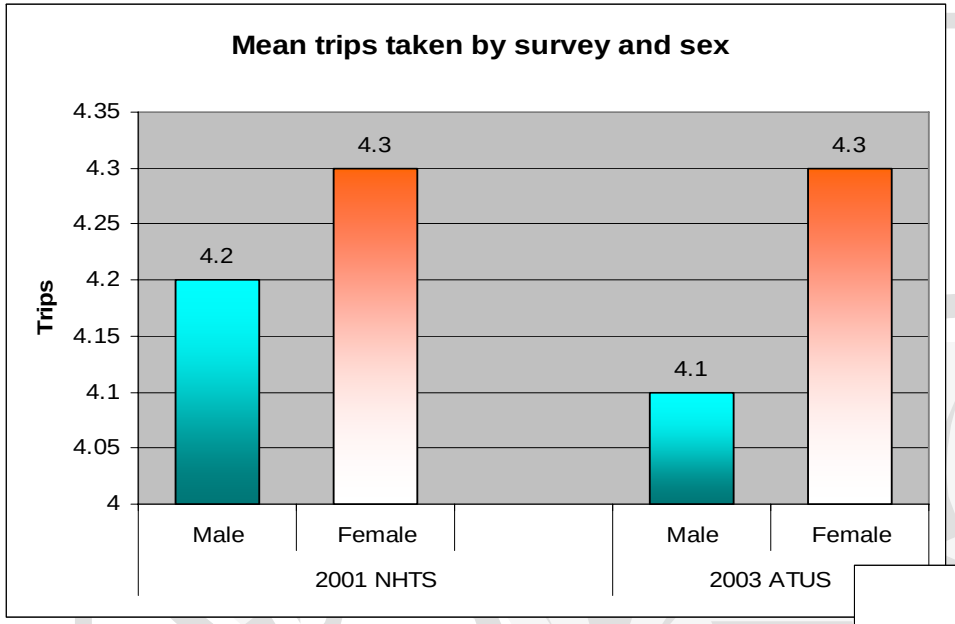
Estimates for each of the modes are significantly different except for bus, though substantive differences are small except for walk.

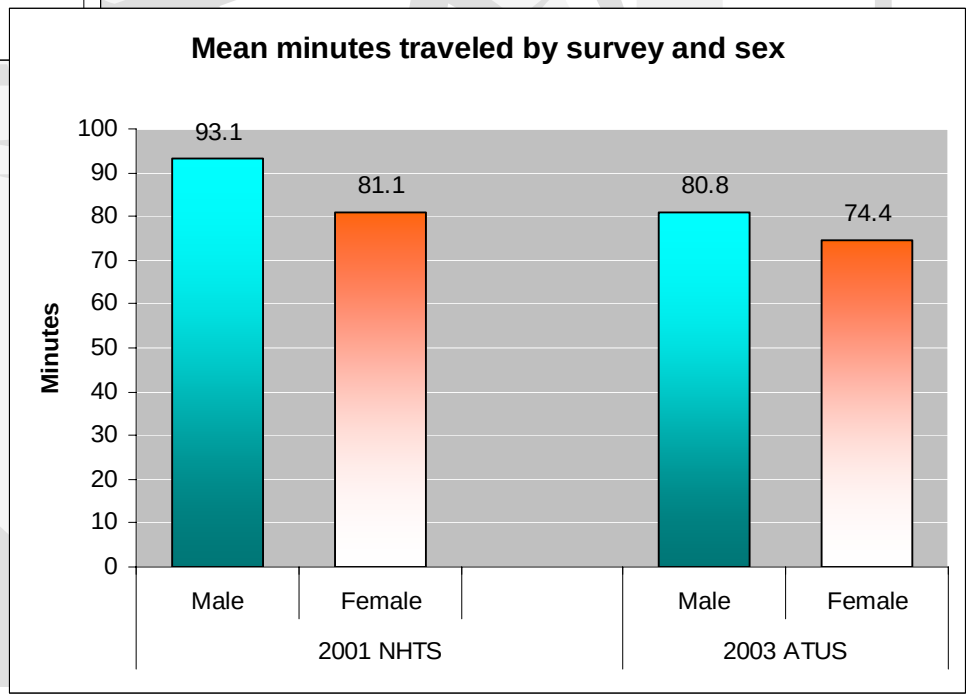
Results- Trip Purpose

Purpose	NHTS (%)	ATUS (c) (%)
Work	20.4	18.5
School/religious activities	5.9	4.9
Caring for others	10.3	15.6
Personal business	35.9	33.2
Social, leisure, exercise	16.3	17.1
Dining	10.4	9.4
Other	0.9	1.4

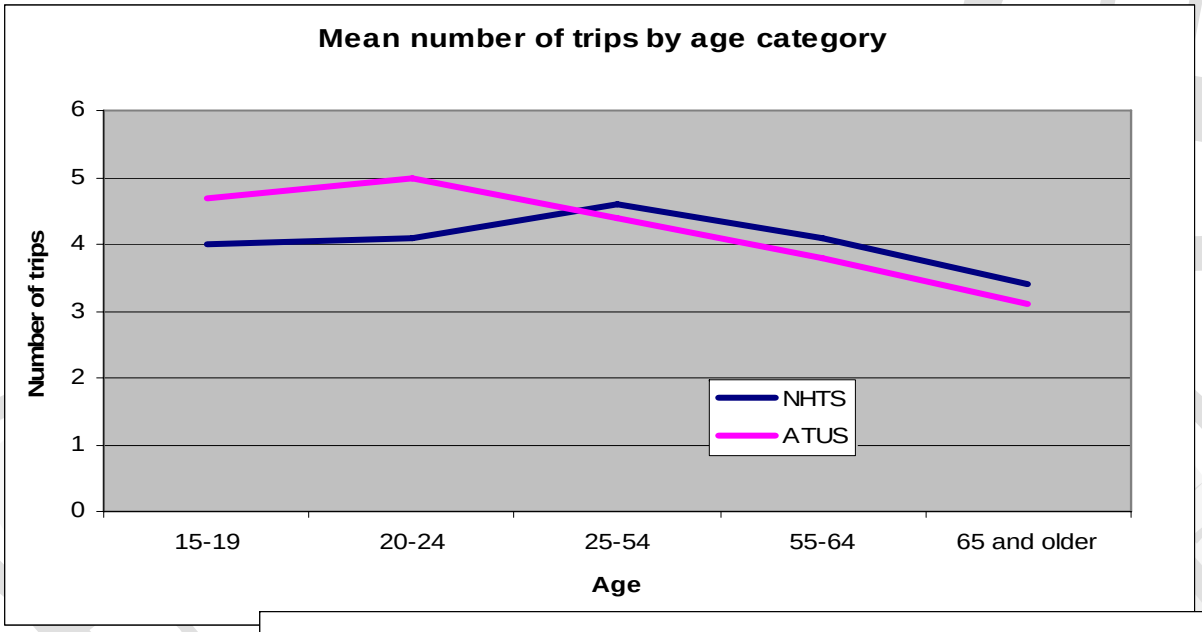
Differences in definitions– especially between caring for others and personal business.

