

# Long term surveillance to promote athlete health and performance

## - the Norwegian health team experiences

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 Oslo Sports Trauma  
RESEARCH CENTER

NORGE  
  
OLYMPIATOPPEN



Oslo Sports Trauma Research Center | Norwegian School of Sport Science |  
Norwegian Olympic Training Center



# Today

- History - aims, value and benefits of injury & illness surveillance
- 10 years of data from Olympic (Youth) and Paralympic Games
  - Beijing 2008 to Lausanne YOG 2020
- The Norwegian team experience following 10 years of health monitoring

LIIKUNTATIETEELLINEN SEURA

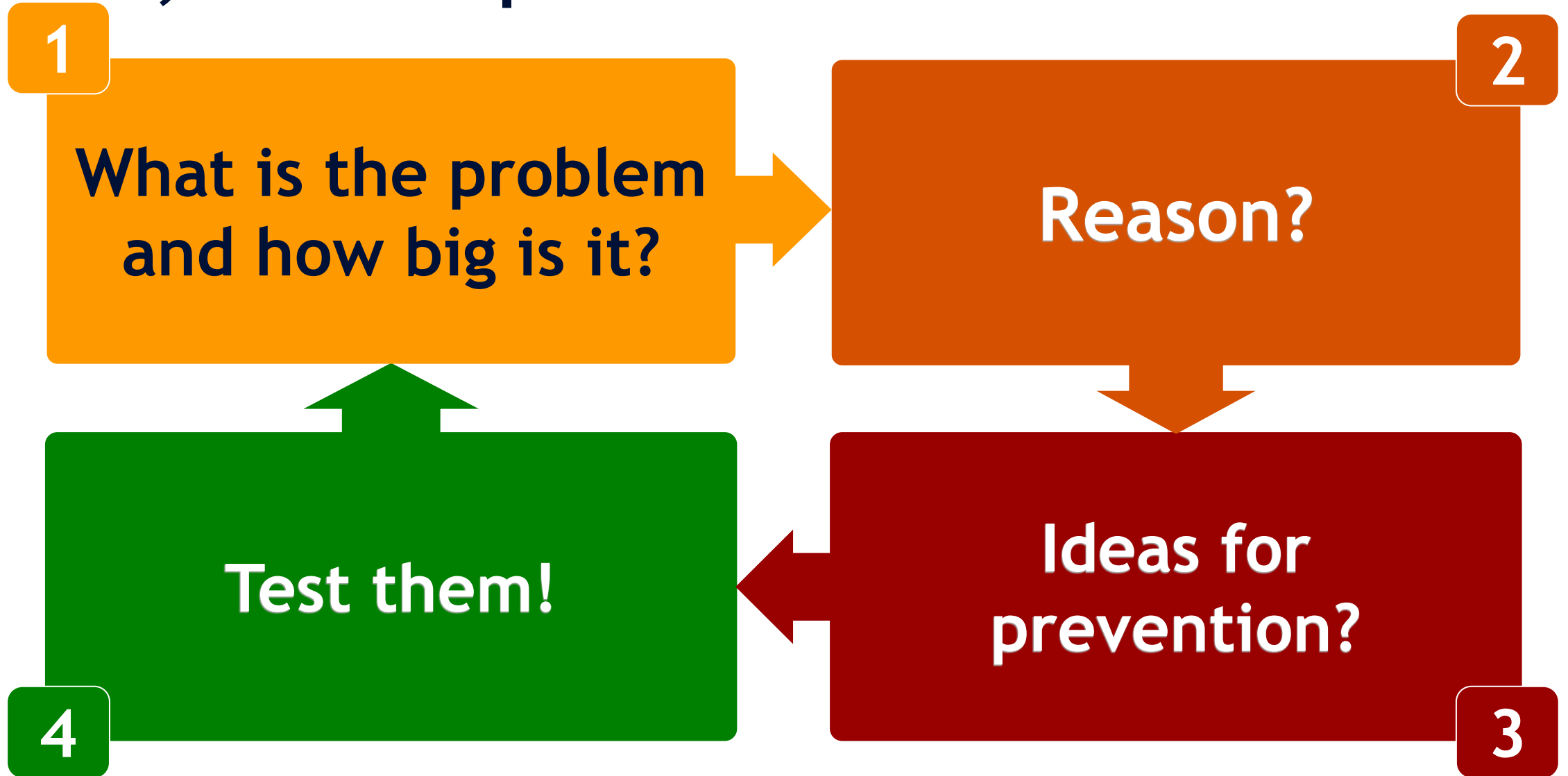
Liikunnan tiedeviestintää vuodesta 1933



# Why are we doing surveillance?



**We want to learn more about ... and we want to act, make impact!**



# History of injury & illness surveillance systems in sport

**Injury surveillance in the International Olympic Games**  
 A Junge,<sup>1</sup> L Engebretsen,<sup>2,3</sup> J ...  
 J Dvorak<sup>1,7</sup>

**ABSTRACT**  
 Background: The International Olympic Committee (IOC) provides not only surveillance but also directions for preventing injuries in sports federations. However, the IOC has not evaluated sports federations' opportunities for monitoring injury frequency and circulation. Objectives: To provide an overview of injury surveillance in multi-sports tournaments in Beijing as an example. Methods: A group of 10 sports federations were invited to participate in the IOC consensus statement on injury and illness surveillance in sport (2010). The IOC consensus statement was reviewed and adapted to the needs of the 2008 Summer Olympics. The IOC consensus statement on injury and illness surveillance in sport (2010) was reviewed and adapted to the needs of the 2008 Summer Olympics. The IOC consensus statement on injury and illness surveillance in sport (2010) was reviewed and adapted to the needs of the 2008 Summer Olympics.

**Correspondence to**  
 Annika Prien, Medical School Hamburg (MSH), Am Kaiserkai 1, Hamburg 20457, Germany; annika.prien@medischsh-hamburg.de

**Injuries in 13 international Athletics championships between 2007–2012**

**Injury surveillance in the Tournaments 1998–2010**

**Injury and illness surveillance in the FINA World Championships 2015**  
 Annika Prien,<sup>1</sup> Margo Cees van den Hoogenhof,<sup>2</sup> Kyriakos Nanoussis,<sup>3</sup> Astrid Junge<sup>1,6,7</sup>

**ABSTRACT**  
 Background: Epidemiological surveillance of injury and illness in sport is required to develop surveillance strategies. Aim: To assess the frequency of injuries/illnesses (I) in the 4th World Championships 2015 compared with 2013 and 2009. Method: (1) Athletes answered a retrospective questionnaire, and (2) the medical staff reported injuries/illnesses prospectively during the championships.

**Original article**

**International consensus statement on methods for recording and reporting of epidemiological data on injury and illness in sport 2020 (including STROBE Extension)**

**Methods for epidemiological studies on injury and illness in sport 2020: an extension of the IOC consensus statement on methods for recording and reporting of epidemiological data on injury and illness in sport 2010**

**Para sport translation of the IOC consensus on recording and reporting of data for injury and illness in sport**

**RECOMMENDED TOOLS FOR RESEARCH METHODOLOGY IN SPORTS INJURY & ILLNESS EPIDEMIOLOGY**

- Guidance on how to conduct surveillance projects
- Data collection tools and analyses
- Definitions
- Data presentation - outcome and exposure

**Tennis-specific extension of the International Olympic Committee consensus statement: methods for recording and reporting of epidemiological data on injury and illness in sport 2020**

**Para sport translation of the IOC consensus on recording and reporting of data for injury and illness in sport**

**Consensus statement**  
 The IOC has proposed standard methods for recording and reporting of data for injury and illness in sport. The IOC consensus statement authors anticipated that sport-specific statements would provide further recommendations. This statement is the tennis-specific extension of the partner IOC statement. The International Tennis Federation Sport Science and Medicine Committee, in collaboration with selected external experts, met in June 2019 to consider athlete health monitoring issues specific to tennis. Once the IOC consensus statement was finalized, the tennis-specific consensus was drafted.

2008

(1998) 2010 - 2018

2020

Development of surveillance methodology (IOC)

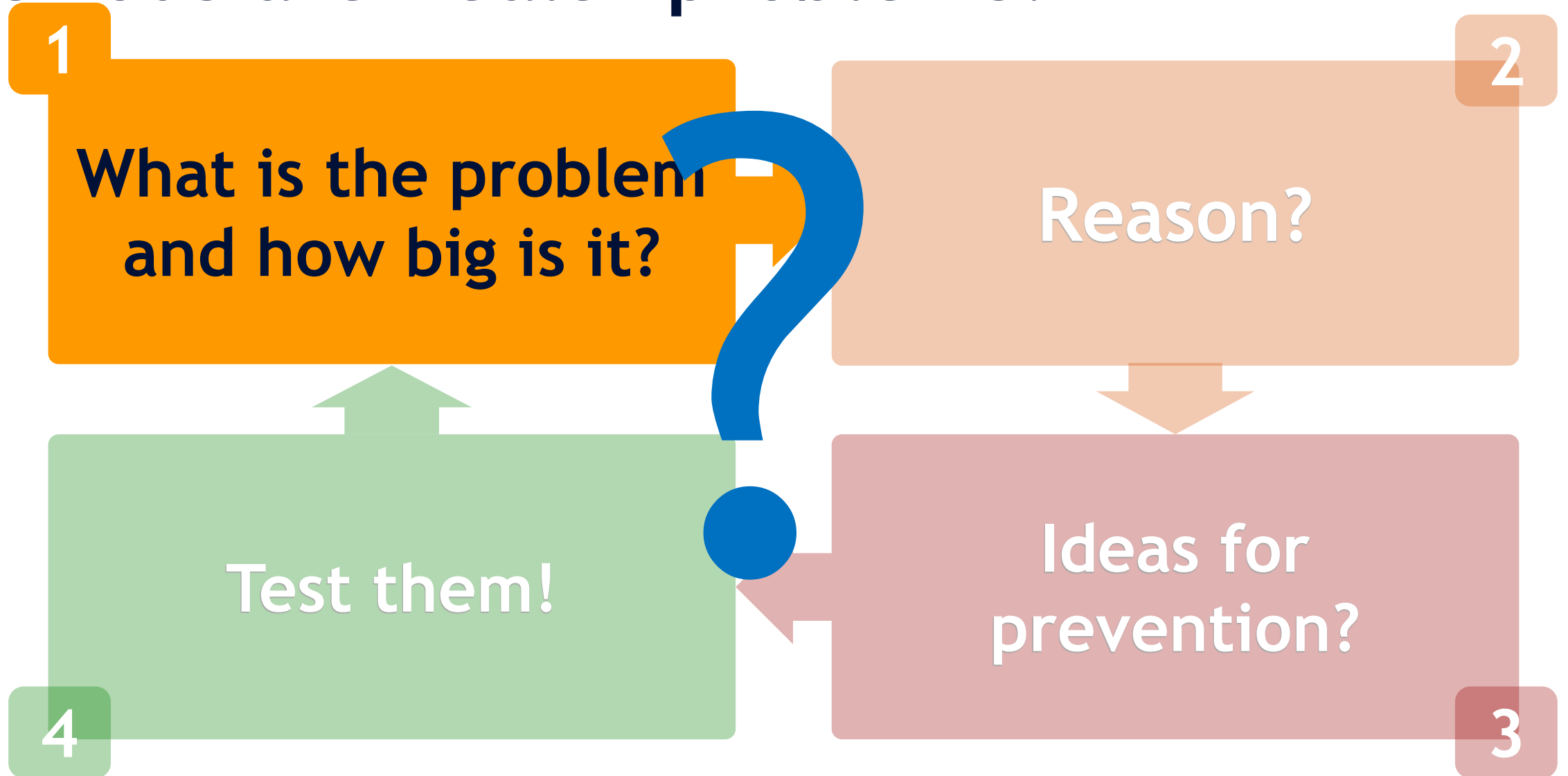
Implementation of surveillance by IFs

Revision of IOC surveillance methodology + sport-specific adaptations



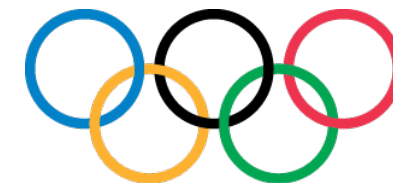
**IOC injury & illness surveillance during Olympic (Youth) Games published in numerous reports**

# Olympic sports: How common and how serious are health problems?





# IOC medical surveillance: up to 1 in 6 athletes are injured and 1 in 10 experience an illness during Olympic Games



Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on September 6, 2010 - Published by group.bmj.com

Highlight paper

## Sports injuries and illnesses during the Winter Olympic Games

Lars Engebretsen,<sup>1</sup> Astrid Junge,<sup>6</sup> Willem H. van Mechelen,<sup>7</sup> Per A. Renner,<sup>8</sup> Lars Engelmark,<sup>9</sup> Mark Aubrey,<sup>10</sup> Willem H. van Mechelen,<sup>7</sup> Per A. Renner,<sup>8</sup> Lars Engelmark,<sup>9</sup> Mark Aubrey,<sup>10</sup> Willem H. van Mechelen,<sup>7</sup> Per A. Renner,<sup>8</sup> Lars Engelmark,<sup>9</sup> Mark Aubrey,<sup>10</sup>

**ABSTRACT** Background Identifying their most common and facilitate the identification at an early stage.

**Additional data** (supplementary tables) are published online only. To view these files please visit (<http://bjsm.bmj.com>).

**Correspondence to** Torbjørn Soligard, Medical & Scientific Department, International Olympic Committee, Lausanne 1007, Switzerland.

Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on November 24, 2016 - Published by group.bmj.com

## Sports injuries and illnesses during the Winter Olympic Games

Torbjørn Soligard,<sup>1</sup> Kathrin Steffen,<sup>2</sup> Marie-Elaine Grant,<sup>5</sup> Willem H. van Mechelen,<sup>7</sup> Lars Engebretsen,<sup>1,2,8</sup>

**ABSTRACT** Background Systematic surveillance of injuries and illnesses sustained during the Olympic Winter Games (OWG) is essential to protect the health of the athletes and to provide epidemiologic data that can be used to protect the health of the athletes and to provide epidemiologic data that can be used to protect the health of the athletes.

**Additional material** is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2018-100236>).

**Correspondence to** Dr Torbjørn Soligard, Medical and Scientific Department, International Olympic Committee, Lausanne, Switzerland.

Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on November 24, 2016 - Published by group.bmj.com

## Sports injury and illness incidence in the PyeongChang 2018 Olympic Winter Games: a prospective study of 1127 athletes

Torbjørn Soligard,<sup>1,2</sup> Roald Bahr,<sup>3</sup> Alexandre Dias Lopes,<sup>4</sup> Jiri Dvorak,<sup>5</sup> Marie-Elaine Grant,<sup>6</sup> Willem Meeuwisse,<sup>2</sup> Margo Mountjoy,<sup>10</sup> Leonardo Oliveira Peixoto,<sup>11</sup> Natalia Salmina,<sup>12</sup> Richard Budgett,<sup>1</sup> Lars Engebretsen,<sup>1,3,13</sup>

**ABSTRACT** Objective To describe the pattern of injuries and illnesses sustained during the Games of the XXXI Olympiad, hosted by Rio de Janeiro from 5 to 21 August 2016.

**Additional material** is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2017-097956>).

**Correspondence to** Torbjørn Soligard, Medical & Scientific Department, International Olympic Committee, Lausanne 1007, Switzerland.

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**Additional material** is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2019-101040>).

**Correspondence to** Dr Debbie Palmer, Moray House School of Education and Sport, University of Edinburgh, Edinburgh EH8 8AQ, UK.

Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on November 24, 2016 - Published by group.bmj.com

## How do the new Olympic sports compare with the traditional Olympic sports? Injury and illness at the 2018 Youth Olympic Games in Buenos Aires, Argentina

Kathrin Steffen,<sup>1</sup> Alan Maximiliano Rodriguez,<sup>2</sup> Joaquin Rodriguez,<sup>3</sup> Lars Engebretsen,<sup>4</sup>

**ABSTRACT** Objective To describe the injury and illness characteristics among participating athletes during the Lausanne 2020 Youth Olympic Winter Games (YOG 2020), 9–22 January 2020.

**Additional material** is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2020-103514>).

**Correspondence to** Dr Debbie Palmer, Moray House School of Education and Sport, University of Edinburgh, Edinburgh EH8 8AQ, UK.

Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on November 24, 2016 - Published by group.bmj.com

## Sports injuries and illnesses at the Lausanne 2020 Youth Olympic Winter Games: a prospective study of 1783 athletes from 79 countries

Debbie Palmer,<sup>1,2</sup> Lars Engebretsen,<sup>3,4</sup> Justin Carrard,<sup>5</sup> Natalia Grek,<sup>6</sup> Karsten Königstein,<sup>5</sup> Debbie J Maurer,<sup>7,8</sup> Thomas Roos,<sup>9</sup> Lauren Stollenwerk,<sup>10</sup> Stephane Tercier,<sup>4,11</sup> Raphael Weinguni,<sup>12</sup> Torbjørn Soligard,<sup>4,13</sup>

**ABSTRACT** Objective To describe the injury and illness characteristics among participating athletes during the Lausanne 2020 Youth Olympic Winter Games (YOG 2020), 9–22 January 2020.

**Additional material** is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2020-103514>).

**Correspondence to** Dr Debbie Palmer, Moray House School of Education and Sport, University of Edinburgh, Edinburgh EH8 8AQ, UK.

Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on November 24, 2016 - Published by group.bmj.com

BJSM Online First, published on November 24, 2016 as 10.1136/bjsports-2016-096977

## Sports injuries and illnesses in the Lillehammer 2016 Youth Olympic Winter Games

Kathrin Steffen,<sup>1,2</sup> Christine Holm Moseid,<sup>1,3</sup> Lars Engebretsen,<sup>1,2</sup> Pia K Søberg,<sup>4</sup> Olav Amundsen,<sup>4</sup> Kristian Holm,<sup>4,5</sup> Thomas Moger,<sup>4,5</sup> Torbjørn Soligard<sup>2</sup>

**ABSTRACT** Objective To describe the injury and illness characteristics among participating athletes during the Lillehammer 2016 Youth Olympic Winter Games (YOG 2016), 12–21 February 2016.

**Additional material** is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2016-096977>).

**Correspondence to** Dr Debbie Palmer, Moray House School of Education and Sport, University of Edinburgh, Edinburgh EH8 8AQ, UK.

Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on November 24, 2016 - Published by group.bmj.com

## Sports injuries and illnesses at the Lausanne 2020 Youth Olympic Winter Games: a prospective study of 1783 athletes from 79 countries

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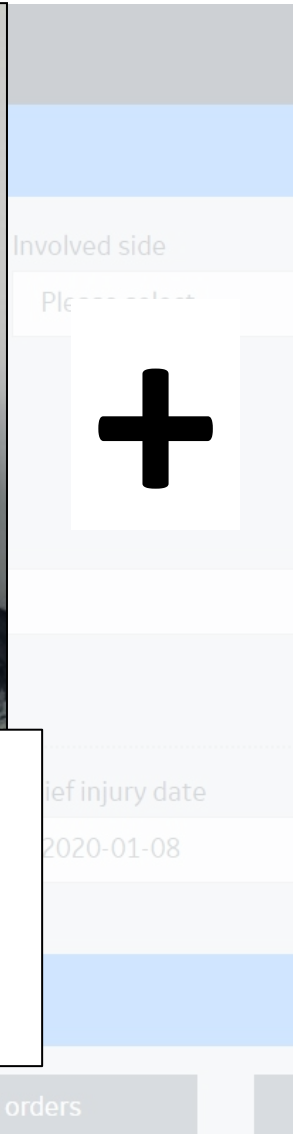
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**Correspondence to** Dr Debbie Palmer, Moray House School of Education and Sport, University of Edinburgh, Edinburgh EH8 8AQ, UK.

