

**HAND ARM
VIBRATION**



Raynaud's phenomenon and hand-arm vibration exposure in the general population of northern Sweden

International conference
6-9 JUNE 2023
Espace Prouvé,
Nancy, France

ICHAV 6/9 JUNE 2023 - NANCY - FRANCE

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Introduction

- This presentation is based on a previously published article with added unpublished data on hand-arm vibration exposure

Stjernbrandt *et al. BMC Rheumatology* (2022) 6:41
<https://doi.org/10.1186/s41927-022-00272-0>


BMC Rheumatology

RESEARCH

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Incidence, remission, and persistence of Raynaud's phenomenon in the general population of northern Sweden: a prospective study

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Introduction

- Raynaud's phenomenon (RP) is a very common condition in Sweden with a prevalence of around 12–14%
- Vibration-induced RP is the most commonly compensated occupational injury in Sweden
- Apart from vibration, cold climate exposure is likely both a causal factor and a trigger factor
- The natural course of RP has not been thoroughly studied since longitudinal studies are scarce, especially cohorts on the general population
- The remission rate of RP has relevance for workers' compensations claims



Introduction

- A US study with a mean follow-up of seven years reported a cumulative incidence of 1.5–2.2% and a remission proportion of 64% [1]
- A French study with 14 years of follow-up reported a cumulative incidence proportion of 3.5% and a remission proportion of 33% [2]
- The primary aim of our study was to determine the incidence, persistence and remission proportions of RP in the general population of northern Sweden

1. Suter et al. The incidence and natural history of Raynaud's phenomenon in the community. *Arthritis Rheum.* 2005;52:1259-1263.
2. Carpentier et al. Incidence and natural history of Raynaud phenomenon: A long-term follow-up (14 years) of a random sample from the general population. *J Vasc Surg.* 2006;44:1023-1028.

Methods

- Cold and Health In Northern Sweden (CHINS)
- A population-based prospective closed-cohort study conducted between 2015 and 2021
- Recruitment was based on the Swedish population register
- Repeated surveys (paper and digital)
- Data was collected on general health status, occurrence of RP, as well as exposure to hand-arm vibration and cold climate
- Annual incidence, remission and persistence proportions were calculated
- Multiple logistic regression was used to investigate factors that could influence the course



Methods

Do you have white fingers?

The picture displays white fingers, also called Raynaud's phenomenon



Does one or several of your fingers turn white as shown on the picture when you are exposed to moist or cold?

- Yes
 No

What year did it occur the first time?

What year did it most recently occur?

Does the pale area affect the fingertip with a clear demarcation?

- Yes
 No
 Don't know

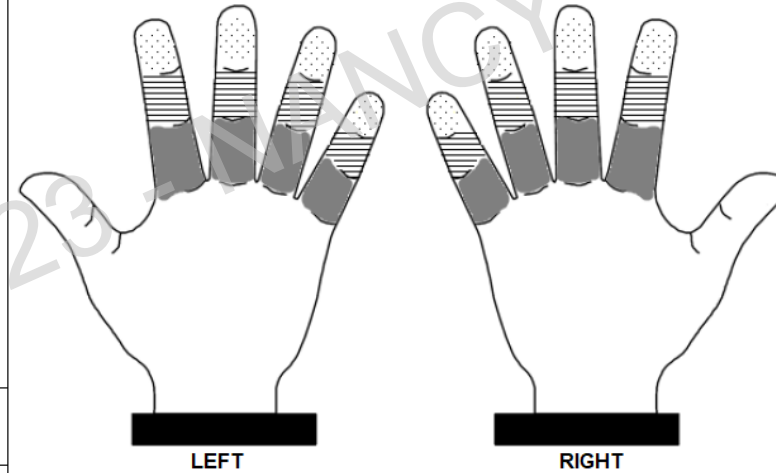
Compared to the onset, how frequently do you experience white fingers now?

