- **Last Week:**
  - Demographic Transition Theories
  - Post DTT
    - More Complex Theories of Demographic Change and Response
  - Consequences of demographic change
    - Economic development
    - Political change
    - Social evolution
    - Individual life chances
      - Cohort hypotheses

Also started last week:

- Mortality
  - Some basic definitions
  - Some basic measures
  - Causes of Death
    - Ultimately only 3 ways to die
      - 1. Communicable and parasitic infections

This week:

- Continue Causes of Death
  - General causes 2 and 3
  - Direct, Proximate and Fundamental Causes
  - Intro to the survival curve
  - Changes to causes over time
    - The epidemiological transition (Omran 1971)
    - Post transition:
      - 4^{th} stage (Olshansky and Ault 1986)?
      - Rectangularization of the survival curve (Fries 1980)?
- More mortality differentials
  - Sex, marital status, ethnicity, SES etc.

Causes of Death

2. Degenerative Diseases

Causes of Death

2. Degenerative Diseases

Causes of Death

2. Degenerative Diseases

- In Canada
  - Leading 4 causes of death are degenerative

1. Malignant neoplasms (Cancer)	27.2%
2. Diseases of the Heart	27.1%
3. Cerebrovascular diseases (Strokes)	7.4%
4. Chronic lung disease (Emphysema, bronchitis, asthma)	4.3%
5. Accidents	4.2%
6. Pneumonia and influenza	3.5%

Causes of Death

3. Injuries/Poisoning
   - accidents
   - suicide
   - homicide

Causes of Death

3. Injuries/Poisoning

Causes of Death

3. Injuries/Poisoning

- Suicide

Causes of Death

3. Injuries/Poisoning

- Homicide

Causes of Death

- How do we know what you died of?

- 002.0 Typhoid fever
- 002.1 Paratyphoid fever A
- 002.2 Paratyphoid fever B
- 002.3 Paratyphoid fever C
- 002.9 Paratyphoid fever, unspecified
- 003 Other Salmonella infections
- 003.0 Salmonella gastro-enteritis
- 003.1 Salmonella septicaemia
- 003.2 Localised Salmonella infections

- 001 Cholera 001.0 Due to Vibrio cholerae 001.1 Due to Vibrio cholerae el tor 001.9 Cholera, unspecified 002 Typhoid and paratyphoid fevers 002.0 Typhoid fever 002.1 Paratyphoid fever A 002.2 Paratyphoid fever B 002.3 Paratyphoid fever C 002.9 Paratyphoid fever, unspecified 003 Other Salmonella infections 003.0 Salmonella gastro-enteritis 003.1 Salmonella septicaemia 003.2 Localised Salmonella infections 003.20 Localised Salmonella infection, unspecified 003.21 Salmonella meningitis 003.22 Salmonella pneumonia 003.23 Salmonella arthritis 003.24 Salmonella osteomyelitis 003.29 Other 003.8 Other specified Salmonella infections 003.9 Salmonella infection, unspecified 004 Shigellosis 004.0 Shigella dysenteriae 004.1 Shigella flexneri 004.2 Shigella boydii 004.3 Shigella sonnei 004.8 Other specified shigella infections 004.9 Shigellosis, unspecified 005 Other food poisoning (bacterial) 005.0 Staphylococcal food poisoning 005.1 Botulism 005.2 Food poisoning due to Clostridium perfringens [C. welchii] 005.3 Food poisoning due to other Clostridia 005.4 Food poisoning due to Vibrio parahaemolyticus 005.8 Other bacterial food poisoning 005.9 Food poisoning, unspecified 006 Amoebiasis 006.0 Acute amoebic dysentery without mention of abscess 006.1 Chronic intestinal amoebiasis without mention of abscess 006.2 Amoebic nondysenteric colitis 006.3 Amoebic liver abscess 006.4 Amoebic lung abscess 006.5 Amoebic brain abscess 006.6 Amoebic skin ulceration 006.8 Amoebic infection of other sites 006.9 Amoebiasis, unspecified 007 Other protozoal intestinal diseases 007.0 Balantidiasis 007.1 Giardiasis 007.2 Coccidiosis 007.3 Intestinal trichomoniasis 007.8 Other specified protozoal intestinal diseases 007.9 Unspecified protozoal intestinal disease 008 Intestinal infections due to other organisms 008.0 Escherichia coli [E. coli] 008.00 E. coli, unspecified 008.01 Enteropathogenic E. coli 008.02 Enterotoxigenic E. coli 008.03 Enteroinvasive E. coli 008.04 Enterohaemorrhagic E. coli 008.09 Other intestinal E. coli infections 008.1 Arizona group of paracolon bacilli 008.2 Aerobacter aerogenes 008.3 Proteus (mirabilis) (morganii) 008.4 Other specified bacteria 008.41 Staphylococcus 008.42 Pseudomonas 008.43 Campylobacter 008.44 Yersinia enterocolitica 008.45 Clostridium difficile 008.46 Other anaerobes 008.47 Other gram-negative bacteria 008.49 Other 008.5 Bacterial enteritis, unspecified 008.6 Enteritis due to specified virus 008.61 Rotavirus 008.62 Adenovirus 008.63 Norwalk virus 008.64 Other small round viruses [SRVs] 008.65 Calcivirus 008.66 Astrovirus 008.67 Enterovirus NEC 008.69 Other viral enteritis 008.8 Other organism, not elsewhere classified 009 Ill-defined intestinal infections 009.0 Infectious colitis, enteritis and gastro-enteritis 009.1 Colitis, enteritis and gastro-enteritis of presumed infectious origin 009.2 Infectious diarrhoea 009.3 Diarrhoea of presumed infectious origin (010-018) Tuberculosis 010 Primary tuberculous infection 010.0 Primary tuberculous infection 010.00 Bacteriological or histological examination not done 010.01 Bacteriological or histological examination unknown (at present) 010.02 Tubercle bacilli found (in sputum) by microscopy 010.03 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 010.04 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 010.05 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 010.09 Unspecified 010.1 Tuberculous pleurisy in primary progressive tuberculosis 010.10 Bacteriological or histological examination not done 010.11 Bacteriological or histological examination unknown (at present) 010.12 Tubercle bacilli found (in sputum) by microscopy 010.13 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 010.14 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 010.15 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 010.19 Unspecified 010.8 Other primary progressive tuberculosis 010.80 Bacteriological or histological examination not done 010.81 Bacteriological or histological examination unknown (at present) 010.82 Tubercle bacilli found (in sputum) by microscopy 010.83 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 010.84 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 010.85 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 010.89 Unspecified 010.9 Primary tuberculous infection, unspecified 010.90 Bacteriological or histological examination not done 010.91 Bacteriological or histological examination unknown (at present) 010.92 Tubercle bacilli found (in sputum) by microscopy 010.93 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 010.94 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 010.95 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 010.99 Unspecified 011 Pulmonary tuberculosis 011.0 Tuberculosis of lung, infiltrative 011.00 Bacteriological or histological examination not done 011.01 Bacteriological or histological examination unknown (at present) 011.02 Tubercle bacilli found (in sputum) by microscopy 011.03 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 011.04 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 011.05 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 011.09 Unspecified 011.1 Tuberculosis of lung, nodular 011.10 Bacteriological or histological examination not done 011.11 Bacteriological or histological examination unknown (at present) 011.12 Tubercle bacilli found (in sputum) by microscopy 011.13 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 011.14 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 011.15 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 011.19 Unspecified 011.2 Tuberculosis of lung with cavitation 011.20 Bacteriological or histological examination not done 011.21 Bacteriological or histological examination unknown (at present) 011.22 Tubercle bacilli found (in sputum) by microscopy 011.23 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 011.24

- Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 011.25 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 011.29 Unspecified 011.3 Tuberculosis of bronchus 011.30 Bacteriological or histological examination not done 011.31 Bacteriological or histological examination unknown (at present) 011.32 Tubercle bacilli found (in sputum) by microscopy 011.33 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 011.34 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 011.35 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 011.39 Unspecified 011.4 Tuberculous fibrosis of lung 011.40 Bacteriological or histological examination not done 011.41 Bacteriological or histological examination unknown (at present) 011.42 Tubercle bacilli found (in sputum) by microscopy 011.43 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 011.44 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 011.45 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 011.49 Unspecified 011.5 Tuberculous bronchiectasis 011.50 Bacteriological or histological examination not done 011.51 Bacteriological or histological examination unknown (at present) 011.52 Tubercle bacilli found (in sputum) by microscopy 011.53 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 011.54 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 011.55 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 011.59 Unspecified 011.6 Tuberculous pneumonia [any form] 011.60 Bacteriological or histological examination not done 011.61 Bacteriological or histological examination unknown (at present) 011.62 Tubercle bacilli found (in sputum) by microscopy 011.63 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 011.64 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 011.65 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 011.69 Unspecified 011.7 Tuberculous pneumothorax 011.70 Bacteriological or histological examination not done 011.71 Bacteriological or histological examination unknown (at present) 011.72 Tubercle bacilli found (in sputum) by microscopy 011.73 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 011.74 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 011.75 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 011.79 Unspecified 011.8 Other specified pulmonary tuberculosis 011.80 Bacteriological or histological examination not done 011.81 Bacteriological or histological examination unknown (at present) 011.82 Tubercle bacilli found (in sputum) by microscopy 011.83 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 011.84 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 011.85 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 011.89 Unspecified 011.9 Pulmonary tuberculosis, unspecified 011.90 Bacteriological or histological examination not done 011.91 Bacteriological or histological examination unknown (at present) 011.92 Tubercle bacilli found (in sputum) by microscopy 011.93 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 011.94 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 011.95 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 011.99 Unspecified 012 Other respiratory tuberculosis 012.0 Tuberculous pleurisy 012.00 Bacteriological or histological examination not done 012.01 Bacteriological or histological examination unknown (at present) 012.02 Tubercle bacilli found (in sputum) by microscopy 012.03 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 012.04 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 012.05 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 012.09 Unspecified 012.1 Tuberculosis of intrathoracic lymph nodes 012.10 Bacteriological or histological examination not done 012.11 Bacteriological or histological examination unknown (at present) 012.12 Tubercle bacilli found (in sputum) by microscopy 012.13 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 012.14 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 012.15 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 012.19 Unspecified 012.2 Isolated tracheal or bronchial tuberculosis 012.20 Bacteriological or histological examination not done 012.21 Bacteriological or histological examination unknown (at present) 012.22 Tubercle bacilli found (in sputum) by microscopy 012.23 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 012.24 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 012.25 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 012.29 Unspecified 012.3 Tuberculous laryngitis 012.30 Bacteriological or histological examination not done 012.31 Bacteriological or histological examination unknown (at present) 012.32 Tubercle bacilli found (in sputum) by microscopy 012.33 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 012.34 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 012.35 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 012.39 Unspecified 012.8 Other specified respiratory tuberculosis 012.80 Bacteriological or histological examination not done 012.81 Bacteriological or histological examination unknown (at present) 012.82 Tubercle bacilli found (in sputum) by microscopy 012.83 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 012.84 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 012.85 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 012.89 Unspecified 013 Tuberculosis of meninges and central nervous system 013.0 Tuberculous meningitis 013.00 Bacteriological or histological examination not done 013.01 Bacteriological or histological examination unknown (at present) 013.02 Tubercle bacilli found (in sputum) by microscopy 013.03 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 013.04 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 013.05 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 013.09 Unspecified 013.1 Tuberculoma of meninges 013.10 Bacteriological or histological examination not done 013.11 Bacteriological or histological examination unknown (at present) 013.12 Tubercle bacilli found (in sputum) by microscopy 013.13 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 013.14 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 013.15 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 013.19 Unspecified 013.2 Tuberculoma of brain 013.20 Bacteriological or histological examination not done 013.21 Bacteriological or histological examination unknown (at present) 013.22 Tubercle bacilli found (in sputum) by microscopy 013.23 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 013.24 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 013.25 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 013.29 Unspecified 013.3 Tuberculous abscess of brain 013.30 Bacteriological or histological examination not done 013.31 Bacteriological or histological examination unknown (at present) 013.32 Tubercle bacilli found (in sputum) by microscopy 013.33 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 013.34 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 013.35 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 013.39 Unspecified 013.4 Tuberculoma of spinal cord 013.40 Bacteriological or histological examination not done 013.41 Bacteriological or histological examination unknown (at present) 013.42 Tubercle bacilli found (in sputum) by microscopy 013.43 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 013.44 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 013.45 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 013.49 Unspecified 013.5 Tuberculous abscess of spinal cord 013.50 Bacteriological or histological examination not done 013.51 Bacteriological or histological examination unknown (at present) 013.52 Tubercle bacilli found (in sputum) by microscopy 013.53 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 013.54 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 013.55 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 013.59 Unspecified 013.6 Tuberculous encephalitis or myelitis 013.60 Bacteriological or histological examination not done 013.61 Bacteriological or histological examination unknown (at present) 013.62 Tubercle bacilli found (in sputum) by microscopy 013.63 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 013.64 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 013.65 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 013.69 Unspecified 013.8 Other specified tuberculosis of central nervous system 013.80 Bacteriological or histological examination not done 013.81 Bacteriological or histological examination unknown (at present) 013.82 Tubercle bacilli found (in sputum) by microscopy 013.83 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 013.84 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 013.85 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 013.89 Unspecified 013.9 Unspecified tuberculosis of central nervous system 013.90 Bacteriological or histological examination not done 013.91 Bacteriological or histological examination unknown (at present) 013.92 Tubercle bacilli found (in sputum) by microscopy 013.93 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 013.94 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 013.95 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 013.99 Unspecified 014 Tuberculosis of intestines, peritoneum and mesenteric glands 014.0 Tuberculous peritonitis 014.00 Bacteriological or histological examination not done 014.01 Bacteriological or histological examination unknown (at present) 014.02 Tubercle bacilli found (in sputum) by microscopy 014.03 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 014.04 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 014.05 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 014.09 Unspecified 014.8 Other 014.80 Bacteriological or histological examination not done 014.81 Bacteriological or histological examination unknown (at present) 014.82 Tubercle bacilli found (in sputum) by microscopy 014.83 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 014.84 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 014.85 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 014.89 Unspecified 015 Tuberculosis of bones and joints 015.0 Vertebral column 015.00 Bacteriological or histological examination not done 015.01 Bacteriological or histological examination unknown (at present) 015.02 Tubercle bacilli found (in sputum) by microscopy 015.03 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 015.04 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 015.05 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 015.09 Unspecified 015.1 Hip 015.10 Bacteriological or histological examination not done 015.11 Bacteriological or histological examination unknown (at present) 015.12 Tubercle bacilli found (in sputum) by microscopy 015.13 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 015.14 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 015.15 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 015.19 Unspecified 015.2 Knee 015.20 Bacteriological or histological examination not done 015.21 Bacteriological or histological examination unknown (at present) 015.22 Tubercle bacilli found (in sputum) by microscopy 015.23 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 015.24 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 015.25 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 015.29 Unspecified 015.5 Limb bones 015.50 Bacteriological or histological examination not done 015.51 Bacteriological or histological examination unknown (at present) 015.52 Tubercle bacilli found (in sputum) by microscopy 015.53 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 015.54 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 015.55 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 015.59 Unspecified 015.6 Mastoid 015.60 Bacteriological or histological examination not done 015.61 Bacteriological or histological examination unknown (at present) 015.62 Tubercle bacilli found (in sputum) by microscopy 015.63 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 015.64 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 015.65 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 015.69 Unspecified 015.7 Other specified bone 015.70 Bacteriological or histological examination not done 015.71 Bacteriological or histological examination unknown (at present) 015.72 Tubercle bacilli found (in sputum) by microscopy 015.73 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 015.74 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 015.75 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 015.79 Unspecified 015.8 Other specified joint 015.80 Bacteriological or histological examination not done 015.81 Bacteriological or histological examination unknown (at present) 015.82 Tubercle bacilli found (in sputum) by microscopy 015.83 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 015.84 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 015.85 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 015.89 Unspecified 015.9 Tuberculosis of unspecified bones and joints 015.90 Bacteriological or histological examination not done 015.91 Bacteriological or histological examination unknown (at present) 015.92 Tubercle bacilli found (in sputum) by microscopy 015.93 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 015.94 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 015.95 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 015.99 Unspecified 016 Tuberculosis of genito-urinary system 016.0 Kidney 016.00 Bacteriological or histological examination not done 016.01 Bacteriological or histological examination unknown (at present) 016.02 Tubercle bacilli found (in sputum) by microscopy 016.03 Tubercle bacilli not found (in sputum) by microscopy, but found by culture 016.04 Tubercle bacilli not found by bacteriological examination, but tuberculosis confirmed histologically 016.05 Tubercle bacilli not found by bacteriological or histological examination, but tuberculosis confirmed by other methods [inoculation in animals] 016.09 Unspecified 016.1 Bladder 016.10 Bacteriological or histological examination not done 016.11 Bacteriological