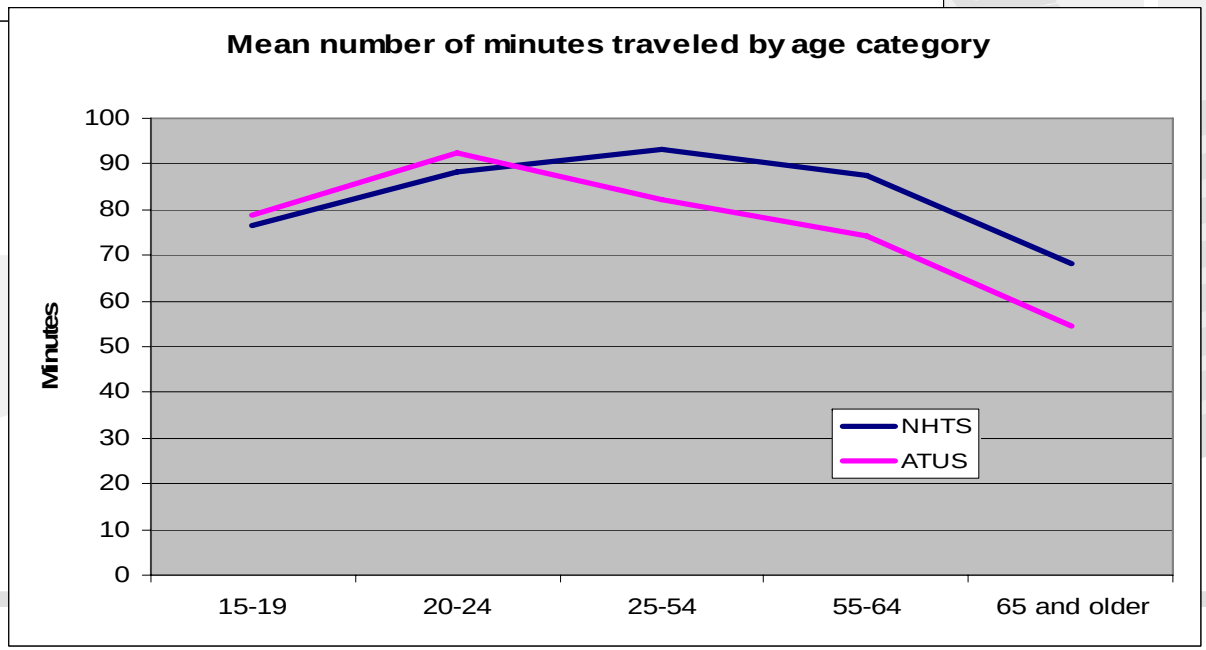
Travel Patterns-- Sex





Travel Patterns-Age

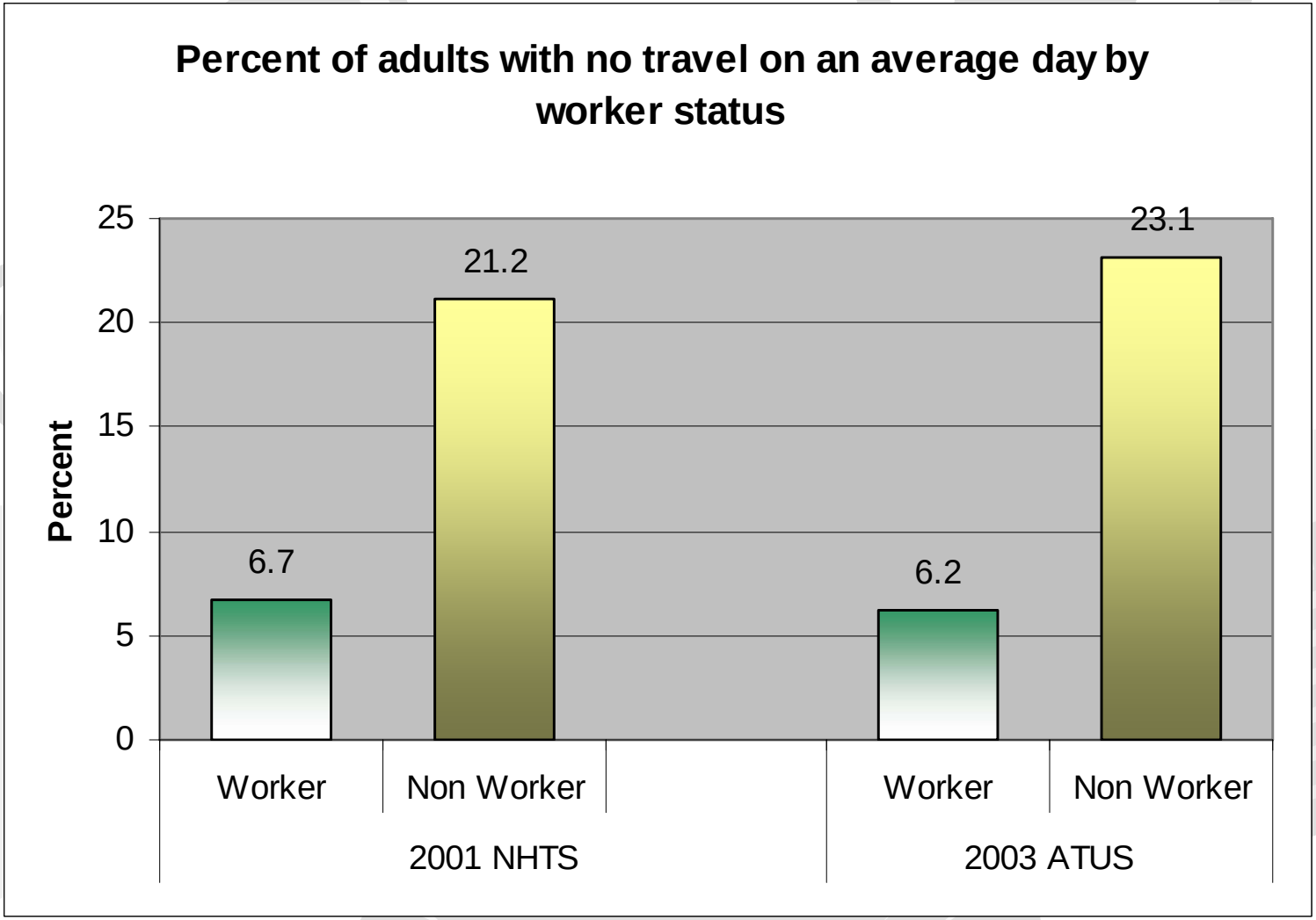




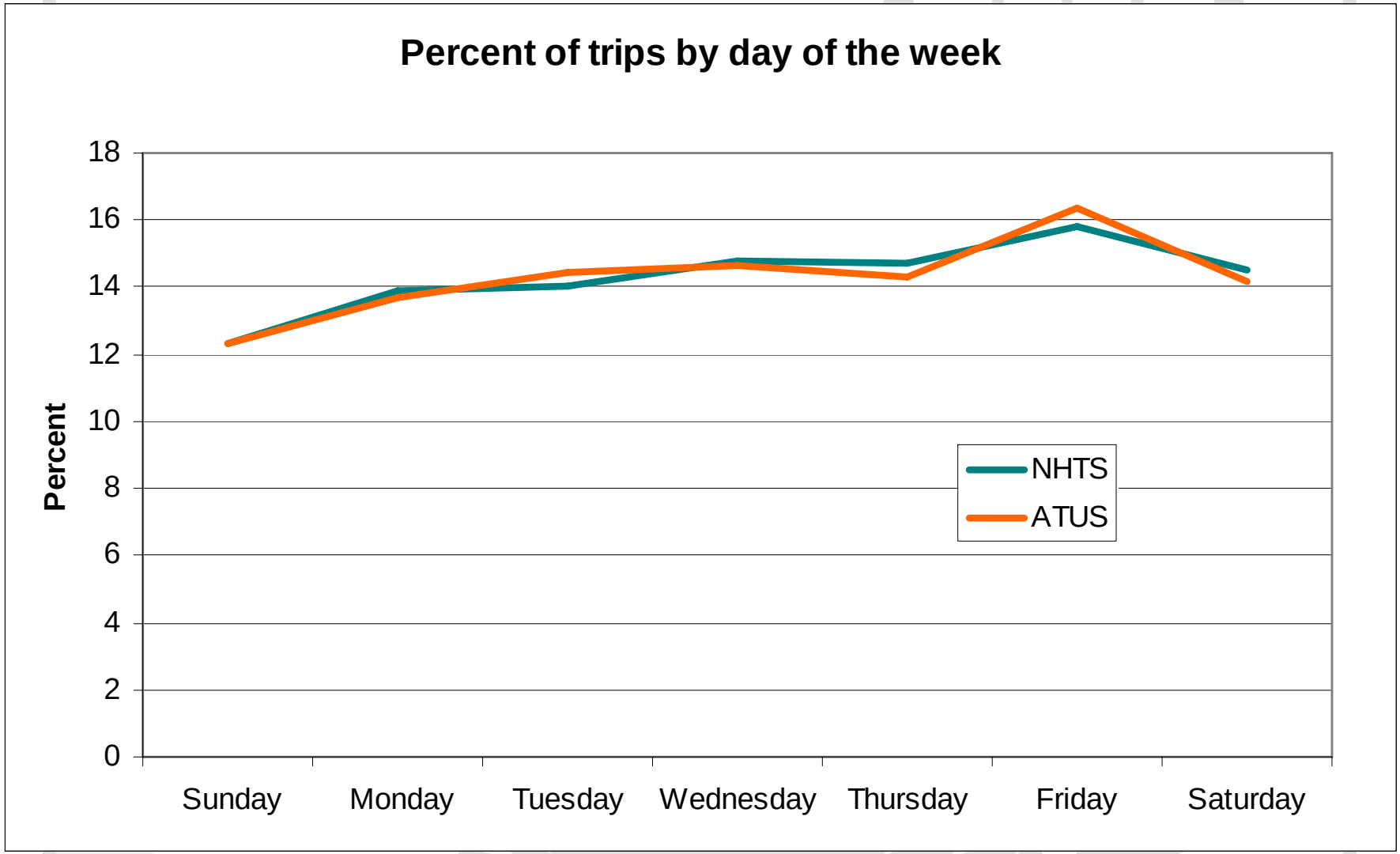
Proxy Effect?

- Proxy respondents tended to have fewer trips reported even when controlling for demographic differences.
- Younger age groups had a higher percent of proxy respondents in the NHTS.
- Did that contribute to a fewer number of trips for those younger in the NHTS?

