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Hispanic Use of Alternative Medicine as Demonstrated in Internet Searches

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Objective: We investigated how cultural shifts occur with respect to the use of traditional medicine for influenza-like illness (ILI) within the Latino population near the US-Mexico border. **Methods:** We extracted searches of ILI treatments (modern, traditional western, and traditional Hispanic) to the Bing search engine from 5 US states near the US-Mexico border. The incidence of these searches was correlated with county-level demographic data and ILI incidence. **Results:** The fraction of queries related to Hispanic medicines is correlated with the distance from the US-Mexico border (Spearman rho = -0.24), which is a slower decay than that observed in the use of Spanish (Spearman rho = -0.35). Demographic and socioeconomic factors predict different searches for ILI treatments. **Conclusions:** People of Hispanic origin rely on traditional Hispanic medicines when treating ILI. Medical providers should guide their patients when such treatments might be clinically detrimental to patients, and know their patients are likely using such medicines.

Key words: complementary and alternative medicine; influenza-like illness; Internet search engines; Internet health; Hispanic health; Latino health

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The arrival of Cortez in Mexico, and his subsequent conquest of the Aztecs and other less powerful tribes, launched the merging of European and indigenous peoples' beliefs about illness and health. The Spaniards learned about the healing properties of the flora and fauna of Mexico, as well as the folk healing rituals of the *curanderos*.¹ The Spaniards brought with them unique medical knowledge and the healing properties of the saints of Catholicism. The epistemologies flowed in 2 directions. Though many of Spain's new subjects in Mexico became Catholic, they did not give up their old belief systems. Indeed, the new beliefs were assimilated with the old. Theological hybrids emerged, especially as concerned health and the curing of diseases. These are known as *curanderismo*.²

Antonio Zavaleta,³ a well-known scholar of *curanderismo* in Mexico, reveals that "both Catholic and native populations in Mexico believed in

saints they worshipped as demi-gods, as well as the celebration feast days and the Catholic ritual of The Holy Mass. Moreover, both Catholics and Native Americans believed in healers called *curanderos*, facilitating the conversion of Indians to Catholicism and sustainable as long as the Indians were placated and allowed to continue the practice of their religious beliefs uninterrupted by the superimposition of Roman Catholicism."³

In the subsequent 4 centuries the merging of the 2 largely compatible theologies has never abated, but each is different because of it. Mexico's Catholicism is different from that of Spain or Rome. It is often called Folk or Popular Catholicism because of the inclusion of saints (often *curanderos*) not recognized by the Vatican. Certainly, the indigenous religions have changed, too, but have retained their beliefs in witches and *curanderos* and spiritists.³

These traditional belief systems, still strong in

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Hispanic populations in the United States (US), often are recognized by health professionals when attending Hispanic patients.⁴ These beliefs, rituals and curative practices are grouped under the heading of complementary and alternative medicine (CAM).

There are just over 9 million Hispanics in Arizona, Louisiana, New Mexico, Texas, and Oklahoma, (Arizona is 25% Hispanic; Louisiana 2.4%; New Mexico 42%; Texas 32%; Oklahoma 5.2%), amounting to 25% of the total US Hispanic population.⁵ The counties along the border, from Brownsville, Texas to western Arizona, are all at least 25% Hispanic and most are majority Hispanic counties.⁶ The Hispanic population in the states under study is mostly of Mexican descent, and therefore, often observe the customs of that heritage. The cultural heritage central to this study is that which contains the belief systems that affect health and the curative and palliative therapies commonly utilized by Hispanics in the southwestern US.

Hundreds of formal health studies in relation to Hispanic populations have been conducted over the past 20 years. Whereas there is a large body of literature (over 1000 studies) that tangentially touched on Hispanic health, and reviewed, for example, by Morales et al⁷ and Thomson and Hoffman-Goetz,⁸ only a relatively small number focused on Hispanic populations and CAM as a variable that affected treatment or approaches to treatment.

