

36 SITEMSH Congress
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Update on Head and Spinal Injury
Trend since 1992 in the French Ski
resorts.
Methodological Consideration.

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Dr JB Delay*, Pierre Jean Arnoux**.

**"Médecins de Montagne"

** »IFFSTAR »

Purpose:

- To determine injury trends since 1992
- To evaluate Head and spinal injury trends in French ski resort.

Background:

Effect of helmet use on traumatic brain injuries and other head injuries in alpine sport

Nicolas Bailly^{1, 2} (PHD), Jean-Dominique Laporte³ (MD), Sanae Afquir¹, Catherine Masson¹ (PHD), Thierry Donnadiou², Jean-Baptiste Delay³ (MD), Pierre-Jean Arnoux¹ (PHD) *Wilderness & Environmental Medecine*. 2013

Factors associated with injuries occurred on slope intersections and in snow parks compared to on-slope injuries.

Ruedl G, Kopp M, Sommersacher R, Woldrich T, Burtscher M *Accid Anal Prev*. 2013;50:1221-1225.

Update on Injury Trend in Alpine Skiing , *Skiing Trauma and Safety 17th Volume STP 1510*.

Robert J.Johnson, Carl F.Ettliger, and Jasper E.Shealy

Main Purpose:

- To discuss Head and spinal injury trends in French ski resort.
- To assess results and relevance of data.

Background:

The effect of Helmets on the risk of head and neck injuries among skiers and snowboarders: a meta analysis Kelly Russel Msc, Josh Christie Bhsc, Brent E. Hagel Phd, CMJA, 1 february 2010.

Snow-sport helmet: injury-saving potential, rate of helmet wearers and recommendations Brügger O, Bianchi G, Schulz D, Kisser R, Rogmans W.. Bern: EuroSafe Task Force Safety in Sports; 2009.



METHOD

Method | Injured Population

- The study group comprises a cohort of injured participants treated by 50 doctors across 37 ski resorts throughout France.
- The study focuses upon 625 410 injured participants using data collected by the network of mountain doctors since 1992.

- A standardized form has been used since 1992, for each injured skier.
- Record and data analysis are performed on the software : « EPI 2000 » and SPSS

Method | Control Group

➤ The control group comprises 38 687 participants
(interview face to face)
sampled from 13 representative ski resorts in France

➤ Random count at the bottom of the slopes,
(Gender, age group, practice, helmet)

Number of ski pass sold by each ski resorts

Method | Incidence rate




The incidence rate is calculated in relation to a number of « **skiers days** », or « **skiers visits** ».

« **Skiers days** » is a standard based on **the number of ski pass that are sold**.

Method Medecins de Montagne



The method has been validated by an independent statistical body – INVS: Institut de la veille sanitaire



R ESULTS

National injury trend

625 410 injured
38687 control

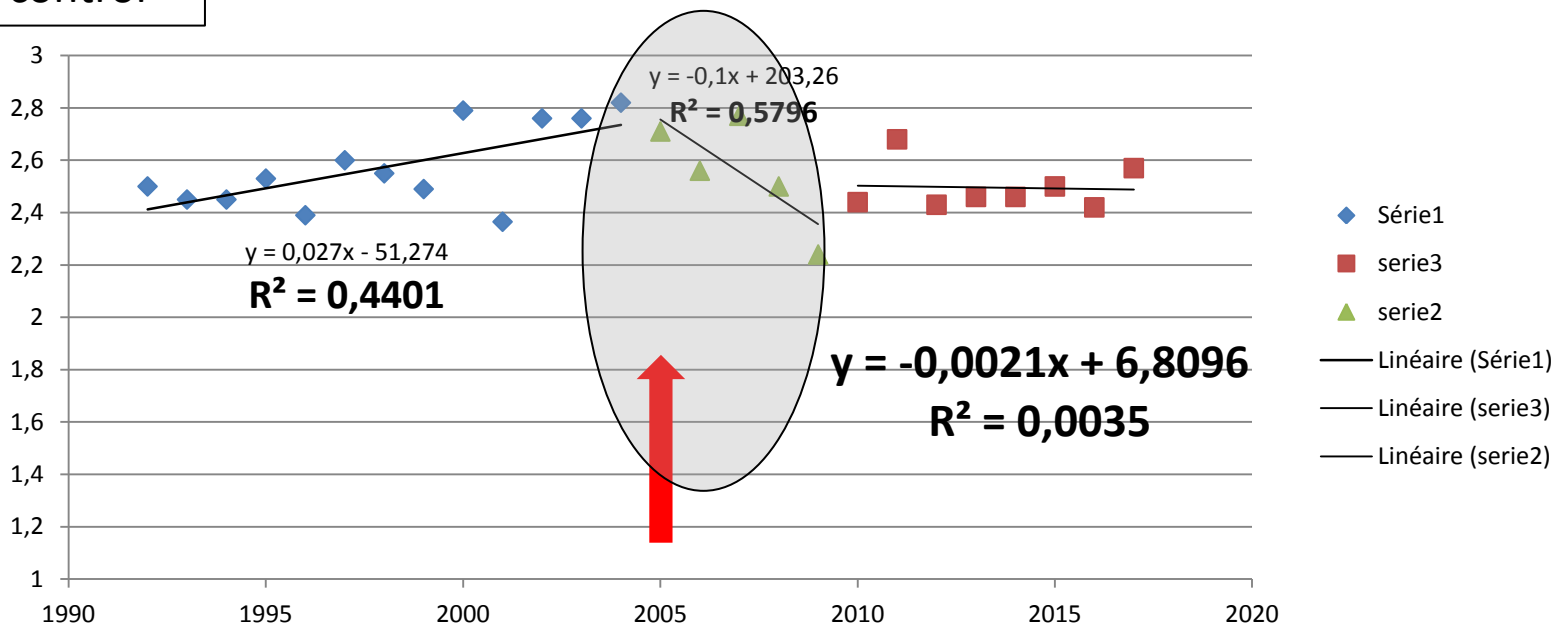
incidence rate :

- 140 000 injured in France each year during participation in winter sports
- 51 000 assistances by ski patrols

