Trends in the incidence, prevalence and YLDs of facial fractures at global, regional and national levels from 1990 to 2017

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Background: Facial fracture is one of the most common injuries globally. Some types of facial fractures may cause irreversible damage and can be life-threatening. This study aimed to investigate the health burden of facial fractures at the global, regional, and national levels from 1990 to 2017. **Methods:** Facial fracture data, including the incidence, prevalence, and years lived with disability (YLDs) from 1990 to 2017, were obtained from the Global Burden of Disease study. We calculated the estimated annual percentage changes (EAPCs) to assess the changes of facial fractures in 195 countries or territories and 21 regions. **Results:** From 1990 to 2017, the change in cases of facial fracture incidence is 39% globally, while the age-standardized incidence rate showed a downtrend with an EAPC of 0.00. Syria experienced a ten-fold increase in incidence cases with an EAPC of 9.2, and this condition is largely responsible for the global health burden of facial fractures. The prevalence and YLDs showed a similar trend worldwide as the incidence. Additionally, we found that the incidence, prevalence, and YLDs showed a discrepancy among various age groups with a gradual change of proportion over the past 28 years. The age-standardized rates (ASRs) of facial fractures were nearly twice for male than those for female from 1990 to 2017. **Conclusions:** EAPC showed a correlation with the ASRs of facial fractures and had no relationship with socio-demographic index. The proportion of children and elderly suffering from facial fractures slightly changed with time. The ratio of facial fractures between males and females was 2:1. These findings suggest that more targeted and specific strategies based on age and gender should be established in various countries and regions.

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Abstract

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experienced a ten-fold increase in incidence cases with an EAPC of 9.2, and this condition is largely responsible for the global health burden of facial fractures. The prevalence and YLDs showed a similar trend worldwide as the incidence. Additionally, we found that the incidence, prevalence, and YLDs showed a discrepancy among various age groups with a gradual change of proportion over the past 28 years. The age-standardized rates (ASRs) of facial fractures were nearly twice for male than those for female from 1990 to 2017.

Conclusions: EAPC showed a correlation with the ASRs of facial fractures and had no relationship with socio-demographic index. The proportion of children and elderly suffering from facial fractures slightly changed with time. The ratio of facial fractures between males and females was 2:1. These findings suggest that more targeted and specific strategies based on age and gender should be established in various countries and regions.

Introduction

Injuries places huge burden on all populations worldwide, leading to high morbidity or mortality, regardless of age, gender, or geographical region (Salomon et al. 2015). Approximately 25% of all injuries reported in the National Trauma Data Bank involve the face (Choi et al. 2020). Facial fracture is a predominant cause of morbidity in the United States (VandeGriend et al. 2015), because among the body parts, the face is the most exposed part, and it lacks protection, leading to the fragility of facial bones. Further, facial nerves and muscles responsible for central conduction, sensations, expressions, and eye movements are positioned near the facial bones (Plaisier et al. 2000). Therefore, fracture of face bones can result in death or inconvertible sequelae (Clavijo-Alvarez et al. 2012; Choi et al. 2020). Major facial fractures are recorded in males, especially for those who aged between 16 and 30 years (Haug et al. 1990). The most common causes of face trauma are assault, fall, and motor vehicle collision based on an epidemiology study of facial fractures in the United States (Erdmann et al. 2008). According to different era, geographic, socioeconomic, and cultural factors, the order of these three leading frequent causes may change (Haug et al. 1990; Avansini Marsicano et al. 2019; Simsek et al. 2007). Based on numerous literatures about facial fractures, the distribution of the etiology and pattern of facial fractures were mostly investigated. (Fasola et al. 2003; Montovani et al. 2006; Thoren et al. 2009; Alam & RCSED 2019).Though a recent study of facial fractures were based on the global burden of disease 2017 study(Lalloo et al. 2020), they focused on the causes of facial fractures globally and referred briefly to the incidence, prevalence, and years lived with disability (YLDs) of facial fractures. In the present study, we analyzed the incidence, prevalence, and YLDs of facial fractures among 195 countries or territories and 21 regions by calculating the change in cases (CIC) and estimated annual percentage changes (EAPCs) from 1990 to 2017 to evaluate the changing trends of facial fractures and analyze the correlation between age-standardized rates (ASRs) or socio-demographic index (SDI) and EAPC. Furthermore, we

discussed the changing trends in the age and gender distribution of facial fractures from 1990 to 2017.

The Global Burden of Disease (GBD) study contained the data of 354 diseases and injuries in 195 countries or territories and regions involving the incidence, prevalence, YLDs, and corresponding ASRs among gender, age, SDI, region, and country. Subsequently, we provided an opportunity for the exhaustive estimation of the distribution, burden, and trends of facial fractures in various countries and regions. Therefore, this study provided reference for policy makers to fully utilize the limited medical resources and formulate relevant policies and thus prevent people from suffering facial fractures.

Results

Analysis of facial fracture incidence worldwide

From 1990 to 2017, the global incident cases of facial fractures rose from 5,405,814 to 7,538,663, increasing by 39.45%. Conversely, the EAPC of ASIR was 0.00 (−0.20 to 0.10), showing a downtrend, and the ASIR of facial fractures decreased from 100.47 per 100,000 persons to 98.47 per 100,000 persons over 28 years (Table 1). In addition, the incidence of facial fractures was 5,009,249 (4,113,772–6,093,590) in males, which was twice more than those in females, thus supporting the trend of ASIR.

In 2017, a high number of facial fractures incident cases was recorded in India (1,127,438.84), China (1,104,811.30), and USA (432,104.19), whereas a few incident cases were recorded in Northern Mariana Islands (36.68), Dominica (41.64), and American Samoa (43.22). Syria recorded the highest (588.34/100,000 people) ASIR in 2017, whereas Indonesia had the lowest ASIR (30.40/100,000 people) among the 195 countries or territories (Fig. 1A). Moreover, the ASIR of facial fractures was highest in Central Europe (310.03) among 21 regions but lowest in Southeast Asia (49.03, Table 1). Furthermore, the ASIR of facial fractures displayed a specific pattern with the various SDI values of 21 regions in the 2017 data. The regions in which the SDI was approximately 0.5 had low ASIR of facial fractures, while those with SDI near 0.8 presented a high ASIR (Fig. 2).

From 1990 to 2017, the incident cases of facial fractures increased in 159 countries or territories, whereas the EAPC was negative in 48 countries. As shown in Table 1, the greatest increase of CIC was observed in Oceania (157.89%), whereas the most prominent decrease of CIC was observed in Central Europe (–12.69%). High-income North America recorded the lowest EAPC of –1.87, whereas Caribbean recorded the highest EAPC of 1.64. In addition, facial fractures showed an average EAPC of less than zero in regions of high and low SDI quintiles (Fig. 3A). The trends of facial fractures over 28 years are presented in Figure 4A. An obvious decline of ASIR was observed between 1995 and 2000 in high SDI quintile, and became stable subsequently. Additionally, a significant correlation was observed between EAPC and ASIR (ρ=

– 0.3842, P<0.0001, Fig. 5A), while no association was found between EAPC and SDI (ρ= 0.0036, P=0.9603, Fig. 5B).

Analysis of facial fracture prevalence worldwide

During the last 28 years, global prevalence of facial fractures increased by 54.39% from 1,819,732 in 1990 to 1,178,636 in 2017. By contrast, the age-standardized prevalence rate (ASPR) decreased worldwide, with an EAPC of −0.10 (−0.20 to 0.10). Similar to incidence, the fractures of face bones predisposed to occur in males (1,155,326 prevalent numbers), which was twice more than that in females (664,406 prevalent numbers), and it was consistent with the ASPR.

Among the countries with various prevalence cases of facial fractures, the lowest ASPRs were recorded in Indonesia (8.7/100,000 people) and Mauritius (11.8/100,000 people, Fig. 6 A). From 1990 to 2017, the ASPR of facial fractures decreased in 82 countries, in which Eritrea recorded a maximum decrease of 77.08% (Fig. 6 B). As shown in Table 2, the number of facial fractures increased in most regions and decreased only in Eastern Europe, while the ASPR showed a downward trend in 10 regions, in which high-income North America recorded the most prominent decrease of ASPR (−29.16%) with the lowest EAPC of −1.78. Otherwise, facial fractures prevalence showed an upward trend in 11 regions, in which Caribbean increased fastest (2.09) followed by East Asia (1.50). In comparison with the 1990 data, the ASPR of facial fractures decreased in high and low SDI quintiles in 2017. The ASPR among five multiple SDI quintiles in the past 28 years are shown in Figure 3B. EAPC showed a negative correlation with the ASPR of facial fractures (ρ= −0.4418, P<0.0001, Fig. 5 C) but had no relationship with SDI (ρ= 0.0150, P=0.8352, Fig. 5 D).

