

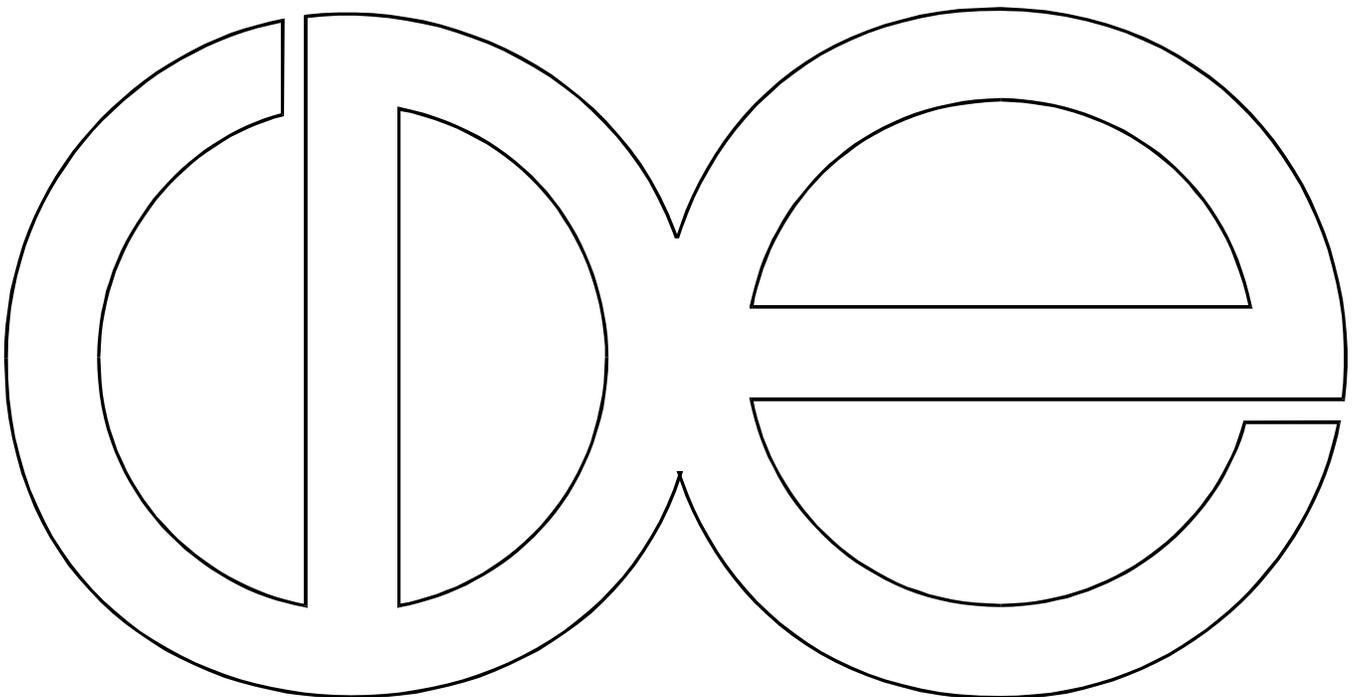
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**Exploring the Racial/Ethnic Gap in Healthy Life Expectancy
United States 1989-1991**

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Racial/Ethnic disparities in healthy life are explored using Disability-Free Life Expectancy (1989-1991) estimated for Native, Asian and Pacific Islanders, black, white, and Hispanic Americans. Four types of disability were analyzed: any disability, work-related disability, limitations in activities of daily living, and disability that is work-related and limits activities of daily living and personal care too. We found that Natives and blacks spend a longer time of their shorter Life Expectancies disabled. Although women enjoy longer LE than men, they spent a higher proportion of life disabled. Racial groups score differently based on the type of disability too.

Cet article explore les disparités ethniques et raciales en matière de santé à travers l'analyse des espérances de vie en santé (1989-1991) estimées pour les natives, les asiatiques, les noirs, les blancs, et les Hispaniques Américains. Quatre types de limitations sont analysées: limitations de tout genre, limitation de travail, limitations des activités de vie quotidiennes, et limitations des activités quotidiennes et activités des besoins personnels. Nous trouvons que les Américains de souche et les noirs vivent une plus longue part de leur courte vie handicapés. Malgré qu'elles bénéficient d'une espérance de vie plus longue que les hommes, les femmes passent une plus longue proportion de leur vie handicapées. Les groupes ethniques et raciaux diffèrent aussi sur la base du type de limitations considérées.

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BACKGROUND

Measuring the health of populations in a comparative perspective is the focus of this paper. Life expectancy (LE) is one of the demographic summary measures traditionally used to assess the health status of populations. Obviously, LE depends more on death, the end of the spectrum of health, than on health itself. For this reason, LE is deemed inappropriate to be used for quality assurance in health care or health outcomes management. Indeed, some argue that LE is not a good summary population health measure at all since it does not account for the health of the population. Summary population health measures should account for the collective health of a population in the same way a GDP accounts for the economy of a nation (Kindig 1997) or other socio-economic indices such as unemployment rate or rate of inflation (Evans et al. 1994). The need for a standard measure of population health that would account for longevity as well as for other dimensions of health such as disability, or quality of life years, has led to efforts aimed at measuring the length of healthy life. Summary measures that account for this concept are recurrent in the demographic and health literature under many different labels. The concept of “Health Adjusted Life Expectancy” was first used in 1964 (Sanders 1964), but the first proposed method of calculation came later (Sullivan 1971). Other currently used measures include Quality Adjusted Life Expectancy (QALE), Active Life Expectancy (ALE), Health Adjusted Life Years (HALY), Quality Adjusted Life Years (QALYs), Years of Healthy Life (YHL), and Disability Adjusted Life Years (DALYs). The differences between these measures reside mainly in the various approaches to defining the health status of a population. Other authors have written

extensively on why summary measures of population health might be useful. Here we assume that a summary measure is a useful tool.

