Helping Vulnerable Hospitals: Evidence from a Medical Poverty Alleviation Program

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Appendix: Supplementary Figures and Tables

Figure A.1 Typical Process of Patients Accessing Medical Services

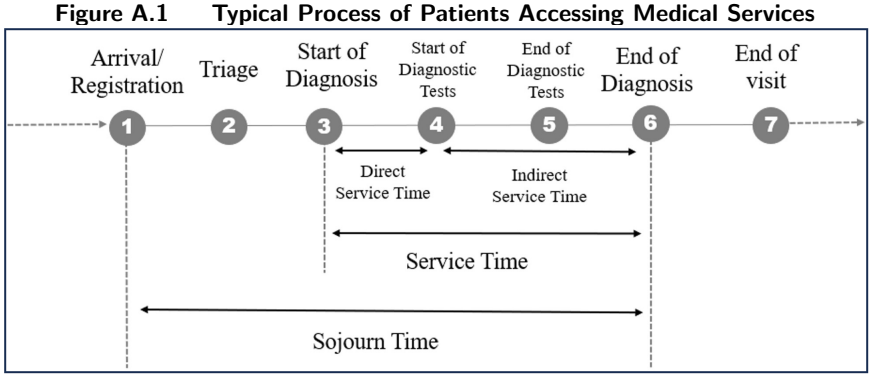
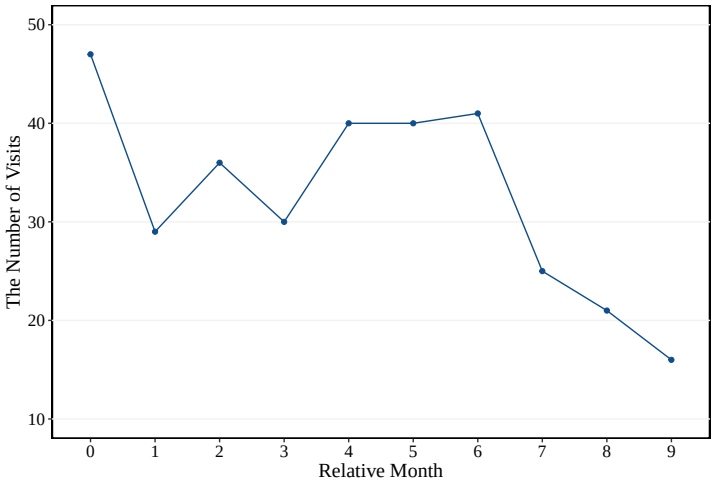


Figure A.2 Monthly Trends in External Expert Visits to the Local Hospital



Note: The values on the x-axis represent months relative to the first month of treatment, with zero indicating the month in which the department received the intervention.

Table A.1 Survey: Effects of MPAP on Service Efficiency and Quality

	Sample Size	Mean	S.D.	Median	Difference from Neutral Point (p value)
Panel A: Survey Results from the Local Hospital					
Q1. Do you think the MPAP improves the service efficiency of your/your institution's services?	98	6.50	0.94	7	0.000
Q2. Do you think the MPAP improves the service quality of your/your institution's services?	98	6.51	0.95	7	0.000
Panel B: Survey Results from Four Other Hospitals					
Q1. Do you think the MPAP improves the service efficiency of your/your institution's services?	146	6.53	1.00	7	0.000
Q2. Do you think the MPAP improves the service quality of your/your institution's services?	146	6.55	0.95	7	0.000

Notes: This table reports the summary statistics of two surveys: (i) we survey 98 physicians in the local hospital of our studied to understand how the MPAP affects their service efficiency and quality, and (ii) we survery 146 physicians from another four hospitals located in under-resourced regions to understand how the MPAP affects their service efficiency and quality. We conduct the t-test to test the difference between the level of agreement and neutral point 4.

Table A.2 Balance Test for MPAP Introduction across Departments

	Introduction Randomness
Service time	0.016
	(0.011)
7-day revisit	0.407
	(2.076)
Total visits	0.00004
	(0.0002)
Follow-up visit	0.0003
	(0.0007)
Acuteness of Illness	-5.467
	(3.454)
Number of physicians	-0.028
	(0.044)
Observations	33

Notes: This table reports the estimated coefficients and standard errors (in parentheses).

