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Health insurance in the United States: A case of effectively maintained inequality?

Samuel R. Lucas

Sociology Department, University of California-Berkeley, United States

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ABSTRACT

The theory of Effectively Maintained Inequality (EMI) (Lucas, 2001) posits that goods have both quantitative (how much?) and qualitative (what kind?) dimensions. Coupled with the hypothesized mechanisms of EMI, this simple observation greatly complicates research and policy development concerning inequality. First applied to explain educational inequality in the United States, evidence for the theory has been found in education systems in over 20 countries, including Chile, China, the Czech Republic, Denmark, Egypt, Germany, Greece, Ireland, Nigeria, South Africa, and South Korea. Yet, while EMI was proposed as a general theory of inequality, to date no research has assessed its applicability to domains outside education. This work uses nearly two decades of National Health Interview Survey data (N = 451,161) to provide the first effort to assess whether EMI illuminates *patterns* of inequality outside education, by taking up the issue of health insurance in the United States.

1. Introduction

Effectively maintained inequality (EMI) (Lucas, 2001) was proposed as a general theory of inequality. First applied to education in the United States, the theory has now been explored in over 20 countries. In every nation studied, analysts have found support for EMI, suggesting EMI is an informative explanation of educational inequality. Yet, whether EMI operates in other domains is unknown. Thus, the question this paper asks: Is there evidence of effectively maintained inequality in another important domain of social support–health insurance?

For health care access, specifically, the question of the pattern of inequality is pointed, because at least from the perspective of an individual doctor, the principle of universal access is long-standing, arguably articulated in inchoate form as early as the Hippocratic Oath in 475 BCE:

> I will *use treatment to help the sick* according to my ability and judgment, but never with a view to injury and wrong-doing. (Asclepiades 475 BCE, Translated by Jones, 1923: 301, emphasis added)

In this ideal "the sick" who will be treated includes *everyone* who has fallen ill, regardless of wealth or any other social distinction. Yet we know access to any health insurance, and to different types of insurance, is unequal in general (Fig. 1, Panel 1), by socioeconomic markers like education (Fig. 1, Panel 2), by sex (Fig. 2, Panel 1), and by race/ethnicity (Fig. 2, Panel 2). Given the well-documented existence of inequality in health care access in general and health care insurance specifically, why ask, yet again, about inequality?

I do not study the *existence* of inequality, for that is well-established (e.g., Dickman et al., 2017). Instead, I interrogate the *pattern* of inequality, and I do so because only *some* patterns of inequality are consistent with effectively maintained inequality. The paper assesses whether the pattern of inequality in lack of health insurance and type of insurance matches an EMI pattern, a consequential determination for at least two reasons. First, EMI has particularly stark implications. The theory suggests not just that inequality is intransigent, but that one major source of the intransigence is embedded in the often under-theorized structure of goods that, as I show below, makes equality extremely difficult to arrange and almost impossible to maintain.

Second, analysts have theorized both individual and collective mechanisms that may instigate and sustain EMI (e.g., Lucas, 2008; Smith, 2022). Owing to the character and institutional implementation of health insurance in the U.S., individuals must act to obtain insurance, assuring a possible pathway for EMI-sustaining kinds of individual action. And, certainly, many of the early 21st century changes in health insurance have been intensely contested by multiple collective actors, setting the stage for collective dynamics and mechanisms that may sustain this severe pattern of inequality.

EMI makes sense of intransigent inequality and offers insights into mechanisms that sustain it. Thus, learning that inequality in health insurance matches an EMI pattern suggests how inequality may have been

E-mail address: Lucas@berkeley.edu.

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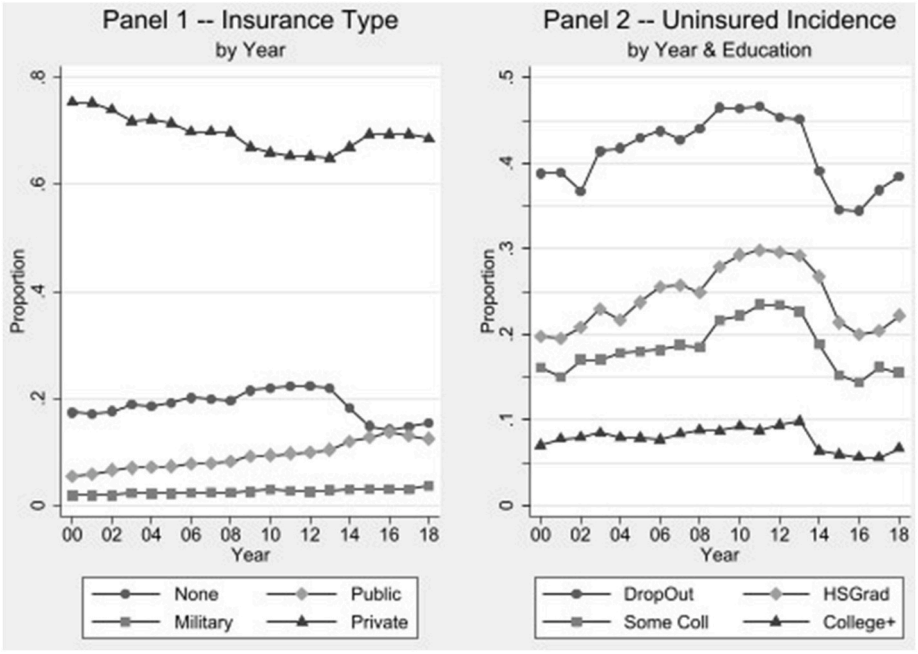

Fig. 1. Insurance types overall and by education.

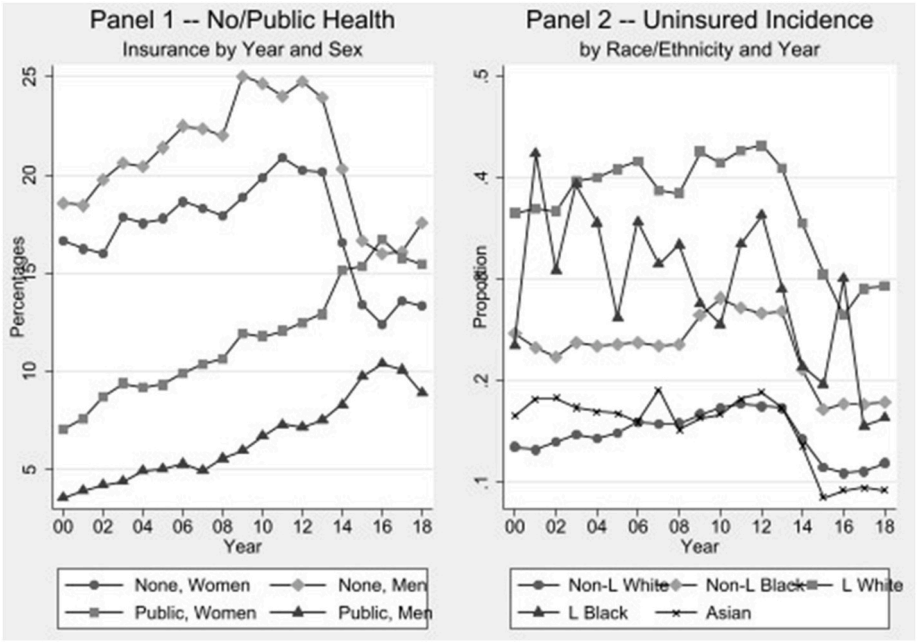

Fig. 2. Insurance types by race and sex.

maintained in the past, and where to look for opportunities to intervene in the future.

Certainly, health insurance access expanded in the United States this century. However, EMI patterns and dynamics may have existed and operated before the expansion and may exist and operate after as well. Because EMI implicates complex challenges and forces that make it extremely difficult for equality to emerge, learning whether EMI does or does not describe patterns of health care access is consequential.

As we consider health care access–as proxied by the presence and kind of health insurance obtained–I will elaborate the assessment in two important ways rare in EMI studies. First, I study 19 years of health insurance enrollment, allowing us to ask change over time questions EMI theorists have mentioned but have yet to empirically address in the U.S. Second, I assess whether EMI patterns emerge for specific sex/racial/ethnic categories; this approach will allow us to learn whether EMI dynamics for some sex/racial/ethnic categories allow socioeconomically disadvantaged members of one or more *other* sex/racial/ethnic categories to escape an EMI pattern.

