INNOVATIONS IN AUSTRALIAN MORTALITY RESEARCH: ANALYSIS, MODELS AND METHODS

DATE  Monday 11 November 2013
TIME  8.40 am to 5:20 pm
LOCATION  Lecture Theatre 2, Hedley Bull Centre
           Building 130, cnr of Liversidge St and Garran Rd

Welcome

The focus of this Workshop is innovation in Australian mortality analysis and methods for mortality research. Interest in mortality research has increased rapidly over the last decade, fuelled by concerns such as the ageing of the population, how long we will live, the demand for aged care and how to finance it, closing the (Indigenous) gap in infant mortality and life expectancy, and the effect of climate change on human survival. This Workshop provides a timely opportunity for the Australian demographic, actuarial and mortality-interested research community to come together to focus on these and other issues in Australian mortality research. The aims of the Workshop are to provide a forum to showcase research on Australian mortality, to facilitate the exchange of ideas and discussion, and to foster interdisciplinary research collaboration.

The Workshop is supported by an ANU College of Arts and Social Sciences (CASS) Workshop Grant and by the ANU College of Business and Economics Research School of Finance, Actuarial Studies and Applied Statistics (RSFAS). It is an activity of the Group on Longevity, Ageing and Mortality (GLAM), situated in the Australian Demographic and Social Research Institute (ADSRI/CASS).

Thank you for participating in the Workshop. We hope you will both benefit from the papers presented and contribute through discussion.

Heather Booth (ADSRI) and Bridget Browne (RSFAS)
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1.1 Alcohol consumption and mortality

Richard Rogers, Director of the Population Program, Institute of Behavioral Science, and Professor of Sociology, University of Colorado Boulder

Even though more developed countries have witnessed incredible improvements in life expectancy over the last several decades, substantial differences persist among health behaviors, including alcohol consumption. The association between drinking and the risk of death is multidimensional and complex. For example, light alcohol consumption can provide health benefits, whereas heavy alcohol consumption increases the risk of illness, social conflict, disability, and death. Interestingly, the relationship between drinking and mortality risk varies by drinking status and patterns, the reasons individuals abstain from drinking, and drinking-related problems. This presentation will review and provide insightful perspectives for better understanding the association between drinking and mortality risk, provide new findings on a variety of drinking factors and the risk of death, and speculate about the impact of alcohol consumption on potential future advances in life expectancy. Our findings address an important gap in the literature, underscore the need to collect additional data on alcohol consumption, and may ultimately contribute to reductions in alcohol abuse, increases in health, and longer lives.

1.2 A Long Look Back: Nineteenth-Century Mortality and Epidemiological Transition in Australia

Michael de Looper, PhD candidate, Australian Demographic and Social Research Institute, ANU

Analyses of national mortality data in Australia generally date back to the forming of the Commonwealth Bureau of Census and Statistics in 1905. Yet detailed information is available from the beginnings of vital registration in the colonies in the mid-nineteenth century, and in the case of Tasmania, as far back as 1838. Abstracts of mortality were published by colonial registrars and statisticians. Although not without problems, these abstracts can be compiled to allow for the examination of the course of mortality in Australia, during a time when the epidemiological transition gathered pace. All-cause mortality fell from around 2,000 per 100,000 population in 1860—a year of fearsome epidemics—to 1,000 in 1906, with a crucial turning point in 1885. Life expectancy at birth rose from 43 years for males and 46 for females, to 54 and 58. More than half of the improvement was contributed by the reduction in under-5 mortality. Two key components were declines in infant deaths from gastrointestinal infections, and in tuberculosis mortality. With scientific medicine largely absent, social and environmental factors—the conditions in which people live, grow, work and age—emerge as major determinants in this early phase of the epidemiological transition.

1.3 Understanding recent trends in Australian mortality: A decomposition analysis of life expectancy change by age and cause

Leonie Tickle, Department of Applied Finance and Actuarial Studies, Macquarie University

The last century has seen a dramatic decline in the level of mortality. Life expectancy at birth in Australia increased from 57 years in 1901-10 to 74 years in 1979 and to 82 years in 2011, and similarly striking changes have been observed in other populations. Some indication of the drivers underlying mortality change may be gleaned from identifying the age-groups and causes which have contributed most to this mortality decline. Based on data from the World Health Organisation Mortality Database, this study uses the decomposition method to investigate the extent to which mortality improvements in different age-groups and for selected causes of death have contributed to increases in life expectancy at birth in Australia over the period 1979 to 2011. Age groups over 50 have contributed most to improving life expectancy over the period, with a tendency for relatively larger contributions from increasingly older groups over time. The key cause groups contributing to improvements in life expectancy over the period are ischaemic heart disease, cerebrovascular disease, other circulatory diseases and transport accidents.
ABSTRACTS – Session 2

