博士論文

The association between coping behaviours and cardiovascular
disease and cancer in a Japanese population cohort

（日本人集団における対処行動パターンと心血管疾患及びがん
との関連に関する研究）

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Abstract

Background: Coping styles are used to deal with stress. This study aims to assess the association between coping styles, and cardiovascular disease (CVD) and cancer incidence and mortality in Japan.

Methods: The Japan Public Health Center-based (JPHC) Study is a large population-based cohort. Participants were between 50-79 years of age and without a history of cardiovascular disease (for CVD end points) or cancer (for cancer end points), and provided complete answers on coping styles. CVD incidence and mortality analyses included 57,017 subjects. Cancer incidence and mortality analyses included 55,130 subjects. Cox regression models, adjusted for confounders, were used to determine Hazard Ratios (HR) and confidence intervals (CI).

Results: Mean follow-up time was 7.9 - 8.0 years for CVD incidence and CVD mortality, and 9.5 - 9.8 years for cancer incidence and cancer mortality, respectively.

A fantasizing coping style was positively associated with incident CVD (HR=1.26, 95% CI: 1.05—1.52) and stroke (HR=1.24, 95% CI: 1.01—1.53). Subanalyses on stroke subtypes indicated that fantasizing was positively associated with subarachnoid haemorrhage (HR=1.72, 95% CI: 1.01—2.94) and that planning was inversely associated with ischemic stroke (HR=0.82, 95% CI: 0.68—0.99). The inverse association between a planning coping

style and ischemic stroke remained significant even in sensitivity analyses which excluded cases in the first three years of follow-up. None of the coping styles were associated with any of the CVD mortality end points.

None of the coping styles were associated with overall cancer incidence. Positive reappraisal was inversely associated with cancer mortality (HR=0.84, 95% CI: 0.72—0.97), a result which remained statistically significant even when excluding cases in the first three years of follow-up. A planning coping style was positively associated with cancers detected through screening (HR=1.27, 95% CI: 1.09—1.47).

Conclusion: The results of this study indicate that in a Japanese population-based cohort, specific coping styles may be associated with cardiovascular disease incidence and cancer mortality as well as cancers detected through screening. These associations are most likely explained through the utilization of health promoting behaviours.

Keywords: cardiovascular disease; cancer; cohort; coping; incidence; mortality; Japan.

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ACS	Acute coronary syndrome
BMI	Body mass index
CSA	Chronic stable angina
CVD	Cardiovascular disease
HR	Hazard ratios
ICD	International Statistical Classification of Diseases and Related Health Problems
IHD	Ischemic heart disease
ICO	International Classification of Diseases for Oncology
JPHC	Japan Public Health Center
MET	Metabolic Equivalent
MI	Myocardial infarction
NCD	Noncommunicable disease
SCI	Stress and Coping Inventory
PHC	Public health center

1. INTRODUCTION

1.1. Cardiovascular disease and cancer

Cardiovascular disease (CVD) and cancer are the two major causes of death from noncommunicable diseases (NCD) in the world[1]. Over a ten-year period ranging from 2005 to 2015, the global death toll due to CVD and cancer increased by 12.5% and 17.0% respectively[1]. Between 1990 and 2013, incident cases of all cancers except for Hodgkin lymphoma increased on a global level[2]. Moreover, CVD and cancer are among the leading causes of disease burden from NCDs, and disability adjusted life years have significantly increased for both diseases over a ten-year period (2005-2015)[3]. Projections estimate that CVD and cancer will be the cause of 23.3 million and 11.5 million deaths, respectively, in the world by the year 2030[4]. When comparing with the latest available data[1], the projected death toll over the next 13 years correspond to a 30% increase in cardiovascular deaths, and a 31% increase in cancer deaths.

CVD and cancer are also the two major NCDs in Japan, accounting for approximately two thirds of all deaths in the country[5] with stroke, ischemic heart disease (IHD) and cancer ranking in seven of the top ten causes of years of life lost in Japan[6]. Although a number of risk factors have been identified for both CVD and cancer, there is a need to identify additional risk factors to improve preventive efforts and to reduce the burden of CVD and cancer in Japan.

1.1.1. Stress and cardiovascular disease and cancer

Stress is an independent risk factor for ischemic heart disease[7], and the association between stress and coronary heart disease cannot entirely be explained by its mediating effect on traditional risk factors[8]. Stress could be a risk factor of cardiovascular disease and mortality through both direct and indirect effects[9]. Direct effects may involve physiologic changes through the hypothalamic-pituitary-adrenal axis and the sympathetic nervous system which could result in downstream cardiovascular effects such as increased blood pressure and increased heart-rate[10]. The indirect effects of stress exposure may instead affect behaviours such as smoking, or physical activity, which are related to health-risks[9, 10].

