ORIGINAL ARTICLE

Impact of social standing on sports injury prevention in a WHO safe community: intervention outcome by household employment contract and type of sport

T Timpka, K Lindqvist, J Ekstrand, N Karlsson

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See end of article for authors' affiliations

Correspondence to: Professor Toomas Timpka, Linköping University, Department of Health and Society, Linköping SE 58185, Sweden; tti@ida.liu.se

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Objectives: As physical activity is promoted as part of a healthy lifestyle, sports injuries are becoming an important public health concern in many countries. The objective of this study is to investigate rates of sports injuries before and after implementation of a WHO Safe Community program.

Methods: Sports injury data were collected pre- and post-implementation from all individuals below 65 years of age during 1 year in the targeted municipality (population 41 000) and in a control municipality (population 26 000). A quasi-experimental design was used and individuals were divided into three categories based on household relationship to the labour market.

Results: There were no differences between socio-economic categories regarding pre-intervention injury rates. No statistically significant post-intervention changes in injury rate were observed in the control area or among any females in either area. In the intervention area, a statistically significant ($p = 0.011$) decrease in injury rate was observed among male members of households in which the vocationally important member was employed. A statistically significant decrease was observed in injuries sustained in team sports among male members of households in which the vocationally important member was employed ($p = 0.001$) and among members of households in which the vocationally important member was self employed ($p < 0.05$).

Conclusions: The study indicates areas for improvement in the civic network based WHO Safe Community model. The results show that females, participants in individual sports, and members of non-vocationally active households were less affected by the interventions. These facts have to be addressed in planning future community based sports injury prevention programmes and their evaluations.

In the US, an estimated 7 million children and adults currently receive medical attention for sports injuries every year, corresponding to 2.6 injury episodes per 100 persons.[1] The highest rates are for children aged 5–14 years (5.9 injury episodes per 100 persons) and persons aged 15–24 years (5.6 injury episodes per 100 persons), with the rate for males being more than twice that for females. Basketball, a team sport, accounts for most injury episodes, with about 0.4 injury events per 100 persons. Recently, 3.7 cases of medically treated sports injuries per 100 persons were reported in Australia,[2] with more males injured than females. Australian football, also a team sport, is associated with the highest number of injuries, accounting for 24% of presentations to emergency departments. Likewise in Europe, sports injuries have been known for several decades to pose a quantitatively important and serious health problem.[3–5] The most frequent injuries in Europe at present occur during soccer and basketball for males, and gymnastics and volleyball for females.[6]

Community based programs that build interventions into existing civic networks and emphasise broad participation are today often suggested for management of central public health issues.[7 8] However, although the number of sports injuries is increasing in many communities and influence from social structures is regarded as central to the community based program model, the outcomes of sports injury prevention programs with regard to differences in social standing have not been analysed. This is an unsatisfactory situation, because recent studies have shown that social structures are associated with differences in injury risk between population groups. For instance, in studies conducted in the US, non-Hispanic white children and children from affluent families have been found to be at increased risk of sports injury,[9] and the age adjusted injury rate for whites has been reported to be 1.5 times higher than for blacks (2.9 *v* 1.9 per 100 persons).[1]

The objective of the present study is to investigate the outcome of the Safe Sports section of a WHO Safe Community program with regard to the prevention of injuries in different social strata of a population. In particular, the aim is to study, using a quasi-experimental design, the rates of sports injuries treated by health care organisations among members of households at different levels of labour market integration before and after program implementation. In the analyses, it is expected that whether or not the significant adult in a household is employed will have a determining influence on social networks, norms of reciprocity, and the potential to control and benefit from leisure time.[10] The relationship to the labour market is classified using the Swedish Socio-economic Index (SEI).[11]

Safe sports in the WHO Safe Community model

The injury prevention program implemented in Motala municipality (population 41 000) in the western part of Östergötland county, Sweden, is one of the original reference sites for the WHO Safe Community model. For the Safe Sports section of the program, an inter-organisational sports safety council was formed in 1983/1984 with representatives from the municipality's leisure time recreation administration, the Educational Association of the Swedish Sporting Organisations (SISU), the Inter-company Sports Association, the health care administration, schools, and the local alliance of soccer clubs. The program design and initiation (1985–1987) stage included organising management of the