- Less often
 As often
 More often
 Don't know

Compared to the onset, how large area of the fingers are affected now?

- A smaller area
 A similar area
 A larger area
 Don't know

The sketch shows the hands, with different parts of the fingers marked with textures



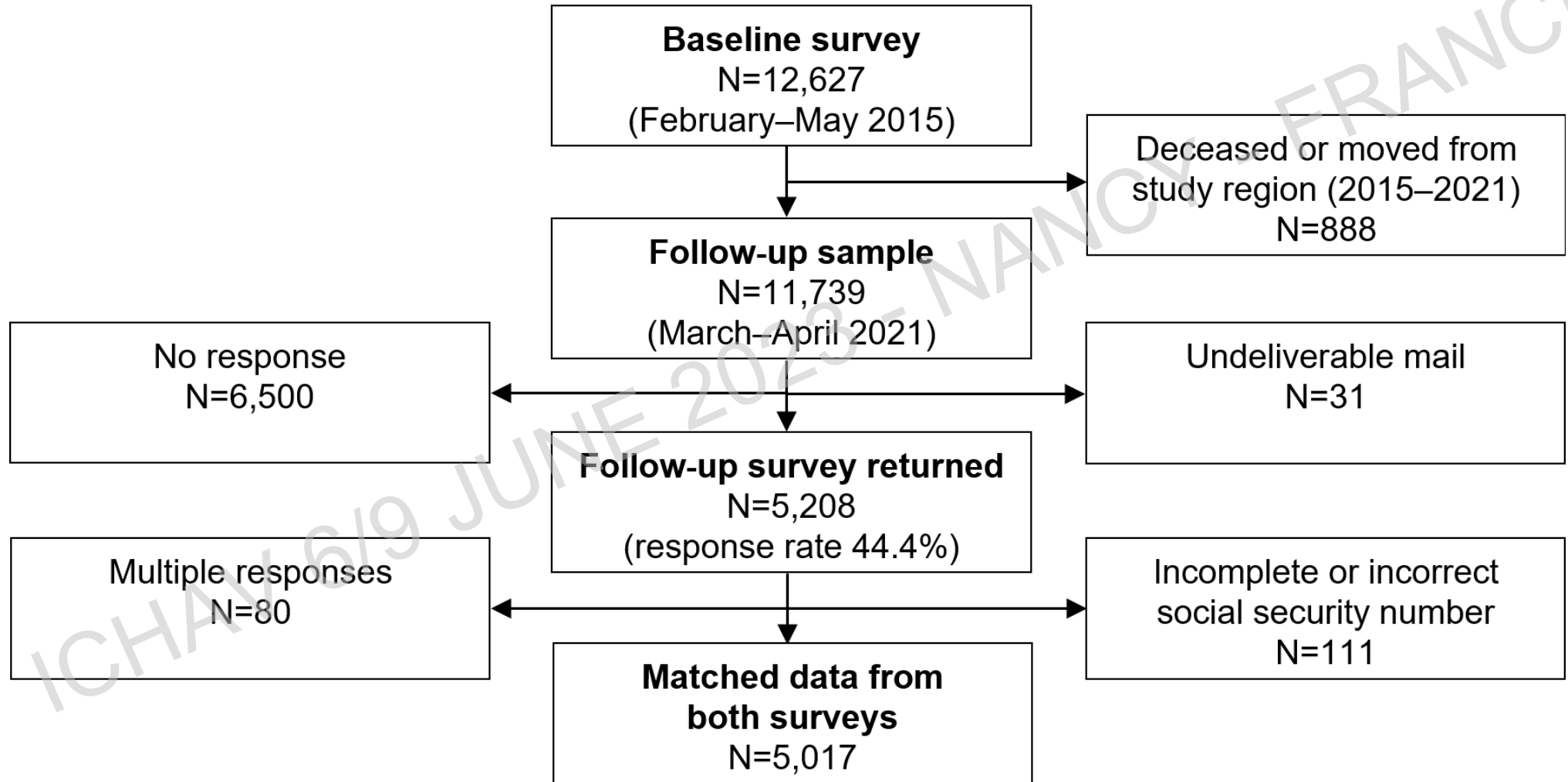
Approximately what part of the fingers are affected on your LEFT hand?

