

# Alcohol Consumption at Any Level Increases Risk of Injury Caused by Others: Data from the Study on Global AGEing and Adult Health

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## Supplementary Issue: Harm to Others from Substance Use and Abuse

### ABSTRACT

**BACKGROUND:** Alcohol use is a well-known risk factor for injury. However, information is needed about alcohol drinking patterns and the risk of injury among older adults in low- and middle-income countries as this population grows. We aimed to examine the influence of drinking patterns on the burden of injury and investigate factors associated with different types of injury in older populations in six emerging economies.

**METHODS:** Data from more than 37,000 adults aged 50 years and older were included from the Study on Global AGEing and Adult Health (SAGE) Wave 1 conducted in six emerging economies, namely, China, Ghana, India, Mexico, Russia, and South Africa. We investigated past-year reported injuries from falls, traffic accidents, and being hit or stabbed. Alcohol drinking patterns were measured as lifetime abstinence, ever but not past-week use, and gender-specific past-week low-risk and high-risk use. We stratified by gender and used logistic regression models to observe the association between alcohol drinking pattern and risk of injury by controlling for other factors.

**RESULTS:** During the year prior to interview, 627 (2.2%) subjects reported bodily injury resulting from a car accident, 1,156 (4.2%) from a fall, and 339 (0.9%) from being hit or stabbed during the past year. For women, only being a high-risk drinker increased the risk of being hit or stabbed, whereas for men, all levels of drinking were associated with an increased risk of being hit or stabbed. We observed a higher risk of being hit or stabbed from past-week high-risk drinking among women (odds ratio [OR] = 6.09,  $P < 0.01$ ) than among men (OR = 3.57,  $P < 0.01$ ). We observed no association between alcohol drinking pattern and injury due to car accidents for either women or men.

**CONCLUSIONS:** The risk of experiencing injury due to violence increased with level of alcohol exposure of the victim. The increase in alcohol use in emerging economies calls for further study into the consequences of alcohol use and for public health initiatives to reduce the risk of violence in older adult populations, with special attention to the experience of older adult women.

**KEYWORDS:** alcohol, harm to others, injury, epidemiology, emerging economies

**SUPPLEMENT:** Harm to Others from Substance Use and Abuse

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## Introduction

Globally, alcohol-related injuries accounted for almost a third of all the years of healthy life lost, or disability-adjusted life years, attributable to alcohol use in 2012.<sup>1</sup> These injuries included unintentional injuries such as motor vehicle accidents and falls and intentional injuries such as suicide and violence. According to the Global Burden of Disease Study, between 1990 and 2013, the worldwide prevalence of these forms of alcohol-related injury increased in both frequency and impact.<sup>2</sup>

Recent cross-national studies indicate that negative alcohol-related outcomes, including injuries, are more common and costly in low- and middle-income (LAMI) countries, even though they often have lower levels of drinking than high-income countries. LAMI countries also have a greater alcohol-attributable mortality burden per liter of alcohol consumed compared with high-income countries, where alcohol-related injuries made the largest contribution.<sup>3</sup> This disparity is possibly due to the fact that some LAMI countries have a lower social tolerance for alcohol use and most of them have very limited



resources to prevent negative alcohol-related consequences.<sup>4,5</sup> Findings suggest that despite comparable alcohol-attributable costs (as a proportion of Gross Domestic Product [GDP]) for high- (2.5%) and middle-income countries (2.1%), high-income countries invest more in direct costs (ie, health care and law enforcement), while middle-income countries invest more in covering the indirect costs (ie, productivity losses).<sup>6</sup> Therefore, alcohol-related injuries in LAMI countries are of particular concern, given the lack of health care and social resources to prevent and address these injuries, and because of the expected increase in alcohol consumption and subsequent alcohol-related injuries as these countries undergo further economic development.<sup>7</sup>