Analysis of facial fracture YLDs worldwide

As shown in Table 3, the YLDs of facial fractures were 117,402.03 years in 2017, which was 1.5-folds higher than that in 1990. Similarly, the age-standardized YLD rate had an average EAPC of −0.07, indicating a downward trend. YLD and age-standardized YLD rates were both high in males and were twice higher than those in females.

The top three countries with high YLDs had the same incidence and prevalence as those in 2017. YLDs were low in Marshall Islands (0.58), Northern Mariana Islands (0.60), and American Samoa (0.62, Fig. 7A). Similar to ASIR and ASPR, the highest age-standardized YLDs was recorded in Syria (5.90), whereas Indonesia had the lowest (0.56). The values of EAPC were negative in 76 countries from 1990 to 2017 (Fig. 7C). Eritrea recorded the lowest EAPC of −2.9 (−4.2 to 1.6), while Syria recorded the highest EAPC of 6.7 (4.1–9.3). At the regional level, the YLDs of facial fractures were high in East Asia (20.98), South Asia (19.71), and Western Europe (10.64), while age-standardized YLD rate was higher in Central Europe (4.36), Australasia (4.00), and Eastern Europe (3.74, Table 3). Only in high and high-middle SDI quintile, the YLDs

of facial fractures increased by less than 50%. Analogously, the greatest increase of facial fractures YLDs was observed in middle SDI quintile (102.8%). The variation tendency of age-standardized YLDs over the past 28 years are presented in Figure 4C. EAPC was negatively correlated with age-standardized YLDs (ρ= −0.4406, P<0.0001, Fig. 5 E) but not correlated with SDI (ρ= −0.0189, P=0.7941, Fig. 5 F).

Age and gender distribution of incidence, prevalence, and YLDs of facial fractures

From 1990 to 2017, in all regions, the incident, prevalent cases, and YLD numbers of facial fractures were mainly assembled between the age of 15 and 49 years, followed by the age group of 50–69 years. In addition, in both sexes, these indices showed upward trends over time in people aged over 50 years and downward trends in people under 14 years. Notably, a dynamic equilibrium was observed in people aged 15–49 years and over 28 years (Fig. 8).

Both in 1990 and 2017, the incidence rate of facial fractures doubled at the age of 20–35 years and in males with age over 80 years (Fig. 9A). The incidence rate in females showed a flat pattern in different age groups except for those over 80 years and presented a sharp increase of incidence rate (Fig. 9A).The prevalence and YLD rate of facial fractures increased gradually with age and reached the peak at age over 80 years in both sexes (Figs. 9B, Figure 9C).

In both sexes, the ASIR, ASPR, and age-standardized YLDs showed a relatively stable trend globally from 1990 to 2017 (Fig. 10 A). Notably, the above parameters in males were always twice higher than those in females. In Syria, where the heaviest global burden of facial fractures was observed, these parameters showed an upsurge in 2011, and the gender proportion between females and males remained approximately 1:2, though a sharp increase was observed from 2011 (Fig. 10 B).

Discussion

Our analysis based on the GBD study displayed the latest worldwide patterns and the trends in the incidence, prevalence, and YLDs of facial fractures. From 1990 to 2006, the ASIR, ASPR, and age-standardized YLD rate of facial fractures showed a slow downward trend globally. However, since 2007, among both females and males, the facial fracture burden increased slightly. The facial fracture burden was more skewed towards males than females worldwide. These findings will provide basis for policy makers to allocate medical resources reasonably and determine the underlying causes of facial fractures, thus decreasing the incidence rate of facial fractures. In addition, considering the various developing trends of facial fractures in different SDI quintiles, more targeted policy should be applied.

As shown in Figure 2, the ASIR, ASPR, and age-standardized YLDs presented a similar and specific pattern according to the different SDIs. Regions with higher SDI showed higher ASRs than those with lower SDI. Motor vehicle collision, fall, and assault are the top three causes of facial fractures (Avansini Marsicano et al. 2019). Therefore, the regions with high SDI index had

high motor vehicle numbers and traffic flux, which increased the incidence risk of road accidents and facial fractures indirectly. However, the high and low SDI quintiles showed a negative EAPC, indicating that these regions showed a downward trend annually between 1990 and 2017. The use rates of seat belt in facial fractures increased by 3% (1990–1995), 8% (1996–2000), and 15% (2000–2004) (VandeGriend et al. 2015). Cormier et al. also demonstrated the importance of using seat belts in the mitigation of facial injuries (2009). Hence, the increase in the use of seat belts, helmets, and advanced car models and the strict control of road traffic may contribute to the negative EAPC of facial fractures in regions with high SDI quintile (Erdmann et al. 2008; Czerwinski et al. 2008). The development and application of 3D printing technology has also been increasingly mature in the last three decades (Liu et al. 2018), thereby improving the cure rate of facial fractures in developed countries or territories. Regions with low SDI showed low ASIR, ASPR, and age-standardized YLDs, which may be attributed to the hysteretic medical level and insufficient diagnosis ability (Erdmann et al. 2008, VandeGriend et al. 2015). Moreover, the probability of occurrence of motor vehicle collisions, as one of the main causes of facial fractures, is low in regions with low SDI (Alam & RCSED 2019). However, regions with middle and high-middle SDI showed high EAPCs, indicating a potential developing trend of facial fractures in the future. Considering the economic growth in these regions, the numbers of motor vehicles increased, whereas the corresponding road laws and regulations did not keep the path, thus increasing the incidence, prevalence, and YLDs of facial fractures. The economic growth may prompt the advancement of medical equipment to raise the diagnosis numbers of facial fractures.

The EAPC of ASIR, ASPR, and age-standardized YLDs had no correlation with SDI, because the fracture mechanisms and risk factors of facial fractures are irrelevant with the SDI or regions. Conversely, EAPC showed negative correlations with the ASR of incidence, prevalence, and YLDs. Facial fractures aggravated the health and financial burden globally. The total hospitalization charges for facial fracture in the United States were reduced by $1.06 billion in 2008 (Nalliah et al. 2013). Accordingly, the government may implement all kinds of effective measures such as punishing the drunk drivers strictly and propagating the use of seat belts and helmets to decrease the health and financial burden of facial fractures. Accordingly, EAPC will be inversely related to ASIR, ASPR, and age-standardized YLDs in 194 countries or territories. As shown in Figure 8, facial fractures were less frequent in children, and the ASPR of patients with facial fractures increased equally with age (Fig. 9), supporting the results of Imahara et al. (2008). Family care, reduced outdoor activities, and increased observations (Montovani et al. 2006) on children resulted in the low incidence, prevalence, and YLDs. In addition, the high bone elasticity and thick soft-tissue layer strengthen the resistance of children against facial fractures, especially maxillary and Le Fort fractures, because the frontal, ethmoid, sphenoid, and

maxillary sinuses of children tend to be small and lack pneumatization (Thoren et al. 2009; Chan et al. 2004). Over 28 years, the proportion of facial fractures in various age groups was gradually altered, the groups aged under 15 years showed a decline of ASRs from 1990 to 2017, whereas those aged over 50 years showed an upward trend. This change can be linked to the demographic alteration worldwide. The population of the world is aging gradually because of the increase in life expectancy (Liu et al. 2019), which may lead to the ascending tendency of facial fractures incidence, prevalence, and YLDs among senior citizens, while the low fertility rates of many regions (Nogami et al. 2019) and the growing attention to children safety may lead to the downward trends of pediatric facial fractures globally. As shown in Figure 9, both in males and females, the prevalence rate and YLD rate increased with aging in 1990 and 2017. Falls are the most common cause of facial fracture among elderly patients (Atisha et al. 2016; Erdmann et al. 2008). The high risk of facial fractures among the elderly patients might have several causes, including the deficiency of the balance and strength while moving or resisting crashing and the tendency to suffer from various age-associated comorbidities, such as osteoarthritis and visual impairment (Atisha et al. 2016). The most commonly injured sites in elderly patients are the mandibular and nasal bones (Wade et al. 2004), and associated injuries from facial fractures occur often and are severe in geriatric patients, leading to a high death rate in (Toivari et al. 2016). The elderly individuals will account for 20% of the population in the United States of America in 2030, and a similar figure can be recorded in other developed countries (Vlavonou et al. 2018). Therefore, effective measures should be implemented to immediately prevent elderly people from suffering from facial fractures.

