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Hospital admissions: An examination of race and health insurance

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Abstract

This study examined the effects of racial differences and differences in insurance status on source of hospital admissions. The data source was the 2001 National Hospital Discharge Survey and included a sub-sample of 104,185 patients. 58.3% of patients were admitted through the emergency room, 75.0% of patients were White, 19.7% were Black, and 61.5% were on government insurance or uninsured. Black patients were found to have significantly higher levels of emergency room admissions (69.1%=$p \leq .0001$), regardless of insurance status (gov't/self-pay, 73.7%=$p \leq .0001$, private insurance, 59.5%=$p \leq .0001$). Patients on government insurance or self-payment had significantly higher levels of emergency room admissions (65.8%=$p \leq .0001$). Regression analysis showed that both race and insurance type are significant predictors ($p \leq .0001$) of Source of Admission to the hospital. Percent probabilities confirmed this finding. Thus, it was concluded that racial differences witnessed in source of admission were not mediated by insurance type and that race and insurance type are significant, independent predictors of hospital admission source.

Keywords: Race, Ethnicity

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Introduction

The term "access to healthcare" is discussed quite often in American society. However, defining access can be challenging. Berk and Schur (1998) performed a meta-analysis of access to healthcare studies performed in the 1980s and 1990s and concluded that at any one point in time between 11%-55% of Americans have difficulty accessing healthcare. Furthermore, those who are uninsured are between two and a half to eight times as likely to have difficulty accessing care compared to those who have health insurance (Berk and Schur, 1998). These findings have a wide range and may overestimate or underestimate access to care. Access can mean treatment at a free clinic, emergency room treatment, health insurance, having a consistent primary care physician, HMO rules and regulations, or hospital admission. The level of access being investigated will determine how many people can or do utilize a particular healthcare service. For example, theoretically, every member of society would have access to a free clinic. The quality of care may not be as good as that provided by a fee-charging or HMO provider, but medical care is provided nonetheless. If access to primary care is defined as having private health insurance that provides quality, primary care services, the numbers who do not have access would be quite large, compared to those who have access to free clinics. Keeping in mind these broad definitions of access, this study attempts to address the factors that predict access to hospital care. Specifically, what factors predict hospital admission through either physician referral or the emergency room?

There is documented evidence that poor populations have higher incidences of chronic disease. Billings et al. (1993) examined this link and looked at the treatment options available to poor patients in New York City. In terms of hospital admissions, patients living in zip codes with an average income below $15,000 were 6.4 times more likely to be admitted to the hospital for asthma, than patients from zip codes with higher incomes. Similar results were found for diabetic coma (6.3 times greater), bacterial pneumonia (5.3 times greater), and congestive heart failure (4.6 times greater) (Billings et al., 1993). It was also found that Black low-income zip

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codes had the greatest health disparities as compared to areas with higher incomes and that the greatest disparities occurred between young to middle age patients. Poor patients between the ages of 25-54 had the greatest differences for number of hospital admissions, compared same-age middle class patients. These differences, although present, were not as strong for pediatric patients or elderly patients (Billings et al., 1993). Thus, people who should be at their healthiest, in young to middle adulthood, are most at risk for chronic health problems and hospitalization due to the effects of poverty.

The trend of financially disadvantaged having greater levels of disease are seen elsewhere in the literature. Olowokure, Hawker, Weinberg, Gill, and Sufi (1999) found that, when breaking income down into quintiles, hospital admission for infectious intestinal diseases increase as income decreases. The rate of hospitalization for infectious intestinal diseases holds constant for the highest three income levels, but increases from 50 people hospitalized per 100,000 in the middle quintile to 100 people hospitalized per 100,000 for the last, and most destitute quintile.

Many poor patients, like those described above, often seek non-emergency care at the emergency room. Kellerman (1991) summarized the factors that play into why patients choose the emergency room as a primary care source. Emergency departments are open 24 hours. If a person cannot afford to miss work to go to the doctor, or has childcare responsibilities during the day, the emergency room is a place to go in the evenings or overnight. Appointments, referrals, and immediate co-payments are not required for emergency care, thus an individual will not need to plan ahead or have to pay any money up front to see a physician, regardless of insurance status. Finally, other services are readily available in the emergency department environment, such as immediate, on-cite prescription filling and social workers, who can help the poor and often undereducated patient.

