

Sounding Board

MISUNDERSTANDINGS ABOUT THE EFFECTS OF RACE AND SEX ON PHYSICIANS' REFERRALS FOR CARDIAC CATHETERIZATION

IN the February 25 issue of the *Journal*, Schulman et al. claimed that the "race and sex of a patient independently influence how physicians manage chest pain."¹ Their study received extensive coverage in the news media. It was reported in most major newspapers²⁻⁶ and was a feature story on ABC's *Nightline*, with Surgeon General David Satcher providing commentary.⁷ Unfortunately, in each case, the results were overstated. We explore what went wrong and suggest ways to improve the communication of data to the public. Our purpose is not to deny the occurrence of racial or sex bias, rather to emphasize the importance of presenting information accurately.

THE STUDY AND MEDIA COVERAGE

In a controlled study, Schulman et al. determined how often doctors recommended cardiac catheterization for hypothetical patients with chest pain. Primary care physicians attending two professional meetings were shown a videotaped interview with a patient (portrayed by an actor) and given other relevant data (cardiac risk factors and the result of a thallium stress test) and were then asked whether they would recommend catheterization. The investigators developed 18 hypothetical scenarios representing all possible combinations of the following factors: 3 descriptions of chest pain, 2 levels of cardiac risk, and 3 results of thallium stress tests. In order to isolate the influence of race, sex, and age on the physicians' decisions, each scenario was portrayed by eight actors (representing two races, both sexes, and two ages). The investigators then determined how often these "patients" with identical symptoms and medical histories were referred for cardiac catheterization.

The central findings of the study are presented in Table 1. On the basis of both the reported referral rates for blacks and whites and for men and women and the reported odds ratios, we inferred the separate referral rates for white men, black men, white women, and black women. Black women were referred for cardiac catheterization less often than white men, black men, and white women (78.8 percent of black women were referred, vs. 90.6 percent for each of the other groups). Although the authors explicitly demonstrated that only black women had lower rates of referral, they focused their discussion on the results aggregated according to race or sex — implying that all blacks (i.e., male and female) were referred

TABLE 1. RATE OF REFERRAL FOR CARDIAC CATHETERIZATION, ODDS OF REFERRAL, ODDS RATIO, AND RISK RATIO ACCORDING TO SEX AND RACE.*

PATIENTS	MEAN REFERRAL RATE %	ODDS OF REFERRAL	ODDS RATIO (95% CI)	RISK RATIO (95% CI)
Four strata				
White men†	90.6	9.6 to 1	1.0	
Black men	90.6	9.6 to 1	1.0 (0.5-2.1)	
White women	90.6	9.6 to 1	1.0 (0.5-2.1)	
Black women	78.8	3.7 to 1	0.4 (0.2-0.7)	0.87 (0.80-0.95)
Aggregate data				
White†	90.6	9.6 to 1	1.0	
Black	84.7	5.5 to 1	0.6 (0.4-0.9)	0.93 (0.89-0.99)
Men†	90.6	9.6 to 1	1.0	
Women	84.7	5.5 to 1	0.6 (0.4-0.9)	0.93 (0.89-0.99)
Overall	87.7	7.1 to 1		

*Referral rates for the four strata were inferred from aggregate rates and odds ratios reported by Schulman et al.¹ The odds of referral were calculated according to the following formula: referral rate/(100-referral rate). The risk ratio was calculated as the referral rate for the group in question divided by the referral rate for the reference group. CI denotes confidence interval.

†This was the reference group.

less often than all whites and that all women (black and white) were referred less often than all men.

The central message reported by the media was that blacks and women were "40 percent less likely" to be referred for cardiac testing than whites or men (or "60 percent as likely" to be referred). Table 2 shows how findings were presented on *Nightline* and in each of the five U.S. newspapers with the largest circulations. Most of the media reports interpreted the article in the *Journal* as meaning that blacks and women receive less adequate care than whites or men. Several reports suggested that the higher cardiac-associated mortality rates observed in blacks might actually be the result of differences in catheterization rates. Moreover, both the reports and the quoted comments of the lead author implied that conscious or unconscious sex and racial biases pervade American medicine.