Causes of Death

- Ideally,

- Real life

Causes of Death
Competing Causes

- Ex. Bill
- More common ex: Betty

Causes of Death

- So far:
  - ***Direct causes*** of death
  - But also ***Proximate Causes***

Causes of Death

- ***Proximate Causes***
  - McGinnis and Foege (1993) Epidemiologists
    - First to really try to measure these causes with reasonable success
    - In the U. S. in 1990:
      - 1. Smoking 19%
      - 2. Diet and exercise 14%
      - 3. Alcohol abuse 5%
      - 4. Infectious disease 4%
      - 5. Toxic agents 4%
      - 6. Fire arms, accidents, etc…
  - NB: More recently with continued obesity epidemic and reduction in smoking, many experts now switch 1 and 2

Causes of Death

Fundamental Causes

Causes of Death

Fundamental Causes

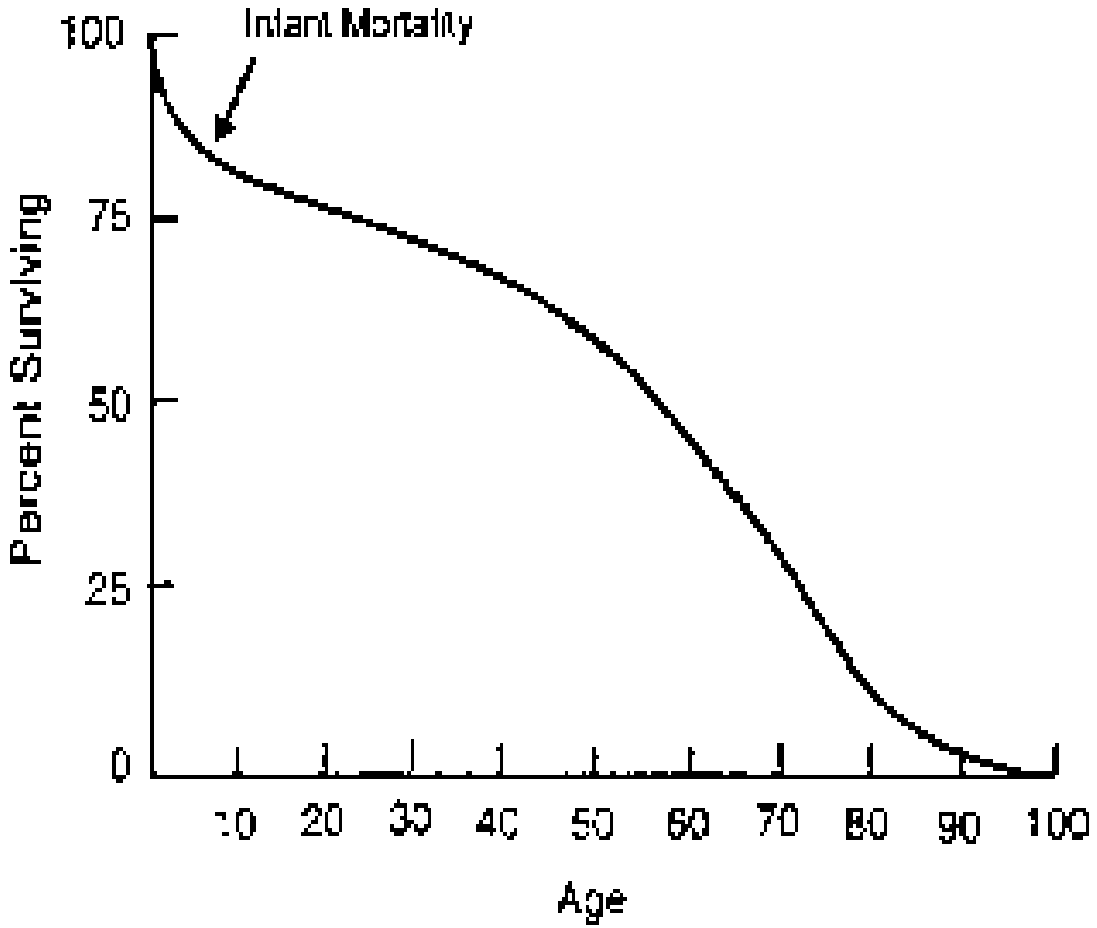
- ***Social Inequality*** the prime fundamental cause

  - **Recommended reading: Link, Bruce and Jo Phelan. 1995. Social conditions as fundamental causes of disease. *Journal of Health and Social Behaviour*, Special Edition, p80-94.**

