

Supplemental Material

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I. Supplementary Tables

Supplementary Table 1A. Characteristics of Patients at Level I, II, III Trauma Centers in Pennsylvania, 2015-2018				
	Total	Established Trauma Centers	New Trauma Centers	p-value
Number of Centers (%)	38 (100.0)	23 (60.5)	15 (39.5)	
Patients (%)	159,282 (100.0)	133,559 (83.9)	25,723 (16.1)	
Female Gender (%)	68,473 (43.0%)	56,402 (42.2%)	12,071 (46.9%)	<0.001
Age (%)				<0.001
16-39	39,868 (25.0%)	34,453 (25.8%)	5,415 (21.1%)	
40-64	47,746 (30.0%)	40,733 (30.5%)	7,013 (27.3%)	
>=65	71,668 (45.0%)	58,373 (43.7%)	13,295 (51.7%)	
Race (%)				<0.001
White	134,587 (84.5%)	111,386 (83.4%)	23,201 (90.2%)	
Black	20,131 (12.6%)	18,296 (13.7%)	1,835 (7.1%)	
AAPI/Other	4,564 (2.9%)	3,877 (2.9%)	687 (2.7%)	
ISS (%)				<0.001
<9	67,464 (42.4%)	56,578 (42.4%)	10,886 (42.3%)	
9-15	59,490 (37.3%)	49,405 (37.0%)	10,085 (39.2%)	
16-24	19,044 (12.0%)	16,124 (12.1%)	2,920 (11.4%)	
>=25	13,284 (8.3%)	11,452 (8.6%)	1,832 (7.1%)	
Penetrating Injury (%)	11,587 (7.3%)	10,436 (7.8%)	1,151 (4.5%)	<0.001
Insurance (%)				<0.001
Private	63,496 (39.9%)	53,020 (39.7%)	10,476 (40.7%)	
Medicare	62,360 (39.2%)	50,956 (38.2%)	11,404 (44.3%)	
Medicaid/Self-pay	32,550 (20.4)	28,808 (21.5)	3,742 (14.5)	
missing	876 (0.5%)	775 (0.6%)	101 (0.4%)	
Rural (%)	36,358 (44.8%)	30,776 (43.1%)	5,582 (56.9%)	<0.001
Comorbidities (%)				<0.001
None	29,139 (18.3%)	24,479 (18.3%)	4,660 (18.1%)	
1	36,233 (22.7%)	30,250 (22.6%)	5,983 (23.3%)	
2	32,186 (20.2%)	26,695 (20.0%)	5,491 (21.3%)	
3 or more	61,724 (38.8%)	52,135 (39.0%)	9,589 (37.3%)	

Supplementary Table 1B. Characteristics of Patients at Level I, II, III Trauma Centers in Pennsylvania, 2018				
	Total	Established Trauma Centers	New Trauma Centers	p-value
Number of Centers (%)	38 (100.0)	23 (60.5)	15 (39.5)	
Patients (%)	43,808 (100.0)	35,315 (80.6)	8,493 (19.4)	
Female Gender (%)	19,128 (43.7%)	15,108 (42.8%)	4,020 (47.3%)	<0.001
Median Age (IQR)	63.0 (42.0-79.0)	62.0 (41.0-79.0)	67.0 (47.0-82.0)	<0.001
Age (%)				<0.001
16-39	10,161 (23.2%)	8,503 (24.1%)	1,658 (19.5%)	
40-64	12,772 (29.2%)	10,484 (29.7%)	2,288 (26.9%)	
>=65	20,875 (47.7%)	16,328 (46.2%)	4,547 (53.5%)	
Race (%)				<0.001
White	36,812 (84.0%)	29,178 (82.6%)	7,634 (89.9%)	
Black	5,505 (12.6%)	4,865 (13.8%)	640 (7.5%)	
AAPI/Other	1,491 (3.4%)	1,272 (3.6%)	219 (2.6%)	
Median ISS (IQR)	9.0 (5.0-13.0)	9.0 (5.0-13.0)	9.0 (5.0-12.0)	<0.001
ISS (%)				<0.001
<9	18,689 (42.7%)	15,023 (42.5%)	3,666 (43.2%)	
9-15	16,808 (38.4%)	13,449 (38.1%)	3,359 (39.6%)	
16-24	4,952 (11.3%)	4,038 (11.4%)	914 (10.8%)	
>=25	3,359 (7.7%)	2,805 (7.9%)	554 (6.5%)	
Penetrating Injury (%)	3,047 (7.0%)	2,655 (7.5%)	392 (4.6%)	<0.001
Insurance (%)				<0.001
Private	16,589 (37.9%)	13,219 (37.4%)	3,370 (39.7%)	
Medicare	18,381 (42.0%)	14,377 (40.7%)	4,004 (47.1%)	
Medicaid/Self-pay	6,873 (15.7%)	6,116 (17.3%)	757 (8.9%)	
missing	232 (0.5%)	189 (0.5%)	43 (0.5%)	
Rural (%)	9,793 (44.4%)	8,022 (42.8%)	1,771 (53.5%)	<0.001
Comorbidities (%)				<0.001
None	7,865 (18.0%)	6,444 (18.2%)	1,421 (16.7%)	
1	10,194 (23.3%)	8,216 (23.3%)	1,978 (23.3%)	
2	9,227 (21.1%)	7,325 (20.7%)	1,902 (22.4%)	
3 or more	16,522 (37.7%)	13,330 (37.7%)	3,192 (37.6%)	

