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Are Long Hospitalizations substituting Primary and Long-term Care? Evidence from Brazil and Mexico

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Abstract[1]

Prolonged hospital stays, or hospital stays that are longer than medically necessary, are a major concern for patients, payers, and providers. We conceptualize and empirically estimate the prevalence and cost of prolonged stays among elderly hospital patients (65 years and older) in Brazil and Mexico. We develop a continuum-of-care conceptual framework based on prior literature and insights obtained through interviews and focus group discussions with experts from Mexico, Argentina, and Colombia. In this framework, hospitals are part of a wider system. This system involves both pre-admission and post-discharge medical and social care services. There are three main sources of prolonged stays: (i) lack of appropriate primary healthcare that leads to more complex admissions; (ii) hospital inefficiency; and (iii) lack of rehabilitation, social, and long-term care at discharge. We estimate the count and share of inappropriate hospital days due to prolonged stays overall and for each source. This estimation is based on administrative records on discharges from public sector hospitals in 2019. Our results show that hospital days due to prolonged stays account for approximately half of all hospital days. Although most of the inappropriate days can be attributed to hospital inefficiency, an important share is linked to the lack of rehabilitation, social, and long-term care. Lack of these services accounts for 12% of total hospital days in Brazil and 7% in Mexico. In a back-of-the-envelope calculation, we estimate that providing six weeks of long-term care services to address the care needs brought about by only thirteen causes of admission would generate annual net savings of approximately US$174 million in Brazil and US$45 million in Mexico.

Keywords: healthcare costs; prolonged hospitalizations; primary health care; long-term care; medical care; population aging; older persons; public policy; social care; rehabilitation care; Latin America and the Caribbean; Mexico; Brazil.

JEL classification: I10, J14, H5, J18

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1. Introduction

In the Latin American and Caribbean region, the convergence of an aging population and technological advancements is expected to significantly raise healthcare spending (Rao et al., 2022). This increase is further compounded by the rising prevalence of chronic diseases and dependence among older adults. Over 85% of those aged 70 and above have at least one chronic condition, and 14% of those over 65 require assistance with activities of daily living (IHME, 2020; Aranco, Ibarrarán, and Stampini, 2022). Furthermore, there is a notable lack of robust primary health, social, post-operative, and long-term care systems, as well as support for family caregivers (Aranco et al., 2022).

Rationalizing hospital use is a key strategy for controlling rising health expenditures. Hospitals account for about one-third of total health spending in the region and are central to the adoption of costly medical technology. They also bear the consequences of inadequate primary care and social systems, which can lead to hospital stays extending beyond what is medically necessary. A prolonged hospitalization occurs when "a medically fit patient is needlessly kept in hospital due to internal organizational/operational factors or where a patient is flagged as in need of alternate level of care and is delayed because of deferred transition of care and/or lack of external transfer-of-care arrangements" (Micallef et al., 2020, p. 105).

Prolonged hospitalizations can be driven by several factors. First, preventable comorbidities or patient frailty may extend hospital stays. Second, inefficiencies within the hospital may lead to longer stays. Third, a lack of appropriate discharge destinations that offer rehabilitative care or social support can also lead to prolonged hospitalizations. Additionally, hospitals face admissions and readmissions that are entirely avoidable with effective primary and social care. Older persons are particularly at risk of prolonged hospitalizations due to their more complex health conditions, frailty at admission, and the need for safe discharge arrangements (Picone et al., 2003; Lenzi et al., 2014).

Prolonged hospital stays are common, costly, and risky for patients. A meta-analysis of 64 studies conducted in Europe and North America found that such stays account for an average of 22.8% of all bed days. The figures range from 1.6% in England to 91.3% in Canada, depending on the methodologies, data sources, and populations studied (Landeiro et al., 2019). There is also substantial within-country variation. These prolonged stays contribute to increased healthcare costs and can worsen access and wait times when hospital capacity is limited (Falcone et al., n.d.; Landeiro et al., 2019). Additionally, prolonged hospitalizations can be potentially unsafe for patients (Lingsma et al., 2018; Landeiro et al., 2019; Rojas-García et al., 2018). Existing research has identified several driving factors of prolonged hospitalizations, including a lack of adequate care structures outside the hospital, as well as hospital and inter-hospital processes from admission to discharge, such as early admission to reserve a bed for a scheduled procedure or administrative delays (Landeiro et al., 2019; Siddique et al., 2021; Micallef et al., 2020).

In this study, we conceptualize and empirically measure hospital days due to prolonged stays among older people in Brazil and Mexico. First, we propose a continuum-of-care conceptual framework for prolonged stays based on existing literature and qualitative insights from interviews and focus group discussions with experts from Mexico, Argentina, and Colombia. The framework categorizes drivers of prolonged stays into three parts: (i) lack of appropriate primary healthcare, leading to more complex admissions; (ii) hospital inefficiency; and (iii) lack of rehabilitation, social, and long-term care at discharge. Second, we estimate the prevalence of prolonged stays and the contribution of these three factors using administrative records on discharges for patients aged 65 and older from public sector hospitals in Brazil and Mexico from 2019. Finally, we estimate the total cost of inappropriate days, by multiplying their number by the average cost of one day of

hospitalization (including infrastructure and equipment amortization, procedures and human resources).

Our results suggest that prolonged stays are highly prevalent and costly, primarily driven by hospital inefficiencies and the lack of discharge destinations that provide post-operative, rehabilitative, and social support. Specifically, we estimate that inappropriate hospital days account for 48.1% of hospital days in Brazil and 56.2% in Mexico. The scarce supply of rehabilitation, social, and long-term care services accounts for 12.1% of all hospital days in Brazil and 6.9% in Mexico.

To the best of our knowledge, this is the first paper to provide such a decomposition of the causes of prolonged hospitalizations, allowing for an initial estimation of the savings that could be achieved through the provision of long-term care. The remainder of the paper is organized as follows. Section 2 outlines the conceptual framework that situates hospitals within a broader health and social care system. We illustrate how primary healthcare, hospital inefficiency, and rehabilitation, social, and long-term care can affect the length of stay. Section 3 reviews the literature on the determinants, definition, and costs of long hospital stays. Section 4 describes the data and explains the methodology used to define prolonged hospitalizations, and decompose the length of stay into its components, following the logic of our conceptual model. Section 5 presents the results on the magnitude of inappropriate hospital days and information on the conditions that contribute most to these excessive days, as well as the potential savings from improved post-discharge services. In Section 6, we further discuss our findings. Section 7 concludes and provides policy recommendations.

2. Conceptual framework

We developed a continuum-of-care conceptual framework for prolonged hospital stays based on existing literature and qualitative insights from interviews and focus group discussions with experts from Mexico, Argentina, and Colombia. These discussions and interviews, which included 6 participants from focus groups and 3 medical doctors, were conducted virtually between June and October 2023. The data was analyzed using thematic analysis, an inductive approach that helped us identify key themes and patterns. This analysis allowed us to conceptualize the information into three stages of care: pre-hospital, in-hospital, and post-hospital. Box 1 presents selected quotes that informed our model, and Annex 1 provides a more detailed summary of the findings.

Our framework views hospitals as part of a broader health and social care system that includes primary care and services for rehabilitation, social support, and long-term care (Falcone et al., n.d.). Prolonged hospital stays can result from inefficiencies and bottlenecks at any stage of this care continuum, leading to avoidable admissions or longer hospitalizations than medically necessary. For instance, patients may be admitted too early or too late, experience delays in becoming clinically fit for discharge once admitted, or face discharge delays due to a lack of post-hospital care support.

Figure 1 illustrates our conceptual framework and identifies three potential sources of inappropriate hospital days:

1. **Intake Issues:** Both inadequate primary healthcare (A) and insufficient rehabilitation, social, and long-term care services (B) can lead to avoidable admissions or readmissions and increase patient frailty, contributing to prolonged hospitalizations (Component 1) (Freitas et al., 2012; Lenzi et al., 2014; Bo et al., 2016; Toh et al., 2017). For example, an older person hospitalized for a femur fracture may require a longer stay if they have poorly

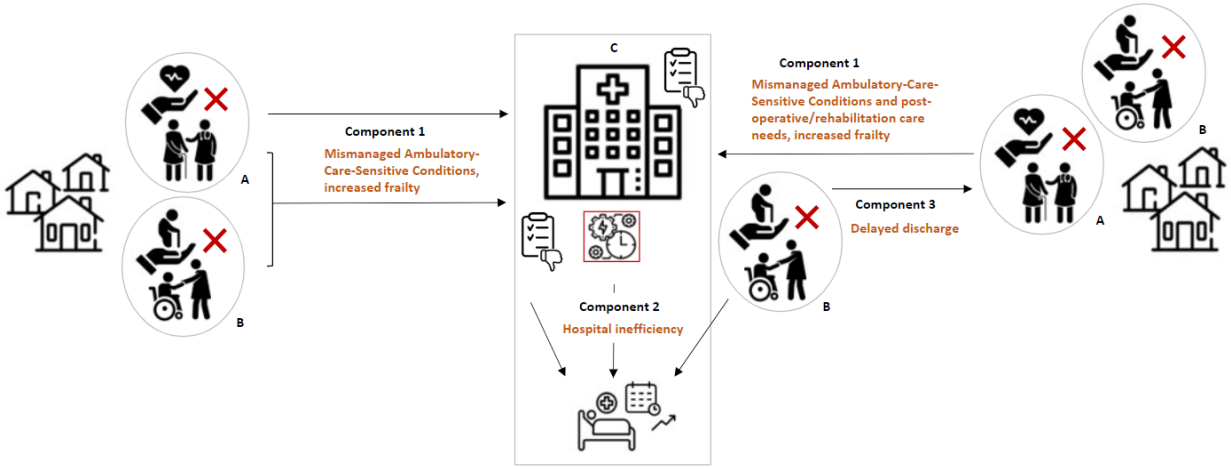
managed chronic conditions that need stabilization or additional care needs that complicate treatment. The same considerations apply to readmissions. Lack of primary healthcare (A) and insufficient rehabilitation, social, and long-term care (B) increase the probability of rehospitalization for people who have been previously discharged and may complicate the clinical picture, extending the duration of these readmissions (Misky et al., 2010). Additionally, too-early discharges due to internal hospital issues may also increase the likelihood of readmission.

2. **In-Hospital Inefficiencies:** Prolonged stays during hospitalization (C) may arise from inefficiencies such as lack of resources, delays in procedures, or poor planning and management (Component 2) (Holmås, Kamrul Islam, et al., 2013). For instance, hospitals with a lower physician-to-patient ratio may experience longer stays as patients wait longer for consultations or test results (Marfil-Garza et al., 2018; Carey et al., 2005).

3. **Discharge Delays:** Discharges for clinically fit patients may be delayed due to a lack of available rehabilitation, social, and long-term care services (B) (Component 3) (Toh et al., 2017; Landeiro et al., 2016; Moore et al., 2015; Carey et al., 2005). For example, older patients may remain hospitalized if they need care or rehabilitation that cannot be provided at home due to a lack of family support or public home care services. Alternatively, they may face delays if suitable institutional arrangements (e.g., rehabilitation centers or long-term care facilities) are unavailable. Such needs may arise from the hospitalization itself or preexist but become more pronounced post-hospitalization. Additionally, families might use the hospital stay as an opportunity to obtain care from public services and may seek to delay or prevent the patient's discharge.

Below, we operationalize this framework to estimate the contribution of the three components – intake, in-hospital, and discharge – to the overall count and prevalence of inappropriate hospital days (prolonged stays) (Figure 1). In practice, distinguishing between hospitalizations and readmissions is challenging because each hospitalization episode is recorded separately and cannot be linked to previous stays. Moreover, we cannot determine whether readmissions result from issues with the initial stay (e.g., premature discharge) or deficiencies in non-hospital support services. Thus, the effect on readmissions is also considered under Component 1. Additionally, we cannot determine whether a stay is prolonged due to family refusal to discharge the patient.

Figure 1. Conceptual framework – Healthcare, social care, and prolonged hospitalizations



Note: Letters (A) to (C) represent different types of care: (A) primary healthcare, (B) social, rehabilitation, and long-term care services, and (C) hospital care.
Source: Authors' elaboration.

Box 1. Mechanisms behind prolonged hospitalizations
(Selected quotes from interviews and focus group discussions)

Appropriate primary healthcare and social care services are essential for preventing hospitalizations, including rehospitalizations, and for improving overall health status (Component 1).