RESULTS

625 410 injured
38687 control

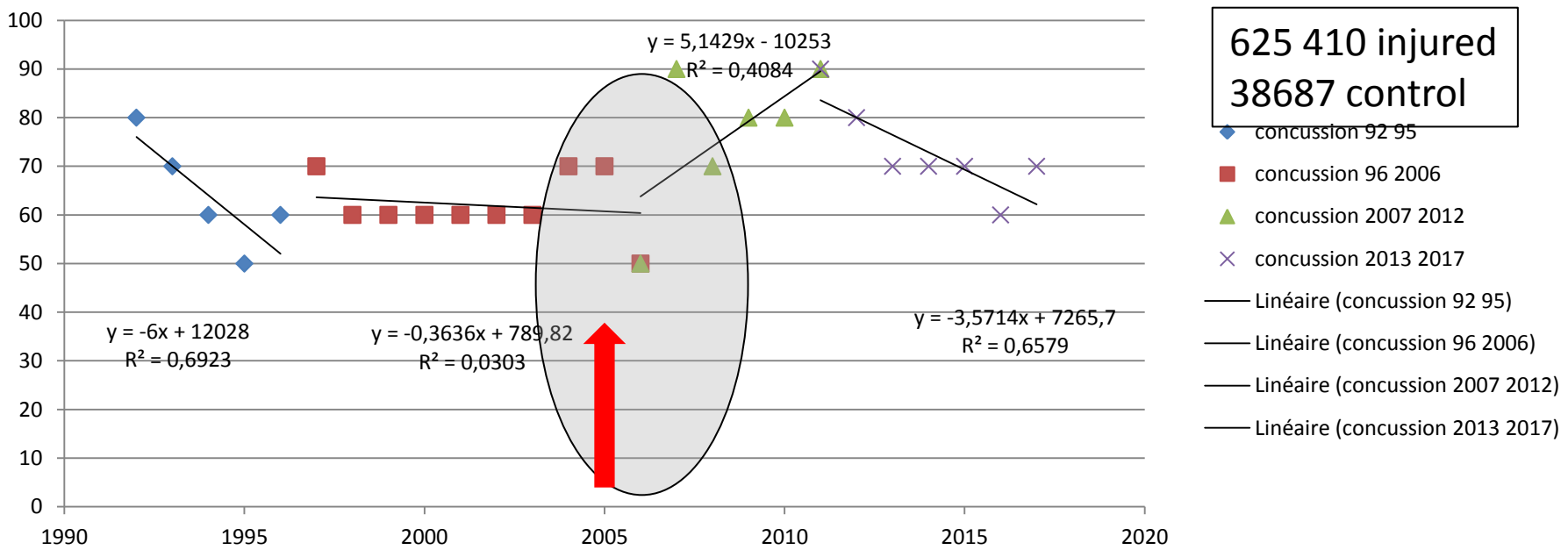
Injury rate, trend 1992-2017



Trend: After large period with increase of the risk
2005-2010 significant decrease of the risk
Now is stable, **2.5/1000 skiers days**

RESULTS

Traumatic Brain Injury (TBI) rate, trend 1992-2017

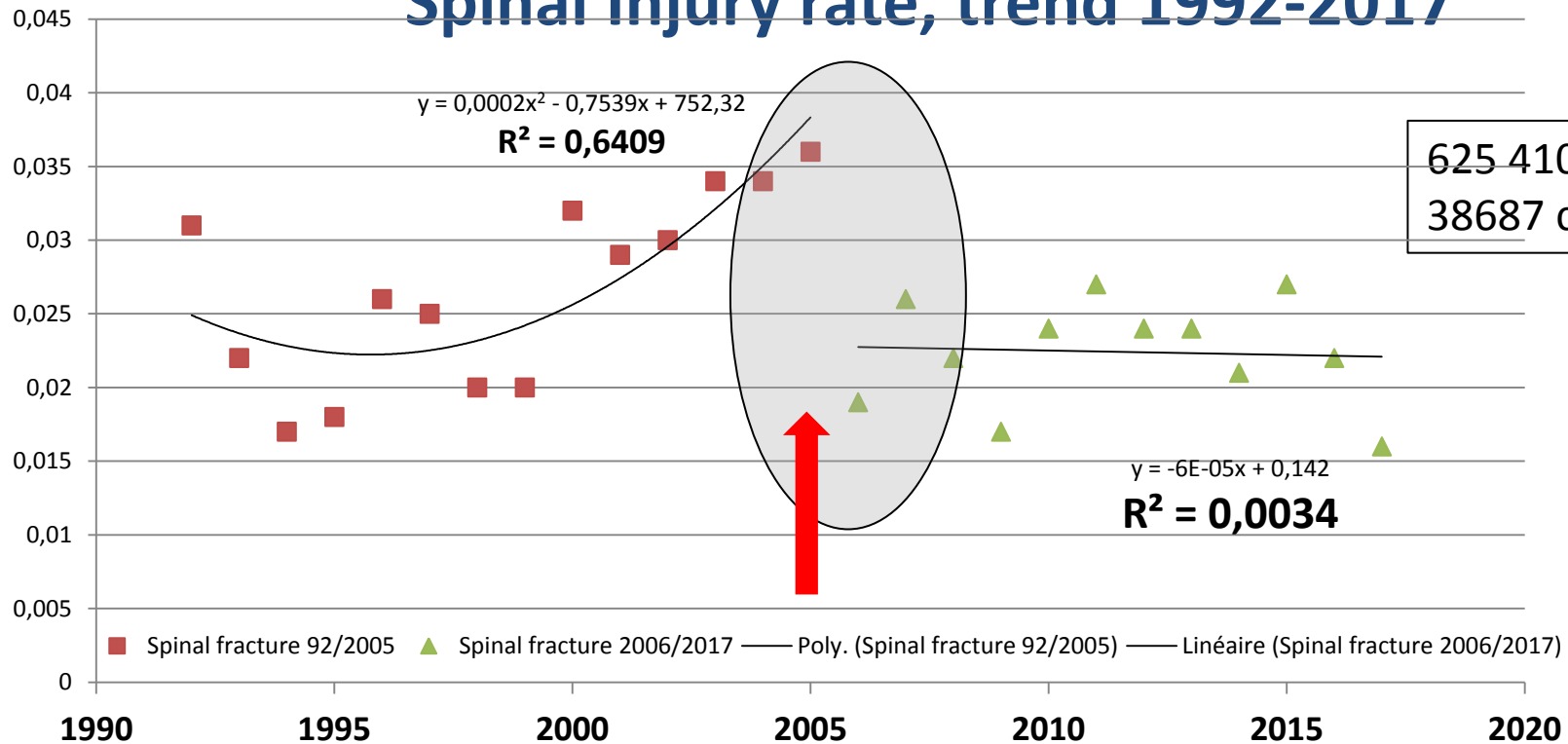


Injury rate, Trend: 2005-2010 significant decrease of the risk
TBI, significant increase of the risk, 2006- 2012!!!

RESULTS



Spinal Injury rate, trend 1992-2017



Spine fracture, the risk rise since 1992 to 2005,
Change the trend the risk decrease since 2006, What append!!!

What append for this period of time, **2005-2009**



Hypothesis and DISCUSSION What do we know?

Nicolas Bailly Doctoral Thesis

A case control study, from this « médecins de Montagne » date bases, 2012/2014
And analysis trend of TBI injury 2005/2014, except children