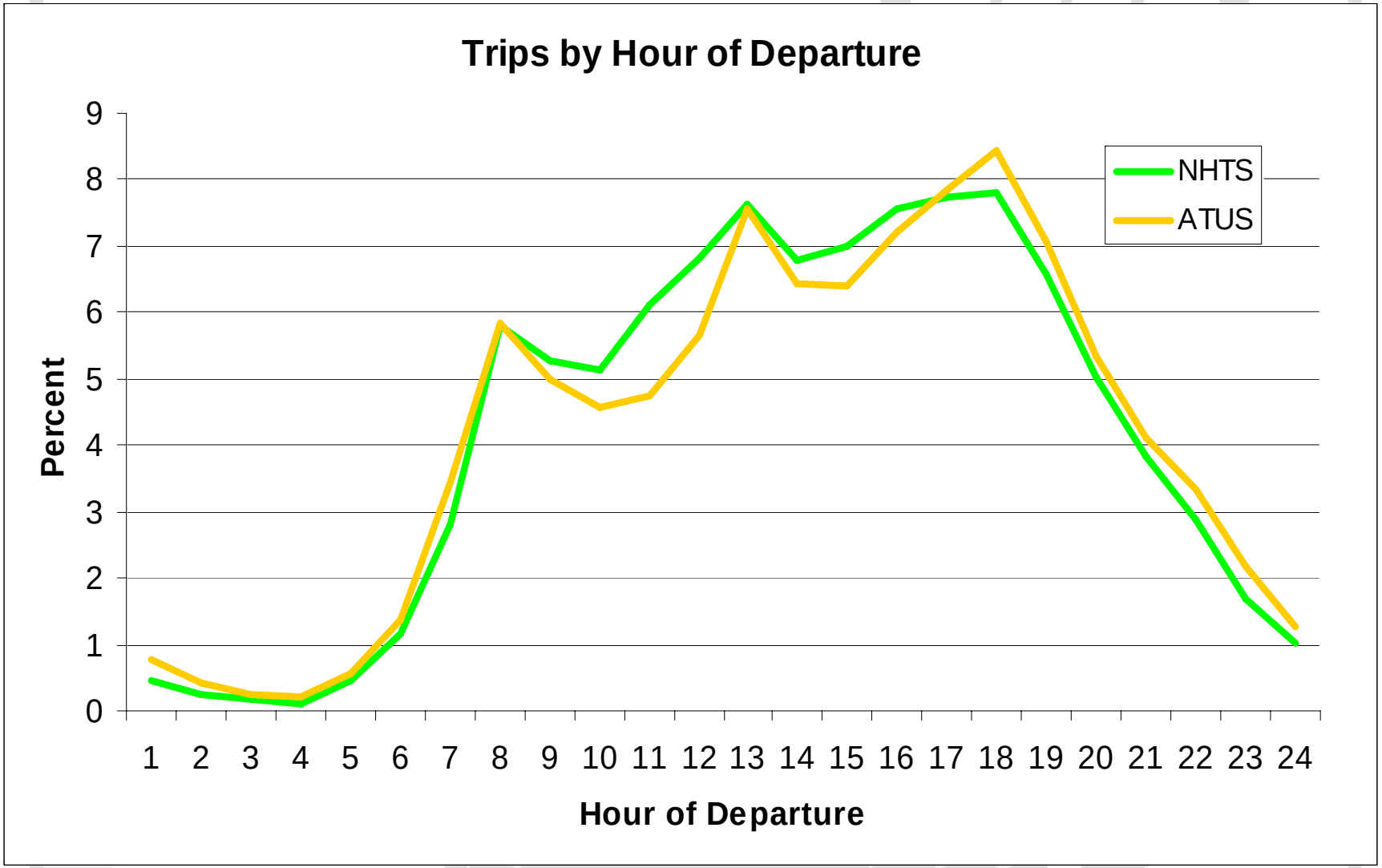
Travel Patterns-Worker Status



Trips by Day of the Week



Trips by Time of Day

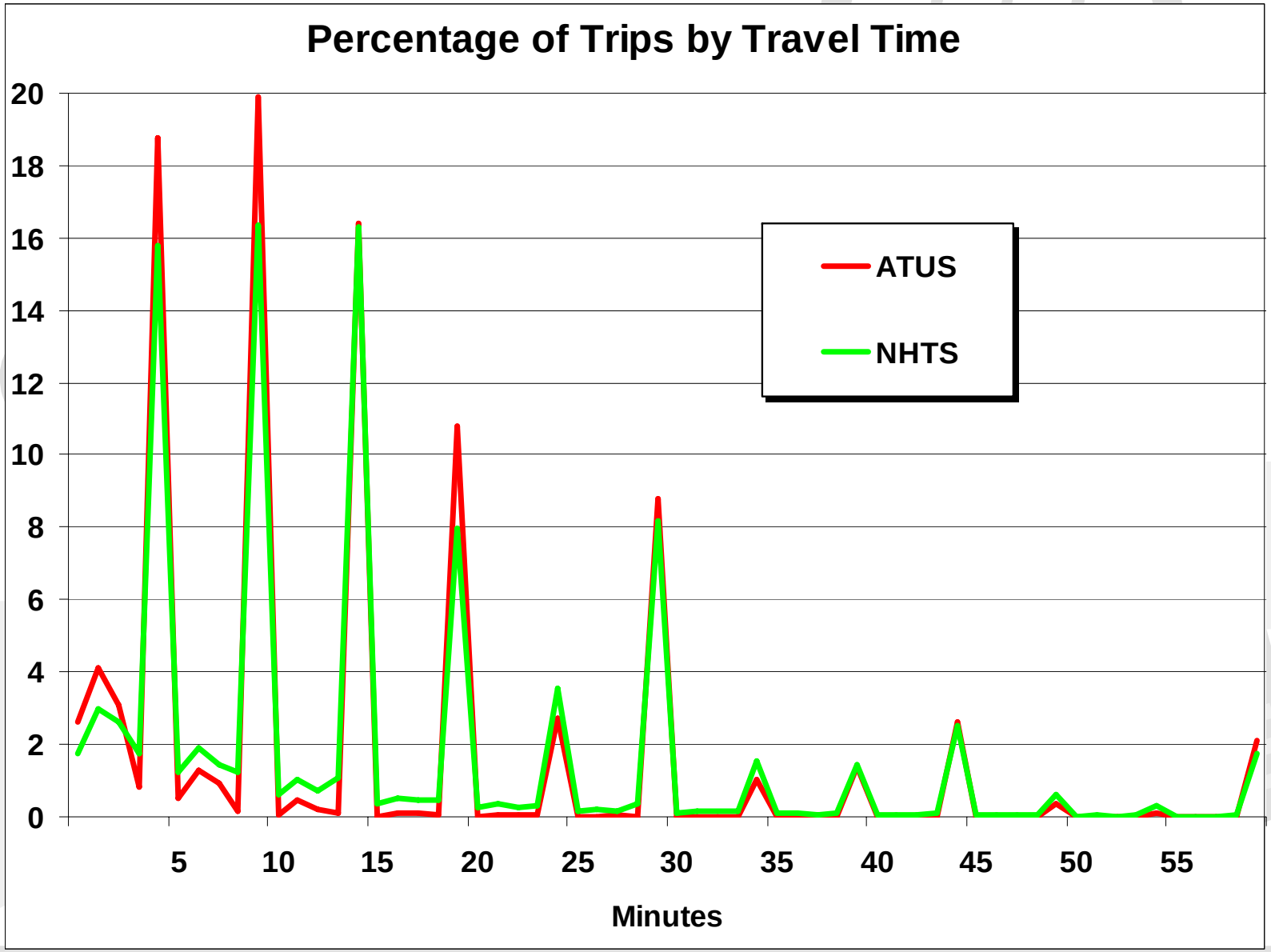


Vehicle Occupancy

	NHTS	ATUS (c)
All	1.8	1.7
Males	1.7	1.6
Females	1.9	1.8

- The NHTS shows higher vehicle occupancies, but both surveys show that women are accompanied by more people when they take trips by car, van, truck, etc.

Activity Duration



Summary of Results

- Unexpected Results
  - Similar number of trips
  - NHTS shows longer travel times
  - ATUS still shows peaks at 5 minute intervals
- Similarities
  - Total number of trips
  - Day of the week and time of day distributions
  - Overall trends for sex, age and worker status
  - Vehicle occupancy rates (substantive difference?)
  - Mode (except walk)
  - Purpose (partially, e.g., work)

Summary of Results (cont.)

- Differences
  - ATUS shows men-women differences (small but consistent w/ research)
  - NHTS-ATUS differences in younger ages (proxy effect?)
  - NHTS shows a greater percent of walk cases
  - Difficult to align NHTS-ATUS for *personal business/caring for others* trip purposes

Unanswered Questions

- Are the differences truly due to proxy effects?
- How do we align trip purposes?
- What do we do with all these cases with only a place code? Transit trip chaining took care of some of the cases, but most of them still remain.
- How do we align walk/run/bike trips for exercise, and trips to walk the dog?
- How are trends impacted if we use data from both surveys?

Conclusions

- Given the differences in methodology these two surveys show closer than expected results.
- However, there are a number of issues that would need to be explained or accounted for before considering these estimates completely comparable.
- Are two separate surveys really needed to measure travel in the U.S.?

Additional NHTS Items

- travel of all household members (desired by many planners and modelers)
- distance traveled (miles)
- travel of persons under 15
- geo-specific data
- vehicle ownership and specifics about each vehicle, including make, model, year, odometer readings, fuel cost and consumption
- larger sample size
- driver status of the respondent
- long distance trips, overnight stops
- detailed mode usage
- explicit, detailed purpose categories
- specifics on commute to work
- attitudinal questions related to transportation issues
- which household vehicle was used for each personal vehicle trip
- occasional transit usage (i.e., transit use in last two weeks).

Benefits of ATUS to NHTS

- Provides valuable source of benchmark data for key travel estimates
- Allows for analysis of methodological & design features
- Provides very rich data set in which to examine travel in the context of other activities and with additional variables
- Since it is a continuous survey, the ATUS can monitor quickly evolving trends & impact of special events on travel
- Possibility for future focused transportation module

Future Research

- Rerun analysis on 2004 ATUS data
- Deconstruct NHTS file (transit trips) and compare to unchained ATUS data
- Further examine walk trips between two surveys; make better informed assumptions about ATUS walk and place code trips
- Analyze relationships between travel and other activities in the ATUS
- Would love to see true experimental design!

