The underestimated stroke risk factors

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Classical risk factors

- Arterial hypertension
- Hyperlipidemia
- Diabetes mellitus
- Smoking
- Obesity

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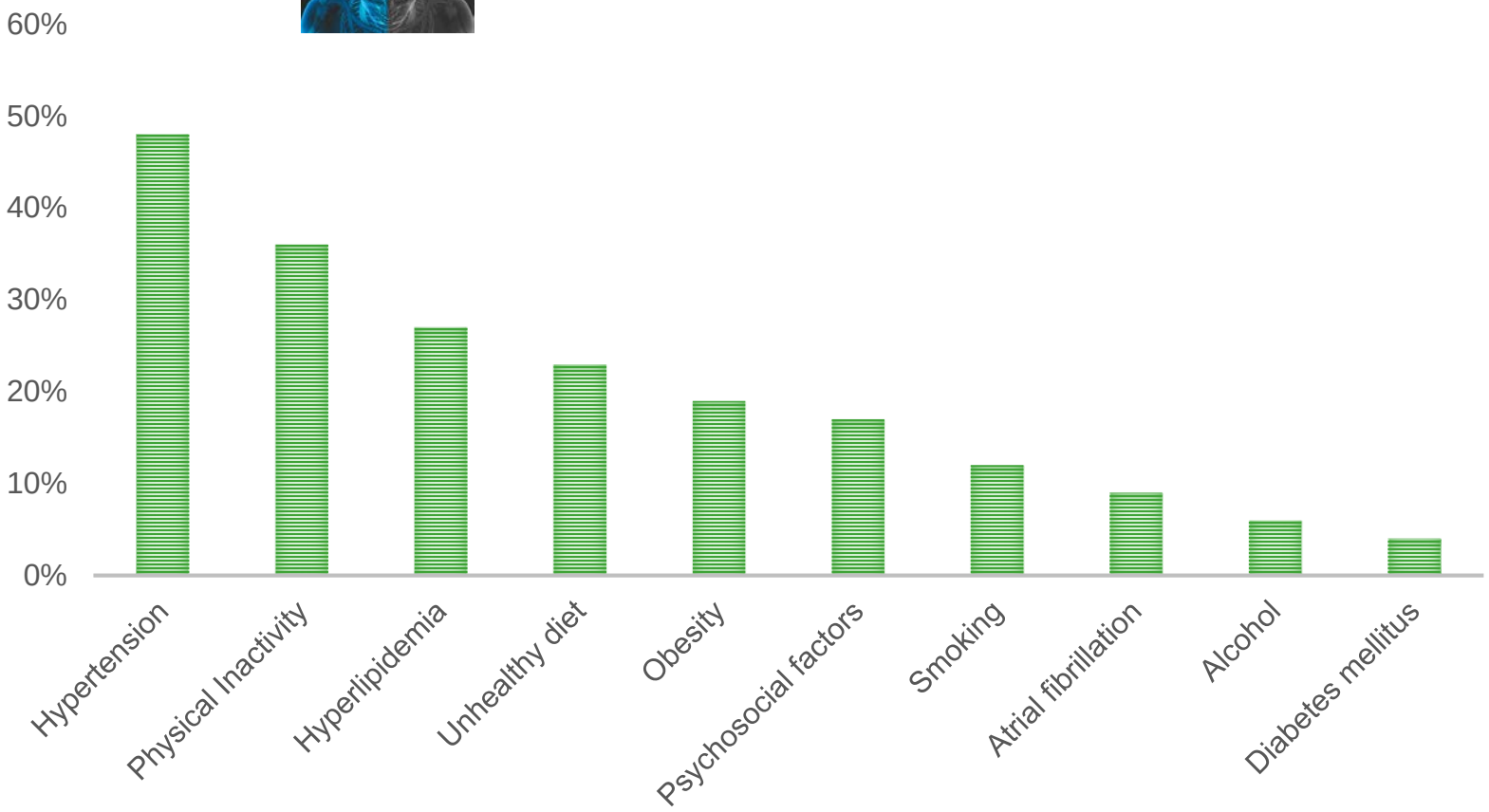
Non-modifiable risk factors

- Age
- Genetics
- Low birth weight
- Ethnics

Global and regional effects of potentially modifiable risk factors associated with acute stroke in 32 countries (INTERSTROKE): a case-control study

Lancet 2016; 388: 761–75



(Old) new risk factors

Migraine with Aura

Migraine and risk of stroke
Journal of Neurology, Neurosurgery & Psychiatry 2020;91:593-604.

