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Differences in Perceived Importance of Preventative Services and Healthcare Provider Trust Among Hispanics

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DIFFERENCES IN PERCEIVED IMPORTANCE OF PREVENTATIVE SERVICES AND HEALTHCARE PROVIDER TRUST AMONG HISPANICS

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Abstract

The Hispanic population varies greatly in their risk factors, health outcomes and access to care by country of origin, level of education and language dominance (Vega & Amaro, 1994) (Fiscella, Franks, Doescher, & Saver, 2002b). The differences within the Hispanic population also extend to their knowledge and attitudes toward health choices and maintenance, where they receive their health information, and what they access to meet their health care needs. Subpopulations within the Hispanic community as defined by language dominance and nativity must be understood as separate and distinct so that the health needs of each can be adequately addressed. The Centers for Disease Control and Prevention (CDC) have recently begun using audience research data sources, the Scarborough Marketing Research Survey and the Multimedia Audience Research Systems (MARS) Consumer Healthcare Study, to better understand the target audiences of health communication messages and campaigns. This study seeks to evaluate the validity and representativeness of the MARS study and evaluate the relationship of Spanish language dominance and foreign birth on attitudes towards annual medical exams and vaccination as well as internet access. A two-tailed independent t-test demonstrates that the means of commonly used demographic variables are significantly different between the MARS survey and the commonly accepted Behavioral Risk Factor Surveillance System (BRFSS) survey. However, the usefulness of the MARS study remains and its representativeness and validity need further study. Linear regression demonstrates a relationship between both foreign birth(B=.011) and Spanish language dominance (B=.018) and considering an annual exam to be important (p=0.00). These two variables are also shown to be related to trust of physician to recommend vaccines (p=0.00). Binomial Logistic Regression

demonstrates that Spanish language dominance decreases the likelihood of using wireless devices to access the internet while foreign birth increases the likelihood although the model's goodness of fit is lacking. The findings of this study may be used as additional evidence to support the use of these new data sources as well as to better understand the health behavior, attitude, and access disparities among Hispanics in the U.S regarding annual exams and vaccination.

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Table of Contents

Abstract iii

Acknowledgements v

Table of Contents vi

List of Tables viii

Introduction 1

Background and Significance 4

The Significance of Annual Exams 4

The Significance of Routine Vaccinations 5

The Significance of Attitudes and Behaviors 7

Market Research 8

Methods and Materials 11

Methods 11

Data Management 13

Human Subjects Protection/Ethical Issues 14

Hypotheses 14

Data Analysis 15

Results 17

Inferential Statistics 17

Discussion 33

Strengths and Limitations 36

Public Health Implications 38

Conclusion 40

Appendix 42

References 44

Curriculum Vitae 49

List of Tables

Table 1: Frequencies: Comparing Variable Percentages of MARS Survey and BRFSS Survey for Hispanic Participants Using Weighted Data 18

Table 2: Descriptive Analysis: Means, Standard Deviation, and Variance Comparison Between Surveys for Demographic Variables Using Weighted Data..... 20

Table 3 Two-tailed independent sample t-test comparing means between MARS and BRFSS Data Sets 21

Table 4: Binary Logistic Regression: Outcome variable is Receiving Flu Vaccine[1]..... 23

Table 5: Linear Regression: Trusting Doctor to Recommend Vaccine as outcome variable[1]..... 24

Table 6: Multiple Linear Regression: Among Foreign Born Hispanics. Outcome Variable: Trusting Dr to Recommend Vaccine as outcome variable[1] 24

Table 7: Multiple Linear Regression Outcome Variable Time Since Last Annual[1]..... 26

Table 8: Multiple Linear Regression Outcome Variable Considering an Annual Exam to be Important [1,2]..... 27

Table 9: Multiple Linear Regression Foreign Born Hispanics Only Outcome Variable Annual Exam Importance[1]..... 27

Table 10: Multiple Logistic Regression Outcome Variable Not Having Internet Access at Home.[1] 29

Table 11. Multiple Logistic Regression Foreign Born Hispanics Only Outcome Variable Not Having Internet Access at Home.[1] 30

Table 12: Multiple Logistic Regression Outcome Variable Using Wireless Device to Access Internet.[1] 31

Table 13: Multiple Logistic Regression Outcome Variable Using Wireless Device to Access Internet Among Foreign Born Hispanics.[1] 32

Table 14. List of Health Conditions in the MARS Survey 42

Introduction

Hispanics are the largest and fastest growing minority group in the U.S. According to the Pew Research Center's Hispanic Trends Tabulation Project based on the 2000 census and the 2012 American Community Survey the US has seen a 50% increase in the Hispanic population which now represents roughly 17% of the total U.S. population. States with the highest Hispanic population are along the US Mexican border including California (38.2% of the population is Hispanic), Arizona (30.2%), New Mexico (47%), and Texas (38.2%). However, even states with low Hispanic populations are seeing incredible growth (Brown & Patten, 2014). Tennessee, which as of 2012 only had 4.8% Hispanic population saw a 162% increase from 2000-2012 (Brown & Patten, 2014). It is predicted that by 2020 there will be nearly 60 million Hispanics in the US and that by 2050 there will be over 102 million Hispanics (Owens, 2006).

As the Hispanic population grows in the United States it remains difficult to appropriately identify and categorized who exactly is "Hispanic." The US Census is a starting place and perhaps a standard on how to define Hispanic. The US Census Bureau collects race and ethnicity data following the guidance of the Office of Management and Budget's (OMB) 1997 Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity. The OMB requires a minimum of two ethnicities be collected: Hispanic or Latino and Not Hispanic or Latino. For the purposes of this study the term Hispanic will be used. The definition of Hispanic or Latino Origin used in the 2010 Census refers to a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race. Then, according to the OMB, federal agencies are required to use a minimum of 5 race categories: White, Black or African American, American Indian or Alaska Native, Asian, and

Native Hawaiian or Other Pacific Islander. The US Census then also uses a sixth category of other. The fact that Hispanic transcends race and can be defined by culture or origin complicates the matter of categorizing such a variety of people under the singular label of Hispanic. However, until recently most health research used only the very general category of Hispanic to define this diverse population. And between this diverse category and Non-Hispanic Whites much disparity of health has been found(Registrar, 1997).

It is imperative to understand the needs of the Hispanic community, but it is equally important to understand the differences within the Hispanic population. The Hispanic population is not a monolith. The population varies greatly in their risk factors, health outcomes and access to care by country of origin, level of education and language dominance (Vega & Amaro, 1994);(Fiscella et al., 2002b). In fact, in a study by Fiscella et al. (2002b), the heath "care use pattern for English-Speaking Hispanic patients was not significantly different than for non-Hispanic White patients"(p.52) while "Spanish-Speaking Hispanic patients were significantly less likely to have had a physician visit, mental health visit, or Influenza vaccination"(p.52). Also, in a study by DuBard and Gizlice (2008), they report that:

> "Physical activity and rates of chronic disease, obesity, and smoking were significantly lower among Spanish-speaking Hispanics than among English-speaking Hispanics. Spanish-speaking Hispanics reported far worse health status and access to care than did English-speaking Hispanics and received less preventive care." (p.1)

The differences within these populations extend to their knowledge and attitudes toward health choices and maintenance, where they receive their health information, and what

they access to meet their health care needs. These subpopulations of the Hispanic community must be understood as separate and distinct so that the health needs of each subpopulation can be adequately addressed and then met. Once we understand the health needs of the Hispanic community, as public health professionals, we also need to understand their access to care and how they receive their health information. Individuals receive their health information from different sources, and different populations have varying trust levels of those sources (Clayman, Manganello, Viswanath, Hesse, & Arora, 2010).

Background and Significance

The Significance of Annual Exams

The significance of annual exams and checkups are stressed by the Centers for Disease Control and Prevention (CDC) stating that "regular health exams and tests can help find problems before they start"(CDC, 2015). Regular checkups can also detect health problems early when chances for successful treatment are better. Preventative health can save the individual from experiencing or worsening poor health outcomes and can also save the health system money. Recently the regular health exam was called into question but then defended in the article "Should We Abandon Routine Visits? There is Little Evidence for or Against"(Himmelstein & Phillips, 2016) In the article Himmelstein and Phillips (2016) suggest that the regular physician visit builds patient doctor relationship and is instrumental in "better patient outcomes and the attenuation of disparities"(p. 498). Unfortunately, many studies have found that Hispanics participate in regular checkups and preventative care with less frequency then non-Hispanic whites (DuBard & Gizlice, 2008; Fiscella, Franks, Doescher, & Saver, 2002a) (Centers for Disease Control and Prevention (CDC), 2004) Regarding the attitudes of individuals toward regular checkups and receipt of preventative services such as mammograms, pap smears, cholesterol check, and endoscopic screening Cherington, Corbie-Smith and Pathman, (2007) found that individuals beliefs about the value of periodic health examinations are associated with the likelihood that they receive recommended preventative services.

