WHO Collaborative Study on Alcohol and Injuries:

Final Report

WHO Collaborative Study Group on Alcohol and Injuries

Department of Mental Health and Substance Abuse

Department of Injuries and Violence Prevention

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1 Introduction

Effective prevention of injuries depends on understanding the epidemiology. Forming an effective system of relevant data collection is vital to defining the nature and extent of the problem, identifying and evaluating risk factors, and setting priorities for policy development. Establishing and monitoring the involvement of alcohol in injuries is an important component of any surveillance system.

The WHO Collaborative Study on Alcohol and Injuries arose from a WHO meeting on the social consequences of alcohol use in Prague, Czech Republic, in May 2000, where participants concluded that the extent and magnitude of the role of alcohol in fatal and non-fatal injury is not yet well understood. New voluntary codes for recording alcohol (Y90 and Y91) had recently been included in the International Classification of Diseases, version 10 (ICD-10). This study presented an opportunity to test the validity of these codes as an international alcohol and injury recording system and examine their potential as a mechanism for establishing a routine alcohol surveillance system for emergency room attendees. The 2000 meeting agreed that the study would focus on alcohol involvement in injuries and would be based within hospital emergency rooms.

Emergency departments (EDs) were chosen because the population of non-fatally injured persons is well represented in these health care facilities; in most countries the emergency department deals with acute injury cases; the location fulfilled the study requirement of a short time span between the time of injury and subsequent assessment; and surveillance systems for non-fatal injuries are currently being planned in many EDs in developing countries (Poznyak and Bartolomeos, 2000; Holder et al., 2001).

The collaborative study set out to identify the role of alcohol involvement in non-fatal injuries among ED attendees in a number of developed and developing countries around the world.

This report presents the main findings. It includes the proportion of alcohol-related injury cases by participating country; details contextual issues such as patterns of alcohol consumption in countries; reports on the validity and reliability of the Y91 code, ICD-10, as a tool to assess and record the level of intoxication, and describes the responses to the feasibility of establishing the Y91 code as a routine tool within EDs.

This report is likely to be useful for alcohol and health policy makers, health system administrators, health professionals dealing with emergencies, first aid and emergency service managers, and alcohol and injury researchers.

1.1 Country partners

Twelve countries were involved in the study: Argentina, Belarus, Brazil, Canada, China, the Czech Republic, India, Mexico, Mozambique, New Zealand, South Africa, and Sweden. Summaries of the social context of alcohol consumption, the clinical setting, and specific methodology issues are reported in each country's individual reports (available from WHO).

1.2 Brief literature review

The alcohol-related burden of disease is considerable, accounting for 4% of the global burden of disease in Disability Adjusted Life Years (DALYs) worldwide (Ezzati et al., 2002; Rehm et al., 2003). Injuries are responsible for a large part of this burden.

In recent years, it has been increasingly recognized that alcohol consumption plays a part in both the number and severity of injuries.

A significant proportion of vehicle crashes, unintentional injuries (like falls, drowning and burns), suicide and interpersonal violence have also been found to be attributable to the acute effects of alcohol. One of the most serious aspects of alcohol-related trauma is that it disproportionately affects younger people, and particularly young men (World Health Organization, 2000).

Whereas a substantial amount of literature exists reporting the association of alcohol and injuries, causal associations are less well established. Apart from some progress in research on traffic-related injuries, only a few studies to date have attempted to answer this question (Roizen, 2003).

Population-based research on alcohol and injury is essential in assessing the bias of hospital-based studies. However,

> "Most empirical studies of injury and alcohol do not ask the important questions, 'What percentage of these injuries can be attributed to alcohol?' or 'How important a contributory cause is alcohol to injury?'" (Roizen, 2003)

1.2.1 Emergency department research

A large number of ED studies have been carried out throughout the world examining the role of alcohol in injury presentations to EDs (United States of America: Cherpitel, 1989; Degutis, 1998; Li et al., 1998; D'Onofrio, 2000; Maio et al., 2000; Mexico: Riley and Marshall, 1999; Borges et al., 2003a; 2003b; Canada: Cherpitel et al., 1999; MacDonald et al., 1999); England: Waller et al., 1998; Wright et al., 1998; Thom et al., 1999; Scotland: Wright and Kariya, 1997; Australia: Mcleod et al., 2000; Roche et al., 2001; Taiwan, China: Chen et al., 1999; and New Zealand: Robinson et al., 1992; Humphrey et al., 2003). There have also been national epidemiological studies (Cherpitel, 1994; Li et al., 1998; Mongold et al., 2001) which have illustrated the contribution of alcohol to the occurrence of injuries using national data sets.

The combined evidence from these studies suggests that 10-18% of injured patients attending EDs are alcohol-related cases. In addition, many of these studies show that young people and males are over-represented in the alcohol-related figures. More recently there have been meta-analyses of ED studies from different countries (Cherpitel et al., 2003a; 2003b; 2003c). Broadly, these meta-analyses examined similarities and differences between individual emergency department studies, they analysed the extent to which contextual variables may help explain, for example, effect size differences for blood alcohol concentration (BAC) and self report alcohol consumption, and effect size differences for drinking pattern and problem variables. These analyses showed substantial variation in the proportion of positive BAC, those intoxicated and positive self-report between sites in the same region, between regions in the same country and between countries. These meta-analyses support earlier associations between both a positive BAC and self-reported alcohol consumption and an admission to an ED for an injury. Patients with violence-related injuries were significantly more likely to be BAC positive and to report drinking before the event than those with injuries from other causes (Cherpitel, 2003c).

Although the association of alcohol with injury events and different types of injury is well known, most of the above studies do not answer the question of how much alcohol contributes to the cause of an injury. Much recent hospital-based research includes only a small number of possible explanatory variables, partly a reflection of the limited time available for interviewing new ED admissions (Roizen, 2003). Petridou et al. (1998), Vinson et al. (1995) and Borges et al. (2004b) have used a case-crossover design to investigate its contribution while Mcleod et al. (2000) used a case control methodology. All these studies found a positive relationship

between alcohol consumption and risk of injury. This risk increased with an increase in quantity of alcohol consumed on the day of the injury.

Some studies have found that non-injured ED patients were more frequently heavy drinkers than people in the general population of the catchment area, as they might seek treatment for acute alcohol consumption or chronic use. This means that comparisons of injured ED patients with non-injured ED patients are likely to lead to conservative estimates of the risk of alcohol-related injury (Cherpitel, 2003c). This recent meta-analysis found no significant differences in the prevalence of alcohol use disorders between injured and non-injured ED patients. In addition to examining the proportion of alcohol-related injury and attempting to demonstrate causality, the large body of ED research also shows that alcohol-related injury patients are also more likely to report heavy alcohol consumption patterns, have experienced prior alcohol-related problems or injury and are less likely to use health care services other than EDs.

The pattern of males and young people utilizing emergency services as their main point of health care contact is also reported in other studies (Beland et al., 1998; Malone, 1995; Malone, 1998). These results suggest that the ED may provide a potential source of routine alcohol-related harm data on these population groups which otherwise do not use health services.

Many factors may bias findings in ED studies, including the severity of patient injury, the type and location of emergency services, the age range of patients, access issues for the surrounding population, the length of data collection, seasonal variation, the length of time between admission to the ED and the BAC estimate, medico-legal requirements for alcohol-related injury, unmeasured drug use and completion rates. Those drinkers who are more severely injured are more likely to reach the ED sooner and therefore more likely to have a positive and higher BAC than those less severely injured drinkers who arrive later.

Data from EDs suggest that alcohol is significantly associated with increased risk of serious injury, but this is thought largely due to other factors associated with alcohol use, such as speeding, not wearing seatbelts or helmets and other risk-taking behaviour. A positive BAC in the ED does not necessarily mean a positive BAC at the time of the injury, as the patient may have been drinking in the meantime. Completion rates are frequently lower for BAC estimates due to patient refusals or other reasons possibly associated with alcohol use.

Findings from ED studies cannot be generalized beyond the EDs sampled and cannot be considered as representative of the larger area from which the injury cases come (Roizen, 2003).

1.2.2 Alcohol surveillance systems in EDs

The detection and recording of underlying problems is not a new concept to health professionals. In the case of smoking and respiratory illness or coronary heart disease both the disease and contributing features are reliably recorded in the medical notes and on the ICD coding forms. This does not happen in the case of alcohol, hence the need to develop and validate a system where the role of alcohol is routinely detected and recorded.

Research assessing the validity and reliability of screening tools for alcohol problems for use in the ED environment has grown over the last decade (Wright, 1996; Bradley et al., 1998; Degutis, 1998; Cherpitel, 2000; D'Onofrio and Degutis, 2002). However, there has been resistance to the routine use of screening (Thom et al., 1999; D'Onofrio, 2000). Furthermore, the purpose of utilizing the alcohol problem screening tools is to identify patients who may require an alcohol intervention. As such the contribution of the information to an alcohol surveillance system has not been fully recognized.

Research investigating the validity and reliability of a clinical assessment of alcohol intoxication is scarce. Two studies by Honkanen and Smith (1991) and Teplin and Lutz (1985), examined the reliability of clinical assessments for alcohol intoxication by using a breathalyser to validate the assessment. Honkanen and Smith (1991) concluded that clinically assessing the level of intoxication was not reliable. However, the study by Teplin and Lutz (1985) reported a high degree of correlation between the assessment and the BAC. Despite this finding there has been little recent research into this area.

In summary, given the large body of research reporting the extent to which alcohol is a factor in injury cases attending the ED, the potential of developing a reliable and valid alcohol-related injury data collection system for use in EDs based on a clinical assessment is great. The information gained could contribute valuable knowledge which is essential to the planning, implementation and evaluation of alcohol-related injury prevention strategies (Holder et al., 2001). However, given the dynamic nature of EDs, current research highlights that for any instrument to be utilized in the ED it needs to be "*administered quickly [and] easily incorporated into routine hospital procedures"* (Thom et al., 1999, p.910).

2 Study objectives and design

The specific objectives of the study were:

1. To describe the proportion of alcohol-related injury among the study sample of injury cases attending selected emergency departments (EDs) during each study partner's research period.
2. To examine the validity of the Y91 code, ICD-10, by comparing the observational rating with a breath alcohol reading, using a validated breath alcohol analyser machine.
3. To examine the data according to the context in which drinking occurred prior to the injury, including violence-related, and other variables (e.g. location, frequency, quantity) and the association of patterns of drinking with injury.
4. To describe the feasibility of establishing the Y91 code, ICD-10, as a reliable and valid alcohol-related injury data source.

In order to attain these objectives, the WHO Collaborative Study on Alcohol and Injury included four major components:

- A trial of Y91 coding for assessment and recording of alcohol intoxication in EDs;
- Quantitative survey among ED attendees using a specifically designed questionnaire;
- Qualitative study of current local system of assessment and recording alcohol involvement in injuries.

2.1 Study cities and site descriptions

Table 1 presents details on the study sites as well as a description of where the study was conducted and the size of the population that the ED covered.

Table 1. Study centre cities and study centre ED site description

Country	City	ED site description	Population served
Argentina	Mar del Plata	Inter-county hospital	1,129,332 (2002)
Belarus	Minsk	Regional trauma centre	347,259 (1999)
Brazil	São Paulo	Large trauma hospital serving citywide	265,566 (2001)
Canada	Orangeville, Ontario	Major area hospital	100,000
China	Changsha	Large general hospital	441 persons/sq km
Czech Republic	Kralovske Vinohrady, Prague	Large central city hospital	300,000
India	Bangalore	Large general hospital	2,979 persons/sq km
Mexico	Mexico City, South	Large general hospital	581,000
Mozambique	Maputo	Large state hospital	1,400,000
New Zealand	Auckland	Large central city trauma hospital	345,768
South Africa	Cape Town	Second level state hospital	707,346
Sweden	Malmö	Large general hospital	250,000

3 Methodology

3.1 Study design

A prospective cross-sectional study design was used to collect injury data from patients.

A case-crossover methodology[1] (Maclure, 1991) was used by 10 of the participating study centres (Argentina, Belarus, Brazil, Canada, China, Czech Republic, India, Mexico, New Zealand, Sweden) to assess the magnitude of the association between alcohol and injury (relative risk). The case-crossover design has been applied to studies of substance use (Wu and Anthony, 2000) including the impact of acute alcohol use on injury (Vinson et al., 1995; Vinson et al., 2003a,b; Borges et al., 2004a,b) and attempted suicide (Cherpitel et al., 2004). In the case-crossover design, each case event is classified as exposed or unexposed in the hazard period prior to the event (e.g. an injury) and is compared to a prior time-window of exposure.

3.2 Sampling frame

The study protocol determined that a proportionate sampling design that reflected the consecutive arrival of patients to the ED was most appropriate for the study. As there was no reason to assume that people arrived within a shift in a particular order this gave similar results to a random sample, and was most suitable to the practical requirements of the EDs.

The advantages of a proportionate sampling design over disproportionate sampling are:

- it is simple and therefore there is less room for error in the field;
- it yields the requisite number of cases;
- it minimizes difficulties for cross country comparative analyses;
- it caters for busy emergency departments;
- it minimizes missed potential participants;
- the sample is self-weighting which means that the analysis is more straightforward which is important when analyses are being done in several centres.

However, given the differences between the ED environments in each country setting, some countries modified the sampling frame to better reflect their specific study site environment. Table 2 documents the sample frameworks used by each of the participating sites for this study. For the purpose of the analysis, these differences were controlled for, where appropriate. A full explanation of this process can be found in the analysis section 5.1 Data set construction).

[1] This methodology was developed for studying transient effects on the risk of acute events to assess changes in risk of an acute event during a hazard period. The case-crossover design also avoids control selection bias as each case serves as its own control and therefore sample numbers need not be as large (Maclure, 2000). Furthermore, the nature of the transient event can make finding appropriate controls, if using a case control study, difficult and potentially very costly and as such it has been argued: "*the people best representative of the population base that produced the cases are the cases themselves*" (Marshall, 1993).

Table 2. Sampling differences between participating study centres

Country	Sampling frame
Argentina	Every eligible patient included from alternative 24-hour periods and every day during weekends
Belarus	Every eligible patient included using a proportionate sample framework based on work shifts
Brazil	Every eligible patient included during study time frame
Canada	The six-hour rule (i.e. only patients included whose injury had occurred within six hours) was waived; Every eligible patient included using a disproportionate shift frame work: first two weeks included all shifts, last four weeks sampled all days but only between 08:00 and 24:00
China	Every eligible patient included during study time frame
Czech Republic	First five weeks every eligible patient included (24/7), following four weeks every eligible patient on alternative 24-hour periods
India	Every eligible patient from 08:00 to 20:00 for nine days, then every eligible patient (24/7) for 37 days, then 20:00 to 08:00 for nine days
Mexico	Every eligible patient included during study time frame
Mozambique	Every eligible patient included during study time frame
New Zealand	Every second eligible patient included and an extra Saturday and Sunday sampled
South Africa	Every eligible patient included using a disproportionate sample based on an idealized week concept (one week shift pattern, collected over a four week period) plus oversampling on weekends; The number of sessions was increased in the last four weeks to ensure that target of 500 subjects reached
Sweden	Every eligible patient included during study time frame

3.3 Data collection periods

The processes which each participating centre used to enable the study to be undertaken meant that the data collection periods were different. The total study period extended from December 2000 (New Zealand) to February 2002 (Mexico) (Table 3). The role of seasonality has not been controlled for although reference to its potential effect is noted in the results where appropriate.

Table 3. Data collection periods by participating study centres

	2000	2001												2002	
Country	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Argentina															
Belarus															
Brazil															
Canada															
China															
Czech Republic															
India															
Mexico															
Mozambique															
New Zealand															
South Africa															
Sweden															

3.4 Data collection instruments

3.4.1 Questionnaire

The questionnaire for the interview with injured patients was developed collectively by WHO and the investigators. The interview took between 10 and 30 minutes to administer.

The version used for the study was Version 1F for data collected between January 2001 and June 2001, and Version 1G for data collected after June 2001. The differences between 1F and 1G were in formatting rather than content or context. New Zealand used an earlier version of the questionnaire which was similar in content, but there were several questions that were not included (e.g. RAPS4) or were modified in later versions (e.g. violence associated with injury).

The questionnaire (1F and 1G) consisted of the following framework:

- Section A: Registration/recruitment form
- Section B: Screening, including consent and time of injury
- Section C: Observational assessment [2]
- Section D: Breath alcohol test
- Section E: Injury questionnaire, including injury location and violence questions
- Section F: Drinking prior to injury, including questions on how much more alcohol would have been consumed if the injury had not happened
- Section G: Typical drinking, including RAPS4 assessment
- Section H: Drinking one week before (case-crossover)
- Section I: Demographic information, including education and income
- Section J: Non-interview (recording why an interview was not conducted)
- Section K: Interview complete (recording interview length and number of contacts)

The final questionnaire may be downloaded from the internet at www.who.int/substance_abuse/activities/injuries/en/.

Countries were allowed to make small modifications to the questionnaire in order to ensure cultural appropriateness and to respond to specific ethical requirements.

Examples of the modifications made included those to the type of beverage and location which reflected the local context. Sweden changed the order of the questions in the questionnaire as a consequence of their pilot study findings. Argentina and Mexico did not modify the questionnaire but added drug questions (not part of this study) and Mozambique excluded Section G on the typical drinking patterns. The reason for this exclusion is reported in their Study Centre Report available from WHO. Table 4 documents the specific questionnaire modifications made by each participating study centre.

[2] Section C was separated from the actual questionnaire during the study with the clinician (doctor, nurse, other) conducting the assessment

Table 4. Variations in patient injury data collection by country

Country	Modifications to the questionnaire
Argentina	No modifications except for drug related questions added to the questionnaire
Belarus	Small changes in terminology of locations of drinking to accommodate local and cultural understanding
Brazil	None
Canada	None (however, participants not restricted to six-hour rule)
China	Drink quantity changed to local unit of measurement
Czech Republic	Small modifications to the type of beverage were made based on local variations
India	Modifications to the type of beverage were made based on local variations
Mexico	No modifications except for drug related questions added to the questionnaire
Mozambique	Section G (questions about typical drinking pattern) was omitted
New Zealand	Participants who had previously visited the ED for an injury were asked whether alcohol had been involved in this/these visit/s; RAPS4 questions were excluded
South Africa	Section H (case-crossover part of the study) was excluded
Sweden	The order of the questionnaire sections was changed after a pilot study to allow for specific injury questions (section E) to be asked by the nurse conducting the clinical assessment rather than by the field researcher

3.4.2 Assessing alcohol involvement using the Y91 code, ICD-10

A person is said to be under the influence of alcohol when the quantity of alcohol consumed exceeds the tolerance (metabolism or elimination) for alcohol and produces impairment in the person's mental and physical ability. The effects of alcohol vary widely from person to person and several factors can account for these differences e.g. alcohol consumption history, body fat content and body water content, and the presence of liver disease and other medical conditions (Greeley and McDonald, 1992). The scale of effect alcohol has on a person is therefore impacted on according to these and other factors. For the purpose of this study the following scale (Table 5), with corresponding expected effects, was used to match clinical observation assessment (Y91 code) with BAC reading.

Table 5. BAC reading matched to Y91 code levels

BAC reading (g/100ml) **(matched to Y90 code for blood alcohol level)**	**Clinical level of intoxication (Y91, ICD-10)**
0.010-0.059 (Y90.0-90.2)	None
0.060-0.099 (Y90.3-90.4)	Y91.0 Mild alcohol intoxication
0.100-0.199 (Y90.5-90.6)	Y91.1 Moderate alcohol intoxication
0.200-0.299 (Y90.7-90.8)	Y91.2 Severe alcohol intoxication
0.300- …… (Y90.8)	Y91.3 Very severe alcohol intoxication
Alcohol involved, not otherwise specified	Y91.4 Alcohol involvement, not otherwise specified

An observational assessment form (Section C of the questionnaire) was developed by WHO and the participating study centres. It was based on the Y91 coding levels of ICD-10. Two forms were developed: the standard observational assessment and the rapid observational assessment (QC-A).

