Session 5 Cross-sectional & Longitudinal Approaches

Health Systems Research Course

Western China School of Public Health

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西部农村卫生发展研究中心

WEST CHINA RESEARCH CENTER FOR RURAL HEALTH DEVELOPMENT (WCRC·RHD)

Four key steps in HSR

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1. Identify research focus (problem/ concern/ opportunity) *and* question
2. **Design study**
3. Ensure quality and rigour
4. Apply ethical principles

Cross-sectional design

- Most frequently used HPSR study design
- Used to explore, describe or explain a phenomenon at a particular time
  - Does not examine change over time
  - Does not assess interventions
- Allows observation/ measurement of multiple variables at same time
- Allows comparison of multiple groups/ populations at a specific time point
- May establish correlations/ relationships between key variables
- Encompasses a range of disciplinary perspectives and design approaches

Definition...

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cross section

noun

1. a surface or shape exposed by making a straight cut through something, especially at right angles to an axis.
   "the cross section of an octahedron is a square"

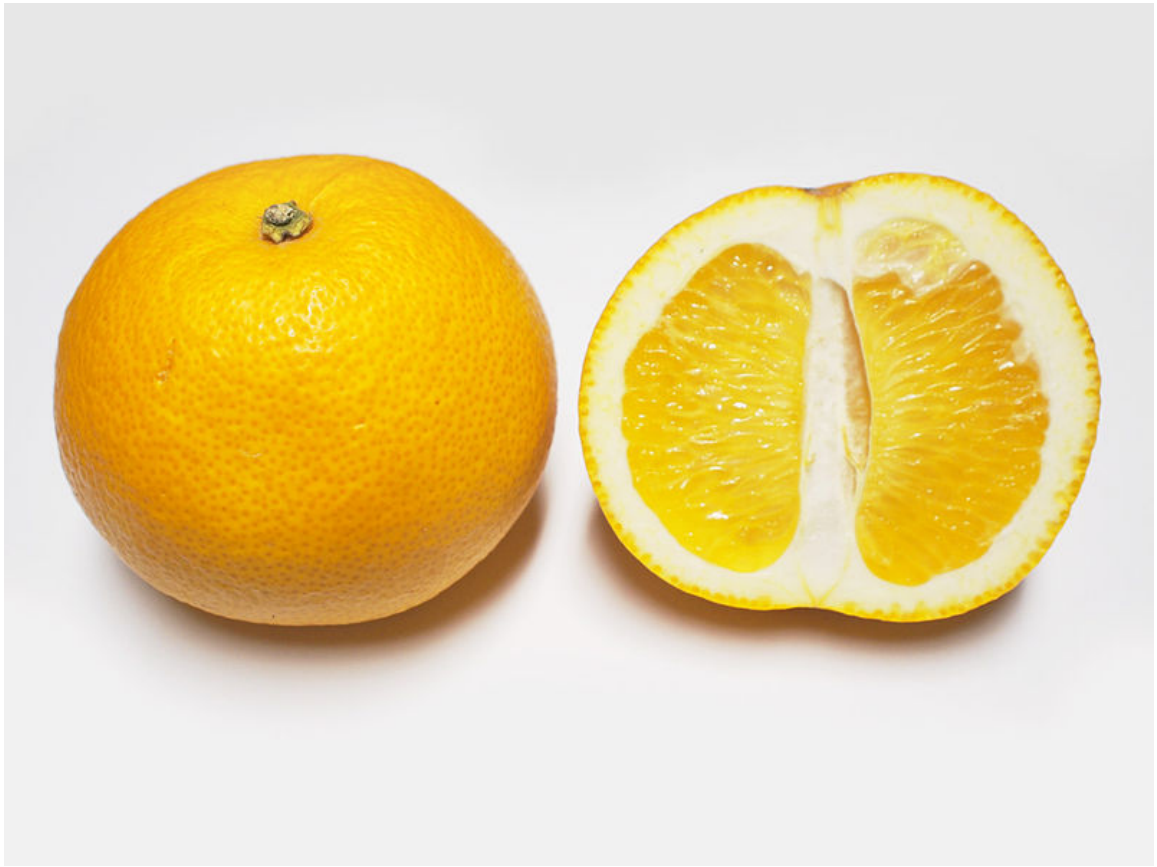
2. a typical or representative sample of a larger group.
   "a cross section of our senior managers"

