Discovering unhealthiness: evidence from cluster analysis

Summary

Purpose This study exploits information on an array of health limitations, chronic conditions, treatments and drug consumptions to reveal the prevalence and severity of unhealthiness that are not directly observed.

Methods Cluster analysis is applied to 265 468 individuals who participated in the 45 and Up Study in Australia.

Results Among the study participants, 8% of those age 45-54, 10% of those age 55-64, 13% of those age 65-74 and 17% of those age 75 and over were classified as unhealthy. For the youngest individuals, unhealthiness is characterized by moderate to high mental distress, a poor physical health score equivalent to the score associated with having four major limitations in physical functioning, teeth health less than good, and having been diagnosed with at least two chronic conditions. The oldest individuals also suffer from these limitations, as well as dependence on at least three different drug groups and two medical treatments, but they are in better mental health state.

Conclusions Understanding unhealthiness across population groups will result in more effective allocation of health resources. Older populations require more resources to be devoted to the management of physical health and chronic illnesses.

Keywords: health dimensions, cluster analysis, unhealthiness, health limitations

INTRODUCTION

Health has many dimensions, and health limitations in these dimensions may or may not occur synchronously. Without examining the various health dimensions in tandem, the notion of an unhealthy state is obscure, making it difficult to assess effectiveness of policy interventions to maintain good health. On the other hand, using a mono-dimensional self-assessed health variable to indicate overall unhealthy state says very little about where to allocate health resources to improve health. The aim of this study is to improve our understanding of unhealthiness by examining underlying health limitations that define it.

The bulk of the existing research has focused on a health dimension one at the time. For example, it has considered physical health [1-3], mental health [4-6], chronic conditions [6] and memory [7]. Several studies consider a number of health outcomes but examine them independently [8-9]. While these studies provide a clear implication as how to tackle depletions in the specific health dimension in question, they are less informative about the state of the other health dimensions, which perhaps, have bigger role in overall health. Another strand of the existing literature has relied on the convenience of a self-assessed general health variable available in most national health surveys and population-representative household surveys [10-15] or used total health care expenditure [16]. The use of these summary measures are justifed by their correlations with objective health indicators. These studies can inform us about how to maintain general or overall health, but have only limited contribution to the question of what comprises overall health in the first place. In a departure from the literature, this study analyses a number of health dimensions together.

Since health is a complex notion, our approach is to use cluster analysis. The premise behind the cluster analysis is that we observe a set of indicators that measure the same underlying quality, in this case health. By grouping or clustering similar observations, this technique discovers the underlying structure or pattern in the data that is not obvious by inspection. The technique is very popular in marketing where it is used it to reveal different types of consumers to enable better targeting of products to consumers. The technique has also been applied in biology,

bioinformatics, social network analysis, climatology, transportation and criminology. In health, nutritionists have used it to examine dietary styles and food patterns. Other health applications include the defining of different types of alcoholics [17], characterising the physical and mental functioning of patients with depression [18] and finding different types of health progression among elderly individuals [19]. The use of this technique in this study is supported by the large sample size of our data which adds stability and interpretability of the resulting clusters. Related work on multidimensional health has focused on the correlations between health indicators, for example through the use of factor analysis [20-22]. In contrast, our focus is on the levels or states of these indicators rather than their relative weights.

METHODS

Study Population

Our study is based on a large cross-section survey of individuals aged 45 and older (45+), the 45 and Up Study, fielded between 2007 and 2009 in New South Wales, the most populous state of Australia (approximately seven million residents). The 45+ is a dominant consumer group of healthcare services and is the key population group to study in the pursuit of the promotion of good health. The survey is managed by the Sax Institute, a coalition of universities and public health and health service research groups in Australia. Given the target age range, participants were selected at random from the central Medicare Australia database covering everyone who has ever used health services in Australia. Details of the survey process and data accessibility can be found from http://www.45andup.org.au/aboutthestudy.aspx. Of the total 267 153 respondents, 265 468 respondents (99.4%) are used for analysis; we excluded those with invalid age or sex or who volunteered without invitation, and there is no further missing data. The gender split in the sample is 46% male and 54% female. The sample age distribution by ten-year age band is as follows: 29% age between 45 and 55 years old, 32% are 56 – 64 years old, 22% are 65 – 74 years old and the remaining 17% are 75 years and over. Other demographic characteristics of the sample respondents are comparable to the NSW 45+ population [23].