Table A.3 Data Selection and Process

Data Sample	Observations	% Prior	% Initial
All outpatient visits between Apr 1, 2017 and March 31, 2018	388,823	NA	100%
Excluding records without necessary information (e.g., time stamps, age, and gender)	332,631	85.55%	85.55%
Excluding service time outliers	317,984	95.60%	81.78%
Exclude all normal follow-up visits	287,715	90.48%	74.00%
Exclude visits treated directly by physicians from the top-tier hospital	283,943	98.69%	73.03%

Note: % prior represents the percentage compared with the prior sample; % initial represents the percentage compared with the initial sample.

Table A.4 Correlation Table of Key Variables in Matched Sample

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Service time	1.00													
2. Direct service time	0.21	1.00												
3. Indirect service time	0.96	-0.08	1.00											
4. 7-day revisit	0.03	-0.01	0.03	1.00										
5. No. of diagnostic tests	0.55	0.11	0.53	-0.04	1.00									
6. Age	0.02	0.00	0.02	-0.07	0.04	1.00								
7. Gender	-0.01	-0.01	-0.01	-0.00	-0.01	0.00	1.00							
8. No. of patients	0.01	-0.07	0.04	0.08	-0.06	-0.01	0.00	1.00						
9. No of patients on duty	-0.08	0.02	-0.08	-0.01	-0.15	0.07	0.01	0.53	1.00					
10. Urgency of the disease	0.07	0.02	0.07	0.08	0.08	-0.11	-0.00	0.07	-0.07	1.00				
11. Time period of registration	-0.17	0.03	-0.18	-0.03	-0.12	-0.04	-0.01	0.05	0.06	0.02	1.00			
12. Physician experience	0.07	-0.03	0.08	0.03	0.11	-0.05	0.01	0.11	-0.15	0.07	-0.12	1.00		
13. Assistant experience	-0.04	0.01	-0.05	-0.05	-0.03	0.08	-0.01	-0.12	0.09	-0.09	0.01	-0.19	1.00	
14. Tenure difference	-0.05	0.01	-0.06	-0.04	-0.07	0.08	-0.01	-0.04	0.17	-0.09	0.04	-0.23	0.85	1.00
Mean	49.13	7.54	41.59	0.17	0.95	4.00	0.58	76.77	3.25	0.14	10.21	20.17	0.13	1.24
S.D.	68.51	19.22	67.26	0.38	1.28	2.96	0.49	39.91	2.52	0.35	2.53	13.69	0.34	3.79

Notes: This corelation relationship table is estimated based on the matched sample with 215,196 observations.

Table A.5 Summary Statistics Before and After Matching: A Comparison

	Before Matching			After Matching		
	Control	Treatment	p-value	Control	Treatment	p-value
Service time	54.809	45.077	0.21	54.087	45.827	0.35
	[56.847]	[54.228]	[0.29]	[56.847]	[54.228]	[0.46]
7-day revisit	0.176	0.093	0.09	0.149	0.130	0.61
	[0.159]	[0.099]	[0.06]	[0.159]	[0.121]	[0.54]
Gender	0.574	0.604	0.36	0.571	0.609	0.15
	[0.576]	[0.616]	[0.10]	[0.576]	[0.616]	[0.09]
Age	3.678	4.592	**0.03**	3.867	4.400	0.16
	[3.635]	[4.340]	[**0.05**]	[3.661]	[4.162]	[0.12]
Number of visits	51.645	30.348	0.24	62.683	44.089	0.39
	[32.046]	[20.054]	[0.33]	[51.228]	[48.548]	[0.61]
Urgency	0.201	0.043	**0.01**	0.208	0.080	0.10
	[0.239]	[0.013]	[**0.02**]	[0.239]	[0.057]	[0.28]

Notes: The first row for each variable presents the mean values for the control and treatment departments, with the corresponding p-value obtained from a t-test. The values in square brackets indicate the median of each variable, with the associated p-value derived from the Wilcoxon signed-rank test. Bold figures represent the significant difference between two groups ($p < 0.05$).

