

Epidemiological study design

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Modern Epidemiology

FOURTH EDITION

Timothy L. Lash

Population and Cohort

- ▶ A closed population does not add members over time and loses only by death. Another definition is population where there is no loss in relation to outcome
- ▶ An open population acquires members over time - and/or loses members
- ▶ A cohort is a population or subpopulation defined in a permanent manner
- ▶ A source population is a population from which a study population is selected
- ▶ A study population is a subset chosen
- ▶ A target population is one from which information is desired

Closed population

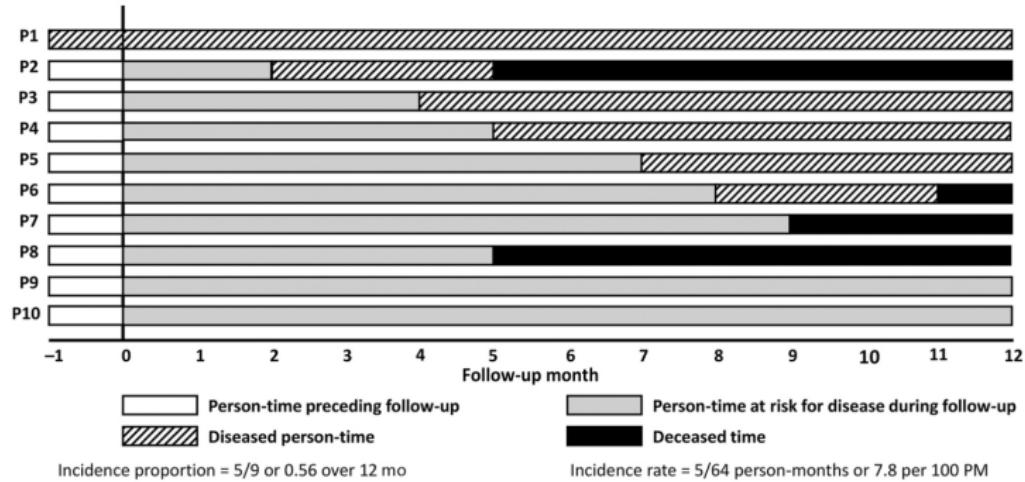


Figure 4.1 Illustration of four basic measures of disease frequency using a population of 10 persons (P1-P10) with person-time depicted 1 month before, and 12 months after, the start of follow-up for the occurrence of a disease.