If we assume that a summary measure is useful so that we can compare the health of various populations, then the logical question to ask is which populations might be interesting to compare. In the United States, race and ethnic differentials in health and mortality have often been described. The utilization of racial/ethnic group identifiers in past research has been evaluated (Lillie-Blanton and Laveist 1996), and their importance in Health Services Research recognized (Martinez and Lillie-Blanton 1996). In addition, among the major public health goals for the United States are reducing or eliminating health disparities by race, which translated into the Centers for Disease Control commitment to eliminate racial disparities in health care by 2010 among other measures (CDC 2000). Therefore, it seems appropriate to use these summary measures to examine race and ethnic differentials in population health.

Racial differentials in mortality are well established. Kington and Nickens (2001) describe the persistence of differential health by race and ethnicity as one of the two central findings in the story of health in the twentieth-century United States. The other is the marked improvement of health for all populations from 1900 to 2000. The most recent national statistics for life expectancy report white female life expectancy at birth to be 80.0 years, compared with 74.5 for white males, 74.8 for black females, and only 67.3 for black males (Murphy 2000).

Recent research on health disparities by race/ethnicity has continued to indicate that blacks live not only shorter, but more disabled lives than do whites (Crimmins, Hayward, and Saito 1996; Crimmins, Saito, and Ingegneri 1989; Guralnik et al. 1993; Hayward and Heron 1999; Laditka and Wolf 1998). While some researchers find that the black/white disparity

narrows with age (Guralnik et al. 1993), the others disagree (Crimmins, Hayward, and Saito 1996; Crimmins, Saito, and Ingegneri 1989; Hayward and Heron 1999; Laditka and Wolf 1998).

Since the late 1980s, there has been an increasing focus on the “paradox” of Hispanic good health. The paradox, as first described by Markides and Coreil (1986) surrounds the question of why lower socioeconomic status does not seem to predict poor health outcomes for Hispanics compared with other socio-economically deprived groups in the United States. A growing body of research has proclaimed the overall advantage that Hispanic Americans have in mortality (Shai and Rosenwaike 1987; Council on Scientific Affairs AMA 1991; Sorlie, Backlund, Johnson and Rogot 1993; Liao et al. 1998).

Recently, Mark Hayward and Melonie Heron (1999) published results from the 1990 US Census that described the active life expectancy. For their measure of active life expectancy, they model the number of years individuals can expect to live without a limitation of activity resulting from chronic disease or impairment. The measure of limitation that Hayward and Heron focused on is disability that limits either the amount of work or prevents the respondent from working. A similar type of disability is called work-related disability in our model. We extend the work of Hayward and Heron to include more measures and more complex measures of disability. In addition to work-related disability, we measure disability related to mobility, and disability that causes a person to need personal care to help with activities of daily living. These definitions have the advantage of not carrying any value judgment about the unhealthy years of LE; unhealthy life years are equally treated within the type of limitation of interest.

We also measure a marker of the most severe form of disability, which requires a person to be disabled in terms of mobility and activities of daily living, as well as prevented from work. This is the most severe form of disability we measure. Finally, we have a measure of any of the

forms of disability—work-related, mobility, or personal care for activities of daily living. As Hayward and Heron (1999) state: “Data limitations have constrained our attention to a single morbidity measure: chronic health conditions limiting work activity. Our understanding of racial differences in active life would be enriched by considering other measures of morbidity, such as difficulties in carrying out the activities of daily life and restrictions in basic physical and mental actions. Moreover, longitudinal information on the timing of morbidity onset and abatement would allow the use of multistate life table methods to calculate more precise estimates of active life expectancy as well as new measures summarizing the expected number of morbidity events over the life cycle.” Here we are able to address one of their concerns by introducing more disability measures, but remain constrained by the other limitations they mention as well.

Measuring the Health Status of a Population

For the first time, in a recent release, the World Health Organization (WHO) adopted Disability Adjusted Life Expectancy (DALE) for a ranking of the countries of the world, instead of using LE. WHO’s definition of disability is based on a weighting of years of ill-health according to severity. The sum of the weighted years of ill-health are then subtracted from the total LE. This definition is not without its own problems, not least of which is that the weighting is a subjective process that emphasizes some aspect of health considered crucial by expert opinion, as opposed to self-evaluation which reflects more loss of functionality. The Quality of Life Years (QALY) approach, which takes a year of healthy life expectancy to be worth one, but applies a weight less than one for a year of unhealthy life has been criticized as “fatally flawed as a way of priority setting in health care and of dealing with the problem of scarce resources” (Harris 1987).

Closer to our approach in defining disability is that of the “Healthy People 2000,” which used information on activity limitation and perceived health from the NHIS to construct 6-

category scaled measure of healthy life. Weights of disability are then calculated and applied to the person-years of the life table (Field and Gold 1998). For rigor of computation methodology, we prefer the census data source, which allows the use of the same denominator for the death rates and weights of health status, rather than adding a separate source for disability data to the two sources used to construct the life tables.

