

Integrating Multiple Social Statuses in Health Disparities Research: The Case of Lung Cancer

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Objective. To illustrate the complex patterns that emerge when race/ethnicity, socio-economic status (SES), and gender are considered simultaneously in health care disparities research and to outline the needed research to understand them by using disparities in lung cancer risks, treatment and outcomes as an example.

Principal Findings. The SES, gender, and race/ethnicity are social categories that are robust predictors of variations in health and health services utilization. These are usually considered separately but intersectionality theory indicates that the impact of each depends on the others. Each reflects historically and culturally contingent variations in social, economic, and political status. Distinct patterns of risk and resilience emerge at the intersections of multiple social categories and shape the experience of health, health care access, utilization, quality, and outcomes where these categories intersect. Intersectional approaches call for greater attention to understand social processes at multiple levels of society and require the collection of relevant data and utilization of appropriate analytic approaches to understand how multiple risk factors and resources combine to affect the distribution of disease and its management.

Conclusions. Understanding how race/ethnicity, gender, and SES are interactive, interdependent, and reinforcing social identities can provide new knowledge to enhance our efforts to effectively address health disparities.

Key Words. Health care disparities, smoking, lung cancer, race/ethnicity, socioeconomic status, gender

Socioeconomic status (SES) as measured by income, education or occupational status, is a robust predictor of variations in health and health service utilization (Braveman et al. 2010). Racial/ethnic differences in health status and health service use have also been well documented (Williams et al. 2010). Although racial/ethnic and SES disparities overlap to some degree, health

disparities researchers tend to study them separately. Race/ethnicity is correlated with SES, such that SES differences between racial/ethnic groups account for a substantial part of the observed racial/ethnic differences in health, including cancer (Albano et al. 2007; Howard et al. 2000; Krieger et al. 1999). Typically, adjustment for SES substantially reduces but does not eliminate disparities in health risks and outcomes by race/ethnicity. Moreover, large gender differences exist in health and health service use (Read and Gorman 2006; Williams 2003). Importantly, race/ethnicity, SES, and gender converge in complex ways that can enhance or impair health (Weber and Parra-Medina 2003). This article explores how the simultaneous consideration of race/ethnicity, SES, and gender can provide novel insights into the disease risks, patterns of health service utilization, and effective interventions to reduce health care disparities.

An intersectional approach emphasizes the importance of intersecting inequalities, multiple vulnerabilities, and the need to examine how multiple dimensions of social statuses combine to facilitate or restrict exposure and response to risk factors and resources relevant for a disease and its treatment (Schulz and Mullings 2006; Weber and Fore 2007). Intersectional theory posits that multiple social statuses are experienced simultaneously and dynamic interdependent processes arise when race/ethnicity, SES, and gender (and/or other social statuses) combine to affect patterns of risks and resources, privilege and disadvantage that can affect health risks and health service utilization across different social contexts (Cole 2009).

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The intersectionality framework emphasizes that social identities and categories should not be viewed as independent variables that capture individual characteristics; instead, they are markers of institutional processes (Cole 2009). (Cole 2009) identifies at least three implications for researchers. First, heterogeneity within social categories, should be examined, especially attending to categories that have been neglected to facilitate the identification of how the meaning and consequences of one social category depend on other categories. Second, the intersectionality perspective highlights that membership in a social category often embodies institutional policies and practices that structure social inequalities and stigma in ways that shape opportunity and life chances. Third, intersectionality calls for exploring how macro-level social processes create commonalities across different social categories. Thus, an intersectional lens calls for research on health disparities to unpack the lived experiences of social groups at the convergence of multiple identities. It emphasizes that various social inequalities do not act independently but interact in ways that can transform and alter processes and outcomes of inequality from one setting or context to another. This approach can also delineate potential avenues of improving population health and inform targeted interventions to effectively address disparities in health care.

Using lung cancer as an exemplar, this conceptual article illustrates the complex patterns that can emerge when race/ethnicity, SES, and gender are considered simultaneously and outlines a health services research agenda to understand and address disparities across the continuum of lung cancer.