As mentioned previously it is imperative to understand the differences within the Hispanic population. Dubard and Gizlice (2008) found that compared to English Speaking Hispanics, Spanish speaking Hispanics did not have health insurance (55% vs 23%), lacked a personal doctor (58% vs 29%) and were less likely to have had a checkup within the last year (45% vs 36%). The health care use pattern for English-speaking Hispanic patients was not significantly different than for non-Hispanic white patients. In contrast, Spanish-speaking Hispanic patients were significantly less likely than non-Hispanic white patients to have had a physician visit (RR, 0.77; 95% CI, 0.72–0.83), mental health visit (RR, 0.50; 95% CI, 0.32–0.76), or influenza vaccination (RR, 0.30; 95% CI, 0.15–0.52). (Fiscella et al., 2002b). In addition to the disparities across language dominance and nativity, country of origin has also been shown to predict disparities in health and preventative care utilization (Vargas Bustamante, Chen, Rodriguez, Rizzo, & Ortega, 2010).

The Significance of Routine Vaccinations

Routine vaccinations are an important part of preventative healthcare in the United States. The CDC now recommends that all adults be vaccinated against influenza. However, even with the new recommendation the US still falls well below the target of 80% influenza vaccination among the population as a healthy people 2020 goal. During the 2012-2013 Influenza season only 42% of adults received the vaccine (U.S. Department of Health and Human Services, 2013b). A recent study by Mcintyre et al. (2013) found that racial and ethnic minorities have the lowest influenza vaccination rates and that only 37.3% of Hispanics compared to 39.8% of whites received the influenza vaccine the previous year although

Hispanics did see an increase in flu vaccination from 2012-2013(McIntyre et al., 2013). Linn et al. found that Hispanics age 65 and older were 44% more likely to be unvaccinated than non-Hispanic whites of the same age group. There were many barriers to receiving the influenza vaccine. Some patients did not know if they should seek the vaccine while others were concerned about potential side-effects(Linn, Guralnik, & Patel, 2010). Multiple studies have found that Hispanic patients perceive access and cost as barriers (Cohen et al., 2012). Cohen et al. (2012) also found that physicians not mentioning the influenza vaccine to be among the top ten reasons for not being vaccinated. The same study by Cohen et al. (2012) found that over the course of 2 flu seasons that there was statistical significance between those born in the U.S. and those born outside the U.S. for having been vaccinated during either flu season. Of those born inside the US 60.1% were vaccinated while only 29.9% of those born outside the US were vaccinated (Cohen et al., 2012). Lu et al. (2014) found that this disparity among Hispanics persists even while adjusting for citizenship, time spent in the US, and interview in language other than English (Lu, Rodriguez-Lainz, O'Halloran, Greby, & Williams, 2014). Also, in a review of influenza vaccination data from 2007 researchers found that Hispanics choosing to fill out the survey in Spanish vs English were 50% less likely than those who chose English to have received the vaccine (Pearson, Zhao, & Ford, 2011). So what are some facilitators to patients getting vaccinated?

Additionally, in 2008 Johnson, Nichol, and Lipczynski (2008) found that 75% of patients said they would be more likely to get the influenza vaccine if their physician recommended it and that 38% said they were not vaccinated because their doctor never told them they needed it. Blank, Bonnelye, Ducastel, and Szucs (2012) found that the recommendation of a general

practitioner was a common reason for a patient to receive the vaccine. A study analyzing the vaccination patterns of adults aged 50-64 years found that a common facilitator was "my doctor thinks I should get the flu shot."(Zimmerman et al., 2003) The study also found that 95% of those who did receive the flu shot cited their doctor making the above statement while only 63% of the unvaccinated cited the same occurrence (Zimmerman et al., 2003). It is apparent that communication between patient and doctor is a key factor in increasing vaccination rates. Unfortunately, racial and ethnic minorities often experience a decrease in the effectiveness of patient-doctor communication (Ashton et al., 2003) It is important to better understand the doctor-patient relationship and communication as it relates to vaccination among Hispanics. This paper will analyze the trust that Hispanic patients have for their physician to recommend vaccines for their continued health by birth place and dominant language.

The Significance of Attitudes and Behaviors

It is most often the goal of Public Health Professionals to change the health outcomes of populations through initiating changes in individual health behaviors. The Health Belief Model is one accepted model used to explain the multitude of influences that can help initiate behavior change(Harrison, Mullen, & Green, 1992). One of those is that the individual in which change is desired must believe in the efficacy of advised action to reduce risk in their health. So one way that behavior change can be initiated by Public Health Communication is by disseminating information about the efficacy of the desired health behavior in hopes that the recipient of such information would increase their own belief in the efficacy of the action. When it comes to behaviors that need medical intervention, those outside of personal lifestyle

choices such as exams, vaccinations, and treatment plans a patients trust in their provider is paramount. "The success of medical care depends most importantly on patients' trust that their physicians are competent, take appropriate responsibility and control, and give their patients' welfare the highest priority" (Mechanic, 1996). It is important for public health professionals to understand the significant influence of both the perceived efficacy of an action and the patients trust of their healthcare provider.

Market Research

Audience research surveys have emerged as an innovative and promising data source used by public health agencies to better understand the health needs of their target communities and assess media strategies to reach them. Audience research consists of surveys designed to target a specific audience for syndicated multimedia and product usage. Some common audience research survey companies are Mediamark Research Inc., Simmons Market Research Bureau, Monroe Mendelsohn, and J.D. Power. Audience research seeks to better understand the audience and consumers so that communication and advertising can be better targeted. These surveys include detailed demographic information as well as buying/consuming attitudes and behaviors for a multitude of products and services. One such company that performs this research is the Nielson Company. Nielson gathers information on television viewers and radio listeners and then sells access to the data to media and communication companies.

One survey that Nielson conducts is the Scarborough Survey. The Scarborough Survey analyzed in this paper contains detailed information on the media access and use of individuals

measuring use of print media, radio and television including what stations and types of programming are watched, as well as online access through computers or mobile phones. While multimedia consumption may be the main focus of the Scarborough Study detailed demographic data is collected as well as a host of other behaviors and attitudes. Another company that performs audience research is Kantar (New York, NY). One survey that Kantar conducts is the MARS (Multimedia Audience Research Systems) Consumer Healthcare Study. The MARS survey collects detailed information about the health behaviors and attitudes of participants and will also be analyzed in this paper. Both of these surveys will be discussed in more detail below (See: Methods and Materials).

The CDC has begun using these data sources to better understand target audiences for health communication messages and campaigns. Nielson also offers a service in which an entity can pay to add questions to their survey. Audience research of this type could become a very effective tool to better understand the needs of target audiences and how best to communicate with them. The added feature of being able to insert questions into the survey could make it extremely effective in gathering specific information on health behaviors or to assess the effectiveness of recent targeted campaigns. Since these new data sources have begun to influence health needs assessment and communication it is necessary to establish their validity and representativeness. This study attempts to accomplish that objective and to make an analysis of health attitudes and behaviors as well as media usage, as mentioned above. Media usage data is the most robust collection of data within the Scarborough study because it is the designed intent of the survey to assess how a target audience receives information and through which mediums in order to better advertise products.

There were two objectives to this study. The first assesses the quality and representativeness of the Scarborough Marketing Research Survey and the MARS Community Healthcare Survey. This paper focuses on the health behaviors and attitudes of Hispanics by nativity and language dominance. The second objective analyzes attitudes, behaviors and access to health care and information sources of Hispanics by nativity and language dominance. Specifically, this study investigates vaccination and annual checkup attitudes and behaviors among Hispanics.

