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Consider the Nonadopter

A Prediction Model of Household-Level Broadband Access

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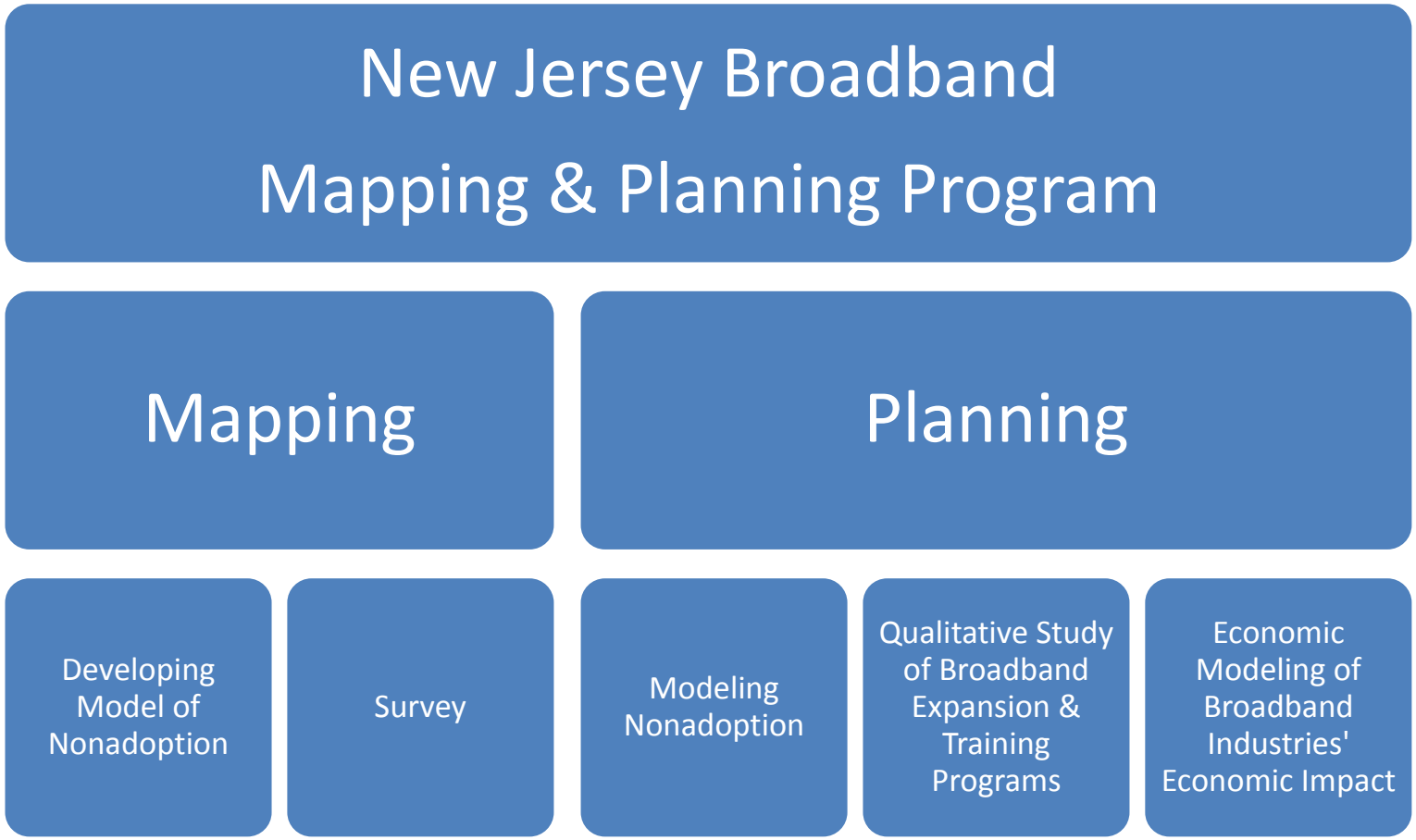
Project Map



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Abstract

In March 2010, the Federal Communications Commission made the establishment and user-adoption of a high-speed internet infrastructure a national policy priority, much in the same way in the mid-20th century the establishment and user-adoption of household-level wired telephone service was a national policy priority.

A vital part of that effort is promoting the adoption of household-level high-speed broadband internet access. To facilitate full adoption, research has mostly focused on user adoption and usage propensities. We, however, focus on the nonadopter as the more interesting source of information about how to achieve the goal of promoting full national adoption of household-level broadband internet.