PROBLEMS IN COMMUNICATING THE FINDINGS

There are three basic problems with how the data were presented: the magnitude of the finding was overstated, the comparison reported was incorrect, and the implicit assumption — that catheterization always represents the best care — was unwarranted. These problems began with the way in which the authors chose to write the article, persisted despite peer and editorial review, and were magnified in the news media. To highlight each problem, we consider three headlines that would have better characterized the findings.

TABLE 2. PRESENTATION OF STUDY FINDINGS IN SELECTED MAJOR NEWS MEDIA.

SOURCE*	HEADLINE	CHARACTERIZATION OF PRIMARY FINDING	INTERPRETATION	IMPLICATION
<i>Nightline</i> ⁷	"A Recent Study Shows That Doctors Diagnose Black and White Patients Differently"	"In our main analysis we found that blacks were 40 percent less likely to be referred for cardiac catheterization compared to whites."	"A recent study shows that doctors diagnose black and white patients differently."	"It's having an adverse effect on the health of their patients and there is growing statistical evidence that if a patient is black he or she is significantly likely to get a lesser quality of medical care."
<i>USA Today</i> ⁶	"Heart Care Reflects Race and Sex, Not Symptoms"	"Blacks and women with chest pain are 40% less likely than whites or men to be referred by physicians for cardiac catheterization."	"Race and sex of patients with chest pain influence whether they're sent for the most definitive test for heart disease."	"... the new study truly does indicate that a bias exists."
<i>Washington Post</i> ⁵	"Georgetown University Study Finds Disparity in Heart Care; Doctors Less Likely to Refer Blacks, Women for Cardiac Test"	"Physicians said they would refer blacks and women to heart specialists for cardiac catheterization tests only 60 percent as often as they would prescribe the procedure for white male patients."	"Doctors are far less likely to recommend sophisticated cardiac tests for blacks and women than for white men with identical complaints of chest pain."	"Authors suggest the differences are the consequences of race and sex bias [and that] the attitudes demonstrated in the survey exist in all medical specialties... you don't have to be consciously racist to see the influence of race and gender playing out in treatment. That's what this study confirms."
<i>Los Angeles Times</i> ⁴	"Heart Study Points to Race, Sex Bias"	"[Doctors] refer blacks and women to heart specialists 60% as often as they would white male patients."	"Doctors are far less likely to recommend sophisticated cardiac tests for blacks and women than for white males."	"Authors suggest the differences are the consequences of race and sex bias."
<i>Wall Street Journal</i> ²	"Study Suggests Race, Sex Influence Physicians' Care"	"Doctors are only 60% as likely to order cardiac catheterization for women and blacks as for men and whites."	"Women and blacks complaining of chest pain are less likely than men and whites to receive the best cardiac testing."	"Unconscious prejudices among doctors may help explain [the findings]."
<i>New York Times</i> ³	"Doctor Bias May Affect Heart Care, Study Finds"			

*Since the *Wall Street Journal* and *New York Times* stories were based on the same Associated Press report, the characterization of the primary finding, interpretation, and stated implication were the same in the two newspapers. The quotations in the table are from the *New York Times*.

"Study Shows Blacks Referred 7 Percent Less Often Than Whites"

The authors chose to summarize the relative chance of referral for blacks as compared with whites using an odds ratio — literally, the ratio of the odds in favor of being referred for catheterization for blacks to the odds for whites: $(0.847 \div 0.153) \div (0.906 \div 0.094) = 5.5 \div 9.6 = 0.6$. In words, the odds that blacks would be referred for catheterization were 40 percent lower than the odds of referral for whites.

The use of odds ratios is unfortunate. Few people think in terms of odds or encounter them in daily life. Perhaps for this reason, many people tend to equate odds with probability (the most familiar way to characterize chance) and thus to equate odds ratios with risk ratios. The quotations noted in Table 2 suggest that the major newspapers, *Nightline*, and even the surgeon general did just that in characterizing the results of the study by Schulman et al. When the outcome of interest is uncommon (i.e., it occurs less than 10 percent of the time), such confusion makes little difference, since odds ratios and risk ratios are approximately equal. When the outcome is more common, however, the odds ratio increasingly overstates the risk ratio.⁸⁻¹¹

Because the study by Schulman et al. involved a very common event (84.7 percent of blacks and 90.6 percent of whites were referred for catheterization), the overstatement in this case was extreme. The reported odds ratio of 0.6 actually corresponds to a risk ratio of 0.93 (i.e., 84.7 percent divided by 90.6 percent). Inappropriately equating odds ratios with risk ratios led to the mistaken impression that blacks had a 40 percent lower probability of referral than whites, whereas in fact, the probability of referral for blacks was 7 percent lower. In this case, the failure to distinguish between odds ratios and risk ratios had profound consequences for how the magnitude of the difference in referral rates for blacks and whites (or women and men) was portrayed. Regardless of the magnitude, however, the comparison itself was misleading.

