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Flu Symposium: Centenary of the 1918 Pandemic

Spanish Flu in Sydney, 1919

Dr Kevin McCracken

Macquarie University



Dr Kevin McCracken, Honorary Fellow, Macquarie University



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Dean, Division of Environmental and Life Sciences: 2008

Associate Professor of Human Geography

Research Areas

Global health, health geography, population ageing, historical demography

Selected Publications

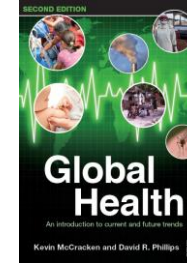
McCracken, K. and Phillips, D.R. (2017). *Global Health: An Introduction to Current and Future Trends* (2nd edition), Routledge, London and New York.

McCracken, K. and Phillips, D.R. (2017). "Demographic and Epidemiological Transition", in D.R. Richardson (Editor-in-Chief), *The International Encyclopedia of Geography: People, the Earth, Environment and Technology*, Wiley-Blackwell: New York.

Caley, P., Philp, D. and **McCracken, K.** (2008). "Quantifying social distancing arising from pandemic influenza", *Journal of the Royal Society Interface*, 5(23), pp.631-639.

Curson, P. and **McCracken, K.** (2006). "An Australian perspective of the 1918-1919 influenza pandemic", *NSW Public Health Bulletin*, 17(7-8), pp.103-107.

McCracken, K. and Curson, P. (2003). "Flu downunder: a demographic and geographic analysis of the 1919 pandemic in Sydney, Australia", pp.110-131 and 272-275 in H. Phillips and D. Killingray (eds.), *The Spanish Flu Pandemic of 1918: New Perspectives*, Routledge Studies in the Social History of Medicine, Routledge: London.





Outline

- Introduction
- Sydney, 1919
- Origins
- Control measures
- Temporal path
- Mortality patterns
 - age and sex
 - socio-economic
 - geographical
- Summary
 - uncertainties (origins? - waves? – govt. regulations? - differentials?)



Table 1

	1918	1919	1920
Estimated mean population	785,000	810,700	884,790
Total deaths	7,862	11,907	9,429
Influenza deaths	134	3,484	118
Crude death rate (per 1,000 population)	10.02	14.69	10.66
Crude influenza death rate (per 1,000 population)	0.17	4.30	0.13

Sources: NSW Statistical Register, 1918–19, 1919–20 and 1920–21.

Global tolls – most radical resculpturing of human populations since 14th century Black Death

1918 influenza pandemic– est. 50-100 million people died (cf. WW1 est. 17 million) – included Donald Trump’s grandfather; Lawrence of Arabia’s father; Arthur Conan Doyle’s son

Simulation of similar highly contagious & lethal modern-day influenza outbreak

(Institute for Disease Modelling/Bill Gates, *NEJM*, May 31, 2018

- After 3 months: 10.1 million deaths
- After 6 months: 32.9 million deaths

Population size and mortality,
Sydney, 1918-20

Source: McCracken, K. and Curson, P. (2003)

Greatest health and social disaster in Sydney’s history

Morbidity

- Estimated 300,000 Sydney residents went down with the flu
- 36-37% attack rate

Mortality

- Sydney’s flu death rate highest of Australia’s metropolitan areas
- many marriages ruptured – children orphaned

Sydney 2018 (5.1 million population) equivalent

- Flu cases: ≈1.8-1.9 million
- Flu Deaths: ≈ 22,000

Sydney, 1919

Area – approximately 480 sq km

Metropolitan boundaries

- North: Manly and Ku-ring-gai
- South: Botany Bay and Georges River
- West: Homebush, Strathfield, Enfield

Population – est. 810,700 persons (about twice size of today's Canberra)

- around one third of population lived within 5 km of CBD
- well over half employment in city centre
- suburban residential development being stimulated by electric tramway and rail system

Health – in midst of demographic and epidemiological transition

Social topography – working class, industrial suburbs south of city centre

- north and east: more advantaged ocean and harbourside suburbs



Figure 1

Epidemic initially seeded in Sydney by arrivals from Melbourne (soldiers then civilians) in late January 1919 – early clusters of cases (Randwick Military Hospital, Paddington, Darlinghurst, central Sydney)

Quickly developed into a general community outbreak, spreading from initial inner city concentration – Canterbury badly hit (21 hospitalised cases Feb 7-27) – also by 20 Feb had reached Willoughby, Ryde, Hunter's Hill, Burwood Auburn, Bankstown, Lidcombe Hornsby)

The arrival of 'Spanish' flu in Sydney, January 1919

(*Sydney Morning Herald*, 28 January, 1919)

Source: McCracken, K. and Curson, P. (2003)

Figure 8.1 The arrival of 'Spanish' flu in Sydney, January 1919.