INTERSECTION OF RACE/ETHNICITY, SES, AND GENDER IN LUNG CANCER AND TOBACCO USE

Lung cancer is the leading cause of cancer deaths for men and women in the United States and is responsible for 80 percent of all deaths from tobacco-related illnesses annually (Thun et al. 2006), and for more American deaths each year than breast, prostate, colon and pancreatic cancer combined (American Cancer Society 2009). The risks linked to lung cancer mortality and cigarette smoking vary by race, SES, and gender. Lung cancer mortality is 10 percent higher for black men than white men but 31 percent higher for white women than black women (Primack et al. 2007). As shown in Table 1, SES differences within each gender are consistently larger than racial differences (Albano et al. 2007). Moreover, black men have lower or equivalent mortality risks compared to those of white men at the two lowest SES levels, but higher

lung cancer mortality rates at higher levels of education. Black women have markedly lower mortality risk than their white counterparts at low levels of education, equivalent risks in the middle educational categories and elevated risks at the two highest levels of education. Table 2 presents current smoking levels by race/ethnicity with income and education for men and women in the United States. Black and white in these data refer to non-Hispanic black and non-Hispanic whites.¹ For blacks and whites of each gender, there are large variations in smoking by income and education with low SES blacks and whites, regardless of gender, being two to three times more likely to smoke cigarettes than their high SES counterparts. However, at every level of SES, black and Hispanic women are less likely than white women to smoke. And although black, Hispanic and white men have comparable smoking rates at high income levels, they diverge at low income levels.

The data in Tables 1 and 2 document complex associations among race/ethnicity, gender, and SES. These patterns may reflect confounding between race/ethnicity and SES or the noncomparability of SES indicators across racial/ethnic groups. Other mediating factors could include exposure to distinctive environmental conditions linked to residential segregation, genetic differences, resilience factors, nativity/migration, and cultural practices and beliefs (Williams et al. 2010). Understanding how race/ethnicity, SES, and gender combine to affect disparities across the continuum of lung cancer prevention and care will require careful attention for unpacking both the risks and resources that each of these variables may represent.

Table 1: U.S. Lung Cancer Death Rates* for 2001, by Gender, Race, and Education

	<i>Men</i>			<i>Women</i>		
	<i>White</i>	<i>Black</i>	<i>B/W Ratio</i>	<i>White</i>	<i>Black</i>	<i>B/W Ratio</i>
All	281.1	305.7	1.09	180.3	137.9	0.76
Education						
0–8 years	94.5	84	0.89	51	22.8	0.45
9–11 years	81.9	84	1.03	56.1	29	0.52
12 years	53.6	69.7	1.30	33.3	34.2	1.03
13–15 years	23.8	29.9	1.26	16.6	18.2	1.10
16 years	16.6	22.5	1.36	12.4	19.6	1.58
17+ years	10.7	15.6	1.46	10.9	14.1	1.29
Low/High ratio	8.8	5.4		4.7	1.6	

*Deaths per 100,000 for persons aged 25–64 years.
Source: (Albano et al. 2007).

Table 2: Percent of U.S. Adults who were Current Cigarette Smokers, U.S., 2007–2009*

	Men			Women		
	White	Black	Hispanic	White	Black	Hispanic
All	24.1	24.0	18.0	20.9	17.3	9.4
Poverty level						
Below 100%	37.8	37.9	19.6	38.9	26.6	12.0
100–199%	34.5	31.1	18.6	31.6	19.1	8.4
200–399%	27.8	21.1	18.9	21.9	11.9	9.4
400% or more	16.9	15.8	16.4	13.8	9.2	7.7
Income difference	20.9	22.1	3.2	25.1	17.4	4.3
Education level						
<HS	44.0	36.5	18.8	44.5	28.1	8.3
HS or GED	34.4	27.8	20.4	29.8	22.6	10.6
≥ Some college	15.8	20.0	15.0	15.1	13.2	10.5
Education difference	28.2	16.5	5.4	29.4	14.9	2.3

*The categories Black and White refer to non-Hispanic Blacks and non-Hispanic Whites. Source: (National Center for Health Statistics 2010).

