



The physical environment and cardiovascular mortality

David Fäh



Workshop Swiss National Cohort (SNC), 1.7.2010: Results after the first 4 years
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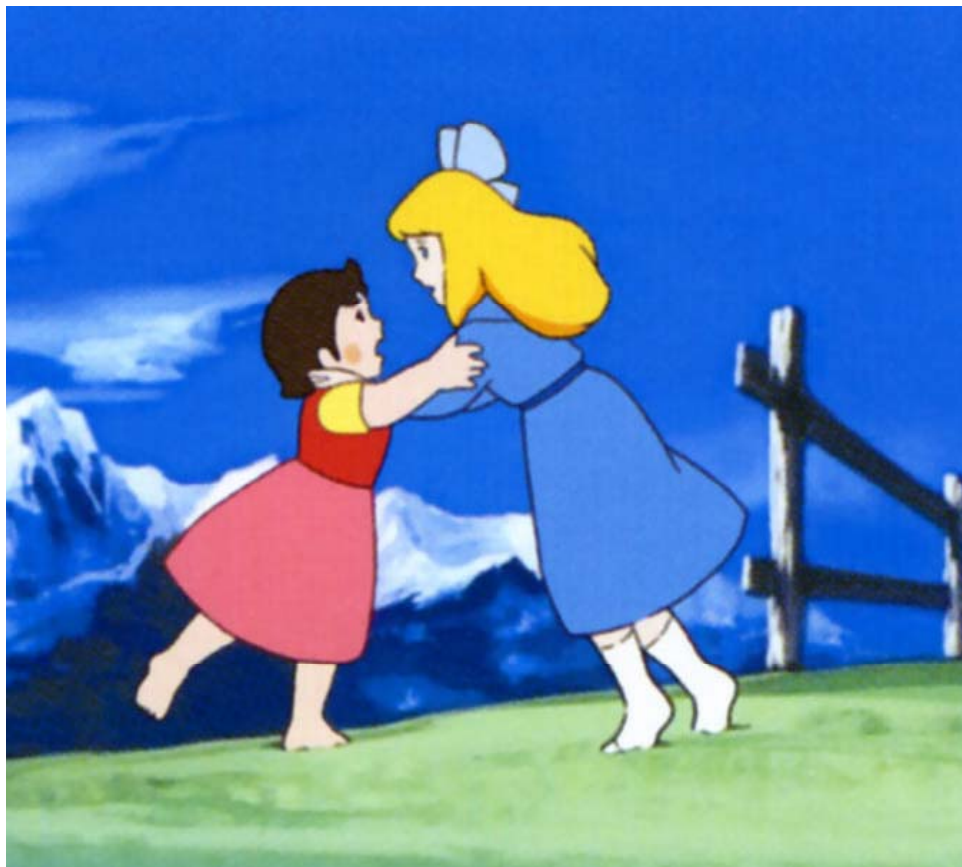
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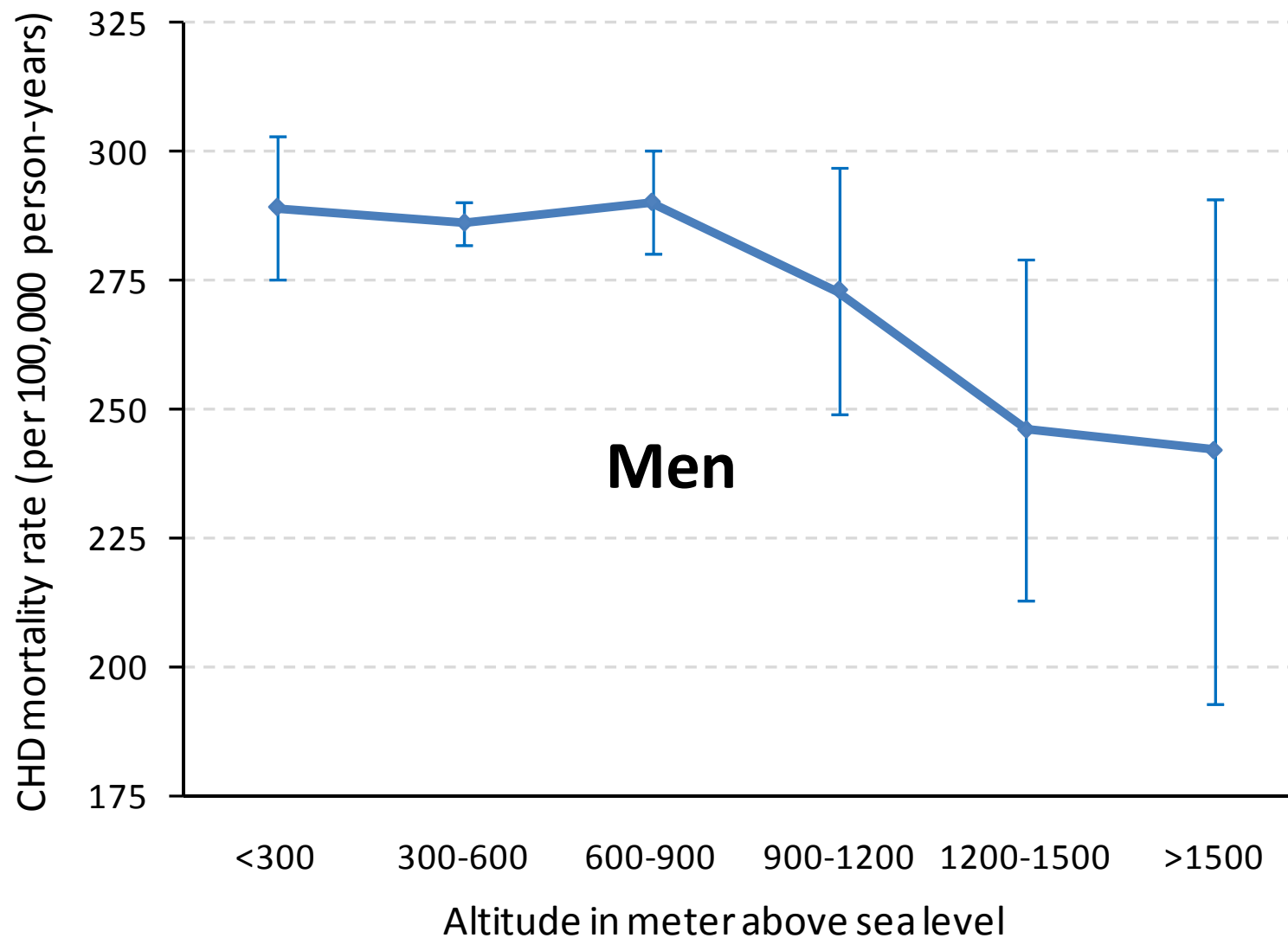


