

BMJ Open Health assets in older age: a systematic review

Yvonne Claire Hornby-Turner, Nancye May Peel, Ruth Eleanor Hubbard

To cite: Hornby-Turner YC, Peel NM, Hubbard RE. Health assets in older age: a systematic review. *BMJ Open* 2017;7:e013226. doi:10.1136/bmjopen-2016-013226

► Prepublication history and additional material are available. To view, these files please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2016-013226>).

Received 28 June 2016
Revised 20 March 2017
Accepted 31 March 2017

ABSTRACT

Background Finding ways to optimise health in older age is key to reducing the impact of population ageing on health and social care systems. A salutogenic approach takes into account an individual's health assets—internal or external strengths or accessible resources which improve and preserve physical, social and mental wellness, independence and quality of life. The aim of this narrative systematic review was to provide a summary and appraisal of the evidence for factors that act as health assets within personal, social, economic and environmental domains.

Methods Systematic searches of databases were conducted for literature published in peer-reviewed journals between January 2000 and November 2016. Selection criteria included community dwelling populations aged 65 years and over and publications written in English. Data on study population, design, measures of health status, factors within the four previously stated domains and results were extracted. Study quality was independently assessed using an appraisal instrument.

Results Twenty-three publications, including 78 422 participants, from more than 13 different countries were identified for inclusion in this review. There was strong evidence that higher scores of self-rated health, psychological well-being and life satisfaction were associated with better health in older age. Social network and contact with family and friends, and engagement in leisure and social activities were important support mechanisms. Education and financial resources consistently proved to be key economic health assets for older adults.

Conclusions Implementing an asset-based approach to health promotion uncovers the skills, knowledge, connections and potential of the individual and the community. This approach is an ideal opportunity for government health bodies and their partners to respond to the challenges faced by global ageing. Factors are often interdependent and cumulative, suggesting the potential for an instrument to measure the accumulated effect of health assets on health status in older adults.

INTRODUCTION

On a global level, people aged 65 years or older are the fastest growing segment of the population.¹ While global ageing is perceived as a success, the continued growth of this population will add increasing economic and social demands on all countries.² This demographic shift in global ageing also

Strengths and limitations of this study

- This review has evaluated an extensive range of health assets, highlighting the evidence for factors that positively influence health in older age.
- Of the studies identified for inclusion in this review, methodological differences in study design, follow-up periods, population samples and the way health assets and health status were measured precluded the pooling of results for meta-analysis.
- The cross-sectional designs of the majority of studies did not allow a cause-effect relationship to be examined between health asset indicators and subsequent health in older age.

entails fundamental social, economic and development challenges and opportunities, not the least of which is the increasing priority to meet the needs of older persons while enabling them to have longer, healthier and more productive lives.³ Identifying ways to enhance health and well-being in older age is key to reducing the impact of global ageing, and is therefore a fundamental issue for policy makers.¹

Based on the WHO definition, health in older age is described as a life course process of optimising opportunities for improving and preserving physical, social and mental wellness, independence, quality of life and enhancing successful transitions.^{2 4} This holistic definition recognises that health is multifactorial, spanning across the various domains of well-being. Hence, factors that influence health are complex and wide-ranging.

In 2002, WHO published the Active ageing: a policy framework.² This framework identifies six key domains of active ageing: economic, behavioural, personal, social, health and social services and the physical environment.² This framework highlights the need for quality evidence to support appropriate policies and programmes across all domains to promote health in older age.

Historically, approaches to the promotion of health have been based on an 'illness' model. The focus is mainly on risk factors



CrossMark

Centre for Research in Geriatric Medicine, Faculty of Medicine, The University of Queensland, Brisbane, Queensland, Australia

Correspondence to

Dr Yvonne Claire Hornby-Turner; y.hornbyturner@uq.edu.au

for disease ‘health deficits’, rather than those associated with improving health status. While the presence of risk factors increases the likelihood of poor health, their absence does not necessarily increase the likelihood of good health. This approach of identifying risk factors for disease is essential for understanding specific needs and priorities; however, it tends to define individuals in negative terms and may overlook important positive factors which improve public health.⁵

In contrast, a ‘wellness’ model accentuates a salutogenic approach, concerned with identifying protective factors, ‘health assets’, to support health and well-being, rather than those that cause disease.⁶ ‘Health assets’ are defined as an individual’s internal or external strengths or accessible resources which enhance ability to optimise health.^{5 7 8} Identifying ‘health assets’ that positively influence or are protective of health in older age will support the design of effective policies and programmes for the promotion of health in older age.

Previous reviews in this research area have examined the concept of health assets in a healthcare context.^{7 9} Other similar systematic reviews include Peel *et al*,¹⁰ who identified a broad range of behavioural predictors, and Depp and Jeste,¹¹ who examined demographic, psychosocial and biomedical correlates of successful ageing. To our knowledge, however, no other review has provided an overview of ‘health assets’ or positive health determinants, with a focus on personal, social, economic and environmental predictors of positive health in older age in community-dwelling adults.

The aim of this review was to conduct a narrative summary and appraisal of evidence, published from the year 2000 onwards, for factors that have potential to act as health assets and promote health in older age. Based on the WHO active ageing policy framework, factors within the personal, environmental, economic and social domains were selected with a focus on only those that are protective of health in older age and potentially amenable to change through policy or intervention. Behavioural and lifestyle factors were excluded from this review as they have been the subject of a previous systematic review.¹⁰

METHODS

Literature search

In October 2014, a systematic search of databases (PubMed, Medline, Embase, Cumulative index to nursing and allied health literature and PsycNet) for literature was undertaken to address the study question ‘What health assets positively influence health in older age?’ Furthermore, additional articles were identified by manually reviewing the reference lists of included papers. An updated literature search using the same methodology was conducted in November 2016. The search strategy for this literature search is presented in [table 1](#).

Titles were screened (YCH-T) for appropriateness. Two authors (YCH-T, NMP) independently reviewed abstracts to further eliminate studies not meeting the selection

Table 1 Search criteria

Outcome terms†	Health status OR successful ag*ing OR healthy ag*ing OR positive ag*ing OR ag*ing well OR longevity
	AND
Factor terms	Factor* OR predict* OR indicator* OR determinant
Filters	<ul style="list-style-type: none"> ▶ Published between January 2000 and November 2016 ▶ Human subjects ▶ English language ▶ Population aged 65 years or older

*Indicates the term is truncated or has spelling variation.

