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**Best Practices in Prevention of Skiing Accidents in Europe:
The New Challenge
(Be.Pra.S.A.)**

Data analysis report

Grant Agreement n. 2004132

European Commission
Health and Consumer Protection Directorate General
Directorate C – Public Health and Risk Assessment



GOALS OF THE DATA REPORT

THE GOALS OF THIS DATA REPORT ARE:

- TO COMPLY WITH THE CONTRACTUAL REQUIREMENTS AGREED AMONG PARTIES (REF. GRANT AGREEMENT N. 2004132)

- TO PROVIDE WITH DATA EVIDENCE ON PREVENTION DATA COLLECTION AND ANALISYS IN ORDER TO ESTABLISH GOOD PRACTICES OF PREVENTION OF SKIING AND SNOWBOARDING INJURIES



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- ◆ *Institute of Public Health of the Republic of Slovenia*
- ◆ *Ski resorts Kranjska Gora, Koblja and Celjska koča*
- ◆ *Ministry of Transport of the Republic of Slovenia*
- ◆ *Prof. Gianni Mazzonetto, IUAV University of Venezia,*
- ◆ *Centro Studi della Montagna*



Table of content:

INTRODUCTION - 5 -

Context	- 5 -
The needs: data on injury and prevention measures	- 5 -
Target groups	- 6 -

METHODOLOGY

Skiing/snowboarding injuries research	- 7 -
Data on prevention measures	- 8 -

MAIN RESULTS - 9 -

Data on skiing/snowboarding injuries	- 9 -
a. Collection of existing data and researches	- 9 -
b. Identification of a Minimum Data Set (MDS)	- 15 -
c. Implementation of a pilot Surveillance System in Italy	- 22 -
1. THE SIMON SYSTEM: SYSTEM ARCHITECTURE	- 22 -
2. THE SIMON SYSTEM: AN INFORMATION TECHNOLOGY PLATFORM	- 23 -
3. EXPERIMENTING THE SYSTEM	- 24 -
4. BEPRASA – SIMON FIRST DATA ANALYSIS	- 27 -
Data on prevention measures	- 27 -
Methodology	- 28 -
Collection of pre-existing questionnaires on injury prevention measures adopted by ski resorts	- 29 -
Creation of a new, exhaustive questionnaire	- 29 -
Submission and collection of 3 questionnaires per each partner countries	- 31 -
Questionnaire validation and recommendations identification	- 32 -



INTRODUCTION

Context

Be.Pra.S.A. project aims to decrease the number, the morbidity and the mortality of skiing and snowboarding accidents providing the Community with recommendations on how to improve and harmonize prevention measures. In order to achieve its goal a substantial part is played by the analysis of data both on injuries and on prevention measures. Only with such analysis it is possible to identify information gaps and problems and depict a more precise picture of what is the real situation, thus of the starting point on which produce recommendations on how to improve the safety conditions.

The needs: data on injury and prevention measures

Epidemiological research on traumas related to skiing/snowboarding activities has developed very slowly, often because the acquiring of medical data on accidents is quite difficult, as is the precise quantification of the effective exposure to risk of the individuals involved.

Consequently, in order to improve safety and the knowledge of the phenomenon in terms of a reduction of the number and seriousness of accidents, it is fundamental to acquire knowledge about the accident rate, define and measure the ‘injury’ phenomenon and try to analyse the relations of cause and effect present in the injury dynamics. This will allow to define the type and priority of intervention and to achieve a realistic quantification and evaluation of the results obtained through such interventions.

Epidemiological surveillance usually does not allow to collect information based on an overview of the ski resort organization, neither details on the management of safety at the facility or on the relative procedures and safety standards adopted.

These type of information would be useful to insert the analysis of skiing and snowboarding injuries in a wider picture including the injury prevention and safety promotion measures and initiatives.



Target groups

This document is the output of a research finalized to provide with a basis of data evidence the final project recommendations. It can be of interest for a number of stakeholders which can benefit from the new adopted approach and the updated information provided. Moreover the validation of 2 new questionnaires obtained thanks to the present study allows for future wider studies in the sectors of skiing/snowboarding injuries and injury prevention measures adopted by ski resort

Among the groups which should more benefit of this work can be listed: policy makers, ski resort managers, winter sports players, researches institutes.



METHODOLOGY

The two different fields of research of the project, the skiing/snowboarding injuries and the skiing/snowboarding injury prevention measures adopted by ski resorts, have been both dealt with great attention trying to make the most of the past experiences.

Skiing/snowboarding injuries research

The collection of existing or new data was implemented following three different directions:

- a. Collection of existing data and research
- b. Identification of a minimum data set for future data collection and test of its submission feasibility
- c. Implementation of a pilot surveillance system in Italy

To carry out these activities the following methodology was adopted:

- a. Collection of existing data and research:
 - Literature review of the existing documents at national level (for Italy, Austria, Slovenia and France)
 - Collection of data produced by National surveillance systems, when existing, or by the surveillance system assuring a better geographical coverage among the existing ones (Italy, Austria, Slovenia and France).
 - Pilot Analysis of the data collected:
 - a. time series analysis for single country
 - b. cross section analysis
- b. Identification of a Minimum Data Set (MDS)
 - Collection of injury questionnaires used in Europe
 - Identification of a Minimum Data Set (MDS) to submit to selected Ski resorts
 - Selection of 3 ski resorts per each partner country
 - Data collection according to the MDS
 - Outcome of the pilot experiment
- c. Implementation of a pilot surveillance system in Italy
 - Involvement of national bodies (Police and Carabinieri) already working on ski slopes
 - Implementation of a web based data communication system



- Implementation of a Injury questionnaire
- Widening the surveillance system to the national territory

Data on prevention measures

A pilot research was carried out about injury prevention measures adopted in ski resorts.

The followed steps have been pursued:

- Collection of pre-existing questionnaire on injury prevention measures in ski resorts
- Elaboration of a new, exhaustive questionnaire
- Submission and collection of 3 questionnaires per each partner country
- Identification of recommendations to be included in the ‘good practices report’ as final output of Be.Pra.S.A. project.



MAIN RESULTS

Data on skiing/snowboarding injuries

It seems that often the problem is not the lack of data, but their dis-homogeneity both at international and national level, sometimes the lack of statistical analysis (the data are collected but that's all, sometimes they are not even transferred from the paper copy to the electronic format) and the difficulty in obtaining the available data, mainly if the interest is in disaggregate data.

a. Collection of existing data and researches

Literature review

In order to have a picture as complete as possible of what information are available to the public, Be.Pra.S.A. project carried out a literature review. This work has developed along three main directions:

1. Study and researches review
2. Legislative review

For the first two directions Be.Pra.S.A. created a 'literature review document' presenting the outcomes produced. The third topic is the issue of the next paragraphs.

(Sub ANNEX H)

National surveillance system data collection review

The research was conducted in the four project partner countries: Italy, Slovenia, Austria and France. The aims were to check the existence of a national surveillance system and to collect the available figures at national level on skiing/snowboarding injuries both in aggregate and disaggregate formats.

Disaggregate figures are meant those data referring to single injury, with respect, it goes without saying, of the privacy norms and laws.

Aggregate data are the data not referring to single cases but presenting figures pouring out from an analysis on disaggregate data.

The first result of the study regards whether a national Surveillance system exists or not.



France

Data at national level are provided by Medecins de Montagne which have one of the longest 'research' tradition on the field in Europe. Their database is one of the most complete at world level. Aggregate figures are available on the net since the ski season 1997/98 and their cover the whole national territory.

Italy

Data are provided mainly by two national bodies: Carabinieri and Police. Be.Pra.S.A. has substantially contributed to the unification of these data thanks to the implementation of the pilot system Simon, which will be discussed in detail in another chapter of the present document. The time coverage is 2003-06. Thanks to Be.Pra.S.A.'s support the geographical coverage has increased up to an estimated 75% coverage of the estimated total cases of ski injuries in Italy per year and the data communication system has been set up.

