Using the NHTS to Increase the Mobility of Non-Drivers

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"Web Knowledge and Information Exchange: Discussions on NHTS Data", a TMIP webinar

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Purpose

- The purpose of this presentation is:
  - 1) To show what can be done with NHTS data
  - 2) To show lessons-learned from the usage of NHTS data
- The basis of this information is:
  - Non-Driver analyses performed using NHTS data.

Overview of Usage of NHTS in Non-Driver Analyses

- In its first two non-driver reports—one for elderly non-drivers, one for non-drivers age 18-64—staff used the NHTS to determine and measure those factors which improve non-driver mobility.
  - For example, it is intuitive that urban form affects non-driver mobility; the questions are:
    - "Which aspects of urban form affect non-driver mobility?"
    - "How much do various aspects of urban form affect non-driver mobility?"
  - Quantification of improvements to elderly non-driver mobility was not found in existing research.

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Regression Analysis and Add-on NHTS Records

- Unlike the case for summary statistics, regression analysis accounts for variables independently.
  - For example, summary statistics show that older people travel less, but is the lower travel actually a function of age or is it actually due to some other factor associated with older age (e.g. lower health, different family structure, and tendency to retire)?
  - A regression model shows the contribution which each factor in the model independently contributes to mobility.
- Therefore, because regression treats each variable independently, the entire NHTS database was used,
  - both national sample and add-ons, providing a total 4,230 records for non-drivers age 65+.

Elderly Non-Drivers & NHTS

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Regression Results: Factors Statistically Significant in Elderly Non-Driver Mobility

variable	B	S.E.	Sig.	Exp(B)
diary completed (yes=1, no=0)	1.168	0.073	0.00	3.217
medical condition results in less travel	-0.719	0.075	0.00	0.487
sum of answers to "problem" questions	0.041	0.007	0.00	1.042
number of years over 75	-0.046	0.007	0.00	0.955
firm collecting data (Westat=1, Morpace=0)	0.535	0.085	0.00	1.707
housing units /sq.mi. in census tract, 1,000s	0.023	0.004	0.00	1.023
# of HH members with jobs, other than subject	-0.260	0.049	0.00	0.771
total household income, $1,000s	0.0057	0.002	0.00	1.0057
travel day vs 9-11-01 (before=1, on/after=0)	0.264	0.073	0.00	1.302
gender (male=1, female=0)	0.212	0.084	0.01	1.236
travel day was Saturday	-0.242	0.100	0.02	0.785
medical condition requires special transport	-0.138	0.059	0.02	0.871
constant in binomial logistic equation	-0.807	0.112	0.00	0.446

Notes

"B": coefficient in binomial logistic regression model equation

"S.E.": standard error

"Sig.": Significance, i.e. the probability of incorrectly assuming the subject variable is correlated to the dependent variable

"Exp(B)": eB, indicates impact of variable on odds of leaving home on subject day

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Interpretation of Regression Model Coefficients

- The exponent of each coefficient, "Exp(B)", indicates the variable's **impact on the odds** of getting out of the home on a given day.
- Bottom Line: The regression of NHTS data **measures the independent impact** of each variable, all other things being equal.

Data Issues - Density

- A problem was found in **density variable** HTEEMPDN:
  - the NHTS variable list reads: “Jobs per sq mile” but the data is actually “Workers Residing per sq mile”.

Data Issues - Public Use

- Some privacy-restricted data has been eliminated from the "Public Use" database available on NHTS website.
  - The "DOT File", a **more complete data set**, is available from FHWA upon signing a privacy statement.
    - For example, actual densities are shown (as opposed to ranges).

Data Issues - Firm Collecting Data

- Note the impact of "firm collecting data" on mobility results.
  - All other factors found significant in predicting the mobility of elderly non-drivers being equal, the odds of one firm recording one or more trips for the subject person are **70% higher** than the odds of the other firm.*
  - Note: firms operated under different completion rules
  - Again, regression may mitigate this problem.

*Exp(B)=1.707

Data Issues - Survey Date

- Note the importance of the "survey date":
  - Less travel taking place (or being reported) after **9-11-01 attack**.
  - Regression may mitigate this problem.

Useful Finding for NHTS Regression Model

- Higher **density** indicates higher mobility for elderly non-drivers, and that increase is measurable:
  - The odds of leaving home increase 2% for each 1,000 increase in housing units / sq mi.*
  - This small amount indicates that perhaps something related to density is the **actual factor** which increases mobility in denser areas.

