Empirical validation of the New Zealand Injury Prevention Strategy indicators:

The identification of ICD diagnoses associated with a high probability of inpatient hospital admission

Injury Prevention Research Unit

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A report for the
Accident Compensation Corporation of New Zealand

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Contents

List of Tables

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Abbreviations

A&E	Accident and Emergency
ACC	Accident Compensation Corporation
CI	Confidence Interval
DOA	Dead on arrival
DSP	Diagnosis-specific Survival Probability
ED	Emergency Department
HCUP	(US) Healthcare Cost and Utilization Project
ICD	WHO International Classification of Diseases and Related Health Conditions
ICD-9	ICD 9th Revision
ICD -9-CM	ICD-9 Clinical Modification
ICD-10	ICD 10th Revision
ICE	International Collaborative Effort on Injury Statistics
IPRU	Injury Prevention Research Unit, University of Otago
LCL	Lower Confidence Limit
LoS	Length of stay in hospital
nec	not elsewhere classified
NMDS	NZ's National Minimum Data Set of hospital inpatient discharges.
NZIPS	New Zealand Injury Prevention Strategy
PDx	Principal diagnosis
PrA	Probability of Admission
USA1	Counts from the US National Hospital Ambulatory Medical Care Survey- ED Component (ie. Survey Based)
USA2	Counts from the. US Health Care Utilization Program State ED data and State Inpatient Data
WHO	World Health Organization

Summary

Background

Critical to the development of valid indicators of serious injury incidence is the operational definition of the term "serious". The solution identified in New Zealand, for the New Zealand Injury Prevention Strategy (NZIPS) serious injury indicators, was to use an objective severity measure, the ICD-based Injury Severity Score (ICISS) – the threat to life severity of injury score – and to classify as "serious" those injuries that have a severity of injury score at least as extreme as an ICISS threshold (ie. ICISS$\leq$0.941 for ICD-10 coded data, ICISS$\leq$0.96 for ICD-9). Using this definition, counts and age standardised rates have been used to monitor trends.

The ICISS threshold was set with the goal of capturing injury diagnoses that firstly are important in terms of threat to life, and secondly have a high probability of admission – in order to largely remove the effects of any extraneous influences (eg. changes in health service provision) on the indicator trends.

The question is: do they in fact capture injury diagnoses with a high probability of admission? On the face of it, they appear to (ie. they have good face validity, e.g fracture of the femur is captured by this threshold and has a known high probability of admission); but prior to this work, this goal had not been tested empirically across all relevant diagnoses. A study to estimate the diagnosis-specific probabilities of admission across all injury diagnoses was needed in order to increase our confidence in the NZIPS indicators.

Additionally, within New Zealand there has been discussion around the development of indicators that capture a greater number of cases. It has been perceived that the current specifications of serious non-fatal injuries for the NZIPS indicators do not capture all of the cases of interest. The question has been asked: can the non-fatal injury indicators be specified in a way that capture a greater number of serious injuries, but which does not compromise validity. This current work also explored this question.

Furthermore, **international comparisons** of non-fatal injury are often based on hospital inpatient data, and are often contaminated by differential health service effects between countries (eg. varying access to, and provision of, inpatient hospital care). One way to control these contamination effects is to make comparisons solely using a case definition based on diagnoses that have a high probability of inpatient admission. That way, health service effects will be largely removed.

Prior to this work, a comprehensive investigation of diagnoses with high probabilities of admission had not been undertaken.

Purpose

1) To empirically validate the existing NZIPS serious non-fatal injury indicators
2) To investigate the opportunity to develop serious injury indicators that capture a greater number of serious injuries
3) To provide the wherewithal to develop reliable methods for international comparisons.

Aim

To identify International Classification of Diseases (ICD) diagnoses associated with a high probability of inpatient admission for developed countries.

Method

In overview, we identified international collaborators who had access to Emergency Department (ED) data whose diagnoses were coded to the ICD codes. A protocol for data provision was agreed with our collaborators. The submitted data was checked by the New Zealand team and then via liaison with the collaborators. Country-specific results were presented at the ICD 4-character level. Results were also contrasted between countries.

In more detail, the initial phase of the project included the following:

- liaison between the New Zealand team and scientists from prospective countries;
- for each collaborator, identification of their country- / region-specific diagnostic coding used (including coding frames), specificity of coding, who codes the diagnostic data in their ED, and the reliability of ED diagnostic coding in each participating country;
- identification of what populations are captured by their data;
- agreement on how to deal with deaths prior to ED attendance, and multiple attendances for the same injury;
- agreement on:
    - an operational definition of injury between countries,
    - the minimum data required - that can be supplied by all participating countries.

This liaison resulted in the development of a protocol and tool to facilitate:

- the extraction of data and
- the generation of aggregates complying with standard definitions and methods, as well as complying with ethical committee requirements within collaborating countries.

The collaborators who agreed to take part provided (typically) regional or state data aggregates from their countries. All of the collaborators involved supplied ED data either ICD-10 or ICD-9-CM coded, or coded such that they could be mapped to ICD. These countries were Australia (diagnosis data could be mapped to ICD-10), Canada, Denmark, Greece (all of which supplied ICD-10 based data), and Spain and the USA (who supplied ICD-9-CM based data). Collaborators were not funded for data provision. Consequently, we were reliant on their good will, and on them fitting the work we asked of them around their paid activities. It is unsurprising that some countries did not respond to some of our requests in a timely manner.

The data were collected together, compared and contrasted. Initially, there was a period of querying and checking to ensure the data aggregates supplied by the countries were as similar in their definitions and the methods of extraction as they could be. Our data checking highlighted problems with the initial data provision for some countries, and so several additional months, than were scheduled, were required to secure data that passed our checks.

Analysis Methods

Diagnoses (at the 4 character level) were identified and presented if the lower confidence limit (LCL) for the probability of admission (PrA) was at least 0.40, ie. PrA LCL $\geq$0.40. (The 0.40 threshold is somewhat arbitrary; however, it was chosen since it was our judgement that all diagnoses with an actual (rather than estimated) high probability of admission would be captured with such a threshold, and all diagnoses which did not have a high probability, or which had very small number of cases, would be discarded.)

Breakdowns by gender, age, external cause, and intent were used to identify additional diagnosis codes for presentation where, for at least one subcategory, the PrA LCL$\geq$0.40. Additionally, a 3 character level analysis was used to identify additional diagnoses of interest which were not picked up at the 4 character level analysis – eg. due to small numbers and / or limited precision.

Also presented were PrA estimates that had an estimated Diagnosis-specific Survival Probability (DSP) at the 4 character level of at least 0.941 (ie. DSP$\leq$0.941 for ICD-10 [DSP$\leq$0.96 for ICD-9]), provided the number of discharges on which the DSP was based was at least 100. This was done to facilitate the empirical validation of the NZIPS serious non-fatal injury indicators. For these indicators, "serious" is defined as an ICISS$\leq$0.941(0.96). ICISS is constructed from DSPs estimated from a training set. If an individual DSP$\leq$0.941 (0.96), it follows that the ICISS will too - hence, our interest in these DSPs for validation purposes.

Results

Validation of the existing NZIPS serious non-fatal injury indicators – under ICD-10

Of those 4-character ICD-10 diagnoses with DSP≤0.941, only two had probabilities of admission unequivocally and consistently greater than 0.75 - namely:

S720 – fractured neck of femur;

S721 - pertrochanteric fracture.

These diagnoses accounted for 63% of the serious threat to life cases identified from the NZ data with ICD-10 4 character DSP≤0.941.

More diagnoses had 95% CIs for PrA that were potentially consistent with high probability of admission across all countries – namely:

S061 – Traumatic cerebral oedema

S063 – Focal brain injury

S064 – Epidural haemorrhage

S066 – Traumatic subarachnoid haemorrhage

S068 – Other intracranial injuries

S069 – Intracranial injury, unspecified

S120 – Fracture of first cervical vertebra

S141 – Other and unspecified injuries of cervical spinal cord

S225 – Flail chest

S272 – Traumatic haemopneumothorax

S361 – Injury of liver or gallbladder

S368 – Injury of other intra-abdominal organs

T213 – Third degree burn of trunk.

The estimated probabilities of admission, for each country that had ED data coded to ICD-10, for the diagnoses mentioned so far in this subsection are:

Canada:	PrA= 0.88,	95% CI 0.87-0.88
Denmark:	PrA= 0.96,	95% CI 0.96-0.97
Greece:	PrA= 0.92,	95% CI 0.91-0.93

The above diagnoses accounted for 78% of the serious threat to life cases identified from the NZ data with ICD-10 4 character DSP≤0.941.

A further set of diagnoses had a probability of admission, for at least one of the three countries, that could have been greater than 0.75 (ie. upper confidence limit was greater than 0.75), but for which other country's estimates were not consistent with a high probability of admission – namely:

S020 – Fracture of vault of skull

S021 – Fracture of base of skull

S065 – Traumatic subdural haemorrhage

S121 – Fracture of second cervical vertebra

S271 – Traumatic haemothorax

S273 – Other injuries to the lung

S328 – Fracture of other and unspecified parts of lumbar spine and pelvis

T223 - Third degree burn of shoulder and upper limb.

The estimated probabilities of admission, for each country, for the diagnoses mentioned so far in this subsection are:

Canada:	PrA= 0.83,	95% CI 0.82-0.83
Denmark:	PrA= 0.95,	95% CI 0.94-0.95
Greece:	PrA= 0.90,	95% CI 0.89-0.91

The above diagnoses accounted for 97% of the serious threat to life cases identified from the NZ data with ICD-10 4 character DSP$\leq$0.941.

There were only 3 codes for which the upper 95% confidence limit was less than 0.75 for all countries for which CIs were presented, and these were:

S062 - Diffuse brain injury,

S218 - Open wound of other parts of thorax (based on only 1 country's data),

T71 - Asphyxiation.

Inclusion of these diagnoses changed the estimates to: :

Canada:	PrA= 0.82,	95% CI 0.82-0.82
Denmark:	PrA= 0.89,	95% CI 0.88-0.90
Greece:	PrA= 0.90,	95% CI 0.89-0.91

The above diagnoses accounted for all of the serious threat to life cases identified from the NZ data with ICD-10 4 character DSP$\leq$0.941, ie. that would be identified as cases for the NZIPS serious injury indicators.

Validation of the existing NZIPS serious non-fatal injury indicators – under ICD-9

The diagnoses that had probabilities of admission unequivocally and consistently greater than 0.75 were:

820.2 – fractured neck of femur, closed pertrochanteric fracture;

820.8 – fractured neck of femur, unspecified part;

852.2 – subdural haemorrhage following injury without mention of open intracranial wound;

860.4 – traumatic pneumohaemothorax without mention of open wound into the thorax;

864.0 and 865.0 – injury to liver / spleen, without mention of open wound into the cavity.

These diagnoses accounted for 79% of the serious threat to life cases identified from the NZ data with ICD-9 4 character DSP≤0.96.

More diagnoses had 95% CIs for PrA that were potentially consistent with high probability of admission across all countries and these were:

800.2 – Fracture of vault of skull: Closed with subarachnoid, subdural, and extradural haemorrhage

801.1 – Fracture of base of skull: Closed with cerebral laceration and contusion

801.2 - Fracture of base of skull: Closed with subarachnoid, subdural, and extradural haemorrhage

801.3 – Fracture of base of skull: Closed with other and unspecified intracranial haemorrhage

806.0 – Fracture of vertebral column with spinal cord lesion: Cervical,

851.0 – Cerebral laceration and contusion: Cortex (cerebral) contusion without mention of open intracranial wound

851.8 – Cerebral laceration and contusion: Other and unspecified, without mention of open intracranial wound

852.0 – Subarachnoid haemorrhage following injury without mention of open intracranial wound

852.4 – Extradural haemorrhage following injury without mention of open intracranial wound

860.2 – Traumatic haemothorax without mention of open wound into thorax.

The estimated probabilities of admission, for both study countries coded to ICD-9, for the diagnoses mentioned so far in this subsection are:

USA: PrA= 0.86, 95% CI 0.85-0.86

Spain: PrA= 0.96, 95% CI 0.93-0.97

The above diagnoses accounted for 89% of the serious threat to life cases identified from the NZ data with ICD-9 4 character DSP≤0.96, ie. that would be identified as cases for the NZIPS serious injury indicators.

There were 5 codes for which the upper 95% confidence limit was greater than 0.75 for neither country for which CIs were presented, and these were:

807.4 - flail chest, and

853.0 - other and unspecified intracranial haemorrhage following injury, without mention of open intracranial wound,

942.3 - third degree burn of trunk,

991.6 - hypothermia, and

994.7 - asphyxiation and strangulation.

If we include all of the diagnoses for which DSP≤0.96, the estimated PrAs changed to:

USA2:	PrA= 0.84,	95% CI 0.84-0.84
Spain:	PrA= 0.96,	95% CI 0.94-0.97

Development of serious injury indicators that capture a greater number of serious injuries – under ICD-10

If we wish to specify indicators based on injury diagnoses for which we have high confidence that admission to hospital would almost always result, in developed countries, then our consideration would be limited to the fractured femur codes S720-S723. An indicator based on these have aggregate estimated probabilities of admission of:

Canada:	PrA= 0.88,	95% CI 0.87-0.88
Denmark:	PrA= 0.96,	95% CI 0.95-0.96
Greece:	PrA= 0.92,	95% CI 0.91-93

If one were willing to take a less conservative approach, other diagnoses would be included that are potentially consistent with a high PrA (ie. with upper 95%CI≥0.75). These additional diagnoses are:

S029	Fracture of skull and facial bones, part unspecified
S052	Ocular laceration and rupture with prolapse of loss of intraocular tissue
S063	Focal brain injury
S272	Traumatic haemopneumothorax
S360	Injury of spleen
S361	Injury of liver or gall bladder

An indicator based on the combination of these diagnoses (S029, S052, S063, S272, S360, S361, S720-S723) has an aggregate estimated probability of admission of:

Canada:	PrA=0.87,	95% CI 0.87-0.88
Denmark:	PrA= 0.96,	95% CI 0.95-0.96
Greece:	PrA= 0.91,	95% CI 0.90-0.92

Both of the above combinations of diagnoses have higher aggregate PrA than the current NZIPS serious non-fatal injury indicators. The benefit of using only these diagnoses to define an indicator, over the current NZIPS indicators, is that of capturing fewer cases whose admissions are potentially influenced by extraneous factors, including health services factors. But, this would be at the cost of a reduced number of non-fatal injury cases identified than the current NZIPS indicators.

Development of reliable methods for international comparisons.

A separate document has been prepared that provides a proposal to use the above results to define a case of serious non-fatal injury that will be robust for international comparisons amongst developed countries, and for which hospital inpatient data is coded to ICD-9 or ICD-10. This has been reproduced in Appendix C. This work will involve the specification of a case of serious non-fatal injury based on hospital data. This specification should be such that it minimises the effect of health service factors on the comparisons. Consequently, we have argued that it should be based on diagnoses that have a high probability of admission, ie. those mentioned above.

Discussion

Strengths

In this work, we developed and implemented a method to validate the NZIPS indicators by means of an international collaborative study made possible by the International Collaborative Effort (ICE) on Injury Statistics.

It is one the first studies that has investigated probabilities of admission, and the first in which probabilities have been estimated comprehensively across all injury diagnoses and across a range of countries. This report is a major contribution to the world literature on the development of valid serious non-fatal injury indicators to support and evaluate injury prevention initiatives.

Whilst the research has been carried out to validate a set of indicators for use in the New Zealand context, the findings have implications for all countries with well developed health sectors. It will guide the development and adoption of injury morbidity indicators in many countries, facilitating more valid analyses of trends in injury admissions and injury incidence as well as cross-national comparisons.

Limitations

External validity

Inference from this study's findings is limited to the study population that the data presented here represent, namely developed countries.

One issue is the extent to which the results apply to NZ. There are a number of reasons why one would de-emphasise the ICD-9 results, and focus on the ICD-10 based results. At the

fundamental level, NZ's National Minimum Data Set of hospital inpatient discharges (NMDS)[a] has been coded to ICD-10-AM since 2000, and so the ICD-10 results are the most relevant. Additionally, the ICD-9 results are based on populations less relevant to the situation in NZ. The USA health system is funded to a greater extent than that of NZ, and has a much greater level of insurance based health care than NZ. Additionally, in the USA, there is a fear of litigation if people are not given the 'full' treatment, and so patients are more likely to be admitted to hospital. The Spanish data, also coded to ICD-9, is limited to MVTC crash injury only.

Focusing on the ICD-10 results, the question is, therefore, how similar are the health systems and data sources provided by Canada, Denmark and Greece, and can we infer NZ PrAs from these data sources? Affecting PrA is not only the mix of public and private funding, but also the level of funding. Focusing solely on Canada, Denmark, Greece and New Zealand, the percentage of Gross Domestic Product (GDP) spent in 2003 on health in each of these countries in the last decade is 9.8%, 9.3%, 8.9% and 8.0%. This ordering also reflects per capita spending on health. One would expect that use of hospital inpatient services would reduce with reducing health expenditure, due to more limited provision in countries with lower health expenditure. Consequently, we hypothesise that the New Zealand probabilities of admission would be marginally less than those for Canada, Denmark and Greece.

Changing emphasis to consider these results in the context of international comparisons, we argue that a choice of case definition based on diagnoses that show high PrA, irrespective of the health system, will result in the most robust comparison. That is, such a choice is **least** likely to demonstrate the biasing impact of health service effects. So a wide variation in types of health system increases confidence in the use of these results to inform international comparison.

Accuracy of ED diagnosis

There could be some problems with ED diagnosis accuracy since these diagnoses could, in some instances, be provisional. At the start of this project, this type of argument was used as the basis for deciding on the ideal source of diagnosis data in estimating the probabilities – namely hospital discharge diagnosis, where this is available. Inpatient data was used as the source of diagnostic data for numerators for Canadian, Spanish and USA2 data. In the former instance, we observed changed results when ED diagnoses solely were used, compared with the use of inpatient diagnosis – again justifying this aspect of our protocol. It is possible that the use of ED diagnosis

[a] A database which records information on all publicly funded hospital discharges in New Zealand. The NMDS excludes cases that are funded privately. There are only a small number of privately funded incident cases that are not captured by the NMDS.

alone for Greece and Denmark could have impacted on the accuracy of the estimated PrAs for these countries.

Limitations of using first diagnosis

A single injury can generate multiple ICD-10 codes. For example, brain injury and skull fracture would generate 2 different ICD-10 codes. This is not the case under ICD-9. The implications of this are that some of the differences between the results for ICD-9 and ICD-10 could be due to the changes to the coding frames and conventions. It also means that some of the ICD-10 codes will be more heterogeneous in PrA than ICD-9 codes. For example, consider fracture of the base of skull (S021). This will include cases of skull fracture, with no brain injury, as well as cases of skull fracture with brain injury. The results from the ICD-9 analysis for USA, which has unique codes for each of these injury types, show different probabilities of admission in these two instances, 0.61-0.69, and 0.85-0.97 respectively. Consequently, the mix of cases (with and without brain injury) attending hospital ED will determine the PrA for fracture of the skull when coded to ICD-10.

Limitations of the probability of admission estimates

The variations in PrA for many serious injuries between countries are surprising, as well as the fact that the PrAs for many of these injuries are around the 65-75% rather than an expected 95-100%. These findings suggest that data quality, specificity, or completeness of coding is a likely explanation for some of the variation and the true PrAs may be higher than indicated.

Conclusions

To validate the existing NZIPS serious non-fatal injury indicators

Our results suggest that, with the exception of a small number of diagnoses, the current ICISS ICD-9 and ICD-10 thresholds used for NZIPS indicators satisfies the goal of capturing only those diagnoses with a high probability of admission. We conclude that, although the case definition of **serious** injury for the NZIPS indicators is not perfect (no definition is), it appears valid to an acceptable level.

To investigate the opportunity to develop serious injury indicators that capture a greater number of serious injuries

Combinations of ICD-10 diagnoses have been identified that have higher aggregate PrA than the current NZIPS serious non-fatal injury indicators. Using these diagnoses (only) to define an indicator would be at a cost of a reduced number of non-fatal injury cases identified than the current NZIPS indicators. On the other hand, the benefit over the current NZIPS indicators is that of capturing fewer cases whose admissions are potentially influenced by extraneous factors, including health services factors.

We conclude that this work has identified diagnoses that could be the basis of slightly more valid indicators, compared with the current NZIPS indicators, but that it would be based on fewer, rather than a greater number of, serious injuries. The benefits of using such an indicator, over the current NZIPS indicators, appear small.

To provide the wherewithal to develop reliable methods for international comparisons.

A proposal has been prepared for international comparisons amongst developed countries. This work will involve the specification of a case of serious non-fatal injury based on hospital data. This specification should be such that it minimises the effect of health service factors and other extraneous factors on the comparisons. Consequently, we have argued that it should be based on diagnoses that have a high probability of admission.

The information that has been generated by this project will inform high income countries of those diagnoses with a high or moderately high estimated probability of admission to hospital. Agreement will be required with partner countries, in future international comparisons work, in respect to the choice of injury diagnoses that should be the basis of the serious non-fatal injury indicator case definition.

1. Background and aims

1.1. Background

Injury is an important cause of mortality and morbidity. Governments wish to monitor progress in the prevention of serious injury. In the past, some national measures of serious injury in New Zealand have been based on national hospital inpatient data and have not been valid - they have produced misleading trends. These trends have been contaminated by changes in the provision of, or access to, health services. [1] Better indicators of serious injury incidence were required.

Critical to the development of valid indicators is the operational definition of the term "serious". The solution identified in New Zealand was to use an objective severity measure – the threat to life severity of injury score, the ICD-based Injury Severity Score (ICISS) [2] [3] – and to classify as "serious" those injuries that have a severity score at least as extreme as an ICISS threshold (ICISS≤0.941[b] for ICD-10 coded data). Using this definition, counts and age standardised rates have been used to monitor trends. [5]

The ICISS threshold was set with the goal of firstly capturing injury diagnoses that are important in terms of threat to life, and secondly that have a high probability of admission – in order to largely remove the effects of any extraneous influences (eg. changes in health service provision) on the indicator trends.

The question is: do they in fact capture injury diagnoses with a high probability of admission? On the face of it, they appear to. That is, they have good face validity. For example, fracture of the femur, captured by this threshold, is estimated to have a probability of admission close to 100%. (For fractures, estimates from other countries have been published previously – see Section 1.2 Previous Literature.) Prior to the present work, this goal of capturing diagnoses with a high probability of admission had not been tested empirically for all relevant injury diagnoses.

[b] It has been our experience that large administrative sets of non-fatal injury data (eg. NZHIS NMDS of hospital discharges, and ACC data) cannot be used to produce valid indicators without some pre-processing. Typically, biases in these data can be minimised by using a severity threshold for our case definition. The non-fatal indicators proposed were based on cases that were hospitalised with an ICD-based Injury Severity Score (ICISS) of less than or equal to 0.941. This is equivalent to selecting patients who, at admission, have injuries that give the patient a survival probability of 94.1% or worse – in other words, a probability of death (at admission) of at least 5.9%. For New Zealand data, this represents around 15% of all injury discharges. 4. Cryer C, Langley JD. Developing valid indicators of injury incidence for "all injury". *Injury Prevention* 2006;12:202-7. This severity threshold includes the majority of the following injuries: fracture of the neck of femur, intracranial injury (excluding concussion only injury), injuries of nerves and spinal cord at neck level, multiple fractures of the ribs, asphyxia, hypothermia, and many other injury diagnoses of similar severity or which are more serious. The full list can be found in an appendix to the report to the NZIPS Secretariat. 1. Cryer C, Langley J, Stephenson S. Developing Valid Injury Outcome Indicators: A report for the New Zealand Injury Prevention Strategy. Dunedin: University of Otago, 2004:1-141.

Additionally, within New Zealand there has been discussion around the development of indicators that capture a greater number of cases. It has been perceived that the current specification of serious non-fatal injuries for the NZIPS indicators does not capture all of the cases of interest. The question has been asked: can the non-fatal injury indicators be specified in a way that captures a greater number of serious injuries, but which does not compromise validity. This current work also explored this question.

Furthermore, international comparisons of non-fatal injury are often based on hospital inpatient data. These are contaminated by health service effects. One way to overcome these contamination effects is to make comparisons solely using a case definition based on diagnoses that have consistently high probabilities of inpatient admission. That way, health service effects will be reduced. Currently, appropriate diagnoses for such valid comparisons have not been identified by the New Zealand, or the international, community.

Probabilities of admission can be estimated where there exist Emergency Department (ED) data that is both accurately coded to ICD, and for which it is known whether attendance at ED resulted in subsequent admission to hospital. At the time of this project, we were unaware of any such data in New Zealand. As a result, we sought the required sources of data overseas, and sought to collaborate with overseas colleagues in order to estimate diagnosis-specific probabilities of admission. There is an issue regarding whether the data sources chosen are relevant to New Zealand. This is addressed in the Discussion.

The idea of a collaborative piece of work was discussed, informally, at the 8th World Conference on Injury Prevention and Safety Promotion in South Africa in March / April 2006, and this was further developed at a meeting of the International Collaborative Effort (ICE) on Injury Statistics on 7-8 September 2006. Scientists from several countries gave their support to this approach and identified data within their own countries that could be the basis of a multi-country project.

1.2. Previous literature

There are few published studies that provide diagnosis-specific estimates of the probability of admission. Relevant previous work include Johansen and colleagues (1998), Pasco and colleagues (2005), and Boufous and colleagues (2007). [6] [7] [8]

Johansen and colleagues report 2 studies. [6] The Cardiff study reports attendances at Cardiff Royal Infirmary Accident and Emergency (A&E) department for fracture during 1994/95. They found almost 100% probability of admission for hip fracture, moderately high admission rates for spinal fracture, and low fracture rates for foot, hand, ankle and forearm. (Precise estimates were not given.) The South Wales study focused on fracture patients aged 55 and over attending one of eight A&E departments in South Wales during 1996. Admission rates were estimated as:

- Hip – over 90%
- Head – over 75%
- Pelvis – over 50%
- Forearm – 23%
- Wrist – 9%.

In a study a decade later, in the Barwon Statistical Division of Victoria Australia, Pasco and colleagues estimated that amongst people with radiologically verified fracture, using self-report from women aged 35 and over, the estimated proportion who were admitted to hospital were:

- Hip – 96% (n=50)
- Pelvis – 67% (n=15)
- Rib – 40% (n=20)
- Tibia/fibula – 38% (n=34)
- Ankle – 35% (n=48)
- Humerus – 26% (n=39)
- Forearm – 24% (n=45)
- Wrist – 20% (n=95)
- Spine – 15% (n=90)

All of the above estimates are based on small numbers. [7]

In a substantially larger study, Boufous and colleagues estimate, for people aged 50 and over, the proportions attending ED in Victoria Australia with fracture of the hip, pelvis and wrist that were admitted to hospital using data from the period 1999/00 to 2004/05. [8] Lower and upper bounds to the estimates for the probabilities of admission were:

- Hip – 86 to 96%
- Pelvis – 68 to 83%
- Wrist – 26 to 29%

Also of relevance to the current work is the accuracy of ED diagnoses. In 60 EDs in the Lazio district of Italy (which includes the city of Rome), Farchi and colleagues investigated the agreement between the principal diagnosis assigned in ED and the first 5 hospital inpatient discharge diagnoses, for 22,892 patients in their ED-inpatient linked dataset. This comprised cases who were assigned, within ED, an external cause of injury code of unintentional road or home injury in the year 2000. [9] Their definition of ED principal diagnosis is "the condition considered the main cause of the need for clinical or diagnostic care" and, where there were several diagnoses recorded, it was the diagnosis that required the most resources for treatment. Diagnoses were said to agree, if they were allocated to the same cell of the Barell matrix. [10] In 62% of instances the diagnoses were concordant. Higher concordance was found for:

- older patients
- less urgent cases, as classified by the triage code
- patients who attended ED in the daytime, compared to the nighttime
- emergency rooms with a higher degree of specialisation,
- patients with longer stays in hospital, and
- seriousness of the condition – as measured by likelihood of death.

For road traffic injuries, high levels of agreement were found for

- upper limb fractures (91%),
- head and neck fractures (89%),
- lower limb fractures (86%), and
- lower limb amputations and crush injuries (86%).

TBI (54%) and internal organ injuries (46%) had the lowest levels of agreement. Similar results were found for home injuries. Others have found that internal injuries, including TBI, are the most frequently missed diagnoses in ED. [11] [12]

1.3. Purpose and Aim

1.3.1. Purpose

1 To validate the existing NZIPS serious non-fatal injury indicators

2 To investigate the opportunity to develop serious injury indicators that capture a greater number of serious injuries

3 To provide the wherewithal to develop reliable methods for international comparisons.

1.3.2. Aim

To identify ICD diagnoses associated with a high probability of admission.

2. Methods

2.1. Methodological approach

The first 12 months of the project included the following:

- liaison between the New Zealand team and scientists from prospective countries (identified at the World Conference on Injury Prevention and Safety Promotion in South Africa in 2006, and at the business meeting of the International Collaborative Effort on Injury Statistics (ICE) in the same year) to confirm their commitment to the project;
- for each collaborator, identification of their country- / region-specific diagnostic coding used, specificity of coding, who codes the diagnostic data in their ED, and the reliability of ED diagnostic coding in each participating country;
- identification of what populations are captured by their data;
- agreement on how to deal with deaths before ED attendance, and multiple attendances for the same injury;
- agreement on:
    - an operational definition of injury between prospective countries,
    - the minimum data required / that can be supplied by all participating countries.

As a result, this liaison resulted in the development of a protocol and tool to facilitate:

- the extraction of data and
- the generation of aggregates complying with standard definitions and methods, as well as ethical committee requirements in collaborating countries.

During the first 12 months, participating countries secured the support necessary to produce the required data aggregates.

It was planned that, during the subsequent 9 months, participating countries would produce the data aggregates. It turned out that data checking highlighted problems with the initial data provision for some countries, and so several additional months were required to secure data that passed our checks (see Section 2.2.6: "Checking the data" and Section 3.2: "Data Checking").

During the final 12 months, the data was collected together, compared and contrasted.

The collaborators who agreed to take part provided (typically) regional or state data aggregates from their countries. They were not funded from New Zealand for data provision. Consequently, we were reliant on their good will, and in them fitting the work we asked of them around their paid activities. It is unsurprising that some countries did not respond to some of our requests in a prompt manner.

2.2. Detailed Methods

2.2.1. Population of study

Only emergency (ie. unbooked) attendances at ED for injury were included in the data provided by each participating country / region. Participating countries (regions) were Australia (Victoria), Canada (Ontario), Denmark (Odense), Greece (Athens), Spain (Barcelona) and two sets from the USA. The first set (USA1) was based on national survey data, and the second set (USA2) was based on all ED and inpatient attendances in selected States. In respect of the latter, the State Inpatient Data [13] [14] and State ED Data files [13] [15] contain censuses of all hospital inpatient and ED discharges in selected States in the USA. They are collected by the Healthcare Cost and Utilization Program (HCUP) through a federal-state-industry partnership sponsored by the Agency for Healthcare Research and Quality. [13]

2.2.2. Time Period

The target time period covered was attendances at ED in the period 2002 to the most recent year, inclusive (Count1). If the collaborators' data spanned a shorter interval within this period, the data from that time interval was included. The date ranges, for each participating country, are shown in Table 1.

2.2.3. Determination of an admission

We asked that admission status be taken from linked ED-inpatient data, if available; otherwise, it was taken from the ED record. Collaborators were asked to provide a statement of the source of admission status.

Four definitions of an admission were used:

1. Those admitted to the same hospital as the ED attendance [Count2]

2. Those admitted to the same hospital as the ED attendance, with length of stay in hospital of at least 1 day (LoS>0) [Count3].
3. Those admitted to the same hospital as the ED attendance or transferred to another hospital [Count4].
4. Those admitted to the same hospital as the ED attendance or transferred to another hospital with LoS>0 [Count5].

Collaborators were asked to provide counts for as many of the above as possible.

The definition of an admission was three or more hours of inpatient treatment at a hospital. A "0 days stay" case was defined as one that stayed in hospital for greater than 3 hours, but not past midnight. (This is with the qualification that all patients treated only in the ED were not designated admitted, no matter how long they stayed.) Someone who was admitted on one day and was discharged the following day, ie. they stayed in hospital over midnight, stayed for 1 day. If a collaborator could not comply with these definitions, they were asked to use local definitions, and provide a statement of these with their aggregate counts.

2.2.4. Estimates

Version of ICD

All of the collaborators involved supplied ED data with diagnosis and external cause of injury coded to either ICD-10, ICD-9-CM, or coded such that they could be mapped to ICD. We had been advised against translating ICD-9-CM to ICD-10 for this project (James Harrison, Flinders, Australia, personal correspondence) hence probability estimates were produced separately for ICD-10 and for ICD-9-CM coded data.

Code ranges

ICD-10 code range was limited to S00 and T78 codes, and ICD-9-CM to the comparable 800-904, 910-995. These exclude "medical injuries" and sequelae / late effects.

Source of diagnosis data

The diagnosis data requested was the principal injury diagnosis from the first inpatient record following the injury event (that had a principal diagnosis of injury), if these data were available. Otherwise, the collaborator took the diagnosis from the ED record. Each country was asked to provide information on the source of diagnostic data.

Reliability of ED coding

We expected that there would be inaccuracies in the ED diagnosis coding, eg. due to the recording and coding of preliminary diagnoses in ED rather than final diagnoses. Our hypothesis, informed

by our advisor, was that, if any problem existed, it would exist mainly for those admitted to hospital. In the only study we found that considered reliability of ED diagnosis coding, Farchi and colleagues (in the Lazio region of Italy) found that 57% of road traffic injuries had an ED diagnosis concordant with the discharge diagnosis amongst admitted patients. [9] The corresponding figure for home injury was 67%. High levels of concordance were found for fractures, amputations and crush injuries, whereas traumatic brain injury, and internal injury had low levels of concordance – ie. around 50%. [9]

This potential problem was addressed for those countries where inpatient diagnosis was also captured. In these instances the latter was used as the source of diagnosis data. It remains a potential problem for other countries.

In this project, we were seeking to identify diagnoses where the evidence suggested that most cases (ie. >75%) were admitted. Even in the presence of inaccuracies amongst the ED coding, the proposed approach should permit the identification of those diagnoses with a high probability of admission. The bias due to miscoding will typically bias estimates towards the mean. Consequently, if a high estimate is found, it is likely to be a diagnosis with a legitimately high probability of admission. The exception to this could be the "other and unspecified codes" (eg fracture of other and unspecified parts of the lumbar spine), which could have estimated high PrA in the presence of non-specific coding.

More than 1 listed diagnosis

The probability estimate was based on the first listed diagnosis on the ED record and / or the first listed diagnosis on the inpatient record. (Note: this is slightly problematic since, for some single injuries, multiple ICD-10 codes are used to classify the injury. This problem is considered further in the Discussion.)

Multiple attendances for the same injury

Probability of admission estimates were based on the first attendance for the injury, where this could be identified.

Deaths

People who died at the scene or who were dead on arrival (DOA) were not included in the analysis. In some countries, these data are not captured well, or at all, by hospital systems. Rather, the data is captured on mortality collections.

Where possible, we included people who died in ED, since it was assumed that had the person survived, they would have been admitted for treatment of their injury. Typically, data on people

who died in ED were captured on the ED systems that generated the data supplied to us. These deaths were included in both the numerator and denominator counts used in the estimates.

2.2.5. Data provision

We asked collaborators to provide a comma separated variable (.csv) file of aggregate counts of first attendances at ED and, within those, aggregate counts of admissions (using all four definitions – see "Determination of an admission", page 25 above), by ICD-10/ICD-9-CM code by gender by age group by intent by cause. The specification that was sent to collaborators, for the counts requested, as well as the codes used to define categories of intent and cause of injury, are shown in Appendix A.

Note: Some countries (ie. Australia, Canada, USA2) could not provide small counts for privacy reasons. Those countries were asked to provide separate files of aggregate data for:

a) ICD by gender;
b) ICD by age group;
c) ICD by intent; and
d) ICD by cause.