CONFOUNDING BETWEEN RACE/ETHNICITY AND SES

Each indicator of SES (e.g. income, education, occupation) is more often than not predictive of variations in health and health service use but SES indicators are not interchangeable and each has strengths and limitations (Krieger, Williams, and Moss 1997). In Table 1, even with the truncated education distribution, the differences by education are larger than those by income for white men and women, whereas the opposite is true for blacks. Researchers should be sensitive to the possibility that mechanisms of social inequality as captured by different indicators of SES could reflect different patterns of adversity over the life course or varying exposure to risks and resources that can contribute to different patterns of health risks, health status, and disease management for various social groups. For example, one national study found that although education played a greater role than income in the onset of illness, income was a stronger predictor of its course (Herd, Goesling, and House 2007).

The degree of confounding between race and SES can vary across different indicators of SES (LaVeist 2005). For example, racial/ethnic differences in wealth are markedly larger than those for income or education, with white households having 15 times as much total wealth and 100 times as much financial wealth (excluding home equity) as the average black or Latino household

(Domhoff 2011). Even the operationalization of an SES indicator can differentially capture confounding with race/ethnicity, with there being little variation between blacks and whites in high school graduation rates but marked differences in college completion (Williams et al. 2010). Thus, the association between SES and lung cancer risk and treatment can vary by the time, place, specific SES indicator utilized, and the particular group under consideration.

NONEQUIVALENCE OF SES

For both men and women, the data in Table 1 showed an elevated risk of lung cancer mortality for college educated blacks compared to their white peers. Research on middle class minorities suggests that the nonequivalence of SES across race/ethnicity is a contributor to these differences. Compared to whites, blacks and Latinos tend to have lower levels of income at every level of education, less wealth at every level of income, higher exposure to occupational risks within the same occupational categories and less purchasing power at a given level of income (Williams et al. 2010). Table 2 also indicates that for both blacks and Hispanics, men and women, the prevalence of smoking is more similar to whites at high levels of education and income, compared to the reduced prevalence at lower SES levels. Elevated levels of stress for middle class minorities compared to their white peers may contribute to this pattern. Research indicates, for example, that middle-class status is often recent, tenuous, and marginal for African Americans and other minorities (Jackson and Williams 2006) (Council of Economic Advisers 1998). Compared to whites, middle class minorities are more likely to experience unemployment and are less likely to translate their higher economic status into desirable housing and neighborhood conditions (Alba, Logan, and Stults 2000; Jackson and Williams 2006).

Other race-related stressors, some of which are gender specific, contribute to this economically fragile position and can affect patterns of health care utilization and treatment. First, perceived racial discrimination is a stressor that is positively related to SES and adversely associated with health risks including tobacco use (Williams and Mohammed 2009). Second, the responsibility of providing support to poorer relatives is often an added burden. Compared to white women, middle class black women receive less social and material support and provide more of these resources to poorer relatives (Jackson and Williams 2006). Third, thwarted aspirations may contribute to unrealized economic gains in ways that differ by gender. For blacks and

Hispanics, compared to whites, the racial gap in earnings at comparable levels of education are larger for men than for women and since the 1960s, minority women have made larger gains in reducing the racial gap in income than men (Council of Economic Advisers 1998).

SEGREGATION AND THE ROLE OF PLACE

In addition to considerations of SES at the individual and household level, exposures linked to place can be key predictors of social disparities in health risks, health care, and outcomes as detailed elsewhere in this special issue (White et al. In Press). A remarkably constant feature of black life in the United States has been a high level of residential segregation (Williams and Collins 2001). Prior research has identified residential segregation by race as a key confounder of the relationship between race and SES and a critical determinant of variations in neighborhood quality and conditions (Acevedo-Garcia et al. 2008). Segregation also varies for ethnic subgroups with mainland Puerto Ricans living under the highest level of segregation among Latinos (Massey 2001) and black Caribbean immigrants residing in areas of higher segregation than African Americans (Logan and Deane 2003).

Segregation can adversely affect smoking and lung cancer outcomes via multiple pathways (Williams et al. 2010). The concentration of economic hardship and other psychosocial stressors in segregated neighborhoods can make it more difficult for residents to lead healthy lives and seek needed care. The levels of cigarette smoking are higher in some racially segregated, economically disadvantaged residential areas than would be predicted by national data (Dell et al. 2005; Delva et al. 2005). Stressors can facilitate the onset of smoking, make quitting more difficult and adherence to medical regimens more challenging (Berg et al. 2010; Webb and Carey 2008). In fact, in those rare instances where whites reside in similar neighborhood conditions to African Americans, their level of smoking and other health risks are similar to or worse than those of African Americans (LaVeist et al. 2007).