OSAS

Does Treatment of Obstructive Sleep Apnea Decrease Risk of Ischemic Stroke?
Curr Treat Options Neurol (2019) 21:29

Depression

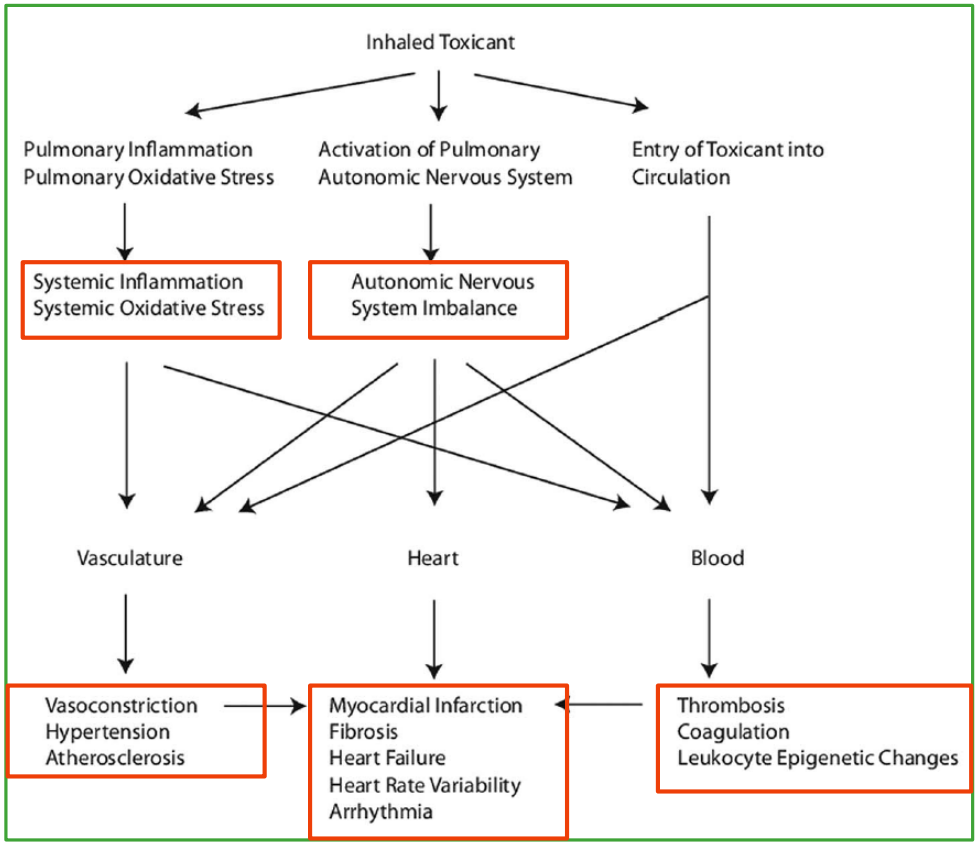
Depression and Risk of Stroke. Stroke. 2012;43:32–37

(New) new risk factors ?

- **Air pollution**
- **Sleep duration**
- **Psychological Stress**
- **Working hours**
- Drugs
- Passive smoking

Air pollution

Air pollution component	Cardiovascular effect
Ozone	Hypertension Stroke Out-of-hospital cardiac arrest
Particulate matter	Ischaemic heart disease Heart failure Cerebrovascular disease Thrombosis Hypertension Arrhythmias
Carbon monoxide	Heart failure Out of hospital cardiac arrest Increased myocardial infarction risk
Nitrogen oxides	Heart failure Transient ischaemic attack and stroke Increased myocardial infarction risk
Sulfur dioxide	Heart failure Increased myocardial infarction risk
Lead	Hypertension

