

Why ethnic designation matters for stroke rehabilitation: Comparing VA administrative data and clinical records

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Abstract—Using existing administrative data to look at issues of ethnic disparities in rehabilitation-related outcomes may lead to misleading results. Problems can emerge from apparently small issues of reliability that are magnified by reclassification of ethnic designation and missing data in complete-subject analyses. We compared the reliability of ethnic assignment in Department of Veterans Affairs (VA) medical rehabilitation records for stroke patients with administrative records; reclassified the racial identifier from the administrative data in two ways; and examined the different sources of ethnic information in relation to severity, length-of-stay, disability assessment, and discharge disposition. Our results show how small changes increase the potential for Type II error when describing ethnic differences in outcomes or using ethnicity as a predictor with dichotomous response variables. We discuss our results with reference to the literature on ethnic classification and underline the importance of initiatives for improved data collection on ethnicity in VA data sources and in rehabilitation research.

Key words: administrative medical records, ethnic groups, outcomes research, reliability.

INTRODUCTION

The reliability of ethnic and racial reporting in administrative data is a matter of concern, particularly as initiatives to meet the challenges of healthcare disparities remain priorities on the national agenda [1,2]. Even

where disparities in care are well documented, the causes behind differentials in utilization and outcomes have frequently remained elusive, in part due to the complex nature of ethnicity as an epidemiologic variable that collapses

Abbreviations: ANOVA = analysis of variance, FIM = Functional Independence Measure, FIM-FRG = Functional Independence Measure function-related group, FSOD = Functional Status and Outcomes Database, ISOD = Integrated Stroke Outcomes Database, LOS = length of stay, PTF = patient treatment files, UDSMR = Uniform Data System for Medical Rehabilitation, VA = Department of Veterans Affairs, VHA = Veterans Health Administration.

This material was based on work supported in part by an Associated Health Professions Postdoctoral HSR&D Fellowship (J. P. Stansbury). The development of the medical rehabilitation data was supported under Department of Veterans Affairs (VA) ROC 01-124, Rehabilitation Outcomes Research Center for Veterans with Central Nervous System Damage, jointly supported by Veterans Health Service Rehabilitation Research and Development and Health Services Research and Development.

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culture, class, and ancestry [3–5]. The situation for Department of Veterans Affairs (VA) stroke rehabilitation is of particular concern, where well-documented national trends in stroke mortality, morbidity, and severity showing disparities in the burden of disease [6–8] contrast with salutary patterns in veterans' acute stroke care showing a decided lack of statistically or clinically significant ethnic variation in procedure and service utilization [9]. A need exists for both new investigations into ethnic variation in rehabilitation and secondary analyses of existing data, as a complement to existing work analyzing or touching on ethnicity and stroke-related disability [10–22]. A need exists for both new investigations into ethnic variation in rehabilitation and secondary analyses of existing data.

Toward contributing to this latter goal, we first examined the reliability of ethnic reporting between medical records for inpatient rehabilitation and a centralized administrative database for Veterans Health Administration (VHA) inpatient rehabilitation stroke patients. We next investigated whether changes in the source of ethnic designation altered the strength and significance of the association between ethnicity and measures of rehabilitation assessment and outcome. In these analyses, we also considered reassignment of ethnic identifiers, a matter of concern since the ethnic categories in administrative databases may vary from those in other data sources, requiring reclassifications for secondary analyses.

METHODS

From the Functional Status and Outcomes Database (FSOD), a core element in the evolving Integrated Stroke Outcomes Database (ISOD), we selected the total sample of 3,105 unique patients having both medical records for inpatient rehabilitation and an entry in the VA administrative data for FY 2001. The VA FSOD stroke extract, at present available only for this initial year, is drawn from the Uniform Data System for Medical Rehabilitation (UDSMR) database [23,24], with patients receiving treatment in VA inpatient rehabilitation facilities included on the basis of stroke-related impairment codes. Records include patients from 50 states, Washington, D.C., and Puerto Rico, from 121 VA facilities. Ethnic and racial identification is recorded in the FSOD as one of five categories: white, black, Asian, Native American, or Hispanic.