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Primary care treatment has been shown to reduce emergency room use and hospital admissions for chronic diseases. In a study of patients with asthma or other chronic obstructive pulmonary diseases, the effects of non-emergency office visits are striking (Sin, Bell, Svenson, and Man, 2002). All patients had been recently been treated for their respiratory disease in the emergency room. Patients showed a 27% reduction in emergency room use over the next three months when an office visit occurred within one month of the initial emergency room visit that did not result in hospitalization (Sin et al., 2002). An 18% reduction in emergency room use over the next three months was found when an office visit occurred within one month of the initial emergency room visit that did result in hospitalization (Sin et al., 2002). Factors that resulted in a second emergency room visit within three months included older age and low-income (Sin et al., 2002). These results clearly show significant reductions in emergency room treatment and hospitalization when chronic disease management occurs in the primary care setting.

Many of these diseases could be preventable or treatable with access to primary care, yet uninsured patients or patients with Medicare or Medicaid have a more difficult time accessing healthcare. For example, Iserson and Kastre (1996) investigated if severity of illness presented by an uninsured patient affected medical treatment. In this case, 54 Arizona emergency rooms were contacted by woman posing as an uninsured patient with a minor rash, moderately sprained wrist, or severely debilitating headache. Race of the caller was not disclosed. No emergency room refused to see the uninsured patient, with 80% requesting that the patient come in immediately for treatment of the headache, 76% for the wrist injury, and 58% for the rash (Iserson and Kastre, 1996). When emergency treatment was not recommended, emergency room staff either recommended visiting a walk-in clinic or home remedies to relieve the discomfort. But, across all scenarios, emergency treatment was offered, even if not recommended by staff (Iserson and Kastre, 1996).

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For comparison, the same woman called 69 private, primary care providers in the same cities as the previously contacted emergency departments. In this scenario however, the woman presented only a minor rash, since the practitioners might not be able to treat the other more severe ailments in their respective clinics (Iserson and Kastre, 1996). Also, the woman called each primary care practitioner twice, once as an uninsured patient, and once as a fully insured patient. In terms of seeing the uninsured patient, 62% of primary care physicians told the caller were not taking new patients or they would need at least $30 up front before seeing the patient. When these same physicians were called by an insured woman presenting a rash, 55% said they would see the woman for less than $30, and that only 40% were not taking new patients (Iserson and Kastre, 1996). Private physicians also offered less advice in terms of home treatment or referrals as opposed to emergency rooms. Thus, we can conclude from these results that private primary care physicians may not be open to any patient who is not fully covered by insurance.

Disadvantages due to insurance status are also found for serious conditions, such as chronic heart problems. In a sample of patients admitted to the hospital after a heart attack, 52% of admissions were deemed to be low-risk (Butler, Hamumanthu, Chomsky, and Wilson, 1998). Low risk patients were defined as being in relatively good health, without life-threatening complications, with cardiac symptoms that could have been managed in a sub-acute setting. It was not reported on what proportion of patients were on Medicare, however, Medicare guidelines state that a patient cannot gain access to a sub-acute facility without spending at least three days in an acute care hospital in the previous month (Butler et al., 1998). If a patient were low-risk, in relatively good health and without complications, the chances of being hospitalized in an acute care facility would be relatively low. Thus, for low-risk patients on Medicare, hospitalization in an acute care facility is the only option for a condition that could be managed at outside the hospital, with a primary care physician, home health nurse and medication adjustment (Butler et al., 1998).

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The literature also shows that there are racial differences in terms of accessing healthcare. For example, in a study of children with the common cold whose parents brought them to the emergency room, 91% of patients were Black (Mayefsky, El-Shinaway, & Kelleher, 1991). The common cold is not an emergent enough disease to seek treatment at an emergency room. Yet, this may be the only source of care available to minority patients.