Austria

Austria is one of the most attractive countries for skiers and snowboarders. It seems that a national surveillance system dedicated to skiing / snowboarding injuries does not exist. Nevertheless data can be gathered by the IDB (European Injury Data Base system) which is an all injuries database spread all over Europe. This database is therefore the main data source for the period 2002-2005.

Slovenia

In 2003 Slovenia has adopted a new national law on skiing safety. According to this law it is obligatory for ski supervisors to fill out a specific protocol in all cases of skiing accidents. These protocols were developed by the Ministry of Transport and have been collected at the Ministry of Transport from 2003 till 2008 (since 2008 they are collected at the Ministry of the Interior). The protocols were introduced for the aims defined in the law, mostly for inspections of compliance with the law, working permits for the ski lifts and ski resorts. In the law there is no obligation for statistical processing or epidemiological research, therefore there is no electronic database containing all the information gathered on the protocols. The Ministry of Transport performed some analyses on key data regarding skiing accidents for their internal purposes and use. The data analyses were more extensive every season. There is no national report or articles containing these analyses. Our partners acquired the data from the Ministry of Transport and provided us with basic



data for seasons 2003/2004 and 2004/2005 and more extensive analyses for seasons 2005/2006 and 2006/2007.

National data analysis

Time series

As can be easily noted actually is not easy to perform either a time series analysis or a cross section analysis.

For time series analysis the only meaningful set of data is the French one which covers 10 years time interval. The Italian one is still a ‘young systems’ with data referring just to 3 ski seasons and Slovenian covering only two past seasons. Furthermore a further difficulty is the timely data processing: only the French system seems able to provide new data in a timely manner while the Italian and Austrian one are still working on 2007 and 2006 data respectively.

Up to date is therefore not possible to compare the time series for the different countries considered by the project both because they actually do not exist or because, although existing, they have a really short common period.

France

- Since 1992 the incidence rate of ski/snowboarding injury is stable: less than 3 injuries per one thousand ski/snowboard days . The absolute number changes as the number of people practicing winter sports changes.
- The type of injury distribution remains unchanged since 1992: 33% sprains, 27% fractures, 16% contusions, 7% wounds, 7% muscle lesions
- An increase in the head injuries and a decrease in knee injuries have been detected since 1992
- Since 1992 the risk of collision against an obstacles has decreased of 2/3

(Source: dossier de presse 2006-2007 Medecins de Montagne)

Italy

The data collected through the pilot national surveillance system SIMON for the ski seasons 2003-04, 2004-05 and 2005-06 present a very high degree of stability in all the main aspects of the injury phenomenon. The data collected are highly representative, covering the 75% of the overall number of ski resorts.



- The number of rescues on ski slopes remain close to 35,000 ca. per ski season.
- Steady average age of skiers: 32,3 years
- A slight increase of the injuries related to snowboard on the overall number of injuries (from 19,4% to 21,2 % for male and from 11,2 % to 13% for female)
- 1,5 injuries per 1000 skiing/snowb. Days, incidence rate stables in the 3 ski seasons
- A slight decrease in the head injuries: from 14,5% to 12,5 %

In the pilot study, taking into account this stability, the figures for the 3 winter seasons have been aggregated: the total number of injuries considered in the analysis, therefore, has been 75,000 ca.. One of the main outputs of Be.Pra.S.A. project is the report on SIMON data: all the results of the pilot analysis are presented in Sub **ANNEX A**: SIMON 2003-2006. (please refer ro ANNEX 11)

Slovenia

For the reasons above mentioned, national statistics on skiing/snowboarding injuries are scarce. Only data on the total number of injuries is available for all the years since the national surveillance was established. More extensive analyses were available for seasons 2005/2006 and 2006/2007.

Skiing season	minor injuries (contusions, abrasions)	medium injuries (disstorsion, dislocations)	severe injuries (fractures, injuries of the backbone)	deaths	Total
2003/2004	574	334	384	2	1294
2004/2005	506	703	236	0	1445

Skiing season	Equipment of the injured person					Total
	alpine	snowboard	sledge	other	no data	
2005/2006	1191	278	13	25	101	1608
2006/2007	806	265		14	97	1182

Although aggregated according different variable these few figures allow us to build a short time series for the total number of injuries. The trend seems to the one of a constant increase of injuries (in absolute number) with an increase of 11% per skiing season from 2003 to 2006. Then a appreciable drop in the number of injuries is registered for the season 2006-07: further investigations on the most recent figures would be useful.



Austria

For Austria we have an estimated national number of skiing/snowboarding related injuries going from 39,000 ca of 2002 to 79,000ca of 2005. It is possible that the figure referring to year 2002 underestimate the real number due to the fact that the surveying system was still new and still to be fully implemented. Moreover much depends on the length of the ski season which is tightly linked to the snow availability. It is not possible to gather information on the incidence rate for skiing days being the IDB database a All injury database and not specifically built for skiing injuries surveys.

Panel data

As far as regards a cross section analysis at national surveillance system level the challenge is even harder: the only comparable data are the French and Italian ones referring to years 2003-2006. It is not possible to use Austrian data for a comparative analysis mainly because aggregated data are organized per year and not per ski season as per France and Italy, and an hypothesis of a linear distribution along the ski season months referring to different years appears too strong although it could be supported by the French and Italian evidence showing that skiing injury is a quite stable phenomenon. No electronic Slovenian database exists, limited number of analyses for seasons 2005/2006 and 2006/2007 is available.

These considerations give us the opportunity to stress once again the fact that data are there, but they are hardly comparable.

Making the most of French data, thanks to the Medecins de Montagne work, and Italian data, thanks to the Be.Pra.S.A. financed pilot national surveillance system SIMON, some comparisons can be performed but we can hardly consider them representative of a wider Alpine area. We can consider the following comparison as examples of what could be done with a better and more harmonized management of data among countries and of the important hints for further investigation they can provide with.

Data on the winter season 2004-05 for France are compared with the aggregated data for 3 winter seasons (2003-06) of Italy. Most of the data are expressed in % terms so the fact that for Italy is considered a 3 year period, given the assumption of stability of the phenomenon, should not create problems. The 2004-05 season has been chosen for France as the central season of the 2003-06 period. Data refers to alpine skiing, snowboarding and skiing related sports (eg.miniskis) activities.

Number of injuries (skiing-snowboarding-skiing related sports)

Italy: 35,000 injuries on around 1,853,000 skiers and 460,000 snowboarders.



France: 170,000 injuries on around 6,500,000 skiers and 1,300,000 snowboarders.

Distribution of injuries among the 2 major sports

Italy: Alpine ski: 79,2%
 Snowboard: 16,7%

France: Alpine ski: 65%
 Snowboard: 25%

Slovenia: alpine 74,1%,
 snowboarding 17,3%

Incidence rate (IR) per sport:

Italy: Alpin ski: 1,495 per 1000 skiing days¹
 Snowboard: 1,27 per 1000 ‘skiing’ days

France: Ski+snow: < 3 per 1,000 skiing days

The incidence rates for the 2 sports are similar in Italy while in France are substantially different (snowboard IR is 1,5 times the ski IR).

This is an aspect which might worth a further investigation with future studies. One of the first things to check is the correctness of the Italian calculation given that the numerator and denominator used for the calculation of the IR are provided by two different data sources.

Nevertheless the data could be correct and could show different dynamics of the phenomenon in the 2 different countries, hypothesis which could be confirmed also by the different weight that the injuries of the 2 sports have with respect the total (previous figures).

To calculate the incidence rates the common problems in this sector are encountered: what can be considered the denominator for the incidence rate calculation and how to calculate it? Should be the number of skiers, the number of runs, the average number of days of permanence in the ski resorts, the average km of slopes run?

