

Appendix: Supplementary tables [posted as supplied by author]

Reconciling race/ethnicity identification from multiple admission records

We used longitudinal data (2004-2010) on inpatient admissions for patients to reconcile race/ethnicity data across all admission records (i.e., not only the admissions during which the index knee and hip replacement procedures were performed). In case of dissimilar race/ethnicity reported in multiple admission records for a patient, we assign the race/ethnicity identified in the latest admission record. If race/ethnicity is unidentified (unknown or missing) in a admission record, then the race/ethnicity identified in the latest admission record is assigned. Following table indicates that reconciling longitudinally results in a decrease in missingness of race/ethnicity from 1.7% to 1.1% in MA and from 3.7% to 1.9% in the comparison states (NY, NJ and PA). We see that majority of the patients with missing race/ethnicity in their admission record were reassigned as white in both MA (81%) and comparison states (78%); consequently, the distribution of the overall patients among minority groups is virtually unchanged.

Table A. Original and reconciled race/ethnicity for patients with hip or knee replacement surgery, 2004-2010

	MA				Comparison States			
	Original		Reconciled		Original		Reconciled	
Whites	31858	89.5%	32013	90.0%	156219	80.4%	159014	81.9%
Blacks	1769	5.0%	1780	5.0%	18634	9.6%	18948	9.8%
Hispanics	784	2.2%	820	2.3%	6906	3.6%	6759	3.5%
Other	584	1.6%	585	1.6%	5206	2.7%	5817	3.0%
Unknown	592	1.7%	389	1.1%	7256	3.7%	3683	1.9%
Total	35587	100%	35587	100%	194221	100.0%	194221	100.0%

Table B. Distribution of admission records with previously “unknown” race/ethnicity and reassigned race/ethnicity

	MA		Comparison States	
	#	%	#	%
Whites	164	81%	2,822	78%
Blacks	17	8%	347	10%
Hispanics	15	7%	198	6%
Other	7	3%	231	6%
Total	203	100%	3,598	100%

Reconciling is infeasible for patients with only one hospitalization during the longitudinal study period. However, following table indicates that racial/ethnicity distribution (original) of such patients is similar to that of patients with multiple hospitalizations.

Table C. Race/ethnicity distribution of patients with single/multiple hospitalizations

	MA				Comparison States			
	Single hospitalization		Multiple hospitalizations		Single hospitalization		Multiple hospitalizations	
Whites	24,048	89.8%	7810	88.7%	121,776	80.1%	34,443	81.5%
Blacks	1,292	4.8%	477	5.4%	14,686	9.7%	3,948	9.3%
Hispanics	596	2.2%	188	2.1%	5,498	3.6%	1,408	3.3%
Other	417	1.6%	167	1.9%	4,166	2.7%	1,040	2.5%
Unknown	426	1.6%	166	1.9%	5,835	3.8%	1,421	3.4%
Total	26779	100%	8,808	100%	151,961	100%	42,260	100%

Table D. Patient Characteristics by Procedure
(Patients from MA and comparison states combined)

Characteristics	Knee Replacement Procedure Counts		Hip Replacement Procedure Counts		Knee+Hip Replacement Procedure Counts	
	Pre-reform	Post-reform	Pre-reform	Post-reform	Pre-reform	Post-reform
All (40-64)	63580	84160	36289	45818	99869	129978
Sex						
Women	41434	53133	17255	21890	58689	75023
Men	22146	31027	19034	23928	41180	54955
Age (years)						
40 to 54	19629	26122	16105	18761	35734	44883
55 to 64	43951	58038	20184	27057	64135	85095
Area income, zip code median						
Low	13312	17813	6415	8421	19727	26234
Medium	17096	22646	8875	11046	25971	33692
High	32487	42539	20612	25760	53099	68299
Race/ethnicity						
Whites	52550	69796	30253	38818	82803	108614
Non-whites	11030	14364	6036	7000	17066	21364
Blacks	5863	8001	3057	4194	8920	12195
Hispanics	2260	3083	1015	1244	3275	4327

Table E-1. Sensitivity Analysis 1: Treat 18-64 age group instead of 40-64 as study population
Utilization of Total Knee and Hip Replacements