- Not affected
 Only the most distal parts of the fingers (dotted area)
 Including the middle parts of the fingers (striped area)
 All the way towards the palm of the hand (grey area)
 Don't know

Approximately what part of the fingers are affected on your RIGHT hand?

- Not affected
 Only the most distal parts of the fingers (dotted area)
 Including the middle parts of the fingers (striped area)
 All the way towards the palm of the hand (grey area)
 Don't know

Methods

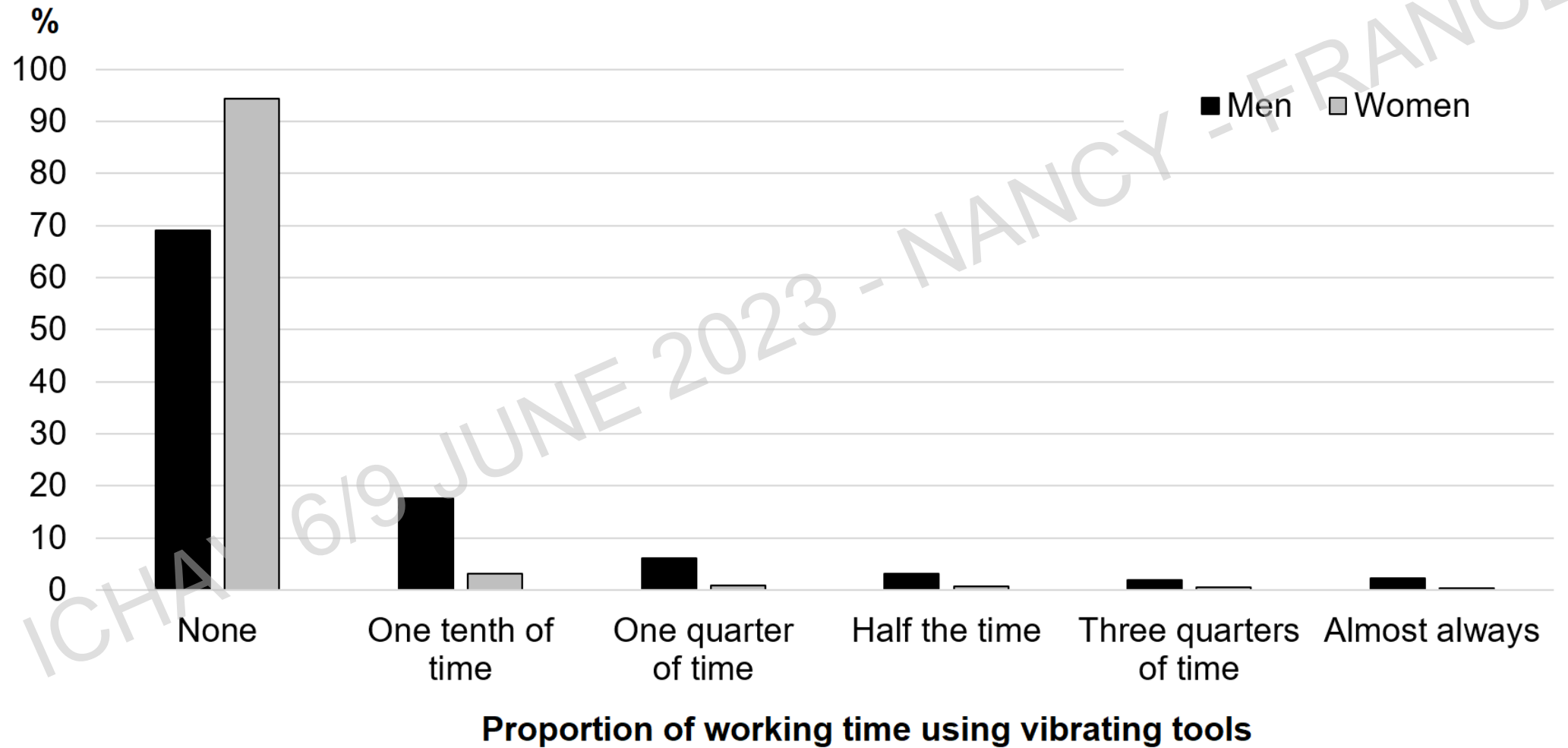


Results

- 5,017 subjects
- 46% men and 54% women
- Mean age 58 years (SD 13)