Survival Curves

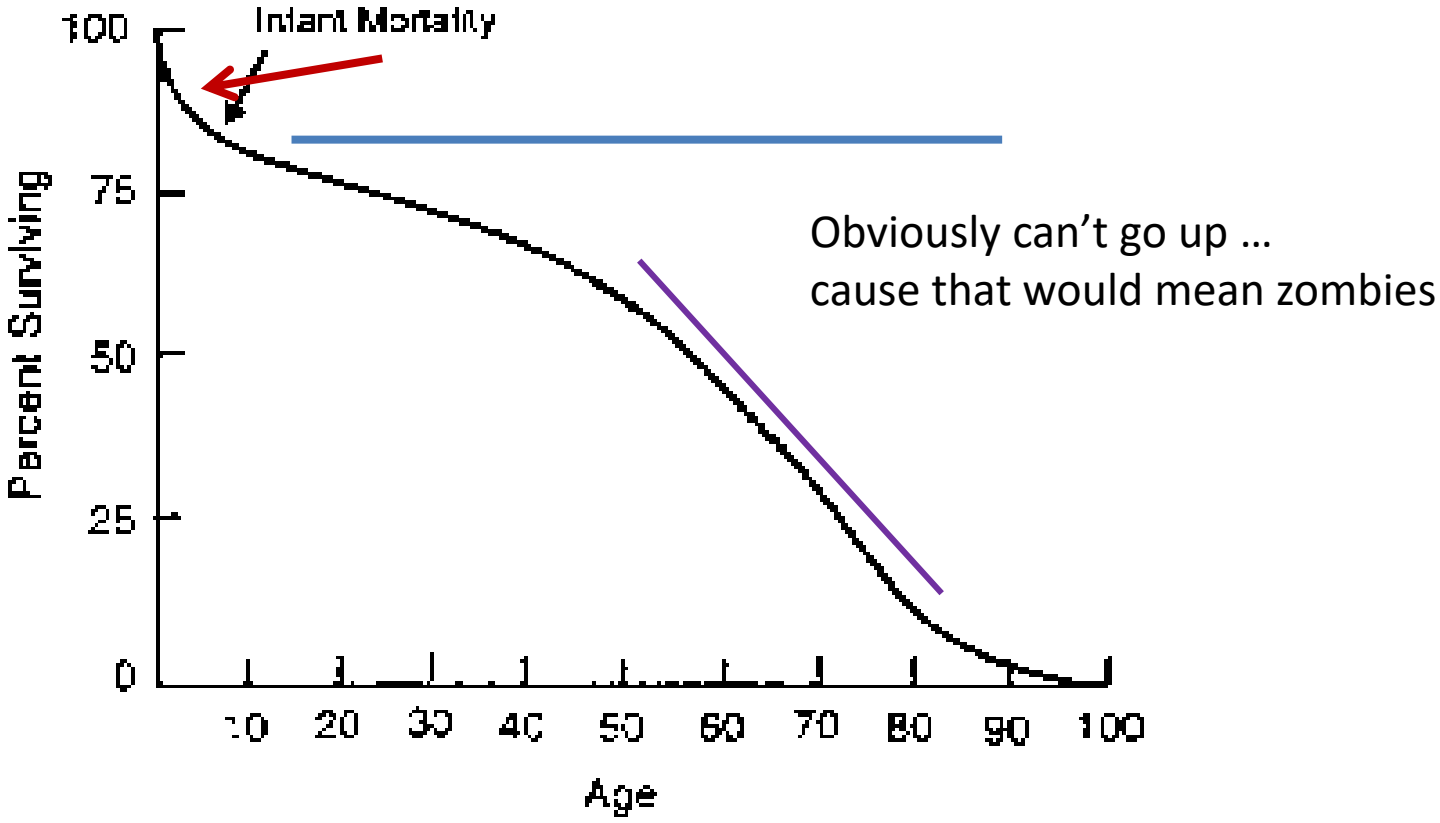
The mortality experience of a cohort

- graphically portrayed as ***survival curves***
  - Derived from the same ***life tables*** as life expectancy
  - represents the proportion of persons born who survive to specific ages



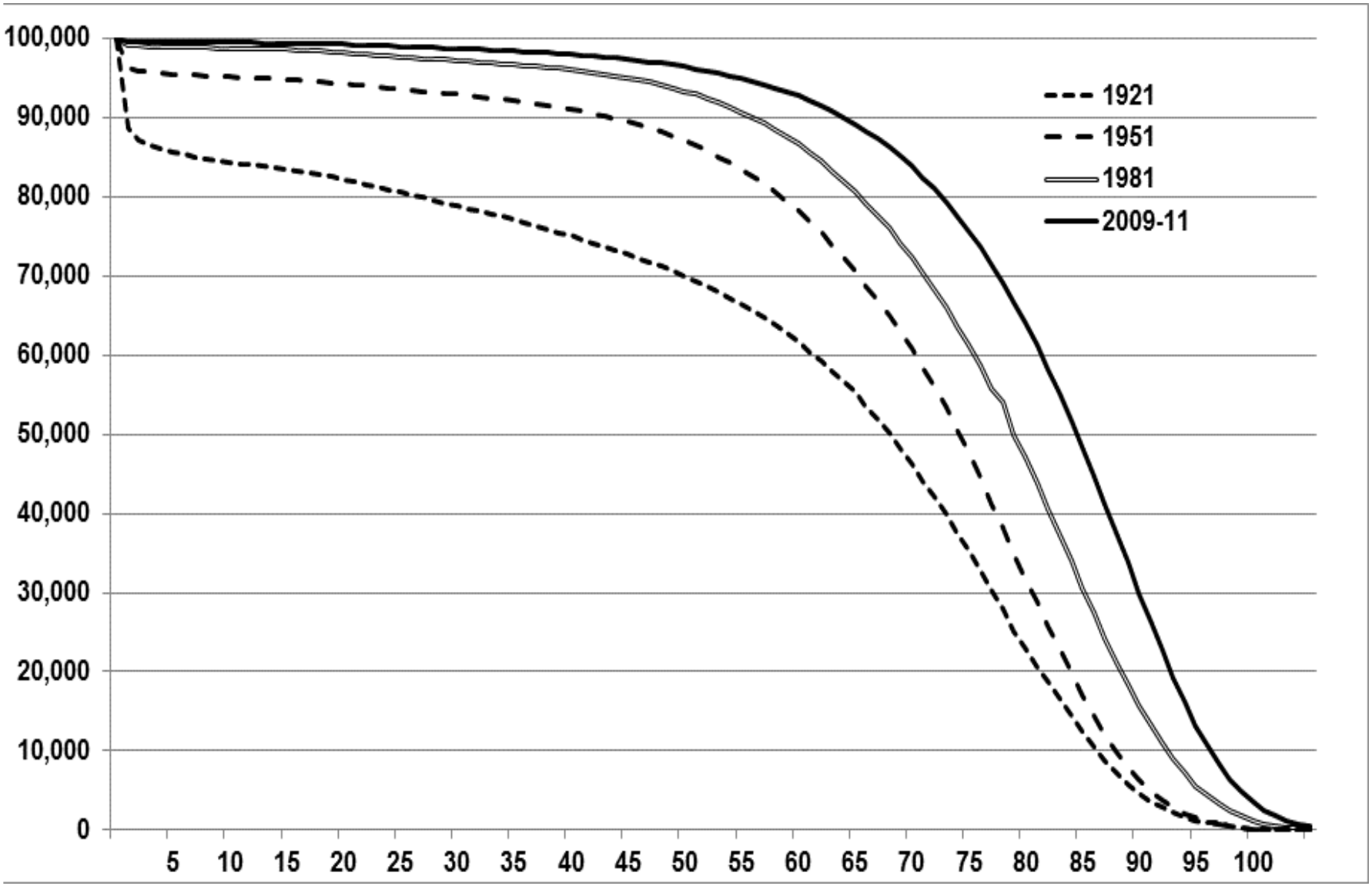
Survival curves

- Depending upon mortality level
  - shape can differ quite dramatically
- 3 things to look for:
  - **1. Size of drop at the youngest ages**
  - **2. How steep the decline is for adults**
  - **3. How far the curve gets before significant declines in survival**



Obviously can't go up …
cause that would mean zombies

Survival Curves



Source: Canadian Human Mortality Data Base, Period Life Tables; Statistics Canada, 2013a

Epidemiological Transition

- Part of *Demographic Transition*
  - Description of change in mortality regimes
- Abdel Omran (1971)
  - History of western Europe as focus
  - 3 basic stages

Epidemiological Transition

- ***1. Age of famine and pestilence***
- ***2. Age of receding pandemics***
- ***3. Age of man-made and degenerative causes***

1. Age of famine and pestilence

- Very high death rates
  - 2 stages:
    - Before agricultural revolution
    - After ag rev

1. Age of famine and pestilence

- Death rates high for all ages but especially

1. Age of famine and pestilence

- Ex. Maternal death risk today

2. Age of receding pandemics

2. Age of receding pandemics

- Reduction in mortality most pronounced among the very young

3. Age of man-made and degenerative causes

- Omran

Currently in Canada

- 99%+ births survive to age 5
- 95%+ complete reproductive years
- Almost 90% make it to age 70
- See life tables link from last week

- So what happens now?