Interestingly, unlike females, the incidence rate of facial fractures in males also peaked at people aged between 25–29 years both in 1990 and 2017. Moreover, as shown in Figure 10, the ASIR, ASPR, and age-standardized YLDs were always twice higher in males than those in females from 1990 to 2017. This finding may be related to the “high risk” recreational activities among young males, such as bicycling and sports (Plawecki et al. 2017) and that men are involved in driving (Montovani et al. 2006). In an Indian survey, the increased incidence of facial injuries and fractures among young men was explained by the reluctance to use helmets, exceeding speed limits, lack of tolerance, and increasing competition (Subhashraj et al. 2007). Syria recorded the highest ASRs of facial fractures worldwide. Therefore, we analyzed the changing trend of ASIR, ASPR, and age-standardized YLDs in males and females since 1990, and the data showed a sharp increase of ASIR, ASPR, and age-standardized YLDs in 2011. We considered an association with the explosion during the Syrian war in 2011 (Hayani et al. 2015). Moreover, the ratio between males and females did not substantially change before and after 2011.

Conclusions

In conclusion, the incident cases, prevalent cases, and YLDs of facial fractures increased

worldwide. By contrast, the ASRs showed a downtrend globally. EAPC showed a correlation with the ASRs of facial fractures and was hardly associated with SDI. The ratio between males and females approached 2:1. Besides, the proportion of children and elderly suffering from facial fractures slightly changed with time. Facial fractures occurred more in young men aged between 25–29 years and in the elderly aged over 80 years in both sexes.

To our best knowledge, this first study was the to systematically investigate the changing trend of incidence, prevalence, and YLDs in facial fractures from 1990 to 2017 at the global, national, and regional levels. However, this study has some limitations. The accuracy of results depended on the quality and quantity of GBD data. For instance, the method utilized in the GBD study cannot provide access to cover all districts worldwide, and the opportunity to be diagnosed with facial fractures was not equal between developed and less developed countries because of differences in specialized medical care and imaging resources. Besides, in this text, we focused solely on the changing tendency of facial fractures in incidence, prevalence, and YLDs and did not analyze the trends of causes leading to facial fractures at the global, national, and regional levels from 1990 to 2017, which could be discussed in future research.

Above all, government in various countries or regions should formulate more targeted policies to reduce the incidence of facial fractures, and the enormous health burden of facial fractures caused by warfare should not be neglected. With the increasing pattern of life expectancy globally, elderly people should be more focused on.

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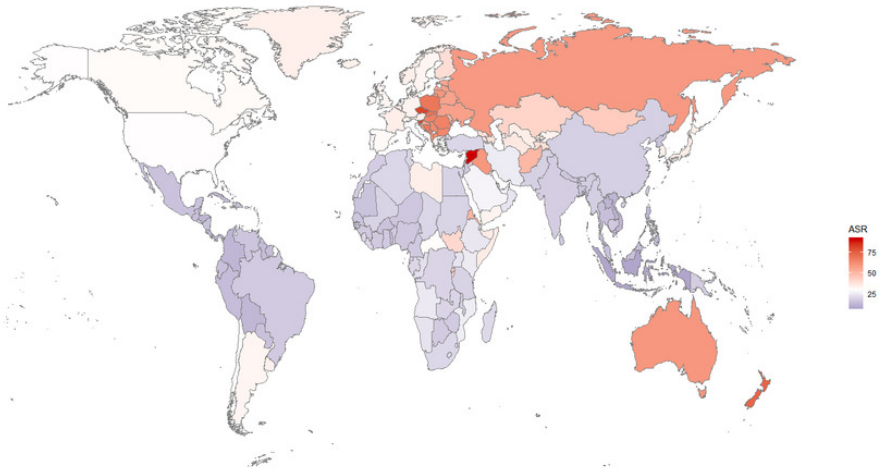
Figure 1

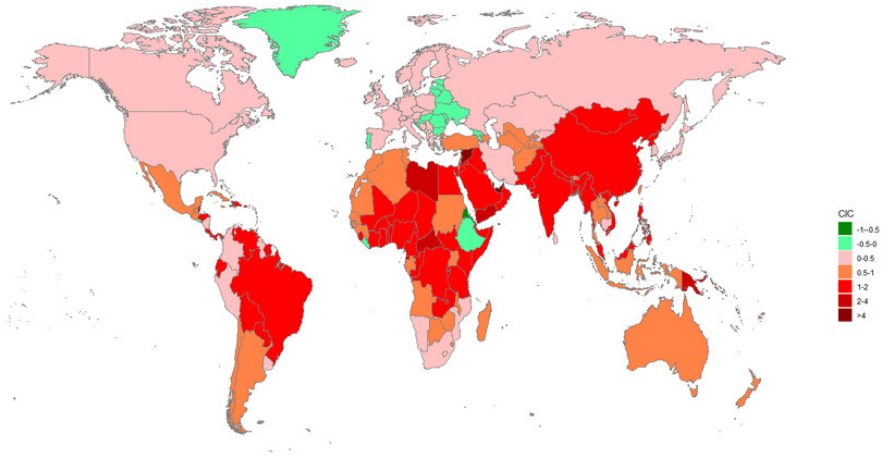
The global incidence burden of facial fractures in 195 countries and territories.

(A) The ASIR of facial fractures in 2017;**(B)**The change in incident cases of facial fractures between 1990 and 2017;**(C)**The EAPC of facial fractures ASIR from 1990 to 2017. ASIR, age-standardized incidence rate; EAPC, estimated annual percentage change.

A



B



C

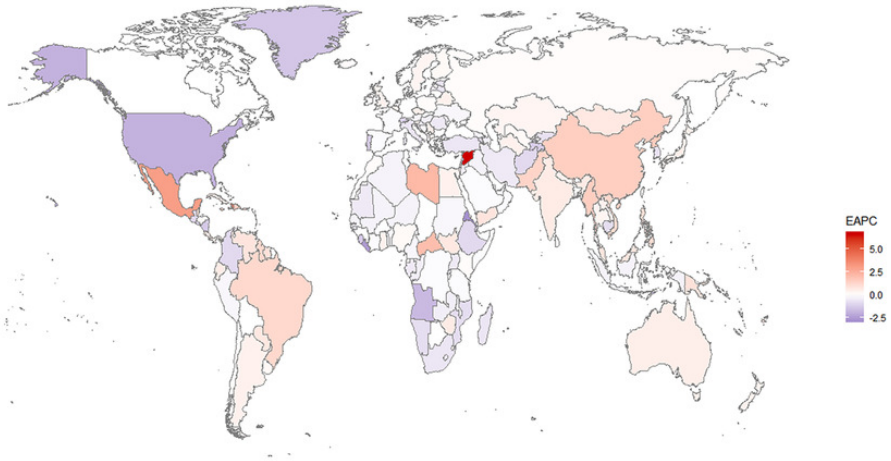


Figure 2

The pattern of ASR according to different SDI in 21 regions in 2017.

(A) ASIR and SDI; **(B)** ASPR and SDI; **(C)** Age-Standardized YLDs and SDI.ASIR, age-standardized incidence rate; ASPR, age-standardized prevalence rate; SDI, socio-demographic index; YLDs, years lived with disability.

