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Review Article

Comparative Review of the Socioeconomic Burden of Lower Back Pain in the United States and Globally

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Internationally, the United States (U.S.) cites the highest cost burden of low back pain (LBP). The cost continues to rise, faster than the rate of inflation and overall growth of health expenditures. We performed a comprehensive literature review of peer-reviewed and non–peer-reviewed literature from PubMed, Scopus, and Google Scholar for contemporary data on prevalence, cost, and projected future costs. Policymakers in the U.S. have long attempted to address the high-cost burden of LBP through limiting low-value services and early imaging. Despite these efforts, costs (~$40 billion; ~$2,000/patient/yr) continue to rise with increasing rates of unindicated imaging, high rates of surgery, and subsequent revision surgery without proper trial of non-pharmacologic measures and no corresponding reduction in LBP prevalence. Globally, the overall prevalence of LBP continues to rise largely secondary to a growing aging population. Cost containment methods should focus on careful and comprehensive clinical assessment of patients to better understand when more resource-intensive interventions are indicated.

Keywords: Low back pain, Chronic low back pain, Health care economics and organizations, Medical economics, Global health, Cost of illness

INTRODUCTION

Approximately 5% of the United States (U.S.) population consumes 50% of all healthcare spending. A portion of this high-cost minority are individuals with chronic low back pain (LBP).[1] Internationally, the U.S. cites having the highest cost burden of LBP is consistent with having the highest national health expenditure overall.[2] In 2013, spinal conditions consisting of both neck and back pain, accounted for the third highest national health spending after only diabetes and ischemic heart disease.[3] The cost continues to rise along with a growing prevalence. In 2016, nearly 10% (31.6 million people) of the U.S. population reported suffering from chronic LBP.[4] Globally, the age-standardized point prevalence is similar, around 8.2%.[5] Between 1997 and 2005, total national expenditure of adults with spine problems increased 65% after adjusting for inflation and faster than the rate of growth of overall health expenditures.[6]

1. Theoretical Framework for Understanding the Cost of Care

This review comprises of 3 sections: (1) an overview of the socioeconomic burden of LBP in the U.S., (2) cost burden globally divided geographically and by level of development, and (3) cost burden of LBP compared to other chronic diseases in the U.S. For domestic data, relevant literature and statistics for each section were gathered first through government- or government-affiliated databases (Healthcare Cost and Utilization Project, Centers for Medicare & Medicaid Services, Centers for Disease Control and Prevention), then a focused literature search of academic and nonacademic databases (MEDLINE, Embase, Web of Science, Google Scholar), including nonprofit domestic economic thinktanks for more updated statistics. Search terms for cost statistics included, "socioeconomic [AND] LBP," "cost [AND] LBP," "spending [AND] LBP," "economic* [AND] LBP," and "healthcare costs [AND] LBP;" for disease burden statistics, search terms included "prevalence [AND] LBP," "incidence [AND] LBP," and "burden [AND] LBP." For statistics on international practices in the management of LBP, search terms were a combination of the prior terms with the country's name. For example, for the cost of LBP in Korea, the following search term was used: "'Korea' [AND] 'LBP' [AND] 'cost.'" The same formula was used for cost and prevalence statistics for every country and region. Authors selected the literature by first using publicly accessible domestic and international government databases with updated data then using nongovernment-based sources to supplement missing data. Inconsistencies were resolved to default on data from government-based databases.

1) Framework

To compare the cost of LBP care per capita across countries of different sizes. The following equation was used.

$$\begin{aligned} P(i,t) &= TruePrevalance(i,t)*Diagnosis(i,t)*C(i,t) \\ &= TurePrevalance(i,t)*Diagnosis(i,t)* \\ &(Cost0\,f\,NonSurgicalCare+Prob0\,f\,Imaging*Cost0\,f\,Imagining+ \\ &Prob0\,f\,Surgery*Cost0\,f\,Surgery+Prob0\,f\,PT*Cost0\,f\,PT) \end{aligned}$$

where,

- P(i,t) is the per capita cost of LBP treatment in country i in year t
- TruePrevalance captures true prevalence in the population
- Diagnosis is the probability to be diagnosed given back pain (not all sick people seek care or are being diagnosed)
- C(i,t) is the cost per diagnosed patient
- Other variables are self-explanatory and are conditional on the positive diagnosis

All costs are reported in US$2021. Domestic costs were converted to US$2021 using the Consumer Price Index for All Urban Consumers as reported by the US Bureau of Labor Statistics for the July of the respective year to July of 2021. The midyear (July 1st) Consumer Price Index index was chosen as the period closest reflecting global pre-COVID-19 pandemic real Gross Domestic Product trends in attempt to attenuate the drastic economic effects experienced due to the pandemic.[7-9]

Per capita costs for international studies were calculated by dividing the total national annual cost by the national annual population size as reported by the World Bank for that year. This amount was then converted to US$2021 using the same methodology described above.

All ensuing costs are given in US$2021.