# How do IOC collect data ? Via 2 sources



Daily EMR reports from the Polyclinic & medical venue stations



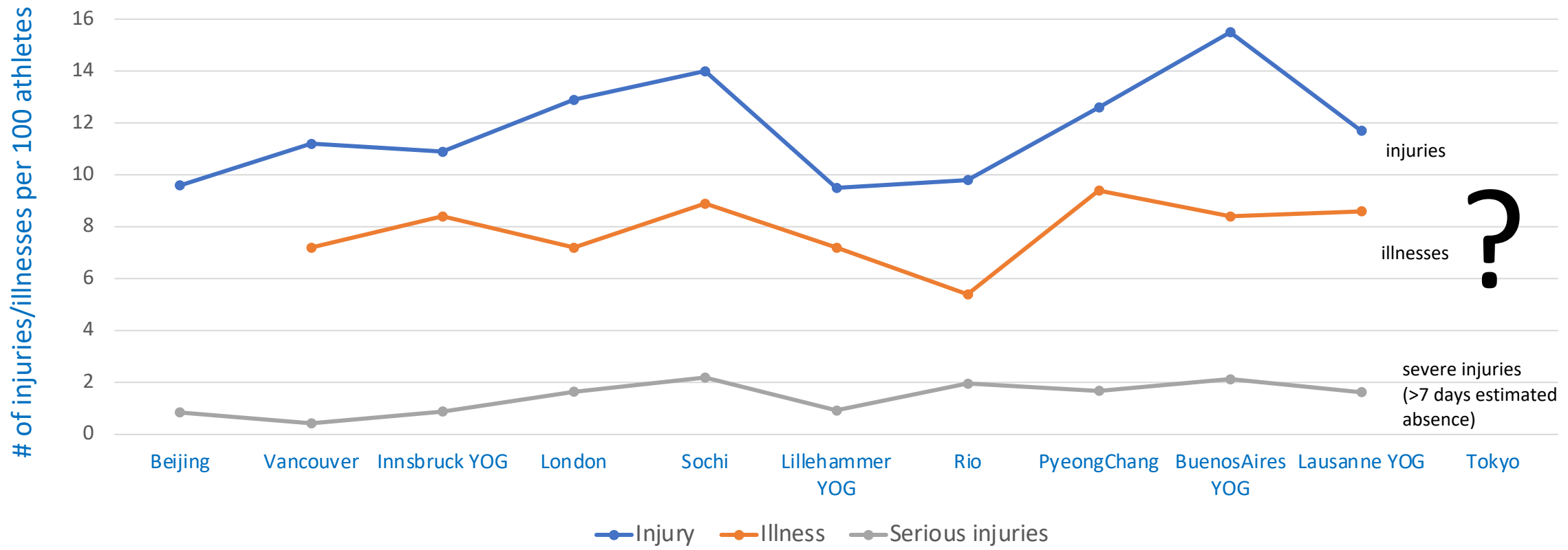
Daily reports from the NOCs medical teams

p.)



**IOC injury & illness surveillance team on site - Tokyo 2020**

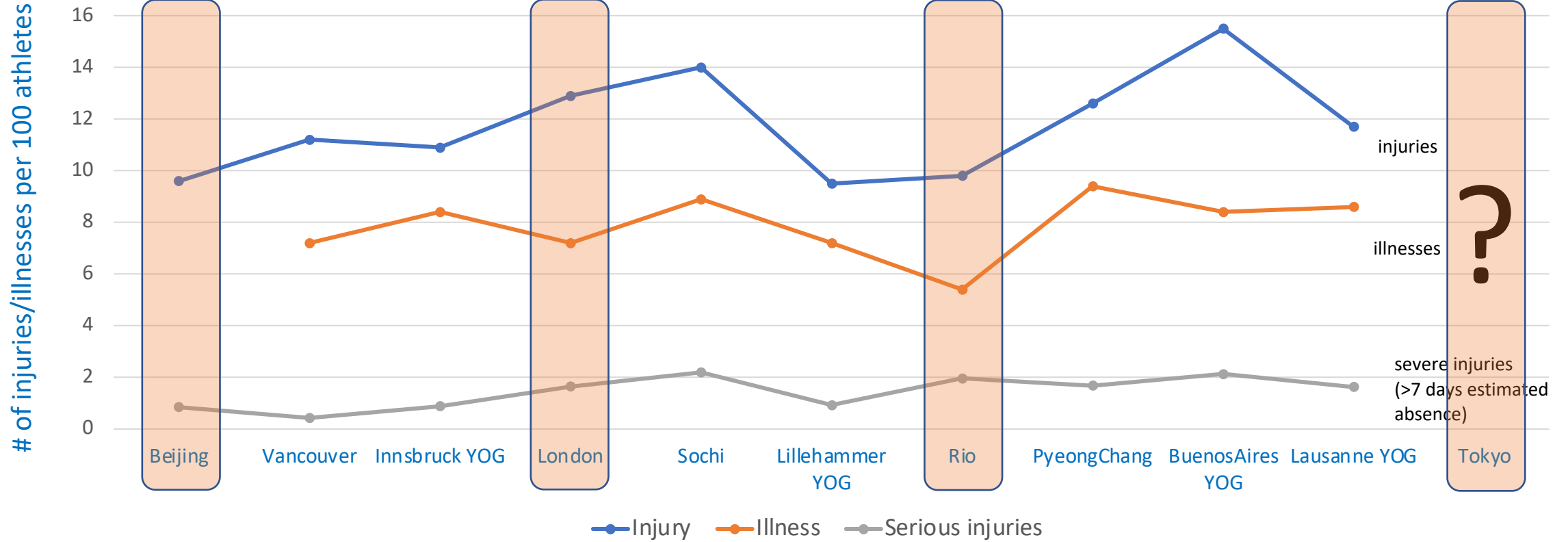
# Injury and illness risk over 10 consecutive (Youth) Olympic Games



2008      2010      2012      2014      2016      2018      2020



# Injury and illness risk over 4 consecutive Summer Olympic Games



2008

2010

2012

2014

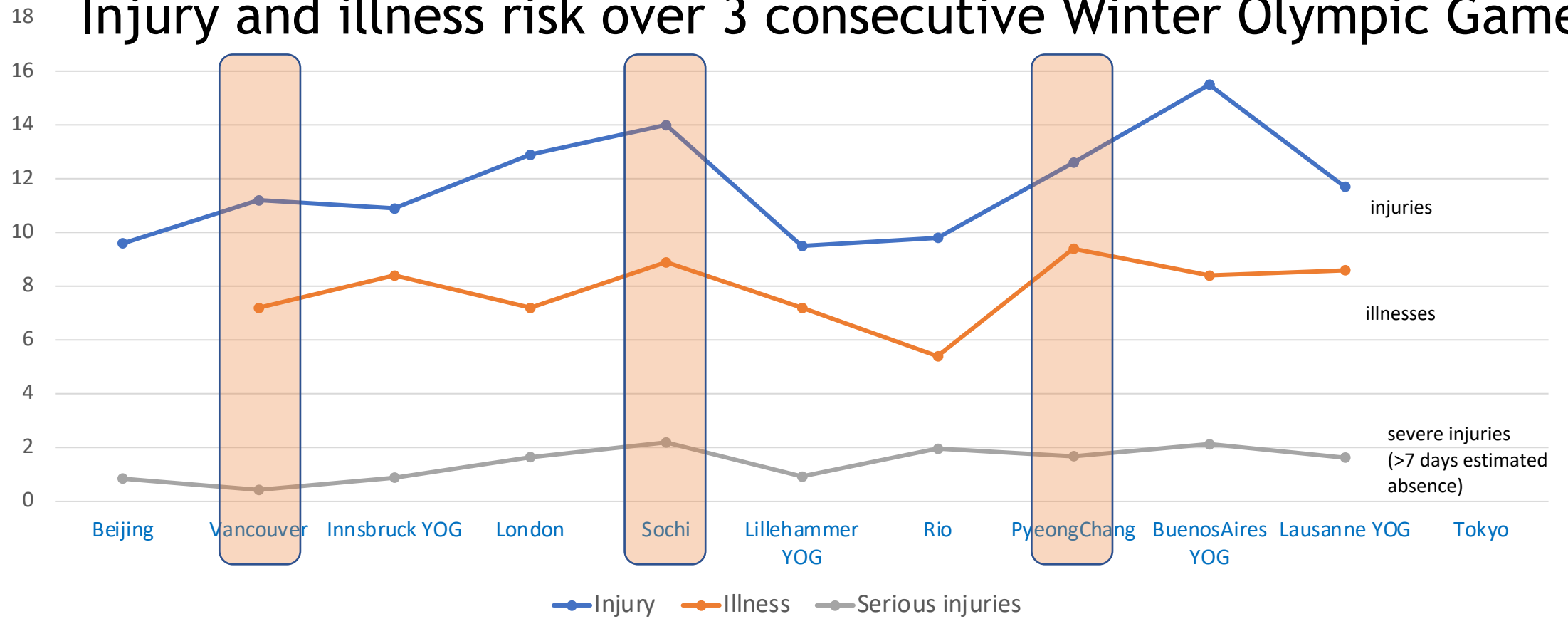
2016

2018

2020

# Injury and illness risk over 3 consecutive Winter Olympic Games

# of injuries/illnesses per 100 athletes



2008

2010

2012

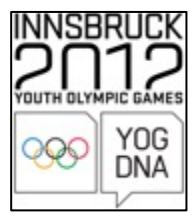
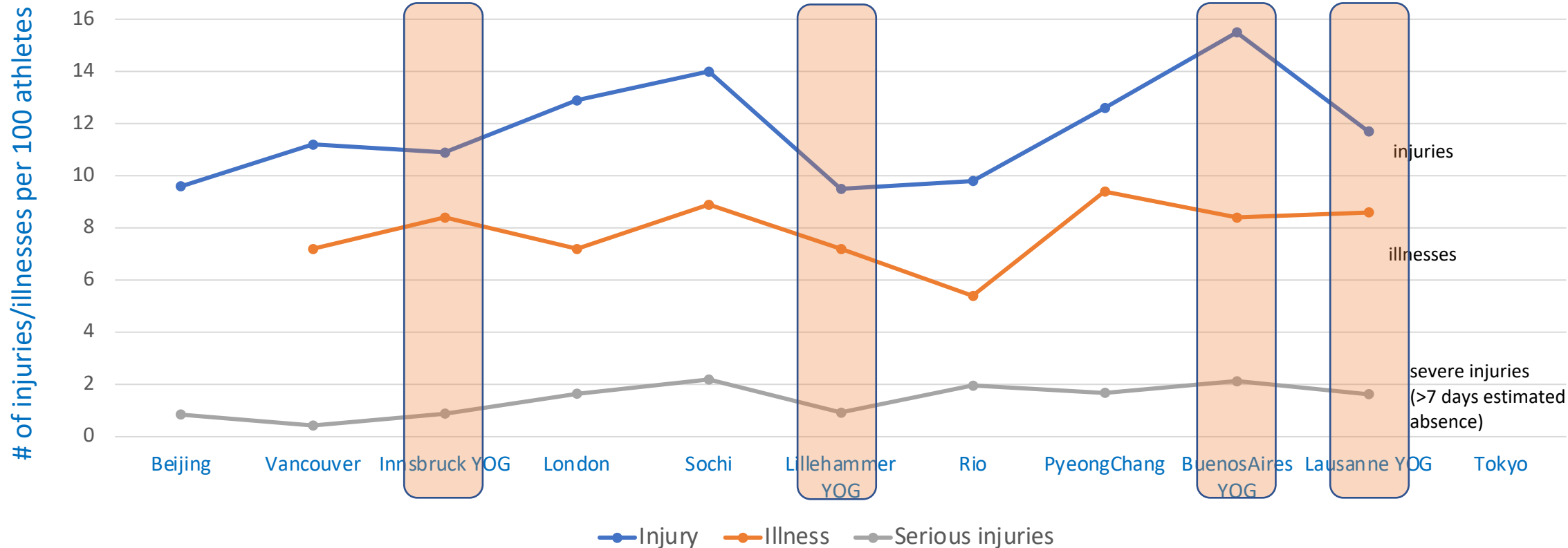
2014

2016

2018

2020

# Injury and illness risk over 4 consecutive Youth Olympic Games



2008      2010      2012      2014      2016      2018      2020



telenor

Alpine Ski

FONDAZIONE TERZO PILASTRO  
ITALIA E MONDORANI

79

Canal

LISK  
SPORT EQUIPME  
MADE IN ITALY



# IPC medical surveillance during Paralympic Games





# IPC medical surveillance during Paralympic Games

**The epidemiology of injuries at the London 2012 Paralympic Games**  
Stuart E Willick,<sup>1,2</sup> Nick Pia Pit-Grosheide,<sup>1</sup> Jaap Norma Angelica Patino,<sup>1</sup> Wayne Derman,<sup>1,10</sup> Mar

**High incidence of injuries at the Rio 2016 Summer Paralympic Games: a prospective cohort study of 6564 athlete days**  
Wayne Derman,<sup>1,2</sup> Phoebe Runciman,<sup>1,2</sup> M

**High precompetition injury rate dominates the injury profile at the Rio 2016 Summer Paralympic Games: a prospective cohort study of 6564 athlete days**  
Wayne Derman,<sup>1,2</sup> Phoebe Runciman,<sup>1,2</sup> M

**High incidence of injuries at the Pyeongchang 2018 Paralympic Winter Games: a prospective cohort study of 6804 athlete days**  
Wayne Derman,<sup>1,2</sup> Phoebe Runciman,<sup>1,2</sup> Esme Jordaan,<sup>3,4</sup> Martin Schwellinus,<sup>5,6</sup> Cheri Blauwet,<sup>7</sup> Nick Webborn,<sup>8</sup> Jan Lexell,<sup>9</sup> Peter van de Vliet,<sup>10</sup> James Kissick,<sup>11</sup> Jaap Stomphorst,<sup>12</sup> Young-Hee Lee,<sup>12</sup> Keun-Suh Kim<sup>13</sup>

**Incidence rate and burden of illness at the Pyeongchang 2018 Paralympic Winter Games**  
Wayne Derman,<sup>1,2</sup> Phoebe Runciman,<sup>1,2</sup> Esme Jordaan,<sup>3,4</sup> Martin Schwellinus,<sup>5,6</sup> Cheri Blauwet,<sup>7</sup> Nick Webborn,<sup>8</sup> Jan Lexell,<sup>9</sup> Peter van de Vliet,<sup>10</sup> James Kissick,<sup>11</sup> Jaap Stomphorst,<sup>12</sup> Young-Hee Lee,<sup>12</sup> Keun-Suh Kim<sup>13</sup>

**What are the findings?**

- This was the first study to document both the incidence rate and burden of illness per 1000 athlete days at a Winter Paralympic Games.
- The sport with the highest incidence rate of illness was Para snowboard, and illnesses were most commonly reported in the skin and subcutaneous system in this sport.
- Illnesses were most common in the respiratory system, skin and subcutaneous system, and eye and ocular adnexa.
- The burden of illness was highest in the respiratory system.



2010

2012

2014

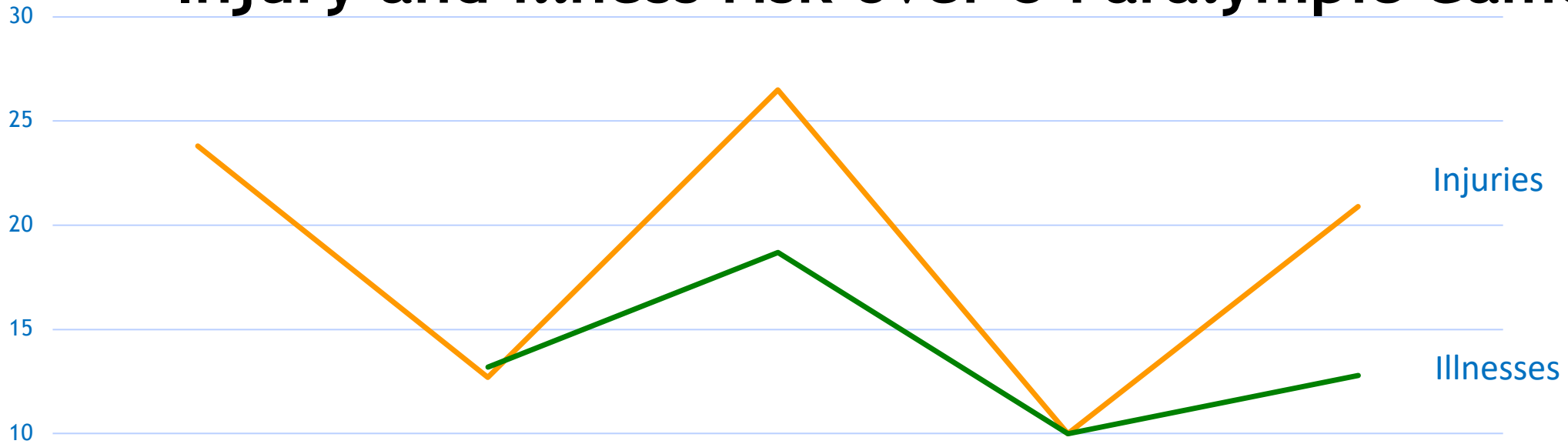
2016

2018

2020 (2021)

# Injury and illness risk over 5 Paralympic Games

# of injuries/illnesses per 1000 athletes



Injuries

Illnesses



2010



2012



2014



2016



2018

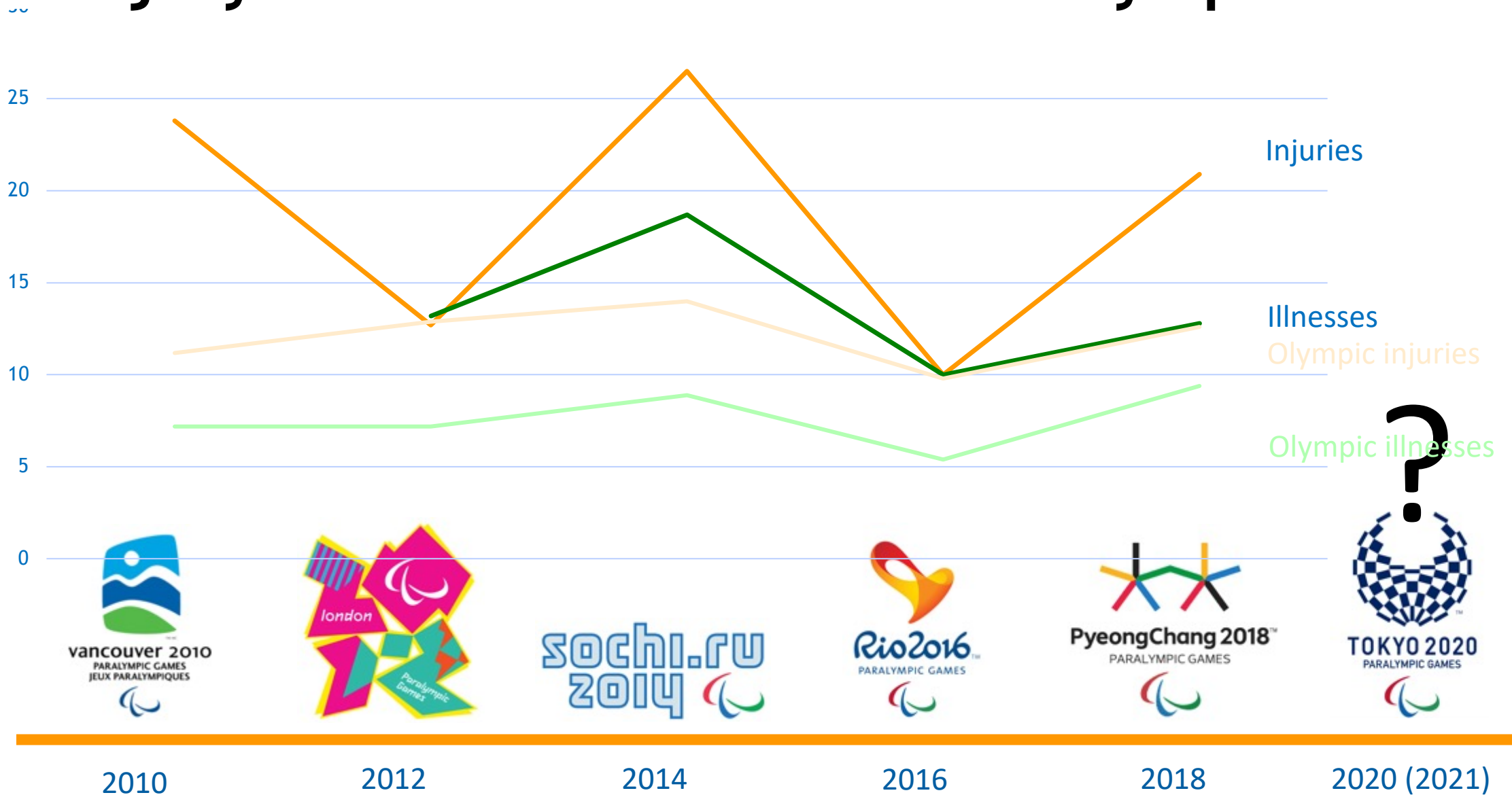


2020 (2021)