Both direct and indirect effects need to be considered also for the association between stress and cancer. One example of a possible direct connection between stress and cancer is proenkephalin, an endogenous opioid neurohormone precursor. Low levels of this neurohormone are strongly associated with a significantly increased risk of incident breast cancer in a large population and in an independent study population[11]. The lowest levels of this specific neurohormone occur in individuals with high levels of perceived stress, thereby indicating that stress may influence the prospect of cancer through a direct pathway.

1.1.2. Personality traits and cardiovascular disease and cancer

There are several population-based studies which have investigated the association between personality traits and CVD and cancer outcomes. An individual-participant meta-analysis found that high levels of conscientiousness are associated with reduced all-cause mortality rates[12], whereas another individual-participant meta-analysis focusing specifically on

cancer outcomes found no association between personality traits and cancer incidence or cancer mortality[13]. Conversely, when considering CVD mortality, a pooled analysis of three cohorts found that a conscientious personality is inversely associated with mortality from both coronary heart disease and stroke, whereas neuroticism and extraversion are associated with increased risk of coronary heart disease and stroke, respectively[14]. A Japanese study found that the personality traits conscientiousness, extraversion and openness may be inversely associated with all-cause mortality[15].

Given the relatively large number of available population-based studies which have investigated the association between personality traits and CVD and cancer outcomes, respectively, it may be of importance to investigate other relevant psychological measures, such as coping styles, and their association with specifically CVD and cancer outcomes. Contrary to the number of studies on personality traits, there are no available population-based studies investigating the association between specific coping styles and incidence and mortality from CVD and cancer.

1.2. Coping

Coping styles are behaviours or strategies used to manage daily problems and psychological stress, a known important and modifiable risk factor for a range of health outcomes including cardiovascular disease and cancer[7, 10, 16-18]. The impact of stress can be minimized through adequate coping[19] or exacerbated through maladaptive coping[20, 21]. Coping is a process, and the term is defined by Lazarus as '[…] *a person's ongoing efforts in thought and action to manage specific demands appraised as taxing or overwhelming*'[22]. As such, the

process approach to coping explains that an individual's coping depends on the situation and is thus contextual. Given that situations may change over time, coping in turn may change to meet new demands and any dynamic stressful encounters that need to be dealt with[23, 24]. Conversely, the term coping styles denote coping which is considered to be a relatively stable characteristic over time[25]. A questionnaire which thus asks how individuals usually deal with problems, without specifying the nature of the problem, allows for an interindividual approach which represents a stable index of an individual's coping style across different situations[25, 26]. Moreover, a specific research question investigating coping in relation to long-term outcomes may warrant coping style measures over coping as a process measure[25]. Indeed, in the current study, incident and mortality outcomes may occur years after coping has been assessed.

Coping styles differ among individuals depending on their cognitive efforts and abilities and can be organised into strategies based on how the individual tackles a problem or stressor. Coping strategies are generally clustered into either approach and avoidance[27], problem-focused and emotion-focused[28], attention and avoidance[29], or a combination of them[26]. Whereas approach, problem-focused, and attention coping tends to focus on the stressor and deal with the source of stress, avoidance and emotion-focused coping is instead utilized to either avoid the stressor or to regulate the individual's own emotions regarding the stressor. Hence, the potential impact of stress on an individual's health could be directly related to the way stress is being dealt with, thereby allowing for coping styles that are favourable or detrimental with respect to health outcomes[30].

Coping in itself cannot be assumed to be good or bad; one must take into account the

individual, the situation the individual is dealing with, the encounter outcome and whether or not the outcome is measured in the short or long run[23, 24, 29]. Avoidance strategies seem to work better in reducing stress in the short run whereas attention strategies seem to work more efficaciously over time[29]. Either strategy also works better than employing no strategy at all[29].

The categorization of coping strategies into specifically approach- or avoidance-oriented may be particularly important for health outcomes. There are benefits and disadvantages of the respective strategies[27], and they are associated with the processing of health threats[31]. In situations where the outcome can be affected or mitigated, the individual's suitable and relevant actions are dependent on approach-oriented strategies oriented towards the stressor[27]. Such action may influence timing of treatment and necessary precautions to prevent exacerbation of illness. Conversely, the disadvantages of adopting avoidance coping on health outcomes that are amenable to change and which require action may be deleterious. Although avoidance-oriented strategies may be beneficial and alleviate any negative emotions and feelings of stress, they do this by orientating the individual away from the source of stress[27]. This may result in emotional numbness and a lack of awareness of the relationship between symptoms and trauma which may in turn impact treatment and recovery[27].