Curanderismo itself has been a major focus of many studies using historical-critical, ethnographic, survey, and experimental methodologies. A review of the literature by Tafur et al⁴ concluded that 50%-75% of Mexican-Americans use traditional healing practices that are common in *curanderismo*. According to the authors: "...75% of Mexican Americans use complementary or alternative therapies to treat their illnesses." Furthermore, they cite a study by Rivera et al⁹ in which it is asserted that "69% of Mexican Americans do not report the use of herbal remedies" for fear their doctor would be openly disapproving of the practice.

A study on *curanderismo* in the Colorado public health system in 2001 included interviews with 405 Hispanics and found that 29% had been to a *curandero* in their lifetime and 91% knew what a *curandero* was.¹⁰ The authors concluded that "Hispanic patients who receive their healthcare at a

public health system use the services of *curanderos*."

Among patients of Puerto Rican descent, in the modern health systems of New York, beliefs in poor health caused by "evil spirits and spells" is persistent. Larson, et al¹¹ conducted a study on upper respiratory infections and learned that 7% of their subjects believed that *mal de ojo* (evil eye) could be the cause and 3.3% believed that *susto* (sudden fright) could be responsible. Perhaps more troubling was the misconception, held by 90%, that antibiotics could cure viral infections.

More religious Hispanics are more likely to use CAM. Heathcote et al¹² developed a slightly new paradigm for studying CAM by excluding prayer from the traditional behaviors to see if religiosity would correlate with CAM without it. Also included in the list of CAM therapies were *curanderismo* practices and rituals – consistent with the National Center for Health Statistics (NHIS) definitional changes of 2007. Heathcote et al found a positive correlation between religiosity and CAM. They also found that women were more reliant on CAM than men.

Two studies done in health systems in California are informative. One looked for differences in CAM among Hispanics using "time since immigration" as an independent variable.¹³ Approximately 68% of the 166 persons reported using CAM within the last year and 28% said they have their own herbs at home. There was no positive correlation between "time since immigration" and CAM use. A second study of interest also demonstrated that CAM use is common among Hispanics of that region.¹⁴ Of the 150 survey respondents, 63% used some type of CAM and 32% used herbal medicine of some kind.

US Hispanics typically make use of both CAM and modern western medicine.¹⁰ Interestingly, around 80% of users of CAM do not discuss their use of it with their medical providers.¹⁵ Moreover, many patients of Hispanic origin would like their primary care physicians to include CAM in their discussion of possible therapies.¹⁴

Internet data and specifically search engine queries have been shown to reflect people's interests and actions, both in the virtual and the physical worlds.¹⁶ For example, search engine queries have been used to identify precursors to disease.¹⁷ These precursors appear in behaviors in the virtual world and in the physical one. Additionally, the number

of people who query about medication in search engines are closely correlated with the number of prescriptions of these medications.¹⁸ Thus, in this study we use search engine queries to investigate the use of CAM in Hispanic and non-Hispanic populations along the US-Mexico border.

Our hypotheses are:

- H1: Higher seeking of CAM is associated with higher levels of Hispanic population, as indicated by: (1) greater volume of CAM searches in Hispanic dominant counties than in Anglo-dominant counties, and (2) that greater Spanish dominance will be positively correlated with CAM searches.
- H2: People of Hispanic origin continue to use CAM even when cultural traits such as language decrease in use.

METHODS

Data

Our data comprised of search engine information, epidemiological information, demographic data, and geographic data, from 4 separate sources, as shown below.

Search engine data. We extracted all English and Spanish queries to the Bing search engine from people based in the US for the period between October 1, 2015 and April 30, 2016. For each query, we extracted the time it was made, its text, and the US county from where it was made.

Epidemiologic data. We collected the percentage of physician visits for influenza-like illness (ILI) reported to the US Centers for Disease Control by sentinel providers in region 6 of the US, which includes the states of Arizona, Louisiana, New Mexico, Oklahoma, and Texas. We chose this region because it represents the region with the most states bordering on Mexico and are known to have a sizable population of people of Hispanic descent. Data include the percentage of ILI visits at a weekly resolution for the period of October 2015 to April 2016 (inclusive).