- "We cannot discuss the demand for emergency and inpatient care without addressing chronic diseases that are not managed through outpatient protocols." – *P2, focus group*
- "The hospital stay is determined by the patient's stability, that is, his functionality. How he is functioning as an individual in terms of motor conditions, in terms of comorbidities."– *P4, focus group*
- "We lack an extensive immunization plan for the elderly. The only free vaccine available is for influenza, and its coverage is very low. Without preventive strategies like vaccines for pneumococcus, pertussis, and herpes zoster, we are exposing the elderly population, especially the frailest, to recurrent hospitalizations." – *P1, interview*

Hospital inefficiencies significantly affect the length of hospital stays. (Component 2).

- "There are no protocols for humanized and differentiated care for the elderly [in the case of emergency care] (…); this makes hospital admission processes long and (...) increases the risk of acquiring opportunistic infections that complicate the initial condition." – *P1, interview*
- "Most emergency and hospitalization physicians lack training in geriatrics (...), so they end up consulting several specialists (...), which leads to excessive laboratory work and delays in the process." – *P1, interview*
- "Few hospitals have "early discharge" protocols, leading to administrative many barriers (…)." – *P2, interview*

Prolonged hospitalizations are closely linked to inadequate post-discharge care (Component 3).

- "After a hip fracture (...), [an elderly person] often needs to move to a medium-stay facility. They cannot return home right away. This is when many problems begin (...), there is a shortage of such facilities, and poor coordination in using them according to patients' needs." – *P3, interview*
- "Family members, who are often informal caregivers, may feel unqualified to care for the patient at home, leading them to refuse discharge." – *P6, focus group*
- "There is a lack of communication with family members to involve them in the care of the elderly person, which is an important determinant (…)." – *P6, focus group*

3. Evidence from the existing literature

In this section, we review the literature on prolonged hospitalizations, their determinants, and associated costs.

3.1. Determinants of length of stay

The length of hospital stay is closely related to the likelihood of a hospitalization being inappropriately long. The existing literature classifies the determinants of hospital length of stay into patient characteristics, hospital features, and contextual factors that reflect the availability of health and social care outside the hospital (Falcone et al., n.d.).

Patient characteristics

Clinical factors such as the main diagnosis, comorbidities, frailty, and functional status, as well as non-clinical factors like demographic characteristics and socioeconomic status, play a crucial role in determining the length of hospital stays. Clinical factors can lead to longer hospitalizations, particularly in complex cases (e.g. Rodrigues et al., 2022; Stone et al., 2022). The effect of age on length of stay is mixed; some studies consider older age as a proxy for frailty. For example, Picone et al. (2003) and Lenzi et al. (2014) find a correlation between older age and extended hospital stays, while Marfil-Garza et al. (2018) find that long hospitalizations are more common among younger patients in Mexico. Gender effects are also inconsistent (Marfil-Garza et al., 2018; Holmäs et al., 2017; Ono et al., 2010, Butterworth et al., 2000). However, socioeconomic status consistently shows a negative correlation with the length of stay, with higher-status patients typically experiencing shorter hospitalizations (Marfil-Garza et al., 2018; Moore et al., 2015; Perelman and Closon, 2011). While patient characteristics contribute to variations in the average length of stay across hospitals, they do not account for the entire variability (Krell et al., 2014).

Hospital features

Hospital characteristics, including managerial and human resources, organizational features, and teaching status, influence length of stay by affecting procedures, consultations, test interpretations, and discharge planning (Marfil-Garza et al., 2018; Carey et al., 2005; Lenzi et al., 2014). Similarly, hospital structural variables, both observable – wage levels, bed size, location, teaching status, and ownership – and unobservable, are important determinants of average length of stay. For example, Walsh et al. (2014) find that approximately 9% of the variation in average length of stay across U.S. community hospitals is due to observable hospital characteristics. A study in Norway shows that unobservable hospital characteristics account for 9% of the average length of stay and 10% of delayed discharges (i.e. clinically inappropriate long stays) (Holmås et al., 2013).

Effect of primary healthcare and rehabilitation, social and long-term care services

Contextual variables, such as the availability of local healthcare services, can account for some of the variation in hospitalization lengths. A delayed discharge can occur due to lack of availability of or coordination with primary healthcare, rehabilitation and/or long-term care services (Micallef et al., 2020; Falcone, n.d.). As discussed in the conceptual framework, these factors could play a role during both admission and discharge.

From an admissions perspective, availability of strong primary healthcare is associated not only with fewer hospitalizations but also with shorter stays (Yang et al., 2022). A quality primary care system allows people to better manage their health, hence preventing unnecessary complications that could increase the length of stay. Similarly, long-term care services improve patients' health

and frailty status at admission by preventing and reducing the loss of functional independence (Curry, 2006).

Primary healthcare, rehabilitation, social and long-term care services also improve patients' post-discharge transitions. For example, working with data from a teaching hospital in the United States, Misky et al. (2010) find that follow up within four weeks of discharge can reduce the number of readmissions of previously discharged patients, and shorten hospital stays at readmission by two days.

Similarly, the availability of rehabilitation and long-term care services and their coordination with healthcare can reduce the average length of hospital stay by enhancing the process of discharge and post-discharge transitions. The effects can be significant. For the United States, Carey et al. (2005) show that 84% of the days attributable to non-medical delayed discharges were due to challenges in finding a place in a nursing facility. Likewise, Zhao et al. (2018) find that 56% of prolonged hospitalizations in the United States occurred due to the inability to coordinate the discharge to a suitable destination. One of the few studies conducted in Latin America found that 36% of long hospitalizations among older adults (defined as stays exceeding 30 days) in Chile could potentially be avoided with adequate social care provisions (Villalobos Dintrans, 2018). Evidence on the importance of long-term care services in allowing timely and safe hospital discharges has also been found in Norway, Canada, England, Spain, and Korea (Holmås, Islam et al., 2013; Moore et al. 2015 Gaughan et al. 2015; Costa-Font et al. 2018, Hyun et al., 2014).

Literature further indicates that the role of post-discharge care availability in determining the length of stay is greater for complex patients, for patients from lower socioeconomic strata, and for those that need to change their residence arrangement after discharge (for example, from home to a nursing facility) (Holmås, Islam et al., 2013; Moore et al., 2015).

Contextual factors are not limited to the availability of formal services. Informal caregiving, such as family care, also plays a role (Toh et al., 2017; Landeiro et al., 2016; Moore et al., 2015; Picone et al., 2003). This support can sometimes be more important than the availability of financial resources to purchase post-hospital care, as evidenced in the case of trauma patients in Canada (Moore et al., 2015). Moreover, coordination and communication with family members play a crucial role. For example, Tan et al. (2010) find that in Singapore 44% of delayed discharges of stroke patients were due to a family member's request and Carey et al. (2005) highlight the importance of keeping both patients and family caregivers involved in the discharge planning process, and of educating and training them on post-discharge care needs. This is in line with the findings from the interviews with experts conducted as part of this study (Annex 1).

3.2. Costs of long hospitalizations

Long hospitalizations and delayed discharges create financial and opportunity costs and negatively impact health. Financial costs arise from the use of hospital resources, including both recurring and capital costs. In a meta-analysis including data from Cuba, Mexico, Singapore, the United Kingdom, Sweden, Israel, and United States, Landeiro et al. (2019) estimate that the average cost of delayed discharges is US$7,020 (PPP adjusted) per patient, ranging from minimum of US$482 (PPP adjusted) in Cuba to a maximum of US$31,935 in the United States. These estimates do not include capital expenditure.

The cost of an additional hospital day varies with patient complexity and hospital characteristics (Kozma et al., 2010). The marginal cost declines with the length of stay, as the first days involve expensive diagnostics and procedures, and the required resources converge to room, board, and limited nursing services. Consequently, the final days of hospitalization are likely to have the lowest marginal costs. Taheri et al. (2000) estimate that the median variable direct cost on the

day of admission in an academic hospital in the United States in 1998 is US$1,246, dropping to US$304 at discharge. The first three days of hospitalizations account for 40% of the total variable costs, while the last day costs 3% or less of the stay. However, such estimates can be misleading as they exclude prorated infrastructure and equipment expenditures.

Because shorter-than-expected stays could lead to avoidable readmissions (Sud et al., 2017; Makowsky and Klein, 2018), the cost of an additional day of hospitalization could be partially offset by a decrease in the likelihood of readmission. Carey (2015) estimates that avoiding readmissions could offset the cost of an additional day of stay by 15% to 65% among Medicare patients in the United States. In capacity-constrained settings, prolonged stays can generate opportunity costs because congestion may prevent the admission of other patients. Although admitting these new patients may be more financially costly, doing so may be welfare-enhancing, given their likely higher care needs.

Long stays can also negatively affect patients' health. They can increase the risk of adverse drug reactions, infections, and ulcers (Hauck and Zhao, 2011), which can lengthen hospital stays even further. For example, an extra day in hospital in the United States has been shown to increase the probability of infection by 1.37% (Hassan et al., 2010). Similarly, long stays can reduce patients' mobility and functioning (Landeiro et al., 2018; Vliet et al., 2017), which leads to care needs at discharge. The negative effects on wellbeing are not limited to patients but have also been found for patients' families and hospital staff (Rojas-García et al. 2018).

Some authors argue that the length of stay could be reduced by pre-admission and post-discharge services that improve the health status of patients at admission and facilitate a smooth and safe discharge process. Matus-López (2023) estimates that the implementation of a long-term care system in Chile could save up to 5% of the public healthcare sector expenditures (with savings ranging between US$4.6 and 64 million per year, depending on the assumptions made).

3.3. Definitions of prolonged hospital stays

Although there is relative consensus among researchers regarding the definition of prolonged hospitalizations, studies differ in their operationalization, using different data, criteria, and methodologies. Determining whether an individual patient is medically fit for discharge or an alternate level of care requires detailed data, such as medical records that are scored by clinicians (Bo et al., 2016; Hendy et al., 2012; or Lewis and Glasby, 2006), or standardized methods such as the Appropriateness Evaluation Protocol (Vetter, 2003).

When only administrative claims or discharge data are available, determining clinical fitness and, consequently, prolonged stays tends to rely on ad-hoc methods. Some studies use an absolute threshold of 20 days for the general population, such as Toh et al. (2017) in Singapore. The same criterion is used by the National Health System in England to classify hospitalizations and design protocols to reduce the prevalence of long stays (NHS n.d.). Other studies on older patients use higher thresholds, such as 60 or 180 days (Olivares-Tirado, n.d.; Cho and Kwon, 2022). The advantage of an absolute threshold is its simplicity. However, since most hospitalizations are likely to have an appropriate duration of less than 20 days, this approach likely underestimates delayed discharges. Moreover, a uniform threshold does not account for the legitimate complexity of patients' clinical profiles.

To address these shortcomings, some studies have used adjusted thresholds that consider reasons for admission and/or specific patient or hospital characteristics. Such adjustments have been based on calculating the average duration for certain conditions or patients, estimating the expected length of stay through regression analysis, or utilizing machine learning techniques (Stone et al., 2022). For example, some methods calculate the threshold by adding one or two

standard deviations to the average or predicted length of stay. Similarly, a method proposed by Krell et al. (2014) and Lingsma et al. (2018) sets the threshold at the 75th percentile of the distribution of different procedures or diagnoses. Using Mexican data, Marfil-Garza et al. (2018) define as long hospitalizations those exceeding the 95th percentile of the distribution (equivalent to 34 days). A disadvantage of this approach is that the prevalence of long stays is predetermined by construction. For instance, if the threshold is set at the 75th percentile, 25% of the hospitalizations will be identified as prolonged. Thus, this approach is unsuitable for estimating the prevalence of prolonged stays.

4. Data and methodology

4.1. Data sources

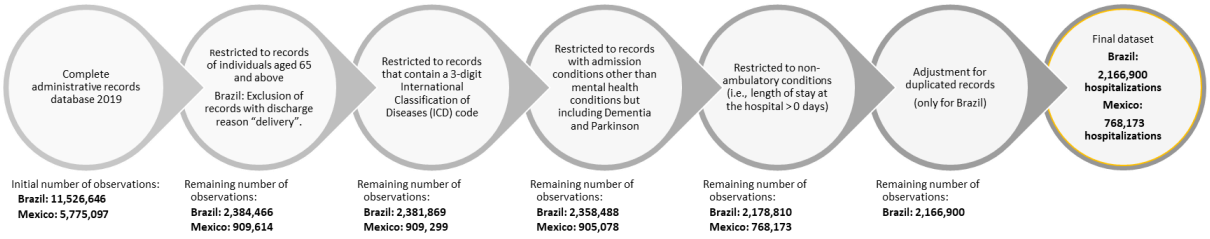
We use administrative data on non-ambulatory hospitalizations for persons aged 65 and above in Brazil and Mexico in 2019, the latest calendar year before the COVID-19 pandemic. These data are generated for each hospital admission and include information on the date, reasons (e.g. surgery, delivery) and type (elective or urgent) of admission, main and secondary diagnoses (comorbidities), date and reason of discharge, and main demographic characteristics of patients.