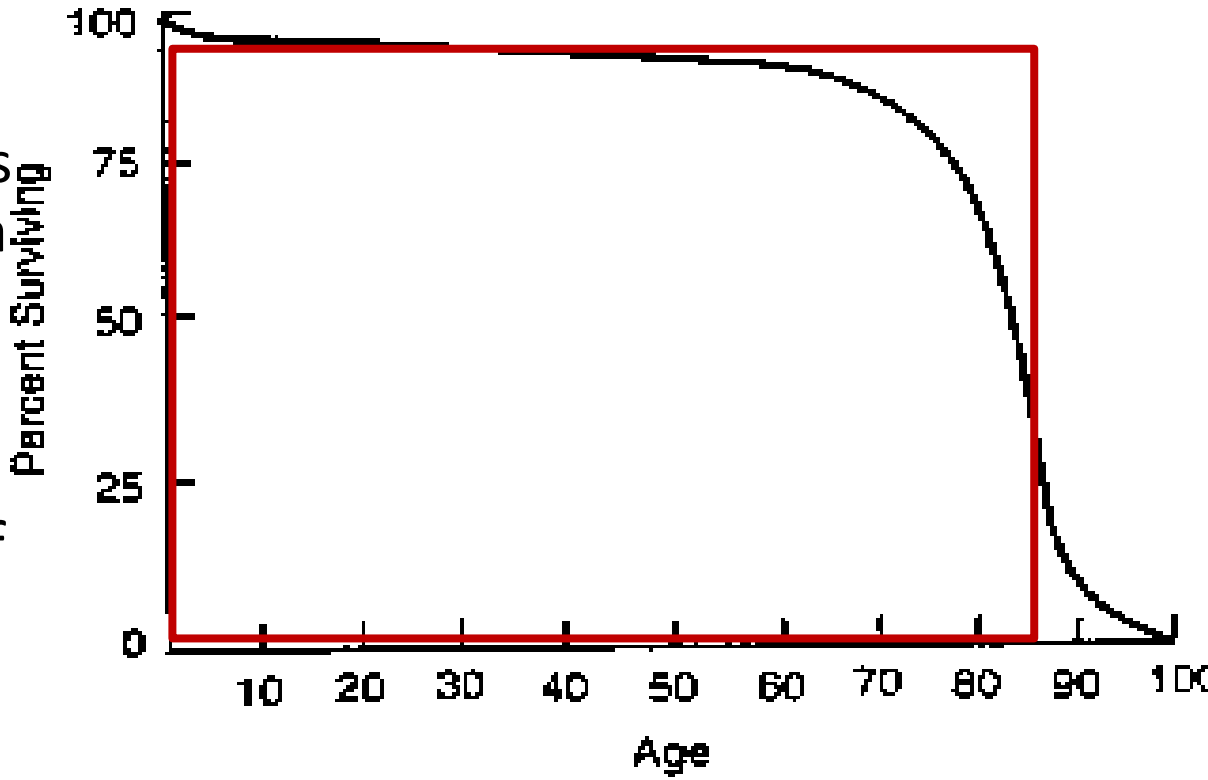
What comes next?

- 2 Opposite Theories
  - Fries (1980)
  - Olshansky and Ault (1986)

What comes next?

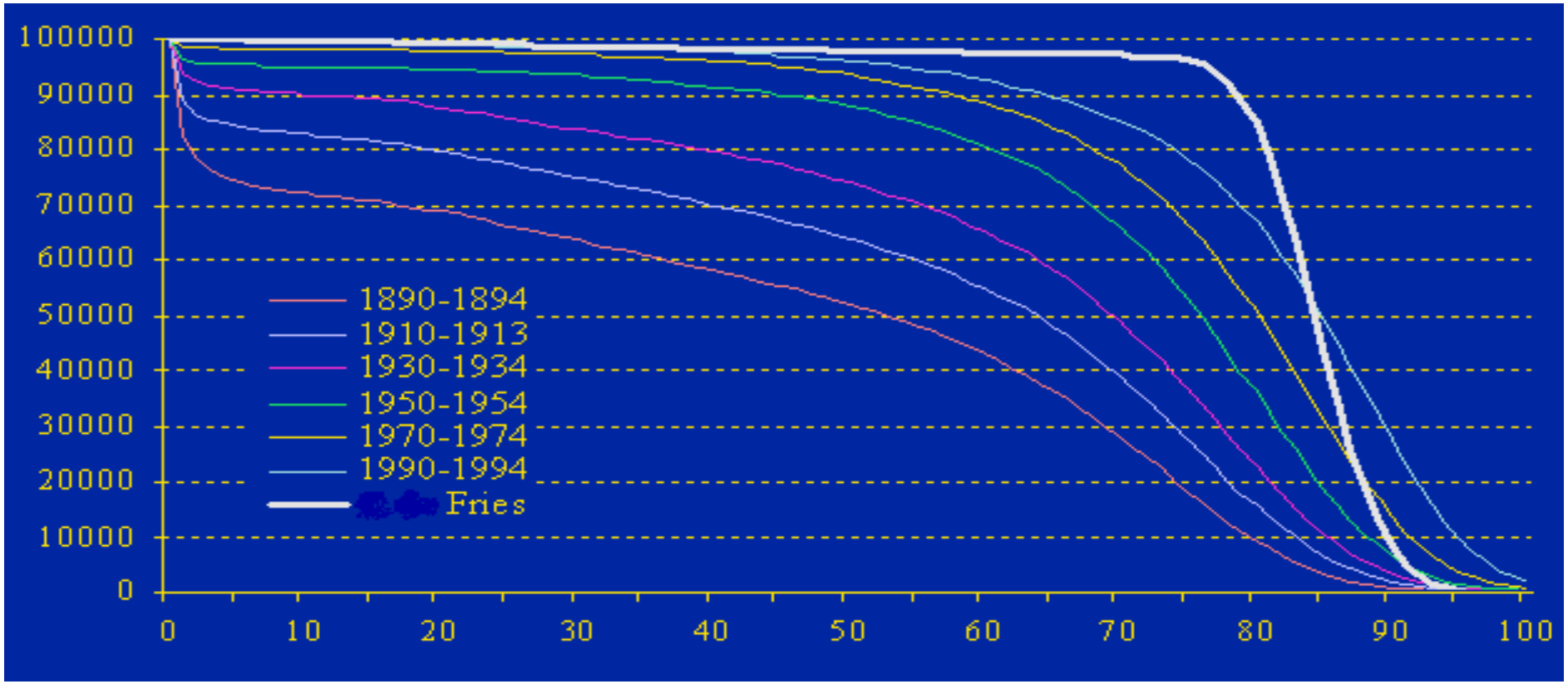
Fries

- Also known as the ***compression of mortality***
  - Because most deaths happen together in a short time
- or also ‘Fries expected ***rectangularization*** of the survival curve’
  - **For obvious reasons**



What comes next?