The FSOD records were merged with the main patient treatment files (PTF) maintained by the VHA. To maximize the capture of ethnic identifiers in the PTF data, we matched records from FY 2001 with previous and subsequent years (FY 2000 and FY 2002), substituting the designations found in those records for unknown values. In the PTF records, 2,947 of the matched patients had an entry for one of six categories for the variable race, and the remaining 158 coded as unknown. Ethnicity is identified by the variable "race" in existing years of the PTF, with six categories including white, black, Hispanic white, Hispanic black, American Indian, Asian, and unknown.

To compare agreement between databases for ethnicity and to look at how a slight shift in ethnic definition might influence reliability, we recoded the race variable from the PTF in two ways. The category Hispanic black from the administrative data was recoded both as Hispanic, presuming an ethnic and cultural designation, and as black, a characterization denoting social race or a presumption of ancestry based on physiognomy. This category accounted for 22, or just 0.71 percent, of the observations. Hispanic white was recoded as white. The two recoded versions of PTF ethnicity were cross-tabulated with ethnic designation from the FSOD to measure exact concordances and calculate kappa, a measure based on the degree of agreement that exists in excess of what might be expected by chance. Kappa and concordances were also calculated for each of the ethnic groups using 2×2 cross-tabulation. For these analyses, missing values, including the category unknown from the PTF, were treated as the nondesignated ethnic classification.

In addition to the reliability study, we conducted a series of bivariate analyses measuring the association between ethnicity and rehabilitation assessment or outcome measures drawn from the FSOD. Each of the analyses was completed using the three different assignments (FSOD, PTF-cultural, and PTF-racial) with three of the ethnic categories (white, black and Hispanic). Categorical dependent variables included Functional Independence Measure function-related group (FIM-FRG) assignment on admission and discharge living setting. The FIM-FRG for stroke is a nine-category case adjustment rating based on a branched algorithm that takes into account a patient's admission Functional Independence Measure (FIM) motor score, FIM cognitive score, and age [25]. The FIM includes 18 questions in 6 domains of independence scored on a 7-point scale. The domains

include self-care, sphincter control, transfers, locomotion, communication, and social cognition; the motor score comprises the first four domains, and the latter two constitute a measure of cognition [26,27]. We also compared continuous outcomes, including length of stay (LOS), total discharge FIM scores, and discharge FIM motor scores, stratified by ethnic designation of the patient.

Analyses were limited to individuals identified as white, black, or Hispanic to assure adequate numbers of observations for each group in the analyses. Binary logistic regressions—and in the case of the unmodified FIM-FRG assessment, ordinal logistic regression—were used to analyze the effects of ethnicity on categorical response variables. FIM-FRG was also treated as a dichotomous variable (i.e., greater severity/less severity), grouping cases by those having an assessment from 1 to 4 and those rated 5 to 9. We compared numeric outcomes for different ethnic designations with analysis of variance (ANOVA), using the SAS general linear models procedure to compare the unbalanced ethnic subsamples (SAS statistical analysis software, version 8.2, SAS, Cary, NC). Finally, we calculated posthoc power analyses using SPSS Sample Power 2.0 (SPSS, Inc., Chicago, IL) for one set of the binary logistic regressions to graphically demonstrate the complication emerging from slight changes in group proportion and event rate accompanying misclassification and reclassification.

RESULTS

There were 2,727 exact matches, or an 87.8 percent concordance between the rehabilitation records and the administrative data with the cultural reassignment of black Hispanic to Hispanic. The reliability measure for this comparison was good ($\kappa = 0.79$), just slightly better than the measure for the racial reassignment ($\kappa = 0.78$). The proportion of matched observations between data sets with black Hispanic recoded as black was 87.4 percent.

Measures of reliability for the different ethnic categories that use the PTF reassignment procedures are also presented in **Table 1**. Taking medical rehabilitation records as reference, we found that the proportions of matching designation were highest for Hispanics and whites. However, the reliability statistics were better for Hispanics and blacks, due to the large number of patients listed as white in the clinical record who had missing

values for ethnicity in the administrative database. Further, in a comparison of racial reassignment of PTF black Hispanic patients with cultural reassignment, agreement for Hispanics dropped from 90.0 percent to 83.1 percent, with 17 fewer concordant observations resulting from reclassifying 22 individuals as black. Native Americans and Asians had the lowest concordance between the medical record and the administrative database, although their numbers were small among VA stroke inpatient rehabilitation patients.