# Injury and illness risk over 5 Paralympic Games

# of injuries/illnesses per 1000 athletes

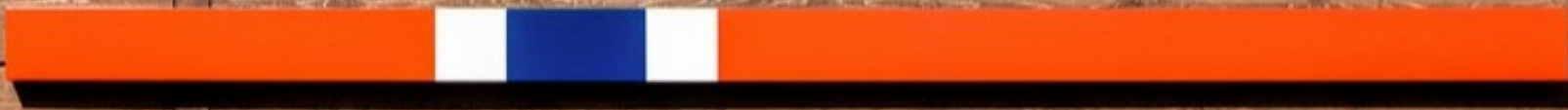


Looking at  
Games/Championships  
is just a snap shot

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NORGE



Olympiatoppen



# Health Team



2.0 admin- + 4.4 physician- + 5.8 physiotherapist-positions





Good health =

*basis for training +  
performance*

NORGE



Olympiatoppen



**Goal:**

NORGE



Olympiatoppen

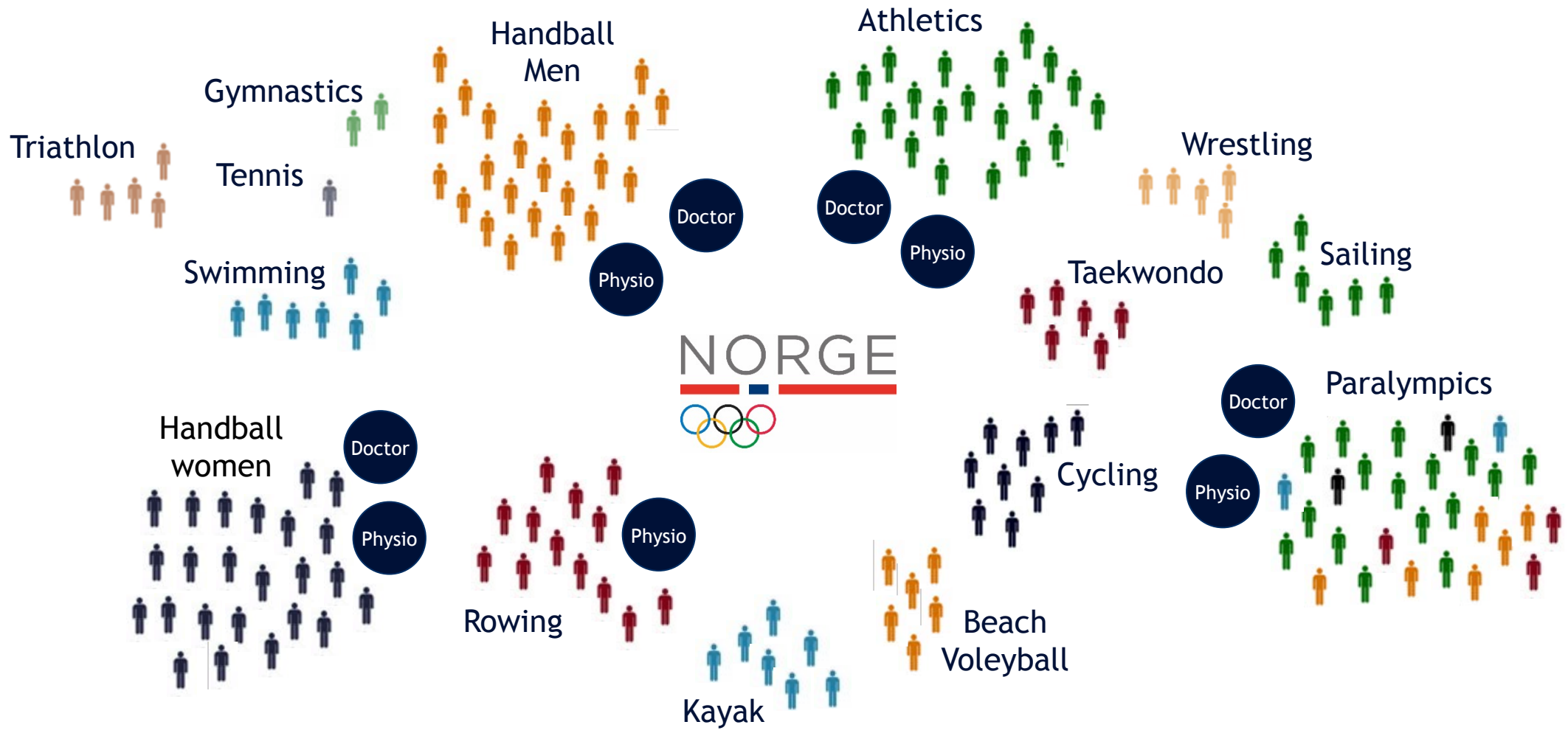
Keep athletes  
healthy, provide  
optimal treatment!

# Challenges providing medical support to an Olympic & Paralympic team

- Lots of small teams
- Athletes live all over the world & travel constantly
- Few sports have year-round medical coverage
- Athletes relate to multiple medical providers
  - Olympic Training Center
  - National team
  - Professional team/club
  - Local support network

# Challenges providing medical support to an Olympic & Paralympic team

- Poor communication between medical providers
- Athletes can be slow to report new health problems
- Many problems remain "under the radar" or without a clear management plan



# Norwegian health monitoring program

Original research

## Methods, challenges and benefits of a health monitoring programme for Norwegian Olympic and Paralympic athletes: the road from London 2012 to Tokyo 2020

British Journal of Sports Medicine 2021: May 26

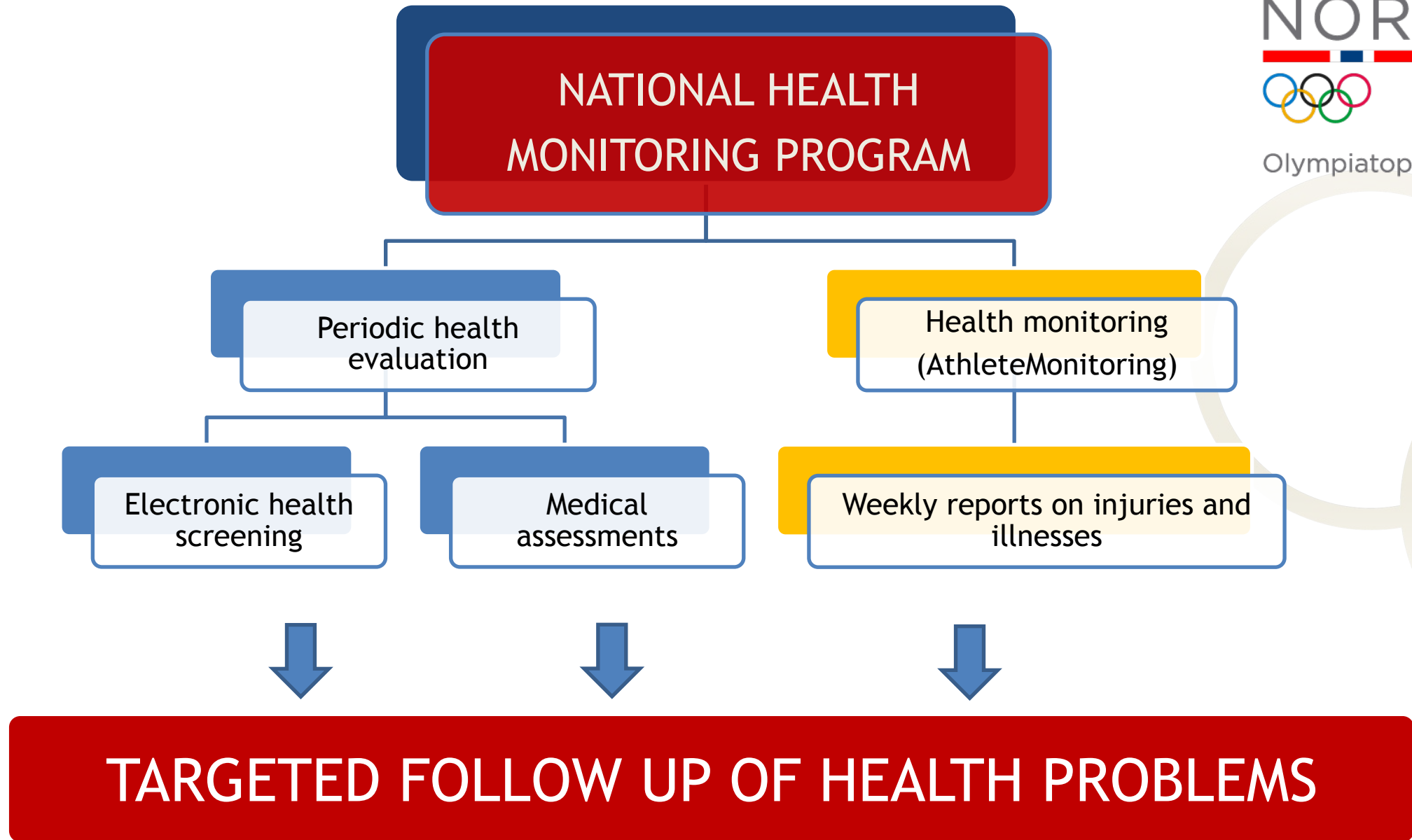
Benjamin Clarsen <sup>1,2,3</sup> Kathrin Steffen <sup>1,2</sup> Hilde Moseby Berge,<sup>1,2</sup>  
Fredrik Bendiksen,<sup>1</sup> Bjørn Fossan,<sup>1</sup> Hilde Fredriksen <sup>1,2</sup> Hilde Gjelsvik,<sup>1</sup>  
Lars Haugvad,<sup>1</sup> Mona Kjelsberg,<sup>1</sup> Ola Ronsen,<sup>1</sup> Thomas Torgalsen,<sup>1</sup> Anders Walløe,<sup>1</sup>  
Roald Bahr <sup>1,2</sup>

► Additional online supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2020-103717>).

### ABSTRACT

**Objective** To describe the implementation of a health monitoring programme for Norwegian Paralympic and Olympic candidates over five consecutive Olympic and Paralympic Games cycles (London 2012, Sochi 2014, Rio

Paralympic athletes are often supported by multiple medical providers (such as in their club or professional team); they often live, train and compete all over the world, and they frequently travel without medical support.



Medical history

Nutrition/travel/vaccines

Time zone/climate experiences

Every 1-2 years

# NATIONAL HEALTH MONITORING PROGRAM

NORGE



Olympiatoppen

Periodic health evaluation

Electronic health screening

Medical assessments

TARGETED FOLLOW UP OF HEALTH PROBLEMS



# Periodic health examination

## - part 1 (for Olympic and Para candidate athletes)

ELECTRONICALLY

- Background information
- Medical information
- Nutrition
- Women's and men's health
- Cardiac
- Family history
- GP, specialists, medication
- Injury history
- Travel experiences, vaccines
- Cognitive function
- Mental health

The screenshot displays the AthleteMonitoring web application interface. The user is identified as 'TEST KATHRIN' with the role 'Individuell oppfølging'. The main heading is 'Helseundersøkelse PL - del 1 (for alle)'. The form includes instructions: 'Vennligst svar på spørsmålene i helseundersøkelsen FØR du har time med din ansvarlige lege/fysioterapeut. Vi anbefaler at du fyller inn svarene på en computer, gjerne med ekstern mus, eller på et nettbrett. Dersom det er spesielle tema du ikke ønsker at alle i helseteamet ditt skal vite om - husk å ta opp disse temaene under fire øyne med lege eller fysioterapeut. Det vil ta deg ca. 20-30 minutter å svare på spørreskjemaene.' A red asterisk indicates a required field. The form sections are: 'BAKGRUNNSINFORMASJON - IDRETT' with questions about years of sports/physical activity, elite level participation, and weekly training hours; and 'SIVIL STATUS, BOFORHOLD, UTDANNELSE, ARBEID, STUDIE, STIPEND' with a 'Sivil status' field. Input fields are labeled 'Enter number' or 'Enter text'.

**AthleteMonitoring** TEST KATHRIN Individuell oppfølging

Vennligst svar på spørsmålene i helsesundersøkelsen - del 2 - FØR du har time med din lege/fysioterapeut. Vi anbefaler at du fyller inn svarene på en computer, gjerne med ekstern mus, eller på en tablet. Avslutt utfyllingen på en computer, gjerne med ekstern mus, eller på en tablet. Avslutt utfyllingen på en computer, gjerne med ekstern mus, eller på en tablet.

Dersom det er spesielle temaer du ønsker å ta opp disse i ditt helseteam skal vite om dem. Avslutt utfyllingen på en computer, gjerne med ekstern mus, eller på en tablet.

**\* Required**

**FOR DEG MED NEDSATT FUNKSJON I URINVEIENE**

Hopp over til neste overskrift hvis dette ikke gjelder deg.

For deg med nedsatt funksjon i urinveiene. \*

Gjelder meg  Gjelder ikke meg

For deg som bruker permanent kateter. \*

Gjelder meg  Gjelder ikke meg

For deg som ikke bruker kateter. \*

Gjelder meg (ikke kateter)  Gjelder ikke meg

For those with urinary dysfunction

**AthleteMonitoring** TEST KATHRIN Individuell oppfølging

Vennligst svar på spørsmålene i helsesundersøkelsen - del 2 - FØR du har time med din lege/fysioterapeut. Vi anbefaler at du fyller inn svarene på en computer, gjerne med ekstern mus, eller på en tablet. Avslutt utfyllingen på en computer, gjerne med ekstern mus, eller på en tablet.

Dersom det er spesielle temaer du ønsker å ta opp disse i ditt helseteam skal vite om dem. Avslutt utfyllingen på en computer, gjerne med ekstern mus, eller på en tablet.

**\* Required**

**FOR DEG MED NEDSATT FUNKSJON I MAGETARMSYSTEMET**

For deg som har eller HAR hatt stomi. \*

Gjelder meg  Gjelder ikke meg

For deg som IKKE har stomi. \*

Gjelder meg  Gjelder ikke meg

**TAKK FOR AT DU TOK DEG TID TIL Å SVARE PÅ ALLE SPØRSMÅLENE**

Husk at du også vil kunne ta opp tema på lege-/fysioterapeut konsultasjonen som ikke er fanget opp i skjemaet, og/eller temaer du ikke ønsker alle i ditt helseteam skal vite noe om.

For those with gastrointestinal and bowel problems

**AthleteMonitoring** TEST KATHRIN Individuell oppfølging

Vennligst svar på alle spørsmålene i helsesundersøkelsen - del 2 - FØR du har time med din lege/fysioterapeut. Vi anbefaler at du fyller inn svarene på en computer, gjerne med ekstern mus, eller på en tablet. Avslutt utfyllingen på en computer, gjerne med ekstern mus, eller på en tablet.

Dersom det er spesielle temaer du ønsker å ta opp disse i ditt helseteam skal vite om dem. Avslutt utfyllingen på en computer, gjerne med ekstern mus, eller på en tablet.

**\* Required**

**BEHOV FOR ASSISTANSE/FORFLYTNINGS- OG AKTIVITETSHJELPEMIDLER/PROTESER**

Har du brukerstyrt personlig assistent hjemme? \*

Nei  Ja

Hvordan beveger du deg i hverdagen? \*

Går uten hjelpemidler  Går med støtte

Går med protese(r)

Rullestol, kan gå med støtte med redusert styrke i ben

ADL and transport needs

# Periodic health examination - part 2 (for Para athletes)

- Medical history
- Nutrition/travel/vaccines
- Time zone/climate experiences
- Every 1-2 years

# NATIONAL HEALTH MONITORING PROGRAM



## Periodic health evaluation

### Electronic health screening

### Medical assessments

- ECG
- Spirometry
- Blood samples
- Clinical examinations with doc and physio

# TARGETED FOLLOW UP OF HEALTH PROBLEMS

# NATIONAL HEALTH MONITORING PROGRAM

Monitoring  
(AthleteMonitoring)

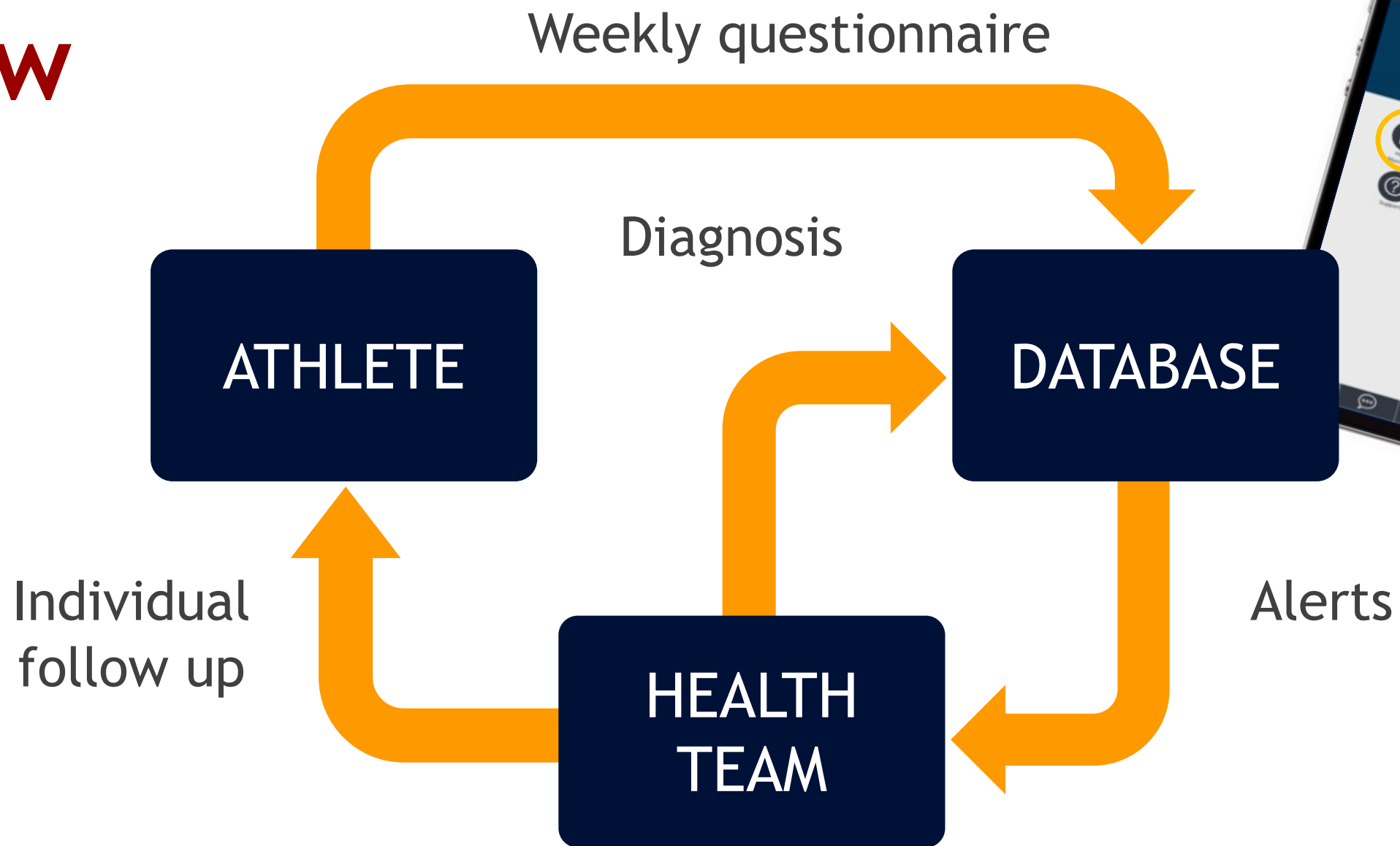
Weekly reporting of injuries & illnesses