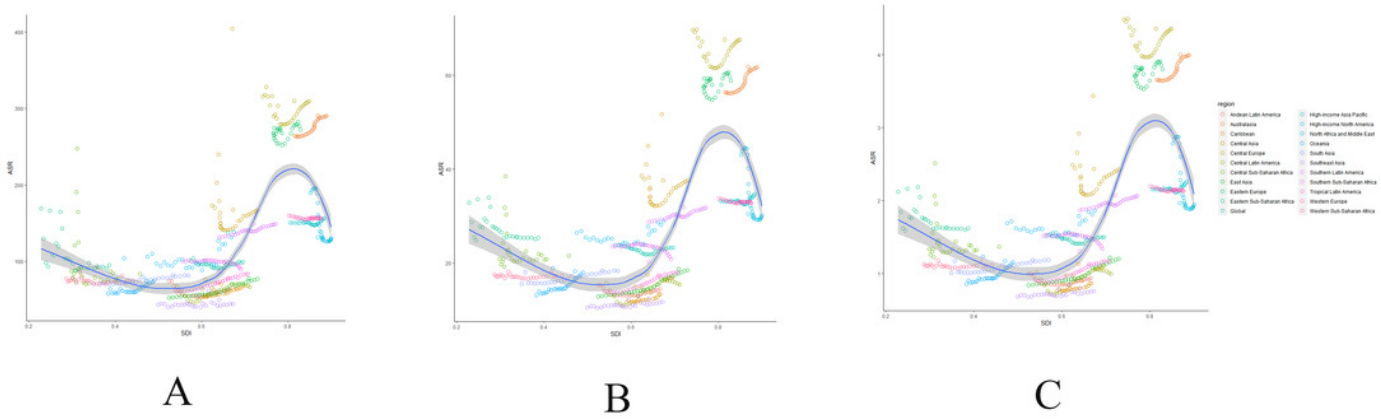


Figure 3

The EAPC of facial fractures ASR from 1990 to 2017, by regions.

(A) The EAPC of ASIR; **(B)** The EAPC of ASPR; **(C)** The EAPC of age-standardized YLDs. EAPC, estimated annual percentage change; ASIR, age-standardized incidence rate; ASPR, age-standardized prevalence rate; YLDs, years lived with disability.

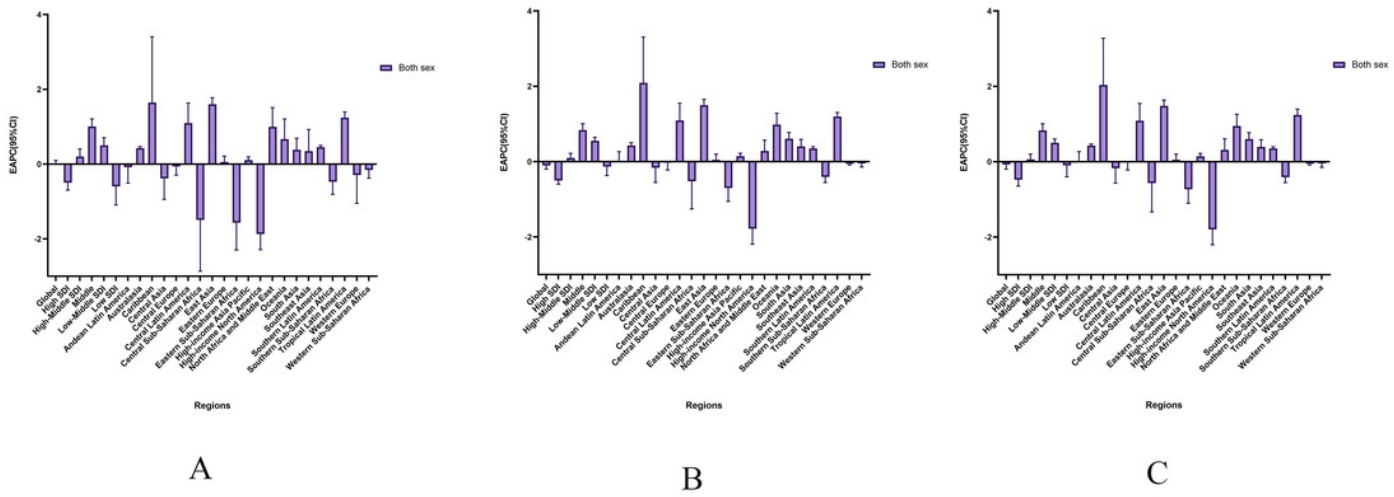


Figure 4

Figure 4.The change trends of age-standardized rate among different SDI quintiles and gender from 1990 to 2017.

(A)ASIR: age-standardized incidence rate;**(B)**ASPR: age-standardized prevalence rate;**(C)**age-standardized YLDs rate. YLDs: years lived with disability.

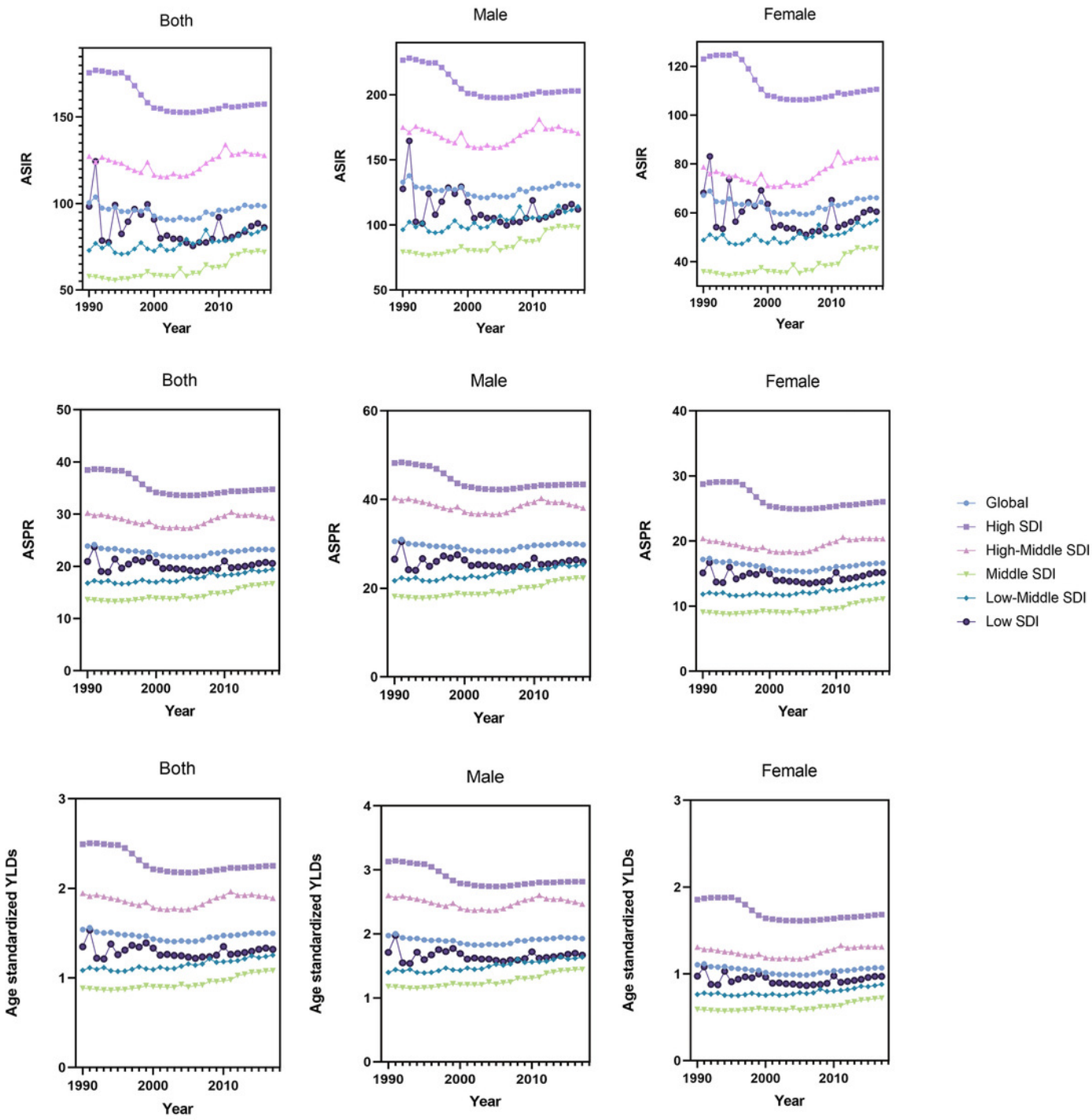

Both
Male
Female
ASIR
ASPR
Age standardized YLDs
Year
1990
2000
2010
Global
High SDI
High-Middle SDI
Middle SDI
Low-Middle SDI
Low SDI

Figure 5

The correlation between EAPC and facial fractures ASR in 1990 as well as SDI in 2017.