We exclude:

(i) Records of individuals aged below 65;[2]
(ii) Observations without a 3-digit International Classification of Diseases (ICD) code;
(iii) Records indicating admissions related to mental health conditions that are associated with semi-residential treatments;
(iv) Observations related to ambulatory procedures;
(v) Duplicated records.

Figure 2 illustrates the data cleaning process and the remaining number of observations after each step.

Figure 2: Data cleaning process



Source: Authors' elaboration.

The dataset for Brazil includes information on all hospitalizations in the public healthcare system (*Sistema Único de Saúde* – SUS), which covers between 75% and 80% of the country's population (Savedoff et al. 2022). The data were retrieved from the Hospital Information System

[2] In Brazil, we also drop 14 records of elderly persons indicating "delivery" as reason for hospital discharge assuming these are data entry errors.

available on the DATASUS website (Ministério da Saúde de Brasil n.d.) After the cleaning process, it includes 2,166,900 hospitalizations from 3,785 health establishments. These generate 15 million days of hospitalization due to 1,441 conditions (classified using ICD-10 codes, 3-digit classification).

The data for Mexico come from Mexico's Health Sector Hospital Discharge Database. For 2019, it includes hospital discharges from the Ministry of Health (Secretaría de Salud), the Mexican Social Security Institute (Instituto Mexicano del Seguro Social – IMSS and IMSS Bienestar), the Institute for Social Security and Services for State Workers (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado – ISSTE), the Mexican Oil Company PEMEX (Petróleos Mexicanos), and State Medical Services. After the cleaning process, the dataset comprises 768,173 hospitalizations from 1,214 medical institutions, corresponding to 4,639,140 days of hospitalization due to 1,348 conditions (classified using ICD-10 codes, 3-digit classification). Hospitalizations from the IMSS account for 54.9% of the observations, those from the Secretaría de Salud for 26.9%, ISSTE accounts for 15.1% of hospitalizations, PEMEX for 2.9% and the State Medical Services for 0.17%.

Table 1 presents the main demographic and health characteristics of the sample, as well as some key admission and outcome characteristics for both countries. The average length of hospitalizations among the over-65 population is 6.9 days in Brazil and 6 days in Mexico. Patients are, on average, 75 years old, which is also the median age. Hospitalizations are also evenly distributed between genders. Considering women's overrepresentation among the older population, this suggests that, compared to men, females are relatively less likely to be hospitalized. This finding is in line with other research indicating that, even though women's use of home and preventive healthcare services is higher than men's, they are not more likely to be hospitalized (Cameron et al., 2010; Bertakis et al., 2000). In the case of Brazil, 22% of the hospitalizations correspond to patients with more than one diagnosis. More than 80% are admissions through the emergency ward; 10% of patients undergo a high-complexity procedure. The percentage of hospitalizations that end with the death of the patient is equal to 12.8% in Brazil and 10.6% in Mexico.

Table 1. Main characteristics of the sample

	Brazil	Mexico
Number of hospitalizations	2,166,900	768,173
Number of days of hospitalization	15.006.168	4,639,140
Average length of stay (days) (Standard deviation)	6.9 (10.6)	6.0 (30.4)
Age 65-69 (%)	26.8	27.9
Age 70-74 (%)	23.2	24.0
Age 75-79 (%)	19.6	19.7
Age 80-84 (%)	15.0	14.4
Age 85+ (%)	15.3	14.0
Average age (years)	75.7	75.4
Females (%)	49.7	51.8
Males (%)	50.3	48.2
% with comorbidities	22.1	-
Charlson comorbidity index	0.27	
Type of admission: Elective (%)	17.3	-
Type of admission: Emergency (%)	82.7	-
Procedure complexity: Medium (%)	89.6	-
Procedure complexity: High (%)	10.4	-
In-hospital mortality (%)	12.8	10.6

Source: Authors' elaboration based on DATASUS hospitalization database, 2019 and Mexico's Health Sector Hospital Discharge Database, 2019.

4.2. Definition of Prolonged Hospitalizations and Decomposition of Length of Stay

Following the conceptual framework, we decompose a hospital length of stay (*LOS*) into four parts: (i) the medically appropriate stay (*T*); (ii) excessive days due to the lack of appropriate primary healthcare that leads to more complex admissions (*ED1*); (iii) excessive days due to hospital inefficiency (*ED2*); (iv) excessive days due the lack of rehabilitation, social, and long-term care at discharge (*ED3*). We include all primary diagnoses in the analysis, even those conditions that should have been prevented at the primary care level. Extensive evidence suggests that a robust primary care system can reduce hospitalizations. However, this paper does not aim to quantify the potential savings from such reductions; instead, it focuses on understanding the factors contributing to prolonged hospital stays once admission has occurred. Box 2 illustrates the decomposition using four stereotypical examples.

For each condition, we define the medically appropriate duration of stay as the average length of stay in the most efficient state (the "benchmark state") or, in other words, in the state with the lowest average length of stay for that condition. To calculate this average, we restrict the sample to patients without comorbidities (secondary diagnoses) that could have been prevented at the primary level. That is, only patients without Ambulatory-Care-Sensitive Conditions (ACSC) comorbidities are considered to determine the benchmark state. By restricting the sample in this way, we remove the portion of the stay that is attributed to clinical complications linked to comorbidities that could have been managed through appropriate primary healthcare.[3] Implicitly,

[3] For hospitalizations due to ACSC (as primary condition), both LOS and ED1 could be avoided through appropriate primary healthcare.

we assume that in the benchmark state, ACSC comorbidities are properly managed at the primary level.

We proceed as follows. For each condition, we calculate the average duration of hospitalizations for patients without ACSC comorbidities by state ($\overline{LOS}_{c,s}$). We then take the lowest average value as the threshold that defines the medically appropriate stay T_c. The calculations are given by equations [1] and [2].

$$\overline{LOS}_{c,s} = \frac{\sum_{i,c,s} LOS_{i,c,s}}{\sum_{i,c,s} I_{i,c,s}} \quad \text{for } i \text{ without ACSC} - \text{comorbidities} \quad [1]$$

$$T_c = \min_s\left(\overline{LOS}_{c,s}\right) \quad [2]$$

Where $LOS_{i,c,s}$ is the length of stay of patient *i*, for condition *c* in state *s*. *I* is an indicator equal to 1 that counts the hospitalizations for the purpose of calculating the average length of stay. Equation [2] identifies *T* and the corresponding benchmark state (*BS*), for each condition *c*.

For each hospitalization, the number of excessive days ED is the difference between the actual length of stay and the threshold, as shown in equation [3]. ED is also equal to the sum of its three components, as shown in equation [4].

$$ED_{i,c} = LOS_{i,c} - T_c \quad if\ LOS_{i,c} > T_c;\ 0\ otherwise \quad [3]$$

$$ED = ED1 + ED2 + ED3 \quad [4]$$

To calculate $ED1$, i.e., the excessive days that could have been avoided through appropriate management of ACSC comorbidities at the primary level, we calculate the average length of stay (Z_c) among patients with ACSC comorbidities hospitalized for condition *c* in the benchmark state *BS* identified in equation [2]. The formula is shown in equation [5].

$$Z_c = \frac{\sum_{i,c,BS} LOS_{i,c,BS}}{\sum_{i,c,BS} I_{i,c,BS}} \quad \text{for } i \text{ with ACSC} - \text{comorbidities} \quad [5]$$

Only patients reporting ACSC comorbidities are considered in equation [5]. The assumption is that poor management of ACSC comorbidities would lead to longer stays even in the most efficient state, because it increases the complexity of a patient's clinical picture at admission. This implies that Z is larger than T.[4]

For patients with ACSC comorbidities in all states, $ED1$ is computed as the difference between Z_c and T_c, or the difference between the actual length of stay and T_c if the length of stay is shorter than Z_c. For patients without ACSC comorbidities, $ED1$ is zero by definition. This is summarized in equation [6].

[4] In few cases where Z<T, we set Z=T. Also, in very few outlying cases in which Z exceeds 2T, we set Z=2T.

$$ED1_{i,c} = 0 \quad \text{for } i \text{ without ACSC} - \text{comorbidities} \quad [6]$$

$$ED1_{i,c} = Z_c - T_c \quad \text{if } i \text{ has ACSC} - \text{comorbidities and } LOS_{i,c} > Z$$

$$ED1_{i,c} = LOS_{i,c} - T_c \text{ if } i \text{ has ACSC} - \text{comorbidities and } Z_c > LOS_{i,,c} > T_c$$

$$ED1_{i,c} = 0 \text{ if } i \text{ has ACSC} - \text{comorbidities and } LOS_{i,c} < T$$

This calculation of $ED1$ can only be done for Brazil, as the Mexican data do not include information on comorbidities. Consequently, for Mexico $ED1$ is included partly in T and partly in $ED2$. It should also be noted that a strong primary healthcare would avoid admissions due to ACSC altogether. That is, the T_c part of admissions due to ACSC as primary conditions can also be considered excessive days (more specifically, *ED1*). However, for this analysis, we aim to identify the contribution of ACSC comorbidities to prolonged hospitalizations, even in cases where a person has been hospitalized due to a primary ACSC.

After accounting for *ED1*, the decomposition of the remaining excessive days depends on whether the condition that caused admission generates new post-discharge care needs. For instance, people with musculoskeletal conditions will require rehabilitation care after leaving the hospital. Similarly, neurological conditions and systemic diseases, mainly respiratory and cardiac failures, affect a patient's mobility and thus generate new post-discharge rehabilitation needs. In contrast, patients with more generic conditions, such as diabetes, can recover without rehabilitation care. We identify the conditions that generate new care needs (*CN*) through expert opinions who assessed a set of 35 diagnoses that most contribute to excessive hospital days in our analysis.[5] We assume that conditions not assessed belong to the no-new-care-needs (*NCN)* group.

If a condition does not create new care needs (*NCN*), we assume that all remaining excessive days are due to hospital inefficiency (*ED2*). If a condition generates post-discharge care needs (*CN*), the remaining excessive days are further disaggregated into *ED2* and lack of rehabilitation, social, and long-term care (*ED3)*.

For conditions in the *NCN* group, the component due to hospital inefficiency is defined by equation [7].

$$ED2_{i,c} = LOS_{i,c} - T_c - ED1_{i,c} \; if \; c \in NCN \; and \; LOS_{i,c} > (T_c + ED1_{i,c}); \; 0 \text{ otherwise} \quad [7]$$

For conditions in the *CN* group, we assume that hospital inefficiency is equal to the average inefficiency observed for the *NCN* group, $\overline{ED2}$, which is defined as:

[5] The following conditions were classified as generating medium to high care needs: Angina pectoris; Bacterial infection of unspecified site; Bacterial pneumonia, not elsewhere classified; Cerebral infarction; Fracture of the femur; Fracture of lower leg, including ankle; Heart failure; Other chronic obstructive pulmonary disease; Other degenerative diseases of nervous system, not elsewhere classified; Other sepsis; Pneumonia, organism unspecified; Sequelae of cerebrovascular disease; Shock, not elsewhere classified; Stroke, not specified as hemorrhage or infarction. The following conditions were assessed as generating no or low care needs: Acute myocardial infarction, Cholecystitis; Cholelithiasis; Chronic ischemic heart disease; Chronic kidney disease; Epilepsy; Essential (primary) hypertension; Intracranial injury; Malignant neoplasm of colon; Other bacterial diseases, not elsewhere classified; Other cerebrovascular diseases; Other diseases of digestive system; Other disorders of fluid, electrolyte and acid-base balance; Other disorders of skin and subcutaneous tissue, not elsewhere classified; Other disorders of urinary system; Other peripheral vascular diseases; Paralytic ileus and intestinal obstruction without hernia; Respiratory failure, not elsewhere classified; Type 2 diabetes mellitus; Unknown and unspecified causes of morbidity; Unspecified diabetes mellitus. See also Table 4.

$$\overline{ED2} = \frac{\sum_{i,c} ED2_{i,c}}{\sum_{i,c} I_{i,c}}, \text{for } c \in NCN \quad [8]$$

$ED2$ is then defined by equation [9].

$$ED2_{i,c} = \overline{ED2}\ if\ c \in CN\ and\ LOS_{i,c} > \left(\mathrm{T_c} + ED1_{i,c} + \overline{ED2}\right) \quad [9]$$
$$ED2_{i,C} = LOS_{i,c} - \mathrm{T_c} - ED1_{i,c}\ \text{ if }\ c \in CN\ and\ \left(\mathrm{T_c} + ED1_{i,c} + \overline{ED2}\right) > \mathrm{LOS_{i,c}} > \left(\mathrm{T_c} + ED1_{i,c}\right)$$
$$ED2_{i,C} = 0\ \text{ otherwise}$$

Finally, $ED3$, the number of excessive days that are due to the lack of rehabilitation, social and long-term care services for conditions that generate new care needs is defined by equation [10]. For conditions that generate no care needs, *ED3* is zero by definition.

$$ED3_{i,c} = 0\ \text{ for } c \in NCN\ \ [10]$$
$$ED3_{i,c} = LOS_{i,c} - T_c - ED1_{i,c} - ED2_{i,c}\ \text{ if } c \in CN\ and\ LOS_{i,c} > \left(\mathrm{T_c} + ED1_{i,c} + ED2_{i,c}\right),$$
$$ED3_{i,C} = 0\ \text{ otherwise}$$

Box 2 illustrates this decomposition analysis for different examples of conditions and types of patients.

