

Pent-up demand for surgery in the Manaus metropolitan region

A population-based cross-sectional study

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Abstract

Waiting lines in healthcare reflect an imbalance between the availability and the demand for medical services. This study aimed to analyze the prevalence and factors associated with the pent-up demand for surgical procedures in the Manaus metropolitan region.

We performed a population-based cross-sectional study in 2015. Pent-up demand was based on self-report by the participants; those who reported waiting were contacted by phone to clarify the nature and reasons for the experienced delay.

We interviewed 4001 adults in their households. The pent-up demand for surgical procedures in the Manaus metropolitan region was 14% (95% confidence interval: 13-15%). The surgical specialties with the highest demand included orthopedics (18.1%), gynecology (17.0%), ophthalmology (12.4%), neurosurgery (10.8%), and general surgery (10.2%). The main reason for not accessing services was their lack of availability in the public health system, leading some patients to pay for procedures in private facilities. The populations most affected by pent-up demand included elderly individuals, women, and housewives.

Pent-up demand for surgical procedures is a common problem in the Manaus metropolitan region and thus requires coordinated actions to optimize access to and capacity of the healthcare system.

Abbreviations: CI = confidence interval, PR = prevalence ratios.

Keywords: access to healthcare services, surgery, survey, wait list

1. Introduction

Waiting lines reflect an imbalance between demand and availability.^[1] In the healthcare system, waiting lines can also be defined as a list of patients requiring similar medical care who receive services according to their position in line. The majority of public hospitals in Brazil have waiting lines, with variations between regions in only the size of the line and the duration of wait time.^[2]

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Pent-up demand for surgical procedures has also been observed in countries with universal access to healthcare. Records from the United Kingdom^[3] and Australia^[4] indicate that waiting for surgical procedures is an issue even in developed countries.

Limited access to health facilities that perform surgical procedures leads to an increase in waiting lines.^[5] In Brazil, the average waiting time for a surgery exceeds 1 year.^[5] A patient's condition may worsen during these waiting periods, which can lead to a reduction in both quality of life and socioeconomic status.

Waiting times are associated with several problems for patients, such as worsening illness, death, and psychological suffering. A study conducted in São Paulo evaluated the consequences of prolonged waiting among cardiac surgery candidates.^[6] Waiting was associated with anxiety, continued loss of organic function, and difficulties in family, professional, and social relationships. Additionally, the sample exhibited a decrease in the initial desire to perform surgery and an increase in the perception of uselessness of the procedure.^[6]

Queues negatively affect the economic status of active individuals who are awaiting surgery. Waiting times during working hours induce income losses, the magnitude of which varies among individuals.^[7,8] From the individual, health system, and societal perspectives, pent-up demand for surgeries has negative effects on both health-related quality of life and costs.

Pent-up demand for surgery is the result of a lack of investment, infrastructure, and health facility materials and personnel.^[9] In this context, the government must organize the healthcare network and manage the available facilities. These actions must focus on eliminating the barriers to healthcare access, and they must contribute to the improvement of health conditions.

Population-based surveys present a way of defining the profile of pent-up demand, especially in less organized contexts, where a list of patients and needed procedures is unavailable. In Brazil, these types of deficiencies are more frequent in less developed settings. In such scenarios, population surveys make it possible to discern the health conditions of the population and the factors associated with pent-up demand.^[10]

This study aims to assess the pent-up demand for surgical procedures in the Manaus metropolitan region and to identify the population characteristics associated with a lack of access to surgery.

2. Methods

2.1. Type of study and setting

This study was part of a major research project entitled “Factors associated with access and use of health materials and services in the Manaus metropolitan region.” Specifically, a population-based survey was performed from May to August 2015 in Manaus, Careiro da Varzea, Iranduba, Itacoatiara, Manacapuru, Novo Airao, Presidente Figueiredo, and Rio Preto da Eva. The sampling design allowed all social classes to be represented.

2.2. Sample selection

Adults ≥ 18 years old were eligible for inclusion. The exclusion criterion was a lack of cognitive ability to participate.

According to official statistics, the Manaus metropolitan region has 2,106,322 inhabitants who are ≥ 18 years old.^[11] The required sample size was calculated based on an estimated 50% use of health services. A sample size of 3598 individuals was determined, considering a 95% confidence interval, 2% precision, and design effect of 1.5. An additional 10% was added to compensate for eventual losses, resulting in 4000 subjects to be interviewed.