RESULTS

1. The Socioeconomic Burden of LBP in the U.S.

1) Sources of high spending: frequent ambulatory visits, surgery, imaging

A major driver of the high-cost burden of LBP in the U.S. is higher rates of surgery and frequent and often initial visits to medical specialists (and the associated interventions) instead of primary providers. Sixty-one percent of the $22.9 billion of total medical spending to address LBP in 2016 was spent on ambulatory visits.[1,4] LBP accounted for 2% of all (or 2.63 million) emergency department visits in 2006.[10,11] Nearly 67% of these patients were admitted and 10% receiving computed tomography (CT) or magnetic resonance imaging (MRI), 3 times higher than imaging rates in 2002.[10,12] One in 4 patients who received primary care for LBP received imaging while 1 in 3 patients in the Emergency Department received imaging.[11]

Within the first 90 days of beginning sick-leave, on average 32% of patients with LBP undergo surgery in the U.S. compared to 6% in other highly developed countries like Sweden.[13] The same trend rings true over time with 92% of U.S. patients receiving surgery within the first year compared to 75% in countries like Germany.[13]

Not only is surgery an earlier therapeutic option in the U.S., but the rate of surgical intervention also continues to rise particularly fusions for degenerative spinal diseases. Between 2004 and 2015, the volume of elective lumbar fusions in the U.S. increased 62.3% (from 60.4 to 79.8 fusions per 100,000 U.S. adults). Amongst those older than 65 years old, the volume increased more drastically, from 98.3 to 170.3 per 100,000 from 2004 to 2015.[6] The market for lumbar fusions continues to grow 18%–20% annually with fusion as the standard for treating common lumbar pathologies which do not typically involve instability, like lumbar stenosis despite few studies demonstrating definitive clinical superiority of fusion over nonfusion decompression.[14,15]

One proven driver of this increase in surgery is imaging overuse which may lead to faulty attribution of pain to an imaging abnormality, particularly as most imaging abnormalities are incidental findings in asymptomatic patients.[16] Although surgery is not the most widespread intervention it is the costliest, averaging $51,500 per admission and exceeding $10 billion in ag-

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gregate in 2015.[6] In another study, while only 1.2% of patients with newly diagnosed LBP received surgery, surgery accounted for almost 30% of the total 12-month costs of the entire cohort.[3]

The American College of Physicians (ACP) has developed clinical guidelines for primary care physicians and Emergency Department physicians seeing a patient for the first time with LBP.[17] ACP guidelines urge against imaging within 30 days of diagnosis and before trying nonsurgical treatments. Deviations from these guidelines are common and costly—responsible for an additional $373 million annually.[3] In a recent study, patients who received imaging (lumbar CT, MRI, or radiograph) within 30 days of diagnosis had double the 12-month costs of those treated under guidelines even after stratifying by imaging modalities.[3] Use of MRIs as the first intervention within 30 days of the LBP diagnosis led to an 8-fold increased risk of spine surgery.[18] Furthermore, Lurie et al. found that 22% of the regional variation in spine surgery rates can be explained by variation in the rate of advanced spine imaging (CT and MRI), a trend that has been true over time and across regions.[19,20] Notably, advanced imaging is twice as predictive of surgery than the regional density of spine surgeons, hospitals in which spine surgery is performed, or socioeconomic or insurance status.[21] Thankfully, the rate of guideline deviance has decreased over the past decade.[3]

One of the most common nonsurgical treatments is prescription medications, which contributed 15% of the direct medical costs in 2007.[22] In 2008, there was a 50% increase in narcotic prescriptions concomitant with a 50% decrease in acetaminophen prescriptions.[23] The prescription of opioids has been linked with worse pain, functioning including higher doses being directly associated with prolonged work disability, catastrophizing and depression.[18,24,25] This has also contributed to the increase in substance abuse disorders and deaths due to overdose. While clinicians are increasingly wary of prescribing narcotics for chronic LBP, opioids remain the most frequently prescribed medication for LBP.[26]

2) Indirect cost burden twice as large due to lost productivity

However high the direct cost, the indirect cost of LBP is at least twice as high.[4] An estimated 149 million workdays are lost annually due to LBP, accounting for 5% of lost workdays from any cause. A major cause of LBP and thus lost workdays is occupation-related LBP from high-risk industries such as lumber retailing, gas extraction, and nursing. Occupation-related LBP was responsible for 101.8 million (68%) of lost workdays due to LBP.[18] Occupations with the highest prevalence of LBP include health care providers, farmers, fishers, and forestry workers.[27]

2. The Socioeconomic Burden of LBP Globally

1) LBP: leading source of global disability since 1990

Since the global burden of disease study was published in 1990, LBP has been a leading cause of years lived in disability (YLD).[28-30] In 2017, about 580 million people worldwide reported having LBP, with an incidence of 250 million responsible for 64 million YLD annually. In the Western population, 70%–85% will develop LBP at one point in life, 60% will continue to report LBP 1 year later, and 10%–15% will have chronic LBP.[31-33] Due to a growing global population, the age-standardized point-prevalence of LBP has decreased in most countries (-2.1%). However, overall number of cases has increased nearly 20% between 2007 and 2017.[5,29] Prevalence is highest among those 80+ years old. Nevertheless, YLD is highest among those 45–49 years old because of the significance of disability on quality of life at a working age. Causes of this absolute rise in prevalence include increased longevity, obesity and psychiatric illness in developed countries. In emerging economies, additional causes include rapid industrialization with a growing working population and increasingly sedentary lifestyles.[5,29,34-36]

Accurate cost comparisons across international studies remains elusive as studies adopt varying methodologies for calculating costs. Regardless, a few systematic reviews have attempted to explore geographic differences.[5,37,38] The findings from these reviews and more recent studies are summarized by their respective geographic region in Table 1 and Figs. 1 and 2.