Black and Hispanic patients also show longer delays in seeking treatment for acute conditions such as heart attacks. In one particular study, minority patients had an average delay of over six hours before seeking treatment for a heart attack (Goldberg, Gurwitz, and Gore, 1999). As mentioned previously, it is possible that half of all heart attacks could be treated, or prevented, in a sub-acute setting (Butler et al., 1998). Thus, by delaying treatment, the risk of emergency treatment increases and longer hospitalization may result.

To go back to a study mentioned previously, Billings et al. (1993), found that Black, low-income zip codes had the greatest health disparities and hospitalizations for chronic conditions, as compared to areas with higher incomes. The Billings study is important, in a number of ways. It provides evidence that poverty is a condition for disease. It is common knowledge that long-term exposure to environmental toxins, such as mercury or asbestos, can lead to cancer or other illnesses. In the case of Billings et al. (1993), we could classify poverty as an environmental toxin, leading to increased levels of chronic conditions and hospitalizations among poor patients and Black patients. Coupled with the findings discussed previously, that minority patients and poor patients with insurance problems have greater difficulty accessing healthcare, a vicious cycle develops. In order to manage a chronic condition, primary care must be available. If primary care is not available and the chronic condition is not managed properly, the emergency room is utilized to provide relief from the chronic condition. However, at some point, improper management of the chronic condition will lead to hospitalization, either through a referral from a physician or through an emergency room, regardless of whether the emergency

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room is being utilized for a true emergency or for a non-emergent need. What is unclear is what specific factor predicts hospital admission, race or insurance status. An attempt to resolve this dilemma will be addressed in this examination of hospital admission data.

Methods

The literature provides evidence that there are racial differences in access to healthcare, with minority patients having less access, especially to primary care. However, insurance status may be the influence underlying this difference. Thus, to test the hypothesis that racial differences in access to healthcare, as measured by source of hospital admission, will be mediated by differences in health insurance status, data from the 2001 National Hospital Discharge Survey (NHDS) will be analyzed.

The NHDS has been collected every year since 1964 by the United States Department of Health and Human Services, National Center for Health Statistics. It is a national sample of all short-stay, non-Federal hospitals. Thus, all Federal, military, and Veterans Administration hospitals were excluded from the sample. To be eligible, a hospital is defined as a facility having at least six staffed beds. All hospitals in the United States that have 1000 or more staffed beds are included every year. The remaining hospitals have a 1 in 40 chance of being selected in any given year. The sample used in this study originally consisted of 504 hospitals. Of these facilities, 27 were eliminated because they did not fit the criteria mentioned above (bed size, etc.) or were no longer operating. An additional 29 hospitals chose not to participate in the survey, brining the total number of facilities to 448.

The data from the hospitals was complied through the use of medical records. Hospitals had the option of either manual or automated coding. A total of 41% of hospitals used the electronic coding system. For this method, the National Center for Health Statistics purchased the records from the hospitals themselves or from a state data tracking system. The remaining hospitals that used the manual system had the option to outsource their data

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management to the United States Census Bureau for processing, or use their own medical records staff. Of the manual coding group, 28% of hospitals used their own medical records staff. The final patient population collected through these methods included 330,210 individuals, of which 36,410 were newborns.