In sum, there are two distinct approaches in defining health status for the purpose of DFLE computation; each has its lot of subjective elements. In the first approach, a subjective element is involved at the level of data collection where respondents are invited to evaluate their health in order to identify whether they had a disability. In the second approach, an “expert” opinion rates the health condition, and then attributes a weight to it. People at different stages of the life course, different gender, and different race/ethnic groups differ with regard to their exposure to disease and experience with disability. Also, the health policy implications are different from one type of disability to another. The health care system requires different resources to deal with a disability which limits personal care and mobility than those needed to address work-related disability or total dependency type of disability. Within the constraint of our data sources, we adopted multiple definitions of disability in order to capture this diversity.

Research Design and Methods

Our research goal was first to calculate life expectancy and second, to adjust that life expectancy for disability. To calculate life expectancy, we used the US population distribution by age and sex as estimated by the 1990 census and the three-year average of the deaths recorded for the three years 1989, 1990, and 1991 in the complete mortality statistics for the United States. We extracted the population data from the Public Use Microdata Sample, the one percent national sample (PUMS 1%) including weights to obtain the complete population count. Age was

recoded from 0 to 90 years and over, as 0 years, 1 to 4 years, and in five-year intervals for age 5 to 90 years. The open age group 90 and over is the highest age group provided by the PUMS. We also dichotomized on gender. For this analysis, the US population is divided into five groups along racial and ethnic lines as defined by the census, that is Native Americans, Asians and Pacific Islanders, blacks, whites, and Hispanics.

The death statistics were treated in a similar fashion to the census, with the additional caveat that the death statistics included an unknown age group. Although this unknown group was not large enough to have a significant impact on the end results, we distributed the counts of deaths with age unknown among age groups according to the weight of each age group within the total deaths, separately for males and females.

According to national mortality data, Hispanics appear to live longer than other persons do in the United States. Taking into account recent work on Hispanic misclassification in the vital statistics records, we adjusted the Hispanic life tables for misclassification (see Swallen and Guend 2003 for details on the adjustment procedure). We also excluded Louisiana, New Hampshire, and Oklahoma from the calculation of the life tables by Hispanic ethnicity because these three states did not report Hispanic ethnicity for some years of interest to our study. Although other race data or other data may also be misclassified, we did not measure or adjust for any other sources of misclassification.

After calculating death rates for age-sex-race/ethnic groups, we created a set of period life tables for the 1989-1991 period. Period life tables describe, in probabilistic terms, the level of mortality as a risk of dying, or alternatively a probability of survival that varies by sex and age. This risk reflects the level of mortality experienced by a specific population during a specific period of time (here the US population during the period 1989-1991). The series of

probabilities of survival by age for instance, express the chances of survival for a fictive cohort whose members experience the condition of the period of reference. Thus life expectancy from a period life table reflects the expected mean age of death among a cohort who lives out its life according to the rates effective in that period (see Preston et al. 2001, for more details).

The US population for the purpose of this study consists of all persons resident in the fifty states and D.C. This restriction was needed to avoid problems due to different classification of US territories in the census and vital statistics. The long form questionnaire of the 1990 US Census contained four disability questions addressed to residents 16 years old and over (U.S Bureau of the Census. 1996). The Census Bureau defined disability as a health condition, which lasted at least six months and could result or resulted in a limitation of work or independent living. Using the 1990 Census data, we measure 1) limitations in mobility; 2) whether the respondent needed personal care for limitations in other activities of daily living (including such activities as bathing, shopping etc.—the list includes both standard ADLs and IADLs); 3) whether the respondent had a condition that limited the nature and amount of work they could do; and 4) whether they had a conditions that prevented them from work. Using these four questions, we created four measures of disability. First, baseline disability is a combination of “yes” response to any of the four census questions. Baseline disability is the least severe and most inclusive measure we use. Second, we combined the two questions about daily living related disability to obtain a life conditions disability, which captures all cases with a mobility or personal care limitation. Third, we combined the responses to the two work-related disability questions. The work-related disability uses the same factors as Hayward and Heron (1999) did. Fourth, we combined the “mobility limitation,” “personal care limitation,” and the “prevented from work” condition to create a category capturing persons who have had a condition of “total

dependency.” The dependency condition measures the most severe form of disability and is quite rare even at old age.

The 1990 US Census provides the disability data described above only for persons aged sixteen years and over. Since our life tables start at age 15, we first tabulated a 4-year disability rate for the age group 16 to 19 years. We then assumed that 15-year olds experience on average the same disability rate as the 16 to 19-year olds and so applied the four-year age group disability rate to five-year person years of the life table.

Having calculated both the period life table and the disability rates for the sex-race/ethnic groups, we then are able to calculate adjusted estimates of Disability Free Life Expectancy (DFLE), and Disability Life Years (DLYs). The period life table is used as a baseline life table that estimates life expectancy regardless of health condition and the stationary population used for disability analysis. This of course implies the assumption that the same force of mortality applies to persons with different health conditions. The column of person-years (${}_aL_x$) is the level where the adjustment for disability operates. The person-years column in the life table expresses the number of years lived by the fictive cohort between the ages x and $x+a$, where x is the age of the life table from zero to ninety years; while a is the age interval, which is equal to five years for all age groups except for three cases, the open age group that closes the life table (90 years and over), the first age group (one year), and the second age group (four years).

We used the Sullivan Method to adjust the life tables for disability (Sullivan, 1971), which requires the person-years of the life table (${}_aL_x$) to be adjusted for disability using cross sectional prevalence rates of disability (${}_aW_x$). Then total Life Expectancy (LE), Disability Free Life Expectancy (DFLE), and Disability Life Years (DLYs) are obtained according to the conventional method of computation of life expectancy. DFLE measures the numbers of years a

person would live free of any kind of disability. DLYs measure the number of years a person will live, on average, with any type of disability.