Methods and Materials

Methods

This is a secondary analysis of two cross sectional studies: The Scarborough Marketing Research Survey (SMRS) and the MARS Community Healthcare Survey (MCHS). The Scarborough Survey is a national survey conducted by the Nielsen Company. This survey collects demographic information and information on behaviors in 36 different areas of participants' lives from media use to travel to shopping to health care and leisure activities. Nielson employs continuous recruitment 48 weeks out of the year. More than 210,000 adults 18 years of age and older are interviewed annually. The survey occurs in two stages and begins with a randomly dialed telephone interview during which interviewers collect demographic and some media use data. During stage two respondents who complete the phone interview then receive a "Consumer Survey Booklet" to capture the rest of their attitudes and behaviors as well as a "Seven-Day Television Diary" to record their TV watching behavior, and a cash incentive. Respondents have the option to fill out the survey and diary online. The survey also asks questions about participants' attitudes towards technology, advertising, food, health, and more. Reminder phone calls are made to promote completion of the survey with extra attention and additional reminders given to Hispanics, African-Americans, Males age 18-34, and respondents with an annual household income over $75,000. Data are then weighted using age within gender, household size, education, race, Hispanic ethnicity and geography and other undisclosed factors. In the first stage a random sample of households is selected from Survey

Sampling Inc.'s (SSI) Random Sample A Frame or Address-Based Sample (ABS) Frame. Then a random respondent is selected in each sample household based on the last birthday.

To obtain their survey sample the Kantar MARS survey uses KBM/AmeriLink, a marketing data resource company that sells data sourcing and analytics to marketing companies. KBM/AmeriLink has a database of 240,000,000 consumers. MARS uses this data list to create a database of a random sample of adults over 18 years old by address. An initial postcard invite is then sent to the address, which is then followed up with cash and gift card incentives, questionnaires and further requests for participation. Greater incentives and more mailings are sent to target demographics. The MARS survey collects more detailed information than the Scarborough survey about health status, health care access, use of health services, attitudes towards health care, services, and providers. Like Scarborough, the MARS survey is a continuous enrollment survey. Kantar mails out 51,000 surveys and aims to collect 20,000 surveys for a response rate of approximately 50%. Although the MARS survey does not have nearly as many participants as the Scarborough Survey, Kantar reports that the MARS data are projectable to 80% of the US population.

Nielson (the company that owns the Scarborough Survey and data) contracts with Kantar (who owns the MARS survey) to pull in the MARS data and "fuses" it with the Scarborough data. By doing this, Nielson assigns MARS health behavior and attitude data to Scarborough participants who closely match demographically to the MARS participants. This matching process uses 50 "hook" variables, a term used by Nielson to describe the variables used to join the responses from the smaller sample of MARS participants to a larger sample of similar participants in the Scarborough Survey. Some of the "hook" variables used are sex, age,

race, education, occupation, income, marital status, numbers and ages of children, home ownership, geography, media usage, lifestyle (gym membership, organic food), medical information sources, health insurance, medications and medical specialists, and making use of hospital services. The fusion process is proprietary and all of the "hook" variables are not disclosed. Each "hook" is assigned a weighting factor depending on its relative importance to determine health attitudes. The weighting factor and other details of the fusion process are proprietary and were not made available to the researcher.

Data Management

Access to the Scarborough and MARS data was gained through the website *myprimelingo.com* which acts both as a portal for access and as a system for analysis. Clients of the Nielson company pay for access to myprimelingo.com in order to know their consumer base better and craft marketing strategies around the consumer information found within. Nielson hosts the data collected from the Scarborough survey since 2011 and MARS Survey since 2014 on the website myprimelingo.com. The CDC pays for access to this website. All employees of the CDC can gain access to the site for free. An employee creates a username and once logged in individuals can access the data from the two surveys. Data can then be searched by local DMA or nationally, or as a combination of several survey releases and years together. Individual level data was accessed through myprimelingo.com and was analyzed using SPSS 22.0. Descriptive statistics were used to analyze the sample population demographics. These descriptive data were compared against descriptive data from the Behavioral Risk Factor Surveillance System (BRFSS) 2014. Individual level data for the BRFSS 2014 was accessed

through *http://www.cdc.gov/brfss/annual_data/annual_2014.html*. The two populations from these two surveys were compared using the Aspin-Welch t-test (Welch, 1937). Linear Regression was used to analyze the relationship between nativity, Spanish language dominance and the outcome variables. Differences in health attitudes and behaviors among Hispanics by nativity and language were measured with nonparametric equivalents of the paired t-test. At 95% Confidence Intervals, results with a P Value <.05 were considered statistically significant.

Human Subjects Protection/Ethical Issues

Since the analysis performed was using existing data stripped of identifiers the research being conducted does not qualify as research involving human subjects. The research proposal was submitted to the University of Nevada, Las Vegas Internal Review Board and was deemed as not needing review.

Hypotheses

The primary hypotheses are:

- The Scarborough/MARS data set is representative of the national Hispanic population as compared to the Behavioral Risk Factor Surveillance System.
- Foreign Birth and Spanish Language Dominance will be predictors for a vaccine being received in the last year.
- Foreign Birth and Spanish Language dominance will be inverse predictors for trust of Doctors to recommend vaccines.

- Foreign birth and Spanish language dominance will be inverse predictors for length of time since last annual medical exam.
- Foreign birth and Spanish language dominance will be inverse predictors for perceived importance of annual medical exams.
- Spanish language dominance will be associated with increased mobile device internet access and usage among Hispanics residing in the United States.
- Foreign birth will be associated with increased mobile device internet access and usage among Hispanics residing in the United States.

Data Analysis

Frequency tables were compiled for demographic factors for both the entire study population and for Hispanics only. Frequency tables were generated to compare the MARS/Scarborough Survey with a commonly used Health Survey: The Behavioral Risk Factor Surveillance Survey (BRFSS). Variables in both data sets were recoded in order to represent the same scale for each variable. In the MARS data set some of the variables of interest were collected as Likert scale responses but coded as categorical variables of a yes/no, 1/0 response to each Likert scale response. These variables included the 5 point Likert scale responses (disagree a lot, disagree a little, neither agree nor disagree, agree a little, or agree a lot) to the statements: I trust my doctor to recommend vaccines beneficial for my health, If required vaccines stopped epidemics would return, I am concerned about possible side effects of vaccines, I participate in preventative care. All of these were recoded into ordinal variables. Also, a 4-point scale of BMI, a 6-point scale of how long it had been since the respondent had

had an annual exam, and a 5-point scale of how important an annual exam is were all recoded into ordinal variables from multiple dichotomous variables.

Normality of the data across the responses of time since last annual exam, considering an annual exam to be important, and trusting doctor to recommend vaccines was explored. Then the smallest two values on the Likert scale were combined for annual exam importance and trust doctor to recommend vaccines, to yield a more normal distribution. For time since last annual exam the categories of 3 to 5 years and 2 to3 years were combined to yield a more normal distribution. Next, Multiple Logistic Regression was used to analyze the relationship between trusting doctor to recommend vaccines and actually receiving a vaccine. This was tested for the whole study population and then for only Hispanics. Weighted Least Squares (WLS) Multiple Linear Regression was also run to analyze the relationship between considering an annual exam to be important and time since last annual exam.

Multiple Logistic Regression was used to analyze the relationship between Spanish Language Dominance and Foreign Birth with “Wireless/cell phone used to access internet.” Multiple Logistic Regression was run again to analyze the relationship between Spanish Language Dominance and Foreign Birth with “no household internet connection.”

Results

Inferential Statistics

Is The Scarborough/MARS Data Set Representative of the National Hispanic Population as Compared to The Behavioral Risk Factor Surveillance System?

All analyses were performed using the weighting factor assigned by Nielson for the MARS data and the final weight weighting factor was used to weight the data for the BRFSS. Nielson's weighting factor is proprietary but the BRFSS weighting factor is defined at *http://www.cdc.gov/brfss/annual_data/annual_2014.html.* First, frequency tables were generated for demographic factors of the Hispanic samples in each of the two surveys (Table 1).

Table 1: Frequencies: Comparing Variable Percentages of MARS Survey and BRFSS Survey for Hispanic Participants Using Weighted Data

Variables		**MARS**	**BRFSS**
Education		Valid Percent[1]	Valid Percent[1]
	Less than 8th Grade	12.1	20.4
	Some High School	8.5	17.7
	High School Graduate or GED	37.7	27.0
	Some College	26.2	23.0
	College Graduate +	15.4	12.0
Household Income			
	Less than 10k	6.1	14.3
	10k-20k	7.9	25.9
	20k-25k	7.3	13.7
	25k-35k	16.2	13.5
	35k-50k	23.3	11.2
	50k-75k	14.7	8.6
	75k+	24.4	12.8
Insurance			
	Insured	80.6	68.3
	Uninsured	19.4	31.7
Language Dominance			
	English	50.1	55.0
	Spanish	49.9	45.0
Flu Vaccine[2]			
	No	65.8	74.0
	Yes	34.2	26.0
Age			
	18-24 years	19.5	17.0
	25-34 years	23.8	24.2
	35-44 years	22.0	21.3
	45-54 years	16.7	16.5
	55-64 years	10.2	11.5
	65 years +	7.6	9.5
Sex			
	Male	47.0	50.0
	Female	53.0	50.0
Marital Status			
	Married	48.9	49.0
	Never Married (Single)	38.5	30.6
	Widowed	3.1	4.6
	Separated	2.6	6.0
	Divorced	6.8	9.8

1. Valid Percent refers to percentage of Participants in each variable category accounting for missing data. All data is weighted using weighting factors provided in data.
2. Flu Vaccine refers to participants who received a flu shot or the nasal mist within the last year.