Questions?

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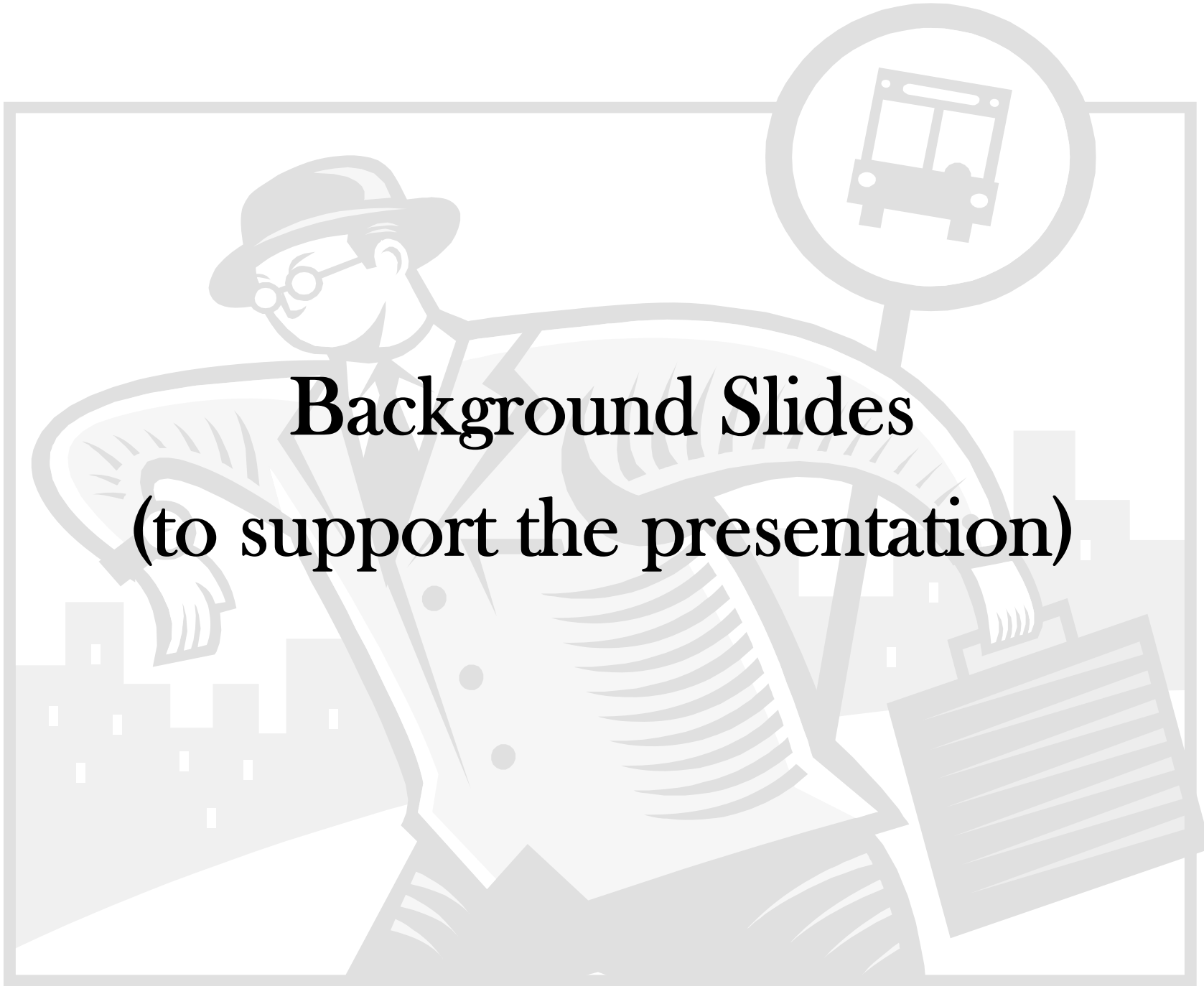
Acknowledgments

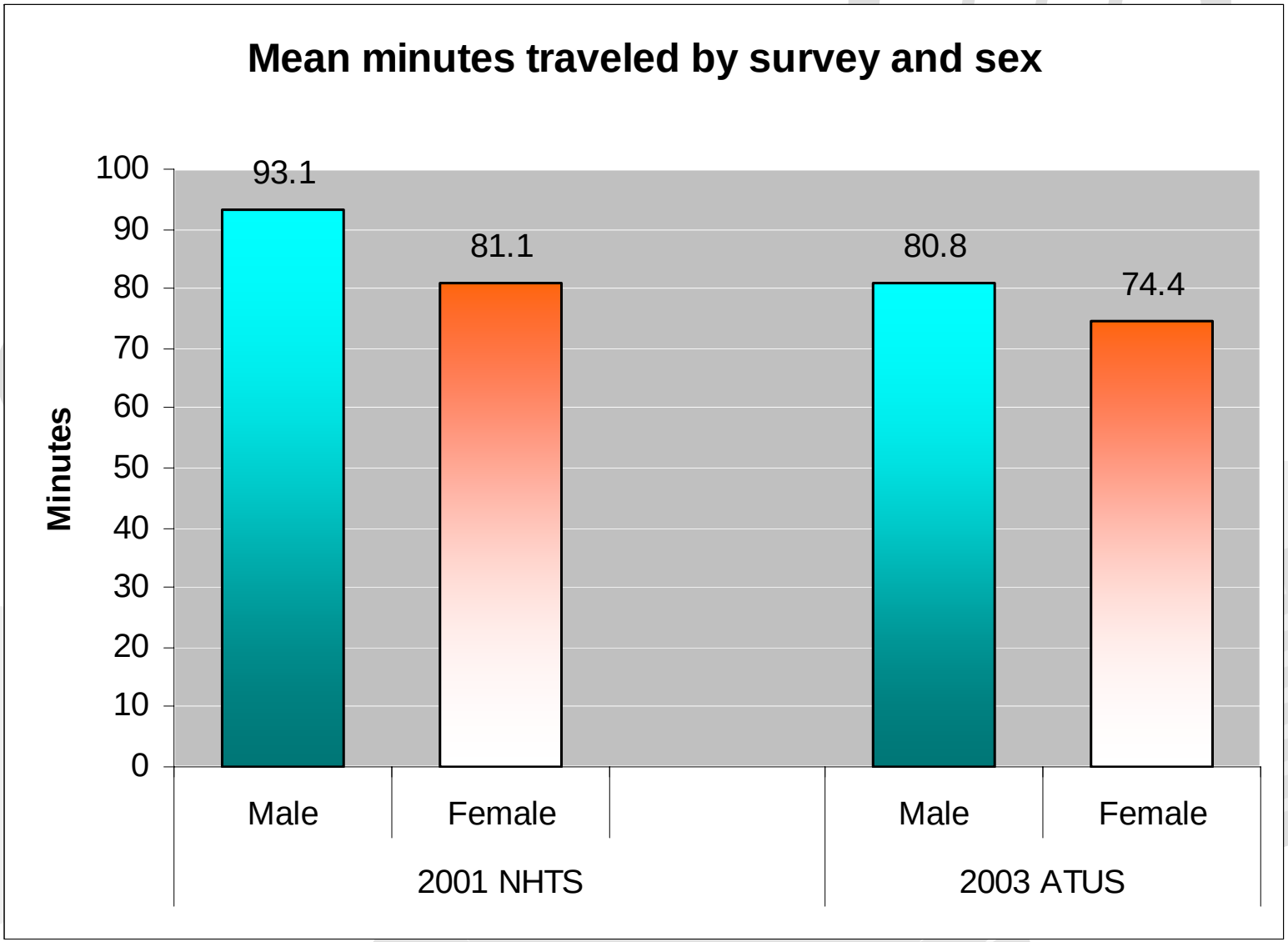


Background Slides
(to support the presentation)