Segregation can also restrict socioeconomic mobility by limiting access to education and employment opportunities, and it can encourage high risk behaviors such as tobacco smoking because of the disproportionate targeting of tobacco advertising to disadvantaged minority communities (Primack et al. 2007). Prior research indicates that the same amount of tobacco has more negative effects on the health of blacks compared to whites (Haiman et al. 2006).

1 Institutional neglect in segregated communities could contribute to this
2 pattern by leading to higher levels of exposure to toxic chemicals (Morello-
3 Frosch and Jesdale 2006), which in turn can interact with tobacco exposure to
4 markedly exacerbate health risks. Although the pattern is not uniform (Earle
5 et al. 2002; Potosky et al. 2004), geographic variation that captures neighbor-
6 hood deprivation and segregation is associated with an elevated risk of lung
7 cancer mortality and the receipt of poorer treatment for lung cancer (Earle
8 et al. 2000; Major et al. 2010).

11 GENETIC DIFFERENCES AND GENE-ENVIRONMENT 12 INTERACTIONS

14 High levels of residential segregation ensure that a large number of social, psy-
15 chological, residential, and other physical-chemical environmental variables
16 differ by racial/ethnic status. SES and racial/ethnic groups are often located in
17 different residential and occupational environments. Gender groups often
18 occupy different occupational contexts. Biology, including genetics, is adap-
19 tive to environmental exposures and the distinctive environments of social
20 groups suggest that more systematic attention should be given to identifying
21 potential epigenetic effects (changes in gene expression and tissue and organ
22 function that are not caused by changes in the DNA sequence). Variations in
23 genetic susceptibility to disease also occur in human populations, although
24 these variations tend not to be strongly patterned by race (Kaufman and Coo-
25 per 2008). Research is needed to identify the extent to which genetic variants
26 of lung cancer are differentially distributed by race, and the potential of gene-
27 environment interactions to play a role in lung cancer risk and disparities (Ra-
28 mos and Rotimi 2009).

29 Racial and ethnic categories are likely to capture simultaneous con-
30 founding by both biological *and* environmental variables that are often
31 unmeasured. The findings of greater vulnerability to tobacco among blacks
32 compared to whites (Haiman et al. 2006) could reflect racial differences in
33 particular genetic variants, gene-environment interactions, and/or differences
34 in gene expression linked to different environments. Research on lung cancer
35 has given scant attention to the extent to which gene frequency and gene
36 expression may vary by race, SES or gender. This information is critical to
37 ensure that these groups benefit equally from the development of genomic
38 tests and tailored treatments, as described elsewhere in this special issue
39 (Shields and Crown In Press).

RESILIENCE FACTORS

In addition to identifying risk factors and vulnerabilities, research also needs to identify and examine the health consequences of the capacities and resources that exist at the intersections of social groups at both the individual and area level (Ahern et al. 2008). Exposure to protective resources and the patterns of response that are mobilized to deal with potential threats can minimize the negative effects of risk factors. Table 2 indicated, surprisingly, that black women have lower rates of smoking than their white peers at every level of SES. This suggests that even in contexts of low SES, other aspects of the social environment can enhance health. Material and psychosocial resources can be mobilized to adapt and cope with risk. These interactions can lead to variations in vulnerability across groups that reflect differential preparedness, ability to recover, and capacity to capitalize on and use available resources including medical care (deFur et al. 2007).

Higher levels of religious engagement by black compared to white women may contribute to black women's lower levels of smoking. Religious attendance – which may influence both individual behaviors and social networks – has been associated with lower levels of smoking in national (Gillum and Sullins 2008) and regional studies (Whooley et al. 2002). Higher level of religious involvement by black than white teens contributes to the lower level of smoking among black adolescents (Wallace et al. 2003). In addition, communities vary in their skills, knowledge, and resources to address local problems (Goodman et al. 1998). Various community institutions (families, neighborhoods, schools, churches, businesses, and voluntary agencies) can be agents of change to seek solutions to local problems (McLeroy et al. 2003).