Supplementary Table 2A: Characteristics of Urban Patients at New vs Established Trauma Centers in Pennsylvania, 2010-2018				
	Total	Established Trauma Centers	New Trauma Centers	p-value
Patients (%)	93,718 (100.0)	86,581 (92.4)	7,137 (7.6)	
Female Gender (%)	35,566 (38.0)	32,093 (37.1)	3,473 (48.7)	<0.001
Age (%)				<0.001
16-39	30,193 (32.2)	28,648 (33.1)	1,545 (21.6)	
40-64	30,063 (32.1)	28,063 (32.4)	2,000 (28.0)	
>=65	33,462 (35.7)	29,870 (34.5)	3,592 (50.3)	
Race (%)				<0.001
White	68,055 (72.6)	61,802 (71.4)	6,253 (87.6)	
Black	22,335 (23.8)	21,625 (25.0)	710 (9.9)	
AAPI/Other	3,328 (3.6)	3,154 (3.6)	174 (2.4)	
ISS (%)				<0.001
<9	37,490 (40.0)	34,083 (39.4)	3,407 (47.7)	
9-15	34,666 (37.0)	31,899 (36.8)	2,767 (38.8)	
16-24	12,191 (13.0)	11,617 (13.4)	574 (8.0)	
>=25	9,371 (10.0)	8,982 (10.4)	389 (5.5)	
Penetrating Injury (%)	10,943 (11.7)	10,701 (12.4)	242 (3.4)	<0.001
Insurance (%)				<0.001
Private	33,618 (35.9)	30,787 (35.6)	2,831 (39.7)	
Medicare	30,547 (32.6)	27,245 (31.5)	3,302 (46.3)	
Medicaid	21,958 (23.4)	21,394 (24.7)	564 (7.9)	
Self-pay	7,189 (7.7)	6,793 (7.8)	396 (5.5)	
missing	406 (0.4)	362 (0.4)	44 (0.6)	
Comorbidities (%)				<0.001
None	24,325 (26.0)	22,777 (26.3)	1,548 (21.7)	
1	22,575 (24.1)	20,865 (24.1)	1,710 (24.0)	
2	17,863 (19.1)	16,393 (18.9)	1,470 (20.6)	
3 or more	28,955 (30.9)	26,546 (30.7)	2,409 (33.8)	