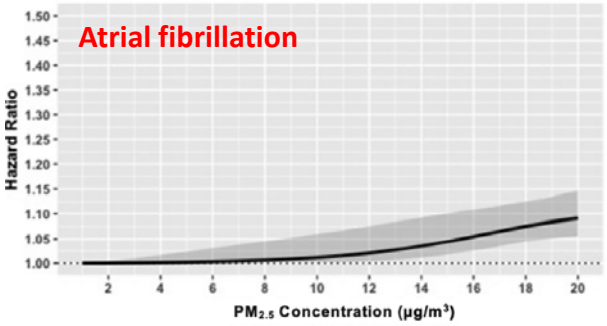


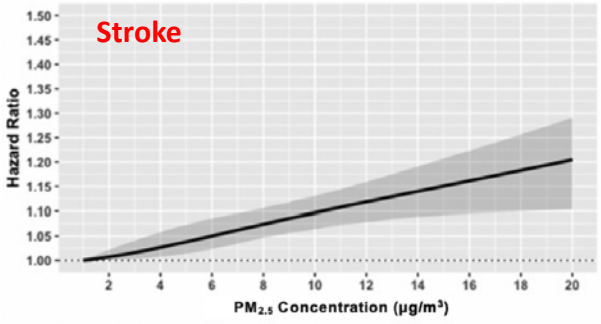
Air pollution

stroke burden attributable to air pollution high (34%)
in low and middle income-countries (10% in high income countries)

Lancet 2016; 388: 761–75

emerging global risk factor for stroke JAMA, March 23/30, 2011—Vol 305, No. 12





Ambient Air Pollution and the Risk of Atrial Fibrillation and Stroke.
https://doi.org/10.1289/EHP4883

Air pollution

Long-Term Exposure to Air Pollution and Incidence of Cardiovascular Events in Women

N Engl J Med 2007;356:447-58.

- 65'893 postmenopausal women without previous cardiovascular disease
- 36 U.S. metropolitan areas from 1994 to 1998
- median follow-up of 6 years

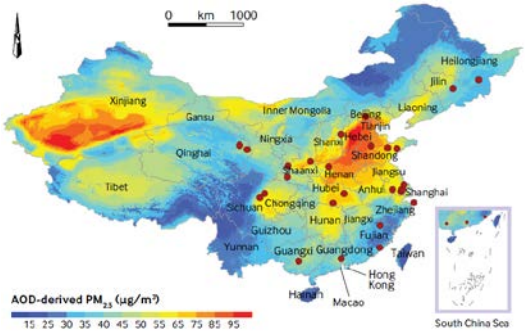
- the women's exposure to air pollutants were assessed
- 1816 women suffered from cardiovascular events

$PM_{2.5}$: each increase of 10 µg per m^3 associated with a 35% increase in stroke risk
HR 1.35 (95% CI 1.08 - 1.68)

Long term exposure to ambient fine particulate matter and incidence of stroke: prospective cohort study from the China-PAR project

BMJ 2019;367:l6720

- 117 575 Chinese men and women without stroke at baseline



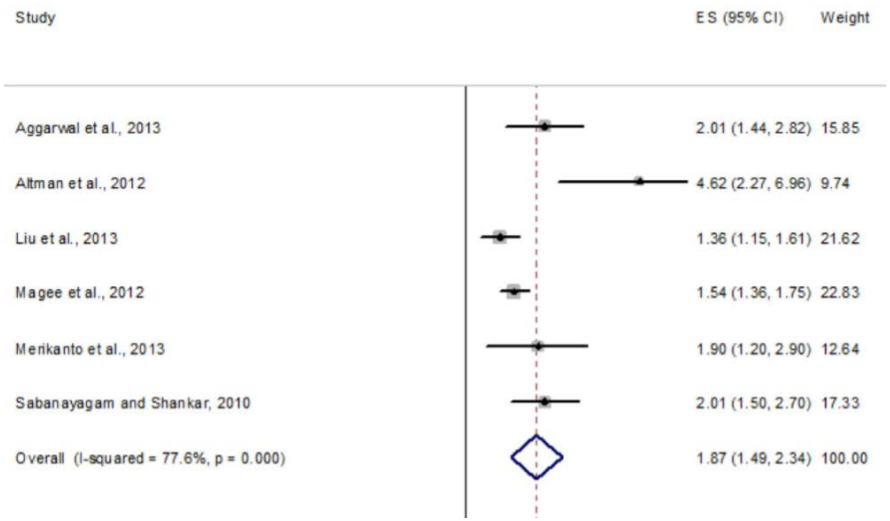
$PM_{2.5}$: participants in highest quarter (>80 ug/m3) had a 80% increase in stroke risk
HR 1.82 (95% CI 1.55 – 2.14)