Table A.6 Effects of MPAP on Direct and Indirect Time

	Direct Service Time (1)	Indirect Service Time (2)
MPAP	0.195***	−0.330***
	(0.049)	(0.091)
Controls	Y	Y
Fixed Effects	Y	Y
Observations	215,196	215,196
Adjusted R^2	0.310	0.404

Notes: All the models include both department and time fixed effects. The dependent variable is log-transformed. Standard errors clustered at the physician level are reported in parentheses. *** $p < 0.01$.

Table A.7 Impact on The Number of Examination Types

	No. of Examination Types (1)
MPAP	−0.062*
	(0.035)
Control Variables	Y
Fixed Effects	Y
Observations	215,196
Adjusted R^2	0.731

Notes: All the models include both department and time fixed effects. The dependent variable is log-transformed. Standard errors clustered at the physician level are reported in parentheses. Significance at * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

Table A.8 Effects of MPAP on Full Sample

	Service Time (1)	7-day Revisit (2)
MPAP	−0.076**	−0.100**
	(0.032)	(0.039)
Controls	Y	Y
Fixed Effects	Y	Y
Observations	283,943	283,943
Adjusted R^2	0.326	–

Notes: All the models include both department and time fixed effects. The dependent variable of service time in Columns (1) is log-transformed. Standard errors clustered at the physician level are reported in parentheses. Significance at * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

Table A.9 Effects of MPAP: Whether Having Assistant Experience

	Physicians with Assistant Experience in the Treatment		Physicians without Assistant Experience in the Treatment	
	Service Time (1)	7-day Revisit (2)	Service Time (3)	7-day Revisit (4)
MPAP	−0.117**	−0.233***	−0.064	−0.130***
	(0.048)	(0.058)	(0.042)	(0.050)
Controls	Y	Y	Y	Y
Fixed Effects	Y	Y	Y	Y
Observations	142,807	142,807	187,360	187,360
Adjusted R^2	0.379	–	0.388	–

Notes: All the models include both department and time fixed effects. The dependent variable of service time in Columns (1) and (3) is log-transformed. Standard errors clustered at the physician level are reported in parentheses. Significance at * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

Table A.10 Dynamic Effects of MPAP on Service Efficiency and Quality

	Service Time (1)	7-Day Revisit (2)
$\text{MPAP}^{After\ 0-1m}$	−0.082***	−0.124**
	(0.029)	(0.048)
$\text{MPAP}^{After\ 2-3m}$	−0.114***	−0.158**
	(0.043)	(0.065)
$\text{MPAP}^{After\ 4-5m}$	−0.058	−0.158**
	(0.050)	(0.065)
$\text{MPAP}^{After\ 6+m}$	−0.070	−0.162***
	(0.057)	(0.059)
Control Variables	Y	Y
Fixed Effects	Y	Y
Observations	215,196	215,196
Adjusted R^2	0.379	–

Notes: All the models include both department and time fixed effects. The dependent variable of service time in Columns (1) is log-transformed. Standard errors clustered at the physician level are reported in parentheses. Significance at * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

Table A.11 Moderating Effect of Visiting Intensity

	No Lag		Lag 1 Month		Lag 2 Months	
	Service Time (1)	7-Day Revisit (2)	Service Time (3)	7-Day Revisit (4)	Service Time (5)	7-Day Revisit (6)
MPAP	−0.081*	−0.147***	−0.074**	−0.158***	−0.074**	−0.158***
	(0.045)	(0.056)	(0.036)	(0.047)	(0.036)	(0.047)
MPAP ×	0.004	−0.008				
Visiting Intensity	(0.011)	(0.014)				
MPAP ×			−0.005	−0.021		
Visiting Intensity (lag 1)			(0.009)	(0.014)		
MPAP ×					−0.013	−0.024*
Visiting Intensity (lag 2)					(0.008)	(0.014)
Control Variables	Y	Y	Y	Y	Y	Y
Fixed Effects	Y	Y	Y	Y	Y	Y
Observations	215,196	215,196	215,196	215,196	215,196	215,196
Adjusted R^2	0.379	–	0.379	–	0.379	–

Notes: All the models include both department and time fixed effects. The dependent variable of service time in Columns (1), (3) and (5) is log-transformed. Standard errors clustered at the physician level are reported in parentheses. Significance at * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