- Olshansky and Ault
  - Don't really see rectangularization
    - Don't seem to be approaching life span
  - Curve stays the same but moves further to the right
    - Rapid mortality decline in ***older population*** since 70s or so
      - dying of the same causes – just later in life



What comes next?

So 4th stage is about declines in mortality moving from younger to older populations

Factors contributing to this

Mortality Differentials

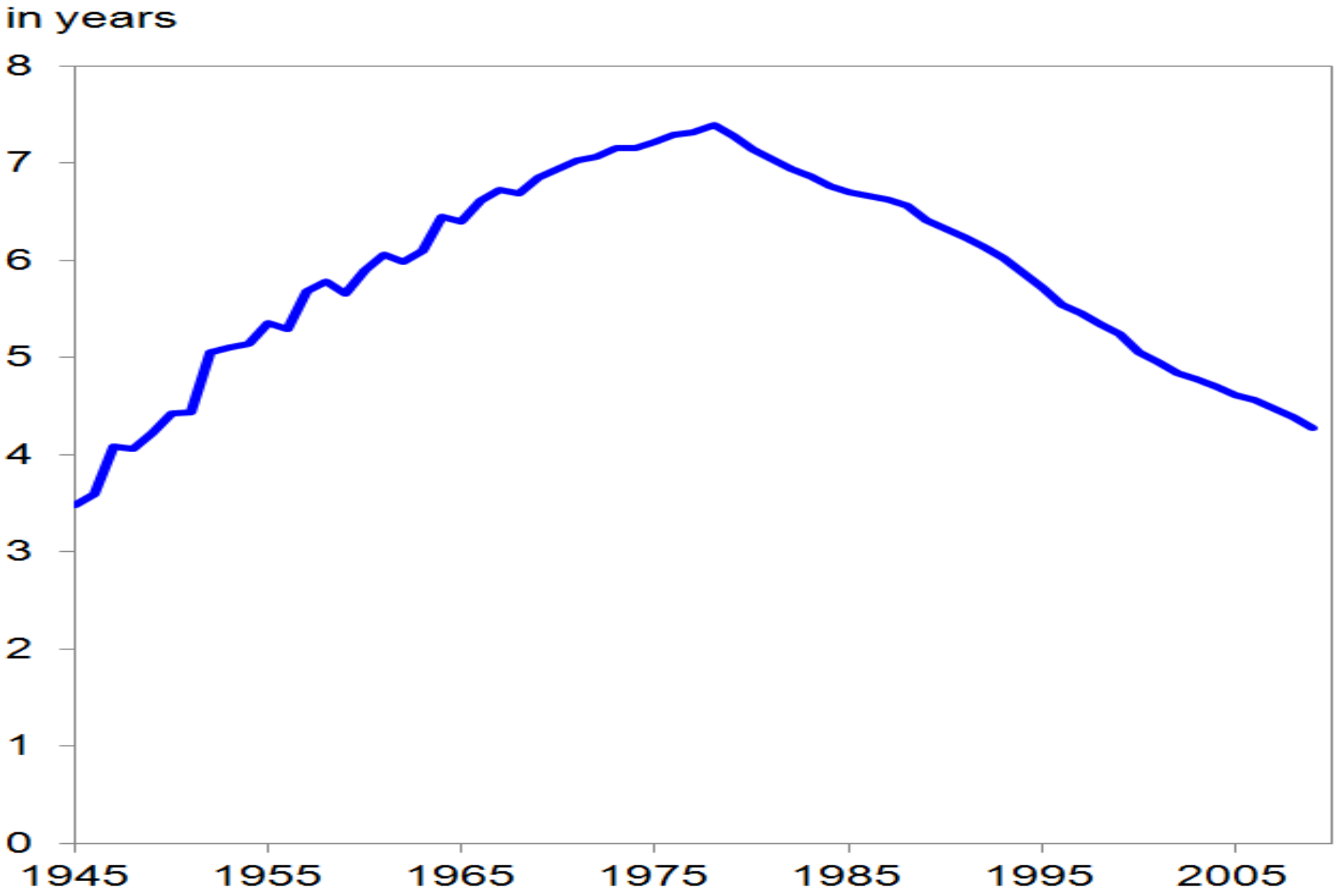
- Mortality varies by biologically and especially socially relevant characteristics

- Age (already covered)
- Sex
- Social integration (Marital Status)
- SES
- Race/Ethnicity

Mortality Differentials

Sex

Difference (in years) between female and male life expectancy at birth, Canada, 1945 to 2009