Sleep duration

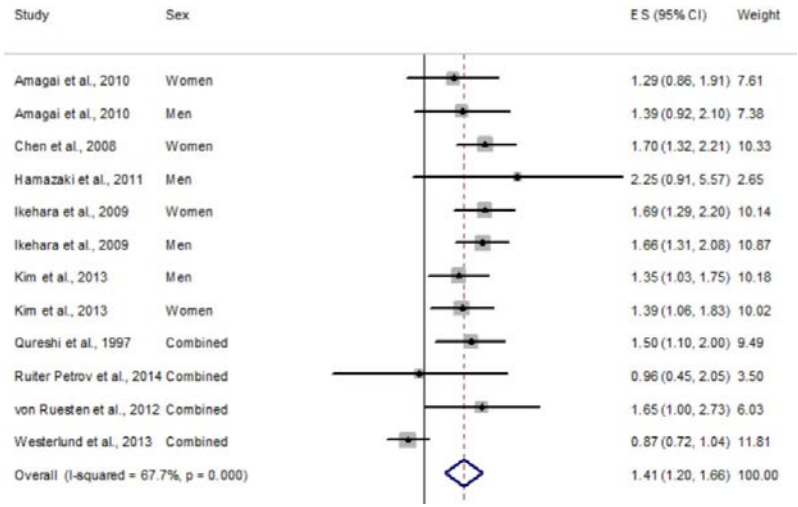
Review › Int J Stroke. 2015 Feb;10(2):177-84. doi: 10.1111/ijs.12398. Epub 2014 Nov 3.

Short and long sleep durations are both associated with increased risk of stroke: a meta-analysis of observational studies

Beihai Ge [1], Xiaomei Guo

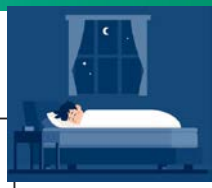


Short sleep duration (**<6h**)



Long sleep duration (**>8h**)

