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**SPORTS AND RECREATIONAL ACTIVITIES RELATED INJURIES IN CHILDREN
AND ADOLESCENTS IN KENYA**

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Abstract

Purpose: Injuries sustained during sports or recreational activities have received more widespread attention in recent years due in part to interest in injury monitoring and prevention and rising rates of traumatic brain injury-related emergency department visits. Although exposure to sports offers many health benefits, participating in sports also increases risk of injury. The general objective of the study was to understand perception of sports and recreational activities related injuries in children and adolescents in Kenya.

Methodology: The paper used a desk study review methodology where relevant empirical literature was reviewed to identify main themes and to extract knowledge gaps.

Findings: Injury is an important child health problem that requires adequate attention and funding. Policies, surgical capacity building, and health systems strengthening efforts are necessary to address the high burden of pediatric injuries in Kenya.

Unique Contribution to Theory and Practice: Safety guidelines, protective equipment and prevention education are crucial to reducing pediatric recreational and sports injuries. Preventing injuries and ensuring safe athletic practices are necessary for children and adolescents to continue to receive benefits from organized sports and recreational activities. Efforts to minimize these injuries are warranted both to ensure the long-term health of children and to reduce medical costs.

Keywords: *paediatric, children, youth, adolescents, sports injuries, recreational, safety*

1.0 INTRODUCTION

Youth and children's sports are becoming increasingly popular in Kenya. Organized sports participation has become a large part of children's and adolescents' lives over recent decades and has contributed to many positive outcomes. Health benefits from physical activity and organized sports participation may include better overall mental health in young adolescents, higher bone mineral density in adult women who spent more time playing sports at 12 years of age, and a decrease in cardiovascular risk, overweight, and obesity in elementary schoolchildren (Logan 2019). Participation in organized sports in adolescence is associated with higher physical activity and better subjective health in young adulthood. Remarkably, the strongest predictor of physical activity and higher level of health in male World War II veterans was shown to be whether they played a varsity sport in high school. Childhood skills developed in organized sports, such as rope jumping, kicking, and throwing, are associated with better cardiovascular fitness, both in the short-term and into adolescence (Minghetti, 2022). Organized sports participation may aid in the development of physical skills, such as hand-eye coordination, functional movement skills and strength, and academic, self-regulatory, and general life skills. It also may have positive social benefits, leading to both improved social identity and social adjustment (Logan 2019).

As more and more children participate in sports and recreational activities, there has been an increase in acute and overuse injuries. Emergency department visits are highest among the school-age to young adult population. Over one-third of school-age children will sustain an injury severe enough to be treated by a doctor or nurse. The yearly costs have been estimated to be as high as \$US1.8 billion (Pinyao, Ashman and Akintunde, 2019).

Previous studies have shown that children and adolescents are not small adults in their responses to exercise and stress. As children around the world become involved in more competitive and organized sports activities, the frequency and severity of acute and overuse injuries continue to rise (Vertommen et al, 2018).

An estimated annual 5.6 million sports injuries affected children and young adults in 2011–2014 (Logan et al. 2019). Sports injuries are a common type of injury presenting to hospital EDs and are most common among older children and young adults (Moon et al, 2016). The number of children and adolescents involved in organized sports has increased dramatically over recent decades.

Playgrounds play an integral role in the lives of most young children and parents in developed countries. They are a place where children not only exercise and develop their gross motor skills, but also interact with other children to acquire social skills (Akamoglu et al., 2019). In fact, playground equipment has become a cornerstone of elementary schools, daycare centers, public parks, apartment building play areas, and the backyards of many homes. Unfortunately, they also pose a significant risk of injury (Jennissen, Koos & Denning, 2018).

Treating these injuries is costly and the injuries can lead to long-term health problems (Khan et al 2016). Reducing the incidence of these injuries may be achieved by identifying factors that may predispose a child to injury and through proper training, technique, and fitness. Efforts to reduce these injuries are warranted both to ensure the long-term health of children and to reduce medical costs (Padua, 2018). Ideally, we would like to have a simple set of guidelines that outline exactly

how often a child can exercise, at what intensity, and for what duration to optimize the physical and psychological benefits of exercise and to minimize the risk of overuse injuries.