Source: *The Sydney Morning Herald*, 28 January 1919. Reproduced here with permission of *The Sydney Morning Herald*.

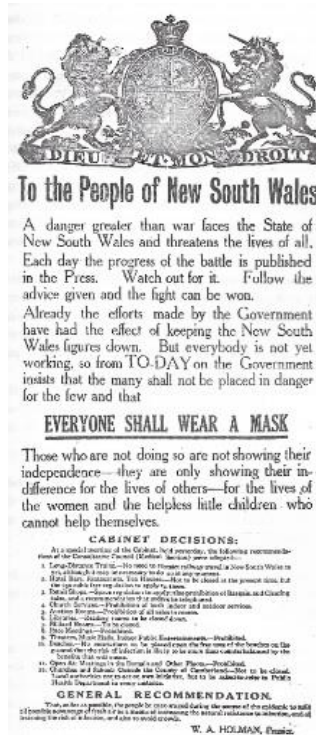


Figure 2

CABINET DECISIONS

Masking

To be closed down

Schools, theatres, music halls, libraries, billiard rooms, race meetings, church services, etc.

Space restrictions

Hotel bars, restaurants, tea houses – 250 cubic feet/person
Retail shops – space regulation to apply

GENERAL RECOMMENDATION

Take all possible advantage of fresh air
Avoid crowds

Proclamation of N.S.W. Government regulations
to control the epidemic
(*Sydney Morning Herald*, 3 February 1919)

Source: McCracken, K. and Curson, P. (2003)

Figure 8.7 Proclamation of N.S.W. Government regulations to control the epidemic.

Source: *The Sydney Morning Herald*, 3 February 1919. Reproduced here with permission of *The Sydney Morning Herald*.

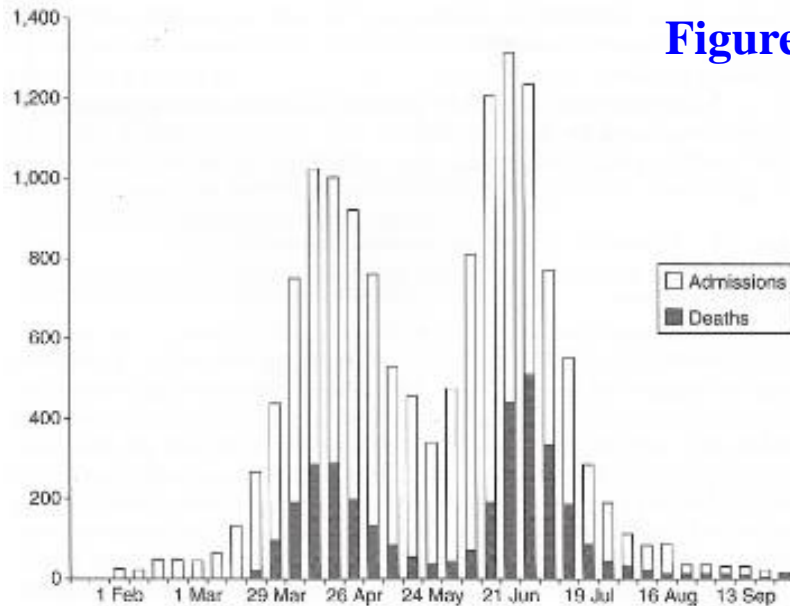
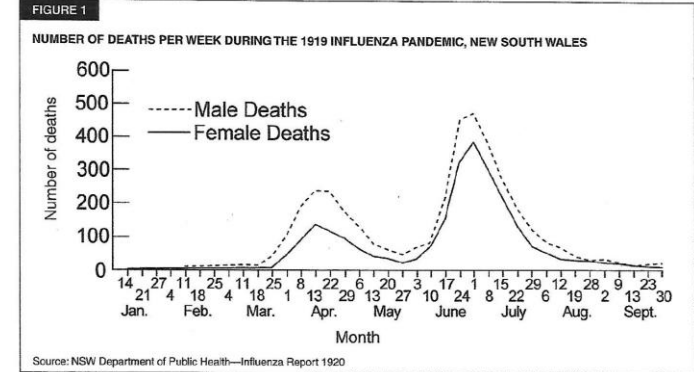