For the purposes of this analysis, all newborns (n=36,410) and patients 18 years of age or younger (n=31,444) were eliminated from the sample to ensure that subjects in the analysis had the potential to be covered by their own health insurance, and not that of their parents or guardians. The variables of interest in this study include source of hospital admission, race, and type of health insurance. For the dependent variable, source of hospital admission, 10 different categories were available for coding. These included: Physician referral, clinical referral, HMO referral, transfer from a hospital, transfer from a skilled nursing facility, transfer from other health facility, emergency room, court/law enforcement, other, or not available. Since there is no possibility of knowing the initial point of entry of patients who have already been admitted to the hospital and transferred to a facility participating in the study, these patients were eliminated from the data set. Also eliminated were those who entered the hospital through law enforcement or through other undocumented methods (n=93,285). For the independent variable, race of patient, eight different categories were available for coding: White, Black, American Indian/Alaska Native, Asian, Native Hawaiian or other Pacific Islander, Other, Multiple race stated, or not stated. For this analysis, those patients for which no race was stated were eliminated from the data set (n=61,468). Also, no measure of Latino ethnicity was provided in the data set, since Latinos are not considered a racial category. Finally, for the other independent variable, type of health insurance, 11 different categories were available for coding: Workers compensation, Medicare, Medicaid, other government payments, Blue Cross/Blue Shield, HMO/PPO, other private or commercial insurance, self pay, no charge, other, or not stated. For this analysis, those patients for which no insurance status was stated were eliminated

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from the data set (n=3,418). This brings the final sample size to be used in this analysis to n=104,185.

Results

For the purposes of this analysis, variables were recoded into dichotomous groups or, in the case of Race, three groups. For the dependent variable, Source of Admission, physician referral, clinical referral, and HMO referral were grouped together into a new group called referral. The frequencies are reported in Table 1.

Table 1 Percent Distribution of Source of Hospital Admission

Source of Admission	n	%
Emergency Room	60,779	58.3%
Referral	43,406	41.7%
Total	104,185	100%

For the independent variable of Race, American Indian/Alaska Native, Asian, Native Hawaiian or other Pacific Islander, and Other were recoded into a new group called Other, since no one racial group comprised more than 3.5% of the total sample. The frequencies are reported in Table 2.

Table 2 Percent Distribution of Race

Race	n	%
White	78,183	75.0%
Black	20,205	19.7%
Other	5,497	5.3%
Total	104,185	100%

For the other independent variable of Insurance Type, the coverage types were reduced into two categories: Government/Self-Pay and Private Insurance. The types of coverage included in the Government/Self-Pay category include: Medicare, Medicaid, other government payments, self-pay, no charge, and other. The types of coverage included in the Private

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Insurance include: Workers compensation, Blue Cross/Blue Shield, HMO/PPO, and other private or commercial insurance. The results are shown in Table 3.

Table 3 Percent Distribution of Patients by Insurance Type

Type of insurance coverage	n	%
Government/Self-Pay	64,114	61.5%
Private Insurance	40,071	38.5%
Total	104,185	100%

Bivariate chi-square analyses were conducted to look at differences between groups within both independent variables in relation to the dependent variable, source of hospital admission.

As can be seen in Table 4, a chi-square test found a significant association between race and source of admission to the hospital ($p \leq .0001$). To determine what differences existed between racial groups, a one-way analysis of variance (ANOVA) with a Bonferroni post-hoc analysis was performed. The results show no significant difference between White patients and patients of Other races ($p < .463$). However, significant differences were found between both White and Black patients ($p \leq .0001$) and between Black and patients from Other racial groups ($p \leq .0001$). Therefore, we can conclude that Black patients have significantly more hospital admissions through the emergency room than both White patients and patients of Other races.

Table 4 Percent Distribution of Hospital Admission Source by Race

	Race		
Admission Source	White (n=78,183)	Black (n=20,505)	Other (n=5497)
Emergency Room	55.8%	69.1%	56.6%
Physician Referral	44.4%	30.9%	43.4%
Total	100%	100%	100%

Chi-square value = 1216.515 df = 2, $p \leq .0001$

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Again, using a chi-square test, Table 5 shows significant difference was found between type of insurance and source of admission to the hospital. Those on government insurance or paying on their own (65.8%) are significantly more likely to enter the hospital through the emergency room than through referral from a physician (46.5%) ($p \leq .0001$).