1.3 Objectives of the Study

The general objective of the study was to understand perception of sports and recreational activities related injuries in children and adolescents in Kenya.

1.4 Significance of the Study

The study correlated the significance of sports and recreational activities along with the injuries associated with them. This will help government especially the ministry of education to come up with preventive measures in dealing with these since most occur at schools

This study will also help schools and institution to understand where the injuries are and deal with them to avoid the cost implications that come along with the injuries.

Some guidelines are needed to help caregivers and parents manage the high spirited stage of childhood and adolescence. Such guidelines are elusive but may be achievable through the collective efforts of scientists and clinicians.

2.0 LITERATURE REVIEW

As more and more children participate in sports and recreational activities, there has been an increase in acute and overuse injuries. Emergency department visits are highest among the school-age to young adult population. Over one-third of school-age children will sustain an injury severe enough to be treated by a doctor or nurse (Waltzman, 2022). The yearly costs have been estimated to be as high as \$US1.8 billion.

There are physical and physiological differences between children and adults that may cause children to be more vulnerable to injury (Dye, 2018). Factors that contribute to this difference in vulnerability include: children have a larger surface area to mass ratio, children have larger heads proportionately, children may be too small for protective equipment, growing cartilage may be more vulnerable to stresses and children may not have the complex motor skills needed for certain sports until after puberty.

The most commonly injured areas of the body include the ankle and knee followed by the hand, wrist, elbow, shin and calf, head, neck and clavicle (Nithin & Singh, 2018). Contusions and strains are the most common injuries sustained by young athletes (Trofa, 2019). In early adolescence, apophysitis or strains at the apophyses are common (Chalmers & Christensen, 2021). The most common sites are at the knee (Osgood-Schlatter disease), at the heel (Sever's disease) and at the elbow (Little League Elbow). Non-traumatic knee pain is one of the most common complaints in the young athlete (West & Jaramillo 2019). Patellar Femoral Pain Syndrome (PFPS) has a constellation of causes that include overuse, poor tracking of the patellar, malalignment problems of the legs and foot problems, such as pes planus (Chambers & Nelson, 2020). In the child, hip pathology can present as knee pain so a careful hip exam is important in the child presenting with an insidious onset of knee pain (Sweeney, Rodenberg & MacDonald, 2020). Other common

injuries in young athletes discussed include anterior cruciate ligament injuries, ankle sprains and ankle fractures (Hart, 2018).

A related concern is the acute and long-term risk associated with concussive episodes. The reported rates of concussion in youth rough sports like rugby vary significantly and may reflect under-reporting (Longworth, 2021). Concussions can have devastating outcomes if not identified or managed accordingly (Albicini & McKinlay, 2018). This is particularly pertinent in adolescent and young athletes, as developing brains undergo a more complex and protracted recovery postconcussion in comparison to an adult (Kerrigan & Giza, 2019).

2.1 Perceptions and awareness

Children's physical activities today are much different than they were 50–100 years ago; 100 years ago, physical chores, free play, and sandlot sports dominated the spare time of children. Now, most children participate in organized and regimented physical activities. The number of children participating in organized sports programs has increased considerably over the past 70 years (Logan, 2019).

For 2010–2016, the top five most frequent activities that caused ED visits for sports injuries by patients aged 5–24 years were football (14.1%), basketball (12.5%), pedal cycling (9.9%), soccer (7.1%), and ice or roller skating or skateboarding (6.9%). Variation was observed by age and sex in the types of activities causing ED visits for sports injuries. (Pinyao Rui, Jill and Akintunde, 2019)

Almost 37 pediatric sport or recreational injuries are treated hourly in the United States (Sollerhed, 2020). The incidence of sport- and recreation-related injuries peaks at widely different ages. Team-sport injuries tend to peak in the middle teen years, playground injuries peak in the early elementary ages and then drop off slowly, and bicycling injuries peak in the preteen years but are a common cause of injury throughout childhood and adolescence. Bowling injuries peaked at the earliest age (4 years), and injuries linked to camping and personal watercraft peaked at the oldest age (18 years) (Harmon, 2018). The 5 most common causes of sport and recreational injuries across development, in order, were basketball, football, bicycling, playgrounds, and soccer. Sex disparities were common in the incidence of pediatric sport and recreational injuries. The conclusion was that both biological and sociocultural factors likely influence the developmental aspects of pediatric sport and recreational injury risk. Biologically, changes in perception, cognition, and motor control might influence injury risk. Socioculturally, decisions must be made about which sport and recreational activities to engage in and how much risk taking occurs while engaging in those activities. Understanding the developmental aspects of injury data trends allows preventionists to target education at specific groups (Beelmann, Arnold & Schulz, 2021).