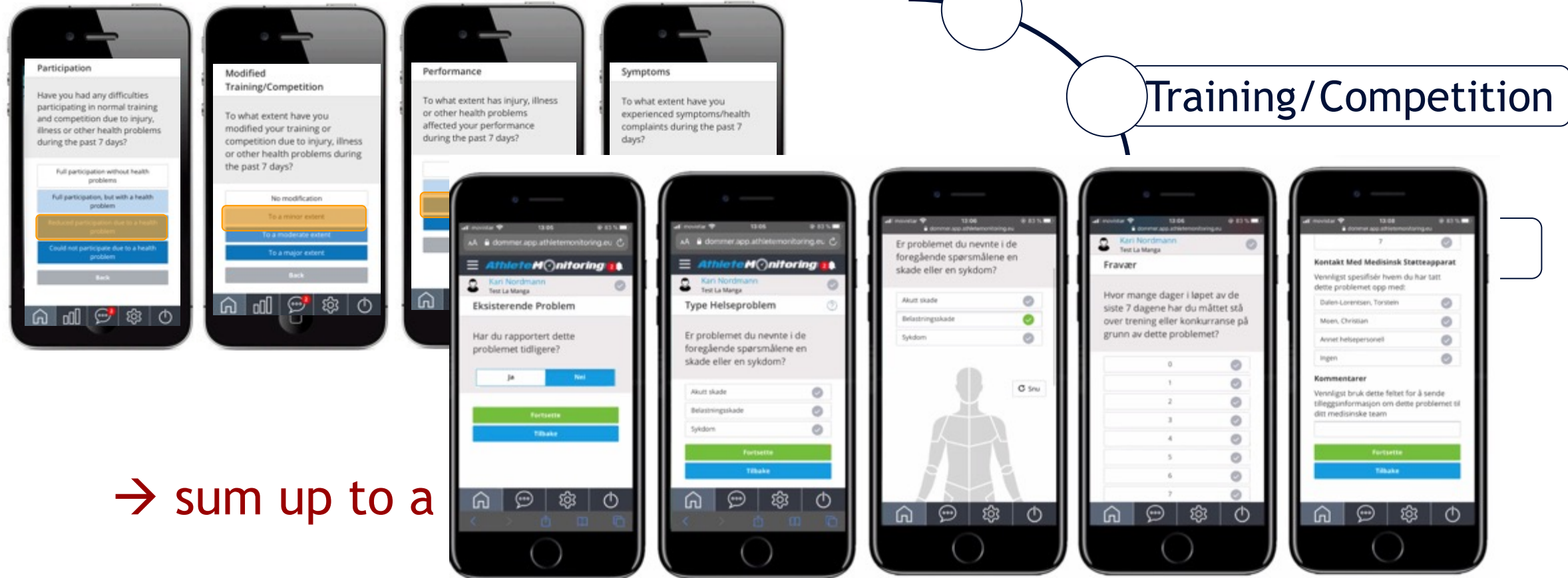
Every week

TARGETED FOLLOW UP OF HEALTH PROBLEMS

# How



# Weekly OSTRC-H questionnaire (4 questions)



→ sum up to a

# Data examples





## My Teams

New Team

**Athletics** ...  
19 athletes

**Beach volleyball** ...  
4 athletes

**Cycling** ...  
14 athletes

**Golf** ...  
11 athletes

**Gymnastics** ...  
2 athletes

**Handball - Men** ...  
27 athletes

**Handball - Women** ...  
29 athletes

**Karate** ...  
3 athletes





### Test team 2 ▾

5 athletes



**Health** 3

Athletes



#### Test athlete, Ben



Aug 20	Aug 27	Sep 03	Sep 10	Sep 17	Sep 24
--------	--------	--------	--------	--------	--------

INJURY - OVERUSE | Lower back | Non-specific low back pain / mechanical pain



#### Test athlete, Brad



Aug 20	Aug 27	Sep 03	Sep 10	Sep 17	Sep 24
--------	--------	--------	--------	--------	--------

INJURY - OVERUSE | Knee (Undiagnosed) ✉



#### Test athlete, Lars



Aug 20	Aug 27	Sep 03	Sep 10	Sep 17	Sep 24
--------	--------	--------	--------	--------	--------

No health problems



#### Lucas, Leon



Aug 20	Aug 27	Sep 03	Sep 10	Sep 17	Sep 24
--------	--------	--------	--------	--------	--------

No health problems



#### Test athlete, Andrea



Aug 20	Aug 27	Sep 03	Sep 10	Sep 17	Sep 24
--------	--------	--------	--------	--------	--------

No health problems



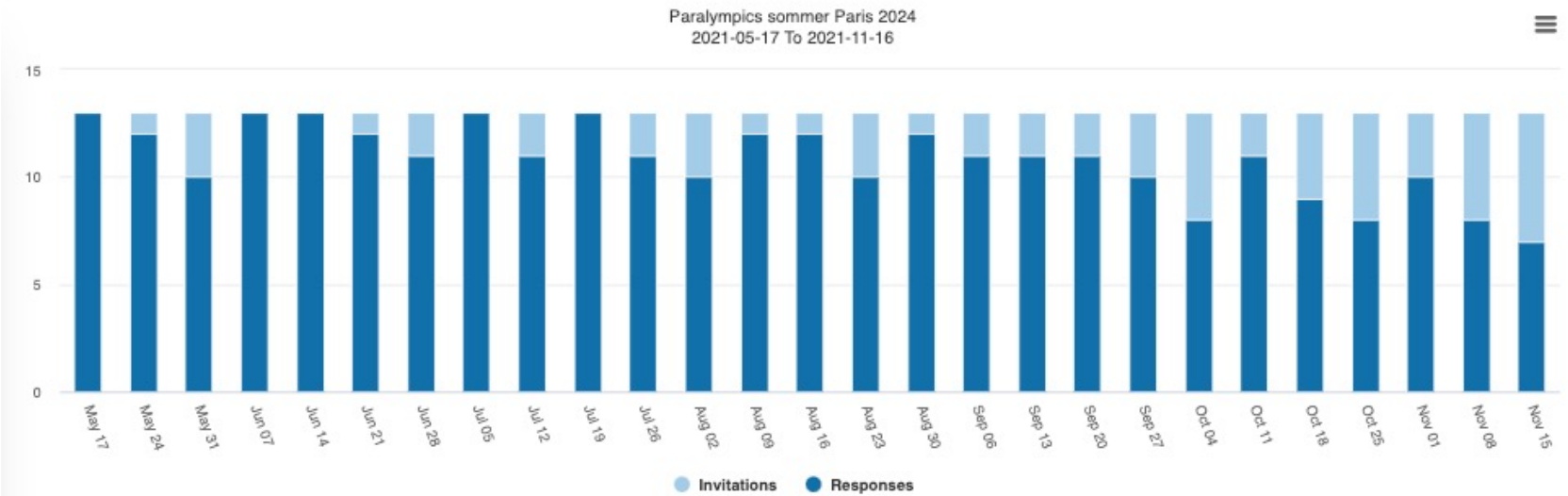
### Triathlon ▾

3 athletes

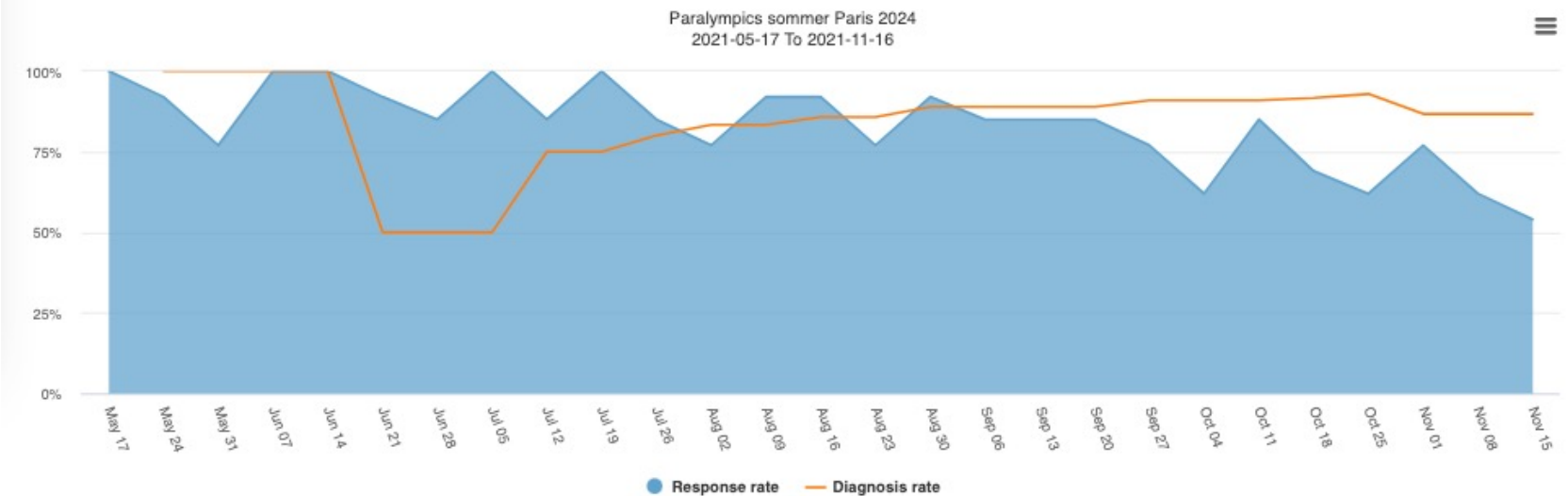


# Response and diagnosis rates

## Data Completeness



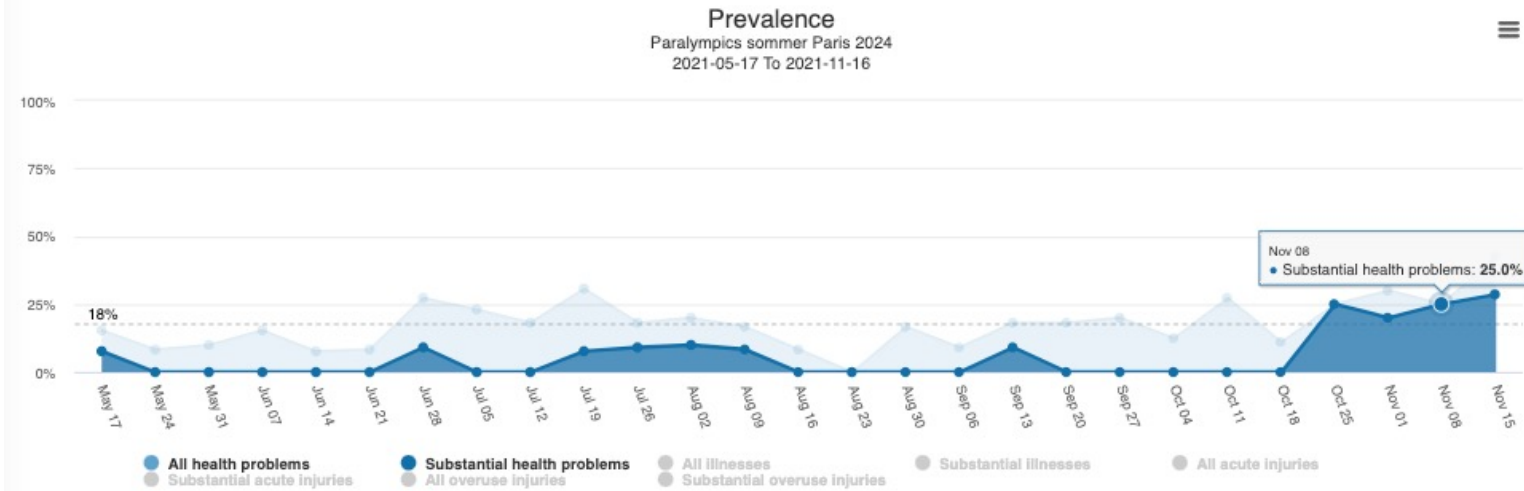
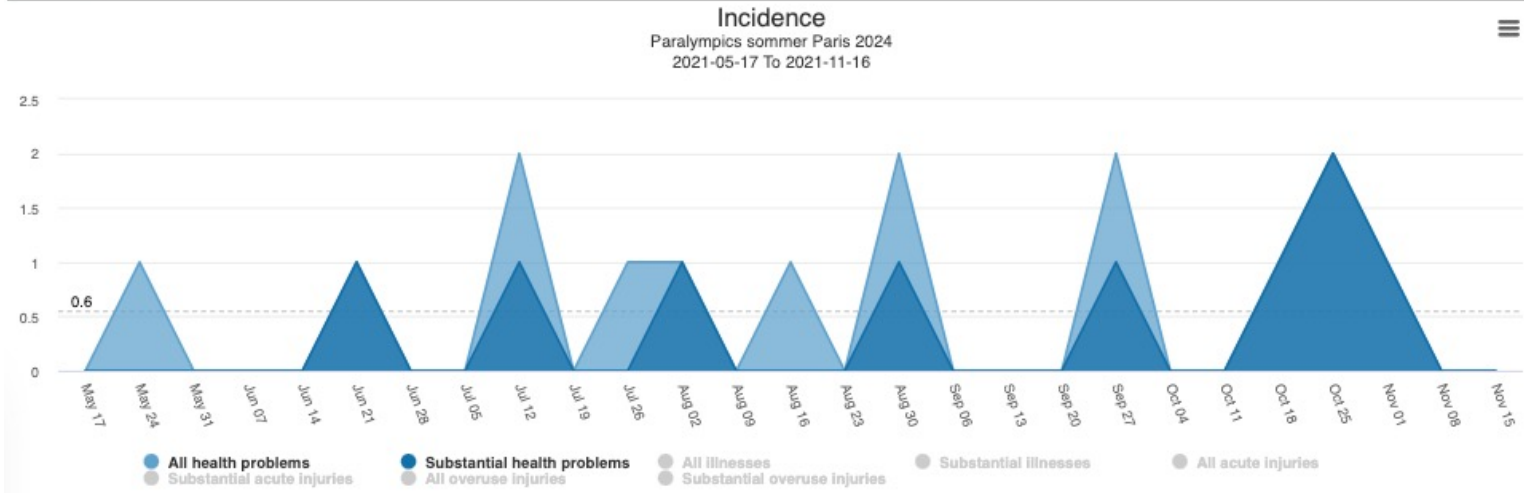
	Total
Invitations	351 (13/wk)
Responses	292 (10.8/wk)



	Total
Response rate	292 / 351 (83.2%)
Diagnosis rate	13 / 15 (86.7%)

# Health outcomes (incidence & prevalence of health problems)

## Health Outcomes

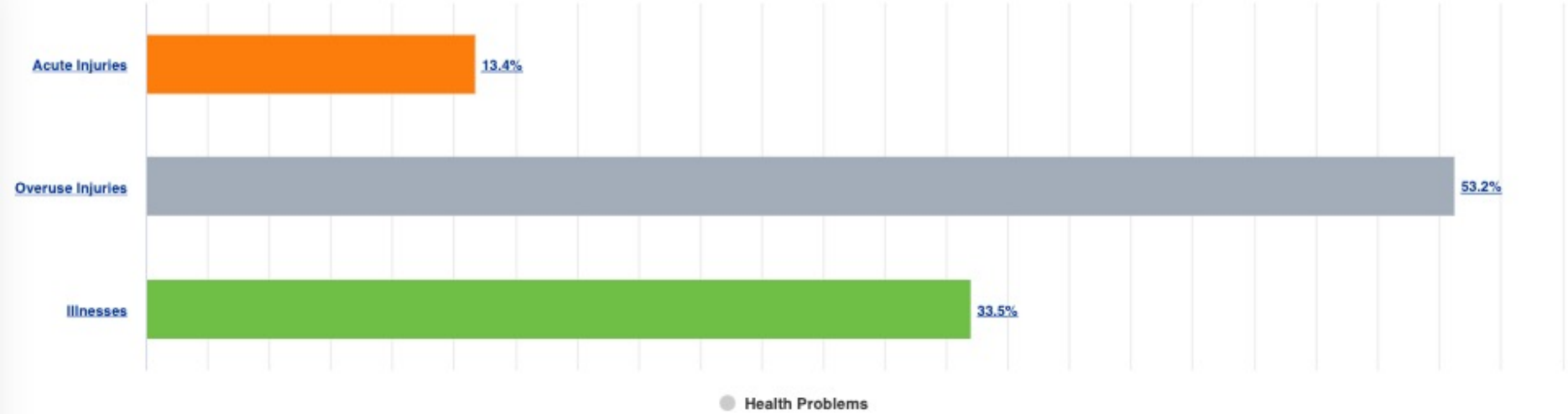


	Average Prevalence	95% CI	Min	Max	Incidence
All health problems	18%	15% to 21%	0%	43%	2.2 cases per athlete per year
Substantial health problems	6%	3% to 9%	0%	29%	1.3 cases per athlete per year
All illnesses	5%	2% to 7%	0%	29%	1.2 cases per athlete per year
Substantial illnesses	4%	1% to 7%	0%	29%	1 cases per athlete per year
All acute injuries	2%	1% to 4%	0%	13%	0.4 cases per athlete per year
Substantial acute injuries	1%	-0% to 2%	0%	13%	0.1 cases per athlete per year
All overuse injuries	11%	9% to 14%	0%	23%	0.6 cases per athlete per year
Substantial overuse injuries	1%	-0% to 2%	0%	9%	0.1 cases per athlete per year

Comments

## Relative Burden

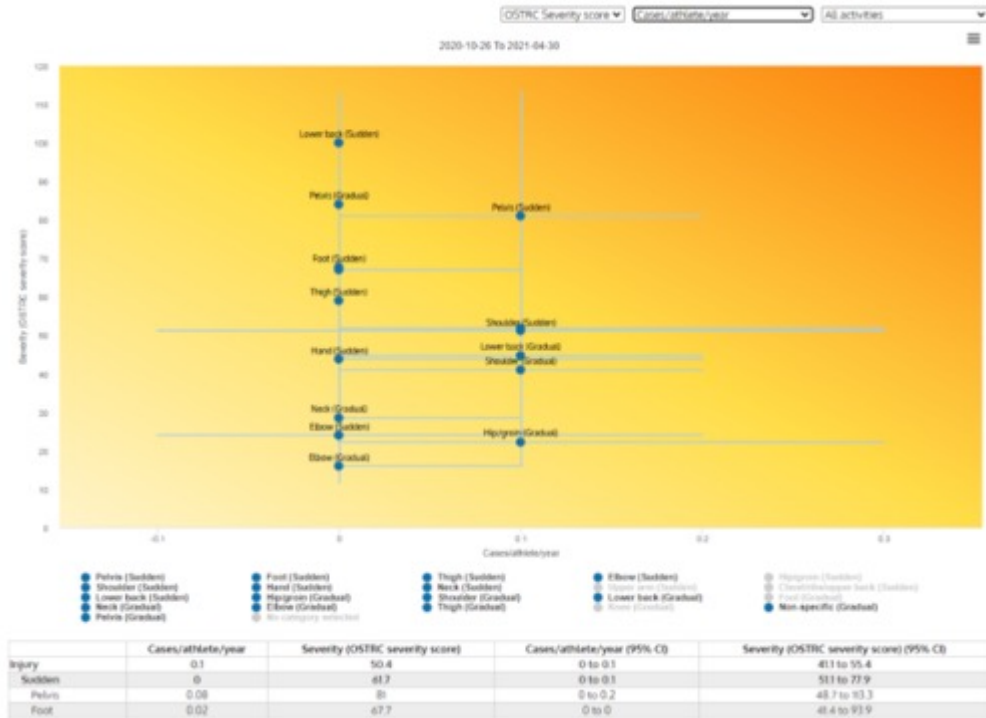
Paralympics sommer Paris 2024  
2021-05-17 To 2021-11-16  
[Click bar to view details](#)



