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Original article

Injuries and their related household costs in a tertiary hospital in Ghana

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ABSTRACT

Introduction: Injuries remain a leading cause of death in many developing countries, accounting for more deaths than HIV, tuberculosis, and malaria combined. This study set out to determine the associated patient costs of reported injury cases at the Accident and Emergency Department of the Korle-Bu Teaching Hospital (KBTH) in Accra, Ghana.

Method: A cross-sectional retrospective Cost-of-Illness study of 301 sampled patients was undertaken, following a review of injured patients' records from January–December 2016. Direct cost, (consisting of consultation, surgery, medicines, transportation, property damage, food and consumables) was estimated. Indirect cost was calculated using the Human capital approach. Intangible cost was assessed using Likert scale analysis. The overall household cost, average cost of various injuries and intangible costs were determined.

Results: The total annual household cost of injuries to patients who attended KBTH was US$11,327,461.96, of which 82% was the direct cost. The average household cost of injuries was US$ 1276.15. All injuries recorded some level of high intangible cost but was exceptional for burns.

Conclusion: Injured patients incur high direct treatment cost in all aetiology, with generally high intangible cost as well. It is therefore imperative that injury prevention strategies be prioritized in national health policies, while broader discussions continue on sustainable health financing of injury management.

African relevance

- Compared to other places, there is paucity of data regarding the household cost of injuries in sub-Saharan Africa.
- Injury related mortality and morbidity are still pertinent public health issues in Africa.
- Health expenditure in injuries require focused policy review.

Introduction

Injuries account for 9% of the world's deaths, aside which, many injured patients are left with temporary or permanent disabilities [1]. Approximately half of injury-related deaths occur in individuals aged 15–44 years, and this is during their most economically productive years, making the burden of injuries exceed by far, the associated perceived immediate medical costs [2]. In Ghana, 72 persons out of every 100,000 population, suffered from grievous bodily injury, and close to 8 persons out of these, died from road traffic injuries (RTI) over the past decade. In this same period, > 60% of road traffic fatalities occurred in children and young persons under 35 years [3].

Cost-of-illness (COI) studies are a type of economic study that determines the total cost of an illness. The aim of a COI study is to identify and measure all the costs of a particular disease, including the direct, indirect, and intangible dimensions [4]. Conventionally, COI studies classify costs into three categories: direct cost being the out-of-pocket expenditure made due to a health condition; indirect cost, referring to the productivity loss incurred; and intangible cost, being the patients' psychological pain and discomfort suffered due to the illness [5]. Cost of illness studies can demonstrate which diseases may require increased allocation of prevention or treatment resources, but they are limited in determining how resources are to be allocated because they do not measure benefits [6]. The COI approach has over the years been used to assess disease burden such as malaria [7], diabetes [8–10] and other non-communicable diseases [10].

There are several benefits to determining the economic costs of diseases, thereby leading to several countries estimating the burden of several diseases, since the first publication in 1986 [11]. Such estimates are over time, becoming a standardized gauge for policymakers in

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informing reimbursement decision making, defining the magnitude of disease or injury, justifying resources for intervention and prevention programs, as well as providing an economic framework for program evaluation [12]. This study therefore, estimates the household cost of injuries reported to a premier tertiary health facility in Ghana.

Methods

The study was conducted at the Korle-Bu Teaching Hospital (KBTH), Accra, Ghana. Established on October 9, 1923, the Hospital is a major national referral center in Ghana, having an over 2000-bed capacity. Korle-Bu Teaching Hospital is in the Accra Metropolis of the Greater Accra region of Ghana. The hospital has 17 clinical and diagnostic departments/units which includes the Accident and Emergency department. This Centre sees both referral and walk-in trauma cases from mainly the southern part of the country. The average annual household income in Ghana is equivalent to USD1,273 [13].

The study was a combination of medical records review and patient survey. The medical records review was used to classify the various injuries presented at the Accident and Emergency Department of KBTH. Patients coming for review were then recruited randomly from the various classified injury list until the required sample size was obtained. Patients who provided consent, were interviewed in person before or after their review sessions. Patients whose injury severity did not allow them to talk at the time of interview were excluded.