The purpose of this paper is to develop a prediction model for determining the conditions under which a New Jersey household is more or less likely to adopt household-level broadband internet access. Follow-on papers will deploy the model to develop best practices configurations of demographic and structural factors to better facilitate the efficient design and implementation of state-sponsored initiatives and private-sector commercial programs to expand broadband access throughout New Jersey.

We introduce and rely on data we collected from 3,101 New Jersey households under the National Telecommunications and Information Administration's nationwide Broadband Mapping and Planning Program. Of our 3,101 households, we have an oversample of 1,241 nonadopters, complemented with 1,860 adopter households.

To capitalize on those survey data, we develop a two-phase prediction model of household-level broadband nonadoption. We model the predictions as a latent variable representing the responding household's propensity to adopt (or not adopt) high-speed broadband internet access.

This prediction model helps us know and confirm which types of households are likely to not have broadband access and why. By analyzing the distribution of those predictions across the characteristics of a large sample of nonadopters, we can generate findings that facilitate the efficient implementation of policies to expand broadband access.

Key Words: modeling survey data, model, broadband, internet, digital divide

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Sampling

Total *N*: 3,100	**Landline:**	**Cellular:**	**Total:**
Adopters:	1,395 (45% of total N)	465 (15%)	1,860 (60%)
Non-Adopters:	465 cross-section (15%) 775 stratified oversample (25%) 1,240 (40%)	0	1,240 (40%)
Total:	1,395 adopters by landline (45%) 1,240 non-adopters by landline (40%)	465 adopters by cell (15%)	1,860 adopters (60%) 1,240 non-adopters (40%) **3,100 total *N* sample (100%)**

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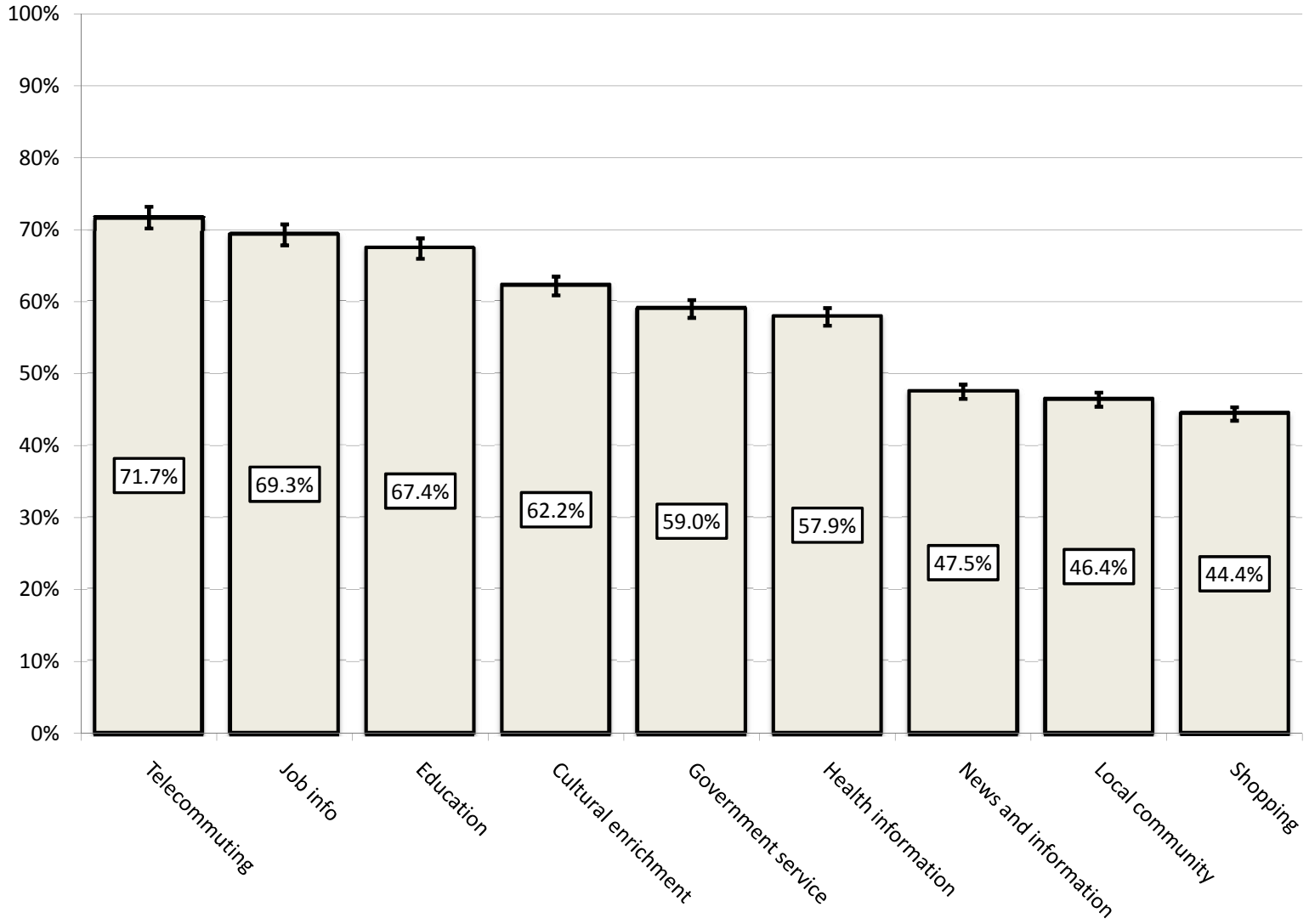
Why Broadband?