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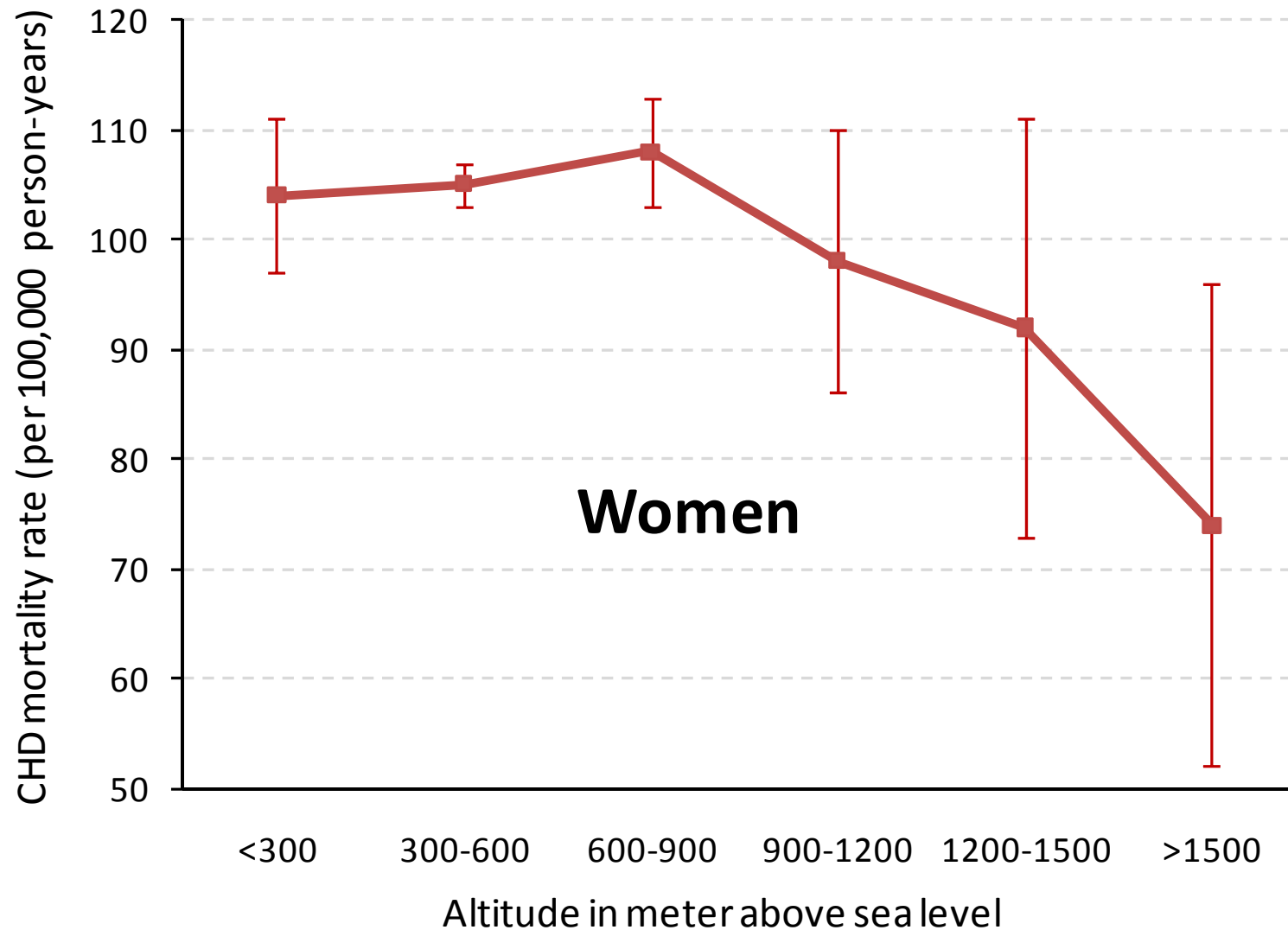
Circulation. 2009 Aug 11;120(6):495-501.

