Preventive Medicine 58 (2014) 75–80

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

The effect of health behavior change on self-rated health across the adult life course: A longitudinal cohort study

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ARTICLE INFO

Available online 4 November 2013

Keywords:
Self-rated health
Health behavior change
Longitudinal cohort study

ABSTRACT

Objective. While it is clear that health behaviors are related to self-rated health (SRH), it is less clear if maintaining positive behaviors, or improving, can protect SRH over time.

Method. SRH trajectories were modeled in a large representative Australian sample (n = 7485 at baseline), of three age cohorts (20–24, 40–44 and 60–64 years at baseline; 1999, 2000 & 2001 respectively), over an 8 year period. Change in smoking, alcohol consumption and physical activity on SRH trajectories were examined, controlling for demographic, physical and mental health factors.

Results. SRH became poorer over time across the sample. Being a non-smoker was associated with more positive SRH levels across all groups. Maintaining or increasing moderate physical activity was associated with less decline in SRH.

Conclusions. Findings highlight the benefits of positive health behaviors, particularly performing regular physical activity over time, for reducing the risk of subjective health becoming poorer across the adult life course.

Introduction

The importance of health behaviors across the lifespan is well established for the process of healthy aging. Not smoking, moderate alcohol intake, and regular moderate and vigorous physical activity (MVPA) reduce the risk of chronic disease and premature mortality (Knoops et al., 2004; Marquez et al., 2009; Proper et al., 2011; van den Brandt, 2011), disability and frailty (Theou et al., 2011), and cognitive decline (Kramer and Erickson, 2007), and increase wellbeing in late life (Strine et al., 2008). Therefore, those who have healthy lifestyles are expected to have better physical and psychological wellbeing as they age.

An important indicator of physical wellbeing at the individual and population level is self-rated health (SRH), a commonly used single-item measure that asks respondents to rate their general health (World Health Organization, 1996). Of interest are the associations between SRH and health outcomes at the individual level in late life. Poor self-rated health is associated with increased risk of stroke, disability, health care usage, and mortality (Ben-Ezra and Shmotkin, 2006; DeSalvo et al., 2005; Emmelin et al., 2003; Sargent-Cox et al., 2010a). Gender has been found to impact SRH ratings, though there is inconsistency within the literature as to the direction of the relationship, particularly with age (e.g. Malmusi et al., 2012; McCullough and Laurenceau, 2004). Understanding mechanisms for maintaining positive self-rated health with age and across genders, as well as risk factors for self-rated health decline may identify opportunities for health promotion and interventions across the lifespan.

In comparison to the well-established link between health behavior and health outcomes, less is known about the association between health behaviors and self-rated health across different adult age groups. Furthermore, there is a lack of information on how maintaining or improving positive health behaviors influence trajectories of SRH. This is an important line of investigation particularly when considering poor health outcomes associated with decline in SRH, and the subsequent public health benefits that would be associated with maintaining positive subjective health with an aging population.

The primary aim of this study is to investigate the association between SRH and health behaviors in three cohorts (20–24 years, 40–44 years and 60–64 years at baseline) over an 8-year period to understand possible age and gender effects on self-rated health evaluations. Health behaviors, including smoking, alcohol intake, and sedentary versus moderate/vigorous physical activity, will be explored.

Method

Participants

Participants were drawn from the PATH Through Life Study, a large longitudinal cohort study from the Canberra/Queanbeyan districts, Australia. The study design and sample have been described elsewhere (Anstey et al., 2011). In brief, a representative sample was recruited using the Australian electoral roll. Eligible participants were within the cohort age-range on the 1st of January of the baseline year for each cohort (1999 for 20–24 years (20s); 2000 for 40–44 years (40s); and 2001 for 60–64 years (60s)). These age-groups were originally chosen to simultaneously investigate cohort and developmental effects across

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http://dx.doi.org/10.1016/j.ypmed.2013.10.017

the adult-lifespan within a relatively short, 24 year measurement span. Data for the main PATH study is collected via interview. Each cohort has been followed up every 4 years. To date three waves of data have been collected for each cohort over 8 years. Retention rates for each cohort from wave 1 to wave 3 were high at 82.3%, 86.3% and 77.3% for the 20s, 40s and 60s cohorts respectively.

