Supplementary Online Content

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eTable 1. Analytical Sample With Exclusions

Hospitalizations (2012-2014)		**N**
Total		32 660 168
Reason for Exclusion	Age < 65 years	6 479 475
	Patients transferred in from another hospital	975 263
	HMO (enrolled in at least 1 month)	1 906 489
	Hospital other than acute care	809 196
	Admission in December 2014	555 122
	Unable to link to American Hospital Association survey data	482 799
Final analytical sample of hospitalizations		**21 451 824**

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eTable 2. Comparison of Seven-Day Mortality[a] for All Hospitalizations and Composite Mortality for Selected Medical and Surgical Conditions, 2012-2014

Seven-Day Mortality		Major Teaching (%)	Minor Teaching (%)	Non-Teaching (%)	Difference (%) (95% CI)[b]	P-Value
Overall	**No. of Hospitalizations**	3 592 378	7 205 576	10 653 870	--	--
	Mortality Adjusted for Patient Characteristics[c]	3.1	3.5	3.7	0.6 (0.5-0.7)	<.001
	Mortality Adjusted for Patient and Hospital Characteristics[d]	3.3	3.6	3.6	0.3 (0.2-0.5)	<.001
Medical Conditions[e]	**No. of Hospitalizations**	1 481 514	3 503 774	5 634 912	--	--
	Mortality Adjusted for Patient Characteristics	4.5	4.7	4.9	0.5 (0.4 -0.6)	<.001
	Mortality Adjusted for Patient and Hospital Characteristics	4.6	4.8	4.8	0.2 (0.1-0.3)	.007
Surgical Procedures[f]	**No. of Hospitalizations**	165 823	331 972	411 429	--	--
	Mortality Adjusted for Patient Characteristics	1.0	1.2	1.4	0.4 (0.3-0.4)	<.001
	Mortality Adjusted for Patient and Hospital Characteristics	1.1	1.2	1.3	0.1 (0.04-0.2)	<.001

[a]Seven-day mortality rate for hospitalizations among Medicare beneficiaries aged 65 and older to acute care hospitals in 2012-2014.
[b]Difference in mortality rates by teaching status (mortality for major teaching hospitals subtracted from that of non-teaching hospitals) with associated 95% confidence intervals (CI).
[c]The model included principal discharge diagnosis, Diagnosis Related Group Weight, state fixed effects and the following patient characteristics: age, sex, Medicaid eligibility, Hierarchical Condition Categories.
[d]Hospital characteristics in the model included profit status, rural/urban location and volume of hospitalizations.
[e]Medical conditions refers to the aggregated mortality for the fifteen most common principal discharge diagnoses (Diagnosis Related Groups) in this sample as specified in eTable 3.
[f]Surgical procedures includes six common, complex procedures (open abdominal aortic aneurysm repair, colectomy, pulmonary lobectomy, coronary artery bypass grafting, endovascular abdominal aortic aneurysm repair, and hip replacement).

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eTable 3. Seven-Day Mortality for Selected Medical and Surgical Conditions Adjusted for Patient and Hospital Characteristics, 2012-2014[a]

