

Racial and Ethnic Disparities in AIDS Incidence: An Examination of Milwaukee, Wisconsin, 1990-2000

Eric N. Reither, PhD; Sang Lim Lee, MA

ABSTRACT

Context: Public health agencies have identified the elimination of health disparities as a major policy objective.

Objectives: The main goals of this study were to assess the magnitude of racial/ethnic disparities in rates of Acquired Immune Deficiency Syndrome (AIDS) incidence in the metropolitan statistical area of Milwaukee, Wis, and determine how those disparities have changed over the period 1990-2000.

Methods: Incidence rates were calculated using data from the AIDS Public Information Data Set (numerators) and US Census Bureau (denominators). Rates of AIDS incidence were produced for broad demographic groups (eg, Hispanics) in Milwaukee. In addition, age-standardized incidence rates were produced for groups defined by age, sex, and race/ethnicity, permitting careful examination of trends in racial/ethnic disparities.

Results: In Milwaukee's general population, AIDS incidence dropped from 7.6 per 100,000 in 1990 to 6.4 per 100,000 in 2000—a decline of over 15%. AIDS incidence rates also dropped for Hispanics (-41.0%) and non-Hispanic whites (-52.1%), but climbed among non-Hispanic blacks (51.1%). Disparities in AIDS incidence between non-Hispanic blacks and non-Hispanic whites increased between 136% (young adult males) and 428% (young adult females) over the period.

Conclusion: Despite progress in reducing rates of AIDS incidence in Milwaukee's general population, racial/ethnic disparities widened substantially between 1990 and 2000.

INTRODUCTION

At the turn of the 21st century, the Wisconsin Department of Health and Family Services (DHFS) identified the elimination of health disparities as 1 of 3 major policy objectives.¹ Research has affirmed the importance of this objective, as socioeconomic and racial/ethnic disparities in morbidity and premature mortality have widened in many parts of the United States, including Wisconsin.²⁻⁴

Combating the Acquired Immune Deficiency Syndrome (AIDS) epidemic is another high priority for the Wisconsin public health community. The rapid spread of Human Immunodeficiency Virus (HIV) in the 1980s led researchers at the Wisconsin Division of Health to project between 9328 and 13,975 new HIV infections in Wisconsin over the period 1990 - 1999.⁵ The number of new HIV infections actually reported over this period was 5371—far fewer than expected.³ Progress in reducing the incidence of HIV during the 1990s is testament to the efficacy of public health initiatives, including prevention programs supported by the Wisconsin DHFS.^{6,7}

Unfortunately, despite progress toward slowing the spread of HIV, racial/ethnic disparities in incident cases of HIV widened in Wisconsin during the 1990s.³ This paper adds to existing knowledge about the HIV/AIDS epidemic in Wisconsin by examining rates of AIDS incidence in the metropolitan statistical area (MSA) of Milwaukee between 1990 and 2000, with a particular focus on patterns of racial/ethnic disparities. As the largest and most diverse urban center in the state of Wisconsin, Milwaukee is well suited for such an investigation.

METHODS

Data from the AIDS Public Information Data Set (APIDS)⁸ and the US Census Bureau⁹ were used to estimate AIDS incidence rates between 1990 and 2000 for various demographic groups in the MSA of Milwaukee, Wis. We utilized a weighting variable (*adjwgt*) included

Author Affiliation: Department of Sociology, Social Work and Anthropology, Utah State University (Reither, Lee).

Corresponding Author: Eric Reither, PhD, Utah State University, Department of Sociology, Social Work and Anthropology, Logan UT 84322-0730; phone 435.797.1217; fax 435.797.1240; e-mail eric.reither@usu.edu.

in APIDS that accounts for reporting delays, thus minimizing the possibility of underestimating incident AIDS diagnoses. To increase the stability of our estimates for a given year (eg 1990), we accumulated AIDS diagnoses over a period of 3 years (eg 1989-1991), then divided by 3 to produce annualized incidence rates. Weighted estimates affected only the final period of observation (ie 1999-2001), increasing the number of AIDS diagnoses from 313 to 323.⁸

In 1993, the CDC expanded the surveillance case definition for AIDS to include immunological criteria (eg <200 CD4+ T-lymphocytes/uL) and 3 new clinical conditions (pulmonary tuberculosis, recurrent pneumonia, and invasive cervical cancer).¹⁰ Although the new definition was retroactively applied, it did not result in substantially more AIDS diagnoses until 1993, at which time the AIDS incidence curve in the United States became temporarily distorted.¹¹ This distortion had essentially disappeared by 1996, suggesting that AIDS estimates for 1990 and 2000 are broadly comparable. Nevertheless, for selected analyses we identified whether AIDS diagnoses fit either pre-1993 or current surveillance definitions to estimate the impact of the expanded case definition on trends in AIDS incidence in Milwaukee.

