Trends in Socioeconomic and Racial/Ethnic Inequalities in Self-Assessed Health, Disability, and Mental Health in California: Findings from CHIS 2001–2011

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Abstract

Purpose Despite growing interest in health inequalities across socioeconomic and racial/ethnic groups, research remains scarce on the subject for California. The purpose of this study is to assess magnitude and trends in socioeconomic and race/ethnicity inequalities in self-assessed health, disability, and psychological distress.

Methods This study used the population-representative sample aged 45 and older ($n=181,964$) in 2001–2011 California Health Interview Survey (CHIS). Based on poverty as socioeconomic position and race/ethnicity as nominal social group, health inequalities and the trend over time were examined by estimating population-weighted measures on both absolute and relative terms.

Results The most economically disadvantaged Californians showed the highest rates of poor self-assessed health, disability, and serious psychological distress for the entire study period. Socioeconomic health inequalities have widened in poor self-assessed health over time for women, while the inequalities appeared to narrow for disability and psychological distress for both men and women. Race/ethnicity inequalities in disability widened considerably for men and women, while those of psychological distress declined from 2005 to 2011.

Conclusion Socioeconomic and race/ethnicity health inequalities are present and persistent in California. Trends in health inequalities appear to reflect potential impact of recent financial crisis and legislative changes in California. Consistent measurement and monitoring of health inequalities are needed to develop socioeconomic and health policies that address health inequalities in California.

Keywords Socioeconomic health inequalities · Race/ethnicity · Health disparities · Trend in health inequalities · Self-assessed health · Disability · Psychological distress

Health inequality has been widely documented across income- or education-based socioeconomic groups and social groups like race/ethnicity. Many countries have striven to investigate the presence and magnitude of health inequalities, monitor its trends, and develop policy and programs aimed at reducing the health gaps. Tackling health inequality continues to garner heightened urgency and becomes a growing policy priority in the USA as it adversely affects social justice, economic cost, and quality of life on both individual- and societal-levels [1].

The level of commitment to addressing health inequalities is found along action spectrum, ranging from recognition, measurement, will to take action, to comprehensive policy [2]. The effort in the USA appears to be in the stage of taking steps for action as seen in the *Healthy People* initiative and the Affordable Care Act [3]. Yet, health inequalities persist in the country, and more challenges still lie ahead in tackling them [4]. Any policy designed to reduce health inequalities is to build upon accurate measurement and monitoring of its trend over time, as it is a prerequisite to developing such strategies and programs [5]. Although measurement and monitoring alone may not solve the problem of health inequalities, it can identify areas that need attention in addressing health inequalities [6]. In the USA, Agency for Healthcare Research and Quality (AHRQ) release of Congress-mandated *National Healthcare Disparities Report* every year reflect ongoing federal government-level measurement and monitoring efforts [7–9].

Health inequality research in the USA appears to (1) place more focus on race/ethnicity than social class or socioeconomic position, (2) utilize varying measures of health inequalities, and (3) show lack of studies on the trends in health inequalities. First, while international research on health inequalities has

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focused on socioeconomic-based health inequalities, the USA primarily emphasizes racial/ethnic disparity in health, although both socioeconomic status and race/ethnicity have been discussed as central themes for health inequalities [8, 10–12]. Only a smaller number of studies have addressed health disparities in socioeconomic status as well as race/ethnicity [13]. Second, various analytic methods of measurement have been employed in assessing health inequalities in the USA. Different methods of measurement could describe different aspects of health inequalities [14, 15], but it may also complicate interpretation and evaluation of current status, let alone monitoring of the inequalities over time [12]. Methodology guidelines [16–18] suggest that summary measures of health inequality be population-weighted because they could account for changes over time in the distribution of all social groups and differences from the population average rate of health. Also, both absolute and relative measures should be presented together, since they often show divergent results on the extent and trend of health inequalities. Third, compared with international research [15, 19–24], studies on the trend in health inequalities based on the population-weighted measures remain relatively scarce in the USA. Only a few trend studies in health inequalities were available on such indicators as breast cancer-related mortality and incidence [12], infant mortality, health behaviors [2, 25, 26], mental health care and service use [27–29], office-based and outpatient visit and medical expenditure [12], and life expectancy and cause-specific mortality [30].