The association between approach and avoidance coping strategies and the processing of health threats indicates that approach coping is associated with short time from symptom discovery to recognition of symptom seriousness and physician contact respectively[31]. Avoidance coping, on the other hand, is associated with long time from symptom discovery

to recognition of symptom seriousness[31].

Approach- and avoidance-oriented coping strategies are complementary as they can be used at different stages of the same taxing situation, e.g. avoidance may allow for emotional respite which provides the necessary energy to tackle the problems using approach-oriented responses[32]. This, in turn, may results in positive associations between the two coping strategies[31], and possibly allow for 'ideal coping' with stress where potential benefits are maximized and disadvantages are minimized[27].

1.2.1. Coping and cardiovascular disease

There is growing evidence on the associations between stress and CVD. Psychological stress is considered an important risk factor for CVD[9, 10], and is associated with increased risk of stroke and coronary heart disease (CHD)[16]. Stress is a factor in both short-term and long-term development of CVD through its direct involvement in physiologic response, indirect involvement with risk factors, as well as a prognostic factor among those with established disease[9]. Stress is however also a potentially modifiable risk factor[9, 10] which may be minimized or exacerbated through coping strategies[19-21], yet there is only limited knowledge available on the importance of coping strategies on CVD related outcomes. Certain coping behaviours or strategies may be associated with important CVD risk factors[33-36]. Coping strategies are associated with systemic inflammatory response[33]. Problem solving or positive reappraisal may be positively associated with body mass index (BMI) as well as overweight/obesity in men[34]. Coping styles are also associated with blood

pressure[35, 36], where an increased use of avoidant coping is associated with lower systolic blood pressure in men, but an increase in systolic blood pressure in women[35]. These variables are all possible mediators for the association between coping and CVD incidence and mortality, with the results indicating that coping styles may have a very important role to play in longitudinal studies on CVD outcomes. Yet, studies to date on the association between coping and CVD outcomes have been conducted in individuals already diagnosed with coronary heart disease. E.g. a case-control study[37] of individuals with chronic stable angina (CSA) (controls) and acute coronary syndrome (ACS) (cases) demonstrated that maladaptive and adaptive coping strategies may be positively and inversely associated respectively with ACS, while coping strategies at the time of a coronary event may be associated with disease severity at follow-up[38]. No studies have however investigated the association between coping styles and CVD incidence or mortality in a premorbid population.

1.2.2. Coping and cancer

Contrary to the paucity of available research on the association between coping and CVD, a number of studies have shown that specific stress coping strategies may be associated with cancer[39-45]. Women with cervical cancer are more likely to report passive stress-coping strategies than active or neutral coping strategies[39]. High scores on avoidant and passive coping styles assessed at the time of cancer diagnosis are associated with an unfavourable evolution of cancer as assessed by cancer stage, and related diagnostic tests[40]. Furthermore, survival of breast cancer patients is inversely associated with behavioural escape-avoidance coping[42] while negative adjustment to disease is positively associated with mortality risk

and relapse of breast cancer at both 5- and 10-year follow-up[43]. Emotion-focused coping strategies are also associated with breast cancer mortality, where expression of emotions is related to better survival whereas suppression of emotions is related to worse survival[44]. For lung cancer patients, depressive coping, e.g. self-pity and arguing with fate, is associated with shorter survival[45]. Such results are, however, ambiguous as there are also studies which have failed to find any associations between coping styles and course of cancer[46], or cancer survival[47-50]. The major limitations of the published research on the association between coping strategies and cancer are the small sample sizes and that studies have focused solely on individuals already diagnosed with an illness prior to the assessment of coping styles. When considering that coping is contextual[24, 28] and that coping strategies may change following diagnosis with severe illness such as cancer[51], the use of a healthy population is crucial for the recognition of any true association between premorbid coping styles and cancer outcomes. To our knowledge there are no such studies to date.

Two main hypotheses have been suggested to explain the relationship between coping and the course of cancer[45]: a biological (direct) effect which considers the influence of coping on immune function, and a behavioural (indirect) effect which focuses on individuals' own health conscious behaviours, e.g. attendance of screening examinations, and reactions to their illness including compliance with treatment and follow-up.

1.3. Objectives

There is only limited evidence available on the association between coping styles and CVD and cancer outcomes. The main objectives of the present study are thus, by using a large general population cohort:

- To assess the association between coping styles—both approach-oriented and avoidance-oriented —and CVD incidence and mortality, and

- To identify the impact of premorbid coping styles on cancer incidence and mortality.