Box 2. Examples of decomposition calculations, Brazilian database

Example 1: Patient with acute myocardial infarction, no ACSC comorbidities.

LOS	T_c	Z_c	ACSC	New care needs	ED	ED1	ED2	ED3
9	5.1	6.2	No	No	3.9	0	3.9	0

Example 2: Patient with acute myocardial infarction, with ACSC comorbidities.

LOS	T_c	Z_c	ACSC	New care needs	ED	ED1	ED2	ED3
10.2	5.1	6.2	Yes	No	5.1	1.1	4.0	0

Example 3: Patient with fracture of the femur, no ACSC comorbidities.

LOS	T_c	Z_c	ACSC	New care needs	ED	ED1	ED2	ED3
12	6.7	7.0	No	Yes	5.3	0	3.1	2.2

Example 4: Patient with fracture of the femur, with ACSC comorbidities.

LOS	T_c	Z_c	ACSC	New care needs	ED	ED1	ED2	ED3
12	6.7	7.0	Yes	Yes	5.3	0.2	3.1	2.0

5. Evidence from Brazil and Mexico

5.1. Prolonged hospitalizations account for approximately half of all hospital days

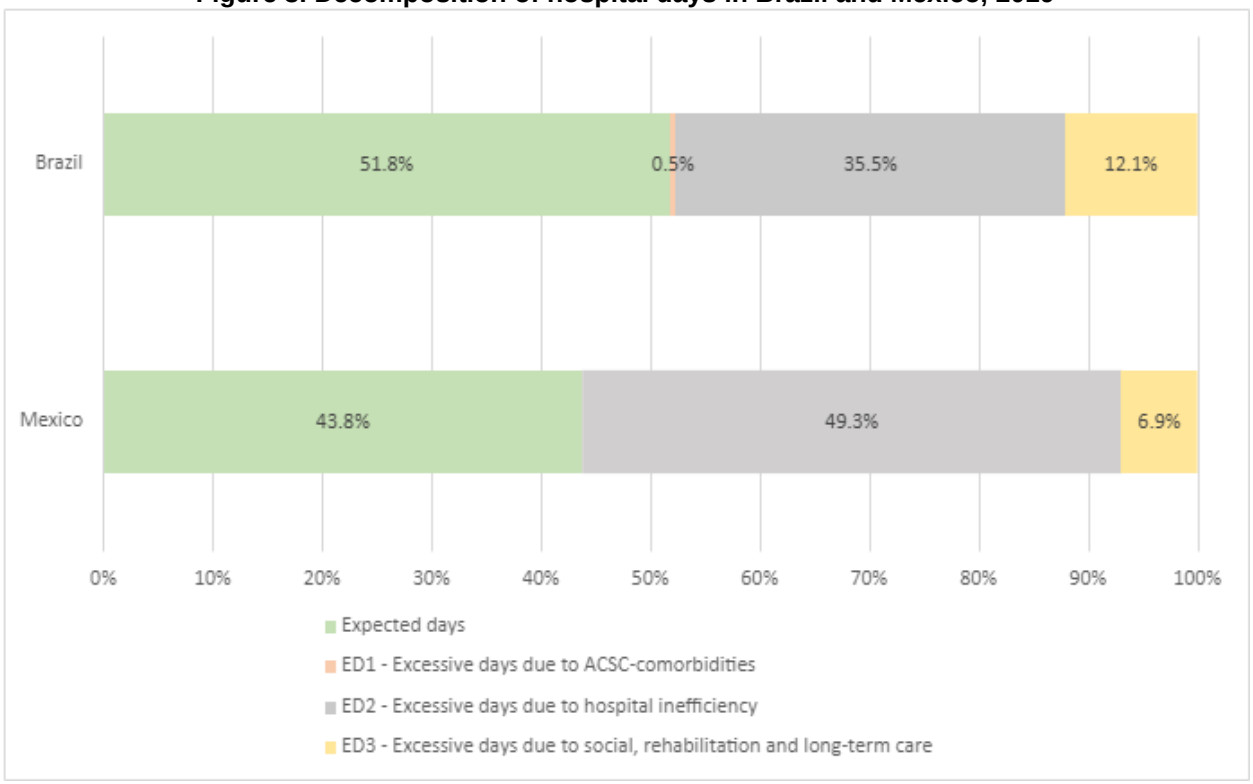
The decomposition analysis shows that excessive days represent 48.1% of total hospital days in Brazil and 56.2% in Mexico (Figure 3). These excessive days come from 1 million hospitalizations in Brazil and 440,000 hospitalizations in Mexico classified as prolonged, representing 46% and 57% of the total number of hospitalizations, respectively.

In Brazil, we estimate that 0.5% of total hospital days result from the increased fragility and clinical complexity of patients with secondary conditions that could have been managed at the primary care level (referred to as ACSC comorbidities). Additionally, 35.5% of hospital days are attributable to inefficiencies within hospitals, such as lack of resources and management models. Finally, 12.1% of hospital days could be avoided by providing better rehabilitation, social, and long-term care services.

In Mexico, hospital inefficiency is the predominant factor, accounting for 49.3% of total hospital days. The percentage of hospital days that could be saved through the provision of rehabilitation, social and long-term care services is lower than in Brazil, at a 6.9%. As discussed in the methodology section, the data from Mexico does not allow for the estimation of the share of excessive days due to mismanagement of ACSC comorbidities. Therefore, these excessive days are partly included in the estimated medically appropriate stay and partly in the share of excessive days due to hospital inefficiency.

Our analysis considers all main causes of hospitalizations, including those for conditions that could have been avoided with better primary care (i.e., hospitalizations with a primary diagnosis of ACSC). From the hospital's perspective, these are valid admissions. However, from the broader perspective of a health system, these admissions should not have occurred and therefore the appropriate length of stay should be zero days, making all days for these conditions excessive. Expected days of stay from ACSC constitute 14.4% and 12.5% of all hospital days in Brazil and Mexico, respectively. If we count all days from admissions with primary diagnosis of ACSC as medically inappropriate, excessive days account for 64.7% and 68.7% of total hospital days in Brazil and Mexico, respectively.

Figure 3. Decomposition of hospital days in Brazil and Mexico, 2019



Source: Authors' elaboration based on DATASUS hospitalization database, 2019 and Mexico's Health Sector Hospital Discharge Database, 2019. Note: Component ED1 cannot be estimated for Mexico, due to lack of information on ACSC comorbidities.

The share of excessive days that can be attributed to the different components varies by state (Annex 2, Tables A2.1 and A2.2), especially for the part related to the lack of rehabilitation, social, and long-term care services. In Brazil, this component accounts for a share of total hospital days ranging between 3.6% in Mato Grosso do Sul and 19% in Amapá. In Mexico, it accounts for a share of total hospital days ranging from 5% in Michoacán de Ocampo and Tabasco to 10.7% in Mexico City. Hospital inefficiency accounts for 24.8% in Paraná and up to 46.0% in Rio de Janeiro. In Mexico, these figures range from 42.4% in Colima to 52.9% in Baja California.

5.2. Which conditions account for most excessive days?

Table 2 shows that in both Brazil and Mexico, the expected stay varies substantially across conditions. Considering the 20 conditions responsible for most of the excessive days, in Brazil, this parameter ranges between just over 2 days for hypertension to nearly 10 days for sequalae of stroke. In Mexico, it varies from 2.6 days for unknown causes of morbidity to slightly more than 6 days for a fracture of the femur. Similarly, the observed average length of stay varies greatly across conditions. For the same 20 conditions in both countries, the average length of stay in Brazil ranges from 4.3 days for cholelithiasis to 32.6 days for sequelae of cerebrovascular disease. In Mexico, it varies between 4.7 days in the case of hypertension and 9.7 days for fracture of the femur.

Table 2 also shows that just 20 conditions account for 51% of excessive days in Brazil (Panel A) and 41% in Mexico (Panel B). In Brazil, two infection-related diseases, pneumonia and sepsis, are at the top of the chart, jointly accounting for more than 11% of excessive days (Table 2, Panel A). If we add bacterial pneumonia, bacterial infection, erysipelas, and other bacterial diseases, the share due to infectious diseases reaches 18% of excessive days. Cardiovascular diseases also rank high, with 5.5% of excessive days due to heart failure, 4.3% to stroke, 3.1% to acute myocardial infarction, 2.2% to angina pectoris, and 1.3% to sequelae of cerebrovascular diseases. Taken together, these cardiovascular conditions account for 16.6% of excessive days. In Mexico, the fracture of the femur is the condition that accounts for most excessive days, 5.4% of the total (Table 2, Panel B). Chronic kidney disease, pneumonia, and diabetes mellitus (type 2) jointly account for an additional 11.4%.

Table 3 indicates key demographic and hospitalization characteristics for the conditions reported in Table 2, comparing the full sample of hospital stays with the subsample of prolonged hospitalizations by country. Overall, there are no clear patterns differentiating prolonged hospitalizations from all hospital stays. In both Brazil (Table 3, Panel A) and Mexico (Table 3, Panel B), demographic and health characteristics are similar among subsamples, except for conditions like cholelithiasis, unspecified diabetes mellitus, and cholecystitis that show slightly lower percentages for females among prolonged stays in Mexico (Table 3, Panel B). Additionally, in Brazil, the type of admission (elective versus emergency) and the complexity of the procedure undertaken do not differ substantially between the two samples. In addition, in both countries, in-hospital mortality varies slightly across subsamples, but without a clear pattern, and the magnitude of the differences is relatively small. In Brazil (Table 3, Panel A), for heart failure, stroke, and bacterial diseases, excessive days appear correlated with a higher mortality rate. In contrast, for conditions like sepsis and sequelae of stroke excessive days seem associated with lower levels of mortality. In Mexico (Table 3, Panel B), prolonged hospitalizations show lower in-hospital mortality rates for acute myocardial infarction and sepsis, and higher rates for diseases classified as unknown and unspecified causes of morbidity.

From Table 3, it seems that the quantity of excessive days is primarily attributed to the cause of hospitalization rather than the patient's characteristics. This aligns with our approach of using an index that varies by condition to identify the component of excessive days due to lack of rehabilitation, social and long-term care services.

