Smoking and Health Disparities

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Current Cardiovascular Risk Reports 2009, **3**:403–408
Current Medicine Group LLC ISSN 1932-9520

Cardiovascular disease (CVD) is the leading cause of death in the United States. Both socioeconomic and racial/ethnic disparities exist for CVD morbidity and mortality, whereby individuals of low socioeconomic status (SES) and members of minority groups are at increased risk of CVD-related disease and death. Smoking is a major contributor to CVD. Quitting smoking can help to improve cardiovascular health and prevent future CVD-related incidents. However, low SES and racial/ethnic minority smokers are less likely to use or have access to effective resources for quitting and less likely to successfully quit smoking. Moreover, the widespread implementation of population-based tobacco cessation approaches may have had the unintended effect of increasing tobacco-related disparities attributable to SES, contributing to CVD-related health disparities. Vulnerable populations of smokers must be provided with effective and accessible treatments for tobacco dependence in order to reduce health disparities.

Introduction

> "*Health disparities are differences in the incidence, prevalence, mortality, burden of diseases and other adverse health conditions or outcomes that exist among specific population groups in the United States*." – National Association of Chronic Disease Directors Board, October, 2006

Cardiovascular disease (CVD) is a primary contributor to disability and the leading cause of death in the United States. Current estimates suggest that one of every three adults in the United States has some form of CVD (eg, high blood pressure, coronary heart disease [CHD], heart failure, stroke) [1]. Individuals with the lowest levels of education, income, and occupational status (ie, low socioeconomic status [SES]) and members of racial/ethnic minority groups (eg, African Americans and Latinos) suffer disproportionately and are most negatively affected by CVD and CVD-related conditions [2]. Moreover, although CVD-related deaths have declined in recent decades, socioeconomic and racial/ethnic disparities in CVD-related mortality remain [3,4]. For example, education is inversely associated with all-cause mortality rates, a relationship largely accounted for by CVD and CVD-related conditions [5]. Similarly, African Americans suffer more life-years lost to CVD [5] and experience two to three times greater CVD mortality rates than do non-Latino whites [1,3]. Moreover, the declines in CVD-related mortality over recent decades have been steeper among non-Latino whites and those of higher SES than among racial/ethnic minorities and those of low SES [4].

Cigarette smoking is a major contributor to CVD risk [6,7]. Currently, one of every five adults in the United States is a smoker [8]. Although recent decades have seen reductions in smoking prevalence among the general population, smoking has become increasingly concentrated among low-SES individuals [8,9]. Compared with nonsmokers, smokers are two to four times more likely to develop CHD, two times more likely to have a stroke, and more than 10 times more likely to develop peripheral vascular disease [7]. Smoking cessation, however, has been associated with lower CVD-related morbidity and mortality among both the general population and specific patient populations (eg, individuals with CHD) [10,11]. However, low SES and racial/ethnic minority smokers may be less likely to quit, at least in part due to less access to and less use of effective resources for quitting [12]. Because SES and racial/ethnic disparities in smoking and smoking cessation are tied to increased CVD risk among these groups, the elimination of tobacco-related disparities could dramatically reduce the substantial social and economic costs of CVD [5]. Thus, it is vital that low-SES and racial/ethnic minority smokers be provided with effective and accessible treatments for tobacco dependence.

The purpose of this article is to provide an overview of SES and racial/ethnic disparities in smoking and smoking cessation, along with the CVD health disparities to which they contribute. An additional goal is to highlight how widespread implementation of population-based tobacco control approaches over the past several decades may have unintentionally increased tobacco-related health disparities attributable to SES. Specifically, evidence suggests that such approaches may have disproportionately affected utilization

of smoking cessation resources among individuals with the most profound tobacco-related health disparities. Therefore, a targeted approach to tobacco control among vulnerable populations is needed for the future [13••]. Although many racial/ethnic groups suffer a tremendous health burden attributable to tobacco use (eg, Native Americans and Alaska Natives), this article focuses on African American smokers, Latino smokers, and non-Latino white smokers (hereafter referred to simply as "whites"), as these racial/ethnic groups comprise the majority of the population in the United States.