The 45 and Up Study is well-suited for this study for several reasons. First, its population-based design means that it is not subject to sample selection bias due to survey participants' interactions with the health system. Second, it has many respondents – perhaps the biggest sample size ever used for this topic – which ensures the robustness of our statistical method. Third, it contains information on a wide range of objective health indicators, ranging from limitations in physical functioning to consumption of medical goods. This survey can be linked deterministically to the database on prescription drugs, which allows us to observe the medication taken by every survey respondent. The data linkage was undertaken by a specialised public institute, the Centre for Health Record Linkage, and the linked data was released with ethics approval.

Outcome Measures

- *Physical* functioning is assessed using the Medical Outcomes Score – Physical Functioning which is a sub-score of the SF-36 instrument. A score of one indicates no limitation, a score of two indicates a little limitation and a score of three indicates a lot of limitation for the activity. For the purpose of this study, we add the scores across the ten activities, with a maximum of 30.
- *Mental* health is measured using the Kessler-10 instrument. The score for each symptom ranges from one to five, where one indicates not experiencing the symptom at all, and five indicates experiencing the symptom all the time. The Kessler-10 score is the sum across the symptoms.
- *Vision*, *Memory*, *Teeth* and *Overall* health is measured using a five-point scale answer to the question "in general, how would you rate your […]"? The scale reflects excellent, very good, good, fair and poor.
- *Chronic* illness is measured by ever being diagnosed for: cancer (including melanoma), high blood pressure, diabetes, asthma, stroke, heart diseases, Parkinsons disease and other serious illnesses, lack of sleep (less than six hours) and hearing loss.
- *Drug* consumption is obtained from administrative data on prescriptions. We use the first digit Anatomical Therapeutic Codes (ATC) of prescriptions filled in the last six months.

Because ATC codes A and C (alimentary tract and metabolism and cardiovascular system) are large groups, we create separate groups for 'vitamin, tonic and minerals' and 'drugs for diabetes' from the rest of ATC code A drugs and 'lipid modifying agents' from the rest of ATC code C drugs.

- *Treatment* is self-reported medical treatment in the last four weeks for: cancer, heart disease, high blood pressure, cholesterol, blood clot, asthma/ hay fever, arthritis, thyroid disorder, osteoporosis and depression/ anxiety.

Following the Australian National Health Survey, the Kessler-10 score is grouped into a five-point scale reflecting: no psychological distress (10), low distress (11-15), moderate distress (16-21), high distress (22-29) and very high distress (30-50). For the physical functioning score, there is no comparable recommended grouping, but it is sensible to group based on number of major limitations. We create a five-point scale reflecting: no limitation (score of 10); having one to three minor limitations, one major limitation, or one minor and one major limitation, (11-13); having four minor limitations, two minor plus one major limitation, two major limitations, one minor plus two major limitations or two minor and two major limitations (14-16); having up to four major limitations (17-22); and having more than four major limitations (23-30). *Chronic*, *Drug* and *Treatment* are counts with thin right-tails and they are also converted to a five-point scale. The *Chronic* and *Treatment* categories are: none, one, two, three and four or more. The *Drug* categories are none, one to two, three to four, five to six, and more than six. Recategorisation avoids a single health dimension with a large variance dominating the others. Furthermore, since our aim is to group similar individuals, there is no extra information from extreme observations beyond placing them in the group with the least or the most severe health. All health dimensions in five-point ordered scales are then converted to a severity index within a unit interval [0,1], where one indicates the worst state by dividing it with the maximum score. Table 1 summarises the severity index.

[Insert Table 1: Levels of health dimensions and severity index]

Statistical method

k-means cluster analysis is used to group individuals into *k* distinct clusters reflecting health states. This technique initially partitions the data into *k* clusters at random. Next it calculates the centroid of each cluster and assigns each individual to the closest cluster. After assignment, new centroids are computed, and individuals are reassigned to the closest new cluster. The degree of dissimilarity between any two points is measured using Euclidean distance, which is the length of the line segment connecting the two points. The reassignment process is repeated until no more reassignment can be made, or so many times so that each cluster consists of very similar individuals in terms of their health. We repeat this sequence 10,000 times. Meanwhile, to minimise sensitivity to the random initial grouping, we repeat the entire command 50 times and analyse the average severity scores. Finally, to ensure that we are grouping comparable individuals, we perform the clustering for eight sex and age-class groups. This would also remove variations in reporting behaviour by age: people tend to compare their health status to others of similar age, resulting in age-norming of responses to subjective health questions [24,25]. Older individuals tend to overvalue the state of their health as they better adapt to long-term conditions. The entire analysis is conducted using STATA/MP software.