The dots represent countries that were available on SDI data. The ρ indices and p values presented were obtained from Pearson correlation analysis.**(A)**EAPC and ASIR; **(B)** EAPC and SDI in incidence; **(C)** EAPC and ASPR; **(D)** EAPC and SDI in prevalence; **(E)** EAPC and age-standardized YLDs rate; **(F)** EAPC and SDI in YLDs. EAPC, estimated annual percentage change; ASIR, age-standardized incidence rate; ASPR, age-standardized prevalence rate; YLDs, years lived with disability.

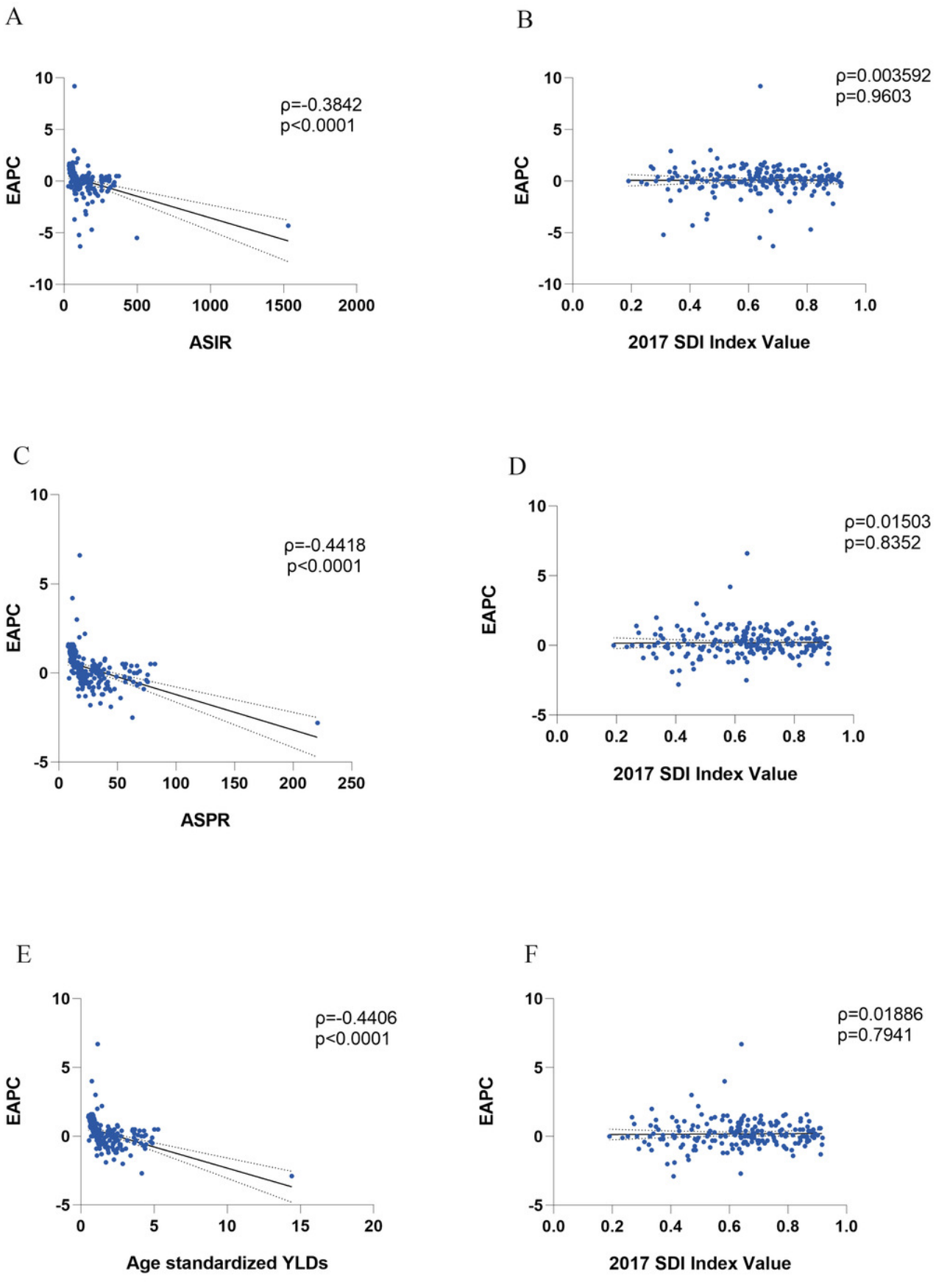
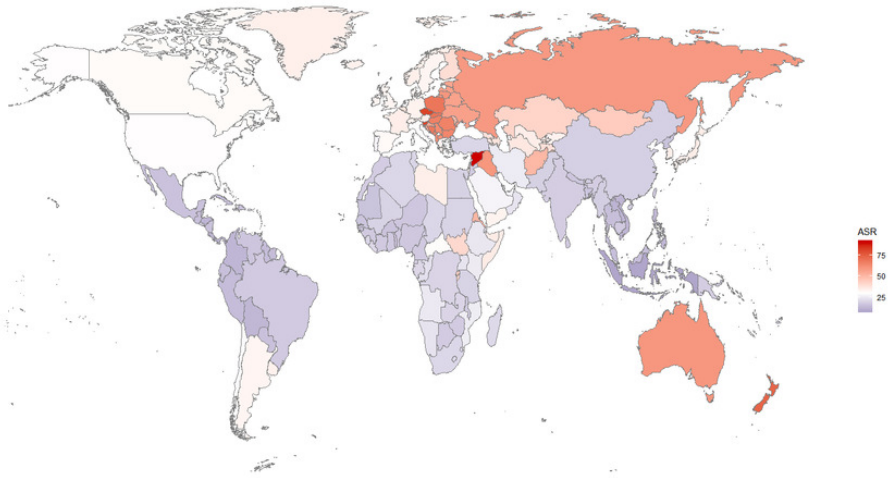

A
ρ=-0.3842
p<0.0001
EAPC
ASIR
B
ρ=0.003592
p=0.9603
EAPC
2017 SDI Index Value
C
ρ=-0.4418
p<0.0001
EAPC
ASPR
D
ρ=0.01503
p=0.8352
EAPC
2017 SDI Index Value
E
ρ=-0.4406
p<0.0001
EAPC
Age standardized YLDs
F
ρ=0.01886
p=0.7941
EAPC
2017 SDI Index Value

Figure 6

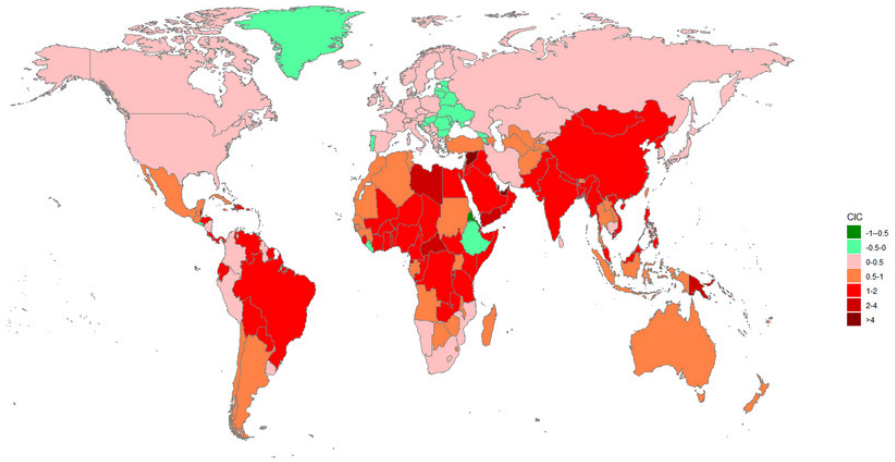
The global prevalence burden of facial fractures in 195 countries and territories.

(A) The ASPR of facial fractures in 2017;**(B)**The change in prevalent cases of facial fractures between 1990 and 2017;**(C)**The EAPC of facial fractures ASPR from 1990 to 2017. ASPR, age-standardized prevalence rate; EAPC, estimated annual percentage change.