2.1  An enhanced mortality database for estimating Indigenous life expectancy

Len Smith, Australian Demographic and Social Research Institute, ANU

COAG has undertaken to eliminate the gap in Indigenous life expectancy within a generation, but information to assess progress is inadequate. While deaths of Aboriginal and Torres Strait Islander Australians are generally included in Australia’s national deaths database, they are often not identified as Indigenous. With support from COAG and the cooperation of ABS, the Department of Health and Ageing, and the State and Territory Health Departments and Registrars of births deaths and marriages, AIHW has established an enhanced mortality database with improved identification of Indigenous deaths. Deaths identified as Indigenous in records of hospital admissions, residential aged care and perinatal care are compared with those identified in death registrations, and a new Indigenous identifier created which combines the information from all sources.

A feasibility study using deaths data from 2001-2007 yielded maximum estimates of Indigenous life expectancy which were comparable to the best estimates obtained by ABS based on census linkage, and highlighted issues of data access, data quality and validation. The Institute is now extending the database, to discern trends over time in Indigenous life expectancy and progress towards the COAG goal, and will validate the enhanced identification against Native Title records.

2.2  What can we learn from multiple-cause-of-death data? —The example for cardiovascular disease mortality in two Chinese cities

Jiaying Zhao, National Center for Epidemiology & Population Health, ANU

The decline in cardiovascular disease (CVD) mortality was a major contributor to increase in life expectancy from seventies to eighties. However, how this decline related to changes in disease prevalence has not yet well studied. This paper, using multiple-cause-of-death data (MCD) in Shanghai and Taipei, examines changes in CVD mortality in the full pattern of conditions reported at death. The analysis suggests that the lethality of CVD in Shanghai and Taipei had been progressively reduced. It also provides information on the associations of causes involving the death process. Using the number of recorded conditions (NRC) on death certificates, the result is compatible with the hypothesis that the comorbidity of CVD with other diseases at time of death is gradually increasing, with a reduction in the lethality of CVD over time.

2.3  The impact of extreme temperature on mortality

Zhongwei Zhao, Australian Demographic and Social Research Institute, ANU

There has been extensive evidence showing that world temperature has increased in recent history and this trend is most likely to continue in the foreseeable future. Accompanying this change, there has been also an increase in extreme climate events (Hale, Edwards and Kovats 2003; Goklany 2007; Deschenes and Moretti 2009). These changes are expected to have some devastating impacts on the future of the planet and humankind. Despite that, however, considerable uncertainty about the precise nature, severity, location and impact of these changes remains. There is a great urgency to improve our knowledge on these issues. One of such issues is the impact of extreme weather conditions on population health and mortality. This presentation will discuss the following questions: 1) Is high or low temperature recorded over a period (for example a year) related to the rise of mortality in a population? 2) Is unusually high or low temperature recorded in the same time period (for example January) of different years related to a mortality increase? 3) Have there been major changes in the relationship between extreme temperature and mortality over time? And 4) Who were more likely to die (or more vulnerable) when there was extreme temperature?
ABSTRACTS – Session 3

3.1  Mortality of Australian Public Sector Pensioners

Martin Stevenson

Every three years Mercer produces the Pensioner Mortality investigation (PMI) which analyses the mortality experience of pensioners of public sector schemes from the Commonwealth of Australia, New South Wales, Victoria, Queensland, South Australia, Western Australia and Tasmania. The paper sets out the results of the analysis based on data from the Mercer pensioner database for both the decade to 30 June 2012 and the experience over the more recent period, 1 July 2009 to 30 June 2012. The previous PMI paper covered the period to 30 June 2009.

3.2  Recent Australian insured lives mortality: a review of the Actuaries Institute/FSC 2004-2008 Lump Sum Investigation

Bridget Browne, Research School of Finance, Actuarial Studies and Applied Statistics, ANU

The Graduation Taskforce of the Australian Institute of Actuaries recently published a report “Graduation of the 2004-2008 Lump Sum Investigation Data”. This is now the most recent publically available report on Australian insured lives’ mortality experience. The tables in that report are compared with, on the one hand, contemporary Australian population mortality, and on the other, the preceding Australian insured lives tables, IA95-97. Thus the paper reports and comments on the level of insured lives’ mortality compared to that of the total population as well as changes in both of these over the 10 year period from 1996 to 2006.