Sleep duration



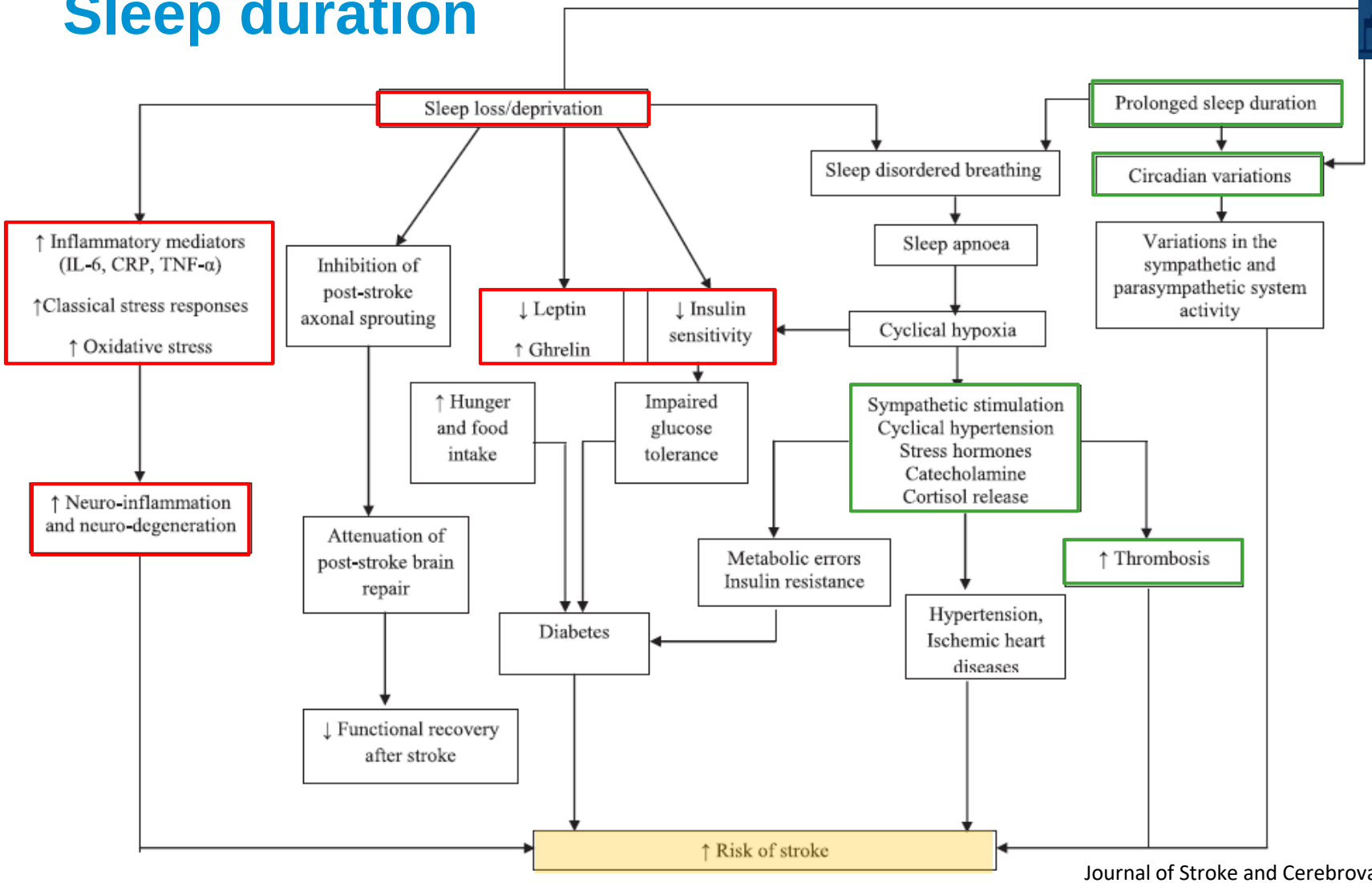


Figure 1. *Pathways associating sleep duration with the risk of stroke.*

Journal of Stroke and Cerebrovascular Diseases, Vol. 24, No. 5 (May), 2015: pp 905-911

Working hours

Review > Environ Int. 2020 Sep;142:105746. doi: 10.1016/j.envint.2020.105746. Epub 2020 Jun 3.

The effect of exposure to long working hours on stroke: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury

Alexis Descatha [1], Grace Sembajwe [2], Frank Pega [3], Yuka Ujita [4], Michael Baer [5], Fabio Boccuni [6], Cristina Di Tecco [7], Clement Duret [8], Bradley A Evanoff [9], Diana Gagliardi [10], Lode Godderis [11], Seong-Kyu Kang [12], Beon Joon Kim [13], Jian Li [14], Linda L Magnusson Hanson [15], Alessandro Marinaccio [16], Anna Ozguler [17], Daniela Pachito [18], John Pell [19], Fernando Pico [20], Matteo Ronchetti [21], Yves Roquelaure [22], Reiner Rugulies [23], Martijn Schouteden [24], Johannes Siegrist [25], Akizumi Tsutsumi [26], Sergio Iavicoli [27]

working >55 h/week is harmful for stroke incidence !

> J Am Heart Assoc. 2020 Jun 16;9(12):e015753. doi: 10.1161/JAHA.119.015753. Epub 2020 Jun 1.

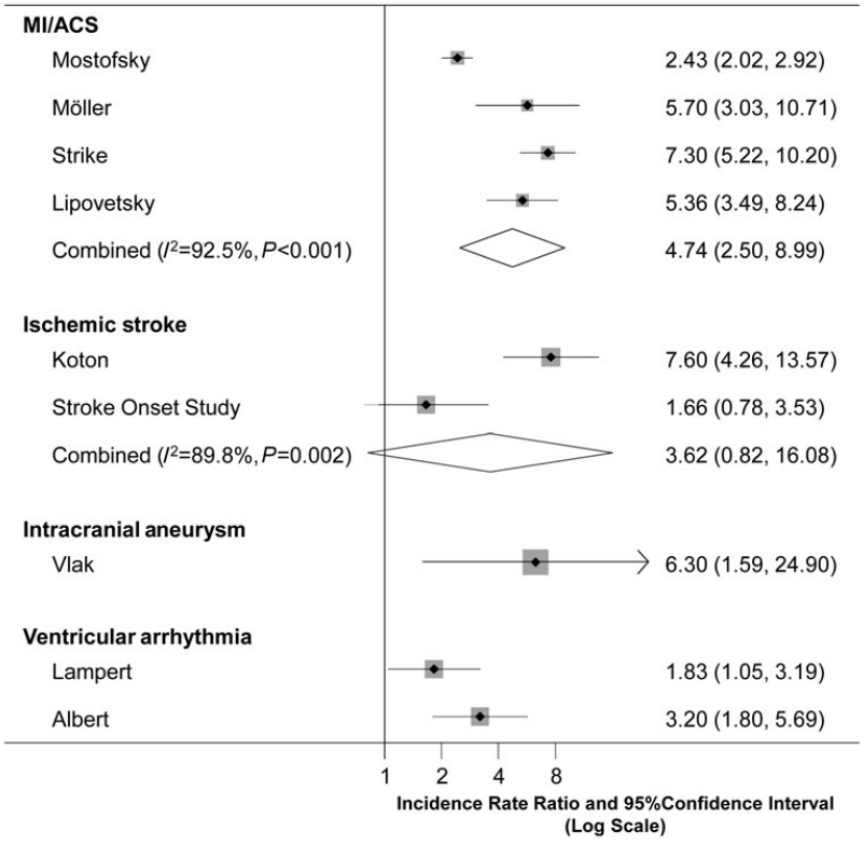
Cumulative Exposure to Long Working Hours and Occurrence of Ischemic Heart Disease: Evidence From the CONSTANCES Cohort at Inception