Table A.12 Effects of MPAP with Second Stage Matching at the Patient Level

	Service Time (1)	7-Day Revisit (2)
MPAP	−0.083**	−0.163***
	(0.038)	(0.050)
Control Variables	Y	Y
Fixed Effects	Y	Y
Observations	193,299	193,299
Adjusted R^2	0.385	–

Notes: All the models include both department and time fixed effects. The dependent variable for service time in Columns (1) is log-transformed. Standard errors clustered at the physician level are reported in parentheses. Significance levels are denoted as * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

Table A.13 Randomized MPAP Introduction Time

	Service Time (1)	7-Day Revisit (2)
Mean of β_{pseudo}	0.0016	0.0004
Std.Dev of β_{pseudo}	0.0427	0.0597
Replication times	1000	1000
t-statistic	56.718	84.872
p-value	p <0.001	p <0.001

Notes: The t-statistic is used to test whether the mean of β_{pseudo} differs significantly from the true value β reported in Columns (3) and (4) of Table 3 in the main manuscript.

Table A.14 Robustness Check: Falsification Test Using 2016 Data

	Service time (1)	7-day revisit (2)
$\text{MPAP}_{Placebo}$	− 0.033	0.138
	(0.074)	(0.129)
Controls	Y	Y
Fixed Effects	Y	Y
Observations	144,800	144,800

Notes: All the models include both department and time fixed effects. The dependent variable in Column (1) is log-transformed. Standard errors clustered at the physician level are reported in parentheses. Significance at * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

Table A.15 Robustness Check: Exclusion of Patient Visits with Comorbidities

	Service time (1)	7-day revisit (2)
MPAP	-0.080**	-0.165***
	(0.036)	(0.050)
Controls	Y	Y
Fixed Effects	Y	Y
Observations	204,693	204,693
Adjusted R^2	0.349	–

Notes: All the models include both department and time fixed effects. The dependent variable of service time in Columns (1) is log-transformed. Standard errors clustered at the physician level are reported in parentheses. Significance at * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

Table A.16 Robustness Checks: Including CCI in Matching Strategies

	Service Time (1)	7-Day Revisit (2)
MPAP	−0.073**	−0.161***
	(0.035)	(0.036)
CCI	0.195***	−0.125***
	(0.034)	(0.048)
Control Variables	Y	Y
Fixed Effects	Y	Y
Observations	154,720	154,720
Adjusted R^2	0.346	–

Notes: All the models include both department and time fixed effects. The dependent variable of service time in Columns (1) is log-transformed. Standard errors clustered at the physician level are reported in parentheses. Significance at * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

Table A.17 International Classification of Diseases 10 (ICD-10) Codes

Code	Type of Disease
A-B	Certain Infectious and parasitic diseases
C	Malignant neoplasms
D00-D09	In situ neoplasms
D50-D89	Diseases of blood, blood-forming organs, immune mechanism
E	Endocrine, nutritional and metabolic disease
F	Mental and behavioral disorders
G	Diseases of the nervous system
H00-H59	Diseases of the eye and adnexa
H60-H95	Diseases of the ear and mastoid process
I	Diseases of the circulatory system
J	Diseases of the respiratory system
K	Diseases of the digestive system
L	Diseases of skin and subcutaneous tissue
M	Diseases of the musculoskeletal system and connective tissue
N	Diseases of the genitourinary system
O	Pregnancy, childbirth, and the puerperium
P	Certain conditions originating in the perinatal period
Q	Congenital malformations, deformations, and chromosomal abnormalities
R	Symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified
S-T	Injury, poisoning, and certain other consequences of external causes
V-Y	External causes of morbidity and mortality
Z	Factors influencing health status and contact with health services

Table A.18 Robustness Checks on Unique ICD-10 and Patient Volume

	Number of Unique ICD-10 (1)	Department Patient Volume (2)
MPAP	0.070	-0.035
	(0.050)	(0.101)
Controls	Y	Y
Fixed Effects	Y	Y
Observations	7,114	7,114
Adjusted R^2	0.661	0.795

Notes: All the models include both department and time fixed effects. Standard errors clustered at the department level are reported in parentheses. Significance at * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.