"Study Finds Black Men and White Men Referred at the Same Rate"

The article in the *Journal* focused on the aggregate data, but the picture is quite different when the data are stratified according to both race and sex. As Table 1 shows, the rate of referral was the same for three of the four strata (90.6 percent); only black

women had a different rate of referral (78.8 percent). In other words, the effect of race on the referral rate was modified by whether the patient was male or female (in other words, the effect of race was modified by sex). When an analysis shows an important effect modification (or interaction), it no longer makes sense to combine the data in a way that obscures this difference.¹² To present the data correctly, the focus should be on the comparisons of these four groups, not on the data aggregated according to age or sex. An accurate statement of the findings would be that white women, white men, and black men were all referred at the same rate and that only black women had a lower rate of referral.

"Study Suggests Possible Overtesting in Black Men and White Men"

The focus on race and sex obscured a remarkable finding of the study by Schulman et al.: overall, almost 90 percent of the patients were referred for catheterization. Both the authors and the journalists argued that the noted differences in referral rates meant that blacks and women receive less adequate care than whites and men. The way in which cardiac catheterization was characterized in the press (e.g., "the most sophisticated examination," "the best cardiac test," and "the most aggressive treatment") implied that a noninvasive evaluation (or treatment without catheterization) is incomplete. The authors and reporters failed to mention the potential complications of catheterization and the possibility of overtreatment (i.e., unnecessary catheterization). In fact, there is growing evidence that more treatment is not always better and can actually be harmful.¹³ A study recently reported in the *Journal*, for example, found that an invasive strategy (immediate cardiac catheterization) for all patients with non-Q-wave myocardial infarction resulted in higher rates of myocardial infarction and death than a more conservative approach.¹⁴

Schulman et al. undoubtedly recognized that referring a patient for catheterization is not always the right decision. They were careful to present the physicians in their study with a broad spectrum of symptoms and medical histories, using 18 scenarios in which the probability of clinically significant coronary artery disease varied widely. Extremely high rates of referral were observed both for patients at low risk and for those at high risk for coronary disease (89 percent and 86 percent, respectively), where the risk of coronary disease was determined on the basis of blood pressure, lipid values, and history of smoking. Although the appropriate rate of referral for this hypothetical cohort is an open question, the observed rate seems implausibly high.

UNINTENDED SIDE EFFECTS

The purpose of the study by Schulman et al. — to look for evidence of racial or sex bias in the eval-

uation of chest pain — is laudable. It is important to expose discriminatory practice in medicine. It is equally important not to exaggerate the prevalence of such practice. Unfortunately, the presentation of the data overstated the magnitude of the differences observed (by interpreting an odds ratio as a relative risk) and the target of discrimination (by suggesting that blacks and women were the targets as opposed to black women), and thus influenced the characterization in the media of the likely consequences (by suggesting that lower referral rates explain higher rates of cardiovascular-associated mortality). These exaggerations serve only to fuel anger and undermine the trust between physicians and their patients.

The lack of caution in presenting and interpreting the results of the study makes it too easy to extend the findings to all physicians in all settings and to come to the erroneous conclusion that discrimination on the basis of race and sex pervades American medicine. As a result, blacks and women may be more likely to ascribe disappointing interactions with their physicians to prejudice rather than to other plausible factors (e.g., cost-containment pressures, poor interpersonal skills, or simply a bad day). Physicians may become fearful that their actions will be misinterpreted by their patients who are black or female. Physicians might even become more concerned about appearance than about good care or, worse, might avoid treating blacks and women. The exaggeration of the data does nothing to advance the fight against discrimination on the basis of race or sex; indeed, it arguably aggravates the problem.