verb

1. make a cross section of.
   "complex triangular terrain models for contour cross-sectioning"

https://translate.google.co.uk/#auto/en/cross-section

Cross-section 1



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Cross-section 1

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Cross-section 2

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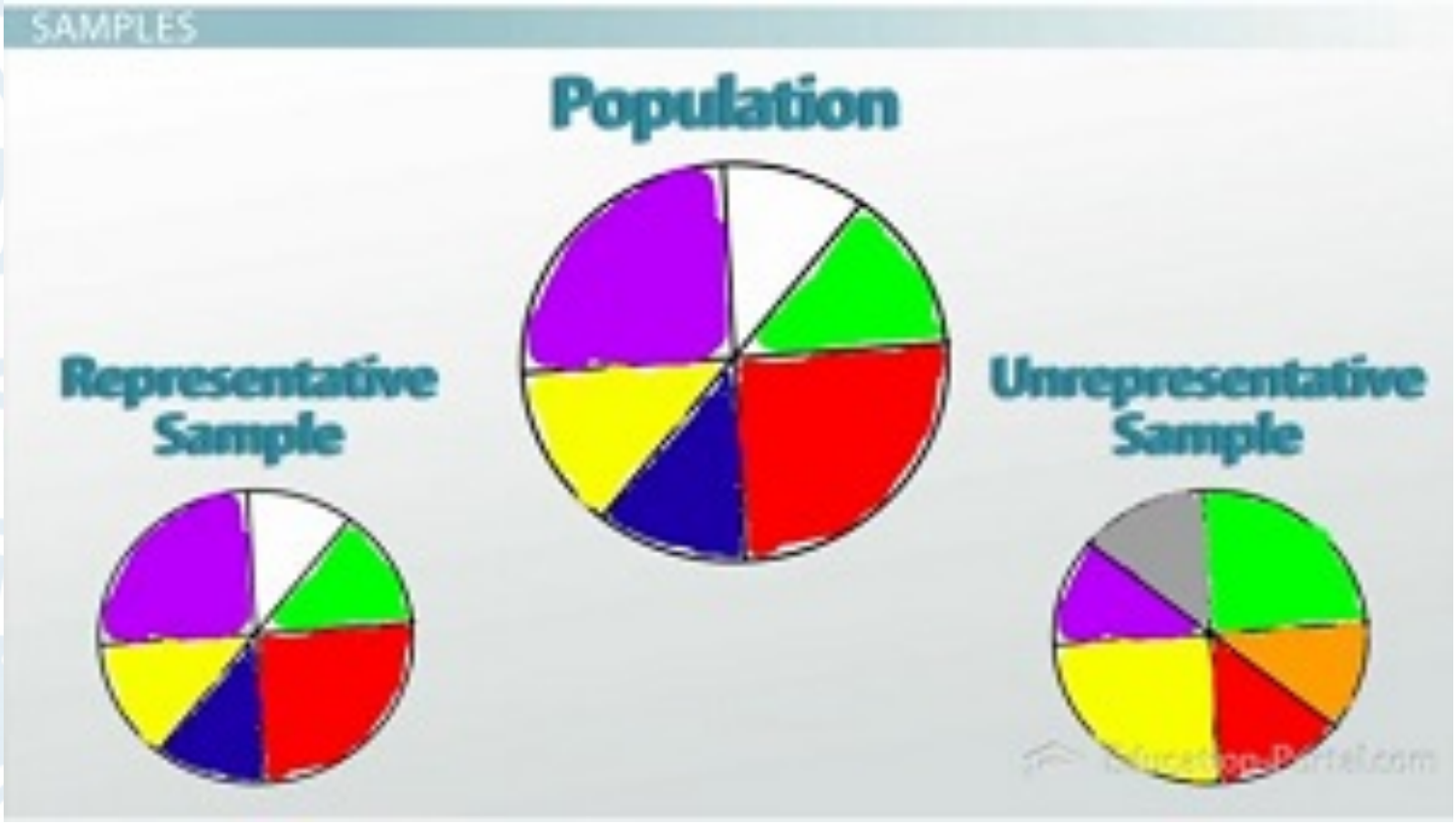

Types of CS design

- Descriptive
  - e.g. to assess the burden of a disease within a particular population at a point in time
- Analytical
  - E.g. to investigate the association between a putative risk factor and a health outcome
  - *But* limited ability to draw valid conclusions about the association between a risk factor and health outcome as all variables measured simultaneously
- Often, both elements are present in study designs