The risks of mortality and disability as well as the type of disability are highly correlated with age. For this reason, a more refined comparison is obtained using Partial Life Expectancies Free of Disability (PLEFD) that target chosen adult life stages. Partial Life Expectancy (PLE) is an age-constrained form of Life Expectancy. It allows the analysis of survival within the age span of interest, also allowing exclusion of age groups with unreliable data, as is often the case for the open terminal life table age group, 90 years and over in the case at hand. We reported PLEFD in early adulthood (15-44), middle age to retirement (45-64), and elderly ages (65-89) excluding the 90 and over age group. The two independent living questions in the census 1990 offer a better proxy to assessing disability of elderly population, while work related disability is more relevant to the 15-64 age group. Finally, while the total dependency type of disability is relevant for all age groups, it is a rare condition even among the elderly.

The weights (${}_aW_x$) applied to the person-years to correct for disability raise two challenges. One is the fact that evaluation of the health status of a population or a sub-population is a subjective enterprise even when done within a single societal context (and poses more problems whenever international comparisons are involved). The initiator of the technique of adjustment highlighted this limitation in his original description and limited the ambition to measures of health in the US (Sullivan, 1966). The second is that the weights applied are merely rates of prevalence of disability that say nothing about the timing and direction of the transitions into and out of disability. Thus, we are essentially assuming in our models that once a person enters a state of disability, he/she will live out the rest of their lives as a disabled person.

Results

Figure 1 describes the prevalence rates of disability by age, sex, race and ethnicity. The series of prevalence rates of disability demonstrate that Native Americans and blacks experience higher levels of disability than do whites and Asian Americans over the whole adult life course except for the “Total Dependency” disability, for which the racial differences show up only above age 50 years. White non-Hispanic Americans and Americans of Hispanic descent have very similar disability rates at all ages and for all types of disability.

The racial difference is more marked among males than among females for baseline disability; and there is a substantial gap between the sets of lines along the entire adult life span. Adult males have different patterns of work-related disability by race, with Asian Americans the least disabled and Native Americans the most, while rates for whites and blacks are situated in between. The rates for daily living disability are nonetheless marked by a smaller racial gradient but more advantageous to Asian and white Americans. Total dependency disability is a rare condition with little to no racial/ethnic gradient. Differentials among racial/ethnic groups show up only after age 45 years among males and females, with Asian Americans having the lowest levels and black and Native Americans the lowest, while whites and Americans of Hispanic descent occupy an intermediate level.

FIGURE 1 ABOUT HERE

LE and its two components DFLE and DLYs at age 15 are presented in Table 1 and Figure 2. Over the adult life course, and with regard to the distribution of adult LE between DLYs, and DFLE by gender, we note that while females live longer than males, they appear to spend more of their lives disabled, regardless of how disability is measured. Blacks on the other hand appear to be notably short-lived and highly disabled. Asian males and females have the longest LE at and the longest DFLE, while black Americans have the lowest value of these two

indicators; a confirmation of the observation highlighted based on the prevalence rates of disability.

Provided that the adjustment for Hispanic misclassification of death brought us closer to reality, we notice that Hispanic women live a shorter adult life (minus one year) than their Native American counterparts but a longer (plus one year) life than white women. However, Hispanic women live an adult life free of disability that is longer than that of Native American women, and shorter than that of white American women. This is also true among men but with a difference in magnitude, with two years difference in LE and 3 to 4 years difference in DFLE.

The Asian advantage is even more marked with regard to work-related disability over the whole adult life course among women and men alike. The most disadvantaged are black and Native males with the latter having the odd characteristic of a long LE with a long DLYs. Native Americans match whites with regard to longevity, but with a DLYs that are the highest among all groups (17 years).

While Native women and men live a little longer than Hispanics, their DFLE is about the same but lower than the average of the four “pooled” racial groups. Close to but above this average are the scores of white males and females, and way above and below are the scores of Asian and black Americans respectively; with respect to longevity as well as to healthy life.

All four main racial groups seem to fare well with regard to total dependency disability, especially when compared with the ethnic Hispanics, who spend much more of their lives in a state of dependency (Figure 2).

TABLE 1 ABOUT HERE

FIGURE 2 ABOUT HERE

Another way to look at the racial/ethnic differential is through the proportion of life expectancy spent free of disability (Table 2). American Asians and non-Hispanic whites spent 82 percent of life expectancy free of all types of disability. On the other end of the scale, Native Americans spend only 69 percent of their life free of disability. Other racial/ethnic groups are distributed between these two extremes. For all racial/ethnic groups except for Native Americans, males live a longer proportion of their life expectancy free of disability than do women.

Looking at daily living related disability, white non-Hispanic men and women are the only groups whose score is respectively one and two percent points above the average of the pooled racial groups. On the lower end of the ranking are black males and females with six percent points lower than that average. Native Americans also rank low but not as low as blacks, the score of the former group is one percentage point higher than that of latter. Hispanic and Asian females spend the same proportion of their LE free of daily-living related disability, while Asian males are one percentage point ahead of their Hispanic peers.

Turning to work related disability, American Asians, the most advantaged, spend 87 percent of their sex combined life expectancy free of this type of disability; closely followed by white non-Hispanics (85%). Native Americans tail the list with only 73 percent of LE free of disability. The disadvantage on this disability indicator drives the Native American baseline disability disadvantage as well. Blacks and Americans of Hispanic origin are four and one point respectively below the all-race average. Our results are essentially the same as found by Hayward and Heron (1999).