Chart One: Percent Agreeing that Nonadopters are at a Disadvantage with regard to…



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Literature

Demographic Indicators

Characteristic *(direction of prediction of nonadoption)*
Education (*lower*)
Race/Ethnicity *(African American and Hispanic)*
Income (*lower*)
Age (*older*)
Disabled (*yes*)
Geography (*rural and urban*)
Gender (*women*)
Marital Status (*single and/or no longer married*)
Household Size (*smaller*)
Unemployed (*yes*)

Reasons for Nonadoption

1. **cost;**
2. **lack of digital literacy;**
3. **lack of the perception of the internet as relevant to their life;**
4. **security and privacy concerns;**
5. **unavailability of internet access at the household level;**
6. **lack of a computer in the household.**

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Our Data

Table Three: Difference in Means Values of Basic Demographic Indicators, by Adoption/Nonadoption Status

Category	*N*	*Value for Broadband Adopters*	*Value for Broadband Nonadopters*	*p value*	*t/Z value*
Age, mean	2,961	48.7	64.5	p<0.00001	t=-26.8073
Reporting respondent's education, mean category	3,051	5.51 (between "some college" and "college grad")	4.24 (nearer to "technical, trade, vocational, school" than "some college"	p<0.00001	t=23.0190
Household income, mean category	2,265	6.65 (approx. $59,750)	4.05 (approx. $30,500)	p<0.00001	t=28.2298
Hispanic ethnicity, proportion	3,048	0.0853	0.0902	p=0.6388	Z=-0.4694
Race=Asian, proportion	2,989	0.0542	0.0169	p<0.00001	Z=5.1085
Race=Black, proportion	2,989	0.0956	0.1559	p<0.00001	Z=-4.9689
SES (standardized summative scale of household income and reporting respondent's education; Cronbach's alpha=0.66)	3,061	0.3457	-0.5371	p<0.00001	t=30.1166

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First Phase Model

Prediction Based on Demography

Pr(nonadoption) = age-squared + SES + race + lives alone + unaccounted-for variation and error.

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Logistic regression                               Number of obs   =       2861
                                                  LR chi2(4)      =    1309.55
                                                  Prob > chi2     =     0.0000
Log likelihood = -1258.6062                       Pseudo R2       =     0.3422

------------------------------------------------------------------------------
    nonadopt | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  agesquared |   1.000493   .0000291    16.97   0.000     1.000436     1.00055
       black |     1.7251   .2518456     3.74   0.000     1.295831    2.296573
  livesalone |    2.63666   .2818746     9.07   0.000     2.138236    3.251267
         ses |   .3003472   .0187332   -19.28   0.000     .2657863     .339402
------------------------------------------------------------------------------
                              -------- True --------
               Classified |         D            ~D  |      Total
               -----------+--------------------------+-----------
                    +     |       764           218  |        982
                    -     |       352          1527  |       1879
               -----------+--------------------------+-----------
                  Total   |      1116          1745  |       2861