Figure 3



Number of deaths per week during
the 1919 influenza epidemic, New
South Wales

Source: Curson, P. and McCracken, K. (2006)

Weekly hospital admissions and deaths from influenza,
Sydney, 1919 (a)

Source: McCracken, K. and Curson, P. (2003)



Figure 4

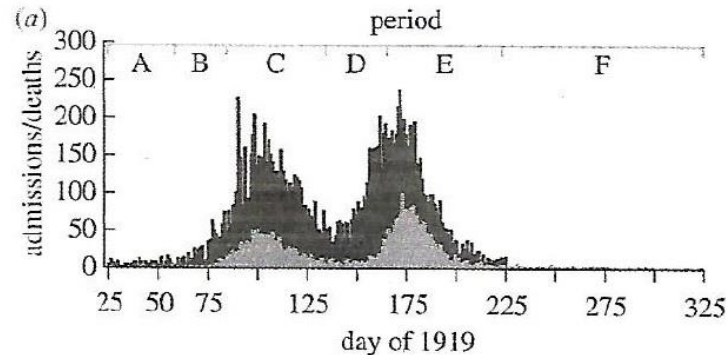


Figure 2. (a) Epidemic curve for Sydney 1919 showing daily hospitalizations $h(t)$ (black bars) and deaths $d(t)$ (grey bars). Data on hospitalizations were not readily available after day 224. Periods A–F are labelled and characterized as follows: A, first cases, infection control measures; B, threat considered passed, lifting of control measures; C, reimposition of control measures, first wave; D, epidemic considered passed, lifting of control measures; E, second wave; F, epidemic passed.

Waxing and waning of epidemic

- Changing nature/virulence of virus?
- Introduction/lifting of restrictions?
- Build up of immunity?
- Weather?

Daily hospital admissions and deaths from influenza, Sydney, 1919 (b)

Source: Caley, P., Philp, D. and McCracken, K. (2008)



Table 2

Table 1. Summary of epidemic incidence, policy and individual's perceived risk factors influencing the degree of social distancing ($\sigma(t)$) during different periods of the influenza epidemic in Sydney 1919. (Day 1 is 1 January 1919. The question mark assigned to $\sigma(t)$ during period D reflects our uncertainty surrounding whether people fully resumed normal contact behaviour at some time during this period.)

period	day, 1919	incidence	drivers of perceptions	perceived risk
A Govt regulations	32–59	very low	high publicity and policy	high waning
B	60–84	low	threat evidently passed	low
C Late Mar – mid May	85–134	high 1 st Wave	high incidence and policy	high
D	135–165	moderate	decreased incidence	moderate
E Mid June – early Aug	166–223	high 2 nd Wave	high incidence	high
F	224 onwards	low	threat passed	low

Summary of epidemic incidence, policy and individual's perceived risk factors influencing the degree of social distancing during different periods of the influenza epidemic in Sydney, 1919

Source: Caley, P., Philp, D. and McCracken, K. (2008)

Figure 5

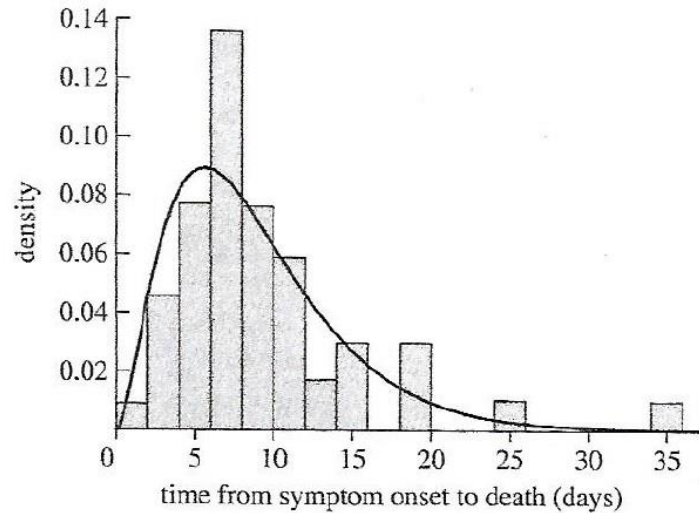


Figure 3. Distribution of time from symptom onset to death for the cases of pandemic influenza in Sydney 1919 (after Armstrong 1920). Fitted curve is a gamma ($k=2.74$, $\theta=3.23$) distribution.