Open population

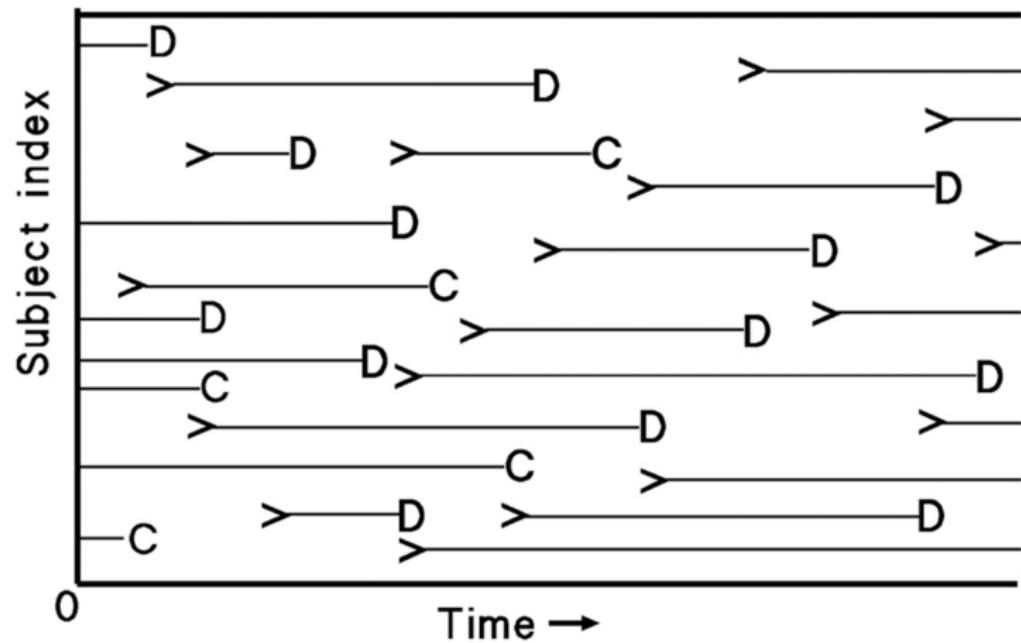
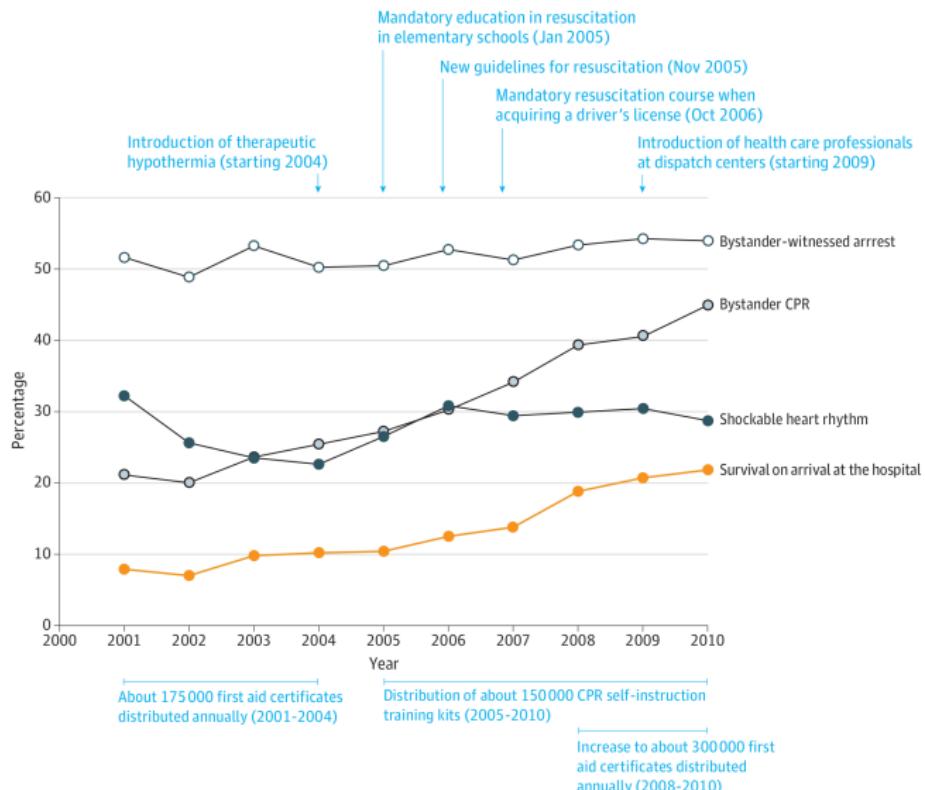


Figure 4.2 Composition of an open population in approximate steady state, by time; > indicates entry into the population, D indicates disease onset, and C indicates exit from the population without the disease.

Cardiac arrest



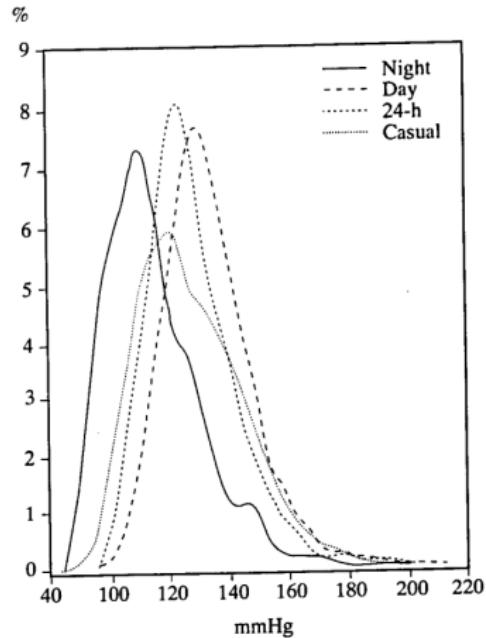
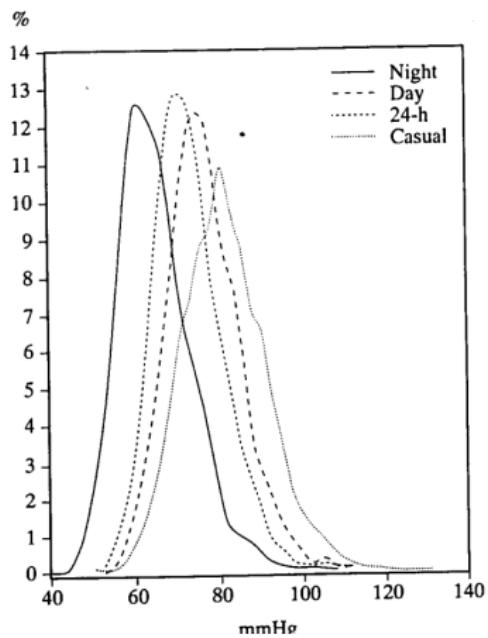
Study Designs