†These terms were adopted in search criteria since this nomenclature dominates the literature describing a multidimensional composite measure of health status in older age.¹⁰

criteria presented in [table 2](#). The full text of all remaining articles was retrieved and the decision to include in the review was made by two authors (YCH-T, NMP) in consultation with third author (REH) where doubt existed. In addition, reference lists of included articles were searched to identify other studies meeting the inclusion criteria.

Data extraction

Two authors (YCH-T and NMP) independently extracted the data on study population, study design, measures of health status, all modifiable social, personal, economic and environmental factors, analyses and results using a standardised spreadsheet. Data were compared and agreement on study variables reached by consensus. Study characteristics are reported in [table 3](#). Measurement of the outcome, health status as well as prevalence in the study population was documented. Factors that positively influenced (or were protective of) health status were classified under personal, social, economic and environmental domains.

Data synthesis and analysis

Data were synthesised and reported according to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement.¹² Due to the heterogeneity of study populations, outcome and predictor measures, a meta-analysis was not possible.

Study quality

Studies were evaluated for methodological quality using an appraisal instrument, previously proven to be a valid and reliable tool for use in epidemiological studies.¹³ Twenty questions relevant to comparative and observational studies were used from this instrument; scores for each question ranged from 2 to 0, depending on whether the question was fully, partially or not addressed. An average score was calculated for each study, which could then be classified into low-quality, medium-quality or high-quality categories. The criteria for quality assessment

Table 2 Selection criteria

Criteria	Included	Excluded
Publication type	<ul style="list-style-type: none"> ▶ Published in peer-reviewed scientific journals ▶ Reporting original research results ▶ Written in English 	<ul style="list-style-type: none"> ▶ Reviews, book chapters, editorials, dissertations, theses and conference abstracts ▶ ‘Grey’ literature
Study design	<ul style="list-style-type: none"> ▶ Observational studies with a primary aim to measure associations between key determinants and health in older age ▶ Quantitative studies 	<ul style="list-style-type: none"> ▶ Qualitative studies ▶ Studies evaluating models for healthy ageing
Population	<ul style="list-style-type: none"> ▶ Mean age at baseline ≥65 years ▶ Community dwelling 	<ul style="list-style-type: none"> ▶ Mean age at baseline <65 years ▶ Hospitalised, residing in long-term care or assisted living communities
Study factor domains	<ul style="list-style-type: none"> ▶ Personal ▶ Social ▶ Economic ▶ Environmental 	<ul style="list-style-type: none"> ▶ Behavioural or lifestyle factors * ▶ Factors which were part of multidomain outcome measure
Outcome measure	<ul style="list-style-type: none"> ▶ Health status to include a composite measure across multidomains of physical, mental and social well-being 	<ul style="list-style-type: none"> ▶ Health measured as a single item question, for example, self-reported health or life satisfaction

*Not included in this review as these factors have been a focus of a previous review.¹⁰

and the number of studies scoring a minimum of 1 point for each assessment item is included in Supplementary data 1. Study quality was independently assessed by two authors (YCH-T, NMP) based on the instrument guidelines.¹³

Review quality

A PRISMA 2009 checklist for this review is included in Supplementary data 2. This review is registered with prospective register of systematic reviews study ID: CRD42016035286.

RESULTS

The search of online databases in October 2014 identified 2819 publications. Following the exclusion of duplicates (from two or more databases) and the screening of titles and abstracts, 226 articles proceeded to full-text screening. Of these, 204 failed to meet the specified selection criteria (table 2), resulting in 22 eligible articles. Five articles were added following screening of references cited in eligible articles, taking the total number to 27. An updated literature search identified an additional three articles, as well as one article from searching the reference lists of these articles. Seven articles were excluded following the decision to remove papers reporting on factors associated with a negative health outcome (such as frailty). The final number of articles included in this review is 23. Figure 1 displays the flow diagram for selection of eligible articles for inclusion in the analysis.

Study characteristics

Study characteristics are reported in table 3. Publication dates of the 23 selected articles ranged from 2001 to 2016, analysing data from populations in the USA,^{14–17}

Canada,^{18 19} Asia,^{20–27} Europe,^{28–30} Australia,^{31–33} Mexico,³⁴ South America³⁵ and Africa.³⁶ Studies included 22 different population cohorts, with sample sizes ranging from 67 to 10048 participants and mean age between 70 and 87 years. Most studies included both males and females, in which the proportion of females varied from 39% to 82%. Two were male only.^{14 17} Cross-sectional analysis was used in 16 studies, with the remaining 7 studies^{14 17 19 25 29 32 36} using baseline data to predict subsequent health status.

Health status measures

All but one article investigated factors in relation to successful or healthy ageing. Studies used different definitions, with the majority basing health measures on the model of Rowe and Kahn,³⁷ who defined successful ageing as the avoidance of disease and disability, the maintenance of high physical and cognitive function and sustained engagement in social and productive activities. One article²⁵ measured health status using a health index, which, similar to the healthy ageing model, assessed physical and cognitive function, psychological well-being and subjective health to provide a composite measure. The prevalence of successful/healthy ageing ranged from 1% in the Hong Kong sample, meeting criteria for high functioning in all four domains (physical, affective and cognitive functioning and productive involvement),²¹ to 81% in a community sample from Singapore,²⁶ who met criteria on physical, mental and social health.

Determinants of health status

Personal

A total of 12 articles investigated personal factors as determinants of health status.^{14 17 18 20 21 24 27 29–31 33 36} Personal