Within LAMI countries, older adults are of particular interest with regard to alcohol-related injuries for several reasons. First, drinking is common among older adults in many LAMI countries, although the prevalence and level of drinking vary. Our previous work using data from the WHO Study on Global AGEing and Adult Health (SAGE) to examine alcohol use among adults aged 50 years and older in Ghana and South Africa observed lifetime prevalence rates of 41.9% and 74.6%, respectively.<sup>8</sup> Yet, other work also using SAGE data identified heavy drinking rates among adults aged 50 years and older from 6.3% of current drinkers in China to 0.1% in Mexico.<sup>9</sup> While the prevalence of current and heavy drinking is often observed to decline as age increases,<sup>10</sup> it remains a relevant health risk factor for older adults.<sup>11</sup> Second, the older adult population in many LAMI countries is growing, making alcohol-related burden of injury and disease among older adults a public health concern.<sup>12</sup> Third, the potential for negative health effects of alcohol consumption is greater among older adults relative to younger age groups. This is in part because of increased sensitivity to the effects of alcohol due to physical aging and commonly used medications.<sup>11,13</sup> Fourth, older adults play important social roles in their families and communities, often serving as caregivers and community leaders.<sup>14</sup> Thus, sustaining alcohol-related injuries would limit their capacity to maintain their social roles and responsibilities, which may, in turn, negatively impact the welfare of their families and communities.

Common and consequential alcohol-related injuries relevant to older adults include falls, motor vehicle accidents, and physical violence. Falls are a common health concern for older adults in developing countries, although prevalence rates of falls vary widely across and within countries. The annual rate of falls among older adults ranges from 14% to 51% in India,<sup>15</sup> 14.7% to 34% in China,<sup>16</sup> and from 21.6% to 34% in the Caribbean and Latin America.<sup>17</sup> The variation in fall rates across countries is likely due to differences in measurement and sampling and cultural and environmental context. Similarly, evidence is also variable regarding the relationship between alcohol use and falls among older adults. Some studies have found no<sup>18–20</sup> or even an inverse association<sup>21</sup> between alcohol use and risk of injury from falls, whereas others have identified a positive association.<sup>22–25</sup> Again, part of the variation in the presence and direction of an association may be

due to different study methodologies and that many of these studies had varied focuses on either elderly (65+ years) or older adult samples (50+ years). Older adults are also at risk of being in motor vehicle accidents, and at high risk of morbidity and mortality due to involvement in such an accident.<sup>26,27</sup> Reports of traffic accidents among older adults in Africa range from a past prevalence of 5.5% in Sierra Leone to a past five-year prevalence of 6.8% in Nigeria.<sup>28,29</sup> Sorock et al identified an increased risk from a history of past-year drinking on the likelihood of being in a motor vehicle accident among a population-based case-control study in the US of adults 55 years and older.<sup>24</sup> Finally, older adults may be exposed to physical violence, such as elder abuse from caregivers,<sup>30</sup> domestic violence by their spouse or family,<sup>31</sup> or violence perpetrated by strangers in public settings.<sup>32</sup> However, there is a paucity of data on violence experienced by older adults in LAMI countries, and how this violence might be associated with the victim's drinking pattern. This is an important knowledge because of not only the negative physical health repercussions of violence but also the potential for associated mental health problems.

Research findings on alcohol use and injury are limited by the methodology employed and the populations studied. Much of the evidence is taken from studies conducted in emergency departments.<sup>33</sup> Also, a majority of these studies were undertaken in high-income countries. Furthermore, many investigations of alcohol-related injury have examined the association between acute alcohol consumption and subsequent injury,<sup>33,34</sup> such that evaluations of overall drinking patterns and risk of injury are less well represented in the literature. Finally, studies on the association between drinking pattern and injury among the general population of older adults in LAMI countries are lacking. Such information would be useful because it would present the experience of people who are not able or willing to access care at emergency departments. It may also capture people who experience injury that is debilitating but not necessarily warranting an emergency room visit. Examining the association between usual drinking pattern and risk of injury is also useful because it will identify at-risk groups to guide preventive efforts. It may also help to identify groups that future research should specifically investigate to better understand why and how they experience greater risk.

Recently, there have been calls to address the overall lack of information on the alcohol burden experienced in LAMI countries.<sup>35</sup> With this study, we aimed to address these gaps in our knowledge of alcohol use in resource-poor settings by examining the association between alcohol drinking patterns and the type of injury experienced among adult men and women aged 50 years and older in six LAMI countries.