Finally, when we examine total dependency disability, Americans of Hispanic origin are the most disadvantaged with only 86 percent of LE spent free of disability, while all the specific

race groups are well over 90%--Asian Americans (96 percent), followed by blacks (95 percent), Native Americans (94 percent), and white non-Hispanics (91%). Females experience total dependency disability much more than males do.

As described above, partial life expectancy (PLE) is an age-constrained form of life expectancy. We reported the distribution of PLE (as percentages) for three age groups—early adulthood (15-44), middle age to retirement (45-64), and elderly ages (65-89) (Table 3).

Looking first at baseline disability, we note that Asian adults live the healthiest life and improve as they move up over the three stages of adult life. In early adulthood, both Asian and white Americans live 93% of PLE free of disability, but a difference of two and three percentage points separates the two groups at middle age and old age, in favor of Asian Americans. Black and Native Americans are the most disadvantaged groups. Blacks spend 86 percent of PLE free of disability in early adulthood, 70 percent of PLE free of disability in the intermediate age group, and 47 percent of PLE free of disability in elderly ages. Native Americans have the same scores except for the intermediate adult life stage where their score is 68%, two percentage points less than Blacks. Americans of Hispanic origin occupy an intermediate position that is lower than the mean for all four racial groups, but are less disabled than Blacks and Native Americans.

The breakdown by gender reveals more disparities, especially among Native Americans. Asian American women are still more advantaged than white women at older ages, while young adult white women are one percentage point higher than their Asian American counterparts. Young adult and elderly Native American women fare better than black women of the same age.

TABLE 3 ABOUT HERE

We expect work-related disability to affect more the younger two age groups since the elder age group may be retired. Whites have the highest percentage of PLE free of independent living disability, but Asian Americans have the highest percentage of PLE free of work related disability, and Hispanics also have a higher percentage compared to other types of disability.

In early adulthood, both Hispanics and whites live 95 percent of PLE free of disability, while Asian Americans' score is 97 percent, and blacks and Native Americans' 92 and 90 percent respectively. This ranking is maintained at older ages with a slight regression of Hispanics compared to whites. These observations apply also to men and women examined separately, except that elderly Native American women fared better than their black counterparts.

Turning to independent living disability, whites are the most advantaged group at all three stages of adult life, for men and women. Between 65 and 89 years of age, a white American (male or female) lives 77 percent of PLE free of independent living disability, while his or her Asian American counterpart lives 74 percent disability-free, Native American and Hispanic 70 percent disability-free, and a black lives only 67 percent of PLE free of disability. This ranking does not hold within gender groups. Hispanic men fare better (75%) than blacks and Native Americans (72%), but worse than Asian Americans (76%), and whites (82%). Among women, whites (74%) and Asian Americans (71%) have the highest percentage of PLE free of disability, while Native American women fare better than Hispanics and blacks.

Finally, total dependency disability reflects the most severe form of disability. For this most severe case, Americans of Hispanic origin are the most disadvantaged. Asian Americans and whites have the highest percent of PLE free of disability, again with Asian American females gaining a slight advantage in older adult ages. Blacks and Native Americans have lower scores.

Discussion

Due to the availability of the data required for its calculation, its comparability across population and across time periods, and its intuitive interpretation, prevalence based Disability Free Life Expectancy (DFLE) is increasingly used in comparative studies of the health of populations (Cambois et al., 1998; Hayward et al., 1999; Robine et al., 2001; Cambois et al., 2001,). We used this index to explore the disparities among racial and ethnic groups in the United States of America for the period centered on the US census 1990.

First, we estimated the levels of mortality for each racial/ethnic group through race/ethnicity specific life tables. A particular effort was made in the estimation of the mortality of Americans of Hispanic origin, through an adjustment for Hispanic misclassification in order to reduce the usual overestimation of life expectancy of Hispanics. Second, we defined four types of disability that can be measured using census data: a baseline disability that accounts for any type of disability recorded in the census; a work related disability referring to those who are unable to work or limited in work; independent living disability referring to those who had either a mobility limitation or personal care limitations; and a total dependency disability, which captures those respondents who were unable to work and needed personal care. Third, we calculated disability prevalence rates from the census data and applied them to the life tables of each of the racial/ethnic groups to calculate Disability Free Life Expectancies and other similar summary measures.

In sum, the results indicate that those groups who appear to be advantaged on simpler measures of health—such as life expectancy—remain advantaged when disability is taken into account. Asians and white non-Hispanics tend to do much better than do blacks and Native American populations. In fact, the disparities in health widen for these disadvantaged groups.

Our results confirm the findings of Hayward and Heron (1999) whose definition of disability is similar to the “work-related” disability variant of this paper.

On the other hand, the well-known female advantage with regard to longevity is reversed when disability is taken into account. Males live a longer proportion of their life expectancy free of disability than females, except among Native Americans who showed atypical survival and health characteristics. WHO’s report (Press Release WHO, 2000) concluded that women live both a longer life and a longer healthy life than men do. Our research showed that women live longer but spend a higher proportion of their life with some kind of impairment. These contradictory findings are not surprising given WHO’s approach in rating health status, which incorporates indicators such as smoking, a behavior more frequent among men than women.