Error bars are 95% confidence intervals

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CHD and Stroke

- Per 1000m of increase in altitude (259-1960m, men and women 40-84y)
 - CHD mortality decreased by 22%
 - Stroke mortality decreased by 12%
 - Place of birth had an independent effect

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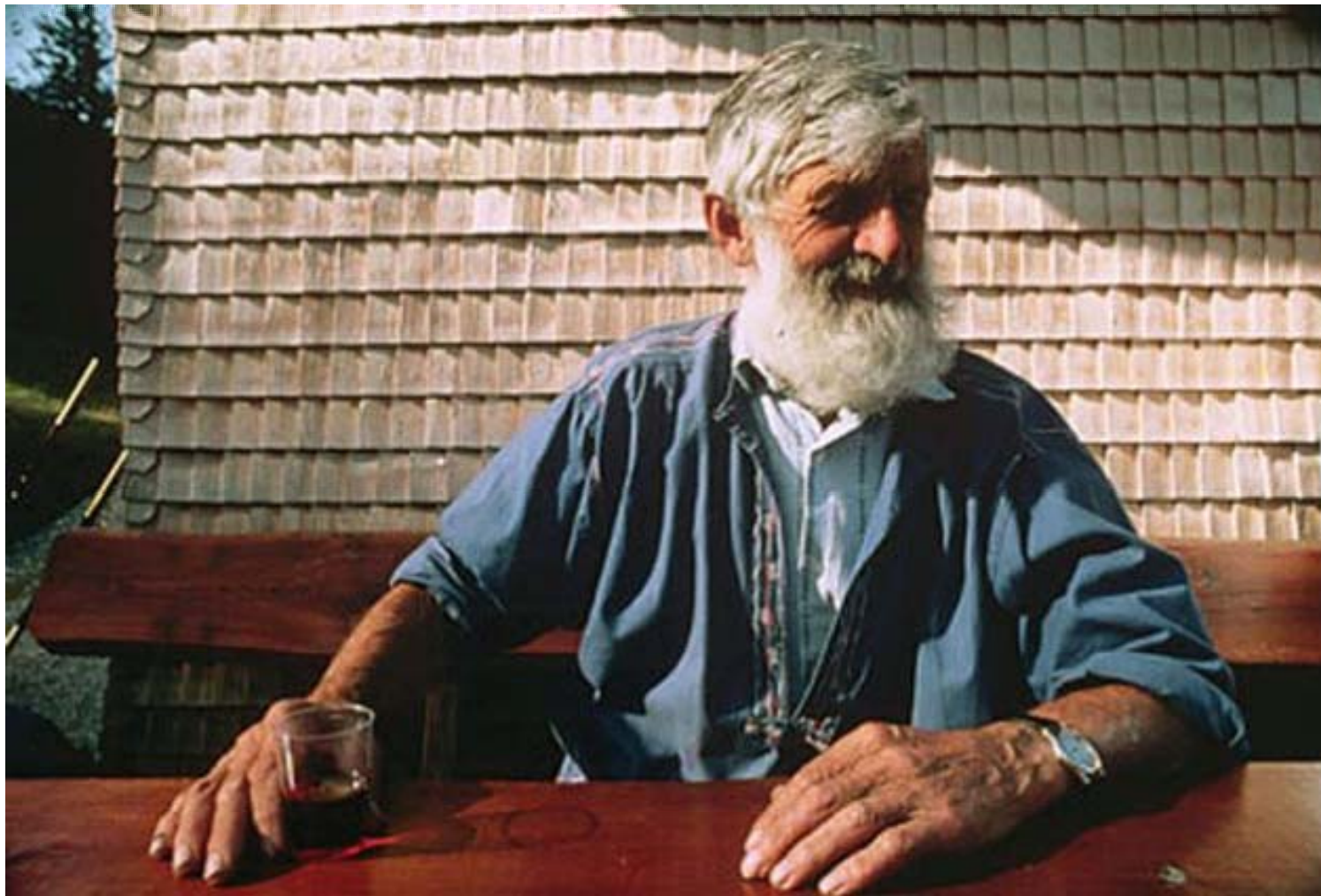
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Possible mechanisms

1. Effect of altitude per se
2. Confounders
3. Effects associated with altitude

1. Effect of altitude per se

- Lower oxygen partial pressure
- Higher „return of investment“ from physical activity
- In utero cardiovascular adaptations?