Study Designs

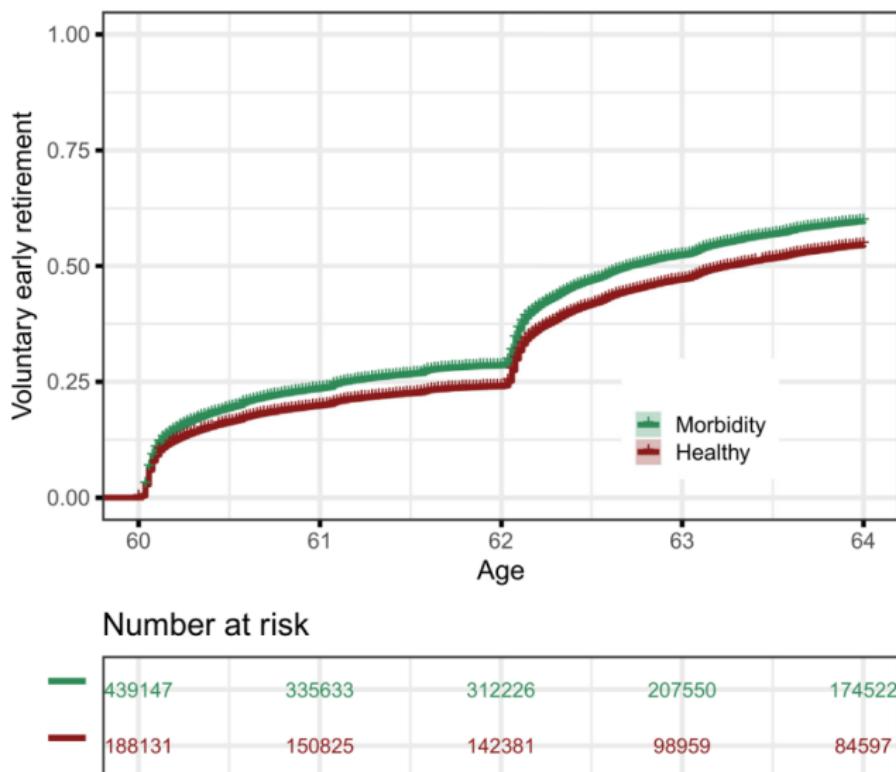
- ▶ Experimental studies
- ▶ Clinical trials
- ▶ Field trials
- ▶ Nonexperimental studies
 - ▶ Cross sectional studies
 - ▶ Cohort studies
 - ▶ Case-control studies
 - ▶ Prospective versus retrospective studies
 - ▶ Proportional mortality studies
 - ▶ Ecological studies

Cross Sectional Study



Rasmussen, Hypertension 1998

Voluntary retirement - Cohort study



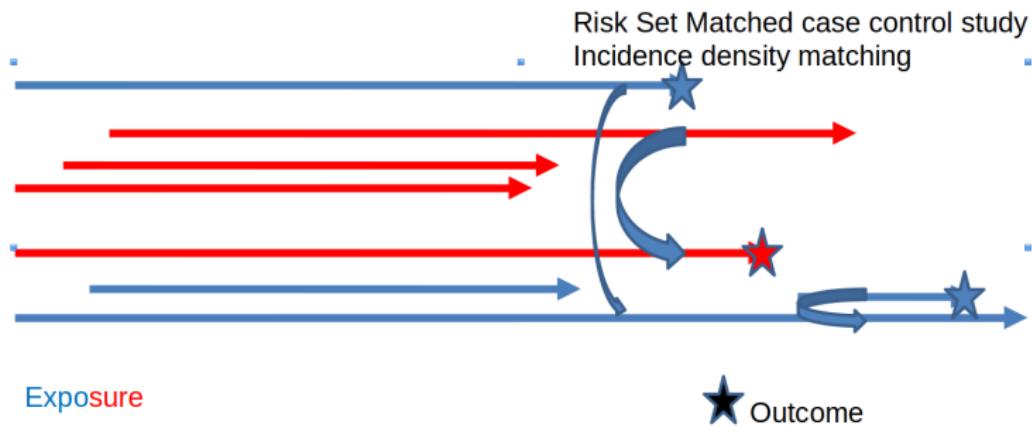
Case Control Study



Nested Case Control

Nestet case control study:

Cases and controls are selected from the same population



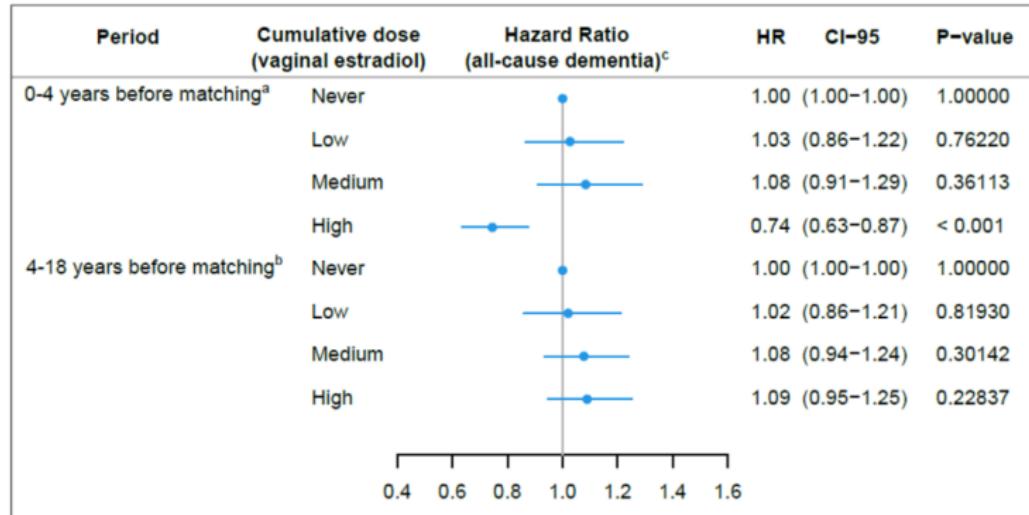
Analysis: Conditional logistic regression stratified by matching identification

Nested Case Control



Nestet case control makes it easy to evaluate time dependent Variable – cumulative exposure – time since exposuree etc.

Estrogen Dementia



Pourhadi, Alzheimer Dementia 2021

Note for Risk-Set-Matching

- ▶ Sampling at each time is independent
- ▶ Therefore, controls can be selected multiple times
- ▶ Controls may later appear as cases
- ▶ Check that multiple selection is not extreme

