

# Bicycle helmet efficacy : 1st case-control study in France

Emmanuelle Amoros, Mireille Chiron,  
Bertrand Thélot (InVS), Jean-Louis Martin,  
Bernard Laumon

UMRESTTE-TS2-IFSTTAR



**IFSTTAR**

# Literature: 2 types of studies

- Countries/states where bicycle helmet is compulsory : before/after studies, on aggregated data  
=> no clear result
- Studies on individual data : case-control studies  
Show protective effect, but based on 1990s data when hard-shell helmets were mostly used.  
now=soft-shell helmets



## French study based on the Rhône road trauma registry

- much more complete than police data
  - 1300 injured cyclists/year
  - police data= 120 injured cyclists/year
- over 1998-2008: 13,797 injured cyclists (outpatients, inpatients and killed)
- all injuries, coded with the AIS
- Data on bicycle helmet routinely collected

# A case-control study

Cases = 4 groups ; cyclists injured at:

- the head (AIS 1+)..... n=1471
- the head, seriously (AIS 3+)..... n= 144
- the face (AIS 1+)..... n=1926
- the neck (AIS 1+)..... n= 529

Controls =

- cyclists injured outside the head-face-neck region  
n=5373

⇒ We compare the proportion of those wearing a helmet

⇒ We adjust on age, sex, crash severity

# Head injuries, all severities (AIS 1+)

	<b>Cases = with any head injury</b>	<b>Controls= solely injured below the neck</b>
<b>Helmet = yes</b>	<b>18.0%</b>	<b>22.1%</b>
<b>Helmet = no</b>	<b>82.0%</b>	<b>77.9%</b>
	<b>100.0%</b>	<b>100.0%</b>
<b>frequency</b>	<b>N=1471</b>	<b>N=5153</b>

Crude OR= 0.78 , 95% CI=[0,67-0,90]

Adjusted OR= 0.69; 95% CI=[0.59-0.81]

= reduction of risk by 31%

# Head injuries, seriously (AIS 3+)

	<b>Cases = Serious head injury</b>	<b>Controls= solely injured below the neck</b>
<b>Helmet = yes</b>	<b>10.4%</b>	<b>22.1%</b>
<b>Helmet = no</b>	<b>89.6%</b>	<b>77.9%</b>
	<b>100.0%</b>	<b>100.0%</b>
<b>frequency</b>	<b>N=144</b>	<b>N=5153</b>

Crude OR= 0.41 , 95% CI=[0.23-0.68]

Adjusted OR= 0.30; 95% CI=[0.16-0.50]

=reduction of risk by 70%

# Face injuries, all severities (AIS 1+)

	<b>Cases = Any face injury</b>	<b>Controls= solely injured below the neck</b>
<b>Helmet = yes</b>	<b>16.3%</b>	<b>22.1%</b>
<b>Helmet = no</b>	<b>83.7%</b>	<b>77.9%</b>
	<b>100.0%</b>	<b>100.0%</b>
<b>frequency</b>	<b>N=1926</b>	<b>N=5153</b>

Crude OR= 0.69 , 95% CI=[0.60-0.79]

Adjusted OR= 0.72; 95% CI=[0.62-0.83]

=reduction of risk by 28%

# Neck injuries, all severities (AIS 1+)

	<b>Cases = Any neck injury</b>	<b>Controls= solely injured below the neck</b>
<b>Helmet = yes</b>	<b>26.3%</b>	<b>22.1%</b>
<b>Helmet = no</b>	<b>73.7%</b>	<b>77.9%</b>
	<b>100.0%</b>	<b>100.0%</b>
<b>frequency</b>	<b>N=529</b>	<b>N=5153</b>

Crude OR= 1.41 , 95% CI=[1.02-1.54]

Helmeted cyclists are older and older people have more risk of neck injuries; when adjusting on age, the OR is smaller and no longer significant

Adjusted OR= 1.18; 95% CI=[0.94-1.47]

*Besides, head injuries are more frequent than neck injuries (16% vs 7%)*



# Conclusion

Helmets are protective, even soft shell helmets

Reduction of risk is greatest for **serious** head injuries (AIS 3+): reduction by 70%

Protective effect is the same for bicycle-only crashes and for collisions with motor vehicles

Helmet wearing should be strongly encouraged

Thank you for your attention

Funded by the French Institute for Public health  
Surveillance (InVS)

Contact: [emmanuelle.amoros@ifsttar.fr](mailto:emmanuelle.amoros@ifsttar.fr)