The sampling process accounted for 3 levels. The first level considered 2647 urban census sectors of the Manaus metropolitan region, among which 400 primary and 20 reposition sectors were randomly sorted. The second stage was based on a systematic procedure that aimed to select 10 households in each identified sector. In this process, a random number was used to define the search order of the households, which were selected systematically on every 20 addresses. In the third stage, every resident ≥ 18 years old in the selected households was registered. The selection of the interviewees accounted for predefined quotas of sex and age based on official census to increase representativeness.

2.3. Data collection procedures

The interviewed individuals completed a consent form when agreeing to participate in the research. A structured questionnaire with objective questions was then administered to each selected household. The questionnaire was completed on tablets by interviewers who were experienced in quantitative research. A pre-test was performed with 150 participants to validate their understanding of the instrument.

Pent-up demand for surgery was measured through the following question: “Has any doctor ever said that you should receive a surgical procedure that you haven’t yet undergone?” All participants who reported pent-up demand for surgery were contacted by phone from November to December 2015 to ascertain the cause of delay and the type of surgical procedures needed, which were grouped by specialty.

2.4. Statistical methods

Descriptive statistics of the variables measured in the study were obtained. The frequencies of categorical variables were calculated and then stratified to assess the variable-dependent pent-up demand for surgery. The adjusted analyses (multivariate analysis) were weighted by age and gender. Prevalence ratios (PRs) were calculated using Poisson regression with robust variance to estimate the association between pent-up demand and the independent variables.^[12]

To minimize random effects, sensitivity analyses were performed by repeating calculations with random subsamples (bootstrap analysis).^[13] Bonferroni correction was used to conservatively estimate the statistically significant variables.^[14] There was no incomplete data imputation. All analyses were performed with Stata software (version 14.2, StataCorp, College Station, TX), considering a 95% confidence interval (CI), a 5% value of statistical significance, and correction for the complex sampling design (svy command).

2.5. Ethical considerations

The research was approved by the Federal University of Amazonas Research Ethics Committee, document number 974.428/2015. All participants signed a consent form. After database validation, participant data were encrypted to conceal any personal identifying information.

3. Results

3.1. Sample composition and participant characteristics

In total, 4001 people were interviewed. The Manaus metropolitan region comprised a young population mainly between 18 and 34 years of age, with a majority of female and mixed race individuals mostly concentrated in the capital, Manaus (Table 1). Employees and/or self-employed individuals represented over half of the interviewed sample; health insurance coverage was available to a smaller portion of the population.

3.2. Main findings

The pent-up demand for surgical procedures among adults living in the Manaus metropolitan region was 14% (95% CI: 13-15%).

Regarding the phone calls with the 561 participants who had a formal medical indication for a surgical procedure, 34.2% of the sample was lost due to the inability to contact them by phone. Among the reported surgical specialties, orthopedics, gynecology, ophthalmology, neurosurgery, and general surgery were the highest in demand (Table 2).

The main reasons for pent-up demand of surgery reported included delay in scheduling blood and imaging tests, appointments, and surgical procedures (55.7%). A smaller portion of the participants reported that did not undergo the procedures due to a lack of time (1.9%), and 4.1% stated that they feared undergoing the procedure. The waiting times caused 11.9% of the individuals to give up on the health system and to self-fund the procedures in private health facilities instead. Other reasons accounted for 24.9% of pent-up demand of surgery and included lack of availability of these procedures in their region or through the public health system.

3.3. Secondary findings

Table 3 shows the results of the unadjusted and adjusted data analyses. The upper age groups were more in need of surgery

Table 1**Sample characteristics and pent-up demand for surgery in the Manaus metropolitan region, 2015.**

Characteristic	Frequency (%) (n=4001)	Needs surgery (%) (n=561)
Age group, years		
18–24	20.9	7.7
25–34	28.8	10.6
35–44	21.1	16.7
45–59	19.3	19.7
60 +	9.9	21.0
Gender		
Male	47.2	11.2
Female	52.8	16.7
Ethnic group		
White	15.9	12.7
Black	7.5	11.0
Asian	3.5	13.8
Mixed	72.2	14.7
Indigenous	1.0	14.7
Municipality		
Manaus	86.9	14.9
Careiro da Várzea	1.1	22.3
Irlanduba	1.7	4.4
Itacoatiara	3.8	3.3
Manacapuru	3.5	9.4
Novo Airão	0.6	8.6
Presidente Figueiredo	1.3	9.0
Rio Preto da Eva	1.2	17.0
Occupation Status		
Does not work	14.0	10.5
Student	8.9	8.8
Retired	7.8	21.4
Housewife	2.1	22.5
Employee	39.7	13.8
Self-employed	27.5	15.3
Health insurance		
No	87.0	14.4
Yes	13.0	11.9
Social class		
A	0.9	14.7
B1	2.3	8.9
B2	12.6	11.1
C1	21.5	11.8
C2	35.6	15.4
D/E	27.2	15.7

