Measuring socioeconomic status/position (SES) in health research: We can do better

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Socioeconomic status/position (SES) — widely used, rarely defined

- Measured by income, education, occupation, accumulated financial assets (wealth)
- Economic resources and/or the associated social influence and prestige
- Ownership of, control over, access to economic resources and the associated social standing or influence
- Status/position in a socioeconomic hierarchy
- Multidimensional
Prevailing approaches in US

- Routine reporting by race/ethnicity with no/little SES information
- Only 1 measure used to described SES
  - Rationale for selected measure rarely stated
- Education often used as proxy for income
- Controlling for income/education without considering potential causal role
Concerns re SES measurement

- Limitations of measures rarely considered
- Studies often conclude a racial/ethnic difference is biological or “cultural” because it persists after controlling for 1-2 SES measures
- Without sound SES measurement, we cannot assess:
  - Role of SES in health
  - Associations between (a) race/ethnicity and health or (b) any predictor & outcome variables for which SES is relevant
Population-based data sources:
4 national, 1 California statewide

- **NHANES III** 1988-’94: ages 1-5; <17; 25-64
- **NHIS/NDI** 1989-’94 (deaths ‗97): ages 18-64
- **BRFSS** 2004 (all states + DC): ages 18-74
- **Add Health Wave I** 1994-’95: ages 11-21
- **MIHA** 1999-2004 (CA. postpartum surveys modeled on CDC’s PRAMS; CDPH-MCAH/UCSF; only mothers >24 for this study)
Different “dimensions” and “specifications” of SES

- **Dimensions**: general constructs, e.g., income, wealth (accumulated), education, occupation
  - Different dimensions could have different effects

- **Specifications**: specific ways to measure e.g.
  - Income, or per family size or as a % of poverty level
  - Continuous vs categorical (and how categorized)
  - Level: maternal vs paternal vs household vs area
  - Timing in life course (e.g., child, young/older adult)
Education is often used as an income proxy

- Studies rarely examine both income & education (many believe they are colinear)
- How closely are they correlated—overall? across racial/ethnic groups?
- Examined multiple specifications of both
  - Conclusions did not vary by specification, so show only one specification of each
At the same education level, income varies by racial/ethnic group. NHIS 1989 – 1994, ages 18 – 64

<table>
<thead>
<tr>
<th>Education</th>
<th>Black</th>
<th>Mexican American</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 9 years</td>
<td>$15,503</td>
<td>$19,104</td>
<td>$22,707</td>
</tr>
<tr>
<td>9 – 11 years</td>
<td>$17,743</td>
<td>$22,377</td>
<td>$28,573</td>
</tr>
<tr>
<td>12 years</td>
<td>$25,337</td>
<td>$30,945</td>
<td>$37,853</td>
</tr>
<tr>
<td>13 – 15 years</td>
<td>$33,026</td>
<td>$37,642</td>
<td>$43,197</td>
</tr>
<tr>
<td>16 + years</td>
<td>$46,815</td>
<td>$48,055</td>
<td>$55,277</td>
</tr>
</tbody>
</table>
Poverty level and educational level are only modestly or weakly correlated*

<table>
<thead>
<tr>
<th></th>
<th>BRFSS 18 – 74 years</th>
<th>NHANES 1 – 5 years</th>
<th>NHANES under 17 years</th>
<th>NHANES 25 – 64 years</th>
<th>NHIS/NDI 18 – 64 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>0.45</td>
<td>0.44</td>
<td>0.42</td>
<td>0.42</td>
<td>0.42</td>
</tr>
<tr>
<td>Latino</td>
<td></td>
<td>0.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexican - American</td>
<td></td>
<td>0.46</td>
<td>0.52</td>
<td>0.50</td>
<td>0.44</td>
</tr>
<tr>
<td>White</td>
<td>0.41</td>
<td>0.54</td>
<td>0.50</td>
<td>0.40</td>
<td>0.37</td>
</tr>
</tbody>
</table>

* Spearman correlation coefficients
Poverty level and educational level are generally only modestly or weakly correlated*

