# Flight, clots and death

*Franco Salomon*

Medizinische Klinik B, Departement für Innere Medizin, University Hospital Zurich, Switzerland

Enrico Fermi's piano tuner problem is the classic example of making estimates. The Italian physicist used to ask students to estimate the number of piano tuners in Chicago given only the population of the city. By making a few common sense assumptions (average family size, percentage of families with a piano etc.) he would come up with an estimate within a factor 2 to 3 of the correct result [1].

Applying Fermi's approach to the recent discussion of air-travel-triggered death by pulmonary embolism could give some indication as to the magnitude of the problem.

In 1996 the total number of air-passengers was 1.3 billion [2]. Last year the total number of deaths due to accidents of multi-engined airliners was 1131. The average death toll over the last 30 years is 1464 casualties per year [3].

Based on clinical data, the overall yearly incidence of pulmonary embolism in the United States is estimated to be 139 per 100 000 [4]. Based on autopsy data, the yearly incidence of fatal pulmonary embolism lies at 94 per 100 000 [4]. A study in France found a yearly incidence of diagnosed pulmonary embolism of 60 per 100 000 [5]. An extrapolation from the USA data gives an estimate of 40 per 100 000 cases of fatal pulmonary embolism in France. In an epidemiological case-control study of deep vein thrombosis 12.6% had undergone a long-distance journey during the 3 weeks before diagnosis [6]. Assuming that 10% of cases of fatal pulmonary embolism occur following long-distance journeys, of which a quarter are by air [7], and that only 1 in 10 air-passengers is a long distance traveller, the estimated total number of cases of fatal pulmonary embolism is as follows: Using the USA data, air-travel would lead to 3000 cases of fatal pulmonary embolism, whereas with the French data, the yearly number would be 1300.

It could well be that more air-travellers worldwide die from pulmonary embolism than through air-traffic disasters. In the event of these estimates being confirmed by prospective studies, air-travel-induced pulmonary embolism would represent an example of biased risk perception, caused by an "out of sight, out of mind" mechanism as described by Fischhoff et al in their classical experiment on fault trees [8].

*Correspondence:*
*Franco Salomon MD*
*Medizinische Klinik B*
*Departement für Innere Medizin*
*Universitätsspital Zürich*
*CH-8091 Zürich*
*E-mail: franco.salomon@dim.usz.ch*

## References

1 http://www.lerc.nasa.gov/WWW/K-12/Numbers/Math/Mathematical_Thinking/fermis_piano_tuner.htm
2 Fasten your safety belts. The Economist, January 11, 1997 (http://www.britannica.com/bcom/magazine/article/0,5744,6430,00.html)
3 http://aviation-safety.net/statistics/2000stats.html
4 Bick RL, Kaplan H. Syndromes of thrombosis and hypercoagulability: Congenital and acquired causes of thrombosis. Med Clin North Am 1998; 3:409–58.
5 Oger E. Incidence of venous thromboembolism: a community-based study in Western France. EPI-GETBP study group. Groupe d'Etude de la Thrombose de Bretagne Occidentale. Thromb Haemost 2000;83:657–60.
6 Meyer-Michel S for the Sirius Study Group. An epidemiologic study of risk factors for deep vein thrombosis in medical outpatients. Arch Intern Med 2000;160:3415–20.
7 Ferrari E, Chevallier T, Chapelier A, Baudouy M. Travel as a risk factor for venous thromboembolic disease. A case-control study. Chest 1999;115: 440–4.
8 Fischhoff B, Slovic P, Lichtenstein S. Fault trees: Sensitivity of estimated failure probabilities to problem representation. J Exp Psychol (Human Perception and Performance) 1978;4:330–4 (Cited in: Kahneman D, Slovic P, Tversky A, eds. Judgment under uncertainty. Heuristics and biases. Cambridge: Cambridge University Press; 1982.)

Swiss
Medical Weekly

Official journal of
the Swiss Society of Infectious disease
the Swiss Society of Internal Medicine
the Swiss Respiratory Society

## The many reasons why you should choose SMW to publish your research

*What Swiss Medical Weekly has to offer:*

- SMW's impact factor has been steadily rising, to the current 1.537
- Open access to the publication via the Internet, therefore wide audience and impact
- Rapid listing in Medline
- LinkOut-button from PubMed with link to the full text website http://www.smw.ch (direct link from each SMW record in PubMed)

- No-nonsense submission – you submit a single copy of your manuscript by e-mail attachment
- Peer review based on a broad spectrum of international academic referees
- Assistance of our professional statistician for every article with statistical analyses

- Fast peer review, by e-mail exchange with the referees
- Prompt decisions based on weekly conferences of the Editorial Board
- Prompt notification on the status of your manuscript by e-mail
- Professional English copy editing
- No page charges and attractive colour offprints at no extra cost

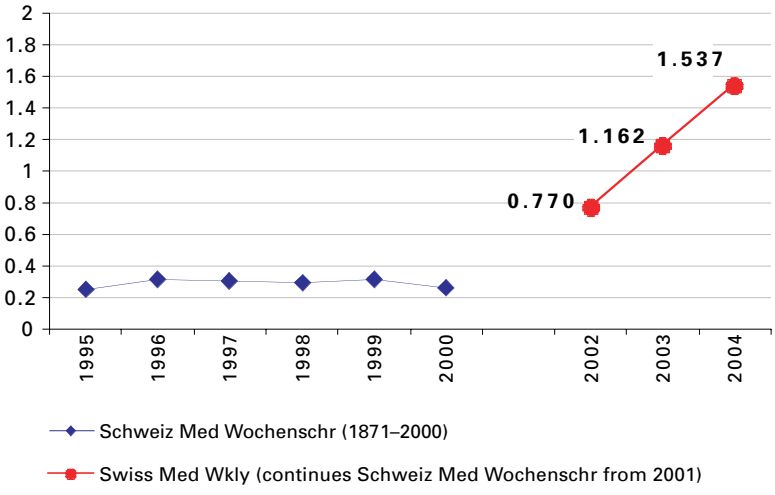


We evaluate manuscripts of broad clinical interest from all specialities, including experimental medicine and clinical investigation.

We look forward to receiving your paper!

Guidelines for authors:
http://www.smw.ch/set_authors.html

**Impact factor Swiss Medical Weekly**




EMH FMH Schwabe
Editores Medicorum Helveticorum

*All manuscripts should be sent in electronic form, to:*

EMH Swiss Medical Publishers Ltd.
SMW Editorial Secretariat
Farnsburgerstrasse 8
CH-4132 Muttenz

Manuscripts: submission@smw.ch
Letters to the editor: letters@smw.ch
Editorial Board: red@smw.ch
Internet: http://www.smw.ch