Data were obtained from two main sources: medical records review and sampled patient survey. Medical records review covered the period from January–December 2016, and were reviewed for the aetiology of sustained injury. A complete count was 9143 cases. These were then verified for their completeness of information. The medical review covered 9061 patients. Data from their folders, supplemented with triage records were entered into a computerized abstraction chart using Microsoft Excel 2010. Extracted patient information were the aetiology of the injury.

A structured questionnaire was employed for primary cost data collection from the sample population. The questionnaire covered patients' socio-demographic information (sex, age, marital status, highest educational level, employment status, National Health Insurance Scheme status, and type of injuries), the direct, indirect and intangible costs incurred. The direct costs covered medical (i.e., surgical and medication) and non-medical (i.e., transportation, property damaged, food and consumables, miscellaneous). The indirect cost covered productivity loss, while the intangible costs covered reported levels of fear, pain and emotional sufferings associated with the injury (Table 1). The main surgical costs were corroborated by patients' bills from their folders, and all other cost areas reported by the patients. Costing data was collected by five (5) trained Medical Officers of KBTH. Assistants were fluent in at least English, and the local languages *"Akan"* and *"Ga"*. They were trained for two (2) days on questionnaire administration, costing data collection, and how to obtain consent, as well as handling the information collected.

Descriptive statistics were used to classify the sociodemographic characteristics of patients by their sex, age, marital status, highest educational level, employment status, National Health Insurance Scheme (NHIS) status, and type of injuries. The distribution of injuries by their mechanism was compiled from the records review. These

Table 1
Cost analysis of reported injuries healthcare management.

Cost type	Cost component	Cost Estimation Approach
Direct	Surgical	*Surgical*: This was the cost of surgical interventions. This was obtained by multiplying the average surgical cost per patient injury type by the number of each aetiology of injury in the sample. Estimations were computed separately for patients with and without access to the National Health Insurance (NHIS).
	Non-surgical (Medical)	*Medical:* This included the cost of medication, laboratory investigations, first aid, the cost of folders, radiographs, allied treatment such as physiotherapy and dietherapy. These were summed up for each aetiology of injury, and an average cost determined. This was obtained by multiplying the average non-surgical cost per patient injury type, by the number of each injury aetiology in the sample. Estimations were computed separately for patients with and without access to the NHIS.
	Non-medical	*Travel:* This was calculated by summing the travel costs incurred by the patients covering all review visits by aetiology of injury when travelling to and from the hospital. *Food and consumables:* This was calculated by summing the costs incurred by patients on food, drinks etc. during their review visits by aetiology of injury. *Property damage*: Where applicable, this was estimated from repair or replacement of lost items or damaged property by aetiology of injury. *Miscellaneous:* This was calculated by summing other costs (e.g. legal/court procedures, communication, photocopies phone calls etc.) by aetiology of injury incurred due to the injury. *Total non-medical cost:* This was estimated by summing the cost incurred by patients on travel, food and consumables, property damaged and other miscellaneous costs due to their injuries.
	Total direct cost	This was the summation of the surgical, non-surgical and non-medical costs.
Indirect	Productivity losses due to health care seeking	Human capital approach was used to estimate the productivity loses by patients and caregivers [5]. This method assumes that the value of lost work is equal to the amount of money which the individual would have been paid to do the work in question [29]. This was the sum of hours spent seeking healthcare by the patient (including waiting and treatment times, and also for review visits) by aetiology of injury.
	Other productivity losses	This was sum of total number of other productive work days lost to patients and caregivers due to the sustained injury which is outside the losses in seeking care.
	Total indirect valuation	The total hours productivity losses (i.e., seeking health care and other productivity losses) was multiplied by the average hourly earnings (i.e. US$2.02 per day).
	Total healthcare cost	This was the summation of the total direct and total indirect costs.
Intangible	Composite intangible cost	The composite intangible cost was obtained from responses to 5-point Likert scale questions in relation to physical pain, fear and emotional sufferings. The aggregated score from the 3 dimensions were categorized into intangible burden: 'low' (11–26), 'moderate' (27–37) and 'high' (38–55) using the tertile descriptive statistics approach. Fisher's exact test was conducted to determine association between intangible burden and age, patient sex and educational level.

Table 2
Background characteristics of study patients.