Injury  
locations  
+  
illness types

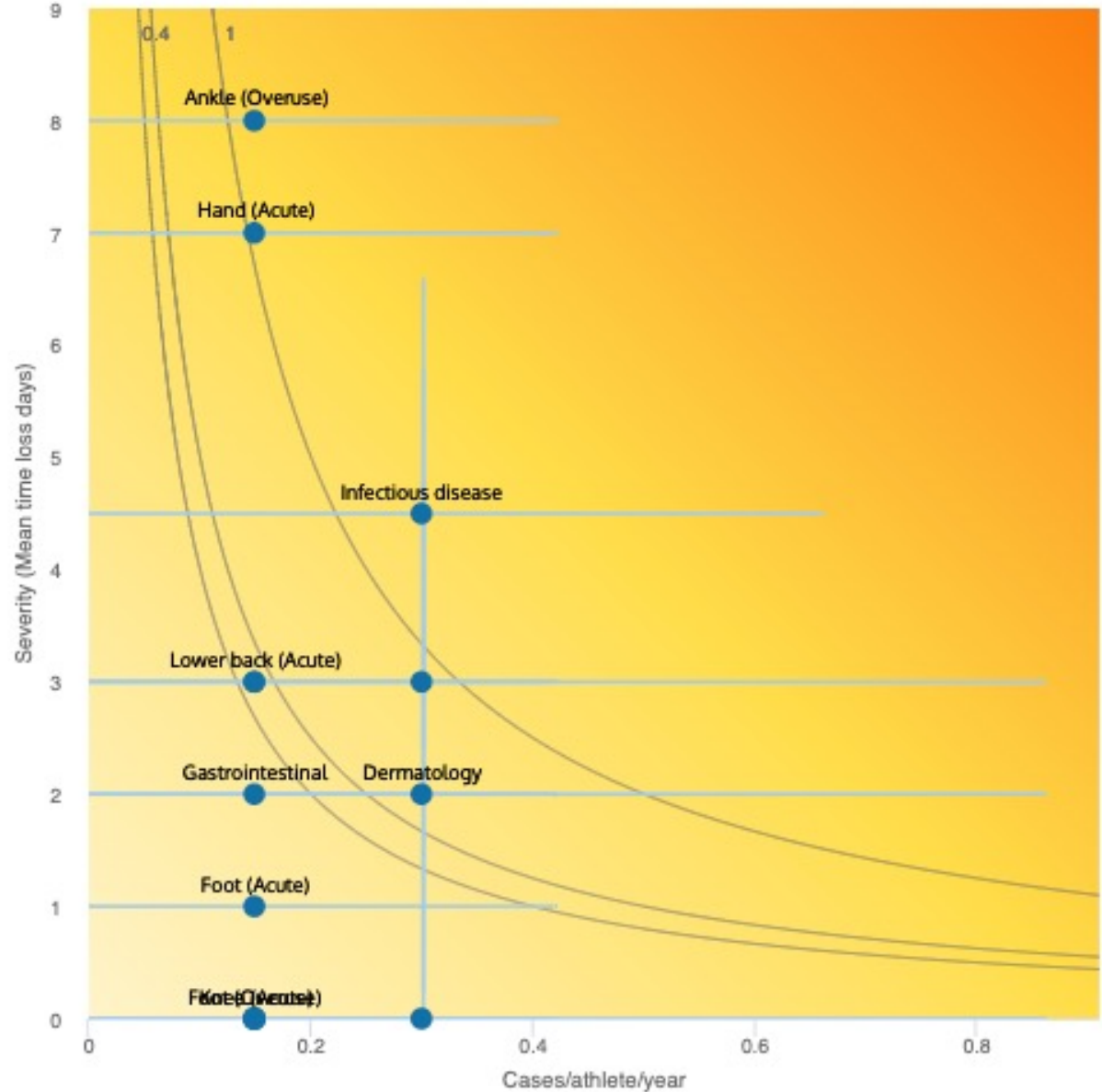
	Cases	Slight (0 days)	Mild (1-7 days)	Moderate (8-28 days)	Severe (>28 days)	Total time loss	Severity score
<b>Injury</b>	11	7	3	1	0	19	1403
<b>Acute</b>	4	1	3	0	0	11	282
Lower back	1	0	1	0	0	6	168
Foot	1	0	1	0	0	1	50
Knee	1	1	0	0	0	0	32
Hand	1	0	1	0	0	7	116
<b>Overuse</b>	7	6	0	1	0	8	1121
Lower back	1	1	0	0	0	0	640
Lower leg	2	2	0	0	0	0	65
Upper arm	1	1	0	0	0	0	144
Ankle	1	0	0	1	0	8	184
Foot	1	1	0	0	0	0	16
Neck	1	1	0	0	0	0	72
<b>Illness</b>	8	1	7	0	0	24	706
Dermatology	2	1	1	0	0	4	166
Respiratory	1	0	1	0	0	3	84
Infectious disease	2	0	2	0	0	9	211
No category selected	2	0	2	0	0	6	177
Gastrointestinal	1	0	1	0	0	2	68

# Risk matrix



All health problems | Mean time loss days | Cases/athlete/year

Paralympics summer Paris 2024 Health issues  
2021-05-17 To 2021-11-16



# Surveillance - *two complimentary benefits*

## Individual/athlete level

- Facilitate consistent communication between athletes and medical staff
- Early identification of new problems
- Continuous monitoring of known problems

## "Big-picture" risk evaluation

- Identify injury and illness patterns
  - What types of injuries and illnesses?
  - Which athletes are affected?
  - What times of the year?
- Identify prevention priorities
- Assess effect of interventions

**How often do our athletes get sick or injured?**

**How many of our athletes are sick or injured at any given time?**

**What are the biggest health problems affecting our team?**

# 10 Olympic/Paralympic cycles

## - 94 Para & 538 Olympic athletes





# 35 272 reports - 4 088 health problems



Original research

## Illness and injury among Norwegian Para athletes over five consecutive Paralympic Summer and Winter Games cycles: prevailing high illness burden on the road from 2012 to 2020

British Journal of Sports Medicine 2021: Oct 4

Kathrin Steffen <sup>1,2</sup> Benjamin Clarsen,<sup>1,2,3</sup> Hilde Gjelsvik,<sup>2</sup> Lars Haugvad,<sup>2</sup> Anu Koivisto-Mørk,<sup>4</sup> Roald Bahr <sup>1,2</sup> Hilde Moseby Berge<sup>1,2</sup>

<sup>1</sup>Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway  
<sup>2</sup>Department of Sports Medicine, Norwegian Olympic Training Center (Olympiatoppen), Oslo, Norway  
<sup>3</sup>Centre for Disease Burden, Norwegian Institute of Public Health, Oslo, Norway  
<sup>4</sup>Department of Nutrition, Norwegian Olympic Training Centre (Olympiatoppen), Oslo, Norway

### ABSTRACT

**Objective** To describe the illness and injury pattern of Norwegian Para athletes over five consecutive Paralympic Summer and Winter Games cycles and to identify which health problems should be targeted in risk management plans with respect to impairment types.

**Methods** We monitored athletes from 12 to 18 months prior to each Game using a weekly online questionnaire (Oslo Sports Trauma Research Center-H2 (OSTRC-H2)). We asked them to report all health problems they had experienced in the preceding 7 days, irrespective of their consequences on their sports participation or performance and whether they had sought medical

Para athletes (32 days lost from sport each year) compared with Olympic athletes (27 days).<sup>3</sup> Para athletes have underlying and pre-existing medical conditions, which may make them more vulnerable to illnesses in particular.<sup>4-6</sup>

Early identification of health problems is important to target treatment and prevention.<sup>1-3</sup> Injury and illness surveillance is now well established in Olympic and Paralympic Games, driven by the Medical and Scientific Commission of the International Olympic Committee and the Medical Committee of the International Paralympic Committee. The incidence proportions of illnesses



TOKYO 2020



TOKYO 2020  
PARALYMPIC GAMES



# How often do our athletes get sick or injured?

How many of our athletes are sick or injured at any given time?

What are the biggest health problems affecting our team?

On average, each of our athletes report

**5** health problems  
per year  
95% CI: 5-6

**3** injuries  
95% CI: 2.8-3.5

**2** illnesses  
95% CI: 1.9-2.6

At any given time ...

**37%** of our Para athletes  
have health problems  
95% CI: 36% to 39%



**20%** Acute (5%) and overuse  
complaints (15%)  
95% CI: 19% to 21%

**19%** Illness  
95% CI: 18% to 20%

At any given time ...

**32%** of our Olympic athletes have health problems  
95% CI: 31% to 33%



**24%** Acute (10%) and overuse complaints (14%)  
95% CI: 23% to 24%

**9%** Illness  
95% CI: 9% to 10%

**37%** of our Para athletes  
have health problems  
95% CI: 36% to 39%



**20%** Acute (5%) and overuse  
complaints (15%)  
95% CI: 19% to 21%

**19%** Illness  
95% CI: 18% to 20%

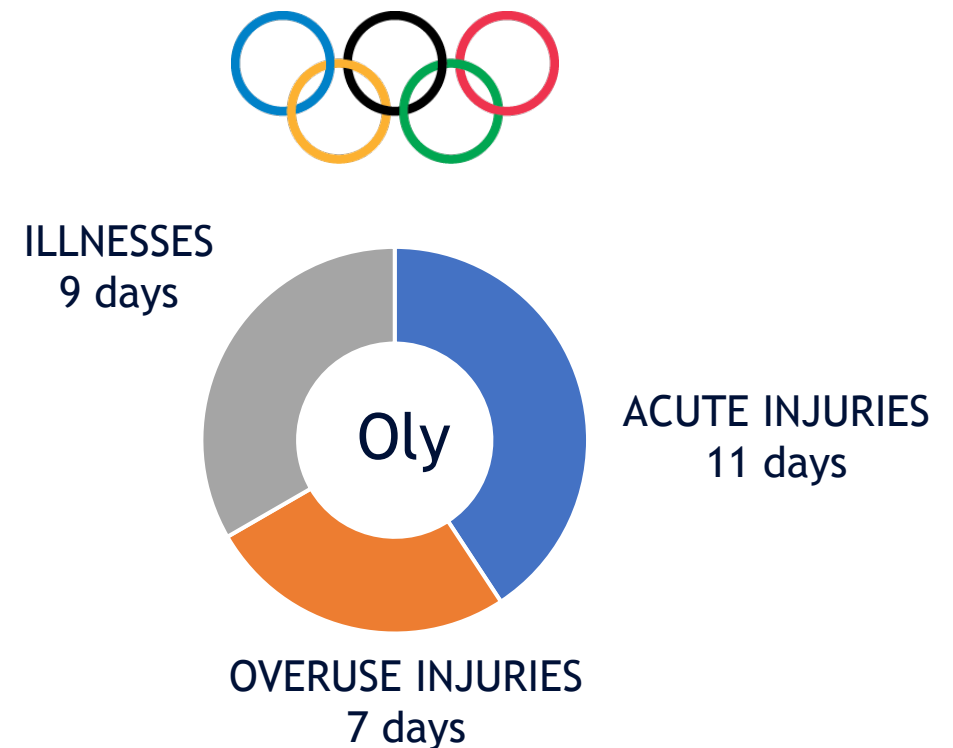
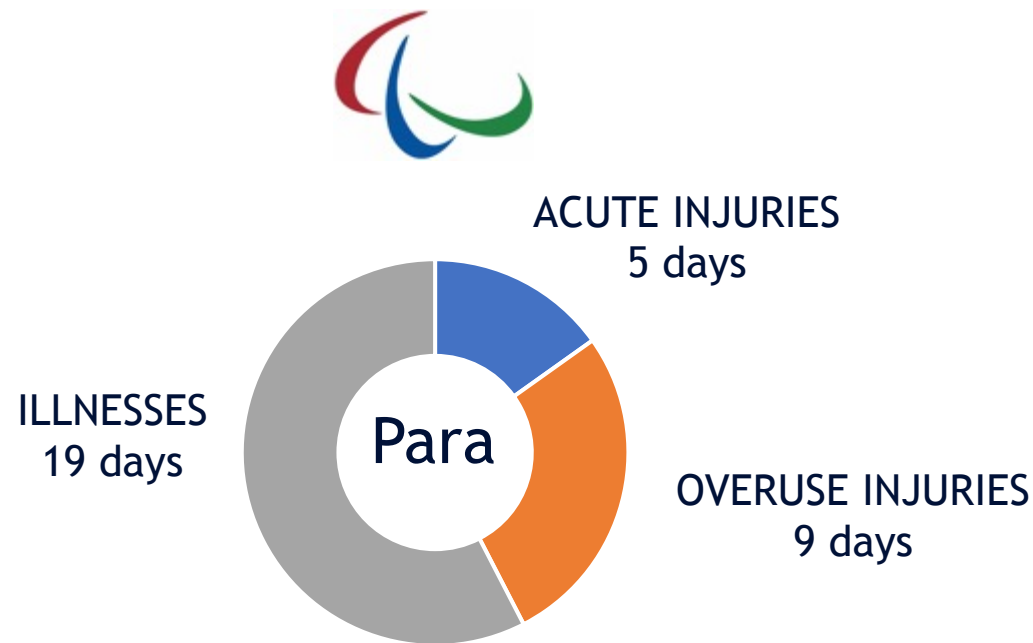
**32%** of our Olympic athletes  
have health problems  
95% CI: 31% to 33%



**24%** Acute (10%) and overuse  
complaints (14%)  
95% CI: 23% to 24%

**9%** Illness  
95% CI: 9% to 10%

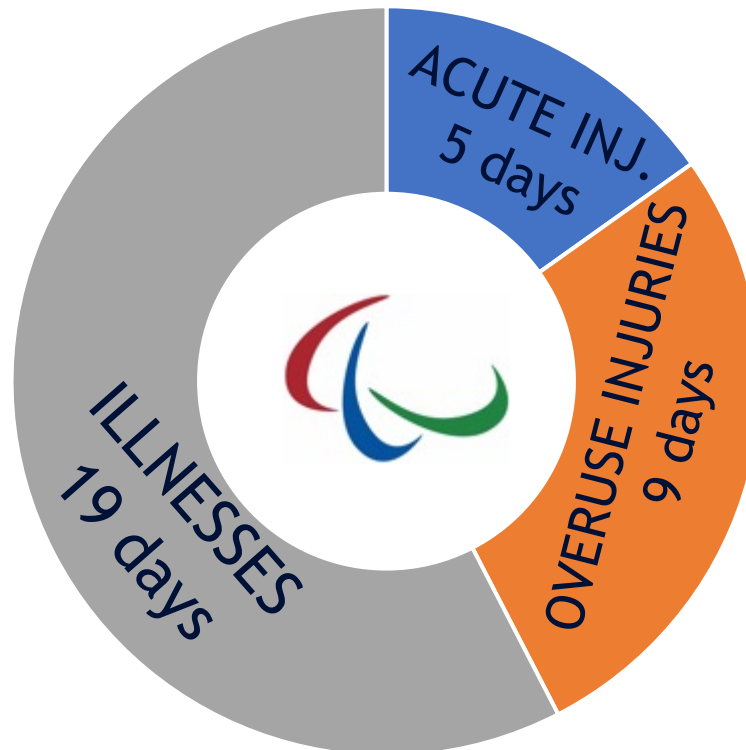
# Our athletes loose on average 33 (Paralympic) and 27 (Olympic) days per year due to health problems ...



# Paralympic athletes loose on average **33 days** per year, mostly due to illnesses

**11 days**  
due to infections  
(respiratory, skin, urinary)

**3 days**  
due to  
gastrointestinal problems



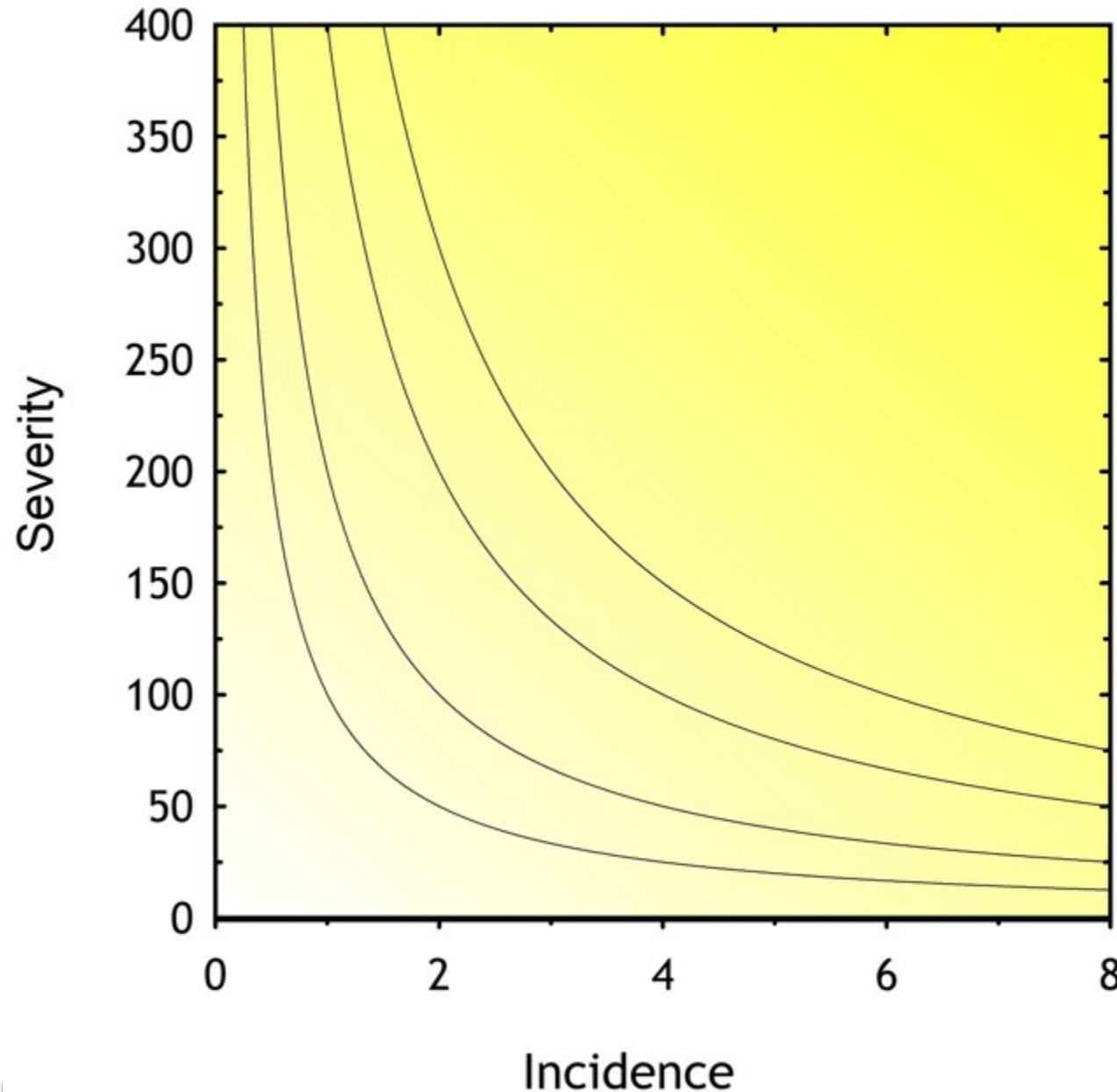
**7 days**  
due to shoulder and  
elbow injuries



How often do our athletes get sick or injured?

How many of our athletes are sick or injured at any given time?

**What are the biggest health problems affecting our team?**



# Risk matrix

**Consensus statement**

**International Olympic Committee consensus statement: methods for recording and reporting of epidemiological data on injury and illness in sport 2020 (including STROBE Extension for Sport Injury and Illness Surveillance (STROBE-SIIS))**

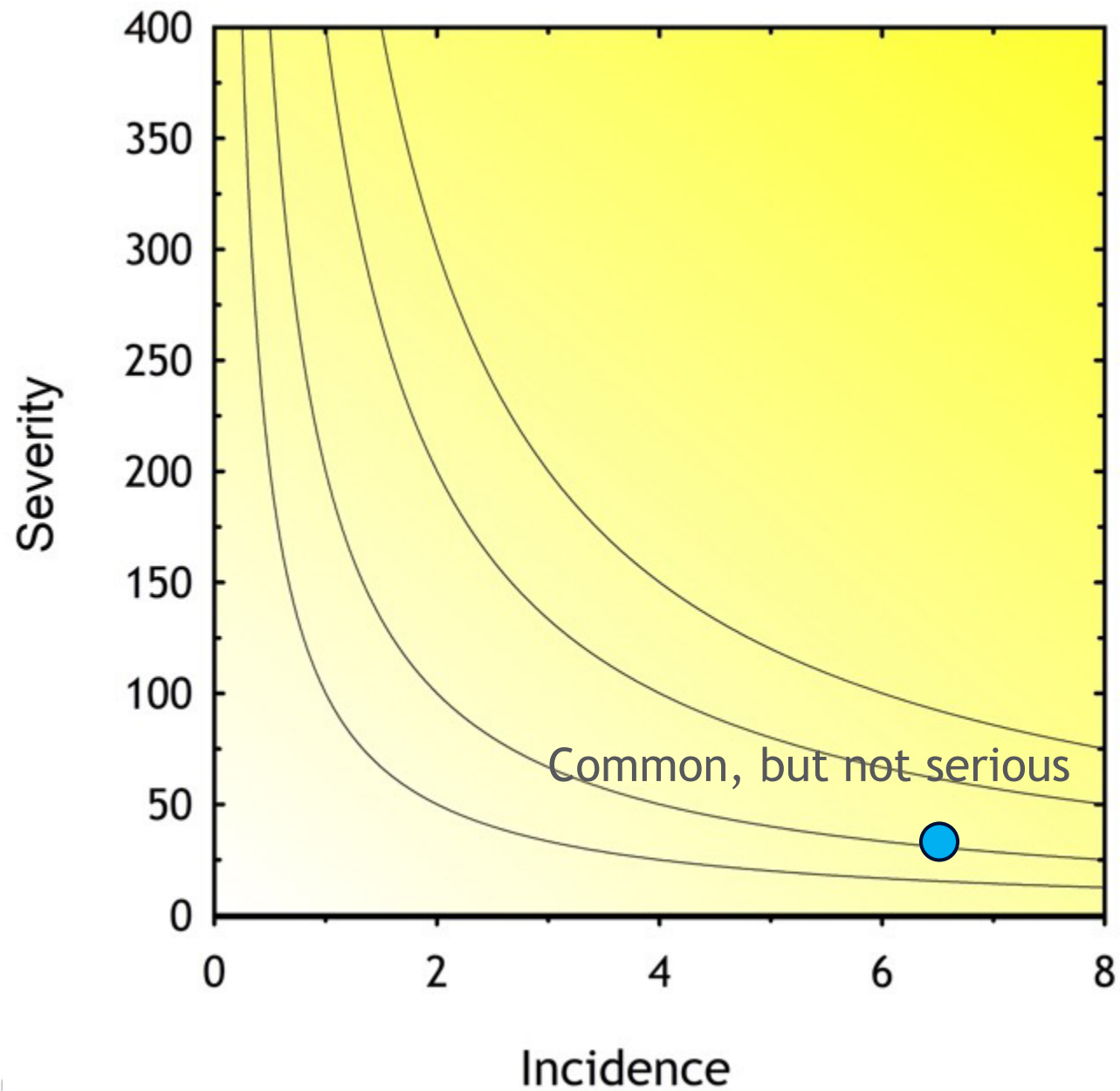
Roald Bahr<sup>1,2</sup>, Ben Clarsen<sup>1,3</sup>, Wayne Derman<sup>4</sup>, Jiri Dvorak<sup>5</sup>, Carolyn A Emery<sup>6,7</sup>, Caroline F Finch<sup>8</sup>, Martin Häggglund<sup>9</sup>, Astrid Junge<sup>10,11</sup>, Simon Kemp<sup>12,13</sup>, Karim M Khan<sup>14,15</sup>, Stephen W Marshall<sup>16</sup>, Willem Meeuwisse<sup>17,18</sup>, Margo Mountjoy<sup>19,20</sup>, John W Orchard<sup>21</sup>, Babette Pluim<sup>22,23</sup>, Kenneth L Quarrie<sup>24,25</sup>, Bruce Reider<sup>26</sup>, Martin Schwellnus<sup>27</sup>, Torbjørn Soligard<sup>28,29</sup>, Keith A Stokes<sup>30,31</sup>, Toomas Timpka<sup>32,33</sup>, Evert Verhagen<sup>34</sup>, Abhinav Bindra<sup>35</sup>, Richard Budgett<sup>28</sup>, Lars Engebretsen<sup>1,28</sup>, Uğur Erdener<sup>28</sup>, Karim Chamari<sup>36</sup>