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2. Confounders

- Probably no differences by altitude:
 - Obesity
 - Cigarette smoking
 - Physical inactivity
 - Eating pattern (e.g., fruit consumption)
 - Alcohol consumption
 - Diabetes
 - Genetic background

Based on Swiss Health Survey 2002

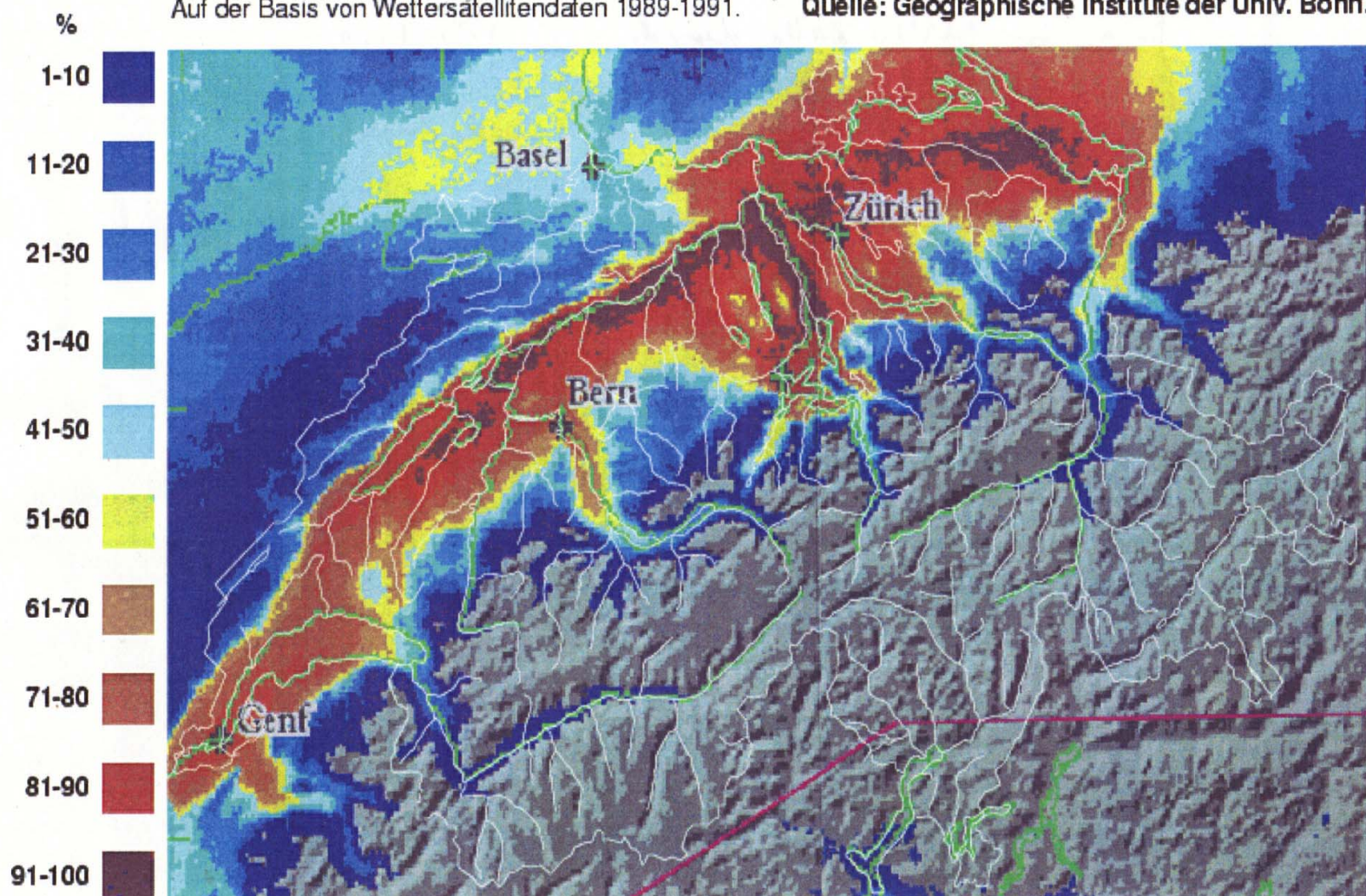
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Nebelhäufigkeit in der Schweiz im Winterhalbjahr in %

bedeutung 100%: Falls eine Nebeltag auftritt, dann hat der Region Nebel *Nebeltage*
 Auf der Basis von Wettersatellitendaten 1989-1991. **Quelle: Geographische Institute der Univ. Bonn.**