Supplementary Table 2B: Characteristics of Rural Patients at New vs Established Trauma Centers in Pennsylvania, 2010-2018				
	Total	Established Trauma Centers	New Trauma Centers	p-value
Patients (%)	76,655 (100.0)	67,549 (88.1)	9,106 (11.9)	
Female Gender (%)	34,614 (45.2)	30,326 (44.9)	4,288 (47.1)	<0.001
Age (%)				<0.001
16-39	17,972 (23.4)	16,075 (23.8)	1,897 (20.8)	
40-64	22,801 (29.7)	20,337 (30.1)	2,464 (27.1)	
>=65	35,882 (46.8)	31,137 (46.1)	4,745 (52.1)	
Race (%)				<0.001
White	68,815 (89.8)	60,545 (89.6)	8,270 (90.8)	
Black	5,843 (7.6)	5,322 (7.9)	521 (5.7)	
AAPI/Other	1,997 (2.6)	1,682 (2.5)	315 (3.5)	
ISS (%)				<0.001
<9	33,217 (43.3)	29,704 (44.0)	3,513 (38.6)	
9-15	27,279 (35.6)	23,759 (35.2)	3,520 (38.7)	
16-24	9,442 (12.3)	8,169 (12.1)	1,273 (14.0)	
>=25	6,717 (8.8)	5,917 (8.8)	800 (8.8)	
Penetrating Injury (%)	4,468 (5.8)	4,147 (6.1)	321 (3.5)	<0.001
Insurance (%)				<0.001
Private	32,722 (42.7)	28,662 (42.4)	4,060 (44.6)	
Medicare	31,154 (40.6)	27,175 (40.2)	3,979 (43.7)	
Medicaid	8,984 (11.7)	8,366 (12.4)	618 (6.8)	
Self-pay	3,537 (4.6)	3,105 (4.6)	432 (4.7)	
missing	258 (0.3)	241 (0.4)	17 (0.2)	
Comorbidities (%)				<0.001
None	15,642 (20.4)	13,503 (20.0)	2,139 (23.5)	
1	16,939 (22.1)	14,731 (21.8)	2,208 (24.2)	
2	14,613 (19.1)	12,731 (18.8)	1,882 (20.7)	
3 or more	29,461 (38.4)	26,584 (39.4)	2,877 (31.6)	

Supplementary Table 3. Association of Patient Characteristics of New vs Established Trauma Centers in Pennsylvania, 2010-2018		
Characteristic	Odds Ratio (95% Confidence Interval)	p-value
Payer status		
Medicare	1.29 (1.23-1.34)	<0.001
Medicaid	0.51 (0.48-0.55)	<0.001
Self-pay	1.02 (0.94-1.11)	0.6
Private	<i>ref</i>	
Female Gender	1.12 (1.08-1.16)	<0.001
Male	<i>ref</i>	
Non-White Race	0.53 (0.50-0.57)	<0.001
White	<i>ref</i>	
Injury Severity Score		
<9	<i>ref</i>	
9-15	1.03 (0.99-1.07)	0.2
16-24	0.87 (0.82-0.91)	<0.001
>=25	0.79 (0.74-0.84)	<0.001
Penetrating Injury	0.59 (0.54-0.65)	<0.001
Blunt	<i>ref</i>	
Rural	1.37 (1.32-1.42)	<0.001
Urban	<i>ref</i>	
Age with Comorbidities		
16-39 without comorbidities	<i>ref</i>	
16-39	0.83 (0.80-0.86)	<0.001
40-64	0.87 (0.85-0.88)	<0.001
≥65	0.89 (0.88-0.90)	<0.001

Supplementary Table 4. Association of Patient Characteristics of Adults Aged 16-65 at New vs Established Trauma Centers in Pennsylvania, 2010-2018		
Characteristic	Odds Ratio (95% Confidence Interval)	p-value
Payer status		
Medicare	0.86 (0.78-0.94)	0.002
Medicaid	0.52 (0.48-0.56)	<0.001
Self-pay	1.08 (0.99-1.2)	0.09
Private	<i>ref</i>	
Female Gender	1.22 (1.15-1.28)	<0.001
Male	<i>ref</i>	
Non-White Race	0.56 (0.52-0.60)	<0.001
White	<i>ref</i>	
Injury Severity Score		
<9	<i>ref</i>	
9-15	1.09 (1.03-1.15)	0.001
16-24	0.86 (0.79-0.93)	<0.001
>=25	0.79 (0.72-0.87)	<0.001
Penetrating Injury	0.62 (0.56-0.69)	<0.001
Blunt	<i>ref</i>	
Rural	1.55 (1.48-1.63)	<0.001
Urban	<i>ref</i>	
Age with Comorbidities		
16-39 without comorbidities	<i>ref</i>	
16-39	0.87 (0.84-0.90)	<0.001
40-64	0.92 (0.90-0.94)	<0.001