Type of injuries distribution

Type of injuries distribution	ITALY	FRANCE
Sprain	32,8%	34%
Contusion	27,4%	16%
Fracture	15,7%	24%

¹ A skiing day is defined calculating the total number of presences in the ski scope and the total numbers of runs
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Luxation	8,7%	4%
Wound	8%	7%

The type injury distribution differs mainly for contusion and fracture. This could be the reason for further investigation on the risk attitude of the two different population: French injuries seems somehow heavier than Italian ones.

Collisions with another slope user

Italy: 11,3% of injuries

France: 10% ca. of injuries

Injury localization

Injury localization	ITALY	FRANCE
Upper limbs	21,2%	37%
Lower limbs	47%	43,2%

The difference could be explained by the different distribution among skiers and snowboarders in the 2 countries. The ratio snowboarders/skiers is higher in France than in Italy and snowboarder are more prone to harm the higher limbs.

b. Identification of a Minimum Data Set (MDS)

Collection of injury questionnaires

Considering the informative gap due to the above mentioned lack of data homogeneity and trying to suggest a possible solution for this issue information were retrieved on the data collection systems in use in the areas covered by BE.PRA.S.A. project. Injury Cards used in Italy, France, Slovenia, Austria, Scotland and Switzerland have been collected (Sub ANNEX B).

It is possible to identify a fair amount of common information collected. Nevertheless the comparison among the information collected (Sub ANNEX C) and among the data collection methodologies, reveals that some differences exists due mainly to:

- 1) Different type of information requested (ex. Only in some countries information on the ability of the skiers/snowboarder is collected)



- 2) Different categorization of the answers to the same questions (injury classified as upper limbs in a country could be more detailed in another)

Therefore it resulted necessary to draft a unified model form containing a *minimum data set* of information to support a deeper knowledge of skiing and snowboarding injury dynamics and consequences which would help in the identification of the most effective measures of prevention.

Identification of a Minimum Data Set

To study what data on skiing/snowboarding injuries are usually collected, 8 questionnaires have been considered:

2 from Italy, 2 from Austria, 1 from Slovenia, 1 from France, 1 from Scotland and 1 from Switzerland. (Sub ANNEX B)

The typologies of information common to all the questionnaires are:

personal data, dynamics of the accident, type of injuries, weather conditions, type of slope and snow, equipment utilised.

Nevertheless, the extent to which the various areas are explored differs from a questionnaire to another. This means that there are questionnaires that are primarily oriented towards medical aspects, other questionnaires which go into great detail on the cause of the accident, but provide little or no information on the traumas sustained by the victims and so on.

The creation of a Minimum Data Set (MDS) should provide basic indications to acquire a minimum amount of detail for each aspect of the injury event.

A series of items have been identified for this purpose, which are common to all of the questionnaires or, in any case, which are deemed indispensable to achieve a certain degree of completeness of information. The result is a unified form that has been able to capture the best form all the questionnaire analysed.

The problems that inevitably arise in disseminating and, to a certain extent, “imposing” a single common data collection questionnaire should be taken into due consideration (difficulties that may arise due to a different cultural and social aspects, to different legal frameworks, different data collection processes, different types of data users, etc.). Thus, it was decided to strike out on the road of the Minimum Data Set: namely, the minimum level of information effectively usable for



purposes of prevention, which could be taken into consideration when organising a surveillance system both at national, regional or local level.

The advantage of this solution is to be soon operational, it is widely exportable and does not necessarily require the total refurbishment of the systems currently in force on the national or territorial level.

The important thing is that whatever the data collection system adopted, at least the information requested in the MDS are present.

The forms for data collection analysed, as stated above, were those adopted in Italy, France, Slovenia, Austria and Scotland.

The French Form

The French injury data collection system seems to be the more advanced making the most of the long experience in the field of *Medicins de Montagne*. Unique among the collected cards, the French data cards have two formats: a complete version and a light version. The data collection is extremely exhaustive as far as regards the injury typology and the medical treatment; on the other hand there are no data on environment conditions (snow condition, weather conditions, visibility, snow typology) and few indications on the dynamic and type of accident. This has the advantage to reduce to the minimum the information collected asking to the injured person and to maximise the epidemiological information.

The Slovenian Form

The Slovenian form which was taken into consideration is a more detailed version of the adopted national form which is in use at some ski resorts. It is very detailed with regard to the dynamics of the accident, and a great amount of information is provided about *Skier's Actions* and *Cause of the Accident and Personal Responsibility*.

The comparison between the cause of the accident as reported by the victim and the reconstruction of the rescuing personnel (*Cause of the Accident and Personal Responsibility in the Opinion of the Ski Patrol*), is unusual and interesting. On the other hand there is very little information concerning the injuries sustained. In the section '*Personal Injuries and Urgent and Medical*' there are many questions requiring "open" responses. An "open" description of the consequences of the accident is definitely a way to describe the event in an exhaustive manner; nevertheless, it does not permit exporting the information to a common database, except through successive standard codification. Particular attention is also given to the description of the weather conditions.



The Italian Form

The Italian form is ideally located halfway between the Slovenian and Scottish forms and could be considered as a synthesis of the two.

Thanks to Be.Pra.S.A. project it, as pilot experiment, has been tested throughout the national territory.

More extensive consideration will be done in the section of the present document dedicated to Simon pilot project.

The Austrian Form

In Austria it seems there are no ‘national cards’, in other words there is not a national surveillance system but many different cards according to the regions, ski slopes, associations.

The Scottish Form

The data collection card adopted in Scotland, together with the Italian one, maybe can be considered among the most balanced form. Actually, the Scottish accident data collection card is the one that has the most epidemiological slant.

The section dedicated to the dynamics of the injury is quite exhaustive, with 10 possible replies and 24 possible bodily areas involved in the injury (even more than one injury can be indicated at the same time). There is also a section that can be considered a real anamnesis section, collecting information on eventual allergies, pulse count, respiratory rhythm and eventual medical treatments underway on the injured person.

Also the section concerning the equipment and protection tools utilised by the injured party results to be quite exhaustive. Great care was taken in providing information on a series of elements that are considered potential risk factors (or protective factors), which do not specifically concern the skiing and/or snowboard equipment. The section relative to the cause of the accident is divided into two parts: the *main accident cause* and *contributing factors*. By crossing these two variables a good description of the accident is obtained. The peculiar aspect of the Scottish form definitely concerns the investigation on the ability of the skier and his/her exposure to the risk of an accident. Question on the number of days skied on the average during the year, on eventual hours of skiing lessons taken, on the time spent skiing on the day of the accident are, therefore, present.



The Swiss form

Maybe the most complete form it contains all the information present also in the other questionnaires and, allows, unique case, the easy reporting of information on multiple injuries. Many information regards personal data of the injured person and of the data collector making the questionnaire, a little time consuming with respect the others one.

The Minimum Data Set

Starting from the above considerations, and continuing with a detail comparison, filed by field, among the different questionnaire (Sub **ANNEX C**) the MDS has been identified and is reported in Sub **ANNEX D**).

The MDS is not the result of a pure and simple merging activity of all the different questions observed in the collected national cards. The challenge faced was to create a MDS not too different from any of the original cards in order not to create problem in data collection, but still more complete than the single cards and with an homogeneous set of questions and possible answers.

Selection of ski resorts

The correct process to follow for the creation of a questionnaire foreseen a ‘validation phase’. This phase aims to test the existence of problems in the interpretation of the questions, in the answers, the typology of errors produced and to evaluate the quality of data, in terms of capability to provided the requested information.

In the framework of Be.Pra.S.A. project, the identification of some ski resorts where to submit the MDS has right the objective to implement this validation phase, in order to provide future researches with a ‘validated and trustworthy working tool’.