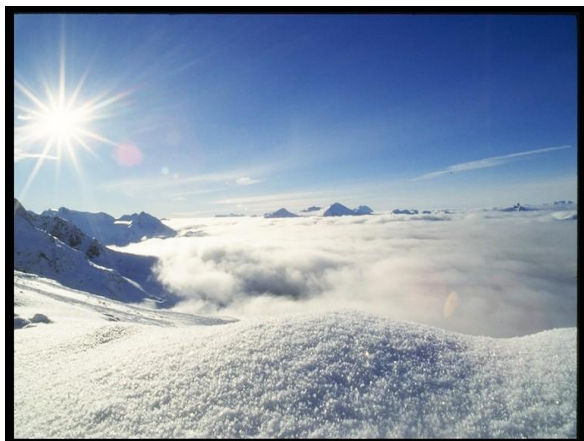
Conclusion, significant link with

Helmet use, protect for TBI

Age, higher risk for young adults and elderly

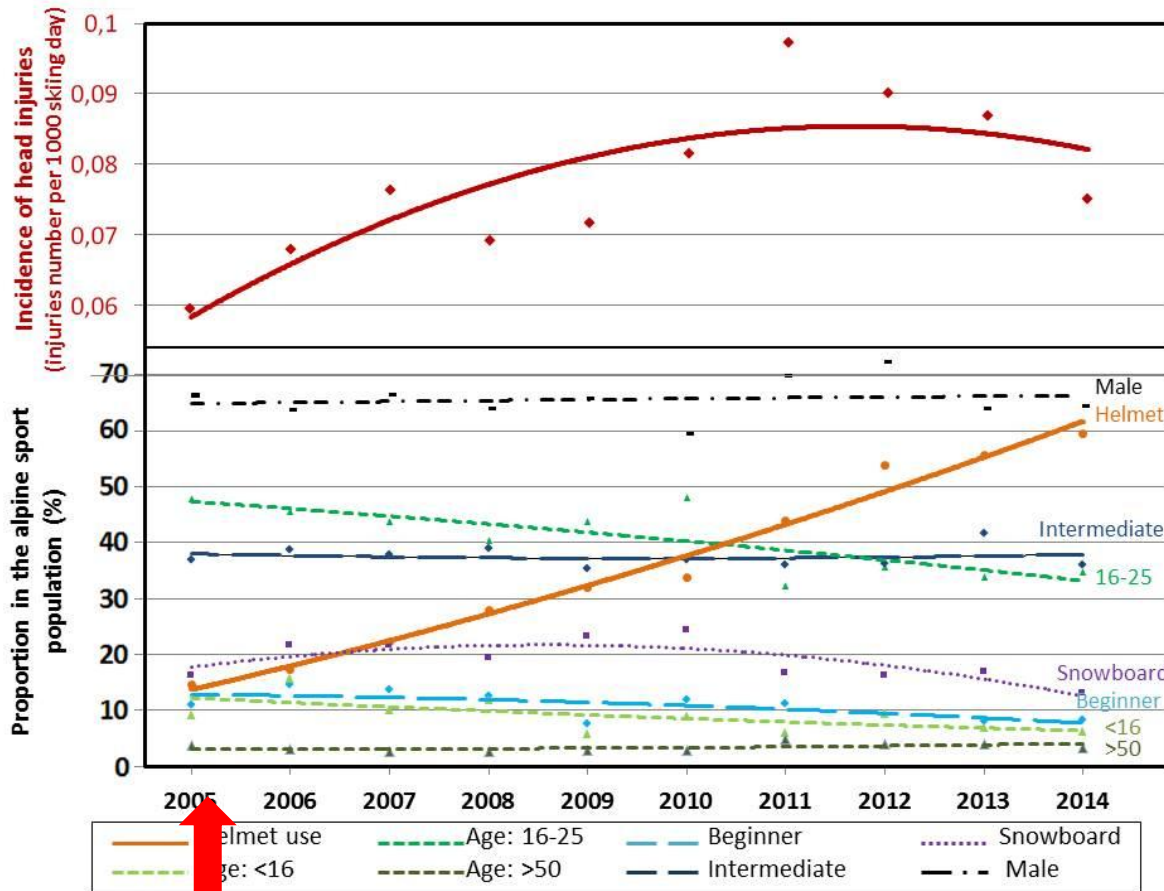
Ski ability, higher risk for beginner

Practice, higher risk for snowboarder



RESULTS

Traumatic Brain Injury (TBI) rate, trend 2005/2014



RESULTS

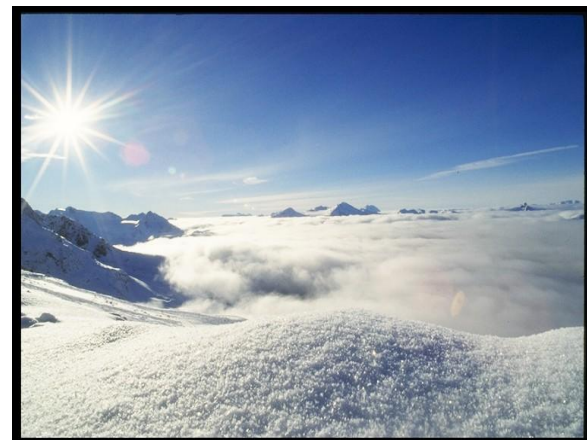
Case Control study Dr Nicolas Bailly 1530 Head injury, 2477 control, **2012/2014**
Characteristics of head injured and control population
 and results of the logistic regression analysis of potential risk factor of head injury



Variables	Head injuries (n=1530)	Controls (n=2477)	Chi ² P values Injuries VS control	Adjusted Odds Ratio	(95% CI)
Helmet use					
			<0,001		
No	894 (58%)	1100 (44%)		1,88**	(1.64-2.17)
Yes	636 (42%)	1377 (56%)		1,00	
Age					
			<0,001		
16-25	363 (37%)	1302 (32%)		1,85**	(1.59-2.15)
26-50	894 (44%)	1500 (52%)		1,00	
>50	1879 (19%)	453 (16%)		2,80**	(2.32-3.40)
Sex					
			0,06		
Female	646 (42%)	971 (39%)			
Male	884 (58%)	1509 (61%)			
Ski ability					
			<0,001		
Good	638 (42%)	1543 (62%)		1,00	
Intermediate	744 (49%)	817 (33%)		2,20**	(1.91-2.53)
Beginner	148 (10%)	117 (5%)		2,99**	(2.29-3.92)
Practice					
			0,04		
Skiers	1167 (76%)	1958 (79%)		1,00	
Snowboarders	363 (24%)	519 (21%)		1,41**	(1.19-1.68)