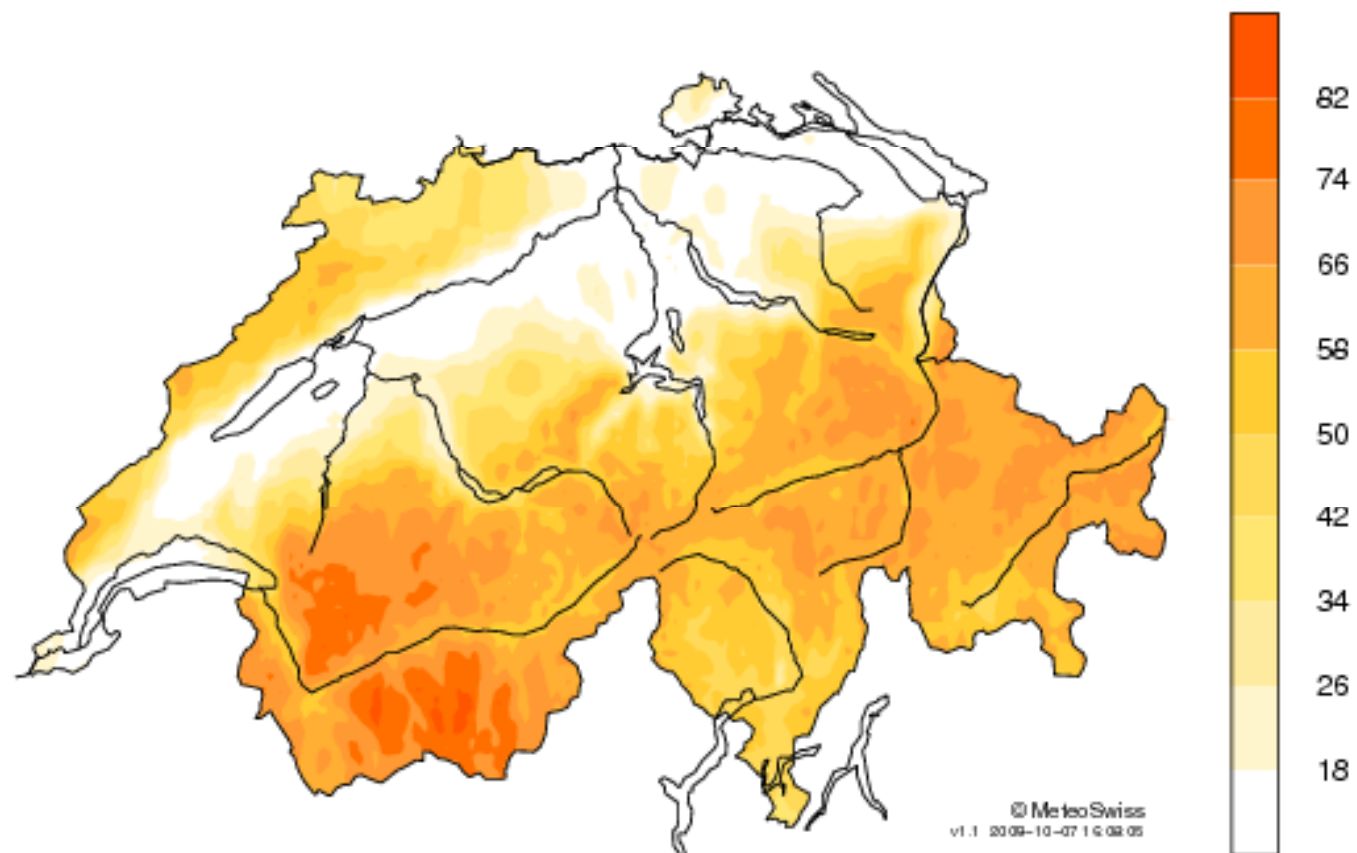


Nördlich der violetten Linie wurden 80 Einzelbilder, südlich davon 59 Einzelbilder ausgewertet.

aus: MeteoSchweiz: Nebelhäufigkeit in der Schweiz. Auszug aus: Klimaatlas der Schweiz. Vierte Lieferung, Schweizerische Meteorologische Anstalt 1991