Results- Mode Use

Mode	2001 NHTS (in billions)	2003 ATUS(a) (in billions)	2003 ATUS(b) (in billions)	2003 ATUS[c] (in billions)
Personal vehicle	297.8	303.3	303.3	302.4
Walk	26.2	41.7	26.4	22.2
Bus	5.4	5.3	5.3	4.8
Train	2.1	2.1	2.1	1.8
Bicycle	1.5	0.9	0.9	0.8

Travel Patterns-- Sex



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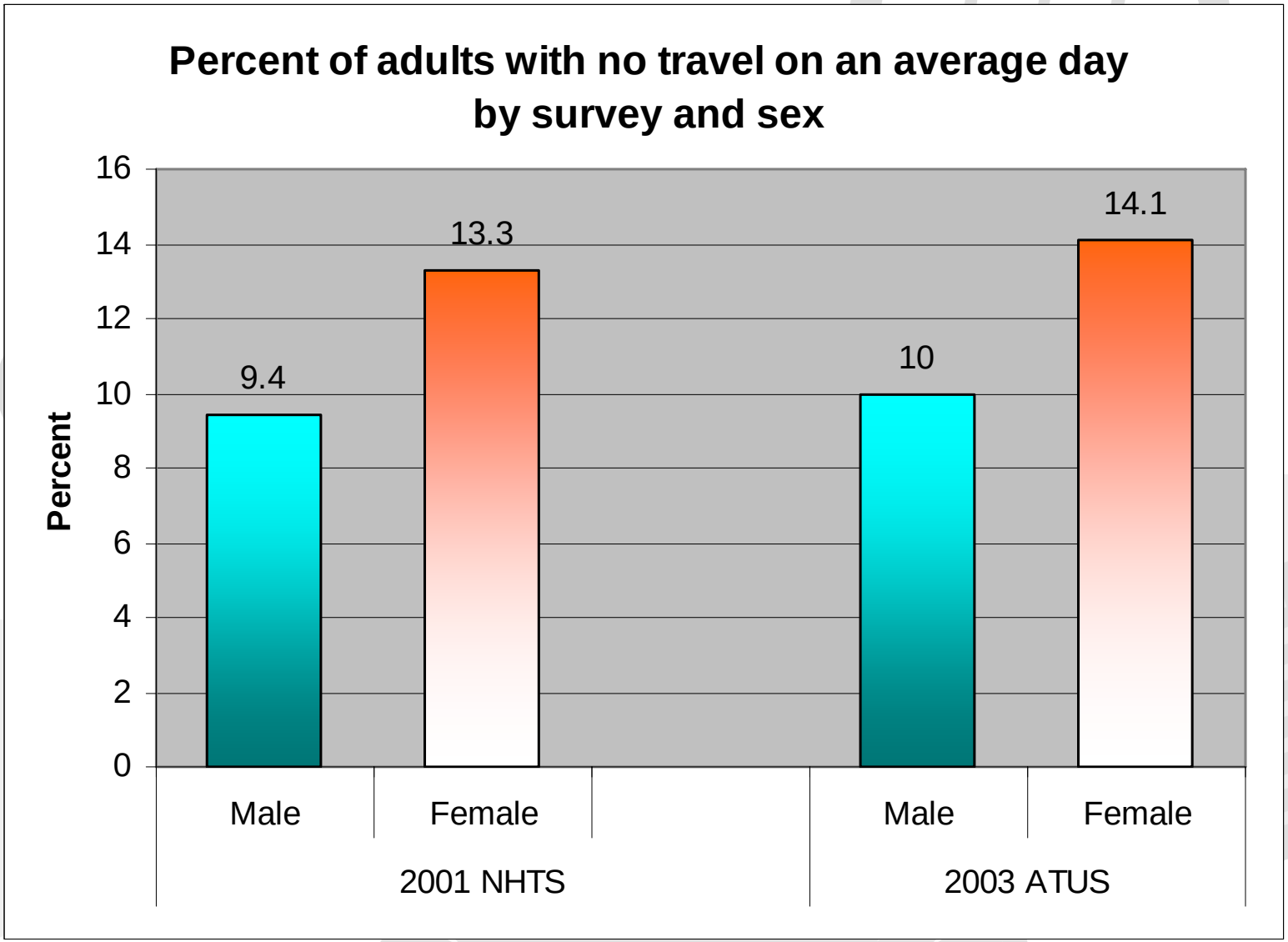