The Role of Smoking in CVD Incidence and Mortality

Cigarette smoking is an established risk factor for CVD incidence and mortality [6,7]. Data from the 2005–2006 National Health and Nutrition Examination Survey (NHANES) indicated that 11% of CVD found among the general population of persons 40 years of age or older was directly attributable to smoking [14]. In fact, smoking was responsible for more CVD incidence than any other non-demographic CVD risk factor measured in that study with the exception of hypertension, which accounted for 16% of CVD incidence [14]. Likewise, another study found that smoking was associated with approximately 11% of CVD-related deaths in the world in the year 2000, with ischemic heart disease and cerebrovascular diseases accounting for 54% and 25% of smoking-attributable CVD deaths, respectively [15]. Also demonstrative of the role smoking plays in CVD-related mortality is the fact that the impact of smoking varies among countries based on their smoking rates. For example, in a study of low- and middle-income countries of the western Pacific and Southeast Asia, where smoking rates are rising rapidly, smoking was estimated to account for as much as 30% of the mortality related to IHD and stroke [16].

Unfortunately, individuals do not have to be smokers to suffer CVD-related health consequences attributable to smoking. Similar to smoking, secondhand smoke exposure (ie, passive smoking) has also been associated with the development of CVD-related conditions. For example, one literature review found that the effects of passive smoking on the cardiovascular system were up to 90% as damaging as active smoking [17]. Data have also supported a significant association between passive smoking and CHD mortality [18]. One estimate, for example, cited a 30% increase in risk of heart disease mortality as the result of the passive smoking associated with living with a smoker [19]. Although policy changes in the past decade (eg, indoor smoking bans) have reduced the prevalence of passive smoking, data indicate that it remains a significant problem for cardiovascular health [18].

In summary, these studies offer strong support for the role of smoking in CVD incidence and death, with at least 1 of every 10 CVD-related deaths directly attributable to smoking [15]. Although already substantial, the true impact might actually be higher due to largely underreported exposure to secondhand smoke [18], which is also a significant risk factor for CVD morbidity and mortality [19].

The Role of Smoking Cessation in CVD Risk

A number of longitudinal studies have supported the beneficial effects of smoking cessation on CVD morbidity. For example, the Nurses' Health Study followed women ages 34 to 59 years from 1980 to 1994 and found that a 41% decrease in smoking prevalence among the women over that time directly accounted for a 13% reduction in the incidence of CHD [20]. In fact, studies show that smokers who abstain from smoking for 1 year experience a 50% decrease in risk of CHD, and they may develop a risk profile similar to nonsmokers after several years [1].

Similarly, population-level reductions in smoking prevalence have been associated with overall decreases in CVD-related mortality. For example, one study explored the reductions in CHD mortality from 1980 to 2000 attributable to medical and surgical treatments versus positive changes in CVD risk factors among adults in the United States ages 25 to 84 years [21]. Results indicated that although 47% of the decline in risk was due to medical/surgical procedures, 44% was attributable to CVD risk factor changes. Reductions in smoking prevalence accounted for 12% of the mortality decline [21]. In addition, numerous studies have indicated that laws restricting smoking in the workplace and public places have rapidly and dramatically reduced acute myocardial infarction (AMI) hospitalizations. In one city, AMI hospitalizations declined 41% over a 3-year period among residents following implementation of city-wide smoke-free ordinance [22]. Furthermore, smoking cessation among CVD patients has been linked to a decrease in secondary CVD incidents [10]. For example, an extensive literature review on the effects of smoking cessation on all-cause mortality among CHD patients found a 36% risk reduction among those who quit versus those who continued smoking, an effect greater than that of other preventive therapies, including aspirin and statins. Likewise, smoking cessation was linked to a 32% decrease in risk for myocardial infarctions [11].

In summary, because of the association between smoking and CVD, increasing smoking cessation among current smokers is an important strategy to substantially decrease CVD-related morbidity and mortality [15,23]. CVD is the most costly disease in the United States, accounting for over $400 billion in annual expenses [3]. Facilitating smoking cessation among current smokers would dramatically reduce those costs as well as save lives [24]. Thus, an examination of the groups most susceptible to disparities in smoking and smoking cessation may offer guidance regarding the focus of those cessation efforts.