Abbreviations: SEI, Swedish Socio-economic Index; SISU, Educational Association of the Swedish Sporting Organisations

Table 1 Populations in numbers (%) below 65 years of age in the intervention and control areas displayed by sex and household relationship to the labour market

	Intervention area				Control area			
	Males		Females		Males		Females	
Household	1983/84	1989	1983/84	1989	1983/84	1989	1983/84	1989
Employed	13 906 (82)	14 164 (81)	13 721 (83)	13 837 (84)	8661 (80)	8817 (81)	8333 (81)	8568 (82)
Self employed	1533 (9)	1370 (8)	934 (6)	776 (5)	1200 (11)	1079 (10)	803 (8)	703 (7)
Not vocationally active	1591 (9)	1834 (11)	1834 (11)	1914 (11)	954 (9)	1014 (9)	1135 (11)	1113 (11)
Total	17 030 (100)	17 368 (100)	16 489 (100)	16 527 (100)	10 815 (100)	10 910 (100)	10 271 (100)	10 384 (100)

interventions and setting local planning goals. The implementation stage (1987–1988) included population based interventions at three levels. At the community level, all physical education teachers in the study area participated in an injury prevention course organised by SISU. At the sports organisation level, SISU was given the primary responsibility for co-ordinating interventions. In team sports, the emphasis was put on safety norms and rules. On the basis of experience from ice hockey,[12] workshops for coaches and referees were used to define a fair play program to discourage foul play. In addition, the administrators of the Inter-company Sports Association introduced compulsory use of shin pads during inter-company soccer matches as well as warm up programmes before kick off. The alliance of soccer clubs also arranged courses for local coaches on how injuries can be avoided by proper physical preparation.[13] For individual sports, a specific attempt was made to increase supervision of novices. A rule was introduced that prescribed supervision of young horseback riders at riding clubs during all interactions with horses, including work at the stables. In elementary schools, a program was implemented aimed at introducing children to athletics and gymnastics. The goal was that all children should have the basics skills before practising an individual sport on their own.

METHODS

A quasi-experimental design[14] was used with pre- and post-implementation registrations covering the total population below 65 years of age in the program implementation area and in a neighbouring control municipality (population 26 000) in Östergötland county. The ethics committee at Linköping University approved the study design. The pre-implementation study period covered the 52 weeks from October 1, 1983 to September 30, 1984. The post-implementation period covered the 52 weeks from January 1, 1989 to December 31, 1989. Data on participation in organised sports activities were collected for the entire population from both communities before and after the intervention.

Data collection

Data were collected from two sources. First, for all patients contacting a health care unit located in the intervention and control areas during the study periods, a report form with the time of contact and standard personal data was filled in by staff at the care unit. The same form stated whether unintentional injury was a possible reason for the contact. For registered patients, specially trained nurses recorded an ICD 8 based diagnostic classification using medical records and following discussions with physicians.

Second, socio-economic data for all individuals in the intervention and control areas were collected from Statistics Sweden.[11] Due to changes in household structure due to retirement and ageing, individuals older than 65 years of age were excluded from the analyses.[15] As the WHO Safe Community model strongly relies on existing civic networks, the detailed SEI categories were used for coding individuals into three secondary categories based on the relationship of the household to the labour market as follows: households in which the vocationally most important member was employed, households in which the vocationally important member was an entrepreneur or self employed, and households in which the adults not were vocationally active. Individuals absent through sickness and temporarily unemployed were coded according to their most recent occupation. The group ''not vocationally active household'' comprised households in which the adult members did not participate in the labour market or had recently arrived in the country as immigrants. Children and young people were categorised to the SEI group to which their parents belonged.

Statistical methods

Rates of injuries (expressed per 100 person-years) were calculated by community (intervention and control municipality) for each study period (1983/84 and 1989), by socio-economic group (employed, self employed, and not vocationally active), and by gender, as well as for women and men together. 95% Confidence intervals were provided for injury rates. For individuals injured more than once, only the first episode during each registration period was included in the calculations. The differences in injury rates between 1989 and 1983/84 were computed for both areas with 95% confidence intervals, and significance tests were conducted. Similarly, differences in changes in injury rate between the intervention and control areas were computed using the expression: Difference in changes in injury rate = (post-intervention injury rate in intervention area − pre-intervention injury rate in intervention area)–(post-intervention injury rate in control area − pre-intervention injury rate in control area).