* Exp(B)=1.023

Non-Drivers Age 18-64 & NHTS

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Regression Results: Factors Statistically Significant in 18-64 Non-Driver Mobility

Variable	Meaning	Range of Values	Sig. (2)	Exp[B] (3)
Diarycmp_1	Travel diary completed	0,1	0.000	3.23
Dtspeed_m	Drivers speeding considered a problem	1-5	0.000	1.26
Educ_x	Education level	0-8	0.015	1.06
Hbh_uc	Home in a population "center"	0,1	0.000	1.41
Hbhtnrnt_m	Portion renter occupied, by tract	0.00-1.00	0.003	1.60
Hhc_4472	LA-Riverside-O.C. MSA/CMSA	0,1	0.016	1.97
Hhr_race01	Household respondent race is White	0,1	0.009	0.81
lif_cyc07	One adult, youngest child 16-21	0,1	0.015	2.17
lif_cyc09	One adult, retired, no children	0,1	0.021	0.70
Medcond6t5	Med. cond., travel difficult, not lifelong	0,1	0.000	0.46
Msacat_2	MSA of 1million or more, no rail	0,1	0.001	0.74
Proxy_no	Travel day info from respondent	0,1	0.000	1.61
R_age50p	Age 50-64	0,1	0.013	0.81
R_relat6	Subject is "Other Relative" of HH resp. (1)	0,1	0.002	0.60
R_sex_male	Male	0,1	0.004	1.25
Smp_westat	Survey completed by Westat	0,1	0.000	2.13
Trav_wkend	Travel day was on weekend	0,1	0.000	0.75
Webacc1	Access to internet	0,1	0.002	1.29
Wherborn01	Born in US Territories	0,1	0.001	0.44
Wrk_oth_y	Worker in house other than self	0,1	0.003	0.79
Constant	n.a.	n.a.	0.000	0.38

Notes

(1) Subject is a relative of household respondent, but not a spouse, child, parent, or sibling.

(2) "Sig.": Significance, i.e. the probably of being incorrect when assuming the subject variable is correlated to the dependent variable.
(The lower the "sig." number, the more certain the correlation.)

(3) "Exp[B]": e^B, where B is the coefficient of the subject variable in the logistic regression equation; measures variable's impact on the odds of "getting out".

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Useful Finding from NHTS Regression Model

- 18-64 Non-Drivers living in **central areas** have 40% higher odds of leaving home than those living elsewhere.*

*Exp(B)=1.41

"Area Type" Meaning in NHTS Data

- Claritas, a company contracted by the federal government to work on the NHTS project, divided the US into 900,000 squares (called "grids"), each approximately 4 sq. mi. in area.
  - Each grid was classified according to **five Area Types**.

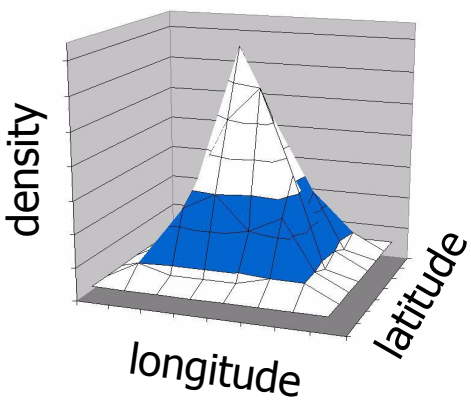
Land-use Types

- Centiles of US population, by Claritas
  - O%-20% "Low Density"
  - 20%-40% "Med/Low Density"
  - 40%-100% "Med-to-High Density"
    - "Central Areas"
    - "Surrounding Areas"

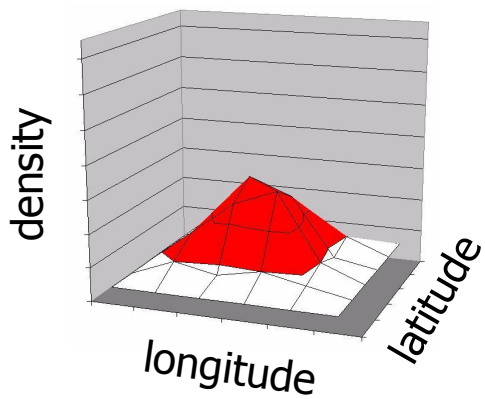
– "Central areas" have density higher than the areas around them.

– "Surrounding areas" have density lower than areas which they surround.