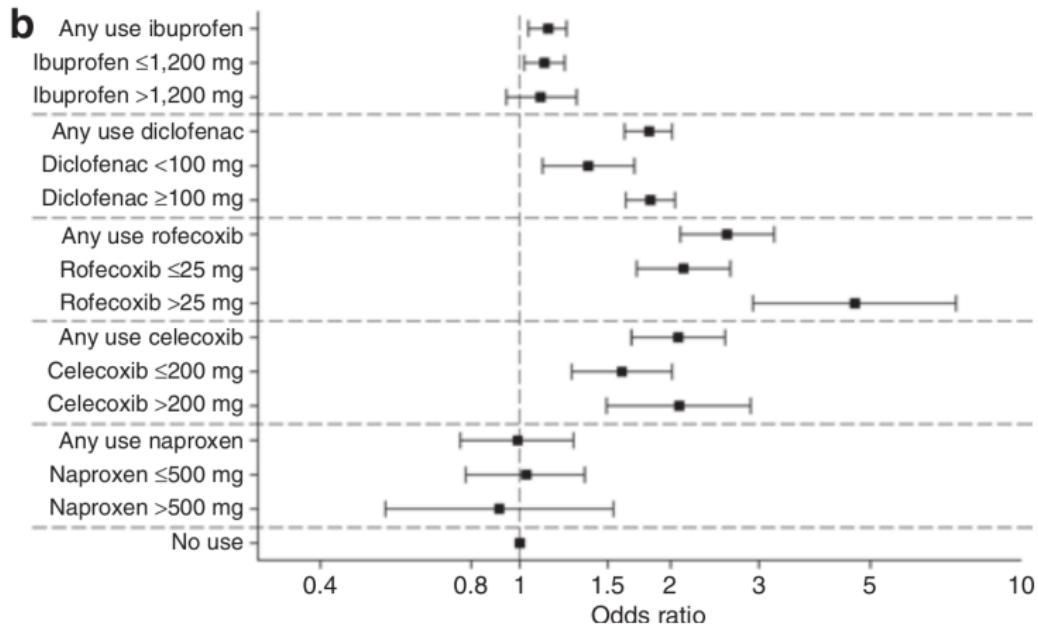
Case Only Design



Case Only Design

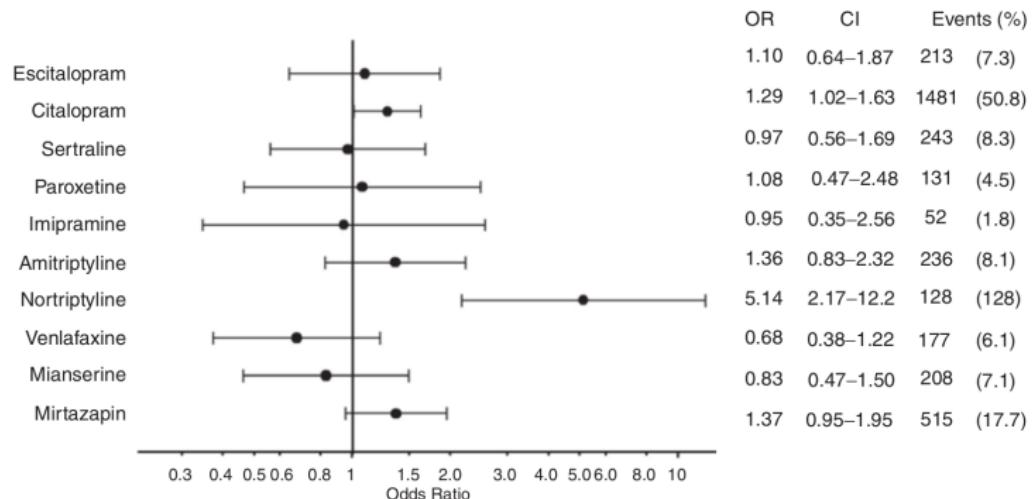
- ▶ Case Cross Over
- ▶ Case Time Control
- ▶ Self Controlled Case Series

Case Cross Over - NSAID Healthy People



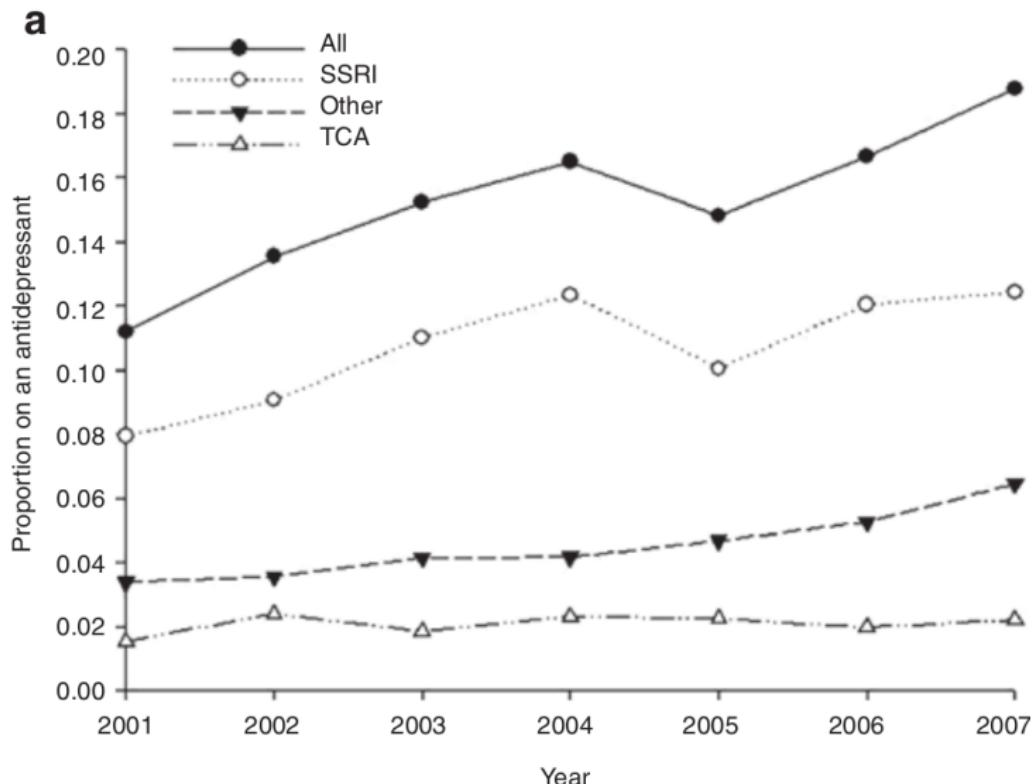
Fosbøll, Clinical Pharmacology and Therapeutics 2009