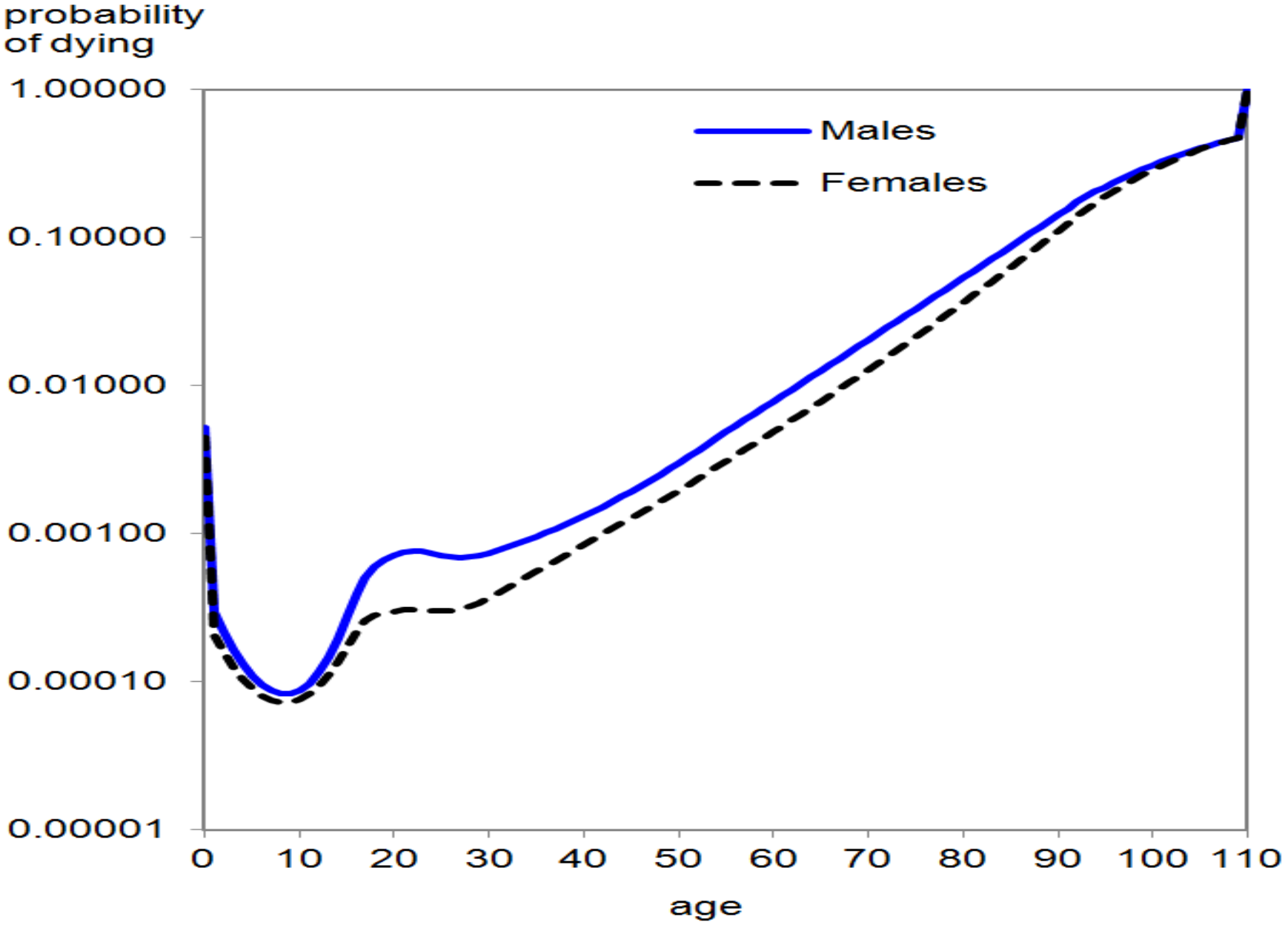
Mortality Differentials

- ***Sex***

Mortality Differentials

- ***Sex***

Probabilities of dying by age and sex, Canada, 2009/2011



Mortality Differentials

- ***Sex***

Mortality Differentials

- ***Marital Status***

Mortality Differentials

- ***Marital Status***

Mortality Differentials

- ***Social Inequality***

Mortality Differentials

- ***Social Inequality***
  - Income

Remaining life expectancy at age 25, by sex and selected socioeconomic and demographic variables

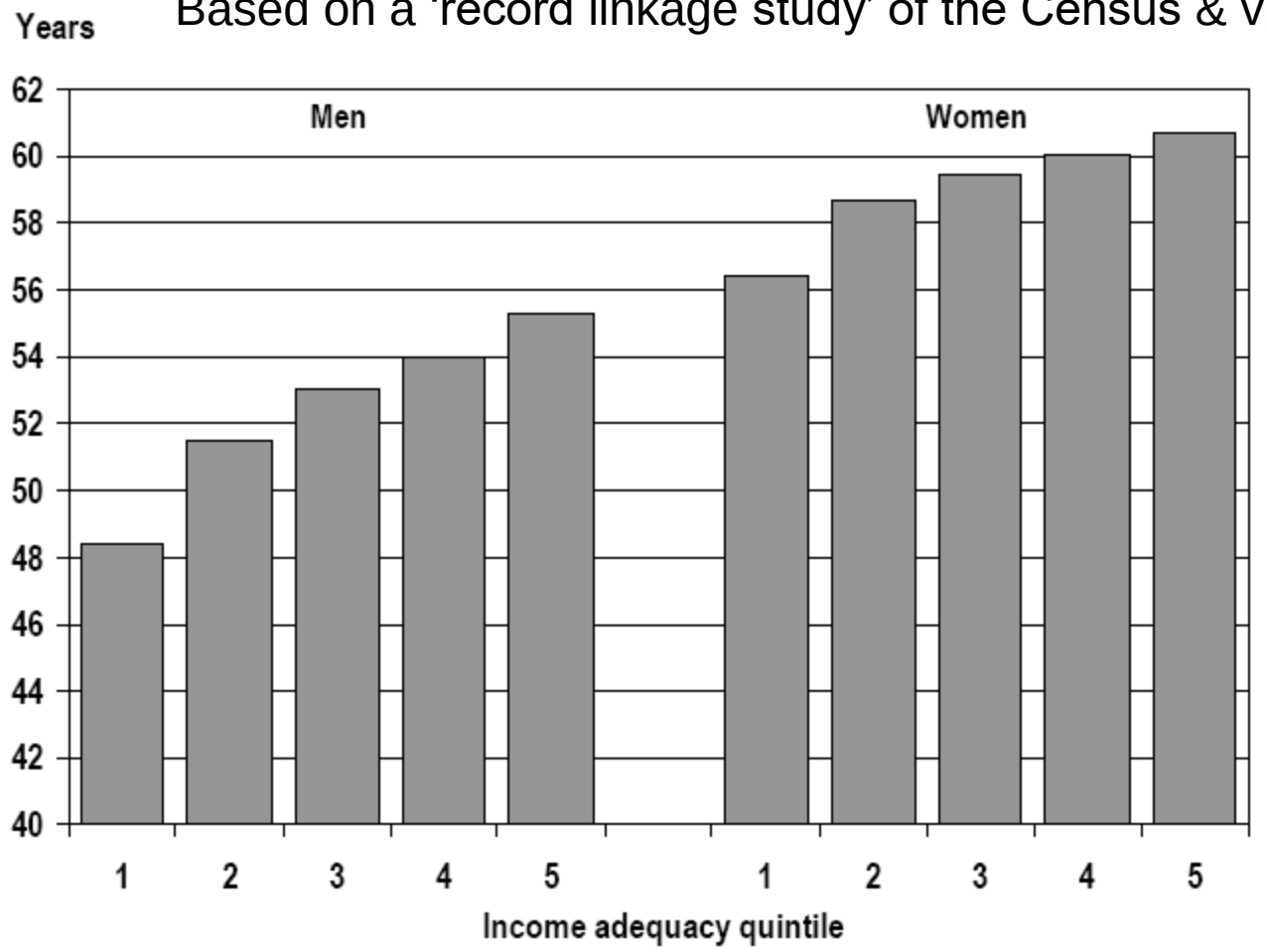
Category	Total			Men			Women		
	Years	95% confidence interval		Years	95% confidence interval		Years	95% confidence interval	
		From	To		From	To		From	To
Income adequacy quintile (area)									
5 (highest)	**58.9**	58.8	59	**57.4**	57.2	57.5	**60.8**	60.6	60.9
4	**57.9**	57.8	58	**55.9**	55.8	56	**60.2**	60	60.3
3	**57.1**	57	57.2	**55**	54.9	55.1	**59.5**	59.4	59.6
2	**56**	55.9	56.1	**53.4**	53.3	53.5	**58.6**	58.4	58.7
1 (lowest)	**53.8**	53.7	53.8	**50.5**	50.4	50.6	**56.2**	56.1	56.3
Difference = quintile 5 minus quintile 1	**5.2**	5.2	5.2	**6.8**	6.8	6.8	**4.5**	4.5	4.6

Sources: Statistics Canada, 2001 Canadian census–tax–mortality cohort, derived from the 2001 Census of Population and the 2014 Amalgamated Mortality Database.

Figure 2
Life expectancy at age 25, by sex and income adequacy quintile, non-institutionalized population aged 25 or older at baseline, Canada, 1991 to 2001

Standard symbols

Based on a ‘record linkage study’ of the Census & vital statistics



Source: Census mortality follow-up study, 1991 to 2001.
Figure source: Statistics Canada, 2008, "The Canadian census mortality follow-up study, 1991 through 2001", *Health Reports, September 2008*, Catalogue number 82-003-X

Mortality Differentials

- ***Social Inequality***
  - Education

Remaining life expectancy at age 25, by sex and selected socioeconomic and demographic variables

Category	Total			Men			Women		
	Years	95% confidence interval		Years	95% confidence interval		Years	95% confidence interval	
		From	To		From	To		From	To
Educational attainment									
University degree	**59.8**	59.7	59.9	**58.6**	58.5	58.8	**61.8**	61.6	62.1
Postsecondary non-university certificate or diploma	**59.3**	59.2	59.4	**56.7**	56.5	56.8	**60.8**	60.7	61
High school with or without trades certificate	**57.1**	57	57.1	**54.8**	54.7	54.9	**59.5**	59.4	59.6
Less than secondary school graduation	**54.4**	54.3	54.4	**51.9**	51.8	52	**56.8**	56.7	56.9
Difference = university minus less than secondary school	**5.4**	5.4	5.5	**6.7**	6.7	6.8	**5**	4.9	5.1

Sources: Statistics Canada, 2001 Canadian census–tax–mortality cohort, derived from the 2001 Census of Population and the 2014 Amalgamated Mortality Database.