In contrast to federal efforts in the USA [8], evidence on measurement of health inequalities and the trend over time is limited in California [31–34]. The state leads the nation in race and ethnic diversity with the largest minority population of 22.3 million, serving potentially as a natural laboratory to study efforts to reduce health inequalities. Given its significance, however, the state was rated less than favorable on some health or health access indicators such as infectious disease, lack of health insurance, and poor health days [35]. While some communities and private sectors in California have introduced the initiatives and efforts against health disparities [8, 36], the state still appears to be in the stage between “recognition” and “framing health disparities to take action,” [36] lacking consistent measurement, reporting, and monitoring of health inequalities. Therefore, the purpose of this study is to assess the magnitude of both socioeconomic- and racial/ethnic inequalities in physical and mental health and to analyze the trend from 2001 to 2011 in California.

Methods

Data

Data was drawn from a compilation of multi-year data from 2001–2011 California Health Interview Survey (CHIS). The

CHIS is a statewide population-based representative survey in California. As a biennial survey, six different survey data have been publicly released. The total sample (2001 to 2011) included 73,047 men and 108,917 women aged 45 years or over. Self-assessed health (SAH) was asked in all of six survey years, but disability and psychological distress measures were collected from 2005. Therefore, while the analysis of SAH from all survey years from 2001 to 2011 was conducted, that of disability and psychological distress was based on four survey years from 2005 to 2011, representing 51,224 men and 76,887 women.

Measures

Health Indicators Three health indicators were used to assess health status. First, self-assessed health (SAH) was selected as it has been studied consistently in international research on health inequalities [19–23]. It was measured with a single question (“*Would you say that in general your health is...?*”) with five responses: “excellent” “very good,” “good,” “fair,” and “poor.” “Fair” and “poor” categories were combined to represent an adverse health event of “poor” SAH, and such dichotomization of the health indicator has been extensively used to represent “less than good” or “poor” health status in the previous health inequalities research [19–23, 52]. Second, the level of disability was assessed by one composite variable available in CHIS. It measures a disability status caused by either physical, mental, or emotion condition, with 0=“not disabled” and 1=“disabled.” The variable was adapted from the American Community Survey and was developed by CHIS from several variables on disability conditions [53, 54]. Finally, mental health status was assessed by the presence of serious psychological distress in the past month. Based on the Kessler-6 scale [37], those who scored 13 or more were considered as experiencing serious psychological distress.

Socioeconomic Position In calculating socioeconomic health inequalities, poverty-level was used as an indicator of socioeconomic position. It was based on the percentage of income relative to federal poverty level (FPL), and coded into four groups: 0–99 %, 100–199 %, 200–299 %, and 300 % FPL or above.

Race/Ethnicity Race/ethnicity was used to estimate race/ethnicity-based measure of health inequalities. Groups defined by the UCLA CHPR were recoded into five categories; White, Latino, Asian, African American, and Others. Others included Pacific Islander, American Indian/Alaskan Native, and other singles/multiple race.

Data Analysis

Rates for poor SAH, disability, and psychological distress were age adjusted by direct standardization. The reference

populations used for the standardization for CHIS 2001 to 2009 and CHIS 2011/12 were from age distribution of California in Census 2000 and 2010, respectively. All analyses were stratified by gender. The selected measures of health inequality are regression-based measures that would weigh social groups by their population size and account for differences from the population average [13, 16].

For health inequalities among race/ethnic groups as nominal social groups, between-group variance (BGV) was used as an absolute measure and mean log deviation (MLD) as a relative measure [17]. The BGV is calculated by squaring the differences in group rates from the population average and weighting by population size. The between-group variance of zero indicates no inequality. The MLD summarizes the disproportionality between shares of health and shares and population [17]. The value of zero for both BGV and MLD is interpreted as no inequality.

For socioeconomic health inequalities, Slope Index of Inequality (SII) and the Relative Index of Inequality (RII) were calculated as the absolute and relative measures [14, 16, 38]. RII was one of the two suggested methods of measuring socioeconomic inequalities in health [39]. For the RII and the SII, a ridit score was calculated for each poverty category based on the midpoint of the range in the cumulative distribution of the population. The interpretation of SII is the absolute difference in the rates between the most advantaged and the most disadvantaged of the social groups, while RII is interpreted as relative difference in the rates between the top and bottom of social groups [16]. Generalized linear model procedure was employed to estimate log-binomial regression for RIIs with a logarithmic link function and for SIIs with an identity link function [40]. To test the trend in SII and RII over time, all survey years pooled and the two-way interaction term was included between a ridit variable and a survey year variable representing six time-periods for poor SAH and four time-periods for disability and psychological distress. The trend was tested for statistical significance at the 0.05 level, and corresponding *p* values are reported.