2) LBP in high-income North America and Australia

The age-standardized mean prevalence of LBP in the US and Canada is 10.71% (95% confidence interval, 10.06–11.39), the 7th highest prevalence globally since 1990.[5] In Canada, emergency department visits for LBP has increased to 3.2% of all visits, only 9% of which are truly attributable to nerve impingement.[39] Disease and treatment regimen has also evolved with increasing incidences of LBP due to "sequelae of previous back surgery" which was claimed 26 times more in 2007 than 2000.[40] Utilization of instrumented lumbar surgeries more than doubled between 1993 and 2012 with the annual procedure rate among those older than 80-year old increasing 7.6-fold.[40] The same is true in Australia. Between 2003 and 2013 the rate of 3+ level or 2+ approach spinal fusion grew 400%, simple fusion grew 115%, while decompression grew 16% for the treatment of spinal stenosis despite minimal evidence of their marginal benefit over decompression alone.[41]

Despite a notably distinct healthcare financing system, Canada, like the U.S., has dramatically increased the rate of surgical

Table 1. Prevalence, direct, and indirect cost of low back pain in high-income countries (US$2023)

Country	Study (FA, year)	Cost collection year	Overall prevalence	Annual direct cost (million)	Direct cost/capita*	Annual indirect cost (million)	Indirect cost/capita
US	Shmagel et al.[81] 2016		20.1% (31.6 million), working age				
	Waters & Graf[4] 2018	2016		$78,700	$244	$445,800	$1,379
Canada	Beaudet et al.[40] 2013	2007	1.4%–3.2% (519,000–1,200,000), recurrent LBP	$31.6	$0.91		
Netherlands	Boonen et al.[43] 2005	2002	20%–50% (3.3–8.2 million)	$31.0–77.2 ($8,342/patient)	$2.00–4.98	$18,000–46,000 ($5,640/patient)	$1,128–2,867
Sweden	Olafsson et al.[49] 2018	2011	15%–30% (1.52–3.04 million)	$496.5 ($2,237/LBP episode)	$52.54	$961.7 ($3,788/LBP episode)	$2,986
Korea	Ahn et al.[82] 2016	2011	15.3% (7.7 million)	$1,885	$37.39		
	Hyeong et al.[52] 2005	1997				$40,192 (workers' compensation)	$875
Japan	Sadosky et al.[83] 2015		20%–25% (25.5–31.8 million)				
	Montgomery et al.[53] 2017	2011		$27,500	$216.43	$12,193 ($14,677/patient)	$95.80

LBP, low back pain.
*Direct and indirect costs reported as costs per person based on the national population size as reported by the World Bank during study period reported.

intervention to address LBP.[40,42] This cost burden is only worsened by postsurgical complications, suggesting potential overmedicalization of a multifactorial pain syndrome.

3) LBP in Europe: Netherlands, Belgium, Sweden

The highest per capita direct cost was reported in 2002 from the Netherlands at 8,533€ ($410)—US$2021 calculated from foreign currency using the historical exchange rate average in the year reported. Then the historic US equivalent is covered to US$2021 using the US Bureau of Labor's Consumer Price Index published annual inflation rate—per capita.[43] Costs were highly variable depending on level of care and referral patterns. Specialist care for back pain cost significantly more than those treated at a primary care setting (4,875€ vs. 2,365€ or $6,045 vs. $2,932, $p<0.001$). General practitioner referrals also accumulated lower costs relative to those referred by a specialist (1,569€ vs. 3,018€ or $1,946 vs. $3,742, $p<0.05$).[44] Among all patients, LBP was managed as follows: 88% treated with exercise therapy, 53% with opioids, and only 26% patients treated with surgical intervention.[44] LBP alone was responsible for 25% of all drug costs for musculoskeletal pathology with an average of 2 medications per patient with chronic lower back pain.[45]

In Sweden, surgery and specialist care are responsible for a quarter each of all direct costs for LBP in Sweden, similar to the US where surgery is responsible for 22% of all direct costs.[46,47] The landscape of medical costs for LBP has changed as treatment regimens evolve. In a recent Belgian study, LBP was responsible for 55% of all transcutaneous electrical nerve stimulation units and 60% of intrathecal pumps.[48]

Across the continent, the indirect cost of absenteeism varies widely, ranging from 38%–85% of all costs.[48,49] In Sweden, each episode of LBP results in on average 51 days of absenteeism, equivalent to 2,753€ ($3,436).[49] Cost of illness comparisons between the U.S. and European countries is difficult as most U.S. studies take the perspective of private insurance. Any cost reduction over time may be due to true cost containment efforts or costs merely shifted to another payer.

Lumbar fusion surgery popularity grows not only in the U.S. but around the world though at a different pace. In Finland, as the rate of lumbar decompressions doubled between 1997 and 2017 from 33 to 77 per 100,000 person-years, the rate of lumbar fusions tripled from 9 to 30 per 100,000 person-years.[50] Norway likewise experienced a faster growth in the rate of complex lumbar surgeries, the majority of which were fusions (13.6 to 21 per 100,000 inhabitants), than simple lumbar surgeries (64.3 to 88.9 per 100,000) between 1999 and 2013. Females and adults