The number of cluster, k, must be chosen, but there is no rule on what is the "optimal" *k*. With our large sample size, we could specify a large number of clusters because data points can be positioned in many ways. Various measures of parsimony and goodness-of-fit would result in very large *k* given our sample size. However, many of these clusters would be quite similar to each other. We find that with $k = 5$, the mean severity levels are considerably different across clusters and there is no cluster with very large or very small number of individuals. Furthermore, given the scale of health states, the resulting five clusters may be interpreted as reflecting excellent, very good, good, fair and poor health states.

Let us define "unhealthy" as the cluster which has the worst *Overall* health. We focus on unhealthiness because of its implications for public health, health inequality, health care

expenditure and the allocation of health resources. Our objective is to study how the various health dimensions behave in this cluster. Using individuals who are categorised into the unhealthy cluster, we analyse the mean severity levels of their health dimensions. Note that this is not the same as analysing the health limitations of those reporting poor health *Overall* in the survey. By using cluster analysis all health limitations jointly define unhealthiness.

The standard error of the mean severity index is computed based on the pooled variance over 50 repeat runs. Because our sample size is large, it is prudent to use a higher significance level of 1% to avoid over-rejection.

RESULTS

Table 2 reports the pairwise correlations between the health dimensions and the mean and standard deviation of the severity index. All health dimensions considered are positively correlated. *Mental* has stronger correlations with *Physical*, *Vision*, *Memory* and *Teeth* than with *Chronic*, *Drug* and *Treatment*. In contrast, *Physical* has higher correlations with the latter three. *Vision*, *Memory* and *Teeth* have higher correlations among themselves and with *Overall*. Expectedly, *Chronic*, *Drug* and *Treatment* are highly correlated with each other. *Overall* has the strongest correlation with *Physical* and the weakest correlation with *Mental*. The average person in the sample has low psychological distress, physical health that is equivalent to having one major physical functioning limitation, good vision, memory and teeth, one or two chronic conditions and consumption of one medical treatment and one or two drug categories.

[Insert Table 2: Pairwise correlations and sample means of health dimensions]

Figure 1 portrays dimensions of unhealthiness across age and sex. The upper panel depicts the severity of health dimensions when unhealthy (the worst *Overall* health) and, as a contrast, the lower panel shows the health dimensions when healthy (the best *Overall* health). Each point is the sample mean for a particular health dimension; 0 is best health (no illness/ limitation) and 1 is

worst health. The first noticeable difference between the two panels is that the severity levels across dimensions are much more condensed in the lower panel. This indicates that there is more agreement in what constitutes a healthy state – which is essentially having minimal health limitations – than what defines unhealthiness. So it is more interesting to focus on the latter. The second difference is that severity levels are much greater for the unhealthy. Finally, except for *Mental*, in the lower panel, health dimensions have an upward age-trend, whilst in the upper panel, there is more variation in the age-trends. Only *Overall* is a subjective measure; observed age-trends for the other dimensions reflect the evolution of severity levels in health dimensions.

[Insert Figure 1: Severity of various health dimensions by health clusters]

Corresponding to Figure 1, Table 3 reports the severity levels of the health dimensions by health state. It also shows the prevalence of the two health states in each age-sex group. Males and females have similar age-distributions of health states. About 8% of the under 55 years old, 10% of the 55-64 years old, 13% of the 65-74 years old and 17% of the 75 years old and over were found to be unhealthy. The increasing rate of unhealthiness reflects age-related frailty.