Stata 12 [41] was used to estimate SII, RII, and their 95 % confidence intervals to account for sampling design and correctly estimate standard errors. Race/ethnicity inequalities measures were calculated by using the grouped data [16].

Results

Demographic and Socioeconomic Characteristics

Table 1 presents demographic and socioeconomic characteristics of the respondents in 2001, 2005, and 2011 by gender. Also provided are overall age-adjusted rates of three health indicators used in the study. Both White male and female populations decreased by more than 10 %, while all other

racial groups increased over the decade, with Hispanic adults growing by 29 %. Socioeconomic status as measured by poverty level showed gender differences; men reported approximately 20 % increase in poverty rate from 2001 to 2011, but women showed 5.5 % decrease during the same period.

Overall, one-fourth of Californian men and women showed poor self-health rating. Over time, men with poor SAH increased about 4.7 %, but women with poor SAH decreased by 2.7 %. More women reported having been disabled than men. Similarly, women also reported higher rates of serious psychological distress during the past 30 days than men. Nevertheless, from 2005 to 2011, women showed greater reduction in the rates (14.3 %) than men (2.8 %).

Rates of Poor SAH, Disability, and Serious Psychological Distress

Table 2 shows age-adjusted rates of poor SAH, disability, and serious psychological distress by gender, according to poverty status. Figure 1 (*left column*) displays poverty status-specific trends of the health indicators for the entire study period. Clear socioeconomic gradients of poor SAH across poverty status were observed. From 2001 to 2011, the gaps remained steady across four poverty groups, showing that those under poverty reported highest level of poor SAH and those with 300 % FPL or more the lowest rates of poor SAH. When examined separately for men and women, both men and women under poverty showed a decline in rates of poor SAH, about 10 and 4 %, respectively. For men and women in the non-poverty groups, however, various levels of increase in poor SAH were reported, from 0.2 to 11.1 %.

For disability and psychological distress, similar social gradients according to four poverty groups were noted as seen in Fig. 1. Compared with 2005, the rates of disability and psychological distress decreased in 2011 for most poverty groups, and men in poverty status of 100–199 % registered the largest decline of 44.3 % over time, followed by women living under poverty line (38.5 %). Both men and women with FPL 300 % or more, however, showed an increase in the rates of psychological distress in 2011.

Socioeconomic Health Inequalities

Socioeconomic measures of health inequalities are presented for 2001, 2005, and 2011 in Table 2 in both absolute (SII) and relative (RII) terms. The results of SII confirmed the presence of socioeconomic inequalities in poor SAH rates between the worst and best poverty-status groups. While the size of inequalities in poor SAH among men narrowed down from 0.60 to 0.54, that of women has widened from 0.55 to 0.60 over ten-year period. However, the narrowing or widening trends of inequalities in poor SAH were not statistically significant, indicating that health inequalities persisted. Persistent

Table 1 Socio-demographic characteristics of adults aged 45 and older in California: 2001 to 2011

	Male			Female			Percent of change from 2001 to 2011	
	2001 (n=12,177)	2005 (n=17,941)	2011 (n=10,618)	2001 (n=15,952)	2005 (n=12,562)	2011 (n=18,363)	Male	Female
Mean age (S.E.)	59.5 (0.06)	59.4 (0.06)	59.3 (0.08)	60.8 (0.05)	60.8 (0.04)	60.5 (0.06)		
Race/ethnicity								
White	65.7 %	64.2 %	54.8 %	64.2 %	62.8 %	55.8 %	−16.6 %	−13.1 %
Latino	14.5	15.5	18.7	14.7	14.8	15.9	29.0	8.2
Asian	10.4	11.0	11.5	11.4	12.5	12.8	10.6	12.3
African American	6.0	5.5	6.6	6.2	6.1	6.3	10.0	1.6
Others ^a	3.4	3.8	8.4	3.5	3.8	9.2	147.1	162.9
Socioeconomic position (poverty as % of FPL ^b)								
300 % or above	60.6 %	65.8 %	57.7 %	49.0 %	56.1 %	53.0 %	−4.8 %	8.2 %
200–299 %	13.5	11.8	17.4	14.6	13.8	18.5	28.9	26.7
100–199 %	16.7	14.8	13.9	21.8	18.7	14.1	−16.8	−35.3
0–99 %	9.2	7.6	11.0	14.6	11.3	13.8	19.6	−5.5
Health indicators								
Poor self-assessed health	23.3 %	23.6 %	24.4 %	26.2 %	27.2 %	25.5 %	4.7 %	−2.7 %
Disabled	–	36.2	37.1	–	43.5	42.6	2.5	−2.1
Serious psychological distress	–	3.6	3.5	–	4.9	4.2	−2.8	−14.3