Table 5 Percent Distribution of Hospital Admission by Insurance Type

	Type of Insurance	
Admission Source	Govt./Self-Pay (n=64,114)	Private Insurance (n=40,161)
Emergency Room	65.8%	46.5%
Physician Referral	34.2%	53.5%
Total	100%	100%

Chi-square value = 3776.395 df = 2, $p \leq .0001$

The analyses in Table 6 show an interesting result. Using chi-square analysis, there is a consistent significant association between Race and Source of Admission. Regardless of insurance status, racial differences exist for both patients on Government Insurance or Self-Pay (chi-square value = 500.916 df = 2, $p \leq .0001$) and patients with Private Insurance (chi-square value = 545.590 df = 2, $p \leq .0001$). To determine what differences existed between racial groups, a one-way analysis of variance (ANOVA) with a Bonferroni post-hoc analysis was performed for patients on government insurance or self-payment. The results show no

Table 6 Percent Distribution of Race by Source of Hospital Admission, Controlling for Insurance Type

	Type of Insurance					
	Govt./Self-Pay*			Private Insurance**		
	Race					
	White (n=46,799)	Black (n=13,839)	Other (n=3,476)	White (n=31,384)	Black (n=6,666)	Other (n=2,021)
Source of Admission						
Emergency Room	63.5%	73.7%	65.0%	44.0%	59.5%	42.3%
Physician Referral	36.5%	26.3%	35.0%	56.0%	40.5%	57.7%
Total	100%	100%	100%	100%	100%	100%

* Chi-square value = 500.916 df = 2, $p < .0001$ ** Chi-square value = 545.590 df = 2, $p < .0001$

significant difference between White patients and patients of Other races ($p < .214$). However, significant differences were found between both White and Black patients ($p \leq .0001$) and between Black and patients from Other racial groups ($p \leq .0001$). The same post-hoc analysis was performed on patients with private insurance. Again, the results show no significant difference between White patients and patients of Other races ($p < .392$). However, significant differences were found between both White and Black patients ($p \leq .0001$) and between Black and patients from Other racial groups ($p \leq .0001$). Therefore, we can conclude that Black patients, regardless of insurance status, have significantly more hospital admissions through the emergency room than both White patients and patients of Other races.

Based on the results discussed above, it is difficult to differentiate what factor contributes most to using the emergency room as a source of admission. A racial difference does exist, with Blacks using the emergency room more than Whites or Other racial groups as a source of admission to the hospital. However, a difference was also found for insurance status,

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with those on government insurance or paying on their own entering the hospital through the emergency room at higher levels than those with private insurance. To find out which factor has a greater influence on source of admission, a logistic regression was performed, with the dichotomous variables, White (vs. non-white), Other (vs. non-other), and insurance status (govt./self-pay vs. private insurance) being regressed upon source of hospital admission through physician referral.

Table 7 Logistic Regression Coefficients of Race and Insurance Type on Source of Hospital Admission

	Race**			**Race and Insurance*****		
Predictors	**Coefficient**	**S.E.**	**Exp(B)**	**Coefficient**	**S.E.**	**Exp(B)**
White	.578*	.017	1.782	.536*	.017	1.709
Other	.538*	.031	1.713	.522*	.032	1.685
Insurance Type (1=private insurance				.776*	.013	2.173
Constant	-.804*	.015	.447	-1.080*	.016	.340

*p < .0001, ** R2 = .012, *** R2 = .045

The model above shows highly significant coefficients, producing results that show both racial differences and insurance status differences for source of hospital admission. Specifically, White patients are significantly different from Blacks in terms of source of hospital admission. The directionality of the coefficient shows that White patients have significantly greater odds of being admitted to the hospital through referral than through the emergency room (B = .578, $p \leq .0001$). The same relationship was found for patients of Other races in comparison to Black patients (B = .538, $p \leq .0001$). However, this model was extremely weak in predicting Source of Admission to the hospital, $R^2 = .012$. The variable Insurance status was added to the model, and a statistically significant relationship was found (B = .776, $p \leq .0001$),

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indicating that patients with private insurance have significantly greater odds of being admitted to the hospital through referral than through the emergency room. Again, this model was not a strong predictor of Source of Admission, $R^2 = .045$. In an attempt to further understand the factors that affect Source of Admission, it was decided that more variables would be added to the model in an attempt to account for more than 4.5% of the variance in Source of Admission to the hospital.