The data collection form proposed, albeit rather simple for a trained first aid operator, is not merely something to be compiled, but requests the person providing assistance to have some ability to make personal evaluations.

For this reason, in order to facilitate compilation of the form, a series of technical notes has been produced to assist operators (Sub **ANNEX D**), and a continuous telephone assistance has been assured to the project partners who acted as intermediaries between the project and the operators.



Data collection according to the MDS

For the ski season 2006-07 the data collected regard **3** ski resorts of Slovenia and **2** of Austria.

Unfortunately many difficulties have been encountered in the collection of disaggregate data as:

1. Unwillingness of the ski manager to provide data
2. Unwillingness to apply a new (although somehow complementary to the existing) set of data
3. Unforecastable lack of snow in some regions

For the ski season 2007-2008, which is still ongoing at the date of the writing of the present document, the only data which has been possible to retrieve in a timely manner are the one from Slovenia.

Despite these difficulties, which prevent from obtaining meaningful and representative database and, therefore, to perform a in depth data analysis, it is still possible to carry out the questionnaire validation phase to provide the EC and the stakeholders with a high quality MDS which could be used in future studies and implementation.

Outcomes

The most important outcomes of this pilot test to validate a new injury questionnaire is right the process of validation, with the different problems encountered to introduce a common set of data and shared definition.

Some of the problems encountered in the questions formulation referred to the exact definition of some categories (i.e. type of snow: ‘packed snow’, type of slope: ‘open/closed’, destination of evacuation: ‘first aid, emergency’), or to some possible misunderstanding of the answer options (i.e. ‘illness’ as cause of an accident, the field ‘nationality’ and ‘country of residence’ or ‘insurance’). These problems have been detected first by the project partners since they had to go carefully through the whole questionnaire and to translate it in the local language.

Then, from the questionnaire submission to the ski resorts, further suggestions came out and additional options to the answers have been added (red lines in Sub **ANNEX D**).

Some of the problems encountered in the questions formulation have been:

Insurance:

- ⇒ Understanding of this variable could be very different in different countries (it is not specified what kind of insurance we are asking about – for rescuing, emergency treatment, salary compensation...)



Type of injury:

- ⇒ We should consider including some additional categories like concussion, amputation, frostbite, internal organ injuries, the variable other could be also an open-end category
- ⇒ There is no specification on how to mark multiple injuries of different types

Body part:

- ⇒ We should consider including some additional categories like lower back and gluteal region (together) ; back – being completely different injury than injury to the backbone; variable head could be divided in more categories like eyes – we could recommend the use of goggles in case of severe or frequent injuries to the eyes, face, brain and skull; we suggest the use of changed variables on the grounds of ethiology of injuries– lower arm and wrist (together) which most frequently represents injuries of snowboarders, and hand and fingers (together) these injuries are more frequent with alpine skiers.

Type of accident:

- ⇒ We suggest additional category – struck by an object (most often in connection to the ski lift)

Evacuation:

- ⇒ People with minor injuries often seek first aid by themselves or by help of friends and do not need any special evacuation procedure, that is why we suggest additional category in this section.

Destination:

- ⇒ It is unclear whether this refers to final treatment, first aid treatment or something else – destination home would be only appropriate when a person seeks first aid help, but actually has no injuries

Equipment condition:

- ⇒ The question is covering two separate entities, does it refer to new versus worn out equipment or does it refer to professional versus basic equipment.

A detailed instruction manual with definitions for all variables and categories is required.

The form of the questionnaire must be as much user friendly as possible, which means it must not be too extensive (max 2 pages), it is better to have pre-written texts that need encircling than open end questions. Open end questions take more time and also make it difficult to process the information in uniform way. Category other should have an option to describe specific setting in case there is no suitable category already provided.

Once kept into due consideration all this, a final MDS has been identified and validated.



c. Implementation of a pilot Surveillance System in Italy

One of the most important and relevant outcome of Be.Pra.S.A. research on skiing/snowboarding injury is the implementation of a national surveillance system pilot project, called SIMON. It has been implemented by one of the project partner, the Istituto Superiore di Sanità (National Health Institute) – ISS. Simon has become in short the main skiing/snowboarding injury data source in Italy and with its high number of injury surveyed it allows to perform further research and to test epidemiological hypothesis.

1. THE SIMON SYSTEM: SYSTEM ARCHITECTURE

The SIMON system is the first investigation on a large scale that specifically concerns winter sports on the ski slopes and in cross country skiing in Italy.

The ski slope accident monitoring system was tested on a sampling of Alpine and Apennine winter sports stations.

SITES WHERE ANALYTICAL ACCIDENT DATA WERE COLLECTED

N.	Station	N.	Station	N.	Station
1	Abetone (PT)	17	Cortina d'Ampezzo (BL)	33	Ovindoli (AQ)
2	Alba di Canazei (TN)	18	Courmayeur (AO)	34	Pampeago (TN)
3	Andalo (TN)	19	Falcade (BL)	35	Passo dello Stelvio (SO)
4	Aprica (SO)	20	Falzarego-Lagazuoi (BL)	36	Pila (AO)
5	Arabba (BL)	21	Folgaria (TN)	37	Pozza di Fassa (TN)
6	Bardonecchia (TO)	22	Gallio (VI)	38	Prato Nevoso (CN)
7	Bormio (SO)	23	La Thuile (AO)	39	Predazzo (TN)
8	Campitello di Fassa (TN)	24	Limone Piemonte (CN)	40	Ravascletto (UD)
9	Campitello Matese (CB)	25	Livigno (SO)	41	Roccaraso (AQ)
10	Campo Imperatore (AQ)	26	Medesimo (SO)	42	S.Martino di Castrozza (TN)
11	Canazei (TN)	27	Madonna di Campiglio (TN)	43	Santa Caterina Valfurva (SO)
12	Cavalese (TN)	28	Marmolada-Malga Ciapela (BL)	44	Sappada (BL)
13	Cervinia (AO)	29	Moena-Passo S.Pellegrino (TN)	45	Tarvisio (UD)
14	Champoluc-Monte Rosa (AO)	30	Monte Campione (BS)	46	Terminillo (RI)
15	Chiesa in Valmalenco (SO)	31	Monte Pratello (AQ)	47	Valtournanche (AO)
16	Col fosco-Alta Badia (BZ)	32	Obereggen (BZ)	48	Vigo di Fassa (TN)

SIMON plans for a two-level-surveillance system: first aid on the slope and treatment at health facilities.

In order to detect the number of presences on the slopes was studied the possibility to have an electronic counter at the entrance turnstiles.



It was also evaluated the possibility of creating a link between the information gathered on the site of the accident, relating primarily to the dynamics of the accident, and the more specifically medical information gathered from local clinics and first aid centres.

Eventually, the possibility of implementing an information technology platform to record and transmit this information to the ISS has been analysed.

2. THE SIMON SYSTEM: AN INFORMATION TECHNOLOGY PLATFORM

A data bank has been developed by ISS, through the Relational Database Management System (RDBMS) Microsoft Inc. SQL Server. The procedure for data extraction and manipulation was developed through Structured Query Language (SQL) and Visual Basic programming.

The data are recorded on the dedicated (O.S. Windows 2.x) server at the Department of the Environment and Connected Primary Prevention of ISS.

Logical protection of the data is guaranteed by a procedure of authentication, with a username and reserved password, for individuals authorised to access the system. The security procedures also involves the activation of special mirroring services on external disks and backup on high capacity magnetic tape.

The information system is based on a network of data collection and transmission, with a “star” framework, whose hub is a server dedicated to data transmission from the peripheral work stations to the central data processing unit at the ISS.

Data recording and data extrapolation at local level takes place through a dedicated application, developed for MS-Windows operating systems, which is installed on personal computers. Data transfer takes place through the Internet, with a safe SSH type of transmission protocol. Network security is also guaranteed by the protected site connection for data transmission, also through site access authentication based on a user name and password and control of the accessing IP address.

