Somos diferentes/We are different:

Racial and ethnic heterogeneity in self-reported diabetes prevalence trends across Hispanic subgroups,

*National Health Interview Survey, 1997-2012*

**SAStravaganza 2015**

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Background

• The Hispanic population represents the largest and most rapidly growing minority group in the US.

• Census projections indicate a 200% increase in the US Hispanic population by the year 2050.

• Hispanics will account for at least 67% of the total population growth from 2015-2060.

• Various sociodemographic attributes have been demonstrated to have a significant inverse relationship on risk factor prevalence and adverse outcomes for US Hispanics, including:
  • Race/Ethnicity
  • Socioeconomic status (SES) – education, income, insurance, etc.
  • Language barriers/Primary language spoken (PLS)
Disadvantaged SES status \rightarrow \text{Less favorable health outcomes}
What is the Hispanic Paradox?

**Definition:**
Health outcomes *unexpectedly* equal or better than Non-Hispanic whites in the US, in spite of the “Hispanics” less favorable socioeconomic status.

**Related outcomes:**
- Chronic disease (Diabetes, CVD)
- Adult mortality
- Birth weight
- Infant mortality (mainly neonatal mortality)
HISPANIC PARADOX

Potential Explanations

• Effects of social networks
• Healthy migrant hypothesis
• Cultural differences in diet
• Differences in type of occupation
Hispanic Paradox: IS IT REAL?

• “Hispanics” is a loaded term
  • Diverse population
  • Different diets
  • Different immigration patterns
  • Different social/political climates in country of origin
  • Acculturation/assimilation effects

• Evidence against Hispanic Paradox continues to mount...
Overview: Applied Methods

• Pan-ethnic grouping = all Hispanic subgroups
• HHANES
• NHANES
• BRFSS
• Recently, HCHS/SOL
• Sample size = Pooling data
• Estimating and predicting trends over time minimal
Public Health Significance

• Risk factors for diabetes and other chronic conditions are disproportionately higher among US Hispanics.
• Little public health information is known about national diabetes risk factor trends among US Hispanics.
• Exploration of heterogeneity of diabetes prevalence across Hispanic subgroup over time sparse or outdated.
• Findings can be used to develop tailored, culturally relevant risk reduction efforts in US Hispanics.
Study Goals

(1) Describe the heterogeneity within Hispanics for self-reported diabetes aggregated, disaggregated, and over time

(2) Estimate time trends in the prevalence of self-reported diabetes over time when compared to non-Hispanic whites and non-Hispanic blacks

(3) Identify disparities in the prevalence of diabetes over time among Hispanic subgroups, non-Hispanic whites, and non-Hispanic blacks.
National Health Interview Survey

• Publicly available data
• Annual face-to-face interviews
• Nationally representative sample of households
  • Each week a probability sample of civilian noninstitutionalized US population interviewed
  • Information obtained on health and other characteristics for EACH member of the household
• Currently the ONLY publicly available source for health data on Hispanic subgroups at the national level.
Study Population

• Inclusion criteria
  • Adults >= 18 years of age
  • Non-Hispanic White, Non-Hispanic Black, Puerto Rican, Mexican/Mexican American and Cuban/Cuban American respondents

• Exclusion criteria
  • Pregnant women
  • Pre-diabetes & borderline diabetes
  • “Other” race AND Hispanic subgroups

• Aggregate data from respondents
Statistical Analysis

• Merge 15 years of NHIS data (DATA step w/ MERGE command)
• Annual, weighted age-adjusted prevalence based on Census 2000 population distribution. (PROC SURVEYFREQ w/ WEIGHT)
• Primary outcome = self-reported diabetes
• Stratification variables = race/ethnicity & level of education
• Graphical displays of outcomes by
  • Race/Ethnicity
  • Hispanic subgroup
  • Level of education
• Chi-square tests and ANOVA for univariate and bivariate analyses (PROC SURVEYFREQ & SURVEYMEANS)
• Time trend: Linear regression with “year” as predictor (PROC SURVEYREG)
## Participant Characteristics, NHIS 1997-2012