Example of CS study

- Cross sectional health surveys (see readings)
- Can establish the disease burden in a population at a point in time
  - Mortality and morbidity
- Can assess prevalence of risk factors for those diseases
  - E.g. correlations between behaviors (e.g. smoking) and conditions (e.g. cancer)
- May look at other variables such as attitudes and knowledge
- Need a random sample for valid data
- Issues with non-responses that can skew data

Disease prevalence

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Prevalence of chronic kidney disease in China: a cross-sectional survey

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Summary

Background The prevalence of chronic kidney disease is high in developing countries. However, no national survey of chronic kidney disease has been done incorporating both estimated glomerular filtration rate (eGFR) and albuminuria in a developing country with the economic diversity of China. We aimed to measure the prevalence of chronic kidney disease in China with such a survey.

Methods We did a cross-sectional survey of a nationally representative sample of Chinese adults. Chronic kidney disease was defined as eGFR less than 60 mL/min per 1·73 m² or the presence of albuminuria. Participants completed a lifestyle and medical history questionnaire and had their blood pressure measured, and blood and urine samples taken. Serum creatinine was measured and used to estimate glomerular filtration rate. Urinary albumin and creatinine were tested to assess albuminuria. The crude and adjusted prevalence of indicators of kidney damage were calculated and factors associated with the presence of chronic kidney disease analysed by logistic regression.

Findings 50 550 people were invited to participate, of whom 47 204 agreed. The adjusted prevalence of eGFR less than 60 mL/min per 1·73 m² was 1·7% (95% CI 1·5–1·9) and of albuminuria was 9·4% (8·9–10·0). The overall prevalence of chronic kidney disease was 10·8% (10·2–11·3); therefore the number of patients with chronic kidney disease in China is estimated to be about 119·5 million (112·9–125·0 million). In rural areas, economic development was independently associated with the presence of albuminuria. The prevalence of chronic kidney disease was high in north (16·9% [15·1–18·7]) and southwest (18·3% [16·4–20·4]) regions compared with other regions. Other factors independently associated with kidney damage were age, sex, hypertension, diabetes, history of cardiovascular disease, hyperuricaemia, area of residence, and economic status.

Interpretation Chronic kidney disease has become an important public health problem in China. Special attention should be paid to residents in economically improving rural areas and specific geographical regions in China.

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Lancet 2012; 379: 815–822

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Health service provision

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Trends in access to health services and financial protection in China between 2003 and 2011: a cross-sectional study

Qun Meng, Ling Xu, Yaoguang Zhang, Juncheng Qian, Min Cai, Ying Xin, Jun Gao, Ke Xu, J Ties Boerma, Sarah L Barber

Summary

Background In the past decade, the Government of China initiated health-care reforms to achieve universal access to health care by 2020. We assessed trends in health-care access and financial protection between 2003, and 2011, nationwide.

Methods We used data from the 2003, 2008, and 2011 National Health Services Survey (NHSS), which used multistage stratified cluster sampling to select 94 of 2859 counties from China's 31 provinces and municipalities. The 2011 survey was done with a subset of the NHSS sampling frame to monitor key indicators after the national health-care reforms were announced in 2009. Three sets of indicators were chosen to measure trends in access to coverage, health-care activities, and financial protection. Data were disaggregated by urban or rural residence and by three geographical regions: east, central, and west, and by household income. We examined change in equity across and within regions.

Findings The number of households interviewed was 57 023 in 2003, 56 456 in 2008, and 18 822 in 2011. Response rates were 98·3%, 95·0%, and 95·5%, respectively. The number of individuals interviewed was 193 689 in 2003, 177 501 in 2008, and 59 835 in 2011. Between 2003 and 2011, insurance coverage increased from 29·7% (57 526 of 193 689) to 95·7% (57 262 of 59 835, p<0·0001). The average share of inpatient costs reimbursed from insurance increased from 14·4 (13·7–15·1) in 2003 to 46·9 (44·7–49·1) in 2011 (p<0·0001). Hospital delivery rates averaged 95·8% (1219 of 1272) in 2011. Hospital admissions increased 2·5 times to 8·8% (5288 of 59 835, p<0·0001) in 2011 from 3·6% (6981 of 193 689) in 2003. 12·9% of households (2425 of 18 800) had catastrophic health expenses in 2011. Caesarean section rates increased from 19·2% (736 of 3835) to 36·3% (443 of 1221, p<0·0001) between 2003 and 2011.