Logistic regressions for admission FIM-FRG assessment and discharge living setting by ethnicity are shown in **Table 2**. The ordinal logistic regression of FIM-FRG for all nine stroke case-mix categories by ethnicity was significant, using observations defined by all database classifications for ethnicity. Across all designations, blacks were from 15 to 20 percent more likely than whites to have a more severe FIM-FRG assessment, while Hispanics were consistently 80 percent as likely to be classified with greater disablement upon admission than whites.

This tendency held up when FIM-FRG was treated as dichotomous, with higher odds for a more severe assessment for whites and blacks than Hispanics. However, while the model Wald χ^2 result using ethnic definition from the FSOD was statistically significant, the results using two classifications of administrative data were marginally significant. This was most pronounced when relying on the PTF-racial categorization, potentiating a Type II error ($p = 0.078$).

Finally, Hispanics were as much as 2.4 times more likely to be discharged home from inpatient rehabilitation than whites, while blacks were only slightly more likely to be sent home than whites, analyses that remained highly significant across ethnic designations. Although the overall model significance did not visibly decline for discharge destination, the point estimates for blacks and Hispanics were reduced in the models using administrative data for ethnicity.

The ANOVAs for continuous rehabilitation outcome measures stratified by the alternative ethnic classifications also show how results can vary with less reliable ethnic designation (**Table 3**). Using our best information on ethnicity from the clinical record, we found that the differences among white, black, and Hispanic patients in rehabilitation LOS from the FSOD were significant ($p = 0.040$). Although means for LOS appeared comparable using the alternative PTF ethnic designations, the

Table 1.

Agreement between rehabilitation records (FSOD) and administrative (PTF) ethnicity data.

Ethnic Designation in FSOD	Number of Patients	Matched Designation (%)	Unmatched Missing (%)	Unmatched Ethnicity (%)	κ^*
White	2,015	1,842 (91.4)	122 (6.0)	51 (2.5)	0.78
Black	738	643 (87.1) [†] 647 (87.7) [‡]	28 (3.8)	67 (9.4) [†] 63 (8.8) [‡]	0.87 [†] 0.86 [‡]
Asian	18	11 (61.1)	0 (0.0)	7 (38.9)	0.66
Native American	10	4 (40.0)	0 (0.0)	6 (60.0)	0.44
Hispanic	249	224 (90.0) [†] 207 (83.1) [‡]	5 (2.0)	20 (8.2) [†] 37 (15.1) [‡]	0.89 [†] 0.86 [‡]
Unknown or Missing	75	3 (4.0)	—	72 (96.0)	—
Total	3,105	2,727 (87.8) [†] 2,714 (87.4) [‡]	155 (5.0)	223 (7.2) [†] 236 (7.6) [‡]	0.79 [†] 0.78 [‡]

FSOD = Functional Status and Outcomes Database

PTF = patient treatment file

*Agreement for individual ethnic categories calculated using FSOD as reference for 3,057 observations having matched observation in PTF. Missing/unknown values from FSOD and PTF treated as the nondesignated category in 2×2 tables. Total κ is based on complete 6×6 tables, including agreement for missing/unknown values.[†]Values reflect assignment of PTF "black Hispanic" designation as Hispanic (PTF-Cultural).[‡]Values reflect assignment of PTF "black Hispanic" designation as black (PTF-Racial).**Table 2.**Odds ratio (OR) (95% CI) and significance (Wald χ^2 , p -value) for FIM-FRG on admission and discharge living setting, by alternative administrative database designations for ethnicity.

Assessment/Outcome	FSOD		PTF-Cultural		PTF-Racial	
	OR (95% CI)	Wald χ^2 (p) [*]	OR (95% CI)	Wald χ^2 (p)	OR (95% CI)	Wald χ^2 (p)
FIM-FRG (All Categories 1–9)						
White	1.00		1.00		1.00	
Black	1.20 (1.02–1.40)	9.67 (0.013)	1.16 (0.98–1.37)	7.48 (0.024)	1.15 (0.98–1.35)	6.88 (0.032)
Hispanic	0.80 (0.63–1.02)		0.80 (0.63–1.03)		0.80 (0.62–1.03)	
FIM-FRG (High 1–4/Low 5–9)						
White	1.00		1.00		1.00	
Black	1.19 (0.99–1.43)	8.83 (0.012)	1.16 (0.96–1.39)	5.82 (0.054)	1.14 (0.95–1.37)	5.08 (0.078)
Hispanic	0.76 (0.57–1.01)		0.80 (0.60–1.05)		0.80 (0.60–1.07)	
Discharge Living Setting (Home/Other)						
White	1.00		1.00		1.00	
Black	1.12 (0.94–1.33)	29.07 (<0.001)	1.05 (0.88–1.26)	22.80 (<0.001)	1.06 (0.88–1.27)	23.40 (<0.001)
Hispanic	2.40 (1.74–3.30)		2.14 (1.57–2.93)		2.27 (1.63–3.16)	