MIGRATION, CULTURAL BELIEFS, AND BEHAVIOR

Hispanic women are less likely than men to smoke cigarettes and the SES gradient in smoking among Latinos is much less marked than that for blacks and whites (Table 2). This profile of smoking behavior is influenced by migration and failure to disaggregate the data by nativity status is likely to obscure important patterns of variation. Hispanic, white, Asian, and black immigrants all have lower current rates of smoking than their native-born counterparts (Dey and Lucas 2006), but their risk increases with length of stay in the United States (Clegg et al. 2009). Moreover, the increasing prevalence of smoking with length of stay in the United States among Latinos is more marked for

1 women than for men (Lara et al. 2005). Prior research also indicates that SES
2 is less strongly related to health status and health risks among recently arrived
3 immigrants than among longer duration immigrants and also among first
4 generation immigrants relative to second or later generation immigrants
5 (Acevedo-Garcia et al. 2010; Angel, Buckley, and Finch 2001). Immigrants of
6 all major racial groups also have markedly lower lung cancer mortality rates
7 than their native-born counterparts (Singh and Miller 2004).

8 Cultural factors play an important role in affecting the current and future
9 health of immigrant and U.S.-born populations and their interactions with the
10 health care system (Kagawa-Singer et al. 2010). Culturally shaped beliefs, atti-
11 tudes, and behaviors can affect prevention, help seeking, treatment, and adher-
12 ence to medical regimens in ways that can shed light on the complex
13 interactions among race/ethnicity, gender, and SES. For example, men are
14 often socialized to demonstrate strength, autonomy, dominance, and physical
15 aggression, and to avoid the expression of emotion or vulnerability (Courtenay
16 2000; Williams 2003). These cultural beliefs about manhood can discour-
17 age men from engaging in preventive health behaviors. Men are markedly
18 more likely than women to engage in a broad range of health damaging behav-
19 iors and less likely to make preventive health care visits (Courtenay 2000).
20 Tobacco companies have often capitalized on these cultural beliefs to develop
21 marketing strategies that link tobacco with independence, social success, and
22 sexual attraction (National Cancer Institute 2008). Cultural factors can also
23 influence the structure and functioning of health care organizations and the
24 attitudes and behavior of health care providers (Kagawa-Singer et al. 2010).
25 For example, compared to women, health care providers spend less time with
26 men and provide men with fewer services, less health information, and less
27 advice to change behaviors (such as smoking) to improve health (Courtenay
28 2000). Thus, cultural influences on lung cancer risks and outcomes deserve
29 more research attention with better conceptual and empirical tools.

31 RESEARCH CONSIDERATIONS FOR UNDERSTANDING 32 THE INTERSECTION OF RACE/ETHNICITY, SES, AND 33 GENDER ACROSS THE CONTINUUM OF LUNG CANCER 34

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36 The complexities that emerge at the intersections of race/ethnicity, SES, and
37 gender are more recognized in research on the social determinants of health
38 than in research on health services utilization. To inform conceptual models
39 and empirical analyses of disparities in health care utilization, we selectively

highlight some of the needed research on intersectionality along the continuum of lung cancer prevention, treatment, and outcomes.

ANALYTIC IMPLICATIONS OF INTERSECTIONALITY

Inadequate attention has been given to analytic methods needed for the quantitative study of intersectionality. The limited understanding of the relative magnitude of various social inequalities is in part a function of the limited methodological approaches that have been used to assess it (Sen, Iyer, and Mukherjee 2009). Recently, Sen, Iyer, and Mukherjee (2009) have proposed an analytic approach that makes meaningful distinctions between various intersecting categories. They begin by developing a unique identity for each intersecting category by creating a set of indicator variables for each category (e.g. indicators for poor black men, poor black women, poor white men, poor white women, etc.). This approach allows for the testing of the significance of each indicator variable relative to a reference group, of any category compared to all other categories, and of differences in the size of social gaps. Moreover, by ranking odds ratios for each category and plotting them on a log scale, one can readily create a visual representation of the relative positions of the various categories on the social scale. This approach can provide critical insights with regard to which population subgroups are most affected, in what settings, and can also facilitate the precise targeting of interventions. New analytic approaches such as this one may also require disproportionate sampling methods to provide adequate statistical power and to investigate within- and between-group differences in cancer risks, treatments, and survival. However, Cole (2009) cautions that given intersectionality theory's emphasis on how social status is experienced, statistical models and interactions may not always capture the subtle ways in which the meaning of one social category is shaped by the level of another.