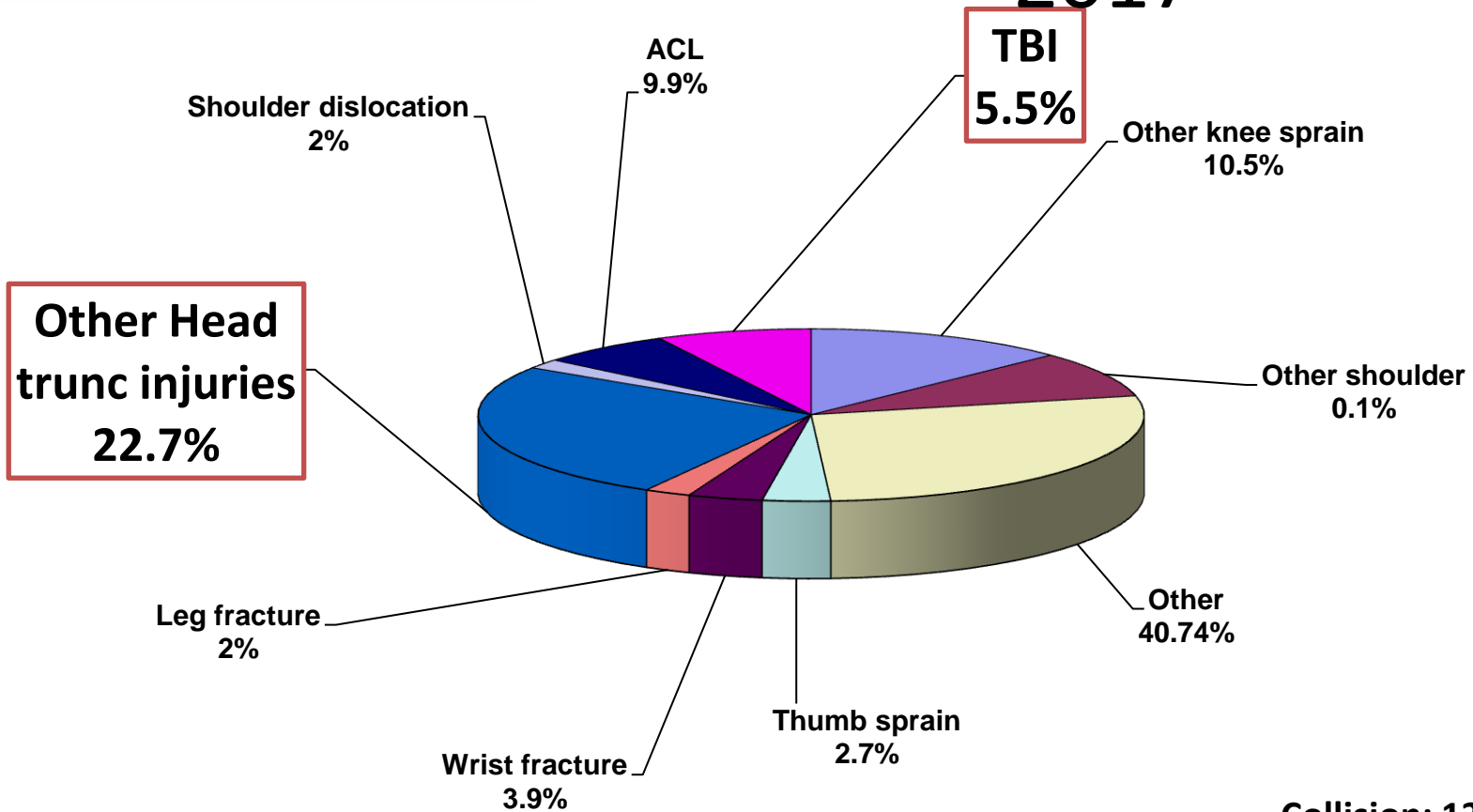
Risk and collision,
significant link for TBI and Spinal injury