A hypothetical example of these aggregate counts was also provided, shown in Appendix A, to aid data provision.

2.2.6. Checking the data

Our checking procedure included the following:

- that Count 1 is the largest of the five;
- Count 2≥Count3 – ie. the number of admissions to the same hospital is at least as large as admissions to same hospital with length of stay (LoS) of at least one day.
- Count 4≥Count 5 – ie. the number of admissions to same hospital or transferred to another hospital are at least as large as admissions to same hospital or transferred to another hospital with LoS of at least one day.
- Count 4≥Count 2 – ie. the number of admissions to same hospital or transferred to another hospital is at least as large as admissions solely to the same hospital.
- Count 5≥Count3 – ie. the number of admissions to same hospital or transferred to another hospital with LoS>0 days are at least as large as admissions solely to same hospital with LoS>0 days.

We also checked:

- each variable to ensure that no additional categories had been introduced.
- A total count of cases for each breakdown, checked against the spreadsheet provided by collaborators.

One of the authors (CC) shared the results of the checking with collaborators and asked whether the results of the checking were consistent with expectations. CC also shared the analysis results with collaborators. This was accompanied with questions regarding inconsistent or counterintuitive results.

In one instance, we compared existing literature to a country's admission rates. Problems with the data provided by Spain were identified when MVTC admission rates were compared to the literature. [16] Revised Spanish data was received promptly once this problem was discovered.

2.2.7. Outcomes

For presentation

1. Diagnoses-specific estimates (at the 4 character level), were presented provided the lower confidence limit (LCL) for the probability of admission (PrA) was greater than or equal to 0.40, ie. PrA LCL≥0.40.

2. Also presented were PrA estimates that had an estimated Diagnosis-specific Survival Probability at the 4 character level less than or equal to 0.941 (DSP≤0.941), provided the number of discharges on which the DSP was based was at least 100. This was done to facilitate the empirical validation of the NZIPS serious non-fatal injury indicators. For these indicators, a case of "serious" injury is identified if its ICD-based Injury Severity Score (ICISS)≤0.941. [1 4] If an individual DSP≤0.941, it follows that ICISS will be too - hence, our interest in these DSPs for validation purposes.

For validation

3. Diagnosis codes for which PrA LCL≥0.75. Should this condition be satisfied, it provides strong evidence of a high diagnosis-specific probability of admission.

4. Diagnosis codes for which PrA UCL≥0.75. Should this condition be satisfied, it provides some, but much weaker, evidence of a high diagnosis-specific probability of admission. For a given diagnosis, if the results show PrA UCL≥0.75 for all countries contrasted, this increases the strength of the evidence ("moderate evidence") for a high diagnosis-specific probability of admission.

2.2.8. Analysis

For each set of data, we presented overall estimates of the diagnosis-specific probabilities of admission, but also by:

- gender
- age group
    - 0, 1-4, 5-14, 15-24, 25-44, 45-64, 65-74, 75+
- intent
    - assault, self-harm, unintentional, other/undetermined
- cause of injury

- falls, MVTC, struck by / against, cut/pierce, poisoning, firearm-related, other/unspecified.

The operational definitions of the intent and cause of injury categories are shown in Appendix A

Statistical Analysis

ICD-10

Our initial assessment of the strengths and limitations of the data from each country were:

Australia: the diagnostic data was coded, as separate fields, to body site and type of injury; these could be mapped to selected ICD-10 codes.

Canada: breakdowns were limited to Gender and Cause, as well as selected ICD-10 codes that satisfied privacy requirements for supply of the data.

Denmark and Greece: The base data included a reasonably large number of cases and so would permit all breakdowns.

Analysis commenced initially using the Greek data, since these data were the first to pass all the checks. Data from Denmark and from Canada were added following responses to outstanding queries from the relevant collaborators. Because of its limitations, results based on the Australia data set were presented only in the table of comparisons between countries.

ICD-9-CM

Our initial assessment of the strengths and limitations of the data from each country were:

Spain: the base data set covered only MVTCs.

USA1 (survey-based): The base data set was small; so these data were only provided at the 3-digit level.

USA2 (all ED attendances in selected States): The base data set included a large number of cases, and so gave the most precise estimates of probability of admission for all breakdowns.

Analysis commenced using USA2 data, for all breakdowns. USA1 data was used to check for consistency with USA2 results at the 3-digit level. Spanish data was used to check for consistency with USA2 results, when restricted to MVTC injury.

Analysis methods detail:

No Breakdowns

Outcomes (1) to (3) were presented. In respect of (1), diagnoses-specific estimates (at the 4 character level), with no breakdowns (by age, gender, cause or intent), were presented provided the lower confidence limit (LCL) for the probability of admission (PrA) $\geq$0.40, ie. PrA LCL$\geq$0.40.

Also for this part of the analysis, breakdowns by gender, age, external cause, intent were used to identify additional diagnosis codes for presentation where, for at least one subcategory, the PrA LCL$\geq$0.40. Additionally, a 3 character level analysis was used to identify additional diagnoses of interest which were not picked up at the 4 character level analysis – eg. due to small numbers and / or limited precision.

Even though breakdowns were used to identify additional diagnoses for presentation, all of the above relate to presentations with no breakdowns (by gender, age, cause or intent).

Variations in Probabilities

For each country, and for each diagnosis within country, we produced PrA with 95% CIs for each category within gender, age, cause and intent separately. [17] Additionally, for each diagnosis within country, we tested the hypotheses that there was no difference between the PrAs between the categories – separately for gender, age, cause and intent. We used a chi-squared test in most instances. However, where there were small numbers, and the assumptions for a chi-squared test did not hold, we used Fisher's exact test.

For each country, diagnosis within country, and for each breakdown by gender, age, cause or intent separately, in the Tables we presented the diagnoses if:

- PrA LCL$\geq$0.40 for at least one of the categories within the breakdown (eg. male or female), and
- there was a statistically significant variation (Chi-squared test at the 5% level of significance) between the PrAs for the categories in the breakdown.

If the above held, we presented all the categories of the breakdown within the ICD code. For example, if for S722 the PrA LCL $\geq$0.40 for females, but not males, and there was a significant difference in PrA between females and males, we presented the results for S722 for both Gender categories: females and males.

3. Results

3.1. Data Provision

Data was provided from all of the countries who agreed to collaborate, namely: Australia, Canada, Denmark, Greece, Spain and USA (2 sets). Some of the characteristics of the data provided, for each set, are shown in Table 1.

3.2. Data Checking

Data was checked using the methods described. Where errors or queries arose, these were discussed with the collaborator and resolved. In some instances, this took over 12 months. Some points of note, from Greece and USA2, are given below.

Greece: Our collaborator wrote:

"In our health care system the diagnosis of a patient that visits the ED is unique and is given by physicians. Based on this diagnosis the patient is hospitalized. It is very rare to change the diagnosis or to add a new type of injury and so, an additional diagnosis. It is the same staff that works (sic) in the ED and the corresponding hospital departments where the patients are hospitalized. So we can consider that the ED diagnosis is the same with the inpatient data."

Furthermore, in regard to the choice of source of data for the diagnosis code, he wrote:

"I have checked our database and I have tried to compare the different diagnoses [ED and hospital discharge]... 8190 (81.0%) cases where the Discharge diagnosis is the same with the diagnosis of the first/primary injury recorded at the ED. 452 (4.5 %) cases where the Discharge diagnosis is the same with the diagnosis of the second injury recorded at the ED. 48 (0.5 %) cases where the Discharge diagnosis is the same with the diagnosis of the third injury recorded at the ED. 1418 (14.0 %) cases where there are differences among the different diagnoses. However for the majority of these cases the discharge diagnosis refers to a general or similar code (eg. other or unspecified) of the corresponding diagnosis for the first injury. We cannot say which is the most accurate and which one was the criterion for the admission.

The discharge diagnosis is coded with the ICD9. ... The [ED] data I have send you is based on the ICD10. I think that if we finally work on small categories and not in any single code we do not have any serious problem for misclassifications."

Table 1: Characteristics of the data provided by each country

Country	Region / City	Contacts	ICD Version	Who codes?	Period	Ages	Causes	Source of admission status	Source of diagnosis data for inpatients	Deaths	Counts provided
Australia	Victoria	Soufiane Boufous	ICD-10*	Nursing and Medicalstaff	2003-06	All	All	ED	ED	Dead on arrival excluded	1,2,4
Canada	Ontario	Alison Macpherson	ICD-10	Professional coders	2003-09	All	All	Inpatient	Inpatient	All excluded	1, 5
Denmark	Odense	Jens Lauritzen	ICD-10	Medical staff	2003-08	All	All	ED	ED	Dead on arrival excluded	1,2,3,4,5
Greece	Athens	Eleni Petridou, Nick Dessypris, Vicki Kalampoki	ICD-10	Trained Health Visitors	2002-04	All#	All	ED	ED	Dead on arrival excluded	1,2,3,4,5
Spain	Barcelona	Catherine Perez	ICD-9-CM^	Professional coders	2003-08	All	MVTC only	ED	Inpatient	All excluded	1,2,3,4,5
USA1	All states	Margaret Warner, Lois Fingerhut, Li-Hui Chen	ICD-9-CM	Professional coders	$2002-04	All	All	Inpatient	Inpatient	Dead on arrival excluded	1,2,3,4,5
USA2	15 States	Ted Miller, Bruce Lawrence	ICD-9-CM	Professional coders	~2003	All	All	Inpatient	Inpatient	Dead on arrival excluded	1, 2, 3

Footnotes:

* = Diagnosis coded using local system based on nature and body site of injury – mapped to ICD-10 codes; ^ = Limited to MVTCs; $ = National Hospital Ambulatory Medical Care Survey- ED Component; ~ = Healthcare Cost and Utilization Program (HCUP), State ED Data and State Inpatient Data; # = Includes 2 general hospital, 1 trauma hospital and 1 children's hospitals.

USA2:: For USA2, there were more missing values for the breakdowns by cause and by intent than for other countries. As a consequence, the E-coding rate was estimated and found to be around 88%. This rate was checked with the USA2 collaborator and confirmed as correct, so accounting for the large numbers of missing values in those breakdowns.

3.3. Analysis results

3.3.1. ICD-10

No breakdowns

This subsection presents, for Greece (Table 2), for Denmark (Table 3), and for Canada (Table 4), those ICD-10 diagnoses satisfying the criteria for presentation. (The results are not presented for Australia, except in the table of comparisons between countries, since the data are not coded to ICD-10 – but rather use a system that maps to a minority of ICD-10 codes.)

The results are presented if they:

- have a moderately high probability of admission (labelled "High PrA" in the tables); or
- have a DSP that indicates a serious injury (labelled "Low DSP" in the tables, with a tick in the column if the ICD-10 diagnosis had a low DSP).

These were described in the Methods: Outcomes (see page 30). Further detail is given below on the first of these.

The diagnoses in Tables 2, 3 and 4 that show a tick in the "High PrA" column include those that have a moderately high 4 character diagnosis-specific probability of admission (ie. lower confidence limit for the probability of admission greater than or equal 0.40 – PrA LCL$\geq$0.40). There is also a tick in that column if the ICD-10 diagnosis has a moderately high probability of admission for at least one category in the breakdowns by age, gender, cause or intent, or in the ICD 3 character analysis.

In tables 2, 3 and 4, the ICD-10 codes for which PrA LCL$\geq$0.75 are highlighted in brown and, if not highlighted in brown, the codes for which PrA$\geq$0.80 (provided the number of diagnosis-specific ED attendances are 10 or more) are highlighted in yellow.

Table 2: Greece - ICD codes with probability of admission of at least 40%, low DSP.

ICD-10	ED Attend	Admissions*		PrA	95% CI			High PrA	Low DSP
		All	LoS>0						
S020	233	212	204	0.88	0.83	-	0.91	√	√
S021	69	50	48	0.70	0.58	-	0.79	√	√
S026	47	29	26	0.55	0.41	-	0.69	√	
S028	21	14	14	0.67	0.45	-	0.83	√	
S029	22	21	21	0.95	0.78	-	0.99	√	
S060	10056	3914	3456	0.34	0.33	-	0.35	√	
S061	3	2	2	0.67	0.21	-	0.94		√
S063	2	1	1	0.50	0.09	-	0.91		√
S064	2	1	1	0.50	0.09	-	0.91		√
S065	5	1	1	0.20	0.04	-	0.62		√
S066	64	56	46	0.72	0.60	-	0.81	√	√
S068	3	2	1	0.33	0.06	-	0.79		√
S120	14	8	8	0.57	0.33	-	0.79		√
S121	8	6	5	0.63	0.31	-	0.86		√
S129	18	13	12	0.67	0.44	-	0.84	√	
S141	2	2	1	0.50	0.09	-	0.91		√
S220	79	54	47	0.59	0.48	-	0.70	√	
S222	39	23	22	0.56	0.41	-	0.71	√	
S224	323	151	149	0.46	0.41	-	0.52	√	
S270	42	36	36	0.86	0.72	-	0.93	√	
S271	10	9	9	0.90	0.60	-	0.98	√	√
S272	1	1	1	1.00	0.21	-	1.00		√
S273	1	1	1	1.00	0.21	-	1.00		√
S320	274	155	147	0.54	0.48	-	0.59	√	
S324	64	48	47	0.73	0.62	-	0.83	√	
S328	236	201	195	0.83	0.77	-	0.87	√	√
S360	19	17	17	0.89	0.69	-	0.97	√	
S361	74	55	54	0.73	0.62	-	0.82	√	√
S362	3	3	3	1.00	0.44	-	1.00	√	
S367	19	14	12	0.63	0.41	-	0.81	√	
S368	1	1	1	1.00	0.21	-	1.00		√
S369	28	27	25	0.89	0.73	-	0.96	√	
S720	1357	1286	1244	0.92	0.90	-	0.93	√	√
S721	1261	1218	1171	0.93	0.91	-	0.94	√	√
S722	111	103	101	0.91	0.84	-	0.95	√	
S723	201	181	177	0.88	0.83	-	0.92	√	
S724	111	90	83	0.75	0.66	-	0.82	√	
S730	79	70	69	0.87	0.78	-	0.93	√	
S821	225	138	136	0.60	0.54	-	0.67	√	
S822	645	399	387	0.60	0.56	-	0.64	√	
S823	403	229	221	0.55	0.50	-	0.60	√	
S828	705	362	341	0.48	0.45	-	0.52	√	
T175	159	111	106	0.67	0.59	-	0.74	√	
T181	109	79	69	0.63	0.54	-	0.72	√	
T202	141	78	75	0.53	0.45	-	0.61	√	
T212	122	54	53	0.43	0.35	-	0.52	√	
T213	2	2	2	1.00	0.34	-	1.00		√
T223	1	1	1	1.00	0.21	-	1.00		√
T398	179	151	130	0.73	0.66	-	0.79	√	
T509	172	116	102	0.59	0.52	-	0.66	√	
T652	397	374	275	0.69	0.65	-	0.74	√	
T71	16	6	6	0.38	0.18	-	0.61		√

Table 3: Denmark - ICD codes with probability of admission of at least 40%, low DSP.

		Admissions							
ICD-10	ED Attend	All	LoS>0	PrA	95% CI			High PrA	Low DSP
S020	49	16	16	0.33	0.21	-	0.47		√
S021	24	18	18	0.75	0.55	-	0.88	√	√
S023	22	12	9	0.41	0.23	-	0.61	√	
S026	191	119	112	0.59	0.52	-	0.65	√	
S060	3300	1826	1256	0.38	0.36	-	0.40	√	
S061	2	1	1	0.50	0.09	-	0.91		√
S062	219	32	24	0.11	0.07	-	0.16		√
S063	2	2	2	1.00	0.34	-	1.00		√
S064	7	6	5	0.71	0.36	-	0.92		√
S065	55	54	47	0.85	0.74	-	0.92	√	√
S066	13	11	10	0.77	0.50	-	0.92	√	√
S068	9	9	8	0.89	0.56	-	0.98	√	√
S069	3	3	3	1.00	0.44	-	1.00	√	√
S120	5	4	4	0.80	0.38	-	0.96		√
S121	8	7	5	0.63	0.31	-	0.86	√	√
S122	41	29	24	0.59	0.43	-	0.72	√	
S141	3	1	1	0.33	0.06	-	0.79		√
S218	108	13	11	0.10	0.06	-	0.17		√
S220	251	153	144	0.57	0.51	-	0.63	√	
S224	63	48	47	0.75	0.63	-	0.84	√	
S225	1	1	0	0.00	0.00	-	0.79		√
S270	72	57	56	0.78	0.67	-	0.86	√	
S271	3	2	2	0.67	0.21	-	0.94		√
S272	5	4	4	0.80	0.38	-	0.96		√
S320	415	272	259	0.62	0.58	-	0.67	√	
S323	52	30	29	0.56	0.42	-	0.68	√	
S324	41	28	28	0.68	0.53	-	0.80	√	
S325	515	252	246	0.48	0.43	-	0.52	√	
S327	18	13	12	0.67	0.44	-	0.84	√	
S328	31	19	19	0.61	0.44	-	0.76	√	√
S360	12	11	9	0.75	0.47	-	0.91	√	
S361	5	4	4	0.80	0.38	-	0.96		√
S370	17	14	11	0.65	0.41	-	0.83	√	
S424	1082	384	355	0.33	0.30	-	0.36	√	
S520	503	233	209	0.42	0.37	-	0.46	√	
S524	472	282	259	0.55	0.50	-	0.59	√	
S533	8	4	4	0.50	0.22	-	0.78	√	
S561	10	4	4	0.40	0.17	-	0.69	√	
S661	108	64	51	0.47	0.38	-	0.57	√	
S684	3	3	3	1.00	0.44	-	1.00	√	

		Admissions							
ICD-10	ED Attend	All	LoS>0	PrA	95% CI			High PrA	Low DSP
S720	2692	2605	2579	0.96	0.95	-	0.96	√	√
S721	1754	1704	1700	0.97	0.96	-	0.98	√	√
S722	283	276	276	0.98	0.95	-	0.99	√	
S723	349	316	312	0.89	0.86	-	0.92	√	
S724	212	144	139	0.66	0.59	-	0.72	√	
S727	3	3	3	1.00	0.44	-	1.00	√	
S729	39	26	25	0.64	0.48	-	0.77	√	
S730	217	194	180	0.83	0.77	-	0.87	√	
S731	314	23	21	0.07	0.04	-	0.10		
S761	215	52	50	0.23	0.18	-	0.29	√	
S821	532	308	298	0.56	0.52	-	0.60	√	
S822	513	239	236	0.46	0.42	-	0.50	√	
S823	532	219	215	0.40	0.36	-	0.45	√	
S827	660	539	530	0.80	0.77	-	0.83	√	
S828	79	46	45	0.57	0.46	-	0.67	√	
S829	159	72	72	0.45	0.38	-	0.53	√	
S927	27	11	11	0.41	0.25	-	0.59	√	
S930	40	18	18	0.45	0.31	-	0.60	√	
S982	5	4	4	0.80	0.38	-	0.96	√	
T079	3603	3298	2750	0.76	0.75	-	0.78	√	
T149	39	8	7	0.18	0.09	-	0.33	√	
T185	15	12	8	0.53	0.30	-	0.75	√	
T213	9	6	5	0.56	0.27	-	0.81		√
T223	11	2	2	0.18	0.05	-	0.48		√
T369	31	25	19	0.61	0.44	-	0.76	√	
T380	20	13	12	0.60	0.39	-	0.78	√	
T390	1107	953	862	0.78	0.75	-	0.80	√	
T399	34	32	28	0.82	0.66	-	0.92	√	
T400	142	101	77	0.54	0.46	-	0.62	√	
T402	29	26	16	0.55	0.38	-	0.72	√	
T420	708	434	302	0.43	0.39	-	0.46	√	
T430	402	260	199	0.50	0.45	-	0.54	√	
T439	37	26	24	0.65	0.49	-	0.78	√	
T440	10	9	7	0.70	0.40	-	0.89	√	
T459	5	5	5	1.00	0.57	-	1.00	√	
T469	14	10	8	0.57	0.33	-	0.79	√	
T489	9	7	6	0.67	0.35	-	0.88	√	
T528	10	6	6	0.60	0.31	-	0.83	√	
T630	8	6	5	0.63	0.31	-	0.86	√	
T689	51	42	32	0.63	0.49	-	0.75	√	
T751	23	13	13	0.57	0.37	-	0.74	√	
T782	37	35	25	0.68	0.51	-	0.80	√	
T783	161	114	69	0.43	0.35	-	0.51	√	

Table 4: Canada - ICD codes with probability of admission of at least 40%, low DSP.

ICD-10	ED Attend	Adm LoS>0	Prob Adm	95% CI			High PrA	Low DSP
S021	980	533	0.54	0.51	-	0.57	√	√
S052	214	178	0.83	0.78	-	0.88	√	
S062	1079	726	0.67	0.64	-	0.70	√	√
S063	470	387	0.82	0.79	-	0.86	√	√
S064	431	324	0.75	0.71	-	0.79	√	√
S065	2399	1737	0.72	0.71	-	0.74	√	√
S066	998	759	0.76	0.73	-	0.79	√	√
S121	620	388	0.63	0.59	-	0.66	√	√
S127	189	110	0.58	0.51	-	0.65	√	
S225	141	101	0.72	0.64	-	0.78	√	√
S268	103	71	0.69	0.59	-	0.77	√	
S270	1109	768	0.69	0.66	-	0.72	√	
S271	230	155	0.67	0.61	-	0.73	√	√
S272	441	373	0.85	0.81	-	0.88	√	√
S273	312	211	0.68	0.62	-	0.73	√	√
S324	974	717	0.74	0.71	-	0.76	√	
S325	3321	2032	0.61	0.60	-	0.63	√	
S327	546	342	0.63	0.59	-	0.67	√	
S328	1391	582	0.42	0.39	-	0.44	√	√
S360	945	762	0.81	0.78	-	0.83	√	
S361	407	324	0.80	0.75	-	0.83	√	√
S364	167	159	0.95	0.91	-	0.98	√	
S368	111	85	0.77	0.68	-	0.83	√	√
S369	40	20	0.50	0.35	-	0.65	√	
S451	38	27	0.71	0.55	-	0.83	√	
S650	42	29	0.69	0.54	-	0.81	√	
S720	14093	12148	0.86	0.86	-	0.87	√	√
S721	11938	10772	0.90	0.90	-	0.91	√	√
S722	1061	975	0.92	0.90	-	0.93	√	
S723	2071	1733	0.84	0.82	-	0.85	√	
S724	2073	1382	0.67	0.65	-	0.69	√	
S727	60	46	0.77	0.65	-	0.86	√	
S728	283	199	0.70	0.65	-	0.75	√	
S729	873	290	0.33	0.30	-	0.36	√	
S730	691	204	0.30	0.26	-	0.33	√	
T025	114	78	0.68	0.59	-	0.76	√	
T175	140	97	0.69	0.61	-	0.76	√	
T213	165	114	0.69	0.62	-	0.76	√	√
T293	98	54	0.55	0.45	-	0.65	√	
T390	756	342	0.45	0.42	-	0.49	√	
T460	117	48	0.41	0.33	-	0.50	√	
T71	202	58	0.29	0.23	-	0.35		√
S027	170	58	0.34	0.27	-	0.42		
T023	13	6	0.46	0.23	-	0.71		

Variations in Probabilities

For each country (Greece, Denmark and Canada), and for each breakdown by gender, age, cause or intent separately within country, Table 16 - Table 25, in Appendix B, show the diagnoses if:

- lower CI for PrA≥40% for at least one of the categories within the breakdown (eg. male or female), and
- there was significant variation (Chi-squared or Fisher's test at the 5% level of significance) between the PrAs for the categories in the breakdown.

If the above held, we presented all the categories of the breakdown within the ICD code. (Like in the previous subsection, the results are not presented for Australia since the data are not coded to ICD-10 – but rather using a system that maps to a minority of ICD-10 codes.)

Presented in the body of the report for Greece (Table 5), Denmark (Table 6) and Canada (Table 7) are the 4-character level ICD-10 diagnoses which have either:

- a high probability of admission (PrA LCL≥0.75, or PrA≥0.80 – the latter if based on at least 10 ED attendances with the particular ICD-10 code) - ie. no breakdowns, and / or,
- PrA LCL≥0.75, PrA≥0.80 (if N≥10) for at least one category of gender, age group, cause, or intent. In this instance, only the categories in the breakdown that show a high probability of admission are highlighted.

As before, the breakdown categories within ICD-10 codes for which PrA LCL≥0.75 are highlighted in brown, and if not highlighted in brown, the codes for which PrA≥0.80 (provided the number of ED attendances are 10 or more) are highlighted in yellow. The breakdown results are only highlighted if they show significant statistical variation ($p<0.05$).

As an example of how to read the tables, consider Table 5. The first line (S020) indicates the following for 'Fracture of the vault of skull':

- Overall: PrA LCL≥0.75, ie. PrA 95% CI is 0.83-0.91
- Gender: no significant variation in probability of admission for females compared to males.
- Age Group: a significant variation between groups, with ages 0, 1-4, and 5-14 with PrA LCL≥0.75.
- Cause: a significant variation between groups, with only 'Falls' with PrA LCL≥0.75.
- Intent: no significant variation in probability of admission between the intent categories.

As a further example, consider S720, 'Fracture of neck of femur'.

- Overall: PrA LCL≥0.75, ie. PrA 95% CI is 0.90-0.93

- Gender: no significant difference in probability of admission for females compared to males.
- Age Group: a significant variation between groups, with age groups 5-14, and 25-44 with PrA$\geq$0.80, but not PrA LCL$\geq$0.75, and with age groups 45-64, 65-74, and 75+ with PrA LCL$\geq$0.75.
- Cause: no significant variation in probability of admission between the cause categories.
- Intent: no significant variation in probability of admission between the intent categories.

Table 5: Greece - diagnoses that show a significant variation in probabilities of admission.

		No breakdown		Gender		Age Group		Cause		Intent	
ICD-10	**Decsription**	**LCL>=0.75**	**PrA>=0.80**	**LCL>=0.75**	**PrA>=0.80**	**LCL>=0.75**	**PrA>=0.80**	**LCL>=0.75**	**PrA>=0.80**	**LCL>=0.75**	**PrA>=0.80**
S020	Fracture of vault of skull	0.83-0.91				0, 1-4, 5-14		Falls	MVTC, Struck by/against, Other/unspec		
S029	Fracture of skull and facial bones, part unspecified	0.78-0.99									
S270	Traumatic pneumothorax		0.72-0.93								
S271	Traumatic haemothorax		0.60-0.98								
S315	Open wound of other and unspecified external genital organs				F						
S324	Fracture of acetabulum				M						
S328	Fracture of other and unspecified parts of lumbar spine and pelvis	0.77-0.87						Falls			
S360	Injury of spleen		0.69-0.87								
S369	Injury of unspecified intra-abdominal organ		0.73-0.96								
S720	Fracture of neck of femur	0.90-0.93				**45-64, 65-74, 75+**	**5-14, 25-44**				
S721	Pertrochanteric fracture	0.91-0.94				**45-64, 65-74, 75+**	**25-44**				
S722	Subtrochanteric fracture	0.84-0.95		F	M	75+	65-74				
S723	Fracture of shaft of femur	0.83-0.92									
S724	Fracture of lower end of femur				F	75+	45-64				
S730	Dislocation of hip	0.78-0.93									
S822	Fracture of shaft of tibia								MVTC		
S823	Fracture of lower end of tibia						15-24, 65-74, 75+				
T202	Burn of second degree of head and neck						0				
T394	Poisoning by drugs - antirheumatics, not elsewhere classified				F						
T528	Toxic effects – other organic solvents			F							

Table 6: Denmark - Diagnoses that show a significant variation in probabilities of admission

		No breakdown		Gender		Age Group		Cause		Intent	
ICD-10	**Decsription**	**LCL>=0.75**	**PrA>=0.80**	**LCL>=0.75**	**PrA>=0.80**	**LCL>=0.75**	**PrA>=0.80**	**LCL>=0.75**	**PrA>=0.80**	**LCL>=0.75**	**PrA>=0.80**
S065	Traumatic subdural haemorrhage		0.74-0.92								
S324	Fracture of acetabulum (pelvic bone)						45-64				
S720	Fracture of neck of femur	0.95-0.96						Falls,MVTC, Struck by/against, Other/unspec			
S721	Pertrochanteric fracture	0.96-0.98				45-64, 65-74, 75+		Falls,MVTC, Struck by/against, Other/unspec			
S722	Subtrochanteric fracture	0.95-0.99		F.M		45-64, 65-74, 75+					
S723	Fracture of shaft of femur	0.86-0.92				45-64, 65-74, 75+	5-14,15-24, 25-44	Falls,MVTC, Other/unspec			
S724	Fracture of lower end of femur								MVTC		
S730	Dislocation of hip	0.77-0.87		F							
S827	Multiple fractures of lower leg	0.77-0.83				45-64	25-44, 65-74, 75+				
T079	Injuries involving multiple body regions	0.75-0.78		M		5-14, 45-64, 75+	65-74	Falls, Struck by/against	Cut/pierce	Self-harm, Unintent	
T390	Poisoning by drugs: Salicylates	0.75-0.80				25-44,45-64	5-14,65-74, 75+			Self-harm	
T399	Poisoning by drugs: Nonopioid analgesic, antipyretic and antirheumatic, unspecified.		0.66-0.82								
T400	Poisoning by drugs: Opium						75+				
T469	Poisoning by drugs: Other and unspecified agents primarily affecting the cardiovascular system										Self-harm
T689	Hypothermia						75+				

Table 7: Canada - Diagnoses that show a significant variation in probabilities of admission.

		No breakdown		Gender		Cause	
ICD-10	**Decsription**	**LCL>=0.75**	**PrA>=0.80**	**LCL>=0.75**	**PrA>=0.80**	**LCL>=0.75**	**PrA>=0.80**
S052	Ocular laceration and rupture with prolapse or loss of intraocular tissue	0.78-0.88					
S063	Focal brain injury	0.79-0.86					
S270	Traumatic pneumothorax					Cut	
S272	Traumatic haemopneumothorax	0.81-0.88				Cut, Falls	MVTC
S273	Other injuries of lung						Cut
S360	Injury of spleen	0.78-0.83					
S361	Injury of liver or gallbladder	0.75-0.83					
S364	Injury of small intestine	0.91-0.98					
S720	Fracture of neck of femur	0.86-0.87		M, F		Falls, MVTC	Struck
S721	Pertrochanteric fracture	0.90-0.91		M, F		Falls, MVTC	
S722	Subtrochanteric fracture	0.90-0.93					
S723	Fracture of shaft of femur	0.82-0.85					

Between country comparison

Presented is a comparison of the three countries' results: Canada, Denmark, and Greece - and also with Australia; the latter only for diagnoses where the mapping corresponds to those for the other countries presented in Table 8. Presented are the diagnoses where at least one of the 3 countries has a probability of admission of at least 0.80 or a lower confidence interval for the probability of admission of at least 0.75. The blanks in the table for a particular country indicate diagnoses that do not satisfy any of the criteria for presentation, or diagnosis-specific counts were not supplied due to small numbers.

Table 8: Comparison of probabilities of admission (95% confidence intervals) between Canada, Denmark, Greece and Australia.

ICD-10	Decsription	Canada	Denmark	Greece	Australia
S020	Fracture of vault of skull		0.21-0.47	0.83-0.91	
S029	Fracture of skull and facial bones, part unspecified			0.78-0.99	0.53-0.57
S052	Ocular laceration and rupture with prolapse or loss of intraocular tissue	0-78-0.88			
S063	Focal brain injury	0.79-0.86	0.34-1.00	0.09-0.91	
S065	Traumatic subdural haemorrhage	0.71-0.74	0.74-0.92	0.04-0.62	
S270	Traumatic pneumothorax	0.66-0.72	0.67-0.86	0.72-0.93	
S271	Traumatic haemothorax	0.61-0.73	0.21-0.94	0.60-0.98	
S272	Traumatic haemopneumothorax	0.81-0.88	0.38-0.96	0.21-1.00	
S328	Fracture of other and unspecified parts of lumbar spine and pelvis	0.39-0.44	0.44-0.76	0.77-0.87	0.81-0.84
S360	Injury of spleen	0.78-0.83	0.47-0.91	0.69-0.87	
S361	Injury of liver or gallbladder	0.75-0.83	0.38-0.96	0.62-0.82	
S364	Injury of small intestine	0.91-0.98			
S369	Injury of unspecified intra-abdominal organ	0.35-0.65		0.73-0.96	0.76-0.82
S720	Fracture of neck of femur	0.86-0.87	0.95-0.96	0.90-0.93	0.97-0.97
S721	Pertrochanteric fracture	0.90-0.91	0.96-0.98	0.91-0.94	
S722	Subtrochanteric fracture	0.90-0.93	0.95-0.99	0.84-0.95	
S723	Fracture of shaft of femur	0.82-0.85	0.86-0.92	0.83-0.92	
S730	Dislocation of hip	0.26-0.33	0.77-0.87	0.78-0.93	0.80-0.83
S827	Multiple fractures of lower leg		0.77-0.83		
T079	Injuries involving multiple body regions		0.75-078		
T390	Poisoning by drugs: Salicylates	0.42-0.49	0.75-0.80		
T399	Poisoning by drugs: Nonopioid analgesic, antipyretic and antirheumatic, unspecified		0.66-0.92		

The only diagnoses where we can be sure that there are consistently high probabilities of admission are for fractured femur codes S720, S721, S722 and S723. Other diagnosis codes that are potentially consistent with high probabilities of admission, but do not stand out due to small numbers in some of the collaborator's data, are:

S052 Ocular laceration and rupture with prolapse of loss of intraocular tissue

S063 Focal brain injury

S272 Traumatic haemopneumothorax

S360 Injury of spleen

S361 Injury of liver or gall bladder

S364 Injury of small intestine

S827 Multiple fractures of lower leg

T079 Injuries involving multiple body regions.

Validations of NZIPS indicators

Presented in Table 9 are the ICD10 codes that have a DSP less than or equal to 0.941 based on at least 100 publicly-funded admissions to NZ's hospitals. These DSPs are based on 4 character codes rather than the full 5 character ICD-10-AM codes, as used by the NZIPS indicators. The table shows the estimates of probability of admission for each of these ICD-10 codes based on the data from Canada, Denmark and from Greece. The blanks in the table for a particular country indicate diagnoses that were not supplied due to small numbers.

Table 9 shows the diagnoses that unequivocally had a high PrA across all three countries were S720 (fractured neck of femur) and S721 (pertrochanteric fracture). The table also shows the following:

- For skull fracture (S020, S021), the probabilities are inconsistent across countries.
- For the codes relating to TBI (S061-S066, S068, S069): S062 (diffuse brain injury) shows inconsistent results that have a low (Denmark) and a mid-range (Canada) PrA; S065 (traumatic subdural haemorrhage) shows inconsistent results across all 3 countries; S069 (unspecified intracranial injury) was only available for one country: the remainder give moderate and potentially consistent evidence of a high probability of admission across all 3 countries (Outcome 4).
- For codes relating to fracture of the cervical vertebrae and spinal cord (S120, S121, S141), the estimates were relatively imprecise. There was moderate evidence consistent with a high PrA in all instances except for fracture of the second cervical vertebra (S121) for Canada.
- S218 (open wound to the thorax) showed low PrA in the one country where results were available; whereas the results for S225 (flail chest) were consistent with a high PrA across the two countries for which results are presented.
- For traumatic haemo/pneumothorax and other injuries to the lung (S271 - S273): for S272 (Traumatic haemopneumothorax) there was moderate evidence of consistent high PrA across all 3 countries. The others (S271, S273) were most consistent with only moderately[c] high admission probabilities.
- Fracture to unspecified lumbar spine and pelvis (S328) shows inconsistent results across the 3 countries.

[c] In the descriptions of the results, the following meanings can be attached to the size of the probabilities indicated by the descriptions:

- "High - PrA$\geq$0.75
- "Moderately High" – 0.6$\leq$PrA<0.75
- "Moderately Low" – 0.4$\leq$PrA$\leq$0.6
- "Low" – PrA<0.4.