Ndung'u, Sun, Musau & Ndirangu, (2019) in their study sought to establish the profile and outcomes of admitted paediatric trauma cases at the Aga Khan University Hospital, Nairobi. This retrospective, descriptive study involved a 12-month chart review (January 2016–December 2016). A total of 218 records were identified of which 144 were reviewed. Most injuries were amongst boys (65.3%) and the very young (mean age 6), occurred in private residences (42.4% homes, 25.7% residential institutions), were typically caused by falls (56.3%) or penetrating

trauma (13.2%), mostly resulted in extremity fractures (45.8% closed, 4.9% open) and burn or head injuries (in infants and small children), and got very little or no pre-hospital care (51.4% no care). Additionally, children with burns, brain injuries, or poly-trauma had the longest hospital stays and highest rates of mortality. A more detailed description of the patterns and outcomes seen are included in the study. Paediatric injuries remain a major public health problem and contribute a substantial proportion of all paediatric surgical admissions at the Aga Khan University Hospital in Nairobi.

2.2 Cost implication of these injuries

Ryan, Pracht & Orban (2019) analysed the 12 financial costs from sports injuries among inpatients and emergency department (ED) patients aged 5–18 years. Fixed-effects linear regression was used to assess the association of patient factors with cost of injury from sports. Florida Agency for Health Care Administration data from 2010 to 2014 were used, which included all inpatient and ED patients aged 5–18 years who had a sports injury. Over 5 years, sports injuries in Florida youth cost \$24 million for inpatient care and \$87 million for ED care. Youth averaged \$6039 for an inpatient visit and \$439 for an ED visit in costs from sports injuries. Sports injuries for Medicaid-insured youth cost \$10.8 million for inpatient visits and \$44.2 million for ED visits. The conclusion was that older athletes and males consistently have higher healthcare costs from sports. Baseball, basketball, bike riding, American football, roller-skating/skateboarding and soccer are sports with high costs for both ED patients and inpatients and would benefit from prevention programmes. Injuries from non-contact sport participants are few but can have high costs. These athletes could benefit from prevention programmes as well.

Unintentional injury is the leading cause of death among children aged 10–19 years and over 95% of injury deaths occur in low- and middle-income countries (LMICs) (Nwanna-Nzewunwa, 2020). As patterns of injury in the pediatric population may differ from those in adults, risks specific to children in LMICs need to be identified for effective injury prevention and treatment. In their study, Nwanna-Nzewunwa et al (2020) explored patterns of pediatric injury epidemiology and cost in Yaoundé, Cameroon to inform injury prevention and resource allocation. Pediatric (age < 20 years) trauma patient data were collected at the emergency department (ED) of Central Hospital of Yaoundé (CHY) from April through October 2009. Univariate, bivariate, and multivariate analyses were used to explore injury patterns and relationships between variables. Regression analyses were conducted to identify predictors of receiving surgical care. Children comprised 19% (544) of trauma cases. About 54% suffered road traffic injuries (RTIs), which mostly affected the limbs and pelvis (37.3%). Half the RTI victims were pedestrians. Transportation to CHY was primarily by taxi or bus (69.4%) and a preponderance (71.1%) of the severely and profoundly injured patients used this method of transport. Major or minor surgical intervention was necessary for 17.9% and 20.8% of patients, respectively. Patients with an estimated injury severity score ≥ 9 (33.2%) were more likely to need surgery ($p < 0.01$). The median ED cost of pediatric trauma care was USD12.71 [IQR 12.71, 23.30]. Pediatric injury prevention efforts in Cameroon should target pedestrian RTIs, falls, and burns and consider school-based interventions was their conclusion.