The MARS survey seems to capture a higher educated portion of the population with 79.4% reporting graduating from High School vs 61.9% of the BRFSS sample. MARS also seems to represent a higher income portion of the Hispanic population with 39.1% reporting earning over $50,000 per year as a household vs 21.4% of the Hispanic participants from the BRFSS. MARS also captured a larger portion of the insured Hispanic population at 80.6% vs 68.3% and also a larger portion of Spanish Speaking Hispanics with 49.9% vs 45%. However, the variable describing Spanish language dominance was measured very differently. Spanish language dominant Hispanics in the MARS survey were defined as those who responded that Spanish was what they most preferred to speak while Spanish language dominance for the BRFSS was determined by what language the survey was administered in. An assumption was made that the survey was performed in the language that the participant disclosed as their preferred language. But this reasoning is just inferred. Age among Hispanics seems pretty similar. MARS Hispanic sample is represented by 65.4% of the sample under 44 years of age vs 62.5% for the BRFSS and the BRFSS had a higher percentage of participants in the oldest age category of over 65 years old with 9.5% vs 7.6% for the MARS Survey. The MARS survey also seemed to capture more females with 53% vs an even split along sexual identification lines for the BRFSS. The percentage of married participants was very similar between surveys at 48.9% for MARS to 49% for BRFSS. Descriptive analysis was also performed and the Means and the Standard Deviation for demographic variables are also reported (Table 2).

Table 2: **Descriptive Analysis: Means, Standard Deviation, and Variance Comparison Between Surveys for Demographic Variables Using Weighted Data.**

Survey/Data Set		**MARS**	**BRFSS**	**MARS**	**BRFSS**	**MARS**	**BRFSS**
Statistic		**Mean**	**Mean**	**Std. Deviation**	**Std. Deviation**	**Variance**	**Variance**
Variables							
	MARITAL[1]	1.800	1.972	1.095	1.289	1.199	1.661
	SEX	1.530	1.500	0.499	0.500	0.249	0.250
	Uninsured	0.190	0.317	0.396	0.465	0.156	0.216
	ECUCATION[2]	3.243	2.885	1.178	1.300	1.388	1.689
	AGE[3]	2.971	3.100	1.510	1.546	2.282	2.391
	Flu Vaccine[4]	0.342	0.260	0.474	0.439	0.225	0.193
	INCOME[5]	4.845	3.586	1.801	1.975	3.244	3.900

1. Marital Status in 5 categories: Married, Never Married, Widowed, Separated, Divorced.
2. Education in 5 categories: Less than 8th grade, Some High School, Completed High School or GED, Some College, and College Graduate or more.
3. Age in 6 categories: 18-24,25-34, 35-44,45-54,55-64, 65+
4. "Flu Vaccine" refers to a participant who received a flu vaccine via injection or nasal mist.
5. Income in 7 categories: <10k, 10-20k,20-25k, 25-35k,35-50,50-75k, 75k+

Subsequently, the data sets were merged and a two tailed independent samples t-test was run to compare means between the two dataset samples. Results are reported in Table 3. The *p* value for all of the tests for equality of means for all variables is less than 0.001, therefore the difference in the means for these variables between the two sample groups is statistically significant. However, with each survey sample containing such large numbers of participants, it is doubtful that the difference would not be statistically significant. The mean difference for sex is 0.038, representing only roughly 4% of the variable's range. Age has a much higher mean difference of 2.669. Since age is reported categorically into only 6 categories each category representing roughly 10 years the mean difference represents roughly 44% of the variable's range. The mean difference of receiving the flu vaccine within the last year whether by

injection or nasal mist is 0.091 representing 9% of the range. Spanish Language Dominance mean difference is -.026 representing not quite 3% of the range and being uninsured mean difference is -0.084 represents roughly 8% of the range. Household Income, like Age, seems to be very different between the samples. The mean difference in Household Income between the two surveys is 1.057 representing 15% of the range and could be equated to roughly $15-$30,000 difference.

Table 3 Two-Tailed Independent Sample T-Test Comparing Means Between MARS and BRFSS Data Sets

	t	Sig. (2-tailed)	Mean Difference	Std. Error Difference	p
Variables					
Sex	9.407	0.000	0.038	0.004	<.000
Age[1]	243.685	0.000	2.669	0.011	<.000
Flu Vaccine[2]	22.603	0.000	0.091	0.004	<.000
Spanish Dominant	-6.375	0.000	-0.026	0.004	<.000
No Insurance	-26.512	0.000	-0.084	0.003	<.000
Household Income[3]	62.944	0.000	1.057	0.017	<.000

1. Age in 6 categories: 18-24,25-34, 35-44,45-54,55-64, 65+
2. "Flu Vaccine" refers to a participant who received a flu vaccine via injection or nasal mist.
3. Income in 7 categories: <10k, 10-20k,20-25k, 25-35k,35-50,50-75k, 75k+

Foreign Birth and Spanish Language Dominance are Predictors for a Vaccine Being Received in the Last Year

After the two data sets were compared, Binary Logistic Regression was run with "Any Vaccine" as the outcome. Hierarchical block entry model selection approach was used. Demographic variables were placed in the first block; those being: Age, Household Income, and Education Level. The variable in the second block was "Trusting Dr. to recommend vaccine." And in the 3rd block were Born in the US and Spanish Language Dominant. In the beginning block, representing the null hypothesis, the -2 Log likelihood statistic is 445343030.04 and the

overall percentage is 60.2%. Block 1, which includes Age, Household Income, and Education level has a -2 Log Likelihood of 43012132.88 and the overall percentage is 63.6%. Adding Trusting Doctor to recommend vaccine into block 2 decreased the -2 log likelihood to 39842338.7 and increased the overall percentage to 67.6. Finally adding born in the US and Spanish Language Dominance in block 3 decreased the -2 log likelihood to 39804865.6 and the overall percentage remained 67.8% (Table 4). However, the model has a low Cox and Snell R^2 (.133) and a low Nagelkerke R^2 (.180) and the Hosmer and Lemeshow test has high Chi-square (107656.084) and a p value < .001, which means the model predicts values significantly different from what is observed. For this logistic regression equation Trusting Doctor to Recommend Vaccines is the largest predictor of being a member of the category "any vaccine" with a logistic coefficient (β) of .701 then Born in the US is the second largest with a logistic coefficient of .156. Interesting enough Spanish Language Dominance has a positive logistic coefficient of .004. Trusting Doctor has an Exp(β) or odds ratio of 2.015, Born in US OE=1.169, and Spanish Language Dominance was a null finding with a OR of 1.004 (Table 4).

Table 4: Multiple Logistic Regression: Outcome Variable is Receiving Flu Vaccine[1]

Variables	β	Exp(β)
AGE[2]	0.117	1.125
HHLDINCOME[3]	0.024	1.025
EDUCATION[4]	0.062	1.063
TRUSTDOCTOR[5]	0.701	2.015
BORNINUS	0.156	1.169
SPANISHDOMINANT	0.004	1.004
Constant	-4.26	0.014

1. Hierarchical block forced entry model selection was used. Demographic variables were placed in the first block: Age, Household Income, and Education Level. The variable in the second block Is "Trusting Dr. to recommend vaccine." And in the 3rd block are Born in the US and Spanish Language Dominant
2. AGE in 12 categories: 18-20,21-24,25-29, 30-34, 35-39, 40-44, 45-49,50-54,55-59,60-64,65-69,70+
3. HHLDINCOME in 13 categories: <10k,10-20k, 20-25k, 25-30k, 30-35k, 35-40k, 40-45k, 45-50k,50-75k, 75-100k,100-150k, 150-250k, 250k+
4. EDUCATION in 7 categories: Less than 8th grade, Some High School, Completed High School or GED, Some College, and College Graduate, Some post Graduate, Post Graduate Degree
5. Trust Dr. in 4 categories: Any Disagree, neither agree nor disagree, agree a little, agree a lot.