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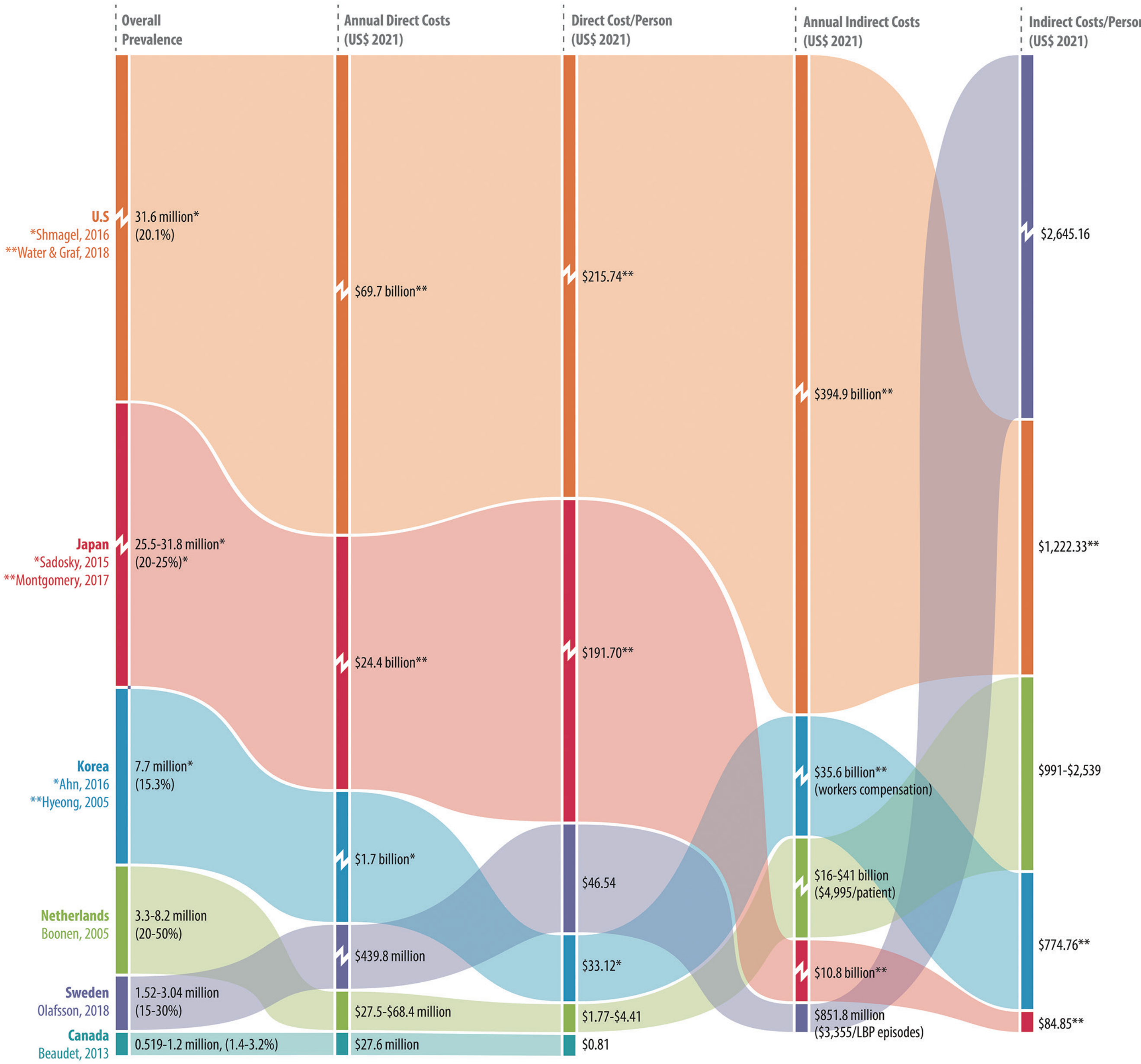

Fig. 1. Prevalence, direct cost and indirect cost of low back pain for select high-income countries. The relative prevalence, direct and indirect cost (US$2021), and direct and indirect cost per person (US$2021) are depicted for the United States (U.S.), Japan, Korea, Netherlands, Sweden, and Canada by colored ribbons with their associated rank. For example, the U.S. has the highest prevalence, annual direct cost, direct cost/person, and annual indirect cost and therefore the orange ribbon has both the widest and topmost ribbon for those categories. However, Sweden has the highest indirect cost per person and likewise, the purple ribbon is the widest and surpasses the orange for indirect cost per person. The referenced article is listed under each country. For countries with more than one referenced article, asterisks help differentiate from which article the prevalence and/or cost data originated.

between 60 and 74 years old made up the most frequent and fastest growing complex lumbar surgery demographic.[51] So while the U.S. reports the fastest growth in the total number of lumbar fusions performed year over year, rate of growth per 100,000 inhabitants in Europe currently outpaces the U.S.

4) LBP in Asia: Korea, Japan, China

In Asia, high-income countries had the highest burden of LBP (age-standardized point prevalence: 13.16 [11.74–14.73]) whereas lower-income East Asia had the lowest of all regions globally (3.92 [3.46–4.37]) likely due to high population density.[5,29]