- Injury to intra-abdominal organs (S361, S368) show moderate evidence of consistent high PrA for the countries for which data is available.
- Although the results for third degree burns to the trunk (T213) are consistent with a high PrA across all 3 countries, equivalent results for shoulder or upper extremity (T223) are most consistent with a moderately low or low PrA.
- The results for asphyxia (T71) are most consistent with a low PrA across the 3 countries.

The final columns in the table show the New Zealand frequency and relative frequency of incident cases of serious threat to life injuries with principal diagnosis (PDx) of the relevant ICD-10 code. Those highlighted in sand colour are the diagnoses (S720, S721) that accounted for 63% of the NZ cases (out of a total for the diagnoses shown). Both of these have a consistently high probability of admission. Those shown in green are the next highest frequency diagnoses (S020, S021, S062, S063, S065, S066, S121 and S361), and these account for a further 25% of the NZ cases. The results for these latter diagnoses show:

- results consistent with a high probability of admission (S063, S066, S361),
- results consistent with a moderately high probability of admission (S121),
- inconsistent probabilities of admission across countries: one with high PrA, others with moderately low / high probabilities (S020, S021, S065), or
- inconsistent probabilities of admission across countries: one with low, and another with moderately high probability (S062).

Table 9: Validation of the ICD10 ICISS threshold.

		Canada			Denmark			Greece			New Zealand (2001-8)	
ICD-10		PrA	95% CI		PrA	95% CI		PrA	95% CI		Freq	Rel Freq (%)
S020	Fracture of vault of skull				0.33	0.21 - 0.47		0.88	0.83 - 0.91		1271	3
S021	Fracture of base of skull	0.54	0.51 - 0.57		0.75	0.55 - 0.88		0.70	0.58 - 0.79		1833	5
S061	Traumatic cerebral oedema				0.50	0.09 - 0.91		0.67	0.21 - 0.94		43	0
S062	Diffuse brain injury	0.67	0.64 - 0.70		0.11	0.07 - 0.16					703	2
S063	Focal brain injury	0.82	0.79 - 0.86		1.00	0.34 - 1.00		0.50	0.09 - 0.91		920	3
S064	Epidural haemorrhage	0.75	0.71 - 0.79		0.71	0.36 - 0.92		0.50	0.09 - 0.91		366	1
S065	Traumatic subdural haemorrhage	0.72	0.71 - 0.74		0.85	0.74 - 0.92		0.20	0.04 - 0.62		1989	5
S066	Traumatic subarachnoid haemorrhage	0.76	0.73 - 0.79		0.77	0.50 - 0.92		0.72	0.60 - 0.81		799	2
S068	Other intracranial injuries				0.89	0.56 - 0.98		0.33	0.06 - 0.79		219	1
S069	Intracranial injury, unspecified				1.00	0.44 - 1.00					225	1
S120	Fracture of first cervical vertebra				0.80	0.38 - 0.96		0.57	0.33 - 0.79		276	1
S121	Fracture of second cervical vertebra	0.63	0.59 - 0.66		0.63	0.31 - 0.86		0.63	0.31 - 0.86		621	2
S141	Other and unspecified injuries of cervical spinal cord				0.33	0.06 - 0.79		0.50	0.09 - 0.91		457	1
S218	Open wound of other parts of thorax				0.10	0.06 - 0.17					3	0
S225	Flail chest	0.72	0.64 - 0.78		0.00	0.00 - 0.79					219	1
S271	Traumatic haemothorax	0.67	0.61 - 0.73		0.67	0.21 - 0.94		0.90	0.60 - 0.98		260	1
S272	Traumatic haemopneumothorax	0.85	0.81 - 0.88		0.80	0.38 - 0.96		1.00	0.21 - 1.00		487	1
S273	Other injuries of lung	0.68	0.62 - 0.73					1.00	0.21 - 1.00		413	1
S328	Fracture of other and unspecified parts of lumbar spine and pelvis	0.42	0.39 - 0.44		0.61	0.44 - 0.76		0.83	0.77 - 0.87		250	1
S361	Injury of liver or gallbladder	0.80	0.75 - 0.83		0.80	0.38 - 0.96		0.73	0.62 - 0.82		650	2
S368	Injury of other intra-abdominal organs	0.77	0.68 - 0.83					1.00	0.21 - 1.00		245	1
S720	Fracture of neck of femur	0.86	0.86 - 0.87		0.96	0.95 - 0.96		0.92	0.90 - 0.93		12948	35
S721	Pertrochanteric fracture	0.90	0.90 - 0.91		0.97	0.96 - 0.98		0.93	0.91 - 0.94		10385	28
T213	Burn of third degree of trunk	0.69	0.62 - 0.76		0.56	0.27 - 0.81		1.00	0.34 - 1.00		305	1
T223	Burn of third degree of shoulder and upper limb, except wrist and hand				0.18	0.05 - 0.48		1.00	0.21 - 1.00		367	1
T71	Asphyxiation	0.29	0.23 - 0.35		0.00	0.00 - 0.56		0.38	0.18 - 0.61		544	1

3.3.1. ICD-9-CM

No breakdowns

This subsection presents, for USA2 (Table 10), and for Spain (Table 11), those ICD-9-CM diagnoses satisfying the criteria for presentation. They are presented if they:

- have a moderately high probability of admission (shown with 'tick' in the "High PrA" column in the tables); or
- have a DSP that indicates a serious threat to life injury (shown with a 'tick' in the "Low DSP" column in the tables if the 4 character ICD-9 diagnosis had a DSP$\leq$0.96).

Each of these were described in the Methods: Statistical Analysis (see page 30). Further detail is given below on the first of these.

The diagnoses in Tables 11 and Table 11 that show a tick in the "High PrA" column have a moderately high 4 character diagnosis-specific probability of admission (ie. lower confidence limit for the probability of admission greater than 0.40 – PrA LCL$\geq$0.40). There is also a tick in that column if the ICD-9-CM 4 character diagnosis has a moderately high probability of admission for at least one category in the breakdowns by age, gender, cause or intent, or in the ICD 3 character analysis.

Table 10 shows these results for USA2 and Table 12 shows the results for MVTC injuries in Spain. In these tables, the ICD-9 codes for which PrA LCL$\geq$0.75 are highlighted in brown and, if not highlighted in brown, the codes for which PrA$\geq$0.80 (provided the number of ED attendances are 10 or more) are highlighted in yellow.

Table 10: USA Census - Probability of admission of at least 40%

ICD-9	ED Attend	Adm* LoS>0	PrA	95% CI			High PrA	Low DSP
8000	641	164	0.26	0.22	-	0.29	√	
8002	224	158	0.71	0.64	-	0.76	√	√
8010	2417	924	0.38	0.36	-	0.40	√	
8011	103	97	0.94	0.88	-	0.97	√	√
8012	769	686	0.89	0.87	-	0.91	√	√
8013								√
8014	24	17	0.71	0.51	-	0.85	√	
8022	3675	955	0.26	0.25	-	0.27	√	
8023	235	172	0.73	0.67	-	0.78	√	
8024	2803	879	0.31	0.30	-	0.33	√	
8032	28	18	0.64	0.46	-	0.79	√	
8050	3718	2171	0.58	0.57	-	0.60	√	
8052	7601	3017	0.40	0.39	-	0.41	√	
8054	11484	5006	0.44	0.43	-	0.45	√	
8056	4188	738	0.18	0.16	-	0.19	√	
8060	136	110	0.81	0.73	-	0.87	√	√
8062	121	75	0.62	0.53	-	0.70	√	
8064	151	119	0.79	0.72	-	0.85	√	
8072	1687	578	0.34	0.32	-	0.37	√	
8074	167	94	0.56	0.49	-	0.64	√	√
8080	2978	2237	0.75	0.74	-	0.77	√	
8082	8150	5526	0.68	0.67	-	0.69	√	
8084	891	475	0.53	0.50	-	0.57	√	
8122	6481	1303	0.20	0.19	-	0.21	√	
8123	40	34	0.85	0.71	-	0.93	√	
8125	48	30	0.63	0.48	-	0.75	√	
8131	120	104	0.87	0.79	-	0.92	√	
8132	5138	851	0.17	0.16	-	0.18	√	
8133	330	273	0.83	0.78	-	0.86	√	
8135	753	632	0.84	0.81	-	0.86	√	
8139	68	36	0.53	0.41	-	0.64	√	
8200	14000	12988	0.93	0.92	-	0.93	√	
8202	26155	23846	0.91	0.91	-	0.92	√	√
8203	49	38	0.78	0.64	-	0.87	√	
8208	12748	10067	0.79	0.78	-	0.80	√	√
8210	7116	5134	0.72	0.71	-	0.73	√	
8211	356	332	0.93	0.90	-	0.95	√	
8212	4206	2891	0.69	0.67	-	0.70	√	
8213	99	96	0.97	0.91	-	0.99	√	
8221	205	167	0.81	0.76	-	0.86	√	
8230	10391	4016	0.39	0.38	-	0.40	√	
8231	162	142	0.88	0.82	-	0.92	√	
8232	5758	2777	0.48	0.47	-	0.50	√	
8233	957	897	0.94	0.92	-	0.95	√	
8238	8702	1397	0.16	0.15	-	0.17	√	
8239	461	377	0.82	0.78	-	0.85	√	
8241	101	88	0.87	0.79	-	0.92	√	
8243	49	40	0.82	0.69	-	0.90	√	
8244	7731	4921	0.64	0.63	-	0.65	√	

* Counts of admissions to the same hospital as the ED attendance.

ICD-9	ED Attend	Adm* LoS>0	PrA	95% CI			High PrA	Low DSP
8245	458	424	0.93	0.90	-	0.95	√	
8246	5784	4480	0.77	0.76	-	0.79	√	
8247	182	176	0.97	0.93	-	0.98	√	
8249	736	608	0.83	0.80	-	0.85	√	
8251	83	77	0.93	0.85	-	0.97	√	
8253	262	178	0.68	0.62	-	0.73	√	
8350	650	209	0.32	0.29	-	0.36	√	
8360	586	88	0.15	0.12	-	0.18	√	
8392	147	62	0.42	0.34	-	0.50	√	
8501	13987	1986	0.14	0.14	-	0.15	√	
8505	10075	2080	0.21	0.20	-	0.21	√	
8510	57	52	0.91	0.81	-	0.96	√	√
8514	131	111	0.85	0.78	-	0.90	√	
8518	1904	1453	0.76	0.74	-	0.78	√	√
8520	1867	1492	0.80	0.78	-	0.82	√	√
8522	4155	3235	0.78	0.77	-	0.79	√	√
8524	63	44	0.70	0.58	-	0.80	√	√
8530	1175	794	0.68	0.65	-	0.70	√	√
8541					-			√
8600	3173	2730	0.86	0.85	-	0.87	√	
8601	256	237	0.93	0.89	-	0.95	√	
8602	296	266	0.90	0.86	-	0.93	√	√
8603	75	70	0.93	0.85	-	0.97	√	
8604	760	710	0.93	0.91	-	0.95	√	√
8605	215	210	0.98	0.95	-	0.99	√	
8610	201	165	0.82	0.76	-	0.87	√	
8611	27	26	0.96	0.82	-	0.99	√	
8612	1282	965	0.75	0.73	-	0.78	√	
8613	27	25	0.93	0.77	-	0.98	√	
8620	45	44	0.98	0.88	-	1.00	√	
8621	58	58	1.00	0.94	-	1.00	√	
8622	78	33	0.42	0.32	-	0.53	√	
8631	43	43	1.00	0.92	-	1.00	√	
8632	48	47	0.98	0.89	-	1.00	√	
8633	223	220	0.99	0.96	-	1.00	√	
8635	42	41	0.98	0.88	-	1.00	√	
8638	33	32	0.97	0.85	-	0.99	√	
8639	12	12	1.00	0.76	-	1.00	√	
8640	758	609	0.80	0.77	-	0.83	√	√
8641	84	80	0.95	0.88	-	0.98	√	
8650	2260	1936	0.86	0.84	-	0.87	√	√
8660	672	331	0.49	0.45	-	0.53	√	
8661	13	13	1.00	0.77	-	1.00	√	
8670	386	194	0.50	0.45	-	0.55	√	
8671	13	13	1.00	0.77	-	1.00	√	
8681	124	96	0.77	0.69	-	0.84	√	
8710	181	55	0.30	0.24	-	0.37	√	
8711	94	76	0.81	0.72	-	0.88	√	
8712	15	13	0.87	0.62	-	0.96	√	
8793	178	33	0.19	0.14	-	0.25	√	
8822	962	121	0.13	0.11	-	0.15	√	
8901	941	170	0.18	0.16	-	0.21	√	

* Counts of admissions to the same hospital as the ED attendance.

ICD-9	ED Attend	Adm* LoS>0	PrA	95% CI			High PrA	Low DSP
8911	4227	533	0.13	0.12	-	0.14	√	
8912	176	99	0.56	0.49	-	0.63	√	
8950	55	27	0.49	0.36	-	0.62	√	
9010	49	31	0.63	0.49	-	0.75	√	
9031	27	22	0.81	0.63	-	0.92	√	
9032	76	42	0.55	0.44	-	0.66	√	
9041	11	11	1.00	0.74	-	1.00	√	
9341	213	129	0.61	0.54	-	0.67	√	
9348	111	51	0.46	0.37	-	0.55	√	
9413					-			√
9423	271	175	0.65	0.59	-	0.70	√	√
9433	473	248	0.52	0.48	-	0.57	√	
9453	1007	615	0.61	0.58	-	0.64	√	
9463					-			√
9471	17	13	0.76	0.53	-	0.90	√	
9520	183	145	0.79	0.73	-	0.84	√	
9556	98	59	0.60	0.50	-	0.69	√	
9588	330	158	0.48	0.43	-	0.53	√	
9623	2538	897	0.35	0.34	-	0.37	√	
9642	578	335	0.58	0.54	-	0.62	√	
9650	10427	3578	0.34	0.33	-	0.35	√	
9651	2309	831	0.36	0.34	-	0.38	√	
9654	8361	3469	0.41	0.40	-	0.43	√	
9658	1369	521	0.38	0.36	-	0.41	√	
9661	654	367	0.56	0.52	-	0.60	√	
9663	2166	902	0.42	0.40	-	0.44	√	
9670	496	284	0.57	0.53	-	0.62	√	
9678	2498	877	0.35	0.33	-	0.37	√	
9685	581	388	0.67	0.63	-	0.70	√	
9690	9440	3762	0.40	0.39	-	0.41	√	
9691	97	47	0.48	0.39	-	0.58	√	
9693	2247	1115	0.50	0.48	-	0.52	√	
9694	12433	5157	0.41	0.41	-	0.42	√	
9697	2181	617	0.28	0.26	-	0.30	√	
9698	1198	559	0.47	0.44	-	0.49	√	
9708	2961	1632	0.55	0.53	-	0.57	√	
9711	213	74	0.35	0.29	-	0.41	√	
9721	185	113	0.61	0.54	-	0.68	√	
9724	308	114	0.37	0.32	-	0.43	√	
9726	1545	536	0.35	0.32	-	0.37	√	
9729	436	148	0.34	0.30	-	0.39	√	
9744	132	61	0.46	0.38	-	0.55	√	
9752	663	281	0.42	0.39	-	0.46	√	
9802	366	141	0.39	0.34	-	0.44	√	
9828	487	130	0.27	0.23	-	0.31	√	
9840	17	11	0.65	0.41	-	0.83	√	
9916	1206	428	0.35	0.33	-	0.38	√	√
9920	231	103	0.45	0.38	-	0.51	√	
9941	839	282	0.34	0.30	-	0.37	√	
9947	177	75	0.42	0.35	-	0.50	√	√
9955	2228	250	0.11	0.10	-	0.13	√	

* Counts of admissions to the same hospital as the ED attendance.

Table 11: Spain – Probability of admission of at least 40%

ICD-9	ED Attend	Adm LoS>0	PrA	95% CI			High PrA	Low DSP
800	7	6	0.86	0.49	-	0.97	√	
8000	5	5	1.00	0.57	-	1.00	√	
8001	8	8	1.00	0.68	-	1.00	√	
8002	22	21	0.95	0.78	-	0.99	√	√
801	22	21	0.95	0.78	-	0.99	√	
8010	22	22	1.00	0.85	-	1.00	√	
8011	11	11	1.00	0.74	-	1.00	√	√
8012	82	79	0.96	0.90	-	0.99	√	√
8013	8	7	0.88	0.53	-	0.98	√	√
8021	5	5	1.00	0.57	-	1.00	√	
8022	44	43	0.98	0.88	-	1.00	√	
8024	37	33	0.89	0.75	-	0.96	√	
8026	9	8	0.89	0.56	-	0.98	√	
8028	10	8	0.80	0.49	-	0.94	√	
8050	47	43	0.91	0.80	-	0.97	√	
8052	68	52	0.76	0.65	-	0.85	√	
8054	108	78	0.72	0.63	-	0.80	√	
8058	8	6	0.75	0.41	-	0.93	√	
8060	21	21	1.00	0.85	-	1.00	√	√
8061	3	3	1.00	0.44	-	1.00	√	
8062	21	21	1.00	0.85	-	1.00	√	
8063	14	14	1.00	0.78	-	1.00	√	
8064	8	8	1.00	0.68	-	1.00	√	
8070	110	90	0.82	0.74	-	0.88	√	
8072	61	43	0.70	0.58	-	0.80	√	
8074								√
808	38	32	0.84	0.70	-	0.93	√	
8082	6	5	0.83	0.44	-	0.97	√	
8084	113	95	0.84	0.76	-	0.90	√	
8088	30	20	0.67	0.49	-	0.81	√	
8110	15	11	0.73	0.48	-	0.89	√	
8122	98	67	0.68	0.59	-	0.77	√	
8123	9	9	1.00	0.70	-	1.00	√	
8124	29	19	0.66	0.47	-	0.80	√	
8125	11	10	0.91	0.62	-	0.98	√	
8131	9	8	0.89	0.56	-	0.98	√	
8132	31	26	0.84	0.67	-	0.93	√	
8135	12	12	1.00	0.76	-	1.00	√	
8161	21	14	0.67	0.45	-	0.83	√	
8200	47	43	0.91	0.80	-	0.97	√	
8202	81	76	0.94	0.86	-	0.97	√	√
8203	3	3	1.00	0.44	-	1.00	√	
8208	8	6	0.75	0.41	-	0.93	√	√
821	43	29	0.67	0.53	-	0.80	√	
8210	139	132	0.95	0.90	-	0.98	√	
8212	32	29	0.91	0.76	-	0.97	√	
8213	10	10	1.00	0.72	-	1.00	√	
822	58	34	0.59	0.46	-	0.70	√	
8221	16	15	0.94	0.72	-	0.99	√	
823	185	139	0.75	0.68	-	0.81	√	
8230	29	19	0.66	0.47	-	0.80	√	
8231	12	12	1.00	0.76	-	1.00	√	
8232	159	145	0.91	0.86	-	0.95	√	
8233	76	71	0.93	0.86	-	0.97	√	
8238	169	100	0.59	0.52	-	0.66	√	
8239	33	27	0.82	0.66	-	0.91	√	

ICD-9	ED Attend	Adm LoS>0	PrA	95% CI			High PrA	Low DSP
8241	5	5	1.00	0.57	-	1.00	√	
8244	88	78	0.89	0.80	-	0.94	√	
8245	24	22	0.92	0.74	-	0.98	√	
8246	23	19	0.83	0.63	-	0.93	√	
8249	7	6	0.86	0.49	-	0.97	√	
8251	4	4	1.00	0.51	-	1.00	√	
8253	18	14	0.78	0.55	-	0.91	√	
828	39	22	0.56	0.41	-	0.71	√	
8350	7	7	1.00	0.65	-	1.00	√	
8381	3	3	1.00	0.44	-	1.00	√	
8390	4	4	1.00	0.51	-	1.00	√	
8501	89	50	0.56	0.46	-	0.66	√	
8505	60	44	0.73	0.61	-	0.83	√	
8509	126	63	0.50	0.41	-	0.59	√	
8510	35	35	1.00	0.90	-	1.00	√	√
8518	3	3	1.00	0.44	-	1.00	√	√
852	14	12	0.86	0.60	-	0.96	√	
8520	74	73	0.99	0.93	-	1.00	√	√
8522	72	68	0.94	0.87	-	0.98	√	√
8524	8	8	1.00	0.68	-	1.00	√	√
8541								√
853	15	14	0.93	0.70	-	0.99	√	
8530	30	30	1.00	0.89	-	1.00	√	√
854	6	6	1.00	0.61	-	1.00	√	
8540	4	4	1.00	0.51	-	1.00	√	
860	27	26	0.96	0.82	-	0.99	√	
8602	7	6	0.86	0.49	-	0.97	√	√
8604	16	16	1.00	0.81	-	1.00	√	√
8612	44	42	0.95	0.85	-	0.99	√	
8622	3	3	1.00	0.44	-	1.00	√	
8632	9	8	0.89	0.56	-	0.98	√	
864	3	3	1.00	0.44	-	1.00	√	
8640	26	24	0.92	0.76	-	0.98	√	√
865	5	5	1.00	0.57	-	1.00	√	
8650	44	41	0.93	0.82	-	0.98	√	√
866	7	6	0.86	0.49	-	0.97	√	
8660	20	18	0.90	0.70	-	0.97	√	
867	5	5	1.00	0.57	-	1.00	√	
8680	10	10	1.00	0.72	-	1.00	√	
8701	3	3	1.00	0.44	-	1.00	√	
8731	3	3	1.00	0.44	-	1.00	√	
8735	3	3	1.00	0.44	-	1.00	√	
8782	3	3	1.00	0.44	-	1.00	√	
8832	4	4	1.00	0.51	-	1.00	√	
8901	3	3	1.00	0.44	-	1.00	√	
8911	9	9	1.00	0.70	-	1.00	√	
8921	6	5	0.83	0.44	-	0.97	√	
897	3	3	1.00	0.44	-	1.00	√	
901	5	5	1.00	0.57	-	1.00	√	
9413								√
9423								√
9463								√
9520	4	4	1.00	0.51	-	1.00	√	
9916								√
9947								√

Variations in Probabilities

For USA2, and for each breakdown by gender, age, cause or intent separately within country, Table 26 - Table 29, in Appendix B, show the diagnoses if:

- lower CI for PrA≥0.40 for at least one of the categories within the breakdown (eg. male or female), and
- there was significant variation (Chi-squared test at the 5% level of significance) between the PrAs for the categories in the breakdown.

If the above held, we presented all the categories of the breakdown within the ICD code. For example, if for the 801.4 ICD-9 code the PrA LCL ≥0.40 for males, but not females, and there was a significant difference in PrA between females and males, we presented the results for 801.4 for both Gender categories: females and males.

Presented in the body of the report for USA2 (Table 12) are the 4 character level ICD-9-CM diagnoses with a high probability of admission (PrA LCL≥0.75, or PrA≥0.80 – the latter is based on at least 10 ED attendances with the particular ICD-10 code). These are presented overall, but also broken down by gender, by age group, by cause, and by intent. The breakdown results are only highlighted if they show significant statistical variation ($p<0.05$). In this instance, only the categories in the breakdown that show a high probability of admission are highlighted. The breakdown categories within ICD-9-CM 4 character codes for which PrA LCL≥0.75 are highlighted in brown, and if not highlighted in brown, the codes for which PrA≥0.80 (provided the number of ED attendances are 10 or more) are highlighted in yellow.

As an example of how to read Table 13, consider 813.3 ('Open fracture of shaft of radius and ulna').

- Overall: PrA LCL≥0.75, ie. PrA 95% CI is 0.78-0.86.
- Gender: a significant variation in probability of admission for females compared to males, with males with PrA LCL≥0.75.
- Age Group: a significant variation between groups, with ages 15-24 and 25-44 with PrA LCL≥0.75, and age 5-14 with PrA≥0.80.
- Cause: no significant variation in probability of admission between the cause categories.
- Intent: no significant variation in probability of admission between the intent categories.

Note that, for Spain, there was only one ICD-9 code which showed significant variation between male and female (namely 824.6: Fracture of the ankle, trimalleolar, closed), and only one that showed significant variation between age groups, and that was at the 3 character level (namely 829: Fracture of unspecified bones). In the former case, PrA LCL≥0.40 only for males (95%CI 0.73-0.99). In the latter case, PrA LCL≥0.40 only for children aged 5-14 (95% CI 0.41-0.93).

Table 12: USA Census - diagnoses that show a significant variation in probabilities of admission

		No breakdown		Gender		Age Group		Cause		Intent	
ICD-9	Decsription	LCL>=0.75	PrA>=0.80	LCL>=0.75	PrA>=0.80	LCL>=0.75	PrA>=0.80	LCL>=0.75	PrA>=0.80	LCL>=0.75	PrA>=0.80
8002	Fracture of vault of skull: Closed wtih subarachnoid, subdural, and extradural hemorrhage						15-24,25-44	MVTC			
8011	Fracture of base of skull: Closed with cerebral laceration and contusion	0.88-0.97									
8012	Fracture of base of skull: Closed with subarachnoid, subdural, and extradural hemorrhage	0.87-0.91									
8014	Fracture of base of skull: Closed with intracranial injury of other and unspecified nature				M		15-24		MVTC		
8023	Fracture of face bones: Mandible, open							MVTC	Other/Unspe	Unintent	
8032	Other and unqualified skull fractures: Closed with subarachnoid, subdural, and extradural hemorrhage.						25-44		MVTC		
8060	Fracture of vertebral column with spinal cord lesion		0.73-0.87								
8080	Fracture of pelvis: Acetabulum, closed					75+		MVTC			
8123	Fracture of humerus: Shaft or unspecified part, open		0.71-0.93							Unintent	
8131	Fracture of radius and ulna: Upper end, open	0.79-0.92									
8133	Fracture of radius and ulna: Shaft, open	0.78-0.86		M		15-24,25-44	5-14				
8135	Fracture of radius and ulna: Lower end, open	0.81-0.86				25-44,45-64,75+	15-24,65-74				
8200	Fracture of neck of femur: Transcervical fracture, closed	0.92-0.93		F,M		45-64,65-74,75+	15-24,25-44	Falls,MVTC, Other/Unspec	Struck by/against		
8202	Fracture of neck of femur: Pertrochanteric fracture, closed	0.91-0.92		F,M		15-24,25-44,45-64,65-74,75+		Falls,MVTC, Other/Unspec			
8208	Fracture of neck of femur: Unspecified part, closed	0.78-0.80		F		65-74, 75+		Falls	Struck by/against		
8210	Fracture of shaft or unspecified parts of femur: Closed					15-24,25-44		MVTC			
8211	Fracture of shaft or unspecified parts of femur: Open	0.90-0.95		F,M		15-24,25-44	5-14				
8212	Fracture of other and unspecified parts of femur: Lower end, closed					65-74, 75+		MVTC			
8213	Fracture of other and unspecified parts of femur: Lower end, open	0.91-0.99									
8221	Fracture of patella: Open	0.76-0.86				25-44	15-24	MVTC	Other/Unspe		
8231	Fracture of tibia and fibula: Upper end, open	0.82-0.92									
8232	Fracture of tibia and fibula: Shaft, closed							MVTC			
8233	Fracture of tibia and fibula: Shaft, open	0.92-0.95									
8239	Fracture of tibia and fibula: Unspecified part, open	0.78-0.85		F		25-44,45-64					
8241	Fracture of ankle: Medial malleolus, open	0.79-0.92		F	M			MVTC			
8243	Fracture of ankle: Lateral malleolus, open		0.69-0.90			25-44					
8244	Fracture of ankle: Bimalleolar, closed							MVTC			
8245	Fracture of ankle: Bimalleolar, open	0.90-0.95				25-44,45-64,65-74,75+	15-24				
8246	Fracture of ankle: Trimalleolar, closed	0.76-0.79		F		45-64,65-74,75+		Falls,MVTC			
8247	Fracture of ankle: Trimalleolar, open	0.93-0.98		F,M		25-44,45-64,65-74,75+		Falls,MVTC			
8249	Fracture of ankle: Unspecified, open	0.80-0.85						Falls,MVTC	Struck by/against		
8251	Fracture of one or more tarsal and metatarsal bones: Fracture of calcaneus (heel bone), open	0.85-0.97									
8253	Fracture of other tarsal and metatarsal bones, open			F				MVTC			
8360	Dislocation of knee: Tear of medial cartilage or meniscus of knee, current						75+				
8510	Cerebral laceration and contusion: Cortex (cerebral) contusion without mention of open intracranial wound	0.81-0.96									
8514	Cerebellar or brain stem contusion without mention of open intracranial wound	0.78-0.90									

		No breakdown		Gender		Age Group		Cause		Intent	
ICD-9	Decsription	LCL>=0.75	PrA>=0.80	LCL>=0.75	PrA>=0.80	LCL>=0.75	PrA>=0.80	LCL>=0.75	PrA>=0.80	LCL>=0.75	PrA>=0.80
8518	Cerebral laceration and contusion: Other and unspecified, without mention of open intracranial wound					75+		MVTC			
8520	Subarachnoid hemorrhage following injury without mention of open intracranial wound	0.78-0.82		F,M		15-24,25-44, 75+		MVTC	Strcuk by/against		
8522	Subdural hemorrhage following injury without mention of open intracranial wound	0.77-0.79				45-64,65-74, 75+	15-24	Falls,MVTC			
8600	Traumatic pneumothorax without mention of open wound into thorax	0.85-0.87				15-24,25-44, 45-64,65-74, 75+		Cut/pierce, Falls,MVTC Struck by/against, Other/unspec			
8601	Traumatic pneumothorax with open wound into thorax	0.89-0.95									
8602	Traumatic haemothorax without mention of open wound into thorax	0.86-0.93									
8603	Traumatic haemothorax with open wound into thorax	0.85-0.97						Firearm-related	Cut/pierce		
8604	Traumatic pneumohaemothorax without mention of open wound into thorax	0.91-0.95									
8605	Traumatic pneumohaemothorax with open wound into thorax	0.95-0.99									
8610	Injury to heart without mention of open wound into thorax	0.76-0.87				75+	25-44,65-74				
8611	Injury to heart with open wound into thorax	0.82-0.99									
8612	Injury to lung, without mention of open wound into thorax					45-64	75+	MVTC			
8613	Injury to lung with open wound into thorax	0.77-0.98									
8620	Injury to diaphragm, without mention of open would into cavity	0.88-1.00									
8621	Injury to diaphragm, with open would into cavity	0.94-1.00									
8622	Injury to other specified intrathoracic organs without mention of open wound into cavity						75+		Falls		
8631	Injury to stomach with open would into cavity	0.92-1.00									
8632	Injury to small intestine without mention of open would into cavity	0.89-1.00									
8633	Injury to small intestine with open would into cavity	0.96-1.00									
8635	Injury to colon or rectum with open would into cavity	0.88-1.00									
8638	Injury to gastrointestinal tract: Other and unspecified gastrointestinal sites, without mention of open wound into cavity	0.85-0.99									
8639	Injury to gastrointestinal tract: Other and unspecified gastrointestinal sites, with open wound into cavity	0.76-1.00									
8640	Injury to liver: Without mention of open wound into cavity	0.77-0.83				15-24,25-44, 45-64		MVTC			
8641	Injury to liver: With open wound into cavity	0.88-0.98									
8650	Injury to spleen: Without mention of open wound into cavity	0.84-0.87		F,M		15-24,25-44, 45-64,75+	65-74	Falls,MVTC			
8661	Injury to kidney: With open wound into cavity	0.77-1.00									
8670	Injury to bladder and urethra, without mention of open wound into cavity								MVTC		
8671	Injury to bladder and urethra, with open wound into cavity	0.77-1.00									
8711	Open wound to the eyeball: ocular laceration with prolapse or exposure of intraocular tissue		0.72-0.88								
8712	Rupture of eye with partial loss of intraocular tissue		0.62-0.96								
8912	Open wound of knee, leg [except thigh], and ankle with tendon involvement								MVTC		
9010	Injury to blood vessels of thorax: Thoracic aorta						15-24,25-44				
9031	Injury to brachial blood vessels		0.63-0.92								
9341	Foreign body in trachea, bronchus, and lung: Main bronchus						75+				
9453	Burn of lower limb(s): Full-thickness skin loss [third degree NOS]						65-74,75+				
9520	Spinal cord injury without evidence of spinal bone injury: Cervical			M		45-64	65-74,75+				
9651	Poisoning by analgesics, antipyretics, and antirheumatics: Salicylates						75+				
9685	Poisoning by other central nervous system depressants and anesthetics: Surface [topical] and infiltration anesthetics					45-64					Other/undet
9698	Poisoning by psychotropic agents: Other specified						65-74,75+				
9744	Poisoning by water, mineral, and uric acid metabolism drugs: Other diuretics						65-74				

Between data set comparisons

Table 13 presents a comparison between USA2 and USA1 results for those ICD-9-CM 3 character codes for which the criteria for presentation is satisfied for either data set. It shows that, amongst the USA1 survey data, there were no diagnoses which had PrA LCL≥0.75, or PrA≥0.80. This is in contrast to the USA2 results. The differences are also highlighted by chi-squared tests, which show statistically significant differences between USA2 and USA1 results for around 40% of the diagnoses presented (highlighted in yellow).

Table 13: Comparison of the probabilities of admission between the two USA data sets.

USA 1							USA 2								
ICD-9	ED Attend	Adm LoS>0	PrA	95% CI			ICD-9	ED Attend	Adm* LoS>0	PrA	95% CI			Chisq	p
800					-		800	879	330	0.38	0.34	-	0.41		
801	21	6	0.29	0.14	-	0.50	801	3313	1724	0.52	0.50	-	0.54	4.60	0.03
803	25	9	0.36	0.20	-	0.55	803	235	28	0.12	0.08	-	0.17	10.73	0.00
805	158	49	0.31	0.24	-	0.39	805	27217	10974	0.40	0.40	-	0.41	5.66	0.02
806	9	3	0.33	0.12	-	0.65	806	408	304	0.75	0.70	-	0.78	7.69	0.01
808	70	41	0.59	0.47	-	0.69	808	13354	8638	0.65	0.64	-	0.65	1.14	0.29
820	282	217	0.77	0.72	-	0.81	820	52966	46948	0.89	0.88	-	0.89	37.87	0.00
821	106	75	0.71	0.61	-	0.79	821	11777	8453	0.72	0.71	-	0.73	0.05	0.82
822	55	5	0.09	0.04	-	0.20	822	6171	1728	0.28	0.27	-	0.29	9.71	0.00
823	239	57	0.24	0.19	-	0.30	823	26442	9606	0.36	0.36	-	0.37	15.97	0.00
824	476	71	0.15	0.12	-	0.18	824	62978	16215	0.26	0.25	-	0.26	29.05	0.00
835	39	19	0.49	0.34	-	0.64	835	650	209	0.32	0.29	-	0.36	4.56	0.03
851	10	5	0.50	0.24	-	0.76	851	2092	1616	0.77	0.75	-	0.79	4.18	0.04
852	40	27	0.68	0.52	-	0.80	852	6096	4771	0.78	0.77	-	0.79	2.70	0.10
853	22	13	0.59	0.39	-	0.77	853	1175	794	0.68	0.65	-	0.70	0.71	0.40
860	12	9	0.75	0.47	-	0.91	860	4775	4223	0.88	0.88	-	0.89	2.11	0.15
861	14	6	0.43	0.21	-	0.67	861	1537	1181	0.77	0.75	-	0.79	8.92	0.00
862	7	2	0.29	0.08	-	0.64	862	205	139	0.68	0.61	-	0.74	4.68	0.03
863	3	3	1.00	0.44	-	1.00	863	467	411	0.88	0.85	-	0.91	0.41	0.52
864	5	4	0.80	0.38	-	0.96	864	842	689	0.82	0.79	-	0.84	0.01	0.92
865	18	10	0.56	0.34	-	0.75	865	2260	1936	0.86	0.84	-	0.87	13.00	0.00
866	5	1	0.20	0.04	-	0.62	866	685	344	0.50	0.46	-	0.54	1.81	0.18
867	8	1	0.13	0.02	-	0.47	867	410	207	0.50	0.46	-	0.55	4.53	0.03
868	2	1	0.50	0.09	-	0.91	868	152	120	0.79	0.72	-	0.85	0.98	0.32
871	36	7	0.19	0.10	-	0.35	871	1672	199	0.12	0.10	-	0.14	1.89	0.17
879	990	41	0.04	0.03	-	0.06	879	4206	530	0.13	0.12	-	0.14	58.63	0.00
895	5	2	0.40	0.12	-	0.77	895	55	27	0.49	0.36	-	0.62	0.15	0.70
901					-		901	49	31	0.63	0.49	-	0.75		
903	4	4	1.00	0.51	-	1.00	903	103	64	0.62	0.52	-	0.71	2.38	0.12
904					-		904	22	11	0.50	0.31	-	0.69		
934	5	1	0.20	0.04	-	0.62	934	828	312	0.38	0.34	-	0.41	0.66	0.42
936	2	0	0.00	0.00	-	0.66	936	990	134	0.14	0.12	-	0.16	0.31	0.58
952	20	5	0.25	0.11	-	0.47	952	283	187	0.66	0.60	-	0.71	13.58	0.00
955	13	1	0.08	0.01	-	0.33	955	521	87	0.17	0.14	-	0.20	0.75	0.39
958	42	6	0.14	0.07	-	0.28	958	2025	336	0.17	0.15	-	0.18	0.16	0.69
962	15	4	0.27	0.11	-	0.52	962	2742	915	0.33	0.32	-	0.35	0.30	0.58
964	7	2	0.29	0.08	-	0.64	964	737	351	0.48	0.44	-	0.51	1.01	0.32
965	140	33	0.24	0.17	-	0.31	965	25939	8842	0.34	0.34	-	0.35	6.86	0.01
966	24	11	0.46	0.28	-	0.65	966	2832	1269	0.45	0.43	-	0.47	0.01	0.92
967	27	8	0.30	0.16	-	0.48	967	3912	1401	0.36	0.34	-	0.37	0.45	0.50
968	17	4	0.24	0.10	-	0.47	968	2326	926	0.40	0.38	-	0.42	1.87	0.17
969	145	42	0.29	0.22	-	0.37	969	28712	11524	0.40	0.40	-	0.41	7.50	0.01
970	14	5	0.36	0.16	-	0.61	970	3048	1670	0.55	0.53	-	0.57	2.05	0.15
972	25	7	0.28	0.14	-	0.48	972	2664	957	0.36	0.34	-	0.38	0.68	0.41
974	4	0	0.00	0.00	-	0.49	974	239	79	0.33	0.27	-	0.39	1.96	0.16
975	24	3	0.13	0.04	-	0.31	975	1622	368	0.23	0.21	-	0.25	1.41	0.24
982	5	1	0.20	0.04	-	0.62	982	501	132	0.26	0.23	-	0.30	0.10	0.75
984					-		984	17	11	0.65	0.41	-	0.83		
991	24	9	0.38	0.21	-	0.57	991	2601	569	0.22	0.20	-	0.24	3.38	0.07

Table 14 we present a comparison of the results for MVTCs only between USA2 and Spain. Presented are the diagnoses where at least one country has a PrA≥0.80 or a PrA LCL≥0.75. The blanks in the table for a particular country indicate diagnoses that do not satisfy any of the criteria for presentation, or diagnosis-specific counts were not supplied due to small numbers.