CI = confidence interval

FIM-FRG = function-related group

FSOD = Functional Status and Outcomes Database

PTF = patient treatment file

^{*}Wald χ^2 tests the significance of the ethnicity effect.

differences were nonsignificant, largely due to slight changes in variance and unknown values being removed in these complete-subject analyses. The ANOVA results were nonsignificant looking across discharge FIM scores.

DISCUSSION

Agreement for the ethnic designation between inpatient rehabilitation records and the administrative data

Table 3.

Mean outcome values for major ethnic designations with ANOVA results, by alternative administrative database designations for ethnicity.

Outcome/Ethnic Group	FSOD			PTF-Cultural			PTF-Racial		
	Mean	SD	<i>n</i>	Mean	SD	<i>n</i>	Mean	SD	<i>n</i>
Length of Stay									
White	22.8	25.0	1,908	22.8	25.3	1,874	22.8	25.3	1,874
Black	25.1	31.3	713	24.7	30.8	659	24.5	30.4	680
Hispanic	20.5	19.8	223	20.6	21.1	223	20.9	21.9	202
	<i>F</i> = 3.23 0.0397		2,844	<i>F</i> = 2.32 0.098		2,756	<i>F</i> = 1.82 0.1621		2,756
Discharge Total FIM Score									
White	88.8	32.7	1,875	88.7	32.8	1,827	88.7	32.8	1,827
Black	89.3	32.0	688	88.9	32.1	631	89.0	32.0	652
Hispanic	92.5	28.0	236	92.9	27.2	236	93.0	26.9	215
	<i>F</i> = 1.41 0.2446		2,799	<i>F</i> = 1.75 0.1734		2,694	<i>F</i> = 1.72 0.1791		2,694
Discharge FIM Motor Score									
White	62.7	25.1	1,876	62.5	25.1	1,828	62.5	25.1	1,828
Black	62.9	24.9	688	62.5	24.9	631	62.5	24.8	652
Hispanic	65.2	21.6	236	65.6	21.0	236	65.8	20.8	215
	<i>F</i> = 1.04 0.3535		2,800	<i>F</i> = 1.70 0.1838		2,695	<i>F</i> = 1.75 0.1742		2,695
ANOVA = analysis of variance					PTF = patient treatment file				
FSOD = Functional Status and Outcomes Database					FIM = Functional Independence Measure				
SD = standard deviation									

was weaker for all nonwhite ethnic groups as measured by the frequency of misclassification (i.e., gross concordances), a tendency noted in previous work examining the reliability of ethnic classification [28,29]. Native Americans and Asians were the most frequently misclassified individuals in the administrative records, a trend also noted in other studies [30,31]. Agreement was further reduced when those classified as black Hispanic in the administrative data were reclassified as black rather than Hispanic. The high frequency of missing or unknown designation in the PTF for race among patients identified as white in the FSOD resulted in a lower measure of agreement for white ethnic designation than for blacks and Hispanics in this study. Overall, our measures of agreement between stroke rehabilitation records and a VA administrative database for this stroke cohort were lower than those for demographic comparisons based on randomly selected medical records [32].

The low measures for reliability in identifying Native American and Asian veterans' ethnicity are a matter of particular concern. The figures reflect the small representation

of these groups in the FY 2001 stroke cohort, and the results should be interpreted with caution. We are limited in this regard by dealing with a new database having a single year of capture, and anticipate that more reliable information about stroke rehabilitation outcomes for the least represented groups will improve as the ISOD develops across several years. However, there is a strong possibility that relatively reduced reliabilities are to be expected with the use of historical administrative data, given the smaller overall representation of Asian and Native Americans in the veteran population. This expectation is based on a generality applicable to all classification systems—that less frequent events (in this case, the arrival of an Asian or Native American veteran in the clinic) are more prone to inter-rater variation [33]. The most recent work comparing VA administrative data with self-reported designation verifies low rates of agreement for the least-represented ethnic groups, and that more frequent use of the system is predictive of agreement [34].