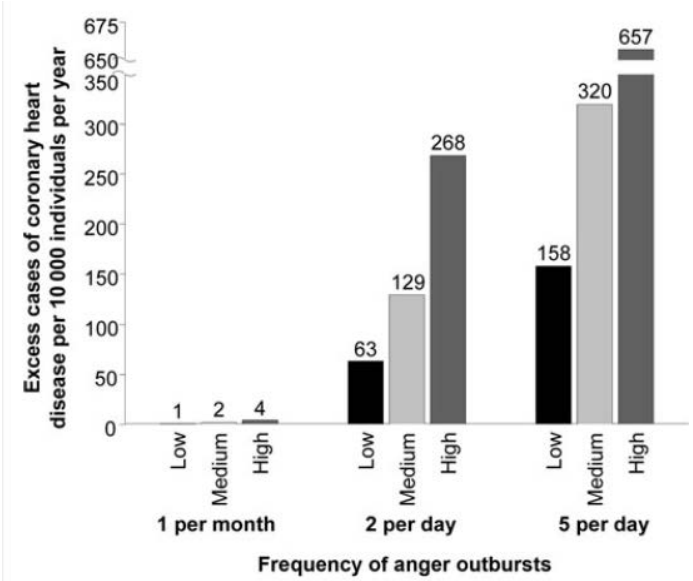
Marc Fadel [1 2], Jian Li [3], Grace Sembajwe [4], Diana Gagliardi [5], Fernando Pico [6 7], Anna Ozguler [1 2], Bradley A Evanoff [8], Michel Baer [2], Akizumi Tsutsumi [9], Sergio Iavicoli [5], Annette Leclerc [1], Yves Roquelaure [10], Johannes Siegrist [11], Alexis Descatha [1 10 2]

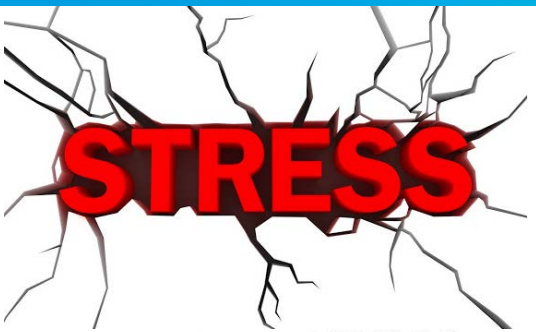
increased risk of IHD in men, but not in women!

Outbursts of anger as a trigger of acute cardiovascular events: a systematic review and meta-analysis†