Monthly Relative Sunshine Duration (%) 2009-01

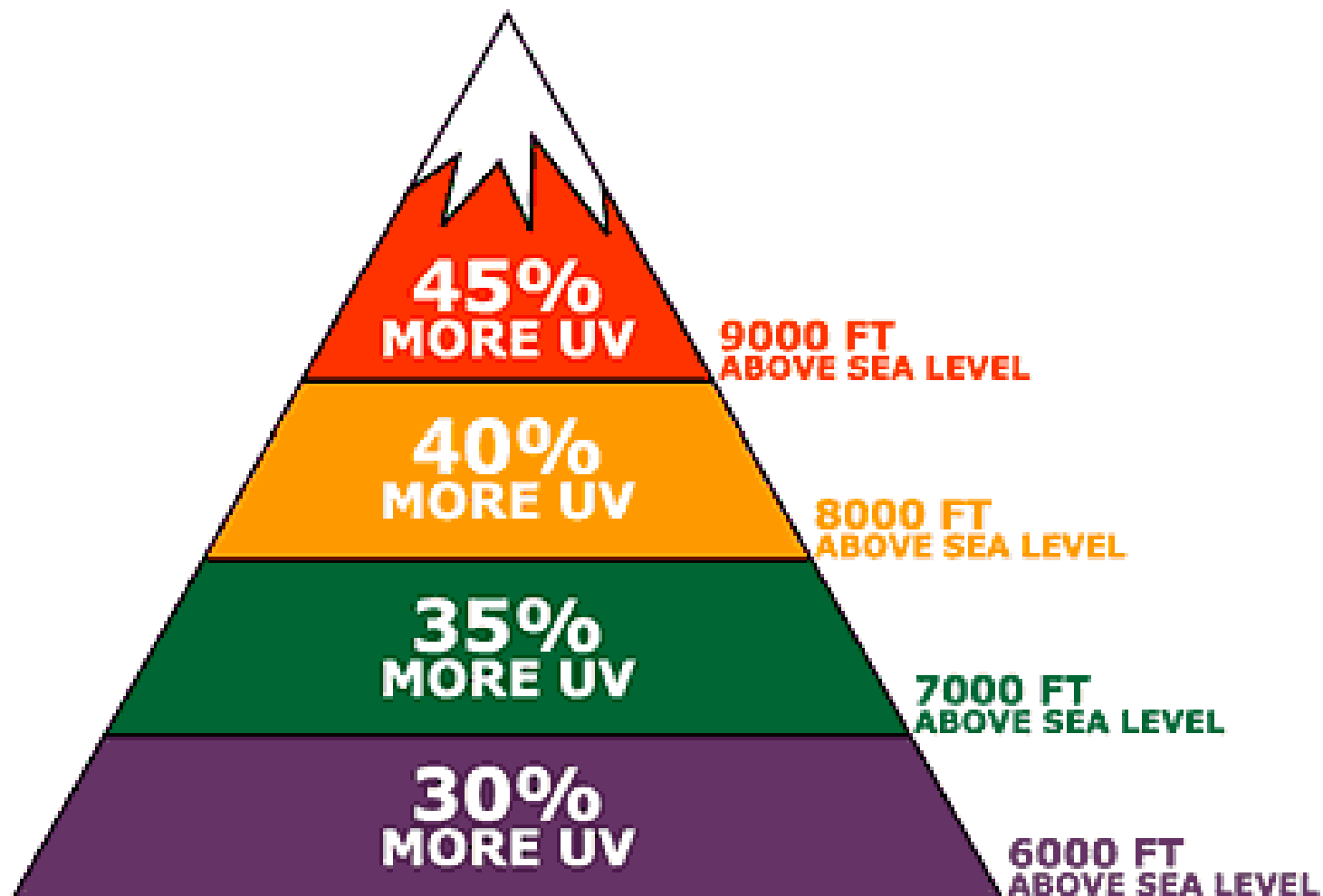




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3. Effects related with altitude

- Lower air humidity
 - Less fog
 - Longer sunshine duration
 - More bearable temperatures
- Thinner atmosphere
 - Higher Sunshine intensity (UV radiation)