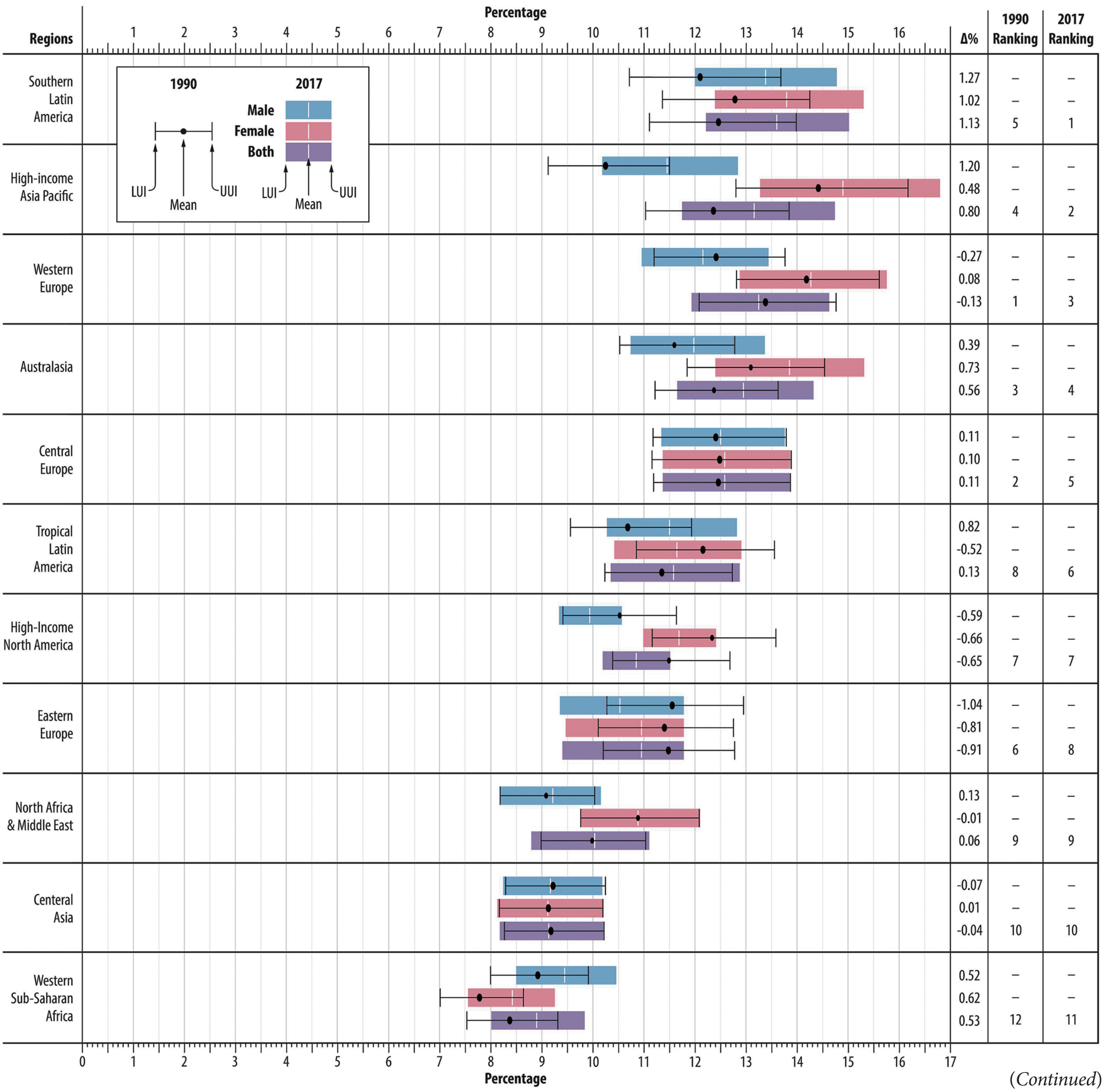

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Fig. 2. Global age-standardized prevalence of low back pain (LBP) by region in 1990 and 2017. Average age-standardized prevalence percentage of LBP by geographic region and gender in 1990 and 2017 represented as black lines and colored bars, respectively, based on the global burden of disease studies. For 2017 estimates, the male average is marked by blue bars; female average by pink; male and female averages depicted in purple. The lower and upper uncertainty level markers are marked by vertical dashes. Regional percent changes between 1990 to 2017 and the male and female average regional rankings in 1990 and 2017 are listed in the right three columns, respectively.

In Korea, duration of pain was the major direct cost determinant consistent with findings from other high-income countries. Fifty-one percent of insurance claims for back pain was for pain lasting less than 6 months accounting for 10% of total costs due to LBP compared to the 6% of claims for pain lasting longer than 2 years which was responsible for 30% of costs.[52]

In Japan, chronic LBP affects an estimated 1.5 million people, accounting for nearly one-third of patients with chronic pain.[53] While no difference was found in costs per ER visits or hospitalization, chronic LBP patients sought their provider seven