The diagnoses where we can be sure that there are consistently high probabilities of admission are: fracture of the vault of skull with brain injury (800.2); fracture of the base of skull with brain injury (801.1, 801.2); open fracture of the radius and ulna (813.5); closed fracture of the neck of femur (820.0, 820.2); closed fracture of the shaft of femur (821.0, 821.2); fractures of the tibia and fibula – upper end open, shaft open, and shaft closed (823.1, 823.2, 823.3); open and closed fracture of the ankle – Bimalleolar (824.4, 824.5); subarachnoid and subdural haemorrhage following injury (852.0, 852.2); traumatic haemopneumothorax (860.4); injury, without mention of open wound, to the lung (861.2), liver (864.0), and spleen (865.0).

Other diagnosis codes that could be consistent with high probabilities of admission, but have not been selected above due to small numbers in one of the collaborator's data, are: open fracture of the mandible (802.3), closed skull fracture with brain haemorrhage (803.2), closed fracture of the cervical vertebral column with mention of spinal cord lesion (806.0); open fracture of the thoracic vertebrae with spinal cord lesion (806.3); closed fracture of the lumbar vertebrae with spinal cord lesion (806.4); close fracture of the pelvis (808.0, 808.4); open fracture of the humerus (812.3, 812.5), and radius and ulna (813.1); open fracture of the shaft or unspecified parts of the femur (821.1, 821.3); open fracture of the patella (822.1), open fracture of the medial or lateral malleolus - ankle (824.1, 824.3), open fracture of the bimalleolar – ankle (824.5), open or closed fracture of the trimalleolar – ankle (824.6, 824.7); unspecified open fracture of the ankle (824.9), open fracture of the calcaneus – heel (825.1), open fracture of other tarsal and metatarsal bones (825.3), cerebral, cerebellar or brain stem laceration, contusion, or intracranial haemorrhage, without mention of open intracranial wound (851.0, 851.4, 851.8, 853.0), traumatic haemo- or pneumothorax without mention of open wound into the thorax (860.0, 860.2); injury to heart (861.0), diaphragm (862.0), small intestine (863.2), gastro-intestinal tract (863.8), bladder or urethra (867.0), or other intra-abdominal organs (868.0) without mention of open wound, and open wound of knee, leg [except thigh], and ankle with tendon involvement (891.2).

Table 14: Comparison of the probabilities of admission between USA2 and Spain for MVTCs.

ICD-9	Description	USA2 - 95% CI	Spain - 95% CI
8002	Fracture of vault of skull: Closed wtih subarachnoid, subdural, and extradural hemorrhage	0.79 - 0.96	0.78 - 0.99
801	Fracture of base of skull		0.78 - 0.99
8010	Fracture of base of skull: Closed without mention of intracranial injury	0.61 - 0.69	0.85 - 1.00
8011	Fracture of base of skull: Closed with cerebral laceration and contusion	0.85 - 0.97	0.74 - 1.00
8012	Fracture of base of skull: Closed with subarachnoid, subdural, and extradural hemorrhage	0.88 - 0.94	0.90 - 0.99
8014	Fracture of base of skull: Closed with intracranial injury of other and unspecified nature	0.67 - 0.99	
8022	Fracture of face bones: Mandible, closed	0.43 - 0.54	0.88 - 1.00
8023	Fracture of face bones: Mandible, open	0.84 - 0.99	
8024	Fracture of face bones: Malar and maxillary bones, closed	0.53 - 0.62	0.75 - 0.96
8028	Fracture of face bones: Other facial bones, closed	0.32 - 0.42	0.49 - 0.94
8032	Other and unqualified skull fractures: Closed with subarachnoid, subdural, and extradural hemorrhage.	0.69 - 0.99	
8050	Fracture of vertebral column without mention of spinal cord lesion: Cervical, closed	0.58 - 0.62	0.80 - 0.97
8060	Fracture of vertebral column with spinal cord lesion: Cervical, closed	0.70 - 0.85	0.85 - 1.00
8062	Fracture of vertebral column with spinal cord lesion: Dorsal [thoracic], closed	0.57 - 0.77	0.85 - 1.00
8063	Fracture of vertebral column with spinal cord lesion: Dorsal [thoracic], open		0.78 - 1.00
8064	Fracture of vertebral column with spinal cord lesion: Lumbar, closed	0.74 - 0.92	0.68 - 1.00
8070	fracture of rib(s), closed	0.28 - 0.31	0.74 - 0.88
808	Fracture of pelvis		0.70 - 0.93
8080	Fracture of pelvis: Acetabulum, closed	0.79 - 0.84	
8084	Fracture of pelvis: Other specified part, closed	0.71 - 0.83	0.76 - 0.90
8123	Fracture of humerus: Shaft or unspecified part, open	0.81 - 0.99	0.70 - 1.00
8125	Fracture of humerus: Lower end, open	0.54 - 0.87	0.62 - 0.98
8131	Fracture of radius and ulna: Upper end, open	0.81 - 0.96	0.56 - 0.98
8132	Fracture of radius and ulna: Shaft, closed	0.55 - 0.63	0.67 - 0.93
8135	Fracture of radius and ulna: Lower end, open	0.81 - 0.94	0.76 - 1.00
8200	Fracture of neck of femur: Transcervical fracture, closed	0.82 - 0.92	0.80 - 0.97
8202	Fracture of neck of femur: Pertrochanteric fracture, closed	0.90 - 0.95	0.86 - 0.97
8210	Fracture of shaft or unspecified parts of femur: Closed	0.85 - 0.88	0.90 - 0.98
8211	Fracture of shaft or unspecified parts of femur: Open	0.89 - 0.95	
8212	Fracture of other and unspecified parts of femur: Lower end, closed	0.76 - 0.85	0.76 - 0.97
8213	Fracture of other and unspecified parts of femur: Lower end, open	0.91 - 0.99	0.72 - 1.00

ICD-9	Description	USA2 - 95% CI	Spain - 95% CI
8221	Fracture of patella: Open	0.79 - 0.90	0.72 - 0.99
8231	Fracture of tibia and fibula: Upper end, open	0.82 - 0.92	0.76 - 1.00
8232	Fracture of tibia and fibula: Shaft, closed	0.75 - 0.81	0.86 - 0.95
8233	Fracture of tibia and fibula: Shaft, open	0.92 - 0.96	0.86 - 0.97
8239	Fracture of tibia and fibula: Unspecified part, open	0.76 - 0.85	0.66 - 0.91
8241	Fracture of ankle: Medial malleolus, open	0.87 - 0.98	0.57 - 1.00
8243	Fracture of ankle: Lateral malleolus, open	0.77 - 1.00	
8244	Fracture of ankle: Bimalleolar, closed	0.75 - 0.81	0.80 - 0.94
8245	Fracture of ankle: Bimalleolar, open	0.87 - 0.96	0.74 - 0.98
8246	Fracture of ankle: Trimalleolar, closed	0.76 - 0.87	0.63 - 0.93
8247	Fracture of ankle: Trimalleolar, open	0.75 - 0.96	
8249	Fracture of ankle: Unspecified, open	0.82 - 0.90	0.49 - 0.97
8251	Fracture of one or more tarsal and metatarsal bones: Fracture of calcaneus (heel bone), open	0.85 - 0.99	0.51 - 1.00
8253	Fracture of other tarsal and metatarsal bones, open	0.89 - 0.99	0.55 - 0.91
8510	Cerebral laceration and contusion: Cortex (cerebral) contusion without mention of open intracranial wound	0.72 - 0.97	0.90 - 1.00
8514	Cerebellar or brain stem contusion without mention of open intracranial wound	0.80 - 0.97	
8518	Cerebral laceration and contusion: Other and unspecified, without mention of open intracranial wound	0.79 - 0.85	0.44 - 1.00
852	Subarachnoid, subdural, and extradural hemorrhage, following injury		0.60 - 0.96
8520	Subarachnoid hemorrhage following injury without mention of open intracranial wound	0.83 - 0.88	0.93 - 1.00
8522	Subdural hemorrhage following injury without mention of open intracranial wound	0.78 - 0.84	0.87 - 0.98
853	Other and unspecified intracranial hemorrhage following injury		0.70 - 0.99
8530	Other and unspecified intracranial hemorrhage following injury: Without mention of open intracranial wound		0.89 - 1.00
860	Traumatic pneumothorax and hemothorax		0.82 - 0.99
8600	Traumatic pneumothorax without mention of open wound into thorax	0.86 - 0.90	
8602	Traumatic haemothorax without mention of open wound into thorax	0.85 - 0.97	0.49 - 0.97
8604	Traumatic pneumohaemothorax without mention of open wound into thorax	0.91 - 0.96	0.81 - 1.00
8610	Injury to heart without mention of open wound into thorax	0.76 - 0.87	
8612	Injury to lung, without mention of open wound into thorax	0.75 - 0.80	0.85 - 0.99
8620	Injury to diaphragm, without mention of open would into cavity	0.88 - 1.00	
8632	Injury to small intestine without mention of open would into cavity	0.89 - 1.00	0.56 - 0.98
8638	Injury to gastrointestinal tract: Other and unspecified gastrointestinal sites, without mention of open wound into cavity	0.85 - 0.99	
8640	Injury to liver: Without mention of open wound into cavity	0.82 - 0.87	0.76 - 0.98
8650	Injury to spleen: Without mention of open wound into cavity	0.88 - 0.92	0.82 - 0.98
8660	Injury to kidney: Without mention of open wound into cavity	0.57 - 0.69	0.70 - 0.97
8670	Injury to bladder and urethra, without mention of open wound into cavity	0.69 - 0.95	
8680	Injury to other intra-abdominal organs: Without mention of open wound into cavity		0.72 - 1.00
8912	Open wound of knee, leg [except thigh], and ankle: With tendon involvement	0.65 - 0.90	

Validation of the NZIPS indicators

Presented in Table 15 are the ICD-9 codes that have a DSP less than or equal to 0.96 based on at least 100 publicly-funded admissions to NZ's hospitals. These DSPs are based on the 4 character codes rather than the full 5 character ICD-9-CM codes, used for the NZIPS indicators. The table shows the estimates of probability of admission for each of these ICD-9 codes based on the data from USA2 and Spain. (This latter source limited to MVTCs.) The blanks in the table for either country indicate diagnoses that were not supplied, or not presented, due to small numbers.

Table 15 shows the diagnoses that unequivocally had a high PrA across both countries were closed fracture of base of skull with subarachnoid, subdural, or extradural hemorrhage (801.2), pertrochanteric fracture (820.2), cortex (cerebral) laceration and contusion without mention of open intracranial wound (851.0), subarachnoid and subdural hemorrhage following injury without mention of open intracranial wound (852.0, 852.2), traumatic pneumohaemothorax without mention of open wound into thorax (860.4), and injury to liver or spleen, without mention of open wound into cavity (864.0, 865.0).

The table also shows the following:

- For most of the other codes relating to TBI (800.2, 801.1, 801.3, 851.8, 852.4, 853.0) with low DSPs, they were potentially consistent with a high PrA (Outcome 4). This was with the exception of 853.0, ie. "Other and unspecified intracranial hemorrhage following injury: without mention of open intracranial wound", which showed different estimates for USA2 (moderately high PrA) and Spain (high PrA).
- For the code relating to fracture of the cervical vertebrae (806.0), the estimates were consistent with a high PrA.
- Surprisingly, the estimated probability of admission for flail chest (807.4) in the USA was consistent, at best, with only a moderately high probability of admission (no estimate for Spain).
- Closed fractured neck of femur – part unspecified (820.8) was consistent with a high PrA, but small numbers of these in the Spanish data resulted in wide CIs.
- Traumatic haemothorax (860.2) was consistent with a high PrA across both countries.
- The other diagnoses with low DSPs showed moderately high / low PrAs. These were: burn of trunk with full-thickness skin loss (942.3), hypothermia (991.6), and asphyxiation and strangulation (994.7).

The final columns in the table show the New Zealand frequency and relative frequency of incident cases with PDx the relevant ICD-9 code. Those highlighted in the colour sand are the diagnoses

(820.2, 820.8) that account for 68% of the serious threat to life NZ cases (out of a total for the diagnoses shown). The former has consistently high probabilities of admission, the latter (accounting for 13% of cases) has potentially consistently high PrA. Those shown in green are the next highest frequency diagnoses (852.2, 853.0, 860.4, 864.0, 865.0, 842.3, 991.6, and 994.7), and these account for a further 21% of the NZ cases. These show:

- results consistent with a high probability of admission (852.2, 860.4, 864.0, 865.0),
- results with a moderately high probability of admission (853.0, 942.3),
- results consistent with a moderately low probability of admission (994.7),
- results consistent with a low probability of admission (991.6).

Table 15: Validation of ICD-9 ICISS threshold

		USA2				Spain (MVTC only)				New Zealand (2001-8)	
ICD-9	Description	PA	95% CI			PA	95% CI			Freq	Rel Freq (%)
8002	Fracture of vault of skull: Closed wtih subarachnoid, subdural, and extradural hemorrhage	0.71	0.64	-	0.76	0.95	0.78	-	0.99	121	1
8011	Fracture of base of skull: Closed with cerebral laceration and contusion	0.94	0.88	-	0.97	1.00	0.74	-	1.00	102	1
8012	Fracture of base of skull: Closed with subarachnoid, subdural, and extradural hemorrhage	0.89	0.87	-	0.91	0.96	0.90	-	0.99	160	1
8013	Fracture of base of skull: Closed with other and unspecified intracranial hemorrhage					0.88	0.53	-	0.98	89	1
8060	Fracture of vertebral column with spinal cord lesion: Cervical, closed	0.81	0.73	-	0.87	1.00	0.85	-	1.00	99	1
8074	Flail chest	0.56	0.49	-	0.64					67	1
8202	Fracture of neck of femur: Pertrochanteric fracture, closed	0.91	0.91	-	0.92	0.94	0.86	-	0.97	6103	55
8208	Fracture of neck of femur: Unspecified part, closed	0.79	0.78	-	0.80	0.75	0.41	-	0.93	1444	13
8510	Cerebral laceration and contusion: Cortex (cerebral) contusion without mention of open intracranial wound	0.91	0.81	-	0.96	1.00	0.90	-	1.00	63	1
8518	Cerebral laceration and contusion: Other and unspecified, without mention of open intracranial wound	0.76	0.74	-	0.78	1.00	0.44	-	1.00	149	1
8520	Subarachnoid hemorrhage following injury without mention of open intracranial wound	0.80	0.78	-	0.82	0.99	0.93	-	1.00	110	1
8522	Subdural hemorrhage following injury without mention of open intracranial wound	0.78	0.77	-	0.79	0.94	0.87	-	0.98	488	4
8524	Extradural hemorrhage following injury without mention of open intracranial wound	0.70	0.58	-	0.80	1.00	0.68	-	1.00	73	1
8530	Other and unspecified intracranial hemorrhage following injury: Without mention of open intracranial wound.	0.68	0.65	-	0.70	1.00	0.89	-	1.00	278	3
8602	Traumatic haemothorax without mention of open wound into thorax	0.90	0.86	-	0.93	0.86	0.49	-	0.97	153	1
8604	Traumatic pneumohaemothorax without mention of open wound into thorax	0.93	0.91	-	0.95	1.00	0.81	-	1.00	252	2
8640	Injury to liver: Without mention of open wound into cavity	0.80	0.77	-	0.83	0.92	0.76	-	0.98	221	2
8650	Injury to spleen: Without mention of open wound into cavity	0.86	0.84	-	0.87	0.93	0.82	-	0.98	348	3
9423	Burn of trunk: Full-thickness skin loss [third degree NOS]	0.65	0.59	-	0.70					196	2
9916	Hypothermia	0.35	0.33	-	0.38					248	2
9947	Asphyxiation and strangulation	0.42	0.35	-	0.50					291	3

4. Discussion

4.1. Principal findings

The discussion has been presented under headings related to the purposes of this work, which are:

1. To validate the existing NZIPS serious non-fatal injury indicators
2. To investigate the opportunity to develop serious injury indicators that capture a greater number of serious injuries
3. To provide the wherewithal to develop reliable methods for international comparisons.

The first is considered separately for the ICD-9 and ICD-10 data analyses. The second is considered just for ICD-10 since, if a new indicator was developed for NZ, it would be ICD-10 based. For the third, which aims to identify diagnoses that could be the basis for the specification of an indicator for international comparisons, we make inferences from both the ICD-9 and ICD-10 results.

Within (1) ICD-10 is presented before ICD-9 since ICD-10 has been used for both NMDS[d] and the Mortality Collection since 2000, and so it is most relevant to NZ now.

4.1.1. Validation of the existing NZIPS serious non-fatal injury indicators – under ICD-10

Empirical validation of NZIPS indicators

For the NZIPS indicators, cases of injury coded to ICD-10 are currently identified as serious if ICISS$\leq$0.941. ICISS scores are calculated by multiplying the individual diagnosis-specific survival probabilities (DSPs) for all injury diagnoses that are listed in an injury-hospital event. We have taken a conservative approach with regard to the diagnoses in which we are interested, and have only used those with a DSP $\leq$0.941. Cases need only have one of these diagnoses listed in their hospital record in order to be considered serious, and hence a case, for the NZIPS indicators.

In order to maximize the precision of the probability of admission estimates, without compromising specificity of diagnosis too much, we limited this investigation to ICD-10 diagnoses

[d] A NZ database which records information on all publicly funded hospital discharges in New Zealand. The NMDS excludes cases that are funded privately. There are only a small number of privately funded injury incident cases that are not captured by the NMDS.

at the 4 character level. Consequently, we estimated and used DSPs at the 4 character level, also. The ICD-10 4 character level DSPs that satisfy the DSP≤0.941 threshold are shown in Table 9.

Of those diagnoses listed, only two had probabilities of admission unequivocally and consistently greater than 0.75 (Outcome 3) - namely:

S720 – fractured neck of femur;

S721 - pertrochanteric fracture.

These diagnoses account for 63% of the serious threat to life cases identified from the NZ data with ICD-10 4 character DSP≤0.941.

More diagnoses had 95% CIs for PrA that were potentially consistent with high probability of admission across all countries (ie. had upper CLs for PrA above 0.75 – Outcome 4) – namely:

S061 – Traumatic cerebral oedema

S063 – Focal brain injury

S064 - Epidural haemorrhage

S066 – Traumatic subarachnoid haemorrhage

S068 – Other intracranial injuries

S069 – Intracranial injury unspecified (based on 1 country only)

S120 – Fracture of first cervical vertebra

S141 – Other and unspecified injuries of cervical spinal cord

S225 – Flail chest

S272 – Traumatic haemopneumothorax

S361 – Injury of liver or gallbladder

S368 – Injury of other intra-abdominal organs

T213 – Third degree burn of trunk.

The estimated probabilities of admission, for each country, for the diagnoses mentioned so far in this subsection are:

Canada:	PrA= 0.88,	95% CI 0.87-0.88
Denmark:	PrA= 0.96,	95% CI 0.96-0.97
Greece:	PrA= 0.92,	95% CI 0.91-0.93

The above diagnoses account for 78% of the serious threat to life cases identified from the NZ data with ICD-10 4 character DSP≤0.941.

A further set of diagnoses had a probability of admission, for at least one country, that could have been greater than 0.75 (ie. upper confidence limit was greater than 0.75 – Outcome 4), but for

which at least one other country estimates were not consistent with a high probability of admission. These diagnoses were as follows:

S020 – Fracture of vault of skull

S021 – Fracture of base of skull

S065 – Traumatic subdural haemorrhage

S121 – Fracture of second cervical vertebra

S271 – Traumatic haemothorax

S273 – Other injuries to the lung

S328 – Fracture of other and unspecified parts of lumbar spine and pelvis

T223 - Third degree burn of shoulder and upper limb.

The estimated probabilities of admission, for each country, for the diagnoses mentioned so far in this subsection are:

Canada:	PrA= 0.83,	95% CI 0.82-0.83
Denmark:	PrA= 0.95,	95% CI 0.94-0.95
Greece:	PrA= 0.90,	95% CI 0.89-0.91

The above diagnoses account for 97% of the serious threat to life cases identified from the NZ data with ICD-10 4 character DSP$\leq$0.941.

There were only 3 codes for which the upper 95% confidence limit was less than 0.75 for all countries for which PrA estimates were presented, and these were:

S062 - Diffuse brain injury,

S218 - Open wound of other parts of thorax (based on only 1 country's data),

T71 - Asphyxiation.

Inclusion of these diagnoses changed the estimates to:

Canada:	PrA= 0.82,	95% CI 0.82-0.82
Denmark:	PrA= 0.89,	95% CI 0.88-0.90
Greece:	PrA= 0.90,	95% CI 0.89-0.91

The above diagnoses account for all of the serious threat to life cases identified from the NZ data with ICD-10 4 character DSP$\leq$0.941.

These results suggest that with the exception of a small number of diagnoses, the current ICISS ICD-10 threshold used for NZIPS indicators satisfies the goal of capturing only those diagnoses with a high probability of admission.

4.1.2. Validation of the existing NZIPS serious non-fatal injury indicators – under ICD-9

The data for USA1 had been provided at the 3 character level due to small numbers. We have worked at the 4 character level, since to work at a lower level of specificity is problematic for the following reason. The results show heterogeneity of PrA within 3 character categories. Consequently, a 3 character analysis will "hide" diagnoses that have a high PrA. For example, within 801 (fracture of base of skull), the results for USA2 provide estimates for 801.0, .1, .2, and .4, and these range from 0.38 (0.38-0.40) to 0.94 (0.88-0.97). Data from USA1 has only been used, therefore, to consider the validity of the USA2 results.

There is an observed lack of consistency between the USA1 and USA2 results. What was measured by USA1 and USA2 data is almost the same phenomena, so we are concerned by these inconsistent results. (What is measured is not exactly the same since the method of data collection and aspects of population coverage differ between the two sets.) This inconsistency in the results for USA1 and USA2 led to initial uncertainties regarding which of the two sets of results can be trusted.

The results for Spain also have limitations in that they are restricted to MVTCs only. The results in this report suggest that, for some diagnoses, there are variations in PrA with cause. For example, for many of the ICD-9 diagnoses, those associated with MVTCs have a higher estimated PrA than other causes (eg. 800.2 fracture of vault of skull with subdural, subarachnoid and extradural haemorrhage). This is due, presumably, to the greater energy transfers (on average) for MVTCs in certain injuries than for other mechanisms of injury. When the results for USA2, restricted to MVTCs, were compared with the Spanish results, it is encouraging to observe the many consistencies between the two sets of results (Table 15).

Despite the inconsistencies between the results for USA1 and USA2, the similarities for USA2 in the comparisons with Spain are such that we have proceeded with the discussion of the validation of NZIPS indicators based on both the USA2 and Spanish data – although greater weight has been given to USA2, since it is the only ICD-9 data set where we can present results for all cause injury.

Validation of NZIPS indicators

For the NZIPS indicators, based on ICD-9 coded data, cases of injury are currently identified as serious if ICISS$\leq$0.96. ICISS scores are calculated by multiplying the individual diagnosis-specific

survival probabilities (DSPs) for all injury diagnoses that are listed in an injury-related hospital event. We have taken a conservative approach with regard to the diagnoses in which we are interested, and have only used those with a DSP≤0.96. Cases need only have one of these diagnoses listed in their hospital record in order to be considered serious for the NZIPS indicators.

Since we have limited our investigation to ICD-9 diagnoses at the 4 character level for the investigation of PrA, we have done likewise for identifying relevant diagnoses with DSP≤0.96. The ICD-9 4 character level DSPs that satisfy the DSP≤0.96 threshold are shown in Table 15.

The diagnoses that had probabilities of admission unequivocally and consistently (across USA2 [all cause] and Spain [MVTC only]) greater than or equal to 0.75 were:

801.2 – closed fracture of base of skull with subarachnoid, subdural, and extradural haemorrhage

820.2 – fractured neck of femur, closed pertrochanteric fracture;

820.8 – fractured neck of femur, unspecified part;

851.0 – cortex (cerebral) contusion without mention of open intracranial wound;

852.0 - subarachnoid haemorrhage following injury without mention of open intracranial wound;

852.2 – subdural haemorrhage following injury without mention of open intracranial wound;

860.4 – traumatic pneumohaemothorax without mention of open wound into the thorax;

864.0 and 865.0 – injury to liver / spleen, without mention of open wound into the cavity.

These diagnoses account for 82% of the serious threat to life cases identified from the NZ data with ICD-9 4 character DSP≤0.96.

All the remaining diagnoses in Table 15 are consistent (across both data sets) with high PrA (Outcome 4), with the surprise exception of:

807.4 - flail chest, and

853.0 - other and unspecified intracranial haemorrhage following injury, without mention of open intracranial wound,

942.3 - third degree burn of trunk,

and with the exception of:

991.6 - hypothermia, and

994.7 - asphyxiation and strangulation.

The percentage of New Zealand serious injury cases accounted for by those diagnoses potentially consistent high estimated PrA (Outcome 4) is 89%. The estimated probabilities of admission, for USA2 and Spain, for the diagnoses mentioned in Table 16, excluding 807.4, 853.0, 942.3, 991.6, 994.7, are:

USA2:	PrA= 0.86,	95% CI 0.85-0.86
Spain:	PrA= 0.96,	95% CI 0.93-0.97

If we include all of the diagnoses mentioned in Table 15, the estimated PrAs changed to:

USA2:	PrA= 0.84,	95% CI 0.84-0.84
Spain:	PrA= 0.96,	95% CI 0.94-0.97

These results suggest that with the exception of a few diagnoses, the current ICISS threshold for ICD-9 used for NZIPS indicators is satisfying the goal of capturing only those diagnoses with a high probability of admission.

4.1.3. Investigation of serious injury indicators that capture a greater number of serious injuries – under ICD-10

If we wish to specify indicators based on injury diagnoses for which we have high confidence that admission would almost always result (in developed countries), then our consideration would be limited to the fractured femur codes S720-S723. An indicator based on these have aggregate estimated probabilities of admission of:

Canada:	PrA= 0.88,	95% CI 0.87-0.88
Denmark:	PrA= 0.96,	95% CI 0.95-0.96
Greece:	PrA= 0.92,	95% CI 0.91-93

Diagnoses for which at least one country had PrA LCL$\geq$0.75 (Outcome 3) are as follows:

S052	Ocular laceration and rupture with prolapse or loss of intraocular tissue
S827	Multiple fractures of lower leg
T079	Injuries involving multiple body regions

If one were willing to take a less conservative approach, other diagnoses would be included that are potentially consistent with a high PrA (ie. with upper 95%CI$\geq$0.75 for estimated PrA where it exists for the 3 countries – Outcome 4). These additional diagnoses are:

S029	Fracture of skull and facial bones, part unspecified
S063	Focal brain injury
S272	Traumatic haemopneumothorax

S360 Injury of spleen

S361 Injury of liver or gall bladder

An indicator based on the combination of the diagnoses the above diagnoses, namely S029, S052, S063, S272, S360, S361, S720-S723, has an aggregate estimated probability of admission of:

Canada:	PrA=0.87,	95% CI 0.87-0.88
Denmark:	PrA= 0.96,	95% CI 0.95-0.96
Greece:	PrA= 0.91,	95% CI 0.90-0.92

Both of the above combinations of diagnoses have higher aggregate PrA than the current NZIPS serious non-fatal injury indicators. The benefit, over the current NZIPS indicators, of using these diagnoses only to define an indicator is that of capturing fewer cases whose admissions are potentially influenced by extraneous factors, including health services factors. But, this would be at the cost of a reduced number of non-fatal serious injury cases identified than the current NZIPS indicators.

4.1.4. Development of reliable methods for international comparisons.

Proposed indicator specification for international comparison.

A separate document has been prepared that provides a proposal to use the above results to define a case of serious non-fatal injury that will be robust for international comparisons amongst developed countries, and for which hospital inpatient data is coded to ICD-9 or ICD-10. This has been reproduced in Appendix C. This work will involve the specification of a case of serious non-fatal injury based on hospital discharge data. This specification should be such that it minimises the effect of health service and other extraneous factors on the comparisons. Consequently, we have argued that it should be based on diagnoses that have a high probability of admission.

The starting point for the identification of diagnoses with consistently high PrA is the discussion in Section 4.1.3. Additionally, we would wish to include the ICD-10 diagnoses, which are the counterparts of the ICD-9 diagnosis that have high PrA in the USA2 and the Spanish data. This is discussed below.

Diagnoses consistent with high PrA across ICD-9 and ICD-10

ICD-9 and ICD-10 diagnoses that have a PrA LCL$\geq$0.75 and / or PrA$\geq$0.80 (N$\geq$10) [Outcome 3] for at least one country, and for which no country's PrA estimate is inconsistent with a high PrA (ie. PrA<0.75) are:

S052 Ocular laceration and rupture with prolapse of loss of intraocular tissue
S272 Traumatic haemopneumothorax
S360 Injury of spleen
S361 Injury of liver or gall bladder
S364 Injury of small intestine
S720 Fractured neck of femur
S721 Pertrochanteric fracture
S272 Subtrochanteric fracture
S273 Fracture of shaft of femur

For S827 (Multiple fractures of lower leg), T079 (Injuries involving multiple body regions), and S063 (Focal brain injury) we could not find a mapping to an ICD-9 code; hence we were unable to determine whether the above conditions held for these ICD diagnosis codes.

We propose that the injuries listed above are the starting point for the injury indicator case definition to be used for international comparisons.

Inferring additional diagnoses

Because only 4 character ICD-10 codes have been used, there was some loss of specificity in our analysis for this project than is available in many data sets. For example, there is no distinction possible, at the 4-character level of ICD-10, between open and closed fracture. Whereas, an open fracture has a high probability of admission (eg. fracture of the radius and ulna – as demonstrated by the USA2 ICD-9 analysis), an equivalent closed fracture does not. Without the distinction between open and closed fracture, the averaging effect when using ICD-10 at the 4 character level has resulted in many open fractures not being identified above.

Additionally, a single injury can generate multiple ICD-10 codes – whereas this is not the case for ICD-9. For example, brain injury with skull fracture would generate 2 different ICD-10 codes. This is not the case under ICD-9. As a consequence, we considered the ICD-9 4 character codes that were consistent with a high probability of admission (PrA UCL$\geq$0.75) [Outcome 4] for both USA2 and Spain. Using the ICD-9 to ICD-10 mapping, we considered the equivalent PrA for Canada, Denmark and Greece. If all available PrA estimates were consistent with high PrA, they were listed below. They are:

Fractured skull with brain injury
- Fractured base of skull with brain injury

Brain laceration or haemorrhage

- Cerebral laceration and contusion – other and unspecified
- Subarachnoid haemorrhage

Spinal cord lesion

- Fractured cervical vertebra with spinal cord lesion
- Fractured dorsal [thoracic] vertebra with spinal cord lesion
- Fractured lumbar vertebra with spinal cord lesion

Open fractures

- Mandible
- Humerus - shaft or other
- Radius and ulna, lower end
- Patella
- Tibia and fibula – unspecified
- Ankle – medial malleolus, lateral malleolus, bimalleolar, trimalleolar, and unspecified
- Heel

Other fractures

- Pelvis – acetabulum

Internal organ injury

- Diaphragm
- Gastrointestinal tract

There could be other open fractures that we should include in the list above, that do not satisfy our condition solely because the equivalent 4 character ICD-10 code includes a mix of open and closed fractures. These include:

- lower end of humerus,
- upper end of radius and ulna
- upper end or shaft of tibia and fibula

Additionally, traumatic haemothorax, pneumothorax, and injury to lung satisfies the conditions for all but one country, and for that country the upper CI only just falls short of the 0.75 threshold (ie. 0.73, 0.72, and 0.73 respectively).

Our recommendation (with the provisos given in the next subsection) is to include in the injury indicator case definition for international comparisons:

- the diagnoses listed in the previous subsection,
- all long bone open factures,
- open fractures of the patella, ankle, heel
- brain laceration and haemorrhage
- spinal cord lesion

- traumatic haemo-, pneumo-, haemopneumothorax and other lung injury
- internal organ injury (excluding bladder and urethra).

Discussion of selected diagnoses for inclusion / exclusion in a case definition for international comparison

Skull fractures

There may be difficulties associated with the inclusion of skull fractures (S020, S021). Clinical management is based on the CT findings and the clinical state of the patient. For example, the UK clinical guidelines state that unless CT scans are required urgently, it is acceptable to admit patients for overnight observation and delay CT scan until the morning. [18] Consequently, variations in clinical practice could result in between country variations in probabilities of admission – and hence in case ascertainment for indicators for comparison.

Those guidelines also indicate that x-rays, which have previously identified skull fractures, are no longer recommended. So, these guidelines will have influenced practice in the UK and probably reduced the likelihood of identifying uncomplicated skull fractures; but increased the likelihood of identifying intracranial injuries (due to more CT scans). This will affect the diagnosis and classification of skull fracture, and of intracranial injury.

Investigating clinical practice in the treatment of head injury, across the countries involved in this collaboration, is beyond the scope of this project. It could certainly be an important factor in influencing the PrA estimates - and hence in case ascertainment for indicators for comparison. Given these uncertainties, there may be a case for excluding skull fractures from any case definition developed for international comparisons.