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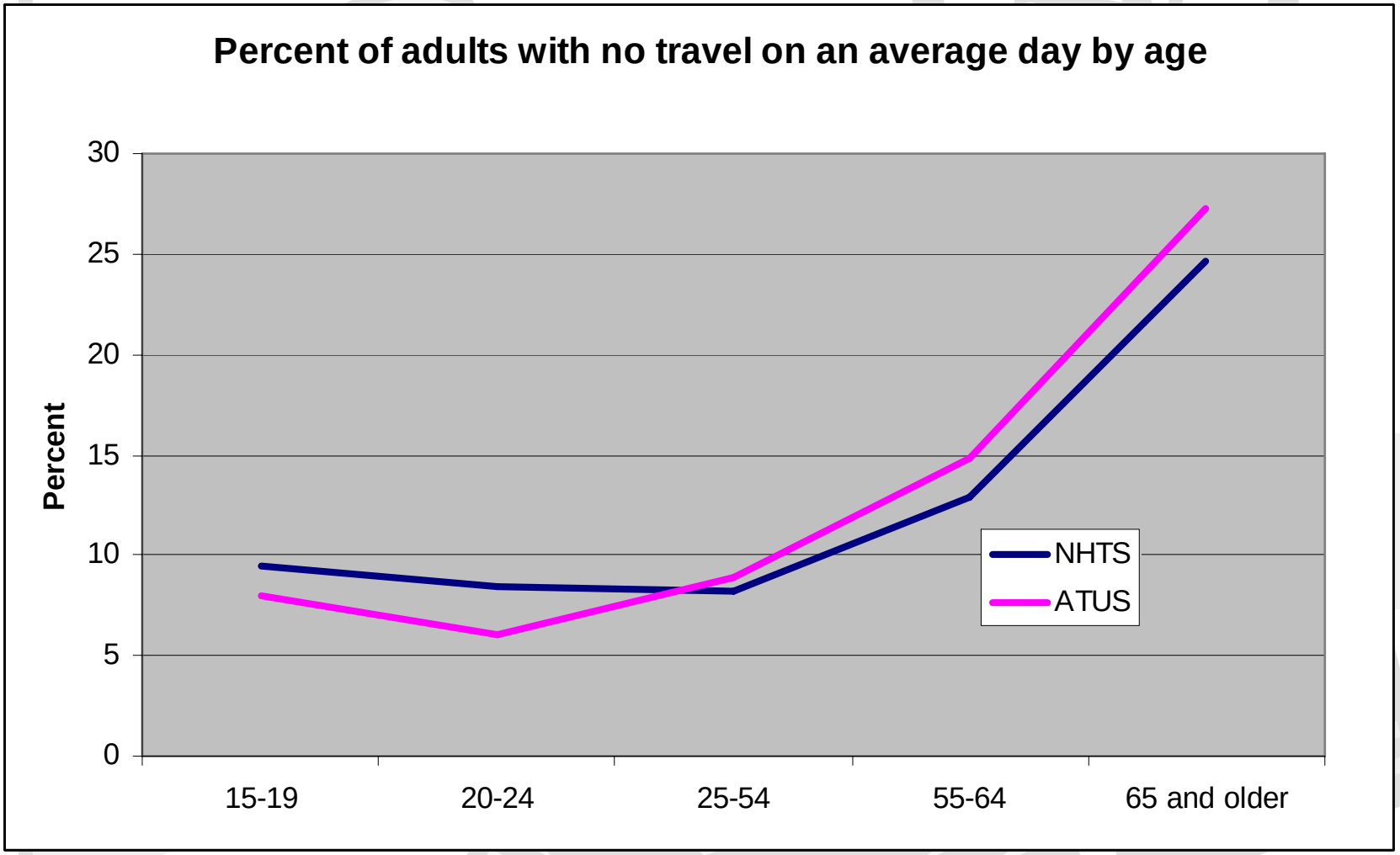
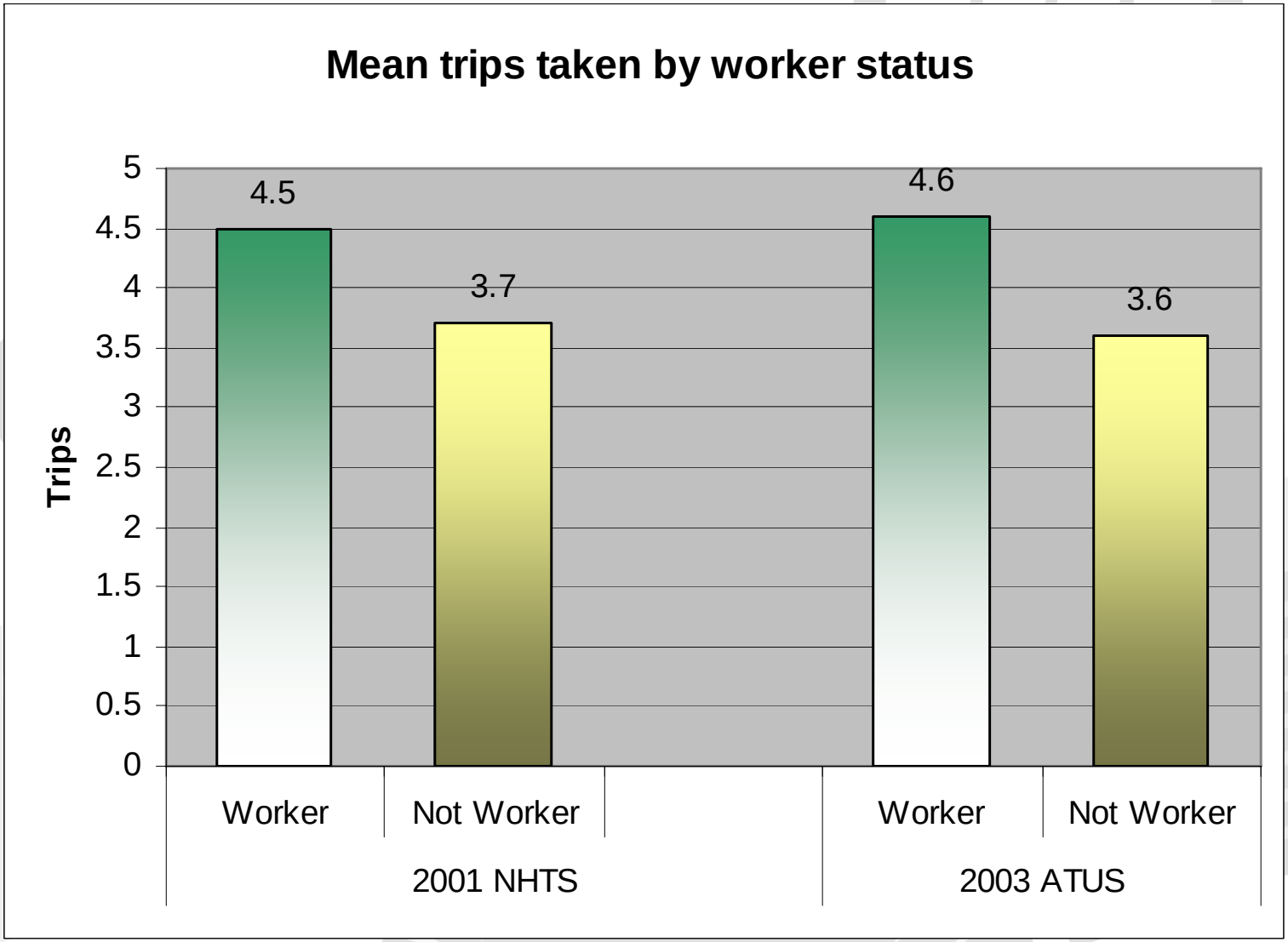