Table 3 Characteristics of included studies

Author /year /country	Study name /design /data collection wave and year	Population / characteristics	Main outcome /how measured /prevalence	Predictors (health assets)	Findings
Andrews et al 2002 Australia ³¹	Australian longitudinal study of ageing Cross-sectional analysis of a population-based sample aged 70+ years Baseline 1992	n=1403 Age range 70–85+ years Female=40%	Successful ageing Met criteria for tests on cognitive and physical functioning and physical performance –High functioning=36% –Intermediate functioning=27% –Low functioning=37%	Personal – Self-rated health – Importance of religion – Self-esteem – Morale – Perceived control Social – Social participation (household, service to others) – Social activity	Factors associated with higher vs lower functioning in logistic regression: – Excellent/good self-rated health – Higher morale – Higher levels of activity (domestic, household, service to others) Study quality—high
Arias-Merino 2012 Mexico ³⁴	Health, well-being, and ageing study Cross-sectional analysis of a multistage, proportional, randomised sample of persons aged 60+ years	n=3116 Mean age (SD) 72 (9) Female=63%	Successful ageing Met criteria for chronic disease, disability, physical and cognitive functioning and being active –Successful ageing=13%	Social – Marital status Economic – Education – Income	Predictors of successful ageing in logistic regression: – Being married – Higher education Study quality—high
Bell et al 2014 USA ⁴	Hawaii lifespans study Longitudinal study of survivors from population-based 1965 Honolulu Heart Program Baseline 1991 FU 21 years to 2012	n=1292 Mean age (SD)=76 (3) All male	Healthy ageing Met criteria for physical and cognitive function and absence of clinical disease. –Healthy survivors=34% –Unhealthy survivors=43% Non-survivors=23%	Personal – Self-rated health Social – Marital status Economic – Education	Predictors of unhealthy vs healthy survival in logistic regression: – Fair or poor self-rated health – <12 years of education Study quality—high
Cernin et al 2011 USA ⁵	Stress and Success in Ageing through Good Health and executive functioning Cross-sectional analysis of a convenience sample of older persons aged 59+ years 2004	n=67 Mean age=73 Females=82%	Successful ageing Met objective criteria for tests on physical performance, physical and cognitive function –Successful ageing=30%	Social – Social support Economic – Education	Factors associated with successful ageing in logistic regression: – Higher quality of education (reading score) Study quality—medium
Cha et al 2012 Korea ²⁰	Cross-sectional analysis of a convenience sample of persons aged 60+ years 2009	n=305 Mean age=71 Females=73%	Successful ageing Measured by physical, psychological and social functioning (range 19–95) –Successful ageing mean (SD)=69 (11)	Personal – Self-esteem – Self-efficacy – Interpersonal relationships – Self-achievement	Factors associated with successful ageing in multiple regression: Higher levels of – Self-esteem – Self-efficacy – Interpersonal relationships – Self-achievement Study quality—high

Continued

Table 3 Continued

Author /year /country	Study name /design /data collection wave and year	Population / characteristics	Main outcome /how measured / prevalence	Predictors (health assets)	Findings
Chaves <i>et al</i> 2009 Brazil ³⁵	Cross-sectional analysis of a random sample of households with at least one person aged 60+ years 1996	n=345 Mean age (SD)=70 (7) Females=70%	Successful ageing Met criteria for health, physical, psychological and cognitive functioning. -Successful ageing=62% -Normal ageing=38%	Social - Marital status - Social network - Social support - Social activities Economic - Education - Income	Factors associated with successful ageing in logistic regression: - Having fewer living children - Having more confidants - Higher family income Study quality—high
Chou and Chi 2002 Hong Kong ²¹	Cross-sectional analysis of a representative sample aged 60+ years 1995	n=1106 Age range 60–69=37% 70–79=45% 80+=18% Females=56%	Successful ageing Measured by physical, affective and cognitive functioning and productive involvement Successful ageing (0–4) met criteria for high function on -4 criteria=1% -3 criteria=8% -2 criteria=25% -1 criterion=33% -0 criterion=34%	Personal - Self-rated health - Life satisfaction - Stressful life events Social - Marital status - Social network - Social support Economic - Education - Income	Factors associated with successful ageing in multiple regression analysis: - Better self-rated health - Greater life satisfaction - More close relatives - Higher frequency of contact with friends - More years of education - Less financial strain Study quality — high
Formiga <i>et al</i> 2011 Spain ³⁰	Octabaix study Cross-sectional analysis of a longitudinal population-based sample of persons born in 1924 Baseline 2009	n=328 Age=85 Females=62%	Successful ageing Non-institutionalised who met criteria for physical and cognitive functioning -Successful ageing=49% -Non-successful ageing=51%	Personal - Quality of life Social - Marital status - Living arrangements - Social risk Economic - Education	Factors associated with successful ageing in bivariate analysis: - Higher quality of life - Being widowed - Lower social risk - Higher level of education Study quality — high
Formiga <i>et al</i> 2012 Spain ²⁹	Octabaix study Longitudinal population-based sample of persons born in 1924 Baseline 2009 FU 2 years	n=146 Age=87 Females=56%	Successful ageing Non-institutionalised who met criteria for physical and cognitive functioning. -Successful ageing at 2 year FU=62% -Non-successful ageing=38%	Personal - Quality of life Social - Marital status - Living arrangements - Social risk Economic - Education	Predictors of (continued) successful ageing in multiple regression: - Higher level of education Study quality — high
Gureje <i>et al</i> 2014 Nigeria ³⁶	Ibadan Study of Ageing Longitudinal study of representative sample aged 65+ years Baseline 2003 FU yearly 2007–2009	n=930 Mean age=79 Females=39%	Successful ageing Met criteria on physical and functional health and life satisfaction. Successful ageing=8%	Personal - Self-rated health Social - Social network - Social participation Economic - Education - Material possessions Environment - Place of residence	Predictors of successful ageing in multivariate analysis: - Having contact with friends - Participation in community activities Study quality—high