Population	Procedure Rate (/10,000) in MA				Overall change (%) in MA, Unadj. ^a	Change in MA associated with health reform ^b		
	Pre-Reform	95% Confidence Interval	Post-Reform	95% Confidence Interval		Mean, %	P-value ^c	95% Confidence Interval
Knee & Hip Replacement Procedures								
All	17.8	[17.5, 18.0]	21.5	[21.2, 21.8]	20.8%	3.6%	0.01	[0.8%, 6.4%]
Race/ethnicity								
Whites, non-Hispanic	18.6	[18.3, 18.8]	22.7	[22.4, 23.0]	22.0%	1.7%	<0.001	[0.5%, 2.9%]
Blacks, non-Hispanic	16.5	[15.3, 17.6]	22.0	[20.8, 23.3]	33.3%	11.7%	<0.001	[7.7%, 15.7%]
Hispanics	7.4	[6.6, 8.3]	10.5	[9.6, 11.3]	41.9%	38.9%	<0.001	[34.8%, 43.1%]
Zip Code Median Income								
Low Income	13.4	[13.0, 13.9]	17.4	[16.9, 17.9]	29.9%	7.7%	<0.001	[4.1%, 11.4%]
Medium Income	15.5	[15.0, 16.0]	18.6	[18.1, 19.1]	20.0%	3.1%	0.12	[-0.8%, 7.3%]
High Income	17.5	[17.2, 17.9]	20.9	[20.5, 21.3]	19.4%	4.3%	<0.001	[2.9%, 5.8%]

Notes:

- a) Overall change is the % change between pre-reform and post-reform procedure rates.
- b) Change associated with MA health reform is obtained from a difference-in-differences Poisson regression model to adjust for difference secular changes (based on comparison with NJ, NY and PA) with fixed effects for quarter and state. Standard errors are corrected for clustering within states.
- c) P-value associated with the null hypothesis of no reform-associated change in procedure use.

**Table E-2. Sensitivity Analysis 2: Adjusting for state-level unemployment (quarterly)
Utilization of Total Knee and Hip Replacements**

Population	Procedure Rate (/10,000) in MA				Overall change (%) in MA, Unadj. ^a	Change in MA associated with health reform ^b		
	Pre-Reform	P-value	Post-Reform	P-value		Mean, %	P-value ^c	95% Confidence Interval
Knee & Hip Replacement Procedures								
All	29.0	[28.5, 29.4]	35.5	[35.0, 36.0]	22.4%	4.6%	<0.001	[2.3%, 7.0%]
Race/ethnicity								
Whites, non-Hispanic	30.1	[29.6, 30.6]	37.3	[36.7, 37.8]	23.9%	2.8%	<0.001	[1.2%, 4.4%]
Blacks, non-Hispanic	28.1	[26.0, 30.2]	37.9	[35.7, 40.1]	34.9%	11.4%	<0.001	[8.0%, 14.8%]
Hispanics	12.9	[11.4, 14.5]	17.9	[16.4, 19.4]	38.8%	37.8%	<0.001	[34.4%, 41.2%]
Zip Code Median Income								
Low Income	25.5	[24.6, 26.4]	33.3	[32.3, 34.2]	30.6%	7.6%	<0.001	[4.8%, 10.5%]
Medium Income	28.9	[28.0, 29.8]	35.1	[34.1, 36.0]	21.5%	3.6%	0.06	[-0.2%, 7.5%]
High Income	30.4	[29.8, 31.1]	36.5	[35.9, 37.2]	20.1%	4.7%	<0.001	[3.1%, 6.2%]

Notes:

- a) Overall change is the % change between pre-reform and post-reform procedure rates.
- b) Change associated with MA health reform is obtained from a difference-in-differences Poisson regression model to adjust for difference secular changes (based on comparison with NJ, NY and PA) with fixed effects for quarter and state. Standard errors are corrected for clustering within states.
- c) P-value associated with the null hypothesis of no reform-associated change in procedure use.