## Methods

**Data collection.** Data were collected as part of the World Health Organization's Study on Global AGEing and Adult Health (SAGE). SAGE Wave 1 was implemented in



2007–2010 in six countries, namely, China, Ghana, India, Mexico, Russia, and South Africa. SAGE collected individual level data from nationally representative household samples of older adults (aged 50+ years) using a multistage cluster sampling design.<sup>36</sup> Standardized questionnaires were used to collect data via face-to-face interviews. Information was collected regarding health, behavioral risk factors such as alcohol consumption, and injuries experienced. SAGE protocols and procedures were approved by the WHO Ethical Review Committee and ethics committees in each participating country, and informed consent was obtained from all participants. SAGE procedures and protocols are described in detail elsewhere.<sup>37</sup> The research complied with the principles of the Declaration of Helsinki.

**Sample.** SAGE Wave 1 included a total of 35,366 people aged 50+ years from China (13,408), Ghana (4,275), India (7,150), Mexico (2,306), the Russian Federation (3,938), and South Africa (3,840). The survey contained valid responses for bodily injury over the past 12 months and past-week alcohol use for 35,056 people (there were 1,907 missing injury data and 1,812 missing alcohol data, or 5.4% and 5.1% of the total sample, respectively). Injuries examined in this analysis included the most commonly reported events for bodily injury, that is, car accidents, falls, hits, and stabbings. Other injuries were reported by 77 individuals, or 0.2% of the total sample. We excluded these individuals and those missing data on bodily injury and alcohol use as described above resulting in a total sample size of 33,357. This sample included 12,830 participants from China, 6,528 from India, 2,203 from Mexico, 3,870 from the Russian Federation, and 3,651 from South Africa. All sample sizes are unweighted raw numbers.

**Variables.** Sociodemographic variables include age, sex, education, rural/urban residence, and marital status. For analysis purposes, age was grouped into four categories: 50–59 years, 60–69 years, 70–79 years, and 80+ years. Sex was recorded as male or female as observed by the interviewer. Education was assessed with the question “Have you ever been to school?” followed by the question “What is the highest level of education that you have completed?” Education levels were mapped to an international standard and recorded as six possible groups<sup>38</sup> as follows: less than primary, completed primary, completed secondary, completed high school, completed college/university, and completed postgraduation. For analysis purposes, education was collapsed into the following three categories: no education, less than/completed primary, and completed secondary or above. Location of residence was recorded using a sampling key correspondence table generated prior to the survey (0 = urban; 1 = rural) based on definitions used by national statistical agencies in each country. Marital status was categorized based on self-report as currently married/cohabiting, never married, separated/divorced, or widowed.

Alcohol variables were based on queries of lifetime and past-week use. Lifetime use was ascertained with the question “Have you ever consumed a drink that contains alcohol (such

as beer, wine, spirits, etc.)?” A country-specific show card was used with pictures to illustrate to respondents what was meant by a *drink*, with a net alcohol content ranging between 8 and 13 g depending on the country. Past-week use was ascertained with the question “During the past 7 days, how many drinks of any alcoholic beverage did you have each day?” We used past-week descriptions of alcohol use to construct gender-specific measures for *low-risk* and *high-risk* drinking, reflecting guidelines of the National Institute on Alcohol Abuse and Alcoholism in the U.S.<sup>39</sup> For women, high-risk drinking was defined as having at least one day of the previous week where four or more drinks were consumed and/or consuming eight or more drinks total for the week. For men, high-risk drinking was defined as having at least one day of the previous week for 5 or more drinks were consumed and/or consuming 15 or more drinks total for the week. For both women and men, low-risk drinking was defined as drinking less than the gender-specific high-risk drinking amounts. Finally, a categorical alcohol drinking pattern variable for each men and women was constructed with the categories lifetime abstainer, ever but not past-week drinker, low-risk drinker, and high-risk drinker.

Injury was ascertained with the questions “In the last 12 months, have you been involved in a road traffic accident where you suffered from bodily injury?” and “In the last 12 months, have you had any other event where you suffered from bodily injury?”. This question about other events was followed up with the question “What was the cause of this injury?” with the following response options: fall, struck/hit by person or object, stabbed, gun shot, fire, flames or heat (burn), drowning or near drowning, poisoning, animal bite, electric shock, and others. As described in the “Sample” section, the 77 people reporting injuries besides fall, struck/hit, and stabbed were excluded. Dichotomous yes/no variables were constructed for each of the following injury categories: no injuries, car accidents, falls, hit, or stabbed. The injuries in the experienced categories, that is, car accidents, falls, and being hit or stabbed, were not mutually exclusive, representing the number of people who experienced the injury, regardless of other injuries.