Mortality Differentials

- ***Social Inequality***
  - Occupation

Age-standardized mortality rate per 100,000 person-years at risk, rate ratios and rate differences, for men aged 20 to 100 years at baseline, by selected socioeconomic characteristics, Canada, 2001 to 2011

			mortality rate	95% CI		Rate ratio	95% CI		Rate differences	95% CI	
	number	Deaths	rate	From	To	ratio	From	To	rate	From	To
Occupation											
Professional	190,930	6,290	**886.4**	835.3	940.7	1	NA	NA	0	NA	NA
Managerial	176,510	6,990	**921.6**	869	977.4	1.04	0.96	1.13	35.2	-40.4	110.7
Skilled, technical, supervisory	434,065	18,825	**1,051.2**	1,017.5	1,085.9	1.19	1.11	1.27	164.7	102	227.5
Semi-skilled	372,780	16,085	**1,065.1**	1,017.8	1,114.7	1.2	1.11	1.29	178.7	107.1	250.3
Unskilled	138,390	7,015	**1,158.7**	1,084.7	1,237.8	1.31	1.2	1.43	272.3	179.4	365.2
No occupation	374,980	131,025	**1,802.2**	1,787.1	1,817.4	2.03	1.91	2.16	915.8	861	970.5

Sources: Statistics Canada, 2001 Canadian census–tax–mortality cohort, derived from the 2001 Census of Population and the 2014 Amalgamated Mortality Database.

Mortality Differentials

Race/ethnicity

Mortality Differentials

Race/ethnicity

Remaining life expectancy at age 25, by sex and selected socioeconomic and demographic variables

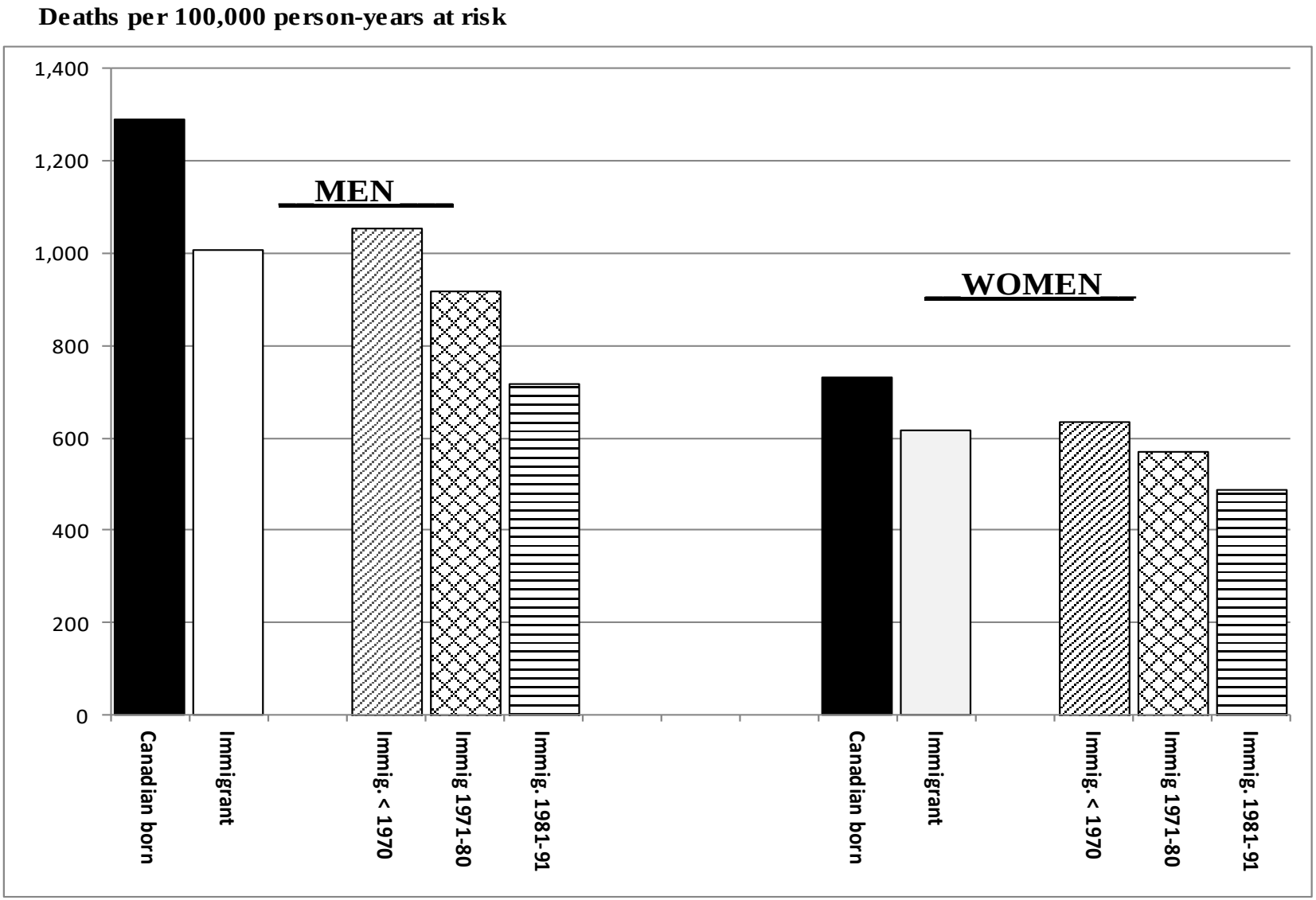
Category	Total			Men			Women		
	Years	95% confidence interval		Years	95% confidence interval		Years	95% confidence interval	
		From	To		From	To		From	To
Visible minority status									
Not a visible minority	**56.8**	56.8	56.9	**54.6**	54.5	54.6	**59**	59	59.1
Visible minority	**60.8**	60.6	60.9	**58.9**	58.7	59.1	**62.5**	62.3	62.7
Chinese	**61.9**	61.6	62.1	**59.9**	59.6	60.3	**63.6**	63.2	64
South Asian	**60**	59.7	60.4	**58.9**	58.3	59.4	**61.4**	60.9	62
Black	**59.6**	59.2	60.1	**57.2**	56.7	57.8	**61.3**	60.7	61.9
Filipino	**60.1**	59.6	60.6	**57.4**	56.7	58.2	**61.9**	61.2	62.6
Latin American	**60.4**	59.5	61.4	**57.1**	56.1	58.1	**62.6**	61.3	63.9
Southeast Asian	**61.8**	60.5	63.1	**59.4**	58.3	60.5	**63.3**	61.3	65.3
Arab	**59.5**	58.6	60.4	**57.7**	56.7	58.8	**62.9**	61.1	64.7
Difference = visible minority minus not visible minority	**3.9**	3.8	4	**4.3**	4.2	4.5	**3.5**	3.3	3.6

Sources: Statistics Canada, 2001 Canadian census–tax–mortality cohort, derived from the 2001 Census of Population and the 2014 Amalgamated Mortality Database.

Mortality Differentials

Race/ethnicity

Figure 3.8. Age-Standardized Mortality Rates for Immigrants, by Sex and Period of Immigration, Compared with Canadian-Born Cohort Members, Persons Aged 25 or Older at Baseline, Canada, 1991-2001



Source: Ng (2011)