Deaths often occurred rapidly

- newspapers fanned alarm – reports of people waking fine in morning and being dead by nightfall
- like media-induced panic in present day epidemics

Time from symptom onset to death for the cases of pandemic influenza in Sydney, 1919

Source: Caley, P., Philp, D. and McCracken, K. (2008)

Figure 6

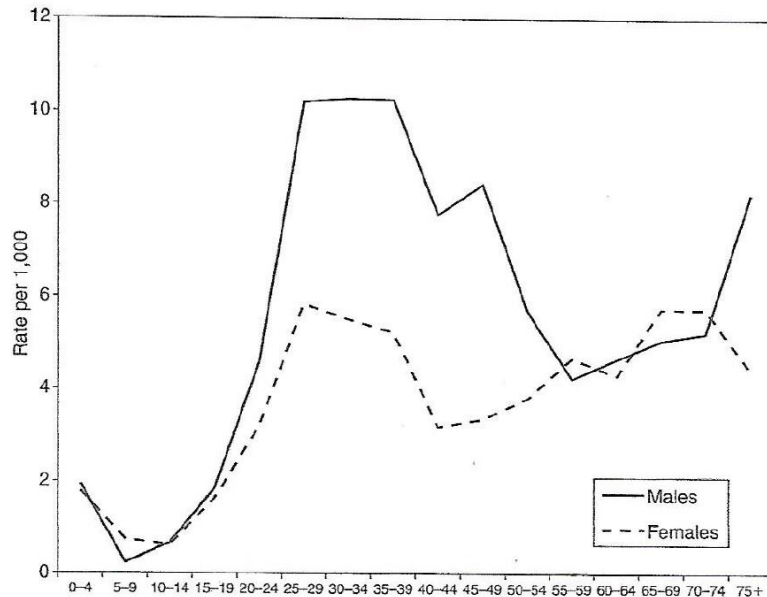


Figure 8.4 Age-specific death rates from influenza, Sydney, 1919.

Uneven sweep across the city – age, sex, social, geographical differentials

Young adults (“*prime of life*” – 25-39yrs) - usual flu victims are the elderly and young

Higher *male* mortality (especially 1st wave) – why?

- some greater male biological susceptibility to the particular viral strain? – 100 years on can only remain conjecture
- differential socio-behavioural risk factors of males/females probably more a factor than biology – i.e. mobility and mixing by males? (employment?, hotels?, races?, football?)

No age-sex tabulations of attacks available – so whether deaths reflected attack rates unknown

Age-sex-specific death rates from influenza, Sydney, 1919

Source: McCracken, K. and Curson, P. (2003)



Table 3

Table 8.2 Death rates from influenza per 1,000 males aged 15+, by occupational group, New South Wales, 1919

Occupational group	Rate per 1,000
Professional	4.3
Commercial	4.8
Domestic	6.0
Industrial	6.2
– Labourer	12.0+
Transport and communication	6.5
– Railways and tramways	5.9
– Roads	6.4
– Seas, rivers, harbours	7.8
– Postal and telegraph services	5.5
Primary producers	2.4
All occupations	4.8

Sources: Deaths by occupations data: *NSW Statistical Register 1919-20*.

Occupations of males data: *Census of the Commonwealth of Australia, 1921. Part X. New South Wales – Population of Local Government Areas*.

Note

The rates are based on the assumption that the *Statistical Register* and *Census* allocations of individuals to occupational groups were identical. The open-ended value for labourers is due to the census tabulations burying labourers within the 'undefined industrial' class.

Occupational differentials – 2 sets of possible mechanisms?

– direct on-the-job risk factors?

and/or

– life style and socio-economic factors?