RESULTS

Members of households in which the vocationally important member was employed constituted the largest share of the population below 65 years of age in both the intervention (82%) and control (81%) areas (table 1).

Pre-intervention injury rates

At the aggregate level, there were no differences between the household types with regard to pre-intervention injury rates (table 2). Males displayed a general tendency for higher injury rates than females, except among members of households in which the vocationally important member was self employed. Among male members of households in which the vocationally important member was employed, more injuries were sustained when participating in team sports than in individual sports. For females of the same household type, the relationship was the reverse, that is, more injuries were sustained while participating in individual sports.

Table 2 Rate per 100 person-years (95% confidence interval) of individuals injured while performing sports activities in 1983/84 in intervention and control areas displayed by sex and household relationship to the labour market

	Employed			Self employed			Not vocationally active		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
Intervention area									
Team sports	2.4 (2.2 to 2.7)	0.6 (0.5 to 0.7)	1.5 (1.4 to 1.7)	1.1 (0.6 to 1.6)	0.7 (0.2 to 1.3)	1.0 (0.6 to 1.4)	1.8 (1.2 to 2.5)	0.4 (0.1 to 0.7)	1.1 (0.7 to 1.4)
Individual sports	1.1 (0.9 to 1.3)	1.0 (0.8 to 1.1)	1.0 (0.9 to 1.2)	1.0 (0.5 to 1.6)	1.5 (0.7 to 2.3)	1.2 (0.8 to 1.6)	1.4 (0.9 to 2.0)	0.7 (0.3 to 1.1)	1.1 (0.7 to 1.4)
Total	3.6 (3.3 to 3.9)	1.6 (1.4 to 1.8)	2.6 (2.4 to 2.8)	2.2 (1.5 to 3.0)	2.2 (1.3 to 3.2)	2.2 (1.6 to 2.8)	3.3 (2.4 to 4.1)	1.1 (0.7 to 1.6)	2.1 (1.6 to 2.6)
Control area									
Total	2.6 (2.3 to 3.0)	1.3 (1.0 to 1.5)	2.0 (1.7 to 2.2)	1.2 (0.6 to 1.8)	2.2 (1.2 to 3.3)	1.6 (1.0 to 2.1)	3.2 (2.1 to 4.4)	0.4 (0.1 to 0.8)	1.7 (1.2 to 2.3)

Post-intervention injury rates

In the control area, no statistically significant post-intervention changes in injury rate were observed (table 3). In the intervention area, the aggregate-level injury rate following the intervention decreased significantly only among male members of households in which the vocationally important member was employed ($p = 0.011$). No statistically significant change in injury rates was observed in the intervention area for female members of any household type. When comparing the rate changes between the intervention and control areas, the same tendencies in injury patterns were observed as in the intervention area alone. However, the differences in changes in injury rate between intervention and control areas following the intervention were not statistically significant.

No statistically significant change was observed in the intervention area regarding the rates of injuries sustained when participating in individual sports activities (table 4). However, a statistically significant decrease was observed in injuries sustained when participating in team sports among members of households in which the vocationally important member was employed ($p<0.01$) or self employed ($p<0.05$), but not in households in which the important person was vocationally inactive.

DISCUSSION

An evident weakness in the design of the present study is that it is not based on a randomised selection of intervention and control areas. Therefore, a set of confounding factors was prospectively followed in both communities. Confounders that possibly influenced the results and were not followed include, for example, differences in alcohol consumption and number of immigrants. Retrospective analyses of the latter aspects using official statistics from each area did not show differences between the areas or unusual rates. The number of recent immigrants was very low in both communities at the time of this study. Hence, although a randomised experiment is the preferable method for evaluating community based injury prevention, the present observations correspond with previous studies which suggests that quasi-experimental approaches using cohorts can provide realistic appraisals of effectiveness.[16]