Serious chest injury

In relation to serious chest injuries, there were no cases coded to S225 (flail chest) in the Greek data and only 1 in the data from Denmark. On the other hand, many more were coded to S225 in the Canadian data, giving an estimated PrA of 0.72 (95% CI 0.64-0.78). As previous mentioned, it is surprising that this is not higher since it seems unlikely that a patients with a flail chest would not be admitted. There is a case for including flail chest in the case definition for international comparison.

4.2. Strengths and Limitations

4.2.1. Strengths

The search for, and validation of, serious non fatal injury indicators has been ongoing for at least 10 years. Many indicators have been suggested, but on detailed analysis and review have been found wanting. We proposed indicators to inform the implementation of the New Zealand Injury Prevention Strategy (NZIPS). These indicators are based on the concept that serious threat to life injuries, which have an appreciable threat to life, will almost always be admitted to hospital. The aggregate of this subset of injuries with high threat to life were the basis of the NZIPS serious non-fatal indicators. All proposed indicators require validation before adoption, but the challenge has always been to validate proposed indicators without access to all the necessary information. In this work, we developed and implemented a method to validate the NZIPS indicators by means of an international collaborative study made possible by the International Collaborative Effort (ICE) on Injury Statistics.

This valuable piece of work has, to a considerable degree, validated the NZIPS indicator approach. It is one the first studies that has investigated probabilities of admission, and the first in which probabilities have been estimated comprehensively across all injury diagnoses and across a range of countries. This report is a major contribution to the world literature on the development of valid serious injury indicators to stimulate, support, and evaluate injury prevention initiatives.

Whilst the research has been carried out to validate a set of indicators for use in the New Zealand context, the findings have implications for all countries with well developed health sectors. It will guide the development and adoption of injury morbidity indicators in many countries, facilitating more valid analyses of trends in injury admissions and injury incidence and cross national comparisons.

4.2.2. Limitations

External validity

Inference from this study's findings is limited to the study population that the data presented here represent, namely developed countries with ICD coded data.

One question is: to what the extent do the results apply to NZ data? There are a number of reasons why one would de-emphasise the ICD-9 results, and focus on the ICD-10 based results. At the fundamental level, NMDS has been coded to ICD-10-AM since 2000, and so the ICD-10 results are the most relevant. Additionally, the ICD-9 results are based on populations less relevant to the situation in NZ.

Two of the ICD-9 data sources are from the USA. The USA health system is essentially private health insurance-based. This differs from the way in which hospital services are funded in NZ, which is predominantly from public funds. (http://www.oecd.org/document/16/0,3343,en_2649_34631_2085200_1_1_1_1,00.html – accessed 10 January 2011.) This limits inferences that can be made from USA data-based results to NZ. Furthermore, the additional ICD-9 data source was from Barcelona, Spain. This is based solely on MVTCs. The results we have produced suggest that the PrAs vary with cause. For example, the greater likelihood of multiple injuries for MVTCs is likely to increase the diagnosis-specific probabilities of admission as estimated by the Spanish data, compared with data sets which provide aggregate estimates across all causes. This makes inference from the results for MVTCs (only) to NZ all cause injury unwise.

Focusing on the ICD-10 results, the question is, therefore, how similar are the health systems and data sources provided by Canada, Denmark and Greece, and can we infer NZ PrAs from these data sources? Affecting PrA is not only the mix of public and private funding, but also the level of funding. The percentage of total expenditure on healthcare funded from the public purse in 2003 in Canada, Denmark, Greece and New Zealand was: 70%, 84%, 60%, and 78%, respectively. That is, they were more similar to New Zealand in Canada and Denmark, than in Greece. The percentage of Gross Domestic Product (GDP) spent in 2003 on health in each of these countries was 9.8%, 9.3%, 8.9% and 8.0%, respectively. Per capita GDP is highest in Canada, then Denmark, next was New Zealand and then Greece. (http://stats.oecd.org/Index.aspx?datasetcode=SNA_TABLE1 – accessed 10 January 2011.) Per capita health expenditure for the 4 countries (in US$) was: 3063, 2831, 2027 and 1847, respectively.

(http://www.oecd.org/document/16/0,3343,en_2649_34631_2085200_1_1_1_1,00.html – accessed 10 January 2011.) One would expect that use of hospital inpatient services would reduce with reducing health expenditure, due to more limited provision in countries with lower health expenditure. Consequently, we hypothesise that the New Zealand probabilities of admission would be marginally less than those for Canada, Denmark and Greece.

On the other hand, considering this project's results in the context of international comparisons, we argue that a choice of case definition based on diagnoses that show high PrA, irrespective of the health system, will result in the most robust comparison. That is, such a choice is most likely to minimise the biasing impact of health service effects. So a wide variation in types of health system increases confidence in the use of these results to inform international comparison. The 7 data sets on which this project's results are based span a wide range of health systems.

Accuracy of ED diagnoses

As part of another project, one of the project team (PG) had interviewed coders in Dunedin, Wellington and Christchurch. Nothing in her interviews contradicted the view that the ED diagnosis would be of acceptable accuracy for those not admitted, but for those admitted, there could be some problems since the ED diagnosis could, in some instances, be provisional. At the start of this project, this type of argument was used as the basis for deciding on the ideal source of diagnosis data in estimating the probabilities.

Inpatient data was used as the source of diagnostic data for numerators for Canadian, Spanish and USA2 data. In the former instance, we observed changed results when ED diagnoses solely were used, compared with the use of inpatient diagnosis – again justifying this aspect of our protocol.

For the other countries, ED data was used for the source of diagnosis data – for both numerators and denominators. This could impact on validity of the probability estimates. Collaborators from one country, Greece, have argued otherwise. To quote:

> *"I have checked our database and I have tried to compare the different diagnoses [ED and hospital discharge]... 8190 (81.0%) cases where the discharge diagnosis is the same with the diagnosis of the first/primary injury recorded at the ED. 452 (4.5 %) cases where the discharge diagnosis is the same with the diagnosis of the second injury recorded at the ED. 48 (0.5 %) cases where the discharge diagnosis is the same with the diagnosis of the third injury recorded at the ED. 1418 (14.0 %) cases where there are differences among the different diagnoses. However for the majority of these cases the discharge diagnosis refers to a general or similar code (eg. other or unspecified) of the corresponding diagnosis for the first injury. We cannot say which is the most accurate and which one was the criterion for the admission.*

The discharge diagnosis is coded with the ICD9. ... The [ED] data I have send (sic) you is based on the ICD10. I think that if we finally work on small categories and not in any single code we do not have any serious problem for misclassifications."

It is possible that the use of ED diagnosis alone for these countries could have impacted on the accuracy of the estimated PrAs. An analysis that is more robust to coding inaccuracies is potentially, therefore, one that is based on ICD 3 character diagnosis codes. As previously mentioned, the disadvantage of such an analysis is the heterogeneity of probabilities of admission within at least some 3 character categories.

Some brain injury will be coded in ED to a general head injury code, since a confirmed diagnosis will not necessarily be made in ED. In contrast, a more specific diagnosis would be expected following admission – and hence show up on the hospital discharge record. As a result, if using solely diagnoses from ED data for both numerators and denominators, there would be an increased use of general head injury code and hence the possibility of inflated estimates of PrA for these general codes. (Counter to this view is the increased use of scanning in outpatients potentially leading to more specific diagnoses being made in outpatients. [19]

Our results suggest that there could also be problems with ED diagnostic coding for other injuries. For example, for Greece, whose PrA estimates are solely ED diagnosis based, the probability of admission estimate for fracture of other and unspecified parts of lumbar spine and pelvis (S329) is 0.77-0.87; whereas the equivalent estimate for Canada is 0.39-0.44. On the other hand, the estimates for the more specific codes, relating to lumbar spine and pelvis, in the Canadian data are much higher; eg. fracture of the acetabulum (S324) 95% CI 0.71-0.76.

Limitations of using first diagnosis

As seen earlier, a single injury can generate multiple ICD-10 codes. For example, brain injury and skull fracture would generate 2 different ICD-10 codes. This is not the case under ICD-9. The implications of this are that some of the differences between the results for ICD-9 and ICD-10 will be due to these difference between the coding frames. It also means that some of the ICD-10 codes will be more heterogeneous in PrA than the ICD-9 4 character codes. For example, consider fracture of the base of skull (S021). This will include cases of skull fracture, with no brain injury, as well as cases of skull fracture with brain injury. The results from the ICD-9 analysis, which has unique codes for each of these injury types, show different probabilities of admission in these two instances. Using USA2 data, 801.0 (fracture of the base of skull – closed without mention of

intracranial injury) has an estimated 95% CI for PrA of 0.36-0.40, whereas 801.1 (fracture of the base of skull – closed with cerebral laceration and contusion) has an estimated PrA 95% CI of 0.88-0.97 (Table 11). Consequently, the mix of cases attending hospital ED will determine the PrA for fracture of the base of skull when coded to ICD-10.

The ICD-10 data we have obtained will not permit the investigation of this phenomenon, a problem that predominantly relates to head injury.

Limitations of the probability of admission estimates

The variation in PrA for many serious injuries between countries are surprising, as well as the fact that the PrAs for many of these injuries are around the 65-75% rather than an expected 95-100%. These findings suggest that data quality, specificity, or completeness of coding is a likely explanation for some of the variation and the true PrAs may be higher than indicated. For example, the results for two groups of injuries are considered below:

- fractures of the neck of femur (S70-S72),
- traumatic intracranial injuries- [S062 (diffuse brain injury), S063 (focal brain injury), S064 (epidural haemorrhage), S065 (subdural haemorrhage), S066 (subarachnoid haemorrhage)].

Fractured neck of femur:

PrA is much higher in Denmark (0.96-98) than in Greece (0.91-0.93), or Canada (0.86-0.92). The vast majority of these injuries have operative fixation, unless they die beforehand or occur in people who are so frail that palliative care is given. The differences in these probabilities could reflect care differences across settings; or differences in coding completeness/quality of the discharge destination code in the ED data.

Serious intracranial injuries:

These are all injuries that should always lead to admission. It is generally accepted that these cases need immediate neurosurgical care in specialist settings. In this project, the PrAs vary for:

- diffuse brain injury (S062: 0.67 in Canada, 0.11 in Denmark),
- subdural haemorrhage (S065: 0.72 in Canada, 0.85 in Denmark, 0.20 in Greece).

The Greece data includes many traumatic brain injuries coded to S066 (subarachnoid haemorrhage) compared with S065 (subdural haemorrhage), which is not the case in Denmark or Canada. There may be an issue of coding accuracy, particularly since the Greece diagnostic data is solely ED based, whereas for Canada, it is predominantly inpatient based.

Limitations of the NZIPS serious injury indicators

The analyses, and the probability of admission estimates, point to a smaller number of diagnoses that would be included in an indicator that would meet the highest standards for validity. The NZIPS all serious injury indicators are dominated by hip fractures; and any new and more valid indicator would be even more so. It is appropriate that that should be the case for falls injury - but it is not the case for the other NZIPS Priority Areas: Assault, Self-harm, Workplace injury, MVTCs and Drowning. Nevertheless, this highlights a limitation of the NZIPS "all injury" indicator. When considering "all injury", there is a case to be made for indicators to be presented with and without hip fractures – in order to get a view of the picture of the trends in injury outside of the group of older people who otherwise dominate the picture presented for serious injury trends for "all injury" in New Zealand.

We recognize in this report that, given data recording and coding constraints, it is not possible to have an absolutely perfect indicator. On the other hand, indicators must be fit for purpose. This work indicates that the current NZIPS serious injury indicators are fit for the purpose of reflecting the trends in the incidence and rates of serious threat to life injuries in New Zealand.

4.3 Recommendations

1. The existing NZIPS serious non-fatal injury indicators are valid as judged by the method used to ascertain a case. The ICISS threshold used identifies cases that, in aggregate, have a high probability of admission. We recommend no change to the NZIPS indicators specifications as a result of this work.

2. This project has demonstrated that it is unlikely that alternative valid indicators, based solely on NMDS data, can be specified to capture a greater number of serious injury cases. If, in the future, new NMDS based indicators are specified, for measuring trends over time or across place, that they be validated using the results of this project.

3. This work provides the wherewithal to develop methods for international comparisons. A proposal has been developed and is shown in Appendix C. We recommend that any case definition used, for international comparison, either be informed by the results of this work, or that the results of this work be used to validate the indicators specified for international comparisons.

4.4 Conclusions

4.4.1 To validate the existing NZIPS serious non-fatal injury indicators

Our results suggest that, with the exception of a small number of diagnoses, the current ICISS ICD-9 and ICD-10 thresholds used for NZIPS indicators is satisfying the goal of capturing only those diagnoses with a high probability of admission. We conclude that, although the case definition of **serious** injury for the NZIPS indicators is not perfect (no definition is), it appears valid to an acceptable level.

4.4.2 To provide the opportunity to develop serious injury indicators that capture a greater number of serious injuries

Combinations of ICD-10 diagnoses have been identified that have higher aggregate probability of admission than the current NZIPS serious non-fatal injury indicators. Using these diagnoses (only) to define an indicator would be at a cost of a reduced number of non-fatal injury cases identified than the current NZIPS indicators. On the other hand, the benefit over the current NZIPS indicators is that of capturing fewer cases whose admissions are potentially influenced by extraneous factors, including health services factors.

We conclude that this work has identified diagnoses that could be the basis of slightly more valid indicators, compared with the current NZIPS indicators, but that it would be based on fewer, rather than a greater number of, serious injuries. The benefits of using such an indicator, over the current NZIPS indicators, appear small.

4.4.3 To provide the wherewithal to develop reliable methods for international comparisons.

A proposal has been prepared for international comparisons amongst developed countries. This work will involve the specification of a case of serious non-fatal injury based on hospital data. This specification should be such that it minimises the effect of health service factors and other extraneous factors on the comparisons. Consequently, we have argued that it should be based on diagnoses that have a high probability of admission.

The information that has been generated by this project will inform high income countries of those diagnoses with a high or moderately high estimated probability of admission to hospital. Agreement will be required with partner countries, in future international comparisons work, in respect to the choice of injury diagnoses that should be the basis of the serious non-fatal injury indicator case definition.

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6. Appendix A: Proposal.

Probability of Admission: Empirical validation of the NZIPS serious non-fatal injury indicators.

Detailed Proposal

Background:

In the report in which we describe the development of the New Zealand Injury Prevention Strategy (NZIPS) indicators[e] we list the injuries that are captured by the ICD-10 ICISS severity threshold. The threshold was set with the aim of capturing injury diagnoses that have a high probability of admission – in order to remove the effects of any extraneous influences (eg. changes in health service provision) on the indicator trends. The question is: do they capture injury diagnoses with a high probability of admission? On the face of it they appear to (ie. they have good face validity), but this has not been tested empirically. Studies to estimate the diagnosis-specific probabilities of admission are needed in order to increase our confidence in the NZIPS indicators. This can be achieved where there exists Emergency Department (ED) data that is both accurately coded to ICD, and for which it is known whether attendance at ED resulted in subsequent admission to hospital. We are unaware of any such data in New Zealand.

As a result, we recommended that the required sources of data be identified overseas, and that collaborative work take place to estimate diagnosis-specific probabilities of admission as a means to empirically validate, and perhaps refine, the NZIPS serious non-fatal injury indicators. This approach was discussed informally at the 8th World Conference on Injury Prevention and Safety Promotion in South Africa in 2006, and at a meeting of the International Collaborative Effort (ICE) on Injury Statistics on 7-8 September 2006. Scientists from several countries gave their support to this approach and identified data within their own countries that could be the basis of a multi-country project.

Aims:

4. to validate the existing NZIPS serious non-fatal injury indicators

[e] Cryer C, Langley J, Stephenson S. Developing valid injury outcome indicators. A report to the New Zealand Injury Prevention Strategy. Injury Prevention Research Unit Occasional Report OR 049. Dunedin: IPRU, University of Otago, September 2004.

5. to provide the opportunity to develop serious injury indicators which capture a greater number of serious injuries
6. to provide the wherewithal to develop methods for international comparisons.

Methods:

The first12 months of the project have included the following:

- liaison with prospective countries (identified in S Africa and at ICE) to confirm their commitment to the project
- identification of information on diagnostic coding including coding frames used, specificity of coding, and who codes the diagnostic data in their ED
- identification of what populations are captured by their data
- review of work on the reliability of ED diagnostic coding in each participating country
- agreement on how to deal with deaths before ED attendance, multiple attendances for the same injury, etc.
- agreement on:
    - an operational definition of injury between prospective countries
    - the minimum data required / that can be supplied by all participating countries.

As a result of this liaison between the New Zealand team and the collaborators, the following methods have been developed.

Detailed methods

Population of study

Only emergency (ie. unbooked) attendances at ED for injury will be included.

Time period.

Incident cases who attend ED in the period 2002-most recent year, inclusive. If the collaborators' data spans a shorter interval within this period, the data from that time interval will be included (eg. for Barcelona, the year range will be from 2003 to the most recent year).

Determination of an admission.

We will take admission status from linked ED-inpatient data, if available; otherwise, this will be taken from the ED record. Collaborators will be asked to provide a statement of the source of admission status.

Four definitions of an admission will be used:

1. Those admitted to the same hospital as the ED attendance
2. Those admitted to the same hospital as the ED attendance, with length of stay in hospital of at least 1 day (LoS>0).
3. Those admitted to the same hospital or transferred to another hospital.
4. Those admitted to the same hospital or transferred to another hospital with LoS>0.

Collaborators will be asked to provide counts for as many of the above as possible.

The definition of an admission requires three or more hours of treatment at a hospital. A "0 days stay" case stays in hospital for greater than 3 hours, but not past midnight. (This is with the qualification that all patients treated in the Emergency Department only were not admitted no matter how long they stayed.) Someone who stays for 1 day is admitted on one day and is discharged the following day, ie. , they stay in hospital over midnight. If a collaborator cannot comply with these definitions, they should use local definitions, and provide a statement of these with their aggregate counts.

Estimates

Version of ICD

All of the collaborators involved have ED data either ICD-10 or ICD-9-CM coded. We have been advised against translating ICD-9-CM to ICD-10 for this project. Probability estimates will be produced separately for ICD-10 and for ICD-9-CM.

Code ranges

ICD-10: limited to S00 and T78 codes

ICD-9-CM: limited to 800-904, 910-995.

These exclude "medical injuries" and sequelae / late effects.

Multiple attendances for the same injury

Probability of admission estimates will be based on the first attendance for the injury, where this can be identified. Countries will be asked to supply qualitative information on the likely circumstances of multiple attendances at ED for the same injury.

Source of diagnosis data

The diagnosis data to be used will be the primary injury diagnosis from the first inpatient record following the injury event that has a primary diagnosis of injury, if these data are available. Otherwise it will be from the ED record. Each country will provide information on the source of diagnostic data.

Reliability of ED coding

We expect there to be inaccuracies in the ED diagnosis coding, eg. the recording and coding of preliminary diagnoses in ED rather than final diagnoses. Our hypothesis, informed by our advisor,

is that the main problems will exist for those admitted to hospital. This problem is addressed for those countries where inpatient diagnosis is also captured and used as a source of diagnosis data. It remains a problem for other countries.

We propose to get estimates of the correspondence between ED diagnosis and primary injury diagnosis for people admitted to hospital from ED – using those data sources that have ED data linked to hospital discharge data. This will be followed up with selected collaborators. Once we have seen the results of these investigations of correspondence, we will interpret the results accordingly. What we are seeking to do, in this project, is to identify diagnoses where evidence suggests that most cases (ie. >90%) are admitted. Even in the presence of inaccuracies amongst the ED coding, the proposed approach should permit the identification of those diagnoses with a high probability of admission.

More than 1 listed diagnosis

The probability estimate will be based on the first listed diagnosis on the ED record or the first listed diagnosis on the inpatient record. (Note: this is slightly problematic since, for some single injuries, multiple ICD-10 codes are used to classify the injury. This problem will be picked up in the discussion to the report and any relevant papers.)

We aim to investigate whether the first listed diagnosis on the ED record is the most serious. This will be carried out as follows. For each diagnosis, we will have estimated the probability of admission, which is associated with severity of injury. We will ask countries that have multiple diagnosis codes on their ED record to identify whether codes with the highest probability of admission appear in the first position.

Deaths

People who die at the scene or who are dead on arrival (DOA) will not be included in this analysis. Countries will be asked to supply the numbers of people who are DOA.

Where possible, we will include people who die in ED, and these will be included in both the numerator and denominator counts used in the estimates. [One source – Barcelona, Spain - cannot differentiate between DOAs and deaths in ED, so we propose that deaths be excluded in this case.]

Confounders

Service-related factors will affect the probability of admission. We propose to ask each country to complete a questionnaire – to be developed - relating to relevant factors, to give context to the analytical work.

Analysis

We will present diagnosis-specific probability of admission estimates overall, but also by:

- gender
- age group
- 0, 1-4, 5-14, 15-24, 25-44, 45-64, 65-74, 75+
- intent
- assault, self-harm, unintentional, other/undetermined
- cause of injury
- falls, MVTC, struck by / against, cut/pierce, poisoning, firearm-related, other/unspecified.
- country

We propose to use logistic regression modeling to obtain main effects estimates and to investigate interactions (particularly with country). Note: type of coder (eg. professional coder, physician) is also an important factor, but it is heavily confounded with country. This information can and will only be used in a qualitative manner, when discussing differences between each country's results.

Data provision

We will ask collaborators to provide a comma separated variable (.csv) file of aggregate counts of first attendances at ED and, within those, aggregate counts of admissions (using all four definitions – see "Determination of an admission" above), by ICD-10/ICD-9-CM code by gender by age group by intent by cause. A specification of the counts that are to be provided is given in Attachment A1. The codes used to define categories of intent and cause of injury are given in Attachment A2.

Note: Several countries (Australia [Soufiane], Canada [Alison], USA [Ted]) cannot provide small counts for privacy reasons. Those countries are asked to provide separate files of aggregates for:

a. ICD*gender
b. ICD*age group
c. ICD*intent
d. ICD*cause.

A hypothetical example of these aggregate counts is also provided in Attachment A3. Note that this only shows combinations where there are non-zero counts. Our request to collaborators will only be for rows where the counts are non-zero – or, for Victoria, Ontario, and USA, combinations where the counts satisfy their privacy requirements.

We will request the data in December 2008 with a deadline of 30 April 2009. There will be a further 2 months (to 30 June 2009) to check the data once received and to rectify any problems.

The final 12 months

During the final 12 months, the data will be collected together, compared and contrasted. It is anticipated that there will be a further period of querying and checking to ensure the data aggregates supplied by the countries that are tabulated are as similar in their definitions and the methods of extraction as they can be, and that they are being provided at their optimum level of specificity.

The data will then be analysed and the work describing the project and its findings will be written up as a draft report and paper for a peer-reviewed journal. All of the NZ team and the collaborators will be invited to be co-authors. Collaborators, where desired, will be encouraged to develop their own papers for peer-review publication.

In the final six months, the report / paper will be finalised, and the work used to develop a protocol for the international comparison of serious non-fatal injuries, based on selected diagnoses, between countries who agree to participate.

Significance

The information that is generated by this project will inform all high income countries of those diagnoses that almost always get admitted to hospital. When using hospital inpatient data, these are the diagnoses least likely to be influenced by extraneous (biasing) factors, and so provide a sensible basis for developing robust case definitions. From a local perspective (New Zealand), it provides the basis for (a) the validation of existing national (NZIPS) indicators, and (b) validation of the newly developed threat of impairment indicators, and (c) will be helpful when developing new indicators.

Further to the above, from this work we will be able to identify those diagnoses that almost always result in admission to hospital in high income countries. These diagnoses could (and should) be

used, therefore, to make international comparisons of serious non-fatal injury whilst minimizing bias resulting from the influence of extraneous (eg. health service-related) factors.

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Canada (Ontario) – Alison Macpherson
Denmark (Odense) – Jens Lauritsen
Greece (Athens) – Eleni Petridou / Vicki Kalampoki
Spain (Barcelona) – Catherine Perez
USA (national)
- Lois Fingerhut / Margie Warner
- Ted Miller

Wales (Swansea) – Ronan Lyons (Advisor)

Milestones and Deliverables:

Sep-08: detailed draft proposal for extraction of statistics by each country
Oct-08: present to ICE
Dec-08: finalized proposal sent to collaborators with a request for aggregates to be returned by 30 April 09.
Apr-09: receipt of statistics from participating countries
June-09: data management of the data received will be completed
Dec-09: Probability of admission draft report
Jun-10: Final report, development of refereed journal manuscript & development of international comparisons protocol.

Attachment A1: Specification for provision of data aggregates

> SELECT
> Code (first diagnosis): either ICD-9-CM (at its most detailed) or ICD-10 (at the 4
> alpha-numeric level - eg. S00.0)
> Gender: in (Male, Female)
> Intent: in (Assault, Self-harm, Unintentional, Unspecified)
> Cause: in (Falls, MVTC, struck by/against, cut/pierce, poisoning, firearm-
> related, other/unspecified)
> Age: in (0, 1-4, 5-14, 15-24, 25-44, 45-64, 65-74, 75+)
> Count1: Attendances at ED (incident cases).
> Count2: Those admitted to the same hospital as the ED attendance.
> Count3: Those admitted to the same hospital as the ED attendance, with LoS>0
> Count 4: Those admitted to the same hospital or transferred to another
> hospital.
> Count 5: Those admitted to the same hospital or transferred to another
> hospital with LoS>0.
>

> WHERE
> Incident cases in the period 2002-2005 inclusive.
> First attendance for the injury, if this can be identified.
> ICD-10: limited to S00 - T78 (1st diagnosis field) or
> ICD-9-CM: limited to 800-904 or 910-995 (1st diagnosis field).
> Deaths within the ED included in all counts (ie. Count1 to Count 5).
> (Deaths prior to, or on, arrival are excluded.)
>

> If no privacy issues, GROUP/AGGREGATE BY
> Code* Gender*Age* Intent* Cause
> If privacy issues, group / aggregate as follows:
> Code*Gender
> Code* Age
> Code*Intent
> Code*Cause

A list of ICD-10 and ICD-9-CM codes relating to each category of Intent and Cause have been provided in Attachment A2.An example of the counts required for two ICD-10 codes is included as Attachment A3.

Attachment A2: Structured English Code Ranges for Defining External Cause and Intent Categories

```
/* Identify External Cause from ICD9 Ecode */
CASE icd9_ecode OF
'920'-'9209', '986'-'9869', '974'-'9749', '956'-'9569', '966'-'9669'
     : cause = 'cut/pierce'
'880'-'8869', '888'-'8889', '987'-'9879', '957'-'9579', '9681'
     : cause = 'falls'
'922'-'9223', '9228', '9229', '985'-'9854', '970'-'9709', '955'-'9554', '965'-
'9654', ‘9794’
     : cause = 'firearm-related'
'810'-'8109', '811'-'8119', '812'-'8129', '813'-'8139', '814'-'8149', '815'-
'8159', '816'-'8169', '817'-'8179', '818'-'8189', '819'-'8199', '9885', '9585',
‘9685’
     : cause = 'mvtc'
'850'-'8699', '980'-'9829', '972'-'9729','950'-'9529', '962'-'9629', ‘9796’,
‘9797’
     : cause = 'poisoning'
'916'-'9179', '973'-'9739', '975'-'9759','9600', '9682'
     : cause = 'struck by/against'
OTHERS : cause = 'other/unspecified'
END CASE

/* Identify Intent from ICD9 Ecode */
CASE icd9_ecode OF
'800'-'8699', '880'-'9299' : intent = 'unintentional'
'950'-'9599'               : intent = 'self-harm'
'960'-'9699', ‘979’-‘9799’, ‘9991’ : intent = 'assault'
OTHERS                     : intent = 'other/unspecified/undetermined'
END CASE
```

```
/* Identify External Cause from ICD10 Ecode */
CASE icd10_ecode OF
'W25'-'W299', 'W45'-'W459', 'X78'-'X789', 'X99'-'X999', 'Y28'-'Y289', 'Y354'
     : cause = 'cut/pierce'
'W00'-'W199', 'X80'-'X809', 'Y01'-'Y019', 'Y30'-'Y309'
     : cause = 'falls'
'W32'-'W349', 'X72'-'X749', 'X93'-'X959', 'Y22'-'Y249', 'Y350'
     : cause = 'firearm-related'
'V304'-'V309', 'V314'-'V319', 'V324'-'V329', 'V334'-'V339', 'V344'-'V349',
'V354'-'V359', 'V364'-'V369', 'V374'-'V379', 'V384'-'V389', 'V394'-'V399',
'V404'-'V409', 'V414'-'V419', 'V424'-'V429', 'V434'-'V439', 'V444'-'V449',
'V454'-'V459', 'V464'-'V469', 'V474'-'V479',
'V484'-'V489', 'V494'-'V499', 'V504'-'V509', 'V514'-'V519', 'V524'-'V529',
'V534'-'V539', 'V544'-'V549', 'V554'-'V559', 'V564'-'V569', 'V574'-'V579',
'V584'-'V589', 'V594'-'V599', 'V604'-'V609', 'V614'-'V619', 'V624'-'V629',
'V634'-'V639', 'V644'-'V649', 'V654'-'V659', 'V664'-'V669', 'V674'-'V679',
'V684'-'V689', 'V694'-'V699', 'V704'-'V709', 'V714'-'V719', 'V724'-'V729',
'V734'-'V739', 'V744'-'V749', 'V754'-'V759', 'V764'-'V769', 'V774'-'V779',
'V784'-'V789', 'V794'-'V799', 'V830'-'V833', 'V840'-'V843', 'V850'-'V853',
'V860'-'V863',
'V203'-'V209', 'V213'-'V219', 'V223'-'V229', 'V233'-'V239', 'V243'-'V249',
'V253'-'V259', 'V263'-'V269', 'V273'-'V279', 'V283'-'V289',
'V294'-'V299', 'V123'-'V129', 'V133'-'V139', 'V143'-'V149', 'V194'-'V196',
'V021'-'V029', 'V031'-'V039', 'V041'-'V049', 'V092', 'V803'-'V805', 'V811',
'V821', 'V870'-'V878', 'V892'
     : cause = 'mvtc'
'X40'-'X499', 'X60'-'X699', 'X85'-'X909', 'Y10'-'Y199', 'Y352'
     : cause = 'poisoning'
'W20'-'W229', 'W50'-'W529', 'X79'-'X799', 'Y00'-'Y009', 'Y04'-'Y049', 'Y29'-
'Y299', 'Y353'
     : cause = 'struck by/against'
OTHERS : cause = 'other/unspecified'
END CASE

/* Identify Intent from ICD10 Ecode */
CASE icd10_ecode OF
'V01'-'X599', 'Y85'-'Y869'
     : intent = 'unintentional'
'X60'-'X849', 'Y870'
     : intent = 'self-harm'
'X85'-'Y099', 'Y871'
     : intent = 'assault'
OTHERS : intent = 'other/unspecified/undetermined'
END CASE
```

Attachment A3: Example of the counts required for two ICD-10 codes

code	sex	intent	cause	age	count1	count2	count3	count4	count5
S00.0	F	Self-harm	other/unspecified	'25-44	7	3	3	5	5
S00.0	F	Unintentional	Falls	'00	22	18	16	20	18
S00.0	F	Unintentional	Falls	'01-04	21	21	19	21	19
S00.0	F	Unintentional	Falls	'05-14	10	9	8	9	8
S00.0	F	Unintentional	Falls	'15-24	21	12	11	15	14
S00.0	F	Unintentional	Falls	'25-44	14	9	8	11	10
S00.0	F	Unintentional	Falls	'45-64	23	15	14	18	16
S00.0	F	Unintentional	Falls	'65-74	23	15	14	18	16
S00.0	F	Unintentional	Falls	'75+	100	66	59	68	61
S00.0	F	Unintentional	MVTC	'00	5	3	3	4	4
S00.0	F	Unintentional	MVTC	'01-04	8	6	5	8	7
S00.0	F	Unintentional	MVTC	'05-14	15	12	11	14	13
S00.0	F	Unintentional	MVTC	'15-24	19	15	14	16	14
S00.0	F	Unintentional	MVTC	'25-44	20	15	14	16	14
S00.0	F	Unintentional	MVTC	'45-64	10	9	8	9	8
S00.0	F	Unintentional	MVTC	'65-74	4	3	3	3	3
S00.0	F	Unintentional	MVTC	'75+	4	3	3	3	3
S00.0	F	Unintentional	cut/pierce	'01-04	4	3	3	3	3
S00.0	F	Unintentional	firearm-related	'15-24	7	3	3	5	5
S00.0	F	Unintentional	other/unspecified	'00	6	3	3	5	5
S00.0	F	Unintentional	other/unspecified	'01-04	8	3	3	6	5
S00.0	F	Unintentional	other/unspecified	'05-14	4	3	3	4	4
S00.0	F	Unintentional	other/unspecified	'25-44	13	9	8	12	11
S00.0	F	Unintentional	other/unspecified	'45-64	8	3	3	6	5
S00.0	F	Unintentional	other/unspecified	'65-74	3	3	3	3	3
S00.0	F	Unintentional	struck by/against	'05-14	7	3	3	5	5
S00.0	F	Unintentional	struck by/against	'15-24	4	3	3	4	4
S00.0	F	Unintentional	struck by/against	'25-44	3	3	3	3	3
S00.0	F	Unintentional	struck by/against	'45-64	8	3	3	6	5
S00.0	F	Unintentional	struck by/against	'65-74	6	3	3	4	4
S00.0	M	Unintentional	Falls	'00	31	27	24	28	25
S00.0	M	Unintentional	Falls	'01-04	35	21	19	24	22
S00.0	M	Unintentional	Falls	'05-14	33	24	22	26	23
S00.0	M	Unintentional	Falls	'15-24	20	12	11	15	14
S00.0	M	Unintentional	Falls	'25-44	34	24	22	24	22
S00.0	M	Unintentional	Falls	'45-64	22	15	14	15	14
S00.0	M	Unintentional	Falls	'65-74	21	18	16	21	19
S00.0	M	Unintentional	Falls	'75+	38	30	27	30	27
S00.0	M	Unintentional	MVTC	'00	8	6	5	8	7
S00.0	M	Unintentional	MVTC	'01-04	13	9	8	11	10
S00.0	M	Unintentional	MVTC	'05-14	17	15	14	16	14
S00.0	M	Unintentional	MVTC	'15-24	32	21	19	23	21
S00.0	M	Unintentional	MVTC	'25-44	21	15	14	16	14
S00.0	M	Unintentional	MVTC	'45-64	12	6	5	8	7
S00.0	M	Unintentional	MVTC	'65-74	4	3	3	3	3
S00.0	M	Unintentional	MVTC	'75+	4	3	3	3	3
S00.0	M	Unintentional	firearm-related	'01-04	6	3	3	6	5
S00.0	M	Unintentional	firearm-related	'25-44	6	3	3	5	5
S00.0	M	Unintentional	other/unspecified	'00	10	6	5	7	6
S00.0	M	Unintentional	other/unspecified	'01-04	11	9	8	10	9
S00.0	M	Unintentional	other/unspecified	'05-14	11	9	8	10	9
S00.0	M	Unintentional	other/unspecified	'15-24	7	6	5	7	6
S00.0	M	Unintentional	other/unspecified	'25-44	10	9	8	9	8
S00.0	M	Unintentional	other/unspecified	'45-64	8	3	3	6	5
S00.0	M	Unintentional	other/unspecified	'65-74	7	3	3	5	5
S00.0	M	Unintentional	other/unspecified	'75+	5	3	3	4	4

code	sex	intent	cause	age	count1	count2	count3	count4	count5
S00.0	M	Unintentional	struck by/against	'00	8	3	3	6	5
S00.0	M	Unintentional	struck by/against	'01-04	3	3	3	3	3
S00.0	M	Unintentional	struck by/against	'05-14	22	12	11	15	14
S00.0	M	Unintentional	struck by/against	'15-24	10	6	5	7	6
S00.0	M	Unintentional	struck by/against	'25-44	12	9	8	11	10
S00.0	M	Unintentional	struck by/against	'45-64	7	3	3	6	5
S00.0	M	Unintentional	struck by/against	'65-74	6	3	3	4	4
S00.0	M	Unintentional	struck by/against	'75+	5	3	3	4	4
S00.1	F	Unintentional	Falls	'01-04	5	3	3	5	5
S00.1	F	Unintentional	Falls	'05-14	8	6	5	6	5
S00.1	F	Unintentional	Falls	'15-24	3	3	3	3	3
S00.1	F	Unintentional	Falls	'25-44	4	3	3	3	3
S00.1	F	Unintentional	Falls	'45-64	8	6	5	6	5
S00.1	F	Unintentional	Falls	'65-74	8	6	5	8	7
S00.1	F	Unintentional	Falls	'75+	49	45	41	48	43
S00.1	F	Unintentional	MVTC	'01-04	4	3	3	3	3
S00.1	F	Unintentional	MVTC	'05-14	4	3	3	3	3
S00.1	F	Unintentional	MVTC	'15-24	11	6	5	8	7
S00.1	F	Unintentional	MVTC	'25-44	14	9	8	10	9
S00.1	F	Unintentional	MVTC	'45-64	4	3	3	3	3
S00.1	F	Unintentional	MVTC	'65-74	6	3	3	5	5
S00.1	F	Unintentional	other/unspecified	'01-04	3	3	3	3	3
S00.1	F	Unintentional	other/unspecified	'05-14	7	3	3	5	5
S00.1	F	Unintentional	other/unspecified	'25-44	5	3	3	4	4
S00.1	F	Unintentional	other/unspecified	'75+	7	3	3	6	5
S00.1	F	Unintentional	struck by/against	'01-04	7	3	3	5	5
S00.1	F	Unintentional	struck by/against	'05-14	8	3	3	6	5
S00.1	F	Unintentional	struck by/against	'15-24	7	3	3	6	5
S00.1	F	Unintentional	struck by/against	'25-44	6	3	3	6	5
S00.1	F	Unintentional	struck by/against	'45-64	4	3	3	4	4
S00.1	M	Unintentional	Falls	'00	6	3	3	5	5
S00.1	M	Unintentional	Falls	'01-04	9	6	5	8	7
S00.1	M	Unintentional	Falls	'05-14	8	3	3	6	5
S00.1	M	Unintentional	Falls	'15-24	7	3	3	6	5
S00.1	M	Unintentional	Falls	'25-44	10	6	5	8	7
S00.1	M	Unintentional	Falls	'45-64	7	3	3	5	5
S00.1	M	Unintentional	Falls	'65-74	9	6	5	6	5
S00.1	M	Unintentional	Falls	'75+	29	18	16	20	18
S00.1	M	Unintentional	MVTC	'01-04	5	3	3	4	4
S00.1	M	Unintentional	MVTC	'05-14	5	3	3	4	4
S00.1	M	Unintentional	MVTC	'15-24	9	6	5	8	7
S00.1	M	Unintentional	MVTC	'25-44	3	3	3	3	3
S00.1	M	Unintentional	MVTC	'45-64	5	3	3	4	4
S00.1	M	Unintentional	MVTC	'65-74	8	3	3	6	5
S00.1	M	Unintentional	firearm-related	'15-24	8	3	3	6	5
S00.1	M	Unintentional	other/unspecified	'01-04	5	3	3	5	5
S00.1	M	Unintentional	other/unspecified	'05-14	15	9	8	12	11
S00.1	M	Unintentional	other/unspecified	'15-24	4	3	3	4	4
S00.1	M	Unintentional	other/unspecified	'25-44	11	9	8	10	9
S00.1	M	Unintentional	other/unspecified	'45-64	4	3	3	3	3
S00.1	M	Unintentional	other/unspecified	'65-74	5	3	3	4	4
S00.1	M	Unintentional	poisoning	'25-44	9	3	3	6	5
S00.1	M	Unintentional	struck by/against	'01-04	7	6	5	6	5
S00.1	M	Unintentional	struck by/against	'05-14	10	9	8	10	9
S00.1	M	Unintentional	struck by/against	'15-24	7	6	5	7	6
S00.1	M	Unintentional	struck by/against	'25-44	6	3	3	4	4
S00.1	M	Unintentional	struck by/against	'45-64	7	3	3	6	5