Interpretation Remarkable increases in insurance coverage and inpatient reimbursement were accompanied by increased use and coverage of health care. Important advances have been made in achieving equal access to services and insurance coverage across and within regions. However, these increases have not been accompanied by reductions in catastrophic health expenses. With the achievement of basic health-services coverage, future challenges include stronger risk protection, and greater efficiency and quality of care.

Lancet 2012; 379: 805–14

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You need to think about...

- What phenomena are we examining?
  - Which policies; processes; practices; rules; individuals; populations, etc
- How can key concepts/variables we examine be operationalised?
  - What do we want to examine e.g. good quality, trust in provider, motivation
  - How can we see, interpret, understand, measure
  - what role for theory?
- What data sources (e.g. people, documents, records) and forms (e.g. numerical, talk, text) are *relevant*?
- What sampling approach is *relevant*? Random, purposive ?

Think about…

- What are most *appropriate* data collection tools?
  - e.g. structured questionnaire or in-depth interview?
  - e.g. epidemiological and other quantitative data?
  - e.g. record audit or analysis of documents?

- What are most *appropriate* analysis strategies?
  - deductive vs. inductive analysis?
  - what role for theory?

- What are *relevant* analysis steps?
  - e.g. DCE steps, statistical modeling, stakeholder analysis, causal loop diagrams

Strengths of CS Design

- Relatively quick and easy to conduct (no long periods of follow-up)
- Data on all variables is only collected once
- Able to measure prevalence for all factors under investigation
- Multiple outcomes and exposures can be studied
- Important for assessing the prevalence / burden of disease in a specified population and in planning and allocating health resources
- Good for descriptive analyses and for generating hypotheses

Weaknesses of CS Design

- Difficult to determine whether the outcome followed exposure in time or exposure resulted from the outcome.
- Not suitable for studying rare diseases or diseases with a short duration.
- As cross-sectional studies measure prevalent rather than incident cases, the data will always reflect determinants of survival as well as aetiology
- Unable to measure incidence.
- Associations identified may be difficult to interpret.
- Susceptible to bias due to low response and misclassification due to recall bias.

Longitudinal design

- Used to explore, describe or explain how phenomena develops over time
  - Examine how policies; processes; practices; rules; organisations etc change/ stay the same
  - Assess the impact of interventions (before and after studies)
- Can establish sequences (and consequences) of events
  - Can study cause and effect
- Can detect changes in a target population at the group and individual level

Definition...

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longitudinal

/ˌlɒŋgɪˈtjuːdɪn(ə)l, ˌlɒn(d)ʒɪˈtjuːdɪn(ə)l/

adjective
adjective: **longitudinal**

1. running lengthwise rather than across.
   "longitudinal muscles"
2. relating to longitude; measured from east to west.
   "longitudinal positions"
3. (of research or data) involving information about an individual or group gathered over a long period of time.
   "a longitudinal study of ten patients"