No apparent relationship for change of
trend, 2005



RESULTS

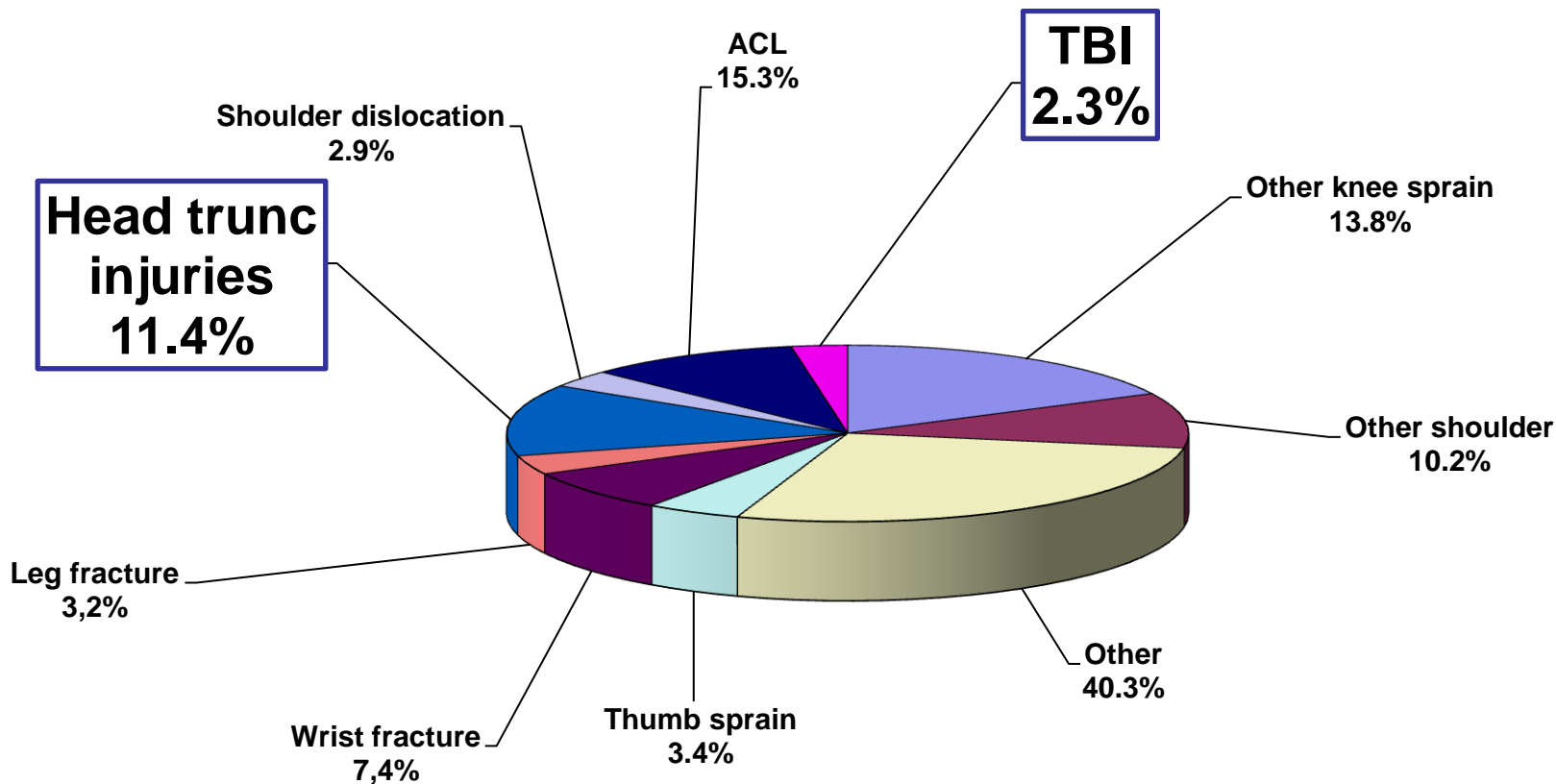
2435 injured by collision 2017



Collision: 12.84% N

RESULTS

16405 injured without collision 2017



Collision: 12.84% N

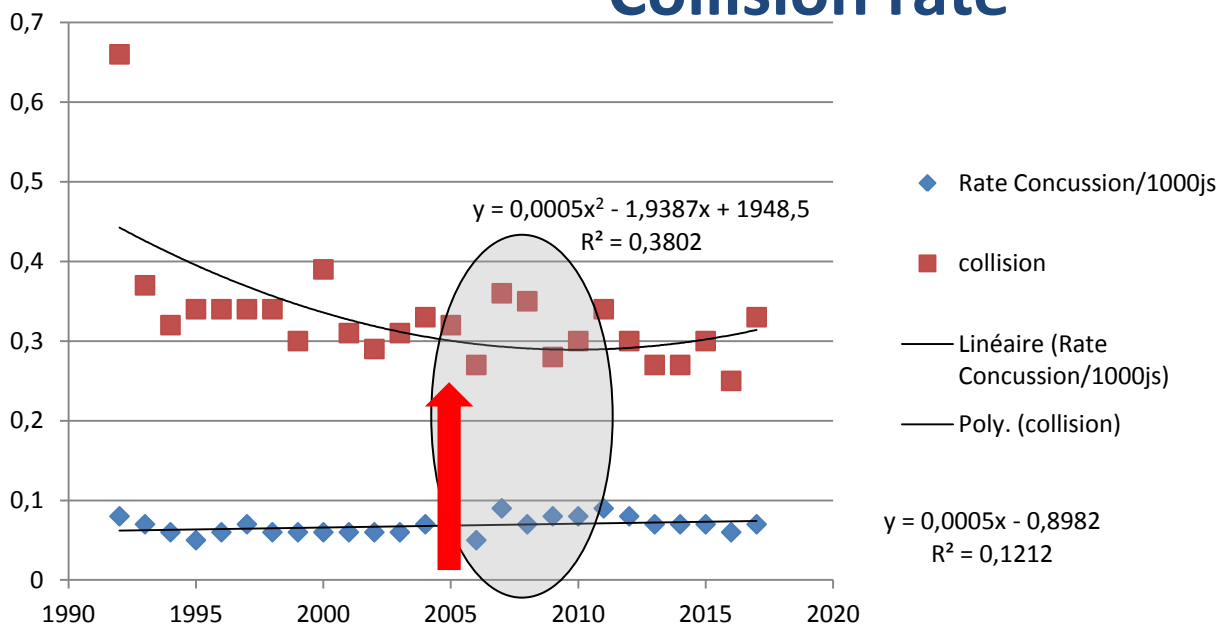
RESULTS

Traumatic Brain Injury (TBI) rate, trend 1992-2017



Collision rate

625 410 injured
38687 control



Collision rate, Trend: decrease of the risk since 1992
TBI, significant increase of the risk, 2006- 2012!!!

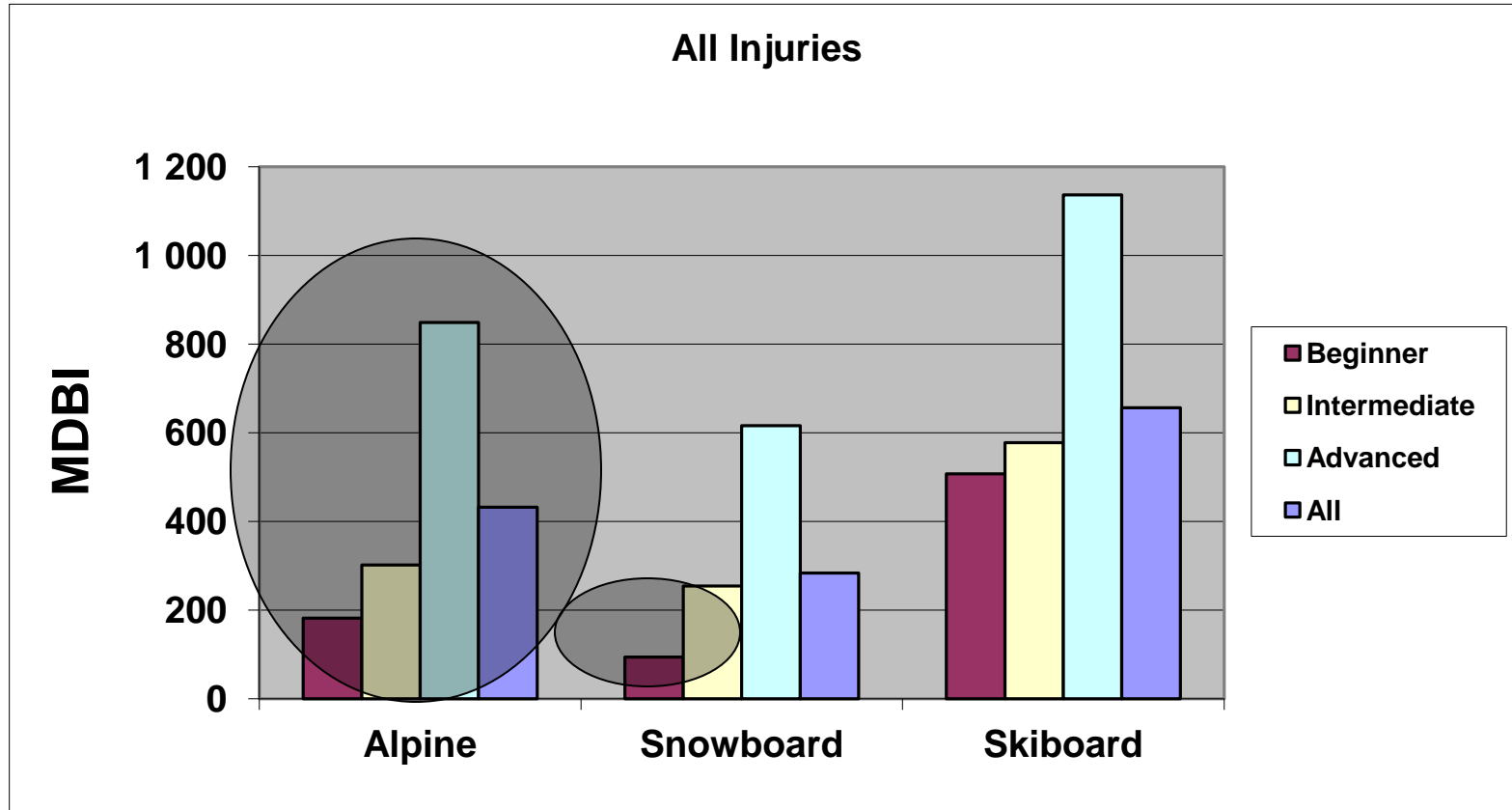
Risk and beginner,
significant link for TBI and Spinal injury