	No. of Hospitalizations	Major Teaching (%)[b]	Minor Teaching (%)[b]	Non-Teaching (%)[b]	Difference (%) (99.8% CI)[c]	P-Value[d]
Medical Conditions		[e]N=1,481,514	N= 5,634,912	N=5,634,912	--	--
Renal Failure	636 095	3.6	4.4	4.8	1.2 (0.9-1.5)	<.001
Respiratory Disease	259 970	9.3	9.9	10.3	0.9 (0.1-1.8)	.004
Metabolic Disorder	419 988	2.4	2.9	3.1	0.7 (0.4-1.0)	<.001
Congestive heart failure	1 280 915	3.3	3.7	3.9	0.5 (0.3-0.8)	<.001
Pneumonia	1 047 303	3.7	4.0	4.3	0.5 (0.2-0.9)	<.001
GI Bleeding	589 180	2.3	2.6	2.7	0.4 (0.2-0.8)	<.001
Acute myocardial infarction	517 889	7.5	7.9	7.9	0.4 (-0.1-0.8)	.02
Esophageal/Gastric Disease	758 911	0.9	1.1	1.2	0.4 (0.3-0.5)	<.001
Urinary Tract Infection	672 281	1.0	1.1	1.3	0.3 (0.2-0.4)	<.001
Chest Pain	224 894	0.3	0.3	0.3	0.1 (-0.05-0.2)	.06
Hip Fracture	474 010	2.6	2.6	2.6	0.1 (-0.2-0.4)	.74
Chronic Obstructive Pulmonary Disease	817 127	1.4	1.4	1.4	0.1 (-0.1-0.2)	.21
Arrhythmia	948 513	1.7	1.7	1.7	0.1 (-0.1-0.2)	.48
Sepsis	1 348 898	13.1	13.4	13.1	-0.1 (-0.8-0.7)	.14
Stroke	624 226	10.0	9.8	9.5	-0.5 (-1.1-0.1)	.01
Surgical Procedures		N=165,823	N= 331,972	N=411,429	--	--
Open AAA	7 220	7.9	9.6	11.6	3.7 (0.6-6.8)	.0016
CABG	127 333	0.9	1.1	1.1	0.2 (-0.1-0.5)	.15
Lobectomy	37 965	0.7	0.8	0.8	0.1 (-0.3-0.5)	.56
Hip Replacement	489 210	0.6	0.7	0.7	0.1 (-0.1-0.2)	.15
Colectomy	196 511	2.3	2.2	2.4	0.1 (-0.3-0.4)	.08
Endovascular AAA	50 985	1.6	1.6	1.4	-0.2 (-0.7-0.4)	.37

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[a]The model included principal discharge diagnosis, patient age, sex, Medicaid eligibility, Hierarchical Condition Categories as well as state fixed effects, hospital profit status, rural/urban location and hospital volume of admissions.
[b]Major teaching hospitals were defined as those with membership in the Council of Teaching Hospitals (COTH). Minor Teaching Hospitals were affiliated with a medical school but were not members of COTH. Non-teaching hospitals had neither COTH membership nor medical school affiliation.
[c]Difference in mortality rates by teaching status (mortality for major teaching hospitals subtracted from that of non-teaching hospitals) with associated 95% confidence intervals (CI).
[d]*P*-Values <.002 were considered statistically significant.
[e]N refers to the number of hospitalizations within each category

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eTable 4. Comparison of Ninety-Day[a] Mortality for All Hospitalizations and Composite Mortality for Selected Medical and Surgical Conditions, 2012-2014

Ninety-Day Mortality		Major Teaching (%)	Minor Teaching (%)	Non-Teaching (%)	Difference (%) (95% CI)[b]
Overall	**No. of Hospitalizations**	3 592 378	7 205 576	10 653 870	--
	Mortality Adjusted for Patient Characteristics[c]	13.3	14.8	15.7	2.4 (2.1-2.7)
	Mortality Adjusted for Patient and Hospital Characteristics[d]	13.8	15.0	15.5	1.6 (1.3-1.9)
Medical Conditions[e]	**No. of Hospitalizations**	1 481 514	3 503 774	5 634 912	--
	Mortality Adjusted for Patient Characteristics	16.9	18.0	19.0	2.1 (1.8 -2.4)
	Mortality Adjusted for Patient and Hospital Characteristics	17.4	18.2	18.7	1.3 (1.0-1.6)
Surgical Procedures[f]	**No. of Hospitalizations**	165 823	331 972	411 429	--
	Mortality Adjusted for Patient Characteristics	5.3	6.3	6.9	1.6 (1.4-1.9)
	Mortality Adjusted for Patient and Hospital Characteristics	5.7	6.4	6.7	1.0 (0.7-1.3)

All differences were significant ($p<0.001$).
[a]Ninety-day mortality rate for hospitalizations among Medicare beneficiaries aged 65 and older at acute care hospitals in 2012-2014.
[b]Difference in mortality rates by teaching status (mortality for major teaching hospitals subtracted from that of non-teaching hospitals) with associated 95% confidence intervals (CI).
[c]The model included principal discharge diagnosis Diagnosis Related Group Weight, state fixed effects and the following patient characteristics: age, sex, Medicaid eligibility, Hierarchical Condition Categories.
[d]Hospital characteristics in the model included profit status, rural/urban location and volume of hospitalizations.
[e]Medical conditions refers to the aggregated mortality for the fifteen most common principal discharge diagnoses (Diagnosis Related Groups) as specified in eTable 3.
[f]Surgical procedures includes six common, complex procedures (open abdominal aortic aneurysm repair, colectomy, pulmonary lobectomy, coronary artery bypass grafting, endovascular abdominal aortic aneurysm repair, and hip replacement).