The study aimed to clarify the prospective association of coping style and incidence and mortality of cardiovascular diseases and cancer using data from a community-based prospective study in Japan. A main hypothesis is that the coping styles of planning, consulting someone, and positive reappraisal will be associated with reduced incidence and mortality, whereas the coping styles of fantasizing, avoidance and self-blame will be associated with increased incidence and mortality of CVD and cancer outcomes, respectively. In addition, since a combination of a planning coping style with other coping styles was reported to have a greater impact than that for a single coping style, associations between combinations of a planning coping style with each of the other coping styles was tested.

2. METHODS

2.1. Setting

The Japan Public Health Center-based prospective Study (JPHC Study) is a large cohort with a baseline population of 140,420 registered Japanese inhabitants identified by the population registries maintained by the local municipalities in 11 public health center (PHC) areas. Following the initiation of the first JPHC cohort aged 40-59 in 1990; the second JPHC cohort aged 40-69 was started in 1993. The five PHC of Cohort I are located in Ninohe (Iwate prefecture), Yokote (Akita prefecture), Saku (Nagano prefecture), Ishikawa (Okinawa prefecture), and Katsushika-kita (Tokyo metropolis). The six PHC of Cohort II are located in Kashiwazaki (Niigata prefecture), Kasama (Ibaraki prefecture), Tosayamada (Kochi prefecture), Arikawa (Nagasaki prefecture), Miyako (Okinawa prefecture), and Suita (Osaka prefecture). Surveys of JPHC-study participants were conducted at baseline and at 5-year and 10-year intervals. The study design has been described in detail elsewhere[52], and the study has been approved by the institutional review board of the National Cancer Center (approval number: 13-021) and the University of Tokyo (approval number: 10508), Japan.

Starting point for the present study was the third survey (2000-2004) which included questions on coping styles and information on lifestyle factors. Participants were individuals who responded to the self-administered 10-year follow-up questionnaire at age 50-79 years.

2.2. Study population

The study population was defined as all registered Japanese inhabitants aged 40-59 in cohort

I and 40-69 in cohort II in 11 public health center (PHC) areas, identified by the population registries maintained by the local municipalities. Two PHC areas (Tokyo and Osaka) were excluded from the present analysis as complete data was unavailable for incidence of myocardial infarction (MI), and stroke.

At baseline, there were 116,974 individuals identified in the study population after excluding subjects from Tokyo and Osaka (n=23,446) (Figure 1). Moreover, after excluding persons with non-Japanese nationality (n=51), duplicate enrolment (n=4), a late report of emigration occurring before the start of the baseline study (n=392), ineligibility due to an incorrect birth date (n=7), and persons who had died, moved refused follow-up or had been lost to follow-up before the starting point (n=3378), 113,142 individuals remained in our cohort. There were a total of 87,934 respondents to the third survey (response rate: 78%).

For analyses of CVD end points we excluded individuals with a history of CVD before starting point (n=5,474), and those who failed to provide complete answers on coping (n=25,443), leaving a total of 57,017 individuals in the present study.