Longitudinal design

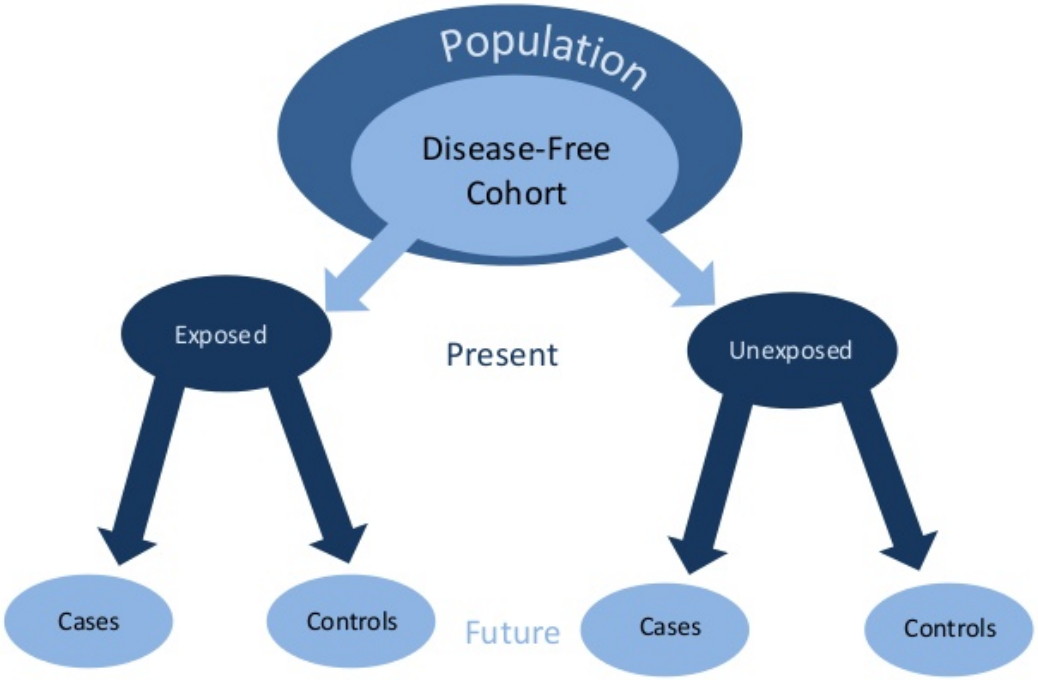
Types of longitudinal study

- Repeated cross sectional studies (surveys)
  - Same study repeated at different points in time with different sample of respondents
  - Focus on population-level change
  - e.g. General Household Survey (UK); Eurobarometer (EU)

- Representative panels
  - Repeated data collection with same sample of respondents at different time points
  - Allow researchers to monitor individual level change
  - E.g. British Household Panel Survey (UK); Panel Study of income Dynamics (US)

- Cohort panels
  - Panel study of a specific generation (often from birth over the life course)
  - Studies long term change
  - E.g. Life History Study (Germany); National Child Development Study (UK)

Panel studies



6th Clinical Methodology Research Course, Dr. Hawazen Zarif, 2014, http://www.slideshare.net/RSS6/study-design-36105826

Chinese cohort study

Int. J. Epidemiol. Advance Access published December 12, 2012

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International Journal of Epidemiology 2012;1–8
doi:10.1093/ije/dys203

COHORT PROFILE

Cohort Profile: The China Health and Retirement Longitudinal Study (CHARLS)

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RESEARCH Open Access

Longitudinal study of rural health workforce in five counties in China: research design and baseline description

Huiwen Xu†, Weijun Zhang†, Xiulan Zhang, Zhiyong Qu, Xiaohua Wang, Zhihong Sa, Yafang Li, Shuliang Zhao, Xuan Qi and Donghua Tian*

Abstract

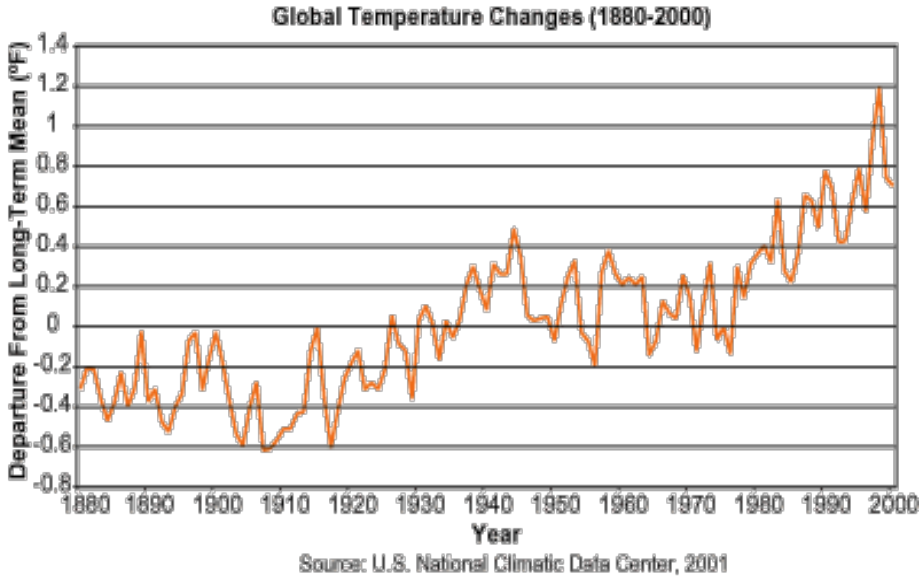
Background: The village doctors have served rural residents for many decades in China, and their role in rural health system has been highly praised in the world; unfortunately, less attention has been paid to the health workforce during the ambitious healthcare reform in recent years. Therefore, we conducted a longitudinal study to explore the current situation and track the future evolution of the rural healthcare workforce.