All differences by health state are statistically significant at 1% level. Focusing on unhealthiness, for both sexes, *Mental* has a sharp downward age-trend. This pattern has also been found in the past, dubbed 'the U bend of life', as those in middle age face many challenges at home, in the workplace and around social relationships [26,27]. To interpret the severity level of various health dimensions, we refer to the severity index construction in Table 1. For younger individuals (under 55 years old), unhealthiness is characterized by moderate to high psychological distress, physical functioning that is equivalent to having three to four major physical functioning limitations, less than good eyesight, memory and teeth, and two to three chronic conditions. Meanwhile, drug consumption and medical treatment are relatively low. For older individuals, unhealthy has physical health equivalent to having four or more major physical functioning limitations and high dependence on health services. In particular, unhealthiness for females age

65 and over is characterized by receiving medical treatment for more than three chronic diseases and consuming drugs in six different categories. Mental distress on the other hand reduces to moderate to low. Age-trends are flat in *Physical*, *Vision*, *Memory* and *Teeth* between the age of 55 and 74 for both sexes, *Memory* for males 65 and over, and *Mental*, *Drug* and *Treatment* for females 65 and over. The severity of *Overall* reflects the health states, with less than good health when unhealthy and excellent health when healthy.

[Insert Table 3: Severity of various health dimensions by health clusters]

DISCUSSION

There is currently limited knowledge both about the specific health limitations that define unhealthiness and the heterogeneity of unhealthiness across different populations. We fill this gap in the literature by utilizing a large and rich survey dataset, perhaps the largest sample ever used to examine this topic. We find that unhealthiness is characterized by a physical health state that is equivalent to having at least three major physical functioning limitations, eyesight, memory and teeth that are reported as less than good, two or three chronic conditions, and dependence on at least two medical treatments and three drug categories. Severity of physical limitations, chronic illness and dependence on health services all rise with age. In contrast, mental distress trends downward with age. Unhealthy younger individuals have moderate to high psychological distress, but in older age groups, unhealthiness is characterized by low to moderate psychological distress. Both the prevalence of unhealthiness and its severity are lower for those with better economic status, particularly among younger individuals. Most of the gaps are found in physical health and dependence of medical products.

A few limitations of our study are worth noting. First, we cannot examine heterogeneity in unhealthiness throughout the whole lifetime as our data only includes older cohorts. Second, except for drugs, health indicators are self-reported and subject to common reporting bias. However, we think that such bias is minimal since, apart from general subjective health, the

health indicators we use are objective and there is only limited scope for individuals to misreport their health conditions. Third, although we include a number of health dimensions, our data excludes potentially important dimensions such as speech and hand strength. In addition, because our data are derived from a general survey as opposed to a special health survey, our health measures may not be sufficiently comprehensive. Our measure of *Physical* and *Mental* are based on the SF-36 and the Kessler-10 scores, which both have been validated in the literature [28, 29], however *Physical* is based on a subset of the SF-36 and *Mental* may be better assessed using Kessler-20 instead of the Kessler-10 instrument available in our data. One may also argue that social relationships are an important health dimension but is unavailable in the data. Fourth, the pharmaceutical data covers only subsidised drugs, although about 80% of prescription drugs dispensed in Australia are subsidised.

Our findings have several important policy implications. They provide information which will assist in the targeting of health resources. Given that unhealthiness is characterized by serious physical limitations and increasing number of chronic illnesses and comorbidities as people age, unhealthiness and severity maybe reduced by active promotion of physical strength, and by bone and chronic disease management. Meanwhile, the results reveal worse mental health conditions among middle-aged individuals. The evidence of an unhealthiness gap by economic status under a universal public health system can mean two things: health inequality would be even greater in the absence of public health insurance and/or there remains scope for programs directed to more economically deprived groups to achieve better health, for example, by subsidies for carers to help with daily physical functioning. By drawing out various health limitations in the unhealthy state, our results also add interpretability to mono-dimension health measures and can provide extra information to health providers, who may not observe an array of health dimensions during treatment.

References

1 Chandola A, Ferrie J, Sacker A, et al. Social inequalities in self reported health in early old age: follow-up of prospective cohort study. BMJ 2007;**334**:990.

2 Bowling A, Seetai S, Morris R, et al. Quality of life among older people with poor functioning. The influence of perceived control over life. Age Ageing 2007;**36**(3):310-315.

3 Hudakova A, Hornakova A. Mobility and quality of life in elderly and geriatric patients. International Journal of Nursing and Midwifery 2011;**3**(7):81-85.

4 Zimmerman FJ, Katon W. Socioeconomic status, depression disparities, and financial strain: what lies behind the income-depression relationship? Health Econ 2005;**14**(12):1197–1215.

5 Gardner J, Oswald AJ. Money and mental wellbeing: A longitudinal study of medium-sized lottery wins. J Health Econ 2007;**26**(1):49–60.