Item	Number	%
Age (years):		
< 19	58	19.3
20–39	124	41.2
40–59	83	27.6
> 60	36	12.0
Sex:		
Male	179	59.5
Female	122	40.5
Educational level:		
No education	26	8.6
Primary	55	18.3
Junior High School equivalent	79	26.2
Senior High School equivalent	92	30.6
Tertiary	49	16.3
Marital status:		
Married/living together	123	40.9
Not married	178	59.1
Employment status:		
Employed	151	50.2
Unemployed	88	29.2
Student/Apprentice	42	14.0
Other*	20	6.6
NHIS		
Beneficiary	203	67.4
Non-Beneficiary	98	32.6
Injury classification:		
Traffic injuries	116	38.5
Occupational injuries	38	12.6
Sport	10	3.3
Domestic violence	13	4.3
Assault/Interpersonal violence	25	8.3
Play	17	5.6
Falls	53	17.6
Burns	25	8.3
Others	4	1.3
Total	301	100

included traffic injury, domestic violence, assault/interpersonal violence, falls, burns (fire, flames or heat), as well as impacts/hits sustained during play, sports, and in work area (occupational).

Cost analyses covered direct and indirect costs from the patients' perspective, as shown in Table 1. All cost analysis was carried out in Microsoft Excel 2010 and Stata 14 software (StataCorp. College Station, TX). The average household cost was calculated. This was done for each injury aetiology studied by summing their respective direct and indirect cost, and the average cost obtained by dividing this total by the corresponding number of patients in the sub-population. The average cost per aetiology was then multiplied by the total number of patients seen at the centre for the review period for each category of aetiology, to estimate the total cost per annum to injured patients at the facility. Intangible cost was obtained using aggregated score from Likert scale questions in relation to physical pain, fear and emotional sufferings. The composite intangible cost score was analysed using tertile descriptive statistics to be categorized into 'low', 'moderate' or 'severe' intangible cost (Table 1).

The study was approved by the Korle-Bu Teaching Hospital-Scientific and Technical Committee/Institutional Review Board (KBTH-STC/IRB/00093/2016).

Results

This study included a total of 301 participants, consisting of 179 (59.5%) males. The mean age for all participants was 35.2 ± 18.3 years, with those for males and females being 34.7 ± 16.2 and 36.0 ± 20.9 years respectively. At least 91.4% of the study participants had received some form of formal education, while 50% were employed. Most injuries sustained resulted from road traffic collisions (38.5%), falls (17.6%) and injuries occurring at workplaces (12.6%) (Table 2).

The average household cost of all injuries was US$ 1276.15. The direct cost constituted 82% of the total economic cost of injuries. Also, injured patients generally reported 'moderate' intangible cost.

At the individual level, the average costs of injuries showed considerable variation among the different aetiologies (Table 3). The highest average cost of injuries was accrued by traffic injuries (US $1687.65), and burns (US$1676.36), with respective average direct cost components of US$1289.40 (81.7%) and US$1370.63 (84%). The highest average indirect cost was however observed in traffic injuries (US$ 398.25), and the least was in domestic violence (US$ 46.35). Nearly all the cost proportions from injuries sustained from domestic violence (93.8%) and play (95.5%) as shown in Fig. 1 were direct. There was no significant difference in the average direct costs of injured patients by education ($p = 0.329$), sex ($p = 0.975$), marital status ($p = 0.279$), nor NHIS status ($p = 0.250$). However, there was significant difference in the average direct cost among the different age groups ($p = 0.005$).

Regarding the components of direct cost, the average out-of-pocket expenditures on the surgical procedures and medication metted out were US$ 588.12 ± 1053.08 and US$ 238.33 ± 318.29 respectively. Food and travel costs on the other hand accrued averages of US$ 58.91 ± 160.10 and US$ 78.02 ± 191.15 respectively. The main surgical/medical intervention, together with medications constituted 45.9% of the average cost of injury, while travel (direct and valued travel time) and food accounted for 6.5% and 7% respectively of the average cost of injuries.

On a population level, the total annual household cost of injuries to patients who attended the KBTH was found to be US$11,327,461.96. The cost accrued by traffic injuries alone was found to be 60% (US $6,730,862.89) of the total household costs, which was more than the cost of all other injuries combined. The direct cost component of the total cost was more than four times the indirect cost component. Across all injury classes, the direct cost component constituted a large proportion of the household cost as shown in Table 3. Road traffic injuries, falls and assaults incurred the highest direct costs in that order.