The standard observational assessment was used by all study centres. This form was designed to include clinical signs and an alcohol severity/prominence indicator matrix. The assessor was expected to complete the matrix and then to compute the observational assessment code dependent on the matrix outcome.

The rapid observational assessment (QC-A) distributed the clinical signs and severity/ prominence indicators under the predetermined five categories of the Y91 code. Allocation of specific indicators was determined according to the standard observational assessment matrix. Allocation of an assessment code was determined according to at least three signs being present within that category. Not all study centres used the QC-A.

The study protocol initially suggested that medical doctors should conduct the alcohol assessment. However, during the planning process for this study it became evident that each study centre had a different triage system and therefore in some cases other professionals were better placed to undertake the assessment. Table 6 documents the variations of personnel who conducted the observational assessments and which study sites used both the standard observational assessment and the rapid observational assessment (QC-A) forms.

Table 6. Variations in alcohol observation data collection by country

Country	Who conducted the standard observational assessment	Who conducted the rapid observational assessment (QC-A)
Argentina	Medical doctors	Not undertaken
Belarus	Physicians	Second field worker
Brazil	Junior doctors and nurses	Untrained health personnel
Canada	Triage nurse	Not undertaken
China	Senior doctors	Junior doctors
Czech Republic	Triage nurse	Nurses
India	Medical doctors	Doctors
Mexico	Medical doctors	Not undertaken
Mozambique	Junior doctor	Not undertaken
New Zealand	Not undertaken	Senior triage registered nurses
South Africa	Trauma unit doctors	Not undertaken
Sweden	Nurse	Not undertaken

3.4.3 Breath alcohol analysis

In order to assess the reliability and validity of the observational assessment (Y91 code) of alcohol intoxication, a breath specimen was obtained from the consenting participants and analysed using a validated breathalyser machine. A breath alcohol analyser instrument (breathalyser) closely reflects the blood alcohol concentration, since the alcohol level in the water vapour of the breath follows the alcohol level in the blood (Widmark, 1982).

The tests were carried out using approved breath alcohol analyser machines. New Zealand used a validated and calibrated Alcotec AR1005 breath alcohol analyser (the standard equipment used by the New Zealand police) and all other countries used the Alco Sensor III. All machines were calibrated and tested for accuracy according to the manufacturers' instructions.

As with the observational process, each participating country selected the professional who would be trained to collect the breath sample. This was to ensure operational, resource and cultural differences were taken into account. Table 7 documents the choice of professional in each study site.

Table 7. Professionals who conducted the breath alcohol analysis by study centre

Country	Who operated breathalyser equipment
Argentina	Field worker*
Belarus	Field worker*
Canada	Field worker*
China	Field worker*
Czech Republic	Field worker*
India	Field worker*
Mexico	Field worker*
Mozambique	Junior doctor
New Zealand	Nurse field worker*
South Africa	Field worker*
Sweden	Practical nurse (not fully trained). This was a condition of Ethics Committee approval as medical practitioners are required to note alcohol involvement on patients' notes.

*The background of the field workers differed by study centre although they were often reported as nurses or field researchers who were familiar with ED practices. All recruited field staff were trained for this study.

3.5 Key informant interview

Each study centre interviewed key staff, including ED heads, medical and nursing staff, and other ED health professionals and administrative staff. Some centres interviewed other informants, such as family members of injured patients and the police.

A semi-structured interview schedule for key informant interviews was developed in consultation with project partners and WHO, including:

- Current ED alcohol recording systems (formal or informal);
- Perceived importance of recording/reporting alcohol involvement in injury cases;
- Legal requirements for alcohol recording;
- Barriers to recording and reporting alcohol involvement;
- Enablers for introducing a systematic alcohol recording system;
- Perceived feasibility of introducing the Y91 code as an alcohol involvement recording system.

4 Data collection processes

4.1 Injury and alcohol data: inclusion/exclusion criteria

All patients were required to give informed consent prior to inclusion in the study. However, some individual sites, in consultation with their local ethics committees, decided to include unconscious and/or ventilated patients by obtaining permission from relatives or the medical doctor/superintendent of the hospital (individual country reports available from WHO).

A standardized data collection process was developed in collaboration with WHO and project partners. This process followed these steps:

- Patients entering the emergency department were first seen by the triage personnel (this role was undertaken by a variety of medical personnel, e.g. nurses, medical doctors, trainees) or an administrative person whose role was to collect patient details and enter them onto the hospital admission form (computer or hard copy).
- The field worker reviewed the electronic or hard copy documents and/or talked with the triage person to determine whether the patient was an injury case.
- If the person was identified as having an injury:

    1. Basic details (age, gender, time of visit, reason for visit, triage code) of all injury patients (from the computer or triage form) were entered into a study logbook.
    2. Potential participants were screened to ensure that

        a) the injury had occurred within six hours (six-hour rule); and

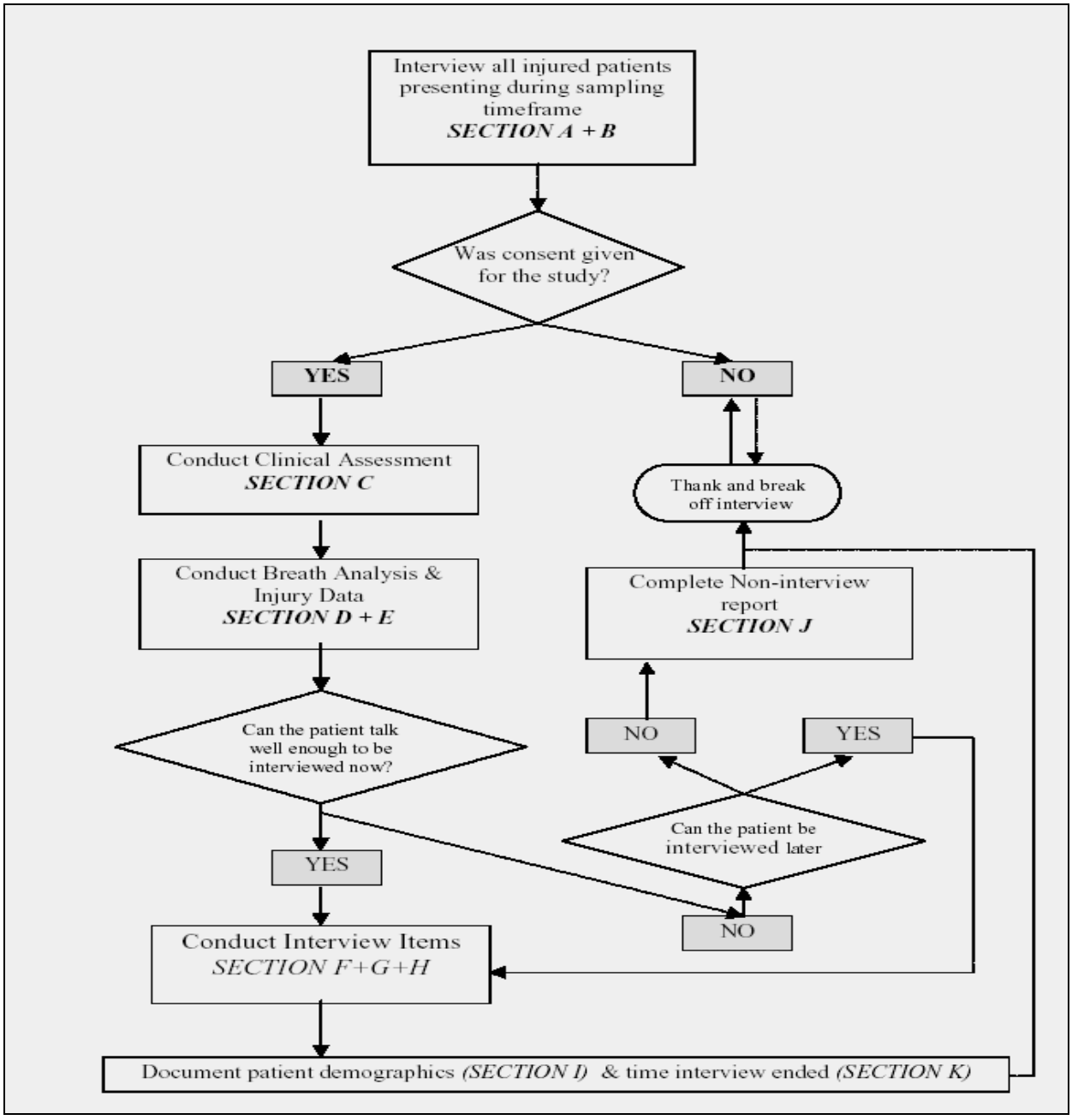
        b) this was the first time treatment had been sought.
    3. If eligible, patients were invited and recruited to participate in the study based on the sampling frame identified for each country (i.e. every case, every third etc).
    4. Immediately after agreement to participate, a breath sample was taken. Any difficulties or refusals were recorded.
    5. If possible, the questionnaire was administered at that same time.

4.2 Observational assessment of alcohol intoxication

The observational assessment of each injury patient was made at the time of the patient's entry to the ED or as soon thereafter as possible by the designated observer (medical doctor, nurse). The time and date were noted to conduct an agreement analysis.

The flow chart below (Figure 1) illustrates the injury patient recruitment and data collection process.

Figure 1. The injury patient recruitment and data collection process



4.3 Key informant data

A face-to-face interview, using a semi-structured interview schedule, was used to collect key informant data from relevant medical, nursing, and administrative staff and from ICD coders. Questions included current documentation of alcohol patients presenting, legal recoding requirements, the perceived extent of presentations that involved alcohol, barriers and aids to an alcohol recording system and identification of strategies that would increase the documentation and reporting of alcohol involvement.

4.4 Data collection instruments matched to research objectives

Table 8 shows how each of the data collection instruments related to the specific research objectives.

Table 8. Study objectives and related data collection instruments

Study objectives	**Data collection method**
1 To describe the proportion of alcohol-related injury among the study sample of injury cases attending selected EDs during the research period of each study centre.	BAC (blood alcohol concentration by breathalyser) matched to Y90 codes; Clinical observational assessment (using Y91 codes); Injured patient interviewer-led questionnaire.
2 To examine the validity of the Y91 code, ICD-10, by comparing the observational rating with a breath alcohol reading, using a validated breath alcohol analyser machine.	BAC; Clinical observational assessment; Self-assessment.
3 To examine the data according to the context in which drinking occurred prior to injury (including violence-related) and other variables (e.g. location, frequency, quantity) and the association of patterns of drinking with injury.	Injured patient interviewer-led questionnaire.
4 To describe the feasibility of establishing the Y91 alcohol code, ICD-10, as a reliable and valid alcohol-related injury data source.	Key informant interviews.

4.5 Definitions

4.5.1 Injury

For the purpose of this study the standard definition of "injury" is that used by WHO, i.e.

> "*Injuries are caused by acute exposure to physical agents such as mechanical energy, heat, electricity, chemicals, and ionising radiation interacting with the body in amounts or at rates that exceed the threshold of human tolerance. In some cases (for example, drowning and frostbite), injuries result from the sudden lack of essential agents such as oxygen or heat"* (Baker et al., 1984).

4.5.2 Mode/type of injury

Injuries can be defined or categorized in different ways. For the purpose of this study injuries have been categorized as follows:

- Unintentional (i.e. accidental);

- Intentional (i.e. deliberate):

  - interpersonal violence (e.g. assault, homicide, intimate partner violence, sexual violence);
  - self-directed violence or self-harm (e.g. deliberate overdose of drugs and alcohol, self-mutilation, self-immolation, suicide);
  - legal intervention (e.g. action by police or other law enforcement personnel);
  - war, civil insurrection and disturbances (e.g. demonstrations and riots);

- Undetermined intent (i.e. when it is difficult to judge whether an injury was inflicted intentionally or accidentally).

4.5.3 Alcohol-related injury

For the purposes of this study, an alcohol-related injury was determined as a positive self-report of alcohol consumption in the six hours prior to the occurrence of an injury or a positive breath alcohol analysis.

4.5.4 Explanations for other specific questions

Years of formal education

This question asked about years of formal education completed, starting with primary level education. If for example, a person dropped out in grade 11, only 10 years of formal education were completed. If a patient had tertiary education, such as a diploma or degree, the number of years each course needed was to be added to their completed years of school education, e.g. a two-year diploma would be 12 (primary and secondary) + 2 (diploma) = 14 years of formal education.

Income

The patient's monthly or annual income was requested, including whether it was income tax inclusive or exclusive (as appropriate). These figures were then coded into the following categories based on the average income by each of the study centres:

- very low
- low
- middle
- high
- very high.

These aggregate categories were used in the analyses to enable comparability across the different participating sites.

5 Analysis

5.1 Data set construction and participant selection

The data from each participating study centre was received in a range of formats. For each study centre a SAS data file was created and these were combined to form a combined data set for this study.

The differences in selection criteria between study centres and the additional investigations by some study centres meant that the data collected in the study centres was not uniform. The WHO Collaborative Study on Alcohol and Injuries: Registration, Screening, Assessment and Questionnaire, Version 1G document was used to select variables into the study data set.

A few additional variables were included, as follows:

- a field worker's assessment of alcohol intoxication (not the study-attributed assessor's);
- identifiers for each country and patient ; and
- variables describing differences in variables between sites, e.g. the different alcohol types that were asked in each country (question F07).

The selection criteria used to select participants into the study data set were the following:

1. The respondent must have consented to be in the study and have given no reason for not consenting, i.e. the answer to question B04 was "yes" and the answer to question B05 was missing.
2. The respondent must have sustained their injury within six hours of screening or the value was missing, i.e. the answer to question B01 was less than six hours or missing (six-hour rule).
3. The attendance at the ED was the first treatment for the injury, i.e. the answer to question B02 was "yes".

Selection criteria 2 allowed for missing values in the "time since injury" variable. This had two implications:

1) it allowed for the inclusion of the Swedish data set where these data were not supplied; and
2) there was a possibility that some of the patients included may have had their injury longer than six hours before screening.

The latter criteria was particularly pertinent for the Canadian study where researchers did not restrict the time between screening and injury, for their own investigations.

All participants who provided information and met the study inclusion criteria were used in the analyses.

Table 9 lists the data received from each study centre, the number of participants selected for inclusion into this study data set and selected participants with missing "time since injury" data. It also gives the minimum age for inclusion in each site. The minimum age of participants was determined by each study centre and was based on local ethical, legal and cultural considerations. Participants were not excluded from the study data set if they were below their study centre's minimum age for inclusion.

Table 9. Participant records received and participants meeting the selection criteria of the study

Country and Abbreviation		Participant Records Received	Participants meeting selection criteria	Participants included with missing time to injury data	Minimum Recruitment Age
Argentina	AR	475	452	5	18
Belarus	BE	520	510	0	15
Brazil	BR	518	496	1	18
Canada	CA	458	222	21	19
China	CN	560	559	1	15
Czech Republic	CZ	511	511	0	18
India	IN	658	556	0	15
Mexico	MX	489	456	0	18
Mozambique	MZ	501	488	0	15
New Zealand	NZ	166	160	6	15
South Africa	SA	503	503	0	14
Sweden	SW	501	497	497	18
TOTAL		5860	5410	531	

Table 10 lists the reasons why data of participants received from the study centres were not selected into the combined study dataset. Note that some study centres, for example China and the Czech Republic, provided data sets with relevant participants already excluded.

Table 10. Reasons why participants were not selected into the combined study data set

	Reasons for non-Inclusion[1]				
	Consent		Greater than 6 hours since injury	First Treatment	
	"No"	Missing		"No"	Missing
Argentina	1	12	4	2	11
Belarus	2	0	0	8	0
Brazil	22	0	0	0	0
Canada	64	67	112	6	61
China	0	1	0	0	0
Czech Republic	0	0	0	0	0
India	51	4	6	44	8
Mexico	31	0	0	2	2
Mozambique	9	2	1	1	2
New Zealand	0	0	5	1	0
South Africa	0	0	0	0	0
Sweden	1	0	0	0	3

notes:

1. There could be more than one reason for being excluded

Some study centres also excluded participants from their data sets before sending them to the coordinating centre in New Zealand. The reasons for the decision in each study centre to exclude participants from the data set sent to the coordinating centre are presented in Table 11. These data were amended to make them comparable between countries. Complete information was not always available, i.e. the number of participants who were excluded by the six-hour rule in Brazil is not known.

The most common reason for excluding patients was that their injury had occurred more than six hours before being screened (six-hour rule only allows for within six hours). Canada collected data on these patients anyway and reported on the differences between them and those participants whose injury was within six hours of screening. Their conclusions can be found in the individual country report (available from WHO).

Table 11. Reasons why study centres excluded participants from their data set

			Reasons for non-Inclusion			
	Participants contacted	Participants exluded	Not interviewed[1]	Consent not given	Greater than 6 hours since injury	Not the first treatment
Argentina	1288	813		40	773	
Belarus	1073	576		23	553	
Brazil				24		
Canada	588	120	95	23		2
China[3]						
Czech Republic[4]	762	299		26	258	15
India[2]	658			44		
Mexico	744	255			255	
Mozambique[4]	523	30		30		
New Zealand	273	107	44	63		
South Africa	803	306		32	272	2
Sweden[5]	1219	718		93	524	101

notes:

1: Potential participants intended for interview but missed. They may not have been eligible.

2: Patients exluded were in the data set received.

3: Figures not mentioned in the study centre report

4: Discrepency between data received and figures in report.

5. Then numbers given for non-inclusion were based on reported percentages.

Participants were not included in the study dataset if they did not give consent. There were two points where this data could be eliminated: 1) non-inclusion into the country data set and 2) non-inclusion into the combined study data set. If the participants had been removed before the data were sent to the coordinating centre in New Zealand, the information about the reasons for non-inclusion was recovered, where available, from the country report. Table 12 gives the reasons why potential participants did not give consent to participate and where this information came from (i.e. from the country report or data set).

Direct refusal by patients was reported as the main reason for non-inclusion by most of the study centres. New Zealand showed the greatest number of patient refusals while India reported "too severely injured" as the main reason for refusal (see individual country reports for explanations, available from WHO).

Table 12. Reasons for not obtaining selected participant's consent

Reasons for not obtaining consent	Argentina	Belarus		Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique		New Zealand	South Africa	Sweden
	Data[1,3]	Data[1,3]	Report[2]	Data[1,3]	Data[1,3]	Data[1,3]	Report[2]	Data[1,3]	Data[1,3]	Data[1,3]	Report[2]	Report[2]	Report[2]	Data[1,3]
Refused	0	1	18	11	37	0	12	8	12	2	16	53	5	0
Too severely injured	0	0	0	9	0	0	3	22	12	1	7	5	16	0
Patient Absconded	0	0	0	0	36	0	0	2	0	0	0	0	0	0
Unknown	12	0	0	0	0	1	0	13	1	3	0	0	0	0
Unable to locate Patient	0	0	3	0	14	0	0	0	0	0	0	0	0	0
Too Intoxicated	0	0	2	0	3	0	1	4	0	0	7	0	0	0
Language Barrier	0	1	0	1	0	0	0	1	1	0	0	4	0	1
Confused	0	0	0	0	2	0	9	1	1	0	0	0	0	0
Ventilated	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Other	1	0	0	1	39	0	1	4	2	5	0	1	11	0

Notes:

1. This information comes from the combined data set.
2. This information comes from the final report produced by the study centre.
3. Information compiled from questions B 05, and if that was missing, from question J 03 if available.

For various reasons, not all participants completed the questionnaire or were able to answer the alcohol consumption questions themselves. Table 13 reports, by country, the reasons why participants did not complete the questionnaire after consenting themselves to participate or having consent given by a relative. The most common reason was being "too severely injured" followed, about equally, by "refusal", "left ED" or being "too intoxicated".