Foreign Birth and Spanish Language dominance are inverse predictors for trust of Doctors to recommend vaccines

Linear Regression was run to determine the predictors for Trusting Doctor to Recommend Vaccines. Born in the US and Spanish Language Dominance were input as independent variables and the WLS was weighted with the weighting factor given by Nielson. The Adjusted R^2 is .003 with a Standard Error of the Estimation of 36.69334, an F statistic of 44567.740 and p <.001. The regression coefficient for Spanish Language Dominance is -.122, Born in the US is -.022. Spanish Language Dominance is a statistically significant factor with p<.001 but Born in the US is not with a p= .151 (Table 5).

Table 5: Linear Regression: Trusting Doctor to Recommend Vaccine as Outcome Variable[1]

Variable	B	Sig.
(Constant)	3.885	0.000
SPANISHDOMINANT	-0.112	0.000
BORNINUS	-0.022	0.151
a. Dependent Variable: TRUSTDOCTOR		

1. Regression run among Hispanics only and data is weighted.

Multiple Linear Regression was used again to examine the influence of time in the US and Spanish Language Dominance on Trusting Doctor to recommend vaccine. This regression was run only among Hispanics not born in the US. This reduces the sample size to 9,958. The adjusted R^2 is .008 and the Standard Error of the Estimate is 38.50341. Significance p=0.000 F = 39.175. In this model Spanish Language dominance drops out as not significant P=.087 and Length of Time in the US has a β of .049 p<.001 (Table 6).

Table 6: Multiple Linear Regression: Among Foreign Born Hispanics. Outcome Variable: Trusting Doctor to Recommend Vaccine as Outcome Variable[1]

Variables	β	Std. Error	Sig.
(Constant)	3.573	0.042	0.000
SPANISHDOMINANT	-0.043	0.025	0.087
RESIDEinUS[2]	0.049	0.006	0.000

1. Data is weighted
2. Reside in US in 4 categories: < 5 years, 10-14 years, 15-19 years, 20+ years.

Foreign Birth and Spanish Language dominance are inverse predictors for length of time since last annual exam.

Linear regression was run to examine the relationship between considering an annual exam to be important and time since last exam among Hispanics while considering Spanish Language Dominance and being born domestically. This was run for only Hispanic respondents so the sample size is 23,972. Again the regression was run using a Hierarchical Forced Entry model selection with 2 blocks. One with considering annual exam to be important and the next block with Spanish Language Dominance and Born in the US. For the first block the adjusted R^2 is .189 with a Standard Error of the Estimate of 44.54539, F=190.059 and a model significance p=0.000. For the second model the adjusted R^2 increases to .192 with a standard error of the estimate of 44.54539. Again this is a very slight R^2 change when we add the subpopulation differences but it is a difference. The model is significant at p=0.000. The regression coefficient for Annual Exam Importance is .534, -.188 for Spanish Language Dominance and 0.004 for Born in the US. Annual Exam Importance and Spanish Language Dominance were significant at p= 0.000 but Born in the US is not (p=0.080) (Table 7). Although the coefficients are not large it does show a trend that Spanish Language Dominance is predictive of longer periods of time between annual exams.

Table 7: Multiple Linear Regression Outcome Variable Time Since Last Annual Exam.[1]

Variable	β	Std. Error	Sig.
(Constant)	3.053	0.032	0.000
ANNUALIMPORTANCE[2]	0.534	0.007	0.000
SPANISHDOMINANT	-0.118	0.018	0.000
BORNINUS	0.004	0.002	0.080

1. Data is Weighted
2. ANNUALIMPORTANCE IN 4 CATEGORIES: Any Disagree, neither agree nor disagree, agree a little, agree a lot

Foreign Birth and Spanish Language dominance are inverse predictors for perceived importance of annual medical exams

Then Multiple Linear Regression was run among Hispanics only (N=23972) examining relationship of Spanish Language Dominance and being born in the US with considering an annual exam to be important and age. The adjusted R^2 is .043, Standard Error of the Estimate(SEE) is 1.064, F=491680.440 and p<0.001 and the Spanish dominant β =-.018 and born in US β =-.011, all p<.001 (Table 8). Again, coefficients are small but demonstrate interesting directionality, especially being born in the US as an inverse predictor of considering an annual exam to be important.

Table 8: Multiple Linear Regression Outcome Variable Considering an Annual Exam to be Important [1,2]

Variables	β	Std. Error	Sig
(Constant)	3.242	0.001	0.000
AGE	0.073	0.000	0.000
BORNINUS	-0.011	0.000	0.000
SPANISHDOMINANT	-0.018	0.000	0.000
a. Dependent Variable: ANNUALIMPORTANCE			

1. Data is Weighted
2. ANNUALIMPORTANCE IN 4 CATEGORIES: Any Disagree, neither agree nor disagree, agree a little, agree a lot

Multiple Linear Regression was run again examining the predictive factors of considering and annual exam to be important except this time the sample was only Hispanics born outside the US. The independent variables being measured are Spanish Language Dominance and length of residence in the US (N=9958). This model yielded a R^2 of .034 and a Standard Error of Estimate of 1.07852, F=175456.715 and p<.001. Longer residence in US is a predictor of higher outcomes of considering annual exam to be important (β=.022). Spanish Language dominance was predictive of lower outcomes of considering annual exam to be important (β=-.066) (Table 9).

Table 9: Multiple Linear Regression Foreign Born Hispanics Only Outcome Variable Annual Exam Importance[1]

Variables	β	Std. Error	Sig
(Constant)	3.243	0.001	0.000
AGE	0.068	0.000	0.000
SPANISHDOMINANT	-0.066	0.001	0.000
RESIDEUS[2]	0.022	0.000	0.000
a Dependent Variable: ANNUALIMPORTANCEordinalnormal			

1. Data is weighted
2. Reside in US in 4 categories: < 5 years, 10-14 years, 15-19 years, 20+ years.

Spanish Language Dominance will be associated with increased mobile device internet access and usage among Hispanics residing in the United States.

Multiple Logistic regression was run for Hispanics only (N=23972), weighted testing for predictors of not having internet access at home. First block was age, income, and education. Second block was Spanish Language dominance and Born in the US. Model yielded at -2 log likelihood of 23962525.67 Cox and Snell R^2 of .095 and Nagelkerke R^2 of .169. In the tables below we see that for each step increase in income there is a -.169 increase in the log of the odds that the individual will not have internet. Spanish Language Dominance yields a .182 unit change in the log of the odds that the individual will not have internet. Interestingly enough, among Hispanics, being born in the US yields a .311 unit increase in the log of the odds that the individual will not have internet. So the odds ratio for being born in the US is 1.365 for not having internet, and Spanish dominance at a 1.199 odds (Table 10). This means, among Hispanics, being born in the US increases your odds for not having internet in the home more than Spanish Language Dominance and more than each step down in annual income of roughly $10,000.

Table 10: Multiple Logistic Regression Outcome Variable Not Having Internet Access at Home.[1]

Variables	β	Std. Error	Sig.	Exp(β)
HHLDINCOME[2]	-0.169	0.000	0.000	0.845
AGE[3]	0.137	0.000	0.000	1.147
EDUCATION[4]	-0.358	0.000	0.000	0.699
BORNINUS	0.311	0.001	0.000	1.365
SPANISHDOMINANT	0.182	0.001	0.000	1.199
Constant	-0.770	0.002	0.000	0.463
a. Variable(s) entered on step 1: HISPANICBORNINUS, SPANISHDOMINANT_recode.				

1. Data is weighted.
2. HHLDINCOME in 13 categories: <10k,10-20k, 20-25k, 25-30k, 30-35k, 35-40k, 40-45k, 45-50k,50-75k, 75-100k,100-150k, 150-250k, 250k+
3. AGE in 12 categories: 18-20,21-24,25-29, 30-34, 35-39, 40-44, 45-49,50-54,55-59,60-64,65-69,70+
4. EDUCATION in 7 categories: Less than 8th grade, Some High School, Completed High School or GED, Some College, and College Graduate, Some post Graduate, Post Graduate Degree

Multiple Logistic regression was run for Hispanics born outside of the US (N=9958) and looking at not having internet access in the home. Variables are age, education, income, time in us and Spanish language dominance. Length of residence was statistically significant but made a very small contribution β =.005 while Spanish language dominance is β =.230 and an Odds Ratio of 1.259 for not having internet (Table 11). The model had a -2 log likelihood of 11783411.404, Cox and Snell R^2=.096 and Nagelkerke R^2 = .163.