Fig. 2 shows the intangible costs for the injury aetiologies. Intangible cost from burns was graded 'high' by all patients (100%). Also, there was no significant difference in intangible cost by sex ($p = 0.137$), education ($p = 0.269$), employment status ($p = 0.506$), nor aetiology of the various injuries ($p = 0.871$).

Discussion

This study determined the household costs of reported injury cases in a tertiary health facility in Ghana, as a measure of the burden of injuries. About a third of these patients had at least completed high school, and half of them employed.

The major component of household cost of injuries was the direct cost. Varying by aetiology, the average household cost of injuries was about US$1276, which is equivalent to the annual household income in 2014–2017 [13]. The total annual household cost of injuries to patients of the hospital was about US$11.3 million, most of which was incurred by traffic injuries, followed by interpersonal violence and falls. The US $1276 average direct cost of injuries in this study corroborates with Wesson et al., [14] who reported direct costs per hospitalization to range from US$14.00 to US$17,400.00 in LMICs [2]. Our finding is higher though, compared to works by Nguyen et al., [15] and Mock et al., [16] who determined average direct cost of injuries to be US $625.00 and US$31.00 ± 105.00 in Vietnam and Ghana respectively

Table 3
Direct and indirect cost to injured patients by aetiology.

Aetiology of Injuries	Cost type	Mean cost (US$, SD)	Median cost (US$)	[a]Annual Incidence at Facility (n)	Total cost to injured patients of facility (US$)
Traffic injuries				3964	
	Direct	1289.40 ± 1507.66	1002.30		5,499,261.76
	Indirect	398.25 ± 689.67	108.35		1231,601.13
	Total	1687.65 ± 1903.66	108.35		6,730,862.89
Occupational injuries				294	
	Direct	775.77 ± 848.36	519.94		217,485.66
	Indirect	136.69 ± 185.48	63.72		42,550.92
	Total	912.46 ± 957.74	675.55		260,036.58
Sports				80	
	Direct	413.75 ± 426.7	459.02		52,358.99
	Indirect	240.74 ± 377.58	20.23		24,051.31
	Total	654.49 ± 601.37	467.11		76,410.30
Domestic violence				559	
	Direct	734.90 ± 742.41	683.33		401,328.59
	Indirect	46.35 ± 65.3	9.61		26,563.42
	Total	781.25 ± 735.84	683.33		427,892.01
Assault/Interpersonal violence				1123	
	Direct	568.65 ± 615.84	616.32		900,999.68
	Indirect	276.88 ± 984.08	16.44		270,624.93
	Total	845.54 ± 1113.30	532.28		1,171,624.61
Play				257	
	Direct	1087.69 ± 1148.30	669.66		229,177.83
	Indirect	144.14 ± 354.66	14.67		10,795.18
	Total	1231.84 ± 1283.95	758.69		239,973.01
Falls				1606	
	Direct	838.80 ± 1054.78	1071.26		1,319,544.98
	Indirect	136.81 ± 260.85	32.37		326,191.52
	Total	975.61 ± 1159.75	1269.66		1,645,736.50
Burns				293	
	Direct	1370.63 ± 2118.71	189.2		390,542.73
	Indirect	305.73 ± 607.66	97.08		74,394.38
	Total	1676.36 ± 2533.31	688.23		464,937.11
Overall injuries				9061	
	Direct	820.09 ± 973.12	604.96		9,277,288.76
	Indirect	192.74 ± 397.15	30.92		2,050,173.20
	Total	1276.15 ± 1622.27	912.41		11,327,461.96

US$1.00 equivalent to GHS4.35 (Bank of Ghana average monthly interbank exchange rate, May 2017).
[a] Difference in total accounted for by other injuries.

[10,11]. Nguyen et al. excluded severe injuries from their study, while Mock et al. used a community approach to their study, likely accounting for the significant difference in reported figures. Our finding is likely further influenced by the tertiary status of the study site, where more sophisticated and standard investigations and treatment options were used, which are invariably costlier. Comparatively, this current study also determined the cost of injuries from the hospital setting.