All the data recording and transmission procedures and, more in general, all the procedures involving the information technology system, were developed in conformity with the existing norms on the protection of personal data.

The user interface for the data transmission procedure is of the web-browser type and is independent from the operating system used by the peripheral transmission stations.

Once the operator has been authenticated through the access procedure, the data transfer to the ISS server takes place simply by dragging data files to the dedicated directory, according to the normal procedures used in a Web Browser environment.



The data loading and interrogation interfaces were developed with what you see is what you get (WYSWYG) type visual technology, according to User Friendly Interface (UFI) standards.

3. EXPERIMENTING THE SYSTEM

The first important objective achieved by SIMON is the adoption, by the first aid assistants on the slopes and several private and public organisations that provide this type of service, of standardized cards to collect data about the accidents and the conditions at the time they take place, as well as the consequent traumas.

SIMON card was tested in Italy in an initial phase by the State Police Alpine Training Centre, in the ski resorts indicated in the table above, with positive results. Police and Carabinieri can assure a geographical coverage up to 90% of all the national ski slopes.

The card in question (Sub **ANNEX B**) is made up of three parts:

- Part A: general data on the intervention;
- Part B: personal information of the individual who suffered the accident;
- Part C: detailed report and information on the accident.

The semi-final version of the card was ready for distribution, test and validation during the 2006-2007 skiing season.

In particular, the card was meant also to provide answers to a series of critical areas of analysis identified through the comparative analysis of the questionnaires explained in the earlier chapters of this document.

The major topics the new card should try to clarify are:

- **Geographical location** where the accidents occur: Are there ski resorts that have abnormal and superior accident rates than might be expected from the literature and observations of the SIMON system in Italy?
- **Sex**: Are males more at risk of trauma, as in the case of other types of accidents (i.e. road accidents)?
- **Age**: Are there age categories that are particularly at risk? Is there any evidence of the effectiveness of secondary instruments of prevention, such as wearing a helmet, as prescribed by law 363/2003 in Italy for less than 14 year old people?



- **Nationality and/or residence of the accident victim:** Is the place of birth correlated to the risk of injury? (i.e. could “locals” be less prone to risk because they are more “expert” than skiers from “emerging” countries, who could display behaviour that increases the risk of accidents)?
- **Equipment:** It is a widespread opinion that snowboarders represent a risk factor for traditional skiers. Is this true or is it only a commonplace? Is it true that snowboarding is practiced mainly by young people? In the final analysis, does it makes sense to divide ski areas, creating protected areas (snowparks) where snowboarders can perform?
- **Time of the accident.** An attempt will be made to identify particularly critical periods, both over the long term (During what period of the year do the greatest number of accidents take place?), the mid-term (what day of the week?) and the short term (what time of day is most at risk?).
- **Dynamics of the accident:** What are the major causes of accidents?
- **Responsibility for accidents:** Especially in cases of collision between skiers, is it possible to understand whether there is a significant difference between the seriousness of the accident for the party at fault and the victim? In other words, who was injured worse, the party hit or the party who collided with him?
- **Injured part iof the body:** What part of the body is more often injured? Does this change with the type of equipment used? Is there a different distribution of seriousness of injuries between male and female, or skiers and snowboarders? Is there any evidence supporting the utility of specific protective devices for particular parts of the body (helmet, rigid gloves, protective lumbar shields, etc.)?
- **Injuries:** People who provide first aid on the ski slopes, although trained, are often not able to perform a clinical diagnosis on the spot; nevertheless, it has been seen that there is an acceptable level of correspondence between what has been ascertained at the site and what is clinically verified afterwards with special instrumental diagnostic examinations. It is therefore of great interest for epidemiological purposes to be able to correlate the type of presumed diagnosis and a whole series of contextual variables that can be gathered only at the accident site.
- **Technical condition of the slope:** Is the difficulty of the slope a risk factor for skiing traumas? Does this factor modify the accident rate or seriousness?
- **Ability of the skier:** How does the technical ability of the skier interact with the probability of an accident? The answer to this question is not easy because in many situations it has



been observed that increased technical skills are sided by increase self confidence and consequently linked to a higher risk undertaking attitude.

- **Condition of snow on the slope:** In recent years, the practice of using artificial snow on the slopes has become very popular. The snow produced in this manner is structurally different from natural snow and has many advantages in terms of compactness minimising the slope deterioration. Nevertheless, skiing on a more compact surface tends to be more demanding in critical conditions (it is more difficult to recover from an error). Is it possible to establish whether artificial snow is a potential cause of increased risk of accidents?
- **Weather conditions:** Do visibility, temperature and condition of the snow play a role in modifying the probability of an accident?
- **Means of evacuation:** For more serious cases it is important to intervene rapidly, removing the victim with a motorised sled or even with a helicopter.
- **Destination:** To create a dichotomy between the individual sent home and the individual sent to a health facility allow to have an indication, although rough, on the seriousness of the accident.

To give a reasonable meaning to the figures calculated through the data collected it is of paramount importance to be able to gather information on the daily flow of skiers. This is a piece of information extremely difficult to obtain and the proposed indicator, tested by Simon, is the number of passages recorded by the ski lift installations. An initial exploratory analysis of the phenomenon has shown that there is a close correlation between the number of accidents and the number of passages recorded at the lift installations: the relation seems to be a linear one.

Other methods are proposed to estimate the incidence of the injuries:

- 1) correlating the number of accidents to the number of kilometres travelled
- 2) correlating the number of accidents to the number of days effectively skied

The first method would give a “global” measurement of exposure. Nevertheless, the number of km travelled is an information difficult to obtain, containing a certain degree of uncertainty. It could be the topic for future studies.

The second method is easier to manage and requires, as is already done in some locations (see the Scottish questionnaire), an evaluation of the number of days per year skied, with a special question on the injury form (it is to be noted, the high chance to incur into an anamnesis bias).



The complete outcomes of the Pilot National Surveillance System Simon can be found in **Sub ANNEX A**.

4. BEPRASA – SIMON FIRST DATA ANALYSIS

In the last months of the project the data collected through Simon have started to be analysed not only for ‘descriptive’ statistics but also for hypothesis testing epidemiological researches.

ISS, for example, carried out a research to test if the new materials (ski) are increasing the number of injuries or their severity (**Sub ANNEX F**).

University of Venice, a project supporting Institution, has tried to elaborate the different risk exposure between female and male (**Sub ANNEX G**).

Data on prevention measures

Parallel to the survey on skiing/snowboarding injuries and to the pilot surveillance system, a research was carried out on the injury prevention measures adopted by ski resorts.

A questionnaire was created and submitted to some ski resorts of the project partner countries. The aim, as for the Minimum Data Set previously described, was to validate the questionnaire and to provide with a new tool future researchers on the field.

Through this questionnaire, it is possible to obtain a full set of information on the organisational and structural conditions of the ski resort to be put in relation with accident indicators obtained from surveillance of first aid on the slopes. This should be a first step to identify preventable accident risk factors in skiing areas and evaluate the potential efficacy of safety measures currently in place.

The idea of this questionnaire came from the pre-project studies highlighting that although epidemiological surveillance offers worthy information on the dynamics of accidents, the behaviour of the parties involved, the environmental condition of the slopes, the used equipment, nevertheless it provides only indirect information on the condition of the ski lifts and the safety measures adopted on the ski resorts.

In Europe, norms and common use increasingly tend to identify a specific party responsible for management of the skiing area, therefore responsible of the organisation and management of safety conditions at the resort. In Italy, for example, a recent law on safety management at ski resorts, defines as direct responsibility of the operators to ensure that consumers are able to use the sports



and recreational facilities in conditions of safety. The operators are also responsible for ordinary and special maintenance of the skiing areas and fulfilment of the necessary safety requirements, including the system of signposts and markings.