To begin I first further detail EMI. Next, I identify developments in health insurance in the U.S. between 2000 and 2018, and show why studying the type of health insurance obtained is a means to study EMI. The data and methods are then described, after which results are presented. I close by discussing the implications of the findings for health care access and for efforts to understand inequality. We begin, however, with a turn to EMI.

2. Theory

2.1. Effectively maintained inequality

EMI posits that goods have at least two kinds of dimensions–quantitative dimensions (how much?) and qualitative dimensions (what kind?). The existence of two disparate dimensions means it is logically possible to eradicate inequality on one dimension yet still have consequential inequality in the other dimension. For example, were a nation to eradicate quantitative inequality, action around the qualitative dimension can *effectively* maintain overall inequality, in at least two senses: 1)the qualitative advantage obtained may confer advantages to the socioeconomically well-off in the same domain where quantitative inequality was eradicated, thus effectively undermining the quantitative equalization, and, 2)the qualitatively better position may help well-off persons obtain advantages in *other* outcomes and domains as well.

2.1.1. EMI postulates

Table 1 contains the 6 postulates of EMI (Lucas, 2009). Postulates 2 and 3 assert that all goods have qualitative and quantitative dimensions. Given Postulate 1, the second and third postulates contend that the socioeconomically advantaged will obtain quantitative and/or qualitative advantages whenever possible.

Postulates 2 and 3 may manifest in health care access in many ways. For example, the cap insurers impose for payments to treat some conditions (where, all else equal, higher caps are better, with "no cap" interpreted as an infinitely large cap) is a quantitative dimension, whereas a qualitative dimension might entail access to various treatments for an illness (Schacht, 1992).[1] If one completely equalized persons' quantitative limits, differences in the qualitative dimension (e.g., access to a specific treatment) could remain.

Treatment access could vary because some insurers may not cover some treatments (e.g., a costly cure for a chronic condition that costs less to manage) or for supply or other reasons. For example, an efficacious treatment may need to be administered by trained practitioners. If trained practitioners are scarce, some needing the treatment may be unable to receive it in time. Notably, such scarcity and institutional rules need not correlate with socioeconomic position. If access is positively associated with socioeconomic position, then the pattern of access *may* be consistent with EMI.

Postulates 4 and 5 add a temporal component. In Postulate 4, advantaged persons focus on obtaining a certain amount of the good when that amount is uncommon, but once obtaining that amount becomes common, socioeconomics shifts from mattering for how much is obtained to mattering for the *quality* obtained. Postulate 5 notes, however, that socioeconomics might always matter for both quantity *and* quality whenever quantity differences and/or quality differences are possible. EMI is agnostic as to which postulate holds. Indeed, Postulate 4 may hold for some goods while Postulate 5 may hold for others. Here, we have a rare opportunity to observe patterns of inequality for nearly two decades, to see if, as access rules change, whether the EMI pattern is stable, as Postulate 5 asserts, or not.

2.1.2. Theorized behavioral mechanisms

EMI analysts have proposed mechanisms that can produce EMI patterns. Lucas (2008) hypothesized that key individual and collective resource differences and behavioral strategies might allow an EMI pattern to emerge and continue. One illustrative resource EMI analysts of education have noted is information, a resource likely also relevant for health care access. In the education case, one example of informational advantage is that there are literally dozens of decision points in a child's educational passage. Socioeconomically advantaged parents tend to have attended college, especially selective colleges; these experiences make them more likely to know which choice points in an educational career are pivotal, allowing them to concentrate their attention on important moments. This focus can increase the efficiency and impact of their educational interventions (e.g., with teachers, with course selection, and more). Notably, if anything, health care information is even *more* complex and potentially impactful.

Scholars have found health literacy to be associated with many health outcomes (e.g., DeWalt et al., 2004), including the use of health resources (DeWalt et al., 2004) and mortality (e.g., Baker et al., 2007; Cavanaugh et al., 2010). And health-seeking behaviors are associated with socioeconomic status and race/ethnicity (e.g., Richardson et al., 2012; Yoon et al., 2020). Considering health insurance specifically, the complexity of insurance provision in the U.S. (Bhargava & Loewenstein, 2015), which can vary by state, employer, and even urbanicity, may raise the value of information and information-gathering skills and proclivities for health care access.

While the above illustratively highlights one individual-level action, EMI also posits a role for collective action. Information-sharing amongst peers can be a form of collective action (e.g., Kontos et al., 2011), and many such opportunities abound. The health care policy space, with well-known participants including pharmaceutical companies, insurers, and their lobbyists; professional organizations (e.g., the American Medical Association (AMA)); as well as high-profile advocacy groups (e.g., the American Association of Retired Persons (AARP)) (e.g., Gordon, 2003; Quadagno, 2005); all suggest that class-related collective action is possible in the domain of inquiry.

Smith (2022) offered an additional actor and action of potential consequence, positing that governments might make budgetary allocations in a way that undoes EMI. The work nicely adds the prospect of government as quasi-independent actors. As the government-led changes in healthcare suggest, this hypothesis is relevant for a study of EMI and health care access.

2.2. Scope conditions: the rules of health insurance provision in the United States–two decades of change

The U.S. entered the 21st century as the only wealthy Western country lacking universal health care and exited the study period as the only wealthy Western country lacking universal health care. Masked by that stability were several changes in the institutional rules of health care and insurance in the United States (Kaiser Family Foundation, 2013).

One important milestone was President George W. Bush's 2002 launch of the Health Center Growth Initiative (HCGI) (Kaiser Family Foundation, 2013). The initiative lasted through 2007 and significantly expanded the number and resource levels of community health centers. Evidence indicates that this initiative increased the number of patients, and especially Medicaid patients, seen at community health centers (Shi et al., 2010).

Another milestone was the 2003 creation of Health Savings Accounts (HSAs). HSAs allow persons in high deductible plans to save pre-tax dollars for (untaxed) qualified health expenses. Funds above a certain amount can be invested in mutual funds and other financial instruments and any gains also are not taxed. Thus, while the HCGI targeted health care access for the poor, the tax preferential nature of HSAs essentially targeted the nonpoor, because the tax advantages are larger at higher incomes. Researchers confirm the design expectation, finding that higher net worth, higher income, and more highly educated persons are more likely to obtain HSAs (e.g., Chen et al., 2013).

Perhaps the biggest milestone of the period, however, was the 2010 passage of the Affordable Care Act (ACA)–popularly and derisively

[1] The Affordable Care Act banned yearly or lifetime caps for essential services, only, defined as Emergency Services; Laboratory Services; Prescription Drugs; Pregnancy, Maternity, and Newborn Care; Preventive and Wellness Services; Mental Health and Substance Use Disorder Services; Outpatient Services; Hospitalization; Rehabilitative and Habilitative Services and Devices; and Pediatric Services. Caps are allowed for other services.

Table 1
Six postulates of EMI.

1) Socioeconomically advantaged actors secure for themselves and their children some degree of advantage wherever advantages are commonly possible.
2) If quantitative differences are common the socioeconomically advantaged will obtain quantitative advantage.
3) If qualitative differences are common the socioeconomically advantaged will obtain qualitative advantage.
4) Postulates 2 and 3 could be true in that when a good is not universal, the socioeconomically advantaged use their advantages to secure that good. Once that good becomes nearly universal, however, the socioeconomically advantaged seek out whatever qualitative differences there are *of that good*, and use their advantages to secure quantitatively similar amounts of qualitatively better goods.
5) Alternatively, it is possible that even when quantitative differences are common qualitative differences are also important; if so, the socioeconomically advantaged will use their socioeconomic advantages to secure both quantitatively and qualitatively better outcomes.
6) To evaluate EMI, analysts need to determine whether their categorical predictions for theoretically focal persons differ on the basis of socioeconomic status. If the category with the highest probability differs on the basis of socioeconomic status, this is evidence of EMI.

known as ObamaCare, depending on the speaker and audience. The ACA took effect in 2014, and federalized the ability of persons under age 26 to obtain insurance through their parents' health care plans, subsidized coverage for low-income persons, prohibited lifetime and annual caps on payouts for ten services deemed essential (see note 1) and (after Supreme Court ruling) allowed states to expand Medicaid coverage to all persons at or below 133 percent of the Federal poverty line. The ACA also required everyone to have insurance, with fines to be levied on violators. Yet fines were only levied for 2015 and 2016, as the Tax Cuts and Jobs Act of 2017 lowered all fines to zero.