2.3 Empirical review

Klaus et al, (2012) aimed to analyze the epidemiology, gender distribution, age, and circumstances of knee injuries in childhood at a Level I Trauma Center in Austria. All pediatric and adolescent trauma patients who presented in a 2-year period were recorded. Children managed with knee injuries were selected prospectively. Patients were divided into five age groups: infants (younger than 1 year); pre-school aged children (1–6 years); pre-pubertal school-aged children (7–10 years); early adolescent patients (11–14 years); and late adolescent patients (15–18 years). Five diagnosis-related groups were formed: extraarticular soft tissue injuries, intraarticular soft tissue injuries, patella disorders, fractures, and overload injuries. The study included 23,832 patients up to the age of 18 years, who presented with 1,199 knee injuries. There was a male predominance (m:f = 58,6%:41.4%). Boys had a lower mean age at presentation (11.9 years) as girls (12.3 years). The most common accident sites were outdoors (34.8%) and sports facilities (32.8%). Leading injury mechanisms were falls on level surfaces (58.1%) and traffic accidents (13.4%). The number of knee injuries and its severity increased with age. Knee injuries did not occur in infants. In general, extraarticular soft-tissue injuries were most common and fractures were rare. It concluded that knee injuries in children and adolescents are rare and extraarticular soft-tissue injury is the most frequent type of knee trauma. The number of knee injuries and its severity increases with age with a male predominance. Sports facilities and traffic injuries are important scenes of knee trauma. Mechanisms and patterns evaluated in this study can serve as the basis for knee-injury prevention efforts in children and adolescents and may be used for necessary precautions.

In their report Pinyao, Ashman and Akintunde (2019) described emergency department (ED) visits made by patients aged 5–24 years for injuries sustained during sports and recreational activities, the treatments provided at these visits, and variation by activity, patient age, and patient sex. Data are from the 2010–2016 National Hospital Ambulatory Medical Care Survey. Sports injuries were defined by the International Classification of Diseases, Ninth Edition, Clinical Modification and 10th Edition, Clinical Modification (ICD–9–CM and ICD–10–CM) external cause-of-injury codes, supplemented by manual review of narrative text fields from ED medical records. Sample weights were applied to each case to provide national estimates of ED visits for injuries sustained during sports and recreational activities. During 2010–2016, approximately 2.7 million annual ED visits for sports injuries were made by patients aged 5–24 years. The top five most frequent activities that caused ED visits for sports injuries were football (14.1%), basketball (12.5%), pedal cycling (9.9%), soccer (7.1%), and ice or roller skating or skateboarding (6.9%). Visits caused by playing football and basketball accounted for a higher percentage of visits by males than females (20.2% compared with 2.2%, and 14.3% compared with 8.9%, respectively), whereas visits caused by gymnastics and cheerleading accounted for a higher percentage of visits by females (11.8% compared with 2.1%). Visits for injuries to the upper extremities decreased with increasing age (37.1% for those aged 5–9 to 27.4% for those aged 20–24), whereas visits for injuries to the lower extremities increased with increasing age (16.2% for those aged 5–9 to 41.0% for those aged 20–24).

Archbold (2017) examined injury patterns in adolescent rugby players and determined factors associated with injury risk. Design Prospective injury surveillance study with setting N=28 Grammar Schools in Ulster, Ireland (2014–2015 playing season) was used. Participants 825