In correspondence to rate numerators, rate denominators were derived for demographic groups classified by age, sex and race/ethnicity. In 2000, the US Census permitted multiracial classifications. To produce population estimates for non-Hispanic Whites, non-Hispanic Blacks and Hispanics in 2000, we adopted the fractional approach outlined by Allen and Turner¹² to apportion multiracial individuals in Milwaukee to these racial/ethnic categories. Also, because 1990 US Census data presented in American FactFinder do not distinguish race from ethnicity in age- and sex-specific tables, we derived non-Hispanic white and non-Hispanic black populations by estimating (and subsequently subtracting) the number of Hispanic individuals in these groups. Finally, we estimated the size of demographic subgroups in 1995 by using a cohort-based interpolation method,¹³ which assumed a geometric rate of growth (or decline) for each cohort between 1990 and 2000. That is:

$$r = \ln \frac{n_{i,j,k+5}^{2000}}{n_{i,j,k-5}^{1990}} / 2, \text{ and}$$

$$n_{i,j,k}^{1995} = n_{i,j,k-5}^{1990} \cdot e^r,$$

where r represents the geometric rate of growth between 1990 and 2000 and $n_{i,j,k}^T$ represents the population for sex i , race/ethnic group j and age group k at time T .

Data from APIDS and the US Census Bureau were managed and analyzed in SPSS 15.0¹⁴ and Microsoft Excel.¹⁵ The analyses proceeded in 2 stages. First, to provide an assessment of general progress, AIDS incidence rates were calculated for all of Milwaukee and broad demographic groups (eg women) in 1990 and 2000. Second, to generate a clearer picture of trends in racial/ethnic disparities, AIDS incidence rates for non-Hispanic whites and non-Hispanic blacks were stratified by sex and age in 1990, 1995, and 2000. The latter analyses omitted children, older adults, and Hispanics due to a relatively small number of AIDS cases in these groups. To minimize the influence of changing age structures on estimated trends in racial/ethnic disparities in AIDS incidence, the stratified analyses were age-standardized according to the 1990 non-Hispanic white population.¹³

In our subsequent discussion of these analyses, we sought to situate Milwaukee in a national context. Consequently, selected analyses were replicated for the United States in 1990 and 2000. Rates of AIDS incidence for the United States include all 50 states and the District of Columbia, but not territories (eg Puerto Rico). Unfortunately, APIDS does not provide AIDS data for individual states or cities with populations less than 500,000, making it impossible to replicate these analyses for either Wisconsin or other urban centers in the state (eg Madison).

RESULTS

In Milwaukee's general population, AIDS incidence rates declined by 15.3% between 1990 and 2000—from 7.5 per 100,000 in 1990 to 6.4 per 100,000 in 2000 (see Table 1). Declining incidence rates were also observed among all demographic groups except females, midlife adults, and non-Hispanic blacks. Females between the ages of 20 and 64 experienced the largest increase (137.5%) over this period, although it is worth noting that males of similar age continue to experience substantially higher rates of AIDS incidence. Among non-Hispanic blacks, AIDS incidence increased from 15.6 to 23.5 per 100,000—an increase of 51.1%. In 1990, the rate of AIDS incidence among non-Hispanic blacks was about even with Hispanics, but 2.6 times higher than non-Hispanic whites. By 2000, non-Hispanic blacks exhibited a rate that was 2.6 times higher than Hispanics and 8.1 times higher than non-Hispanic whites.