6 Goetzel R, Hawkins K, Ozminkowski RJ, et al. The Health and Productivity Cost Burden of the "Top 10" Physical and Mental Health Conditions Affecting Six Large U.S. Employers in 1999. J Occup Environ Med 2003;**45**(1):5-14.

7 Westa L, Bagwell DK, Dark-Freudeman A. Self-Efficacy and Memory Aging: The Impact of a Memory Intervention Based on Self-Efficacy. Neuropsychol Dev Cogn B Aging Neuropsychol Cogn. 2008;**15**(3):302-329.

8 Case A. Does Money Protect Health Status? Evidence from South African Pensions. NBER Working Paper 2001 no 8495.

9 Frijters P, Ulker, A. Robustness in health research: Do differences in health measures, techniques, and time frame matter? J Health Econ 2008;**27**(6):1626–1644.

10 Case A, Deaton A. Broken Down by Work and Sex: How our Health Declines. In: Wise D. eds. Analyses in the Economics of Aging. Chicago: University of Chicago Press 2005:185-212.

11 Contoyannis P, Jones AM, Rice N. The dynamics of health in the British Household Panel Survey. Journal of Applied Econometrics 2004;**19**(4):473–503.

12 Lorgelly PK, Lindley J. What is the relationship between income inequality and health? Evidence from the BHPS. Health Econ 2008;**17**(2):249–265.

13 Gravelle H, Sutton M. Income, relative income, and self-reported health in Britain 1979–2000. Health Econ 2009;**18**(2):125–145.

14 Jones AM, Schurer S. How does heterogeneity shape the socioeconomic gradient in health satisfaction? Journal of Applied Econometrics 2011;**26**(4):549–579.

15 Frijters P, Haisken-DeNew JP, Shields MA. The causal effect of income on health: Evidence from German reunification. J Health Econ 2005;**24**(5):997–1017.

16 Ellis RP, Fiebig D, Johar M, et al. Explaining health care expenditure variation: Large-sample evidence using linked survey and health administrative data. Health Econ Published Online First 12 Mar 2013 doi: 10.1002/hec.2916.

17 Babor T, Hofmann M, DelBoca FK, et al. Types of Alcoholics, Evidence for an Empirically Derived Typology Based on Indicators of Vulnerability and Severity. Arch Gen Psychiatry 1992;**49**(8):599-608.

18 Sugar CA, Sturm R, Lee TT, et al. Empirically defined health states for depression from the SF-12. Health Serv Res 1998;**33**(4):911–928.

19 Wickrama K, Mancini JA, Kwag K, et al. Heterogeneity in Multidimensional Health Trajectories of Late Old Years and Socioeconomic Stratification: A Latent Trajectory Class Analysis. J Gerontol B Psychol Sci Soc Sci 2013;**68**(2):290-297.

20 Baken D, Stephens C. More dimensions for the multidimensional health locus of control: confirmatory factor analysis of competing models of the structure of control beliefs. J Health Psychol 2005;**10**(5):643-656.

21 Chan MSC, Kitzmann KM. Exploratory factor analysis: health perceptions of Chinese early childhood educators in Hong Kong. Health Promot Int 2010;**25**(4):412-424.

22 Headey B, Kelley J, Wearing A. Dimensions of mental health: Life satisfaction, positive affect, anxiety and depression. Social Indicators Research 1993;**29**(1):63-82.

23 Johar M, Jones G, Savage E. Healthcare expenditure profile of older Australians: Evidence from linked survey and health administrative data. Economic Papers 2012;**31**(4):451-463.

24 Groot W. Adaptation and scale of reference bias in self-assessments of quality of life. J Health Econ 2000;**19**:403–420.

25 Layes A, Asada Y, Kephart G. Whiners and deniers: What does self-rated health measure? Soc Sci Med 2012;**75**(1):1-9.

26 The Economist. The U-bend of life. Available http://www.economist.com/node/17722567 (accessed date 4/1/2013).

27 Frijters P, Johnston D, Shields M. The optimality of tax transfers: what does life satisfaction data tell us? Journal of Happiness Study 2012;**13**:821-832.

28 Butterworth P, Crosier T. The validity of the SF-36 in an Australian National Household Survey: demonstrating the applicability of the Household Income and Labour Dynamics in Australia (HILDA) Survey to examination of health inequalities. BMC Public Health 2004; **4**:44.