Comparison of DFLE showed that during their active life Asian Americans and whites have about the same rates of baseline disability, followed by Hispanics, and trailed by Native Americans and blacks. With regard to total dependency disability however, Asian Americans have the least, followed by blacks and Native Americans, then whites, and Hispanics. We also notice that whites fared better than Asian Americans and Hispanics with regard to independent living disability, while their score is the same as that of Hispanics and worse than that of Asian Americans with regard to work-related disability. These differences could reflect real disparities by health status but alternative explanations are not to be totally excluded. For example, these remarks might point to a possible bias in evaluation of personal health status that is tied to the racial/ethnic origin of the respondent and the type of job taken as implicit reference.

One could hypothesize that whites may be more likely to have secure jobs, where sick leave does not put employment at risk. Therefore whites might be prone to declare a condition work-limiting more often than they declare a condition limiting in terms of independent living.

On the other hand, Asian and Hispanic Americans might have less secure jobs, or perceive their employment status as such, therefore would not easily declare a condition work-related, while their independent living condition is more frequently reported. Put simply, minority people may go to work even if they are sick, while whites may evaluate a condition as serious enough to prevent them from working even if the same condition is not affecting their independent living ability. While here we have depicted this as due to differences in security of employment, other explanations might include different personal ethics with regard to the value of work or the value of personal comfort.

The analysis of adult Partial Life Expectancy (PLE) confirms the previous general remarks. American Asian adults live the healthiest life and improve as they move up over the three stages of adult life. Black and Native Americans are the most disadvantaged groups at all three stages of adult life. Americans of Hispanic origin occupy an intermediate position that is lower than the mean for all four racial groups, but closer to it than the values of Black and Native Americans.

Using the census data and complete vital statistics is advantageous since the population is very large and not subject to sampling errors. However, only period effects can be measured. Thus, if cohort effects are important, our methodology may not uncover these. In addition, our simplifying assumption that once a person becomes disabled they remain disabled has profound implications for the rates that we calculate. Populations that have high disability rates at young ages may have these rates amplified over time. Further investigation into some of the more anomalous findings—for example, those for the Native American male population—may need to explore other sources of data that would allow for movement into and out of disability.

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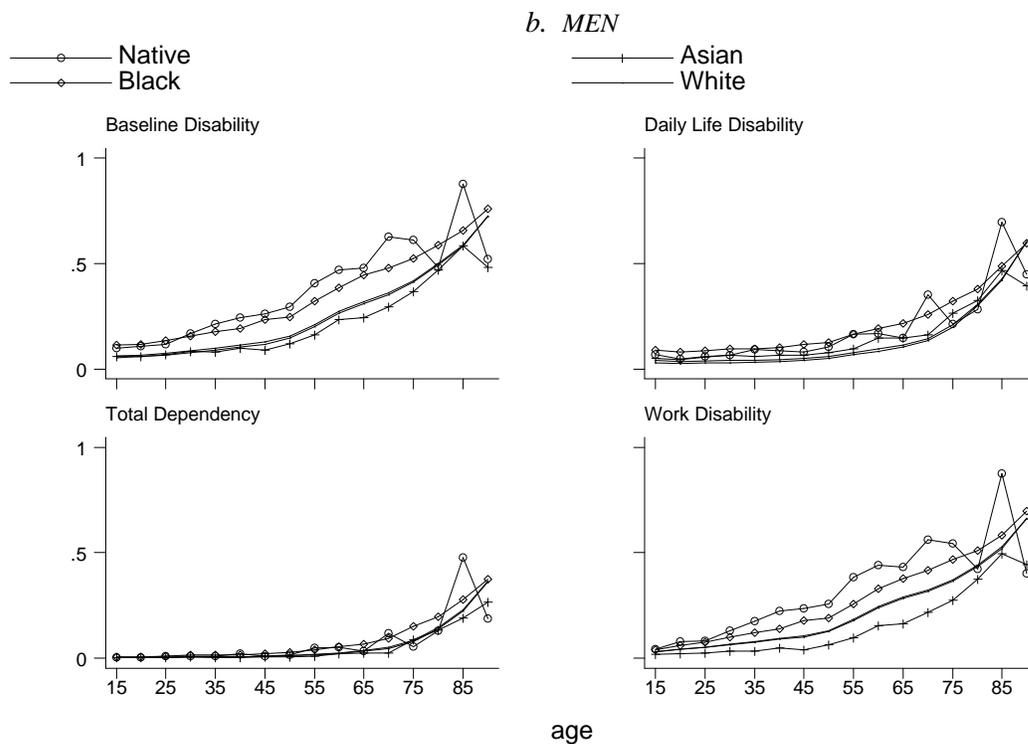
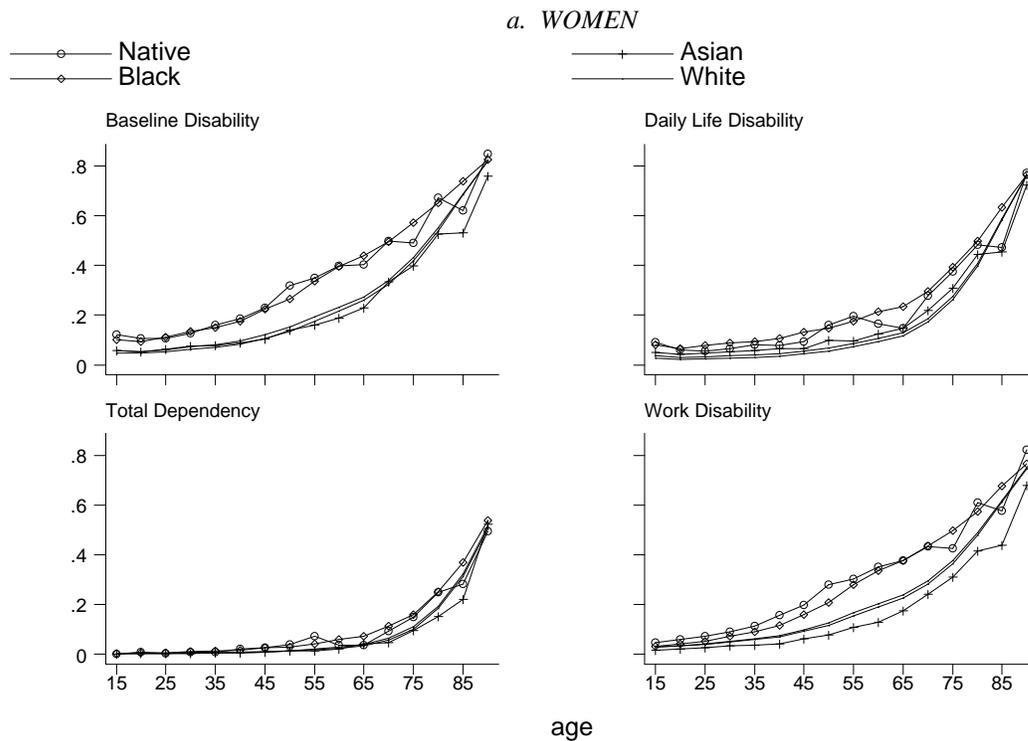
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Figure 1. Prevalence Rates of Disability, by Race/Ethnicity, United States 1990*