Indirect cost of injuries from this study constituted 18% of the total household cost. This is consistent with many cost-of-illness evaluations [12,13] However, several other COIs have also reported a higher proportion of indirect cost, as demonstrated by cost-of-illness studies of obesity schizophrenia [20], and stroke [21], while that of smoking in Vietnam showed a comparable 49.5% of the total cost being accounted for by indirect cost [22]. Some authors have suggested that the varying weights and proportions of indirect cost could be related to the associated comorbidities of conditions [23].

Our study uses a descriptive approach to ascertain the intangible component without costing. We found that six out of the seven main injury etiologies had at least 30% of patients sustaining 'high' intangible cost (Fig. 2). Though the role of clinical psychologists in Ghana's healthcare remains relevant, their numbers and regulation leaves much to be desired [24]. This finding may highlight the importance of psychologic and counseling programs in the rehabilitation and management of injured patients in Ghana. More especially, for severe injuries in such institutions. Furthermore, it is evident that injuries are strongly associated with the mental health, thus effective psychological management could be pivotal in the long-term rehabilitation of injured patients [25].

The most prevalent cause of injuries in our sample population was traffic injuries, but we observed that falls and interpersonal violence represented a proportionate amount of injury causes. This observation mirrors the general pattern of injured patients who present to the study site [26], and seems to be common in both developed and emerging countries [27].

Though the benefits package of the NHIS includes injuries and emergencies [28], this study shows that it does not provide full financially protection to patients and their households who incur high health care costs due to severe injuries. Severe injury management is expensive, thus there is the need to advocate for prioritizing injury prevention and public education to reduce the cost to both health care providers and households.

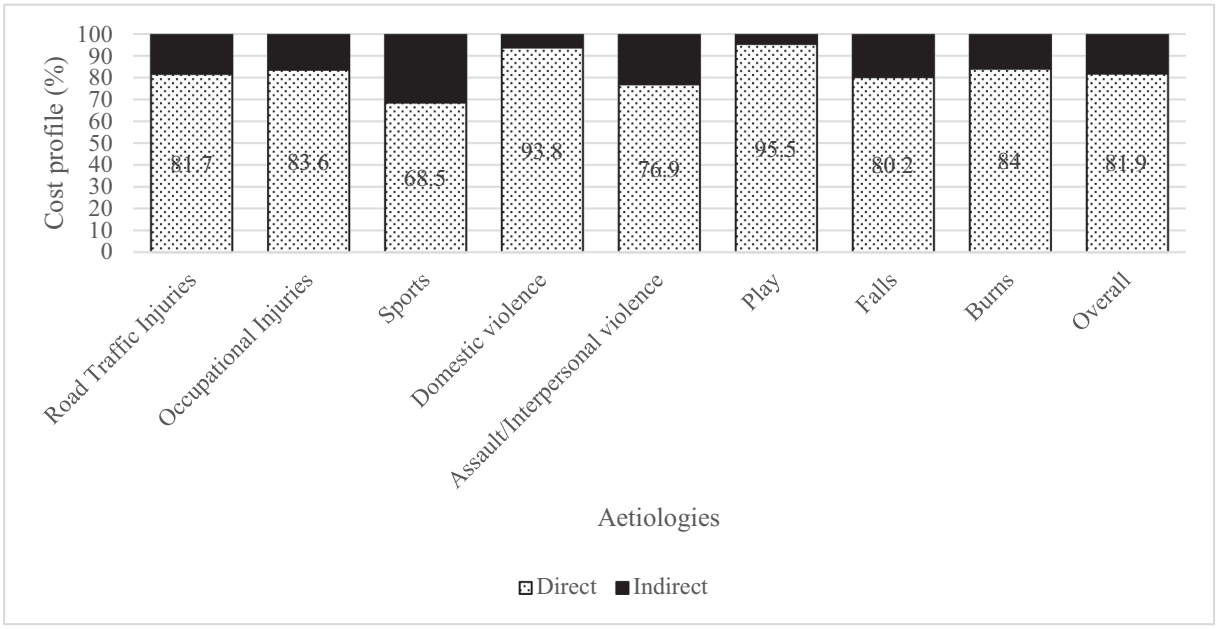

Fig. 1. Cost profiles of injuries by aetiology.