Continued

Table 3 Continued

Author /year /country	Study name /design /data collection wave and year	Population / characteristics	Main outcome /how measured / prevalence	Predictors (health assets)	Findings
Hamid <i>et al</i> 2012 Malaysia ²²	Mental health and quality of life of older Malaysians Cross-sectional analysis of a national representative sample aged 60+ years 2004	n=2749 Age groups: 60–69=1408 70–79=1005 80+=329 Females=50%	Successful ageing Met criteria for physical and psychocognitive functioning and absence of major disease. -Successful ageing=14%	Social - <i>Marital status</i> Economic - <i>Education</i> - <i>Income</i> - <i>Employment</i> Environment - <i>Place of residence</i>	Factors associated with successful ageing in logistic regression: - <i>Higher educational attainment</i> - <i>Higher household income</i> Study quality—medium
Hodge <i>et al</i> 2013 Australia ³²	Melbourne collaborative study Longitudinal population-based study Baseline 1990–1994 Follow-up 2003–2007	n=5512 Age=70+ years Females=63%	Successful ageing Met criteria for physical and psychological functioning and survived to age 70 years, with absence of chronic disease -Successful ageing=22% -Usual ageing=79%	Social - <i>Marital status</i> , - <i>Living arrangements</i> - <i>Social network</i> - <i>Social activity</i> Economic - <i>Socio-Economic Indexes For Areas (SEIFA)</i> - <i>Education</i>	Predictors of successful ageing in multivariate logistic regression: - <i>Being in the top SEIFA quintile</i> Study quality—high
Jang <i>et al</i> 2009 Korea ²³	Cross-sectional analysis of a representative sample of residents aged 65 + years 2003	n=1825 Mean age (SD)=73 (6) Females=65%	Successful ageing Met criteria for physical, psychological and social functioning and subjective well-being and low level of chronic disease -Successful ageing=24%	Social - <i>Marital status</i> Economic - <i>Education</i> - <i>Income</i> - <i>Material possessions</i>	Factors associated with successful ageing in logistic regression: - <i>Higher years of education</i> - <i>Higher personal income</i> Study quality—medium
Li <i>et al</i> 2006 China ²⁴	Shanghai dementia survey Cross-sectional analysis of a random sample of community-dwellers aged 65+ years 2000–2001	n=1516 Mean age (SD)=73 (6) Females=53%	Successful ageing Met criteria on psychological and physical functioning, with no disabilities -Successful ageing=46% -Usual ageing=40% -Remainder excluded because of cognitive impairment	Personal - <i>Life satisfaction</i> - <i>Life events</i> Social - <i>Marital status</i> - <i>Social support</i> - <i>Leisure activities</i> Economic - <i>Education</i> - <i>Economic status</i> - <i>Employment</i>	Factors associated with successful ageing using logistic regression: - <i>Greater life satisfaction</i> - <i>Being currently married</i> - <i>More leisure activities</i> - <i>Being satisfied with economic situation</i> Study quality—high
Li and Zhang 2015 China ²⁵	Chinese longitudinal healthy longevity survey Longitudinal health survey of persons aged 80+ years Data analysis of three waves 2005, 2008 and 2012	n=4190 Age range (64–114) Mean age (SD) baseline: 78 (9) Females=54%	Health index Met criteria on physical and cognitive function, psychological well-being and subjective health Health Index range –9.69–2.86 Mean (SD)=0.58 (1.34)	Social Social support networks - <i>Diverse</i> - <i>Friend-focussed</i> - <i>Family focussed</i> - <i>Restricted</i>	Factors associated with better (higher) Health Index in linear regression: - <i>Diverse network type</i> Study quality—high

Continued

Table 3 Continued

Author /year /country	Study name /design /data collection wave and year	Population / characteristics	Main outcome /how measured /prevalence	Predictors (health assets)	Findings
Meng and D'Arcy 2013 Canada ¹⁸	Canadian community health survey: healthy ageing Cross-sectional analysis of a national sample of persons aged 45+ years 2008–2009	n=8154 Aged 65+ years	Successful ageing Measured by the absence of major disease and met criteria for cognitive and physical functioning and life engagement -Successful ageing=37%	Personal - Self-rated health - Life satisfaction Social - Marital status Economic - Education - Income Environment - Place of residence	Factors associated with successful ageing using logistic regression: - Better self-rated health - Greater life satisfaction - Being married Study quality – high
Ng et al 2014 Singapore ²⁶	Marine parade elderly needs survey Cross-sectional analysis of a stratified random sample of community dwelling adults aged 60+ years from a national database of dwellings 2011	n=2444 60–64 =807 65–74=1183 75–84=341 85+ =113 Females=57%	Healthy ageing Met criteria on physical, mental and social health. -Health at risk=19% -Relatively healthy=81%	Economic - Education - Income - Employment - Housing type	Factors associated with Health at risk using logistic regression: - Higher level education - Employed Study quality – medium
Ng et al 2009 Singapore ²⁷	Singapore longitudinal ageing study Cross-sectional analysis of a population-based study of persons aged 55+ years 2003–2004	n=1281 Mean (SD)=72 (6) Females=60%	Successful ageing Met criteria for physical health and functioning, cognitive, emotional and social functioning and life satisfaction -Successful ageing=29% -Non-successful ageing=71%	Personal - Religious beliefs - Quality of life (QoL) Social - Marital status - Living arrangements - Social network - Social support - Social activity Economic - Education - Financial resources - Housing type	Factors associated with successful ageing in multivariate analysis: - Better scores on physical and mental well-being (QoL) - Having religious beliefs - More years of education - Better housing Study quality - high
Parslow et al 2011 Australia ³³	Survey of mental health and well-being Cross-sectional analysis of a population-based sample aged 60+ years 2007	n=2286 Mean age (SD)=71 (7) Females=51%	Successful ageing Met criteria for physical and mental health, life satisfaction, cognitive functioning (weighted scores ranged from 4.6 to 16.26) Successful ageing Mean (SD) weighted score=13 (2) -Highest decile=8% -Lowest decile=10%	Personal - Traumatic life events Social - Living arrangements - Social network - Social support Economic - Education	Factors associated with being highest decile compared with lowest decile of successful ageing - Fewer traumatic life events - More contact with friends - Being able to rely on, confide in family, friends - Less likely to live alone - Higher level of education Study quality – high