Measures

Self-rated health was measured with the five response item "In general how would you rate your health? Excellent, Very Good, Good, Fair or Poor? Items were reversed coded so that a higher score indicated excellent health rating. Skewness and Kurtosis statistics for SRH at each wave were within acceptable range, indicating the data were normally distributed (Allen and Bennet, 2008).

Outcome measures

Smoking status was measured through the single question "Do you currently smoke (yes/no)". Alcohol consumption was measured using items from the World Health Organization (WHO) Alcohol Use Disorders Identification Test (Saunders et al., 1993). The u-shaped association between alcohol consumption and health outcomes reported in the literature (e.g. Ronksley et al., 2011) guided the dummy categories (abstainers versus rest, and moderate drinkers versus rest at baseline, with hazardous and harmful categories as the reference group). These categories were calculated based on Australian Guidelines (National Health and Medical Research Council (NHMRC), 2001, 2009). Items from the UK Whitehall II Study (Stafford et al., 1998) assessed physical activity. Hours per week engaging in mild, moderate or vigorous physical activity were dummy coded (0 = sedentary/mild and 1 = meeting moderate to vigorous physical activity (MVPA) criteria) (Haskell et al., 2007).

Covariates

Covariates included gender, cohort (20s, 40s, 60s) and years of education. Physical and psychological health covariates were also included in the models, as they have been shown to be associated with SRH (e.g. Sargent-Cox et al., 2008). Forced Expiratory Volume (FEV_1) measures pulmonary function using a Micro Medical spirometer in liters, averaged across two trials (after an initial practice trial). The Goldberg Depression Scale (Goldberg et al., 1988) assessed the number of depressive symptoms via nine items. A higher score indicates higher depressive symptoms. Body mass index (BMI) was calculated as weight (in kilograms) divided by height (in metres^2). Respondents were asked if they had any of the following medical problems (heart trouble, cancer, arthritis, asthma, diabetes and/or stroke). An aggregate score was calculated to reflect the number of chronic medical conditions, ranging from 0 to 6.

Statistical analysis

Smoking behaviors over time were dummy coded to reflect smokers in wave 1 who gave up smoking, stable non-smokers, and those who took up smoking over the measurement period. The reference group for all smoking categories was persistent smokers. Stable alcohol abstainers over the 3 waves were coded as 1, with all other categories coded as 0 for the abstainer variable. Consistent moderate drinkers and those who reduced consumption over the three waves (1 — "continued moderate — reduce intake") were compared to abstainers, those who increased drinking levels or who reported stable harmful/hazardous levels of drinking over time (0). Positive physical activity was identified as those who maintained stable moderate to vigorous activity levels and those who increased levels over the three waves (1 — "Continued moderate — increased PA"), compared to stable none/mild activity and a reduction in activity over the three waves (0).

To examine the associations between health behaviors and change in SRH mixed linear models with random intercept and slope were estimated in SPSS (IBM Corporation, 2012). A major advantage of the linear mixed models over repeated measure ANOVAs, for example, is the maximum likelihood estimator that allows data from all individuals with an observation of the outcome variable to be included (Singer and Willett, 2003). This estimator is a well-established method for reducing potential bias created by missing data (Graham et al., 1996). In the first models the effect of health behavior categories on SRH change were examined while adjusting for cohort effects (including cohort by health behavior interactions). In the second models physical and psychological health covariates were also adjusted for. Model fit between the two models was compared using −2 Log Likelihood statistic (−2LL). The difference in the −2LL is distributed asymptomatically as a χ^2 with degrees of freedom (DF) equivalent to the difference in the number of parameters between models (Singer and Willett, 2003).