^a Others include Pacific Islander, American Indian/Alaskan Native, other single/multiple race, as per UCLA CHPR definition

^b FPL federal poverty level

socioeconomic inequalities were also observed from the absolute measures for disability and psychological distress as shown in Fig. 2. The trend analyses of the SII over time showed no significant changes in socioeconomic inequalities in all of the health indicators for both men and women alike. The only exception was a significant narrowing trend in health inequalities of psychological distress for women ($P=0.012$).

For the relative measures of inequality, the values of RII for poor SAH remained above 2.00 for both men and women during the study period (see Table 2), indicating that those living under poverty were approximately two times more likely to report poor SAH than those living above 300 % FPL or above. The P values above 0.05 for the trend analysis showed that the gaps in poor SAH between the two extreme groups remained wide and persistent over the entire study period. Greater socioeconomic health inequalities were noted for psychological distress, with the RIIs exceeding 3.70 for men and 2.30 for women. Over time, inequalities in psychological distress appeared to show downward trend to some extent, but the decline was not significant either for men ($P=0.844$) nor for women ($P=0.266$).

Race/Ethnicity-Based Health Inequalities

Age-adjusted rates of poor SAH, disability, and serious psychological distress according to race/ethnicity are presented in

Table 3. Rates of poor SAH declined about 7–10 % over time for White men and women and Latino women. In contrast, the rates of poor SAH for Asian men increased by 12.3 %. In particular, men from “Other” groups showed the largest gain (23.4 %). Disability rates by Asian men and women declined sharply from 2005 to 2011 (around 17 %), but Latino men showed substantial increase (11.4 %). For the rates of psychological distress, non-White groups of men and women reported varying levels of decline over time (18 to 56 %), with an exception of 20 % increase by African American men. Both White men and women displayed slight increases in the rates of psychological distress by 4.0 and 5.7 %, respectively.

Table 3 also displays both absolute and relative measures of race/ethnicity health inequalities and changes in the inequalities from 2001 to 2011. For poor SAH, absolute race/ethnicity inequalities were the largest in 2011 for men (BGV=103.9) and in 2001 for women (BGV=142.3). Relative measures of race/ethnicity inequalities (MLD) showed the identical pattern to the absolute measure of BGV. While race/ethnicity inequalities of poor SAH widened by 13–19 % for men over the decade, those for women narrowed by about 4–10 %. Both absolute and relative race/ethnicity inequalities of disability increased for both men and women. Most notably, relative race/ethnicity inequalities of disability in MLD have jumped by 215 % from 2.6 in 2005 to 8.2 in 2011. For psychological

Table 2 Age-Adjusted Rates and Measures of Health Inequalities for Poor SAH, disability, and serious psychological distress by socioeconomic position: CHS 2001–2011