It is important to note that our use of the FSOD as a reference is based on its status as a computerized medical

record. Data entry for the UDSMR is restricted and a clinician, most often the patient's physical or occupational therapist, enters the information including ethnic designation. Ethnic determination and entry of that information in the PTF in the past has been more variable. While the conventional wisdom has been that a provider entered information for inpatients and that ethnicity was self-reported for VA outpatient files, there has been more variation in practice. Ethnicity may have been self-reported by the patient, determined by a ward clerk, or assessed by a clinician; and then it may have been subsequently entered by a representative of the medical information service at the facility. Only recently, the VA has moved to ensure standardization of self-reported ethnicity within a two-question ethnic and racial format [35], bringing the PTF and VA reporting into conformity with the Office of Management and Budget and Department of Health and Human Services guidelines [36].

Broad consensus has emerged that the closest approximation to an adequate standard for ethnic assignment in health services research and clinical epidemiology should be based on self-report [4,33,37,38]. One recent study comparing self-report with medical records in two hospitals found not only that third-party assignments are unreliable, but also that forced choice responses were often inconsistent with the self-identification of patients [39], echoing the perspective that ethnic and racial classification is frequently a moving social target [33]. For studies involving primary data collection, self-identification of ethnic affiliation has become a preferred alternative that authors suggest should be the standard for adequate assessment of ethnic and racial disparities in care [29,40]. We anticipate that self-report of ethnic information in the VA system will enhance the reliability of administrative records, even as we recognize continued problems rooted in the conceptual validity of race [41–45].

An additional concern emerges from analyses using historical race designations from the administrative data. Among these stroke rehabilitation patients, we found African Americans to have average greater severity on admission and longer LOS than both Hispanics and those classified as white. However, the conjugation of errors from missing data, misclassification, and the reclassification used in this study brought small changes to effect sizes that altered the statistical significance of the results. The reason for this can be seen most clearly where FIM-FRG was treated as a dichotomous outcome, shown graphically in **Figure 1**, based on posthoc power analyses

of the logistic regressions in **Table 2**. The curves show the sample needed to reject the null hypothesis that the rate of high FIM-FRG is the same in all three groups (i.e., that the odds ratio for any comparison is 1.0) at the specified subsample proportions and event rates. The top curve projects power based on the FSOD analysis, the middle curve is based on the PTF-cultural analysis, and the bottom curve reflects analysis with the same observations where PTF-identified black Hispanics are identified as black. Power for the regression of dichotomous FIM-FRG by the PTF-racial designation for three categories was 55 percent, compared with a power of 73 percent using the medical record designations. This decrease in power resulted from an increase of just 2 percent in the rate of high FIM-FRG detected for Hispanics, coupled with slight changes in ethnic proportions and reduction in sample size. The attenuated significance in the analyses using PTF-based designations reflects this loss of power that can be particularly acute with a dichotomous response. Our results parallel caveats about the potential for Type II error in clinical rehabilitation studies, and more general concerns about over-interpreting the meaning of significance tests [46,47].

The comparison of average LOS for different ethnic groups also reflects this concern in looking at measures that have considerable policy relevance. Overall, both the ANOVA results and the logistic regressions reflect the problem of nondifferential misclassification—in this case with a demographic “exposure” having more than two levels—that can lead to underestimation, and in some cases overestimation, of the strength of an association [48].