Table 11. Multiple Logistic Regression Foreign Born Hispanics Only Outcome Variable Not Having Internet Access at Home.[1]

Variables	β	Std. Error	Sig.	Exp(β)
HHLDINCOME[2]	-0.151	0.000	0.000	0.859
AGE[3]	0.130	0.000	0.000	1.139
EDUCATION[4]	-0.349	0.001	0.000	0.705
SPANISHDOMINANT	0.230	0.002	0.000	1.259
RESIDEUS[5]	0.005	0.001	0.000	1.005
Constant	-0.886	0.004	0.000	0.412

1. Data is weighted.
2. HHLDINCOME in 13 categories: <10k,10-20k, 20-25k, 25-30k, 30-35k, 35-40k, 40-45k, 45-50k,50-75k, 75-100k,100-150k, 150-250k, 250k+
3. AGE in 12 categories: 18-20,21-24,25-29, 30-34, 35-39, 40-44, 45-49,50-54,55-59,60-64,65-69,70+
4. EDUCATION in 7 categories: Less than 8th grade, Some High School, Completed High School or GED, Some College, and College Graduate, Some post Graduate, Post Graduate Degree
5. Reside in US in 4 categories: < 5 years, 10-14 years, 15-19 years, 20+ years.

Being foreign born will be associated with increased mobile device internet access and usage among Hispanics residing in the United States.

Then Multiple Logistic regression was run with using wireless device to access the internet as the outcome variable. The covariates are: income, age, education, born in US, and Spanish Language Dominant. Increased income is a predictor of increase in the log likelihood of using wireless devices to access the internet (β=0.166), increased age decreases the log likelihood (β= -0.558), increased education increases the log likelihood (β=0.192), being born in US decreases the log likelihood (β=-0.204), and Spanish Language Dominant Decreases the log likelihood of using Wireless devices to access the internet (β=-0.120) (Table 12).

Table 12: Multiple Logistic Regression Outcome Variable Using Wireless Device to Access Internet.[1]

Variables	β	Std. Error	Sig.	Exp(β)
INCOME_recode	0.164	0.000	0.000	1.178
AGE6GROUPS	-0.568	0.000	0.000	0.567
EDUCATION	0.194	0.000	0.000	1.214
SPANISHDOMINANT_recode	-0.104	0.001	0.000	0.901
HISPANICBORNINUS	-0.369	0.001	0.000	0.691
Constant	2.005	0.002	0.000	7.425

1. Data is weighted.
2. HHLDINCOME in 13 categories: <10k,10-20k, 20-25k, 25-30k, 30-35k, 35-40k, 40-45k, 45-50k,50-75k, 75-100k,100-150k, 150-250k, 250k+
3. AGE in 12 categories: 18-20,21-24,25-29, 30-34, 35-39, 40-44, 45-49,50-54,55-59,60-64,65-69,70+
4. EDUCATION in 7 categories: Less than 8th grade, Some High School, Completed High School or GED, Some College, and College Graduate, Some post Graduate, Post Graduate Degree

Multiple Logistic Regression was run using wireless device to access the internet as the outcome variable only among Foreign Born Hispanics. The covariates are: income, age, education, Spanish Language Dominant, and Length of Residence in the US. In this model Age maintains the highest Odds Ratio at OR= 0.562. Spanish Dominance decreases the log likelihood (β=-0.167, OR=0.846) and length of time in the US also decreases but only slightly at β=-0.071, OR = 0.932(Table 13).

Table 13: Multiple Logistic Regression Outcome Variable Using Wireless Device to Access Internet Among Foreign Born Hispanics.[1]

Variables	β	Std. Error	Sig.	Exp(β)
INCOME[2]	0.133	0.000	0.000	1.143
AGE[3]	-0.576	0.001	0.000	0.562
EDUCATION[4]	0.191	0.001	0.000	1.21
SPANISHDOMINANT	-0.167	0.002	0.000	0.846
RESIDEUS[5]	-0.071	0.001	0.000	0.932

1. Data is weighted.
2. HHLDINCOME in 13 categories: <10k,10-20k, 20-25k, 25-30k, 30-35k, 35-40k, 40-45k, 45-50k,50-75k, 75-100k,100-150k, 150-250k, 250k+
3. AGE in 12 categories: 18-20,21-24,25-29, 30-34, 35-39, 40-44, 45-49,50-54,55-59,60-64,65-69,70+
4. EDUCATION in 7 categories: Less than 8th grade, Some High School, Completed High School or GED, Some College, and College Graduate, Some post Graduate, Post Gradute Degree
5. Reside in US in 4 categories: < 5 years, 10-14 years, 15-19 years, 20+ years.

Discussion

When analyzing the reliability of the MARS data as compared to the BRFSS, the difference in the means of the demographic variables from the two data sets was determined to be statistically significant. However, does this disqualify the data as not being reliable? It would be curious to evaluate the differences in frequencies and means of multiple national data sets that are considered valid and reliable such as the BRFSS, the 2012 American Community Survey (ACS), and others. This may provide a baseline for how much variability should be accepted. Also, the equation for the weighting factor used by Nielson is not disclosed. It would be useful to attempt to recreate the BRFSS weighting factor for the MARS data and see what the weighted outcome would be and how the data sets would compare then.

The Scarborough/MARS survey offers a distinct advantage: Attitudinal insights are valuable and not often recorded in national surveys; especially not linked with concurrently collected media usage. These attitudinal insights can be correlated with media usage and then the results used to tailor specific health attitude campaigns for targeted audiences.

However, it must be taken into account that this survey was designed to discover the attitudes and behaviors of target audiences in order to market products and drive sales. This is a very different objective then most surveys used for assessing the health and health behaviors and attitudes of the population. It may be for this reason that the Scarborough/MARS survey seems to capture and more highly educated and higher income segment of the population. However, it is often the lower educated and lower income segment of the population that is of interest to public health professionals because most often it is this segment of the population

that bears the greatest burden of health disparity. The design of the study as well as the design of the weighting factor used must be taken into account if this type of surveillance is to be used in the future. For this reason, it is recommended that the Scarborough/MARS survey and other market research like it be used in conjunction with current data collection methods such as the BRFSS.

Nonetheless, because the survey is designed for marketing purposes, the public health community can tap into the power of the marketing machine that is capitalism. Billions of dollars are poured into marketing in the US and Nielson is one of the top companies doing market research. Over the course of many years in business Nielson has fine-tuned questions in order to assess the attitudes of customers as well as the best medium for reaching them. This fact, combined with the breadth and depth of health care and media consumption data collected through the survey, make the Scarborough/MARS surveys a potentially powerful tool in the hands of public health professionals.

Surprisingly, Spanish language dominance and being foreign born did not have nearly the predictive power expected for the outcome variables of interest: receiving vaccine, trusting Doctor to recommend vaccine, length of time since annual exam, and considering an annual exam to be important. These results may be influenced by several factors. It may be because the outcome variables are heavily negatively skewed with most responses falling in the 4 or 5 values of the Likert scale responses. Lower values were combined in an attempt to create more normal distribution but normality was not achieved, although Central Limit Theorem permits the violation of this assumption(Rice, 1995). Another factor may be due to the MARS survey only being conducted in English and so participants more comfortable speaking Spanish or with

limited English proficiency may have responded differently had they completed the survey in Spanish. Finally, these demographic factor just might not be that influential among Hispanics for these particular outcome variables.

It was interesting to see that in the Multivariate Logistical Model with being vaccinated as the outcome and trusting doctor to recommend vaccines, being born in the US and Spanish language dominant as covariates that Spanish language dominant had a positive log likelihood but then when Linear Regression was run with trusting doctor to recommend vaccines as the outcome, Spanish language dominance was predictive of lower trust. Then when linear regression was run again with the same outcome variable among foreign born Hispanics only, Spanish language is no longer classified as significant (p=.080). Similarly, being born in the US is a predictor for a lower outcome in considering annual exams to be important (β= -0.011) but then when compared among only foreign born Hispanics time of residence in the US is a predictor of higher outcomes in considering annual exams to be important (β=0.022). But again, these coefficients are so small that that it is not unexpected to see the coefficients transgress across the 0 point.