               Classified + if predicted Pr(D) >= .5
               Correctly classified                        80.08%
```

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Second Phase Model

Familiarity Predictors

Familiarity with Computers and the Internet

USECOMPUTER: *Do you use a computer at your workplace, at school, at home, or anywhere else on at least an occasional basis?*

	Freq.	*%*
No	788	77.6%
Yes	227	22.4%
Total	1,015	100.0%

EVERUSEINTERNET: *Did you ever at some point use the internet or email, but have since stopped for some reason?*

	Freq.	*%*
No	767	75.9%
Yes	244	24.1%
Total	1,011	100.0%

WANTINTERNET: Would you like to start using the internet and email [again], or isn't that something you are interested in?

	Freq.	*%*
No	812	81.0%
Yes	190	19.0%
Total	1,002	100.0%

NEEDHELP: If you wanted to start using the internet and email (again), do you feel that you know enough about computers and technology to be able to do that on your own, or would you need someone to help you?

	Freq.	*%*
Yes *(need help)*	812	81.0%
No *(know enough to go online)*	190	19.0%
Total	1,002	100.0%

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Second Phase Model

Bases of Nonadoption Predictors

What is the MAIN reason you don't use the internet or email?

1. Lack of Inclination: Over four in ten of all non-adopters – 41.2% – reported that they're "just not interested," "don't need it/ don't want it," "it's a waste of time," or they're "too busy/just don't have the time."

2. Lack of resources: Just under one-third – 30.4% – stated "it's too expensive," they "don't have a computer," they "don't have access," or assert that while they don't currently use it, they're "getting it."

3. Lack of training or skill: 16.1% of non-adopters reported that it's "too difficult/frustrating," they "just don't know how," or that they're "too old to learn." Only 24% to 28% of nonadopters report using a computer at any time on at least an occasional basis, or that they ever did so, or would like to do so in the future. Over half (53.5%) indicate they "would need someone to help" them with computers or technology to start using the Internet.

4. Fear of Technology: 5.10% – or 53 respondents – reported worry about "computer viruses," "spam" "spyware," "adware," "privacy," or that "it's an evil thing," or, simply, "religion."

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Final Second Phase Model

Joint Familiarity and Bases of Nonadoption Predictors

Table Seven

Joint Familiarity and Bases of Nonadoption Model as Predictors of Nonadoption Model

Dependent Variable: Exponentiated PPN Score

DV: e^{PPN}_i	Model #7 N=819; F(8,810)=149.51; p>F=0.0000) R^2=0.5961 / Adj-R^2=0.5923 Std. Error of the Estimate=.307			
Variable	Coefficient	t-value	p-value	beta
usecomputer	-.134	-4.55	0.000	-.124
everuseinternet	-.085	-3.26	0.001	-.083
wantinternet	-.147	-5.31	0.000	-.139
needhelp	-.147	-5.61	0.000	-.149
nouseinclination	-.122	-4.00	0.000	-.125
nousemoney	-.087	-2.62	0.009	-.090
nousefear	-.289	-5.30	0.000	-.136
residuals	-.340	-20.76	0.000	-.518
constant	2.50	96.50	0.000	.

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Discussion

The challenge of this paper was to develop a model of broadband nonadoption. From that model, there are a number of conclusions that can be drawn, and the extensive mining of model outcomes and model adjustments will be the subjects of follow-on research. For now, though, we can draw some preliminary inferences to give the model a test run by selecting two of the familiarity variables for some first level analysis.

We know, for example, that people who use a computer are more likely to adopt household-level broadband access. This computer-use predictor also underscores the importance of teaching computer literacy in the schools and suggests that even if broadband expansion policy is ignored, the generational replacement effect alone is likely to expand the household-level reach of high-speed internet access to its maximum penetration. Interestingly, across the variable of computer use we do not see a statistically significant difference for the effect of being a black household, and only a relatively small effect for being a Hispanic household.

We also know from the familiarity predictors that a belief that one does not need help go online, i.e., that they "know enough to go online," is an important consideration that speaks directly to computing and internet educational initiatives, as well as the secular effect of maintaining a strong digital literacy component in primary and secondary schools. Interestingly again, we don't see any effect on the distribution of the need-help variable due to being a black household, and only a small effect of being a Hispanic household. These are just some examples of the types of analyses for which we will deploy the prediction model in later papers.

Practically speaking, this model can identify groups of nonadopters with predicted probabilities closer to 0.5 than to 1.0, who we can assume are more elastic, meaning they are more likely to be "closer to the point of adoption." These groups therefore constitute the best target constituencies for user training and resource support initiatives and programs for household broadband adoption. By statistically accounting for each nonadopter household's unique constellation of structural and demographic considerations, we can predict which of those households are more likely to be "closer to adopting broadband" than the others, so that dollars spent on encouraging broadband adoption can be directed to groups mostly likely to adopt in the most efficient way.