Table 2. Top 20 conditions responsible for excessive days of hospitalization - Panel A. Brazil

	Thresholds		All stays						Long stays			
	T[1]	Z[2]	av. days[3]	SD[4]	days from condition[5]	% in total days[6]	cases from condition[7]	% of long hosp.[8]	av. days[9]	SD[10]	# exc. days[11]	share in excessive days[12]
Pneumonia, organism unspecified	5.46	7.61	7.17	7.36	1,024,904	6.8%	142,972	46%	11.99	8.64	424,799	5.9%
Other sepsis	5.78	5.78	11.23	11.37	695,576	4.6%	61,914	64%	15.98	11.82	402,662	5.6%
Heart failure	5.11	6.97	7.39	7.87	868,204	5.8%	117,441	44%	12.82	9.23	400,795	5.5%
Stroke, not specified as hemorrhage or infarction	5.52	9.35	7.62	9.00	684,707	4.6%	89,896	44%	13.41	11.01	312,943	4.3%
Acute myocardial infarction	5.07	6.17	8.22	9.30	431,797	2.9%	52,547	48%	14.08	10.66	225,682	3.1%
Bacterial pneumonia, not elsewhere classified	5.00	8.67	7.47	7.86	472,917	3.2%	63,320	47%	12.39	9.19	219,401	3.0%
Other disorders of urinary system	4.10	5.00	6.41	7.15	430,282	2.9%	67,101	50%	10.36	8.51	206,121	2.9%
Other chronic obstructive pulmonary disease	4.60	6.24	6.84	9.39	384,751	2.6%	56,228	47%	11.45	12.04	182,348	2.5%
Fracture of the femur	6.76	7.00	8.62	8.21	461,928	3.1%	53,559	49%	13.71	9.22	181,857	2.5%
Chronic kidney disease	5.84	6.50	9.73	11.30	311,414	2.1%	32,000	54%	15.67	12.62	169,391	2.3%
Angina pectoris	3.16	6.31	5.52	6.70	291,174	1.9%	52,735	46%	9.74	7.94	160,969	2.2%
Bacterial infection of unspecified site	7.60	9.38	9.48	9.81	320,050	2.1%	33,760	42%	16.93	11.28	133,193	1.8%
Respiratory failure, not elsewhere classified	5.10	5.10	9.37	11.14	172,712	1.2%	18,430	50%	16.05	12.57	100,645	1.4%
Sequelae of cerebrovascular disease	9.78	11.00	32.63	66.18	126,058	0.8%	3,863	60%	52.07	80.16	97,169	1.3%
Other diseases of digestive system	3.66	5.24	5.42	6.18	201,272	1.3%	37,167	49%	8.96	7.26	96,586	1.3%
Essential (primary) hypertension	2.32	2.54	5.85	19.20	115,465	0.8%	19,723	46%	10.82	27.45	77,307	1.1%
Cholelithiasis	3.07	3.07	4.34	6.17	134,577	0.9%	31,037	31%	10.23	8.52	68,385	0.9%
Other bacterial diseases, not elsewhere classified	6.14	12.27	10.94	11.07	123,663	0.8%	11,303	56%	16.64	11.97	66,472	0.9%
Unspecified diabetes mellitus	3.98	3.98	6.12	6.94	138,245	0.9%	22,587	55%	9.21	8.08	65,481	0.9%
Erysipelas	5.02	10.04	7.41	7.24	146,680	1.0%	19,804	50%	11.45	8.36	64,149	0.9%
Total					7,536,377	50%	987,387				3,656,357	51%

Panel B. Mexico

	Threshold	All stays						Long stays			
	T[1]	av. days[3]	SD[4]	days from condition[5]	% in total days[6]	cases from condition[7]	% of long hosp.[8]	av. days[9]	SD[10]	# exc. days[11]	share in excessive days[12]
Fracture of the femur	6.34	9.66	11.46	307,947	6.6%	31,885	62%	13.42	13.15	139,905	5.4%
Chronic kidney disease	3.26	5.70	10.32	228,505	4.9%	40,092	49%	9.84	13.58	128,604	4.9%
Pneumonia, organism unspecified	5.66	8.13	93.93	193,211	4.2%	23,757	50%	13.23	132.29	90,487	3.5%
Type 2 diabetes mellitus	3.71	5.63	8.44	158,308	3.4%	28,102	52%	9.09	10.50	79,132	3.0%
Other disorders of urinary system	3.60	6.25	7.43	106,890	2.3%	17,099	63%	8.79	8.39	55,630	2.1%
Other chronic obstructive pulmonary disease	3.88	5.64	7.57	120,058	2.6%	21,273	61%	8.01	8.95	53,145	2.0%
Shock, not elsewhere classified	5.28	8.43	11.10	93,702	2.0%	11,118	47%	15.21	13.08	52,219	2.0%
Heart failure	3.69	6.01	6.16	89,461	1.9%	14,893	61%	8.54	6.70	44,278	1.7%
Other cerebrovascular diseases	4.15	6.09	9.12	92,546	2.0%	15,190	46%	10.36	12.01	43,690	1.7%
Other diseases of digestive system	4.01	5.64	8.22	101,288	2.2%	17,966	47%	9.13	10.89	43,439	1.7%
Cholelithiasis	3.64	4.94	8.79	88,039	1.9%	17,833	41%	9.40	12.31	42,584	1.6%
Chronic ischemic heart disease	3.50	6.65	8.03	72,018	1.6%	10,829	56%	10.44	9.04	42,137	1.6%
Acute myocardial infarction	3.60	6.63	21.07	71,377	1.5%	10,769	63%	9.47	26.22	39,573	1.5%
Other sepsis	5.62	9.57	36.13	66,528	1.4%	6,953	52%	16.10	49.28	37,761	1.4%
Unknown and unspecified causes of morbidity	2.65	7.37	8.30	54,404	1.2%	7,383	69%	9.98	8.78	37,495	1.4%
Essential (primary) hypertension	3.21	4.73	7.13	60,199	1.3%	12,721	45%	8.33	9.41	29,327	1.1%
Unspecified diabetes mellitus	4.71	6.28	6.72	65,272	1.4%	10,400	49%	10.49	7.55	29,215	1.1%
Fracture of lower leg, including ankle	5.03	7.29	9.10	53,434	1.2%	7,327	49%	12.14	10.90	25,783	1.0%
Cholecystitis	3.48	4.85	19.25	52,541	1.1%	10,832	41%	9.26	29.58	25,542	1.0%
Other disorders of fluid, electrolyte and acid-base balance	3.50	6.42	19.35	44,100	1.0%	6,868	58%	9.77	24.99	24,791	1.0%
Total				2,119,828	46%	323,290				1,064,735	40.8%

Notes: (1) medically appropriate stay for patients without ACSC comorbidities; (2) threshold for patients with ACSC comorbidities; (3) average length of stay; (4) standard deviation of length of stay; (5) total days attributed to the condition; (6) percentage of total days attributed to the condition; (7) number of hospitalizations attributed to the condition; (8) percentage of hospitalization from condition that contain excessive days; (9) average length of stay, in sample of hospitalizations that include excessive days; (10) standard deviation of average length of stay, in sample of hospitalizations that include excessive days; (11) excessive days attributed to the condition; (12) excessive days attributed to the condition as a percentage of total excessive days.
Source: Authors' elaboration based on DATASUS hospitalization database, 2019 and Mexico's Health Sector Hospital Discharge Database, 2019.

Table 3. Main demographic and hospitalization characteristics in top 20 conditions responsible for excessive days of hospitalization, all stays versus prolonged stays (top 20 conditions responsible for excessive days) - Panel A: Brazil

	All stays						Prolonged stays					
	mean age	% females	Charlson comorbidity index	% in-hospital mortality	% emergency	% complex	mean age	% females	Charlson comorbidity index	% in-hospital mortality	% emergency	% complex
Pneumonia, organism unspecified	79.2	51.6%	0.1	19.1%	96.4%	0.1%	79.2	51.8%	0.12	21.5%	95.8%	0.1%
Other sepsis	77.7	50.5%	0.2	59.6%	95.9%	0.7%	77.3	49.8%	0.23	53.7%	95.4%	0.8%
Heart failure	76.9	51.4%	1.1	12.7%	95.8%	0.6%	76.6	51.1%	1.10	15.0%	94.6%	0.6%
Stroke, not specified as hemorrhage or infarction	76.4	49.5%	1.1	17.1%	97.7%	0.3%	76.5	50.0%	1.06	20.2%	97.1%	0.3%
Acute myocardial infarction	73.9	41.9%	1.1	12.2%	92.0%	33.3%	73.8	42.1%	1.10	10.2%	92.9%	26.5%
Bacterial pneumonia, not elsewhere classified	79.2	51.4%	0.1	18.6%	96.1%	0.1%	79.0	51.7%	0.10	21.0%	95.4%	0.1%
Other disorders of urinary system	78.5	52.8%	0.1	8.3%	94.7%	0.4%	78.8	52.4%	0.11	10.2%	94.2%	0.6%
Other chronic obstructive pulmonary disease	76.7	47.5%	1.0	10.6%	95.6%	0.0%	76.4	49.0%	1.05	13.1%	94.4%	0.0%
Fracture of the femur	79.9	70.2%	0.0	5.6%	92.6%	4.5%	80.0	70.3%	0.03	7.4%	91.3%	5.3%
Chronic kidney disease	74.7	41.6%	2.1	16.5%	93.5%	2.5%	74.5	40.5%	2.08	17.3%	94.1%	3.6%
Angina pectoris	72.9	43.4%	0.0	2.8%	78.8%	48.9%	72.9	42.6%	0.05	3.8%	84.9%	46.0%
Bacterial infection of unspecified site	76.7	49.3%	0.1	22.8%	95.6%	0.3%	76.3	48.1%	0.12	26.1%	93.6%	0.4%
Respiratory failure, not elsewhere classified	77.0	51.2%	0.1	42.1%	95.8%	0.2%	76.7	51.8%	0.14	40.6%	95.4%	0.3%
Sequelae of cerebrovascular disease	76.3	50.6%	1.0	13.2%	62.9%	0.8%	76.2	51.1%	1.03	10.9%	57.5%	0.5%
Other diseases of digestive system	76.2	48.8%	0.1	10.5%	95.0%	0.3%	76.5	48.1%	0.10	11.1%	96.4%	0.4%
Essential (primary) hypertension	75.7	59.8%	0.1	2.4%	95.6%	0.1%	75.8	62.4%	0.05	3.2%	95.2%	0.1%
Cholelithiasis	72.4	65.8%	0.0	2.2%	41.4%	0.1%	74.5	58.9%	0.05	5.2%	77.6%	0.2%
Other bacterial diseases, not elsewhere classified	76.3	46.5%	0.1	26.8%	94.7%	0.3%	76.2	47.0%	0.15	27.8%	94.3%	0.5%
Unspecified diabetes mellitus	74.7	53.6%	1.4	6.2%	96.3%	0.2%	74.4	51.5%	1.44	6.8%	95.9%	0.3%
Erysipelas	76.2	54.3%	0.0	4.9%	95.8%	0.0%	75.9	54.5%	0.07	5.8%	95.0%	0.1%

Panel B: Mexico

	All stays			Prolonged stays		
	mean age	% females	% in-hosp mort	mean age	% females	% in-hosp mort
Fracture of the femur	80.3	69.4%	1.7%	80.0	69.2%	1.5%
Chronic kidney disease	72.8	46.8%	6.9%	73.0	46.9%	7.9%
Pneumonia, organism unspecified	79.0	51.3%	28.6%	78.5	51.7%	27.9%
Type 2 diabetes mellitus	73.7	52.3%	7.2%	73.7	50.7%	7.4%
Other disorders of urinary system	77.8	58.3%	7.1%	78.0	57.0%	6.7%
Other chronic obstructive pulmonary disease	79.1	53.4%	7.6%	79.0	53.7%	7.1%
Shock, not elsewhere classified	77.0	50.2%	88.4%	76.6	50.1%	86.7%
Heart failure	76.7	56.7%	12.2%	76.5	58.1%	11.4%
Other cerebrovascular diseases	77.5	52.2%	14.1%	77.4	53.3%	15.1%
Other diseases of digestive system	77.2	52.2%	7.5%	77.1	51.1%	6.5%
Cholelithiasis	73.9	61.6%	0.9%	75.2	56.6%	1.5%
Chronic ischaemic heart disease	73.7	35.7%	4.2%	73.7	34.6%	4.3%
Acute myocardial infarction	74.7	37.6%	26.2%	74.4	36.6%	19.6%
Other sepsis	77.6	52.6%	73.5%	77.0	54.1%	69.2%
Unknown and unspecified causes of morbidity	76.3	49.3%	83.5%	76.4	49.6%	87.1%
Essential (primary) hypertension	76.4	57.7%	7.9%	76.5	57.1%	8.9%
Unspecified diabetes mellitus	73.6	46.0%	5.7%	73.4	42.8%	6.0%
Fracture of lower leg, including ankle	73.1	63.5%	0.2%	73.0	61.7%	0.4%
Cholecystitis	73.9	61.7%	1.2%	75.2	56.1%	1.8%
Other disorders of fluid, electrolyte and acid-base balance	77.6	60.1%	39.3%	77.4	60.7%	38.3%

Note: Comorbidity index, emergency and complexity are not available in Mexico's data.
Source: Authors' elaboration based on DATASUS hospitalization database, 2019 and Mexico's Health Sector Hospital Discharge Database, 2019.

Table 4 presents, for each condition listed in Table 2, the decomposition of the hospitalizations based on the conceptual framework described in Section 2.

The part of the excessive days due to mismanagement of ACSC comorbidities at the primary healthcare level (*ED1*) can only be analyzed for Brazil. This share ranges from 0% for conditions like cholelithiasis, diabetes mellitus, fracture of the femur, hypertension, other sepsis, and respiratory failure, to 1.7% in the case of other bacterial diseases (Table 4, panel A). Overall, the magnitude of this component is small. However, as discussed in Section 5.1, ACSCs are responsible for a large share of hospitalizations that could be avoided at the primary healthcare level.