	Male			Female			Percent of change from 2001 to 2011	
	2001	2005	2011	2001	2005	2011	Male	Female
Poor SAH								
FPL (300 % or up)	12.9 %	15.0 %	13.5 %	14.2 %	15.8 %	12.1 %	4.7 %	−14.8 %
FPL (200–299 %)	28.9	28.5	29.5	24.4	29.3	27.1	2.1	11.1
FPL (100–199 %)	40.2	41.5	40.3	37.1	44.2	40.4	0.2	8.9
FPL (0–99 %)	55.3	55.0	49.6	56.8	57.7	54.6	−10.3	−3.9
							<i>p</i> for trend	
SII (95 % CI)	0.60 (0.55, 0.65)	0.55 (0.50, 0.61)	0.54 (0.48, 0.60)	0.55 (0.51, 0.61)	0.59 (0.54, 0.63)	0.60 (0.55, 0.64)	<i>p</i> =0.074	<i>p</i> =0.254
RII (95 % CI)	2.27 (2.11, 2.43)	2.07 (1.89, 2.25)	1.99 (1.81, 2.17)	2.15 (2.02, 2.28)	2.07 (1.92, 2.22)	2.24 (2.06, 2.41)	<i>p</i> =0.225	<i>p</i> =0.320
Disability								
FPL (300 % or up)	–	31.3 %	29.5 %	–	35.2 %	32.6 %	−5.8 %	−7.4 %
FPL (200–299 %)		43.9	40.7		46.7	44.8	−7.3	−4.1
FPL (100–199 %)		47.0	48.7		56.3	54.1	3.6	−3.9
FPL (0–99 %)		58.9	55.8		63.2	59.9	−5.3	−5.2
							<i>p</i> for trend	
SII (95 % CI)	–	0.41 (0.35, 0.47)	0.38 (0.32, 0.46)	–	0.48 (0.43, 0.52)	0.43 (0.39, 0.47)	<i>p</i> =0.275	<i>p</i> =0.155
RII (95 % CI)	–	1.03 (0.89, 1.16)	0.97 (0.81, 1.13)	–	1.02 (0.93, 1.11)	0.95 (0.86, 1.05)	<i>p</i> =0.321	<i>p</i> =0.424
Serious psych. distress								
FPL (300 % or up)	–	1.1 %	1.2 %	–	1.9 %	2.1 %	9.1 %	10.5 %
FPL (200–299 %)		5.5	3.5		5.3	4.0	−36.4	−24.5
FPL (100–199 %)		7.9	4.4		8.8	7.1	−44.3	−19.3
FPL (0–99 %)		14.0	13.8		15.6	9.6	−1.4	−38.5
							<i>p</i> for trend	
SII (95 % CI)	–	0.15 (0.12, 0.18)	0.12 (0.08, 0.15)	–	0.14 (0.11, 0.16)	0.09 (0.07, 0.12)	<i>p</i> =0.086	<i>p</i> =0.012
RII (95 % CI)	–	3.84 (3.30, 4.38)	3.71 (2.80, 4.63)	–	2.94 (2.48, 3.40)	2.29 (1.76, 2.81)	<i>p</i> =0.844	<i>p</i> =0.266

distress, race/ethnicity inequalities declined among both men and women. On the absolute terms (BGV), the decline for men and women were 32.1 and 44.7 %, respectively. Conversely, on the relative terms (MLD), race/ethnicity inequalities of psychological distress showed 51.7 % decline for women from 73.9 in 2005 to 35.7 in 2011.

Figure 3 shows trends in race/ethnicity health inequalities as relative percent changes in both absolute and relative measures by gender for all the study periods. For men, trends in absolute and relative inequalities of poor SAH since 2001 were similar in that the race/ethnicity inequalities showed decline until 2007, then sharply increased (72 % for BGV and 69 % for MLD) in 2009, and showed modest decline in 2011. For women, race/ethnicity inequalities in poor SAH in 2011 were somewhat attenuated, compared to 2001. Nevertheless, from 2005 to 2011, absolute and relative

measures showed divergent patterns. While the relative inequality measure of MLD increased until 2009 and declined, the absolute measure of BGV declined until 2009, followed by an increase. For disability, both men and women showed widening race/ethnic inequalities in 2011, relative to 2001, as all of percent changes in 2011 stayed above zero. In particular, the relative measure of race/ethnic inequality in disability showed the dramatic increase of about 400 % in 2009, despite the decline of absolute measure by 16 %. The trends in serious psychological distress show that race/ethnicity inequalities (in BGV and MLD) had general tendency to decline both men and women. The initial downward trend appeared to be followed by modest increase from 2009. Overall, as most of percent changes since 2005 moved below zero, pointing to narrowing of race/ethnicity inequalities in serious psychological distress, with the exception of 36 % increase in MLD for men in 2009.

Fig. 1 Trends in age-adjusted rates of poor SAH, disability, and psychological distress by poverty level and race/ethnicity: CHIS 2001–2011

Discussion

This study examined the magnitude of socioeconomic and race/ethnic inequalities in poor SAH, disability, and psychological distress and their trends from 2001 to

2011 in California. Inequalities in the health indicators were persistent across race/ethnicity as well as socioeconomic groups in California, consistent with previous studies in the USA [3, 4, 7, 25] and international research [15, 22–24].