The results for internet access at home and usage of a wireless device to access the internet were also unexpected. It was an unforeseen result to find that being born in the US decreased the odds of an individual having some kind of internet connection in their home. As expected, foreign born Hispanics were more likely to use wireless devices to access the internet. This may be because of financial reasons, Wi-Fi is free in most places, or because wireless internet access is generally more widespread abroad in developing countries than is some form of wired internet connection.

Additionally, the Scarborough Survey showed a 34.7% increase in Spanish Dominant Hispanics who use a cellular phone to access the internet from 2011 to 2014. This large increase is corroborated by other research on Hispanics and technology including a Pew Hispanic Center's Report (YEAR), which revealed a 10% increase in cell phone ownership and a 14% increase in individuals who used the internet among Hispanics from 2009-2012. The same report shows internet use among predominantly Spanish Dominant Hispanics increasing by roughly 30% across the same time period. This increase in wireless devices accessing the internet might have implications for mobile platform web based public health communications among Hispanics.

Further questions that need answering include: What does it mean that there is more in depth coverage of 77 of the 210 DMAs? If the MARS data are projectable to 80% of the population then who are the 20% who are missing? What is the "fusion" process and what are all of the "hook" variables? Is information weighted to achieve balance nationally or locally for each DMA? These questions will be important in more thoroughly assessing the representativeness of the data.

Strengths and Limitations

The MARS survey is not conducted in Spanish. This creates an issue with the generalizability of the data collected from those who responded that they were Spanish language dominant while still being able to fill out the survey and complete the interview in English. This potentially created some selection bias within the Hispanic population with only those with a moderate amount of English proficiency being able to participate in the Survey.

Kantar has begun conducting the survey in Spanish as well as English but that data will not be made available until April of 2016. It will be very interesting to compare this most recent data set. As mentioned previously, Nielson combines the MARS data with the Scarborough data to create the MARS MultiMarket data used in this paper. The Scarborough survey is conducted in Spanish. Further investigation is needed to find how Nielson combines the responses of Spanish language dominant participants in the Scarborough survey who took the survey in Spanish with Spanish language dominant participants in the MARS survey who took the survey in English. Discrepancies in survey responses have been found to be significant in respondents that take the Spanish translation version verses an English translation of the same survey (Berkanovic, 1980). Similar discrepancies would be expected for Hispanics who took a survey in English but are Spanish language dominant.

Fear of consequences, such as deportation, for being in the US illegally is often a large factor as to whether undocumented Hispanics will participate in a survey. Citizenship is not a question that is asked in the survey so we have no way of knowing if people without their citizenship participated in the study. It is reasonable for this question not to be included because it would have the possibility of scaring off potential participants. The advantage that a non-government survey such as Scarborough/MARS may have is that participants might feel more comfortable participating over other conducted by the government or affiliated entities. The probable exclusion of undocumented Hispanics could have a large impact on the findings of this study including the generalizability of the results. It may be the reason why the variable of foreign birth had such small Betas. The possible lack of participation of undocumented

Hispanics may have reduced the sampling of lower income foreign born Hispanics and lower income generally confers a host of health disparities.

Another possible issue with the Scarborough Survey's representativeness is the survey's low response rate (16%). In one meta-analysis of Random Digit Dialing (RDD) surveys response rates ranged from 42%-79% with an average of 62% (Massey, O'Connor, & Drotki, 1997). In a pilot study conducted as part of the 2005 Behavioral Risk Factor Surveillance System (BRFSS) comparing mail surveys to RDD surveys, a response rate of 22.5-45.8% was found across a sampling of states for RDD surveys and a mail survey response rate of 20-36.9% and 26.2-40.3% upon a second mailing (Link, Battaglia, Frankel, Osborn, & Mokdad, 2008). A meta-analysis of mail-in response rates found response rates from 40.8-59.2% (Yammarino, Skinner, & Childers, 1991). The primary concern is the representativeness of these data in light of such a low response rate. However, for RDD surveys low response rates and non-response bias often do not significantly reduce the representativeness of the data (Keeter, Kennedy, Dimock, Best, & Craighill, 2006).

Public Health Implications

The hope is that the results of this analysis may influence future public health policy and practice. Combined with other recent literature on the effects of foreign birth and Spanish language dominance on the health behaviors and attitudes of Hispanics it should be common practice to ensure proper sampling of these Hispanic subgroups. Furthermore, these factors should be taken into account when designing public health interventions and strategies.

Moreover, given the influence of attitudes on behavior, two things warrant additional attention: The first is why do some individuals not consider annual exams important and why is there distrust of physicians to recommend vaccines? The second is discovering that if individuals do find both of these preventative practices important and they do trust their physicians, then what are the obstacles that prevent them from taking advantage of these interventions? Given the breadth of information packed into these audience research data sets, they could be useful to uncover additional information about the aforementioned discrepancies in behavior and action. These surveys also collect information on a variety of health maladies (table 14). Furthermore, because information is collected by DMA's, it would be easy to analyze regional differences among the population. Finally, because information is collected according to DMA's and is released every 6 months, a local health agency could release a media campaign targeting a certain DMA and then analyze the results of the campaign as compared to a control group of individuals in a different DMA who would be much less likely to encounter the communication intervention.

Perhaps the strongest model generated was the Multiple Linear Model assessing the relationship of the outcome variable; time since last annual exam, and the independent variables; annual exam importance, Spanish language dominance, and foreign birth. The R^2 of this model was .192 demonstrating that the model predicts over 19% of the change outcome variable. The β for considering an annual exam to be important is .534 and the β for Spanish language dominance is -.118. Of note is that the independent variable, considering an annual exam to be important, alone accounted for over 18% of the change in time since last exam. This gives public health professionals a great avenue to approach increasing the frequency of

annual exams by increasing the perceived importance of such exams and working with healthcare providers to increase the perceived efficacy of annual exams possibly through more thorough communication during those appointments. The model also shows that Spanish language, as an inverse predictor of time since last exam, must be taken into account and more focus given to the Spanish dominant Hispanic population.

It is vital, considering the findings of this study, to include language dominance and place of birth as variables when collecting health data. These Hispanic subgroups should be taken into account when designing public health interventions and strategies. And seeing that both language and nativity are significant predictors of both perceived importance of preventative services as well as trust in health care providers it is imperative that public health agencies collecting population health information and designing health interventions continue to work closely with the healthcare provider system in order to better equip practitioners in order to increase trust and perceived importance of preventative services among the foreign born and Spanish language dominant Hispanic population.

Conclusion

Both the Scarborough Survey and the Kantar MARS survey seem to compare well with BRFSS data in some areas but not in others. Both Scarborough and MARS seem to lag behind the BRFSS in reaching the less educated, lower income, and uninsured Hispanic population. Both surveys ask very detailed questions about health attitudes and media use which is very helpful for understanding the needs of the population and how to communicate information about those needs. Although there are questions surrounding both surveys that need further

investigation, both the Scarborough and MARS surveys have potential to be valuable public health tools and deserve further investigation.

Most of the hypotheses surrounding the predictive nature of Spanish Language Dominance and Foreign Birth were correct; however, the strength of their influence was underwhelming when analysis was performed. Nonetheless, Spanish Language Dominance and Foreign Birth were predictive of health attitudes and behaviors as well as internet access among Hispanics. These relationships need to be further evaluated in the Public Health arena. The findings of this study may be used as additional evidence to support the use of these new data sources as well as to promote research to better understand the health behavior, attitude, and access disparities among Hispanics in the U.S regarding annual exams and vaccination.