No apparent relationship for change of
trend, 2005



Results – All Injuries – 1998-2004

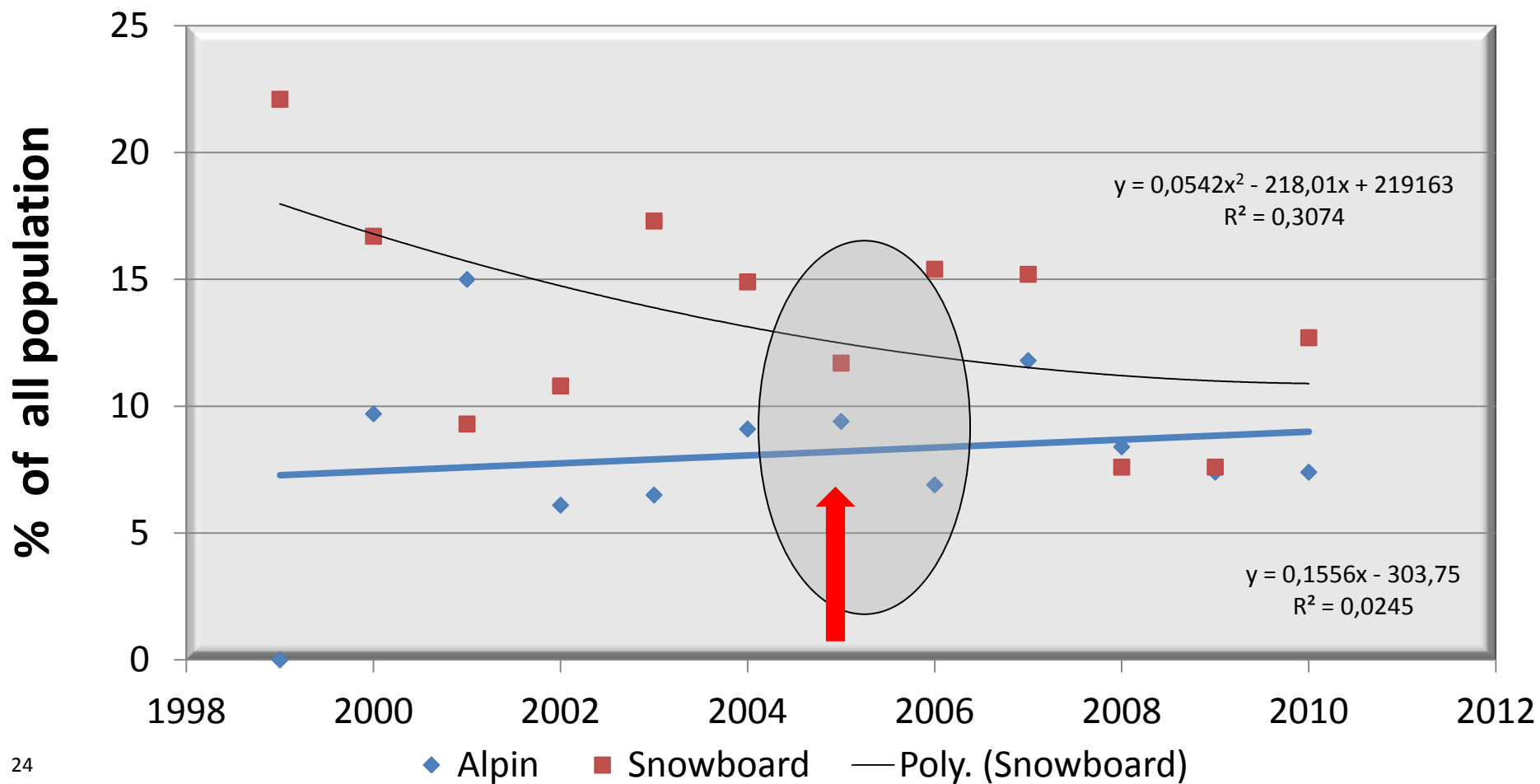
By Experience Level



Beginner injury rates 2-3x higher than all injuries, 4-6x advanced
 Beginner Snowboarders less than 100 MDBI – WOW!

RESULTS

**% of beginners in a control group
(less than 7 days of practice)
trend 1999-2010 Alpine and Snowboard**



Risk ,collision, ang Agegroup
significant link for TBI and Spinal injury
Change in trend, 2001
No apparent relationship for change in
trend, 2005