Fig. 2 Trends in absolute and relative socioeconomic inequalities (SII and RII) in Poor SAH, disability, and psychological distress over time by gender: CHIS 2001–2011

Table 3 Age-Adjusted Rates and Measures of Health Inequalities for Poor SAH, disability, and serious psychological distress by race/ethnicity: CHIS 2001–2011

	Male			Female			Percent change	
	2001	2005	2011	2001	2005	2011	Male	Female
Poor SAH								
White	17.5 %	17.8 %	16.2 %	18.4 %	19.5 %	16.4 %	−7.4 %	−10.9 %
Latino	43.7	40.8	42.1	51.7	50.0	46.2	−3.7	−10.6
Asian	25.2	33.2	28.3	29.1	34.0	29.2	12.3	0.3
African American	31.2	24.9	26.3	34.8	35.0	31.8	−15.7	−8.6
Others	26.9	21.7	33.2	33.9	30.1	35.9	23.4	5.9
BGV	87.0	77.8	103.9	142.3	123.9	128.6	19.4 %	−9.6 %
MLD (×1,000)	66.3	58.9	74.6	88.4	71.8	85.2	12.5	−3.6
Disability								
White	–	36.5 %	35.9 %	–	41.3 %	40.2 %	−1.6 %	−2.7 %
Latino		38.7	43.1		50.3	50.9	11.4	1.2
Asian		33.0	27.4		40.3	33.1	−17.0	−17.9
African American		41.6	43.6		52.3	51.8	4.8	−1.0
Others		40.4	44.6		52.1	44.5	10.4	−14.6
BGV	–	13.9	25.7	–	18.7	31.2	84.0 %	66.8 %
MLD (×1,000)	–	4.6	6.8	–	2.6	8.2	47.8	215.4
Serious psych. distress								
White	–	2.5 %	2.6 %	–	3.5 %	3.7 %	4.0 %	5.7 %
Latino		7.1	5.8		8.8	7.2	−18.3	−18.2
Asian		3.3	2.5		5.7	2.5	−24.2	−56.1
African American		4.5	5.4		6.9	5.3	20.0	−23.2
Others		4.2	2.6		5.9	5.4	−38.1	−8.5
BGV	–	2.8	1.9	–	3.8	2.1	−32.1 %	−44.7 %
MLD (×1,000)	–	93.5	92.4	–	73.9	35.7	−1.2	−51.7

While overall rates of the poor SAH declined over the time, the gap between the most advantaged and the most disadvantaged groups remained unchanged for men and women. Despite the persistence of health inequalities, however, substantial fluctuations in the inequalities should also be noted from the findings. While the degree of socioeconomic inequalities (in terms of poverty status) appeared to be relatively stable for poor SAH and disability, inequalities in psychological distress among female did appear to go from a widening between the below poverty-line group to a narrowing of that gap until 2008, and they again grew wider in 2011. In addition, there existed wide health gaps across the racial and minority groups in California. The degree of race/ethnic inequalities also showed a great deal of fluctuations on all three indicators. Especially, Latinos and African-Americans were worse off on all of the health indicators than the other groups. In California, the trend in the health inequalities over the 10-year period showed very complex and mixed patterns, depending on the indicators and gender. Such patterns also appear to mirror earlier studies. Some studies [20, 21] showed stability in socioeconomic inequalities of SAH over time, while others [15, 19] reported on consistently increasing trend over time.

SAH is known to have the shortest lag [20] in displaying the health effect of economic condition as it is the most subjective measure of health. Economic crisis may lead to growing income inequality, thereby affecting people's perception of health and widening health inequality [20, 42, 43]. A nationwide financial crisis of 2008, coupled with a growing income inequality in California (Gini index of over 0.45) may explain the observed persistence of health inequalities in poor SAH over time.

Although disability was much broadly defined than other studies [44, 45], the widening race/ethnicity inequalities in disability were confirmed for Californian adult population, particularly in absolute terms for men and in relative terms for women. It is a cause for concern due to its potential impact on quality of life and social/ economic consequence of dependency [45]. The observed increases seem to coincide with or at least reflect the aftermath of the 2008 recession mentioned above. In fact, the Social Security Administration reported an increase of 12.6 % for disability benefits award and 21 % increase in the number of applications to the Social Security Disability Insurance, following the economic crisis [55]. In addition, the crisis had taken greater toll on racial/ethnic

Fig. 3 Trends (percent change from the first year of observation) in absolute and relative race/ethnicity inequalities (BGV and MLD) in poor SAH, disability, and psychological distress by gender: CHIS 2001–2011

minorities, especially among African American and Latinos, as evidenced by greater loss of wealth and assets and higher rates of foreclosure [56]. Taken together, the increases in racial/ethnic disparities in disability among African American and Latinos in this study may be closely associated with the differential impact of the financial crisis.