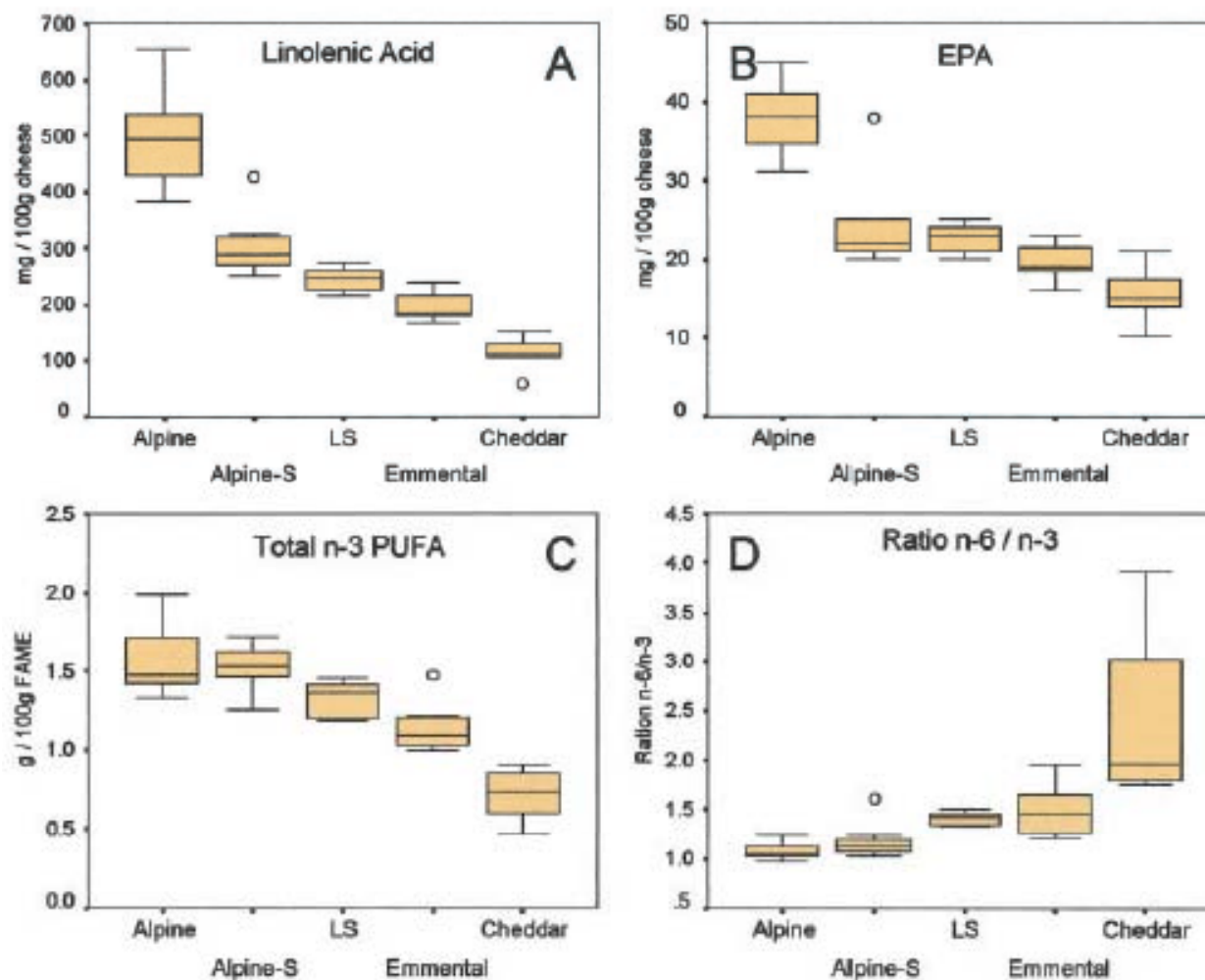
3. Effects related with altitude

- Sunshine (duration & intensity):
 - Higher vitamin D levels in mountaineers
 - Associated with decreased risk for Stroke & CHD
 - Critically low levels in wintertime at low altitudes in Switzerland
 - Effect on vegetation and produced food (Alpine paradox)?
 - Other effects?

Am J Clin Nutr. 1992;56(3):537-42; Circulation. 2004;109(1):103-7.

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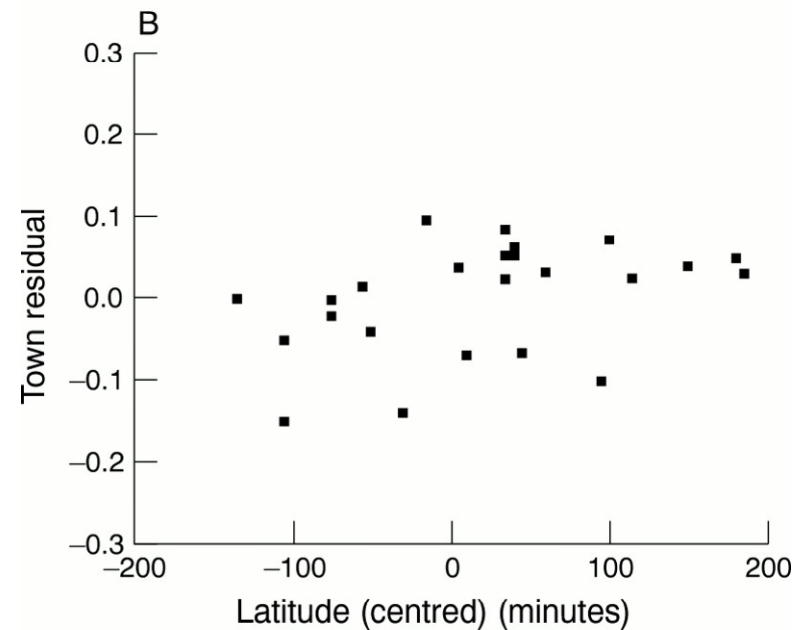
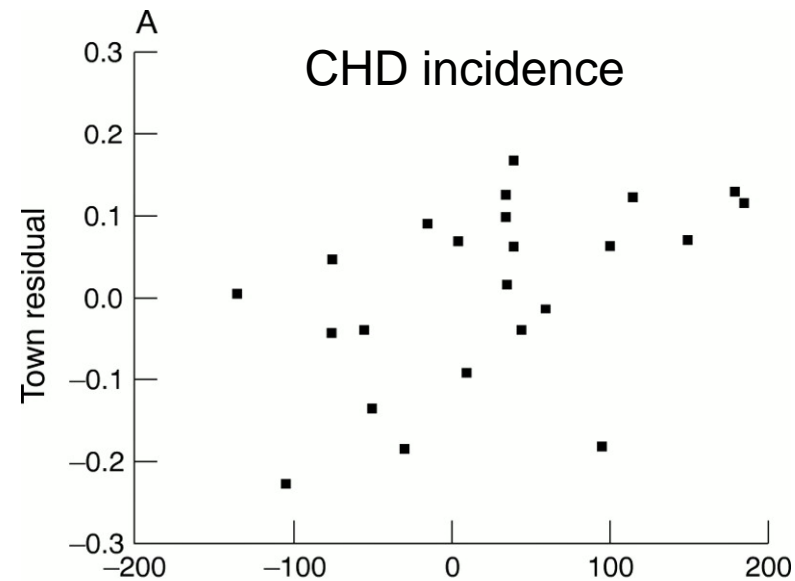