Case Time Control - SSRI Cardiac Arrest



Weeke, Clinical Pharmacology and Therapeutics 2012

Case Time Control



Persistent User Bias?

Practice of Epidemiology

Persistent User Bias in Case-Crossover Studies in Pharmacoepidemiology

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Initially submitted August 11, 2015; accepted for publication February 10, 2016.

Hallas, American Journal of Epidemiology 2016

Proportional Mortality Study

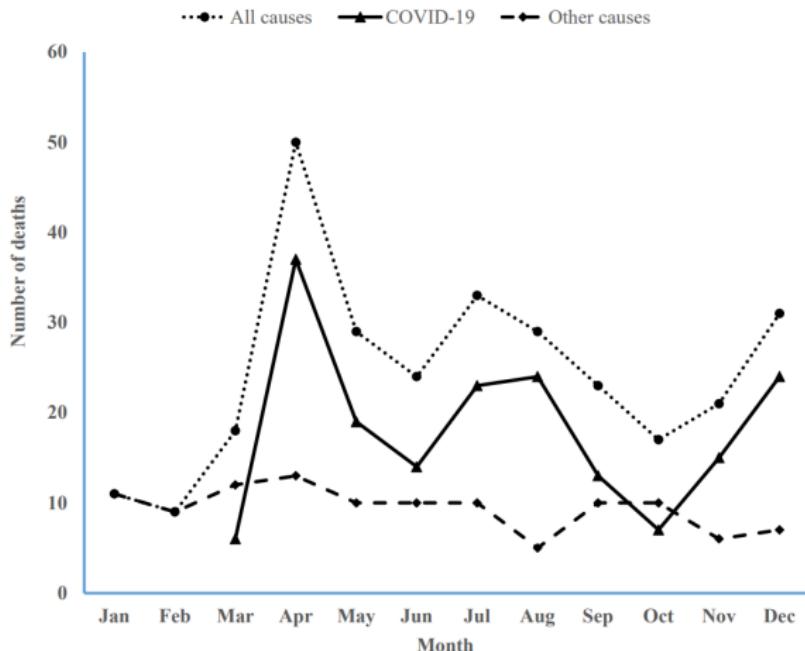
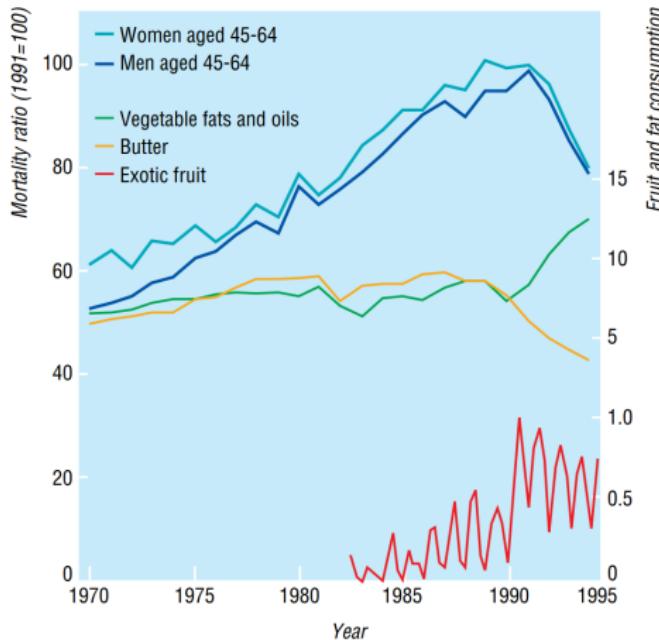


Figure 1.
Monthly frequency and
type of US law
enforcement officer
duty related
deaths, 2020

Ecological Study - Proportional Mortality



Zakonski, BMJ 1998