Lung Cancer Risk

Smoking. Smoking is the foremost contributor to lung cancer risk and disparities. Data on smoking show somewhat inconsistent patterns over time among certain racial/ethnic groups. For example, among high school students 19.4 percent of Whites report smoking compared to only 7.4 percent of African Americans (United States Centers for Disease Control and Prevention 2011). This early use trend then changes in adulthood with Whites (22 percent) and

1 African Americans (21 percent) reporting similar rates (United States Centers
2 for Disease Control and Prevention 2011). Currently the extent to which this
3 pattern varies for specific subgroups of these populations and the driving fac-
4 tors behind these variations over time are not well defined. To better under-
5 stand these patterns, we recommend routine reporting of the prevalence of
6 cigarette smoking simultaneously by race/ethnicity, SES (income or educa-
7 tion), and gender. Newer methods of data collection such as the use of elec-
8 tronic medical records to track smoking over time would not only allow for
9 longitudinal assessment among large sample sizes necessary to conduct exam-
10 ination of intersectionality but these data systems would also allow agencies
11 such as public health departments to examine local and dynamic trends over
12 time.

13 Moreover, there are a variety of drivers that may potentially explain
14 changing patterns. These include differential and targeted exposure to tobacco
15 marketing and promotions, social networks and peer pressures, and exposure
16 to stressors such as discrimination as young adults enter the workforce. Future
17 research should include surveillance of the marketing/promotions environ-
18 ment in different contexts as defined by geography, workplace, and retail envi-
19 ronments. Data on youth and adult risk behaviors as well as the tobacco retail
20 environment and promotions are often collected by various state and federal
21 agencies as well as the private sector. What is needed is the integration of these
22 data systems to facilitate comprehensive analyses of the exposures that influ-
23 ence tobacco use. Such reporting will lay the foundation for identifying vul-
24 nerable subgroups and patterns of risk to more clearly understand the
25 conditions under which particular social processes combine to influence the
26 initiation and subsequent trajectories of smoking.

27 Second, future research should routinely report racial/ethnic data for
28 populations with a high proportion of immigrants, such as Asians and Hispan-
29 ics, by nativity status (U.S.-born versus foreign-born), and generational status,
30 whenever feasible. Generational status can be easily obtained by obtaining the
31 place of birth data for the respondent and his or her parents and grandparents
32 (Takeuchi et al. 2007).

33 Third, greater research attention to delineating the relevant protective
34 factors that may be linked to lower cigarette use among African American
35 youth but appear to dissipate in adulthood, as well as, the resilience factors
36 responsible for the low rates of cigarette smoking among Hispanic adults.
37 To achieve this goal, variables such as parental involvement, religious involve-
38 ment, social support, social and gender norms, and acculturation should be
39 included in large scale studies of youth such as the Youth Risk Behavior

1 Surveys and Monitoring the Future survey. The dynamic nature of these fac-
2 tors must also be addressed across the life course and these variables should
3 also be considered for inclusion in the newly announced Tobacco Control Act
4 National Longitudinal Study of Tobacco Users (Food and Drug Administra-
5 tion 2011). This large scale national study, jointly sponsored by the FDA and
6 the National Institutes of Health, seeks to assess and monitor the behavioral
7 and health effects of new tobacco regulations. By following a cohort of more
8 than 40,000 users of tobacco product and those at risk for tobacco use, aged 12
9 and older, over time, this survey will provide an excellent opportunity to doc-
10 ument the root causes of differential smoking rates among U.S. adults as
11 researchers investigate how multiple variables unfold over the life course and
12 interact with each other. Research on smoking also needs to take a multilevel
13 approach in assessing environmental factors along with individual-level vari-
14 ables such as the potential protective factors listed above and psychosocial fac-
15 tors such as anxiety, depression, perceived chronic stress, and discrimination.
16 Data collection and multilevel analyses of this nature may help clarify the
17 mechanisms at play at the intersection of race/ethnicity, SES, and gender and
18 what factors either limit or enhance the impact of prevention interventions
19 (Greaves, Vallone, and Velicer 2006; National Cancer Institute 2008).