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eTable 5. Ninety-Day Mortality for Medical and Surgical Conditions Adjusted for Patient and Hospital Characteristics, 2012-2014[a]

	No. of Hospitalizations	Major Teaching (%)	Minor Teaching (%)	Non-Teaching (%)	Difference (%)[b]	P-Value[c]
Medical Conditions[d]						
Respiratory Disease	259 970	36.2	38.7	40.1	3.9 (2.4-5.4)	<.001
Renal Failure	636 095	19.0	21.1	22.1	3.1 (2.3-3.8)	<.001
Pneumonia	1 047 303	17.1	18.2	19.4	2.2 (1.5-3.0)	<.001
Metabolic Disorder	419 988	15.9	16.9	17.8	2.0 (1.2-2.8)	<.001
Urinary Tract Infection	672 281	11.8	12.7	13.4	1.5 (1.0-2.1)	<.001
GI Bleeding	589 180	11.3	12.2	12.8	1.5 (0.9-2.0)	<.001
Congestive heart failure	1 280 915	19.5	20.3	20.9	1.4 (0.8-2.1)	<.001
Esophageal/Gastric Disease	758 911	8.1	8.9	9.3	1.1 (0.7-1.6)	<.001
Acute myocardial infarction	517 889	18.1	18.7	19.2	1.1 (0.4-1.8)	<.001
Chronic Obstructive Pulmonary Disease	817 127	10.4	11.1	11.4	1.0 (0.3-1.6)	<.001
Hip Fracture	474 010	13.3	14.0	14.2	0.9 (0.2-1.6)	<.001
Arrhythmia	948 513	7.9	8.4	8.7	0.8 (0.4-1.1)	<.001
Chest Pain	224 894	3.0	3.3	3.5	0.5 (0.1-0.9)	.0016
Sepsis	1 348 898	33.9	34.4	34.2	0.3 (-0.9-1.4)	.30
Stroke	624 226	23.4	23.5	23.5	0.1 (-0.8 -1.0)	.92
Surgical Procedures[e]						
Open AAA	7 220	14.9	17.0	19.8	4.9 (1.1 -8.7)	<.001
Colectomy	196 511	10.5	11.2	11.5	1.0 (0.3-1.7)	<.001
Lobectomy	37 965	4.4	4.8	5.3	0.9 (-0.1-1.9)	.02
CABG	127 333	3.9	4.6	4.7	0.8 (0.0-1.6)	.01
Hip Replacement	489 210	4.8	5.1	5.2	0.4 (0.1-0.7)	.01
Endovascular AAA	50 985	4.6	5.3	4.9	0.3 (-0.6-1.3)	.05

[a]The model included principal discharge Diagnosis Related Group weight, patient age, sex, Medicaid eligibility, and Hierarchical Condition Categories, as well as state fixed effects, hospital profit status, rural/urban location and hospital volume of admissions.
[b]Difference in mortality rates by teaching status (mortality for major teaching hospitals subtracted from that of non-teaching hospitals) with associated 99.8% confidence intervals (CI).
[c]*P*-Values <.002 were considered statistically significant.
[d]There were 1,481,514 hospitalizations to major teaching, 3,503,774 to minor teaching and 5,634,912 to non-teaching hospitals for the 15 selected medical conditions.
[e]There were 165,823 admissions for selected surgical procedures to major teaching hospitals, 331,972 to minor teaching and 411,429 to non-teaching hospitals.