<table>
<thead>
<tr>
<th></th>
<th>Total (%)</th>
<th>NHW (%)</th>
<th>NHB (%)</th>
<th>M/MA (%)</th>
<th>PR (%)</th>
<th>C/CA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total N</strong></td>
<td>427,975</td>
<td>298,803</td>
<td>68,489</td>
<td>48,093</td>
<td>8,171</td>
<td>4,419</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td>48.6 [48.4-48.8]</td>
<td>48.7 [48.4-48.9]</td>
<td>45.2 [44.7-45.7]</td>
<td>53.2 [52.6-53.8]</td>
<td>47.8 [46.3-49.4]</td>
<td>50.8 [49.2-52.4]</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>51.4 [51.2-51.6]</td>
<td>51.3 [51.1-51.5]</td>
<td>54.8 [54.2-55.3]</td>
<td>46.8 [46.2-47.4]</td>
<td>52.2 [50.6-53.7]</td>
<td>49.2 [47.6-50.8]</td>
</tr>
<tr>
<td><strong>Age (y), mean (SE)</strong></td>
<td>46.0 (0.07)</td>
<td>47.3 (0.08)</td>
<td>42.8 (0.13)</td>
<td>38.4 (0.14)</td>
<td>42.1 (0.26)</td>
<td>49.0 (0.48)</td>
</tr>
<tr>
<td><strong>BMI, kg/m², (SE)</strong></td>
<td>27.2 (0.02)</td>
<td>26.7 (0.02)</td>
<td>28.6 (0.04)</td>
<td>28.0 (0.04)</td>
<td>28.1 (0.09)</td>
<td>27.0 (0.11)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
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<tr>
<td>&gt; HS</td>
<td>54.5 [54.1-55.0]</td>
<td>58.7 [58.2-59.2]</td>
<td>48.3 [47.4-49.2]</td>
<td>27.3 [26.4-28.1]</td>
<td>40.4 [38.6-42.3]</td>
<td>47.8 [45.9-49.7]</td>
</tr>
<tr>
<td><strong>Income, %</strong></td>
<td></td>
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<tr>
<td>&lt;35k</td>
<td>73.6 [73.3-73.9]</td>
<td>71.2 [70.9-71.6]</td>
<td>80.0 [79.4-80.7]</td>
<td>85.0 [84.4-85.6]</td>
<td>79.6 [78.3-81.0]</td>
<td>78.6 [76.8-80.5]</td>
</tr>
<tr>
<td><strong>Health Insurance</strong></td>
<td></td>
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</tbody>
</table>
Weighted age-adjusted annual diabetes prevalence by race & Hispanic subgroup, NHIS 1997-2012

a) Race and pan-ethnic Hispanic group

b) Race and Hispanic subgroups

Diabetes Prevalence (%)

Year

0 2 4 6 8 10 12 14 16


NHW NHB Hispanic

0 2 4 6 8 10 12 14 16


NHW NHB PR M/MA C/CA Other
Weighted age-adjusted annual diabetes prevalence by race & Hispanic subgroup, NHIS 1997-2012: Less than HS diploma
Weighted age-adjusted annual diabetes prevalence by race & Hispanic subgroup, NHIS 1997-2012: HS diploma/GED
Weighted age-adjusted annual diabetes prevalence by race & Hispanic subgroup, NHIS 1997-2012: More than HS diploma
## Average annual diabetes prevalence by race/ethnicity, Hispanic subgroup, and education 1997-2012

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Education</th>
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<tbody>
<tr>
<td></td>
<td>&lt; HS</td>
<td>HS/GED</td>
<td>&gt; HS</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% [CI]</td>
<td>P^a</td>
<td>% [CI]</td>
<td>P^a</td>
<td>% [CI]</td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
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<td></td>
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<tr>
<td>Non-Hispanic White^b</td>
<td>12.1 [11.7-12.5]</td>
<td>&lt;0.0001</td>
<td>8.1 [7.9-8.3]</td>
<td></td>
<td>5.3 [5.2-5.4]</td>
</tr>
<tr>
<td>Non-Hispanic Black^b</td>
<td>16.1 [15.3-16.9]</td>
<td>&lt;0.0001</td>
<td>9.7 [9.2-10.2]</td>
<td>&lt;0.0001</td>
<td>8.2 [7.8-8.6]</td>
</tr>
<tr>
<td>Hispanic^b,c</td>
<td>10.6 [10.0-11.1]</td>
<td></td>
<td>7.0 [6.6-7.4]</td>
<td></td>
<td>6.6 [6.2-7.1]</td>
</tr>
<tr>
<td>Hispanic Subgroup</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Mexican/MA^b</td>
<td>9.7 [9.2-10.3]</td>
<td>&lt;0.0001</td>
<td>6.3 [5.8-6.9]</td>
<td></td>
<td>6.7 [6.1-7.2]</td>
</tr>
<tr>
<td>Puerto Rican^b</td>
<td>17.6 [15.7-19.6]</td>
<td>&lt;0.0001</td>
<td>9.8 [8.3-11.2]</td>
<td>&lt;0.0001</td>
<td>6.8 [5.8-7.8]</td>
</tr>
</tbody>
</table>