* Note: When Hispanics' and whites' lines are not confounded, Hispanics' line has a higher intercept

Figure 2. Disability Free Life Expectancy and Disability Life Years at Age 15
Race/Ethnic Groups and Sex, US 1989-1991

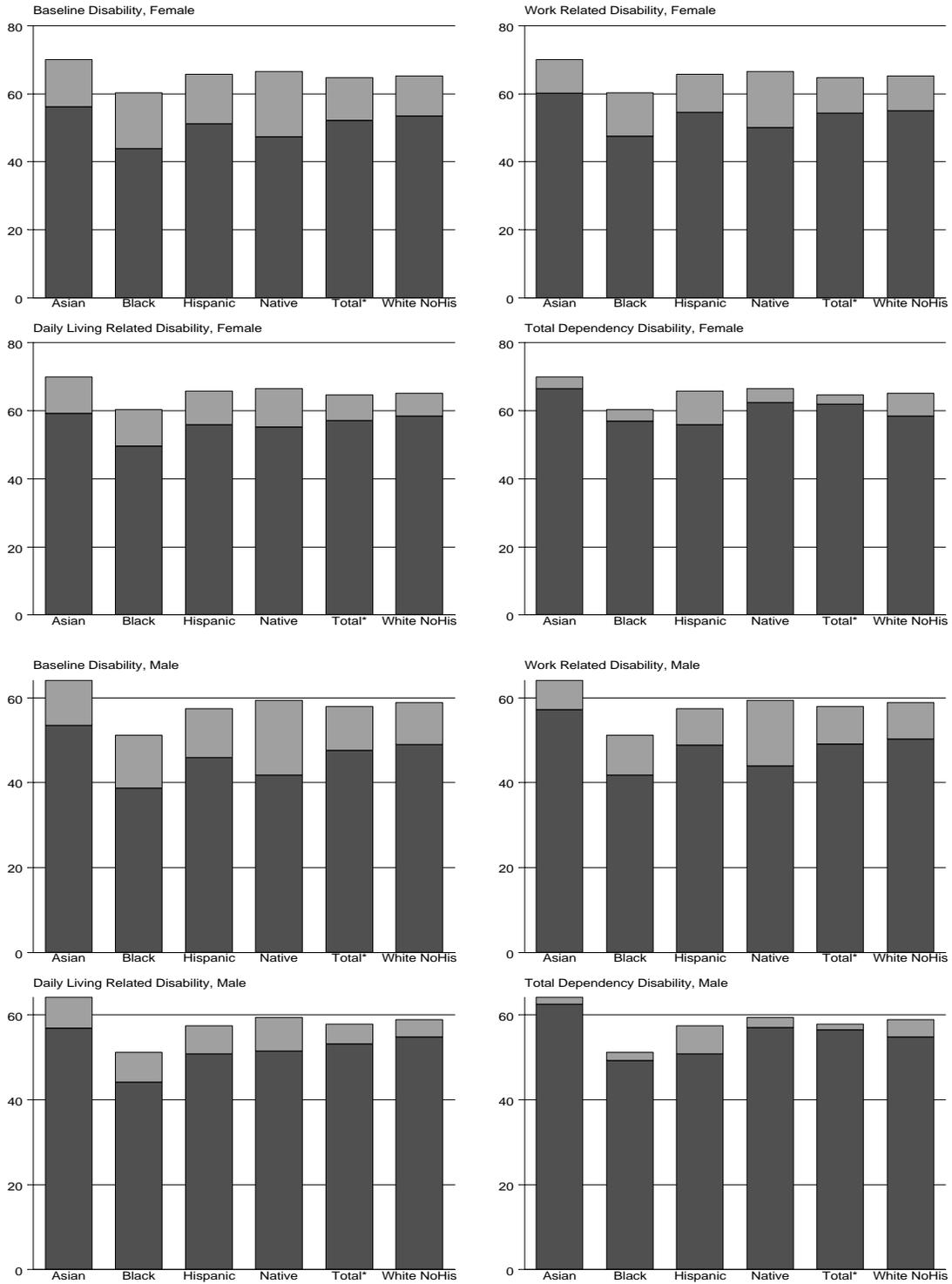


Table 1.
Life Expectancy (LE), Disability Free Life Expectancy (DFLE), and Disability Life Years (DLYs) at Age 15; Race/Ethnic Groups and Sex, United States 1989-1991