Disparities in Smoking Prevalence

As a result of population-based approaches to reducing tobacco use in the United States initiated over the past

few decades, smoking prevalence has decreased dramatically. Unfortunately, this decline in smoking prevalence has not been equivalent among all groups, and low SES individuals now smoke at significantly greater rates than their higher SES counterparts. For example, a higher percentage of individuals below the federal poverty level smoke compared with those living at or above the poverty level (28.8% vs 20.3%) [8]. Likewise, less education is a significant predictor of higher smoking prevalence. Recent estimates indicate that 44% of individuals with a general equivalency diploma (GED) were current smokers, as compared with 11.4% of individuals with an undergraduate degree and 6.2% of individuals with a graduate degree [8]. In fact, between 1974 and 1985, education surpassed gender as the strongest sociodemographic correlate of smoking [25]. Moreover, these SES disparities in smoking have increased over the past several decades despite the aforementioned declines in smoking prevalence among the general population [26].

Currently, there are no racial/ethnic disparities in smoking prevalence that favor whites over African Americans and Latinos. Smoking rates among African Americans and whites are similar (21% vs 20%), and are significantly higher than among Latinos (13%) [27]. Furthermore, African Americans and Latinos smoke fewer cigarettes per day on average [28] and are more likely to be non-daily smokers than whites [29]. However, as described in the following text, striking disparities among African American, Latino, and white smokers exist for the health consequences of smoking, smoking cessation, and the delivery of cessation interventions.

Disparities in Smoking Cessation

Lower SES smokers are more likely to smoke but less likely to successfully quit smoking than their higher SES counterparts [30•]. Historically, the rate of smoking cessation among smokers with higher levels of education has been almost double that found among smokers with lower levels of education [25]. Recent data indicate that the quit ratio (percentage of ever smokers who have quit smoking) in the United States ranged from 34% among individuals with lower educational levels to 74% among individuals with graduate degrees [31]. Thus, despite the widespread availability of free, effective cessation treatment (eg, smoking quit-lines), SES disparities in smoking cessation persist. However, it may be that higher SES smokers are more likely than lower SES smokers to use effective resources for quitting smoking [12]. Moreover, the home environments of low-SES smokers may be less restrictive of smoking, which may contribute to lower cessation rates among low-SES individuals [12].

Racial/ethnic minority groups do not smoke at higher rates than whites, but they manifest significant disparities in the likelihood of successfully quitting. Latino and African American smokers are less likely to successfully quit despite an equivalent desire to do so and a large number of quit attempts [32]. For example, in 2000, the quit ratio was significantly higher among whites (50.4%) than among African Americans (37.5%) and Latinos (42.9%) [33]. More recent data based on a sample of privately insured individuals 25 to 44 years of age indicated that the quit ratio was substantially higher among whites and Latinos compared with African Americans (52% and 49% vs 35%) [34]. However, Latinos in the general population are two to three times less likely to have health insurance than whites [35], and the higher than expected quit ratio found among Latinos in the study by Fu et al. [34] is likely an artifact of their sample composition and not generalizable to the larger population of Latino smokers. Similar to the smoking cessation disparities attributable to SES, racial/ethnic disparities in smoking cessation may also be due to limited use of existing evidence-based resources for quitting and limited access to such resources [12].

Disparities in Smoking Cessation Treatment Delivery

Important disparities in the delivery of smoking cessation treatment may explain the smoking cessation disparities attributable to SES and race/ethnicity. For example, after nicotine replacement therapy (NRT) became available over the counter (OTC), higher income smokers increased their OTC NRT use substantially, whereas rates of NRT use among low SES smokers increased only slightly (ie, 18.5% to 26.1% among higher SES smokers versus 17.2% to 19.5% among lower SES smokers) [36]. Likewise, African Americans [34] and Latinos [32] are far less likely than whites to use NRT. When OTC NRT became available, use among minorities declined dramatically (ie, 20.7% before NRT became available OTC versus 3.2% after NRT became available OTC), whereas no changes were seen among whites [36]. Some of the disparities in OTC NRT use, especially as related to SES, may have been partially attributable to an increase in out-of-pocket costs for NRT for smokers whose insurance companies no longer covered the cost. In any case, a policy change intended to increase access to NRT among all smokers appears to have had the unintended effect of creating SES and racial/ethnic disparities in the use of an evidence-based tool to facilitate smoking cessation.