7. Appendix B: Supplementary Tables

Table 16: Greece - Variation in diagnosis-specific probability of admission - by gender

ICD-10	Gender	ED Attend	Adm LoS>0	PA	95% CI			Chi sq	p
S220	F	38	18	0.47	0.32	-	0.63	4.50	0.04
S220	M	41	29	0.71	0.56	-	0.82		
S224	F	112	42	0.38	0.29	-	0.47	5.10	0.02
S224	M	211	107	0.51	0.44	-	0.57		
S315	F	11	10	0.91	0.62	-	0.98	11.60	0.00
S315	M	19	5	0.26	0.12	-	0.49		
S320	F	127	55	0.43	0.35	-	0.52	10.20	0.00
S320	M	147	92	0.63	0.55	-	0.70		
S324	F	25	15	0.60	0.41	-	0.77	3.80	0.05
S324	M	39	32	0.82	0.67	-	0.91		
S722	F	76	73	0.96	0.89	-	0.99	7.50	0.01
S722	M	35	28	0.80	0.64	-	0.90		
S724	F	69	56	0.81	0.70	-	0.89	3.90	0.05
S724	M	42	27	0.64	0.49	-	0.77		
S822	F	208	112	0.54	0.47	-	0.60	4.80	0.03
S822	M	437	275	0.63	0.58	-	0.67		
S828	F	408	213	0.52	0.47	-	0.57	5.70	0.02
S828	M	297	128	0.43	0.38	-	0.49		
T394	F	15	12	0.80	0.55	-	0.93	4.40	0.04
T394	M	22	10	0.45	0.27	-	0.65		
T528	F	16	16	1.00	0.81	-	1.00	5.90	0.01
T528	M	45	32	0.71	0.57	-	0.82		

Table 17: Greece - Variation in diagnosis-specific probability of admission - by age group

ICD-10	Age Group^	ED Attend	Adm LoS>0	PA	95% CI			Chi sq*	p
S020	nr	1	0	0.00	0.00	-	0.79		0.01
	0	68	63	0.93	0.84	-	0.97		
	1-4	82	72	0.88	0.79	-	0.93		
	5-14	53	49	0.92	0.82	-	0.97		
	15-24	4	2	0.50	0.15	-	0.85		
	25-44	7	4	0.57	0.25	-	0.84		
	45-64	7	5	0.71	0.36	-	0.92		
	65-74	4	4	1.00	0.51	-	1.00		
	75+	7	5	0.71	0.36	-	0.92		
S021	nr	1	1	1.00	0.21	-	1.00		0.04
	0	13	7	0.54	0.29	-	0.77		
	1-4	19	15	0.79	0.57	-	0.91		
	5-14	18	14	0.78	0.55	-	0.91		
	15-24	7	2	0.29	0.08	-	0.64		
	25-44	5	5	1.00	0.57	-	1.00		
	45-64	5	4	0.80	0.38	-	0.96		
	65-74	1	0	0.00	0.00	-	0.79		
S029	0	7	7	1.00	0.65	-	1.00		0.05
	1-4	5	5	1.00	0.57	-	1.00		
	5-14	9	9	1.00	0.70	-	1.00		
	25-44	1	0	0.00	0.00	-	0.79		
S060	nr	20	3	0.15	0.05	-	0.36	20.47	0.01
	0	251	69	0.27	0.22	-	0.33		
	1-4	1134	362	0.32	0.29	-	0.35		
	5-14	1890	681	0.36	0.34	-	0.38		
	15-24	1774	666	0.38	0.35	-	0.40		
	25-44	2170	730	0.34	0.32	-	0.36		
	45-64	1431	486	0.34	0.32	-	0.36		
	65-74	717	243	0.34	0.31	-	0.37		
	75+	669	216	0.32	0.29	-	0.36		
S222	5-14	1	0	0.00	0.00	-	0.79		0.02
	15-24	8	7	0.88	0.53	-	0.98		
	25-44	11	6	0.55	0.28	-	0.79		
	45-64	8	2	0.25	0.07	-	0.59		
	65-74	6	2	0.33	0.10	-	0.70		
	75+	5	5	1.00	0.57	-	1.00		
S325	1-4	2	2	1.00	0.34	-	1.00		0.00
	5-14	1	1	1.00	0.21	-	1.00		
	15-24	3	1	0.33	0.06	-	0.79		
	25-44	7	5	0.71	0.36	-	0.92		
	45-64	20	13	0.65	0.43	-	0.82		
	65-74	29	9	0.31	0.17	-	0.49		
	75+	106	29	0.27	0.20	-	0.37		
S370	0	1	0	0.00	0.00	-	0.79		0.03
	1-4	3	0	0.00	0.00	-	0.56		
	5-14	29	20	0.69	0.51	-	0.83		
	15-24	3	0	0.00	0.00	-	0.56		
	25-44	8	3	0.38	0.14	-	0.69		
	45-64	4	1	0.25	0.05	-	0.70		
	65-74	7	3	0.43	0.16	-	0.75		
	75+	1	1	1.00	0.21	-	1.00		
S720	nr	3	3	1.00	0.44	-	1.00		0.01
	0	1	0	0.00	0.00	-	0.79		
	1-4	6	5	0.83	0.44	-	0.97		
	5-14	16	15	0.94	0.72	-	0.99		
	15-24	23	18	0.78	0.58	-	0.90		
	25-44	31	25	0.81	0.64	-	0.91		
	45-64	113	105	0.93	0.87	-	0.96		
	65-74	290	263	0.91	0.87	-	0.94		
	75+	874	810	0.93	0.91	-	0.94		

ICD-10	Age Group^	ED Attend	Adm LoS>0	PA	95% CI			Chi sq*	p
S721	nr	1	1	1.00	0.21	-	1.00		0.01
	1-4	1	0	0.00	0.00	-	0.79		
	5-14	6	4	0.67	0.30	-	0.90		
	15-24	8	7	0.88	0.53	-	0.98		
	25-44	11	9	0.82	0.52	-	0.95		
	45-64	63	56	0.89	0.79	-	0.95		
	65-74	201	188	0.94	0.89	-	0.96		
	75+	970	906	0.93	0.92	-	0.95		
S722	nr	1	1	1.00	0.21	-	1.00		0.01
	1-4	1	0	0.00	0.00	-	0.79		
	15-24	2	2	1.00	0.34	-	1.00		
	25-44	3	1	0.33	0.06	-	0.79		
	45-64	9	8	0.89	0.56	-	0.98		
	65-74	23	21	0.91	0.73	-	0.98		
	75+	72	68	0.94	0.87	-	0.98		
S724	0	1	1	1.00	0.21	-	1.00		0.01
	1-4	4	1	0.25	0.05	-	0.70		
	5-14	13	5	0.38	0.18	-	0.64		
	15-24	4	3	0.75	0.30	-	0.95		
	25-44	13	9	0.69	0.42	-	0.87		
	45-64	10	8	0.80	0.49	-	0.94		
	65-74	24	19	0.79	0.60	-	0.91		
	75+	42	37	0.88	0.75	-	0.95		
S822	nr	3	2	0.67	0.21	-	0.94	68.72	0.00
	0	4	1	0.25	0.05	-	0.70		
	1-4	59	13	0.22	0.13	-	0.34		
	5-14	137	64	0.47	0.39	-	0.55		
	15-24	87	66	0.76	0.66	-	0.84		
	25-44	147	99	0.67	0.59	-	0.74		
	45-64	119	87	0.73	0.65	-	0.80		
	65-74	44	28	0.64	0.49	-	0.76		
	75+	45	27	0.60	0.45	-	0.73		
S823	nr	1	0	0.00	0.00	-	0.79	92.74	0.00
	0	3	1	0.33	0.06	-	0.79		
	1-4	62	7	0.11	0.06	-	0.22		
	5-14	137	62	0.45	0.37	-	0.54		
	15-24	35	29	0.83	0.67	-	0.92		
	25-44	63	43	0.68	0.56	-	0.78		
	45-64	57	40	0.70	0.57	-	0.80		
	65-74	26	23	0.88	0.71	-	0.96		
	75+	19	16	0.84	0.62	-	0.94		
S828	nr	1	0	0.00	0.00	-	0.79	55.54	0.00
	1-4	9	0	0.00	0.00	-	0.30		
	5-14	69	11	0.16	0.09	-	0.26		
	15-24	48	17	0.35	0.23	-	0.50		
	25-44	162	79	0.49	0.41	-	0.56		
	45-64	232	131	0.56	0.50	-	0.63		
	65-74	120	74	0.62	0.53	-	0.70		
	75+	64	29	0.45	0.34	-	0.57		
T181	0	10	7	0.70	0.40	-	0.89		0.04
	1-4	47	36	0.77	0.63	-	0.86		
	5-14	22	14	0.64	0.43	-	0.80		
	15-24	3	0	0.00	0.00	-	0.56		
	25-44	4	2	0.50	0.15	-	0.85		
	45-64	10	4	0.40	0.17	-	0.69		
	65-74	10	4	0.40	0.17	-	0.69		
	75+	3	2	0.67	0.21	-	0.94		
T202	0	15	12	0.80	0.55	-	0.93		0.01
	1-4	78	43	0.55	0.44	-	0.66		
	5-14	32	18	0.56	0.39	-	0.72		
	15-24	2	0	0.00	0.00	-	0.66		
	25-44	4	1	0.25	0.05	-	0.70		
	45-64	6	1	0.17	0.03	-	0.56		
	65-74	4	0	0.00	0.00	-	0.49		

* Note: Where no chi squared value is presented, Fisher's exact was used as the test statist

^ nr = not recorded

Table 18: Greece - Variation in diagnosis-specific probability of admission - by cause

ICD-10	Cause	ED Attend	Adm LoS>0	PA	95% CI			Chi sq*	p
S020	Falls	167	150	0.90	0.84	-	0.94	329.33	0.00
	Firearm-related	1	1	1.00	0.21	-	1.00		
	MVTC	23	19	0.83	0.63	-	0.93		
	Other/unspecified	16	13	0.81	0.57	-	0.93		
	Struck by/against	26	21	0.81	0.62	-	0.91		
						-			
S224	Falls	238	102	0.43	0.37	-	0.49	20.00	0.00
	MVTC	51	37	0.73	0.59	-	0.83		
	Other/unspecified	23	8	0.35	0.19	-	0.55		
	Struck by/against	11	2	0.18	0.05	-	0.48		
						-			
S328	Falls	220	188	0.85	0.80	-	0.90		0.00
	MVTC	12	5	0.42	0.19	-	0.68		
	Other/unspecified	3	2	0.67	0.21	-	0.94		
	Struck by/against	1	0	0.00	0.00	-	0.79		
						-			
S821	Falls	90	52	0.58	0.47	-	0.67	18.27	0.00
	MVTC	91	67	0.74	0.64	-	0.82		
	Other/unspecified	27	13	0.48	0.31	-	0.66		
	Struck by/against	17	4	0.24	0.10	-	0.47		
						-			
S822	Falls	257	131	0.51	0.45	-	0.57	87.91	0.00
	MVTC	275	219	0.80	0.74	-	0.84		
	Other/unspecified	69	23	0.33	0.23	-	0.45		
	Struck by/against	44	14	0.32	0.20	-	0.47		
						-			
S828	Falls	502	266	0.53	0.49	-	0.57	30.54	0.00
	MVTC	85	45	0.53	0.42	-	0.63		
	Other/unspecified	90	21	0.23	0.16	-	0.33		
	Struck by/against	28	9	0.32	0.18	-	0.51		
						-			
T509	Other/unspecified	22	0	0.00	0.00	-	0.15		0.00
	Poisoning	150	102	0.68	0.60	-	0.75		

* Note: where no chi sq value is presented, Fisher's exact is used as the test statistic

Table 19: Greece - Variation in diagnosis-specific probability of admission - by intent

ICD-10	Intent	ED Attend	Adm LoS>0	PA	95% CI			Chi sq	p
S060	Assault	629	142	0.23	0.19	-	0.26	44.69	0.00
	Other/undet.	3	1	0.33	0.06	-	0.79		
	Self-harm	18	10	0.56	0.34	-	0.75		
	Unintentional	9406	3303	0.35	0.34	-	0.36		
T509	Self-harm	32	25	0.78	0.61	-	0.89	5.77	0.02
	Unintentional	140	77	0.55	0.47	-	0.63		

Table 20: Denmark - Variation in diagnosis-specific probability of admission - by gender

ICD-10	Gender	ED Attend	Adm LoS>0	PA	95% CI			Chi sq*	p
S121	F	3	0	0.00	0.00	-	0.56		0.02
	M	5	5	1.00	0.57	-	1.00		
S424	F	533	194	0.36	0.32	-	0.41	6.14	0.01
	M	549	161	0.29	0.26	-	0.33		
S520	F	276	136	0.49	0.43	-	0.55	15.02	0.00
	M	227	73	0.32	0.26	-	0.38		
S524	F	195	95	0.49	0.42	-	0.56	5.08	0.02
	M	277	164	0.59	0.53	-	0.65		
S661	F	31	10	0.32	0.19	-	0.50	3.91	0.05
	M	77	41	0.53	0.42	-	0.64		
S722	F	206	204	0.99	0.97	-	1.00		0.02
	M	77	72	0.94	0.86	-	0.97		
S730	F	139	121	0.87	0.80	-	0.92	4.60	0.03
	M	78	59	0.76	0.65	-	0.84		
S761	F	80	12	0.15	0.09	-	0.24	4.87	0.03
	M	135	38	0.28	0.21	-	0.36		
T079	F	1096	800	0.73	0.70	-	0.76	9.68	0.00
	M	2507	1950	0.78	0.76	-	0.79		
T420	F	406	192	0.47	0.42	-	0.52	8.36	0.00
	M	302	110	0.36	0.31	-	0.42		
T783	F	67	36	0.54	0.42	-	0.65	5.54	0.02
	M	94	33	0.35	0.26	-	0.45		

* Where no chi-squared value is presented, Fisher's exact test was used.

Table 21: Denmark- Variation in diagnosis-specific probability of admission- by age group

ICD-10	Age Group	ED Attend	Adm LoS>0	PA	95% CI			Chi Sq*	p
S026	5-14	17	7	0.41	0.22	-	0.64		0.01
	15-24	55	34	0.62	0.49	-	0.73		
	25-44	68	46	0.68	0.56	-	0.78		
	45-64	36	22	0.61	0.45	-	0.75		
	65-74	4	0	0.00	0.00	-	0.49		
	75+	10	3	0.30	0.11	-	0.60		
						-			
S060	0	59	11	0.19	0.11	-	0.30	278.30	0.00
	1-4	277	50	0.18	0.14	-	0.23		
	5-14	642	201	0.31	0.28	-	0.35		
	15-24	773	221	0.29	0.26	-	0.32		
	25-44	659	246	0.37	0.34	-	0.41		
	45-64	514	281	0.55	0.50	-	0.59		
	65-74	135	86	0.64	0.55	-	0.71		
	75+	241	160	0.66	0.60	-	0.72		
						-			
S324	5-14	1	0	0.00	0.00	-	0.79		0.05
	25-44	4	1	0.25	0.05	-	0.70		
	45-64	12	11	0.92	0.65	-	0.99		
	65-74	7	5	0.71	0.36	-	0.92		
	75+	17	11	0.65	0.41	-	0.83		
						-			
S424	0	1	0	0.00	0.00	-	0.79	36.28	0.00
	1-4	217	56	0.26	0.20	-	0.32		
	5-14	572	172	0.30	0.26	-	0.34		
	15-24	41	11	0.27	0.16	-	0.42		
	25-44	35	10	0.29	0.16	-	0.45		
	45-64	77	33	0.43	0.32	-	0.54		
	65-74	41	21	0.51	0.36	-	0.66		
	75+	98	52	0.53	0.43	-	0.63		
						-			
S520	0	1	0	0.00	0.00	-	0.79	71.05	0.00
	1-4	37	5	0.14	0.06	-	0.28		
	5-14	103	21	0.20	0.14	-	0.29		
	15-24	57	19	0.33	0.22	-	0.46		
	25-44	67	23	0.34	0.24	-	0.46		
	45-64	106	54	0.51	0.42	-	0.60		
	65-74	48	33	0.69	0.55	-	0.80		
	75+	84	54	0.64	0.54	-	0.74		
						-			
S524	0	1	0	0.00	0.00	-	0.79		0.00
	1-4	85	32	0.38	0.28	-	0.48		
	5-14	300	176	0.59	0.53	-	0.64		
	15-24	32	22	0.69	0.51	-	0.82		
	25-44	10	7	0.70	0.40	-	0.89		
	45-64	10	6	0.60	0.31	-	0.83		
	65-74	13	4	0.31	0.13	-	0.58		
	75+	21	12	0.57	0.37	-	0.76		
						-			
S721	0	5	5	1.00	0.57	-	1.00		0.01
	1-4	5	5	1.00	0.57	-	1.00		
	5-14	2	2	1.00	0.34	-	1.00		
	25-44	13	9	0.69	0.42	-	0.87		
	45-64	146	144	0.99	0.95	-	1.00		
	65-74	258	250	0.97	0.94	-	0.98		
	75+	1325	1285	0.97	0.96	-	0.98		
						-			
S722	1-4	1	1	1.00	0.21	-	1.00		0.01
	5-14	2	1	0.50	0.09	-	0.91		
	15-24	1	0	0.00	0.00	-	0.79		
	25-44	2	2	1.00	0.34	-	1.00		
	45-64	31	31	1.00	0.89	-	1.00		
	65-74	55	55	1.00	0.93	-	1.00		
	75+	191	186	0.97	0.94	-	0.99		
						-			
* Where no chi-squared value is presented, Fisher's exact test was used.									

ICD-10	Age Group	ED Attend	Adm LoS>0	PA	95% CI			Chi Sq*	p
S723	0	9	3	0.33	0.12	-	0.65		0.00
	1-4	37	29	0.78	0.63	-	0.89		
	5-14	26	21	0.81	0.62	-	0.91		
	15-24	14	12	0.86	0.60	-	0.96		
	25-44	17	15	0.88	0.66	-	0.97		
	45-64	53	51	0.96	0.87	-	0.99		
	65-74	38	34	0.89	0.76	-	0.96		
	75+	155	147	0.95	0.90	-	0.97		
						-			
S724	0	6	2	0.33	0.10	-	0.70		0.01
	1-4	9	2	0.22	0.06	-	0.55		
	5-14	13	6	0.46	0.23	-	0.71		
	15-24	8	3	0.38	0.14	-	0.69		
	25-44	7	5	0.71	0.36	-	0.92		
	45-64	38	25	0.66	0.50	-	0.79		
	65-74	30	21	0.70	0.52	-	0.83		
	75+	101	75	0.74	0.65	-	0.82		
						-			
S761	1-4	16	0	0.00	0.00	-	0.19	50.62	0.00
	15-24	49	1	0.02	0.00	-	0.11		
	25-44	53	6	0.11	0.05	-	0.23		
	45-64	62	23	0.37	0.26	-	0.50		
	65-74	19	11	0.58	0.36	-	0.77		
	75+	16	9	0.56	0.33	-	0.77		
						-			
S821	0	2	0	0.00	0.00	-	0.66	69.01	0.00
	1-4	37	2	0.05	0.01	-	0.18		
	5-14	39	10	0.26	0.15	-	0.41		
	15-24	27	13	0.48	0.31	-	0.66		
	25-44	87	57	0.66	0.55	-	0.75		
	45-64	187	113	0.60	0.53	-	0.67		
	65-74	49	32	0.65	0.51	-	0.77		
	75+	104	71	0.68	0.59	-	0.76		
						-			
S822	0	4	0	0.00	0.00	-	0.49	173.38	0.00
	1-4	119	8	0.07	0.03	-	0.13		
	5-14	115	30	0.26	0.19	-	0.35		
	15-24	61	42	0.69	0.56	-	0.79		
	25-44	91	61	0.67	0.57	-	0.76		
	45-64	73	58	0.79	0.69	-	0.87		
	65-74	16	12	0.75	0.51	-	0.90		
	75+	34	25	0.74	0.57	-	0.85		
						-			
S823	0	6	1	0.17	0.03	-	0.56	112.02	0.00
	1-4	92	7	0.08	0.04	-	0.15		
	5-14	144	36	0.25	0.19	-	0.33		
	15-24	36	11	0.31	0.18	-	0.47		
	25-44	105	67	0.64	0.54	-	0.72		
	45-64	94	59	0.63	0.53	-	0.72		
	65-74	31	19	0.61	0.44	-	0.76		
	75+	24	15	0.63	0.43	-	0.79		
						-			
S827	1-4	5	1	0.20	0.04	-	0.62	32.56	0.00
	5-14	32	17	0.53	0.36	-	0.69		
	15-24	44	32	0.73	0.58	-	0.84		
	25-44	154	124	0.81	0.74	-	0.86		
	45-64	238	204	0.86	0.81	-	0.90		
	65-74	96	78	0.81	0.72	-	0.88		
	75+	91	74	0.81	0.72	-	0.88		
						-			
S828	1-4	1	1	1.00	0.21	-	1.00		0.00
	5-14	12	1	0.08	0.01	-	0.35		
	15-24	9	5	0.56	0.27	-	0.81		
	25-44	16	7	0.44	0.23	-	0.67		
	45-64	24	16	0.67	0.47	-	0.82		
	65-74	9	9	1.00	0.70	-	1.00		
	75+	8	6	0.75	0.41	-	0.93		
						-			
S927	1-4	3	0	0.00	0.00	-	0.56		0.01
	5-14	4	0	0.00	0.00	-	0.49		
	25-44	6	5	0.83	0.44	-	0.97		
	45-64	10	6	0.60	0.31	-	0.83		
	65-74	2	0	0.00	0.00	-	0.66		
	75+	2	0	0.00	0.00	-	0.66		
						-			

* Where no chi-squared value is presented, Fisher's exact test was used.

ICD-10	Age Group	ED Attend	Adm LoS>0	PA	95% CI			Chi Sq*	p
T079	0	12	9	0.75	0.47	-	0.91	64.88	0.00
	1-4	58	41	0.71	0.58	-	0.81		
	5-14	250	202	0.81	0.75	-	0.85		
	15-24	946	668	0.71	0.68	-	0.73		
	25-44	1199	876	0.73	0.70	-	0.75		
	45-64	812	687	0.85	0.82	-	0.87		
	65-74	184	148	0.80	0.74	-	0.86		
	75+	142	119	0.84	0.77	-	0.89		
						-			
T149	1-4	2	0	0.00	0.00	-	0.66		0.00
	5-14	4	0	0.00	0.00	-	0.49		
	15-24	4	0	0.00	0.00	-	0.49		
	25-44	13	0	0.00	0.00	-	0.23		
	45-64	10	1	0.10	0.02	-	0.40		
	65-74	2	2	1.00	0.34	-	1.00		
	75+	4	4	1.00	0.51	-	1.00		
						-			
T380	1-4	3	0	0.00	0.00	-	0.56		0.03
	15-24	6	6	1.00	0.61	-	1.00		
	25-44	5	2	0.40	0.12	-	0.77		
	45-64	5	3	0.60	0.23	-	0.88		
	65-74	1	1	1.00	0.21	-	1.00		
						-			
T390	1-4	50	27	0.54	0.40	-	0.67	31.74	0.00
	5-14	65	52	0.80	0.69	-	0.88		
	15-24	415	305	0.73	0.69	-	0.78		
	25-44	356	292	0.82	0.78	-	0.86		
	45-64	183	151	0.83	0.76	-	0.87		
	65-74	18	17	0.94	0.74	-	0.99		
	75+	20	18	0.90	0.70	-	0.97		
						-			
T400	1-4	2	0	0.00	0.00	-	0.66		0.00
	15-24	12	5	0.42	0.19	-	0.68		
	25-44	60	25	0.42	0.30	-	0.54		
	45-64	43	24	0.56	0.41	-	0.70		
	65-74	9	9	1.00	0.70	-	1.00		
	75+	16	14	0.88	0.64	-	0.97		
						-			
T420	0	1	1	1.00	0.21	-	1.00	36.88	0.00
	1-4	9	2	0.22	0.06	-	0.55		
	5-14	3	1	0.33	0.06	-	0.79		
	15-24	60	12	0.20	0.12	-	0.32		
	25-44	321	126	0.39	0.34	-	0.45		
	45-64	240	110	0.46	0.40	-	0.52		
	65-74	33	22	0.67	0.50	-	0.80		
	75+	41	28	0.68	0.53	-	0.80		
						-			
T430	1-4	6	4	0.67	0.30	-	0.90	24.84	0.00
	5-14	1	1	1.00	0.21	-	1.00		
	15-24	131	44	0.34	0.26	-	0.42		
	25-44	166	87	0.52	0.45	-	0.60		
	45-64	84	55	0.65	0.55	-	0.75		
	65-74	8	4	0.50	0.22	-	0.78		
	75+	6	4	0.67	0.30	-	0.90		
						-			
T689	1-4	2	2	1.00	0.34	-	1.00		0.01
	5-14	2	0	0.00	0.00	-	0.66		
	15-24	3	1	0.33	0.06	-	0.79		
	25-44	8	2	0.25	0.07	-	0.59		
	45-64	16	10	0.63	0.39	-	0.82		
	65-74	7	5	0.71	0.36	-	0.92		
	75+	13	12	0.92	0.67	-	0.99		
						-			
T783	1-4	1	0	0.00	0.00	-	0.79		0.03
	5-14	2	1	0.50	0.09	-	0.91		
	15-24	20	5	0.25	0.11	-	0.47		
	25-44	30	13	0.43	0.27	-	0.61		
	45-64	59	20	0.34	0.23	-	0.47		
	65-74	26	15	0.58	0.39	-	0.74		
	75+	23	15	0.65	0.45	-	0.81		

* Where no chi-squared value is presented, Fisher's exact test was used.

Table 22: Denmark - Variation in diagnosis-specific probability of admission - by cause

ICD-10	Cause	ED Attend	Adm LoS>0	PA	95% CI			Chi sq*	p
S023	Falls	3	0	0.00	0.00	-	0.56		0.02
	MVTC	4	4	1.00	0.51	-	1.00		
	Other/unspecified	2	0	0.00	0.00	-	0.66		
	Struck by/against	13	5	0.38	0.18	-	0.64		
S060	Cut/pierce	10	4	0.40	0.17	-	0.69	88.62	0.00
	Falls	1516	593	0.39	0.37	-	0.42		
	MVTC	719	336	0.47	0.43	-	0.50		
	Other/unspecified	148	78	0.53	0.45	-	0.61		
	Poisoning	2	2	1.00	0.34	-	1.00		
	Struck by/against	905	243	0.27	0.24	-	0.30		
S220	Falls	161	103	0.64	0.56	-	0.71	14.00	0.00
	MVTC	24	15	0.63	0.43	-	0.79		
	Other/unspecified	54	19	0.35	0.24	-	0.49		
	Struck by/against	12	7	0.58	0.32	-	0.81		
S520	Cut/pierce	2	0	0.00	0.00	-	0.66	22.95	0.00
	Falls	323	132	0.41	0.36	-	0.46		
	MVTC	83	51	0.61	0.51	-	0.71		
	Other/unspecified	24	6	0.25	0.12	-	0.45		
	Struck by/against	71	20	0.28	0.19	-	0.40		
S561	Cut/pierce	4	4	1.00	0.51	-	1.00		0.01
	other/unspecified	4	0	0.00	0.00	-	0.49		
	Struck by/against	2	0	0.00	0.00	-	0.66		
S661	Cut/pierce	73	43	0.59	0.47	-	0.69		0.00
	Falls	11	8	0.73	0.43	-	0.90		
	MVTC	1	0	0.00	0.00	-	0.79		
	Other/unspecified	13	0	0.00	0.00	-	0.23		
	Struck by/against	10	0	0.00	0.00	-	0.28		
S72	Falls	10	8	0.80	0.49	-	0.94		
S720	Cut/pierce	5	5	1.00	0.57	-	1.00		0.00
	Falls	2233	2150	0.96	0.95	-	0.97		
	MVTC	120	116	0.97	0.92	-	0.99		
	Other/unspecified	221	197	0.89	0.84	-	0.93		
	Poisoning	1	1	1.00	0.21	-	1.00		
	Struck by/against	112	110	0.98	0.94	-	1.00		
S721	Cut/pierce	1	0	0.00	0.00	-	0.79		0.00
	Falls	1535	1493	0.97	0.96	-	0.98		
	MVTC	76	74	0.97	0.91	-	0.99		
	Other/unspecified	85	77	0.91	0.83	-	0.95		
	Struck by/against	57	56	0.98	0.91	-	1.00		

* Where no chi-squared value is presented, Fisher's exact test was used.

ICD-10	Cause	ED Attend	Adm LoS>0	PA	95% CI			Chi sq*	p
S723	Cut/pierce	3	2	0.67	0.21	-	0.94		0.01
	Falls	243	220	0.91	0.86	-	0.94		
	MVTC	31	31	1.00	0.89	-	1.00		
	Other/unspecified	36	32	0.89	0.75	-	0.96		
	Struck by/against	36	27	0.75	0.59	-	0.86		
S724	Cut/pierce	2	0	0.00	0.00	-	0.66		0.01
	Falls	141	100	0.71	0.63	-	0.78		
	MVTC	15	12	0.80	0.55	-	0.93		
	Other/unspecified	36	17	0.47	0.32	-	0.63		
	Struck by/against	18	10	0.56	0.34	-	0.75		
S761	Cut/pierce	3	2	0.67	0.21	-	0.94	66.35	0.00
	Falls	68	38	0.56	0.44	-	0.67		
	MVTC	7	0	0.00	0.00	-	0.35		
	Other/unspecified	109	6	0.06	0.03	-	0.11		
	Struck by/against	28	4	0.14	0.06	-	0.31		
S821	Cut/pierce	5	3	0.60	0.23	-	0.88	26.84	0.00
	Falls	257	142	0.55	0.49	-	0.61		
	MVTC	100	77	0.77	0.68	-	0.84		
	Other/unspecified	79	36	0.46	0.35	-	0.57		
	Struck by/against	91	40	0.44	0.34	-	0.54		
S822	Cut/pierce	20	11	0.55	0.34	-	0.74	20.32	0.00
	Falls	244	102	0.42	0.36	-	0.48		
	MVTC	44	34	0.77	0.63	-	0.87		
	Other/unspecified	58	26	0.45	0.33	-	0.58		
	Struck by/against	147	63	0.43	0.35	-	0.51		
S823	Cut/pierce	18	4	0.22	0.09	-	0.45	15.72	0.00
	Falls	277	119	0.43	0.37	-	0.49		
	MVTC	42	25	0.60	0.44	-	0.73		
	Other/unspecified	105	30	0.29	0.21	-	0.38		
	Struck by/against	90	37	0.41	0.32	-	0.51		
S828	Falls	48	36	0.75	0.61	-	0.85		0.00
	MVTC	2	1	0.50	0.09	-	0.91		
	Other/unspecified	20	4	0.20	0.08	-	0.42		
	Struck by/against	9	4	0.44	0.19	-	0.73		
S829	Cut/pierce	1	0	0.00	0.00	-	0.79		0.00
	Falls	70	37	0.53	0.41	-	0.64		
	MVTC	6	5	0.83	0.44	-	0.97		
	Other/unspecified	50	12	0.24	0.14	-	0.37		
	Struck by/against	32	18	0.56	0.39	-	0.72		
T079	Cut/pierce	73	59	0.81	0.70	-	0.88	160.71	0.00
	Falls	772	678	0.88	0.85	-	0.90		
	Firearm-related	8	7	0.88	0.53	-	0.98		
	MVTC	2134	1473	0.69	0.67	-	0.71		
	Other/unspecified	68	52	0.76	0.65	-	0.85		
	Poisoning	2	2	1.00	0.34	-	1.00		
	Struck by/against	546	479	0.88	0.85	-	0.90		

* Where no chi-squared value is presented, Fisher's exact test was used.