In both Brazil and Mexico, hospital inefficiency accounts for most of the excessive days, and a substantial proportion of the total days of hospitalizations. In Brazil, it accounts for 5% of total days for sequelae of cerebrovascular disease and up to 67% for primary hypertension (Table 4, Panel A). In Mexico, it ranges from 14.5% for other sepsis to 68.9% for unknown and unspecified causes of morbidity (Table 4, Panel B).

In Table 4, the ten conditions with a positive value in the ED3 column are those identified by experts as creating new post-discharge care needs (conditions marked with: *). These represent approximately half of the conditions included in Table 2. Among these conditions in Brazil, the lack of rehabilitation, social and long-term care services accounts for 26% of hospital stays for pneumonia and fracture of the femur and more than 70% for sequelae of cerebrovascular disease (Table 4, Panel A). In Mexico, this share ranges from 22% for other chronic obstructive pulmonary disease to 42% for other sepsis (Table 4, Panel B). For fracture of the femur, a condition known to generate high care needs, the lack of long-term care accounts for 26.2% of total hospital days in Brazil, and 28% in Mexico.

Table 4. Decomposition of excessive days, top 20 conditions responsible for excessive days of hospitalization - Panel A. Brazil

	Expected days	ED1 - Excessive days due to ACSC comorbidities	ED2 - Excessive days due to hospital inefficiency	ED3 - Excessive days due to social, rehabilitation and long-term care	Total
Pneumonia, organism unspecified*	58.6%	0.7%	14.7%	26.0%	100%
Other sepsis*	42.1%	0.0%	14.6%	43.3%	100%
Heart failure*	53.8%	0.7%	15.2%	30.2%	100%
Stroke, not specified as hemorrhage or infarction*	54.3%	1.4%	13.5%	30.8%	100%
Acute myocardial infarction	47.7%	0.7%	51.6%	0.0%	100%
Bacterial pneumonia, not elsewhere classified*	53.6%	1.1%	15.9%	29.4%	100%
Other disorders of urinary system	52.1%	0.4%	47.5%	0.0%	100%
Other chronic obstructive pulmonary disease*	52.6%	0.5%	15.7%	31.2%	100%
Fracture of the femur*	60.6%	0.0%	13.2%	26.1%	100%
Chronic kidney disease	45.6%	0.3%	54.1%	0.0%	100%
Angina pectoris*	44.7%	1.2%	20.4%	33.7%	100%
Bacterial infection of unspecified site*	58.4%	0.4%	11.3%	30.0%	100%
Respiratory failure, not elsewhere classified	41.7%	0.0%	58.3%	0.0%	100%
Sequelae of cerebrovascular disease*	22.9%	0.2%	5.2%	71.7%	100%
Other diseases of digestive system	52.0%	0.8%	47.2%	0.0%	100%
Essential (primary) hypertension	33.0%	0.0%	66.9%	0.0%	100%
Cholelithiasis	49.2%	0.0%	50.8%	0.0%	100%
Other bacterial diseases, not elsewhere classified	46.2%	1.7%	52.0%	0.0%	100%
Unspecified diabetes mellitus	52.6%	0.0%	47.4%	0.0%	100%
Erysipelas	56.3%	1.3%	42.5%	0.0%	100%

Panel B. Mexico

	Expected days	ED2 – Excessive days due to hospital inefficiency	ED3 - Excessive days due to social, rehabilitation and long-term care	Total
Fracture of the femur*	54.6%	17.5%	28.0%	100%
Chronic kidney disease	43.7%	56.3%	0.0%	100%
Pneumonia, organism unspecified*	53.2%	14.9%	31.9%	100%
Type 2 diabetes mellitus	50.0%	50.0%	0.0%	100%
Other disorders of urinary system	48.0%	52.0%	0.0%	100%
Other chronic obstructive pulmonary disease*	55.7%	22.4%	21.9%	100%
Shock, not elsewhere classified*	44.3%	15.7%	40.0%	100%
Heart failure*	50.5%	23.2%	26.3%	100%
Other cerebrovascular diseases	52.8%	47.2%	0.0%	100%
Other diseases of digestive system	57.1%	42.9%	0.0%	100%
Cholelithiasis	51.6%	48.4%	0.0%	100%
Chronic ischemic heart disease	41.5%	58.5%	0.0%	100%
Acute myocardial infarction	44.6%	55.4%	0.0%	100%
Other sepsis*	43.2%	14.5%	42.2%	100%
Unknown and unspecified causes of morbidity	31.1%	68.9%	0.0%	100%
Essential (primary) hypertension	51.3%	48.7%	0.0%	100%
Unspecified diabetes mellitus	55.2%	44.8%	0.0%	100%
Fracture of lower leg, including ankle*	51.7%	18.9%	29.3%	100%
Cholecystitis	51.4%	48.6%	0.0%	100%
Other disorders of fluid, electrolyte and acid-base balance	43.8%	56.2%	0.0%	100%

Notes: Conditions marked with (*) are those assessed by experts as creating new post-operative care needs. For Mexico, ED1 cannot be estimated and is captured in part by the expected stay, in part by ED2.

5.3. How much can be saved by providing rehabilitation, social, and long-term care services?

Fabiani et al. (2023) estimate that the total yearly cost of a long-term care system that provides services to 2.1 million persons in Brazil and 2.5 million persons in Mexico would be US$18 billion and US$16 billion, respectively.[6] This system would combine nursing homes (for 5% of users), home care (75%) (40 hours per week), day service centers (10%), and telecare (10%). The average daily cost per user would be US$23 in Brazil and US$18 in Mexico.

According to our estimates, there are 705 thousand hospitalizations in Brazil and 140 thousand in Mexico that generate post-discharge care needs, each year. These represent 12% and 7% of total yearly hospital days, respectively. Considering an average cost of US$500 per hospital

[6] The estimated figure includes fixed and variable costs. The former includes the depreciation of the infrastructure, the land, and the equipment, while the latter represents operating costs (for example, caregivers' and managers' salaries).

day for both Mexico[7] and Brazil[8], the total yearly cost of prolonged stays due to lack of post-discharge care services amounts to US$908 million and US$161 million, respectively.

Using the estimates from Fabiani et al. (2023), the cost of providing one and a half month (45 days) of long-term care services for people whose hospitalizations generate post-discharge care needs would amount to US$734 million per year in Brazil, and US$116 million per year in Mexico. These services would replace the last part of the hospitalization. The net yearly savings for the Government would amount to US$174 million in Brazil and US$45 million in Mexico.

6. Discussion

Our study shows that approximately half of older persons' hospital length of stay in Brazil and Mexico, in 2019, can be classified as excessive days. This is in line with previous studies on the subject that found long stays can be as high as 91.3% of all bed days, with an average of 22.8% (Landeiro et al. 2019). Although the lion's share of this is due to hospital inefficiency, 12% of total hospital days in Brazil and 7% in Mexico could be saved by providing rehabilitation, social and long-term care services.

These results are consistent with previous research that advocates for the implementation of long-term care systems that work in coordination with healthcare, not only to improve older people's quality of life but also to generate savings in healthcare. From this perspective, the development of rehabilitation, social, and long-term care services in integration and coordination with healthcare services can be seen as an investment. The focus group discussion and interviews also highlighted the need for improved coordination between health and social care. Box 3 provides insights into the challenges and complexities of this interaction.

Box 3. Complexities of the interaction and coordination between health and social care
(selected quotes from interviews and focus group discussions)

- "[Lack of] support from the social security area for hospital discharge is one of the biggest problems we have, or in the pre-discharge phase." – *P2, focus group*
- "Social workers […] have a very limited activity, they are only in the hospital receiving and providing orientation to patients on hospitalization, but they handle neither pre- nor post-hospitalization." – *P1, focus group*
- "The profession of the physician is to cure, and social problems cannot be cured. So, the level of frustration, fighting, anger, is very high (...). This is also a risk factor for discharge, because communication is complicated and when the family does not feel listened to and gets angry, they ask us [the hospital] for more." – *P3, interview*
- "The development of discharge plans by a multidisciplinary team (doctors, nurses, social workers, rehabilitation specialists, orderlies, etc.) will help us, so that both patients and family members understand the medical situation and can be involved in care." – *P4, focus group*
- "We have a discharge planning unit (...), we are adding more and more actors because it is a negotiation that we have to carry out with each family and with each payer." – *P3, interview*
- "It is important [for hospitals] to work, for example, together with medium-stay units. – *P2, interview*

Our study has several limitations. First, our data does not contain patient identifiers; therefore, identification of rehospitalizations is not possible. A person discharged and readmitted shortly

[7] Data from "Diario Oficial de la Federación, Secretaría de Gobernación: DOF: 22/12/2021" (available at: https://www.dof.gob.mx/nota_detalle.php?codigo=5639077&fecha=22/12/2021#gsc.tab=0) reports an average cost per day of US$560.

[8] Data from Unicamp (available at: https://unicamp.br/unicamp/coronavirus/quanto-custa/) shows that the cost of a hospital day during COVID-19 ranged between US$443 and US$532.

after generates two data records that cannot be linked. Similarly, patients who have been transferred to another establishment or have undergone a change in procedure generate several data records from which we cannot calculate the total length of stay. These data features artificially shorten the average length of stay, thus underestimating the number of excessive days.

Second, our analysis does not adjust for in-hospital mortality, a factor that truncates the length of stay of some patients. To address this issue in studies of long hospitalizations, some authors drop the observations that end with the death of the patient. Our data, however, show that the correlation between mortality and length of stay is positive in some cases and negative in others. For this reason, we make no corrections.

Third, our data do not allow us to precisely identify the clinically appropriate length of stay for each hospitalization. This would only be possible by analyzing patients' medical records and assessing, case by case, the optimal clinical length of stay. Our threshold is adjusted solely for the reason of admission and assumes that all hospitalizations due to a given reason should last the same. We plan to collect complementary information through detailed analysis of medical records for future research.

Studies utilizing data from medical records or professional opinions generally focus on smaller samples drawn from a specific healthcare institution. Their results confirm that, even considering the clinically justified delays, long hospitalizations account for a large proportion of total hospitalizations. For example, in a study conducted in Italy, Bo et al. (2016) show that 31.5% of hospitalizations could be classified as long by clinical standards, while Hendy et al. (2012) estimate this figure to be at nearly 50% for a London hospital.

The threshold we use to identify excessive days is arbitrary and assumes that cross-state variability provides information on the medically appropriate stay. This may be subject to some errors. For example, a state might report a short length of stay for a certain condition because of high in-hospital mortality or because complex cases are transferred to another hospital. States with a large proportion of university hospitals may report longer stays as these institutions receive complex cases and part of the stay is dedicated to training (Freitas et al., 2012; Walker et al., 2021).

In our threshold, the relationship between patients' frailty and length of stay is only adjusted for the reason of hospitalization and the existence of ACSC comorbidities. For Brazil, only approximately 5% of hospitalizations are recorded with ACSC comorbidities. For Mexico, this information is not available in our data. Due to this likely underreporting (or lack of data on) ACSC comorbidities, we may be overestimating the percentage of prolonged days overall, and the part due to hospital inefficiency.

In Annex 3, we present a sensitivity analysis based on a different threshold, for each condition, set at the average length of stay in the state with the median – instead of the minimum – of this average. With this alternative threshold, 36% of hospitalization days are excessive in both Brazil and Mexico. Similar to our main analysis, almost 10% of hospital days in Brazil and 6% in Mexico are due to the lack of rehabilitation, social and long-term care services (Figure A3.1, Annex 3).

Fourth, the component that measures hospital inefficiency may be affected by factors we are not controlling for. A teaching hospital, for example, may report larger average stays even with high efficiency levels.

Finally, our analysis is likely to underestimate the share of hospital days that can be saved through rehabilitation, social, and long-term care services. Our index for post-discharge care needs only classifies 36 of the more than 1,400 admission conditions available in Brazil and Mexico and we only consider post-discharge care needs that are directly caused by the reason of admission. Due

to lack of data, we are unable to account for increased frailty resulting from long hospitalizations due to any condition, even in patients that have no previous care needs. For already frail patients, a common situation among older persons, a few days at the hospital can create significant loss of autonomy. Given the proportion of older persons with care needs in Brazil (10.5%) and Mexico (25.2%) (Aranco, Ibarrarán and Stampini, 2022), this underestimation may thus be large.