21 *Lung Cancer Outcomes*

23 *Diagnosis and Screening.* Lung cancer often presents with common and
24 often nonspecific symptoms such as cough, lacks definitive screening rec-
25 ommendations, and typically requires invasive staging tests, thereby mak-
26 ing early diagnosis challenging for clinicians. Delays in diagnosis for lung
27 cancer are common and these vary by patient insurance status, region,
28 and hospital (Molina et al. 2008; Ward et al. 2004; Yorio et al. 2009).
29 Patients of color and low-SES often present with late stage disease, and
30 then have fewer opportunities for curative interventions (Albano et al.
31 2007; Alberg, ?????, and Samet 2005). However, inadequate attention has **3**
32 been devoted to social influences on diagnosis. Prior research reveals that
33 characteristics of the health care environment interact with patient demo-
34 graphics to shape provider behavior (Wright and Perry 2010). However,
35 our understanding is limited regarding the extent to which similar pro-
36 cesses occur for lung cancer and how they may vary by race/ethnicity,
37 SES, and gender. In an effort to better understand this interplay future
38 research must collect and analyze data with the intent of focusing on the
39 course of lung cancer. Inclusion of such variables in a longitudinal data-

set, merged with claims level data, would allow for a more complete look at patterns of risk and potential targets of intervention across the lung cancer spectrum. In addition, the potential impact of national screening recommendations for smokers must be considered in existing and future research related to lung cancer diagnosis in an effort to track and minimize further exacerbation of existing disparities by gender, race/ethnicity, and SES.

Treatment. Most patients with lung cancer present with advanced disease, and early stage lung cancer is usually discovered incidentally. Surgery for early stage disease is the only treatment modality that is potentially curative, and black race and inadequate insurance are associated with lower rates of surgery (Bach et al. 1999). More severe comorbid disease (Blackstock et al. 2002), differences in patient preferences due to mistrust and prevalent beliefs (Margolis et al. 2003), poor physician and patient communication (Gordon et al. 2006), and access to care may all contribute to these disparities (Cykert et al. 2010). Unfortunately, prior research has not examined how all these identified risk factors combine at the intersection of race/ethnicity, SES, and gender in the treatment of early stage lung cancer. Similar limitations exist in research on advanced disease. Although disparities by race are well documented for the treatment of advanced disease with chemotherapy and radiation (Earle et al. 2000) (Potosky et al. 2004) future studies should jointly evaluate the effects of SES, race/ethnicity, and gender in the treatment of end-stage disease and the extent to which these patterns may vary by region.

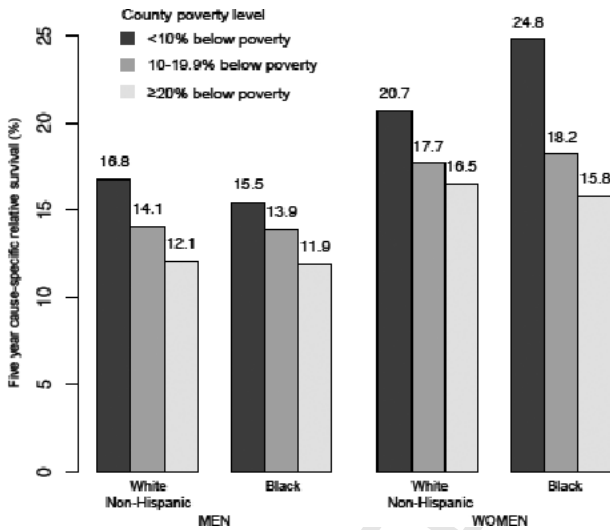
A final consideration for future disparities research on the treatment of lung cancer is the increasing development and use of targeted therapies and their implications across gender, racial/ethnic, and SES groups. Although molecular/genetic determinants have long been recognized for their decisive roles in tumor biology and clinical behavior, these factors are rarely measured in population-based studies of cancer health outcomes. However, several intriguing lines of evidence support the notion that significant differences in “druggable” somatic genetic variations exist across racial and ethnic groups. Non-small cell lung cancer patients who are East Asian in origin more frequently harbor mutations in the epidermal growth factor receptor (EGFR) than do white patients (Shepherd et al. 2005). When patients with EGFR mutations are treated with specific inhibitors, nearly all respond, compared to patients without EGFR mutations (Mok et al. 2009; Paez et al. 2004). Future