Table 13. Reasons given by the interviewer for participants not completing the questionnaire or answering the alcohol consumption question themselves, by country

	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden
Reason												
Too severely injured to interview	2		4			0	5	0	0			0
Refusal or indirect Refusal	2		0			1	0	4	0			2
Patient absconded or left ER	2		1			0	1	0	0			3
Too intoxicated	2		2			0	2	0	0			0
Language barrier	0		1			0	0	1	1			0
Unable to locate patient	0		1			0	0	0	0			0
Other	0		0			0	0	0	0			9
Unknown	0		0			0	10	1	0			0

There are similarities in the reasons for refusal to participate in the study at all (Table 12) and reasons for not completing the questionnaire (Table 13).

5.2 Data set sample description

As illustrated in Table 3, the study centres collected their data at different periods from 2000 to 2002. Similarly, there are differences in the time of the day and the days data were collected. Figure 2 reports the time of the day when patients in each study centre were recruited (Section A, QA06). South Africa showed an excess of late night and early morning screening times which was probably due to over-sampling on weekends. China showed a large excess in evening and night screening times. The country report from China mentioned that injured people would attend the hospital of the study centre outside work hours and attend other clinics during work hours. Participants of the study in Brazil attended mostly during the day-time hours (08:00 to 20:00).

Although Canada sampled the time strata after 08:00 with higher probability, the screening times did not look very different compared to other countries. Time related data was not available in the Swedish data set.

Figure 2. Time at which patients in each of the study centres were screened

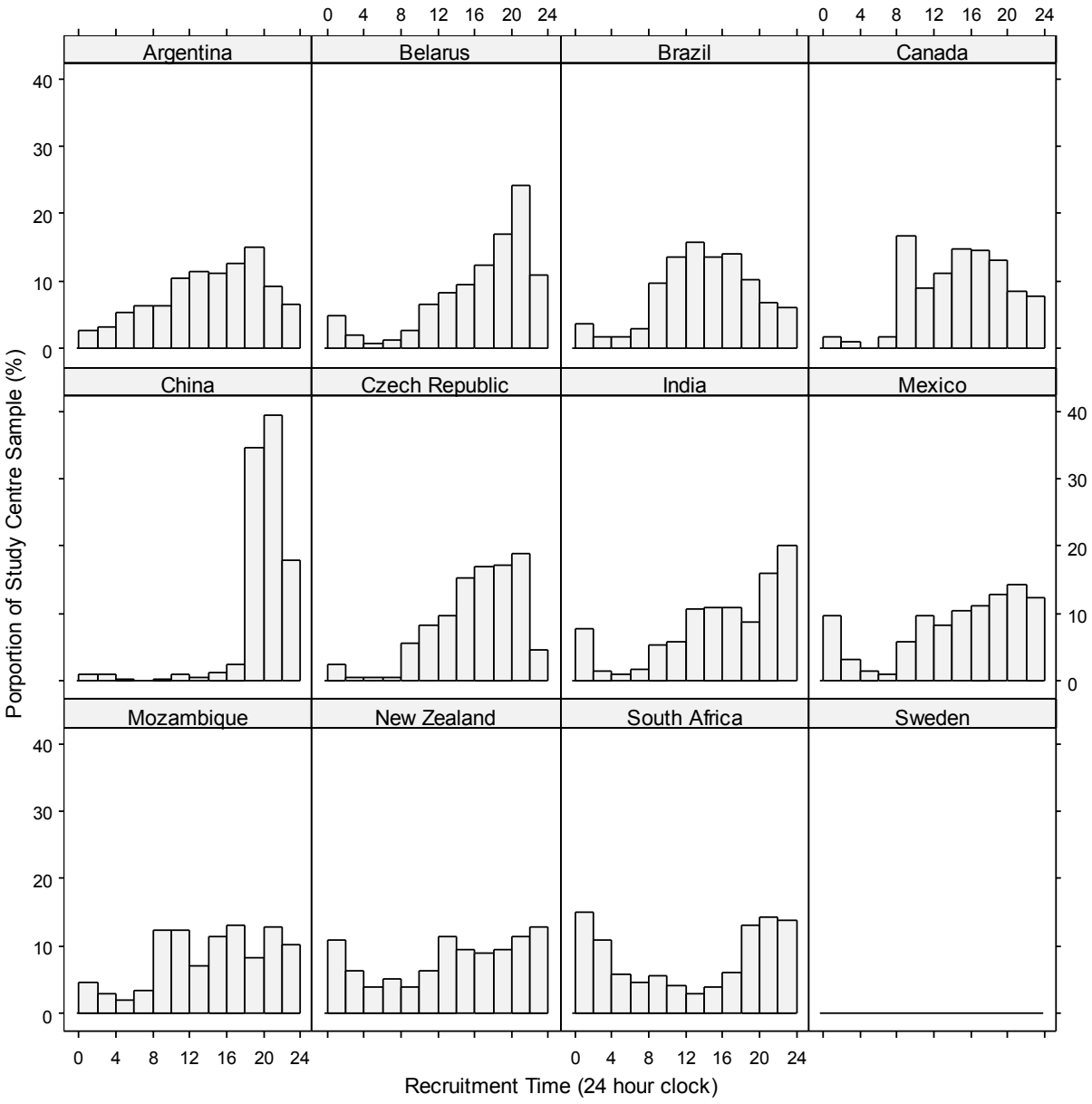
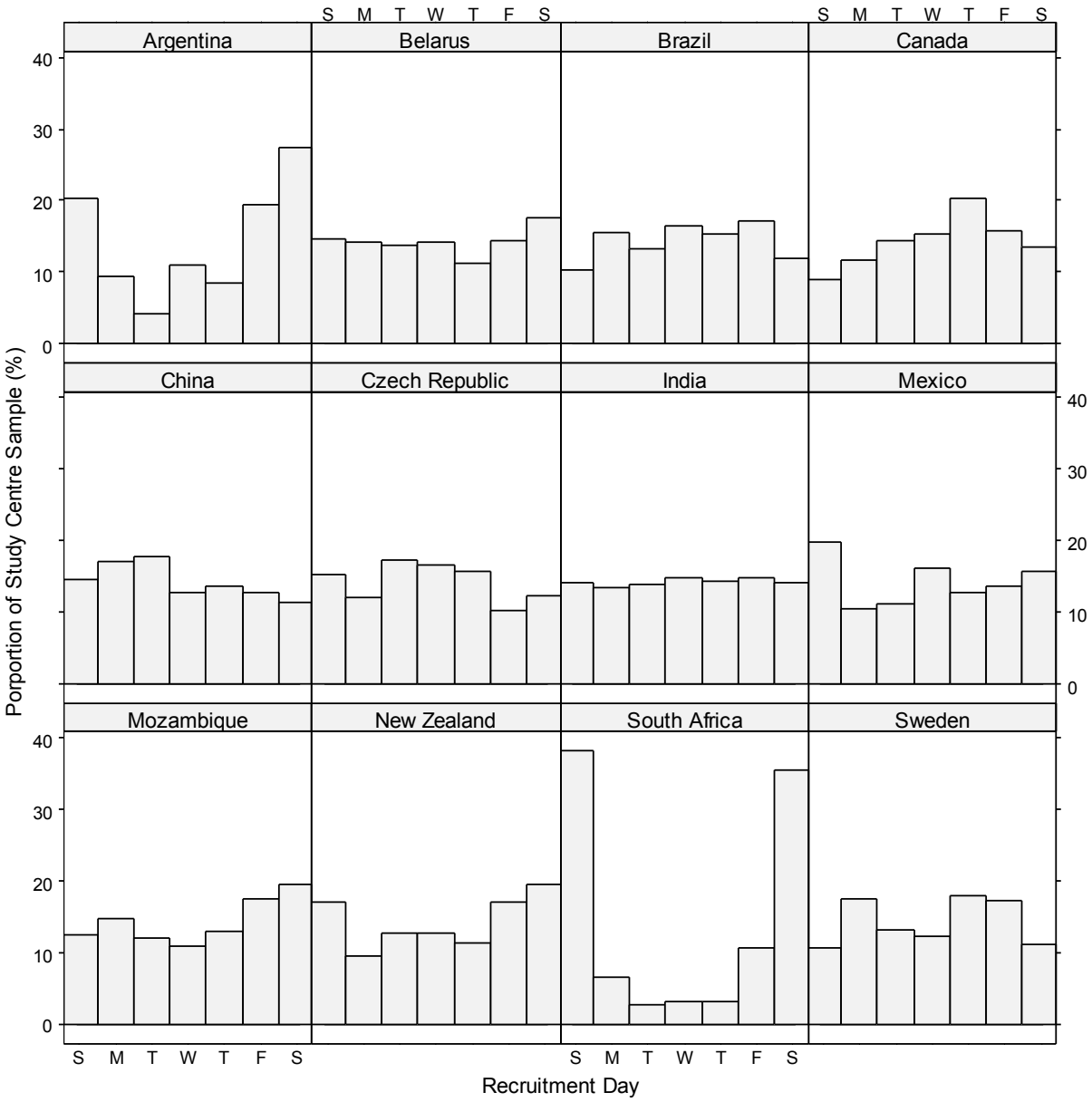


Figure 3 shows the day on which patients were recruited. South Africa showed the most obvious difference, with Saturday and Sunday far out-weighing the other days of the week. India showed the least difference with each day of the week evenly represented. Argentina over-sampled Fridays, Saturdays and Sundays. There is no consistent day on which injuries occurred most frequently across all study centres.

Figure 3: Days on which patients in each site were screened



5.3 Weighting for combined data set analyses

To make comparisons between the study centres possible, (see Table 2, Section 3.2 Sampling frame, for details of differences in sampling processes across study centres) data from some of the study centres had to be weighted. Argentina, Canada, New Zealand and South Africa sampled time strata at different rates and their data were adjusted with weights. Weights were normalized within each study centre.

The other study centres (Belarus, Brazil, China, Czech Republic, India, Mexico, Mozambique and Sweden) used self-weighting sampling methods with respect to the time strata and therefore were not weighted for the comparative analyses.

For each table in the results the number of participants answering the question will be given. For weighted data, even with normalization, the number of participants answering a question may not equal the sum of their weights. This occurs when there are missing values or when the question is only applicable to a subset of the participants. It is most apparent when there is a relationship between available data and the weights, e.g. South Africa over-sampled on weekends and those days are associated with increased likelihood of alcohol consumption.

5.4 Case-crossover data analysis

Two analytic strategies were used in the case-crossover analyses: the pair matching approach and the usual frequency approach (Borges et al., 2004b).

The usual frequency approach uses the quantity and frequency of drinking during the last 12 months to define the person-time at risk. Pair matching was performed comparing, for each patient, the reported use of alcohol during the six-hour period prior to the injury with the use of alcohol during the same time period the same day the previous week.

6 Results

The results presented in the text and tables are based on the weighted combined data set. Figures based on categorical data or continuous data which has been aggregated, with the objective to show relative proportions, such as histograms, will be based on the weighed data set. Figures based on continuous data, such as dotplots, where the objective was to show patterns, will be based on the unweighted data set. Plotting the unweighted data, although less preferable than graphing the weighted data set, was also used, as it is not easy to effectively show non-integer weights on figures. The results are presented according to the study objectives.

6.1 Objective 1. To describe the proportion of alcohol-related injury among the study sample of injury cases attending selected EDs during the research period of each study centre

Table 14 presents the demographic characteristics of the combined study sample by country. Males were the majority of study participants across all study centres, except for the Czech Republic and Sweden, where the proportion of male participants and female participants was similar. India and South Africa showed the greatest difference between the numbers of males and females.

The mean age across all countries ranged from 29 years (South Africa) to 48 years (Sweden). The top median interquartile range result indicated that three quarters of the total participants were aged 38 years or under for all of the country study sites, excluding Sweden.

Years of formal education ranged between the countries with a mean of five years in India to 14 years in New Zealand. However, the New Zealand data was collected as years of education after leaving high school and the total years of formal education was estimated in conjunction with that; it may be an over-estimate. The interquartile range was smallest for Canada with 3 years, and largest in India with 10 years.

Excluding China, 29% or more of the participants across the study centres were in employment of 30 hours or more per week.

In the majority of centres, those with very low to middle incomes were most at risk for alcohol-related injuries. In Brazil, Mozambique and Sweden, the vast majority of participants were in the low and very low income brackets.

Table 14. Demographic characteristics of the study population

Statistic	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden
Sex												
n[1]	451	510	494	222	559	511	553	456	487	160	503	497
Female (%)	32	39	33	38	29	45	25	40	28	36	24	46
Age												
n[1]	429	510	493	214	559	511	546	456	488	160	503	496
mean	35	35	35	41	33	40	31	34	30	37	29	48
stddev	16	16	16	17	13	18	11	16	12	18	11	22
median	30	32	30	38	30	35	28	29	27	32	27	44
interquartile range	23	24	21	22	17	27	14	19	14	21	14	38
Years of Formal Education[2]												
n[1]	426	510	481	220	559	508	551	452	473	150	497	481
mean	9	12	9	13	10	13	5	9	7	14	9	11
stddev	4	3	5	3	3	3	5	4	3	3	3	3
median	8	12	9	13	9	12	6	9	7	14	9	11
interquartile range	5	3	7	3	4	3	10	6	4	6	4	4
Working 30+ hours per week												
n[1]	431	510	468	220	536	508	517	453	482	158	503	482
working (%)	51	33	29	33	22	36	29	36	37	38	63	52
Distribution of Incomes												
n[1]	0	510	483	149	558	467	556	449	283	146	184	480
Very low (%)	0	13	13	13	5	8	7	14	25	6	15	42
Low (%)	0	13	56	17	25	13	22	20	49	10	76	32
Middle (%)	0	39	16	16	29	13	38	16	21	28	2	13
High (%)	0	30	6	17	2	6	0	13	3	25	1	1
Very high (%)	0	0	4	13	1	3	0	2	1	7	0	2
Refused (%)	0	3	1	24	24	48	33	2	0	17	6	2
Don't know (%)	0	2	4	0	14	10	0	33	1	7	0	8

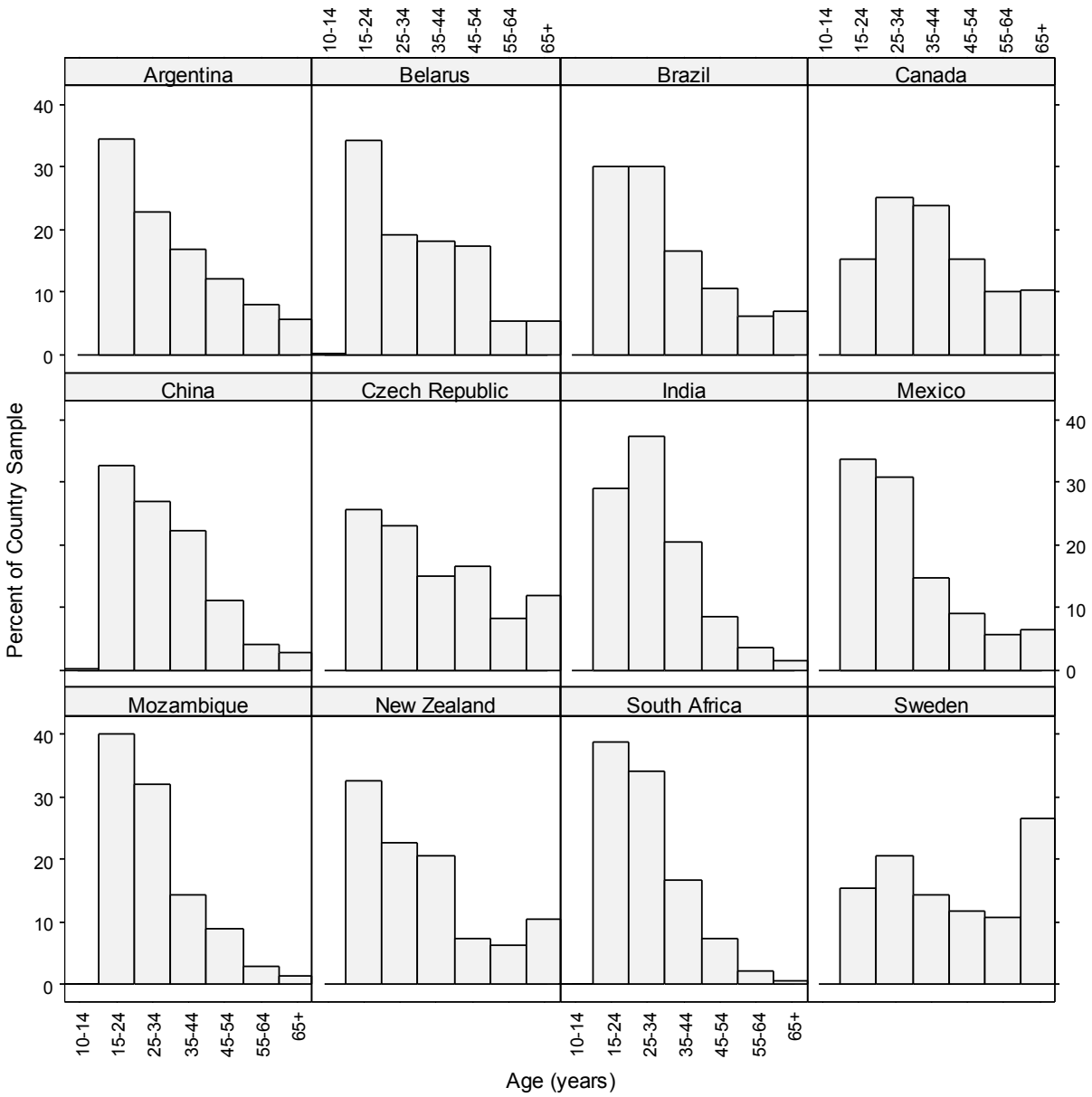
Notes:

1: n represents the number of people answering the question.

2 : New Zealand asked for years of post school education. Years of school education was calculated based on a starting age of 5 and a leaving age of 16 plus extra years when required for entering post school education. This is likely to be an overestimate as it does not include people who left school before legally allowed or account for increases in the legal leaving age over time.

Figure 4 illustrates the age distribution pattern of study participants across the study centres. It clearly illustrates that the majority of participants were under 35 years of age. Excluding Sweden and Canada, the age distributions from the remaining centres show a peak in the late teen and young adult age groups. In the case of Sweden, the distribution pattern is fairly flat with a peak among the 65+ years age group. The Sweden study centre was situated in Malmö and the individual country report highlighted that 18.4% of the Malmö population were 65 years or older (report available from WHO). The age distribution from the study centre in Canada presented a more normal distribution pattern.

Figure 4. Age distribution of each study population



The proportion of participants who had consumed alcohol within six hours of their injury varied from 6% in Canada to 45% in South Africa (Table 16). Males were over-represented among those participants for all the study centres. The largest contrast between male (m) and female (f) alcohol-related cases were in India (males=28%, females=3%), China (males=24%, females=3%) and Mexico (males=25%, females=5%).