While each year the Trump Administration was slow in opening internet sites for ACA enrollment, and researchers have contended that the administration attempted to undermine the law (e.g., Thompson, 2020), evidence indicates that one effect of the ACA was to stabilize health insurance markets (Corlette et al., 2020). While the law was neither repealed nor overturned during the study period, with the advent of COVID-19 health care changed in dramatic ways–elective procedures were postponed (Dewine, 2020), emergency department usage declined (e.g., Hartnett et al., 2020), and public health measures were widely imposed (e.g., Mervosh et al., 2020). Consequently, the focus here falls on the 21st century up through the last full year before the worldwide pandemic.

Thus, in addition to the 2014 ACA implementation, two noteworthy changes occurred in 2002 and 2003. The 2002/2003 changes are so close together that there is likely insufficient resolution to attribute results to only one. Taking 2002/2003 and 2014 as dividing lines concerning health care and health insurance during the study period, at the conclusion of our analysis I will informally, provisionally, and briefly consider whether EMI patterns existed before each change, after each change, during both periods, or during neither period. In this way we can suggest which policies, if any, may have interrupted EMI, instantiated EMI, or otherwise.

2.2.1. No health insurance, public health insurance, and private health insurance: appropriate dependent variable for assessing EMI?

Given the number, breadth, and complexity of the changes in health insurance, why analyze the no insurance, public insurance, private insurance divides? Certainly, there are many ways to conceive of health care access. While this is true, practically speaking, a study of two decades of possible EMI dynamics benefits from a consistent measure over time. Health insurance status is one such variable. Further, from the perspective of EMI, the outcome variable must connect to *other* consequential outcomes. There is evidence that some differences in health outcomes are associated with persons' status as privately insured, publicly insured, or uninsured.

Some late 20th century epidemiological studies suggested that public insurance was worse than no insurance (e.g., Hahn & Flood, 1995; Ross & Mirowsky, 2000). Were it true that, on average, the least insured fared better than those with public insurance, it would at the least seriously complicate the effort to consider the applicability of EMI in health insurance. However, Quesnel-Vallee (2004) used prospective data to account for earlier health and a sibling design that controlled more effectively for social and genetic factors. After making these adjustments Quesnel-Vallee found that the publicly-insured fared better than the uninsured. Prior counterintuitive findings were owing to adverse selection, possibly because the criteria to obtain public health insurance included poor health. Failure to adjust for such selection led to faulty estimates.

Most research, however, finds connection between health insurance type/presence and mortality and/or quality of life in line with Quesnel-Vallee's results. For example, Hahn et al. (1999) show that quality of life is affected by Irritable Bowel Syndrome (IBS). Insurance can matter for prospects for effective treatment; Mittal et al. (2022) find that uninsured, Medicare, and Medicaid-insured patients are more likely to present for first IBS diagnosis with "red flag" symptoms, such as gastrointestinal bleed, blood in the stool, or weight loss, than are the privately insured. Such studies suggest that insurance status can matter for early diagnosis, which can matter for treatment success for some illnesses.

Multiple lines of evidence also indicate downstream mortality effects of insurance type/presence. For example, men covered by private insurance were more likely to obtain prostate-specific antigen (PSA) screening (Zanwar, 2015), and PSA screening has been found to reduce prostate cancer deaths by 21–38 percent (e.g., Labrie, 2013). Davis et al. (2018) found that publicly insured and uninsured women present with later stage cervical cancer than do women who are privately insured, and Benard et al. (2017) found net survival rates associated with cancer stage at diagnosis, reporting localized, regional, and distant stage net survival rates of 85.9 percent, 55.8 percent, and 16.3 percent, respectively, between 2004 and 2009.

As another example, researchers have found that adolescent and young adult cancer patients with public health insurance are at risk of inferior long term (post-5 year) survival rates compared to those with private insurance (Cuglievan et al., 2021). Further, in Dozier et al.'s (2011) study of gunshot victims, with injury severity and several sociodemographic factors controlled, the insured were more likely to survive than were the uninsured.

A comprehensive review of research on the impact of insurance on mortality found consistent evidence of higher mortality for those lacking insurance, this despite the complications introduced by the tendency of some to cycle in and out of the uninsured category, despite the rarity of death, and despite other challenges (e.g., the long-run nature of many mortality processes) (Woolhandler & Himmelstein, 2017).

Thus, research suggests that, in general, private insurance entails benefits over public insurance, and public insurance entails benefits over noninsurance, making insurance type/noninsurance a consequential matter for quality of life and mortality outcomes. And the connection between health insurance and both quality of life and adverse health events such as mortality make health insurance type/presence an appropriate focus for an assessment of EMI.

2.2.2. Considering race/ethnicity and gender

Socioeconomic position was the original focus of EMI, taking central place in EMI analyses of U.S. education. But the first effort to replicate EMI assessed whether EMI dynamics pertained in Israel along not only socioeconomic but also gender and ethnic lines (Ayalon & Shavit, 2004).

They demonstrate that there is no necessary reason to confine consideration of EMI to only socioeconomic factors.

Indeed, in the U.S., differences in health treatment by race and sex are clear. From the Tuskegee Syphilis Experiment (Jones, 1981) to the differential treatment of pain (e.g., Anderson et al., 2009), analysts routinely find health care experiences to differ for White and non-White persons. At the same time, sex differences in susceptibility (e.g., Yang & Kozlowski, 2011) and in access to needed procedures (e.g., Reingold & Gostin, 2019) can create sex differences in health care experience. With race and sex implicated in health care inequality and, as Fig. 2 shows, in health insurance access and type, I consider EMI for multiple groups identified by sex/race-ethnicity categories.

3. Methods

Our aim is to assess EMI's qualitative claim. Assessing the quantitative claim for health insurance can be difficult because it is unclear which is better, higher health insurance expenditures or lower. The former may buy better plans, or may instead reflect misunderstanding (Bhargava et al., 2015). Thus, I focus on EMI's qualitative claim and analyze health insurance type/presence owing to evidence of their association with health outcomes and experience.

3.1. Data

I use National Health Interview Survey (NHIS) data from 2000 to 2018 (Blewett et al., 2022). These data are nationally-representative of the civilian noninstitutionalized population, and provide excellent and consistent measurement of health insurance enrollment (United States Department of Health & Human Services, 2005).

In some study years persons under 26 were allowed to enroll in their parents' insurance, challenging the effort to estimate impacts of younger adults' socioeconomic position and health insurance status. Further, as almost all persons over 65 are eligible for Medicare, they thus experience a different health insurance regime than do others. For these reasons I confine attention to persons aged 26–64 in each study year.

NHIS includes measures of education, occupation, and earnings, a very common set of socioeconomic variables. But, as health analysts have usefully argued (e.g., Krieger et al. (1997); Galobardes et al., 2007), one can broaden the dimensionality of socioeconomic position by adding to these three measures. NHIS includes a measure of home ownership, a variable that in and of itself is of value as a measure of socioeconomic position, as well as partly reflecting differences in wealth. I add home-ownership to the measures of socioeconomic position. Table 2 lists all the variables and conveys details of their measurement.

I use insights from the graphical causal model (Pearl, 2010) to craft the analysis so as to capture the total effect of socioeconomic position. First, mediating variables are omitted because controlling for them biases total effect estimates (Rohrer, 2018). Second, I omit variables that are outcomes of health insurance as well as variables that are caused by both health insurance and socioeconomic position, because including them will introduce endogenous selection bias (Elwert, 2013). If one theorizes marital status and age as causally connected to socioeconomic position, as do I–or not, as some might–analysis of graphical causal model structures indicate marital status and age should be controlled. Thus, for this first assessment of EMI in health insurance I control for only marital status and age, as opportunities for insurance are related to marital status and interest in health insurance changes by age. Sex and race/ethnicity serve not so much as controls as ways to identify subgroups to allow group-specific estimates of socioeconomic effects.[2] All other variables indicate socioeconomic position.

The dependent variable has four categories: uninsured, publicly insured, "militarily" insured, and privately insured. While NHIS is a civilian sample, a few respondents have military health insurance through their spouse's employment. Whether military-provided health insurance is best conceived as public health insurance or private health insurance is unclear. Fortunately, we need not resolve this issue unless and until military-provided insurance rises into prominence in the results, for the *model* makes no ordinal assumption. Thus, for completeness I obtain estimates for military insurance while relying on published research to sustain the *interpretation* of private insurance as better than public insurance as better than no insurance, in general.