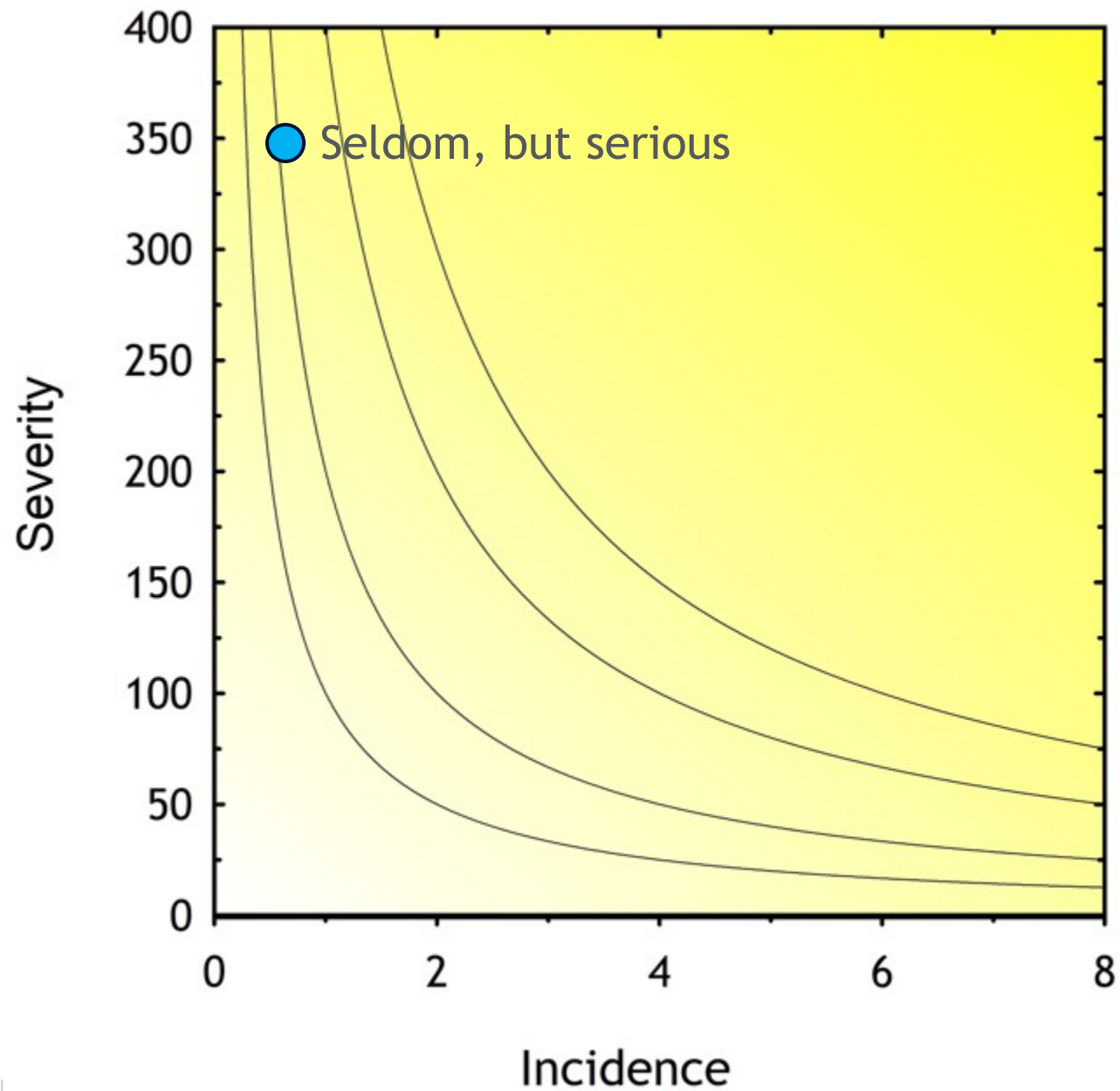
**ABSTRACT**  
Injury and illness surveillance, and epidemiological studies, are fundamental elements of concerted efforts to protect the health of the athlete. To encourage consistency in the definitions and methodology used, and to enable data across studies to be compared, research groups have published 11 sport-specific or setting-specific consensus statements

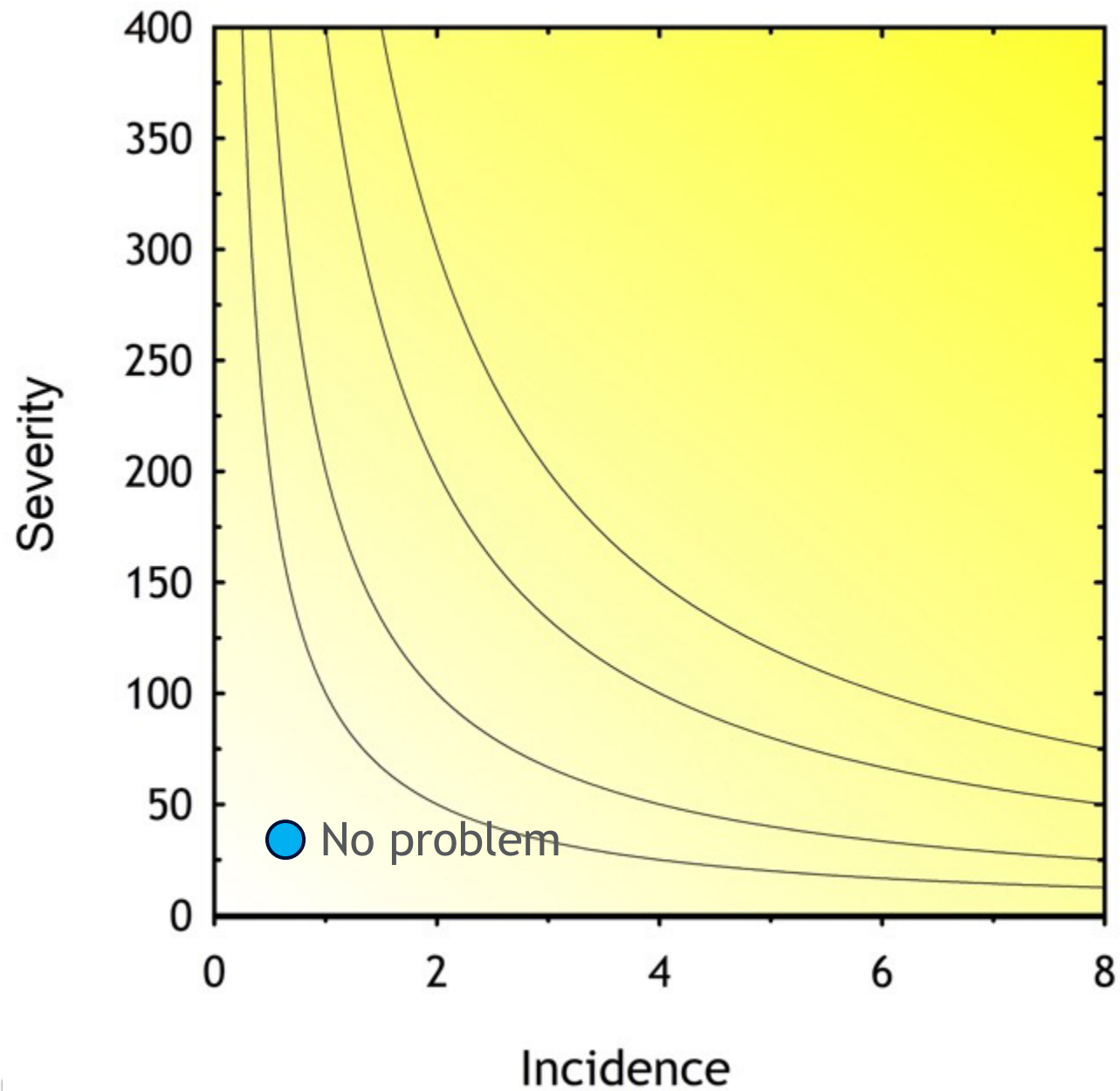
**accurate data capture and careful analysis of data are building blocks for sports injury/illness prevention programmes.** Important questions that sports injury and illness surveillance projects are designed to address include: What is the risk of an individual athlete sustaining an acute injury, developing an overuse injury or becoming ill in a given sport?

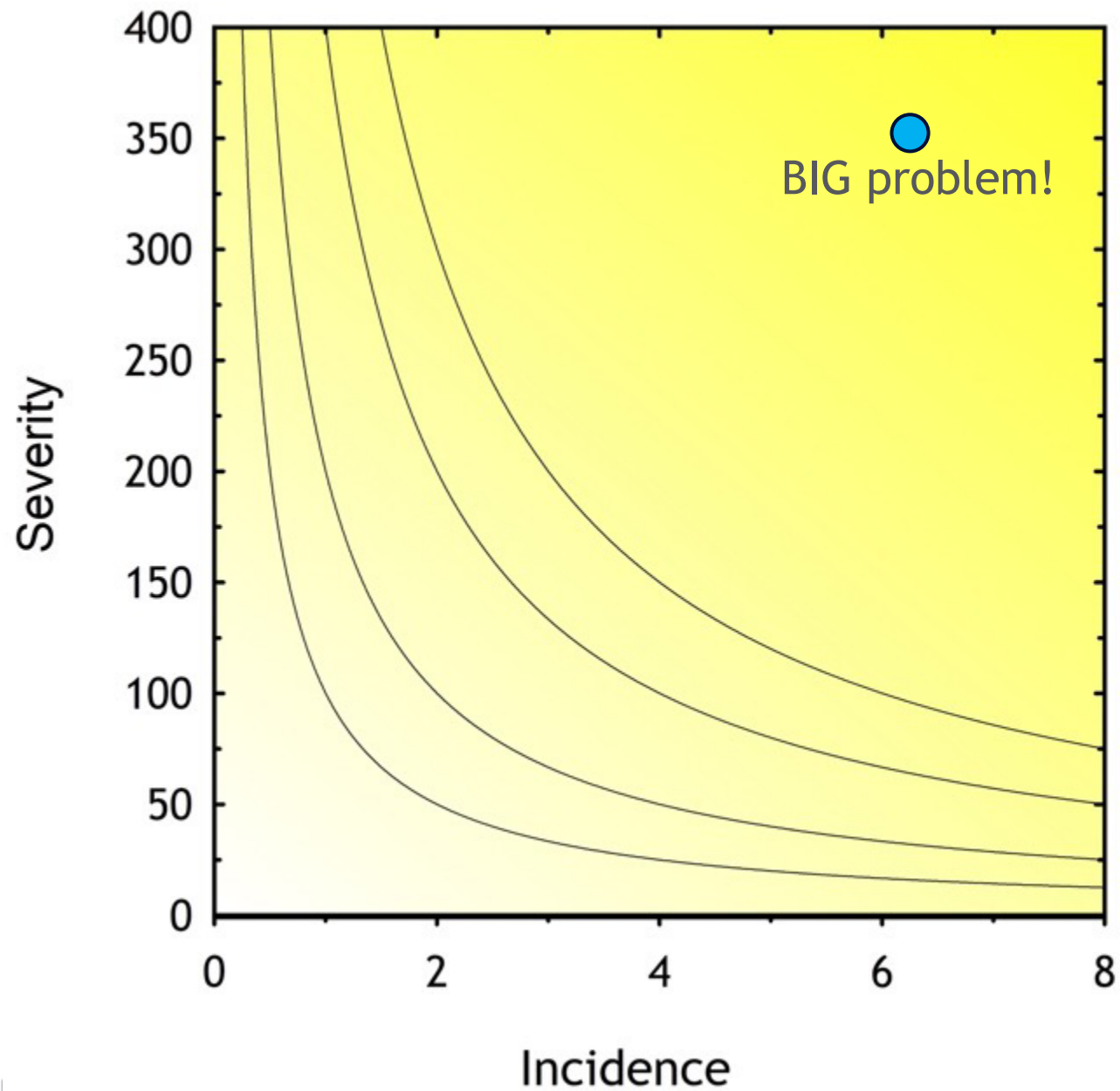
► Additional material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2019-101969>).

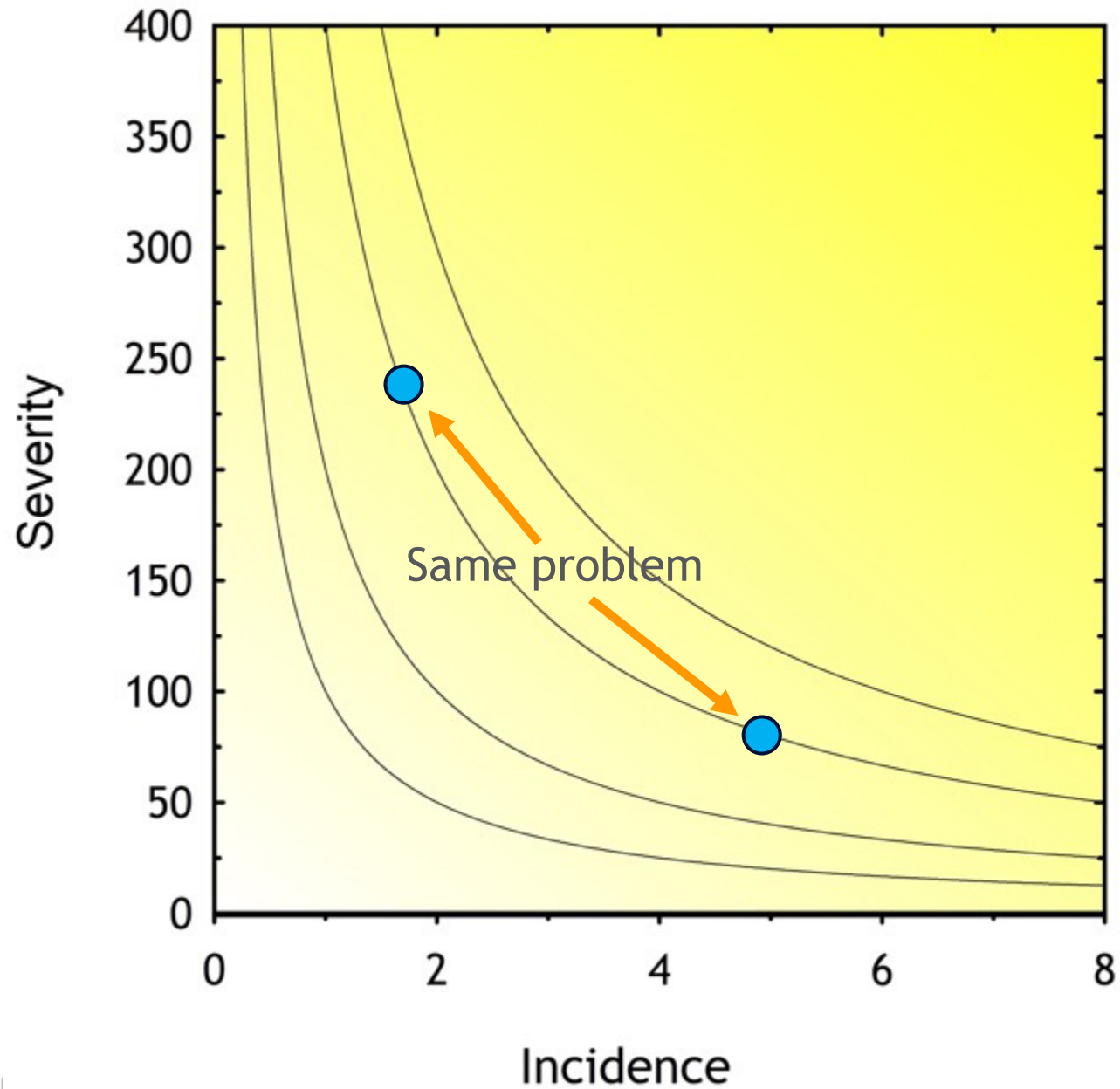
For numbered affiliations see end of article.