Continued

Table 3 Continued

Author /year /country	Study name /design /data collection wave and year	Population / characteristics	Main outcome /how measured / prevalence	Predictors (health assets)	Findings
Sowa <i>et al</i> 2016 Europe ²⁸	Survey of health ageing and retirement in Europe (share) Longitudinal survey from 20 European countries of persons aged 50+ years Cross-sectional analysis of a subsample of data from six European countries in wave four (2010–2011)	Males n=5139 Females n=5909 Age groups Males 60–67=39% 68–79=47% 80+=15% Females 60–67=39% 68–79=43% 80+=18%	Healthy ageing Met criteria for self-assessed health, functional capabilities and meaning of life - Males=47% - Females=41%	Social Psychosocial index incorporating: - Employment - Social participation - Leisure activities - Social network satisfaction - Life satisfaction Economic - Socioeconomic status Environmental - Geographical location in Europe	Factors associated with better health using logistic regression: Males and females - Being in Western or Southern Europe vs Central Europe - Higher level of education - Higher psychosocial index score Study quality - high
Stevens-Ratchford 2011 USA ¹⁶	Cross-sectional analysis of convenience sample of community dwellers aged 55+ years	n=292 Mean age=72 Females=67%	Successful ageing Measured by the absence of disease and met criteria for cognitive and physical functioning and engagement with life Measured by successful ageing profile -Successful ageing mean (SD)=34 (6) (range 14–68)	Economic - Productive engagement	Successful ageing had weak to moderate positive correlations with: - Continuity of long-standing occupation - Meaning of long-standing occupation - Continuity of productive occupation - Meaning of productive occupation Study quality – medium
Vaillant and Mukamal 2001 USA ¹⁷	Harvard study of adult development Longitudinal study of male adolescents (college students and core city youths) Baseline at age 50 years FU 15–25years	College men n=237 Aged 75–80 years Core-city men n=332 Aged 65–70 years	Successful ageing Met criteria for objective and subjective physical and mental health, years of active life, life satisfaction and social support -College men (75-80)=26% -Core-city men (65-70)=29%	Personal - Coping mechanisms Social - Marital stability Economic - Education	Predictors of successful ageing (most vs least) using multivariate analysis: - Having mature coping defences - Stable marriage (core-city men) - More years of education (core-city men) Study quality - medium
White <i>et al</i> 2015 Canada ¹⁹	Manitoba study of health and ageing Longitudinal study of community-based adults aged +55 years Baseline 1991–1992 Follow-up 1996–1997	n=946 Mean age (SD) 77 (6) years Female=61%	Health ageing Met criteria for physical, cognitive, social and psychological health -Healthy ageing=38%	Economic - Education - Income - Occupation	Factors associated with healthy ageing using logistic regression: - Higher level of education - High level satisfaction with finances Study quality - high

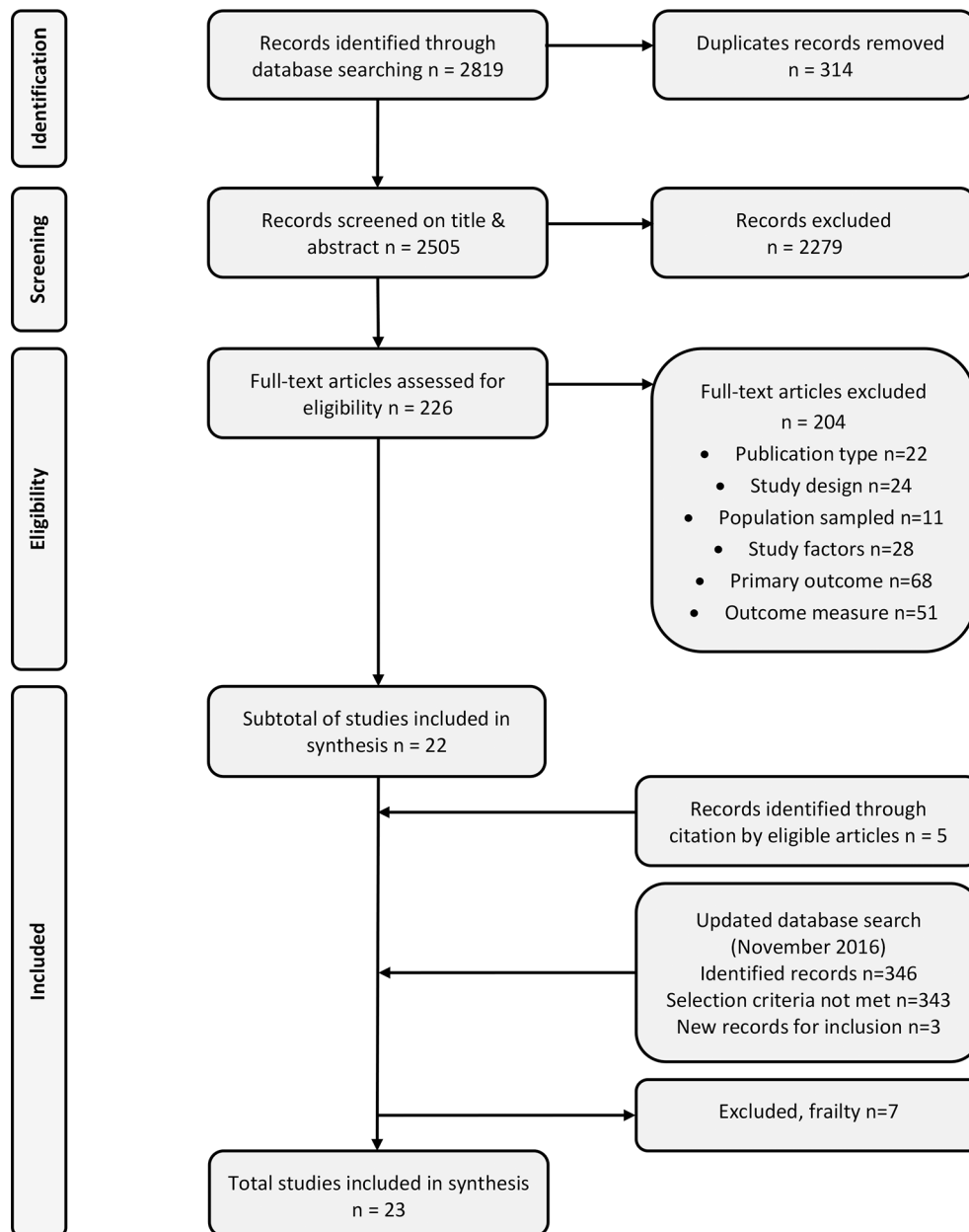


Figure 1 Flow diagram of article selection.

factors incorporate a wide range of attitudes, perceptions and internal resources that relate to health and well-being.

Self-rated health, measured on a scale from poor to excellent, was investigated in five studies.^{14 18 21 31 36} A significant relationship between self-reported health and successful ageing was reported in all but one study,³⁶ suggesting those who perceived their health as good to excellent were more likely to age successfully than those who perceived their health as fair to poor.

Well-being was investigated in nine studies.^{17 18 20 21 24 27 29–31} Higher levels of self-esteem, self-achievement, self-efficacy, interpersonal relationships²⁰ and religious beliefs²⁷ were found to be associated with successful ageing, while a higher morale was associated with higher functioning.³¹ Successful agers expressed greater life satisfaction^{18 21 24}

and a higher quality of life^{27 30} in cross-sectional analysis. However, quality of life was no longer a predictor of continued successful ageing in the Octabaix study in longitudinal follow-up.²⁹ Having mature coping mechanisms¹⁷ and fewer traumatic life events³³ were also found to be associated with successful ageing.