3.2. Models

We estimate multinomial logit models of the following form:

$$P(y_i = j) = \frac{e^{(\beta_j' x_i)}}{1 + \sum_{j=1}^{J} e^{(\beta_j' x_i)}}$$

where j=(0, 1, …, J) unordered outcomes, and where to norm the equation $\boldsymbol{\beta_0}=\mathbf{0}$. I use this model because it allows covariates to have different signed coefficients for different outcome categories. For health insurance, we should expect some factors to have different signed coefficients for different outcome categories. For example, in relation to no insurance, income may be positively related to private insurance but, owing to means-testing during much of the period, income may be negatively related to public insurance. Such realities might contort the results of an ordered outcomes model. Consequently, the models do not assume ordinality.

However, the multinomial logit model does assume the independence of irrelevant alternatives (IIA). The assumption is that results are conditional on assuming that probabilities would not change if the options were supplemented in a trivial way. For example, a person who chooses to learn to speak Chinese when offered the option of learning Czech or Chinese should not, upon being offered a chance to learn either Czech, Chinese, or Arabic, decide to learn Czech instead. In this framing Arabic is irrelevant to the ranking of Czech and Chinese, and the assumption of the model is that the addition of Arabic, an irrelevant option, will have no effect.

McFadden (1972: 113) suggests the IIA assumption is difficult to satisfy when the options are close substitutes. More troubling, many analysts question the empirical tests of the assumption (e.g., Allison, 2012; Cheng & Long, 2007; Fry & Harris, 1996, 1998). In the present case one could argue that public, military, and private insurance are too close substitutes for the model. On the other hand, these sectors differ in price (Dave et al., 2024), features (e.g., ability to keep your doctor), and results (see section 2.2.1), suggesting that they may not be close substitutes after all.

However, while IIA is both a methodological assumption and an empirical question, it is also a theoretical assertion (e.g., Arrow, 1951; Luce, 1959). Thus, while it is beyond the scope of this analysis to fully engage the theoretical and methodological issues, it is possible to note that there is considerable disagreement as to whether the IIA assumption is theoretically tenable (e.g., Sen, 1993) or empirically valid as a criterion (e.g., Huber et al., 1982; Mellers & Cooke, 1994). In this context, therefore, I maintain that the model is illuminating, and use the Hausmann-McFadden test to provide information on whether the model

[2] "Sex" is a binary male/female self-classification. The self-report could reflect sex assigned at birth, sex-category identity which may or may not be the same, or something else. During the period studied, this is how the NHIS collected these data.

Table 2
Variables (SES variables are italicized; original NHIS variables are underlined).

Dependent variable:
Health Insurance–Hinotcov, hipubcov, hiprivatee, and himilite are used to classify persons as having No Insurance (0), Public Insurance (1), Military Insurance (2), or Private Insurance (3). If a person reports having two kinds of insurance they were assigned Private Insurance over all other types and Military Insurance over Public Insurance.
Independent Variables:
Age–Persons self- or proxy-reported age at the time of the interview.
Sex–A 2-category sex variable records self-identity or proxy-imputed identity. NHIS recoded responses other than Male or Female to missing; the small number of persons missing on this variable were removed from the analysis. See footnote 2 for more information.
Race/Ethnicity–We used racenew and hispeth to produce a 7 category race/ethnicity variable. Five categories–1)Non-Latine and 2)Latine White; 3)Non-Latine and 4)Latine Black, and 5)Asian–had enough cases for inference. Two categories–Native American/Alaskan Native, and all other racial/ethnic categories–did not. All groups are included so estimates reflect the total, but category-specific results are reported for only the first five.
Education–Educ is recoded into years of formal education.
Earnings–Earnings (in 2009 dollars) for the prior calendar year are recoded to the category midpoint, 500 is added, and divided by 1000. We used a Pareto curve to estimate an open-ended category midpoint (Shyrock and Siegel, 1976: 366) and rounded it to 142,000.
' *Socioeconomic Index*–Occ1995 is recoded into Hauser and Warren (1997) SEI scores for the total civilian workforce.
Own Home–The person's ownership of their residence is recoded into owned (if owned or being bought) or not. The 2.72 percent of study cases missing on this variable were removed.
Marital Status–Marstcohab is recoded into five separate categorical variables: Married, divorced, widowed, cohabiting, and single.
Missing and Weight Variables:
Missing Education – Persons missing on the education variable were assigned the mean value of 13.499 and "Missing Education," was coded 1 if education is missing and zero otherwise.
Missing Earnings – Persons missing on earnings were assigned the mean value of $33,679 and "Missing Earnings," was coded 1 if earnings is missing and zero otherwise.
Missing SEI– Persons missing on the SEI variable were assigned the mean value of 36.04 and "Missing SEI," was coded 1 if SEI is missing and zero otherwise.
Weights – PerWeight is used in all models to account for differential selection and nonresponse.

appears to meet the IIA assumption.[3]

The full model includes the four socioeconomic variables of education, occupational SEI, earnings, and home ownership. Age and Age-squared are in the model, as well as dummy variables for married, divorced, widowed, and cohabiting, with single as the omitted variable. A dummy variable for female and a set of dummy variables identifying non-Latine Blacks, Latine Whites, Latine Blacks, Native American/Alaskan Natives, and Asians are included. Non-Latine Whites are the omitted group. Education is also interacted with the race/ethnicity variables.

Models are estimated for each year separately so that a year's results are unaffected by other years. This maximizes the chance for discordant findings. For each year I test four specifications against the full model described above, and focus discussion on the best-fitting models.

3.3. Evaluating EMI

Typically researchers peruse estimated coefficients for statistical significance, i.e., discernible differences from zero. If found, they conclude that the factor matters. This use of statistical significance has come under persuasive criticism (e.g., McCloskey, 1985; Ziliak & McCloskey, 2008). Statistical significance is not EMI's litmus test. Although EMI requires socioeconomic coefficients to be discernibly different from zero collectively, satisfying this criterion only justifies the next, crucial step in the process of assessing EMI.

That step follows through on Postulate 6's call to assess EMI's theoretical claims by focusing on targeted calculations from the statistical model (Lucas, 2001). For a qualitative dimension the claim is that if inequality is being effectively maintained, then we should observe socioeconomic effects such that the predicted outcome categories differ for theoretically focal persons simply on the basis of socioeconomic position.

Because quantitative dimensions of a good (e.g., size of the annual cap on coverage) can vary smoothly over many ordered values, predicted values for quantitative variables generally differ if the estimated regression coefficient is discernibly different from zero. In contrast, our best estimate of a categorical outcome is the *category* with the largest probability, not the estimated probability itself. Thus, qualitative outcomes are "lumpy" such that it is possible for the socioeconomic background coefficient to be statistically significant yet still predict the same categorical location for persons in disparate socioeconomic positions.

Figs. 3 and 4 illustrate this point. Fig. 3 traces high and low SES persons' predicted probabilities of placement in each of the four categories of an outcome variable as the socioeconomic position *coefficient* changes. If the coefficient is negative we clearly reject EMI.

When the coefficient exceeds zero, the pattern shifts, making EMI a viable possibility, as after that point higher SES persons are predicted to fare as well or better than lower SES persons. Yet, EMI's qualitative claim has still not been assessed.

Fig. 4 illustrates that assessment by tracing the "best categorical guess," the category with the highest predicted probability for those of high and low socioeconomic positions as the coefficient changes. Sometimes high and low SES persons' modal predicted category is the same, as at social position coefficient = 0.7 in Fig. 4. However, sometimes high and low SES persons' modal predicted categories differ, as at social position coefficient = 1.2 in Fig. 4. The shaded region of Fig. 4 covers the portions where the category predicted for well-off persons is better than the category predicted for poor persons. Thus, the shaded region is where the coefficient must fall–in this example–in order to reflect EMI.

Intriguingly, as Fig. 4 shows, EMI implies a possibly nonzero lower bound as well as an upper bound on the socioeconomic coefficient.[4] When the positive coefficient is too low or too high, the predicted category will not differ by socioeconomic position. Thus, while virtually half of the possible coefficients are positive, much less than half of the coefficients would be consistent with EMI. Therefore, it is possible for the health insurance/socioeconomic position relation to be statistically significant but still inconsistent with EMI's qualitative claims (Lucas, 2009). This implication makes EMI falsifiable even amidst ubiquitous findings of a positive health insurance/socioeconomic position relation. This implication motivates the paper because while innumerable prior studies showing socioeconomic-linked health insurance inequality are greatly illuminating, they do not generally reveal whether inequalities fall into an EMI pattern, and thus they do not intentionally implicate the multi-dimensional nature of goods, the ramifications of that

[3] I thank Reviewer 2 for suggesting more substantive and theoretical consideration of the IIA assumption.