European Heart Journal (2014) **35**, 1404–1410



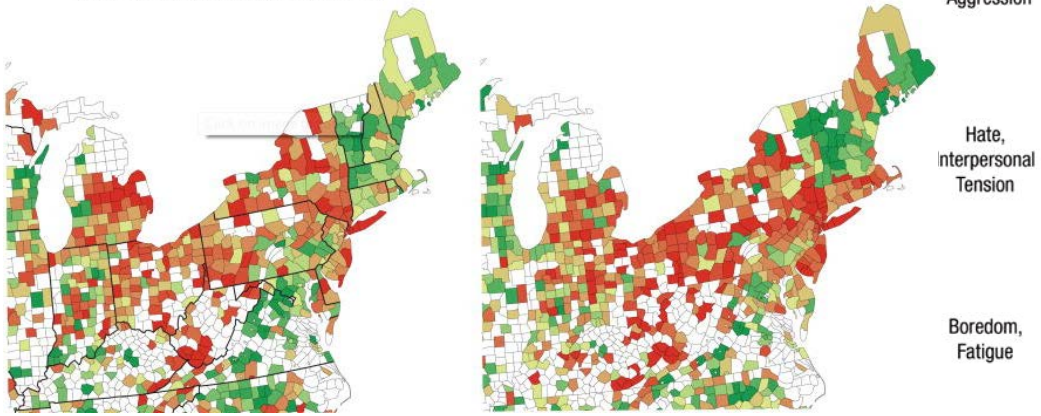




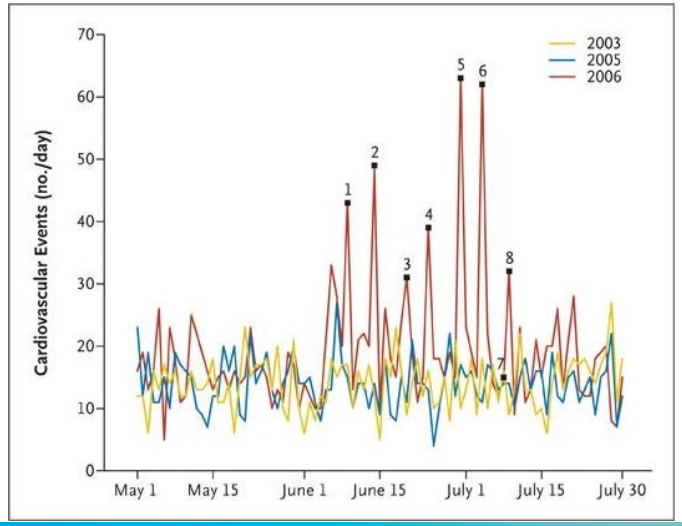
Psychol Sci. 2015;26(2):159-69

CDC-Reported AHD Mortality

Twitter-Predicted AHD Mortality



Twitter Topics Positively Correlated With County-Level AHD Mortality



N Engl J Med 2008; 358:475-483

Other triggers ?

Prevalence of Triggering Factors in Acute Stroke: Hospital-based Observational Cross-sectional Study

Journal of Stroke and Cerebrovascular Diseases, Vol. 24, No. 2, 2015: pp 337-347

Trigger factors present in 44.2% of acute stroke patients (n=290)

- psychological stress (17.6%)
- acute alcohol abuse (10.7%)
- clinical infections (8.3%)

Triggers of Ischemic Stroke
A Systematic Review

Stroke. 2010;41:2669-2677

Triggering risk factors for ischemic stroke
A case-crossover study

NEUROLOGY 2004;63:2006–2010

Trigger factors present in 38% of acute stroke patients (n=200)

- **negative emotions** (OR 14.0, 95% 4-90)
- **anger** (OR 14.0, 95% CI 3-253)
- **sudden changes in body posture** (OR 24.0, 95% CI 5-428)

NEUROLOGY 2004;63:2006–2010

Triggering factor	The day of the stroke only	The day before only	Both periods	No exposure	OR (95% CI)
At least one of seven potential triggers*	76	9	13	102	8.4 (4.5–18.1)
At least one of three potential triggers†	57	4	2	137	14.3 (5.3–54.2)
Negative emotions	29	2	2	167	14 (4.4–89.7)
Anger	14	1	1	184	14 (2.8–253.6)
Sudden posture change in response to a startling event	24	1	1	174	24 (5.1–428.9)
Sudden temperature change	5	1	0	194	5 (0.8–95.8)
Positive emotions	8	2	2	188	4 (1.0–26.5)
Heavy eating	8	2	1	189	4 (1.0–26.5)
Heavy physical exertion	15	7	0	178	2.1 (0.9–5.6)

At least one of seven potential triggers*	The day of the stroke only	The day before only	Both periods	No exposure	OR (95% CI)
1st hour	71	10	7	112	7.1 (3.8–14.7)
2nd hour	31	4	5	160	7.8 (3.1–26.1)
3rd hour	22	3	2	173	7.3 (2.5–30.9)
4th hour	17	3	2	178	5.7 (1.9–24.3)
5th hour	11	2	0	187	5.5 (1.5–35.5)

Summary

- avoid air pollution √
- sleep 6-8h √
- work < 55h/w √
- avoid stress √
  take it easy √
- be happy (≠ depressive)