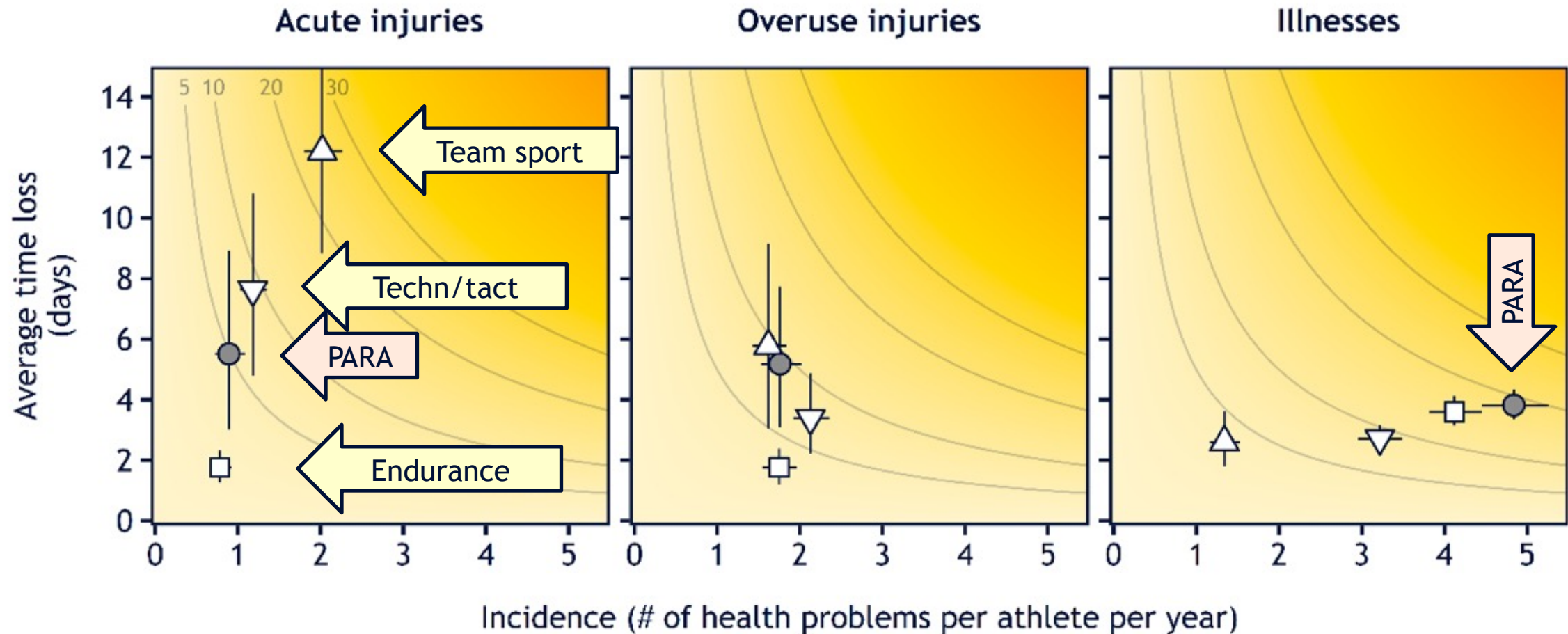








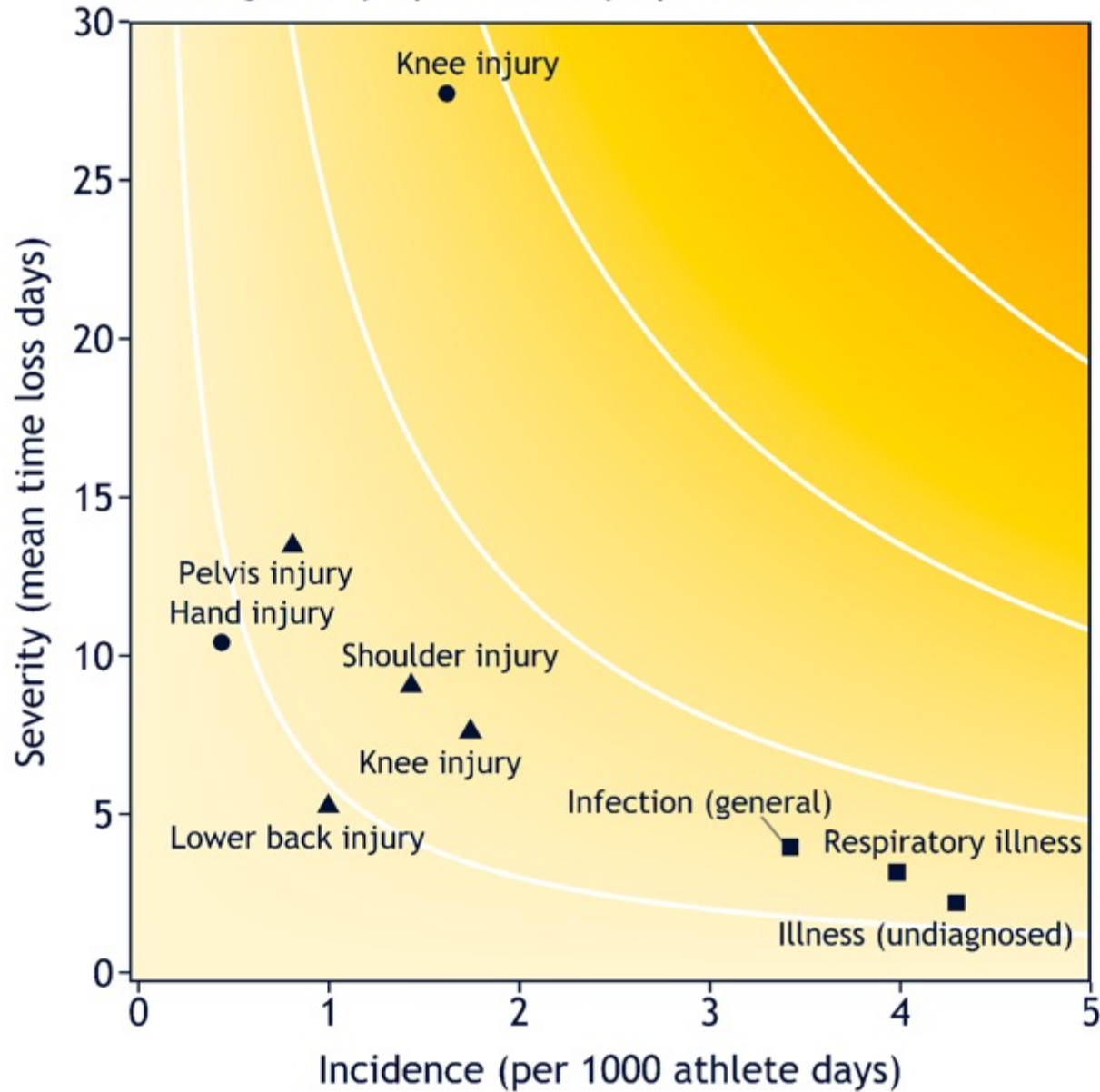
# Risk matrix for acute and overuse injuries and illnesses in Norwegian Olympic and Paralympic athletes





# Injury and illness risk matrix

Norwegian Olympic & Paralympic Team 2018-2019

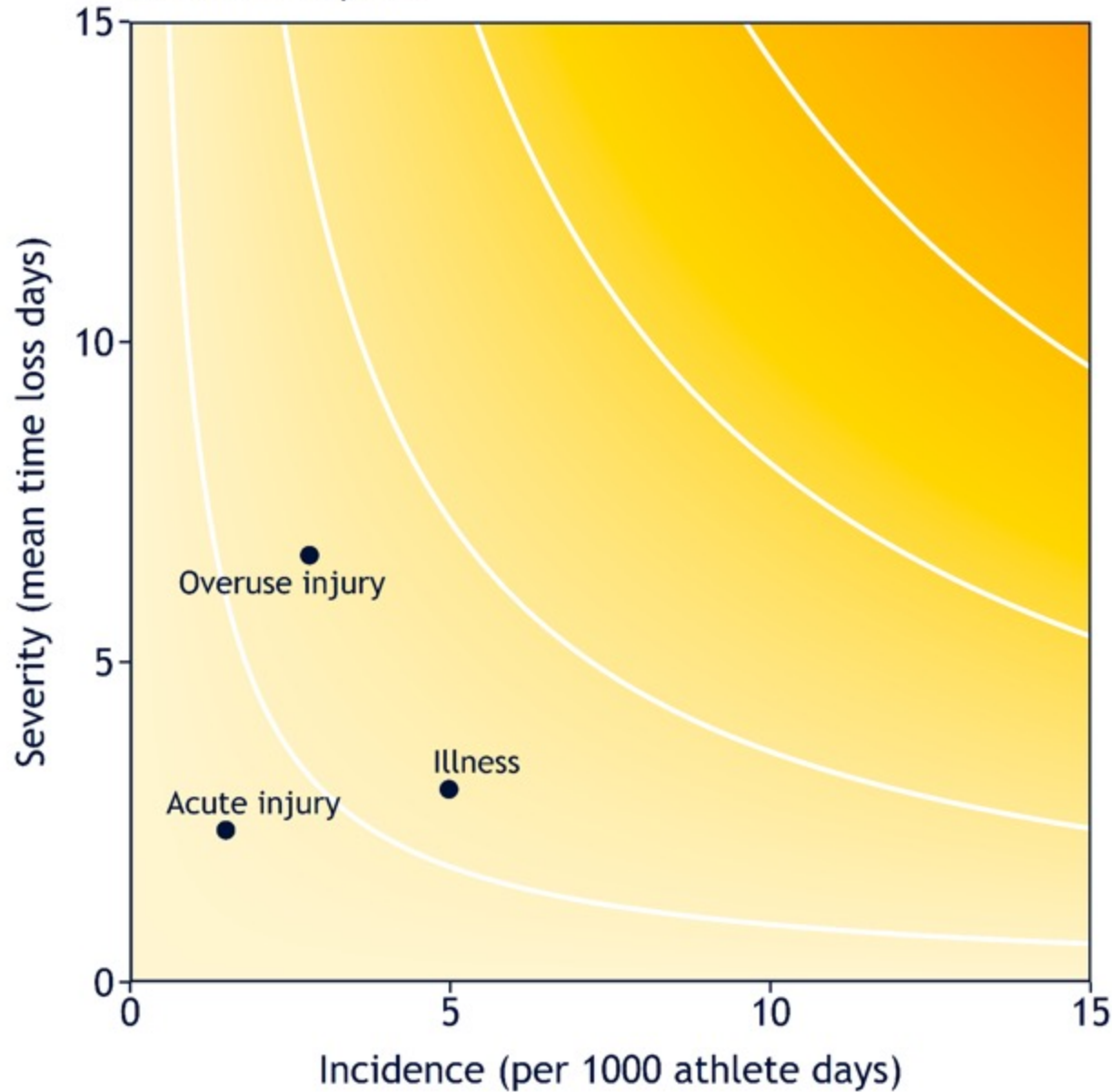


Norwegian Olympic and Paralympic athletes

2018-19

# Injury and illness risk matrix

Endurance sports



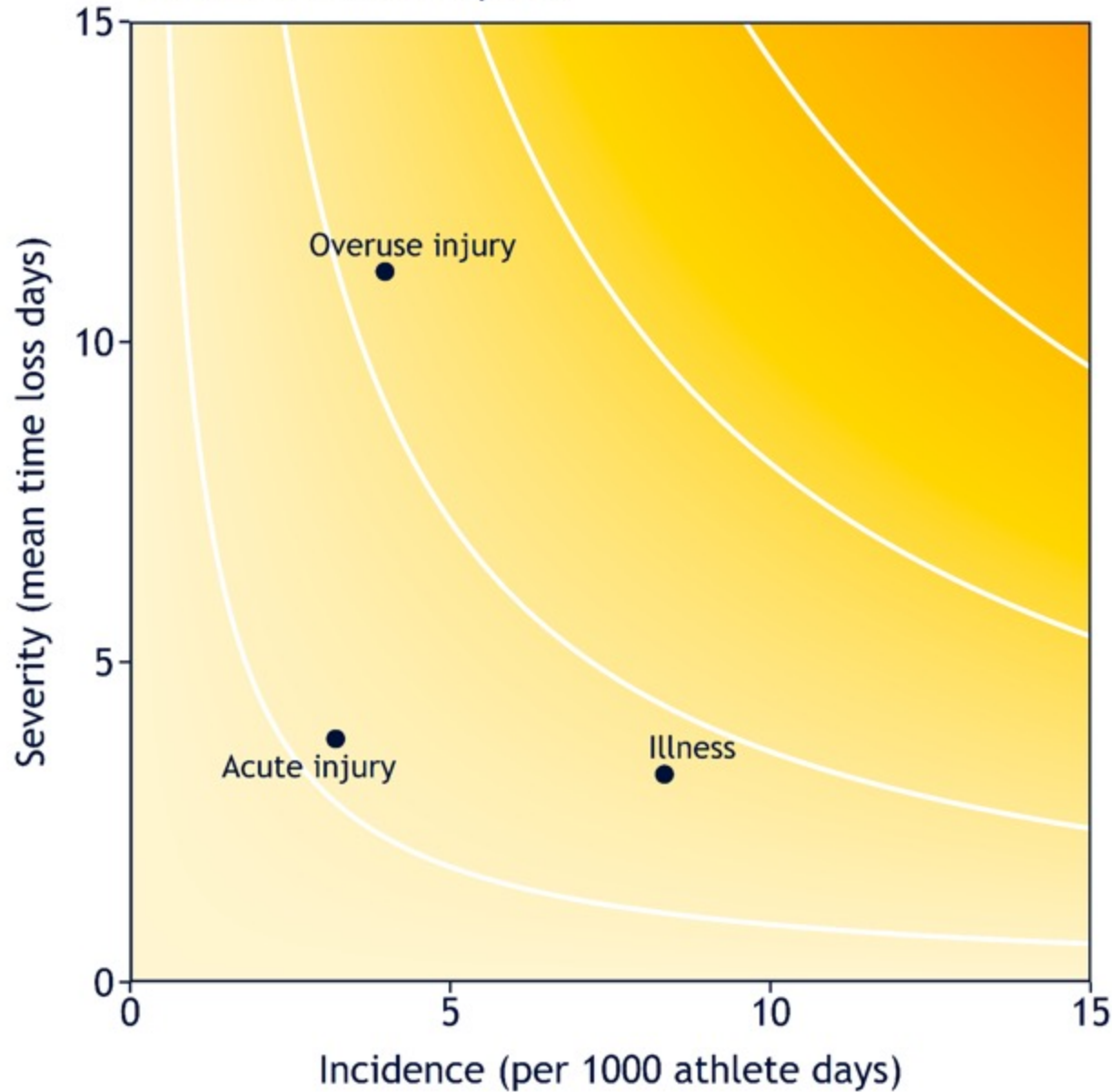
Endurance sports

2018-19

Athletics (8)  
Cycling (14)  
Rowing (11)  
Kayak (3)  
Swimming (3)  
Triathlon (5)

# Injury and illness risk matrix

Tactical/technical sports



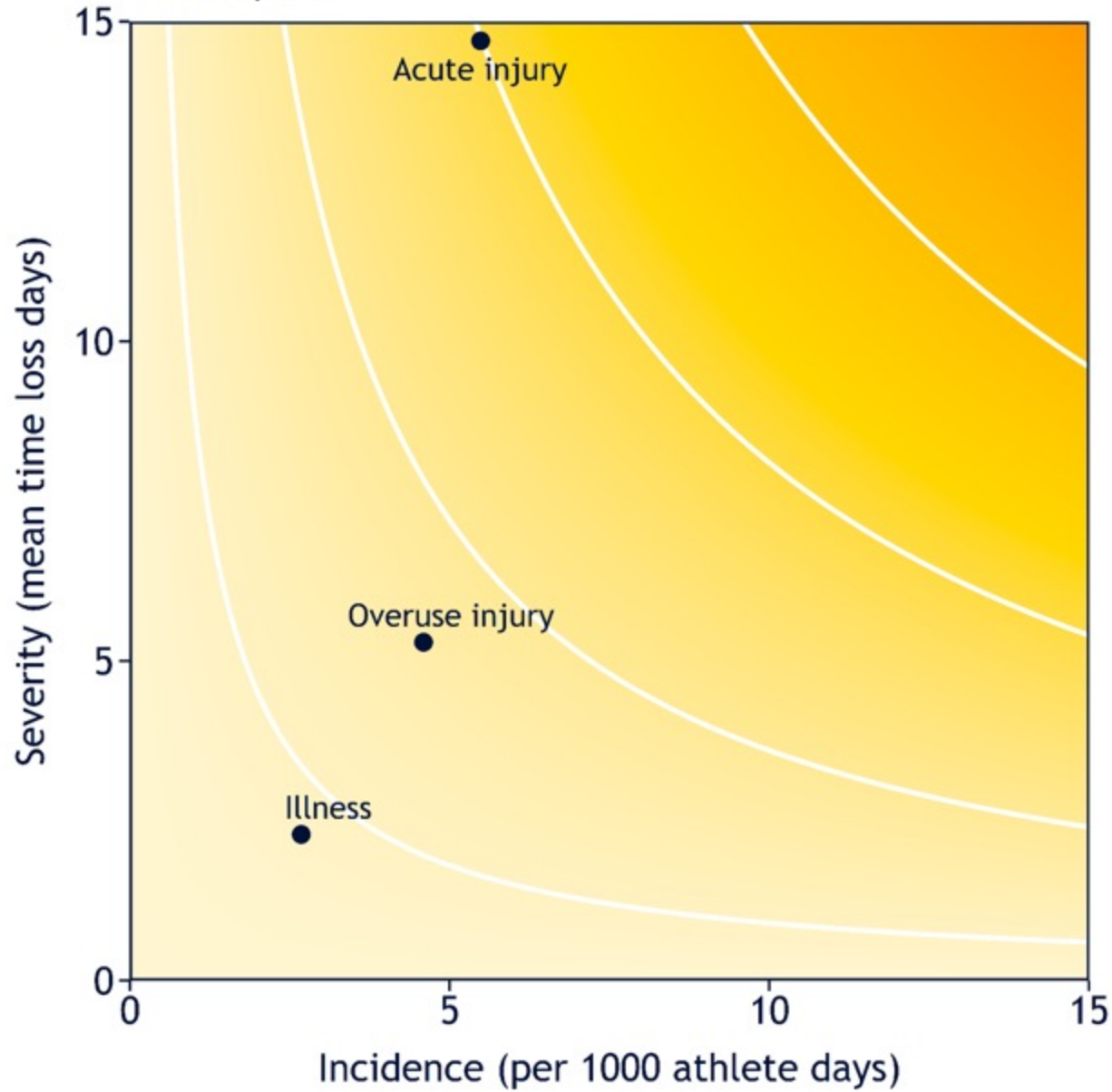
Technical/  
tactical sports

2018-19

- Athletics (11)
- Golf (11)
- Gymnastics (2)
- Sailing (5)
- Taekwondo (6)
- Wrestling (7)

# Injury and illness risk matrix

Team sports



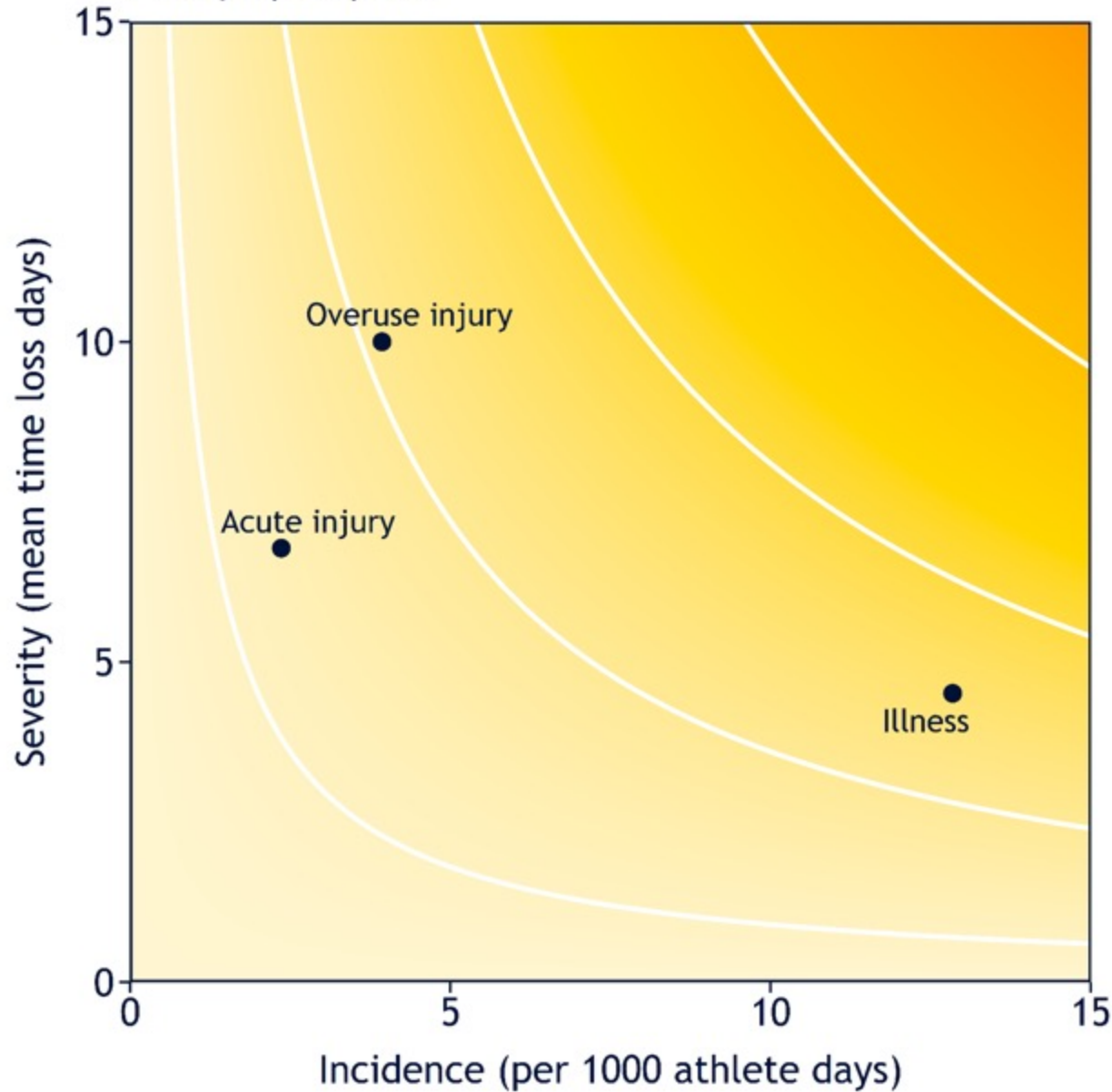
Team sports

2018-19

Beach volleyball (4)  
Handball (56)

# Injury and illness risk matrix

Paralympic sports



Paralympic sports

2018-19

- Athletics (3)
- Badminton (1)
- Equestrian (5)
- Rowing (1)
- Shooting (5)
- Swimming (5)
- Table tennis (4)

# Practical implications and benefits of continuous health monitoring/surveillance

- For a health team/NOC: planning of health resources, staffing a team, collaboration between athlete, coach and health team
- For IF: organizing health resources in preparation of major sport events, special needs, evaluation of policy changes
- For everybody: Building of knowledge, transfer to recreational athletes