29 Andrews G, Slade T. Interpreting scores on the Kessler Psychological Distress Scale (K10). Australian and New Zealand Journal of Public Health 2001;**25**(6): 494-497.

Table 1: Levels of health dimensions and severity index

Severity	*Mental* (level of distress)	*Physical* (major limitations)	*Vision*, *Memory*, *Teeth* & *Overall*	*Chronic* & *Treatment* (count)	*Drug* (categories)
1 (worst)	Very high	More than 4	Poor	More than 3	More than 6
0.75	High	3 to 4	Fair	3	5 to 6
0.5	Moderate	2	Good	2	3 to 4
0.25	Low	1	Very Good	1	1 to 2
0 (best)	No	0	Excellent	0	0

Table 2: Pairwise correlations and sample means of health dimensions

	Mental	*Physical*	*Vision*	*Memory*	*Teeth*	*Chronic*	*Drug*	*Treatment*	*Overall*
Mental	1								
Physical	0.262	1							
Vision	0.244	0.251	1						
Memory	0.258	0.238	0.463	1					
Teeth	0.227	0.251	0.422	0.449	1				
Chronic	0.146	0.419	0.167	0.180	0.175	1			
Drug	0.102	0.467	0.167	0.164	0.177	0.468	1		
Treatment	0.169	0.377	0.122	0.122	0.130	0.447	0.485	1	
Overall	0.345	0.541	0.447	0.402	0.415	0.398	0.378	0.355	1
Mean	0.273	0.312	0.418	0.410	0.480	0.382	0.295	0.200	0.369
SD	0.216	0.295	0.231	0.239	0.254	0.300	0.304	0.268	0.237

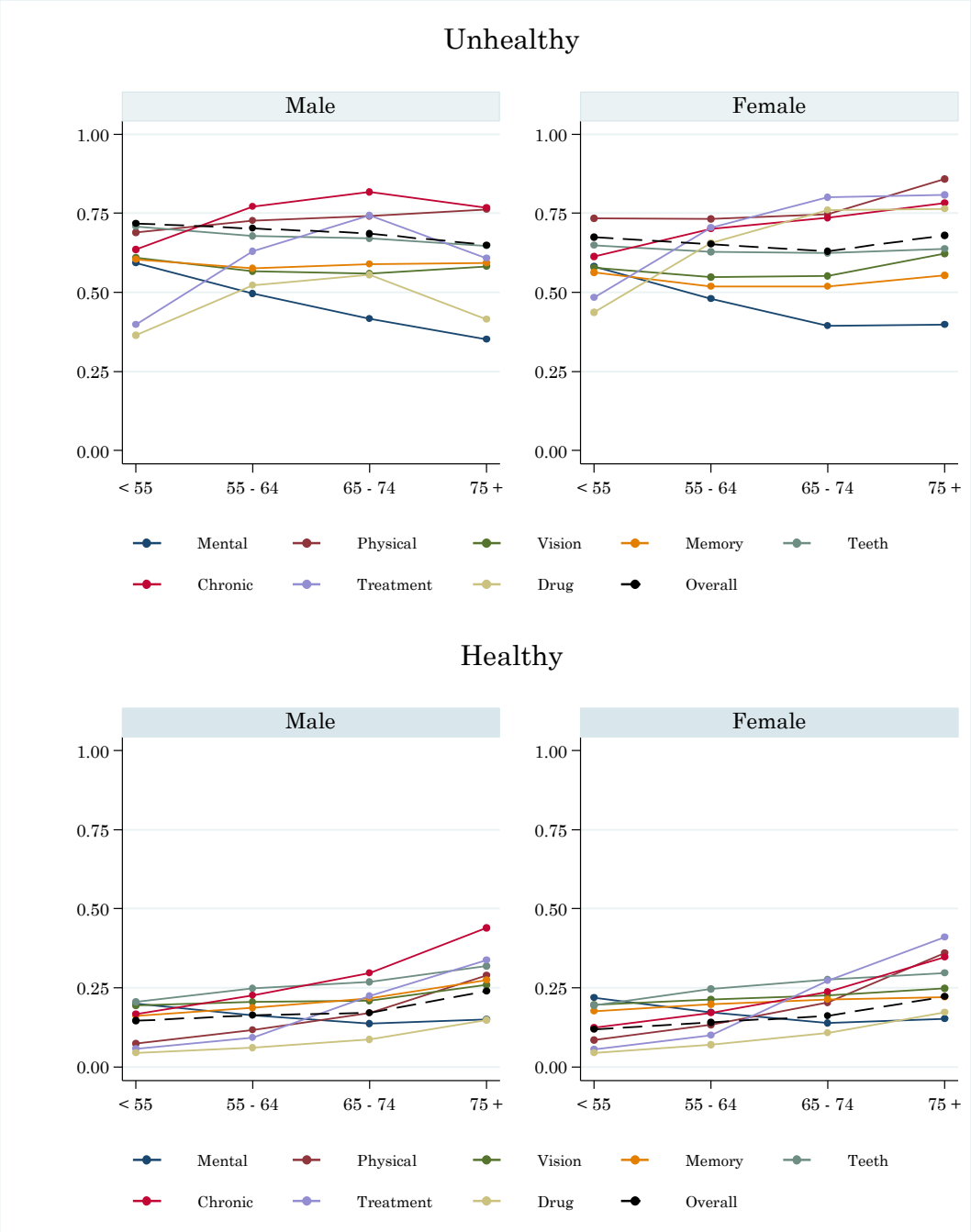
Note: all pairwise correlations have p-value<0.001. The health dimensions are measured in unit interval.