Table 23: Denmark - Variation in diagnosis-specific probability of admission - by intent

ICD-10	Intent^	ED Attand	Adm LoS>0	PA	95% CI			Chi sq*	p
S060	nr	122	67	0.55	0.46	-	0.63		0.00
	Assault	295	82	0.28	0.23	-	0.33		
	Self-harm	6	2	0.33	0.10	-	0.70		
	Unintentional	2876	1105	0.38	0.37	-	0.40		
	Unspecified	1	0	0.00	0.00	-	0.79		
T079	nr	54	42	0.78	0.65	-	0.87	5.93	0.05
	Assault	117	82	0.70	0.61	-	0.78		
	Self-harm	70	60	0.86	0.76	-	0.92		
	Unintentional	3362	2566	0.76	0.75	-	0.78		
T380	Self-harm	17	12	0.71	0.47	-	0.87		0.05
	Unintentional	3	0	0.00	0.00	-	0.56		
T390	Assault	2	1	0.50	0.09	-	0.91		0.00
	Self-harm	1036	824	0.80	0.77	-	0.82		
	Unintentional	69	37	0.54	0.42	-	0.65		
T469	Self-harm	10	8	0.80	0.49	-	0.94		0.02
	Unintentional	4	0	0.00	0.00	-	0.49		

* Where no chi-squared value is presented, Fisher's exact test was used.

^ nr = not recorded.

Table 24: Canada - Variation in diagnosis-specific probability of admission - by gender.

ICD-10	Gender	ED Attend	Adm Los>0	Pr Adm	95% CI			Chi sq	p
S324	Female	338	232	0.69	0.64	-	0.73	6.60	0.01
	Male	636	485	0.76	0.73	-	0.79		
S328	Female	963	433	0.45	0.42	-	0.48	12.55	0.00
	Male	428	149	0.35	0.30	-	0.39		
S369	Female	9	0	0.00	0.00	-	0.30	9.60	0.00
	Male	27	16	0.59	0.41	-	0.75		
S720	Female	10172	8860	0.87	0.86	-	0.88	25.06	0.00
	Male	3921	3288	0.84	0.83	-	0.85		
S721	Female	8493	7746	0.91	0.91	-	0.92	31.53	0.00
	Male	3445	3026	0.88	0.87	-	0.89		
S724	Female	1253	890	0.71	0.68	-	0.73	27.13	0.00
	Male	820	492	0.60	0.57	-	0.63		
T213	Female	69	42	0.61	0.49	-	0.72	3.75	0.05
	Male	96	72	0.75	0.65	-	0.83		

Table 25: Canada - Variation in diagnosis-specific probability of admission - by cause.

ICD-10	Cause	ED Attend	Adm LoS>0	Prob Adm	95% CI			Chi sq	p
S021	Cut	12	5	0.42	0.19	-	0.68	13.86	0.00
	Falls	469	250	0.53	0.49	-	0.58		
	MVTC	236	142	0.60	0.54	-	0.66		
	Struck	180	76	0.42	0.35	-	0.50		
S062	Falls	413	270	0.65	0.61	-	0.70	50.71	0.00
	MVTC	463	350	0.76	0.71	-	0.79		
	Struck	129	55	0.43	0.34	-	0.51		
S268	Cut	19	11	0.58	0.36	-	0.77	35.43	0.00
	Falls	6	0	0.00	0.00	-	0.39		
	MVTC	57	45	0.79	0.67	-	0.88		
	Struck	12	0	0.00	0.00	-	0.24		
S270	Cut	94	85	0.90	0.83	-	0.95	34.28	0.00
	Falls	396	277	0.70	0.65	-	0.74		
	MVTC	426	295	0.69	0.65	-	0.73		
	Struck	133	72	0.54	0.46	-	0.62		
S272	Cut	79	72	0.91	0.83	-	0.96	8.40	0.04
	Falls	116	104	0.90	0.83	-	0.94		
	MVTC	183	147	0.80	0.74	-	0.85		
	Struck	33	26	0.79	0.62	-	0.89		
S273	Cut	15	14	0.93	0.70	-	0.99	33.62	0.00
	Falls	72	37	0.51	0.40	-	0.63		
	MVTC	175	138	0.79	0.72	-	0.84		
	Struck	20	7	0.35	0.18	-	0.57		
S325	Falls	2535	1539	0.61	0.59	-	0.63	10.51	0.01
	MVTC	560	375	0.67	0.63	-	0.71		
	Struck	41	20	0.49	0.34	-	0.64		
S328	Falls	947	436	0.46	0.43	-	0.49	8.43	0.02
	MVTC	255	99	0.39	0.33	-	0.45		
	Struck	42	12	0.29	0.17	-	0.44		
S720	Falls	12537	10922	0.87	0.87	-	0.88	16.63	0.00
	MVTC	340	273	0.80	0.76	-	0.84		
	Struck	125	102	0.82	0.74	-	0.87		
S721	Falls	11019	9998	0.91	0.90	-	0.91	27.57	0.00
	MVTC	306	261	0.85	0.81	-	0.89		
	Struck	102	80	0.78	0.69	-	0.85		
S724	Falls	1368	955	0.70	0.67	-	0.72	17.88	0.00
	MVTC	286	214	0.75	0.69	-	0.80		
	Struck	153	85	0.56	0.48	-	0.63		
S728	Falls	203	156	0.77	0.71	-	0.82	25.05	0.00
	MVTC	39	24	0.62	0.46	-	0.75		
	Struck	8	0	0.00	0.00	-	0.32		
S729	Falls	523	202	0.39	0.35	-	0.43	13.06	0.00
	MVTC	175	52	0.30	0.23	-	0.37		
	Struck	46	7	0.15	0.08	-	0.28		
T025	Falls	67	50	0.75	0.63	-	0.84	14.18	0.00
	MVTC	25	17	0.68	0.48	-	0.83		
	Struck	6	0	0.00	0.00	-	0.39		

Table 26: USA2 - Variation in diagnosis-specific probability of admission - by gender

ICD-9	Gender	ED Attend	Adm* LoS>0	PA	95% CI			Chi sq	p
8014	F	11	<11	0.45	0.21	-	0.72	6.33	0.01
	M	13	12	0.92	0.67	-	0.99		
8050	F	1391	874	0.63	0.60	-	0.65	18.04	0.00
	M	2327	1297	0.56	0.54	-	0.58		
8054	F	5973	2658	0.45	0.43	-	0.46	4.18	0.04
	M	5511	2348	0.43	0.41	-	0.44		
8082	F	6502	4484	0.69	0.68	-	0.70	19.81	0.00
	M	1648	1042	0.63	0.61	-	0.66		
8084	F	467	282	0.60	0.56	-	0.65	19.73	0.00
	M	424	193	0.46	0.41	-	0.50		
8125	F	13	<11	0.38	0.18	-	0.64	4.40	0.04
	M	35	25	0.71	0.55	-	0.84		
8133	F	101	75	0.74	0.65	-	0.82	7.31	0.01
	M	229	198	0.86	0.81	-	0.90		
8200	F	10452	9751	0.93	0.93	-	0.94	16.74	0.00
	M	3548	3237	0.91	0.90	-	0.92		
8202	F	18871	17385	0.92	0.92	-	0.93	76.56	0.00
	M	7284	6461	0.89	0.88	-	0.89		
8208	F	9149	7353	0.80	0.80	-	0.81	38.26	0.00
	M	3599	2714	0.75	0.74	-	0.77		
8211	F	54	54	1.00	0.93	-	1.00	4.60	0.03
	M	302	278	0.92	0.88	-	0.95		
8212	F	2913	2214	0.76	0.74	-	0.78	232.98	0.00
	M	1293	677	0.52	0.50	-	0.55		
8230	F	5102	2119	0.42	0.40	-	0.43	36.16	0.00
	M	5289	1897	0.36	0.35	-	0.37		
8232	F	2085	1067	0.51	0.49	-	0.53	11.37	0.00
	M	3673	1710	0.47	0.45	-	0.48		
8239	F	106	96	0.91	0.83	-	0.95	7.13	0.01
	M	355	281	0.79	0.75	-	0.83		
8241	F	29	29	1.00	0.88	-	1.00	6.01	0.01
	M	72	59	0.82	0.72	-	0.89		
8244	F	4960	3329	0.67	0.66	-	0.68	71.78	0.00
	M	2771	1592	0.57	0.56	-	0.59		
8246	F	4110	3261	0.79	0.78	-	0.81	28.99	0.00
	M	1674	1219	0.73	0.71	-	0.75		
8247	F	151	148	0.98	0.94	-	0.99	4.77	0.03
	M	31	28	0.90	0.75	-	0.97		
8253	F	36	34	0.94	0.82	-	0.98	13.46	0.00
	M	226	144	0.64	0.57	-	0.70		
8520	F	836	689	0.82	0.80	-	0.85	5.90	0.02
	M	1031	803	0.78	0.75	-	0.80		
8650	F	507	461	0.91	0.88	-	0.93	14.74	0.00
	M	1753	1475	0.84	0.82	-	0.86		
8660	F	71	51	0.72	0.60	-	0.81	16.19	0.00
	M	601	280	0.47	0.43	-	0.51		
8710	F	18	12	0.67	0.44	-	0.84	12.44	0.00
	M	163	43	0.26	0.20	-	0.34		
9520	F	22	14	0.64	0.43	-	0.80	3.70	0.05
	M	161	131	0.81	0.75	-	0.87		
9654	F	5712	2429	0.43	0.41	-	0.44	7.94	0.01
	M	2649	1040	0.39	0.37	-	0.41		
9690	F	6272	2443	0.39	0.38	-	0.40	6.33	0.01
	M	3168	1319	0.42	0.40	-	0.43		
9708	F	896	520	0.58	0.55	-	0.61	4.43	0.04
	M	2065	1112	0.54	0.52	-	0.56		
9721	F	115	78	0.68	0.59	-	0.76	5.82	0.02
	M	70	35	0.50	0.39	-	0.61		

Table 27: USA2 - Variation in diagnosis-specific probability of admission - by age group

ICD-9	Age Group	ED Attend	Adm* LoS>0	PA	95% CI			Chi sq	p
8000	0	342	83	0.24	0.20	-	0.29	25.32	0.00
	1-4 yrs	190	38	0.20	0.15	-	0.26		
	5-14 yrs	96	33	0.34	0.26	-	0.44		
	75+	13	<11	0.77	0.50	-	0.92		
8002	0	93	66	0.71	0.61	-	0.79		0.00
	1-4 yrs	37	25	0.68	0.51	-	0.80		
	5-14 yrs	38	26	0.68	0.53	-	0.68		
	15-24	29	26	0.90	0.74	-	0.96		
	25-44	16	15	0.94	0.72	-	0.99		
	45-64	11	0	0.00	0.00	-	0.26		
8010	0	69	17	0.25	0.16	-	0.36	52.68	0.00
	1-4 yrs	150	48	0.32	0.25	-	0.40		
	5-14 yrs	255	73	0.29	0.23	-	0.34		
	15-24	628	213	0.34	0.30	-	0.38		
	25-44	745	293	0.39	0.36	-	0.43		
	45-64	341	163	0.48	0.43	-	0.53		
	65-74	56	27	0.48	0.36	-	0.61		
	75+	173	90	0.52	0.45	-	0.59		
8014	15-24	13	12	0.92	0.67	-	0.99	6.33	0.01
	75+	11	5	0.45	0.21	-	0.72		
8024	5-14 yrs	106	30	0.28	0.21	-	0.38	96.50	0.00
	15-24	648	155	0.24	0.21	-	0.27		
	25-44	1161	326	0.28	0.26	-	0.31		
	45-64	590	212	0.36	0.32	-	0.40		
	65-74	89	37	0.42	0.32	-	0.52		
	75+	209	119	0.57	0.50	-	0.63		
8032	0	14	5	0.36	0.16	-	0.61	9.96	0.00
	25-44	14	13	0.93	0.69	-	0.99		
8050	15-24	581	319	0.55	0.51	-	0.59	21.26	0.00
	25-44	1148	634	0.55	0.52	-	0.58		
	45-64	814	470	0.58	0.54	-	0.61		
	65-74	269	173	0.64	0.58	-	0.70		
	75+	906	575	0.63	0.60	-	0.67		
8052	5-14 yrs	175	31	0.18	0.13	-	0.24	111.52	0.00
	15-24	865	321	0.37	0.34	-	0.40		
	25-44	1649	560	0.34	0.32	-	0.36		
	45-64	1346	517	0.38	0.36	-	0.41		
	65-74	820	317	0.39	0.35	-	0.42		
	75+	2746	1271	0.46	0.44	-	0.48		
8054	5-14 yrs	131	38	0.29	0.22	-	0.37	144.36	0.00
	15-24	1166	452	0.39	0.36	-	0.42		
	25-44	2398	877	0.37	0.35	-	0.39		
	45-64	2385	1020	0.43	0.41	-	0.45		
	65-74	1256	538	0.43	0.40	-	0.46		
	75+	4148	2081	0.50	0.49	-	0.52		
8056	5-14 yrs	167	5	0.03	0.01	-	0.07	931.96	0.00
	15-24	671	92	0.14	0.11	-	0.17		
	25-44	1861	127	0.07	0.06	-	0.08		
	45-64	730	105	0.14	0.12	-	0.17		
	65-74	205	75	0.37	0.30	-	0.43		
	75+	554	334	0.60	0.56	-	0.64		
8072	5-14 yrs	32	0	0.00	0.00	-	0.11	94.65	0.00
	15-24	149	25	0.17	0.12	-	0.24		
	25-44	389	96	0.25	0.21	-	0.29		
	45-64	499	175	0.35	0.31	-	0.39		
	65-74	224	88	0.39	0.33	-	0.46		
	75+	394	194	0.49	0.44	-	0.54		

ICD-9	Age Group	ED Attend	Adm* LoS>0	PA	95% CI			Chi sq	p
8080	5-14 yrs	37	<11	0.19	0.09	-	0.34	72.88	0.00
	15-24	372	283	0.76	0.71	-	0.80		
	25-44	820	606	0.74	0.71	-	0.77		
	45-64	689	510	0.74	0.71	-	0.77		
	65-74	279	208	0.75	0.69	-	0.79		
	75+	781	623	0.80	0.77	-	0.82		
8082	5-14 yrs	109	47	0.43	0.34	-	0.52	99.30	0.00
	15-24	504	323	0.64	0.60	-	0.68		
	25-44	569	338	0.59	0.55	-	0.63		
	45-64	906	547	0.60	0.57	-	0.64		
	65-74	944	636	0.67	0.64	-	0.70		
	75+	5118	3635	0.71	0.70	-	0.72		
8084	5-14 yrs	101	11	0.11	0.06	-	0.18	137.72	0.00
	15-24	192	73	0.38	0.31	-	0.45		
	25-44	90	68	0.76	0.66	-	0.83		
	45-64	114	65	0.57	0.48	-	0.66		
	65-74	49	25	0.51	0.37	-	0.64		
	75+	345	233	0.68	0.62	-	0.72		
8133	5-14 yrs	177	141	0.80	0.73	-	0.85	15.65	0.01
	15-24	47	42	0.89	0.77	-	0.95		
	25-44	70	66	0.94	0.86	-	0.98		
	45-64	36	24	0.67	0.50	-	0.80		
8135	5-14 yrs	132	98	0.74	0.66	-	0.81	12.11	0.03
	15-24	51	44	0.86	0.74	-	0.93		
	25-44	131	111	0.85	0.78	-	0.90		
	45-64	170	150	0.88	0.83	-	0.92		
	65-74	71	60	0.85	0.74	-	0.91		
	75+	198	169	0.85	0.80	-	0.90		
8200	5-14 yrs	86	49	0.57	0.46	-	0.67	224.45	0.00
	15-24	28	23	0.82	0.64	-	0.92		
	25-44	171	136	0.80	0.73	-	0.85		
	45-64	1103	1009	0.91	0.90	-	0.93		
	65-74	1905	1763	0.93	0.91	-	0.94		
	75+	10707	10008	0.93	0.93	-	0.94		
8202	1-4 yrs	12	<11	0.67	0.39	-	0.86	251.44	0.00
	5-14 yrs	55	24	0.44	0.31	-	0.57		
	15-24	108	101	0.94	0.87	-	0.97		
	25-44	575	512	0.89	0.86	-	0.91		
	45-64	2328	2020	0.87	0.85	-	0.88		
	65-74	3290	2957	0.90	0.89	-	0.91		
	75+	19787	18224	0.92	0.92	-	0.92		
8208	5-14 yrs	78	21	0.27	0.18	-	0.38	303.21	0.00
	15-24	80	37	0.46	0.36	-	0.57		
	25-44	262	145	0.55	0.49	-	0.61		
	45-64	1264	941	0.74	0.72	-	0.77		
	65-74	1867	1483	0.79	0.78	-	0.81		
	75+	9197	7440	0.81	0.80	-	0.82		

* Counts of admissions to the same hospital as the ED attendance.

ICD-9	Age Group	ED Attend	Adm* LoS>0	PA	95% CI			Chi sq	p
8210	0	167	52	0.31	0.25	-	0.39	546.92	0.00
	1-4 yrs	1035	538	0.52	0.49	-	0.55		
	5-14 yrs	1161	784	0.68	0.65	-	0.70		
	15-24	1319	1120	0.85	0.83	-	0.87		
	25-44	964	814	0.84	0.82	-	0.87		
	45-64	706	519	0.74	0.70	-	0.77		
	65-74	409	292	0.71	0.67	-	0.76		
	75+	1355	1015	0.75	0.73	-	0.77		
8211	5-14 yrs	17	16	0.94	0.73	-	0.99	9.86	0.02
	15-24	158	150	0.95	0.90	-	0.97		
	25-44	152	143	0.94	0.89	-	0.97		
	45-64	29	23	0.79	0.62	-	0.90		
8212	0	80	<11	0.11	0.06	-	0.20	765.44	0.00
	1-4 yrs	69	<11	0.13	0.07	-	0.23		
	5-14 yrs	360	115	0.32	0.27	-	0.37		
	15-24	145	47	0.32	0.25	-	0.40		
	25-44	355	182	0.51	0.46	-	0.56		
	45-64	860	633	0.74	0.71	-	0.76		
	65-74	531	434	0.82	0.78	-	0.85		
	75+	1806	1462	0.81	0.79	-	0.83		
8221	15-24	50	43	0.86	0.74	-	0.93	5.88	0.05
	25-44	118	99	0.84	0.76	-	0.89		
	45-64	37	25	0.68	0.51	-	0.80		
8230	0	11	<11	0.09	0.02	-	0.38	912.65	0.00
	1-4 yrs	433	<11	0.02	0.01	-	0.04		
	5-14 yrs	797	107	0.13	0.11	-	0.16		
	15-24	768	203	0.26	0.23	-	0.30		
	25-44	2914	1037	0.36	0.34	-	0.37		
	45-64	3238	1362	0.42	0.40	-	0.44		
	65-74	945	500	0.53	0.50	-	0.56		
	75+	1285	798	0.62	0.59	-	0.65		
8232	1-4 yrs	563	15	0.03	0.02	-	0.04	1200.00	0.00
	5-14 yrs	1240	288	0.23	0.21	-	0.26		
	15-24	1003	483	0.48	0.45	-	0.51		
	25-44	1468	958	0.65	0.63	-	0.68		
	45-64	1060	718	0.68	0.65	-	0.70		
	65-74	183	135	0.74	0.67	-	0.80		
	75+	241	180	0.75	0.69	-	0.80		
8239	5-14 yrs	21	12	0.57	0.37	-	0.76	11.61	0.01
	15-24	73	56	0.77	0.66	-	0.85		
	25-44	214	178	0.83	0.78	-	0.88		
	45-64	153	131	0.86	0.79	-	0.90		
8243	25-44	13	13	1.00	0.77	-	1.00	3.98	0.05
	45-64	36	27	0.75	0.59	-	0.86		
8244	5-14 yrs	218	66	0.30	0.25	-	0.37	277.97	0.00
	15-24	808	453	0.56	0.53	-	0.59		
	25-44	1925	1129	0.59	0.56	-	0.61		
	45-64	2605	1634	0.63	0.61	-	0.65		
	65-74	990	729	0.74	0.71	-	0.76		
	75+	1185	910	0.77	0.74	-	0.79		
8245	15-24	28	25	0.89	0.73	-	0.96		0.02
	25-44	136	118	0.87	0.80	-	0.91		
	45-64	181	171	0.94	0.90	-	0.97		
	65-74	47	46	0.98	0.89	-	1.00		
	75+	66	64	0.97	0.90	-	0.99		
8246	5-14 yrs	57	23	0.40	0.29	-	0.53	175.16	0.00
	15-24	384	240	0.63	0.58	-	0.67		
	25-44	1482	1072	0.72	0.70	-	0.75		
	45-64	2406	1900	0.79	0.77	-	0.81		
	65-74	796	674	0.85	0.82	-	0.87		
	75+	659	571	0.87	0.84	-	0.89		
8247	25-44	36	32	0.89	0.75	-	0.96		0.01
	45-64	80	80	1.00	0.95	-	1.00		
	65-74	36	34	0.94	0.82	-	0.98		
	75+	30	30	1.00	0.89	-	1.00		

ICD-9	Age Group	ED Attend	Adm* LoS>0	PA	95% CI			Chi sq	p
8253	15-24	69	35	0.51	0.39	-	0.62	12.76	0.00
	25-44	149	110	0.74	0.66	-	0.80		
	45-64	44	33	0.75	0.61	-	0.85		
8350	15-24	94	74	0.79	0.69	-	0.86	164.46	0.00
	25-44	156	74	0.47	0.40	-	0.55		
	45-64	152	21	0.14	0.09	-	0.20		
	65-74	77	<11	0.10	0.05	-	0.19		
	75+	171	32	0.19	0.14	-	0.25		
8360	15-24	93	<11	0.06	0.03	-	0.13	176.45	0.00
	25-44	268	16	0.06	0.04	-	0.09		
	45-64	169	25	0.15	0.10	-	0.21		
	65-74	19	11	0.58	0.36	-	0.77		
	75+	37	30	0.81	0.66	-	0.91		
8501	0	34	<11	0.03	0.01	-	0.15	666.38	0.00
	1-4 yrs	629	36	0.06	0.04	-	0.08		
	5-14 yrs	2391	177	0.07	0.06	-	0.09		
	15-24	4673	479	0.10	0.09	-	0.11		
	25-44	3593	601	0.17	0.16	-	0.18		
	45-64	1919	417	0.22	0.20	-	0.24		
	65-74	343	91	0.27	0.22	-	0.31		
	75+	405	184	0.45	0.41	-	0.50		
8505	0	13	<11	0.08	0.01	-	0.33	400.95	0.00
	1-4 yrs	182	14	0.08	0.05	-	0.12		
	5-14 yrs	1249	110	0.09	0.07	-	0.11		
	15-24	3403	574	0.17	0.16	-	0.18		
	25-44	3045	706	0.23	0.22	-	0.25		
	45-64	1569	411	0.26	0.24	-	0.28		
	65-74	259	102	0.39	0.34	-	0.45		
	75+	355	162	0.46	0.41	-	0.51		
8518	0	14	<11	0.43	0.21	-	0.67	58.35	0.00
	5-14 yrs	43	21	0.49	0.35	-	0.63		
	15-24	379	275	0.73	0.68	-	0.77		
	25-44	457	340	0.74	0.70	-	0.78		
	45-64	404	304	0.75	0.71	-	0.79		
	65-74	132	93	0.70	0.62	-	0.78		
	75+	475	414	0.87	0.84	-	0.90		
8520	15-24	199	171	0.86	0.80	-	0.90	9.55	0.05
	25-44	333	267	0.80	0.76	-	0.84		
	45-64	531	406	0.76	0.73	-	0.80		
	65-74	233	183	0.79	0.73	-	0.83		
	75+	571	465	0.81	0.78	-	0.84		
8522	0	36	17	0.47	0.32	-	0.63	41.53	0.00
	1-4 yrs	34	18	0.53	0.37	-	0.69		
	5-14 yrs	20	12	0.60	0.39	-	0.78		
	15-24	154	124	0.81	0.74	-	0.86		
	25-44	327	242	0.74	0.69	-	0.78		
	45-64	830	651	0.78	0.76	-	0.81		
	65-74	597	479	0.80	0.77	-	0.83		
	75+	2157	1692	0.78	0.77	-	0.80		
8530	0	11	<11	0.36	0.15	-	0.65	30.19	0.00
	5-14 yrs	42	19	0.45	0.31	-	0.60		
	15-24	106	76	0.72	0.62	-	0.79		
	25-44	152	111	0.73	0.65	-	0.79		
	45-64	193	117	0.61	0.54	-	0.67		
	65-74	114	67	0.59	0.50	-	0.67		
	75+	557	400	0.72	0.68	-	0.75		
8600	5-14 yrs	18	12	0.67	0.44	-	0.84	37.03	0.00
	15-24	529	437	0.83	0.79	-	0.86		
	25-44	1023	853	0.83	0.81	-	0.86		
	45-64	1023	895	0.87	0.85	-	0.89		
	65-74	216	204	0.94	0.91	-	0.97		
	75+	364	329	0.90	0.87	-	0.93		

* Counts of admissions to the same hospital as the ED attendance.

ICD-9	Age Group	ED Attend	Adm* LoS>0	PA	95% CI			Chi sq	p
8610	15-24	26	17	0.65	0.46	-	0.81	13.42	0.01
	25-44	38	31	0.82	0.67	-	0.91		
	45-64	58	44	0.76	0.63	-	0.85		
	65-74	41	36	0.88	0.74	-	0.95		
	75+	38	37	0.97	0.87	-	1.00		
8612	1-4 yrs	28	18	0.64	0.46	-	0.79	25.42	0.00
	5-14 yrs	79	46	0.58	0.47	-	0.68		
	15-24	321	232	0.72	0.67	-	0.77		
	25-44	389	292	0.75	0.71	-	0.79		
	45-64	285	235	0.82	0.78	-	0.86		
	65-74	66	50	0.76	0.64	-	0.84		
	75+	114	92	0.81	0.73	-	0.87		
8622	25-44	35	<11	0.26	0.14	-	0.42	17.33	0.00
	45-64	30	12	0.40	0.25	-	0.58		
	75+	13	12	0.92	0.67	-	0.99		
8640	5-14 yrs	100	60	0.60	0.50	-	0.69	32.10	0.00
	15-24	312	256	0.82	0.77	-	0.86		
	25-44	287	240	0.84	0.79	-	0.87		
	45-64	59	53	0.90	0.80	-	0.95		
8650	5-14 yrs	425	301	0.71	0.66	-	0.75	104.50	0.00
	15-24	854	739	0.87	0.84	-	0.89		
	25-44	606	548	0.90	0.88	-	0.93		
	45-64	342	316	0.92	0.89	-	0.95		
	65-74	11	10	0.91	0.62	-	0.98		
	75+	22	22	1.00	0.85	-	1.00		
8660	5-14 yrs	105	33	0.31	0.23	-	0.41	28.30	0.00
	15-24	245	129	0.53	0.46	-	0.59		
	25-44	208	97	0.47	0.40	-	0.53		
	45-64	77	48	0.62	0.51	-	0.72		
	65-74	14	<11	0.43	0.21	-	0.67		
	75+	23	18	0.78	0.58	-	0.90		
8710	5-14 yrs	17	<11	0.18	0.06	-	0.41	13.31	0.10
	15-24	29	<11	0.24	0.12	-	0.42		
	25-44	74	21	0.28	0.19	-	0.40		
	45-64	43	12	0.28	0.17	-	0.43		
	75+	18	12	0.67	0.44	-	0.84		
8950	15-24	16	<11	0.63	0.39	-	0.82	12.32	0.00
	25-44	25	<11	0.24	0.11	-	0.43		
	45-64	14	11	0.79	0.52	-	0.92		
9010	15-24	17	14	0.82	0.59	-	0.94		0.00
	25-44	19	17	0.89	0.69	-	0.97		
	45-64	13	<11	0.00	0.00	-	0.23		
9341	0	11	<11	0.00	0.00	-	0.26		0.00
	1-4 yrs	80	53	0.66	0.55	-	0.76		
	5-14 yrs	29	16	0.55	0.38	-	0.72		
	45-64	45	30	0.67	0.52	-	0.79		
	65-74	11	<11	0.00	0.00	-	0.26		
	75+	37	30	0.81	0.66	-	0.91		

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ICD-9	Age Group	ED Attend	Adm* LoS>0	PA	95% CI			Chi sq	p
9348	45-64	36	16	0.44	0.30	-	0.60	10.20	0.01
	65-74	27	<11	0.22	0.11		0.41		
	75+	48	29	0.60	0.46		0.73		
9433	1-4 yrs	11	<11	0.55	0.28	-	0.79	12.81	0.01
	5-14 yrs	12	<11	0.42	0.19	-	0.68		
	15-24	113	46	0.41	0.32	-	0.50		
	25-44	238	127	0.53	0.47	-	0.60		
	45-64	99	64	0.65	0.55	-	0.73		
9453	1-4 yrs	34	16	0.47	0.31	-	0.63	45.92	0.00
	5-14 yrs	126	65	0.52	0.43	-	0.60		
	15-24	160	84	0.53	0.45	-	0.60		
	25-44	363	205	0.56	0.51	-	0.61		
	45-64	249	184	0.74	0.68	-	0.79		
	65-74	32	26	0.81	0.65	-	0.91		
	75+	43	35	0.81	0.67	-	0.90		
9520	25-44	46	29	0.63	0.49	-	0.75	9.81	0.02
	45-64	112	95	0.85	0.77	-	0.90		
	65-74	12	10	0.83	0.55	-	0.95		
	75+	13	11	0.85	0.58	-	0.96		
9623	1-4 yrs	124	20	0.16	0.11	-	0.24	84.71	0.00
	5-14 yrs	61	13	0.21	0.13	-	0.33		
	15-24	127	42	0.33	0.25	-	0.42		
	25-44	574	240	0.42	0.38	-	0.46		
	45-64	866	275	0.32	0.29	-	0.35		
	65-74	399	114	0.29	0.24	-	0.33		
	75+	387	193	0.50	0.45	-	0.55		
9642	1-4 yrs	52	<11	0.00	0.00	-	0.07	80.11	0.00
	25-44	69	40	0.58	0.46	-	0.69		
	45-64	142	91	0.64	0.56	-	0.72		
	65-74	88	55	0.63	0.52	-	0.72		
	75+	227	149	0.66	0.59	-	0.72		
9650	0	38	<11	0.08	0.03	-	0.21	701.74	0.00
	1-4 yrs	217	18	0.08	0.05	-	0.13		
	5-14 yrs	70	10	0.14	0.08	-	0.24		
	15-24	2037	468	0.23	0.21	-	0.25		
	25-44	4960	1498	0.30	0.29	-	0.31		
	45-64	2695	1293	0.48	0.46	-	0.50		
	65-74	240	173	0.72	0.66	-	0.77		
	75+	170	115	0.68	0.60	-	0.74		
9651	0	11	<11	0.00	0.00	-	0.26	249.75	0.00
	1-4 yrs	202	<11	0.04	0.02	-	0.08		
	5-14 yrs	243	46	0.19	0.15	-	0.24		
	15-24	1048	356	0.34	0.31	-	0.37		
	25-44	517	239	0.46	0.42	-	0.51		
	45-64	244	148	0.61	0.54	-	0.67		
	65-74	17	12	0.71	0.47	-	0.87		
	75+	27	22	0.81	0.63	-	0.92		
9654	0	75	<11	0.11	0.06	-	0.20	1100.00	0.00
	1-4 yrs	1028	31	0.03	0.02	-	0.04		
	5-14 yrs	666	186	0.28	0.25	-	0.31		
	15-24	3480	1469	0.42	0.41	-	0.44		
	25-44	2357	1269	0.54	0.52	-	0.56		
	45-64	647	424	0.66	0.62	-	0.69		
	65-74	59	45	0.76	0.64	-	0.85		
	75+	49	37	0.76	0.62	-	0.85		
9658	1-4 yrs	64	<11	0.00	0.00	-	0.06	203.64	0.00
	5-14 yrs	15	<11	0.27	0.11	-	0.52		
	15-24	320	54	0.17	0.13	-	0.21		
	25-44	533	198	0.37	0.33	-	0.41		
	45-64	322	183	0.57	0.51	-	0.62		
	65-74	37	25	0.68	0.51	-	0.80		
	75+	78	57	0.73	0.62	-	0.82		

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ICD-9	Age Group	ED Attend	Adm* LoS>0	PA	95% CI			Chi sq	p
9661	1-4 yrs	28	<11	0.29	0.15	-	0.47	28.69	0.00
	15-24	54	16	0.30	0.19	-	0.43		
	25-44	281	172	0.61	0.55	-	0.67		
	45-64	217	131	0.60	0.54	-	0.67		
	65-74	39	21	0.54	0.39	-	0.68		
	75+	35	19	0.54	0.38	-	0.70		
9663	1-4 yrs	201	30	0.15	0.11	-	0.21	124.86	0.00
	5-14 yrs	146	38	0.26	0.20	-	0.34		
	15-24	518	183	0.35	0.31	-	0.40		
	25-44	895	434	0.48	0.45	-	0.52		
	45-64	356	195	0.55	0.50	-	0.60		
	65-74	20	<11	0.45	0.26	-	0.66		
	75+	30	13	0.43	0.27	-	0.61		
9670	1-4 yrs	13	<11	0.15	0.04	-	0.42	28.00	0.00
	15-24	43	21	0.49	0.35	-	0.63		
	25-44	261	134	0.51	0.45	-	0.57		
	45-64	179	127	0.71	0.64	-	0.77		
9678	1-4 yrs	109	<11	0.02	0.01	-	0.06	232.47	0.00
	5-14 yrs	68	<11	0.07	0.03	-	0.16		
	15-24	450	95	0.21	0.18	-	0.25		
	25-44	1075	361	0.34	0.31	-	0.36		
	45-64	606	295	0.49	0.45	-	0.53		
	65-74	91	64	0.70	0.60	-	0.79		
	75+	99	55	0.56	0.46	-	0.65		
9685	1-4 yrs	52	<11	0.00	0.00	-	0.07	139.96	0.00
	15-24	22	10	0.45	0.27	-	0.65		
	25-44	335	229	0.68	0.63	-	0.73		
	45-64	172	149	0.87	0.81	-	0.91		
9690	0	26	<11	0.08	0.02	-	0.24	788.11	0.00
	1-4 yrs	532	43	0.08	0.06	-	0.11		
	5-14 yrs	585	105	0.18	0.15	-	0.21		
	15-24	2633	784	0.30	0.28	-	0.32		
	25-44	3927	1809	0.46	0.45	-	0.48		
	45-64	1541	891	0.58	0.55	-	0.60		
	65-74	105	71	0.68	0.58	-	0.76		
	75+	91	57	0.63	0.52	-	0.72		
9691	15-24	13	<11	0.00	0.00	-	0.23		0.00
	25-44	73	42	0.58	0.46	-	0.68		
	45-64	11	<11	0.45	0.21	-	0.72		
9693	1-4 yrs	96	19	0.20	0.13	-	0.29	136.93	0.00
	5-14 yrs	114	20	0.18	0.12	-	0.26		
	15-24	515	209	0.41	0.36	-	0.45		
	25-44	1099	605	0.55	0.52	-	0.58		
	45-64	395	246	0.62	0.57	-	0.67		
	65-74	15	<11	0.60	0.36	-	0.80		
	75+	13	<11	0.54	0.29	-	0.77		
9694	0	12	<11	0.00	0.00	-	0.24	732.52	0.00
	1-4 yrs	344	29	0.08	0.06	-	0.12		
	5-14 yrs	248	32	0.13	0.09	-	0.18		
	15-24	2045	555	0.27	0.25	-	0.29		
	25-44	6052	2507	0.41	0.40	-	0.43		
	45-64	3204	1672	0.52	0.50	-	0.54		
	65-74	288	190	0.66	0.60	-	0.71		
	75+	240	172	0.72	0.66	-	0.77		
9697	1-4 yrs	154	11	0.07	0.04	-	0.12	149.56	0.00
	5-14 yrs	203	23	0.11	0.08	-	0.16		
	15-24	929	231	0.25	0.22	-	0.28		
	25-44	761	274	0.36	0.33	-	0.39		
	45-64	134	78	0.58	0.50	-	0.66		
9698	1-4 yrs	65	<11	0.09	0.04	-	0.19	123.78	0.00
	5-14 yrs	69	11	0.16	0.09	-	0.26		
	15-24	304	114	0.38	0.32	-	0.43		
	25-44	489	246	0.50	0.46	-	0.55		
	45-64	248	163	0.66	0.60	-	0.71		
	65-74	12	<11	0.83	0.55	-	0.95		
	75+	11	<11	0.82	0.52	-	0.95		

* Counts of admissions to the same hospital as the ED attendance.