Travel Patterns-Worker Status



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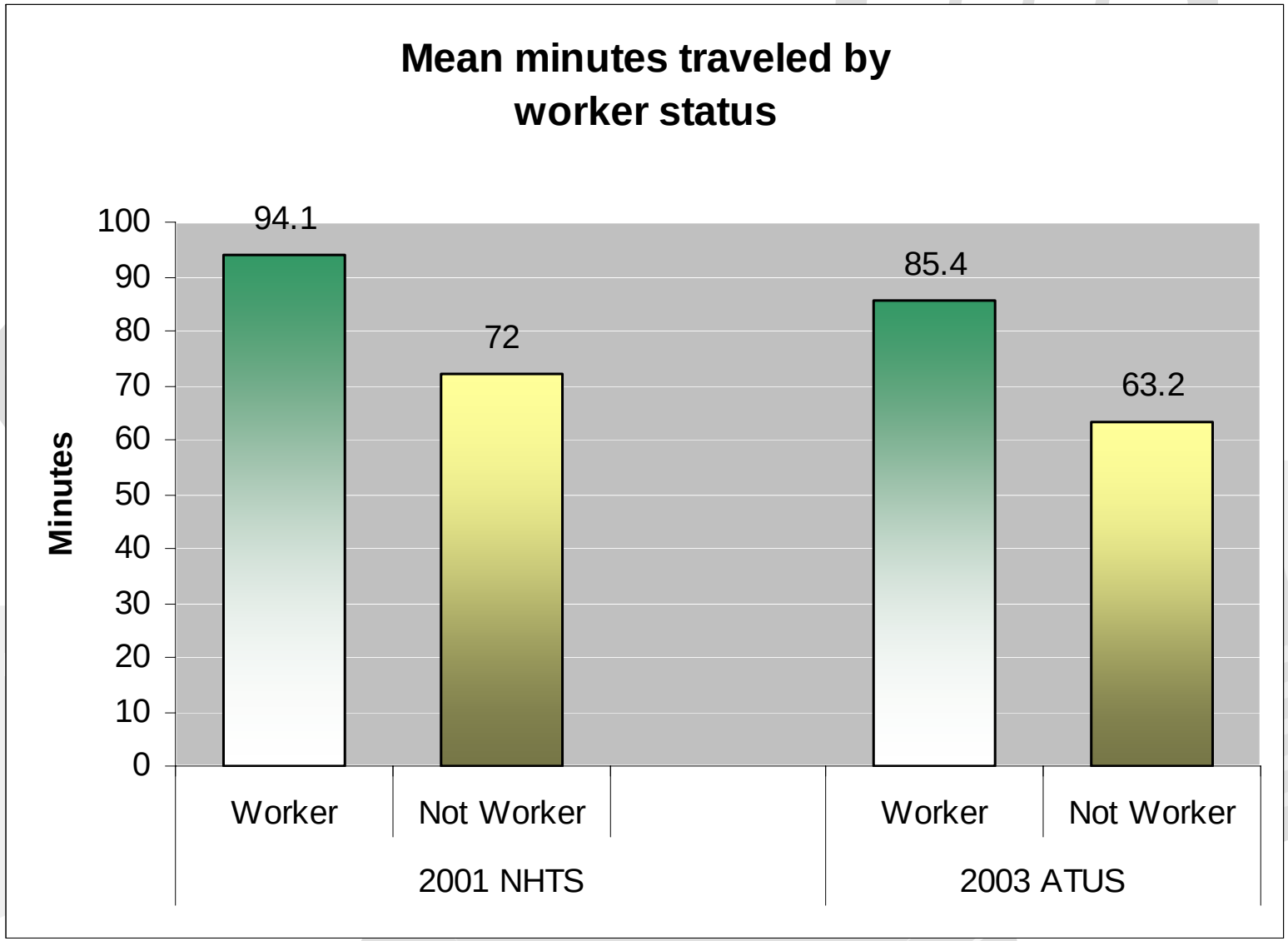

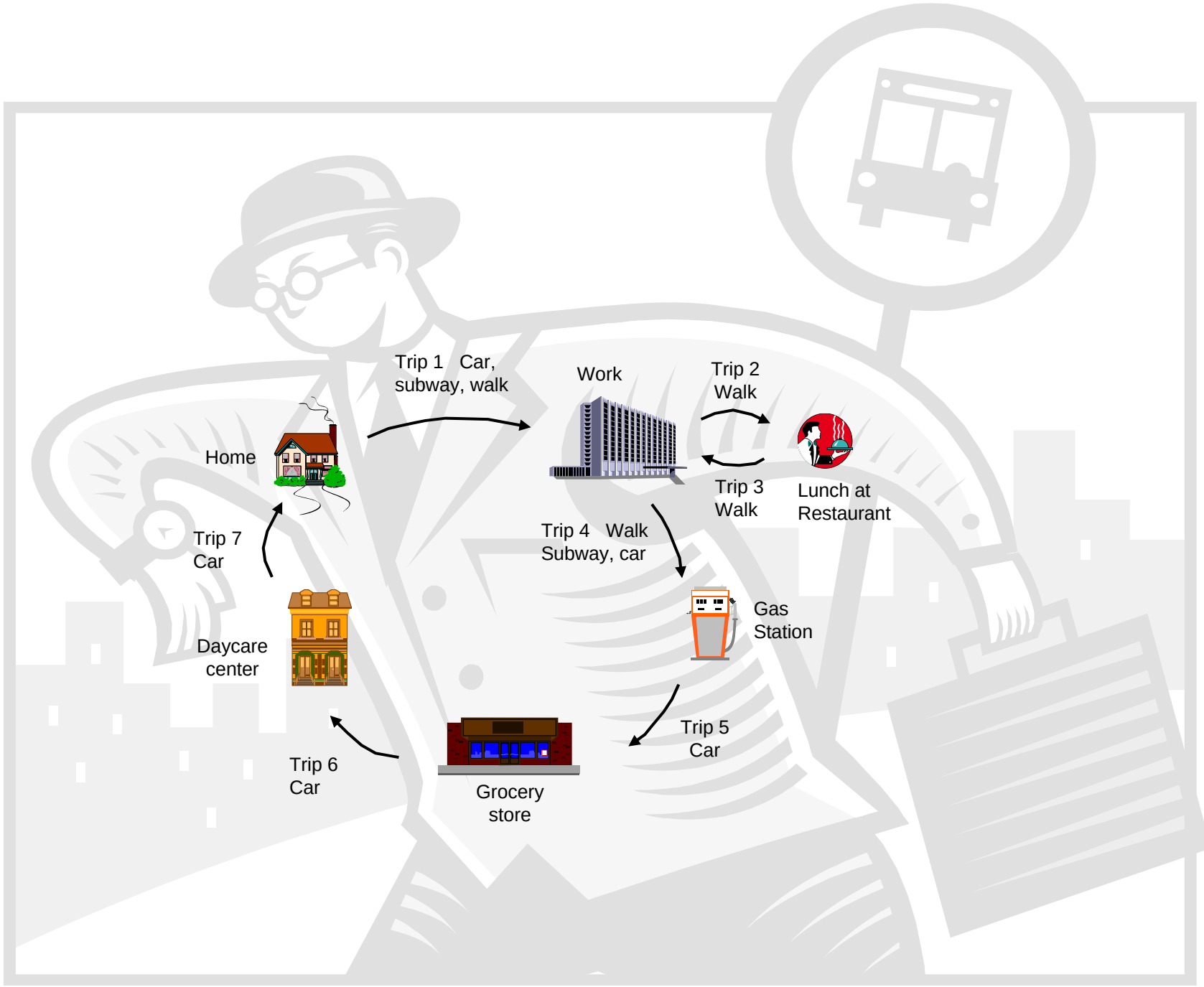
Trip 1 Car, subway, walk
Work
Trip 2 Walk
Trip 3 Walk
Lunch at Restaurant
Home
Trip 4 Walk Subway, car
Trip 7 Car
Gas Station
Daycare center
Trip 5 Car
Trip 6 Car
Grocery store