Table 3 Rate per 100 person-years (95% confidence interval) of individuals injured while performing sports activities in 1989, change in rates between 1989 and 1983/84 (95% confidence interval) in intervention and control areas, and differences in changes between intervention and control area rates (95% confidence interval) displayed by sex and household relationship to the labour market

	Employed			Self employed			Not vocationally active		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
Intervention area	3.0 (2.8 to 3.3)	1.4 (1.2 to 1.6)	2.2 (2.1 to 2.4)	2.2 (1.4 to 3.0)	1.5 (0.7 to 2.4)	2.0 (1.4 to 2.5)	3.1 (2.3 to 3.9)	0.9 (0.5 to 1.3)	2.0 (1.5 to 2.4)
Change from 1989 to1983	−0.5 (−1.0 to −0.1)	−0.2 (−0.5 to 0.1)	−0.4 (−0.6 to −0.1)	0.0 (−1.1 to 1.0)	−0.7 (−2.0 to 0.6)	−0.3 ?(−1.1 to 0.6)	−0.2 (−1.3 to 1.0)	−0.3 (−0.9 to 0.4)	−0.2 (−0.8 to 0.5)
p value	0.011	0.262	<0.01	0.959	0.293	0.520	0.790	0.433	0.639
Control area	2.5 (2.2 to 2.9)	1.1 (0.8 to 1.3)	1.8 (1.6 to 2.0)	2.1 (1.3 to 3.0)	1.8 (0.9 to 2.8)	2.0 (1.4 to 2.7)	2.2 (1.3 to 3.1)	0.7 (0.2 to 1.2)	1.4 (0.9 to 1.9)
Change from 1989 to 1983	−0.1 (−0.6 to 0.4)	−0.2 (−0.5 to 0.1)	−0.2 (−0.4 to 0.1)	1.0 (−0.1 to 2.0)	−0.4 (−1.8 to 1.0)	0.4 (−0.4 to 1.3)	−1.1 (−2.5 to 0.4)	0.3 (−0.4 to 0.9)	−0.3 (−1.1 to 0.4)
p value	0.702	0.202	0.295	0.069	0.593	0.329	0.139	0.384	0.413
Differences in change of rate	−0.4 (−1.1 to 0.2)	0.0 (−0.4 to 0.5)	−0.2 (−0.6 to 0.2)	−1.0 (−2.5 to 0.5)	−0.3 (−2.2 to 1.6)	−0.7 (−1.9 to 0.5)	0.9 (−0.9 to 2.8)	−0.5 (−1.4 to 0.4)	0.2 (−0.8 to 1.2)
p value	0.158	0.841	0.309	0.195	0.752	0.252	0.333	0.243	0.759

Table 4 Rate per 100 person-years (95% confidence interval) of individuals injured while performing team and individual sports in 1989 and change in rates between 1989 and 1983/84 (95% confidence interval) in the intervention area displayed by sex and household relationship to the labour market

	Employed			Self employed			Not vocationally active		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
Team sports	1.9 (1.6 to 2.1)	0.5 (0.4 to 0.6)	1.2 (1.1 to 1.3)	0.7 (0.2 to 1.1)	0.1 (−0.1 to 0.4)	0.5 (0.2 to 0.8)	1.8 (1.2 to 2.4)	0.4 (0.1 to 0.6)	1.1 (0.7 to 1.4)
Change from 1989 to 1983	−0.6 (−0.9 to −0.2)	−0.1 (−0.2 to 0.1)	−0.3 (−0.5 to −0.1)	−0.5 (−1.1 to 0.2)	−0.6 (−1.2 to 0.0)	−0.5 (−1.0 to 0.0)	0.0 (−0.9 to 0.9)	0.0 (−0.4 to 0.4)	0.0 (−0.5 to 0.5)
p value	0.001	0.482	<0.01	0.197	0.06	<0.05	0.959	0.936	0.947
Individual sports	1.2 (1.0 to 1.3)	0.9 (0.7 to 1.0)	1.0 (0.9 to 1.1)	1.5 (0.8 to 2.1)	1.4 (0.6 to 2.2)	1.4 (0.9 to 1.9)	1.3 (0.7 to 1.8)	0.5 (0.2 to 0.8)	0.9 (0.6 to 1.2)
Change from 1989 to 1983	0.0 (−0.2 to 0.3)	−0.1 (−0.3 to 0.1)	0.0 (−0.2 to 0.1)	0.4 (−0.4 to 1.2)	−0.1 (−1.2 to 1.1)	0.2 (−0.4 to 0.9)	−0.2 (−1.0 to 0.6)	−0.2 (−0.7 to 0.3)	−0.2 (−0.6 to 0.3)
p value	0.776	0.449	0.773	0.312	0.889	0.498	0.627	0.465	0.460