Therefore, resort operators are directly involved in the management of the activities and installations in conditions of safety and in the adoption of good practices to maintain the necessary organisational, infrastructural and logistical standards. The technical directors of the installations are the direct referents and implementing authorities for the development and application of these standards.

It results of paramount importance, in order to identify good practices for accident prevention, to be able to make the most of the experience developed in the field on safety equipment and conditions in skiing areas.

This concerns not only risk factors identification and morbidity reduction measures, which are under the direct responsibility of the resort managers, but also the organisation of services (i.e. first aid and emergency health care) which, although not under direct responsibility of the management, nevertheless significantly influence safety conditions at the skiing facilities.

Methodology

Before starting with any other activity it is important to stress the definition of skiing/snowboarding area: a snow-covered area equipped and open to the public, which includes slopes, ski lifts and artificial snow plants, normally reserved for winter sports, such as: Alpine skiing, snowboarding, cross-country skiing, sledding and sleighing and other sports normally practiced on mountain slopes and at especially equipped facilities.

The main parties capable of providing competent and exhaustive information on the safety management of ski resorts are the technical plant directors: they are concretely charged with the operational management of the skiing area, including the equipment, plants and infrastructures, as well as of their maintenance and fulfilment of the necessary safety requirements.

The step followed have been:

- Collection of pre-existing questionnaires on injury prevention measures adopted by ski resorts
- Creation of a new, exhaustive questionnaire
- Submission and collection of 3 questionnaires per each partner countries



- Validation of the questionnaire to be used for future wider researches and identification of recommendations to be possibly included in the ‘good practices report’ as final output of Be.Pra.S.A. project

Collection of pre-existing questionnaires on injury prevention measures adopted by ski resorts

A research was conducted to collect existing questionnaires on injury prevention measures adopted by ski resorts. The result of this research was that no questionnaires existed apart from one in Italy still in its pilot phase.

Creation of a new, exhaustive questionnaire

It was decided to perform a survey on the safety management of skiing areas, through interviews and the submission of a new questionnaire to ski resort managers.

The new questionnaire was, therefore, created capable to investigate how ski resorts in alpine regions are equipped in order to prevent skiing/snowboarding injuries. And to highlight some topics which should be investigated further, through a wider survey, in order to define safety standards and to formulate safety guidelines in skiing areas, which may be adopted throughout Europe.

The fields included in the questionnaire (Sub ANNEX E) will refer to the variables relative to the conditions of safety of stations, divided in following sections:

- slopes
- plants and equipment
- surveillance of the slopes
- First aid services
- health assistance
- safety information

The first module will be dedicated to record the following type of information on the organisation and condition of the slopes:

- altitude and length in kilometres
- technical difficulty
- signal/sign system used



- protective devices (i.e. nets, barriers)
- snow, weather conditions and visibility normally present during the skiing season.
- methods of producing artificial snow utilised.
- reserved slopes (i.e. snow park, slope for children)
- off-slope itineraries

The module on plants and equipment, presents information on:

- type of ski lift and safety standards
- means of transportation and slope maintenance (motorised sleds, snow pounders, etc.) and the relative procedures for movement and operation.
- Personnel employed for control and maintenance of plants and equipment.
- Fixed installations i.e. (control stations, refuges, equipped rest stations)

The section on surveillance on the slopes, aimed at ensuring the respect of norms on behaviour and safety procedures, investigates:

- type of FF.OO or other organisms assigned for surveillance
- means of transportation utilised for inspection
- control devices (i.e. videocamera, photographic installations, remote viewing devices or devices for low visibility, audio-video communications apparatus, acoustic signals).
- control stations
- infractions detected and tickets administered to violators

For first aid services on the slopes, the questionnaire requires information on the who performs this service, on the equipment and human resources available and on time required for intervention:

- type of personnel and training (i.e. level of training for recovery and first aid)
- means of transportation utilised for first aid (i.e. motorised sleds, toboggans, helicopters)
- equipment used for first aid (i.e. search and rescue equipment, first aid equipment)
- means of audio-video communication
- means and procedures for rapid connection with health facilities
- medical and para-medical personnel dedicated to first aid operations



- average intervention time for types and locations of accidents

Concerning health assistance, are investigated:

- medical and para-medical personnel
- ambulatory clinics and first aid stations
- technical health equipment within the skiing district or on the slopes (i.e. diagnostic equipment, defibrillator)

Concerning health care in a more general sense, the presence of health assistance in a wider territory that includes the ski resort are taken into consideration:

- emergency health services (i.e. emergency phone numbers, serious case selection, mobile emergency resuscitation units, helicopter rescue service)
- hospitals and private nursing homes (i.e. first aid stations or emergency departments, specialist emergency resuscitation units, cardiology, traumatology, emergency surgery and neuro-surgical units)
- on duty medical service
- non-hospital medical assistance structures in the territory
- specialist ambulatory clinics
- pharmacies

Eventually, information on how the public is made aware of the norms of behaviour on the slopes, on potential accident risks and safety equipment and services available to users in the skiing area, are gathered.

This section is particularly important in light of the provisions of Article 7 of the Turin Charter on Ski Safety, which entrusts ski resort operators with the responsibility to inform customers, citizens, members, guests or readers thoroughly and to orient them on safety.

Submission and collection of 3 questionnaires per each partner countries

Given the resources available to the project, the survey took place in three ski resorts for each project partner country. With such a small sample there isn't any representativeness claim, although there was the trial to differentiate the ski resort according to their dimension in order to better resemble the national situation. Eventually 3 questionnaires from Italy, 3 from Slovenia, 2 from



Austria and 0 from France were collected. If we consider as ‘small’ ski resort the one with up to 10 kms of slopes, as ‘medium’ ski resort with up to 30 kms of slopes and as ‘large’ ski resort with more than 30 kms of slopes, the questionnaire collected regard 2 small, 2 medium and 4 large slopes.

Indeed with such a small number of questionnaires the stratification has been arbitrarily chosen. It is useful, by the way, to give hints for further studies and for a more rigorous stratification based on statistical procedures.

The major problems encountered in obtaining some answer from the ski resort managers were:

1. The deep concern that such questionnaire could represent a ‘bad’ publicity for the ski resort
2. The somehow long time requested to fulfil the entire questionnaire
3. The scarce attitude to provide anybody with any kind of information, mainly when a direct benefit for the ski resort is not foreseen.

The interview were introduced by a preparatory telephone call with the interviewee and the dispatch of the questionnaire and the relative instruction manual by e-mail.

All the partners remained at disposal of the ski resort managers for direct consultation in case of any doubt about the questions in the questionnaire. To achieve a better understanding the questionnaire was translated in the national language.

The interviews took place at the end of the skiing season 2006-2007.

The data gathered by each partner were transmitted to the project leader which proceeded in analyse them.

A synoptic table (see below) was produced to compare the information gathered from the different ski resorts.

Questionnaire validation and recommendations identification

It worth stressing again that the final goal of this process was to validate the questionnaire, reviewing it according to the collected feedbacks, in order to obtain a useful tool for future wider research. It has been thanks to the first review, performed by the project partners, that the handbook was created as it is now, in order to make it as clear as possible the definitions contained in the questionnaire. Then a second review took place thanks to some Italian ski resorts managers who helped to refine some questions and to clear some concepts.

Eventually this research has been also a way to gather some useful information in order to formulate recommendations for the increase of safety of the ski resorts.