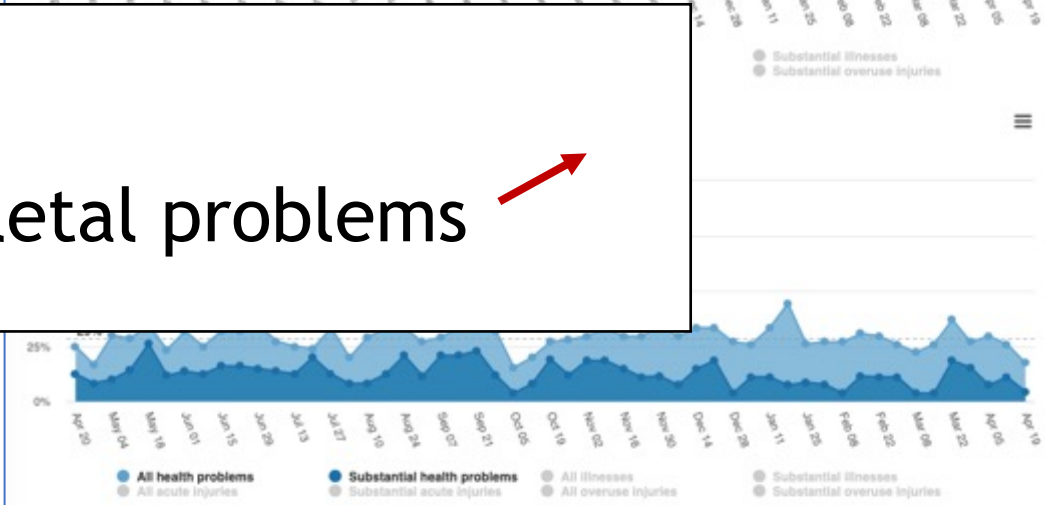
Norwegian examples: pre and post COVID-lockdown

**Changes in weekly prevalence of health issues BEFORE and AFTER lock-down/COVID-restrictions (april 2020)**

Para - team TOKYO 2020

Para ice sledge hockey team BEIJING 2022

# TOKYO - para team BEFORE and AFTER lock-down (april 2020)



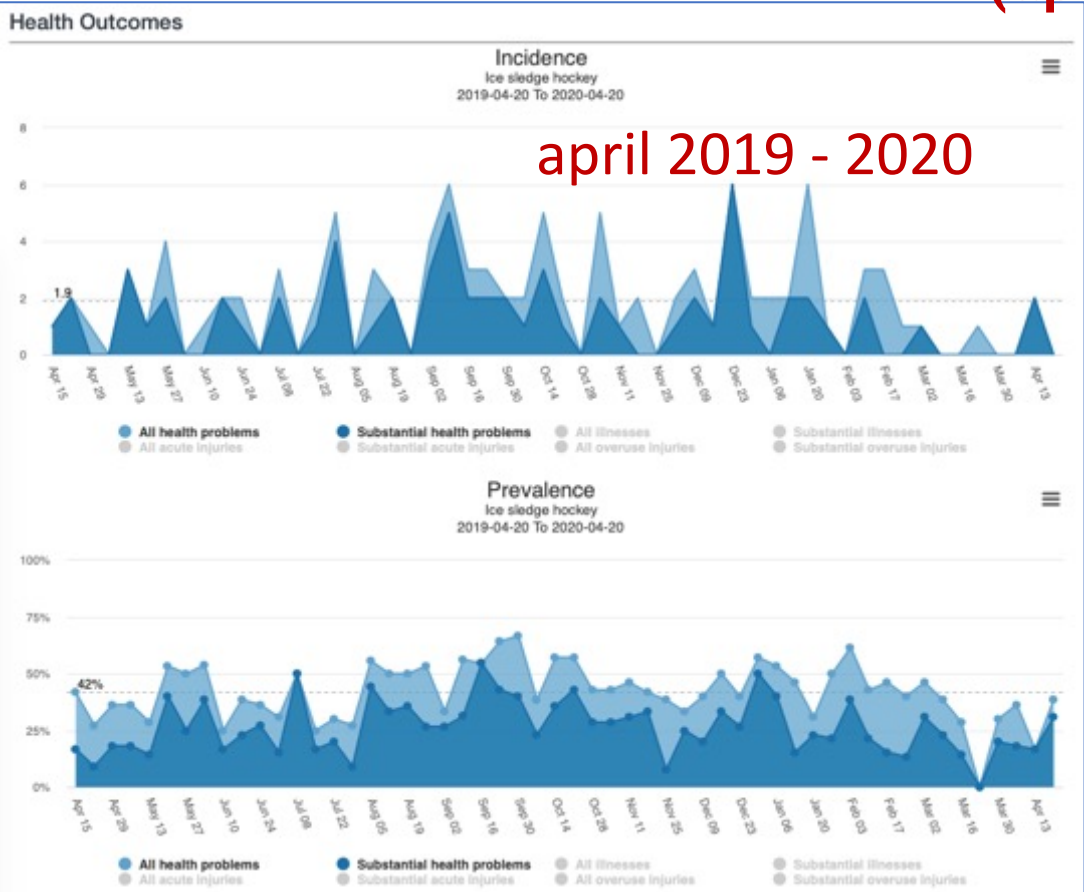
Illnesses ↓  
Musculoskeletal problems ↗

	Average Prevalence	95% CI	Min	Max	Incidence
All health problems	26%	24% to 28%	12%	47%	3.3 cases per athlete per year
Substantial health problems	13%	11% to 15%	0%	41%	2.2 cases per athlete per year
All illnesses	13%	11% to 15%	0%	29%	2.3 cases per athlete per year
Substantial illnesses	6%	5% to 8%	0%	24%	1.5 cases per athlete per year
All acute injuries	6%	5% to 8%	0%	24%	0.4 cases per athlete per year
Substantial acute injuries	5%	4% to 6%	0%	24%	0.4 cases per athlete per year
All overuse injuries	8%	7% to 9%	0%	17%	0.5 cases per athlete per year
Substantial overuse injuries	2%	1% to 3%	0%	10%	0.3 cases per athlete per year

	Average Prevalence	95% CI	Min	Max	Incidence
All health problems	29%	27% to 30%	15%	44%	2.6 cases per athlete per year
Substantial health problems	13%	11% to 14%	4%	26%	2 cases per athlete per year
All illnesses	6%	4% to 7%	0%	19%	1.7 cases per athlete per year
Substantial illnesses	4%	3% to 5%	0%	19%	1.1 cases per athlete per year
All acute injuries	10%	9% to 12%	0%	22%	0.4 cases per athlete per year
Substantial acute injuries	4%	3% to 5%	0%	17%	0.3 cases per athlete per year
All overuse injuries	13%	12% to 15%	6%	22%	0.5 cases per athlete per year
Substantial overuse injuries	5%	4% to 6%	0%	15%	0.5 cases per athlete per year

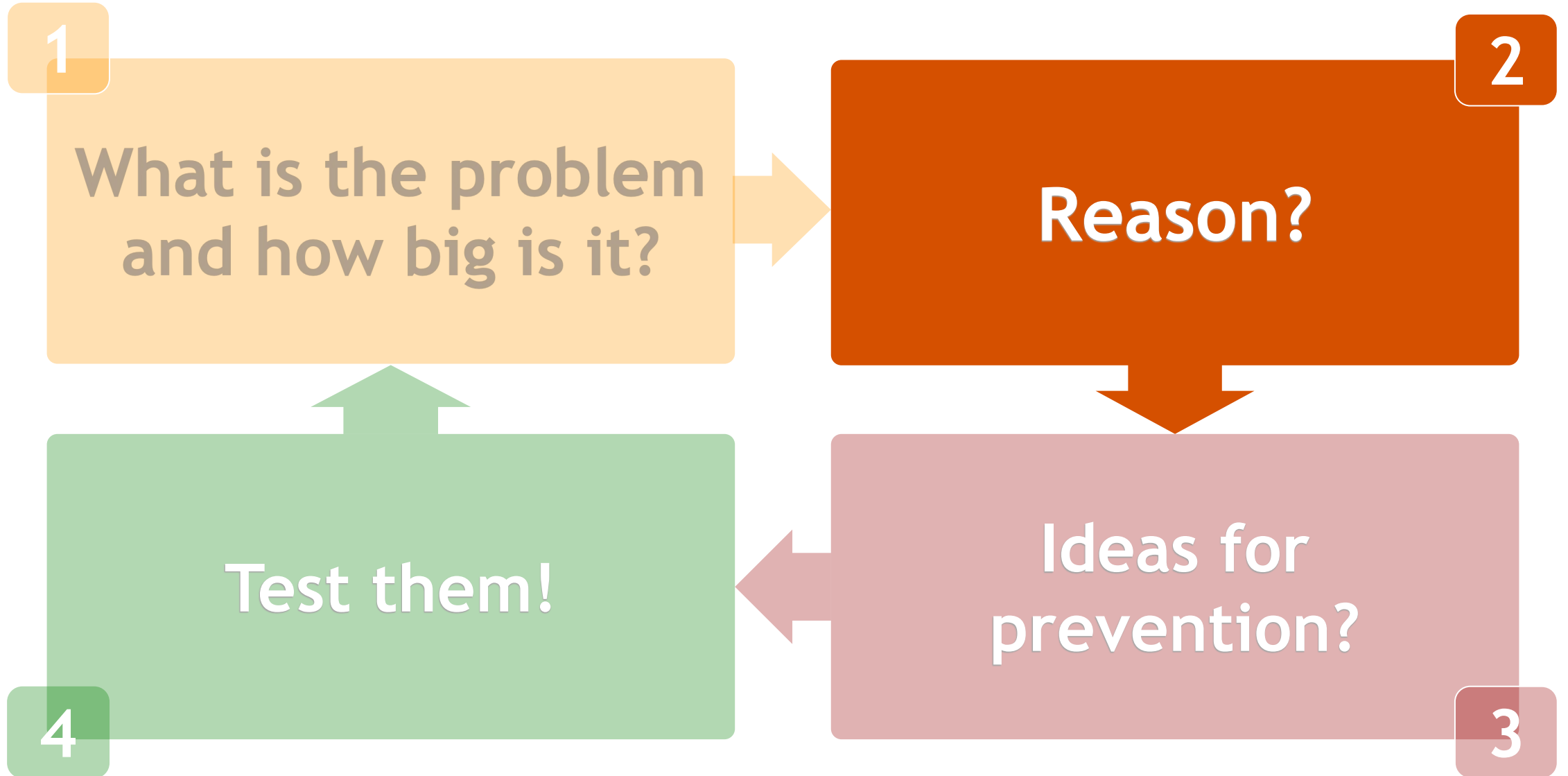


# Para Hockey team BEFORE and AFTER lock-down (april 2020)



	Average Prevalence	95% CI	Min	Max	Incidence
All health problems	42%	39% to 45%	0%	67%	5.4 cases per athlete per year
Substantial health problems	26%	23% to 29%	0%	55%	3.4 cases per athlete per year
All illnesses	21%	18% to 24%	0%	44%	3.7 cases per athlete per year
Substantial illnesses	14%	11% to 17%	0%	44%	2.3 cases per athlete per year
All acute injuries	8%	7% to 10%	0%	21%	0.7 cases per athlete per year
Substantial acute injuries	7%	6% to 9%	0%	21%	0.5 cases per athlete per year
All overuse injuries	16%	14% to 18%	0%	33%	1.1 cases per athlete per year
Substantial overuse injuries	7%	6% to 9%	0%	22%	0.6 cases per athlete per year

# What are reasons for health problems?



# Benefits of health screening for Olympic and Paralympic athletes

Omfattende helseanamnese

Kosthold/reise

Tids-/klimaakklimatisering

Alle 1-2 år

# HELSETILBUDD



Helseundersøkelse

Elektronisk  
spørreskjema

Medisinske  
undersøkelser

EKG

Spirometri

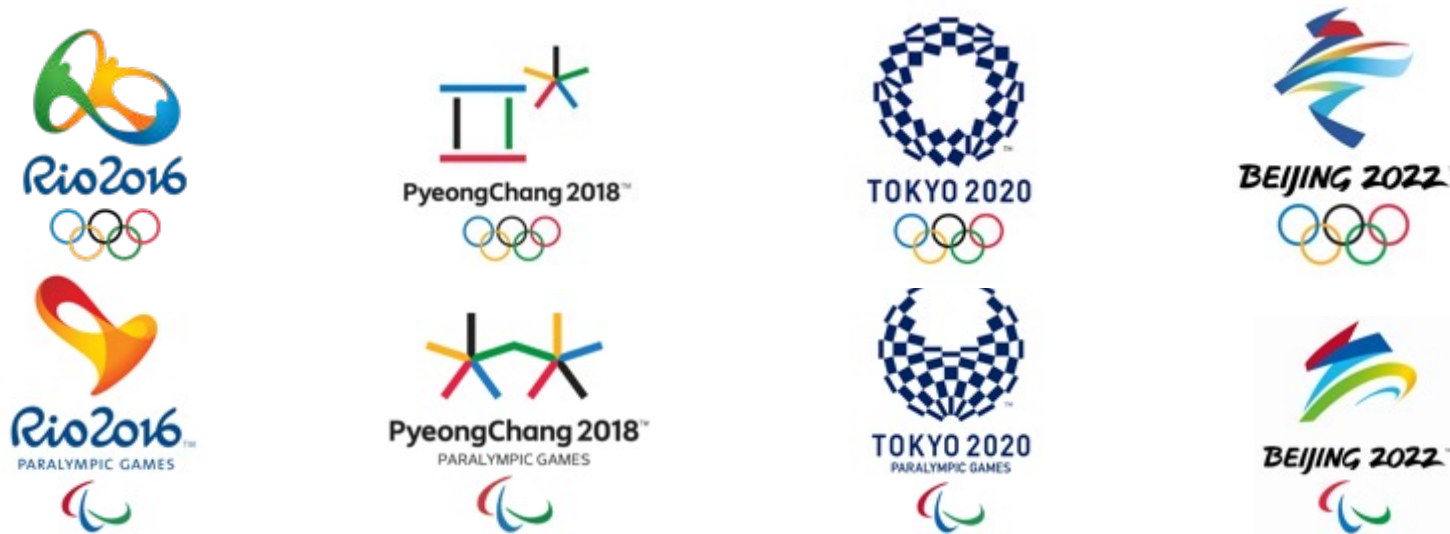
Blodprøver

Samtaler/undersøkelser  
med lege/fysioterapeut

MÅLRETTET OPPFØLGING AV HELSEPROBLEMER

# 4 Olympic and Paralympic Games cycles

## 546 OL + 94 PL athletes

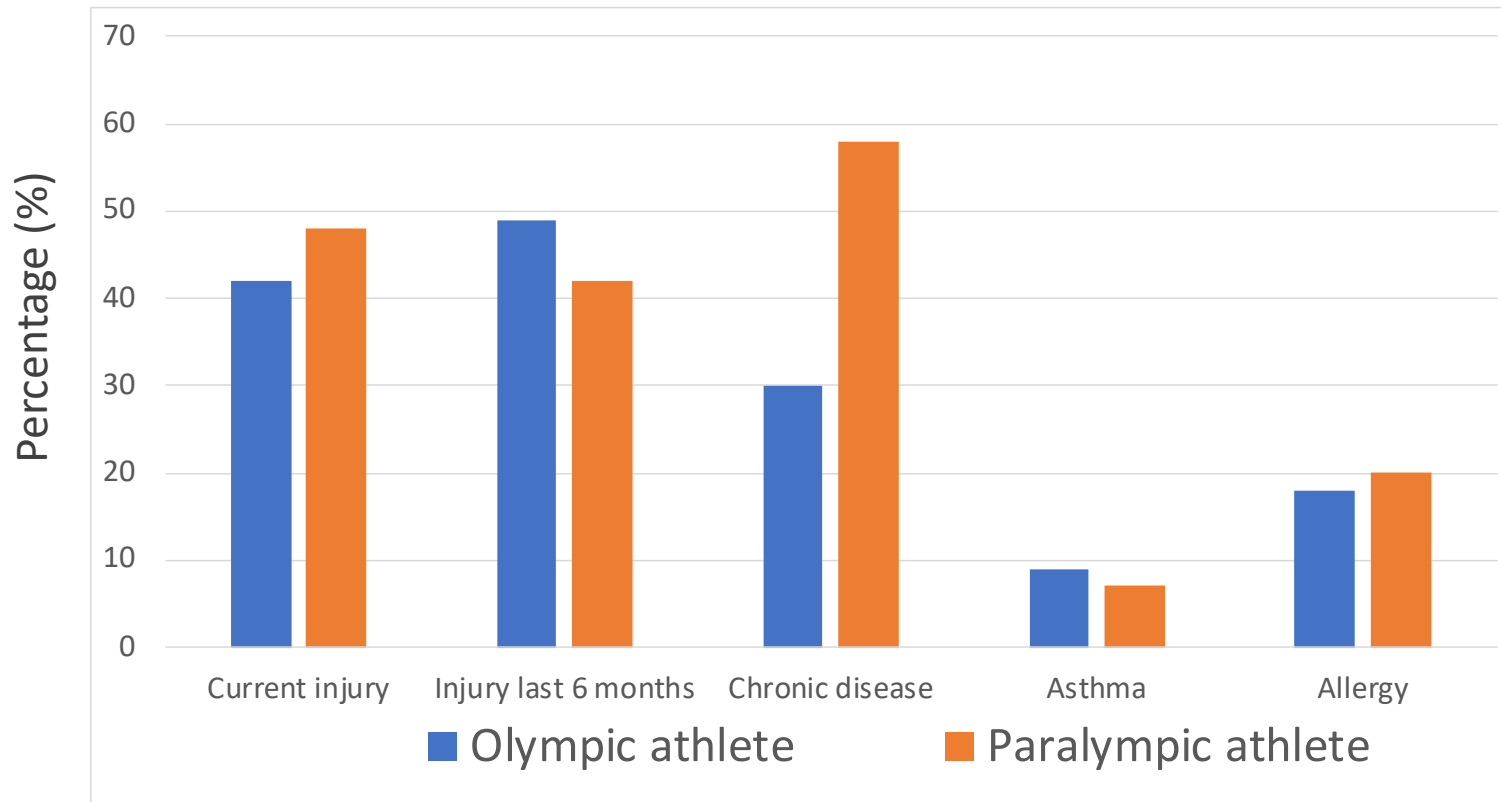


828 games cycles



# Outcomes of PHEs

Goal: to identify pos findings that need follow-up



# Health challenges (findings from PHE)

MSK-problems  
(shoulder, elbow, lower back +++)

Low energy expenditure  
due to less active muscle mass

Greater risk for skin irritations/infections

Greater risk for adverse body composition

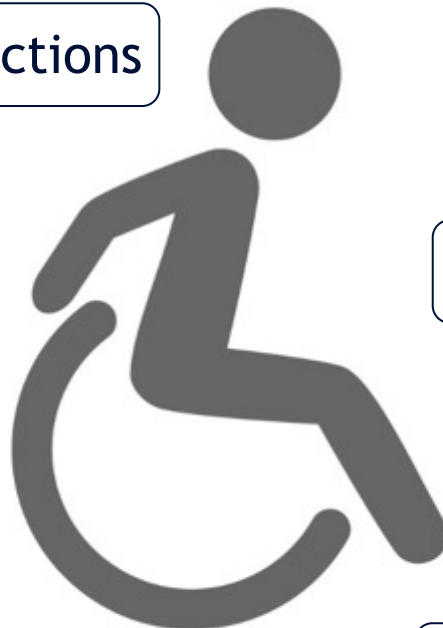
Greater risk for overweight  
and metabolic syndrome  
(cardio, diabetes, ++)

Greater risk for infections (urinary, respiratory)

Poor bone health

Problems with bowel and digestive system

Social, mental and cognitive challenges





# Making it happen



**What´s in it for me?**

What's in  
it for me?



What's in it for me?





What's in it for me?

# What's in it for me?

Athlete

"Better medical care"

Medical team

"Easier to do a good job"

Coach

"More training days"

# Take home messages

- Ongoing surveillance of individual sports is difficult, but possible using athlete-based reporting systems
  - ... and builds the foundation for the development and evaluation of preventive measures
- Good surveillance data informs risk management at both an individual and a group level
- For long-term success, the surveillance system needs to have direct benefits for athletes, medical staff and coaches

# The Oslo Sports Trauma Research Center

has been established at the Norwegian School of Sport Sciences through generous grants from the Royal Norwegian Ministry of Culture, the South-Eastern Norway Regional Health Authority, the International Olympic Committee, the Norwegian Olympic Committee & Confederation of Sport, and Norsk Tipping AS



INTERNATIONAL  
OLYMPIC  
COMMITTEE



NORSK TIPPING

HELSE ●●● SØR-ØST

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