CONCLUSIONS

Misclassification and missing data for ethnicity suggest caution in using administrative data for assessing differences in rehabilitation outcomes and ethnic disparities. However, an awareness of the limitations should not lead us to rule out the use of this valuable resource. As a means for dealing with missing information in clinical data sets like the FSOD, substitution from administrative sources has been suggested as a viable solution [49], and health services researchers have noted how secondary data can be a “value-added feature of primary data collection efforts” [50]. The inverse procedure is a possibility for improving analyses with incomplete administrative databases, as well as the common procedure of seeking

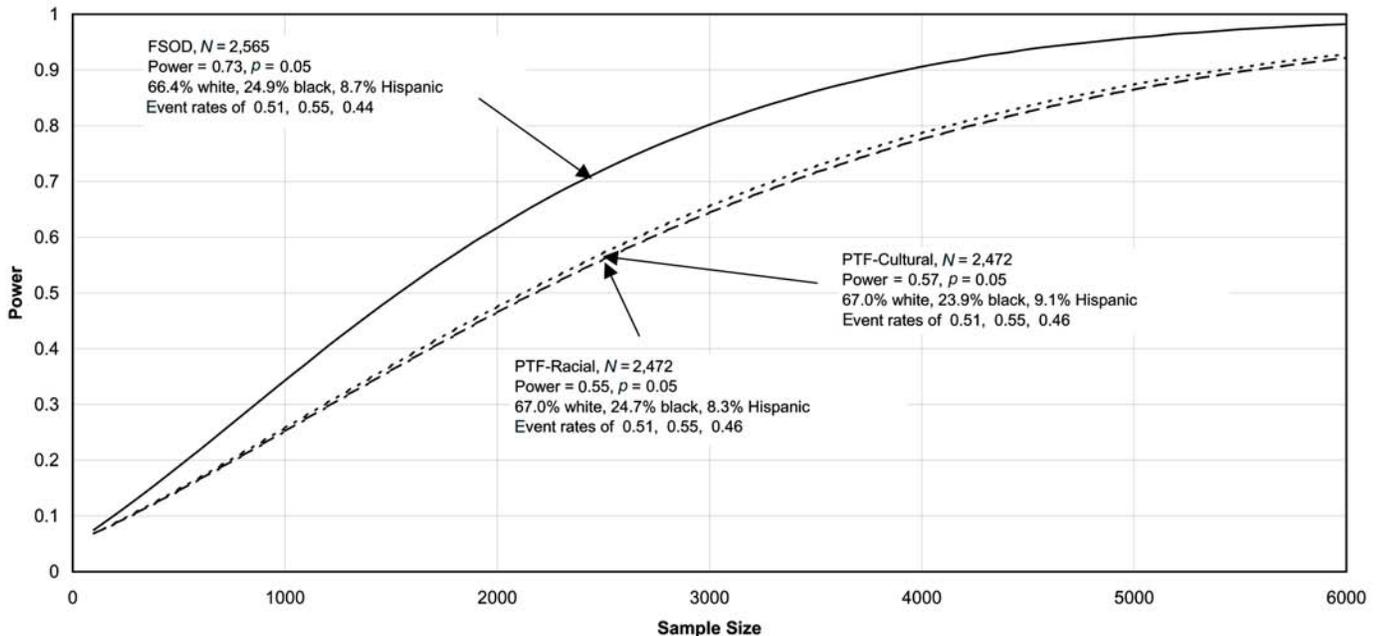


Figure 1.

Power analyses for logistic regressions of dichotomous Functional Independence Measure function-related group (FIM-FRG) by ethnic designation. Curves show differences in power with changes in group proportions and in rates of higher FIM-FRG categories within group.

information from previous years, subsequent years, and other admissions. In the absence of reliable substitute information, complete subject analysis may remain the best alternative given the questionable validity of trying to impute ethnic designation [51].

In classifying ethnicity and race, we find ourselves challenged with a sociodemographic predictor where there is no ultimate gold standard, nor categories that are mutually exclusive and valid [28,31]. Nonetheless, the standardization of ethnic categories based on self-report provides improvements over the existing data. Certainly the stakes for providing the best approximation for ethnic designation are high. Evidence for ethnic disparities in the burden of disease for stroke as measured by incidence, mortality, and severity are unambiguous, while gauging the potential for disparities in the burden of disability will remain the task of continued research. Part of that research will rely on the use of administrative data.

ACKNOWLEDGMENTS

We acknowledge the funding of VA ROC 01-124, jointly awarded by Veterans Health Services Rehabilitation

Research and Development for the development of the data used. The first author is supported by an Associated Health Professions Postdoctoral Fellowship from Health Services Research and Development. We thank Nancy Kressin, Gary Becker, Bruce Vogel, Haijing Qin, and the *JRRD* reviewers for their helpful suggestions.

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Submitted for publication April 4, 2003. Accepted in revised form October 8, 2003.