Table 15. The proportion of participants who consumed alcohol within six hours of their injury by age and sex

Statistic	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden
Proportion drinking within 6 hours of injury												
n [1]	444	508	491	221	559	511	556	454	479	160	503	484
Drinking (%)	21	29	13	6	18	8	21	18	18	36	45	15
The proportion of participants within each age group who consumed alcohol within 6 hours of injury [2] (%)												
n [1]	421	508	488	212	559	511	546	454	479	160	503	483
< 25	25	34	17	11	10	8	11	25	10	39	35	25
25-34	17	38	13	7	19	9	23	21	21	49	51	15
35-44	23	27	9	5	31	8	32	9	13	35	53	10
45-54	24	18	19	9	21	8	30	10	28	31	41	24
54-64	24	32	7	0	0	10	5	0	29	28	31	19
65+	12	4	0	4	13	3	0	0	29	22	77	6
The proportion of participants within each sex who consumed alcohol within 6 hours of their injury (%)												
n [1]	442	508	489	221	559	511	553	454	478	160	503	484
Male	26	37	17	9	24	11	28	25	19	43	48	20
Female	11	17	4	2	3	4	3	5	8	28	30	9

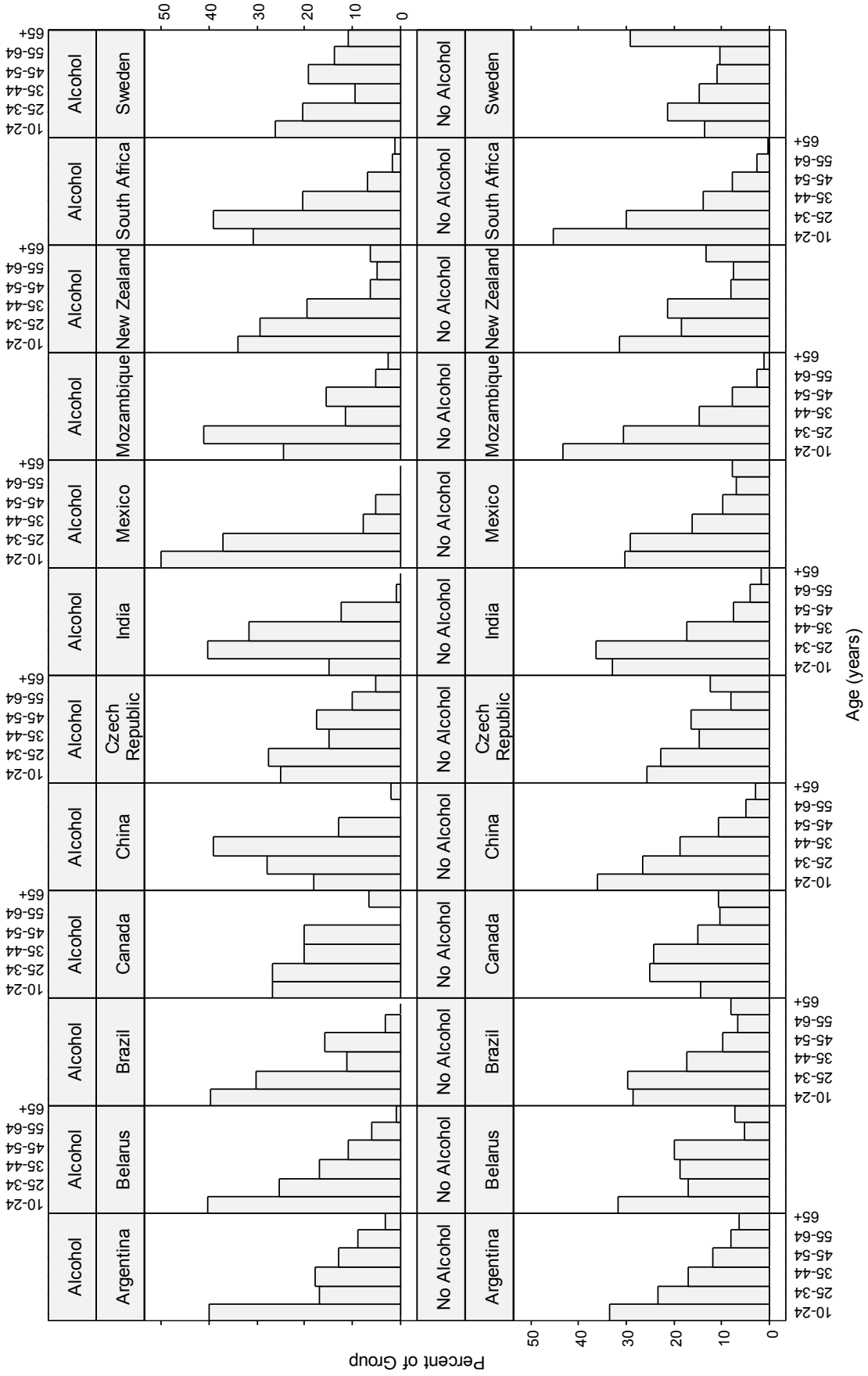
Notes:

1: n represents the number of people answering the question.

2: For New Zealand in the 45-54 age group, for Mozambique and New Zealand in the 55-64 age group and for India, Mozambique and South Africa in the 65+ age group there are less than 15 participants in the cell.

The age distribution between injury participants who consumed alcohol and those who did not, by country, are shown in Figure 5. For most of the countries those under 35 years old were the more likely to be represented in the injury (alcohol-related or not) data and the distribution patterns for alcohol-related and non-alcohol-related injury cases were similar. The age distribution in China was different in that the alcohol-related injury cases were more frequent among the 25-34 and 35-44 age groups than for non-alcohol-related injury cases.

Figure 5. Age distribution of those who had and had not consumed alcohol within six hours prior to injury



6.2 Objective 2. To examine the validity of the Y91 code, ICD-10, by comparing the observational rating with a breath alcohol reading, using a validated breath alcohol analyser machine

6.2.1 Analysis method

The study used three methods of capturing the level of alcohol intoxication: a self assessment recalling intoxication at the time of the injury, a BAC reading, and clinical assessment at the ED.

Cohen's kappa was used as a measure of agreement between BAC, clinical assessment and self-assessment of levels of intoxication as defined by the Y91 code, ICD-10. Two versions of kappa are reported here, simple kappa, which is a measure of exact agreement and weighted kappa, which gives some weight to assessments that are close but not exact.

Results are presented here for all participants providing information and the subset of participants with BAC readings greater than zero. The high proportion of participants with zero BAC levels, for whom it is assumed to be easy to assess their levels of intoxication, may obscure the difficulty of classifying participants who are intoxicated.

Table 16 lists the values of Cohen's kappa and the interpretation that will be used in this report.

Table 16. Kappa values and their agreement interpretation

Kappa Value	Interpretation
Below 0.00	Poor
0.00 - 0.20	Slight
0.21 - 0.40	Fair
0.41 - 0.60	Moderate
0.61 - 0.80	Substantial
0.81 - 1.00	Almost perfect

The study centres had different proportions of participants in each of the three categories of assessment, i.e. BAC reading, clinical and self-assessment of the levels of intoxication. These differences in marginal distributions meant it was not meaningful to directly compare kappa between study centres. A study centre with a high kappa may be fortunate to have participants at levels of intoxication that are easier to classify. Therefore, to compare kappa values across countries, the data were weighted so that one of the assessment variables had the same uniform marginal distribution across study centres. To make this possible, where there were sparse numbers of participants at the higher levels of alcohol intoxication within some study centres, the number of intoxication categories was reduced from five to three. However, even with this reduction, some study centres had very few participants in the higher categories of alcohol intoxication and these participants had high weight and were influential.

Repeated measures logistic regression was used to look at the association between achieving agreement between assessment variables and the type of assessment variables with BAC level, country, sex and age as confounding factors. A similar model was used to look at

the association between achieving agreement between assessment variables, and the type of assessment variables and time, with BAC level and country as confounders. The response was coded "1" if there was an agreement between each pair of assessment variables and "0" if there was not.

As before, figures that represent relative proportions are be based on the combined weighted data set. Figures used to show pattern are based on results using the unweighted data set.

Sweden measured their breath alcohol readings in g/l (rather than g/100ml). For those readings over one g/l, the readings were recorded on the form as 0.99g/l (as zero was the only acceptable non-decimal figure given on the form). In one case the correct reading was entered in another part of the form. For the purposes of the analyses all 0.99g/l readings were changed to 1.00g/l (equivalently 100mg/100ml) which effectively put all such cases in the moderate intoxication category rather than the slight intoxication category. This reclassification would put the actual reading closer to the true value but in some cases if may not be the correct classification. This reclassification was done for 11 cases. It is likely that the number of misclassifications was a much smaller figure.

6.2.2 Results

The proportion of participants with non-zero BAC (BAC>0 mg/100ml) readings ranged from 4% in Canada to 45% in South Africa (Table 17). Of the positive readings, Belarus had the highest positive BAC and the highest proportion of readings in the highest BAC level (level 4: very severe intoxication). After Sweden, the Czech Republic and then China had the lowest maximum readings.

Table 17. Range and distribution of BAC readings

Statistic	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden
Proportion of BAC readings in each BAC level (%)												
n[1]	450	509	485	206	526	463	556	420	477	143	503	380
Level 0	89	75	93	99	97	97	91	89	88	80	69	93
Level 1	3	5	2	0	2	1	6	4	3	9	16	4
Level 2	5	8	4	0	2	2	3	7	5	10	12	3
Level 3	2	8	1	0	0	0	0	1	4	1	3	0
Level 4	1	4	0	0	0	0	0	0	1	0	0	0
Proportion of non-zero BAC readings (BAC>0 mg/100ml)												
n[1]	450	509	485	206	526	463	556	420	477	143	503	380
Non-zero readings (%)	18	34	31	4	12	15	22	29	17	29	45	12
Statistics of non-zero readings												
n[1]	91	175	151	8	63	70	125	120	82	41	254	46
Median	93	133	2	32	23	2	50	13	117	86	88	66
Maximum	323	392	284	346	230	215	280	293	390	241	365	116

Notes:

1: n represents the number of people answering the question.

Agreement between BAC and clinical assessment of level of intoxication

The following table (Table 18) reports the levels of agreement between the BAC and the clinical assessment. The results clearly showed that the majority of countries had moderate levels of agreement between BAC and clinically assessed levels of intoxication. South Africa, with a kappa level of 0.55 had, by far, the best level of agreement. The weighted kappa statistic, which gives some value to near misses, was higher than simple kappa for every study centre, with South Africa having the largest value of 0.64.

Table 18. Measuring the agreement between BAC and clinical assessment of intoxication

Statistic	Argentina	Belarus	Brazil	Canada[5]	China[5]	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden	All
All													
n[6]	424	508	478	206	479	456	556	386	473	124	492	377	4959
Simple Kappa	0.39	0.37	0.46	0.25	0.38	0.21	0.30	0.45	0.44	0.41	0.55	0.48	0.42
ASE[1]	0.04	0.03	0.06	0.16	0.07	0.09	0.04	0.06	0.04	0.06	0.03	0.06	0.01
SDF 0[2,3]	***	***	***		***	*	***	***	***	***	***	***	***
Weighted Kappa[4]	0.57	0.51	0.53	0.60	0.46	0.31	0.35	0.54	0.55	0.51	0.64	0.58	0.54
ASE[1]	0.04	0.03	0.06	0.23	0.08	0.12	0.04	0.06	0.04	0.06	0.03	0.05	0.01
SDF 0[2,3]	***	***	***	*	***	**	***	***	***	***	***	***	***
BAC > 0[5]													
n[6]	86	175	147			65	125	113	80	34	244	43	1112
Simple Kappa	0.08	0.11	0.40			0.19	0.00	0.36	0.14	0.04	0.22	0.21	0.15
ASE[1]	0.07	0.04	0.06			0.10	0.04	0.07	0.06	0.11	0.04	0.08	0.02
SDF 0[2,3]		**	***					***	*		***	*	***
Weighted Kappa[4]	0.27	0.26	0.46			0.27	0.04	0.44	0.24	0.14	0.33	0.31	0.25
ASE[1]	0.07	0.04	0.07			0.13	0.04	0.07	0.07	0.12	0.04	0.08	0.02
SDF 0[2,3]	***	***	***			*		***	**		***	***	***

Notes:

1. Assymptotic standard error.
2. Significantly different from zero with adjustment for the design effect for Argentina, Canada, New Zealand, South Africa and All.
3. * = significant at the 5% level, ** = significant at the 1% level, ***=significant at the 0.1% level
4. Weighted kappa is similar to kappa but gives some weight to "near misses".
5. A study centre's data was excluded if they provided less than 30 participants in this category.
6. The frequency reported is the number of observations e.g. unweighted n.

Given that the majority of BAC readings were 0mg/100ml, agreement calculations were undertaken using BAC readings >0mg/100ml only. By excluding the participants with zero BAC levels, Table 18 above revealed that the majority of countries showed only slight levels of agreement, with Brazil, Mexico, South Africa and Sweden showing at best, fair levels of agreement. Brazil and Mexico with kappa values of 0.40 and 0.36 had by far the best levels of agreement. As before, weighted kappa is uniformly higher than simple kappa. These results indicate that clinical assessment did not agree with the BAC readings with any degree of certainty.

The direction of misclassification (Table 19) was not consistent across countries. Belarus, Canada and Mozambique had clinical assessments that largely under-classified the level of intoxication while China, India, South Africa and Sweden had clinical assessments that tended to over-classify the level of intoxication compared to the BAC. Argentina, Brazil, Mexico and New Zealand were rather mixed in the direction of their classification errors. Examining the direction of classification error by assessor (see Table 5 for differences by assessors) found no differences.

Table 19. Countries and their disagreement directions

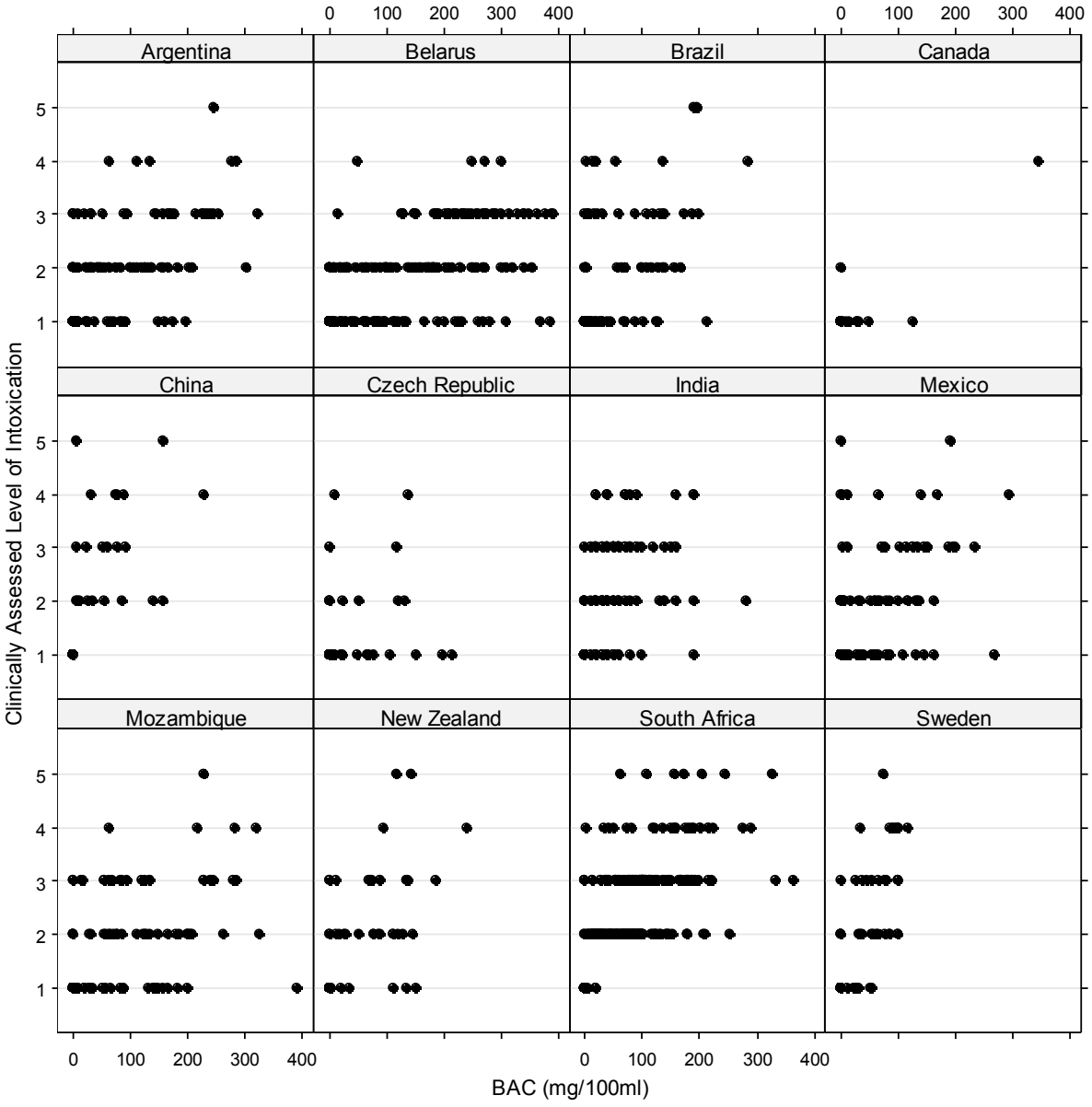
Statistic	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden
n[1]	60	122	37	2	20	14	96	42	52	22	130	26
Disagreement Direction												
Clinical < BAC level	59	87	41	100	10	64	11	45	71	36	16	8
Clinical > BAC level	41	13	59	0	90	36	89	55	29	64	84	92

Notes:

1: n represents the number of people answering the question.

Figure 6 shows a considerable overlap between the clinical assessment of intoxication and BAC readings, although there is some evidence of increasing BAC with increasing levels of clinical assessment intoxication.

Figure 6. A dotplot of BAC readings and the clinicians' assessment of intoxication by country



Agreement between clinical assessment and participants' self-assessment of intoxication level

The kappa statistic for agreement between clinical assessment and participants' self-assessed levels of intoxication showed that the majority of centres had moderate agreement (Table 20). South Africa had substantial agreement while Argentina, Brazil, Canada and the Czech Republic had fair agreement.

After excluding those participants with zero BAC readings, the kappa statistic for the majority of countries was fair, with Argentina and New Zealand being slight and India being poor. In both cases, the values for weighted kappa were uniformly higher than simple kappa.

Table 20. Agreement between clinicians' assessments and participants' self-assessments of intoxication

Statistic	Argentina	Belarus	Brazil	Canada[5]	China[5]	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden	All
All													
n[6]	417	506	480	221	499	496	556	411	462	136	492	477	5153
Simple Kappa	0.32	0.46	0.36	0.21	0.46	0.36	0.45	0.44	0.50	0.47	0.69	0.59	0.51
ASE[1]	0.06	0.04	0.06	0.19	0.05	0.09	0.03	0.05	0.05	0.05	0.03	0.05	0.01
SDF 0[2,3]	***	***	***		***	***	***	***	***	***	***	***	***
Weighted Kappa[4]	0.40	0.54	0.49	0.35	0.66	0.55	0.54	0.55	0.55	0.60	0.78	0.71	0.65
ASE[1]	0.06	0.04	0.07	0.26	0.04	0.10	0.03	0.05	0.05	0.06	0.02	0.05	0.01
SDF 0[2,3]	***	***	***		***	***	***	***	***	***	***	***	***
BAC > 0[5]													
n[6]	81	174	144			65	125	110	69	34	244	39	1085
Simple Kappa	0.16	0.26	0.32			0.32	-0.09	0.30	0.20	0.03	0.38	0.24	0.22
ASE[1]	0.06	0.06	0.07			0.11	0.06	0.07	0.08	0.11	0.05	0.09	0.02
SDF 0[2,3]	*	***	***			**		***	*		***	*	***
Weighted Kappa[4]	0.19	0.33	0.45			0.55	-0.07	0.43	0.26	0.18	0.51	0.41	0.34
ASE[1]	0.08	0.06	0.08			0.12	0.06	0.07	0.09	0.13	0.04	0.09	0.02
SDF 0[2,3]	*	***	***			***		***	**		***	***	***

Notes:

1. Assymptotic standard error.
2. Significantly different from zero with adjustment for the design effect for Argentina, Canada, New Zealand, South Africa and All.
3. * = significant at the 5% level, ** = significant at the 1% level, ***=significant at the 0.1% level
4. Weighted kappa is similar to kappa but gives some weight to "near misses".
5. A study centre's data was excluded if they provided less than 30 participants in this category.
6. The frequency reported is the number of observations e.g. unweighted n.