3.3  Impact of Economic Cycles on Mortality: The Australian Context

Gaurav Khemka, Research School of Finance, Actuarial Studies and Applied Statistics, ANU

In many countries it has been established that short-run cyclical patterns in mortality are associated with economic fluctuations. This study aims to investigate the pattern of cyclical mortality in Australia, that is, whether increases or decreases in mortality rates are associated with changes in the economy. Employing logistic fixed-effects models, we show that there is a significant counter-cyclical pattern of mortality (mortality increases during economic contractions) in the general Australian population, over the period 1985-2008. This is an important finding that suggests that during downturns in the economy steps taken to stimulate the economy could, apart from other benefits, help reduce the associated increase in mortality. Evidence in the literature suggests that the pattern of cyclical mortality experienced in other countries is varied. Drawing from this literature, we argue that one reason for the observed counter-cyclical mortality in Australia is the country’s relatively high level of social security expenditure.
Workshop on innovations in Australian mortality research: analysis, models and methods

ABSTRACTS – Session 4

4.1 Developments in mortality forecasting methods with application to Australian data

Heather Booth, Australian Demographic and Social Research Institute, ANU

Mortality forecasting has come a long way since the seminal work of Lee and Carter was published twenty years ago. Among the methodological developments of this single principal component model is the use of functional data modelling and multiple principal components. This functional forecasting method has the advantages of smooth functions, improved uncertainty estimation and greater accuracy than some of the earlier forecasting models. A recent development is the product-ratio method for coherent forecasting of two or more theoretically-related mortality schedules, such as the male and female schedules for a nation. This method is applied to Australian data for males and females and for the Australian states. The advantages of the method include greater forecast accuracy and reduced variation in accuracy across subpopulations.

4.2 Projecting Australian Mortality: the CMI Mortality Projection Model

Chen Tang, Research School of Finance, Actuarial Studies and Applied Statistics, ANU

We project Australian mortality using the Continuous Mortality Investigation (CMI) Projection Model approach. In contrast to many projections, which often use extrapolation approaches, the CMI Projection Model is an approach based on expectation. By selecting a base rate of mortality, initial and long-term rates of mortality change, and a structure for convergence from one to the other, we can project future mortality rates. Our results reveal that the projection initially follows past experience, and that the projection results are sensitive the structure of convergence. A comparison is made between our projection results and results based on rates of change produced by the Australian Government Actuary (AGA), which is a major public reference for actuarial projections. This study provides an alternative approach to projecting mortality rates.

4.3 Future changes in disease-specific mortality rates

Richard Cumpston, Research School of Finance, Actuarial Studies and Applied Statistics, ANU

The author is involved in the construction of household microsimulation models for Australia and New Zealand. These models are broadly based on Australian Institute of Health and Welfare (AIHW) models of incidence rates and development for many diseases. Deaths of individuals are simulated using disease-specific mortality rates, rather than general population rates. Mortality rates for specific diseases are sometimes poorly defined in the AIHW models, particularly for disease stages with high mortality rates. No expert assumptions are generally available about future changes in disease-specific mortality rates. Can the present AIHW burden of disease study provide better-defined mortality rates, as well as long-term future estimates?
Workshop on innovations in Australian mortality research: analysis, models and methods

BIOGRAPHIES

Session 1

Richard Rogers

Richard Rogers is Director of the Population Program, Institute of Behavioral Science, and Professor of Sociology, University of Colorado Boulder. His major research interests focus on differences in adult mortality by demographic characteristics, socioeconomic status, social relations, health behaviors, and health conditions. Rogers and Eileen Crimmins recently co-edited the International Handbook of Adult Mortality (Springer).

Michael de Looper

Michael de Looper is a Senior Analyst at the Australian Institute of Health and Welfare. He has recently returned from overseas, where he worked in the Health Division of the Organisation for Economic Co-Operation and Development. He is currently finishing his PhD through ADSRI at the Australian National University. Michael is interested in the intersection of demography, epidemiology and history.

Leonie Tickle

Leonie Tickle is an actuary and an Associate Professor in Actuarial Studies at Macquarie University. Her research focuses on the modelling, analysis and forecasting of mortality in the general population and for insured lives, and she has received the H M Jackson and the A M Parker prizes of the Institute of Actuaries of Australia for this work. She has also conducted research on indigenous mortality, financial literacy and learning and teaching in higher education.