7. Conclusions and policy recommendations

Our results highlight the importance of developing post-discharge care services to reduce excessive days of hospitalizations among older people. A strong care system outside hospitals allows patients who are clinically fit for discharge, but still need rehabilitation or support services, to be released in a timely manner and without compromising their wellbeing. As shown in this paper, investing in long-term care services can generate substantial savings in the healthcare system.

Increasing the coverage and quality of long-term care services is still a challenge in the region. Currently, there is a limited supply of long-term care systems and services in the region, and where available, they are significantly underfunded and focused on the socioeconomically vulnerable population (Aranco et al., 2022). The two countries that are the focus of this study, Brazil and Mexico, are discussing the creation of care systems, which include the provision of long-term care (da Mota Peroni et al., 2023; López-Ortega and Aranco, 2019). The path towards a long-term care system will vary by country, but there are common steps that countries need to take (Cafagna et al., 2019; Me dellín et al., 2018).

First, eligibility for services needs to be assessed through a scale that evaluates care needs (Oliveira et al., 2022). Second, the assessment needs to be translated into the definition of a care plan for every person. Third, countries need to decide how to finance the system. This may be achieved through general taxation, social insurance, co-payments, or a combination thereof. Each financing mechanism has strengths and weaknesses which need to be assessed by the countries in order for them to select a mechanism that guarantees the system's financial, social, and political viability (Fabiani et al., 2022).

Fourth, it is important to ensure quality of services. This requires the establishment and monitoring of quality standards, and training and professionalization of human resources who are essential for quality service provision (Arroyo et al., 2023; Fabiani, 2023; Villalobos Dintrans et al., 2022).

Fifth, it is critical to create strong coordination mechanisms between hospitals and long-term care, social, and rehabilitation services. This is not easy, particularly in countries like Brazil, Mexico, and many others in the Latin American and Caribbean region. In these countries, healthcare and social services are delivered by different institutions, have separate funding, different regulations, and different eligibility rules.

Integration requires a fundamental paradigm change, one that places persons in the center of the care delivery system, and that encompasses the adaptation of both processes and infrastructures (Lloyd-Sherlock et al. 2024; Albertson et al., 2022). The role of a care manager or coordinator, a professional who works closely with patients (and their families) to guarantee the continuity of care across all levels, has emerged as a good practice.

In Latin America, there are some examples of systems that have attempted to coordinate social and health care. In Brazil, the programs *Maior Cuidado* in the city of Belo Horizonte, and the *Programa Acompanhante de Idosos* (PAI) in the municipality of São Paulo, are two promising examples of improved sociosanitary coordination that have the potential to facilitate older people's transition from the hospital to their post-discharge destination (Lloyd-Sherlock et al., 2023; Lloyd-

Sherlock et al., 2024). Always in Brazil, the program *Melhor em Casa* of the Ministry of Health is a large-scale, national effort to reduce the number and the length of hospitalizations by providing healthcare at home (da Mota Peroni et al. 2023, Ministério da Saúde do Brasil 2024).

An evaluation analysis of Belo Horizonte's program shows that the length of hospital stays for patients that belong to the *Maior Cuidado* program is 0.22 days shorter compared to patients that do not belong to the program, generating savings of approximately US$100 per admission (Lloyd-Sherlock et al., 2024). The authors identify two features crucial in explaining the program's success: (i) the joint development of the program by the Department of Health and the Department of Social Assistance, with both institutions working in close collaboration; (ii) the creation of a new worker category – the family care support workers – who are fully integrated into the local health and social assistance teams (Lloyd-Sherlock et al., 2024).

The benefits of implementing a long-term care system are not limited to the potential savings that can be achieved in the healthcare sector but extend to other areas (Aranco et al., 2022), Villalobos-Ditrans, 2018). Such systems can free up time from family caregivers, mostly women, promoting their labor market participation or allowing them to pursue other activities. These systems can also contribute to the professionalization of caregiving work, generating more and better jobs in a sector that is currently characterized by high feminization, low levels of education, and suboptimal working conditions (Fabiani 2023, Villalobos-Ditrans et al. 2022).

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Annex 1. Findings from interviews and focus group discussions

We complement our analysis with qualitative information to get a better understanding of the causes and consequences of long hospitalizations. The data were collected through interviews (3 participants) and focus group discussions (6 participants) with health experts in the region (Mexico, Argentina, and Colombia) between June and October 2023. The data were analyzed through the method of thematic analysis. This inductive approach allowed us to identify major themes and patterns and conceptualize the information into the stages of pre-hospital, in-hospital, and post-hospital care. The conversations provided crucial insights into the different final components along the continuum-of-care referred to in our analysis.

The findings from the interviews and focus group discussions emphasize the importance of appropriate primary healthcare and social services for preventing hospitalizations and strengthening a person's health status. The participants highlighted that the inability to ensure timely access and use of such services negatively affects a person's health conditions, ultimately increasing the risk of a higher length of stay in the hospital.

> "El cuidado previo a pisar urgencias/hospital es fundamental. El que el paciente acuda de manera regular a sus visitas de medicina familiar también es fundamental." – *P2, focus group*

> "No podemos hablar de la demanda de urgencias y de la atención hospitalaria si no hablamos de las enfermedades crónicas que no se protocolizan en el manejo ambulatorio." – *P2, focus group*

> "No tenemos plan ampliado de inmunizaciones en personas mayores, la única vacuna gratuita es la de influenza y su cobertura es muy baja; entonces si no tenemos estrategias de prevención como la vacunación contra neumococo, tosferina, herpes zoster... estamos exponiendo a la población mayor, en especial a la más frágil, a hospitalizaciones recurrentes." – *P1, interview*

> "El hecho de que el adulto mayor no tenga soporte para buscar atención médica oportuna, lo hace que llegue al hospital en una fase más grave de la enfermedad." – *P6, focus group*

> "La estancia hospitalaria la determina la estabilidad del paciente, es decir, su funcionalidad. Cómo está funcionando él como individuo en cuestión de condiciones motoras, en cuestión de comorbilidades." – *P4, focus group*

> "Cualquier cosa que cambia dramáticamente la funcionalidad de una persona (…) es de riesgo para una estadía hospitalaria mayor." – *P2, interview*

> "No tenemos rutas de detección temprana de osteoporosis y riesgo de caída y fractura; las cirugías ortopédicas generan hospitalizaciones más prolongadas en personas mayores." – *P1, interview*

Moreover, inadequate rehabilitation and long-term care, including information and support, and long hospital stays may increase the risk of rehospitalization. The following observations exemplify this point:

> "[Después de una hospitalización,] un tema importante es la orientación nutricional adaptada a la persona. Otro aspecto importante es la educación en salud, es decir, un paciente con incluso 10 años con hipertensión no entiende su enfermedad, no hemos sabido informarle al respecto." – *P2, focus group*

> “Después de los 70 años en un solo día de hospitalización, si no me muevo, puedo perder hasta el 3% de la masa muscular total lo que va a generar grandes problemas de movilidad, dependencia funcional y sobrecarga a los cuidadores familiares.” – *P1, interview*

The discussions also showed that hospital characteristics and inefficiencies can have important repercussions for a patient’s length of stay in the hospital. According to the participants, the absence of protocols, resources, and knowledge at various levels can lead to delays in processes at the beginning, during, and at the end of a hospitalization. With regards to elderly persons, common issues seem to particularly revolve around coordination between the different levels of health care, scarcity of training in geriatrics, especially among doctors working in emergency services, insufficient resources for timely and appropriate treatment of patients, and absence of clear discharge procedures.

> “(…) La falta de coordinación es un asunto mayor.” – *P1, focus group*

> “Hay un retardo enorme del médico familiar para enviar a los pacientes a 2º o 3º nivel.” – *P1, focus group*

> “Si el médico familiar no está capacitado para atender a los pacientes geriátricos con enfermedades como diabetes mellitus e hipertensión, las más comunes, cuando llega al 2º nivel el médico especialista tiene que internarlo y el paciente llega con todas las patologías agravadas y complicaciones.” – *P3, focus group*

> “No existen protocolos de atención humanizada y diferencial a personas mayores [en el caso de urgencias] por la cantidad de pacientes que reciben; esto hace que los procesos de admisión hospitalaria sean largos y que (…) en los servicios de urgencias se compliquen o adquieran gérmenes oportunistas que hacen que se complique el cuadro inicial, sin contar todo lo que ocurre en personas mayores con deterioro cognitivo que generan episodios delirantes y terminan siendo inmovilizados tanto física como farmacológicamente.” – *P1, interview*

> “Los médicos de Urgencias y Hospitalización en su mayoría no han recibido capacitación en geriatría ni cuentan con médicos geriatras (…), por lo que terminan inter-consultando a varios especialistas (…), lo cual lleva a toma excesiva de laboratorios y demoras en el proceso.” – *P1, interview*

> “No tenemos geriatras en los servicios de urgencias en todos los hospitales como sería lo ideal, entonces se va retrasando la atención porque el médico general tal vez tiene miedo de abordar al paciente adulto mayor. Si se capacitara al personal ayudaría a que la atención fuera más eficiente y oportuna.” – *P5, focus group*

> “En el tema de fractura de cadera, retrasan mucho desde el diagnóstico y en las áreas hospitalarias, la cirugía. Esto es atribuible a la falta de conocimiento de que este padecimiento es una urgencia y en general los médicos esperan a que el paciente esté lo más estable posible para operarlo.” – *P6, focus group*

> “Hay hospitales de 2º nivel que no tienen recursos y tienen que esperar a que el 3º nivel les dé un espacio para el diagnóstico, el paciente puede estar hasta 10 días esperando el diagnóstico, en lugar de recibir el tratamiento.” – *P1, focus group*

> *“*La falta de insumos necesarios. Por ejemplo, los pacientes de fracturas de cadera se quedan mucho tiempo hospitalizados porque no hay la tuerca o el tornillo o el medicamento necesario.” – *P1, focus group*

> “Pocos hospitales tienen protocolos de "alta temprana", por lo que administrativamente existen muchas barreras y procesos (…).” – *P2, interview*

> “Algunas entidades no tienen dispositivos para el egreso (…), no tienen asistentes sociales.” – *P3, interview*

> “No hay dispositivos de ayuda, no hay dispositivos de transición para que los pacientes continúen el cuidado en otro lugar o (…) los contratos [que tienen con otras entidades] son pequeños para la población que atienden, [los] pacientes pasan a lista de espera.” – *P3, interview*

Inappropriately long hospitalizations are also closely linked to the availability of post-discharge rehabilitation, social and long-term care services. The respondents' reflections indicate that the length of hospitalization, as well as the probability of rehospitalization, may be extended due to the insufficiency of both formal institutional arrangements and informal support mechanisms. Moreover, there seems to be a consensus among the participants regarding the challenges households face to care for the affected person after discharge and some comments highlight the importance of clear, close, and ongoing communication between the different levels of formal and informal care.