Added to the model were the demographic variables of Sex and Age and variables that assessed hospital characteristics. These included Hospital Type and Hospital Size. Tables 8-11 show the percent distributions for these new variables.

Table 8 Percent Distribution of Sex

Sex	**n**	**%**
Male	40,078	39%
Female	63,307	61%
Total	104,185	100%

Table 9 Percent Distribution of Age

Age Range	**n**	**%**
19-29	12,625	12.2%
30-39	14,316	13.8%
40-49	13,744	13.3%
50-59	13,536	12.9%
60-69	14,044	13.5%
70-79	18,485	17.7%
80-89	14,047	13.4%
90-99	3,388	3.2%
Total	104,185	100%

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Table 10Percent Distribution of Hospital Type

Hospital Type	n	%
For Profit	6,438	6.2%
Government, non-Federal	13,478	12.9%
Non-Profit, including religious	84,269	80.9%
Total	104,185	100%

Table 11 Frequencies, Hospital Size (total number of staffed beds)

Number of Beds	n	%
6-99	11,516	11%
100-199	26,604	25.5%
200-299	19,970	19.2%
300-499	29,138	28%
500+	16,957	16.3%
Total	104,185	100%

The variables assessed above: Sex, Age, Hospital Type, and Hospital Size were included in another logistic regression analysis, along with the original independent variables of Race and Insurance Type. Again, these variables were regressed upon the dependent variable of Source of Admission, physician referral. The results are shown in Table 12.

All of the coefficients in the above analyses were significant. The model which included the additional variables accounted for a considerable amount of variance when compared to the previous models, $R^2 = .099$. The results show that White patients ($B = .741$, $p \leq .0001$) and patients of Other races ($B = .479$, $p \leq .0001$) have significantly greater odds of entering the hospital through referral as opposed to Black patients. We also see that patients on private insurance ($B = .431$, $p \leq .0001$) have significantly greater odds of entering the hospital through

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referral than those on government assistance or self-payment. Patients who seek treatment at larger hospitals, 500+ beds (B = .346, p ≤ .0001) and 300-499 beds (B = .286, p ≤ .0001) have significantly greater odds of entering the hospital through referral than patients who seek treatment at smaller hospitals. However, patients at medium sized hospitals, 200-299 beds (B = -.103, p ≤ .0001), have significantly lower odds of entering the hospital through referral than

Table 12 Logistic Regression Coefficients of Race and Insurance Type and Other Potential Intervening Variables on Source of Hospital Admission

	Race[1]			Race and Insurance[2]			Race, Insurance, and other Variables[3]		
Predictors	**Coefficient**	**S.E.**	**Exp (B)**	**Coefficient**	**S.E.**	**Exp (B)**	**Coefficient**	**S.E.**	**Exp (B)**
White	.578*	.017	1.782	.536*	.017	1.709	.741*	.018	2.099
Other	.538*	.031	1.713	.522*	.032	1.685	.479*	.033	1.614
Insurance Type (private ins. = 1)				.776*	.013	2.173	.431*	.015	1.583
Sex (female = 1)							.501*	.014	1.650
Hospital size									
200-299							-.103*	.019	.902
300-499							.286*	.017	1.331
500+							.346*	.020	1.414
Hospital Type									
							-.958*	.034	.384
Government									
Non-Profit							-.874*	.028	.417
Age							-.020*	.000	.981
Constant			.447			.340	.409*	.040	1.505

*p < .0001, 1R2 = .012, 2 R2 = .045, 3 R2 = .099

those who seek treatment at smaller hospitals. Also, patients who seek care at a Government-owned hospital (B = -.958, p ≤ .0001) and those patients who seek care at a Non-Profit hospital (B = -.874, p ≤ .0001) have significantly lower odds of entering the hospital through referral than patients who seek care at a For Profit facility. Finally, younger patients (B = -.020, p ≤ .0001) have significantly lower odds of entering the hospital through referral than older patients. As stated earlier, all of the coefficients were significant, which can be attributed in part to the

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large sample size of 104,185 patients. Therefore, it is difficult to determine which variable, Race or Insurance Type, has a greater influence on Source of Admission to the hospital. To get at what effects are actually at play, a careful interpretation of the results is needed.