In the validation phase we encountered some problems:



- skiing routes should be defined more precisely
- the definition for signs for dangerous slopes is required
- Do signs on snow conditions refer to snow conditions on specific slopes or snow conditions for entire ski resort
- We suggest to add some categories of the ski lifts (platter lift) and to require information on length and capacity uniformly (for all types of skilifts or none)
- The section ‘Medical assistance: services’ it is not clear to what does that refer to (e.g. privat clinics are already in the part ‘Out patient departments’)
- In the patrol and rescuing section it is not defined what type of organization performs what part of patrol and rescuing (e.g. patrolling on alcohol is in jurisdiction of the police)



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A) SLOPES

Number of slopes in the ski resort
 Total slopes extension (KM)
 Total altimetric extension (m)
 Easy slopes (Number)
 Easy slopes (Km)
 Medium slopes (Number)
 Medium slopes (Km)
 Difficult slopes (Number)
 Difficult slopes (Km)
 Training area for ski-schools (number)
 Training area for ski-school (Km)
 Slopes dedicated to children (Number)
 Slopes dedicated to children (Km)
 Snowparks/Ski cross parks (numbers)
 Snowparks / Ski cross parks (m2)
 Skiing routes (Number)
 Skiing routes (Km)
 Sledge runs (Number)
 Kiderland (Number)
 Area dedicated to fun activities

B) ARTIFICIAL SNOW MAKING

Artificial snow guns (Number)
 Slopes equipped with artificial snowmaking (Km)
 % of Km equipped with artificial snowmaking
 % of slopes equipped with artificial snowmaking

C) SIGNALS AND SIGNPOSTS

Signs showing lenght, wideness and steepness of the slopes

	AT001	AT002	SL001	SL002	SL003	IT001	IT002	IT003
Number of slopes in the ski resort	4	33	19	8	2	35	15	22
Total slopes extension (KM)	10	44	18	24	1	55	35	31,6
Total altimetric extension (m)	1800	1200	4105	1700	150	1000	3500	1015
Easy slopes (Number)	1	13	10	3	1	16	5	5
Easy slopes (Km)	3	14	9	4,5	0,4	28	10	7,6
Medium slopes (Number)	2	11	5	4	1	13	5	12
Medium slopes (Km)	8	20	5	19	0,6	20	10	24
Difficult slopes (Number)	1	9	4	1	0	5	5	1
Difficult slopes (Km)	1	9	4	0,5	0	7	15	1
Training area for ski-schools (number)	1	1	2	2	1	4	5	4
Training area for ski-school (Km)	0,5	1	1	1	0,1	6	10	1,5
Slopes dedicated to children (Number)	0	1	1	0	1	0	0	0
Slopes dedicated to children (Km)	0	1	0,4	0	0,1	0	0	0
Snowparks/Ski cross parks (numbers)	0	1	0	0	1	1	1	2
Snowparks / Ski cross parks (m2)	0	45000	0	0	10000	15000	20000	0
Skiing routes (Number)	0	6	6	1	0	0	0	1
Skiing routes (Km)	0	14	36	5	0	0	0	31
Sledge runs (Number)	1	1	1	1	1	0	2	0
Kiderland (Number)	1	4	1	1	1	0	0	1
Area dedicated to fun activities	0	2	1	1	0	0	0	0
B) ARTIFICIAL SNOW MAKING								
Artificial snow guns (Number)	150	6	110	17	8	600	120	85
Slopes equipped with artificial snowmaking (Km)	8	3	15	15	1	45	20	30
% of Km equipped with artificial snowmaking	80	7	83	70	100	80	60	98
% of slopes equipped with artificial snowmaking	80	9	82	70	100	90	50	99
C) SIGNALS AND SIGNPOSTS								
Signs showing lenght, wideness and steepness of the slopes	nr	No	y	no	y	y	nr	no



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Signs relating to slope grade	y	y	y	y	y	y	y	y
Lateral delimitation of the slopes	nr	y	y	y	y	y	y	y
With poles		y	y	y	y	y	y	y
showing name and number of the slope		y	no	y	y	y	y	y
With colours showing grade		y	y	y	y	y	y	no
showing a progressive numeration		y	no	y	no	no	no	no
with refracting devices		No	no	y	no	no	y	no
other types		No	y					
Direction-signs towards the different locations	y	y	y	y	y	y	y	y
Warnings on ski risk of avalanche (off piste)	y	y	y	y	n.r.	y	no	y
Warning of sudden risks/dangers	nr	y	y	y	y	no	y	no
Signs for bottlenecks and critical points	nr	y	y	y	no	y	y	y
Signs for slopes confluence/cross-junctions	y	y	y	y	y	y	y	no
Signs for dangerous slopes	y	y	no	y	y	y	y	y
Signs relating to snow conditions	nr	y	no	y	y	no	y	no
Signs for ski schools	y	y	y	y	y	y	nr	y
Signs for restaurants and mountain huts	y	y	y	y	y	y	y	y
Signs for medical assistance	y	y	y	y	y	no	y	no
Signs for security and police station	no	y	no	no	no	y	y	no
Information on meteorological conditions	no	y	y	y	y	no	y	no
Multilingual information on rules of conducts	y	y	y	y	y	y	y	y
Video cameras for slopes surveillance	no	No	y	no	y	no	y	no
SOS Electronic devices on slopes	no	No	no	no	no	no	no	no
D) PROTECTIVE DEVICES								
Nets in critical dangerous points/areas	y	y	y	y	y	y	y	y
Elastic impact absorbing barriers along cableway pillars	y	y	y	y	y	y	y	y
Barrier adjustable in height	no	y	no	y	no	y	no	y
Fixed barrier	y	no	y	no	y	no	y	no
Nets along all slopes in the resort	y	no	no	no	no	no	no	no
Other types of barriers		y	no	no	no	n/a	no	y
No protection/nets/barriers		no	no	no	no	n/a	no	no
E) MOUNTAIN HUTS								
Mountain huts with the same closing time of the ski slpes (Number)	1	3	3	1	1	0	2	9



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Mountain huts open after ski slopes closing time (Number)	1	0	0	0	1	8	3	4
Mountain huts offering accommodation for the night (Number)	no	no	0	0	1	2	4	0
F) TRANSPORT AND SLOPES MAINTENANCE								
Number of snow cats	3	9	10	4	3	14	4	10
Number of motor sleighs for assistance	2	4	2	0	1	4	5	9
G) STAFF DEDICATED TO SURVEILLANCE And MAINTENANCE OF SKILIFTS AND SLOPES								
Number of ski lift personnel	12	48	96	40	4	180	30	104
% of seasonal workers	20	75	65	90	100	60	50	85
Average number of staff per Ski lift	14	34	96	2,5	3	120	25	85
Do staff attend regular updating training courses	y	y	y	y	y	no	no	no
If yes, how often (Months)	3	12	24	24	12			
H) SKILIFTS								
Number of cableways	0	0	0	0	0	0	2	0
Total in KM	0	0	0	0	0	0	5	0
Hourly capacity	0	0	0	0	0	0	600	0
Number of cabin lifts	2	2	0	0	0	5	1	2
Total in KM	6	4	0	0	0	12	2	3,6
Hourly capacity	3000	3400	0	0	0	13000	1300	4000
Number of chairlifts	1	2	5	3	0	12	4	13
of which sheltered	0	1	0	0	0	5	0	5
Total in KM	0,8	3	5,7	2	0	14	4	13
Hourly capacity	1600	4200	6835	3000	0	19000	5700	1424
Number of j-bars lifts	1	4	0	0	0	2	3	1
Total in KM	1	3	0	0	0	9	2	0,2
Hourly capacity	1400	3700	0	0	0	1400	2100	650
Funiculars	no	no	no	no	no	no	no	no
Hand lifts	y	y	no	no	no	no	no	no
Magic carpet lifts	no	y	no	no	no	y	y	y
T-bar lifts	no	no	y	y	y	no	no	no
Other								

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**I) HEALTH ASSISTANCE: HOSPITAL**