ICD-9	Age Group	ED Attend	Adm* LoS>0	PA	95% CI			Chi sq	p
9708	1-4 yrs	14	<11	0.36	0.16	-	0.61	205.61	0.00
	5-14 yrs	13	<11	0.23	0.08	-	0.50		
	15-24	527	178	0.34	0.30	-	0.38		
	25-44	1758	961	0.55	0.52	-	0.57		
	45-64	649	485	0.75	0.71	-	0.78		
9721	1-4 yrs	20	<11	0.10	0.03	-	0.30	28.12	0.00
	45-64	37	20	0.54	0.38	-	0.69		
	65-74	35	25	0.71	0.55	-	0.84		
	75+	93	66	0.71	0.61	-	0.79		
9724	1-4 yrs	93	12	0.13	0.08	-	0.21	39.08	0.00
	25-44	50	29	0.58	0.44	-	0.71		
	45-64	84	39	0.46	0.36	-	0.57		
	65-74	24	<11	0.29	0.15	-	0.49		
	75+	57	27	0.47	0.35	-	0.60		
9726	0	19	<11	0.21	0.09	-	0.43	122.70	0.00
	1-4 yrs	402	76	0.19	0.15	-	0.23		
	5-14 yrs	144	19	0.13	0.09	-	0.20		
	15-24	118	52	0.44	0.35	-	0.53		
	25-44	302	134	0.44	0.39	-	0.50		
	45-64	331	157	0.47	0.42	-	0.53		
	65-74	82	28	0.34	0.25	-	0.45		
	75+	147	66	0.45	0.37	-	0.53		
9729	1-4 yrs	124	11	0.09	0.05	-	0.15	65.27	0.00
	5-14 yrs	16	<11	0.06	0.01	-	0.28		
	15-24	16	<11	0.50	0.28	-	0.72		
	25-44	85	43	0.51	0.40	-	0.61		
	45-64	109	53	0.49	0.39	-	0.58		
	65-74	29	<11	0.28	0.15	-	0.46		
	75+	57	24	0.42	0.30	-	0.55		
9744	1-4 yrs	42	<11	0.05	0.01	-	0.16		0.00
	45-64	32	21	0.66	0.48	-	0.80		
	65-74	11	<11	0.82	0.52	-	0.95		
	75+	47	29	0.62	0.47	-	0.74		
9752	1-4 yrs	62	<11	0.03	0.01	-	0.11		0.00
	15-24	153	53	0.35	0.28	-	0.42		
	25-44	338	162	0.48	0.43	-	0.53		
	45-64	110	64	0.58	0.49	-	0.67		
9802	1-4 yrs	114	<11	0.02	0.00	-	0.06	99.95	0.00
	15-24	12	<11	0.25	0.09	-	0.53		
	25-44	95	51	0.54	0.44	-	0.63		
	45-64	145	85	0.59	0.50	-	0.66		

* Counts of admissions to the same hospital as the ED attendance.

ICD-9	Age Group	ED Attend	Adm* LoS>0	PA	95% CI			Chi sq	p
9916	0	15	<11	0.27	0.11	-	0.52	128.30	0.00
	1-4 yrs	25	<11	0.16	0.06	-	0.35		
	5-14 yrs	48	<11	0.08	0.03	-	0.20		
	15-24	115	12	0.10	0.06	-	0.17		
	25-44	267	73	0.27	0.22	-	0.33		
	45-64	363	123	0.34	0.29	-	0.39		
	65-74	95	48	0.51	0.41	-	0.60		
	75+	278	160	0.58	0.52	-	0.63		
9920	15-24	30	<11	0.27	0.14	-	0.44	13.41	0.01
	25-44	93	35	0.38	0.28	-	0.48		
	45-64	61	30	0.49	0.37	-	0.61		
	65-74	15	<11	0.60	0.36	-	0.80		
	75+	32	21	0.66	0.48	-	0.80		
						-			
9941	0	56	15	0.27	0.17	-	0.40	47.93	0.00
	1-4 yrs	340	93	0.27	0.23	-	0.32		
	5-14 yrs	175	49	0.28	0.22	-	0.35		
	15-24	99	37	0.37	0.28	-	0.47		
	25-44	80	34	0.43	0.32	-	0.53		
	45-64	64	40	0.63	0.50	-	0.73		
	65-74	12	<11	0.33	0.14	-	0.61		
	75+	13	10	0.77	0.50	-	0.92		
9955	0	221	155	0.70	0.64	-	0.76	892.84	0.00
	1-4 yrs	690	74	0.11	0.09	-	0.13		
	5-14 yrs	1151	17	0.01	0.01	-	0.02		
	15-24	166	<11	0.02	0.01	-	0.06		

* Counts of admissions to the same hospital as the ED attendance.

Table 28: USA2 - Variation in diagnosis-specific probability of admission - by cause

ICD-9	Cause^	ED Attend	Adm LoS>0*	PA	95% CI			Chi sq	p
8000	Falls	523	124	0.24	0.20	-	0.28	19.74	0.00
	MVTC	15	11	0.73	0.48	-	0.89		
	Other/unspecified	55	14	0.25	0.16	-	0.38		
	Struck by/against	48	15	0.31	0.20	-	0.45		
8002	Falls	166	109	0.66	0.58	-	0.72	11.56	0.00
	MVTC	45	41	0.91	0.79	-	0.96		
8010	Falls	785	316	0.40	0.37	-	0.44	290.46	0.00
	MVTC	553	360	0.65	0.61	-	0.69		
	Other/unspecified	315	102	0.32	0.27	-	0.38		
	Struck by/against	721	135	0.19	0.16	-	0.22		
	nr	43	11	0.26	0.15	-	0.40		
8014	Falls	11	<11	0.45	0.21	-	0.72	6.33	0.01
	MVTC	13	12	0.92	0.67	-	0.99		
8022	Falls	353	70	0.20	0.16	-	0.24	110.68	0.00
	MVTC	328	160	0.49	0.43	-	0.54		
	Other/unspecified	715	138	0.19	0.17	-	0.22		
	Struck by/against	2154	573	0.27	0.25	-	0.29		
	nr	125	14	0.11	0.07	-	0.18		
8023	MVTC	31	30	0.97	0.84	-	0.99	13.77	0.00
	Other/unspecified	13	12	0.92	0.67	-	0.99		
	Struck by/against	191	130	0.68	0.61	-	0.74		
8024	Falls	589	215	0.37	0.33	-	0.40	238.85	0.00
	MVTC	449	259	0.58	0.53	-	0.62		
	Other/unspecified	532	142	0.27	0.23	-	0.31		
	Struck by/against	1106	209	0.19	0.17	-	0.21		
	nr	127	54	0.43	0.34	-	0.51		
8032	Falls	14	<11	0.36	0.16	-	0.61	9.96	0.00
	MVTC	14	13	0.93	0.69	-	0.99		
8050	Falls	1309	756	0.58	0.55	-	0.60	36.66	0.00
	MVTC	2109	1272	0.60	0.58	-	0.62		
	nr	83	57	0.69	0.58	-	0.78		
8052	Falls	3815	1590	0.42	0.40	-	0.43	147.48	0.00
	MVTC	1406	667	0.47	0.45	-	0.50		
	Other/unspecified	1581	434	0.27	0.25	-	0.30		
	Struck by/against	133	38	0.29	0.22	-	0.37		
	nr	666	288	0.43	0.40	-	0.47		
8054	Falls	6366	2862	0.45	0.44	-	0.46	113.42	0.00
	MVTC	1934	925	0.48	0.46	-	0.50		
	nr	856	434	0.51	0.47	-	0.54		
8056	Falls	3266	414	0.13	0.12	-	0.14	431.54	0.00
	MVTC	271	162	0.60	0.54	-	0.65		
	Other/unspecified	383	105	0.27	0.23	-	0.32		
	Struck by/against	78	<11	0.04	0.01	-	0.11		
	nr	190	54	0.28	0.22	-	0.35		
8062	Falls	37	18	0.49	0.33	-	0.64	4.02	0.045
	MVTC	84	57	0.68	0.57	-	0.77		
8074	Falls	72	23	0.32	0.22	-	0.43	30.48	0
	MVTC	95	71	0.75	0.65	-	0.82		
8080	Falls	1250	924	0.74	0.71	-	0.76	103.46	0.00
	MVTC	1285	1048	0.82	0.79	-	0.84		
	Other/unspecified	281	153	0.54	0.49	-	0.60		
	nr	126	93	0.74	0.66	-	0.81		

* Counts of admissions to the same hospital as the ED attendance.

^ nr = Not recorded.

ICD-9	Cause^	ED Attend	Adm LoS>0*	PA	95% CI			Chi sq	p
8082	Falls	5905	4036	0.68	0.67	-	0.70	101.93	0.00
	MVTC	1041	771	0.74	0.71	-	0.77		
	Other/unspecified	687	358	0.52	0.48	-	0.56		
	Struck by/against	68	37	0.54	0.43	-	0.66		
	nr	449	324	0.72	0.68	-	0.76		
8084	Falls	509	291	0.57	0.53	-	0.61	137.14	0.00
	MVTC	177	137	0.77	0.71	-	0.83		
	nr	13	11	0.85	0.58	-	0.96		
8122	Falls	4341	781	0.18	0.17	-	0.19	344.20	0.00
	MVTC	671	305	0.45	0.42	-	0.49		
	Other/unspecified	966	127	0.13	0.11	-	0.15		
	Struck by/against	186	<11	0.04	0.02	-	0.08		
	nr	317	83	0.26	0.22	-	0.31		
8132	Falls	3172	358	0.11	0.10	-	0.12	731.84	0.00
	MVTC	503	297	0.59	0.55	-	0.63		
	Other/unspecified	820	135	0.16	0.14	-	0.19		
	Struck by/against	532	52	0.10	0.08	-	0.13		
	nr	111	<11	0.08	0.04	-	0.15		
8139	Falls	55	26	0.47	0.35	-	0.60	3.71	0.05
	Other/unspecified	13	<11	0.77	0.50	-	0.92		
8200	Falls	12314	11475	0.93	0.93	-	0.94	47.29	0.00
	MVTC	174	153	0.88	0.82	-	0.92		
	Other/unspecified	557	481	0.86	0.83	-	0.89		
	Struck by/against	15	12	0.80	0.55	-	0.93		
	nr	940	867	0.92	0.90	-	0.94		
8202	Falls	22886	20953	0.92	0.91	-	0.92	128.81	0.00
	MVTC	530	491	0.93	0.90	-	0.95		
	Other/unspecified	818	662	0.81	0.78	-	0.83		
	Struck by/against	84	66	0.79	0.69	-	0.86		
	nr	1837	1674	0.91	0.90	-	0.92		
8208	Falls	10774	8677	0.81	0.80	-	0.81	141.24	0.00
	MVTC	215	140	0.65	0.59	-	0.71		
	Other/unspecified	694	441	0.64	0.60	-	0.67		
	Struck by/against	18	15	0.83	0.61	-	0.94		
	nr	1047	794	0.76	0.73	-	0.78		
8210	Falls	3191	2178	0.68	0.67	-	0.70	349.15	0.00
	MVTC	2020	1753	0.87	0.85	-	0.88		
	Other/unspecified	1173	688	0.59	0.56	-	0.61		
	Struck by/against	308	207	0.67	0.62	-	0.72		
	nr	424	308	0.73	0.68	-	0.77		
8212	Falls	3056	2219	0.73	0.71	-	0.74	329.47	0.00
	MVTC	328	265	0.81	0.76	-	0.85		
	nr	211	181	0.86	0.80	-	0.90		
8221	MVTC	171	146	0.85	0.79	-	0.90	21.45	0.00
	Other/unspecified	12	11	0.92	0.65	-	0.99		
8230	Falls	5522	2191	0.40	0.38	-	0.41	478.64	0.00
	MVTC	1698	965	0.57	0.54	-	0.59		
	Other/unspecified	2099	522	0.25	0.23	-	0.27		
	Struck by/against	724	170	0.23	0.21	-	0.27		
	nr	348	168	0.48	0.43	-	0.54		
8232	Falls	2917	1402	0.48	0.46	-	0.50	386.70	0.00
	MVTC	753	586	0.78	0.75	-	0.81		
	nr	144	72	0.50	0.42	-	0.58		
8238	Falls	4313	724	0.17	0.16	-	0.18	571.00	0.00
	MVTC	792	344	0.43	0.40	-	0.47		
	Other/unspecified	2429	191	0.08	0.07	-	0.09		
	Struck by/against	656	71	0.11	0.09	-	0.13		
	nr	512	67	0.13	0.10	-	0.16		

* Counts of admissions to the same hospital as the ED attendance.

^ nr = Not recorded.

ICD-9	Cause^	ED Attend	Adm LoS>0*	PA	95% CI			Chi sq	p
8241	Falls	22	16	0.73	0.52	-	0.87		0.01
	MVTC	61	58	0.95	0.87	-	0.98		
	Other/unspecified	18	14	0.78	0.55	-	0.91		
8244	Falls	5061	3430	0.68	0.66	-	0.69	344.48	0.00
	MVTC	606	475	0.78	0.75	-	0.81		
	Other/unspecified	1457	654	0.45	0.42	-	0.47		
	nr	380	257	0.68	0.63	-	0.72		
8246	Falls	4358	3506	0.80	0.79	-	0.82	141.11	0.00
	MVTC	187	154	0.82	0.76	-	0.87		
	Other/unspecified	849	530	0.62	0.59	-	0.66		
	Struck by/against	86	57	0.66	0.56	-	0.75		
	nr	304	233	0.77	0.72	-	0.81		
8247	Falls	145	143	0.99	0.95	-	1.00	8.23	0.00
	MVTC	37	33	0.89	0.75	-	0.96		
8249	Falls	290	242	0.83	0.79	-	0.87	14.08	0.00
	MVTC	276	239	0.87	0.82	-	0.90		
	Other/unspecified	156	114	0.73	0.66	-	0.79		
	Struck by/against	14	13	0.93	0.69	-	0.99		
8253	Cut/pierce	49	21	0.43	0.30	-	0.57	63.60	0.00
	Firearm-related	39	14	0.36	0.23	-	0.52		
	MVTC	75	72	0.96	0.89	-	0.99		
	Other/unspecified	67	52	0.78	0.66	-	0.86		
	Struck by/against	32	19	0.59	0.42	-	0.74		
8350	Falls	109	28	0.26	0.18	-	0.35	181.98	0.00
	MVTC	170	127	0.75	0.68	-	0.81		
	Other/unspecified	330	50	0.15	0.12	-	0.19		
	nr	41	<11	0.10	0.04	-	0.23		
8392	Falls	63	35	0.56	0.43	-	0.67	10.70	0.01
	MVTC	11	6	0.55	0.28	-	0.79		
	Other/unspecified	73	21	0.29	0.20	-	0.40		
8518	Falls	1042	793	0.76	0.73	-	0.79	75.45	0.00
	MVTC	656	537	0.82	0.79	-	0.85		
	Struck by/against	115	79	0.69	0.60	-	0.76		
	nr	24	20	0.83	0.64	-	0.93		
8520	Falls	1040	793	0.76	0.74	-	0.79	25.26	0.00
	MVTC	737	630	0.85	0.83	-	0.88		
	Other/unspecified	37	26	0.70	0.54	-	0.83		
	Struck by/against	40	33	0.83	0.68	-	0.91		
	nr	13	<11	0.77	0.50	-	0.92		
8522	Falls	3056	2399	0.79	0.77	-	0.80	18.13	0.00
	MVTC	573	466	0.81	0.78	-	0.84		
	Other/unspecified	138	92	0.67	0.58	-	0.74		
	Struck by/against	108	76	0.70	0.61	-	0.78		
	nr	280	202	0.72	0.67	-	0.77		
8530	Falls	862	562	0.65	0.62	-	0.68	19.56	0.00
	MVTC	287	218	0.76	0.71	-	0.81		
	nr	15	11	0.73	0.48	-	0.89		
8600	cut/pierce	51	47	0.92	0.81	-	0.97	14.34	0.01
	Falls	960	833	0.87	0.84	-	0.89		
	MVTC	1315	1158	0.88	0.86	-	0.90		
	Other/unspecified	468	389	0.83	0.79	-	0.86		
	Struck by/against	234	190	0.81	0.76	-	0.86		
	nr	145	113	0.78	0.71	-	0.84		
8603	Cut/pierce	34	29	0.85	0.70	-	0.94		0.02
	Firearm-related	41	41	1.00	0.91	-	1.00		
8612	Falls	132	95	0.72	0.64	-	0.79	22.77	0.00
	MVTC	967	752	0.78	0.75	-	0.80		
	Other/unspecified	103	71	0.69	0.59	-	0.77		
	nr	45	31	0.69	0.54	-	0.80		
8622	Falls	13	12	0.92	0.67	-	0.99		0.00
	Other/unspecified	65	21	0.32	0.22	-	0.44		
8640	Falls	12	<11	0.75	0.47	-	0.91	45.87	0.00
	MVTC	624	529	0.85	0.82	-	0.87		
	Other/unspecified	122	71	0.58	0.49	-	0.67		

* Counts of admissions to the same hospital as the ED attendance.

ICD-9	Cause^	ED Attend	Adm LoS>0*	PA	95% CI			Chi sq	p
8650	Falls	474	394	0.83	0.79	-	0.86	58.93	0.00
	MVTC	1264	1140	0.90	0.88	-	0.92		
	Other/unspecified	333	254	0.76	0.71	-	0.81		
	Struck by/against	175	134	0.77	0.70	-	0.82		
	nr	14	14	1.00	0.78	-	1.00		
8660	Falls	234	108	0.46	0.40	-	0.53	34.26	0.00
	MVTC	232	146	0.63	0.57	-	0.69		
	Other/unspecified	82	38	0.46	0.36	-	0.57		
	Struck by/against	124	39	0.31	0.24	-	0.40		
8670	MVTC	29	25	0.86	0.69	-	0.95	18.53	0.00
	nr	63	37	0.59	0.46	-	0.70		
8710	Cut/pierce	14	<11	0.43	0.21	-	0.67	15.73	0.00
	Falls	18	12	0.67	0.44	-	0.84		
	Other/unspecified	52	16	0.31	0.20	-	0.44		
	Struck by/against	97	21	0.22	0.15	-	0.31		
8822	Cut/pierce	711	54	0.08	0.06	-	0.10	144.41	0.00
	Falls	30	<11	0.27	0.14	-	0.44		
	MVTC	39	26	0.67	0.51	-	0.79		
	Other/unspecified	124	30	0.24	0.18	-	0.32		
	Struck by/against	42	<11	0.02	0.00	-	0.12		
	nr	16	<11	0.13	0.03	-	0.36		
8911	Cut/pierce	1340	109	0.08	0.07	-	0.10	317.81	0.00
	Falls	540	76	0.14	0.11	-	0.17		
	Firearm-related	187	58	0.31	0.25	-	0.38		
	MVTC	150	81	0.54	0.46	-	0.62		
	Other/unspecified	1187	145	0.12	0.10	-	0.14		
	Struck by/against	475	36	0.08	0.06	-	0.10		
	nr	348	28	0.08	0.06	-	0.11		
8912	Falls	26	19	0.73	0.54	-	0.86	17.98	0.00
	MVTC	36	29	0.81	0.65	-	0.90		
9588	Falls	53	34	0.64	0.51	-	0.76	23.95	0.00
	MVTC	13	<11	0.69	0.42	-	0.87		
	Other/unspecified	140	70	0.50	0.42	-	0.58		

* Counts of admissions to the same hospital as the ED attendance.

^ nr = Not recorded.

Table 29: USA2 - Variation in diagnosis-specific probability of admission - by intent

ICD-9	Intent^	ED Attend	Adm LoS>0*	PA	95% CI			Chi sq	p
8010	nr	43	11	0.26	0.15	-	0.40	72.36	0.00
	Assault	509	113	0.22	0.19	-	0.26		
	Unintentional	1865	800	0.43	0.41	-	0.45		
8023	Assault	204	142	0.70	0.63	-	0.76		0.00
	Unintentional	31	30	0.97	0.84	-	0.99		
8054	nr	856	434	0.51	0.47	-	0.54	5.55	0.02
	Assault	22	4	0.18	0.07	-	0.39		
	Unintentional	10606	4568	0.43	0.42	-	0.44		
8123	Assault	14	9	0.64	0.39		0.84		0.01
	Unintentional	26	25	0.96	0.81		0.99		
8230	nr	348	168	0.48	0.43	-	0.54	6.96	0.01
	Assault	33	20	0.61	0.44	-	0.75		
	Unintentional	10010	3828	0.38	0.37	-	0.39		
8660	Assault	11	1	0.09	0.02	-	0.38		0.01
	Unintentional	661	330	0.50	0.46	-	0.54		
8793	nr	12	1	0.08	0.01	-	0.35	41.53	0.00
	Assault	12	7	0.58	0.32	-	0.81		
	Self-harm	17	11	0.65	0.41	-	0.83		
	Unintentional	137	14	0.10	0.06	-	0.16		
8901	nr	51	11	0.22	0.12	-	0.35	112.06	0.00
	Assault	112	60	0.54	0.44	-	0.63		
	Other/undet.	14	3	0.21	0.08	-	0.48		
	Unintentional	764	96	0.13	0.10	-	0.15		
9623	nr	105	39	0.37	0.29	-	0.47	295.04	0.00
	Other/undet.	92	28	0.30	0.22	-	0.40		
	Self-harm	424	303	0.71	0.67	-	0.76		
	Unintentional	1917	527	0.27	0.26	-	0.30		
9642	nr	25	14	0.56	0.37	-	0.73	13.75	0.00
	Other/undet.	26	17	0.65	0.46	-	0.81		
	Self-harm	62	49	0.79	0.67	-	0.87		
	Unintentional	465	255	0.55	0.50	-	0.59		
9650	nr	302	128	0.42	0.37	-	0.48	171.72	0.00
	Other/undet.	2327	569	0.24	0.23	-	0.26		
	Self-harm	2477	1049	0.42	0.40	-	0.44		
	Unintentional	5321	1832	0.34	0.33	-	0.36		
9654	nr	201	84	0.42	0.35	-	0.49	685.06	0.00
	Other/undet.	631	204	0.32	0.29	-	0.36		
	Self-harm	5216	2711	0.52	0.51	-	0.53		
	Unintentional	2313	470	0.20	0.19	-	0.22		

* Counts of admissions to the same hospital as the ED attendance.

ICD-9	Intent^	ED Attend	Adm LoS>0*	PA	95% CI			Chi sq	p
9663	nr	34	16	0.47	0.31	-	0.63	89.71	0.00
	Other/undet.	167	57	0.34	0.27	-	0.42		
	Self-harm	1168	592	0.51	0.48	-	0.54		
	Unintentional	797	237	0.30	0.27	-	0.33		
9670	Other/undet.	87	46	0.53	0.42	-	0.63	7.46	0.02
	Self-harm	257	162	0.63	0.57	-	0.69		
	Unintentional	152	76	0.50	0.42	-	0.58		
9678	nr	39	15	0.38	0.25	-	0.54	71.19	0.00
	Other/undet.	249	59	0.24	0.19	-	0.29		
	Self-harm	1327	564	0.43	0.40	-	0.45		
	Unintentional	883	239	0.27	0.24	-	0.30		
9685	nr	100	58	0.58	0.48	-	0.67	8.92	0.01
	Other/undet.	85	68	0.80	0.70	-	0.87		
	Self-harm	47	36	0.77	0.63	-	0.86		
	Unintentional	349	226	0.65	0.60	-	0.70		
9690	nr	221	102	0.46	0.40	-	0.53	360.09	0.00
	Other/undet.	800	222	0.28	0.25	-	0.31		
	Self-harm	6307	2917	0.46	0.45	-	0.47		
	Unintentional	2112	521	0.25	0.23	-	0.27		
9693	nr	43	26	0.60	0.46	-	0.74	94.45	0.00
	Other/undet.	189	67	0.35	0.29	-	0.42		
	Self-harm	1488	842	0.57	0.54	-	0.59		
	Unintentional	527	180	0.34	0.30	-	0.38		
9694	nr	338	162	0.48	0.43	-	0.53	221.96	0.00
	Other/undet.	1696	512	0.30	0.28	-	0.32		
	Self-harm	7356	3423	0.47	0.45	-	0.48		
	Unintentional	3043	1060	0.35	0.33	-	0.37		
9698	Other/undet.	101	41	0.41	0.32	-	0.50	37.55	0.00
	Self-harm	693	375	0.54	0.50	-	0.58		
	Unintentional	404	143	0.35	0.31	-	0.40		
9708	nr	177	96	0.54	0.47	-	0.61	40.21	0.00
	Other/undet.	697	336	0.48	0.45	-	0.52		
	Self-harm	564	277	0.49	0.45	-	0.53		
	Unintentional	1523	923	0.61	0.58	-	0.63		
9711	Other/undet.	12	3	0.25	0.09	-	0.53	24.58	0.00
	Self-harm	115	57	0.50	0.41	-	0.59		
	Unintentional	86	14	0.16	0.10	-	0.25		
9724	Self-harm	86	53	0.62	0.51	-	0.71	31.01	0.00
	Unintentional	222	61	0.27	0.22	-	0.34		
9726	Other/undet.	39	13	0.33	0.21	-	0.49	111.07	0.00
	Self-harm	459	249	0.54	0.50	-	0.59		
	Unintentional	1047	274	0.26	0.24	-	0.29		
9729	Self-harm	138	78	0.57	0.48	-	0.65	45.90	0.00
	Unintentional	298	70	0.23	0.19	-	0.29		
9752	Other/undet.	31	11	0.35	0.21	-	0.53	36.67	0.00
	Self-harm	434	220	0.51	0.46	-	0.55		
	Unintentional	198	50	0.25	0.20	-	0.32		
9802	Other/undet.	55	32	0.58	0.45	-	0.70	27.27	0.00
	Self-harm	104	53	0.51	0.41	-	0.60		
	Unintentional	207	56	0.27	0.21	-	0.33		
9828	Self-harm	143	103	0.72	0.64	-	0.79	212.62	0.00
	Unintentional	344	27	0.08	0.05	-	0.11		

* Counts of admissions to the same hospital as the ED attendance.
^ nr = Not recorded.

8. Appendix C: International Comparisons Proposal

Background

The proposed research seeks to answer the question: How well do New Zealand (NZ)'s serious injury rates and trends compare with other developed countries?

Comparison of a country's performance on a variety of outcomes is a powerful catalyst for changes to policy and practice. Such comparisons are, however, difficult to do well, and are often very contentious. A recent example that received much debate is NZ's child death rates from injuries, detailed in the 2007 Innocenti Report on Child Health[i]. Based on the OECD league tables for child (18 years and under) injury death rates, NZ was ranked lowest. Major threats to the validity of indicators used in international comparisons mean that, until now, it has been impossible to reach an informed view of NZ's injury control performance relative to comparable countries. As a result, resources aimed at improving NZ's performance may be inappropriately targeted.

This two year project seeks to provide more valid international comparisons of injury rates and trends. There has, as yet, been no valid comparison of serious injury rates and trends between countries. Valid comparisons of trends in serious injury rates is now possible using methods developed in some of our recently completed research.Valid international comparisons depend on good quality data, consistent definitions and methods, that are consistently applied. Here, we are proposing that such international comparisons be carried out for fatal and serious non-fatal injury rates and trends. While comparing fatal injury rates may appear less problematic than comparisons of non-fatal injury rates, such comparisons can still produce results that are unreliable or difficult to interpret. The way an injury-related death is defined, the way it is recorded on a death certificate, and the sources of information used to collate the statistics may all differ between countries, and so affect the validity of the comparisons made.[ii] These threats to validity are less for comparisons of trends, provided consistent methods are used within each country across the time period considered.

The proposed use of combined fatal and serious non-fatal injury incidence rates will result in increased precision for comparisons between countries, since the incidence will be higher than for comparisons conducted for fatal injuries alone. In addition, intelligent case selection of serious non-fatal injury cases will mitigate the effects of extraneous factors such as variations in the provision of health services (e.g. number of hospital beds per 1000 population). [2]

Hospital admission / discharge data can be used for international comparisons of the non-fatal component of serious injury since (a) these provide the most comprehensive and reliable health service data in NZ, and (b) there are comparable sources of these data in other countries (eg. Australia, Canada, England & Wales).

For the serious non-fatal component we propose comparisons based solely on a selected group of injury diagnoses, which have been shown to have a high probability of hospital admission consistently across a selection of developed countries.[iii] Basing the comparison on these injuries will minimize the effect of extraneous factors on our comparisons. The selected diagnoses include traumatic brain injury (TBI), head and neck fracture with spinal cord involvement (eg. paraplegia, quadriplegia), internal organ injury (intra-abdominal and intra-thoracic), and fractured femur. These injuries are of high cost to the Accident Compensation Corporation (ACC), and subsequently a high cost to NZ, as they result in long term disability.

If a comparator country shows reductions in serious injury rates, compared with other countries including NZ, this would stimulate an investigation of what is causing those reductions. If the evidence suggests that it is due to a successful intervention, this would provide the opportunity to investigate whether that intervention can be introduced successfully in NZ. The stimulation resulting from this proposed work of the identification of effective interventions to reduce the likelihood of the injuries listed has the potential to reduce the impact of serious, disabling and life-threatening injuries on the NZ population.

We propose the international comparisons be restricted to countries from the developed world, as the quality of hospital data is generally better. Furthermore, the project to estimate probabilities of admission, from which the diagnoses for the operational definition were identified, was carried out solely in developed countries.

Study Design and Methods

Identify and obtain agreement from collaborating countries.
We have found, from previous projects, that significant liaison is necessary to identify, and get agreement from, potential collaborating countries. Key to the process is the identification of a contact who can be relied upon to reply promptly to correspondence.

The International Collaborative Effort (ICE) on Injury Statistics (http://www.cdc.gov/nchs/injury.htm) is pursuing an agenda to develop injury morbidity indicators for international comparisons. The upcoming business meeting in September 2010 includes time to develop ideas, and draft specifications, for such indicators. This follows up work to develop fatal injury indicators for international comparison. Existing contacts through the ICE (of which the research team are members) and the Global Burden of Injuries project (http://www.globalburdenofinjuries.org/) will be key to the identification of collaborators. These contacts have proven effective for a recent international collaboration administered out of the IPRU. That project aimed to provide diagnosis-specific probability of admission estimates across 6 developed countries. Where possible, we will use some of the same collaborators for the proposed research. We are aiming to collaborate with 10 countries for these international comparisons.

Agreement on the protocol for data extraction.
A protocol will be developed. Collaborators will be invited to comment on, and to propose revisions to, the protocol. Collaborators responses will be accommodated where possible, with the aim of achieving complete agreement between participating countries around the methods used for generating rates and trends. The agreed protocol will make optimal and consistent use of the data across all participating countries. It is anticipated that it will include details regarding the following elements:

- population of study;
- sources of data;
- methods for data extraction;
- methods for dealing with readmissions;
- time period under investigation:
- operational definition of a case of death or serious non-fatal injury;
- source of appropriate denominator data for rates;
- methods for standardization.

We will seek to obtain the longest, and most recent, time period available to investigate trends in injury incidence over time within each participating country. This will be dictated by the version(s) of the International Classification of Diseases coding scheme that have been used within each country over that time period.

The operational definition of injury will include the following elements: version of the World Health Organisation coding scheme (International Classification of Diseases), code ranges, use of principal and additional diagnoses / multiple cause of death data, and use of cause of injury code to define injury 'priority areas'. It is anticipated that international comparisons will be carried out for 'all injury' and for selected priority areas. The priority areas will be agreed with collaborators, but we will aim to include the New Zealand Injury Prevention Strategy (NZIPS) priority areas of falls, motor vehicle traffic crashes, assault, and self-harm.

Develop an instrument for collecting information on source data sets
Information on the source data will be collected. For example, for deaths, the processes by which underlying cause of death and secondary causes are captured and recorded on the death certificate will be obtained. We will also seek information on the process of coding diagnostic data used by the country (diagnostic data is critical for defining a cases, and so knowledge is crucial of who codes these data, their level of training, the source data on which coding is based, and what automatic systems / computer algorithms (if any) are used, the reliability of coding, and confounders. For example, in respect of confounders, information will be gathered on known

service-related factors that affect the likelihood of admission, financial incentives that can affect the way in which data is coded, and the public versus private hospital mix in the treatment of injury.

Collect data and macro-information
The request for the data and associated information will be sent to collaborating countries and we will subsequently liaise with these countries regarding the provision of these data / information. It is our experience that some countries will respond almost immediately, but for others periodic reminders have been required. It is proposed to include a monetary incentive for provision of all relevant data and information.

Check data
Checking the data supplied and liaison with the collaborating countries will be essential to ensure that the data are as similar in their definitions and the methods of extraction as they can be, and that they are being provided at their optimum level of specificity.

Analysis
The data will be presented as age-standardised rates and trends. We will seek data at a sufficient level to permit analysis broken down by sex, broad age groups, and circumstance of injury. Trends will be presented both on an absolute scale, but also relative to an agreed baseline.

Gantt Chart

	Year 1												Year 2											
	Month												Month											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1																								
2																								
3																								
4																								
5																								
6																								
7																								
8																								
9																								

Milestones:

1. Identify and obtain agreement from collaborating countries.
2. Develop the draft protocol for for data extraction / develop the instrument for collecting information on source data sets
3. Agree the protocol with collaborating countries
4. Collect data and information on datasets
5. Check data and re-request if necessary
6. Analyse
7. Write report
8. Review by peer reviewers
9. Finalise report

Expected Outcomes

The proposed research will provide, for the first time, an opportunity for New Zealand (NZ) to compare its safety record and injury prevention performance with similar countries. NZ has consistently been identified as being a very poor performer, relative to other OECD countries, in respect of injury control. Injury is the leading

cause of death for the NZ population aged 1 to 34 years[iv]. New Zealand is ranked lowest (ie. worst) in the OECD countries for injury death rates for children aged 18 years and under[1].

Undertaking the proposed project will also ensure that the Injury Prevention Research Unit, of which the research team are staff members, will continue to work at the forefront of the measurement of the burden of injury on the international stage. Two of the research team (CC & JL) are long term members of the International Collaborative Effort (ICE) on Injury Statistics. JL is a founder member; CC has been a member for over 10 years. International comparison of injury incidence rates has been a goal for ICE. This interest from the international community will facilitate the success of the project; similarly, the project will facilitate the achievement of ICE's goal for international comparisons.

We intend to publish the results of the project in academic journals and present at international conferences. It is also envisaged that the results of this research will be of interest to the New Zealand Injury Prevention Strategy Secretariat, providing evidence of the relative success of New Zealand's injury prevention efforts.

Due to the international nature of the proposed project, we expect it to have a significant impact on PBRF scores, especially for the relatively junior members of the research team (Dr Pauline Gulliver and Ms Gabrielle Davie). The project will contribute to 'Peer Esteem' and 'Contributing to Research Environment' by allowing these team members to be contributors to a significant international research project, obtaining internal research grants, and being part of a team brokering international research activities.

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[i] UNICEF Innocenti Report Card 7, Child poverty in perspective: An overview of child well-being in rich countries. Unicef Innocenti Research Centre, Florence. 2007.

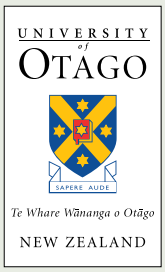
[ii] Connor J, Langley J, Cryer C. International comparisons of injury. A compilation of reports t the New Zealand Injury Prevention Strategy Secretariat. Dunedin: Injury Prevention Research Unit, University of Otago, Occasional Report OR 063, September 2007.

[iii] Langley J, et al. Progress report for the 2007/2010 contract to Accident Compensation Corporation for the period March – June 2009. Dunedin: Injury Prevention Research Unit, June 2009.

[iv] Gulliver, P. J. Simpson, J. C. IPRU Fact Sheet Number 38: Injury as a leading cause of death and hospitalisation. University of Otago, April 2007.

Empirical validation of the New Zealand Injury Prevention Strategy indicators:

The identification of ICD diagnoses associated with a high probability of inpatient hospital admission



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