Demographic data. We collected demographic information from the 2010 US census. The information, at a county level, includes the following:

- Number of healthcare providers per 100 thousand people;
- Percent of people in each county living in

poverty;

- Median household income;
- Total population; and
- Fraction of the population of white, African-American, American Indian, Asian, Hawaiian, Hispanic, and other.

Geographic data. We calculated the distance from the center of each US county to the nearest point of the US-Mexico border using the Haversine formula.¹⁹ Our analysis focuses on a total of 497 counties from the aforementioned 5 states.

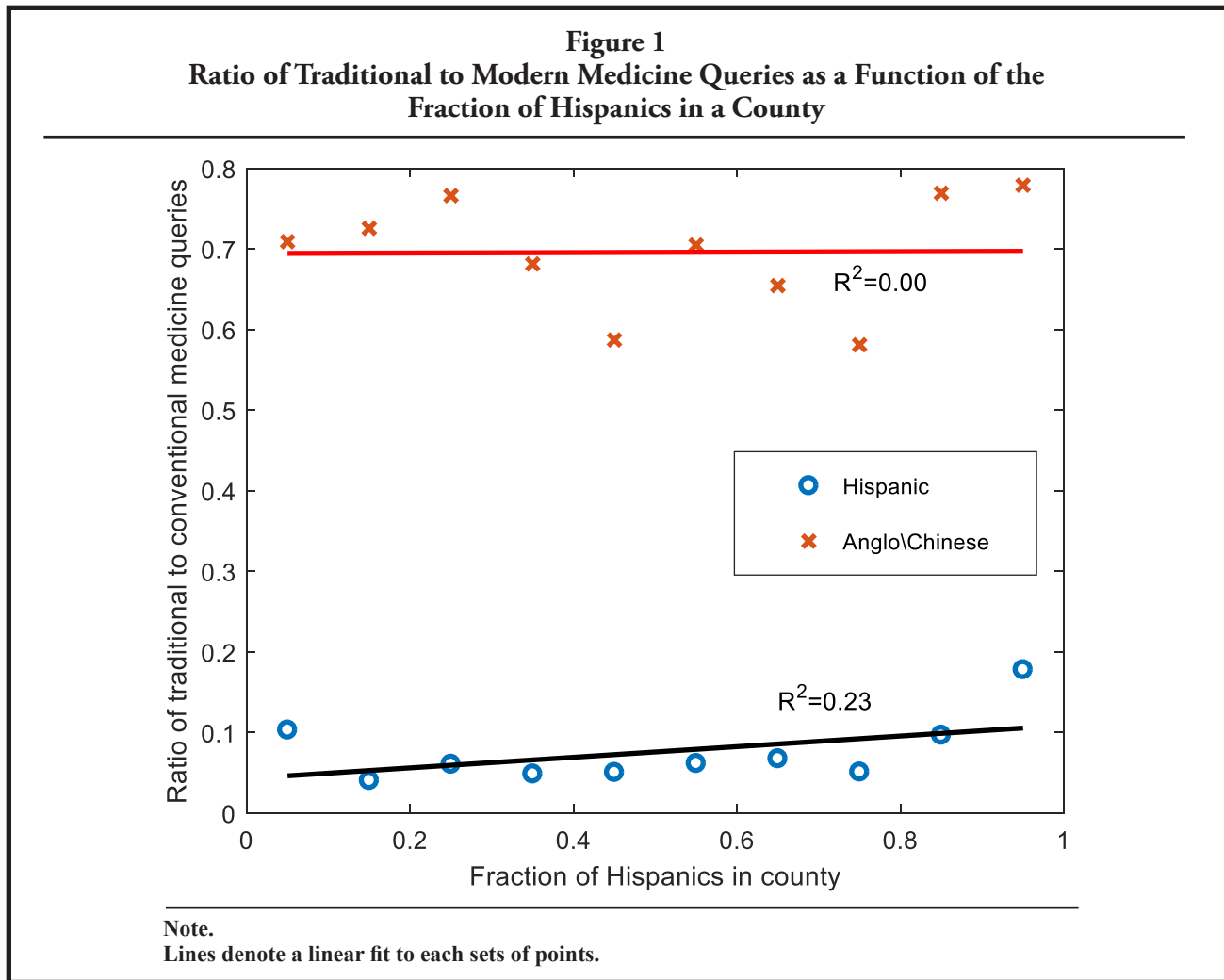
Influenza-related Key Words

We collected a set of keywords related to treatments for alleviating influenza-like illnesses by scanning the top pages returned in response to the queries “flu” and “influenza” from Google and Bing. The keywords were divided into 3 classes as shown below.