<table>
<thead>
<tr>
<th></th>
<th>Add Health 11 – 21 years old</th>
<th>MIHA Over 24 years old</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian/Pacific Islander (immigrant)</td>
<td></td>
<td>0.48</td>
</tr>
<tr>
<td>Asian/Pacific Islander (US born)</td>
<td></td>
<td>0.47</td>
</tr>
<tr>
<td>Black</td>
<td>0.45</td>
<td>0.59</td>
</tr>
<tr>
<td>Cuban</td>
<td>0.42</td>
<td></td>
</tr>
<tr>
<td>Latina (immigrant)</td>
<td></td>
<td>0.35</td>
</tr>
<tr>
<td>Latina (US born)</td>
<td></td>
<td>0.56</td>
</tr>
<tr>
<td>Mexican American</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>Puerto Rican</td>
<td>0.37</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>0.44</td>
<td>0.49</td>
</tr>
</tbody>
</table>

*Spearman correlation coefficients
Does choice of income/education measure really matter?

- Income/education correlations were generally modest/weak and varied by race/ethnic group but
- Would conclusions about racial/ethnic disparities vary by SES measure?
- We examined associations between racial/ethnic group and each health-related indicator
  - Always adjusting for age & gender or total no. of births (and family structure in Add Health)
  - Then adding different SES measures: any difference?
22 health or health-related “outcome” indicators

- **Maternal-infant:** LBW, unintended pregnancy, early prenatal care, breastfeeding intention
- **Child:** lead levels (age 1-5), asthma (age <17)
- **Adolescents (age 11-21):** smoking, alcohol, marijuana, ever had sex, violent behavior
- **Adults age<64 or <74:**
  - Mortality: all-cause, CVD, motor-vehicle, homicide
  - HTN, diabetes, self-assessed health, smoking (2 sources), obesity (2 sources), fruit/vegetables, exercise
### Odds of poor/fair health compared with whites

**NHIS ’89 – ’94, ages 18-64**

<table>
<thead>
<tr>
<th>All adjusted for age + gender</th>
<th>African-American</th>
<th>Mexican-American</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) No SES measure</td>
<td>2.47*</td>
<td>2.16*</td>
</tr>
<tr>
<td>(2) + Poverty status</td>
<td>1.65*</td>
<td>1.30*</td>
</tr>
<tr>
<td>(3) + Income per $1,000</td>
<td>1.67*</td>
<td>1.44*</td>
</tr>
<tr>
<td>(4) + Ed. level</td>
<td>1.96*</td>
<td>1.06</td>
</tr>
<tr>
<td>(5) + Ed. years</td>
<td>2.02*</td>
<td>0.89*</td>
</tr>
<tr>
<td>(6) + Poverty status + Ed. Level</td>
<td>1.53*</td>
<td>0.86*</td>
</tr>
</tbody>
</table>

* significant
Conclusions about racial/ethnic disparities in delayed/no prenatal care vary based on SES measure

CA. MIHA 1999-2004 (n = 13,952 women age 25+)

<table>
<thead>
<tr>
<th>All adjusted for age + # births</th>
<th>Black: White odds</th>
<th>Latina immigrant: White odds</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) No SES measure</td>
<td>1.86*</td>
<td>2.21*</td>
</tr>
<tr>
<td>(2) + Poverty status</td>
<td>1.16</td>
<td>1.08</td>
</tr>
<tr>
<td>(3) + Income</td>
<td>1.12</td>
<td>1.05</td>
</tr>
<tr>
<td>(4) + Ed. level</td>
<td>1.57*</td>
<td>1.47*</td>
</tr>
<tr>
<td>(5) + Ed. years</td>
<td>1.72*</td>
<td>1.37*</td>
</tr>
<tr>
<td>(6) + Poverty status &amp; ed. level</td>
<td>1.13</td>
<td>0.98</td>
</tr>
</tbody>
</table>

* significant
Choice of income/education measure does matter sometimes

- Above examples demonstrate that conclusions could vary based on which SES measure was used (dimension may matter more than specification)
- Similar findings for some but not all other indicators studied
- Did not always vary – but often enough
- Often not statistically significant – nevertheless, conclusions would have been different
1. Education is not a proxy for income

- Important SES measure in its right
  - May capture dimensions that income doesn’t
- But not an acceptable proxy for income
- Applies across all life stages
2. SES is multi-dimensional