- RP was reported by 290 men and 390 women at follow-up
- Occupational exposure to HAV at follow-up was reported by 31% of men and 5.6% of women
- Sustaining a local cold injury affecting the hands during the study period was associated with incident RP (adjusted OR 3.92; 95% 2.60–5.90)









Results



Results









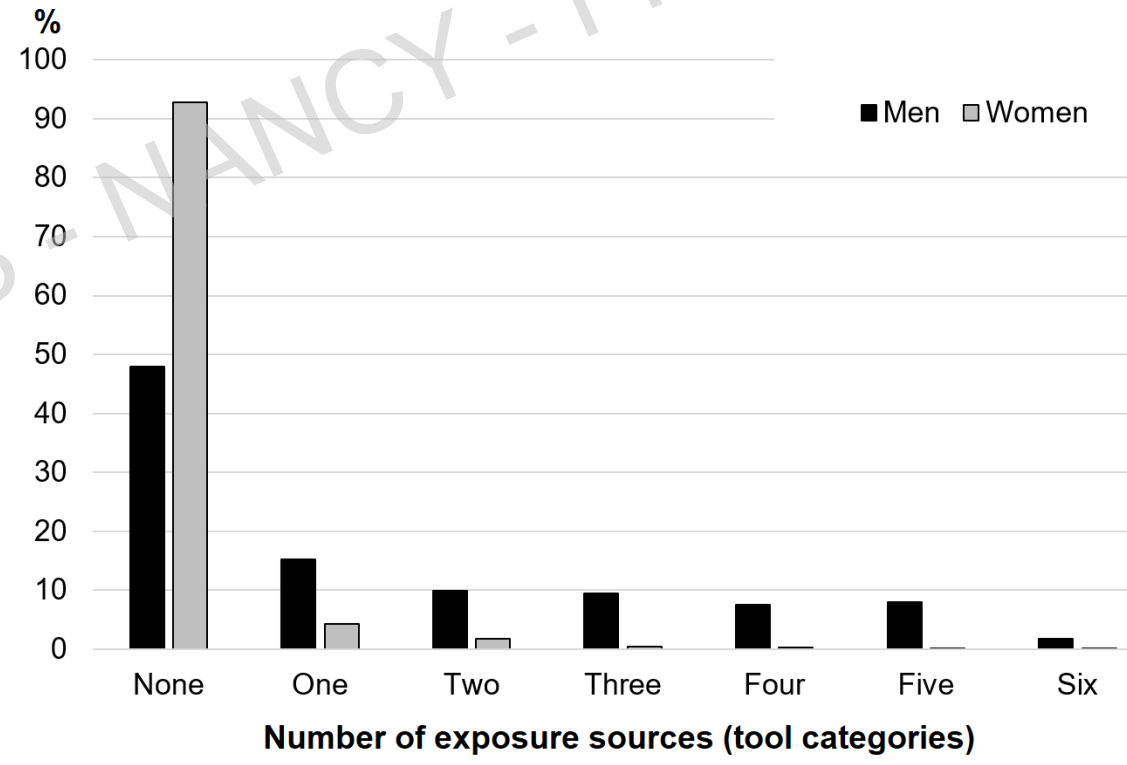
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Tool category	Men	Women
 Vibrating tools	32.4%	3.1%
 Forestry and gardening tools	31.2%	2.9%
 Heavily vibrating tools	27.6%	1.2%
 Vehicles with vibrating controls	27.3%	2.6%
 Impact tools	25.9%	1.8%
 Rapidly rotating tools	5.6%	1.3%