INDEX	TOTAL*	NATIVE	ASIAN	BLACK	HISPANIC	WHITE
A. BASELINE DISABILITY (BASEDIS)						
Female						
LE	65	67	70	60	66	65
DFLE	52	47	56	44	51	53
DLY	13	19	14	17	15	12
Male						
LE	58	59	64	51	57	59
DFLE	47	42	53	39	46	49
DLY	10	18	11	12	12	10
Total						
LE	61	65	67	56	64	62
DFLE	50	45	55	41	49	51
DLY	12	20	12	15	14	11
B. DAILY LIVING RELATED DISABILITY (LIFEDIS)						
Female						
LE	65	67	70	60	66	65
DFLE	57	55	59	50	56	58
DLY	8	11	11	11	10	7
Male						
LE	58	59	64	51	57	59
DFLE	53	51	57	44	51	55
DLY	5	8	7	7	7	4
Total						
LE	61	65	67	56	64	62
DFLE	55	54	58	47	54	56
DLY	6	11	9	9	9	5
C. WORK RELATED DISABILITY (WORKDIS)						
Female						
LE	65	67	70	60	66	65
DFLE	54	50	60	47	54	55
DLY	11	17	10	13	11	10
Male						
LE	58	59	64	51	57	59
DFLE	49	44	57	42	49	50
DLY	9	15	7	9	9	9
Total						
LE	61	65	67	56	64	62
DFLE	52	48	59	45	53	53
DLY	10	17	8	11	11	9
D. TOTAL DEPENDENCY DISABILITY (DEPEND)						
Female						
LE	65	67	70	60	66	65
DFLE	62	62	66	57	56	58
DLY	3	4	4	3	10	7
Male						
LE	58	59	64	51	57	59
DFLE	56	57	62	49	51	55
DLY	1	2	2	2	7	4
Total						
LE	61	65	67	56	64	62
DFLE	59	61	64	53	54	56
DLY	2	4	3	3	9	5

* Pooled total of White, Black, Asian, and Native Americans

Table 2.
 Percent of Life Expectancy Free of Disability at Age 15, Race/Ethnic Groups,
 Sex, and Type of Disability; United States 1989-1991

SEX	TOTAL*	NATIVE	ASIAN	BLACK	HISPANIC	WHITE
A. BASELINE DISABILITY (BASEDIS)						
Female	81	71	80	73	78	82
Male	82	70	83	76	80	83
Total	81	69	82	74	78	82
B. DAILY LIVING RELATED DISABILITY (LIFEDIS)						
Female	88	83	85	82	85	90
Male	92	87	89	86	88	93
Total	90	83	87	84	86	91
C. WORK RELATED DISABILITY (WORKDIS)						
Female	84	75	86	79	83	84
Male	85	74	89	82	85	85
Total	84	73	87	80	83	85
D. TOTAL DEPENDENCY DISABILITY (DEPEND)						
Female	96	94	95	94	85	90
Male	98	96	97	96	88	93
Total	97	94	96	95	86	91

* Pooled total of White, Black, Asian, and Native Americans

Table 3. Percent of Partial Life Expectancy Free of Disability, Race/Ethnic Groups, and Sex. Selected Adult Life Stages, US 1989-1991

SEX	TOTAL*	NATIVE	ASIAN	BLACK	HISPANIC	WHITE
A. BASELINE DISABILITY (BASEDIS)						
Female						
15-44	93	87	93	87	92	94
45-64	83	69	85	70	78	85
65-89	59	50	62	46	55	60
Male						
15-44	92	85	93	85	90	93
45-64	81	66	85	71	79	82
65-89	60	43	65	50	58	62
Total						
15-44	92	86	93	86	91	93
45-64	82	68	85	70	79	83
65-89	59	47	63	47	56	61
B. DAILY LIVING DISABILITY (LIFEDIS)						
Female						
15-44	96	93	95	91	94	97
45-64	92	85	90	83	88	94
65-89	73	69	71	64	68	74
Male						
15-44	96	93	94	91	94	97
45-64	93	88	91	85	90	94
65-89	81	72	76	72	75	82
Total						
15-44	96	93	95	91	94	97
45-64	93	86	91	84	89	94
65-89	76	70	74	67	70	77
C. WORK RELATED DISABILITY (WORKDIS)						
Female						
15-44	95	91	97	93	96	95
45-64	85	73	91	76	83	87
65-89	64	55	70	52	62	65
Male						
15-44	94	89	97	91	94	94
45-64	84	69	91	77	84	84
65-89	65	48	73	57	64	65
Total						
15-44	95	90	97	92	95	95
45-64	84	71	91	76	83	85
65-89	64	52	72	54	63	65
D. TOTAL DEPENDENCY DISABILITY (DEPEND)						
Female						
15-44	100	99	100	99	94	97
45-64	98	96	99	96	88	94
65-89	89	86	90	84	68	74
Male						
15-44	99	99	100	99	94	97
45-64	98	97	99	97	90	94
65-89	92	88	93	88	75	82
Total						
15-44	99	99	100	99	94	97
45-64	98	96	99	96	89	94
65-89	90	87	91	86	70	77

* Pooled total of White, Black, Asian, and Native Americans

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