Surrounding Area vs. Central Area



"Surrounding Area"



"Central Area"

Five Area Types

Claritas' combination of the three density classes and the two relational natures resulted in the following five area types:

Area Type	NHTS Label
Low Density	Rural
Medium/Low Density	Town
Surrounding Area with Medium-to-High Density	Suburban
Central Area with Medium Density	Second City
Central Area with High Density	Urban

Note: NHTS variables for area type: "HBHUR" & "HTHUR"

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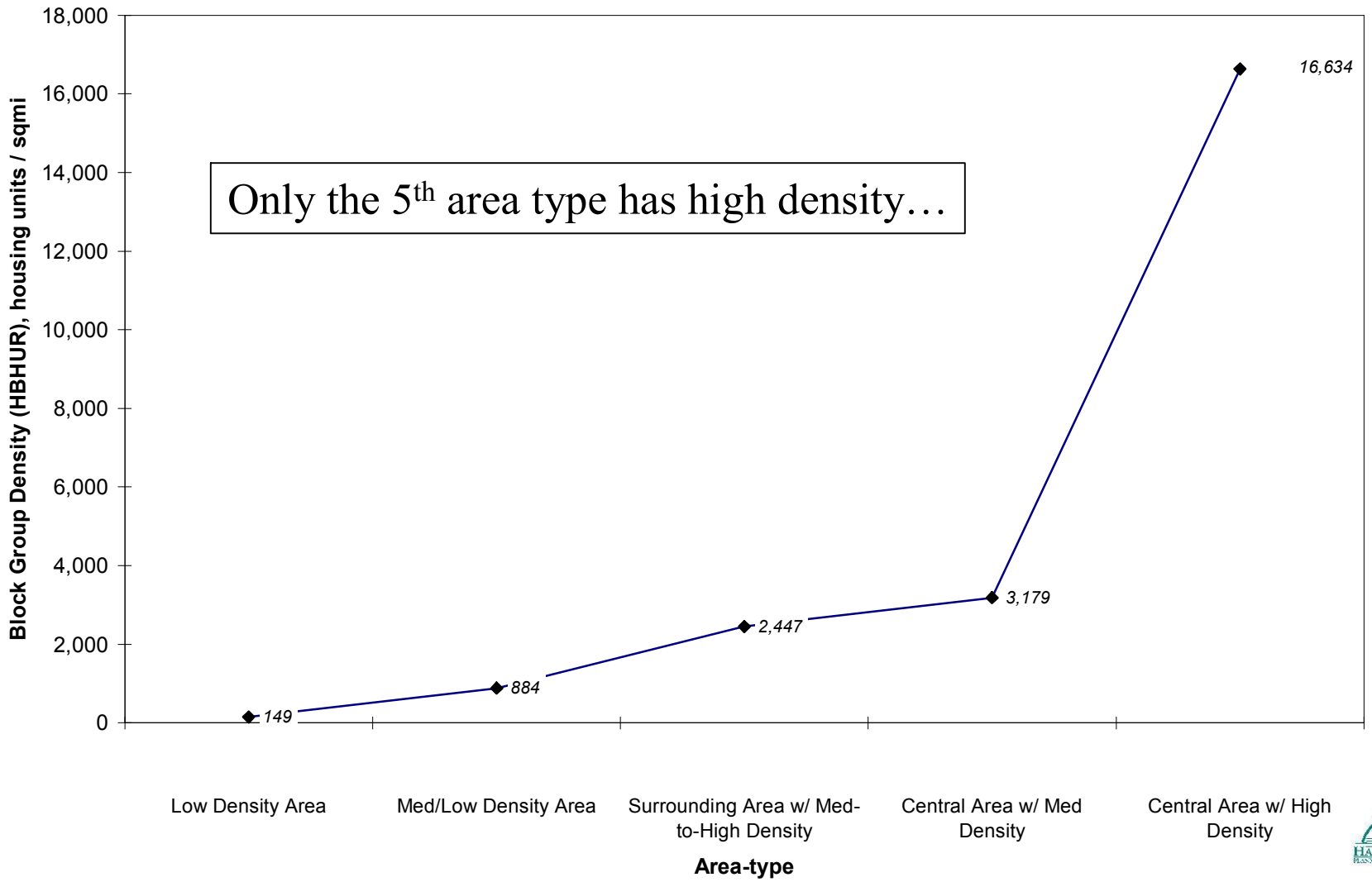
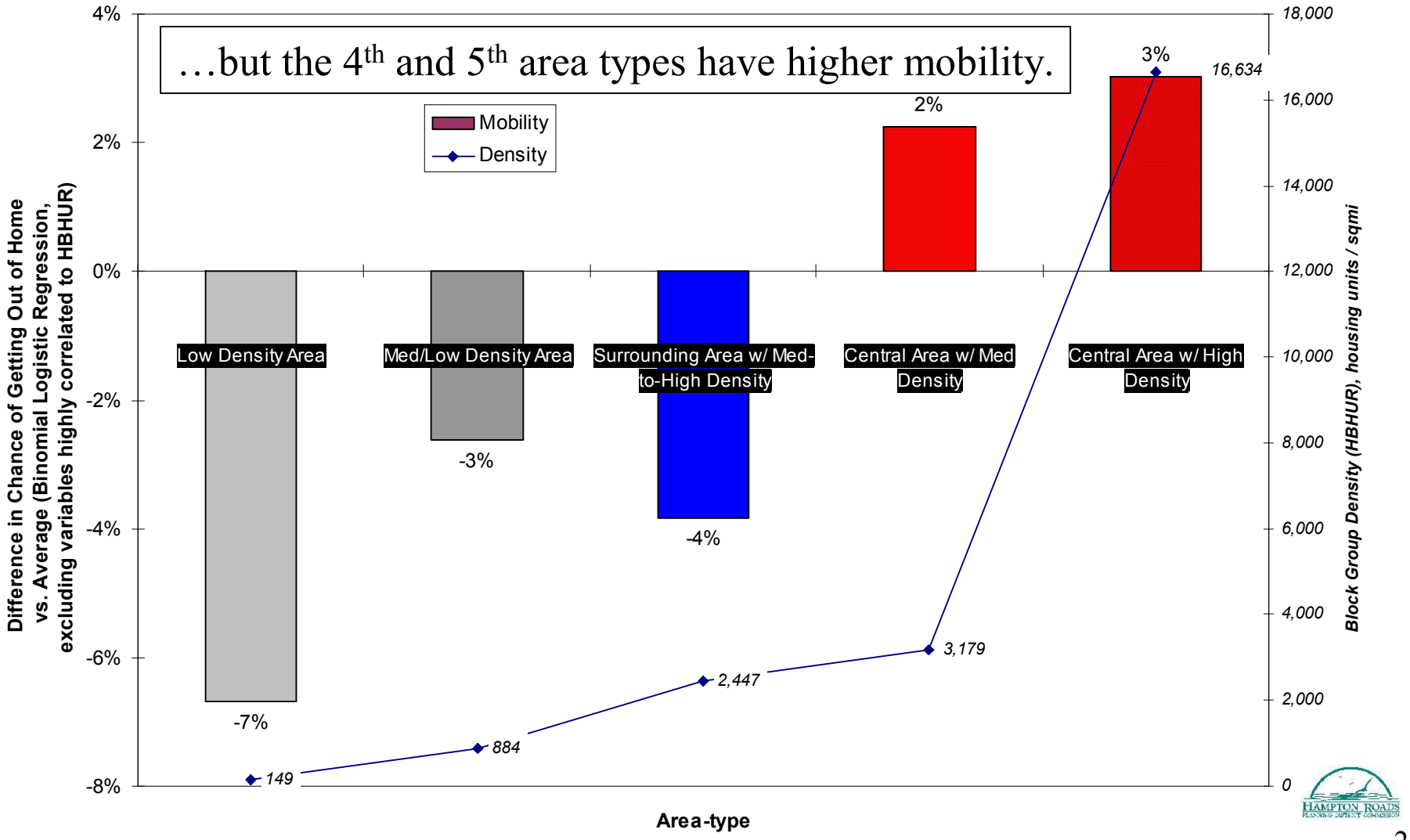
Density, by Area-Type