1 studies should assess the additional joint contribution of SES and gender to
2 this line of research, as these variables may indicate differential, more effective
3 targeted therapies in future. Related, the lack of adequate inclusion of
4 minorities in clinical trials must also be considered. Significant disparities in
5 clinical trial participation is particularly problematic for genomically targeted
6 treatments. If we were to effectively reduce disparities in the treatment of lung
7 cancer and to adequately investigate the role of intersectionality there must be
8 significant attention directed to inclusion of racial minorities, women, and low
9 SES groups in clinical trials.

10
11
12 *Survival.* Unfortunately, only about 15 percent of lung cancer patients survive
13 5 years after diagnosis (American Cancer Society 2008), and available data
14 show inconsistent patterns of survival by gender, race, and SES. For example,
15 Figure 1 highlights that in the most affluent counties black men have
16 decreased survival relative to white men but black women have markedly bet-
17 ter survival relative to white women (Singh et al. 2003). The factors underly-
18 ing these racial/ethnic, SES, and gender disparities in survival are
19 multilayered and complex, relating to patients, providers, health care systems,
20 and communities (Ayanian 2008; Smedley, Stith, and Nelson 2003). Identify-
21 ing the contribution of each factor is necessary to design focused strategies to
22 eliminate disparities. Collection of SES data at the individual and area levels is
23 also needed. With the absence of individual-level SES in cancer registries,
24 income, and education are typically estimated using area-based measures.

25 Analyses that rely only on area-based measures may be subject to
26 ecologic bias (Greenland 2001). This bias can be reduced by using area-
27 based SES measures derived from Census tract data instead of broad
28 county-level data (Krieger et al. 2002). However, efforts to fully under-
29 stand the interactions of race/ethnicity, area-level, and individual-level
30 SES and gender will require multilevel data and modeling techniques to
31 inform health policy interventions (Zaslavsky and Ayanian 2005).
32 If between-hospital or between-community differences are a major compo-
33 nent of disparities in survival, then policy solutions can focus on improv-
34 ing care in hospitals and communities with large numbers of
35 disadvantaged patients or on expanding access for patients in these com-
36 munities to better hospitals. Alternately, if racial/ethnic, gender, and socio-
37 economic disparities are mainly evident within hospitals and communities,
38 then attention can focus on addressing reasons why some groups have
39 worse outcomes in these settings.

Figure 1: Five year cause-specific relative survival by gender, race/ethnicity, and area-level SES. Source: (Singh et al. 2003)



CONCLUSION

The intersectional perspective helps to identify population subgroups that are most at risk. It highlights the importance of understanding the local context in terms of both identifying patterns of risk and in targeting interventions to vulnerable groups. It also emphasizes that many of the observed social variations in health in general and lung cancer risks in particular are not biologically inevitable but are shaped by social processes and institutions including the response of the health care system. A multilevel life-course perspective is essential given the interactive nature of these exposures across the life span and the dynamic and heterogeneous patterning of risks. Adequate sample sizes for small populations defined by patient's race/ethnicity, SES, and gender is also critical. Future research should give increased attention to quantifying social exposures at multiple levels of analysis and documenting the extent to which, they have consequences for health and patterns of health service utilization. This approach will require transdisciplinary approaches that are informed by quantitative and qualitative research that attempts to capture all relevant aspects of the social environment and seeks to identify how these factors combine with biological susceptibility to affect the organization, need, use, and outcomes of care across the entire continuum of disease.

NOTE

1. We acknowledge that categorizing these categories as if they did not overlap obscures the reality of multiple identities linked to race and ethnicity.

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Appendix SA1: Author matrix.

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