We believe the findings of the study would be better characterized as follows: in a study of referral for cardiac catheterization, physicians shown videotaped vignettes referred black women 79 percent of the time but referred other patients 91 percent of the time. We are unsure about the correct interpretation. Is it possible that none of the physicians discriminated between white and black men or between white men and white women and that discrimination could be detected only when race and sex were combined? Could the findings reflect some systematic problem in the study design, the collection of the data, or the analysis? Or could the findings simply be the result of chance? We believe the study raises questions about differential treatment of black women and that the most reasonable approach is to take a second look.

HOW TO DO BETTER

Table 3 presents guidelines for helping researchers, journal editors, and reporters present the results of medical research more clearly and accurately.

Reporting Absolute Event Rates

In covering the study by Schulman et al., reporters presented relative measures of difference when

TABLE 3. GUIDELINES FOR COMMUNICATORS.

PROBLEM	EXAMPLE OF MISLEADING LANGUAGE	SOLUTION	EXAMPLE OF IMPROVED LANGUAGE
Relative measure reported without event rates	Blacks are 40% less likely to be referred for catheterization	Report absolute event rates	91% of white men, white women, and black men were referred for catheterization, as compared with 79% of black women
Odds ratios interpreted as risk ratios	Black women are referred 60% less often than white men (odds ratio, 0.4)	Convert odds ratios to risk ratios	Black women were referred 13% less often than white men (risk ratio, 0.87)
Findings about black women attributed to all blacks and all women	Blacks and women are less likely to be referred for catheterization than whites and men	Ensure that reported comparisons are appropriate	White and black men were referred at the same rate, and white men and women were referred at the same rate; only black women were referred at a lower rate
Implicit assumption that more health care means better health care	"Health Care: It's Better If You're White"	Question whether 100% is the desired rate for testing and treatment	The appropriate referral rate is not known; whether the referral rate for black women is too low or whether it is appropriate is unknown

*This is the title of an article in the *Economist*.¹⁵

comparing the referral rates for blacks and whites but failed to report the absolute rate of referral for each group. This is not surprising, since the article in the *Journal* emphasized the odds ratios. In fact, the absolute catheterization rates are not mentioned in the abstract or in the text of the article and are reported only in one table. Reporting that blacks were 40 percent less likely to be referred for catheterization than whites is not meaningful unless the rate at which whites were referred is known (0.6 percent vs. 1.0 percent and 60 percent vs. 100 percent both yield the same 60 percent relative risk). Stating the rate for each group under consideration would also help readers assess the magnitude of the differences and might be easier for readers to understand.¹⁶

Converting Odds Ratios to Risk Ratios

Odds ratios are bound to be interpreted as risk ratios. The problem is all the more relevant given the increasing use of logistic regression (which yields an odds ratio). It is unrealistic to expect reporters or the public to understand this distinction. When event rates are high, odds ratios should be converted to risk ratios. There are simple methods of conversion for both crude and adjusted data.^{9,10} Alternatively, odds ratios can be converted to the number needed to treat (i.e., the number of patients who would need to be treated in order to obtain one favorable outcome or to prevent one adverse event).¹⁷ If odds ratios cannot be avoided, one should remind the reader that the higher the base rate, the more the odds ratio will overstate the relative risk. Tools are available to help estimate the extent of overstatement.¹⁰

Ensuring That Comparisons Are Appropriate

In reporting the results of comparisons, one should be clear about the reference group. If an important interaction is identified, aggregate data should not be

used in reporting the results. For example, the finding that blacks were less likely to be referred for catheterization only if they were female demonstrated an important interaction between race and sex. Once this interaction was found, presenting the results for all blacks without accounting for sex was inappropriate.

Questioning the Desired Outcome

What is the gold standard against which the results presented are to be judged? In this case, a number of the reports in the media implied that a referral rate lower than 100 percent was inappropriate, an assumption that is unfounded. In general, question the assumption that more care (testing or treatment) is always better.¹³

CONCLUSIONS

It is tempting to place the blame for what went wrong in the coverage of the study by Schulman et al. on reporters, science writers, and editors in the media and to demand that they improve their reporting. To a large extent, however, the media simply reported what they were told. If the research community does not get it right, we cannot expect the media to do better. The problems we raise here clearly arose from multiple sources: the article itself, the editing process, and statements made by the authors in interviews. Acknowledging these problems is a critical step in preventing their recurrence.

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