The observed pre-intervention sports injury rates are similar to those reported in other studies using similar definitions and routines for data collection.[1–3] One way to analyse the post-intervention injury rates is to use a socio-ecological framework[17–19] that visualises the modifying conditions and mediating mechanisms involved in the occurrence of sports injuries (fig 1). In this context, modifying conditions are social or environmental factors that independently impact on sports injury rates but are not influenced by planned interventions. The mediating mechanisms, in contrast, are factors influencing the individual's performance of sports activities and the occurrence of sports injuries which are potentially modifiable within the planned interventions. When applying the framework to the present results, the first point to be noted is that exposure data were not collected because the study involved the entire

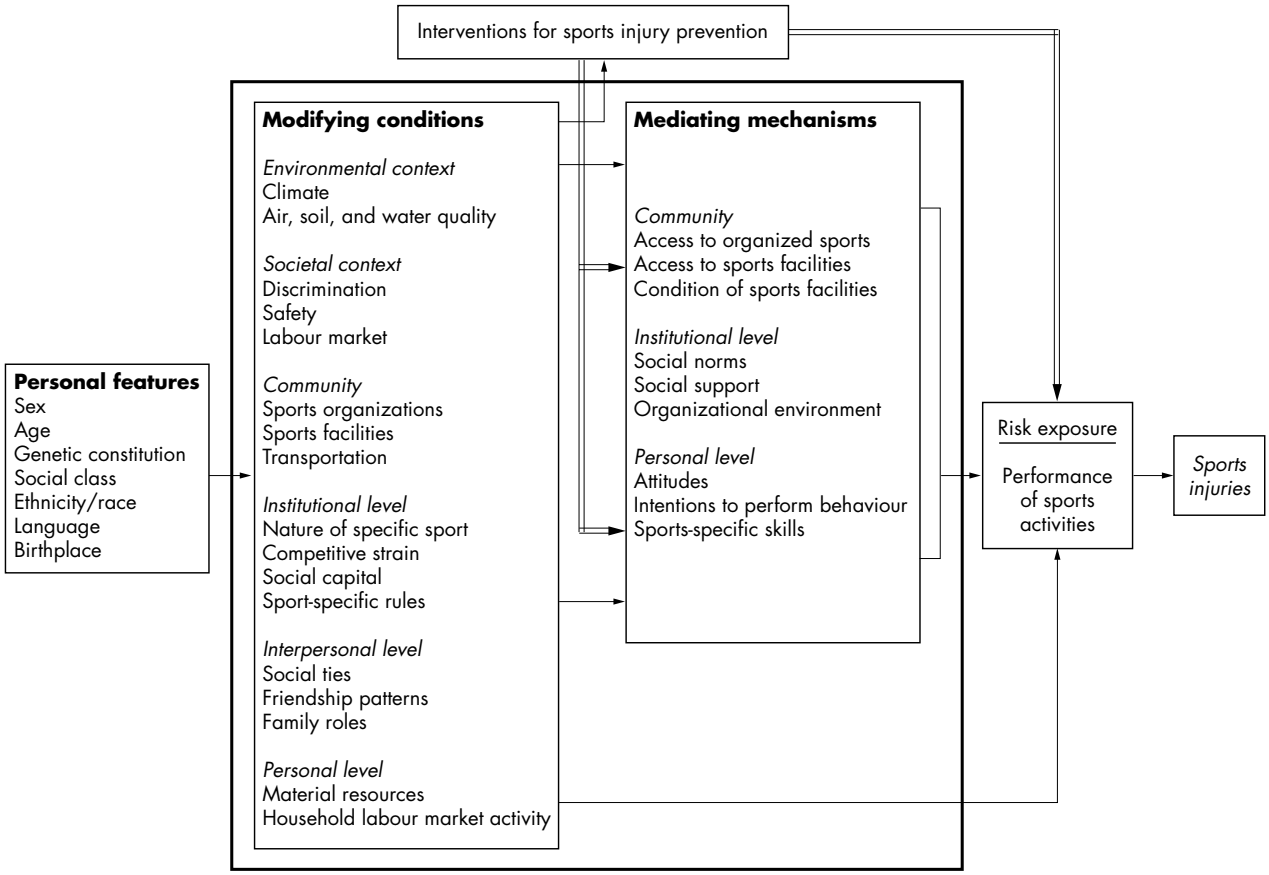

Figure 1 Socio-ecological framework displaying the modifying conditions and mediating mechanisms involved in the occurrence and prevention of sports injuries.

population below 65 years of age in both areas and the registration of daily sports activities at this level was considered to be impractical. Due to this lack of specific exposure data, which, however, is shared by most previous studies of sports injuries in the community,[1 2] it cannot be concluded whether or not the observed pre-intervention differences in injury rates between the household types, as well as differences between males and females, were based on variations in performance of sports activities or variations in genuine risks for sports injury. For example, the higher rate of injury in individual compared to team sports among women from households where the vocationally important member was employed can easily be explained by differences in exposure. It has recently been concluded that recording of exposure data is necessary to optimise preventive efforts and improve the comparability of studies in sports injury epidemiology,[20 21] and this study shows that attention to exposure issues is also a crucial component in the community setting. Nevertheless, due to the fact that the community-level participation rates in organised sports activities were recorded and were found not to have changed between the data registration periods, it is reasonable to assume that the analysis of pre- and post-intervention differences in injury rates is valid at the level of the study aims.