> “Un adulto mayor que está solito en su casa (…) y después de una fractura de cadera (…) tiene que ir a una institución por lo menos de media estancia. No puede volver a su hogar, entonces ahí empiezan muchos problemas (…), hay poca oferta de estos lugares, no hay buena coordinación para usarlos eficientemente o según la necesidad de cada paciente.” – *P3, interview*

> “Una vez que el paciente sale del hospital, hay que entender que los recursos comunitarios para atender al paciente son muy limitados. No existen en México a dónde se pueda guiar u orientar a un paciente o a un familiar para solicitar ese tipo de ayuda. Generalmente son servicios contratados, caros y de mala calidad.” – *P6, focus group*

> “Un factor importante es la referencia al siguiente nivel de atención o a los centros de seguridad social, y que estos sean suficientes. Es decir, estos cursos que hay en los centros de seguridad social pueden ser de mucha ayuda. Lugares para practicar yoga o hacer ejercicio conveniente, la prescripción y seguimiento de su rehabilitación, este tipo de acciones están todavía pendientes.” – *P2, focus group*

> “No existe un seguimiento post hospitalario con las familias y cuidadores, (…) luego de una hospitalización prolongada, ese mismo paciente vuelva de nuevo al hospital rápidamente por complicaciones, polifarmacia, caídas o infecciones.” – *P1, interview*

> “No nos sirve de nada si (…) se va a la casa, no tiene quien lo cuide, (…) y es una reinternación.” – *P2, interview*

> “Cuando los pacientes superaban el período agudo, lo que hacíamos era contratar instituciones para continuar con el cuidado crónico. (…) [En nuestro hospital] la familia se siente sumamente contenida. Y cuando iban a estas instituciones, ¿qué pasaba? No había personal, no eran puertas abiertas, lo edilicio no era lindo, entonces volvían al hospital. Una vez que volvían al hospital, no los podíamos sacar más (…) y eso se estaba convirtiendo en un problema muy grave.” – *P3, interview*

> “[En la] población añosa (…), la internación (…), en algunos casos por familias disruptivas o algunos aspectos legales (…), se prolonga durante años.” – *P3, interview*

> “Es muy común que el familiar que sea el cuidador informal no se sienta capacitado para poderlos atender en casa, entonces ellos también se rehúsan a que el paciente sea egresado.” – *P6, focus group*

> “Encontramos como factores principales para el egreso no oportuno familias que son cada vez menos continentes, personas solas que no han tenido hijos, (…), [personas cuyos] hijos viven en el exterior o familias disfuncionales, familias [que] no se ocupan.” – *P3, interview*

> “No es poco común que haya ausencia de algún familiar que acompañe al adulto mayor durante la hospitalización, pero esta falta de comunicarnos con ellos para involucrarlos en el cuidado es un determinante importante. Y también la forma de sistematizar lo que le transmitimos sobre cómo cuidar a su familiar adulto mayor y poderlo empoderar. Existe una amplia variedad de buenos y malos conocimientos que se traslapan y que a veces puede generar más duda al cuidador y hacerlo temeroso de poder atender a su familiar en el domicilio.” – *P6, focus group*

> “Es necesario que el paciente aprenda de su enfermedad, igual que la familia y su cuidador primario, y además tengan la posibilidad de llamar a trabajo social en caso de tener dudas al ser dado de alta.” – *P2, focus group*

> “Hay falta de comunicarnos con los familiares para involucrarlos en el cuidado del adulto mayor, lo cual es un determinante importante. Además, se carece de sistematización en la transmisión de conocimientos sobre el cuidado del paciente/familiar adulto mayor para poder empoderarlo.”— *P6, focus group*

> “Idealmente debe existir una comunicación muy estrecha entre el médico y el paciente o la familia, para educarlos sobre el seguimiento, pero al llegar a casa se les olvida. Ejemplo, el doctor me mandó un anticoagulante, ¿me lo tomo hoy o mañana? Ante la falta de una respuesta, el paciente regresa al hospital. Debería haber una línea telefónica para resolver dudas.” – *P6, focus group*

The narratives further allow for a better understanding of the complexity of the interaction between health and social services and point to the need for an improved integration of the two. The respondents’ statements and observations also provide insights into their different perspectives regarding what roles they consider the health and social services personnel and the families (should) play along the continuum-of-care.

> “En la mayoría de los países no hay tanta integración entre lo sanitario y lo social.” – *P2, interview*

> “Ahora bien (…) cuando hay un cambio de contexto, es muy difícil porque las familias no están preparadas para ese cambio y cuando vos no ayudas a facilitarles esa nueva vivienda semipermanente (…), es muy problemático.” – *P2, interview*

> “Algunas de las enfermedades agudas se consideran como catastróficas, una de ellas es la fractura de cadera porque puede modificar toda la estructura de cómo funciona el adulto mayor y la familia. Existe un acceso limitado a esta parte de la rehabilitación. Uno de los determinantes que prolongan la estancia hospitalaria es la falta de atención del personal de salud para capacitar intensivamente al cuidador y darle seguridad para poder continuar con el manejo del paciente. El personal de salud solo se enfoca en ciertos aspectos, por ejemplo, sobre la lista de medicamentos, pero no contemplan la educación del paciente para lograr el apego terapéutico (…).” – *P6, focus group*

> “El apoyo del área de seguridad social en la salida hospitalaria es uno de los problemas más grandes que tenemos, o en la pre-alta.” – *P2, focus group*

> “La profesión del médico es curar, y los problemas sociales no se pueden curar. Entonces, el nivel de frustración, de pelea, de enojo es muy alto. (…) Esto también es un factor de

riesgo para el egreso, porque la comunicación se complica y cuando la familia no se siente escuchada y se enoja, nos pide más." – *P3, interview*

"Tenemos una crisis en el personal de salud (…). Nos pasa cada vez más que los médicos no consideran que es parte de la tarea, o sea, si la familia no se hace cargo, (…), lo que no es netamente médico, ya no le toca al médico, y esto también agrega mucha dificultad." – *P3, interview*

"Los trabajadores sociales en el […] tienen una actividad muy limitada, solo están en el hospital recibiendo y orientando a los pacientes sobre la hospitalización, pero no manejan ni el pre ni el post internamiento." – *P1, focus group*

Finally, the conversations provided some ideas on what is needed to overcome the identified challenges of integrating health and social services and examples of existing practices.

"La elaboración de los planes de alta mediante un equipo multidisciplinario, médicos, enfermeras, trabajo social, rehabilitación, camillería, etc., nos va a ayudar a que, tanto el paciente como el familiar, comprendan la situación médica y se puedan involucrar en su cuidado." – *P4, focus group*

"(…) [Una] unidad de planificación de altas es muy importante." – *P2, interview*

"Nosotros tenemos una Unidad de Planificación de altas (…), cada vez vamos sumando más actores porque es una negociación que tenemos que llevar adelante con cada familia y con cada pagador." – *P3, interview*

"Desde el lado hospital que creamos la unidad de planificación de altas que trata de identificar precozmente los casos (…) tenemos una enfermera, 3 administrativos y 3 asistentes sociales trabajando ahí. (…) le sacamos al médico la carga de lo administrativo [, por ejemplo,] una autorización, pedir la ambulancia, todo lo que tiene que ver con el egreso." – *P3, interview*

"[Las] unidades ayudan a que [los frágiles] recuperen cierta funcionalidad (…) y a decomplejizar desde el punto de vista médico para la inserción social (…) y bajar los costos de cuidado. (…) Es importante trabajar, por ejemplo, con unidades de media estancia." – *P2, interview*

Annex 2. Decomposition of hospital days in Brazilian and Mexican states

Table A2.1 - Decomposition of hospital days by state, Brazil 2019

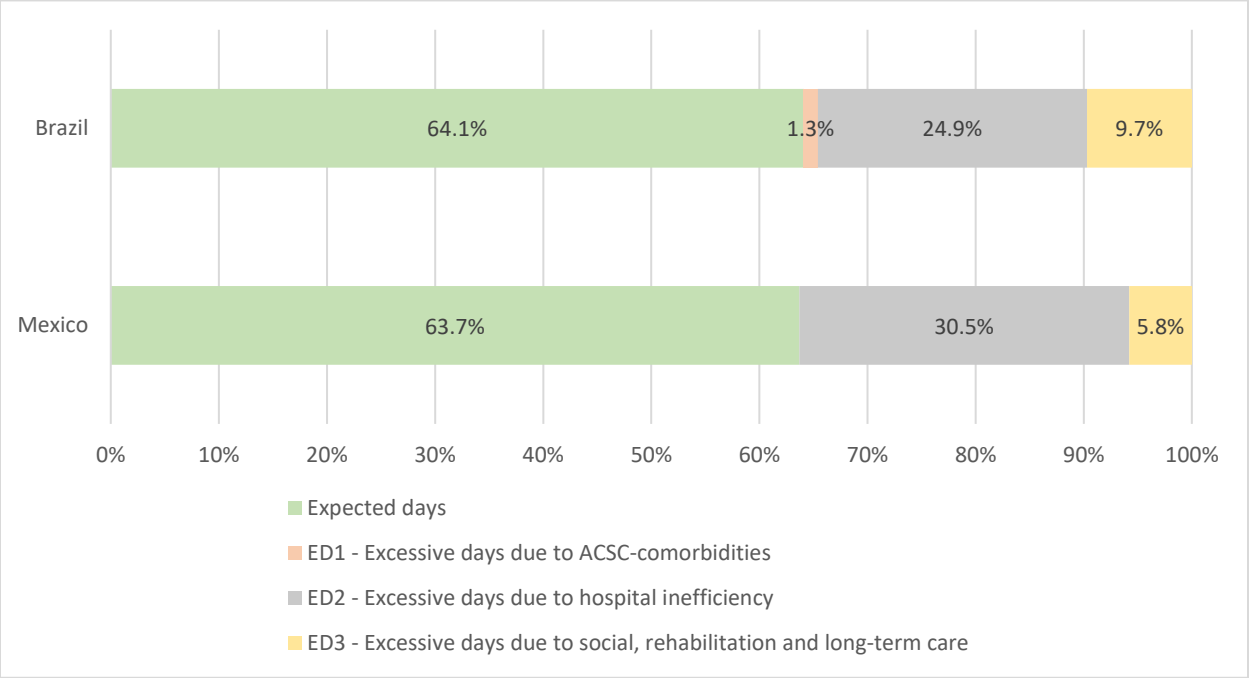
State	Expected days	ED1 - excessive days due to ACSC comorbidities	ED2 - excessive days due to hospital inefficiency	ED3 - excessive days due to social, rehabilitation and long-term care
Acre	48,7%	0.1%	41.5%	9.7%
Alagoas	56,1%	0.1%	34.8%	8.8%
Amapá	44,5%	0.0%	36.4%	19.0%
Amazonas	48,2%	0.2%	38.8%	12.8%
Bahia	49,3%	0.0%	40.6%	10.1%
Ceará	50,0%	0.0%	35.5%	14.5%
Distrito Federal	40,1%	0.4%	41.9%	17.6%
Espírito Santo	54,2%	0.2%	35.6%	10.0%
Goiás	56,3%	0.1%	31.5%	12.1%
Maranhão	54,0%	0.2%	37.6%	8.1%
Mato Grosso	53,2%	0.0%	33.7%	13.1%
Mato Grosso do Sul	68,2%	0.6%	27.1%	3.5%
Minas Gerais	55,0%	0.3%	32.1%	12.5%
Paraná	66,3%	0.3%	24.5%	8.9%
Paraíba	52,0%	0.1%	37.5%	10.4%
Pará	55,9%	0.0%	34.7%	9.3%
Pernambuco	49,7%	0.9%	37.0%	12.4%
Piauí	58,5%	0.0%	33.4%	8.1%
Rio Grande do Norte	55,0%	0.1%	34.3%	10.6%
Rio Grande do Sul	53,3%	0.1%	34.7%	11.9%
Rio de Janeiro	38,3%	0.5%	45.8%	15.3%
Rondônia	49,4%	0.1%	34.5%	16.0%
Roraima	42,6%	0.1%	45.2%	12.1%
Santa Catarina	58,2%	0.1%	31.7%	10.0%
Sergipe	43,4%	0.2%	43.9%	12.5%
São Paulo	51,4%	2.1%	34.2%	12.3%
Tocantins	45,6%	0.8%	39.6%	14.0%

Table A2.2 - Decomposition of hospital days by state, Mexico 2019

State	Expected days	ED2 - excessive days due to hospital inefficiency	ED3 - excessive days due to social, rehabilitation and long-term care
Aguascalientes	44.9%	47.9%	7.2%
Baja California	38.0%	52.9%	9.1%
Baja California Sur	46.8%	47.0%	6.2%
Campeche	42.8%	52.3%	4.8%
Chiapas	44.3%	49.8%	5.8%
Chihuahua	42.9%	50.7%	6.3%
Coahuila de Zaragoza	48.7%	45.3%	6.0%
Colima	51.8%	42.4%	5.8%
Distrito Federal	39.1%	54.8%	6.1%
Durango	45.9%	46.9%	7.2%
Guanajuato	49.9%	44.6%	5.5%
Guerrero	47.6%	45.4%	7.0%
Hidalgo	44.7%	50.9%	4.4%
Jalisco	43.6%	47.9%	8.5%
Michoacán de Ocampo	51.3%	43.7%	5.0%
Morelos	36.8%	53.3%	9.8%
México	38.4%	50.8%	10.7%
Nayarit	48.1%	45.6%	6.3%
Nuevo León	42.7%	50.6%	6.7%
Oaxaca	49.3%	45.5%	5.2%
Puebla	48.9%	46.8%	4.2%
Querétaro de Arteaga	45.3%	47.7%	7.0%
Quintana Roo	42.3%	52.0%	5.6%
San Luis Potosí	49.5%	44.9%	5.6%
Sinaloa	45.9%	45.8%	8.2%
Sonora	40.6%	48.5%	10.9%
Tabasco	47.3%	47.7%	5.0%

Annex 3. Sensitivity analysis

Figure A3.1. Decomposition of hospital days in Brazil and Mexico, 2019, with alternative threshold



Source: Authors' own elaboration based on DATASUS hospitalization database, 2019 and Mexico's Health Sector Hospital Discharge Database, 2019. Note: Component ED1 cannot be estimated for Mexico, due to lack of information on ACSC comorbidities. The threshold for each condition is set as the average length of stay in the state with the median average stay.