Discussion

As mentioned previously, the effects of sample size should not ignored in interpretation of the results. Although statistical significance is the measure of change or difference between to groups, means, outcomes, or measures, practical significance is just as important. This sample is very large, and therefore all chi-square analyses and logistic regression coefficients have significance levels of $p \leq .0001$. Thus, practical significance becomes evident when looking at the R^2 results. The finding that nine independent variables can be entered into a logistic regression analyses and only account for 9.9% of the variance is surprising, considering the strong statistical significance of the coefficients.

The hypothesis of this study: Racial differences in access to healthcare, as measured by source of hospital admission, will be mediated by differences in health insurance status could be answered simply by looking at a few of the analyses. Table Four shows the anticipated racial differences, as stated in the hypothesis, with Black patients having significantly higher emergency room hospital admission rates than Whites (69.1% vs. 55.8%, $p \leq .0001$). Table Five, then, supports the idea that those patients on government insurance or self-payment use the emergency room as a source of entry at a significantly higher level than those on private insurance (65.8% vs. 46.5%, $p \leq .0001$). Thus, having established both predictions stated in the hypothesis, multivariate analyses should confirm the prediction. Table Six, in which a chi-square analysis was performed on Race and Source of Admission, controlling for Insurance Type, there is a consistent significant association between Race and Source of Admission. Regardless of insurance status, racial differences exist for both patients on Government Insurance or Self-Pay and patients with Private Insurance. Black patients, as opposed to White patients or patients of

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Other races, were less likely to be admitted to the hospital via referral. However, this result is not as supportive of the hypothesis as it looks at first glance. Across all races, those on government insurance or self-payment use the emergency room at a much higher level than those patients on private insurance. In one final attempt to investigate the hypothesis that racial differences are mediated by insurance status, logistic regression analyses were used, and the results in Tables Seven and Twelve do not support the hypothesis, since all variables significantly contributed to the model.

Since the analyses have not resulted in a clear-cut acceptance or rejection of the hypotheses, that Insurance Type is a stronger predictor, and thus, mediates Racial differences on of Source of Hospital, predicted probabilities using the sum of coefficients will be calculated, varying the age, race, and insurance status of hypothetical patients in the equation, to see which variables produce stronger probabilities.

The formula of the equation to be used is $e^x/1+e^x$, with $x=B_0+B_1(age)+B_2(sex)+B_3(race)+B_4(Insurance\ Type)+B_5(Hospital\ Type)+B_6(Hospital\ Size)$. This formula will tell us the probability of a patient, based on the included characteristics, of entering the hospital through referral (1) versus the emergency room (0).

The first set of equations will control for Age, Sex, Insurance Type, Hospital Size, and Hospital Type while varying race.

(.409) + (-.020)(40) + (.741)(0) + (.501)(1) + (.431)(0) + (-.103)(0) + (-.874)(1) = -.764
$e^{-.764}$ = .4658 .4658/1.4658 = 31.8%

Thus, the probability of a 40 year old Black woman on government insurance seeking treatment at a small, non-profit hospital has a 31.8% probability of being admitted through referral. The same equation was computed for a 40 year old white woman.

(.409) + (-.020)(40) + (.741)(1) + (.501)(1) + (.431)(0) + (-.103)(0) + (-.874)(1) = -.023
$e^{-.023}$ = .9773 .9773/1.9773 = 49.4%

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Here, it is shown that comparing racial groups while holding other variables constant, there is 17.6% difference between the odds of a 40 year old White woman, being admitted to the hospital through referral, as opposed to a Black woman (Black 31.8% vs. White 49.4%). To check for differences in insurance type, the same equation was computed, but the Race variable was held constant. The equation below includes a 40 year old woman with government insurance, seeking care at a small, Non-Profit hospital.