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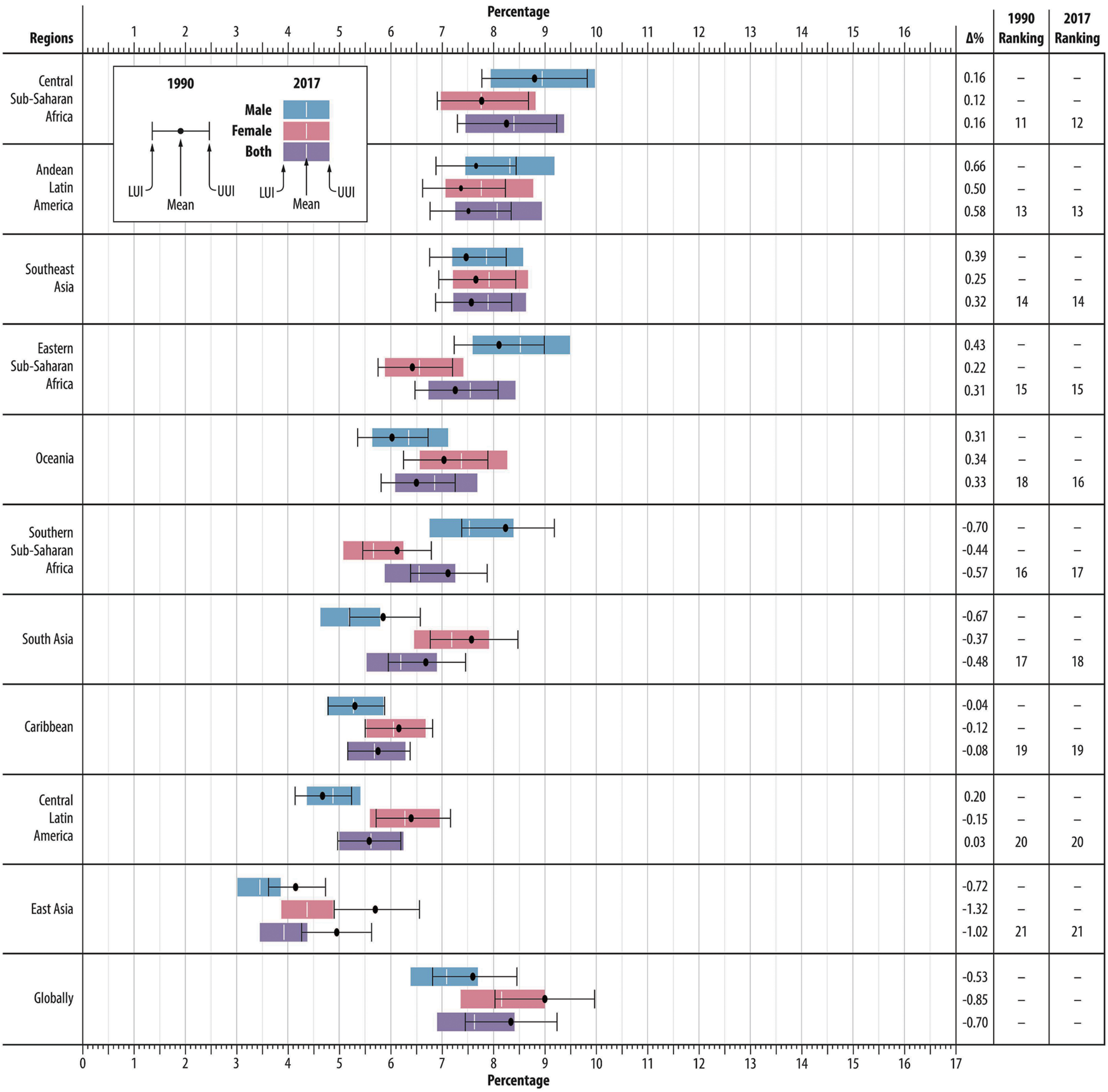

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times more than age, sex, body mass index, Charlson Comorbidity Index, and smoking status-matched controls leading to an incremental cost of $1,230 per person and a national direct cost burden of $24.4 billion.[53] Unlike in other developed countries, loss of productivity in Japan due to chronic LBP is largely due to presenteeism, or decreased productivity while being present at work. Like in other high-income countries, the socioeconomic burden of LBP is significantly worsened by psychiatric comorbidities.[54–56] Depression and anxiety is associated with higher pain, lower quality of life, increased productivity loss, and increased healthcare utilization in patients with chronic LBP.[57,58] This recognition has shifted Japanese health policy makers towards addressing chronic LBP as a holistic pain to be treated with cognitive behavioral treatment, exercise, and sleep hygiene.[59]

Since 1990, China has seen a gradual decline in point prevalence of LBP nationwide attributed to an improving primary care system as the YLD due to LBP increased 23% between 1990 and 2016 due to the population growth and increased longevity.[60]

5) LBP in emerging economies: Sub-Saharan Africa, India, Brazil

Known risk factors like height and fat distribution in high-income populations have no relationship to LBP in lower income populations.[61]

In Sub-Saharan Africa, after degenerative spine disease, spinal infections are the second leading cause of LBP with tuberculosis responsible for nearly 80% of symptomatic infections.[62] Human immunodeficiency virus is the cause cited for 84% of lower back spondyloarthropathies and the third leading cause of LBP.[63]

Multiple studies have examined the occupational hazards affecting men and women of lower economic status in urban India.[64-66] For men in Southern India, lack of educational attainment is a significant risk factor for LBP.[61] For working women, the high incidence of LBP (70%–80%) has been attributed to a combination of prolonged hours in suboptimal working positions, occupational monotony, and inadequate income—highlighting the complex biopsychosocial model underpinnings of chronic pain.[65] Prevalence of LBP among rural housewives in India is likewise high (83%) though the economic burden to society is significantly lower due to reduced access to healthcare and lower wages.[67]

In countries with rapidly expanding economies, like Brazil, the epidemiology of LBP looks increasingly like those of higher income countries. In 2016, two-third of government spending on spinal disorders was spent on LBP. The direct cost impact is growing secondary to high utilization of healthcare services, procedural interventions, and imaging.[34]

Treatment and prevention of chronic LBP in lower-income regions varies significantly from those in higher-income countries due to the prevalence of preventable communicable diseases and occupational hazards while countries with rapidly growing economies are beginning to demonstrate the same over-medicalization seen in high-income countries.