Generally, kappa values were higher for agreement between participant self-assessment and clinical assessment compared to kappa values for the agreement between clinical assessment and BAC level. This could suggest that some interaction between participant and assessor may have influenced the assessor's or participant's classification choice.

If there was disagreement between self- and clinical assessment of intoxication, it was more likely to be assessed at a lower level by the participant when compared to the clinician (Table 21); even though the participants were meant to assess their level of intoxication at the time of the accident while the clinician assessed it at the ED room. However, New Zealand and Sweden had participants tending to estimate a higher level of intoxication than the clinician.

Table 21. Direction of disagreement

Statistic	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden
n[1]	49	85	36	0	18	10	94	46	38	24	95	23
Disagreement Direction												
Self < Clinical	79	67	69		100	50	66	48	50	26	50	39
Self > Clinical	21	33	31		0	50	34	52	50	74	50	61

Notes:

1: n represents the number of people answering the question.

Participants' self-assessment and BAC reading

The kappa statistic for agreement between clinical assessment and participants' self-assessed levels of intoxication showed that the majority of centres were split between fair and moderate agreement (Table 22). The exception was Canada with poor agreement.

After excluding those participants with zero BAC readings, the kappa statistic for the majority of countries was slight, with Brazil, the Czech Republic, Mexico and South Africa having fair agreement and New Zealand being poor. In both cases, the values for weighted kappa were uniformly higher than simple Kappa.

Table 22. BAC reading and self-assessment

Statistic	Argentina	Belarus	Brazil	Canada[5]	China	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden	All
All													
n[6]	440	506	481	206	523	463	556	417	457	143	503	371	5066
Simple Kappa	0.31	0.34	0.30	0.14	0.27	0.26	0.35	0.47	0.44	0.43	0.51	0.43	0.40
ASE[1]	0.06	0.03	0.06	0.12	0.08	0.09	0.04	0.05	0.04	0.05	0.03	0.06	0.01
SDF 0[2,3]	***	***	***		***	**	***	***	***	***	***	***	***
Weighted Kappa[4]	0.34	0.42	0.44	0.35	0.31	0.37	0.38	0.54	0.52	0.53	0.59	0.53	0.48
ASE[1]	0.07	0.03	0.07	0.24	0.09	0.11	0.04	0.05	0.05	0.05	0.03	0.06	0.01
SDF 0[2,3]	***	***	***		***	***	***	***	***	***	***	***	***
BAC > 0[5]													
n[6]	84	174	148		60	70	125	117	71	41	254	42	1186
Simple Kappa	0.09	0.09	0.24		0.13	0.21	0.03	0.35	0.15	-0.01	0.20	0.01	0.14
ASE[1]	0.07	0.04	0.06		0.09	0.09	0.05	0.06	0.06	0.08	0.04	0.08	0.02
SDF 0[2,3]		*	***			*		***	*		***		***
Weighted Kappa[4]	0.08	0.17	0.39		0.17	0.32	0.03	0.41	0.22	0.08	0.28	0.16	0.20
ASE[1]	0.07	0.03	0.07		0.10	0.11	0.05	0.06	0.07	0.08	0.04	0.07	0.02
SDF 0[2,3]		***	***			**		***	**		***	*	***

Notes:

1. Assymptotic standard error.
2. Significantly different from zero with adjustment for the design effect for Argentina, Canada, New Zealand, South Africa and All.
3. * = significant at the 5% level, ** = significant at the 1% level, ***=significant at the 0.1% level
4. Weighted kappa is similar to kappa but gives some weight to "near misses".
5. A study centre's data was excluded if they provided less than 30 participants in this category.
6. The frequency reported is the number of observations e.g. unweighted n.

In general, the participants were more likely to assess their level of intoxication at a lower level than that indicated by BAC except for New Zealand, South Africa and Sweden where the reverse occurred (see Table 23).

Table 23. Direction of disagreement

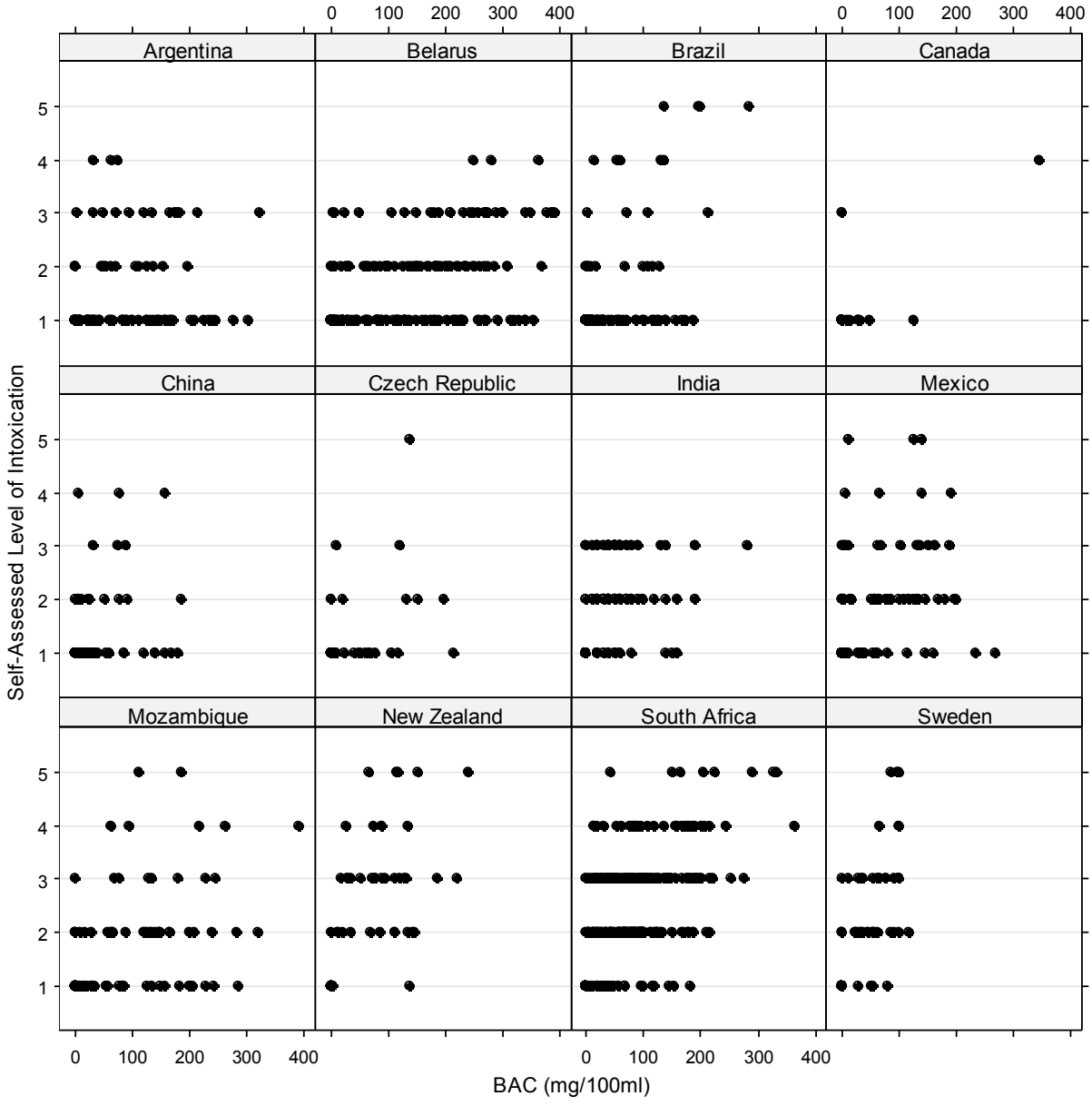
Statistic	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden
n[1]	52	123	37	2	22	15	87	45	46	31	145	31
Disagreement Direction												
Self < BAC level	78	89	57	100	45	73	18	49	74	19	23	10
Self > BAC level	22	11	43	0	55	27	82	51	26	81	77	90

Notes:

1: n represents the number of people answering the question.

There is a considerable overlap between the participants' self assessment of intoxication level and BAC levels although there is some evidence of increasing BAC levels with increasing levels of self-reported intoxication (Figure 7).

Figure 7. A dotplot of BAC readings and the participants' self-assessment of intoxication within country



Cross country comparisons – BAC levels, self-assessed and clinically assessed levels of intoxication

The kappa statistic cannot be meaningfully compared between countries when the marginal distributions of the responses differ between countries, i.e. the countries have different proportions of participants in each level for an assessment variable. To compare the agreement of two assessment variables between countries, the variables were collapsed into three levels of alcohol intoxication: 1) none, 2) mild and moderate, and 3) severe and very severe. Weights were developed for each country so that there were equal numbers in each category for one of the assessment variables. Kappa statistics were then calculated. This was done for each pair of the three assessment variables and appears in Table 24 as stratified kappa statistics. For comparison, simple kappa statistics based on the three levels of the assessment variables were also provided. A chi-squared test of equal kappa coefficients between countries for the stratified kappa statistic was conducted for each pair. For the comparison between self-assessed and clinically assessed alcohol intoxication the chi-squared statistic was 179 on 11 degrees of freedom with $p<0.001$. Therefore, we did not accept that countries had equal values for kappa for this comparison. In other words, countries were significantly different in the levels of agreement found between self- and clinical assessment of intoxication.

Table 24. Kappa statistics by country with uniform marginal distributions

Statistic	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India[1]	Mexico	Mozambique	New Zealand	South Africa	Sweden	All
Self Assessment/Clinical Assessment													
n[2]	417	506	480	221	499	496	556	411	462	136	492	477	5153
Simple kappa	0.38	0.56	0.44	0.21	0.69	0.53	0.72	0.61	0.57	0.71	0.83	0.72	0.70
Stratisfied simple kappa	0.27	0.38	0.51	0.49	0.45	0.47	0.38	0.50	0.48	0.57	0.72	0.58	0.48
BAC/Self Assessment													
n[2]	440	506	481	206	523	463		417	457	143	503	371	4510
Simple kappa	0.39	0.44	0.40	0.28	0.36	0.40		0.62	0.59	0.60	0.61	0.55	0.53
Stratisfied simple kappa	0.24	0.64	0.33	0.50	0.18	0.24		0.31	0.46	0.35	0.43	0.22	0.34
BAC/Clinical Assessment													
n[2]	424	508	478	206	479	456	556	386	473	124	492	377	4959
Simple kappa	0.53	0.46	0.58	0.50	0.53	0.30	0.45	0.54	0.59	0.62	0.65	0.56	0.55
Stratisfied simple kappa	0.47	0.52	0.33	0.50	0.27	0.16	0.18	0.31	0.62	0.42	0.48	0.24	0.34

Notes:

1. The India data set lacked a participant in the highest BAC category with a self-assessed observation and so the marginal distribution could not be formed.
2. The frequency reported is the number of observations e.g. unweighted n.

For the comparison between BAC level and clinically assessed alcohol intoxication the chi-squared statistic was 254 on 11 degrees of freedom with $p<0.001$. Therefore, we did not accept that the countries had equal values for kappa for this comparison. For the comparison between BAC level and clinically assessed alcohol intoxication the chi-squared statistic was 315 on 11 degrees of freedom with $p<0.001$. Therefore, we did not accept that the countries had equal values for kappa for this comparison.

6.2.3 A combined model of agreement: agreement between BAC, clinical assessment and participants' self-assessment of intoxication

A combined model of agreement was formed where a participant had three observation. The first observation was "1" if there was an agreement between the level of BAC and self-assessed levels of intoxication; otherwise "0". The second observation was "1" if there was a

match between BAC and clinically assessed levels of intoxication; otherwise "0". The third observation was "1" if there was a match between self- and clinically assessed levels of intoxication. A model was used to look at the association between this response and the type of agreement with age, sex, level of BAC and country as confounders. The SAS macro GLMMIX was used to fit a repeated measures logistic regression. The results are shown in Table 25.

Table 25. A repeated measures logistic regression comparing agreement between the three different classifications

Variable	Levels	Degrees of Freedom	Parameter Estimate	Standard Error	F Value / t Value	Pr > F / Pr > |t|
Intercept		1	-1.59	0.49	-3.28	0.00
BAC		4			296.69	<.0001
	0	1	4.33	0.45	9.62	<.0001
	1	1	1.52	0.46	3.30	0.00
	2	1	0.93	0.46	2.02	0.04
	3	1	0.22	0.49	0.45	0.65
	4	0	0.00			
Country		11			8.48	<.0001
	Argentina	1	0.01	0.22	0.05	0.96
	Belarus	1	-0.18	0.21	-0.84	0.40
	Brazil	1	0.21	0.23	0.93	0.35
	Canada	1	1.22	0.45	2.73	0.01
	China	1	0.62	0.25	2.52	0.01
	Czech Republic	1	0.84	0.28	3.02	0.00
	India	1	-0.66	0.20	-3.34	0.00
	Mexico	1	-0.09	0.22	-0.39	0.70
	Mozambique	1	0.30	0.22	1.33	0.19
	New Zealand	1	-0.72	0.26	-2.74	0.01
	South Africa	1	-0.13	0.20	-0.64	0.52
	Sweden	0	0.00			
Sex		1			55.16	<.0001
	Female	1	0.82	0.11	7.43	<.0001
	Male	0	0.00			
Age		5			1.57	0.17
	65+	1	0.55	0.30	1.84	0.07
	55-64	1	0.21	0.23	0.92	0.36
	45-54	1	-0.04	0.16	-0.24	0.81
	35-44	1	-0.16	0.12	-1.27	0.20
	25-34	1	-0.10	0.11	-0.97	0.33
	0<25	0	0.00			
Type		2			11.48	<.0001
	BAC / Clinical	1	-0.23	0.05	-4.79	<.0001
	BAC / Self	1	-0.14	0.05	-2.66	0.008
	Clinical / Self	0	0.00			
	BAC / Clinical	1	0.08	0.05	1.85	0.06
	BAC / Self	0	0.00			

The most notable finding was that the highest level of agreement was between clinical assessment and self-assessment, and that it was significantly different from the comparison between 1) BAC and self-assessment ($p<0.001$) and 2) BAC and clinical assessment ($p=0.008$). This result did not change when the model was restricted to only those participants who had all non-missing observations for all three agreement measures or to only those who had been drinking.

The comparison of the agreement between 1) BAC and self-assessment and 2) BAC and clinical assessment was marginally significant ($p=0.06$) based on all observations, significant ($p=0.04$) for observations based on those participants with complete assessment information and non-significant ($p=0.8$) for observations based on only those participants who had been drinking. This reflects the difficulty in measuring intoxication level in drinkers.

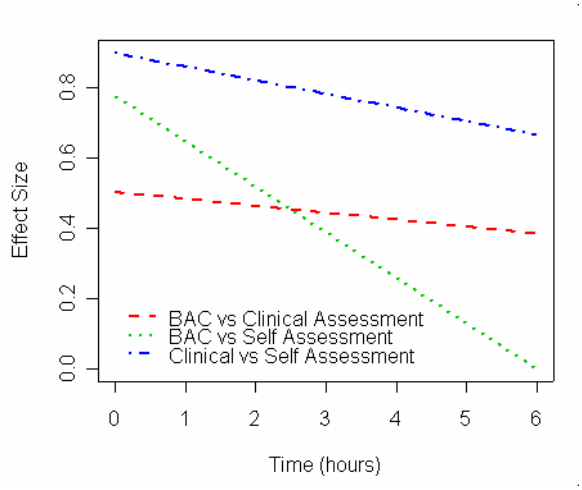
It should be noted that even though the highest agreement was between self- and clinical assessment, it does not mean that this was the correct assessment. An explanation for the similarity in observations is that the social/clinical interaction between the clinical staff and participant could jointly influence how intoxicated they both perceived the participant was.

The chance of matching decreased as the BAC level of the participant increased. Age of the participants was shown not to have a significant impact on the chance of matching. However the U-shape of the effect of age is worth investigating further, with reference to the age of the clinicians doing the classifying. Males and females were not significantly different when the analysis was restricted to only those who had been drinking.

A further repeated measures logistic regression model was run, where the time since the accident was used to see if it affected the chance of matching with country and BAC level as confounders. The model showed that the time since the accident had no effect on the level of matching overall and for each agreement type. When this model was restricted to only those who had been drinking then the time since the accident had a marginally significant negative effect on matching ($p=0.09$ for the interaction) and the effect was most apparent in the match between BAC level and self-assessment. This was to be expected as the self-assessment taken in the ED was a recall of the level of intoxication at the time of injury while the BAC reading was recorded at the ED.

Figure 8 plots the predicted interaction of time and the different types of agreements from the regression model. The larger the effect size the greater the chance of matching. The plot shows that clinical versus self assessment always has a greater chance of matching. BAC versus self assessment has a smaller chance of matching and the chance falls away markedly over time. The chance of an agreement between BAC versus clinical assessment is uniformly lower than BAC versus self-assessment but falls away at a similar rate over time.

Figure 8. Interaction plot of time versus the effect size of matching two assessment variables from the repeated measures logistic regression model



6.3 Objective 3. To examine the data according to the context in which drinking occurred prior to injury (including violence-related) and other variables (e.g. location, frequency, quantity) and the association of patterns of drinking with injury

6.3.1 Method

All results in the following section will be analysed using the weighted combined dataset described in Section 5.3. For each table the number of participants answering the question is given. For weighted data, the number of participants answering a question may not equal the sum of their weights. This occurs when there are missing values or when the question is applicable to only a subset of the participants and is most apparent when there is a relationship between available data and the weights, e.g. South Africa over-sampled on weekends and weekends are associated with increased likelihood of alcohol consumption.

Figures based on categorical data or continuous data which has been aggregated, where the objective was to show relative proportions, such as histograms, are based on weighed data. Figures based on continuous data, such as dotplots, where the objective was to show patterns, are be based on unweighted data. This is necessary as it is not easy to effectively show non-integer weights on figures.

The volume of absolute alcohol consumed on the injury occasion (Questionnaire 1G, QF07) and on a typical occasion (Questionnaire 1G, QG02) was calculated from the types of drinks and volume of beverage consumed. Beverage volumes were calculated from the types of containers the participant reported having consumed alcohol from. The volume of absolute alcohol in each type of beverage reported was calculated according to the standard conversions in each study centre.

6.3.2 Results

Alcohol-related injury participants are labelled "drinkers" in the table and non-alcohol related injury participants are labelled “non-drinkers”.

<u>Types of injuries</u>

The types of injuries suffered by the participants were predominantly "cut, bite, penetrating injury, open wound" and "bruise, scrape, superficial wound". Across all countries, the participants drinking within six hours of their injury (drinkers) were generally more likely to have these types of injuries and less likely to have "fracture" or "strain, sprain or dislocation" compared to the entire sample of participants (Table 26). There was also a tendency for the drinkers to have a higher number of injury types (Table 27).

Table 26. Type of injury by country

	Argentina		Belarus		Brazil		Canada		China		Czech Republic		India		Mexico		Mozambique		New Zealand		South Africa		Sweden	
	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker
Number of Respondents (n[1])	436	108	510	147	489	62	222	13	559	100	511	40	556	119	455	78	487	78	160	57	503	248	495	73
Type of Injury[2] (%)																								
Fracture	11	10	17	18	13	6	9	27	7	11	22	18	9	5	16	12	15	15	16	15	18	16	40	26
Strain, sprain, dislocation	18	13	32	24	19	13	35	20	14	11	39	15	1	0	33	14	17	8	22	15	12	9	42	27
Cut, bite, penetrating injury, open wound	34	37	39	46	40	58	39	47	29	30	30	60	28	37	22	36	44	63	40	44	60	70	34	51
Bruise, scrape, superficial wound	27	32	17	16	32	45	10	7	71	78	26	33	12	23	25	35	30	19	36	39	17	16	36	33
Burn	3	1	3	2	1	2	1	0	1	0	0	0	16	3	1	0	0	0	1	0	1	0	2	4
Concussion, closed head injury	12	19	4	7	2	5	2	0	4	6	4	0	5	6	13	31	1	1	2	3	9	5	7	8
Organ system injury / Multiple organ injury	10	15	0	1	1	2	0	0	0	0	1	3	5	8	1	3	1	1	0	1	1	1	6	8
Other	1	0	0	0	0	2	3	0	0	0	0	0	22	15	11	6	3	1	15	17	5	1	6	8
Unknown	4	4	0	0	5	3	0	0	0	0	0	0	2	3	0	1	0	0	5	1	0	0	2	1

Notes:

1: n represents the number of people answering the question.