A



B



C

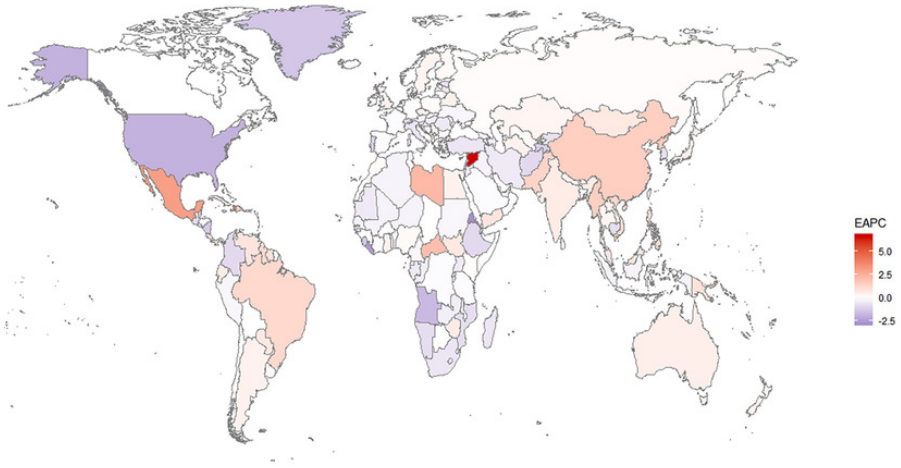
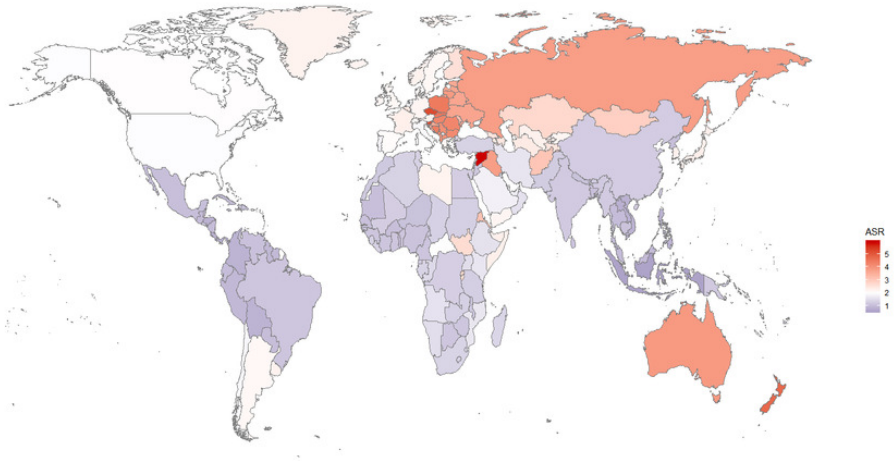


Figure 7

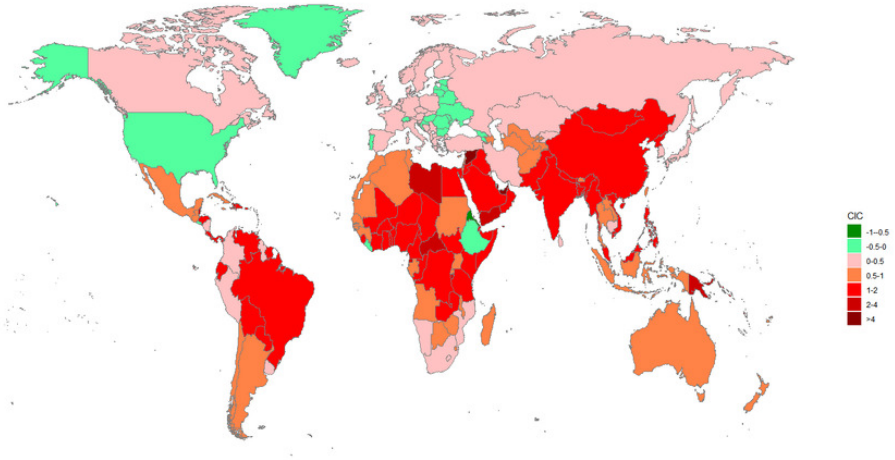
The global YLDs burden of facial fractures in 195 countries and territories.

(A) The age-standardized YLDs rate of facial fractures in 2017;**(B)**The change in YLDs of facial fractures between 1990 and 2017;**(C)**The EAPC of facial fractures age-standardized YLDs rate from 1990 to 2017. YLDs: years lived with disability; EAPC, estimated annual percentage change.

A



B



C

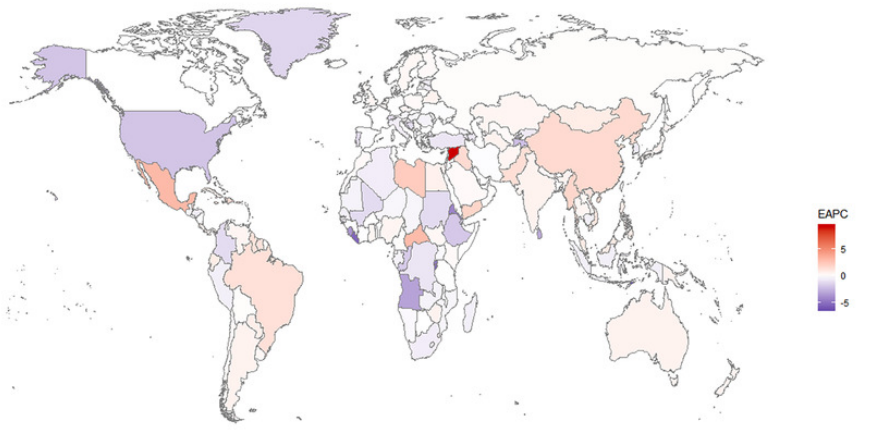


Figure 8

The proportion of different age groups in facial fractures by years.

(A) incidence, **(B)** prevalence, **(C)** YLDs. YLDs: years lived with disability.

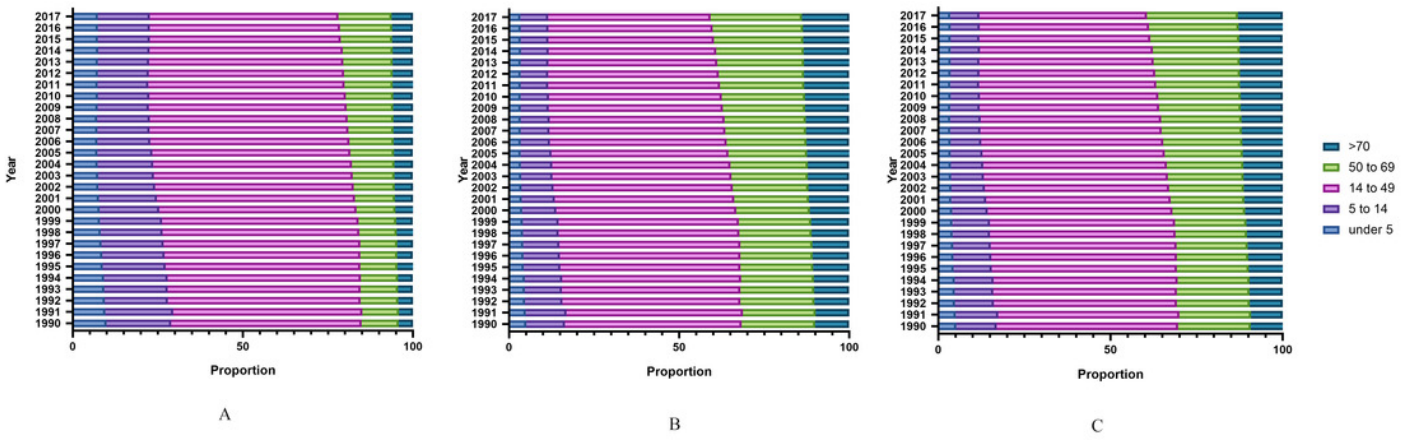
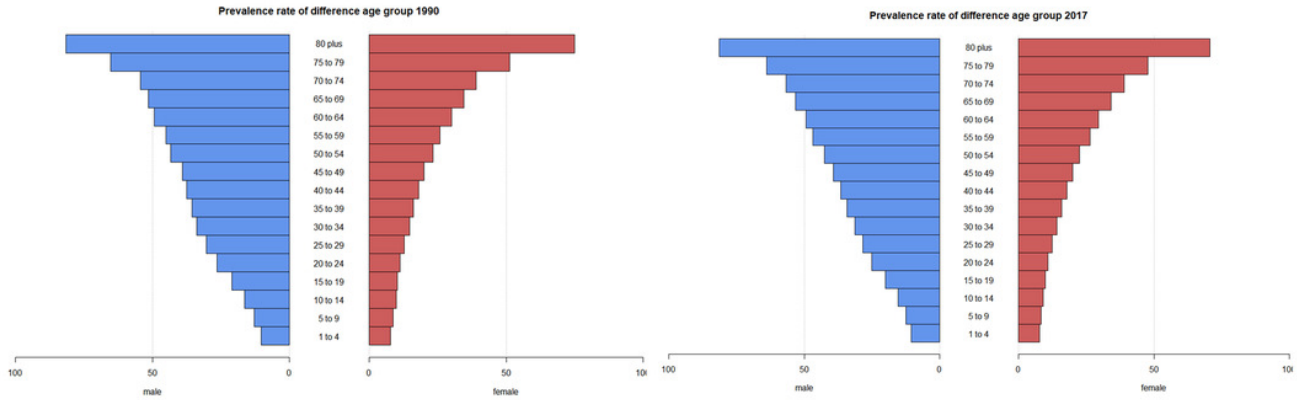