Circulation. 2004;109:103-107

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Heart 2001;86:277-283 doi:10.1136/heart.86.3.277

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Other differences by altitude

- Urbanity (large cities at lower altitudes)
- Air pollution
- Noise (traffic)
- Access to health care services?

What is it?

- Altitude alone?
- Climate? Which element?
- Geographical aspect (north vs. south of the alps)?

Aims

- Disentangle altitude from climate
- Define geographical and climatic conditions with high and low CVD-risk
- Look for a “dose-dependent” and sustained effect of exposure
- Assess the influence of air pollution & noise

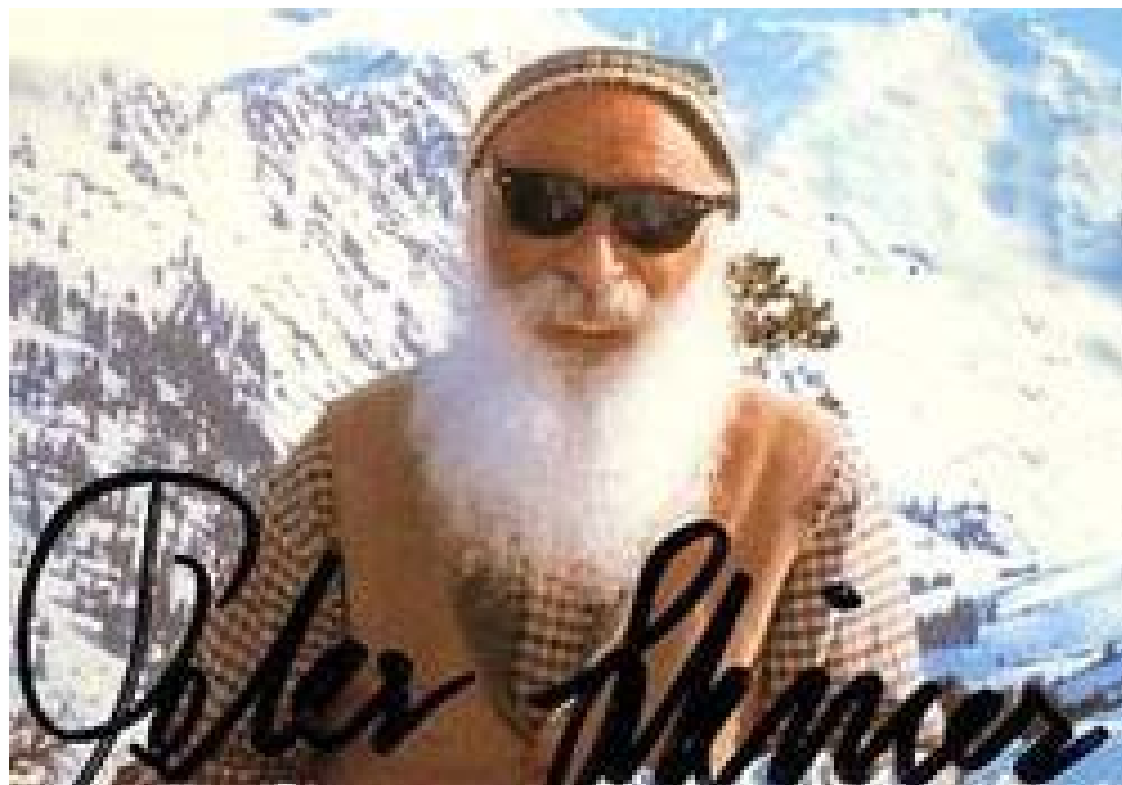
Hypotheses

- Sunshine duration has an effect independent of altitude
- Larger mortality variations in wintertime
- Sustained and dose-dependent effect of duration of sunshine exposure

Data sources

Data source	Information
Swisstopo	Digital altitude model (DHM). Obtain altitude (on building level) out of coordinates by using the GIS*-method
Das Bundesamt für Umwelt (BAFU)	Air pollution and noise model
TeleAtlas	Distance to major roads
Bundesamt für Statistik (BFS)	Coordinates of buildings (GWR: Gebäude- und Wohnungsregister)
Bundesamt für Meteorologie und Klimatologie (MeteoSchweiz)	Climate data (temperature, air humidity, sunshine duration, precipitation)
Swiss National Cohort (SNC)	Sex, age, mortality (date and cause of death), socio-economic information, place of residence & at birth

*Geographical Information Systems (GIS)



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www.davidfaeh.ch/lehre