2: Participants may record upto three injuries so percentages may sum to more than 100

Table 27. Count of injuries sustained by participants by country

	Argentina		Belarus		Brazil		Canada		China		Czech Republic		India		Mexico		Mozambique		New Zealand		South Africa		Sweden	
	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker
Number of Respondents (n[1])	452	109	510	147	496	63	222	13	559	100	511	40	556	119	456	78	488	78	160	57	503	248	497	73
Number of Injuries																								
0	4	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	80	75	89	88	88	70	100	100	75	68	80	78	100	100	80	68	90	91	68	67	78	81	42	48
2	12	18	10	10	9	22	0	0	23	28	17	18	0	0	17	27	9	9	28	32	22	19	39	37
3	4	6	1	1	2	6	0	0	1	4	3	5	0	0	3	5	1	0	5	1	0	0	19	15

Notes:
1: n represents the number of people answering the question.

Table 28. Location where injury occurred by country

	Argentina		Belarus		Brazil		Canada		China		Czech Republic		India		Mexico		Mozambique		New Zealand		South Africa		Sweden	
	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker
Number of Respondents (n[1])	449	109	510	147	492	162	222	13	559	100	511	40	556	119	454	78	482	78	160	57	503	248	495	73
Place of Injury (%)																								
Unknown	0	1	0	0	0	0	0	0	0	0	0	3	3	1	0	0	0	1	0	0	0	0	0	1
Own home	25	19	34	36	16	11	35	33	14	14	25	38	42	29	30	12	20	9	21	13	22	21	19	23
Other home	6	6	5	8	2	2	4	27	0	0	3	10	4	3	7	17	5	10	6	11	13	15	4	10
Street, highway	43	54	42	47	39	55	13	7	48	45	28	23	37	52	37	54	44	58	0	0	55	49	36	33
School	0	0	2	0	1	0	0	0	2	0	0	0	0	0	2	3	2	0	0	0	0	0	1	1
Pub, hotel, tavern, other drinking place	1	5	1	1	2	8	2	7	6	23	1	5	3	5	0	1	2	9	11	24	4	9	1	8
Work place	17	9	12	7	32	19	25	0	20	11	19	8	0	0	16	8	21	6	18	7	0	0	15	3
Other	7	7	5	1	8	5	21	27	9	7	23	15	11	10	9	6	6	6	45	45	6	5	23	21

Notes:

1: n represents the number of people answering the question.

Location where injury occurred

Study participants were most likely to get injured on the street or highway and at their own home. In general, participants who had consumed alcohol prior to the occurrence of their injury were more likely to be injured at the side of a highway and less likely to be injured at work (Table 28).

The selection of the category "other" came up in the results of all study centres. It was used more frequently in Canada, the Czech Republic, New Zealand and Sweden. When "other" was selected, the participant was asked to specify the location. Table 29 shows the results of "other" answers as specified by the participant.

A sports place, generally football (soccer), was frequently named in Argentina, Belarus, Brazil, the Czech Republic, Mexico, South Africa and Sweden. Generally, this was as a result of playing, but also of watching. China reported almost half of its "other" answers as involving a vehicle/garage. Injuries involved in using the train or crossing the tracks were predominant in South Africa. "Own home, other's home and work" were repeatedly found in the "other" category; this was a potential misclassification.

Activity at time of injury

Table 30 shows the activities participants were involved in at the time of their injury. "Commuting /travelling", "work", "leisure or playing" or "doing nothing in particular" were the most frequently reported activities undertaken when the injury occurred. Participants who had consumed alcohol prior to the injury were more likely to be involved in "leisure or playing" and less likely to be doing "paid work".

Table 29. Other places where injury occurred

	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden
Number of Respondents (n[1])	36	25	40	44	52	119	61	40	30	68	39	115
Place of Injury (%)												
Unspecified	3	0	3	100	4	0	100	0	33	10	0	1
Sport's Place	41	36	28	0	13	55	0	65	20	0	30	44
Vehicles and Garage	5	32	5	0	48	9	0	0	3	24	0	16
Outdoor Public Place	20	8	0	0	2	3	0	5	13	66	5	8
Shop	11	4	13	0	12	3	0	0	7	0	7	6
Parks and Forests	0	12	15	0	8	8	0	0	0	0	2	3
Inside building (stair well, own home)	0	4	0	0	10	8	0	0	7	0	0	7
Outside own home	0	0	0	0	0	12	0	3	0	0	0	9
Train And Environs	0	0	10	0	2	0	0	0	0	0	52	0
Institution	0	0	10	0	2	1	0	10	3	0	2	3
Business Outside The Workplace	12	0	5	0	0	0	0	3	0	0	0	2
Club	4	4	0	0	0	0	0	0	0	0	2	1
Other's Home	0	0	0	0	0	0	0	0	10	0	0	0
Work	0	0	0	0	0	0	0	0	0	0	0	1
Not able to be translated	5	0	13	0	0	0	0	15	3	0	0	1

Notes:

1: n represents the number of people answering the question.

Table 30. Participant activity at time of injury

	Argentina		Belarus		Brazil		Canada		China		Czech Republic		India		Mexico		Mozambique		South Africa		Sweden	
	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker	All	Drinker
Number of Respondents (n[1])	449	109	510	147	492	63	222	13	559	100	511	40	556	119	454	78	482	78	503	248	495	73
Doing What (%)																						
Unknown	1	1	0	0	1	0	0	0	1	0	0	0	5	3	0	3	0	0	0	0	0	1
Paid work	19	11	12	7	41	22	29	0	21	8	20	8	14	13	19	9	26	12	2	1	17	4
Commuting, travelling	40	47	25	14	25	27	24	7	30	29	18	13	23	29	36	46	46	56	56	52	30	22
Education	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0
Sports	2	2	4	1	3	0	12	27	3	0	17	8	0	0	3	3	3	0	2	0	4	0
Leisure, playing	9	13	28	44	7	25	8	27	12	25	24	45	2	3	11	23	7	19	12	21	25	45
Doing nothing in particular	15	15	22	27	15	19	16	7	16	13	14	18	42	41	20	14	8	5	23	20	19	25
Other	14	11	8	5	9	6	11	33	18	25	7	10	13	10	10	1	10	8	4	6	3	3

Notes:

1: n represents the number of people answering the question.

2: New Zealand data is not reported as it was ascertained in an incompatible way

Participants were involved in a wide range of "other" activities not directly specified in the questionnaire. Table 31 shows what these "other" activities were reported as. China and India did not specify the activity and New Zealand did not collect this data.

Primarily activities involving the home, e.g. housework, house or car repairs, household activities and care- giving were most commonly mentioned. "Travelling" was reported by 60% of the "other" category for China, and "drinking" was reported by 48% in South Africa.

Cultural differences play a part in the drinking context and as such can impact on the acceptability of consuming alcohol in different locations and while undertaking certain activities.

Table 31. Other things the participants were doing at the time of injury by country and alcohol-related injury participants

	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	South Africa	Sweden
Number of Respondents (n[1])	61	43	43	27	98	35	72	46	48	21	16
Doing What?[3] (%)											
Unspecified	2	0	2	100	1	3	100	0	19	0	0
Don't Know	0	0	2	0	0	0	0	0	0	0	0
Housework	23	0	28	0	11	66	0	33	21	7	31
Travelling	0	2	2	0	60	0	0	2	4	0	31
Household Activities	6	79	0	0	3	3	0	15	2	3	6
Personal - sleeping, eating, grooming, bathing	12	0	7	0	8	0	0	13	4	4	13
Cooking	13	0	5	0	7	14	0	0	8	0	6
Repairs - car, house	10	12	7	0	0	0	0	7	4	0	0
Caregiving - people, animals	14	0	2	0	1	0	0	7	2	0	0
Shopping	0	0	7	0	4	0	0	2	4	0	0
Drinking	0	0	0	0	0	0	0	0	0	48	0
Work - paid/unpaid, seeking	4	0	7	0	0	0	0	2	6	0	0
Argument	0	0	7	0	0	0	0	2	4	11	0
Law Breaking	1	0	5	0	0	0	0	2	0	15	0
Celebrating	1	2	2	0	1	0	0	2	2	0	6
Sports	0	0	7	0	1	0	0	0	4	0	0
Gardening	1	0	0	0	0	11	0	0	0	0	6
Detained	2	0	0	0	0	0	0	0	0	11	0
Social - talking, visiting	1	0	0	0	2	0	0	0	2	0	0
Convalescing	0	0	5	0	0	0	0	0	0	0	0
Waiting	0	0	2	0	0	0	0	2	0	0	0
Dancing	0	2	0	0	0	0	0	0	0	0	0
Protest Rally	0	2	0	0	0	0	0	0	0	0	0
Not able to be translated	10	0	2	0	0	3	0	11	13	0	0

Notes:

1: n represents the number of people answering the question.

2: New Zealand data is not reported as it was ascertained in an incompatible way

3: Options other then unspecified, don't know and not able to be translated are listed in descending order of weighted numbers of people.

Mode/type of injury

Table 32 shows that across all countries the majority of all participants suffered an injury that was "unintentional" (see Section 4.5.2 for definition of mode (type) of injury). The exception was South Africa where the majority of participants suffered an injury that was "intentional by someone else". Across all countries, drinkers were more like to have suffered an injury that was "intentional by someone else".

"Intentional by someone else" was more likely to occur among participants who consumed alcohol prior to their injury. New Zealand collected the mode of injury data slightly differently from the other study centres and, as a consequence, the data are not comparable. The New Zealand country report provides information on injury involving violence (report available from WHO or Centre for Social and Health Outcomes Research, Massey University, New Zealand).

Table 32. Injuries by different modes by country

	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand[1]	South Africa	Sweden
Number of participants answering question	436	510	478	220	499	502	553	454	451	159	476	475
Proportion of Participants having attended an ED in the previous year by mode of injury (%)												
All	20	18	13	26	1	18	63	10	13	21	17	13
Unintentional	19	18	13	27	1	18	65	9	13		16	12
Intentional self-inflicted	48	20	0		0		68	40	0		13	80
Intentional by someone else	21	21	16	0	4	19	55	10	14		18	18
Other	16	0	13		0		84	0	0		9	
Number of participants answering question	84	93	57	55	6	88	4	46	49	37	82	63
Mean number of visits for Paticipants who attended ED in the previous year	2.2	1.2	1.8	2.0	2.3	1.4	2.0	1.2	1.7	1.7	1.4	1.5

Notes:

1: New Zealand asked about mode of injury in a way that was not compatible with the final version of the questionnaire

Quantity of alcohol prior to injury

In Table 33 the mean alcohol consumption for each mode of injury is recorded. Except for China, Mexico, Mozambique and South Africa, the mean amount consumed by the participants who suffered an "intentional injury by someone else" was higher than for the participants who suffered an "unintentional injury". For Argentina, this difference was the equivalent to an extra seven standard drinks (standard drink = 15ml absolute alcohol) by the participant who suffered an "intentional injury by someone else".

Excluding Brazil and China, there was little difference between the mean absolute alcohol for "intentional self-inflicted" injury and the other two injury modes. However, caution is required when interpreting this result as the numbers responding to "intentional self-inflicted" were very small.

Table 33. Number of participants and the mean absolute alcohol consumption (mls) for each mode of injury and by country

	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	South Africa	Sweden
Unintentional											
n[1]	73	105	40	12	67	34	26	35	37	60	49
Mean absolute alcohol (mls)	68	88	68	114	70	55	107	134	104	186	82
Intentional self-inflicted											
n[1]	3	4	1	0	2	0	12	6	0	3	4
Mean absolute alcohol (mls)	124	96	990		285		132	191		147	144
Intentional by someone else											
n[1]	27	36	15	1	29	5	56	36	27	184	19
Mean absolute alcohol (mls)	174	143	121	137	54	74	132	99	80	180	123
Other											
n[1]	1	2	2	0	2	0	3	1	1	1	0
Mean absolute alcohol (mls)	110	120	48		195		128	116	80	125	

Notes:

1: n represents the number of people answering the question.

2: New Zealand asked about mode of injury in a way that was not compatible with the final version of the questionnaire

Time difference between the time of injury and ED arrival time for alcohol and non alcohol-related injury cases

The mean time from the occurrence of an injury to the attendance at the ED was examined. Except for Canada, China and New Zealand, alcohol-related injury participants tended to get to the ED before their non-drinking peers (Table 34). It is however not possible to make any conclusions from this result, as there are numerous confounders, for example the ED location and accessibility and the injury severity.

Table 34. Mean time to the ED by alcohol-related injury and non-alcohol-related injury participants and by country

	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa
All											
n[1]	447	510	495	201	558	511	556	456	488	154	503
Time to ED (mins)	94	156	111	155	45	103	109	112	142	135	188
Drinkers											
n[1]	108	147	63	11	100	40	119	78	78	52	248
Time to ED (mins)	92	126	92	185	46	88	95	111	138	165	183
non-Drinkers											
n[1]	334	361	427	189	458	471	437	376	401	102	255
Time to ED (mins)	94	167	114	153	45	105	113	111	143	119	192

Notes:

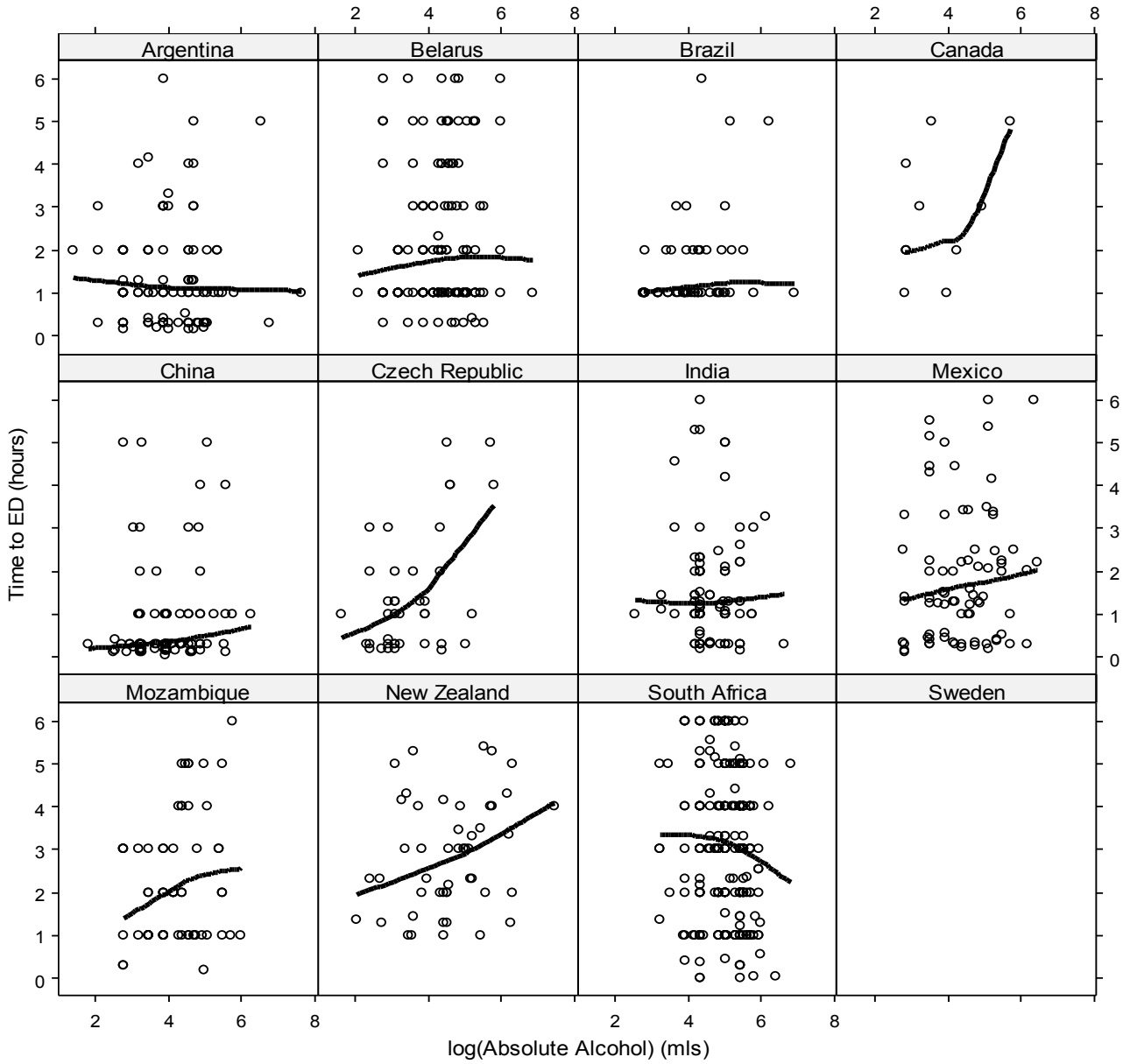
1: n represents the number of people answering the question.

2: Sweden's data about time to ED was not available

Time difference to ED and quantity of alcohol consumed by country

The association between time to ED and quantity of alcohol consumed was investigated. Quantity of alcohol consumed is skewed and bounded by zero so it was transformed to the log scale. The result was that, except for Argentina and South Africa, participants tended to reach the ED less quickly as their alcohol consumption, on the log scale, increased (Figure 9).

Figure 9. Participants time to ED by the amount of alcohol consumed by country



Quantity of typical absolute alcohol consumed in the previous 12 months

Typical alcohol consumption (quantity and frequency) questions were asked of participants in all study centres. In all countries, except for China (39%), India (25%) and South Africa (53%), the majority of the participants answering this question had consumed alcohol in the last year. Caution is required when interpreting this data in the individual country reports, as India, for example, reports that there is a heavy stigma surrounding alcohol use and as such the 25% reporting having consumed alcohol in the previous 12 months may be an underestimate.

Across all countries, the mean typical occasion quantity and the mean yearly frequency of consumption was greater for those who had consumed alcohol six hours prior to their injury compared to last year drinkers (Table 35).