Table 3: Severity of various health dimensions by health clusters

MALE								
	< 55		55-64		65-74		75+	
	Unhealthy	Healthy	Unhealthy	Healthy	Unhealthy	Healthy	Unhealthy	Healthy
Mental	0.593	0.200	0.497	0.163	0.417	0.137	0.352	0.151
Physical	0.690	0.074	0.728[a]	0.116	0.741	0.171	0.762	0.289
Vision	0.609	0.195	0.567[a]	0.206[a]	0.560	0.209	0.581	0.260
Memory	0.603	0.160	0.577[a]	0.187	0.589[a]	0.217	0.593	0.274
Teeth	0.709	0.206	0.678[a]	0.248	0.671	0.268	0.647	0.319
Chronic	0.635	0.166	0.771	0.226	0.817	0.297	0.767	0.439
Drug	0.398	0.056	0.631	0.093	0.743	0.223	0.609	0.338
Treatment	0.365	0.043	0.523	0.061	0.556	0.087	0.414	0.148
Overall	0.718[a]	0.145	0.702[a]	0.163	0.687	0.170	0.650	0.239
N	2,493	7,851	3,722	10,460	3,693	6,346	3,954	4,735
(%)	7.94	25.00	9.57	26.90	12.57	21.61	16.73	20.03
FEMALE								
	< 55		55-64		65-74		75+	
	Unhealthy	Healthy	Unhealthy	Healthy	Unhealthy	Healthy	Unhealthy	Healthy
Mental	0.581	0.219	0.479	0.172	0.394[a]	0.139	0.398	0.151
Physical	0.734[a]	0.084	0.733[a]	0.133	0.748	0.204	0.859	0.360
Vision	0.577	0.196	0.548[a]	0.213	0.552	0.227	0.623	0.248
Memory	0.562	0.176	0.519[a]	0.198	0.519	0.213[a]	0.554	0.221
Teeth	0.649	0.193	0.629[a]	0.245	0.624	0.275	0.638	0.297
Chronic	0.613	0.124	0.700	0.170	0.736	0.237	0.782	0.347
Drug	0.483	0.055	0.705	0.100	0.801[a]	0.272	0.808	0.410
Treatment	0.436	0.045	0.655	0.069	0.760[a]	0.107	0.764	0.173
Overall	0.676	0.118	0.653	0.141	0.630	0.161	0.681	0.223
N	3,803	12,500	4,472	13,012	3,862	6,218	3,519	2,488
(%)	8.22	27.03	9.64	28.04	13.67	22.00	16.56	16.41

Note: [a] indicates insignificant difference at 1% level with the next age group, for a given health group. All differences between Unhealthy and Healthy are statistically significant at 1% level, for a given age group. N is the mean sample size over 50 repeat runs and (%) gives its proportion over the sample size of the age-sex pair.

Figure 1: Severity of various health dimensions by health clusters



Note: each point is the sample mean for a particular health dimension. 0 is best health (no illness/ limitation) and 1 is worst health.