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eTable 6. Comparison of Mortality[a] for All Hospitalizations and Composite Mortality for Selected Medical and Surgical Conditions, Excluding Transfers, 2012-2014[b]

Adjusted Mortality[c]		Major Teaching (%)	Minor Teaching (%)	Non-Teaching (%)	Difference (%) (95% CI)[d]	P-Value
Overall Hospitalizations[e]	7-Day Mortality	3.3	3.6	3.7	0.4 (0.4-0.5)	<.001
	30-Day Mortality	8.2	9.1	9.4	0.9 (0.6-1.1)	<.001
	90-Day Mortality	13.7	14.8	15.3	1.6 (1.3-1.9)	<.001
Medical Conditions[f]	7-Day Mortality	4.6	4.8	4.9	0.2 (0.1-0.4)	.003
	30-Day Mortality	11.0	11.6	11.8	0.9 (0.6-1.1)	<.001
	90-Day Mortality	17.4	18.2	18.6	1.3 (1.0-1.6)	<.001
Surgical Procedures[g]	7-Day Mortality	1.1	1.2	1.3	0.1 (0.04 to 0.2)	.02
	30-Day Mortality	3.3	3.8	4.0	0.7 (0.5-0.9)	<.001
	90-Day Mortality	5.6	6.4	6.6	1.0 (0.7-1.2)	<.001

[a]Seven-day, thirty-day and ninety-day mortality rate for hospitalizations among Medicare beneficiaries aged 65 and older at acute care hospitals in 2012-2014.
[b]Hospitalizations originating or ending in transfer were excluded from the analysis.
[c]The model included principal discharge Diagnosis Related Group weight and the following patient characteristics: age, sex, Medicaid eligibility, Hierarchical Condition Categories and state fixed effects as well as the following hospital characteristics: hospital profit status, urban/rural location and volume of admissions.
[d]Difference in mortality rates by teaching status (mortality for major teaching hospitals subtracted from that of non-teaching hospitals) with associated 95% confidence intervals (CI).
[e]For overall hospitalizations, there were 3,569,362 hospitalizations to major teaching hospitals, 7,095,508 to minor teaching hospitals and 10,332,658 to non-teaching hospitals.
[f]Medical conditions refers to the composite mortality for the fifteen most common principal discharge diagnoses (Diagnosis Related Groups) as specified in eTable 3. There were 1,471,369 hospitalizations to major teaching, 3,447,413 to minor teaching and 5,453,797 to non-teaching hospitals.
[g]Surgical procedures includes six common, complex procedures (open abdominal aortic aneurysm repair, colectomy, pulmonary lobectomy, coronary artery bypass grafting, endovascular abdominal aortic aneurysm repair, and hip replacement). There were 165,166 admissions for these procedures to major teaching hospitals, 330,030 to minor teaching and 408,291 to non-teaching hospitals.

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eTable 7. Comparison of mortality[a] for all hospitalizations and composite mortality for selected medical and surgical conditions, using Elixhauser conditions[b] to adjust for patient comorbidities, 2012-2014

Adjusted Mortality[c]		Major Teaching (%)	Minor Teaching (%)	Non-Teaching (%)	Difference (%) (95% CI)[d]	P-Value
Overall[e]	7-Day Mortality	3.3	3.6	3.6	0.4 (0.3-0.5)	<.001
	30-Day Mortality	8.4	9.2	9.5	1.1 (0.8-1.3)	<.001
	90-Day Mortality	14.1	14.9	15.4	1.3 (1.0-1.6)	<.001
Medical Conditions[f]	7-Day Mortality	4.6	4.8	4.8	0.3 (0.1-0.4)	<.001
	30-Day Mortality	10.9	11.7	11.9	1.0 (0.7-1.2)	<.001
	90-Day Mortality	17.4	18.3	18.7	1.2 (0.9-1.6)	<.001
Surgical Procedures[g]	7-Day Mortality	1.1	1.2	1.3	0.2 (0.1-0.3)	.002
	30-Day Mortality	3.3	3.8	4.1	0.8 (0.6-1.0)	<.001
	90-Day Mortality	5.7	6.4	6.7	1.1 (0.8-1.3)	<.001