**Analysis.** SAGE Wave 1 sampling weights were applied, with poststratification adjustments for age and sex based on UN population estimates.<sup>30</sup> All *n*'s are unweighted and all proportions are weighted unless noted otherwise, and stratified by sex. To assess differences in the frequency of injuries across the four categories of drinking pattern types, chi-square tests of independence were used. To determine the association between drinking pattern and injury within each gender, we fitted multivariable logistic regression models for each type of injury with gender-specific drinking pattern as a categorical-independent variable and controlled for age, education, urban/rural status, and marital status. We did not make country comparisons given the low frequencies of injuries in some countries (Table 1), opting to take advantage of this dataset for pooled analysis of injuries among adult men and women aged 50 years and older in LAMI countries. However, to observe the



**Table 1.** Unweighted frequencies\* of past year injuries by gender for each country in Wave 1 of SAGE.

	CHINA		GHANA		INDIA		MEXICO		RUSSIA		SOUTH AFRICA		TOTAL	
	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN
No injuries	5,719	6,425	2,096	1,885	3,015	2,895	804	1,239	1,305	2,360	1,503	2,056	14,442	16,860
Car accident	103	96	36	43	88	67	31	23	32	56	30	22	320	307
Fall	140	230	36	81	166	264	30	71	28	79	15	16	415	741
Hit or stabbed	74	68	63	40	30	24	7	3	9	9	6	6	189	150

**Note:** \*Unweighted frequencies are presented and not weighted proportions because the injury-experienced categories are not mutually exclusive.

influence of countries with higher numbers within the sample, sensitivity analyses were conducted where the countries with the two largest samples, China and Ghana, were excluded from the analysis. All analyses were run in STATA 12.0.<sup>40</sup>

### Results

Unweighted frequencies of car accidents, falls, and being hit or stabbed are reported by sex for each country in Table 1. Of 33,357 older adults from all six countries combined, China, Ghana, India, Mexico, Russia, and South Africa, 627 (2.2%) reported bodily injury resulting from a car accident, 1,156 (4.2%) from a fall, and 339 (0.9%) from being hit or stabbed during the past year. Among the 627 people who reported a car accident injury, 18 (2.9%) also reported an injury from being hit or stabbed, and 49 (7.8%) people reported an injury from a fall. There was no overlap between reports of experiencing a fall and being hit or stabbed.

Among women, falls were the most common cause of bodily injury ( $n = 741$ , 5.2%), followed by car accidents ( $n = 307$ , 2.0%) and being hit or stabbed ( $n = 150$ , 0.6%). There were no differences across age for any of the injuries reported for both sexes. However, women with no education reported falls more frequently than women with higher levels of education, 2.8% vs. 1.2%, respectively,  $P < 0.001$ ). Among men, falls were also the most common form of bodily injury ( $n = 415$ , 3.1%), followed by car accidents ( $n = 320$ , 2.3%) and being hit or stabbed ( $n = 189$ , 1.1%). Men with secondary or

higher education level had a greater weighted proportion of falls compared with men with no education (1.2% vs. 0.9%, respectively,  $P < 0.001$ ), and a greater weighted proportion of being hit or stabbed (0.4% vs. 0.2, respectively,  $P < 0.01$ ). Falls were more often reported among women compared with men (5.2% vs. 3.1%, respectively,  $P < 0.001$ ). Conversely, being hit or stabbed was more commonly reported among men compared with women (1.1% vs. 0.6%,  $P < 0.01$ ). There were no differences in reports of being injured in a car accident in the last 12 months between men and women (2.3% vs. 2.0%, respectively,  $P = 0.24$ ).

Unweighted frequencies and weighted proportions of alcohol drinking patterns by gender for each country are presented in Table 2, and alcohol drinking pattern by type of injury and gender is presented in Table 3. Lifetime abstinence from alcohol was more common among women than men (78.7% vs. 50.0%,  $P < 0.0001$ ), while having ever used alcohol but not in the past week was more common among men than women (23.7% vs. 15.6%,  $P < 0.0001$ ). Among past-week drinkers, low-risk drinking was more common among women than men (75.7% vs. 61.0%,  $P < 0.0001$ ), and high-risk drinking was more common among men than women (30.0% vs. 24.3%,  $P < 0.0001$ ).