18-64 Non-Drivers, NHTS, Full Data Set, 2001



Mobility vs. Area Type

Area Type vs Getting Out of Home, 18-64 Non-Drivers, NHTS, Full Data Set, 2001



Useful Finding - Refined

- Based on previous chart, mobility is related to **both density and centrality**
  - "Area Type" data (which reflects both density and centrality) is **more useful** than density alone.

Limitations of 2001 NHTS Data

- Analysis of NHTS data indicates that:
  - Density and centrality are **related to** higher non-driver mobility
- But, neither density nor centrality (both of which are based on the number of residences per area) actually **cause** higher mobility.
  - The actual cause of higher mobility are factors which are sometimes associated with density and centrality:
    - **proximity to destinations** (e.g. businesses) and **proximity to public transit**.
- Note: Although the 2001 data set used for the research **did not include** proximity to transit, 2001 NHTS proximity to transit data does exist.
- Problem: Because the **2001 NHTS did not measure** proximity to destinations, the NHTS could not be used to measure the mobility impact of that factor.

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Conclusions

- Regression of NHTS data provides valuable understanding of ways to increase non-driver mobility
- The next NHTS will be more valuable than the 2001 NHTS if it measures **proximity to destinations**
  - Proximity to destinations could be approximated if the **density of retail and non-retail jobs** within the vicinity of the surveyed home were provided in NHTS records
    - Data might come from journey-to-work census data

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