[4] The mechanisms discussed earlier highlighted factors behind EMI's lower bound for socioeconomic coefficients, but analysts have suggested mechanisms behind an upper bound as well, hypothesizing satisficing (Simon, 1956), Sakoda-Schelling (Sakoda, 1971; Schelling, 1971) processes whereby the satisfied exit a class-based movement before straggling class peers are satisfied, logistical limits on how many persons can be accommodated (Lucas, 2009), and more.

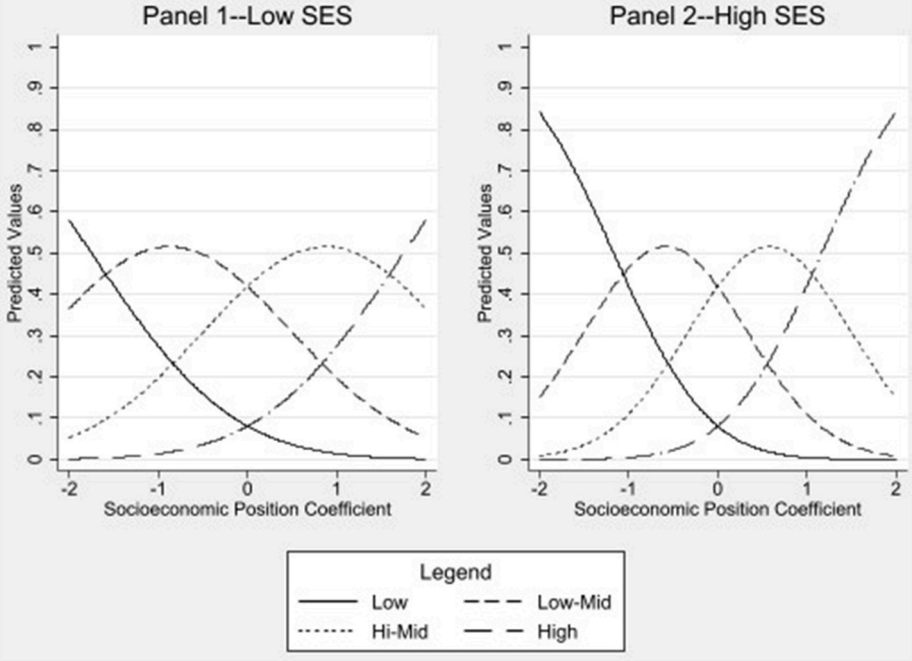

Fig. 3. Predicted probabilities for each category as coefficient changes.

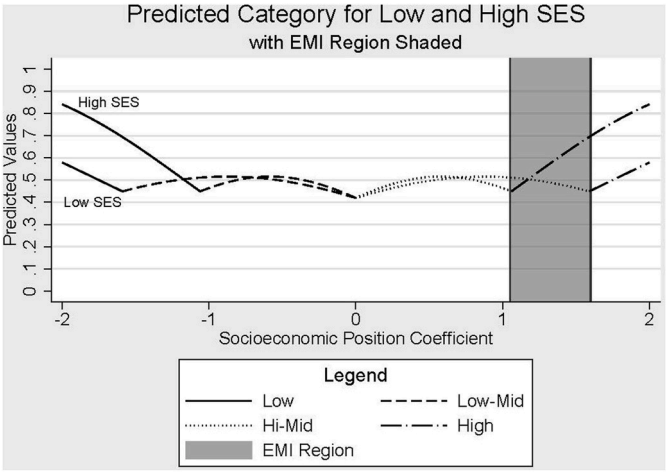

Fig. 4. Predicted category as coefficient changes.

multi-dimensionality, nor the posited mechanisms of EMI.

A key moment in the evaluation of EMI is the selection of theoretically focal persons. I follow published guidance (Lucas & Byrne, 2017) to set age = 35 and marital status = single, such that we always consider 35 year old single persons. What varies are the values for socioeconomic position (High, Low), race/ethnicity, and sex. For each year I calculate predicted categories for men and women who are non-latine white, non-latine black, latine white, latine black, and Asian. For each combination of sex and race/ethnicity I calculate predicted categories for those of both high and low socioeconomic position. For low socioeconomic position home-owner = 0, education = 10, earnings = 16,000 (2009 dollars), and occupational SEI = 22.13. And for high socioeconomic position we set homeowner = 1, education = 16, earnings = 73,000 (in 2009 dollars), and occupational SEI = 49.95. These values mean we compare a non-home-owner with 10 years of schooling, earning $16,000 (in 2009 dollars), at a job at the level of a baker, auto mechanic, or miscellaneous precision metal worker (SEI = 22.13), to a home owning college graduate earning $73,000 (in 2009 dollars) at a job at the level of a supervisor of financial records processing, archivist/curator, or computer programmer (SEI = 49.95). For SEI these values correspond to approximately 1 standard deviation from the mean. For education I use 10 and 16 years instead of 10.662 and 16.578 in order to use socially meaningful values (e.g., values job applicants might report). The lower value for earnings is set at a round number near the one-half standard deviation point because, owing to the skew of earnings, one standard deviation down from the mean would be negative. I also use a high earnings value about $6000 less than the nearly $80,000 value that would correspond to one standard deviation up from the mean. Lowering the value for high earnings and raising the value for low-earners reduces the chance of finding support for EMI.

Finally, analysts disagree whether the theoretically focal test requires the use of confidence intervals. Some EMI analysts use confidence intervals for predictions (e.g., Andrew, 2017), but Lucas and Byrne (2017) contend the test is too stringent because it could allow uncertainty in control variable coefficients to possibly reject the theory. This, they argue, is inappropriate because in testing the theory control variables should be treated as fixed, nuisance parameters because they have the same impact on categorical predictions for both the lower and upper SES positions. Rather than wade into that debate, I construct two different confidence intervals for each prediction, one based on standard errors estimated as usual, and one based on "targeted" standard errors that treat control variables as fixed. The targeted standard error reflects uncertainty only in the coefficients of factors that vary in the assessment of EMI–education, earnings, SEI, home ownership, sex, and race/ethnicity.

4. Results

4.1. Model selection

Table 3 contains BIC statistics for all models estimated. As the table shows, the same specification was best-fitting for all years. In Hausman-McFadden tests of the multinomial logit model's IIA assumption (Hausman & McFadden, 1984) a total of 71 of the 76 tests conducted–93.4% of the tests–found no violation of the IIA assumption. Of the five tests that found violations, two were for military health insurance (2012 and 2016), two were for the no insurance category (2004

Table 3
Fit statistics for multinomial logit models of health insurance enrollment and type, by year.

Year					
Model	**2000**	**2001**	**2002**	**2003**	**2004**
1)Full Model BIC	6.875E+07	7.212E+07	7.515E+07	8.218E+07	8.334E+07
How much better fit Full Model BIC is					
2)1 but no Earnings^2	937035.919	1029042.021	737410.613	472715.074	1401876.764
3)2 but Ln Earnings instead of Earnings	1426320.467	1532718.451	1327751.592	1499753.049	1214153.216
4)1 but no Age^2	78045.998	125846.403	185001.598	34835.147	74017.622
5)1 but no Earnings^2 or Age^2 terms	1006913.690	1141157.162	897399.097	503431.300	1460107.170

Model	**2005**	**2006**	**2007**	**2008**	**2009**
1)Full Model BIC	8.174E+07	8.600E+07	8.533E+07	8.071E+07	8.964E+07
How much better fit Full Model BIC is					
2)1 but no Earnings^2	1173842.414	1844598.100	1748848.297	1687957.953	1923890.968
3)2 but Ln Earnings instead of Earnings	1420321.001	1357026.716	1345515.788	1530705.873	1801081.553
4)1 but no Age^2	97098.295	135366.399	236664.625	55760.966	191693.000
5)1 but no Earnings^2 or Age^2 terms	1247717.771	1941409.561	1971725.002	1733010.445	2098614.464