1993, Collisions and Age

13%

Adults

20%

Children

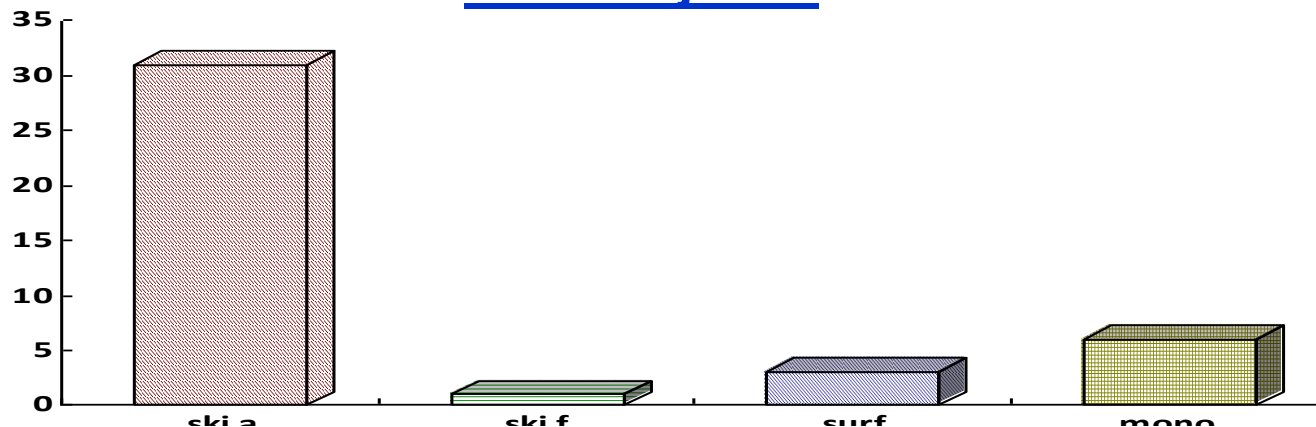
% of all injuries in each group

1993

415 children injured
by collision

49% dangerous localisations

Off all injuries



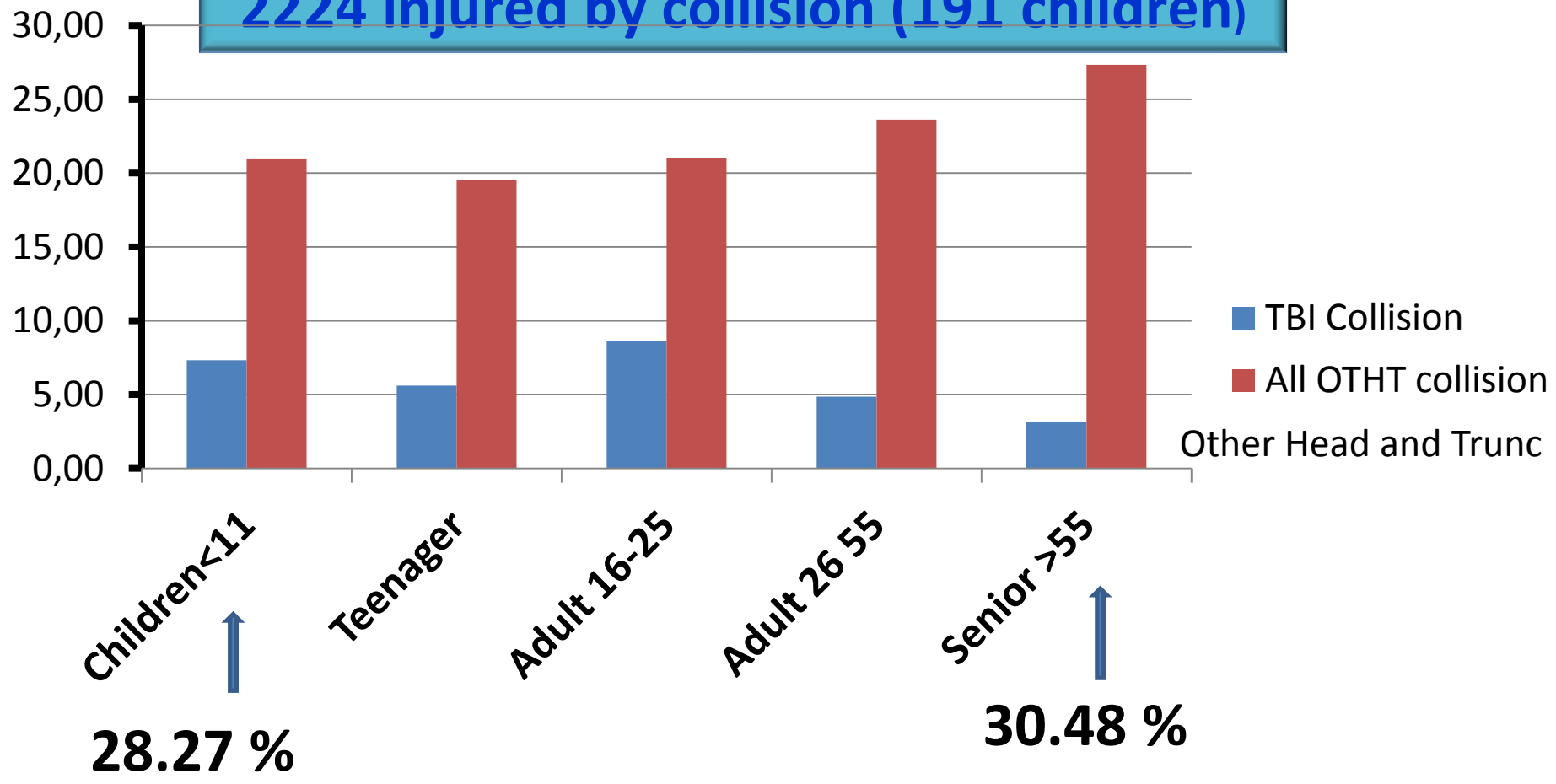
Head + FACE
41 %

ABDOMEN
1 %

CHEST
2 %

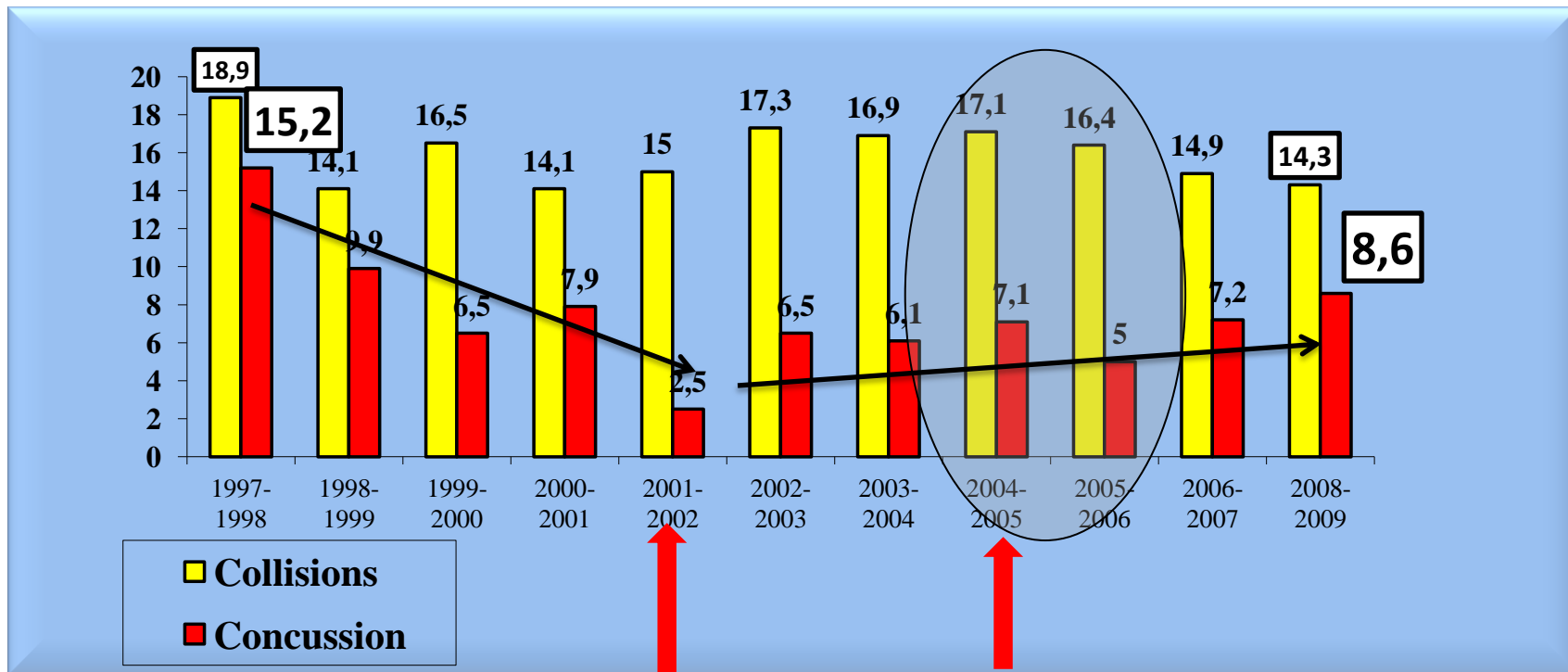
spine
5 %

2017
2224 injured by collision (191 children)



RESULTS

Trend: % of TBI in case of collision
Kids and teenager, 16 years old, 1997-2009



In the same time, for adults, TBI from collision increase 4,2% in 1993 , 10% in 2010

Risk and practice
Significant Higher risk for snowboard
practice
Significant change in trend, 2005