Regarding the post-intervention injury rates in the intervention community, the results indicate a decrease mainly among males from employed households involved in team sports. No statistically significant post-intervention changes were observed among females, those involved in individual sports, or members of vocationally inactive households. Using the socio-ecological framework to interpret these findings, it can be observed that both modifying conditions (household activity in the labour market, nature of specific sport) and a personal feature (gender) were associated with the intervention effect. This is disappointing in the context of the WHO Safe Community model, considering that it was hoped it would be effective for all individuals and in all community settings. Moreover, the framework emphasises that the design of the present study does not allow conclusions about whether or not the variances in intervention effects were due to certain groups not being exposed to interventions or not responding to these if they were exposed. One hypothesis is still that females and individual sports were less exposed to the intervention program due to the fact that inter-company team sports competitions, in particular ''Sunday soccer'', were identified as important high risk activities in the program design phase.[22] The successful intervention included ''fair play'' routines (for example, shaking hands with opponents before and after games), the compulsory use of protective equipment (such as shin pads in soccer), and mandatory warm up before games, but it applied mainly to males. That no effect was observed among those from vocationally inactive households performing team sports can be explained by the fact that they had insufficient material and social resources available, for example, to comply with the safety rule intervention, to buy new equipment, or be fully physically prepared for competitions.

In summary, this study reveals important areas requiring improvement in the civic network based WHO Safe Community model for sports safety promotion. A recent economic evaluation of the injury prevention program in Motala indicates that the intervention led to a reduction in societal costs related to sports injuries in the community (population 41 000) of 11% from 21.8 million SEK to 18.3 million SEK at the 1995 prices.[23] This study suggests that to increase effectiveness and equity, community based sports injury prevention programs should be based on interventions that are informed by local injury data not only stratified by age and gender, but also by social standing and participation in specific sport activities.

What is already known on this topic

As physical activity is promoted as part of a healthy lifestyle, sports injuries are becoming an important public health concern in many countries.

What this study adds

This study suggests that to increase effectiveness and equity, community based sports injury prevention programs should be based on interventions that are informed by local injury data not only stratified by age and gender, but also by social standing and participation in specific sport activities.

Authors' affiliations
T Timpka, K Lindqvist, J Ekstrand, N Karlsson, Linköping University, Linköping, Sweden

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