Results

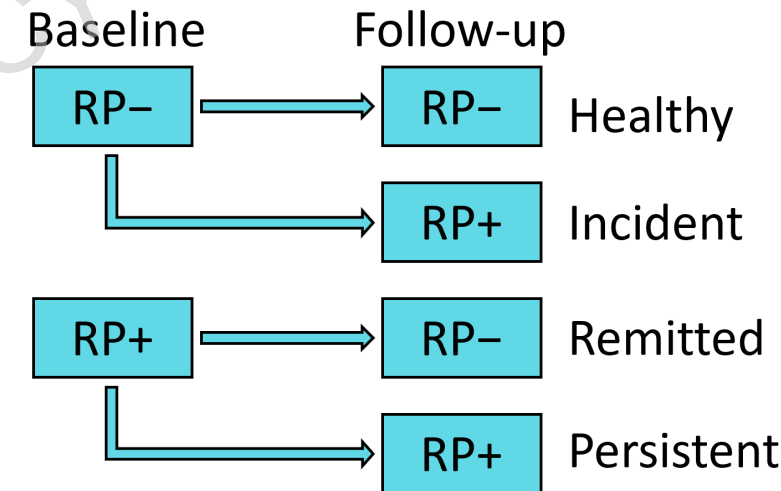


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Results

Measure	Men	Women	Gender difference
	%	%	p value
Baseline RP	11.5	14.7	<0.01
Incident RP (per year)	5.5 0.9	4.2 0.7	0.04
Remitted RP (per year)	33.2 5.5	26.3 4.4	0.05
Persistent RP	66.0	73.0	



