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**MORE THAN JUST POPULATION AGEING: AN EVALUATION USING DYNAMIC  
MICROSIMULATION OF THE ESCALATION OF AUSTRALIAN GOVERNMENT  
EXPENDITURE ON HEALTH OVER THE NEXT 40 YEARS.**

A thesis submitted in fulfilment for the Doctor of Philosophy of the University of  
Canberra

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## ABSTRACT

Health of the ageing population has the potential to place fiscal pressure on future Australian governments. The aim of this research was to build a dynamic microsimulation model of the Australian health system to evaluate the impact of an ageing population on government health expenditure, as well as consider the moderating effects of the population's health status and health behaviour profiles. As a modelling platform, the Australian Population and Policy Simulator (APPSIM) was used to provide the basefile and inform general socio-economic parameter inputs across time. This allowed the consideration of health from a wider socio-economic perspective including factors such as education, income and labour force status. Further, the module was developed to consider health risk behaviours, as well as general health status and their resultant impacts on health service usage and expenditure. Generalised linear models were used for both the baseline imputation and the transitioning through time of the individual's health characteristics. Development of equations to inform the transition of an individual's health status and obesity status used both socio-economic explanatory variables and lagged dependant variables, due to the strong persistence of health characteristics.

Validation to look at the quality of the health module has included comparative analysis with external data. Both cross-sectional and longitudinal comparisons have been used in the validation. To demonstrate the capacity of the health module and its ability to evaluate possible policy levers, scenarios around shifts in population levels primarily of obesity and secondarily of physical activity have been completed. In comparison with the baseline simulations, which project an ageing population and allows the probability equations of the model to operate as is, scenarios that increase obesity have substantial effect on the population health profile and associated health expenditure. Also, there are substantial gains to be made with respect to the population health profile with decreases in the prevalence of inadequate physical activity. Under the assumptions of this modelling, change in physical activity offered more potential to improve health due to it acting on health both directly but also on health through obesity, than only changing obesity levels within the population. The health module that has been developed offers a framework from which relevant policy levers can be examined. It also provides a starting point for the development of more sophisticated relationships associated with the health system within a dynamic microsimulation model.

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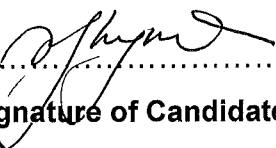
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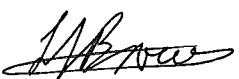
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## ABBREVIATIONS

ABS	Australian Bureau of Statistics
ACE	Angiotensin Converting Enzyme
ADL	Activities of Daily Living
AIHW	Australian Institute of Health and Welfare
AHCA	Australian Health Care Agreement
Alc.	Alcohol
ALSA	Australian Longitudinal Survey of Ageing
ANU	Australian National University
APPSIM	Australian Population and Policy Simulator
AUSDIAB	Australian Diabetes Survey
ARC	Australian Research Council
BMI	Body Mass Index
CATI	Computer Assisted Telephone Interview
CD	Collection District
cdf	Cumulative Distribution Function
CHD	Coronary Heart Disease
COA	Chronic Obstructed Airways
COAG	Council of Australian Governments
COPD	Chronic Obstructive Pulmonary Disease
CI	Confidence Interval
CPI	Consumer Price Index
CSM	Continuing Sample Members
CSV	Comma-Separated Values
CURF	Confidentialised Unit Record File
df	Degrees of Freedom
DMSM	Dynamic Microsimulation
DoHA	Department of Health and Ageing
DVA	Department of Veterans Affairs
EMSN	Extended Medicare Safety Net
ERP	Estimated Resident Population
FEM	Future Elderly Model
FT	Full-Time
GDP	Gross Domestic Product
GLM	Generalised Linear Model
GP	General Practitioner
GST	Goods and Services Tax
HES	Household Expenditure Survey
HILDA	Household Income and Labour Dynamics of Australia
HH	Household
HT	Hypertension
IADL	Instrumental Activities of Daily Living
IGR	Intergenerational Report
LFS	Labour Force Status
LSAC	Longitudinal Survey of Australian Children
MBS	Medical Benefit Scheme
MCMC	Markov Chain Monte Carlo
MDC	Major Diagnostic Category

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MINT	Modelling Income in the Near Term
MSM	Microsimulation
NA	Not Applicable
NATSEM	National Centre for Social and Economic Modelling
NB	Negative Binomial
NDSHS	National Drug Strategy Household Survey
NHHRC	National Health and Hospitals Reform Commission
NHMRC	National Health and Medical Research Council
NHS	National Health Survey
NILF	Not in Labour Force
NHMD	National Hospital Morbidity Database
NHPA	National Health Priority Area
NOM	Number of Migrants
NPV	Negative Predictive Value
NSW	New South Wales
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PA	Physical Activity
PBAC	Pharmaceutical Benefits Advisory Committee
PBS	Pharmaceutical Benefits Scheme
PHI	Private Health Insurance
PHIAC	Private Health Insurance Administration Council
PPV	Positive predictive value
PT	Part-Time
PVD	Peripheral Vascular Disease
QALY	Quality Adjusted Life Years
RADL	Remote Access Data Laboratory
RPBS	Repatriation Pharmaceutical Benefits Scheme
SAHS	Self-Assessed Health Status
SCQ	Self Completed Questionnaire
SDAC	Survey of Disability Ageing and Carers
SEIFA	Socio-Economic Indexes for Areas
SNAP	Smoking, Nutrition, Alcohol and Physical Activity
SRCGSP	Steering Committee for the Review of Government Service Provision
SSP	Special Purpose Payments
TFR	Total Fertility Rate
TGA	Therapeutic Goods Administration
TRIM	The Transfer Income Model
TSM	Temporary Sample Member
UK	United Kingdom
USA	United States of America
WC	Waist Circumference
WHR	Waist Hip Ratio
WHO	World Health Organisation