The odds of each type of injury by sex are reported as odds ratios (ORs) in Table 4. Among women, being a high-risk drinker was associated with an increased odds of being hit or stabbed (OR = 6.09,  $P < 0.01$ ). For car accidents and falls,

**Table 2.** Unweighted frequencies and weighted proportions of alcohol drinking pattern by gender for each country in Wave 1 of SAGE.

	CHINA		GHANA		INDIA		MEXICO		RUSSIA		SOUTH AFRICA		TOTAL	
	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Lifetime abstainer	2,795 (43.1)	6,071 (88.7)	683 (32.6)	1,082 (52.1)	2,345 (71.4)	3,148 (97.7)	215 (21.6)	934 (65.1)	168 (13.0)	838 (34.9)	966 (66.5)	1,679 (80.9)	7,172 (50.0)	13,752 (78.7)
Ever not current drinker	1,161 (19.6)	399 (6.4)	662 (29.1)	655 (31.4)	577 (18.4)	41 (1.2)	472 (46.4)	343 (32.1)	662 (48.4)	1,295 (52.0)	271 (15.1)	243 (11.8)	3,805 (23.7)	2,976 (15.6)
Low risk current drinker*	1,091 (48.6)	211 (62.6)	681 (74.8)	232 (74.4)	322 (86.8)	42 (83.0)	123 (71.8)	46 (81.1)	388 (72.5)	307 (84.9)	212 (68.0)	104 (54.6)	2,817 (61.0)	942 (75.7)
High risk current drinker*	980 (51.4)	122 (37.4)	203 (25.2)	77 (25.6)	44 (13.2)	9 (17.0)	61 (28.2)	9 (18.9)	154 (27.5)	58 (15.1)	104 (32.0)	72 (45.4)	1,546 (39.0)	347 (24.3)

**Note:** \*Weighted proportions are among past-week (current) drinkers.





**Table 3.** Frequencies and proportions of past year injuries for each drinking category among men and women in Wave 1 of SAGE.

	WOMEN				MEN				TOTAL n (%)
	LIFETIME ABSTAINER n (%)	EVER NOT CURRENT DRINKER n (%)	LOW RISK DRINKER n (%)	HIGH RISK DRINKER n (%)	LIFETIME ABSTAINER n (%)	EVER NOT CURRENT DRINKER n (%)	LOW RISK DRINKER n (%)	HIGH RISK DRINKER n (%)	
No injuries	13,549 (98.3)	2,912 (97.5)	917 (96.2)	337 (97.3)	17,715 (92.5)	7,033 (97.7)	3,732 (98.4)	2,401 (97.0)	15,028 (93.7)
Car accident	207 (1.8)	65 (2.5)	25 (3.8)	10 (2.4)	307 (2.0)	143 (2.3)	75 (1.9)	43 (2.8)	320 (2.3)
Fall	557 (5.5)	129 (4.5)	37 (3.2)	18 (4.8)	741 (5.2)	177 (2.9)	123 (3.6)	40 (2.9)	415 (3.1)
Hit or stabbed	90 (0.6)	35 (0.5)	12 (0.9)	13 (3.3)**	150 (0.6)	55 (0.5)	48 (1.6)	37 (2.4)	189 (1.1)
Total	13,752 (78.7)	2,976 (15.6)	942 (4.3)	347 (1.4)	18,017	7,172 (50.0)	3,805 (23.7)	1,546 (10.3)	15,340

Note: \* $P \leq 0.05$ . \*\* $P \leq 0.01$ . Column totals are not sums of columns due to overlap in reported injuries, but the total number who reported the drinking pattern in the column heading.