To probe this increasing disparity in more detail, trends in AIDS incidence rates among non-Hispanic blacks and non-Hispanic whites were compared while holding sex and age constant. In Milwaukee's popula-

Table 1. AIDS Incidence Rates (per 100,000) Among Major Demographic Groups in Milwaukee, Wis, 1990-2000

	1990*	2000*	Percent Change*
General Population	7.6 (12.0)	6.4 (11.3)	-15.3 (-5.2)
Sex			
Male	14.1 (23.4)	9.8 (16.4)	-30.2 (-30.0)
Female	1.5 (2.2)	3.2 (5.3)	112.4 (137.5)
Age†			
Children (0-19)	0.3	0.1	-72.0
Young adult (20-34)	14.1	9.2	-35.0
Midlife adult (40-64)	9.0	10.3	14.4
Mature adult (65+)	0.9	0.3	-64.6
Race/Ethnicity			
Non-Hispanic white	6.0 (9.6)	2.9 (4.8)	-52.1 (-50.3)
Non-Hispanic black	15.6 (29.5)	23.5 (43.4)	51.1% (47.4)
Hispanic	15.5 (30.8)	9.1 (16.6)	41.0% (-46.0)

*Figures in parentheses include only adults aged 20-64; figures to the left of parentheses include all age groups. While percent change figures are correct, they do not correspond neatly to incidence rates shown here due to rounding.

†The age category 35-39 is omitted because missing data are included in this group. However, given the high probability that individuals in this category are between 20 and 64 years of age and the considerable underestimation of AIDS incidence among adults aged 20-64 when the category 35-39 is excluded, we retained this category in calculations of AIDS incidence among adults aged 20-64.

tion of young adult (20-34) males, both non-Hispanic whites and non-Hispanic blacks experienced a general decline in AIDS incidence rates between 1990 and 2000, in spite of a massive increase in 1995 among non-Hispanic blacks (Figure 1). As the figure suggests, this increase was strongly influenced by the 1993 change in diagnostic criteria. Consistent with national data, this distortion of the AIDS incidence curve had resolved by 2000. However, despite improvements within both groups, racial/ethnic disparities widened over this period. In 1990, the rate of AIDS incidence for young adult males was 4.2 times higher among non-Hispanic blacks than non-Hispanic whites. By 2000, this rate ratio was 9.9—an increase of 136%.

Similarly, racial/ethnic disparities widened substantially between 1990 and 2000 for midlife adult (40-64) males, young adult females and midlife adult females (see Figure 1 and Figure 2). To illustrate, in 1990 the rate of AIDS incidence for young adult females was 5.8 times higher among non-Hispanic blacks than non-Hispanic whites. Just 10 years later, this rate ratio was 30.6—an increase of 428%. However, unlike young adult non-Hispanic black males, midlife adult non-Hispanic black males and both groups of non-Hispanic black females experienced higher rates of AIDS incidence in 2000 than in 1990. The incidence rate among midlife non-Hispanic black males climbed 102%, from 37.6 per 100,000 in 1990 to 75.9 per 100,000 in 2000. Unfortunately, neither young nor midlife adult non-Hispanic black females

fared any better, increasing by 113% and 463%, respectively, over this period. The only group of non-Hispanic whites to experience rising AIDS incidence was midlife females, who increased from 0.4 per 100,000 in 1990 to 0.8 per 100,000 in 2000—a relative increase of 100% despite being a fairly small gain in absolute terms.

DISCUSSION

Federal and state agencies have identified the elimination of health disparities as a top public health priority.^{1,16} These calls to action are timely in their importance, as evidenced by research showing that health disparities have widened in recent decades.²⁻⁴ Our investigation adds to this body of research by demonstrating that racial/ethnic disparities in rates of AIDS incidence widened substantially in Milwaukee, Wis over the final decade of the 20th century. Specifically, this study made the unsettling discovery that the disparity in AIDS incidence between non-Hispanic Blacks and non-Hispanic Whites—which was already quite large in 1990—more than tripled between 1990 and 2000. Among certain demographic subgroups such as young adult females, disparities in AIDS incidence between non-Hispanic Whites and non-Hispanic Blacks widened to an even greater extent.