Modern medicines. Vicks Vapor Rub, Amantadine, Symmetrel, Rimantadine, Flumadine, Zanamivir, Relenza, Oseltamivir, Tamiflu, Peramivir, Interferons, Ephedrine, Efedrina, Levomethamphetamine, Naphazoline, Oxymetazoline, Phenylephrine, Phenylpropanolamine, Propylhexedrine, Pseudoephedrine, Synephrine, Tetryzoline, Tramazoline, Xylometazoline, Bronkaid, Primatene, Acutrim, Eventin, Otrivin, Otrivine, paracetamol, acamol, Tylenol, acetaminophen, Panadol, Motrin, ibuprofen, Aspirin, Aspirina, Aleve, Probiotics, Vitamin C, B12, Bedoyecta Tri, Inyeccion B12, Lozenges, Halls, Nyquil, DayQuil.

Hispanic alternative medicines (HAM). Manzanilla Tea, Anis, Cayenne Pepper, Guindilla seca, Pimienta de cayena, Pimienta picante, Pimienta roja, Tequila Agave and Lime, Mal de Ojo, Yerba Buena, Sancocho, Estafiate, Hierba del Carbonero, Nopal, Nopales, Nopalitos, Sauco, Caldo de pollo, Echinacea, Te verde, ajo, Aceite de eucalipto Vinagre de sidra, Campana dorada, Campana china, Madreselva, Zulla.

Western and Chinese alternative medicines (WCAM). Eldeberry, chicken soup, Chamomile Tea, Ginseng, Siberian ginseng, Kan Jang, Green Tea, Garlic, Oscillocoquinum, Oregano Oil, Colloidal Silver, eucalyptus oil, woad root, woad leaf, forsythia fruit, honeysuckle flower, Anise, apple cider vinegar.



Data Analysis

We counted the total number of queries in each of the counties in the 5 states, using a weekly resolution. Additionally, we separately calculated the fraction of queries that included an influenza-related keyword from each of the 3 classes of keywords.

We used the demographic information and ILLI burden to model the county-level ratio between: (1) the number of queries for HAM and the number of queries for modern medicine; and (2) the ratio between the number of queries for WCAM and the number of queries for modern medicine.

RESULTS

Approximately 1.12 million queries contained one or more of the influenza-related key words.

The fraction of Spanish-language queries of all queries (English and Spanish) decreased as a function of the distance from the US-Mexico border. The Spearman correlation between the fraction of Spanish language queries out of all queries and the distance from the border was -0.352 ($p < 10^{-10}$). The Spearman correlation between the fraction of Hispanic Alternative Medicine (HAM) queries among all queries and the distance from the US-Mexico border was -0.240 ($p < 10^{-6}$). No similar statistically significant correlations were found for modern medicines and western alternative medicines. Thus, though both the use of Spanish and Hispanic alternative medicines decreases with distance from the US-Mexico border, the latter decreased at a slower rate. We hypothesize that this is due to people of Hispanic origin who, though not using Spanish as much as their compatriots living

Table 1
Model Parameters for Predicting the Ratios between Traditional and Modern Medicines