Social

A total of 19 articles investigated social factors as determinants of health status.^{14 15 17 18 21–25 27–36} Two studies screened multiple factors to create a composite measure of social risk. Formiga *et al*^{29 30} used the Gijon scale to assess family and economic situation, housing, relationships and social support as a composite measure of social risk. Data were collected from this Spanish sample at both baseline and 2-year follow-up. A lower score on the

social risk scale was associated with successful ageing in cross-sectional analysis³⁰; however, this association was no longer significant in longitudinal follow-up.²⁹ Sowa *et al*²⁸ used a psychosocial index based on a combination of social and personal factors, including employment, social participation, leisure activities and satisfaction with social network, in a subsample of the European SHARE data. A higher score on the psychological index was associated with better health in cross-sectional analysis in both the male and female samples.

Marital status and living arrangements were investigated in 13 articles.^{14 18 21–24 27 29 30 32–35} Being married, or not living alone, were positively associated with successful ageing.^{18 24 33 34} In contrast, the Octabaix study found being widowed was associated with successful ageing at baseline, 85 years of age, but not at follow-up 2 years later.^{29 30} A longitudinal study, of two cohorts of adolescent boys (college students and city youth) in the USA, investigated marriage stability and its ability to predict health status in later life.¹⁷ For the city cohort, having a stable marriage in midlife was a predictor for successful ageing in later life. This factor did not influence health status in the college cohort.

Social network, commonly measured by the number and frequency of contact with family, friends and neighbours was investigated in seven studies.^{21 25 27 32 33 35 36} Having a wide social network²¹ and close contact with friends^{21 33 36} was found to support successful ageing in all but one³⁵ of these studies. Li and Zhang²⁵ investigated a range of social support network types and their effect on health status in a Chinese population, aged 80 years and over. Those who had a diverse network, including contact with family and friends, as well as participation in social activities, had better health than those with either a restricted, friend or family-only focused network type. However, a South American study,³⁵ using cross-sectional analysis, found having fewer living children was associated with successful ageing in their largely female (70%) sample.

Social support, measured in terms of emotional or instrumental support was investigated in five study cohorts; three of which found having confidants and support from family and friends were positively associated with successful ageing.^{21 33 35} In an Australian sample of persons aged 70 years and over,³¹ providing support to others in cross-sectional analysis was significantly associated with higher level functioning.

Engagement in social activities was investigated in six studies.^{24 27 31 32 35 36} Participation in community-leisure activities was found to be associated with successful ageing in two study cohorts.^{24 36} Finally, participation in domestic and household activities was found to be a protective factor in successful ageing in a sample of older Australians.³¹

Economic

A total of 20 studies investigated economic factors as determinants of health status.^{14–19 21–24 26–30 32–36} All studies included education as an economic indicator in their

investigations, with level of attainment and years of study the most common measures of education. Thirteen of these studies found more years, or a higher level of education was associated with, or predictive of successful ageing in cross-sectional^{21–23 26–28 30 33 34} as well as longitudinal^{14 17 19 29} data analysis. One study focused on the quality of education derived from a reading score,¹⁵ showing that a higher quality of education was associated with successful ageing.

Income was investigated in eight studies.^{18 19 21–23 26 34 35} In cross-sectional analyses, having higher personal,²³ or household^{22 35} income was associated with successful ageing. Financial strain was investigated in three studies, cross-sectional^{21 24} and longitudinal analysis¹⁹ of these data found those reporting that their financial resources were adequate for their needs were more likely to age successfully than those experiencing financial strain.

Occupation class or employment status was investigated in four articles.^{16 19 22 24} Of these, one study²⁶ found being employed was associated with better health, and a second¹⁶ found a weak-to-moderate correlation between continuity and meaning of occupation and successful ageing.

The influence of housing type^{26 27} and material possessions^{23 36} on successful ageing was investigated in four studies. One study²⁷ found better housing was associated with successful ageing in cross-sectional analysis.

A composite measure of socioeconomic status was investigated in data from the Melbourne collaborative study.³² Based on census data, the Socio-Economic Index for Areas (SEIFA) is an index of relative socioeconomic disadvantage, measuring, at an area level, factors such as income, education and occupational status. Longitudinal analysis found, being in the top SEIFA quintile was a predictor of successful ageing.

Environmental

Environmental factors, including geographical location²⁸ and place of residence,^{18 22 36} were investigated in relation to successful ageing in four studies. The latter three studies examined the effect of urban versus rural locality on successful ageing and found no significant relationship. However, those residing in Western or Southern Europe were more likely to be in the healthy ageing group, compared with those in Central Europe.

Study quality

Using the modified Epidemiological Appraisal Instrument, scores for assessment of methodological quality ranged from 14 to 36, out of a possible 40 points, with an average score of 27.8 points. Studies were classified into low quality (0–13), medium quality (14–27) or high quality (28–40) categories, determined by their final score. Study quality results are reported in table 3. The assessment criteria that were most poorly reported by the studies included in this review were the participation rates, and the reliability and validity of the exposure variables (see Supplementary data 1).

DISCUSSION

This narrative systematic review summarises the evidence for factors within personal, social, economic and environmental domains that can be termed 'health assets' of older adults. Of these, there was strong evidence from multiple high quality studies to suggest self-rated health, life satisfaction, psychological well-being, social networks, engagement in leisure and social activities, education and financial resources are associated with health status in community dwelling older populations.

Although the review included studies from a diverse range of countries in the high-income and middle-income world, cross-national comparisons of factors influencing ageing well were not possible because of differences in population sample characteristics, health status and study factor measures. The prevalence of successful ageing covered a wide range from 1% to 81%. The one study incorporating cross-country comparisons found the differences in healthy ageing could be attributed to the prevalence of chronic conditions in Central–Eastern Europe as opposed to Western or Southern Europe. Education was the most commonly studied factor in this review with strong evidence cross-nationally that a higher level of education is widely associated with positive health in older age. This study was unable to identify any specific trends in health assets that were attributable to geographical diversity. However, we recognise that differences in access to resources and healthcare services can vary significantly by geographical location and consequently impact health.