[a] Seven-day, thirty-day, and ninety-day mortality rate for hospitalizations among Medicare beneficiaries aged 65 and older at acute care hospitals in 2012-2014.
[b] Comparison of adjustment models, including Elixhauser method, described in Li et al. BMC Health Services Research. 2010 Aug 20;10:245. doi:10.1186/1472-6963-10-245.
[c] The model included principal discharge Diagnosis Related Group weight and the following patient characteristics: age, sex, Medicaid eligibility, Elixhauser conditions, and state fixed effects as well as the following hospital characteristics: hospital profit status, urban/rural location, and volume of admissions.
[d] Difference in mortality rates by teaching status (mortality for major teaching hospitals subtracted from that of non-teaching hospitals) with associated 95% confidence intervals (CI).
[e] For overall hospitalizations, there were 3,592,378 hospitalizations to major teaching hospitals, 7,205,576 to minor teaching hospitals, and 10,653,870 to non-teaching hospitals.
[f] Medical conditions refers to the aggregated mortality for the 15 most common principal discharge diagnoses (Diagnosis Related Groups) as specified in eTable 3. There were 1,481,514 hospitalizations to major teaching hospitals, 3,503,774 to minor teaching hospitals, and 5,634,912 to non-teaching hospitals.
[g] Surgical procedures included six common, complex procedures (open abdominal aortic aneurysm repair, colectomy, pulmonary lobectomy, coronary bypass grafting, endovascular abdominal aortic aneurysm repair, and hip replacement. There were 165,823 admissions for these procedures to major teaching hospitals, 331,972 to minor teaching hospitals, and 411,429 to non-teaching hospitals.

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eTable 8. Coefficient for Intern/Resident to Bed Ratio[a] as a Measure of Teaching Intensity, 2012-2014

	7-Day Mortality[b]		30-Day Mortality[b]		90-Day Mortality[b]	
	Beta[c] (CI[d])	P-Value[e]	Beta[c] (CI)	P-Value	Beta (CI)	P-Value
Overall Hospitalizations[f]	-0.07 (-0.09 to -0.05)	<.001	-0.23 (-.27 to -0.19)	<.001	-0.31 (-0.37 to -0.26)	<.001
Composite Medical[g]	-0.04 (-0.06 to -.0.01)	0.004	-0.15 (-0.19 to -0.11)	<.001	-0.23 (-0.28 to -0.17)	<.001
Composite Surgical[h]	-0.02 (-.0.04 to -0.01)	0.01	-0.13 (-0.17 to -0.10)	<.001	-0.19 (-0.24 to -0.15)	<.001
Medical Conditions						
Respiratory Disease	-0.16 (-0.31 to -0.01)	<.001	-0.54 (-0.89 to -.0.38)	<.001	-0.69 (-1.1 to -0.5)	<.001
Renal Failure	-0.27 (-0.32 to -0.21)	<.001	-0.54 (-0.65 to -0.43)	<.001	-0.62 (-0.77 to -0.47)	<.001
Congestive Heart Failure	-0.14 (-0.18 to -0.09)	<.001	-0.29 (-0.37 to -0.21)	<.001	-0.35 (-0.46 to -0.24)	<.001
Pneumonia	-0.11 (-0.17 to -0.05)	<.001	-0.31 (-0.42 to -0.20)	<.001	-0.41 (-0.55 to -0.27)	<.001
Acute Myocardial Infarction	-0.09 (-0.17 to -0.01)	<.001	-0.22 (-0.33 to -0.11)	<.001	-0.28 (-0.42 to -0.14)	<.001
Metabolic Disorder	-0.15 (-0.20 to -0.09)	<.001	-0.3 (-0.42 to -0.18)	<.001	-0.38 (-0.54 to -0.22)	<.001
COPD	-0.02 (-0.05 to 0.02)	0.13	-0.15 (-0.22 to -0.08	<.001	-0.25 (-0.36 to -0.14)	<.001
Esophageal/Gastric Disease	-0.08 (-0.1 to -0.05)	<.001	-0.17 (-0.23 to -0.12)	<.001	-0.22 (-0.30 to -0.14)	<.001
Urinary Tract Infection	-0.05 (-0.07 to -0.02)	<.001	-0.19 (-0.26 to -0.12)	<.001	-0.3 (-0.41 to -0.20)	<.001
Gastrointestinal Bleeding	-0.07 (-0.11 to -0.02)	<.001	-0.15 (-0.23 to -0.07)	<.001	-0.25 (-0.35 to -0.14)	<.001
Hip Fracture	-0.05 (-0.1 to 0.01)	0.01	-0.12 (-0.20 to -0.03)	<.001	-0.22 (-0.34 to -0.10)	<.001