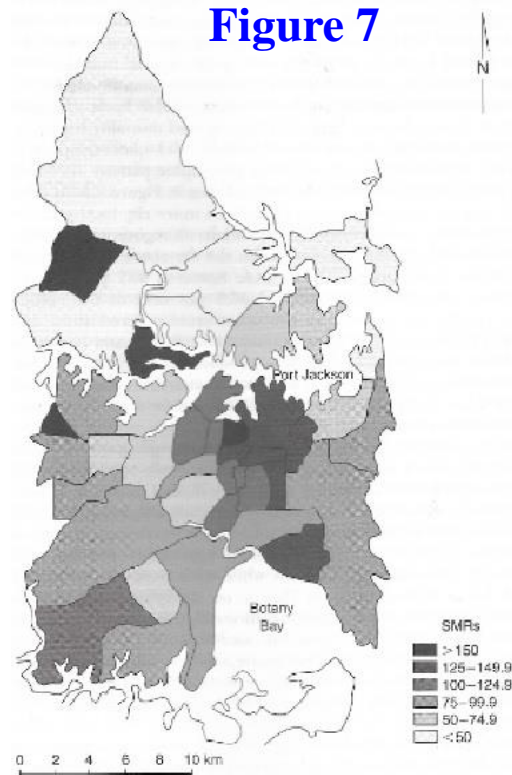
Jobs involving close contact with public (e.g. tramways, postal, road carters/carriers)

LS and SES

Workers on low incomes, living in sub-standard houses, poor nutrition

Death rates from influenza per 1,000 males aged 15+, by occupational group, New South Wales, 1919

Source: McCracken, K. and Curson, P. (2003)



Index case – soldier from Melbourne 21/1 – admitted RMH 23/1

- pneumonic influenza suspected in Melbourne but not officially declared
- flu spread quickly to others within RMH isolation ward

Other military cases arrived in city – inner city stays – infection clusters emerged

City residents with no Melbourne contact soon started falling ill from flu – initial inner city focus, but soon spread out to more distant areas – *cases* data poor

Final pattern – spatial core of epidemic (deaths) 13 inner city LGAs plus 5 other above average mortality areas (Eastwood, Homebush, Hunter's Hill, Botany, Hurstville)

Lowest mortality LGAs were Ryde, Lane Cove, Ku-ring-gai, Willoughby, Manly, plus Vacluse

Some puzzles

Age-sex standardised influenza mortality ratios, Sydney, 1919

Source: McCracken, K. and Curson, P. (2003)



Table 4

Table 8.3 Correlations (r) between 1919 standardised influenza mortality ratios and selected 1921 Census demographic and socio-economic indicators, Metropolitan Sydney

Constructs/Variables	r
<i>Population density/crowding</i>	
Persons per square kilometre	0.25
Occupied dwellings per square kilometre	0.23
Average number of persons per occupied private dwelling	0.47
Average number of persons per room (occupied private dwellings)	0.53
<i>Population mixing</i>	
Male population – per cent breadwinners	0.02
Female population – per cent breadwinners	0.01
Total population – per cent breadwinners	0.20
<i>Socio-economic status</i>	
Male breadwinners – per cent in professional occupations	-0.60
Male breadwinners – per cent in manufacturing occupations	0.39
Male breadwinners – per cent employers	-0.60
Male breadwinners – per cent unemployed	0.51
Occupied private dwellings – average weekly rent	-0.57
Occupied private dwellings – per cent owner occupied	-0.46

Explaining the geography ...

Can only study deaths – *case* numbers x *area* initially reported by metropolitan newspapers – but dropped after a few weeks

Patterning of mortality (Fig. 7) suggests some “urban regularity” is at work – i.e.

- population density/crowding?
- population mixing?
- SES?

Simple and multiple correlation and regression analysis – interpretation

- r values over/under 0.30 rate as statistically significant
- SES and density/crowding significant
- No mixing association found? – concept poorly measured?

Multiple regression/correlation models lift *statistical* explanation, but not *real world* explanation

Simple correlations between 1919 standardised influenza mortality ratios and selected 1921 Census demographic and socioeconomic indicators, Metropolitan Sydney LGAs

Source: McCracken, K. and Curson, P. (2003)