Table 2. Cost of major chronic diseases in the United States (US$2023)

Disease	Study (FA, year)	Cost data collection year	Overall prevalence	Annual direct cost (billion, US$2021)	Direct cost/person (US$2021)	Annual indirect cost (billion, US$2021)	Indirect cost/person (US$2021)	Annual total cost (billion, US$2021)	Total cost/person (US$2021)
Low back pain	Soni[22] 2010	2007	27,000,000	$43.02	$142.91	-	-	-	-
	Katz[84] 2006	NA	-	-	-	$88	-	-	-
	Shmagel et al.[81] 2016	2016	31,600,000	-	-	-	-	-	-
	Waters & Graf[4] 2018	2016	31,573,940	$78.69	$243.63	$445.84	$1,380.32	$524.54	$1,830.25
Stroke	Virani et al.[85] 2020	2015	790,000	$31.95	$99.53	$19.98	$62.25	$51.93	$161.79
	Waters & Graf[4] 2018	2016	8,794,418	$62.40	$193.30	$64.01	$198.19	$126.45	$441.21
	Benjamin et al.[86] 2017	2017	8,794,418	-	-	-	-	-	-
Dementia	Plassman et al.[87] 2007	2002	3,400,000 (70-year projection)	$148.46	$515.50	$292.86	$1,016.88	$441.30	$1,532.39
	Waters & Graf[4] 2018	2016	5,619,500	$221.62	$686.14	$98.22	$304.10	$319.85	$1,116.03
	Alzheimer Association* 2017	2017	5,619,500	-	-	-	-	-	-
Cardiovascular disease	Nichols et al.[88] 2010	2005	128,000,000 (2020 projection)	$178.83	$604.18	$312.96	$1,057.30	$491.79	$1,661.47

NA, not available.
*Prevalence includes only those diagnosed with Alzheimer disease.

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3. Socioeconomic Burdens of Major Chronic Diseases in the U.S.

While neither the costliest nor the most prevalent chronic disease, chronic back pain has one of the highest cost per person.[4] An aging population and increased longevity will only exacerbate the socioeconomic burden of these chronic diseases, in particular LBP, in the next few decades. Findings are summarized in Table 2 and Fig. 3.

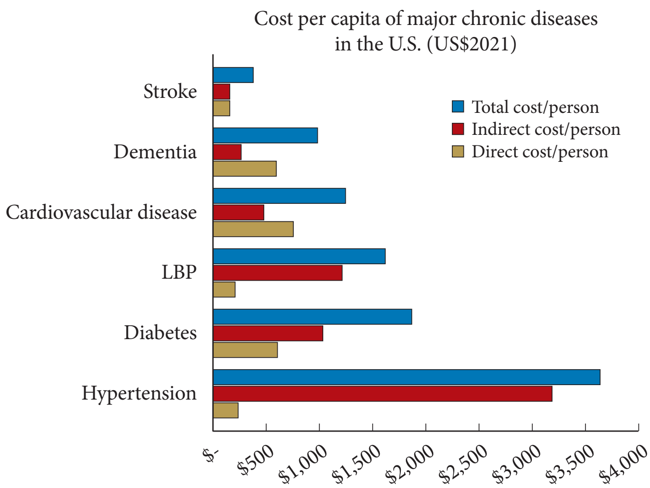

Fig. 3. Relative per capita cost of major chronic diseases in the United States (U.S.). The direct, indirect, and total cost per capita of major chronic diseases in the U.S. are depicted by horizontal bars. Per capita costs were calculated by dividing the respective cost by the U.S. population size in the year for which the cost data was collected as sourced from the World Bank. LBP, low back pain.

4. Relative Cost of Major Chronic Diseases in Other High-Income Countries

Across high-income countries, LBP is one of, if not the costliest chronic disease per case. Between cardiovascular disease, dementia, stroke and diabetes, LBP is responsible for the highest per capita cost in Sweden. In the Netherlands and the U.S., the per capita cost of LBP ranks second only to diabetes. Both diabetes and LBP carry growing cost burdens associated with sedentary lifestyles and rising obesity rates. The cost per capita of LBP and major chronic diseases is presented in Table 3.

DISCUSSION

1. Why Does LBP Cost so Much in the U.S.? A Healthcare Pricing Issue

The high cost of LBP in the U.S. is in proportion to its high national healthcare costs, not the population's health status. While the U.S. boasts the highest obesity rates, the prevalence of LBP in the U.S. is similar to other high-income countries.[68]

Table 3. Relative per capita cost of major chronic diseases in select high-income countries (US$2023)

Country	LBP	CVD	CVD: LBP	Dementia	Dementia: LBP	Stroke	Stroke: LBP	Diabetes	Diabetes: LBP
US	$1,830.25 (Waters & Graf[4] 2018)	$1,407.78 (Virani et al.[85] 2020)	0.769	$1,117.84 (Waters & Graf[4] 2018)	0.611	$441.93 (Waters & Graf[4] 2018)	0.241	$2,114.94 (Waters & Graf[4] 2018)	1.168
Canada	$0.81* (Beaudet[40] 2013)	$1,059.57 (Tarride et al.[89] 2019)	NA†	$251.18 (Østbye et al.[90] 1994)	NA†	$199.94 (Goeree et al.[91] 2005)	NA†	$296.44 (Dawson et al.[92] 2002)	NA†
Netherlands	$330.71 (Lambeek et al.[93] 2011)	$0.61 (Wilkins et al.[94] 2017)	1.63×10^{-3}	$307.72 (Koopmanschap et al.[95] 1998)	0.824	$180.57 (Struijs et al.[96] 2006)	0.484	$509.00 (Peters et al.[97] 2017)	1.390
Sweden	$379.79 (Ekman et al.[45] 2005)	$0.26 (Wilkins et al.[94] 2017)	6.06×10^{-4}	$363.02 (Wimo et al.[98] 1997)	0.847	$341.32 (Terént et al.[99] 1994)	0.796	$157.38 (Henriksson et al.[100] 1998)	0.367
Korea	$147.28 (Lee et al.[76] 2019)	$157.12 (Chang et al.[101] 2012)	0.945	$85.79 (Suh et al.[102] 2006)	0.516	$172.70 (Cha[103] 2018)	1.040	$422.95 (Oh et al.[104] 2021)	2.54
Japan	$318.50 (Montgomery et al.[53] 2017)	$157.54‡ (Gochi et al.[105] 2018)	0.438	$1,336.91 (Sado et al.[106] 2018)	3.720			$0.12 (Urakami et al.[107] 2019)	3.45×10^{-4}