Clearly, widening disparities in HIV and AIDS pose a significant challenge to the objectives set forth in *Healthiest Wisconsin 2010*.¹ However, this should not obscure important progress that has been made in

combating the AIDS epidemic. Between 1990 and 2000, the rate of AIDS incidence declined in Milwaukee, both in the general population and in many important demographic groups—including males, children and adolescents, young adults, mature adults, non-Hispanic Whites, and Hispanics. Moreover, the disparity in AIDS incidence between males and females in Milwaukee declined by about 66% over this period, although it should be noted that this reduction was caused in part by rising incidence rates among females.

Our analyses of APIDS data for the United States revealed that Milwaukee is part of broader national trends (results not shown). Between 1990 and 2000 in the United States, rates of AIDS incidence declined in the general population and among certain demographic groups—including males, non-Hispanic Whites, Hispanics, and persons aged 34 and under—just as they did in Milwaukee. Moreover, increasing rates of AIDS incidence were observed among females and non-Hispanic Blacks, both in Milwaukee and the United States.

But despite similarities between Milwaukee and the rest of the nation, there are some notable differences to consider. First of all, it is important to recognize that AIDS incidence rates in Milwaukee are well below those found nationwide. As of 2000, the overall rate of AIDS incidence in the United States (14.6 per 100,000) was over twice that in Milwaukee (6.4 per 100,000). In terms of AIDS incidence, Milwaukee also compares favorably to major MSAs such as Los Angeles (16.9 per 100,000), Chicago (22.9 per 100,000), and New York (68.1 per 100,000).¹⁷ Second, although rates of AIDS incidence are relatively low among women in Milwaukee, they increased more quickly between 1990 and 2000 in Milwaukee (up 137.5%) than in the United States (up 43.6%). Third, it is of particular importance for the present investigation to note that AIDS incidence rates increased at a faster pace among non-Hispanic Blacks in Milwaukee (up 51.1%) than among non-Hispanic Blacks nationwide (up 8.3%). Should these trends continue, AIDS incidence rates among non-Hispanic Blacks in Milwaukee (23.5 per 100,000 as of 2000) could soon resemble incidence rates found among non-Hispanic Blacks in the United States (58.9 per 100,000 as of 2000). When combined with the finding that AIDS incidence rates declined by 52% over this period among non-Hispanic Whites in both Milwaukee and the United States, these figures make it clear that racial disparities in AIDS incidence widened more rapidly in Milwaukee than in the nation as a whole.

This study had various limitations. First, APIDS data do not extend past 2002, making it impossible to

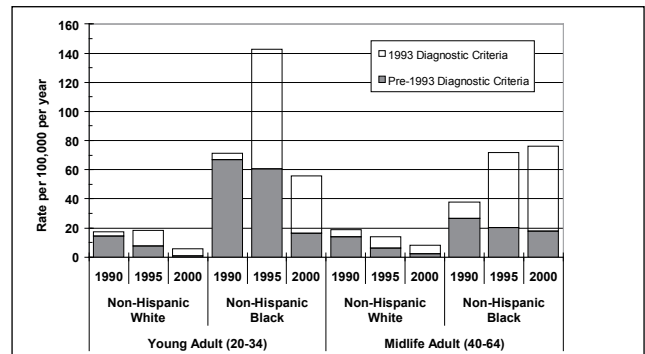


Figure 1. Racial disparities in AIDS incidence rates among young (20-34) and midlife (40-64) adult males, Milwaukee, Wis, 1990-2000.

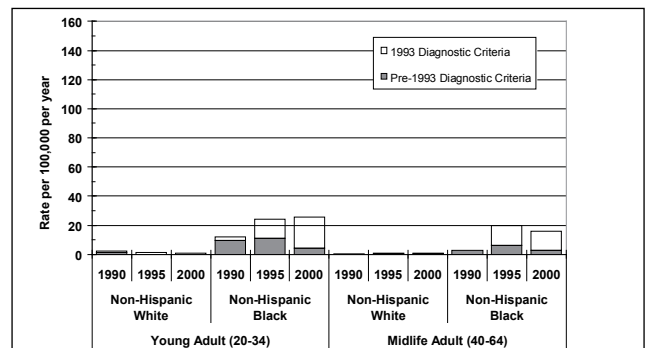


Figure 2. Racial disparities in AIDS incidence rates among young (20-34) and midlife (40-64) adult females, Milwaukee, Wis, 1990-2000. Incidence rates are based on fewer than 5 cases for non-Hispanic white young adult females in 2000 and non-Hispanic white midlife adult females in 1990. Trends in AIDS incidence for these groups should be interpreted with caution.