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Arrhythmia	-0.02 (-0.05 to 0.01)	0.04	-0.09 (-0.13 to -0.04)	<.001	-0.15 (-0.23 to -0.08)	<.001
Chest Pain	-0.003 (-0.03 to 0.02)	0.66	-0.02 (-0.07 to -0.03)	0.25	-0.07 (-0.14 to 0.01)	0.01
Sepsis	0.07 (-0.08 to 0.22)	0.16	0.15 (-0.06 to 0.35)	0.03	0.14 (-0.08 to 0,35)	0.05
Stroke	0.11 (0.0 to 0.23)	0.002	0.06 (-0.10 to 0.21)	0.27	0.002 (-0.17 to 0.17)	0.98
Surgical Procedures						
Open AAA	-0.05 (-1.0 to 0.01)	0.003	-0.71 (-1.3 to -0.14	<.001	-0.73 (-1.4 to -0.1)	<.001
Colectomy	-0.01 (-0.07 to 0.05)	0.48	-0.14 (-0.25 to -0.03)	<.001	-0.16 (-0.29 to -0.04)	<.001
Pulmonary Lobectomy	-0.01 (-0.06 to 0.04)	0.51	-0.12 (-0.22 to -0.02)	<.001	-0.16 (-0.29 to -0.02)	<.001
CABG	-0.03 (-0.1 to 0.04)	0.18	-0.11 (-0.22 to -.005)	0.001	-0.16 (-0.31 to -0.02)	<.001
Hip Replacement	-0.02 (-0.05 to 0.004)	0.51	-0.04 (-0.09 to .01)	0.02	-0.07 (-0.15 to 0.0)	0.003
Endovascular AAA	0.03 (-0.09 to 0.14)	0.48	-0.07 (-0.23 to 0.09)	0.17	-0.1 (-0.29 to 0.09)	0.1

[a]Intern/resident to bed ratio is an indicator of teaching intensity used to determine Medicare payments to teaching hospitals.
[b]Model for adjusted mortality included state fixed effects, patient age, sex, Elixhauser chronic conditions, Medicaid eligibility, hospital profit status, rural/urban location and volume of admissions. Transfers were attributed to the original hospital.
[c]Change (%) in mortality rate per 0.1 increase intern/resident to bed (IRB) ratio. The standard deviation for intern/resident to bed ratio in this sample was 0.15.
[d]95% Confidence intervals as presented for overall hospitalizations, composite medical and composite surgical hospitalizations. 99.8% confidence intervals are presented for individual medical and surgical conditions.
[e]*P*-Values <.05 were considered statistically significant for overall hospitalizations and composite medical and surgical mortality. *P*-Values <.002 were considered statistically significant for individual medical and surgical conditions.
[f]There were 3,592,378 hospitalizations at major teaching hospitals, 7,205,576 at minor teaching hospitals and 10,653,870 hospitalizations at non-teaching hospitals for all conditions.
[g]Composite medical and surgical mortality refers to aggregated mortality of the selected 15 medical and 6 surgical conditions presented in the table. There were 1,481,514 hospitalizations at major teaching hospitals 3,503,774 hospitalizations at minor teaching hospitals and 5,634,912 hospitalizations at non-teaching hospitals for the selected medical conditions.
[h]There were 165,823 hospitalizations at major teaching hospitals, 331,972 hospitalizations at minor teaching hospitals and 411,429 hospitalizations at non-teaching hospitals for the selected surgical conditions.

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eMethods. Description of the Linear Probability Model Applied to Binary Outcomes

The linear probability model is a regression technique commonly used in econometrics and health services research that applies ordinary least squares regression to binary outcomes. The outcome Y becomes the probability of the dependent variable (e.g. death) occurring. The coefficient for each predictor in the model represents the probability of death occurring given a change in the exposure (teaching status in this study).

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