$$(.409) + (-.020)(40) + (.741)(0) + (.501)(1) + (.431)(0) + (-.103)(0) + (-.874)(1) = -.764$$
$$e^{-.764} = .4658 \quad .4658/1.4658 = 31.8\%$$

Thus, the probability of a 40 year old woman on public insurance seeking care at a small Non-Profit hospital as a 31.8% probability of being admitted through referral. The same equation was computed for a woman on private insurance.

$$(.409) + (-.020)(40) + (.741)(0) + (.501)(1) + (.431)(1) + (-.103)(0) + (-.874)(1) = -.333$$
$$e^{-.333} = .7168 \quad .7168/1.7168 = 41.8\%$$

Here we see a difference for insurance type, with a 40 year old woman, with private insurance seeking care at a small Non-Profit hospital having a 41.8% probability of being admitted through referral.

Taking these probability equations into consideration, we can conclude that when controlling for Race, there is a 10% difference between the probabilities of a 40 year old woman with private insurance being admitted to the hospital through referral, as opposed to a 40 year old woman on government insurance (Govt./Self-Pay 31.8% vs. Private Insurance 41.8%). However, when Insurance Type is held constant and we are looking at differences in probabilities between White and Black patients, the difference is a robust 17.6%. A breakdown of these results can be seen in Table 13. This result would not support the hypothesis that Insurance Type mediates the differences seen in hospital admission for patient's Race. What is found is that, regardless of Insurance Type, Race is a significant factor in predicting Source of

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Admission to the hospital. Therefore, Race and Insurance Type are significant, independent predictors of Source of Admission to the hospital.

Table 13 Predicted Probabilities of Hospital Admission Through Physician Referral

	40 year old female, government insurance, small, non-profit hospital	40 year old female, private insurance, small, non-profit hospital
Race		
Black	31.8%	-
White	49.4%	-
No Race	31.8%	41.8%

Conclusion

The results of this study do little to untangle the relationship between race, insurance and access to healthcare. In the literature reviewed previously, both race and insurance status are predictors of higher levels of chronic conditions (Billings et al., 1993). In other studies race has been found to be predictive of delays in seeking care (Goldberg et al., 1999), while lack of insurance has been shown as a barrier to accessing primary care for even the most minor of ailments (Iserson and Kastre, 1996). In this study, both race and insurance status have been found to predict higher levels of emergency room admissions. Specifically, Black patients and patients without health insurance or on government insurance have higher levels of emergency room admission. This could be interpreted several ways. This finding may be indicative of the factors mentioned in the literature, that there is an effect for race and insurance status on accessing healthcare. An alternative, and very plausible explanation, is that patients in this sample who were admitted through the emergency room, truly had emergent conditions. This was not assessed in the analysis.

Several other limitations of this study warrant mention. First, Hispanic ethnicity was not measured in the study. Hispanic and/or Latino are not racial categories, but ethnic groups. There was a question on the initial survey assessing Hispanic ethnicity, but the results were not

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included in the data set. Thus, the Other race category does not include any data on Hispanics. Second, 226,025 patients were eliminated from the data set, either for missing data, age under 18 years old, or being admitted to the hospital from sources other than the emergency room or physician referral. Three categories of Source of Admission were eliminated: Transfer from a hospital, transfer from a skilled nursing facility, and transfer from another health facility. Unfortunately, why these patients were transferred to their current hospital and how they were admitted to their initial facility was not assessed. A total of 10,019 patients over the age of 18 were deleted because their source of admission was transfer.

Although this study had several limitations and the relationship between the variables of race, insurance status, and source of hospital admission predicted in the hypothesis did not exist, an important finding did result. Specifically, the relationship between race and insurance type, which could be used as a proxy for socioeconomic status, is complex and difficult to assess. Studies like this, and those reviewed in the literature; repeatedly show differences in healthcare access for both minorities and poor people. However, if one is truly break ground, a study that attempts to answer "why" these differences exists as opposed to "if", will truly break ground. If we know why poor White patients have more hospital admissions through referral than poor Black patients, advances in improving access to healthcare for all people of all socioeconomic levels will follow.

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