**Table 4.** Odds ratios for reported bodily injuries among men and women in Wave 1 of SAGE.

LIFETIME ABSTAINER	WOMEN			MEN		
	CAR ACCIDENT OR (95%CI) REF	FALL OR (95%CI) REF	HIT/STABBED OR (95%CI) REF	CAR ACCIDENT OR (95%CI) REF	FALL OR (95%CI) REF	HIT/STABBED OR (95%CI) REF
Ever not past week drinker	1.36 (0.77,2.41)	1.19 (0.83,1.72)	1.24 (0.56,2.73)	0.84 (0.48,1.45)	1.29 (0.86,1.92)	3.26 (1.49,7.11)**
Low risk past week drinker	2.14 (0.95,4.84)	0.76 (0.48,1.20)	1.84 (0.82,4.11)	1.18 (0.67,2.07)	1.20 (0.83,1.75)	2.72 (1.31,5.66)*
High risk past week drinker	1.36 (0.63,2.96)	0.99 (0.53,1.86)	6.09 (1.65,22.45)**	1.03 (0.62,1.70)	1.00 (0.63,1.59)	3.48 (1.71,7.10)**

Note: \* $P \leq 0.05$ . \*\* $P \leq 0.01$ . Models controlled for age, education, urban/rural status, and marital status.



drinking pattern was not statistically significantly associated with injury among women. For falls among women, having some primary education (OR = 0.72, 95% confidence interval [CI; 0.52, 0.99],  $P < 0.05$ ) and secondary education (OR = 0.45, 95% CI [0.31, 0.64],  $P < 0.000$ ) were inversely associated with odds of falls. Among men, all levels of drinking were significantly associated with an increased odds of being hit or stabbed, ranging from an OR = 3.26 for ever using alcohol but not in the past week to an OR = 3.48 for high-risk drinking. No other covariates were associated with being hit or stabbed. Drinking pattern was not associated with injuries from car accidents or falls among men. However, for car accidents, age was inversely associated (OR = 0.97, 95% CI [0.94, 0.99],  $P < 0.05$ ), and rural status was associated with an increased odds (OR = 2.25, 95% CI [1.40, 3.62],  $P < 0.001$ ). For falls, age was positively associated (OR = 1.02, 95% CI [1.00, 1.03],  $P < 0.05$ ).

Sensitivity analyses showed little differences in the identification of statistically significant associations between drinking pattern and risk of injury. When China and Ghana were excluded from the sample, the only difference observed was no association between ever but not current alcohol use and low-risk drinking with being hit or stabbed among men.

## Discussion

Among both men and women, falls dominated as the cause of injury, followed by car accidents and being hit or stabbed by others. Any alcohol use and high-risk drinking were more common among men than women in these six LAMI countries, yet lifetime abstinence is the dominant drinking pattern overall, consistent with previous reports from many LAMI countries. Among both men and women, alcohol drinking pattern was associated with an increased risk of injury only for being hit or stabbed. The main finding of this study is that past-week high-risk drinking, thought to reflect a general drinking behavior, was strongly associated with being hit or stabbed by others, with the magnitude of the relationship being higher among women than men.

The influence of alcohol on the risk of injury varies across the types of injury and alcohol consumption levels and by gender. In older age, the risk of injury from alcohol-related causes is generally lower than among younger segments of the population. Still, both falls and motor vehicle accidents have previously been found to be relatively common causes of injury among older adults.

Becoming a victim of violence is associated with the victim's alcohol consumption pattern, as has been previously shown from the emergency department setting research.<sup>41,42</sup> Still, it is worrisome that females in community samples from LAMI countries experience this elevated risk of becoming a victim of violence with high-risk drinking behavior. The causal mechanisms underlying the observed association can only be speculated upon based on the available data, but it may be that in cultures dominated by male drinkers, females

enter male-dominated social arenas when consuming alcohol, such as bars or clubs, and in these drinking settings dominated by men, violent behavior overall may be taking place at high rates. There is evidence to suggest that the violence experienced by drinkers can result from perpetrators who themselves have been drinking.<sup>43,44</sup> In a study conducted in emergency rooms in 14 countries, 62.9% of the injuries due to violence involved alcohol use on the part of the victim, perpetrator, or both. The victim's perception of the perpetrator's definitely having been drinking ranged from 14% to 73% across countries and was positively associated with the patient's own drinking in the event.<sup>45</sup> Relatedly, the higher rates of female victims of violence may also stem from higher rates of domestic violence or elder abuse, which may be more likely in homes with alcohol consumption compared with abstinent homes. A US study of intimate partner violence showed that between 27% and 41% of men and 4% and 24% of women were drinking at the time of a violent incident from an intimate partner.<sup>46</sup>