Figure 9

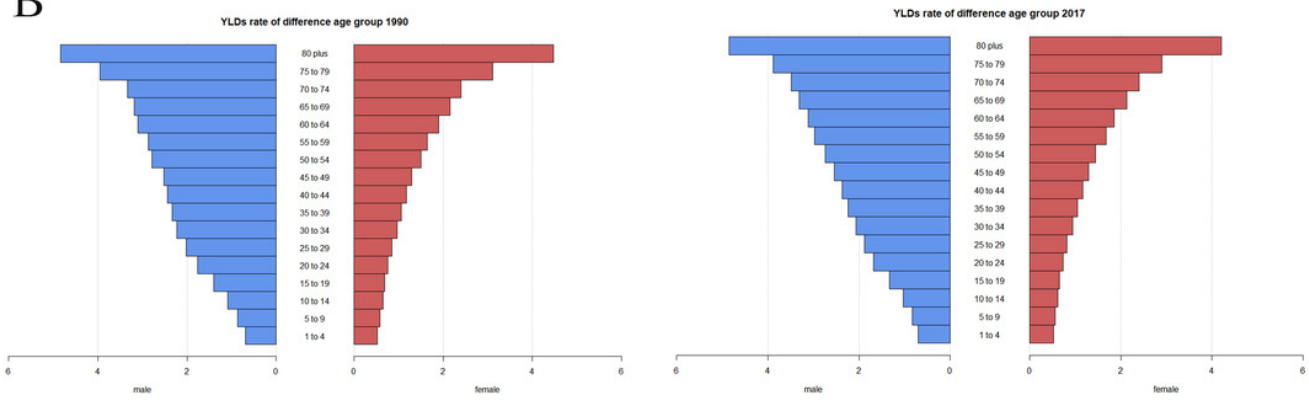
The rate of facial fractures between males and females among different age groups in 1990 and 2017.

(A) incidence rate; **(B)** prevalence rate; **(C)** YLDs rate. YLDs: years lived with disability.

A


Prevalence rate of difference age group 1990
Prevalence rate of difference age group 2017
80 plus
75 to 79
70 to 74
65 to 69
60 to 64
55 to 59
50 to 54
45 to 49
40 to 44
35 to 39
30 to 34
25 to 29
20 to 24
15 to 19
10 to 14
5 to 9
1 to 4
male
female

B


YLDs rate of difference age group 1990
YLDs rate of difference age group 2017
80 plus
75 to 79
70 to 74
65 to 69
60 to 64
55 to 59
50 to 54
45 to 49
40 to 44
35 to 39
30 to 34
25 to 29
20 to 24
15 to 19
10 to 14
5 to 9
1 to 4
male
female

C

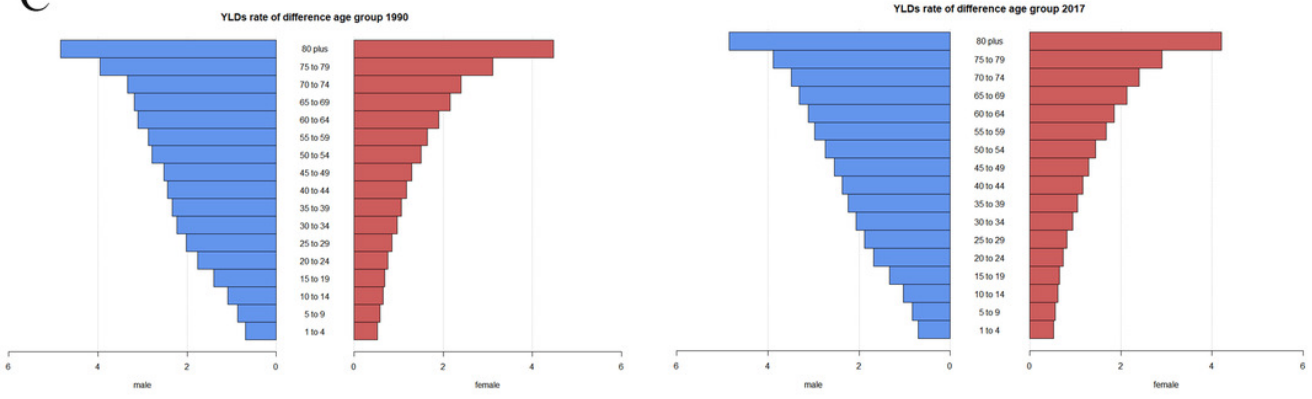

YLDs rate of difference age group 1990
YLDs rate of difference age group 2017
80 plus
75 to 79
70 to 74
65 to 69
60 to 64
55 to 59
50 to 54
45 to 49
40 to 44
35 to 39
30 to 34
25 to 29
20 to 24
15 to 19
10 to 14
5 to 9
1 to 4
male
female

Figure 10

The trends of age-standardized rate of facial fractures among gender from 1990 to 2017.

(A) Global; **(B)** Syria

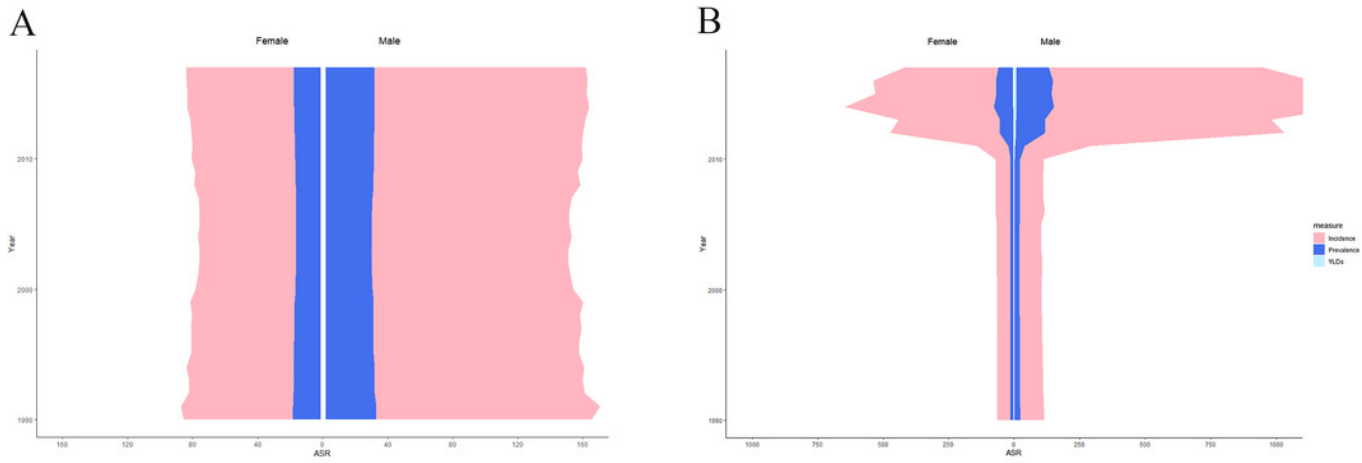


Table 1(on next page)

The incidence of facial fractures, and its temporal trends from 1990 to 2017.

ASIR: age-standardized incidence rate; SDI: socio-demographic index; YLDs: years lived with disability; EAPC: estimated annual percentage change.