Appendix

Table 14. List of Health Conditions in the MARS Survey

Acid Reflux/GERD	Gout
Acute Coronary Syndrome/Heart Attack	Hair Loss
ADD/ADHD	Hangover
Adult Acne	Headache (Non-Migraine)
Age Related Memory Loss	Heart Disease
Allergy (Year Round)	Heartburn/Indigestion
Allergy/Hay Fever (Seasonal)	Herpes
Anemia	High Cholesterol
Anxiety/Panic Disorder	Hyperhidrosis/Excessive Sweating
Anxiety/Social Anxiety Disorder	Hypertension/High Blood Pressure
Arthritis (Osteoarthritis)	Irritable Bowel Syndrome (IBS)
Arthritis (RA/Rheumatoid Arthritis)	Kidney Disease
Asthma	Menopause
Athlete's Foot	Menstrual Cramps/Pain
Backache/Lower Back Pain	Migraine Headache
Bipolar Disorder	Muscle Pain
Blood Clots in the Legs (DVT)	Nail Fungus
Body Ache	Nerve Pain
Bronchitis	Obesity
Cold Sores/Canker Sores	Osteoporosis
Cold/Flu	Overactive Bladder
Constipation/Irregularity	Post Traumatic Stress Disorder (PTSD)
COPD (including Chronic Bronchitis and Emphysema)	Psoriasis
Cough	Restless Leg Syndrome (RLS)
Depression	Seizures/Epilepsy
Diabetes (Insulin User)	Severe Pain
Diabetes (Non-Insulin User)	Shingles
Dry Eye	Sinus Congestion/Sinus Headache
Dry Skin/Eczema	Sleeping Difficulty/Insomnia
Enlarged Prostate/Benign Prostate Hyperplasia	Stroke
Erectile Difficulty	Tired/Run Down Feeling
Fibromyalgia	Urinary Tract Infections
Food Allergy	Yeast Infections
Gas	

Figure 1: Map of Designated Market Areas (DMA) in California

References

Ashton, C. M., Haidet, P., Paterniti, D. A., Collins, T. C., Gordon, H. S., O'Malley, K., … Street, R. L. (2003). Racial and ethnic disparities in the use of health services: Bias, preferences, or poor communication? *Journal of General Internal Medicine*, *18*(2), 146–152. http://doi.org/10.1046/j.1525-1497.2003.20532.x

Berkanovic, E. (1980). The effect of inadequate language translation on Hispanics' responses to health surveys. *American Journal of Public Health*, *70*(12), 1273–1276. http://doi.org/10.2105/AJPH.70.12.1273

Brown, A., & Patten, E. (2014). *Statistical Portrait of Hispanics in the United States, 2012*. Pew Hispanic Center. Retrieved from http://www.pewhispanic.org/2014/04/29/statistical-portrait-of-hispanics-in-the-united-states-2012/

CDC Office of Women's Health. (2015). *Regular Check-Ups are Important* (Online). Retrieved from http://www.cdc.gov/family/checkup/index.htm

Centers for Disease Control and Prevention (CDC). (2004). Access to health-care and preventive services among Hispanics and non-Hispanics--United States, 2001-2002. *MMWR. Morbidity and Mortality Weekly Report*, *53*(40), 937–941.

Clayman, M. L., Manganello, J. A., Viswanath, K., Hesse, B. W., & Arora, N. K. (2010). Providing Health Messages to Hispanics/Latinos: Understanding the Importance of Language, Trust in Health Information Sources, and Media Use. *Journal of Health Communication*, *15*(sup3), 252–263. http://doi.org/10.1080/10810730.2010.522697

Cohen, B., Ferng, Y. -h., Wong-McLoughlin, J., Jia, H., Morse, S. S., & Larson, E. L. (2012). Predictors of flu vaccination among urban Hispanic children and adults. *Journal of*

Epidemiology & Community Health, *66*(3), 204–209. http://doi.org/10.1136/jech.2009.099879

DuBard, C. A., & Gizlice, Z. (2008). Language spoken and differences in health status, access to care, and receipt of preventive services among US Hispanics. *American Journal of Public Health*, *98*(11), 2021–2028. http://doi.org/10.2105/AJPH.2007.119008

Fiscella, K., Franks, P., Doescher, M. P., & Saver, B. G. (2002a). Disparities in Health Care by Race, Ethnicity, and Language Among the Insured. *Medical Care*, *40*(1), 52–59.

Fiscella, K., Franks, P., Doescher, M. P., & Saver, B. G. (2002b). Disparities in Health Care by Race, Ethnicity, and Language Among the Insured: Findings From a National Sample. *Medical Care*, *40*(1). Retrieved from http://journals.lww.com/lww-medicalcare/Fulltext/2002/01000/Disparities_in_Health_Care_by_Race,_Ethnicity,_and.7.aspx

Harrison, J. A., Mullen, P. D., & Green, L. W. (1992). A meta-analysis of studies of the Health Belief Model with adults. *Health Education Research*, *7*(1), 107–116. http://doi.org/10.1093/her/7.1.107

Himmelstein, D. U., & Phillips, R. S. (2016). Should We Abandon Routine Visits? There Is Little Evidence for or AgainstShould We Abandon Routine Visits? *Annals of Internal Medicine*, *N/A*(N/A), N/A–N/A. http://doi.org/10.7326/M15-2097

Keeter, S., Kennedy, C., Dimock, M., Best, J., & Craighill, P. (2006). Gauging the Impact of Growing Nonresponse on Estimates from a National RDD Telephone Survey. *Public Opinion Quarterly*, *70*(5), 759–779. http://doi.org/10.1093/poq/nfl035

Link, M. W., Battaglia, M. P., Frankel, M. R., Osborn, L., & Mokdad, A. H. (2008). A Comparison of Address-Based Sampling (ABS) Versus Random-Digit Dialing (RDD) for General Population Surveys. *Public Opinion Quarterly*, *72*(1), 6–27. http://doi.org/10.1093/poq/nfn003

Linn, S. T., Guralnik, J. M., & Patel, K. V. (2010). Disparities in influenza vaccine coverage in the United States, 2008. *Journal of the American Geriatrics Society*, *58*(7), 1333–1340. http://doi.org/10.1111/j.1532-5415.2010.02904.x

Lu, P., Rodriguez-Lainz, A., O'Halloran, A., Greby, S., & Williams, W. W. (2014). Adult Vaccination Disparities Among Foreign-Born Populations in the U.S., 2012. *American Journal of Preventive Medicine*, *47*(6), 722–733. http://doi.org/10.1016/j.amepre.2014.08.009

Massey, J. T., O'Connor, D., & Drotki, K. (1997). Response Rates in Random Digit Dialing (RDD) Telephone Surveys. *Mathmatica Policy Research*.

McIntyre, A. F., Gonzalez-Feliciano, A. G., Bryan, L. N., Santibanez, T. A., Williams, W. W., & Singleton, J. A. (2013). Seasonal Influenza Vaccination Coverage—United States, 2009–10 and 2010–11. *CDC Health Disparities and Inequalities Report—United States, 2013*, *62*(3), 65.

Mechanic, D. (1996). The Impact of Managed Care on Patients' Trust in Medical Care and Their Physicians. *JAMA: The Journal of the American Medical Association*, *275*(21), 1693. http://doi.org/10.1001/jama.1996.03530450083048

Owens, A. (2006). *Hispanics in the United States* (PowerPoint). Ethnicity and Ancestry Branch, Population Division, U.S. Census Bureau. Retrieved from

http://www.census.gov/population/hispanic/files/hispanic2006/Internet_Hispanic_in_US_2006.pdf

Pearson, W. S., Zhao, G., & Ford, E. S. (2011). An Analysis of Language as a Barrier to Receiving Influenza Vaccinations among an Elderly Hispanic Population in the United States. *Advances in Preventive Medicine*, *2011*, 1–6. http://doi.org/10.4061/2011/298787

Registrar, F. (1997). Revisions to the standards for the classification of federal data on race and ethnicity. *Federal Registrar*, *62*, 58781–58790.

Rice, J. A. (1995). *Mathematical statistics and data analysis* (2nd ed). Belmont, CA: Duxbury Press.

Vargas Bustamante, A., Chen, J., Rodriguez, H. P., Rizzo, J. A., & Ortega, A. N. (2010). Use of Preventive Care Services Among Latino Subgroups. *American Journal of Preventive Medicine*, *38*(6), 610–619. http://doi.org/10.1016/j.amepre.2010.01.029

Vega, W. A., & Amaro, H. (1994). Latino outlook: good health, uncertain prognosis. *Annual Review of Public Health*, *15*. http://doi.org/10.1146/annurev.pu.15.050194.000351

Welch, B. L. (1937). On the z-Test in Randomized Blocks and Latin Squares. *Biometrika*, *29*(1/2), 21. http://doi.org/10.2307/2332405

Yammarino, F. J., Skinner, S. J., & Childers, T. L. (1991). Understanding Mail Survey Response Behavior: A Meta-Analysis. *Public Opinion Quarterly*, *55*(4), 613. http://doi.org/10.1086/269284

Zimmerman, R. K., Nowalk, M. P., Raymund, M., Tabbarah, M., Hall, D. G., Wahrenberger, J. T., … Ricci, E. M. (2003). Tailored Interventions to Increase Influenza Vaccination in

Neighborhood Health Centers Serving the Disadvantaged. *American Journal of Public Health*, *93*(10), 1699–1705. http://doi.org/10.2105/AJPH.93.10.1699

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