Model	**2010**	**2011**	**2012**	**2013**	**2014**
1)Full Model BIC	8.870E+07	9.425E+07	9.110E+07	9.643E+07	9.283E+07
How much better fit Full Model BIC is					
2)1 but no Earnings^2	1777139.396	1764046.507	1630163.715	2042705.203	1548126.959
3)2 but Ln Earnings instead of Earnings	1865728.162	2059364.166	2107201.140	2302554.870	1920058.817
4)1 but no Age^2	186630.565	250690.999	122590.080	123684.607	212166.120
5)1 but no Earnings^2 or Age^2 terms	1949471.061	1982283.059	1735368.495	2148931.305	1733687.452

Model	**2015**	**2016**	**2017**	**2018**
1)Full Model BIC	9.049E+07	9.086E+07	9.243E+07	9.803E+07
How much better fit Full Model BIC is				
2)1 but no Earnings^2	1816759.278	1606262.387	1842997.202	1778423.889
3)2 but Ln Earnings instead of Earnings	1524327.066	2027285.746	1861061.356	1993447.343
4)1 but no Age^2	262172.735	255391.574	243344.896	225466.360
5)1 but no Earnings^2 or Age^2 terms	2061645.939	1824310.557	2063683.625	1955832.104

The regressors of the full model are: Age, Age^2, Non-Latine Black, Latine White, Latine Black, Native American/Alaskan Native, Asian, Other Race/Ethnicity, Non-Latine Black × Education, Latine White × Education, Latine Black × Education, Native American/Alaskan Native × Education, Asian × Education, Other Race/Ethnicity × Education, Earnings, Earnings^2, Occupational SEI, Homeowner, Female, Married, Divorced, Widowed, and Cohabiting. The omitted variable for race is Non-Latine White; the omitted variable for marital status is Single.

and 2016), and one was for the public insurance category (2017). The only year with two violations of the assumption is 2016. As stated earlier, the multinomial logit model IIA assumption is simultaneously a statistical, empirical, and theoretical matter. Some readers may choose to ignore the results for the years noted above, while others may justify interest in those years by more heavily weighting theoretical (e.g., Sen, 1993) and behavioral economic (e.g., Huber et al., 1982; Mellers & Cooke, 1994) rejection of the IIA assumption itself. Because disagreement about this axiom is notable, I present and discuss results for all years between 2000 and 2018 inclusive.

Socioeconomic variable coefficients are collectively statistically significant, thus justifying the next step in the analysis–predicting the categorical outcome for theoretically focal persons. Coefficients for the best-fitting models are in Online Appendix A.

4.2. Main analyses

Figs. 5 and 6 show the predicted probability of private insurance by race/ethnicity for high SES men and women, respectively. Because the predictions vary more by year for Black Latines than for any other group, including a line for them makes all other racial/ethnic differences indiscernible. Consequently, the probabilities for Black Latines are listed at the bottom. Regardless, for both sexes and for all racial/ethnic groups, the take-home point is that the probability of having private health insurance vastly exceeds the fifty percent mark; in fact, for all but Black Latines in some years, the probability of private insurance approaches certainty. Thus, while there are noteworthy racial/ethnic differences,

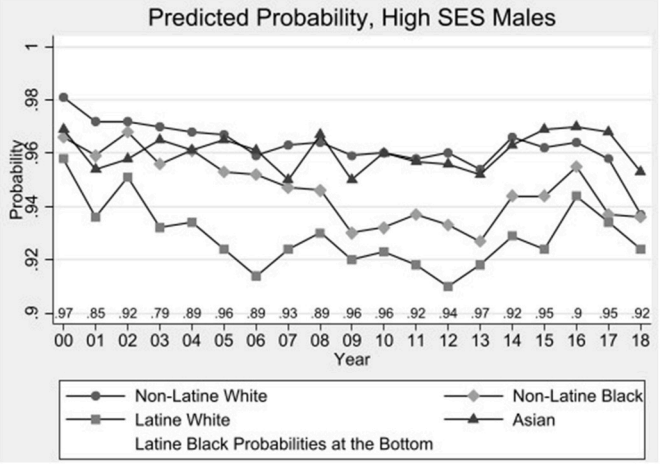

Fig. 5. Private insurance by race/ethnicity and year, high SES males, age 26 to 64.

for all race/ethnicities and sexes studied, the predicted category for high SES persons is private health insurance by far. Year-by-year I will ask whether the modal category of health insurance for low SES persons of different races and sexes is private insurance or something else. If it is private insurance, then an EMI pattern does not pertain for that

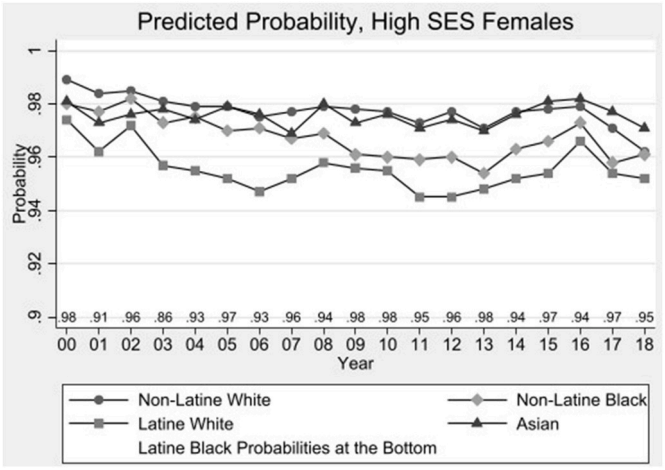

Fig. 6. Private insurance by race/ethnicity and year, high SES females, age 26 to 64.

sociodemographic group that year.

Figs. 7–11 trace the probabilities of no insurance, public insurance, or private insurance for low SES men and women of five different racial/ethnic groups. Consider Fig. 7. The lines trace the year-by-year predicted probability that a low SES non-Latine Black Male (left side) or Female (right side) will be uninsured (●), have public insurance (◆) or have private insurance (■). The predicted probability of military insurance is estimated but omitted from the figures for clarity because it is always below 3 percent. For each year, asterisks (*) at the bottom of the figure indicate that the difference between the estimated probability for private insurance and the highest other predicted probability category is statistically significant at $\alpha \leq 0.05$ using both the regular standard error and the (smaller) targeted standard error. Hashtags (#) indicate the difference is statistically significant only in terms of the targeted standard error. In years without a symbol the difference is not statistically significant using either standard error. (The figures are replicated with confidence intervals in Online Appendix B.)

In Fig. 7, the asterisks marking each year studied for non-Latine Black men indicates that they are statistically significantly unlikely to have private insurance, the modal type of insurance their higher SES sociodemographic peers obtain. For all years except 2000, 2001, and 2002 the finding is the same for non-Latine Black women. For 2000–2002 the gap between the modal category of noninsurance and private insurance was not statistically significant, but the point estimate for noninsurance exceeded that for private insurance all three years. For low SES non-Latine Black men and women, for many years no insurance is the most likely category, but when it is not, public insurance is. These results reflect divergent placements for high and low SES non-Latine Blacks, a pattern consistent with EMI.

And this is the overwhelmingly dominant story with men and women of all racial/ethnic groups studied. Fig. 8 traces the conditions for low SES Latine Black males and females. As expected given the low incidence of sampled persons identifying as Black Latines, the predicted values are very divergent year-to-year and easily have high standard errors. Even so, for 18 of the 19 years low SES Black Latine males are statistically significantly more likely to have either no insurance (15 years) or public insurance (3 years) in contrast to private insurance, and never is the point estimate for private insurance the highest. For low SES Black Latine females the same is true for 14 of the 19 years. In one year private insurance had the highest predicted probability, but it was not statistically significantly higher than the next closest category. In all other instances the point estimate for private insurance was lower than the alternative.

Low SES White male Latines' (Fig. 9) probability of no insurance exceeds 50 percent for all 19 years, and sometimes even topped 70 percent. And for 15 years low SES White Latine womens' most likely health insurance category was "none"; the point estimate for public insurance was highest in the remaining four. Thus, Black and White Latines have an EMI pattern.