Table F. Safety-net status and share of admissions with Medicaid, self-pay and Free-care as primary payer in Massachusetts, by period
 [All inpatient admissions for adults aged 18-64]

Hospital Name	% admissions paid by Medicaid, self-pay and Free-care	
	Pre-Reform: 2004Q1 to 2006Q2	Post-Reform: 2008Q1 to 2010Q2
Safetynet Hospitals		
Cambridge Health Alliance	67.9%	47.0%
Boston Medical Center	58.6%	50.9%
Mercy Medical Center - Springfield Campus	44.6%	40.0%
Clinton Hospital	44.1%	19.8%
Holyoke Medical Center	42.3%	42.2%
Signature Healthcare Brockton Hospital	41.2%	37.6%
Caritas Good Samaritan Medical Center	40.6%	33.4%
Athol Memorial Hospital	39.1%	37.9%
Lawrence General Hospital	37.2%	33.1%
North Shore Medical Center, Inc.	37.2%	30.4%
North Adams Regional Hospital	36.9%	40.3%
Caritas Carney Hospital	36.8%	36.1%
Nantucket Cottage Hospital	36.6%	49.3%
Wing Memorial Hospital and Medical Centers	35.4%	24.2%
Berkshire Medical Center	34.7%	34.2%
Non-safetynet Hospitals		
Noble Hospital	34.6%	29.9%
Southcoast Hospitals Group - St. Luke's	33.7%	36.8%
Heywood Hospital	33.7%	29.6%
Martha's Vineyard Hospital	32.0%	30.3%
Merrimack Valley Hospital	31.8%	31.0%
Morton Hospital and Medical Center	31.4%	35.8%
Quincy Medical Center	30.7%	26.4%
Health Alliance Hospitals, Inc.	30.6%	31.3%
Baystate Franklin Medical Center	30.1%	31.8%
Baystate Medical Center	30.0%	34.2%
UMass Memorial Medical Center	29.4%	24.7%
Northeast Health System - Beverly Campus	28.2%	30.3%
Northeast Health System - Addison Gilbert	27.7%	27.0%
Cape Cod Hospital	27.7%	25.8%

Table F (continued)

Hospital Name	% admissions paid by Medicaid, self-pay and Free-care	
	Pre-Reform: 2004Q1 to 2006Q2	Post-Reform: 2008Q1 to 2010Q2
UMass Memorial Medical Center - Marlborough Hospital	27.7%	22.0%
Caritas Holy Family Hospital and Medical Center	27.5%	32.6%
Caritas St. Anne's Hospital	27.2%	35.4%
Tufts-New England Medical Center	26.9%	27.2%
MetroWest Medical Center	26.9%	26.8%
Baystate Mary Lane Hospital	26.2%	30.2%
Fairview Hospital	26.2%	29.8%
Lowell General Hospital	26.0%	30.7%
Cooley Dickinson Hospital	25.9%	22.8%
Saints Memorial Medical Center	25.2%	25.5%
Saint Vincent Hospital	24.7%	24.7%
Children's Hospital Boston	23.4%	16.8%
Hallmark Health System - Melrose-Wakefield Hospital	22.8%	25.3%
Falmouth Hospital	22.5%	22.5%
Anna Jaques Hospital	22.2%	20.6%
Jordan Hospital	21.9%	21.9%
Sturdy Memorial Hospital	21.5%	20.4%
Massachusetts General Hospital	20.4%	16.9%
Caritas St. Elizabeth's Medical Center	20.1%	19.2%
Harrington Memorial Hospital	20.0%	35.4%
Faulkner Hospital	17.9%	16.9%
Milton Hospital	17.9%	15.7%
Mount Auburn Hospital	17.7%	14.9%
Nashoba Valley Medical Center	17.1%	15.2%
Dana-Farber Cancer Institute	17.1%	10.1%
Beth Israel Deaconess Medical Center	16.9%	14.0%
Caritas Norwood Hospital	15.9%	15.5%
Brigham and Women's Hospital	15.6%	13.6%
Milford Regional Medical Center	13.5%	17.0%
Newton-Wellesley Hospital	12.7%	10.3%
Winchester Hospital	10.6%	13.6%
South Shore Hospital	9.6%	12.1%
Lahey Clinic -- Burlington Campus	8.8%	7.7%
New England Baptist Hospital	3.3%	2.6%