investigate more recent trends in racial/ethnic disparities in AIDS incidence. Second, although this may be considered good fortune rather than a limitation, there was an insufficient number of Hispanics in Milwaukee with incident AIDS diagnoses to permit refined analysis by age and sex. Consequently, it was not possible to compare trends among specific groups of Hispanics (eg young adult females) to trends among their non-Hispanic Black and White counterparts. Third, because APIDS data do not include indicators of socioeconomic status (SES), it was not possible to disentangle race/ethnicity from potential confounders such as education and income. Typically, research on racial/ethnic health disparities—including research on HIV/AIDS—has found that controlling for SES may attenuate but does not eliminate racial/ethnic disparities.¹⁸⁻²⁰ Fourth, there is a large and increasing share of missing data on mode of transmission in APIDS, making it difficult to estimate what forms of HIV transmission might account for shifting patterns of AIDS incidence in Milwaukee.

Several mechanisms could be responsible for increasing disparities in AIDS incidence between non-Hispanic

Blacks and non-Hispanic Whites in Milwaukee. Race/ethnicity is associated with markers of SES such as income, which has become less equitably distributed in Wisconsin in recent decades.²¹ Widening income inequality between racial/ethnic groups could exacerbate differences in HIV exposure through high-risk activities such as unprotected intercourse and intravenous drug use. Insufficient income could also limit access to key medical treatments such as highly active antiretroviral therapy (HAART), thus delaying progression from HIV to AIDS longer for economically advantaged racial/ethnic groups. In addition, recent studies have found that non-Hispanic Blacks in the United States are less knowledgeable about medical treatments¹⁸ and less likely to receive appropriate medical care for HIV¹⁹ than non-Hispanic Whites, even after controlling for factors such as education and income. Additional evidence on the importance of non-economic factors is gleaned from the present study, which found different trajectories of AIDS incidence for Hispanics and non-Hispanic Blacks, in spite of socioeconomic conditions that tend to be reasonably similar.

Although the elimination of racial/ethnic disparities in AIDS incidence seems unlikely without broad societal change, opportunities exist for clinicians and the public health community in Wisconsin to contribute toward their reduction. For example, Kelly cites strategies clinicians can adopt (eg threat sensitization and positive reinforcement) to educate and motivate members of vulnerable groups.²² Physicians can also take measures to ensure that disadvantaged patients—particularly non-Hispanic Blacks—are aware of HIV treatment options that may delay the onset of AIDS. Broader public health strategies could also be developed to encourage HIV prevention and HIV/AIDS treatment among non-Hispanic Blacks in Milwaukee. Appropriate modification of the community-level intervention model developed by researchers at the Center for AIDS Intervention Research (CAIR)²²—which relies upon well-liked “opinion leaders” to convey public health messages—seems like a potentially promising approach. Although widening racial/ethnic disparities in AIDS incidence are disheartening, they are no cause for fatalistic assessments. As shown by ominous HIV projections that failed to materialize, concerted effort from clinicians and the public health community can yield substantial and even surprising improvements in HIV/AIDS trends. This encouraging lesson of recent history should help energize Wisconsin’s stakeholders as they continue their efforts toward achieving the important goals outlined in *Healthiest Wisconsin 2010*.

Support/Funding: None declared.

Financial Disclosures: None declared.