Table 35. Consumption patterns for last year drinkers by country

	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand	South Africa	Sweden
Last Year Drinkers (%)	81	88	68	80	39	83	25	68	58	86	53	86
Last year drinkers typical occasion consumption (mls of absolute alcohol)												
n[1]	362	449	333	181	209	424	123	304	264	127	294	424
Median	32	36	51	34	52	44	77	66	64	60	198	48
Mean	72	60	75	54	87	60	92	96	87	122	196	69
The typical occasion consumption for last year drinkers who drank within 6 hours of injury (mls of absolute alcohol)												
n[1]	105	147	54	13	96	36	100	73	68	55	241	71
Median	48	64	85	68	77	57	77	94	80	74	200	72
Mean	98	86	129	135	108	78	98	130	123	139	202	113
Last year drinkers yearly frequency of consumption												
n[1]	362	451	336	180	212	425	137	309	279	133	294	424
Median	130	30	30	130	30	130	183	9	130	130	130	30
Mean	126	69	82	97	95	108	213	29	90	97	123	76
The yearly frequency of consumption for last year drinkers who drank within 6 hours of injury												
n[1]	106	147	58	13	99	37	107	76	77	57	241	72
Median	130	130	130	130	182	183	183	30	130	130	130	130
Mean	203	101	130	126	164	194	229	57	119	119	130	117

Notes:

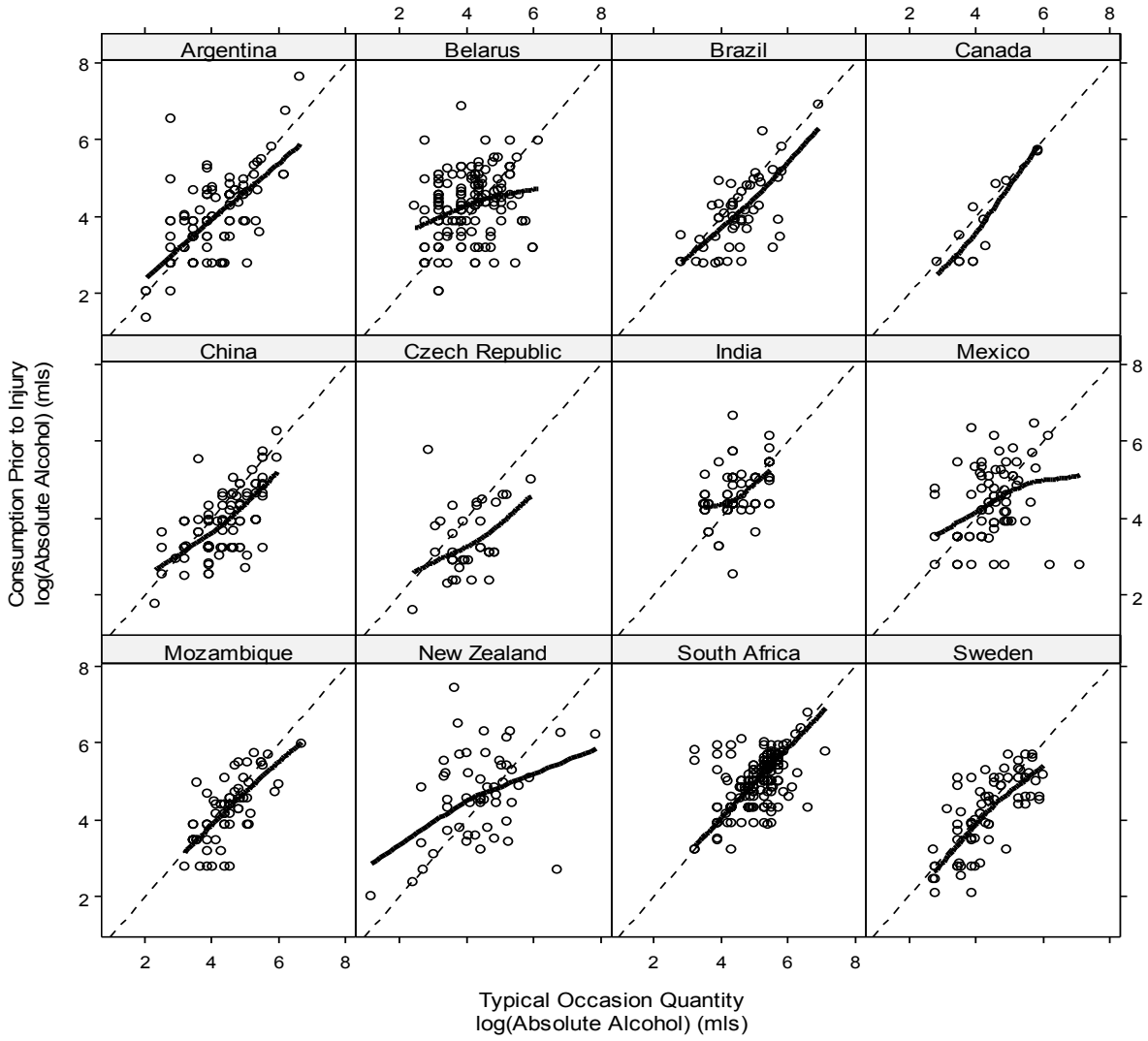
1: n represents the number of people answering the question.

Quantity of typical absolute alcohol consumed in the previous 12 months compared with quantity of absolute alcohol consumed on injury occasion

Logarithmic scales were also used to examine typical occasion quantity versus quantity of alcohol consumption prior to injury. Figure 10 displays the results. Each country has a loess line fitted to the data and, for comparison, a line of slope 1, intercept 0.

Most countries reported that the participants with low levels of typical occasion quantity had, on average, tended to drink about the same low quantity in the six hours prior to their accident. Belarus, India and New Zealand were the exceptions, where the participants tended to drink more in the six hours prior to injury than they reported was a typical occasion quantity, perhaps indicating celebratory consumption (e.g. data was collected over the Christmas period in New Zealand). Participants with higher levels of typical occasion quantity, tended, on average, to drink at about the same level or slightly less in the time surrounding the occurrence of their injury.

Figure 10. Typical occasion quantity versus alcohol consumption prior to injury by country



Screening for alcohol problems: Rapid Alcohol Problems Screen 4 (RAPS4)

The RAPS4 was developed for the emergency department population and is based on the most sensitive questions from several different instruments. The following table (Table 36) shows the RAPS4 scores versus amount consumed in the six hours prior to injury, typical occasion quantity, yearly frequency of drinking and ED visits. In general it shows that all these variables increase with increased RAPS4 score.

Table 36. RAPS4 score versus consumption and ED attendances by country

	Argentina		Belarus		Brazil		Canada		China		Czech Republic		India		Mexico		Mozambique		South Africa		Sweden	
	n[1]	mean	n[1]	mean	n[1]	mean	n[1]	mean	n[1]	mean	n[1]	mean	n[1]	mean	n[1]	mean	n[1]	mean	n[1]	mean	n[1]	mean
Amount consumed in the 6 hours prior to injury (mls absolute alcohol)																						
RAPS 0	299	14	265	18	222	8	139	1	158	16	342	3	29	105	204	18	217	18	102	111	324	6
RAPS 1	38	118	107	45	63	17	31	10	18	62	52	5	30	90	63	53	17	48	49	116	55	30
RAPS 2	15	89	51	70	31	18	7	47	5	71	18	11	22	98	26	68	10	47	32	167	24	46
RAPS 3	3	73	16	86	13	97	3	103	3	130	4	6	15	96	8	12	4	61	43	184	9	131
RAPS 4	2	56	2	136	6	138					2	0	10	148	5	60	1	0	56	212	3	164
Typical Occasion Quantity (mls absolute alcohol)																						
RAPS 0	299	54	265	45	218	54	139	43	152	68	342	54	29	95	202	77	217	81	102	148	325	52
RAPS 1	38	127	107	60	61	81	31	66	18	160	51	83	28	94	61	106	16	110	49	166	55	106
RAPS 2	16	175	51	110	31	124	7	91	5	154	18	88	20	86	25	178	11	176	32	249	25	137
RAPS 3	3	411	16	121	13	227	3	194	3	207	4	117	20	80	8	159	4	84	43	210	9	226
RAPS 4	2	103	2	264	6	181					2	82	11	115	5	232	2	128	56	232	3	187
Yearly Frequency																						
RAPS 0	299	114	267	45	220	59	138	92	154	72	341	98	32	192	204	18	226	85	102	85	323	69
RAPS 1	38	174	107	95	62	102	31	117	18	157	52	145	32	181	62	34	17	89	49	133	55	92
RAPS 2	17	186	51	126	31	132	7	96	5	83	18	153	22	209	26	67	12	128	32	121	25	90
RAPS 3	2	156	16	113	13	192	3	114	3	169	4	76	19	256	8	79	4	89	43	123	9	124
RAPS 4	2	274	2	67	6	234					2	182	13	281	5	127	2	182	56	138	3	226
ED visits																						
RAPS 0	298	0.2	267	0.2	219	0.2	137	0.5	143	0.0	339	0.2	30	0.0	204	0.1	227	0.2	101	0.2	327	0.1
RAPS 1	38	0.3	107	0.3	63	0.1	31	0.5	14	0.0	51	0.4	34	0.0	63	0.2	17	0.4	49	0.2	55	0.1
RAPS 2	17	0.2	51	0.4	29	0.1	6	1.0	5	0.0	17	0.6	23	0.0	26	0.2	11	0.5	29	0.7	25	0.4
RAPS 3	3	2.3	16	0.3	13	1.4	3	1.7	3	0.0	4	0.3	19	0.3	8	0.3	4	0.0	36	0.4	8	2.0
RAPS 4	1	0.0	2	0.0	6	1.8					2	0.0	13	0.2	5	0.0	2	0.0	50	0.6	3	1.3

Notes:

1: n refers to the number of people answering the question

2: New Zealand did not ask the RAPS 4 questions

Previous emergency department attendance for an injury

Except for China and India, most countries reported around 20% of all their participants having visited the ED within the previous 12 months. It appears that participants with 'Intentional - self inflicted' injuries were more likely to have visited the ED in the previous year than other participant type of injury, however the numbers in this group were small (Table 37).

Participants with "unintentional" and "intentional by someone else" categories had similar chances of having used the ED in the previous year.

The mean number of previous ED visits varied widely between countries (Table 37); Argentina and China had the highest mean number of visits (2.2 and 2.3 respectively); Belarus and Mexico had the least visit repeats with a mean of 1.2.

Violence and injury

The role of violence ("intentional by someone-else") has a clear relationship to alcohol consumption and the environment where alcohol is consumed. The data was examined to look at the role of violence in injury.

Table 38 highlights that the majority of intentional injuries caused by someone else were caused by a stranger. The exception was India where the largest proportion of responses was in the "unknown" category. The country report from India suggests that because of the medico-legal responsibilities of the hospital, patients are unwilling to identify the individual who harmed them. Despite this, the report goes on to say that from the wider anecdotal information available, relatives and acquaintances were the most likely perpetrators.

Table 37. Emergency department visits by country

	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	New Zealand[1]	South Africa	Sweden
Number of participants answering question	436	510	478	220	499	502	553	454	451	159	476	475
Proportion of Participants having attended an ED in the previous year by mode of injury (%)												
All	20	18	13	26	1	18	63	10	13	21	17	13
Unintentional	19	18	13	27	1	18	65	9	13		16	12
Intentional self-inflicted	48	20	0		0		68	40	0		13	80
Intentional by someone else	21	21	16	0	4	19	55	10	14		18	18
Other	16	0	13		0		84	0	0		9	
Number of participants answering question	84	93	57	55	6	88	4	46	49	37	82	63
Mean number of visits for Paticipants who attended ED in the previous year	2.2	1.2	1.8	2.0	2.3	1.4	2.0	1.2	1.7	1.7	1.4	1.5

Notes:

1: New Zealand asked about mode of injury in a way that was not compatible with the final version of the questionnaire

Table 38. Person causing intentional injury by country

	Argentina	Belarus	Brazil	Canada	China	Czech Republic	India	Mexico	Mozambique	South Africa	Sweden
Number of participants answering question	54	48	45	2	108	18	188	72	108	317	33
Person causing intentional injury (%)											
Spouse	3	10	7	0	10	22	6	4	10	6	3
Other Relative	7	6	4	0	2	17	15	7	6	9	15
Friend/Acquaintance	29	19	22	0	19	11	23	11	17	30	9
Stranger	57	60	67	100	64	39	17	71	39	49	70
Unknown/Other	5	4	0	0	5	11	38	7	29	6	3

Notes:

1: New Zealand asked about mode of injury in a way that was not compatible with the final version of the questionnaire

The data was also pooled by sex to look at who caused the intentional injury. Females were almost equally likely to be intentionally injured by a spouse, friend/acquaintance or stranger, whereas men were most likely to be intentionally injured by a stranger (Table 39).

Table 39. Person causing intentional violence by sex of victim

	Female	Male
Number of participants answering question	198	792
Person causing intentional injury (%)		
Spouse	25	3
Other Relative	12	8
Friend/Acquaintance	24	22
Stranger	26	53
Unknown/Other	13	15

The country data was also pooled regionally in such a way that numbers would be sufficient to look for patterns in the drinking behaviour of people who caused intentional injury on the participants. Table 40 reports on the regional allocation of the countries.

Table 40. Pooling of countries regionally

Country			
European/Commonwealth	Latin Americas	Asia	Africa
Belarus	Argentina	China	Mozambique
Canada	Brazil	India	South Africa
Czech_Republic	Mexico		
New Zealand			
Sweden			

Apart from Asia, it was the friend or acquaintance who was most likely to have been definitely or probably drinking when they caused an intentional injury (Table 41). The alcohol involvement when a stranger caused an intentional injury was most likely to be unknown except for in Asia.

In Africa a high number of cases was reported who answered "don't know" when the perpetrator had consumed alcohol.

Table 41. Person causing intentional injury and intoxication regionally

	Africa			Latin Americas			Asia			European		
	Yes/Probably	No	Don't Know	Yes/Probably	No	Don't Know	Yes/Probably	No	Don't Know	Yes/Probably	No	Don't Know
Number of participants answering question	217	67	139	83	47	40	141	103	50	52	22	27
Person causing intentional injury (%)												
Spouse	48	40	12	50	50	0	55	41	5	70	30	0
Other Relative	59	28	13	40	50	10	52	21	28	27	64	9
Friend/Acquaintance	65	19	16	52	46	2	54	31	15	71	7	21
Stranger	39	10	50	49	19	31	32	48	21	49	14	37
Unknown/Other	42	15	44	34	14	52	61	26	13	60	40	0

Note:

1: The percentages sum across a row within region

6.4 Objective 4. To describe the feasibility of establishing the Y91 alcohol code, ICD-10, as a reliable and valid alcohol-related injury data source

The International Classification of Diseases, version 9 (ICD-9) enables alcohol poisoning (E860.0 or E860.1) to be easily classified and coded due to its primary relationship to the injury. However, other injury classifications do not have the facility to easily include alcohol as a contributory factor. This lack of a potential source of alcohol related harm data means that complex calculations are required in order to attribute alcohol's involvement and hence gain some measure of alcohol's burden of disease.

The update for the ICD to version 10 (ICD-10) in the mid-1980ies proposed that coding the severity of alcohol intoxication should be included. Two coding paths were developed, with one verifying alcohol involvement using blood alcohol content (BAC) and in the absence of a BAC a separate code would be used to record the evident level of intoxication determined by observation. These two levels were adopted in the ICD-10 as Y90 (BAC levels) and Y91 codes (evident level of intoxication determined by observation).

The new Y91 code required further research into assessing its true reliability and validity as well as to assess whether it could be used effectively within the dynamic environment of the emergency department. Objective 2 of this report attempts to investigate the validity and reliability of the Y91 code as a potential alcohol surveillance tool.

This section reports on the findings of the qualitative element of the study where each study site conducted a range of key informant interviews, as a means to identify the current barriers to recording alcohol and barriers and enablers for utilising the Y90 and Y91 as a means for recording alcohol. The findings draw on the information that was provided within each study centre's country report and correspondence with study centres to clarify information where appropriate. Where differences emerge the participating country is mentioned otherwise the findings are reported collectively.

Table 42. Key informants

Country	**Key informants**
Argentina	Administrators, nurses, doctors, ED chiefs
Belarus	Medical and other trauma centre staff
Brazil	ED professional team members
Canada	Triage nurses
China	ED staff and managers
Czech Republic	ED medical and nursing staff
India	ED medical, nursing and administrative staff, family members of patients, police
Mexico	ED medical staff
Mozambique	ED clinical staff
New Zealand	ED health professionals and medical coders
South Africa	Trauma staff and heads of EDs
Sweden	ED staff

6.4.1 Barriers to the recording of alcohol

It was clear from the participating study centres that there had been no routine recording of alcohol. Although Belarus, Canada, Mexico, New Zealand and South Africa reported that a system for the recording of alcohol did exist, these study centres explained that the collection and recording of this information could be inconsistent resulting in a variable quality of the information provided.

The study centres reported many reasons for not recording alcohol as a factor in injury. The most common of these was the perception that the information was not useful in the ED environment. Alcohol was acknowledged as an inherent factor in some patient admissions.

The informants mentioned in varying degrees the following barriers to why recording alcohol was difficult within the ED environment. These barriers were the following:

- did not perceive alcohol as an issue important enough in the ED to warrant a specific recording system;
- perception that if the individual is not aggressive or does not behave in an improper way it is not a problem and hence the link between harm and alcohol is missed;
- lack of recognition due to deficit in medical education around screening and treating alcohol problems;
- difficulty in attributing problem drinking to non-dependent drinkers, i.e. hazardous and harmful drinkers;
- perception that the ED was not the place for treating the dependent drinker or "alcoholic";
- did not want to label a person a "problem drinker";
- medico-legal implications and subsequent responsibilities associated with recording alcohol;
- lack of integrated substance abuse support system if ED patient required skilled substance abuse professionals, i.e. identify a problem but no capacity to intervene.

6.4.2 Barriers to utilizing the Y90 and Y91 codes

Most of the study sites reported that utilizing the Y91 clinical observation form was not difficult. The study centre in Mexico reported that despite the ease of using the observation forms there was an "attitude of indifference" because the relevance to the work was not seen. This indifference was also reported in varying degrees by the other sites, apart from Sweden and Canada, who reported that their key informants could see no barriers to utilizing the Y90 and Y91 codes as means for developing a routine alcohol surveillance system in the ED.

Many of the key informants discussed a range of barriers to establishing an alcohol surveillance system based on the Y91 and Y90 codes. The study centres from Argentina, India and Mozambique specifically reported the lack of staff, resources, and work pressures as barriers to adding to what was perceived as a further task. Furthermore, Argentina also indicated that they would like dedicated people on site to undertake the role of recording alcohol involvement which would mean that ED staff could continue to do their core work. The problems of lack of time and resources also emerged.

For the purposes of this study, the Y91 observational assessment form was a separate document from the standard paperwork utilized in the various EDs of the study centres. Having a separate form was specifically mentioned by Mexico and New Zealand as an inhibitor to completing the forms and completing them in a timely and accurate manner. The prime reason

for this barrier was that the separate form meant that at times the “observer” may have multiple patients and hence multiple forms to complete simultaneously. This was perceived by these key informants to impact on the veracity of the assessment and hence reinforced their indifference to the Y91 forms as a useful data source. However, the inclusion of an assessment section as part of the standard ED forms was reported as a positive means to using the assessment criteria. The integration of the Y90 and Y91 codes into standard forms was also reported by most of the other study centres as an effective mechanism for establishing an alcohol surveillance system.

Although the assessment itself posed no difficulty, the purpose of distinguishing the levels of intoxication was questioned by informants from New Zealand, the Czech Republic and India. These study centre informants highlighted that if a definitive level of alcohol was required a blood alcohol (BAC) should be taken; otherwise a "yes/no" response might be more useful. In addition, the study centre informants from New Zealand did not think that the observational assessment should be matched to a BAC equivalent because of the range of variables which impact on the extent to which an individual becomes intoxicated, as the following comment illustrates: *A person could have a very high BAC but not show the equivalent in an observational situation resulting in a mismatch and so making the information recorded invalid.*

The study site in the Czech Republic also reported that for some of the informants, the clinical observation was perceived as not useful because of the implication of medico-legal requirements. Medico-legal issues and responsibilities were mentioned as a barrier by almost all sites. For example, there was a requirement in some sites to report to insurance companies if alcohol was a factor. This was seen as a negative for recording alcohol involvement on patient documents.

Another barrier identified was the social acceptability of alcohol use, which could make it difficult for the clinician to make the connection between an injury and the role of alcohol if the alcohol use was not perceived as a dependency or abuse situation. Lack of training and skills among medical professionals was discussed as the main reason for this situation. However, despite this lack of training and skills, India, Argentina, Belarus and New Zealand also reported that some informants remarked that alcohol problem interventions should be left to specialists and that the ED was not really the location for such interventions.