adolescent rugby players, across in 28 school first XV rugby squads; mean age 16.9 years. Main outcome measures Injuries were classified by body part and diagnosis, and injury incidence using injuries per 1000 match hours of exposure. HRs for injury were calculated through Cox proportional hazard regression after correction for influential covariates. Results A total of $n=426$ injuries were reported across the playing season. Over 50% of injuries occurred in the tackle situation or during collisions (270/426), with few reported during set plays. The 3 most common injury sites were head/face ($n=102$, 23.9%), clavicle/shoulder ($n=65$, 15.3%) and the knee ($n=56$, 13.1%). Sprain ($n=133$, 31.2%), concussion ($n=81$, 19%) and muscle injury ($n=65$, 15.3%) were the most common diagnoses. Injury incidence is calculated at 29.06 injuries per 1000 match hours. There were no catastrophic injuries. A large percentage of injuries (208/424) resulted in absence from play for more than 28 days. Concussion carried the most significant time out from play ($n=33$; 15.9%), followed by dislocations of the shoulder ($n=22$; 10.6%), knee sprains ($n=19$, 9.1%), ankle sprains ($n=14$, 6.7%), hand/finger/thumb ($n=11$; 5.3%). 36.8% of participants in the study (304/825) suffered at least one injury during the playing season. Multivariate models found higher risk of injury (adjusted HR (AHR); 95% CI) with: higher age (AHR 1.45; 1.14 to 1.83), heavier weight (AHR 1.32; 1.04 to 1.69), playing representative rugby (AHR 1.42; 1.06 to 1.90) and undertaking regular strength training (AHR 1.65; 1.11 to 2.46). Playing for a lower ranked team (AHR 0.67; 0.49 to 0.90) and wearing a mouthguard (AHR 0.70; 0.54 to 0.92) were associated with lower risk of injury. Conclusions There was a high incidence of severe injuries, with concussion, ankle and knee ligament injuries and upper limb fractures/dislocations causing greatest time loss. Players were compliant with current graduated return-to-play regulations following concussion. Physical stature and levels of competition were important risk factors and there was limited evidence for protective equipment.

Räisänen, Parkkari, Karhola, & Rimpelä (2016), did a study whose objective was to study physical activity (PA)-related injuries in sports club, school sports, and other leisure time PA, and the associations between injuries and PA participation frequency and intensity. A nationally representative sample was obtained and a structured questionnaire was sent. A total of 9,462 Finns (12–18 years) completed the survey. Prevalence of PA-related injuries was gathered by separate questions about sports club injuries, school sports injuries and other leisure time PA injuries. Injury prevalence was higher in sports club activities than in other leisure time PA or school sports for boys ($p < 0.001$) and girls ($p < 0.001$). The prevalence of other leisure time injuries was higher than the prevalence of injuries in school sports for boys ($p < 0.001$) and girls ($p < 0.001$). Injuries were associated with higher frequency (OR 10.4, 95% CI 6.7–16.3) and intensity (OR 4.1, 95% CI 2.9–5.8) of PA. Out of the three settings, injury prevalence was highest in sports club activities. Higher PA participation frequency and intensity increased the risk of injury. There seems to be a need for further preventative measures to reduce the risks of PA-related injuries, especially in the sports club setting.

Hauser (2018), sought in their study to estimate the incidence of sports injuries among adolescents in Africa. Data from the World Health Organization Global School-Based Student Health surveys were used to estimate the annual number of African adolescents sustaining sports injuries. Gender-stratified injury rates were calculated and applied to every African country's adolescent population to estimate country-specific and continent-wide injury totals. A total of 21,858 males and 24,691 females from 14 countries were included in the analysis. Country-specific annual sports injury rates ranged from 13.5% to 38.1% in males and 5.2% to 20.2% in females. Weighted average sports injury rates for males and females were 23.7% (95% CI 23.1%–24.2%) and 12.5% (95% CI 12.1%–12.9%), respectively. When these rates were extrapolated to the adolescent populations of the African continent, an estimated 15,477,798 (95% CI 15,085,955–15,804,333) males and 7,943,625 (95% CI 7,689,429–8,197,821) females sustained sports injuries. Our findings suggest that over 23 million African adolescents sustained sports injuries annually. Further work will help to more precisely define the burden of sports injuries in Low and Medium Income Countries and the role that surgery can play in mitigating this burden.