REFERENCES

1. Wisconsin Department of Health and Family Services. *Healthiest Wisconsin 2010: A Partnership to Improve the Health of the Public*. Madison, Wis; 2000.
2. Singh G, Siahpush M. Increasing inequalities in all-cause and cardiovascular mortality among US adults aged 25–64 years by area socioeconomic status, 1969–1998. *Int J Epidemiol*. 2002;31:600-613.
3. Hoxie NJ, Vergeront JM, Druckenmiller JK, Reiser WJ, Davis JP. HIV infection in Wisconsin: an overview of epidemiologic trends, 1983-1999. *WMJ*. 2000;99(5):38-40.
4. Reither EN, Peppard PE, Remington PL, Kindig DA. Increasing educational disparities in premature adult mortality, Wisconsin, 1990-2000. *WMJ*. 2006;105(7):38-41.
5. Hoxie NJ, Vergeront JM, Davis JP. AIDS and HIV in Wisconsin: projections for the decade. *WMJ*. 1990;89(6):261-266.
6. Davis PJ. Infectious disease in Wisconsin: a public health perspective. *WMJ*. 2000;99(5):12-21.
7. Vergeront JM, Dierwechter T, McFadden ME, Reiser WJ, Davis JP. HIV infection in Wisconsin: state and national resources for clinicians and patients. *WMJ*. 2000;99(5):49-54.
8. CDC. APIDS: AIDS Public Information Data Set. 2007. Web Page. Available at: www.cdc.gov/hiv/topics/surveillance/resources/software/apids/index.htm. Accessed October 1, 2007.
9. US Census Bureau. American FactFinder. 2007. Web Page. Available at: http://factfinder.census.gov/home/saff/main.html?_lang=en. Accessed October 1, 2007.
10. CDC. 1993 revised classification system for HIV infection and expanded surveillance case definition for AIDS among adolescents and adults. *MMWR*. 1992;41(RR-17):1-19.
11. CDC. AIDS Public Information Data Set [Manual]. 2007. Web Page. Available at: www.cdc.gov/hiv/topics/surveillance/resources/software/apids/index.htm. Accessed October 1, 2007.
12. Allen J, Turner E. Bridging 1990 and 2000 census race data: fractional assignment of multiracial populations. *Pop Res Policy Rev*. 2001;20:513-533.
13. Preston S, Heuveline P, Guillot M. *Demography: Measuring and Modeling Population Processes*. Malden, Mass: Blackwell Publishers; 2001.
14. SPSS Inc. *SPSS 15.0 for Windows*. Chicago, Illinois; 2006.
15. Microsoft Corporation. *Microsoft® Office Excel*. United States; 2003.
16. US Department of Health and Human Services. *Healthy People 2010: Understanding and Improving Health*. 2nd Ed. Washington DC: US Government Printing Office; 2000.
17. CDC. HIV/AIDS Surveillance Report. 2000;12(1): Web Page. Available at: www.cdc.gov/HIV/topics/surveillance/resources/reports/pdf/hasr1201.pdf. Accessed October 1, 2007.
18. Ebrahim S, Anderson J, Weidle P, Purcell D. Race/ethnic disparities in HIV testing and knowledge about treatment for HIV/AIDS: United States, 2001. *AIDS Patient Care STDS*. 2004;18(1):27-33.
19. Moore R, Stanton D, Gopalan R, Chaisson R. Racial differences in the use of drug therapy for HIV disease in an urban community. *N Engl J Med*. 1994;330(11):763-768.
20. Robert S, Reither E. A multilevel analysis of race, community disadvantage, and body mass index among adults in the US. *Soc Sci Med*. 2004;59(12):2421-2434.
21. Center on Wisconsin Strategy, Wisconsin Council on Children & Families. *Pulling Apart: Wisconsin’s Growing Income Inequality*. University of Wisconsin-Madison: Madison, Wis; 2006.
22. Kelly J. Behavior changes and disease prevention: MCW research shows effectiveness of HIV/AIDS risk reduction interventions. *WMJ*. 2000;99(1):41-47.

Wisconsin Medical Journal

The mission of the *Wisconsin Medical Journal* is to provide a vehicle for professional communication and continuing education of Wisconsin physicians.

The *Wisconsin Medical Journal* (ISSN 1098-1861) is the official publication of the Wisconsin Medical Society and is devoted to the interests of the medical profession and health care in Wisconsin. The managing editor is responsible for overseeing the production, business operation and contents of the *Wisconsin Medical Journal*. The editorial board, chaired by the medical editor, solicits and peer reviews all scientific articles; it does not screen public health, socioeconomic or organizational articles. Although letters to the editor are reviewed by the medical editor, all signed expressions of opinion belong to the author(s) for which neither the *Wisconsin Medical Journal* nor the Society take responsibility. The *Wisconsin Medical Journal* is indexed in Index Medicus, Hospital Literature Index and Cambridge Scientific Abstracts.

For reprints of this article, contact the *Wisconsin Medical Journal* at 866.442.3800 or e-mail wmj@wismed.org.

© 2007 Wisconsin Medical Society