Distance to the nearest Hospital (Km)	5	40	23	35	10	30	16	18
Average time needed to reach the hospital (Minutes)	10	30	20	25	15	35	20	20
Hospital with first aid room	no	y	y	y	y	y	y	y
Hospital with Emergency Dpt	y	y	y	y	y	no	y	no
Intensive care	y	y	y	y	y	y	y	no
Neurosurgery	y	y	no	no	no	no	y	no
Orthopedics	y	y	y	y	y	y	y	no
Resuscitation centre	y	y	y	y	y	y	y	no
Surgery	y	y	y	y	y	y	y	no

J) MEDICAL ASSISTANCE

Public Out patients' Dpt /Public accident wards	y	y	y	y	y	y	y	y
Distance from ski resort (Km)	5	1	0,5	0,5	10	n/a	16	0,5
Private surgeries/Private accident wards	y	y	no	no	no	no	y	y
Distance from ski resort (Km)	5	65	0	0	0	0	16	20
Specialist surgeries	y	no	no	no	no	y	y	y
Distance from ski resort (Km)	5	0	0	0	0	n/a	6	20

K) MEDICAL ASSISTANCE: SERVICES

Chemist	y	y	y	y	y	y	y	y
Private clinics	y	y	no	no	no	no	y	no
Doctor on call	y	y	y	y	y	y	y	y
Emergency number	y	y	y	y	y	y	y	y
Other emergency services phone numbers	y	y	no	no	y	y	y	y
Rescue Helicopter	y	y	y	y	y	no	y	y
Ambulance	y	y	y	y	y	no	y	y
Itinerant resuscitation service station	y	y	y	y	y	y	y	y
System in place for sorting serious cases		no	y	no	y	y	y	y
Number of doctors at the ski resort	0	0	2	0	0	4	1	3
Number of paramedics at the ski resort	1	2	8	6	2	0	2	3

L) HEALTH ASSISTANCE ON SLOPES

Non medical staff trained for first aid intervention	no	y	y	y	y	y	y	y
Ski Patrol	y	y	y	y	y	n/a	no	no

**Azienda ULSS 20 Verona**

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Special devices/Equipment on slopes	y	y	y	y	y	n/a	y	y
number of medical staff for first aid intervention	3	2	0	0	0	0	1	2
Number of non medical staff for first aid intervention	0	32	2	6	2	12	10	22
M) PATROL & RESCUING								
Type of org patrolling:								
Military bodies	no	no	no	no	no	no	no	no
Police or other law enforcement bodies	no	y	y	y	no	y	y	y
Ski lift staff	y	y	y	y	y	no	no	no
Alpine rescuing	y	y	y	y	y	no	y	no
Private patrol service	no	no	no	y	y	no	no	no
Other				y				
Number of identified violations on slopes	0	n/a	0	0	0	96	n/a	n/a
Total amount of inflicted fines (€)	0	0	0	0	0	4056	n/a	n/a
Type of rescuing organization								
Military bodies	no	n	y	y	y	no	no	no
Police or other law enforcement bodies	no	y	y	y	y	y	no	y
Ski lift staff	y	y	y	y	y	no	no	no
Alpine rescuing	y	y	y	y	y	no	y	y
Private patrol service	no	no	no	y	y	no	no	no
Other				y	y			
Means of transport for recuing								
motor sleigh	y	y	y	no	y	y	y	y
Toboggan	no	no	no	y	no	y	y	y
Helicopter	no	no	y	y	y	y	y	y
Ambulance	no	no	y	y	y	y	y	y
Ski lifts	no	y	y	no	y	y	y	y
Other			y					
Rescuing Equipment								
Folding stretcher	no	no	y	no	no	y	y	y
Roll stretcher	no	no	y	y	y	no	no	no
Spinal board	no	no	y	y	no	y	y	y



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Air depression mattress	y	y	y	y	y	y	y	y
Cervical collar	no	no	y	y	y	y	y	y
Extruder	no	no	no	y	y	no	no	no
Rigid bandages supports	no	y	y	y	y	y	y	y
Other								
Average duration of rescuing operations with toboggan (Minutes)	45	n/a	0	20	0	5	10	4
Average duration of rescuing operations with motor sleighs (Minutes)	30	n/a	5	0	15	3	5	2
Average duration of rescuing operations with helicopter (Minutes)	30	n/a	45	45	45	15	30	7
N) PREVENTION								
Information provided at ski school courses	y	y	y	y	y	y	no	y
Information disseminated via leaflets	no	y	no	y	no	y	y	y
Information provided together with ski pass	no	y	y	y	y	y	y	y
Information disseminated by patrolling staff	no	y	y	y	no	no	no	no
Information disseminated by patrolling staff	no	no	y	y	y	no	y	no
Information disseminated at hotels/B&Bs	no	y	y	y	y	y	no	no
Rules of conducts on ski slopes	y	y	y	y	y	y	y	no
Risk of accidents linked to alcohol consumption	y	no	y	y	no	y	no	y
Compulsory use of safety equipment	no	y	y	y	y	no	no	no
Prevention/First aid/rescuing measures on slopes	no	y	y	y	y	no	no	no
Other		y						
Italian	y	no	no	no	no	y	y	y
German	y	no	y	y	no	y	y	no
English	y	no	y	y	y	y	y	y
French	no	no	no	no	no	no	no	no
Slovenian	no	no	y	y	y	no	no	no
Polish	no	no	no	no	no	no	no	no
Russian	no	no	no	no	no	no	no	no
Spanish	no	no	no	no	no	no	no	no
other								
Are any insurance packages covering the risk of skiing accidents offered	no	no	no	y	y	y	y	y



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Optional
Compulsory
Included in the skypass
Other

			no	no	y	no	y
			no	no	no	no	no
			y	y	no	y	no



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Example of possible analysis

At a quick glance the resort dimension seems not to be so meaningful in explaining the injury prevention measures adopted, while it seems important to know the country the resort belong to. It makes sense thinking of the different legal regulations existing in the different countries as an important factor for determining the prevention measures adopted, highlighting that safety on the slopes is not yet become an absolute value to pursue but is still perceived as an obligation.

The best slopes, under the point of view of the injury prevention measures adopted, seem to be the Slovenian ones (keeping in mind, however, that the 8 questionnaires analysed cannot be considered representative for the 3 countries). It would be worth conducting a wider research in order to test whether this Slovenian top rate is still true for a larger and more representative slope sample and in case it is, to test some hypothesis trying to understand the possible reasons and its effects on skiing and snowboarding injuries.

The 3 surveyed Italian slopes (it worths repeating they cannot be considered representative of the Italian situation) present a lack of:

- Warning signals along the slopes
- Training to the slope personnel
- Security as far as regards the mountain huts: there is a number of huts which remain open beyond the slope closure time increasing the risk to have drunk people skiing/snowboarding at a late time in the evening.

On the other hand Italian slopes seem to be really well equipped and organized for everything concerning the rescuing activities and the injury treatment: this substantially contributes in reducing the injury's morbidity.

As far as regards the 2 Austrian slopes surveyed, there is room for improvement for the rescuing service, which present a slower and worst equipped rescuing service with respect the other surveyed slopes. Nothing, however, can be said on the general situation of the Austrian slopes, being 2 slopes too few for generalizing the findings to the whole country.

The issue regarding information to the public suggest another hypothesis to test with future research: the information increase with the average increase of the slopes difficulty. As to say: for a ski resorts with easy slopes there is no much need of information. Should this hypothesis be verified it goes without saying that there could be several considerations to do.



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A positive aspect is that all this slope are within 30 minutes from the nearest hospital and in general the medical assistance, starting from the slopes, is well organized and present: aspects that contributes to reduce the injury morbidity



Sub Annexes

Sub Annex A – SIMON System

Sub Annex B – European Injury cards

Sub Annex C – Synoptic Table of Injury card

Sub Annex D – Minimum Data Set and MDS cards

Sub Annex E – Injury Prevention measures and questionnaire

Sub Annex F – SIMON Analysis of collisions

Sub Annex G – Italian data analysis

Sub Annex H – Literature and legislative review