- For most outcomes, better model fit with both education & income vs either alone
- For all outcomes/samples, racial/ethnic disparities diminished (but didn’t always disappear) further when including both education and income vs either alone
- Other literature supports this
- Cannot be captured by a single measure
3. Income is not an adequate measure of wealth

- Wealth (accumulated economic assets) is rarely measured in US health studies.
- But could be important for health if buffers effects of temporarily lower income.
- This could be problematic if wealth varies across racial/ethnic groups of similar income.
### Income vs wealth: Median net worth ($) by income in each of 3 racial/ethnic groups

<table>
<thead>
<tr>
<th>Quintile</th>
<th>White</th>
<th>Black</th>
<th>Latino</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest income quintile (poorest)</td>
<td>$24,000</td>
<td>$57</td>
<td>$500</td>
</tr>
<tr>
<td>Second quintile</td>
<td>$48,500</td>
<td>$5,275</td>
<td>$5,670</td>
</tr>
<tr>
<td>Third quintile</td>
<td>$59,500</td>
<td>$11,500</td>
<td>$11,200</td>
</tr>
<tr>
<td>Fourth quintile</td>
<td>$92,842</td>
<td>$32,600</td>
<td>$36,225</td>
</tr>
<tr>
<td>Highest income quintile (richest)</td>
<td>$208,023</td>
<td>$65,141</td>
<td>$73,032</td>
</tr>
</tbody>
</table>

4. Rarely measured but could matter a lot for health

- Quality of education
- Occupation – ranking in a hierarchy reflecting monetary rewards, autonomy, influence, prestige
- Neighborhood socioeconomic features
- Subjective social status
- Past socioeconomic experiences
Past SES could influence health independently

- SES in utero/early childhood could have crucial effects not erased by more/less favorable later circumstances
- Different health effects of chronic/long-term vs short-term poverty/deprivation
- May not be reflected by current or short-term SES measures
% of college graduate women raised by a college-graduate parent (indicates childhood SES)

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American/Black</td>
<td>35%</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>50%</td>
</tr>
<tr>
<td>European American (White)</td>
<td>59%</td>
</tr>
<tr>
<td>Latina (Immigrant)</td>
<td>25%</td>
</tr>
<tr>
<td>Latina (US born)</td>
<td>19%</td>
</tr>
</tbody>
</table>

CA. MIHA, 2003 (n = 3728 postpartum women)
Conclusions: Choice of SES measure can matter

- Our examples and literature show one could reach different conclusions about roles of racial/ethnic group, SES, and other factors in health, based on SES measures used.

- The dimension of SES (e.g., income vs education; wealth vs income) may matter:
  - Reflecting multi-dimensional nature of SES

- The specification (how measured) may matter.

- The same SES measure may have different meanings in different social groups.
Researchers should select measures based on plausible pathways

- NOT one-size-fits-all
- Consider: what is likely to be relevant?
  - Income, wealth, education, occupation, SSS?
    - Measured how?
- Different times in life course
- Neighborhood, household/individual levels
- A measure’s meanings in different social groups
  - E.g., interactions with race/ethnicity, gender, age, marital status, nativity…
Practical implications for public health practitioners

- Be critical when you read studies that:
  - use education as an income proxy
  - consider any single factor as measuring “SES”
  - do not consider consequences of using the same measure across different social groups
- Ask: what relevant SES measures were NOT examined – and how could that affect conclusions?
- NEVER accept a claim to have “controlled for SES,” especially in studies of racial/ethnic disparities
Before claiming a racial/ethnic (or other) disparity is independent of SES, one must measure all SES aspects that could have important effects, including all relevant:

- Dimensions (income, wealth, education, occupation),
- Stages in life course (in utero, childhood, adult…),
- Levels (individual/household, neighborhood…)

Probably impossible

Consider & acknowledge SES measurement limitations
Final conclusions: We need to do better

- Usual SES measurement is problematic

- Can lead to erroneous conclusions on:
  - Nature of racial/ethnic disparities
  - Any associations for which SES is relevant

- Can be done better
  - Based on considering pathways and mechanisms for different socioeconomic factors to influence a given health outcome in a given population

- We need better SES data, but also could make better use of what we have
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