6.4.3 Facilitating factors for increasing the use of Y90 and Y91 codes as an alcohol recording system

Three main themes emerged as ways to improve the recording of alcohol, as follows:

- Training:

  All the study centres highlighted the lack of training around alcohol-related harms beyond that of alcohol dependence. There is a need to raise awareness among ED professionals of the extent to which alcohol misuse and harmful use are contributing to the health of patients attending the ED and that they may be the only health contact these patients have.

  Training was also seen as an ongoing process rather than a one-time investment; this would require commitment and resources.

  The development of clinical practice guidelines for the ED was seen as an effective mechanism for ensuring the routine documentation of alcohol involvement.

- Usefulness of data reported back including validation and reliability data:

  If data was to be collected it was essential that the information was reported back to the ED in a timely and useful manner.

Furthermore, consideration of who else may utilize this information and how this may impact on the ED was reported as being useful.

- Integrated into specialist services and resources:

  Screening and recording of alcohol-related harm raised the issue of lack of integration with other services. It was seen as essential that any screening system adopted was integrated into other services where positively screened patients could be referred to specialists as required.

6.5 Results of the case-crossover analyses

Since the current form of the macros used for the usual frequency analyses does not include weighting, Table 43 presents the unweighted relative risk (RR) estimates for each of the participating sites. Also, some numbers (Ns) of these tables do not match with what is presented in other parts of this document, due to missing data in some key variables used in the case-crossover analyses. As expected, there was a wide range of estimates, from a low RR of 1.05 in Canada to a high estimate of 35.00 in South Africa. With the exception of Canada and the Czech Republic, all other sites showed increased and significant RRs.

Table 43. Reported alcohol use (NB: applies to data of those aged 18 years and over) six hours prior to injury and risk of injury by study site: usual frequency analyses (unweighted data)

Alcohol use six hours prior	**Usual frequency analyses**				
	Total	**Exposed**	**RR**	**CI 95%**	**p**
Argentina (Yes)	452	109	4.52	3.56-5.73	<0.001
Belarus Yes	457	137	12.49	9.90-15.75	<0.001
Brazil (Yes)	496	63	2.39	1.83-3.12	<0.001
Canada (Yes)	222	13	1.05	0.58-1.88	0.876
China (Yes)	533	100	23.22	14.33-37.64	<0.001
Czech Republic (Yes)	510	40	1.09	0.77-1.56	0.619
India (Yes)	544	118	33.46	18.49-60.54	<0.001
Mexico (Yes)	456	78	12.53	9.65-16.28	<0.001
Mozambique (Yes)	459	77	6.39	4.75-8.59	<0.001
New Zealand (Yes)	153	56	8.89	6.27-12.59	<0.001
South Africa (Yes)	464	238	35.00	24.80-49.39	<0.001
Sweden (Yes)	497	73	3.93	3.00-5.15	<0.001

Table 44 presents the odds ratio (OR) estimates based on the pair matching. Since neither Mozambique nor South Africa included the questions on alcohol use a week prior to the injury, they were not included in these analyses. Differences in sample size of Table 44 when compared with Table 43 are due to sites with large amount of missing information on the questions related to last week drinking, and, for Argentina, Canada and New Zealand, the use of the weights for the calculation of the pair matched odds ratio. The result ranged from a low OR of 0.55 in Canada to a high of 46.0 in India. China showed a table with a zero cell that precluded a point estimate of the OR. With the exception of Canada and the Czech Republic, all sites showed increased and significant ORs.

Table 44. Reported alcohol use six hours and one week prior to the injury by study site. Pair matched analyses (weighted data)

Alcohol use six hours prior	One Week Prior to the injury				
	Yes	No	OR	CI 95%	p
Argentina*					
Yes	34	57	4.75	2.52-9.73	<0.001
No	12	333			
Total	46	390			
Belarus					
Yes	13	124	24.8	10.34-77.72	<0.001
No	5	313			
Total	18	437			
Brazil					
Yes	18	43	6.14	2.73-16.18	<0.001
No	7	419			
Total	25	462			
Canada*					
Yes	8	6	0.55	0.17-1.61	0.225
No	11	195			
Total	19	201			
China					
Yes	13	34	Ind	8.73-∞	<0.001
No	0	403			
Total	13	437			
Czech Republic					
Yes	7	22	0.81	0.44-1.48	0.475
No	27	413			
Total	34	435			
India					
Yes	45	46	46.00	7.85-1855.90	<0.001
No	1	416			
Total	46	462			
Mexico					
Yes	8	68	6.80	3.48-14.81	<0.001
No	10	366			
Total	18	434			
Mozambique					
Yes					
No					
Total					
New Zealand*					
Yes	21	37	7.40	2.90–24.12	<0.001
No	5	87			
Total	26	124			
South Africa					
Yes					
No					
Total					
Sweden					
Yes	15	51	7.28	3.29-19.02	<0.001
No	7	399			
Total	22	450			

*Data weighted

Some sites had high percentages of missing information on alcohol use a week prior to the accident: China (16%), Czech Republic (8%), India (7%), and Sweden (5%).

7 Discussion

This study is one of the first to attempt to quantify the role of alcohol in injury among presentations at EDs across several different countries using the same research methodology. The use of the case-crossover design (Maclure, 1991) by 10 of the participating countries enabled the calculation of the risk of injury associated with consuming alcohol. Also, the usual frequency analyses were carried out for all sites which allowed for estimates of the relative risk. In general, these results showed that acute alcohol use was associated with injuries in all sites except in Canada and the Czech Republic (using both the pair-matched and the usual frequency analyses). A more detailed examination of the possible reasons of failure to show a positive association in these two sites is beyond the scope of this document.

The study was limited to non-fatal cases of injury that came to ED facilities and although the study design provided a representative sample of patients from these facilities, patients may not have been representative of other ED facilities in the city or the country that participated. As is common with other ED studies, cases also cannot be assumed to be representative of those with injuries who do not seek medical attention. All analyses reported here were based on the patients' self-reported alcohol consumption for differing time frames. It is possible that patients were more likely to recall with exactitude their consumption immediately prior to an injury event than for any other previous period. On the other hand, there is no reason why patients would overestimate their drinking prior to an injury, as compared to any other time period.

7.1 Contextual factors about sites which may affect results

Five of the sites were identified as providing free emergency services, and one provided services in a poor area at a sliding scale. In these sites, cost is likely to have been less of a barrier to access. Other services may have been free but not stated. However, one site which provided nominally free services was known to require bribes or tips for service. Two sites were secondary services, which either received the less seriously-injured cases or received cases after preliminary treatment at smaller, community-based services. Both these situations would have biased the proportion of alcohol-related injuries identified.

7.2 Demographic characteristics and injury

Males were over-represented in the total combined injured participant population (alcohol-related and non alcohol-related) for all countries except Sweden, where males were only a slight majority. Excluding Sweden, males were also significantly over-represented in the alcohol-related injury cases; in the sites in Brazil, China and India, over 90% of the alcohol-related injury cases were male. These differences between sites are likely to reflect the acceptability of alcohol consumption by females in the different countries. This over-representation of males in injury and alcohol-related injury findings is consistent with international research (Cherpitel, 1996; Li et al., 1998; Mcleod et al., 1999; Hanlin et al., 2000; Mcleod et al., 2000; Roche et al., 2001).

The age group under 30 years dominated participant numbers for all injury and alcohol-related injury cases in 10 countries. In Canada and China, the dominant injured age group was 30-39 years. The over-representation of the under 30 age groups in the injury findings are consistent with the international literature (Cherpitel, 1993; Vinson et al., 1995; Mcleod et al., 1999). Explanations in the literature relate injuries to a higher likelihood and severity of acute alcohol-related problems among young people because of drinking modes, such as binge drinking, and settings (Murgraff et al., 1999).

7.3 The proportion of alcohol-related injury

This study found a combined proportion of alcohol-involved injury cases for all countries of 20.4%, slightly higher than the 10-18% found in other international studies (Borges et al., 1998; Pickett et al., 1998; Cherpitel et al., 1999; Mcleod et al., 1999; Maio et al., 2000). Participating sites in Argentina, Belarus, New Zealand and South Africa reported higher proportions of alcohol-related injury (24.5%, 28.8%, 35.5% and 50.3% respectively). The differences between countries in the proportion of participants who consumed alcohol is likely to reflect the differences in the patterns of alcohol consumption within each country, cultural differences and differences in alcohol harm minimization policies (e.g. drink driving legislation and enforced minimum alcohol purchase age).

7.4 The validity of the Y91, ICD-10, code framework

Several factors play a part in the degree of intoxication, including age, gender, weight, the number of drinks, the length of time over which they are consumed and consumption of food (Sastre et al., 2000). The manner in which a person is behaving also contributes to the perception of alcohol intoxication, making estimating a level of intoxication difficult at an individual level (McKnight et al., 1997).

Emergency department doctors were most often used to rate the level of intoxication for each injury case, with four countries using nurses. Assessors were able accurately to distinguish not-intoxicated participants (BAC <0.059) and very severely intoxicated participants (BAC>0.299), but their ability to estimate the level of intoxication in the middle categories was weak. This suggests that although the reliability of matching BAC to assessment based on the five Y91 categories is poor, the identification of alcohol involvement was significantly accurate.

Analysing the data using Cohen's kappa showed that assessors were able to rank the level of intoxication similarly across groups (Cohen's kappa statistic range 0.71 -0.91).

7.5 Alcohol consumption patterns and injury

Quantity and frequency of alcohol consumption are crucial variables for determining health problems and estimating health risks (World Health Organization, 1999).

The quantity reported as typically consumed on these occasions differed markedly across the participating sites. However, two associations were clear: Firstly, in 11 countries alcohol-related injury participants were more likely than non-alcohol-related injury cases to consume alcohol at least once a week ($p<0.001$). The data from New Zealand were not compatible for this analysis, although the researchers from New Zealand found that the risk of an alcohol-related injury increased with every 30mls of absolute alcohol consumed ($p=0.046$); 50 % of the respondents had 3.9 times or more the risk of an injury.

Three other countries identified strong associations between heavy drinking patterns and injury. In Canada, participants with alcohol-related injuries were significantly more likely to drink more alcohol, drink more frequently and reported they had more alcohol problems than those with non alcohol-related injuries. The researchers from China found that participants with alcohol-related injuries were significantly more likely to drink heavily (five or more drinks in a session) more often ($p=0.01$). In South Africa, binge drinking (those that drink a lot at certain times of the week, presumably over weekends) was a substantial factor in frequency of injuries. More than half of the injured respondents indicated that they drank up to four times a week.

The study found that participants who drank tended to drink about the same quantity in the six hours before injury as in a typical drinking occasion. However, in New Zealand, where data was collected over the Christmas celebration period, participants drank more than their

typical amount in the six hours before the injury. This indicates a need for future research to take into account seasonal peaks in alcohol consumption.

The second association was between alcohol and intentional injury; in eight countries the mean amount consumed by participants who suffered an intentional injury by someone else was higher than for those who suffered an unintentional injury. The exceptions were China, Mexico, Mozambique and South Africa.

A variety of early international studies reviewed by Cherpitel (1992) clearly associate the consumption of alcohol as related to an increased risk of having an injury. However, Cherpitel (1992) argues that these studies cannot categorically state that the injury events are related to or caused by alcohol.

7.5.1 Place of injury

Alcohol-related injuries were more likely to occur in public places in all countries except for Canada and the Czech Republic, where the participants' own home was the most common location.

These results reflect the evidence reported in the international literature. In an alcohol and injury study by Cherpitel (1993) comparing Mexico, Spain, and the United States of America, home (own or others) and public place/street were over-represented as injury locations (Cherpitel et al., 1993). A Canadian study (MacDonald et al., 1999) found that those with accidental injuries were more likely to have consumed alcohol within the six hours beforehand and that the injury was more likely to have occurred in a public/recreational place compared with controls.

7.5.2 Last drink and injury

This study asked participants the time and location of their injury and their last drink. Belarus and New Zealand reported a significant association between where people had their last drink and where they were injured; at home in New Zealand and at home and in public places in Belarus. Public places were a common injury location for those who reported their last drinking at a drinking place such as a pub, tavern or restaurant. For all countries there was only a moderate chance that the location of the last drink location was the same as the injury location. This differs from the international research where the place of drinking was also most likely to be the place of injury (Pickett et al., 1998; Mcleod et al., 2000).

Excluding Mozambique, a third or more of the participants reported that their injury occurred within 30 minutes of their last drink. In sites in Belarus, China, Mexico and New Zealand, half of those with an alcohol-related injury reported having their last drink within 30 minutes from the time of injury.

7.6 The feasibility of routine use of the Y91, ICD-10, code framework

Although the assessment itself posed no difficulty, informants from the Czech Republic, India and New Zealand questioned the purpose of distinguishing levels of intoxication. These study centre informants preferred a BAC test or a yes/no response.

Informants from the site in the Czech Republic also reported that the clinical observation was not seen as useful because of its medico-legal implications. Medico-legal responsibilities were mentioned as a barrier by most sites. For example, some sites were required to report to insurance companies, if alcohol was a factor in injury. In at least two sites, this led to patients pressuring or bribing medical staff to keep this information off their records.

However, Mexican and Brazilian informants were positive about ongoing surveillance of alcohol in injury cases Canadian informants suggested a self-administered questionnaire for ED patients as the costs of extra personnel to conduct breathalyser tests would be too great.

8 Summary

Alcohol is a major contributor to the global burden of disease accounting for 4.0% of Disability Adjusted Life Years worldwide and 3.2% of mortality (Ezzati et al., 2002). A substantial portion of the burden of disease attributable to acute alcohol-related factors is accounted for by injuries. The World Health Report 2002 states that injury is accountable for about one tenth of the disease burden (World Health Organization, 2002). The role of hospital emergency departments (ED) as a first provider of treatment for emergency or urgent medical care has highlighted the potential role of the ED as a source of harm information. Previous combined research evidence reports that between 10–18% of injury patients (with intentional and unintentional injuries) involve alcohol. The systematic recording of alcohol as a contributing factor in injury (excluding that of alcohol poisoning) around the world is poor.

The International Classification of Disease (ICD) - which most countries of the world use to some extent to record national disease statistics - is a surveillance tool which enables national statistics to be compared in an international context with other nations. ICD-10 has included an "Alcohol: harmful use" category, defined as "Harm experienced in the absence of dependence". The ICD-10 has also added another two new categories, the Y90 and Y91 codes. These codes enable specific recording of blood alcohol level (Y90) and the recording of a clinical assessment of the level of intoxication (Y91).

This WHO study set out to describe alcohol-related injuries in EDs in developed and developing countries in Africa, Asia, America, Europe, and the Pacific in terms of demographic patterns. The study also aimed to test the validity of the Y91 code, ICD-10, as a potential reliable alcohol-involved surveillance tool and assess the feasibility of establishing its use in the ED. The final aim was to examine the context in which drinking occurred prior to the injury and other alcohol-related variables, and the association of patterns of drinking with injury.

The study utilized a comparable protocol across the countries and assessed alcohol level using a breath analysis machine at the time of arrival at the ED. It gathered self-reported alcohol consumption, self-rated intoxication and context, and information about drinking and injury. An assessment of the participants' intoxication level was gathered by a clinician using the ICD-10 framework.

This study found that the proportion of alcohol-related injury cases ranged from 6-45%, in contrast to international literature reports of between 10-18% (Cherpitel, 1993; Borges et al., 1998; Li et al., 1998; Roche et al., 2001). There was considerable variation in alternative sources of care available (i.e. private emergency care services), the location and population served by the hospital ED, and accessibility, but the results clearly illustrate that alcohol is a contributing factor in the injury event in a variety of settings.

A case crossover design was utilized in a number of countries and demonstrated a causal association between alcohol use and injuries.

The findings showed that males and young people were over-represented in the alcohol-related figures, again reflecting earlier ED study findings.

Questions about the quantity and frequency of typical alcohol consumption were asked of all study centre participants and, although caution is required when interpreting this data across all countries, the mean typical occasion quantity and the mean yearly frequency of consumption was greater for those who had consumed alcohol six hours prior to their injury compared to last year drinkers. (India, for example, reports heavy stigmatization surrounding alcohol use and as such the 25% reporting having consumed alcohol in the previous 12 months may be an underestimate).

The study used three methods of capturing the level of alcohol intoxication – a self-assessment recalling intoxication at the time of the injury, a BAC reading and clinical assessment at the ED. Cohen's kappa was used as a measure of agreement between BAC, clinical assessment and self-assessment of levels of intoxication as defined by the Y91, ICD-10, code.

Overall, there were low levels of agreement within countries between the different assessments – clinical, self and BAC. The highest levels of agreement were between self- and clinical assessment. This does not indicate their assessment was correct, but this could be due to the clinical and social interaction between participants and clinicians. The next highest level of agreement was between BAC level and self assessment, followed by BAC level and clinical assessment. In all cases, agreement was likely to be lower when only those people who said they had consumed alcohol in the six hours prior to the injury were considered. This reflected greater ease of assessment of participants who had not consumed any alcohol. Weighted kappa, a statistic that allows for near misses in judgement, was higher than kappa. Further investigation could look at the effect of having fewer levels than the five levels of the Y91, ICD-10, code as a way of increasing agreement.

The countries were not uniform in the proportion of participants they had in the under- and over-classification groups. This could be due to the acceptability of alcohol within the culture or the nature of the participants, i.e. a high proportion of tolerant drinkers.

Cultural differences also play a role in the drinking context – locations and activities. Most commonly mentioned locations involved the home, e.g. housework, house or car repairs, household activities, care-giving, and on a street or highway. "Commuting/travelling", "work", "leisure, playing" or "doing nothing in particular" were the most frequently reported activities. Participants who had consumed alcohol prior to their injury were more likely to be involved in "leisure, playing" and less likely to be doing "paid work".

The RAPS4 was developed for the ED population and is based on the most sensitive questions from several different instruments. The RAPS4 scores versus amount consumed in the six hours prior to injury, typical occasion quantity, yearly frequency of drinking and ED visits, in general showed that all these variables were highly correlated with RAPS4 score.

All countries except one reported that the majority of all participants suffered an injury that was "unintentional". Across all countries, participants who consumed alcohol prior to their injury were more likely to have suffered an injury that was "intentional by someone else". The role of violence ("intentional by someone else") has an increasingly clear relationship to alcohol consumption and the environment where alcohol is consumed. The data was examined to look at the role of violence in injury generally as well as at who caused the intentional injury by sex. Females were almost equally likely to report being intentionally injured by a spouse, friend/acquaintance, or stranger, but men were most likely to report being intentionally injured by a stranger.

Participants with "unintentional" and "intentional by someone else" categories varied widely between countries, but had similar chances of having used the ED in the previous year, so the use of a screening tool is an aid in identifying harm, as those with high RAPS4s are likely to have previous ED injury, higher typical quantity, and high frequency of alcohol consumption. Participants with "intentional, self-inflicted" injuries were also more likely to have visited the ED in the previous year than other participant types of injury; however, the numbers in this group were small.

It was clear from all the participating study centres that there was no routine recording of alcohol within each of the participating study centres and whatever collection and recording of information there is, is arbitrary and therefore widely variable.

Many key informants for this report discussed a range of barriers to establishing an alcohol surveillance system based on the Y90 and Y91 codes. The inclusion of an assessment

section as part of the standard ED forms was reported as a positive means to using the assessment criteria. The integration of the Y90 and Y91 codes into standard forms was also reported by most of the other study centres as an effective mechanism for establishing an alcohol surveillance system.

Three main themes emerged as ways to improve the recording of alcohol-related presentations in EDs. These were the following:

1. A commitment to ongoing training to raise awareness of the extent to which alcohol misuse and harmful use is contributing to the health of patients; including developing clinical practice guidelines for the ED to ensure the routine documentation of alcohol involvement;

2. Reporting back to the ED workers on the usefulness of data including validation and reliability of the data collected; and

3. Integrating ED screening and recording of alcohol-related harm into specialist services and resources.

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