**Methodological considerations.** The interpretation of the current results needs to take into account several limitations. First, the data on alcohol consumption patterns and injury data are from a cross-sectional survey, limiting establishment of causal inference. Also, the time frames from which the data were collected are not totally overlapping, as injury was reported as *past-year prevalence*, whereas drinking patterns were reported as *past-week frequencies*. This would likely explain why both falls and motor vehicle accidents were not associated with the alcohol-use pattern, as there may be no close temporal relation between the consumed alcohol and the injury reported. Data on experience with intoxicated driving, and on car ownership and driving engagement were not available. For the injury as a result of violence by others, there was a strong relationship between drinking pattern and general drinking behavior and being involved as a victim of violence. Given the small number of high-risk drinking women, however, the CIs for the odds observed for this association among women suggest that they should be read with caution and further studied for replication in this and other settings.

For injury as a result of violence, the drinker's alcohol consumption pattern would be of less importance to the direct *mechanism* of injury than what would be expected for falls and motor accidents, as these latter injury mechanisms would reflect impaired coordination and motor skills, by the drinker. For the victims of violence injuries, alcohol consumption of any pattern may be viewed as a proxy for drinking behavior in general and potentially indicative of being part of *hazardous* and potentially male-dominated social networks/arenas where violence is more common. The more frequent drinking would hence reflect more frequent participation in alcohol-dominated social settings generally, and hence risk of injury as a victim of violence beyond the past week. Alternately, alcohol consumption may instead be used as a coping mechanism (again as a general tendency rather than a specific past-week event)



after being injured or the victim of violence. Both directions of causality are likely present in the study population, still at unknown proportions.

There may be differential recall bias regarding injuries (past year) and alcohol drinking patterns (past week), likely resulting in a higher degree of underreporting of experienced injuries, particularly those accidental events not recalled as an *injury* or injuries not resulting in the need for attention by health-care professionals. If alcohol abuse is occurring, again underreporting may be considerable. Of note is that studies reporting on incidence of falls would be expected to report higher rates than studies reporting on experienced *injuries* from falls. Relatively high levels of lifetime abstinence rates reported compared with the literature may be due to the nonrepresentative community samples as well as responder underreporting of alcohol consumption. Still, the observed associations between drinking behavior and victimization are considered a robust finding. The strength of the study is the ability to study a range of injuries from a representative, population-based sample of older adults in LAMI countries and the association with a known risk factor (alcohol). The examination of differing risk profiles associated with alcohol consumption by sex was only allowed due to the extensive sample size available through the multicountry SAGE/WHO data.

**Implications.** Alcohol consumption is associated with being a victim of violence for both sexes and more so for women than men. As women in LAMI countries, in particular, are expected to increasingly partake in the consumption of alcohol in the future due to increased access and acceptability, this may imply a higher burden of injuries among women in the future. Policy makers and public health specialists need to address this current and pending public health concern to advance preventive efforts. It will be important in future studies to address alcohol-related harms in various societies using culture- and gender-appropriate population-based measures.

Future research in the field would benefit from integrating further details and chronological order of circumstances of injuries and, in particular, explore the relation with alcohol and drugs with the situations leading up to injury. Similarly, exploring the drinking venues, ie, in a public place or at home, would improve our understanding of the mechanisms leading to alcohol-related injuries, particularly those caused by others.

## Conclusion

About 7% of older adults in LAMI countries report the experience of at least one injury in the preceding year, most frequently caused by falls, followed by motor vehicle accidents and injuries caused by other individuals. The risk of experiencing injury due to violence increased with the level of alcohol exposure of the victim. Injury caused by others was most commonly reported by men, but the relationship between any level of alcohol consumption and injury as a result of violence was stronger among women. Women who drink, at any level, in cultures where alcohol consumption is a *minority activity*

among females, are at increased risk of becoming victims of violence. It may be that alcohol consumption among women in these societies is associated with these women entering male-dominated and *hazardous* social circumstances when consuming alcohol. Further research is needed to establish causal relationships between drinking pattern and injury caused by others in community samples.

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## Author Contributions

PK planned and designed the SAGE with colleagues in the World Health Organization. TC and PM conceived the design and strategy for the analysis for this paper. All authors jointly developed the structure and arguments for the paper. PM analyzed the data. TC wrote the first draft of the manuscript. TC, PM, AT, TG, and PK all contributed to the writing of the manuscript, agree with the results and conclusions and made critical revisions and approved the final version of the final manuscript.

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