Finally, while rates of psychological distress remained somewhat stable with slight downward trends for those non-below-poverty-level groups, increasing trend was obvious for below-poverty (0–99 % FPL) group from 2009. In terms of racial/ethnic groups, the downward trend from White, African Americans, and Latinos was followed by the increase since 2009. This observed pattern may be also related to the financial crisis, given its close association with mental health [57]. On the other hand, both socioeconomic- and race/ethnic-health inequalities showed generally downward trends from 2005 and 2011 for both men and women, although they increased for men in relative terms in 2009, followed by the decline in 2011. No clear insight based on empirical analysis can be offered in this study on how to explain the overall downward trends in health inequalities in psychological distress. However, it is worthwhile to note that the Mental Health Services Act (MHSA) of 2004 was passed to expand mental health services in California that included prevention and early intervention (PEI) services, suicide prevention, and treatment services. Given the fact that the MHSA became effective in 2005 from which CHIS started measuring psychological distress, the results afford an opportunity to speculate about the potential effect of the MHSA on psychological distress as an indicator of population health. Nevertheless, despite strong adoption of PEI strategies and focus on disparities in access to mental health services [46, 47], no direct association can be drawn between the declining rates and inequality trend and the impact of the MHSA. Therefore, the results suggest that more formal examination and research is needed in order to investigate the association between levels and changes in inequalities and key economic changes or healthcare-related legislation. Furthermore, it is also necessary to continue to examine and track health inequalities with regard to different subgroups (e.g., by education or occupation) and other health and health access indicators.

A final point is that this study provides possible evidence that race/ethnicity-based health inequalities differentially affect different minority groups. For example, unlike African Americans and Latinos during the same period, Asian-Americans in California showed improved levels of self-assessed health, disability, and psychological distress, especially the rate of disability increasingly lower levels than Whites over time. Although a definite and reliable conclusion cannot be readily drawn from this study due to the aggregation of diverse Asian groups into one group and the relatively smaller sample size of this subgroup, it may suggest that health inequalities over time may be a confluence of

race/ethnicity with socioeconomic levels manifested in a very complex manner.

Findings from the present study should be interpreted with the following limitations in mind. First, while socioeconomic health inequalities can be investigated across income, education, or social class, only poverty status was used in this study to examine health inequalities. For a fuller picture of socioeconomic health inequalities, future research should include income, education, or occupation-based socioeconomic groups for different perspective of health inequalities. Second, this study only focused on health inequalities in terms of some selected health status, although health inequalities could encompass inequalities in health access or health care quality. Third, health is a complex construct that builds on both objective and subjective assessment. All of the indicators used in the study are primarily based on self-reporting of health status, rather than any medical diagnosis of acute or chronic health conditions which should also be studied.

Literature highlights health and other socioeconomic policy as potential solution or the most important medicine in addressing health inequalities in nations [48–50]. The Nordic European countries showed favorable changes in health inequalities despite adverse impact of the economic crises on health. It was attributed to economic development and socioeconomic policies that moderated such adverse effect of the economic crises [21]. Therefore, we should take proactive and concerted efforts toward a development of systematic and comprehensive policy aimed at reducing the persistent socioeconomic and race/ethnicity health inequalities not only in the USA, but also in California. For that, a system of monitoring and tracking the magnitude and trends over time should be developed as found in Europe [15] or the English Indices of Deprivation in Great Britain [51]. Monitoring health inequalities is the first and the most significant step in reducing health inequalities. Such efforts provide detailed description of health indicators, methods, measurement, and monitoring of health inequities, paving the ways to identify determinants or pathways [50] for socioeconomic-based and race/ethnicity-based health inequalities. Only then, we can develop health and socioeconomic policies to move forward with more effective efforts to tackle health inequalities.

Conflict of Interest Author Jong Won Min declares that he has no conflict of interest.

Informed Consent “All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all patients for being included in the study.”

Animal Studies “No animal or human studies were carried out by the authors for this article.”

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