The majority of studies included in this review measured factors individually, even though their effects are often interdependent and additive.³⁸ A small number of studies, however, used composite measures including a multidomain measure of social risk,^{29 30} and single domain multifactor measure of socioeconomic status.³² A multidomain summative measure of protective factors was investigated in older adults in Beijing.³⁸ This study reported that for each accrued protective factor, the risk of health decline and death was reduced by 13%–25%. These data suggest that the more protective factors the individual possesses, the more the risk of poor health is reduced and the greater the opportunity for recovery. The rationale underpinning the study of 'health assets' is similar to that of 'health deficits'; both measure an accumulation of factors across multiple domains that predict health status. While an accumulation of deficits predicts ill health, an accumulation of health assets may mitigate risk and promote good health. This highlights potential for a 'health assets' tool to evaluate cumulative factors known to positively influence health and well-being. Such a tool could be useful in epidemiological studies to examine why individuals have different health outcomes depending on their level of health assets.

A person's health and well-being has many facets, resulting from a complex interplay between factors within multiple domains.² Such factors are highly influenced by cultural norms, gender-specific roles³ and the resources

and policies of the wider society.³⁹ The modifiability of these factors therefore can be highly dependent on the individual and the context in which they live. While some factors are seemingly immutable at the individual level, population health policies to reduce poverty provide social support, connection to culture and equitable access to healthcare can protect against the effects of living in disadvantaged circumstances. Other factors under personal control, for example, engagement in leisure and social activities, are more amenable to interventional programmes and policies.³⁹ Furthermore, enabling people to develop and maintain varied social networks and participation in social and recreational activities may help them on a social level and can have a positive impact in other domains including maintaining independence, life satisfaction, well-being and physical and mental health.

The mechanism through which health assets can influence health may be direct or indirect. For example, those on very low incomes may lack resources and access to adequate housing, safe environments and healthcare, which can impact negatively on health. Financial and life stressors, as well as lack of resources, social support and connectedness can contribute directly to poorer physiological health (eg, increased risk of high blood pressure, immune and circulatory complications) or indirectly, through less healthy coping skills and behaviours (eg, excessive alcohol consumption or substance abuse). Although self-rated health is a consistent indicator of objective health and a robust predictor of health outcomes, little is known about the mechanism by which it influences health status.⁴⁰ The degree of control that people believe they possess over their personal health may increase an individual's self-rated health and lower disease burden.⁴⁰

Implications of findings

Health interventions addressing personal, social, economic and environmental determinants may reduce health-related inequalities and the risk of disease late in life.^{41 42} This review provides evidence of health assets that can be applied across the life course to promote better health and well-being into old age.

Although many health assets are already present in our lives, the individual and others around them may not necessarily be mindful or make purposeful use of them. Empowering people to recognise and build on their potential health assets may help protect and promote health status. An asset-based approach to health promotion exposes and values the skills, knowledge, connections and the potential of the individual and those around them.⁴³ The aim of this approach is to strike a balance between meeting the needs and nurturing the strengths and resources of the individual and community. Demographic changes in global ageing means that more people will require help and support. This asset-based approach is an ideal opportunity for government health bodies and their partners to respond to these challenges.

Strengths and limitations of this study

This review has evaluated an extensive range of health assets, highlighting the strongest evidence for factors that positively influence health in older age.

Methodological differences in study design, follow-up periods, population samples and the way health assets and outcomes were measured by the studies included in this review precluded the pooling of results for meta-analysis. Including only papers published in English is acknowledged as a limitation, affecting cross-cultural comparisons and ability to generalise results to non-English-speaking countries.

Cross-sectional analysis in the majority of studies did not allow for investigation of causality, while longitudinal analysis was largely unidirectional, with study factors such as better self-rated health, social network support and higher educational attainment predicting subsequent successful ageing. Only one study²⁵ examined bidirectional relationships, showing that social network types were predictive of subsequent health status, and that a decline in health affects social network type.

CONCLUSIONS

This systematic review summarises the evidence for health assets, thus adding to the currently limited body of literature within this field. This evidence is essential for the preparation of appropriate policies and effective health interventions.

Health assets are the individual's accessible internal or external strengths and resources; empowering people to recognise and build on their health assets may help protect and promote health status in older age. Implementing an asset-based approach to health promotion uncovers the skills, knowledge, connections and the potential of the individual and the community. This approach is an ideal opportunity for government health bodies and their partners to respond to the challenges faced by global ageing.

Factors known to influence health are often interdependent and cumulative, but the effect on health of a multidomain, composite measure of positive factors is largely unknown. This suggests potential for an instrument to measure the cumulative effect of multidomain health assets on health status in older adults.

Contributors YCH-T assisted in the design of the study protocol and methodology, searched and screened the articles, extracted, synthesised and analysed the data and wrote the first draft of the manuscript. NMP designed the study protocol and methodology, screened, extracted, synthesised and analysed the data. REH formulated the idea for the study, assisted with the design of the study protocol. All authors contributed significantly to the preparation and revisions of the manuscript and approve the final version.

Competing interests None declared.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement All data are contained in this article and no additional data are available.

Open Access This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially,

and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

© Article author(s) (or their employer(s) unless otherwise stated in the text of the article) 2017. All rights reserved. No commercial use is permitted unless otherwise expressly granted.