1

Characteristics	1990		2017		1990-2017	
	Incident cases No.×10³	ASIR per 100,000 No.	Incident cases No.×10³	ASIR per 100,000 No.	CIC No.(%)	EAPC No.
Global	5405.81	100.47	7538.66	98.47	39.45	0.00
Sex						
Male	3627.63	132.86	5009.25	130.14	38.09	-0.03
Female	1778.19	67.15	2529.41	66.16	42.25	-0.14
Socio-demographic index						
High SDI	1630.33	175.66	1709.50	157.54	4.86	-0.50
High-middle SDI	1428.97	127.38	1749.21	127.83	22.41	0.20
Middle SDI	909.18	57.87	1511.64	71.92	66.26	1.01
Low-middle SDI	749.74	72.96	1456.72	85.58	94.30	0.50
Low SDI	674.05	98.35	1089.16	86.27	61.59	-0.60
Region						
Andean Latin America	28.20	73.69	38.20	62.54	35.47	-0.08
Australasia	51.20	264.17	77.13	290.95	50.62	0.42
Caribbean	18.52	52.95	33.50	72.16	80.84	1.64
Central Asia	122.39	173.15	154.20	167.19	25.99	-0.39
Central Europe	387.03	315.87	337.91	310.03	-12.69	-0.06
Central Latin America	103.47	67.07	164.81	65.28	59.28	1.10
Central Sub-Saharan Africa	46.46	87.26	99.55	83.74	114.29	-1.49
East Asia	684.58	52.12	1157.96	77.53	69.15	1.60
Eastern Europe	607.99	274.19	532.37	267.97	-12.44	0.05
Eastern Sub-Saharan Africa	317.55	169.01	368.28	97.68	15.98	-1.57
High-income Asia Pacific	247.26	150.69	259.95	157.77	5.13	0.11
High-income North America	515.19	189.25	481.47	131.42	-6.55	-1.87
North Africa and Middle East	368.77	105.86	783.03	126.96	112.33	1.00
Oceania	3.73	57.65	9.61	75.33	157.89	0.66
South Asia	762.17	71.09	1443.65	81.63	89.41	0.38
Southeast Asia	206.85	43.37	329.18	49.03	59.14	0.34
Southern Latin America	65.11	130.99	95.91	149.05	47.31	0.45
Southern Sub-Saharan Africa	52.07	99.70	67.96	87.02	30.53	-0.47
Tropical Latin America	90.47	62.10	172.31	77.30	90.45	1.24
Western Europe	581.33	159.71	616.04	155.02	5.97	-0.29
Western Sub-Saharan Africa	145.48	77.52	315.65	74.96	116.97	-0.16

2

Table 2(on next page)

The prevalence of facial fractures, and its temporal trends from 1990 to 2017.

ASPR: age-standardized prevalence rate; SDI: socio-demographic index; CIC: change in cases; EAPC: estimated annual percentage change.

1

Characteristics	1990		2017		1990-2017	
	Prevalent cases No.×10³	ASPR per 100,000 No.	Prevalent cases No.×10³	ASPR per 100,000 No.	CIC No.(%)	EAPC No.
Global	1178.64	23.87	1819.73	23.20	54.39	-0.10
sex						
Male	754.57	30.56	1155.33	29.83	53.11	-0.03
Female	424.07	17.18	664.41	16.62	56.67	-0.15
Socio-demographic index						
High SDI	397.01	38.45	475.20	34.75	19.69	-0.50
High-middle SDI	323.55	30.21	453.56	29.27	40.18	0.10
Middle SDI	187.35	13.61	364.25	16.66	94.42	0.84
Low-middle SDI	147.76	16.82	300.83	19.45	103.59	0.55
Low SDI	119.94	20.93	219.79	20.56	83.24	-0.13
Region						
Andean Latin America	5.10	15.29	8.46	14.31	66.08	0.02
Australasia	11.73	56.38	19.52	61.75	66.47	0.43
Caribbean	3.76	11.64	8.43	17.53	124.18	2.09
Central Asia	24.35	38.58	33.55	37.62	37.78	-0.16
Central Europe	91.50	69.67	92.39	67.62	0.97	-0.02
Central Latin America	20.90	15.72	37.30	14.99	78.48	1.09
Central Sub-Saharan Africa	8.89	20.88	20.30	21.52	128.18	-0.52
East Asia	153.80	12.87	324.20	18.72	110.79	1.50
Eastern Europe	143.33	59.29	139.75	57.94	-2.50	0.05
Eastern Sub-Saharan Africa	51.18	32.89	75.00	25.62	46.54	-0.70
High-income Asia Pacific	59.84	33.18	80.15	35.04	33.92	0.14
High-income North America	127.98	43.03	132.60	30.48	3.61	-1.78
North Africa and Middle East	77.94	26.47	159.84	27.80	105.07	0.28
Oceania	0.69	13.17	1.96	18.24	182.88	0.98
South Asia	143.12	15.57	303.06	18.38	111.76	0.61
Southeast Asia	43.10	10.56	81.65	12.31	89.45	0.40
Southern Latin America	14.02	28.77	22.10	31.85	57.59	0.35
Southern Sub-Saharan Africa	10.38	23.55	14.51	20.21	39.83	-0.41
Tropical Latin America	18.26	14.04	40.08	17.40	119.45	1.19
Western Europe	142.03	33.77	166.36	32.65	17.13	-0.06
Western Sub-Saharan Africa	26.73	17.55	58.52	17.31	118.95	-0.04

2

Table 3(on next page)

The YLDs of facial fractures, and its temporal trends from 1990 to 2017.

YLDs:years lived with disability; SDI: socio-demographic index; CIC: change in cases; EAPC: estimated annual percentage change.

1

Characteristics	1990		2017		1990-2017	
	YLDs No.×10³	Age-standardized YLDs rate (per 100,000) No.	YLDs No.×10³	Age-standardized YLDs rate (per 100,000) No.	CIC No.(%)	EAPC No.
Global	76.51	1.54	117.4	1.50	53.44	-0.07
Sex						
Male	49.10	1.97	74.73	1.93	52.2	-0.02
Female	27.41	1.10	42.67	1.07	55.67	-0.05
Socio-demographic index						
High SDI	25.59	2.49	30.33	2.25	18.52	-0.48
High-middle SDI	20.93	1.95	29.16	1.89	39.32	0.06
Middle SDI	12.30	0.88	23.65	1.08	92.28	0.83
Low-middle SDI	9.65	1.08	19.57	1.25	102.8	0.50
Low SDI	7.84	1.35	14.29	1.32	82.27	-0.10
Region						
Andean Latin America	0.33	1.00	0.55	0.93	66.67	0.02
Australasia	0.76	3.66	1.25	4.00	64.47	0.42
Caribbean	0.25	0.76	0.54	1.13	116	2.04
Central Asia	1.58	2.49	2.18	2.43	37.97	-0.17
Central Europe	5.86	4.48	5.86	4.36	0	-0.02
Central Latin America	1.37	1.02	2.42	0.97	76.64	1.09
Central Sub-Saharan Africa	0.58	1.33	1.32	1.37	127.59	-0.57
East Asia	10.09	0.84	20.98	1.22	107.93	1.48
Eastern Europe	9.21	3.83	8.91	3.74	-3.26	0.05
Eastern Sub-Saharan Africa	3.36	2.12	4.87	1.63	44.94	-0.73
High-income Asia Pacific	3.88	2.16	5.11	2.28	31.7	0.14
High-income North America	8.24	2.78	8.45	1.97	2.55	-1.80
North Africa and Middle East	5.05	1.69	10.34	1.79	104.75	0.31
Oceania	0.05	0.85	0.13	1.17	160	0.95
South Asia	9.38	1.01	19.71	1.19	110.13	0.60
Southeast Asia	2.83	0.69	5.31	0.80	87.63	0.39
Southern Latin America	0.91	1.87	1.43	2.07	57.14	0.35
Southern Sub-Saharan Africa	0.68	1.52	0.94	1.30	38.24	-0.41
Tropical Latin America	1.20	0.91	2.60	1.13	116.67	1.24
Western Europe	9.15	2.19	10.64	2.12	16.28	-0.06
Western Sub-Saharan Africa	1.75	1.13	3.84	1.12	53.44	-0.05

2