LBP, low back pain; CVD, cardiovascular disease.
*Direct cost per person. No total cost of LBP in Canada. †Not reported as there was no available total of LBP in Canada. ‡Includes only the total cost of ischemic heart disease.

Furthermore, Papanicolas et al.[69] found that population health factors at large (smoking, drinking, obesity) were not responsible for the substantially higher healthcare costs of the U.S. Instead, the high price of healthcare, in particular physician and hospital services, pharmaceuticals, and diagnostic testing in the U.S. drives the high cost of chronic disease.[70] Across surgical specialties ranging from obstetrics, general surgery, and orthopedic surgery, surgeries in the U.S. are more expensive and thus more lucrative than other comparable countries. For example, the cost of a knee replacement is 53% more expensive in the U.S. than Switzerland and 77% more expensive than Australia.[71] The higher rate and revenue of performing spine surgery and other high-margin procedures like caesarean deliveries and angioplasties account for a fifth of the difference in healthcare cost per capita between the U.S. and other high-income countries![72]

Another possible cause of the U.S.' disproportionate spending on LBP is its well-known litigious nature, which may predispose to overutilization of indisputable clinical evidence such as imaging. The U.S. performs many more CT scans (278.5 per 1,000 people, in 2019) than any other country. Iceland, which ranks second, performs 234 CT scans per 1,000 people and Korea, third, 228 per 1,000 people.[73] The price of scans is also higher in the U.S. with a the nearly 10-fold difference in CT per capita cost between the U.S. and the Netherlands ($220 vs. $23, respectively).[72] Emanuel et al. notes that 7% of the cost difference between the U.S. and Netherlands is due to imaging.[72]

2. The Future of LBP in the U.S.

The fastest growing segment of the U.S. population are people aged 60 years and older, from 962 million 2017 to 2.1 billion

Table 4. International evidence-based guidelines on the management of LBP[78-82]

Level of treatment	Acute LBP	Chronic LBP
First-line	Remaining active Education/reassurance	Remaining active Education/reassurance Exercise therapy Cognitive behavioral therapy
Second-line	Spinal manipulation Massage Acupuncture NSAIDs Superficial heat	Spinal manipulation Massage Acupuncture Yoga Midfulness-based exercises Interdisciplinary rehabilitation NSAIDs SNRI Surgery - Discectomy for herniated disc - Laminectomy for spinal stenosis
Limited use where indicated	Exercise therapy Cognitive behavioral therapy Skeletal muscle relaxants Opioids*	Opioids* Epidural glucocorticoid injection for herniated disc
Insufficient evidence	Yoga Mindfulness-based exercises Interdisciplinary rehabilitation SNRI Antiseizure medications Surgery - Discectomy for herniated disc - Laminectomy for spinal stenosis - Spinal fusion for non-radicular LBP with degenerative disc findings	Superficial heat Skeletal muscle relaxants Antiseizure medications Surgery (spinal fusion for nonradicular LBP with degenerative disc findings)
Not recommended	Epidural glucocorticoid injection for herniated disc Systemic glucocorticoids Paracetamol	Paracetamol

LBP, low back pain; NSAID, nonsteroidal anti-inflammatory drugs; SNRI, selective norepinephrine reuptake inhibitor.
*Use with caution.

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in 2050. In the U.S., 2 out of every 3 adult male over 60 years old reports having LBP in the past year.[74] A critical subdivision of the elderly population are those older than 65, a population particularly prone to the complications of LBP (depression, falls, etc.). Superaging populations like Japan where those over 65 years old outnumber those under 18 face the economic crisis of a simultaneously decreasing labor force and increasing public sector demands on health care.[75,76] By 2034, the U.S. too is projected to become a superaging population.[77]

Considering these impending demographic challenges, adherence to evidence-based management of LBP can help safeguard from wasteful healthcare spending. A 2018 Lancet series highlights global recommendations on the management of acute and chronic LBP summarized in Table 4.[17,28,30,78-80] A seriously underutilized tool—patient education and reassurance—is the first line therapy for both acute and chronic LBP.

CONCLUSION

The cost of LBP will continue to rise in the U.S. and other high-income countries largely due to an aging population becoming an ever-greater public budget strain. This urges discernment of the cost-contributors and inefficiencies in the clinical and health system-wide management of chronic LBP. Respecting guidelines for imaging and surgical management and cautious referrals to specialists for the first visit would be reasonable initial approaches to managing a complex biopsychosocial issue like chronic pain.

NOTES

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