Session 2

Len Smith

Len Smith works in demography, epidemiology and prosopography, and has visiting appointments at ANU, Melbourne and Charles Darwin. Current projects include work with AIHW on estimating Indigenous life expectancy, with colleagues from Melbourne and Tasmania on the historical demography and epidemiology of Aboriginal Victorians and Tasmanian convicts and their descendants, with colleagues from Waikato, Melbourne and Umea on colonialism and the health transition, with colleagues from Melbourne on the development of open source semantic web based genealogy and prosopography database software, and with colleagues from Stats New Zealand on Bayesian demographic estimation.

Jiaying Zhao

Jiaying Zhao is a Post-doc fellow with the National Center for Epidemiology & Population Health at the Australian National University (ANU). She finished her PhD training in Australian Demographic & Social Research Institute at ANU. Her research interests include population ageing, mortality, socioeconomic determinants of health, and policy implications.

Zhongwei Zhao

Zhongwei Zhao graduated from University of Cambridge (PhD), University of Exeter (MA), and Peking University (BA). Since 2008, he has been a Professor at the Australian Demographic and Social Research Institute, the Australian National University. Prior to taking up the present appointment, he was a senior fellow/research fellow at the Demography Program, Research School of Social Sciences, Australian National University, a senior research associate at the Cambridge Group for the History of population and Social Structure, a Bye-Fellow at Pembroke College, University of Cambridge. Zhongwei Zhao has been doing research in the following areas: Environmental impacts on population health and mortality; Mortality and fertility transition in East Asia, especially China; China’s far below replacement fertility and evaluation of China’s demographic data; Computer micro-simulation in demographic research; Historical demography; Changes in families, households and kinship networks; Demographic estimation and mortality models; and Demographic impact of famines. He has published many papers in world leading demographic journals.
Session 3

Martin Stevenson

Martin is a recently retired Partner at Mercer, where he consulted on all aspects of superannuation. His client base included major private sector and public sector institutions and funds. He was Mercer’s Asia Pacific Head of post retirement solutions. Martin has been President of the Actuaries Institute of Australia, and was the founder of the International Actuarial Association’s Mortality Working Group which he chaired until last month. He is currently a Non-Executive Director of Mercer’s superannuation trusts in Australia and New Zealand, a consultant to one of the largest superannuation funds in Australia and is Chair of the Actuaries Institute’s International Council Committee.

Bridget Browne

Bridget Browne is a Senior Lecturer in Actuarial Studies at the Australian National University in Canberra. She joined ANU in 2011 after serving as Life Chief Pricing Actuary at Partner Reinsurance Europe Ltd where she was responsible for all aspects of pricing of Partner Re’s Life portfolio worldwide, including the full range of traditional and alternative mortality and longevity transactions. Prior to her work with Partner Re, Bridget worked in a variety of actuarial roles with Zurich Financial Services and Hazell Carr. Bridget is a member of the Mortality Working Group of the International Actuarial Association and a Fellow of both the Australian and UK actuarial institutes. Her research interests include life insurance, longevity, long-term care, mortality modelling, and life insurance-linked securities.

Gaurav Khemka

Gaurav Khemka is a recent PhD graduate in Actuarial Studies and currently a lecturer at the Research School of Finance, Actuarial Studies and Applied Statistics at ANU. His areas of interest are mortality, superannuation and post retirement products along with long term care products.

Session 4

Heather Booth

Heather Booth is Associate Professor of Demography at the Australian Demographic and Social Research Institute (ADSRI) in the ANU College of Arts and Social Sciences. She leads the ADSRI Group on Longevity, Ageing and Mortality (GLAM), and was Founding Editor of the Journal of Population Research (JPR). Heather has held positions at the London School of Economics, the University of North Carolina at Chapel Hill, and the South Pacific Commission, in a career spanning over 30 years’ experience in demographic research. Her current interests are in mortality forecasting and the socio-demography of ageing.

Chen Tang

Chen Tang is a 2013 Honours student in Actuarial Studies in the Research School of Finance, Actuarial Studies and Applied Statistics at ANU.

Richard Cumpston

Richard Cumpston is a director of Australian Projections Pty Ltd, a company formed to commercialise the microsimulation methods he developed for his ANU PhD thesis. He is a visitor at the ANU Research School of Finance, Actuarial Studies and Applied Statistics. He was a consulting actuary until 2007, when he resigned from Cumpston Sarjeant Pty Ltd.