Results

Sample characteristics and self-rated health trajectories

Sample characteristics by cohort and gender are displayed in Table 1. Each cohort had significantly fewer depressive symptoms than the younger groups, and higher BMI and number of conditions. Females had overall lower FEV than males. 60's females were more likely to be non-smokers, and abstain from alcohol while 60's males were less likely to be meeting MVPA criteria than other groups. 20's males were least likely to be stable non-smokers over time, less likely to consume alcohol at a moderate level over time, though more likely to be meeting MVPA criteria over time than other groups.

Compared to the 40's cohort, the 60's had less positive SRH at baseline. An unadjusted mixed linear model determined that SRH became significantly poorer by 0.08 points each wave (95% CI = −0.09, −0.06, $p < .001$; random effect (variance) = 0.02, CI = 0.02, 0.03, $p < .001$). In a second model cohort was not associated with baseline SRH nor change over waves.

Table 1
Descriptive statistic summaries stratified by age cohort (Australia; 1999 to 2009).

	20's Cohort		40's Cohort		60's Cohort	
	Male	Female	Male	Female	Male	Female
Years of education (M, SD)	14.48 (1.52)	14.73 (1.60)	14.79 (2.32)	14.45 (2.32)	14.24 (2.83)	13.41 (2.82)
Self-rated health baseline (M, SD)	3.71 (0.94)	3.66 (0.88)	3.70 (0.90)	3.73 (0.94)	3.67 (0.98)	3.65 (0.98)
Medical conditions baseline (M, SD)	0.21 (0.44)	0.25 (0.47)	0.26 (0.51)	0.30 (0.58)	0.73 (0.88)	0.57 (0.90)
FEV_1 baseline (M, SD)	4.19 (0.73)	3.02 (0.53)	3.63 (0.69)	2.68 (0.51)	2.84 (0.66)	2.01 (0.45)
BMI baseline (M, SD)	24.21 (3.84)	23.02 (4.25)	26.87 (4.55)	25.83 (5.53)	27.03 (4.87)	26.61 (5.73)
Depressive symptoms baseline (M, SD)	2.61 (2.29)	3.16 (2.42)	2.24 (2.30)	2.55 (2.42)	1.53 (1.82)	1.77 (1.88)
Non-smoker baseline (%, N)	68.6% (756)	69.4% (812)	80.3% (870)	82.4% (999)	88.3% (1000)	91.4% (921)
Give up smoking (%, N)	7.25 (61)	10.3% (100)	4.0% (37)	4.6% (47)	2.7% (24)	1.2% (9)
Stable non-smoker (%, N)	69.7% (593)	71.5% (697)	82.6% (762)	82.8% (849)	92.0% (805)	93.3% (722)
Take-up smoking (%,N)	3.4% (29)	3.5% (34)	2.4% (22)	1.7% (17)	1.3% (11)	0.6% (5)
Abstainer alcohol baseline (%, N)	7.1% (78)	9.1% (106)	6.9% (75)	10.6^ (128)	9.7% (110)	17.8% (179)
Abstainer overtime (%, N)	9.9% (84)	15.1% (146)	10.6% (98)	17.6% (181)	13.3% (117)	26.8% (208)
Moderate alcohol baseline (%, N)	86.9% (958)	987% (84.4%)	87.1% (944)	83.7% (1015)	83.7% (947)	76.8% (7733)
Continued moderate/reduce alcohol (%, N)	65.1% (554)	61.2% (593)	73.0% (674)	59.1% (606)	76.1% (668)	58.6% (455)
Moderate to vigorous PA at baseline (%, N)	67.9% (720)	49.2% (553)	73.05 (754)	54.1% (601)	54.3% (541)	38.4% (347)
Continued moderate/increased PA (%,N)	67.3% (546)	55.7% (517)	56.9% (498)	45.2% (417)	50.6% (381)	43.8% (292)

Note: PA — physical activity. FEV_1 _ Forced Expiratory Volume. BMI — Body Mass Index.