Fig. 10 contains results for low SES Asian males and females, and again findings are strongly consistent with EMI. In all 19 years men's predicted probability for private insurance was statistically significantly lower than that for no insurance (15 years) or public insurance (4 years). For women, two years did not have statistically significant differences between private insurance probabilities and an alternative, and one year had statistically significant differences only on the basis of the targeted standard error. Yet, in all three of those years, as well as for the other 16

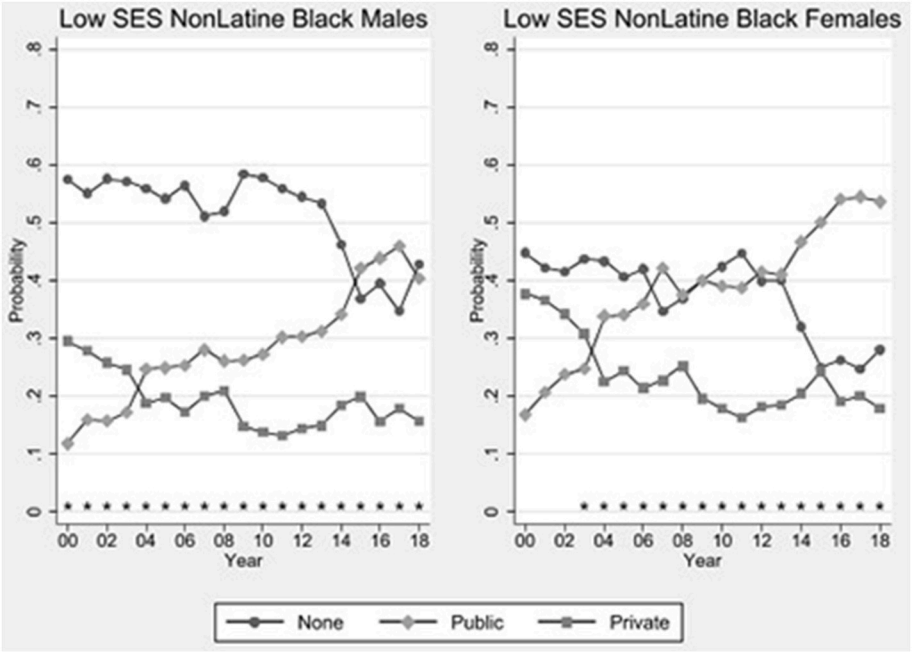

Fig. 7. Insurance type by year, age 26 to 64, NonLatine Blacks.

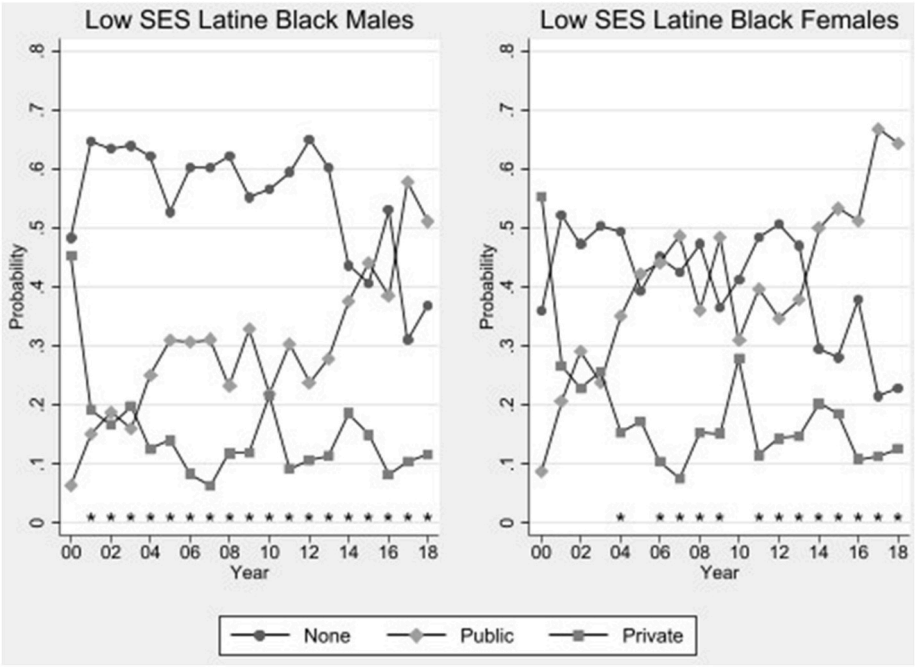

Fig. 8. Insurance type by year, age 26 to 64, Black Latines.

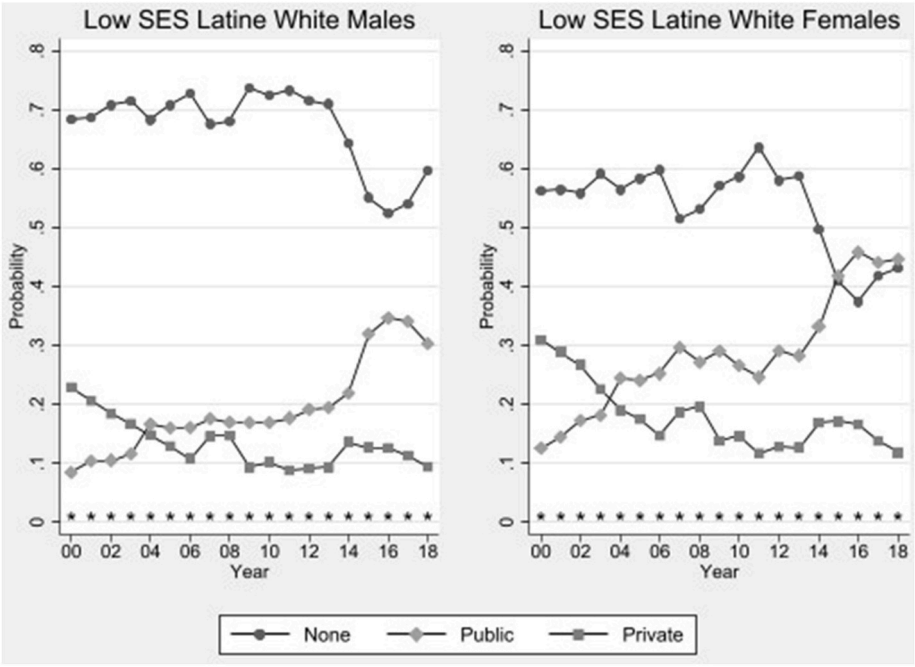

Fig. 9. Insurance type by year, age 26 to 64, White Latines.

years, the point estimates for private insurance lagged behind that of an alternative, supporting EMI.

As some combination of Blacks, Latines, and Asians are often at the back of the socio-racial queue, their pervasive EMI dynamics could allow low-SES Whites to escape the pattern. Fig. 11 shows this is not the case–for non-Latine White men (all 19 years) and women (16 of the 19), the EMI pattern is found. For women the first three years are different, and that provides the barest suggestion of a queueing effect. For 2000–2002 predicted probabilities of private insurance exceed those for the next closest alternative, in this case no insurance, which is consistent with queueing, yet private insurance is not statistically significantly more probable than the next most likely category. And, for most years that follow, low SES non-Latine White women are more likely to have no insurance than any kind of insurance. Only after the 2014 implementation of the ACA did their predicted probability of insurance–in this case, public insurance–clearly rise above the no insurance category. Thus, despite this slight and theoretically important difference, in the main non-Latine Whites also fall into an EMI pattern.

4.3. *Provisional Assessement around Turning points*

Provisionally, I find no consistent patterns of change in insurance associated with 2002/2003. For most groups EMI pertained both before and after, though for some groups the pattern was less clear before. And,

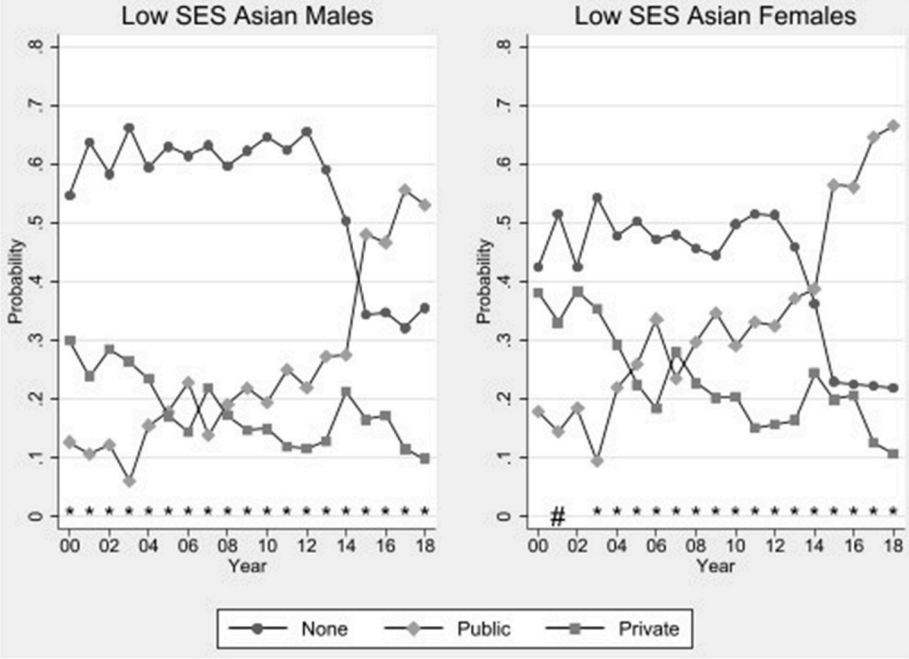

Fig. 10. Insurance type by year, age 26 to 64, Asians.