	Hispanic medicine ($R^2 = 0.13$)		Western/Chinese medicines ($R^2 = 0.02$)	
	Slope (SE)	p-value	Slope (SE)	p-value
Percent ILI	0.013 (0.022)	NS	0.078 (0.022)	3×10^{-4}
Healthcare providers	0.004 (0.000)	$<10^{-10}$	0.001 (0.0004)	.001
Percent poverty	0.010 (0.004)	.01	-0.008 (0.004)	NS
Median household income	2×10^{-5} (2×10^{-6})	$<10^{-10}$	7×10^{-6} (2×10^{-6})	3×10^{-4}
Total population	4×10^{-7} (4×10^{-8})	$<10^{-10}$	2×10^{-7} (4×10^{-8})	5×10^{-5}
Percent white	-0.172 (0.167)	N.S.	-0.707 (0.173)	4×10^{-5}
Percent African-American	-0.063 (0.154)	N.S.	-0.447 (0.159)	.005
Percent Hispanic	0.651 (0.149)	10^{-5}	-0.580 (0.153)	10^{-4}

closer to the border, still use Hispanic alternative medicines.

Figure 1 shows the ratio between the fraction of Hispanic alternative medicine queries and the fraction of modern medicines, and, similarly, the ratio of WCAM fraction and the fraction of modern medicines. Both are shown as a function of the fraction of people of Hispanic origin in their county. As Figure 1 shows, although no correlation is apparent in the ratio for WCAM queries, the correlation for HAM queries is high ($R^2 = 0.23$). This provides another indication of the correlation between the use of HAM by people of Hispanic origin, where no such correlations exist for WCAM and the respective race.

To quantify the effects in Figure 1, we modeled the 2 ratios described above for each county and at each week of the flu season using demographic and epidemiological parameters as shown below.

Percent of ILI at that week:

- Number of healthcare providers per 100 thousand people;
- Percent of people in each county living in poverty;
- Median household income;

- Total population;
- Fraction of the population of white origin;
- Fraction of the population of African-American origin; and
- Fraction of the population of Hispanic origin.

The ratios are distributed such that they appear closer to a lognormal distribution than to a normal distribution. Therefore, we transformed the ratios using the log transform. We used a linear model to predict the transformed ratios with the independent parameters above.

Table 1 shows the parameters of the 2 models. The models show that the use of HAM was correlated with more healthcare providers, greater poverty, higher median household income, and greater population. Greater populations of Hispanic people are associated with more HAM queries.

Interestingly, the results for WCAM are different: Higher ILI burden was associated with greater use of WCAM relative to modern medicines. More healthcare providers, higher income and larger populations also were associated with greater WCAM use. Having more minorities (not African-American, white, or Hispanic) was associated with higher WCAM use.

DISCUSSION

People who move from one culture to another often adopt aspects of the new culture while abandoning aspects of their original tradition. Here we investigated how these cultural shifts occur with respect to traditional medicine for influenza-like illnesses. Our baseline of change was the use of Spanish – another cultural attribute that differs between Mexico and the US.

Our findings supported both of our hypotheses. As predicted in H1, the data demonstrated a correlation between Hispanic dominant counties and searches for CAM. Something that was counter-intuitive in the results, and unexpected, was the additional correlation that showed increased searches for CAM in counties that also had higher levels of access to modern healthcare services. This finding raised our curiosity, so we assembled a focus group of 20 Hispanic students at a large Hispanic serving institution on the US-Mexican border to gain some insights about this apparent conundrum. We simply shared the results of the search study with them and asked why patients would go the doctor and then also seek out CAM or even *curanderos*? Their responses coalesced around the idea that “there is no harm in covering all your bases. Maybe the *curandero*, or folk herbs and medicines offer something that modern medicine doesn’t.” A similar consistent response was this: “*Mi abuela va a mirar la medicina que el médico le dio y decir, usted no necesita eso - usted necesita esto.* (My grandmother will look at the medicine the doctor gave me and say: ‘you don’t need that, you need this’.)” Though most of the people in the focus groups did not go to *curanderos* themselves anymore, many of their grandparents and parents did, and they have become the repositories of the folk knowledge. They then administer the CAM and the attendant rituals that will address the problem through herbs and spiritualism.