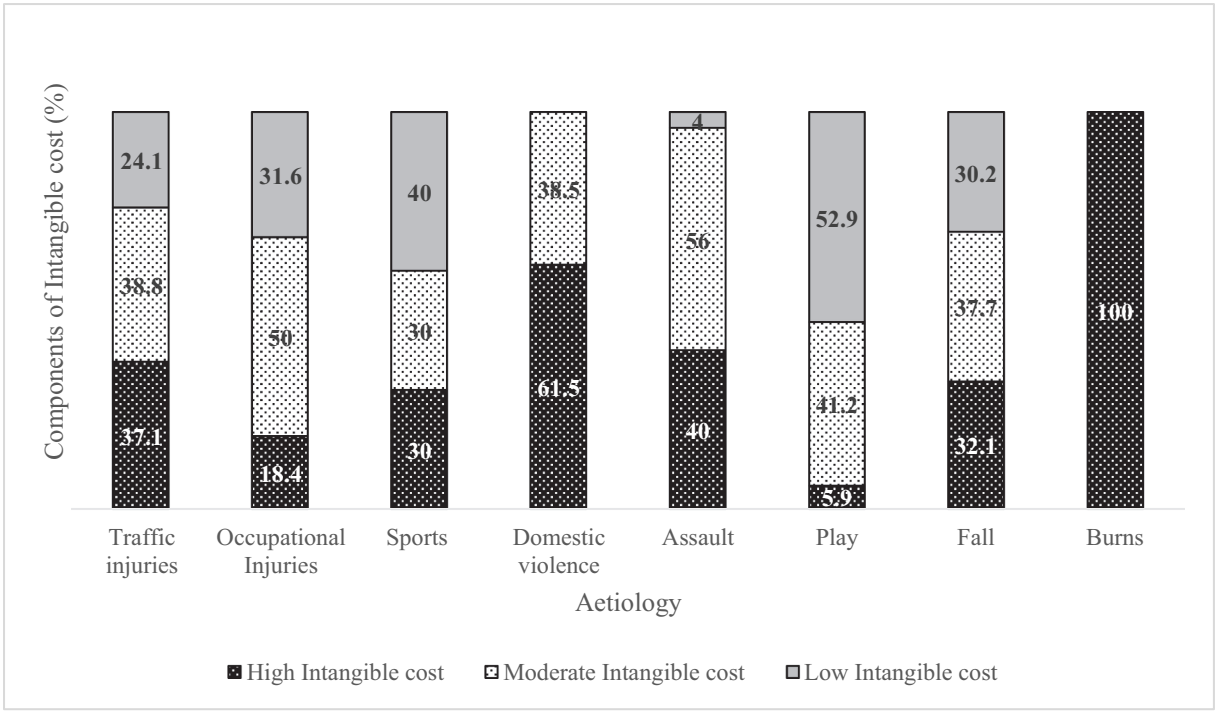

Fig. 2. Intangible cost of injuries by aetiology.

The main limitations to our study was (1) possibility of recall biases or misreporting by patients in accounting for the costs of injuries; (2) the study site, being a referral hospital and one of the largest in the sub-region, influences the nature of injuries reporting to the hospital towards more severe injuries; (3) being a cross-sectional study, long-term disability after injury effect on productivity was not considered; and (4) typical of using Likert-type scales, individuals may sometimes hide information that they find objectionable or provide information that is perceived to be "acceptable by the interviewer" in eliciting responses on intangible cost. The findings of this study, would nonetheless inform critical policy issues regarding the holistic management of patients who sustain severe injuries.

Conclusion

Injured patients incur high direct treatment cost in all aetiologies, with generally high intangible cost as well. It is therefore imperative that injury prevention strategies be prioritized in national health policies, while broader discussions are initiated on sustainable health financing of injury management.

Dissemination of results

Results from this study was shared with the office of Research and Development of the Korle-Bu Teaching Hospital for publication in its

newsletter. Presentations of results have also been done at several stakeholder forums.

Author contributions

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: PKB contributed 50%; JN 15%; GA 10%, and MA contributed 25%. This section should be included in the main manuscript above the introduction section

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Declaration of competing interest

The authors declare no conflicts of interest.

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