Supplementary Table 5A. Association of Patient Characteristics of New vs Established Trauma Centers in Pennsylvania, 2015-2018		
Characteristic	Odds Ratio (95% Confidence Interval)	p-value
Payer status		
Private	1.52 (1.41-1.63)	<0.001
Medicare	1.88 (1.73-2.04)	<0.001
Medicaid/Self-pay	<i>ref</i>	
Female Gender	1.17 (1.12-1.22)	<0.001
Male	<i>ref</i>	
Non-White Race	0.57 (0.53-0.62)	<0.001
White	<i>ref</i>	
Injury Severity Score		
<9	<i>ref</i>	
9-15	1.08 (1.03-1.13)	0.003
16-24	0.97 (0.90-1.05)	0.44
>=25	0.93 (0.86-1.02)	0.12
Penetrating Injury	0.55 (0.48-0.62)	<0.001
Blunt	<i>ref</i>	
Rural	1.47 (1.40-1.54)	<0.001
Urban	<i>ref</i>	
Age with Comorbidities		
16-39 without comorbidities	<i>ref</i>	
16-39	0.82 (0.79-0.85)	<0.001
40-64	0.84 (0.82-0.86)	<0.001
≥65	0.86 (0.85-0.88)	<0.001

Supplementary Table 5B. Association of Patient Characteristics of New vs Established Trauma Centers in Pennsylvania, 2018		
Characteristic	Odds Ratio (95% Confidence Interval)	p-value
Payer status		
Private	1.98 (1.73-2.27)	<0.001
Medicare	2.15 (1.86-2.49)	<0.001
Medicaid/Self-pay	<i>ref</i>	
Female	1.18 (1.09-1.28)	<0.001
Male	<i>ref</i>	
Non-White Race	0.63 (0.55-0.73)	<0.001
Injury Severity Score		
<9	<i>ref</i>	
9-15	1.09 (1.00-1.19)	0.044
16-24	0.98 (0.86-1.12)	0.74
>25	1.02 (0.87-1.19)	0.85
Penetrating Injury	0.55 (0.44-0.68)	<0.001
Blunt	<i>ref</i>	
Rural	1.27 (1.18-1.38)	<0.001
Urban	<i>ref</i>	
Age with Comorbidities		
16-39 without comorbidities	<i>ref</i>	
16-39	0.91 (0.85-0.97)	0.008
40-64	0.92 (0.89-0.95)	<0.001
≥65	0.92 (0.89-0.94)	<0.001

Supplementary Table 6A. Association of Patient Characteristics of Urban Patients at New vs Established Trauma Centers in Pennsylvania, 2010-2018		
Characteristic	Odds Ratio (95% Confidence Interval)	p-value
Payer status		
Medicare	1.33 (1.25-1.42)	<0.001
Medicaid	0.45 (0.40-0.49)	<0.001
Self-pay	1.05 (0.94-1.19)	0.4
Private	<i>ref</i>	
Female Gender	1.20 (1.13-1.26)	<0.001
Male	<i>ref</i>	
Non-White Race	0.44 (0.40-0.47)	<0.001
White	<i>ref</i>	
Injury Severity Score		
<9	<i>ref</i>	
9-15	0.83 (0.79-0.88)	0.001
16-24	0.49 (0.44-0.54)	<0.001
>=25	0.47 (0.42-0.53)	<0.001
Penetrating Injury	0.53 (0.46-0.62)	<0.001
Blunt	<i>ref</i>	
Age with Comorbidities		
16-39 without comorbidities	<i>ref</i>	
16-39	0.88 (0.84-0.92)	<0.001
40-64	0.93 (0.91-0.95)	<0.001
≥65	0.94 (0.93-0.96)	<0.001

Supplementary Table 6B. Association of Patient Characteristics of Rural Patients at New vs Established Trauma Centers in Pennsylvania, 2010-2018		
Characteristic	Odds Ratio (95% Confidence Interval)	p-value
Payer status		
Medicare	1.25 (1.18-1.32)	<0.001
Medicaid	0.62 (0.56-0.68)	<0.001
Self-pay	1.03 (0.92-1.16)	0.6
Private	<i>ref</i>	
Female Gender	1.08 (1.03-1.13)	0.002
Male	<i>ref</i>	
Non-White Race	0.81 (0.73-0.89)	<0.001
White	<i>ref</i>	
Injury Severity Score		
<9	<i>ref</i>	
9-15	1.23 (1.17-1.30)	<0.001
16-24	1.30 (1.21-1.40)	<0.001
>=25	1.15 (1.06-1.25)	0.001
Penetrating Injury	0.68 (0.60-0.78)	<0.001
Blunt	<i>ref</i>	
Age with Comorbidities		
16-39 without comorbidities	<i>ref</i>	
16-39	0.78 (0.75-0.82)	<0.001
40-64	0.82 (0.80-0.84)	<0.001
≥65	0.986(0.84-0.87)	<0.001

II. Supplementary Figures

New vs Established Trauma Center Patient Volume by Payer over Time