(RP=2.72; 95% CI: 2.00–3.68 for those 60 years of age or more compared to those in the youngest stratum). Pent-up demand in the region was more frequent among women (RP=1.50; 95% CI: 1.28–1.76) and housewives (RP=1.84; 95% CI: 1.15–2.94). The lowest recorded prevalence of pent-up demand for surgery was in Itacoatiara (RP=0.22; 95% CI: 0.10–0.53). No association between pent-up demand for surgery and ethnicity, health insurance coverage, or social class was observed.

4. Discussion

4.1. Synthesis of results

A significant portion of adults (14%) were in need of surgery. Lack of access to surgical procedures in the region affected the most fragile segments of the population (elderly individuals and women) and those with lower economic capacity (retired individuals or home workers). These results reveal that difficulty

Table 2**Pent-up demand by surgical specialty and reasons in the Manaus metropolitan region, 2015 (n=369).**

Variables	Frequency, %
Surgical specialty	
Orthopedics	18.1
Gynecology	17.0
Ophthalmology	12.4
Neurosurgery	10.8
General	10.2
Urology	6.2
Head and Neck	4.8
Vascular	4.6
Gastroenterology	2.9
Mastology	2.1
Proctology	2.1
Oncology	2.1
Dentistry	1.8
Cardiology	1.3
Dermatology	0.8
Plastic	0.5
Thoracic	0.2
Otolaryngology	0.2
More than 1 specialty	0.8
Reasons	
Delay	55.7
Self-funded the surgery	11.9
Fear of surgery	4.1
Lack of time	1.9
Others	24.9

accessing surgery in the region affected more socially vulnerable individuals on a larger scale.

The surgical specialties with the highest demand were orthopedics, gynecology, ophthalmology, neurosurgery, and general surgery. Other Brazilian studies have shown similar results.^[15–17] Waiting lines for procedures within these specialties have long been a reality in several regions of the country. Our research describes the current health status of the population in the Manaus metropolitan region and the pent-up demand for surgery.

4.2. Research validity

Our study has several limitations, including selection bias. Sorted individuals were free to participate in the study.^[18] There was also a risk of survival bias, as some surgical needs prevent patients from staying at home, including institutionalized and non-surviving patients, who were consequently not interviewed.

Measurement bias can also be considered, as some participants may have omitted their need for surgery, had difficulty understanding the terms used in the questionnaire or been uncomfortable during the interview.^[18] Finally, the losses detected during the phone audit may have led to under- or overestimation of the reasons for pent-up demand.

4.3. Comparison with the literature and interpretation of findings

The demand for surgical procedures was higher among female and elderly individuals, similar to the findings of the National Sampling Households Research.^[19] In Brazil, elderly individuals have a higher use of health facilities due to organic frailty, and they also incur a significant increase in medical expenses.^[19]

Table 3**Prevalence ratio (PR) of the pent-up demand for surgery in the Manaus metropolitan region, 2015 (n=4001).**