REFERENCES

1. World Health Organisation, National Institute on Aging. Global health and aging. 2011 http://who.int/ageing/publications/global_health.pdf?ua=1 (accessed 28 Apr 2016).
2. World Health Organisation. Active ageing: a policy framework. 2002 http://apps.who.int/iris/bitstream/10665/67215/1/WHO_NMH_NPH_02.8.pdf (accessed 28 Apr 2016).
3. United Nations, Department of Economic and Social Affairs, Population Division. World Population Ageing 2013. 2013 <http://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2013.pdf> (accessed 21 Jan 2017).
4. Peel N, Bartlett H, McClure R. Healthy ageing: how is it defined and measured? *Australas J Ageing* 2004;23:115–9.
5. Morgan A, Ziglio E. Revitalising the evidence base for public health: an assets model. *Promot Educ* 2007;Suppl 2:17–22.
6. Lindström B, Eriksson M. Salutogenesis. *J Epidemiol Community Health* 2005;59:440–2.
7. Rotegård AK, Moore SM, Fagermoen MS, et al. Health assets: a concept analysis. *Int J Nurs Stud* 2010;47:513–25.
8. Seligman MEP, Peterson C, Barsky AJ, et al. Positive health and health assets: re-analysis of longitudinal datasets. 2013 <https://ppc.sas.upenn.edu/sites/ppc.sas.upenn.edu/files/positivehealthassetspub.pdf> (accessed 28 Apr 2016).
9. Gregorevic KJ, Lim WK, Peel NM, et al. Are health assets associated with improved outcomes for hospitalised older adults? A systematic review. *Arch Gerontol Geriatr* 2016;67:14–20.
10. Peel NM, McClure RJ, Bartlett HP. Behavioral determinants of healthy aging. *Am J Prev Med* 2005;28:298–304.
11. Depp CA, Jeste DV. Definitions and predictors of successful aging: a comprehensive review of larger quantitative studies. *Am J Geriatr Psychiatry* 2006;14:6–20.
12. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* 2009;6:e1000097.
13. Genaidy AM, Lemasters GK, Lockey J, et al. An epidemiological appraisal instrument - a tool for evaluation of epidemiological studies. *Ergonomics* 2007;50:920–60.
14. Bell CL, Chen R, Masaki K, et al. Late-life factors associated with healthy aging in older men. *J Am Geriatr Soc* 2014;62:880–8.
15. Cernin PA, Lysack C, Lichtenberg PA. A comparison of self-rated and objectively measured successful aging constructs in an urban sample of African American older adults. *Clin Gerontol* 2011;34:89–102.
16. Stevens-Ratchford RG. Longstanding occupation: the relation of the continuity and meaning of productive occupation to Life satisfaction and successful aging. *Act Adapt Aging* 2011;35:131–50.
17. Vaillant GE, Mukamal K. Successful aging. *Am J Psychiatry* 2001;158:839–47.
18. Meng X, D'Arcy C. Successful aging in Canada: prevalence and predictors from a population-based sample of older adults. *Gerontology* 2014;60:65–72.
19. White CM, St John PD, Cheverie MR, et al. The role of income and occupation in the association of education with healthy aging: results from a population-based, prospective cohort study. *BMC Public Health* 2015;15:1181.
20. Cha NH, Seo EJ, Sok SR. Factors influencing the successful aging of older Korean adults. *Contemp Nurse* 2012;5:2046–66.
21. Chou KL, Chi I. Successful aging among the young-old, old-old, and oldest-old Chinese. *Int J Aging Hum Dev* 2002;54:1–14.
22. Hamid TA, Momtaz YA, Ibrahim R. Predictors and prevalence of successful aging among older Malaysians. *Gerontology* 2012;58:366–70.
23. Jang SN, Choi YJ, Kim DH. Association of socioeconomic status with successful ageing: differences in the components of successful ageing. *J Biosoc Sci* 2009;41:207–19.
24. Li C, Wu W, Jin H, et al. Successful aging in Shanghai, China: definition, distribution and related factors. *Int Psychogeriatr* 2006;18:551–63.
25. Li T, Zhang Y. Social network types and the health of older adults: exploring reciprocal associations. *Soc Sci Med* 2015;130:59–68.

26. Ng CW, Luo N, Heng BH. Health status profiles in community-dwelling elderly using self-reported health indicators: a latent class analysis. *Qual Life Res* 2014;23:2889–98.
27. Ng TP, Broekman BF, Niti M, *et al*. Determinants of successful aging using a multidimensional definition among Chinese elderly in Singapore. *Am J Geriatr Psychiatry* 2009;17:407–16.
28. Sowa A, Tobiasz-Adamczyk B, Topór-Mądry R, *et al*. Predictors of healthy ageing: public health policy targets. *BMC Health Serv Res* 2016;16(Suppl 5):289.
29. Formiga F, Ferrer A, Alburquerque J, *et al*. The challenge of maintaining successful aging at 87 years old: the Octabaix study two-year follow-up. *Rejuvenation Res* 2012;15:584–9.
30. Formiga F, Ferrer A, Megido MJ, *et al*. Low co-morbidity, low levels of malnutrition, and low risk of falls in a community-dwelling sample of 85-year-olds are associated with successful aging: the Octabaix study. *Rejuvenation Res* 2011;14:309–14.
31. Andrews G, Clark M, Luszcz M. Successful aging in the Australian Longitudinal Study of Aging: applying the MacArthur Model Cross-Nationally. *J Soc Issues* 2002;58:749–65.
32. Hodge AM, English DR, Giles GG, *et al*. Social connectedness and predictors of successful ageing. *Maturitas* 2013;75:361–6.
33. Parslow RA, Lewis VJ, Nay R. Successful aging: development and testing of a multidimensional model using data from a large sample of older australians. *J Am Geriatr Soc* 2011;59:2077–83.
34. Arias-Merino ED, Mendoza-Ruvalcaba NM, Arias-Merino MJ, *et al*. Prevalence of successful aging in the elderly in Western Mexico. *Curr Gerontol Geriatr Res* 2012;2012:1–6.
35. Chaves ML, Camozzato AL, Eizirik CL, *et al*. Predictors of normal and successful aging among urban-dwelling elderly Brazilians. *J Gerontol B Psychol Sci Soc Sci* 2009;64:597–602.
36. Gureje O, Oladeji BD, Abiona T, *et al*. Profile and determinants of successful aging in the Ibadan study of ageing. *J Am Geriatr Soc* 2014;62:836–42.
37. Rowe JW, Kahn RL. Successful aging. *Gerontologist* 1997;37:433–40.
38. Wang C, Song X, Mitnitski A, *et al*. Effect of health protective factors on health deficit accumulation and mortality risk in older adults in the Beijing Longitudinal Study of Aging. *J Am Geriatr Soc* 2014;62:821–8.
39. Australian Institute of Health and Welfare. Australia's health 2010. 2010 <http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=6442452962> (accessed 28 Apr 2016).
40. Berglund E, Lytsy P, Westerling R. The influence of locus of control on self-rated health in context of chronic disease: a structural equation modeling approach in a cross sectional study. *BMC Public Health* 2014;14:492.
41. Kuh D, Ben-Shlomo Y, Lynch J, *et al*. Life course epidemiology. *J Epidemiol Community Health* 2003;57:778–83.
42. World Health Organization. A life course approach to health. 2000 http://www.who.int/ageing/publications/lifecourse/alc_lifecourse_training_en.pdf (accessed 28 Apr 2016).
43. Glasgow Centre for Population Health. Asset based approaches for health improvement: readdressing the balance. 2011 http://www.gcph.co.uk/assets/0000/2627/GCPH_Briefing_Paper_CS9web.pdf (accessed 21 Jan 2017).