National Health Interview Survey (NHIS); High School (HS); General Equivalency Diploma (GED); Time trend model intercept (B_0); Five year trend in diabetes prevalence (b_{SYR}); Non-Hispanic white (NHW); non-Hispanic black (NHB); Mexican/Mexican American (M/MA); Puerto Rican (PR); Cuban/Cuban American (C/CA);

^a P for ANOVA test of race/ethnicity and Hispanic subgroup differences < .001; ^b P for ANOVA test of race/ethnicity < .001 and Hispanic subgroup differences = .03; ^c All Hispanic ethnic groups combined
<table>
<thead>
<tr>
<th>Education</th>
<th>&lt; HS</th>
<th>HS/GED</th>
<th>&gt;HS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B_0$</td>
<td>$b_{5YR}$</td>
<td>$P$</td>
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<tr>
<td></td>
<td>$B_0$</td>
<td>$b_{5YR}$</td>
<td>$P$</td>
</tr>
</tbody>
</table>

| Race/Ethnicity | | | |
|----------------|----------------|----------------|
| NHW            | 9.1            | 2.1            | <0.001 |
|                | 5.0            | 2.1            | <0.001 |
|                | 3.2            | 1.3            | <0.001 |
| NHB            | 12.9           | 2.2            | <0.001 |
|                | 6.7            | 2.0            | <0.001 |
|                | 5.5            | 1.7            | <0.001 |
| Hispanic¹     | 7.5            | 1.9            | <0.001 |
|                | 5.1            | 1.1            | 0.001 |
|                | 4.1            | 1.5            | <0.001 |

| Hispanic Subgroup | | | |
|-------------------|----------------|----------------|
| M/MA              | 6.0            | 2.2            | <0.001 |
|                   | 4.4            | 1.1            | 0.005 |
|                   | 4.4            | 1.3            | 0.001 |
| PR                | 14.3           | 2.2            | 0.06  |
|                   | 6.8            | 1.8            | 0.03  |
|                   | 2.4            | 2.6            | 0.001 |
| C/CA              | 6.6            | 4.8            | 0.002 |
|                   | 5.4            | 1.8            | 0.17  |
|                   | 5.6            | 0.4            | 0.61  |

National Health Interview Survey (NHIS); High School (HS); General Equivalency Diploma (GED); Time trend model intercept ($B_0$); Five year trend in diabetes prevalence ($b_{5YR}$); Non-Hispanic white (NHW); non-Hispanic black (NHB); Mexican/Mexican American (M/MA); Puerto Rican (PR); Cuban/Cuban American (C/CA);

¹ All Hispanic ethnic groups combined
Other Results

• Highest prevalence seen among NHB & PR
• No significant difference between NHB & PR overall
• No significant difference between NHB & PR at 2 lower levels of education
• No significant difference between PR & CCA at higher level of education
• Trend over time varied by Hispanic subgroup and education.
• Hispanics with more than a HS education
  • Less diabetes
  • Demonstrate larger benefit than NHB’s
Limitations

• Did not examine nativity, despite fact that recent studies have suggested its importance (1st gen. vs 2nd gen. etc)

• Self-reported diabetes

• Type of diabetes

• BMI calculated from self-reported height and weight.

• Cross-sectional estimates at each time-point

• Did not construct a more comprehensive measure of SES.
Strengths

• Ability to qualitatively describe trends by important sociocultural factors.
• Estimated time trend
• Large samples are available at each time point.
• Consistent sampling scheme over survey periods allow for time trend analysis.
• Subgroup data available on national level
Conclusions

• Results reveal considerable heterogeneity regarding variation in the prevalence of diabetes among US Hispanics over time.

• More comprehensive databases are necessary to
  • Ascertain ethnic variability within the US Hispanic population
  • Identify and target specific groups at higher risk

• Longitudinal studies needed to examine trends and incidence of diabetes within the US Hispanic population.

• Evidence-based, culturally appropriate targeted interventions to improve high school graduation rates, college enrollment, and retention can benefit all racial and ethnic groups.
Why is this important?

• Great potential for economic burden on healthcare system if ignored.
• Missing out on groups at higher risk.
• Ability to develop tailored intervention and prevention strategies.
• No one likes to be ignored in research.
• Move away from the traditional approaches to research involving the underserved.
• Other applications – LGBTQ, nativity analysis, high-dimensional data analysis
• Developing methods to explore and acknowledge the heterogeneity that IS the United States!!!!