Characteristic	Unadjusted PR	95% CI	P	Adjusted PR*	95% CI	P	Bootstrap P
Age group, years							
18–24	1.00	–	–	1.00	–	–	
25–34	1.38	1.03–1.84	.030	1.38	1.04–1.84	.028	.013
35–44	2.17	1.64–2.87	<.001	2.18	1.65–2.88	<.001	<.001
45–59	2.55	1.94–3.36	<.001	2.58	1.96–3.40	<.001	<.001
60 +	2.73	2.01–3.70	<.001	2.72	2.00–3.68	<.001	<.001
Gender							
Male	1.00	–	–	1.00	–	–	
Female	1.49	1.27–1.75	<.001	1.50	1.28–1.76	<.001	<.001
Ethnic group							
White	1.00	–	–	1.00	–	–	
Black	0.87	0.59–1.27	.460	0.82	0.56–1.20	.310	.275
Asian	1.08	0.68–1.72	.737	0.98	0.62–1.56	.940	.928
Mixed	1.15	0.92–1.44	.210	1.09	0.88–1.36	.419	.390
Indigenous	1.16	0.54–2.49	.712	0.94	0.45–1.95	.871	.978
Municipality							
Manaus	1.00	–	–	1.00	–	–	
Careiro da Várzea	1.50	0.84–2.68	.173	1.49	0.83–2.70	.184	.225
Iranduba	0.29	0.10–0.89	.030	0.30	0.10–0.94	.039	.721
Itacoatiara	0.22	0.09–0.53	<.001	0.22	0.10–0.53	<.001	.001
Manacapuru	0.63	0.37–1.07	.085	0.65	0.39–1.08	.096	.041
Novo Airão	0.58	0.09–3.64	.557	0.60	0.11–3.38	.560	.883
Presidente Figueiredo	0.61	0.26–1.40	.242	0.61	0.26–1.44	.261	.296
Rio Preto da Eva	1.14	0.58–2.27	.699	1.21	0.59–2.47	.602	.472
Occupation Status							
Does not work	1.00	–	–	1.00	–	–	
Student	0.83	0.55–1.26	.386	1.11	0.72–1.71	.634	.583
Retired	2.03	1.47–2.80	<.001	1.36	0.93–1.98	.116	.104
Housewife	2.13	1.34–3.40	<.001	1.84	1.15–2.94	.011	.004
Employee	1.31	1.00–1.72	.049	1.12	0.85–1.47	.418	.379
Self-employed	1.45	1.09–1.91	.010	1.33	1.00–1.76	.050	.037
Health insurance							
No	1.00	–	–	1.00	–	–	
Yes	0.83	0.65–1.06	.132	0.81	0.63–1.04	.095	.085
Social class							
A	1.00	–	–	1.00	–	–	
B1	0.60	0.20–1.85	.377	0.53	0.17–1.62	.264	.313
B2	0.75	0.30–1.88	.545	0.69	0.28–1.72	.423	.333
C1	0.80	0.33–1.97	.635	0.73	0.30–1.80	.495	.414
C2	1.05	0.43–2.54	.920	0.91	0.37–2.21	.834	.799
D/E	1.07	0.44–2.60	.882	0.85	0.35–2.06	.712	.649

CI = confidence interval, PR = prevalence ratio.

* Adjusted by sex and age.

Additionally, women use health services more than men. Previous findings indicate that the notion of healthcare needs seems to differ between genders. Unlike men, women more readily report their health issues, reflecting inequalities in disease perception and in care seeking.

Among the studied cities, Itacoatiara showed the lowest levels of pent-up demand for surgical procedures despite having the second largest population in the region, second only to Manaus.^[20]

Some participants reported being fearful of the proposed procedure and consequently gave up on receiving it. This fear may be associated with the inherent risks of the surgical procedure itself or with the use of anesthesia. Fear can also be related to uncertainties about the future based on the individual's chances of dying and possible complications.^[21] The unknown surgical procedures can cause uneasiness as well as patient stress, which is the main reason for preoperative fear.

Providing universal healthcare coverage in Brazil is a major challenge. The Ministry of Health first attempted to broaden

access to these procedures by implementing the Elective Surgery Taskforces in 1999,^[22] which aimed to reduce the waiting lines for cataract, diabetic retinopathy, and prostate surgical procedures. These taskforces were intended to resolve a specific national demand and thus resulted in a reduction in waiting times for only the aforementioned procedures. However, as they did not contribute to the organization of a health services network, new demands for these types of procedures eventually reappeared, and the waiting lines for other surgical specialties also increased.

Accordingly, the Ministry of Health established the National Policy for Elective Surgical Procedures in 2005.^[23] This policy aimed to improve access to specialized care by stimulating awareness of demand and reorganizing the network to improve the feasibility of preoperative tests and procedures. One of the final improvements was the reformulation of the prioritized surgical procedures list to contain eleven specialties,^[24] including orthopedics, gynecology, ophthalmology, neurosurgery, and

general surgery, which were identified and mentioned in our study.

Despite the efforts of the Ministry of Health in partnership with both state and city administrations to reduce the demands for elective surgery, access to these procedures remains deficient. Another initiative to mitigate waiting times and maintain transparency involves the publication of health facilities' waiting lists to give patients an estimate of their anticipated wait time.

5. Conclusions

The data show that for every 100 adults in the Manaus metropolitan region, 14 are in need of surgery but do not have access to it. Orthopedics, gynecology, ophthalmology, neurosurgery, and general surgery are the fields with the highest surgical demands. The main reason for not receiving a surgical procedure was found to be lack of access to treatment in the public health system, which led some of the population to pay the costs in private facilities. Patients who were elderly, retired, female, and housewives were the most affected by this pent-up demand.

Pent-up demand for surgical procedures is a common problem in public health systems. However, few studies are available on this subject, especially with population representativeness.

The results of our study identify aspects of pent-up demand that can be targeted to support the local health administration. More studies on this subject are needed to quantify the pent-up demand for surgery in other regions of Brazil.

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