Think about

- What do you want to measure?
- Are you interested in individual or group level
- Repeated cross sectional designs can't trace individual level developments or those within cohorts
- How can you prove causation (versus correlation)

Strengths

- Allow changes to be measured over time and patterns to emerge
- Allows causes and effects to be identified
- *But*, beware confounding variables



Global Temperature Changes (1880-2000), U.S. National Climatic Data Center, 2001, http://lwf.ncdc.noaa.gov/oa/climate/climateresearch.html

Weaknesses

- Cost: expensive to administer and sustain; labour intensive
- Time
  - Often 'large n' studies so each survey point is time consuming to complete
  - long lead time for results
- Panel attrition (people dropping out/ losing contact)
  - Can affect the representativeness of the cohort and thus the robustness of results
- Panel conditioning
  - Answers affected by previous answers given; respondents change as a result of participating/ being studies
- Lack of information between survey points
  - Additional data is needed to triangulate results and make sense of them

Combining studies

- Longitudinal studies can be combined with or may complement cross-sectional studies

- Cross sectional studies can identify relationships between factors (hypotheses) which can be examined (tested) over time by longitudinal analyses

- Possibility for ‘data crossover’

Data cross-over

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Health system strengthening and hypertension awareness, treatment and control: data from the China Health and Retirement Longitudinal Study

Xing Lin Feng,[a] Mingfan Pang[a] & John Beard[b]

Objective To monitor hypertension prevalence, awareness, treatment and control in China two to three years after major reform of the health system.

Methods Data from a national survey conducted in 2011–2012 among Chinese people aged 45 years or older – which included detailed anthropometric measurements – were used to estimate the prevalence of hypertension and the percentages of hypertensive individuals who were unaware of, receiving no treatment for, and/or not controlling their hypertension well. Modified Poisson regressions were used to estimate relative risks (RRs).

Findings At the time of the survey, nearly 40% of Chinese people aged 45 years or older had a hypertensive disorder. Of the individuals with hypertension, more than 40% were unaware of their condition, about 50% were receiving no medication for it and about 80% were not controlling it well. Compared with the other hypertensive individuals, those who were members of insurance schemes that covered the costs of outpatient care were more likely to be aware of their hypertension (adjusted RR, aRR: 0.737; 95% confidence interval, CI: 0.619–0.878) to be receiving treatment for it (aRR: 0.795; 95% CI: 0.680–0.929) and to be controlling it effectively (aRR: 0.903; 95% CI: 0.817–0.996).

Conclusion In China many cases of hypertension are going undetected and untreated, even though the health system appears to deliver effective care to individuals who are aware of their hypertension. A reduction in the costs of outpatient care to patients would probably improve the management of hypertension in China.

Summary

- Cross sectional and longitudinal studies measure different things and answer different questions
- There are strengths and weaknesses of each type of study which the researcher must be aware of
- They can be combined in multi-methods studies
- Both are relevant for health services research

Exercise

- Each group is assigned 1 article from the lecture
- In your groups discuss the article (25 mins) and prepare a short presentation (5 minutes) to report back to the group about its findings
- These Questions will help guide your discussion:
  - What are the main research questions addressed in the article?
  - What is the relevance of this research for health services?
  - What study design do the authors use?
  - Is this the best approach to use to answer their questions?
  - What other methods could they have used
    - What extra information would these give us?
  - What other research does the article draw on?
  - What other research is needed to understand the issue from a health services perspective?
  - What other interesting aspects are there to the article

Acknowledgements

Some of the material in this presentation is drawn from:

- *Introduction to Health Policy and Systems Research, course presentation, Presentation 7,* Copyright CHEPSAA (Consortium for Health Policy & Systems Analysis in Africa) 2014, www.hpsa-africa.org , www.slideshare.net/hpsa_africa
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- *6th Clinical Methodology Research Course,* Dr. Hawazen Zarif, 2014, http://www.slideshare.net/RSS6/study-design-36105826
- *Global Temperature Changes (1880-2000)*, U.S. National Climatic Data Center, 2001, http://lwf.ncdc.noaa.gov/oa/climate/climateresearch.html

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