Our data also supported H2. The expected concomitant covariation in relation to use of Spanish and distance from the US-Mexican border was clearly demonstrated by the data. Not surprisingly, the use of Spanish search terms was most pronounced near the border and weakened as distance from the US-Mexican border increased. Nonetheless, the reliance on CAM decreased at a slower rate as distance from the border increased. “Cul-

tural DNA,” one could conclude, is an attribute not easily weakened. This relationship was supported by White et al’s study that found no relationship between reliance on CAM and “time since immigration.”¹³

Hispanic immigrants, through search data, demonstrate a significant and persistent reliance on CAM, despite time in country. Their search efforts may undergo linguistic adaptation from Spanish terms to English terms, but the epistemological trust in the herbal pharmacopeia remains strong and often supersedes trust in more modern options and procedures.

The findings here supporting the identified correlation are important because they are the result of behavioral rather than self-report or attitudinal data. Most of the studies about Hispanics and CAM often have relied on self-report methodologies that have special challenges in the realms of accurate recall, social acceptance bias, and even willful blindness. This study provides insight into actual healthcare behavior in self-directed searches for therapies. We hypothesize that CAM will exhibit similar uses in other medical conditions, and plan to investigate this in future research.

IMPLICATIONS FOR HEALTH BEHAVIOR OR POLICY

Though we should never make the mistake of believing the Hispanic diaspora is monolithic, and therefore, the same in values and beliefs, we can entertain the notion that Hispanics in the southwestern US who also utilize CAM, do share similar demographics and psychographics. One could conclude that this minority of patients within the Latino community is at greatest risk to long-term health issues because of their adherence to CAM in place of modern western medical strategies that have proved to have greater validity and efficacy with serious, chronic illnesses. In addition, these patients tend to keep the CAM practices private, whether because of distrust or uncertainty in dealing with physicians, or the belief that CAM practice cannot possibly interfere with what the doctors may prescribe. As traditionalists, Latino adherents to CAM believe such practices are natural and can do no harm. Moreover, medical providers are often wary of discussing alternative medicine with their patients.²⁰

Medical practitioners should strive to accommodate the following principles when dealing with Hispanic patients in the southwestern US or with those who have been influenced by those cultural traditions:

Realize that some Hispanics may be suspicious of western medicine because it is impersonal and, to their way of thinking, even rude. It is divorced from the intensely personal approach that they have received from their *abuelita* and *tias* (grandmother and aunts). These *abuelitas* and *tias* have, in many cases, conditioned them against western medicine by contradicting doctors' advice with their own heritage of folk medicine.

Hispanic culture, even in the US, tends to be polychronic. The monochronic system in place in US medical systems, where time is money produces a disease-centered rather than patient-centered bias. It is a jarring bias to one who is used to the intensely personal bedside manner of *curanderismo* that offers generous amounts of time for empathetic listening.

Respeto (respect) is one word, but also a virtual value system in and of itself within Hispanic culture. Healthcare providers should never belittle the practices and rituals common to traditional medicine. One should never say things like: "I know many believe that *echinacea* will cure a cold and even bronchitis, but that is nonsense." Instead, it is best to say: "*Echinacea* could be useful. We don't know everything about how it works and what it does. So, go ahead and take it. However, I am concerned that you are developing bronchitis so I want to add this antibiotic to get you better faster." Respect for tradition is paramount because without it, patient compliance may disappear.

Naturally, in situations where CAM and a given drug would be contraindicated, the practitioners must alert them to the dangers and be exceptionally unambiguous about the outcomes, ie, "The interaction of this with certain herbs could damage your liver or cause a horrible rash."

Assume CAM may be in use. It does no harm to assume that many Hispanic patients may be influenced by CAM. So, it does no harm for the healthcare practitioner to bring it up on their own, to say, for instance: "When you do Internet searches for stomach flu you will see Manzanilla tea. Your *abuelita* will probably recommend it, too. Good

advice. Now let's add to that this medicine so we can hit it from both sides."

Taking time and establishing interpersonal respect through good, cultural manners will result in the patient being more forthcoming and providing a fuller picture of their health and the therapies they utilize, both those of CAM and modern medicine. This leads naturally to better healthcare overall.

Human Subjects Approval Statement

This study was deemed exempt by the Microsoft IRB.

Conflict of Interest Disclosure Statement

The authors disclose no conflict of interest. Dr Yom-Tov is employed by Microsoft, owner of Bing.

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