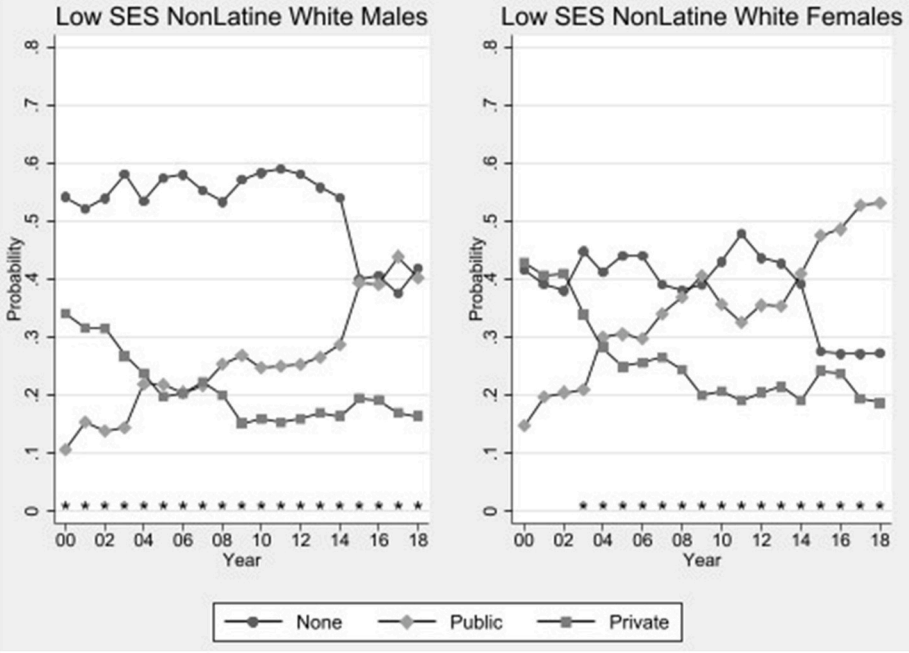

Fig. 11. Insurance type by year, age 26 to 64, NonLatine Whites.

also provisionally, EMI patterns were evident before ACA implementation, too, though for many groups noninsurance rates had been declining for two to four years. Thus, change could be unrelated to the ACA, or it could reflect employers', insurers', states', and individuals' anticipatory actions in the wake of the law's 2010 passage. Thus, provisionally, consistent with Postulate 5, the EMI pattern existed both before and after the ACA rollout. Thus while the ACA seems associated with a decline in the proportion of uninsured, the provisional assessment is that Obamacare did not undo EMI patterns.

5. Discussion

While EMI was first studied in the realm of education, the two and one-half millennia old Hippocratic principle of health care for all who are ill appears to vastly predate the rise of mass schooling and thus any sustained articulation of ideals of equal access to education. Further, debate continuously smolders as to who deserves what amount and kind of educational opportunity based on what prior level and kind of accomplishment. In contrast, while implementation of the Hippocratic ideal can be uncertain, that universal care *is* the ideal is much less contested. These two conditions, as well as perhaps others, make health care access an important, and perhaps even a fundamental, area about

which to inquire as to whether inequality falls into an effectively maintained inequality pattern, with all that may mean for its severity and intransigence.

In the United States, the first two decades of the 21st century saw major changes in the health insurance domain, some of which reduced noninsurance rates. The increase in coverage is not nothing. However, the policies adopted leave in place dynamics that can culminate in leaving some behind. Prior research suggests that those left behind would be the socioeconomically disadvantaged, but we asked a more pointed question: is health insurance working such that a particularly intensive pattern of inequality, effectively maintained inequality, will be evident?

EMI contends that goods have quantitative and qualitative dimensions, and it predicts a particular pattern to the distribution of qualitative dimensions. Existing research has established that the presence and type of health insurance can affect quality of life and mortality, making health insurance presence and type a possible site for EMI dynamics. This study offered a first opportunity to assess that possibility, to ask whether a qualitative dimension of health care access is distributed in an EMI pattern. For the racial/ethnic groups analyzed, for men and for women, and in every year studied, EMI is evident. All told, using the conventional standard error revealed 174 instances of statistically significant EMI patterns, 12 instances of non-statistically significant EMI patterns, and four instances of non-statistically significant non-EMI patterns. Thus, despite the changing arrangements for health insurance in the U.S. during the first two decades of this century, I conclude that the EMI pattern held throughout.

The results' consistency opens the door to additional research. EMI posits individual and collective action mechanisms that can produce and sustain the pattern. Given the evidence of EMI, it is possible that some of those mechanisms may operate in the provision of health care access. Yet, the posited mechanisms hail from education research. Still *other* mechanisms may operate in the health care domain, and a fuller understanding of how EMI works in health care requires identifying them. Discerning such additional mechanisms would pay dividends not only in the study of health care access, but also in the study of inequality more generally, by conveying possible additional mechanisms we might consider when we study how EMI is sustained in any domain in which it is found.

A second line of work might engage efforts to explain or elaborate the EMI finding. For example, perhaps interrogating labor market and working conditions factors, such as unionization status and industry, might elaborate how the EMI pattern is generated.[5] Such efforts, however, depend first on recognizing the in-general presence of EMI patterns in inequality in health insurance, patterns established above. Once recognized, the task of explanation need know no bounds.

Another line of possible study concerns not explaining the presence of EMI patterns but, instead, probing to discover the breadth of EMI in this domain. Are there other healthcare issues where EMI patterns may pertain? Even with insurance, are there complexities in the kinds of insurance available that, if captured well, might deepen the degree of inequality already studied? These are just a few of the many questions to which an EMI lens can be trained in the area of healthcare.

While these questions await further study, the findings appear robust and consequential. Considering the noninsurance rates reported, it is noteworthy that in the U.S. the biggest health insurance milestone of the early 21st century was an "Affordable Care Act," not a universal one. The act worked to stabilize insurance markets, not to universalize care. Thus it should come as no surprise that while early 21st century policy changes appear to have helped lower non-insurance rates (by approximately 5 percentage points), stark socioeconomic differences in health insurance remain. For Latines, Asians, Blacks, and Whites, the analysis of EMI extends our understanding beyond the observation that non-homeowners with less education, lower earnings, and lower status jobs are less likely to obtain private health insurance than are homeowners with more education, higher earnings, and higher status jobs. The study suggests the health insurance gap between persons in high and low socioeconomic positions is not merely one of degree, it is closer to one of kind. Persons of differing socioeconomic positions do not share the same most likely outcome, albeit with differing rates of that outcome. Instead, while the most likely health insurance for those of means is private insurance, the most likely health insurance for those of modest means is public insurance–or none at all. And those differences issue in different quality of life experiences and mortality risk.

Seen in this way, at base study of EMI is about whether persons in the same country essentially live in two different societies, served, if at all, by two different, consequentially dissimilar systems. Attending to the multidimensional nature of goods and integrating qualitative dimensions deeply into our assessment of inequality brings one directly to this concern. By pursuing this question we may reveal the depth and complexity of inequality that may pertain, the height of the challenge that addressing it may entail, and, possibly, the mechanisms one must leverage, negotiate, or dismantle to dissolve EMI patterns in a way that brings everyone into one, shared society, a society deeply supportive of human flourishing.

CRediT authorship contribution statement

Samuel R. Lucas: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2024.101687.

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[5] I am indebted to Reviewer 1 for suggesting this line of inquiry.

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