In addition to being less likely to use NRT, African American and Latino smokers are also significantly less likely than white smokers to use other smoking cessation treatments (ie, pharmacotherapy or behavioral intervention) when attempting to quit [37•]. Low-SES and racial/ethnic minority smokers are less likely to be asked about their smoking status, advised to quit smoking, or counseled to quit by their health care providers [38]. These and other barriers, including language and cultural issues, serve to widen smoking-related disparities in the United States, resulting in dramatic health consequences for racial/ethnic and low SES smokers. Moreover, very little research has addressed targeted interventions for smoking cessation among minority groups or low SES groups [39••], although these are precisely the groups who suffer from CVD health disparities [4].

The Relation of Disparities in Smoking Prevalence and Cessation to Disparities in CVD

There is substantial evidence supporting the relationship of SES and race/ethnicity with CVD incidence and mortality [3,6]. For example, there is an inverse relationship between SES and CVD, and some research suggests that SES may be an independent risk factor for CVD [6]. Data from the National Health Interview Survey on all-cause mortality indicated that low SES individuals suffered four times as many potential life-years lost compared with high SES individuals, an effect partially accounted for by CVD [5]. Moreover, although CVD mortality has decreased in recent years, declines in CVD mortality among low SES groups were more gradual than declines among higher SES groups [6].

Higher smoking prevalence and lower smoking cessation rates among those of low SES may contribute to CVD disparities attributable to SES. This is so because as smoking is clearly a causal risk factor for CVD morbidity and mortality [6,7], it follows that the higher rate of smoking among low SES individuals [8] may contribute to higher CVD-related morbidity and mortality seen among this group [3,6]. Also, higher rates and greater acceptability of smoking in the home [12] may lead to the greater rates of passive smoking among low SES individuals, a known risk factor for CVD and CVD-related conditions [18,19]. Additional support for the relation of disparities in smoking prevalence and cessation with CVD-related disparities is provided by data indicating that trends in both areas have mirrored one another over time (ie, the gaps between the high and low SES groups in terms of both smoking prevalence/cessation and CVD morbidity and mortality have been growing almost synchronously in recent years) [4,16,26]. Thus, although a number of other factors (eg, lack of health insurance, poor access to treatment, and other lifestyle factors) clearly play a contributing role in CVD and CVD-related disparities attributable to SES, disparities in smoking and smoking cessation are likely to play a substantial part as well.

As with SES, there are also racial/ethnic disparities in CVD incidence and mortality risk. For example, approximately 46% of African Americans have CVD compared with 26% and 33% of Latino men and women, respectively, and 38% and 33% of white men and women, respectively [40]. African Americans have a higher prevalence of strokes [41] and greater stroke mortality than whites or Latinos [42]. African Americans are also hospitalized for hypertension at greater rates than whites across the lifespan [3]. Moreover, CVD mortality rates are higher among African Americans than among any other racial/ethnic group [2,5,7], and mortality declines seen in recent years have been more gradual among African Americans than whites [4]. Likewise, Latinos also suffer CVD-related health disparities relative to whites. For example, research supports higher rates of early-age stroke [43] and higher hospitalization rates for congestive heart failure among Latinos compared with whites [2].

Disparities in smoking cessation among racial/ethnic minorities are likely a contributing factor to racial/ethnic disparities in CVD and CVD-related conditions. For example, the failure to successfully quit smoking can lead to greater risk for CVD and higher rates of secondary incidents among those with a history of CVD [11]. As African American and Latino smokers may have more difficulty quitting, they may be at increased risk of both primary and secondary CVD-related problems. Also, as racial/ethnic minorities are less likely to quit smoking [32], family members who do not smoke but reside in smoking households may also be at increased risk of CVD incidence as a result of passive smoking [18,19]. Thus, although other variables clearly impact racial/ethnic CVD disparities, such as lower rates of outpatient visits and revascularization procedures [23], higher prevalence of contributing comorbidities [41,44], language barriers [35], lack of health insurance [35], and racism [45], disparities in smoking cessation may be an important influence as well.