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Results

Baseline variable	OR for incident Raynaud's phenomenon				OR for remitted Raynaud's phenomenon			
	Incident	Never	OR (95% CI) ^a	OR (95% CI) ^b	Remitted	Persistent	OR (95% CI) ^a	OR (95% CI) ^b
<i>Age (years)</i>								
18–31	24	420	1.00	–	8	17	1.00	–
32–44	51	699	1.28 (0.77–2.11)	–	26	84	0.66 (0.26–1.70)	–
45–57	68	1282	0.93 (0.58–1.50)	–	53	182	0.62 (0.25–1.51)	–
58–70	65	1650	0.69 (0.43–1.11)	–	105	181	1.23 (0.51–2.95)	–
Continuous	–	–	0.99 (0.98–0.99)	–	–	–	1.02 (1.01–1.04)	–
<i>BMI (kg/m²)</i>								
< 20	13	139	1.44 (0.79–2.64)	1.52 (0.83–2.81)	4	31	0.35 (0.12–1.03)	0.40 (0.14–1.19)
20–25	101	1558	1.00	1.00	99	271	1.00	1.00
25–30	66	1617	0.63 (0.46–0.87)	0.62 (0.45–0.86)	62	133	1.28 (0.87–1.87)	1.18 (0.80–1.74)
> 30	26	679	0.59 (0.38–0.92)	0.60 (0.38–0.93)	25	26	2.63 (1.45–4.77)	2.57 (1.41–4.70)
Continuous	–	–	0.94 (0.91–0.98)	0.94 (0.91–0.98)	–	–	1.10 (1.06–1.16)	1.10 (1.05–1.15)
<i>Daily smoker</i>								
Never or former	197	3790	1.00	1.00	178	445	1.00	1.00
Current	11	241	0.88 (0.47–1.63)	1.00 (0.54–1.89)	13	17	1.91 (0.91–4.02)	1.87 (0.88–3.94)
<i>Daily snuff user</i>								
Never or former	170	3516	1.00	1.00	165	386	1.00	1.00
Current	37	514	1.49 (1.03–2.15)	1.35 (0.93–1.96)	25	76	0.77 (0.47–1.25)	0.72 (0.43–1.19)
<i>Hypertension</i>								
No	176	3064	1.00	1.00	130	377	1.00	1.00
Yes	28	945	0.52 (0.34–0.77)	0.56 (0.37–0.85)	61	84	2.11 (1.43–3.10)	1.88 (1.25–2.83)
<i>Diabetes mellitus</i>								
No	199	3841	1.00	1.00	186	453	1.00	1.00
Yes	7	185	0.73 (0.34–1.57)	0.80 (0.37–1.73)	3	9	0.81 (0.22–3.03)	0.73 (0.19–2.76)
<i>Migraines</i>								
No	188	3675	1.00	1.00	165	400	1.00	1.00
Yes	16	324	0.97 (0.57–1.63)	1.00 (0.59–1.71)	20	56	0.87 (0.50–1.49)	0.95 (0.54–1.64)
<i>Psychological stress</i>								
Low	171	3208	1.00	1.00	143	360	1.00	1.00
High	37	816	0.85 (0.59–1.22)	0.85 (0.59–1.23)	48	101	1.20 (0.81–1.78)	1.29 (0.86–1.92)
<i>Cold injury hands</i>								
No	169	3781	1.00	1.00	127	322	1.00	1.00
Yes	36	257	3.13 (2.14–4.59)	2.90 (1.97–4.27)	64	139	1.17 (0.81–1.67)	1.29 (0.88–1.89)
<i>Work cold exposure</i>								
NRS 1	112	2348	1.00	1.00	98	254	1.00	1.00
NRS 2–10 ^c	87	1573	1.16 (0.87–1.55)	1.05 (0.78–1.42)	88	190	1.20 (0.85–1.69)	1.18 (0.82–1.69)
Continuous	–	–	1.04 (0.99–1.09)	1.02 (0.97–1.07)	–	–	1.05 (0.99–1.11)	1.05 (0.99–1.11)
Continuous working ^d	–	–	1.03 (0.97–1.08)	1.01 (0.96–1.07)	–	–	1.08 (1.01–1.15)	1.07 (1.01–1.14)
<i>Leisure cold exposure</i>								
NRS 1–5	89	2039	1.00	1.00	75	199	1.00	1.00
NRS 6–10 ^c	115	1962	1.34 (1.01–1.78)	1.28 (0.97–1.71)	114	257	1.18 (0.83–1.66)	1.20 (0.85–1.70)
Continuous	–	–	1.07 (1.01–1.13)	1.06 (1.01–1.12)	–	–	0.99 (0.93–1.06)	1.00 (0.93–1.07)

BMI body mass index, NRS numerical rating scale, OR odds ratio, 95% CI ninety-five percent confidence interval

^a Crude estimate

^b Adjusted for gender and age (continuous)

^c Dichotomized based on the 50th percentile

^d Only working subjects (N = 3843), excluding students, pensioners, unemployed, and those on sick or parental leave

Discussion

- The annual incidence of RP in our study was higher than previous US and French studies
 - Colder climate in Sweden
 - Different case definitions
- The incidence was higher among men than women in our study
 - Novel result
 - Could be related to more frequent hand-arm vibration exposure among men
- The annual remission proportion in our study was lower than the 9% in the US study but higher than the 3% in the French study
 - RP should not necessarily be considered a chronic condition



Conclusions

- Raynaud's phenomenon is a common but variable condition in the general population of northern Sweden, and symptoms may remit over time
- Contracting a local cold injury increases the probability of incident Raynaud's phenomenon
- Men were more commonly exposed to hand-arm vibration than women and had a higher incidence proportion of Raynaud's phenomenon



Acknowledgements

VECTOR research group: Vibration, Ergonomics, Climate and Translational Occupational Research



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