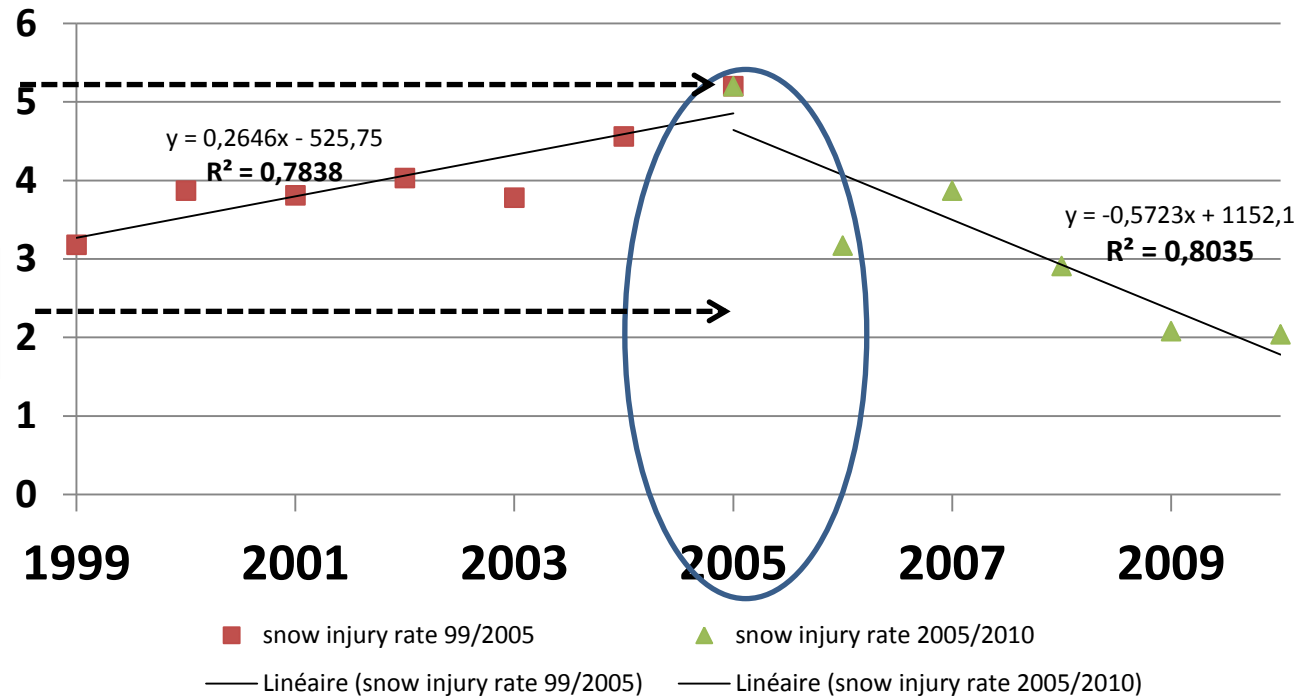
RESULTS

Snowboard Injury rate, trend 1999-2010

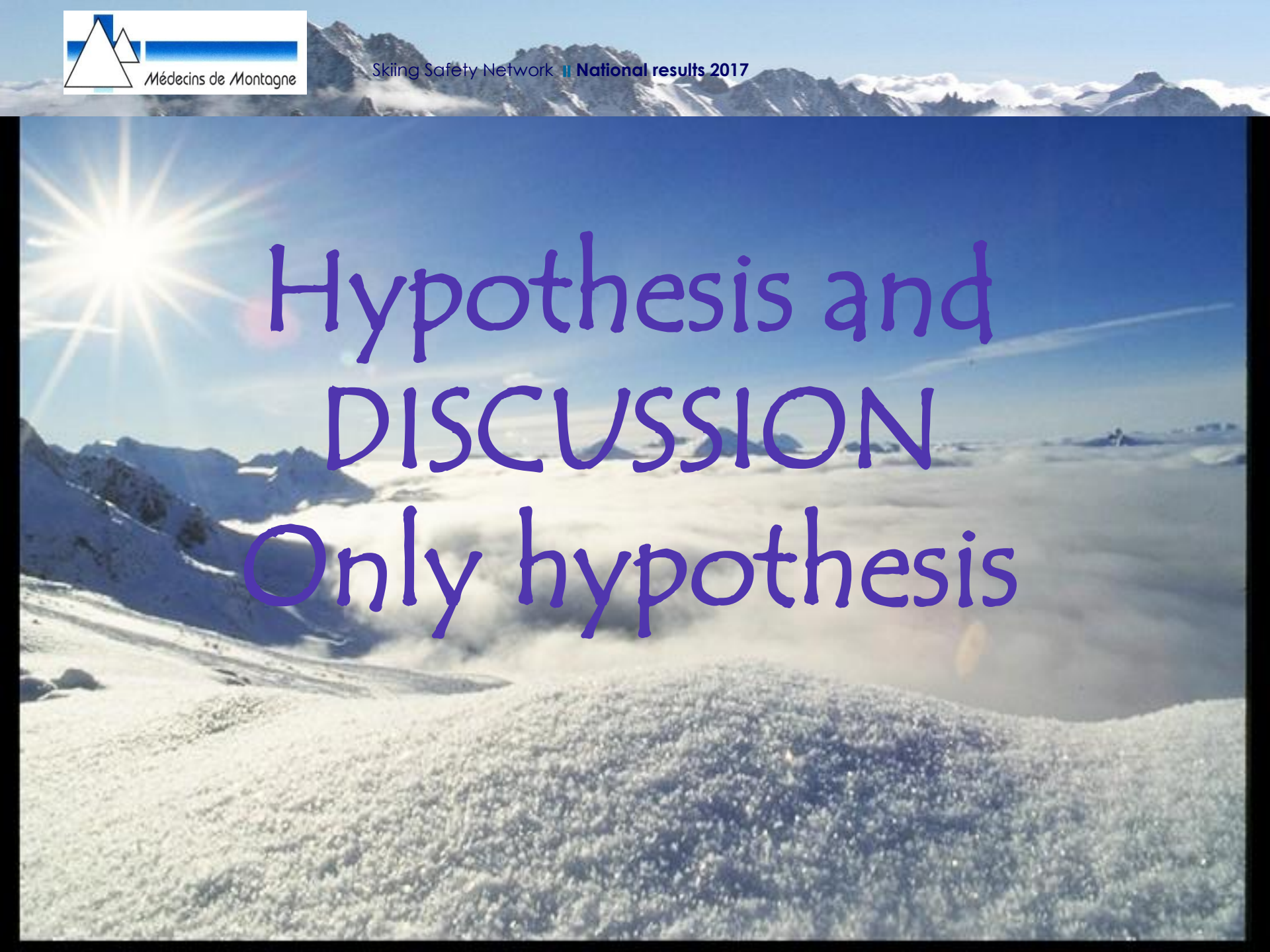


Skier day /1000
**Snow: 5.2 /1000 SD
 2005**

**Alpin : 2.4/1000 SD
 2005**



**Trend: 92-2005 significant increase of the risk
 2006-2010 important decrease of the risk**



Hypothesis and DISCUSSION Only hypothesis

Discussion | Incidence rate

In France, from 1992 to 2005, incidence rate of ski injuries has increased.

Why ?

Hypothesis:

- % of snowboarders on the slopes increased
- snowboarders have a higher incidence rate of injuries because of a high percentage of beginners (definition of beginners = less than 7 days practice)

Discussion



- For snowboarding , in 2006/2012, the lower overall incidence of injuries could be linked with the fact that
Beginners proportion decrease in the control group compared to the earlier period?
- Or change in ski slope organization:
Normalization process for Terrain Park start ?
?

Discussion about effect of Helmet wearing

Is helmets lead to a reduction of head injuries?

Is an effect of Safety campaigns to prevent collisions on ski slopes?

Snow-sport helmet according to EN 1077 category B



Discussion about effect of Helmet wearing

Is helmets lead to a reduction of head injuries?

“The rate of helmet wearers has increased considerably. However, on the basis of European accident statistics, it cannot be proven that the increase in the rate of helmet wearers has led to a reduction in the frequency of head injuries, as other factors exerting an influence on the accident cannot be monitored.”

Brügger O, EuroSafe Task Force Safety in Sports; 2009.

**Snow-sport helmet according
to EN 1077 category B**





C ONCLUSION

Conclusion



Trends for traumatic brain injury and spinal injury presented a change for 2004-2009 period with no consistent or clear relationship between various findings of this study

Conclusion



Analysis of trend is complex

Analysis of large data basis require a special field of analitical expertise,

This is a goal for the French team of “Medecins de Montagne Safety network” and the research Team of IFFSTAR

Skiing Safety Network 1992 - 2017

Thanks to all members of skiing safety network
For all the Team of IFFSTAR

Thanks for your attention