Khisa, (2018) in her study purposed to establish the different patterns of sports injuries in rugby playing high school students in Eldoret, and the initial care given. The study was conducted in four public secondary schools within Eldoret town, using the prospective descriptive study design for eight months: September 2015 to April 2016. The study population was composed of high school students who participated in rugby. Eldoret town was selected due to its proximity. Only four schools participated in rugby and hence all were included. IREC formally approved the proposal to conduct the study. The study subjects signed informed consent/assent to participate. Census method was used due to the low numbers participating in the sport. Questionnaires used in data collection were validated instruments which were interviewer administered. Physical examination was done for all injured players. Data analysis was done using R: A language and environment for statistical computing version 3.3.1, and presented in diagrams and prose so as to make detailed interpretations. A total of 123 male high school rugby players were recruited into the study: 69 forwards and 54 backs. The average age, weight, height and BMI was 17.6 years, 68.7kgs, 177.2cm and 22.1kg/m² respectively. Fifty three players (43.1%) were injured, with 47 recording one injury and 6 recording two injuries making a total of 59 injuries. The backs recorded 53% of injuries while the forwards recorded 47% of injuries. The anatomic distribution of injuries was: lower limbs 24(41.7%), upper limb 22(37%), trunk 5(8.5%), and head and neck 14 (13.6%). Thirty two injuries (54%) occurred as a result of contact with another player. The tackle recording 28 injuries (48%) and the scrum recorded 9 injuries (15%). Seventy one percent of the injuries occurred in the second half with the first half recording 29%. Minor and mild injuries constituted 68% of all injuries, while 32% were moderate and severe injuries. All the injured players were given initial care on the field involving use of icepacks, bandaging, topical analgesics, rest and massage by fellow students or coach. Twenty two (37%) of the 59 injuries reported were referred to a health facility with the rest receiving first aid on the field. Increase in weight was associated with increase in risk of injury to the participant $p = 0.038$. The pattern showed that majority of the injuries occurred on the lower limbs mainly on the knee. The initial care was first aid on the field offered by fellow students or coach. In view of the high injury rate; there is need for continuous surveillance of risk factors associated with rugby injuries and ways to mitigate such risks.

2.4 Research Gaps

A knowledge gap occurs when desired research findings provide a different perspective on the issue discussed. For instance in the study done by Khisa, (2018) to establish the different patterns of sports injuries in rugby playing high school students in Eldoret, and the initial care given. The study was conducted in four public secondary schools within Eldoret town, using the prospective descriptive study design for eight months: September 2015 to April 2016. The study population was composed of high school students who participated in rugby. Eldoret town was selected due to its proximity. Only four schools participated in rugby and hence all were included. IREC formally approved the proposal to conduct the study. The study subjects signed informed consent/assent to participate. Census method was used due to the low numbers participating in the sport. Questionnaires used in data collection were validated instruments which were interviewer administered. Physical examination was done for all injured players. Data analysis was done using R: A language and environment for statistical computing version 3.3.1, and presented in diagrams and prose so as to make detailed interpretations. A total of 123 male high school rugby players were recruited into the study: 69 forwards and 54 backs. The study is limited to one demographic which is male. There is a methodological gap as the current study is a desk study.

3.0 METHODOLOGY

The study adopted a desktop literature review method (desk study). This involved an in-depth review of studies related to climate variability and response strategies among communities in the Northern parts of Kenya. Three sorting stages were implemented on the subject under study in order to determine the viability of the subject for research. This is the first stage that comprised the initial identification of all articles that were based on of sports and recreational activities related injuries in children and adolescents in Kenya. The search was done generally by searching the articles in the article title, abstract, keywords. A second search involved fully available publications on the subject on of sports and recreational activities related injuries in children and adolescents in Kenya. The third step involved the selection of fully accessible publications. Reduction of the literature to only fully accessible publications yielded specificity and allowed the researcher to focus on the articles that related to of sports and recreational activities related injuries in children and adolescents in Kenya which was split into top key words. After an in- depth search into the top key words (*paediatric, children, youth, adolescents, sports injuries, recreational, safety*), the researcher arrived at 2 articles that were suitable for analysis. These are the findings from the research

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4.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

Injury is an important child health problem that requires adequate attention and funding. Policies, surgical capacity building, and health systems strengthening efforts are necessary to address the high burden of pediatric injuries in Kenya.

4.2 Recommendations

Prevention of sports and recreation-related injuries is the ideal. There are six potential ways to prevent injuries in general: the pre-season physical examination; medical coverage at sporting events; proper coaching; adequate hydration; proper officiating; and proper equipment and field/surface playing conditions.

Ndung'u, Sun, Musau, & Ndirangu (2019) based on the patterns and outcomes seen in their study, therefore recommend for Nairobi (and possibly Kenya) to establish greater supervision and safety measures for children; targeting safety interventions at all children but particularly at boys, the very young, at home and in residential buildings; building pre-hospital emergency care that can accommodate children; and equipping paediatric trauma hospitals to especially handle bony fractures, burns, head injuries, and poly-traumas. A bespoke trauma registry would benefit the hospital, and likely the country as a whole.

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