Reducing CVD Disparities by Reducing Smoking Disparities

Numerous studies have supported that smoking cessation reduces the risk of CVD, CVD-related conditions [1,20,21], and secondary CVD incidents [10,11], with effects ranging from a 13% to 36% reduction in risk. Because of the association between smoking cessation and CVD risk, increasing smoking cessation among current smokers is an important strategy to substantially decrease CVD-related morbidity and mortality [15,23]. Because smoking is currently concentrated among individuals with low SES and because racial/ethnic minorities and low SES individuals demonstrate greater difficulty quitting smoking than their counterparts, focusing efforts to facilitate smoking cessation among these vulnerable populations could have a dramatic effect on reducing disparities in CVD [5]. Widely disseminated, population-based approaches to reducing tobacco use, such as public education campaigns, tobacco excise taxes, counter-advertising, and the availability of cessation tools have influenced the dramatic decline in smoking prevalence in the United States over the past 45 years. However, the overall decline in smoking prevalence has been coupled with an unintended increase in SES-related smoking health disparities [13••]. In order to eliminate such disparities, intervention approaches must specifically target the most vulnerable and at-risk groups, which are low SES and racial/ethnic minority smokers [4,13••,26,46]. Thus, new strategies to increase smoking cessation among vulnerable populations are needed.

Intervention approaches targeted to vulnerable populations have been identified as a national health priority and could entail the development of new smoking cessation treatments or the wider dissemination of existing treatments [47]. On an individual level, this might include greater attention to tailoring interventions to be both culturally sensitive and language appropriate, providing interventions in a manner that is most accessible to individuals of lesser means (eg, via community-based organizations, over the telephone), and exploring the potential benefits of incentivizing quit attempts. On the other hand, existing "best practices" for tobacco cessation could be better directed toward smokers

with the least motivation to quit, highest smoking rates, and most profound smoking-related health disparities [46].

Aggressively targeted, proactive dissemination strategies to reach low SES and minority smokers might include integration into existing programs (eg, workers unions) and treatment delivery systems in order to achieve widespread dissemination [46,48]. One crucial strategy for accomplishing this may be to formalize partnerships with health care providers that include physician-assisted access to established treatment resources, such as smoking quit-lines. Such "systems approaches" could ultimately have a dramatic impact on reducing socioeconomic and racial/ethnic tobacco-related disparities. For example, our research team is preparing to evaluate two approaches to increase dissemination and enhance utilization of a smoking cessation quit-line within the context of a unique partnership between the quit-line and one of the nation's largest safety net public health care systems, which serves a very low SES and predominantly minority population.

In sum, more effectiveness and implementation research is needed to increase uptake and utilization of evidence-based interventions and to identify barriers that may impede the widespread adoption of such interventions among low SES and racial/ethnic minority smokers [49]. Even modest increases in the reach (ie, the number, proportion, and representativeness of smokers who attempt to quit) and effectiveness (ie, the number or proportion of smokers willing to utilize existing treatments) of existing evidence-based smoking cessation interventions could dramatically reduce tobacco-related health disparities at the population level [50].

Finally, policy level initiatives to reduce smoking health disparities might include examining environmental factors that encourage smoking and impede cessation attempts. Environmental factors include but are not limited to curtailing tobacco marketing strategies targeted toward minority groups and considering zoning regulations to impact the ready availability (and prominent advertising) of cigarettes in low SES neighborhoods. Important steps gained through individual level and systems level cessation interventions may be enhanced through these broader policy level approaches focused on the elimination of health disparities.

Conclusions

Over the past 40 years, CVD has been the leading contributor to racial/ethnic disparities in mortality rates in the United States [1], and smoking is a major risk factor for CVD and CVD-related conditions [7]. Unfortunately, smoking has become increasingly concentrated among individuals with the lowest levels of education, income, and occupational status and generally has a disproportionate impact on the health of members of racial/ethnic minority groups [8]. Moreover, racial/ethnic minority and low SES smokers are less likely to successfully quit smoking compared with whites. This is due, in part, to relatively lower access to, and use of, effective treatments [12], an unintended but potential consequence of the widespread implementation of population-based tobacco cessation approaches over the past several decades [13••]. Therefore, targeted individual-, systems-, and policy-level approaches are needed to reduce smoking-related health disparities among vulnerable populations. Facilitating smoking cessation among low SES and racial/ethnic minority smokers is important for the prevention and reduction of CVD-related health disparities.

Acknowledgments

The research and preparation of this manuscript were partially supported by grants from the Centers for Disease Control and Prevention (R18DP001570 and K01DP001120), the National Cancer Institute (R01CA125413, R01CA094826, and R01CA089350), and the National Institute on Drug Abuse (R01DA014818).

Disclosure

No potential conflicts of interest relevant to this article were reported.

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