For cancer analyses we excluded individuals who failed to provide complete answers on coping (n=27,554) and those with a history of cancer before starting point (n=3469). Additionally, to diminish the effects of reverse causality, a further 1781 individuals with a body mass index (BMI) less than 18.5 kg/m^2 (a possible sign of occult disease) were excluded as we confirmed the same results before and after their exclusion. There were a total of 55,130 participants included in our analyses of cancer end points.
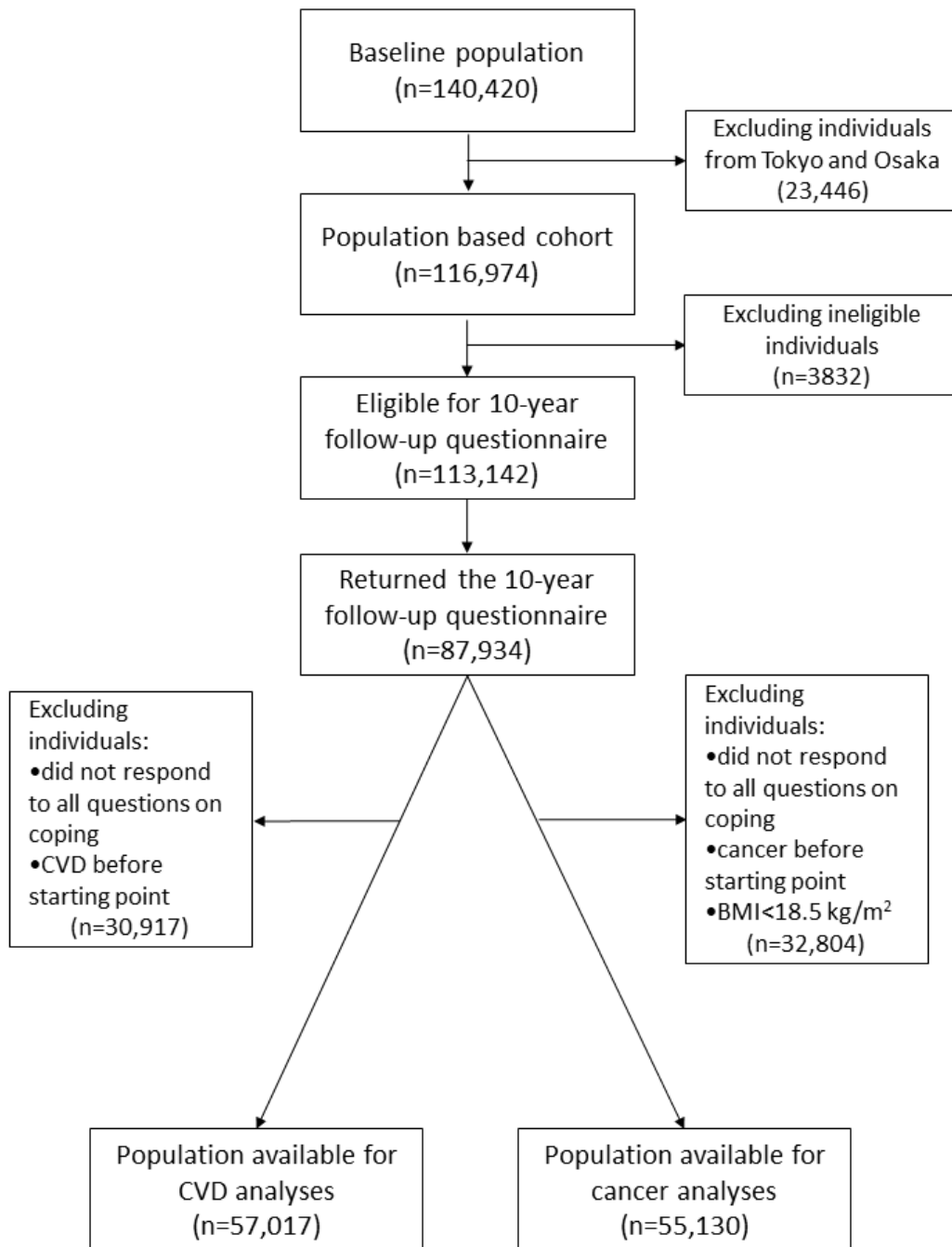
Figure 1: Flowchart depicting the inclusion and exclusion of study participants for cardiovascular disease (CVD) and cancer analyses respectively

2.3. Follow-up

All participants for CVD end points were followed from starting point until 31 December 2009. Participants for cancer end points were followed from starting point until 31 December 2011.

2.4. Assessment of cardiovascular disease outcomes

2.4.1. Identification of cause of cardiovascular mortality

Information on the cause of death for deceased participants was obtained, with the permission of the Ministry of Health, Labour and Welfare, from death certificates on which the cause of death is defined according to the International Statistical Classification of Diseases and Related Health Problems, tenth revision (ICD-10)[53]. Residency registration and death registration are required by the Basic Residential Register Law and Family Registry Law, respectively, and the registers are thought to be complete.

The cardiovascular disease end points of the current study were mortality from IHD (ICD-10: I20-I25), cerebrovascular disease (ICD-10: I60-I69), as well as combined mortality from IHD and cerebrovascular disease (hereafter 'CVD mortality').

2.4.2. Identification of cardiovascular disease incidence

For cardiovascular disease incidence analyses, the endpoints in the current study were myocardial infarction (MI), stroke, and combined incidence of MI and stroke (hereafter 'CVD incidence'). The medical records were reviewed by hospital physicians, public health centre (PHC) physicians, or research physicians. MI was confirmed and diagnosed according to criteria of the MONICA project[54] whereas stroke was diagnosed by Computer Tomographic scan and/or Magnetic Resonance Imaging according to the National Survey of

Stroke criteria[55]. Subtypes of stroke were classified as haemorrhagic (intraparenchymal or subarachnoid) or ischemic.

2.5. Assessment of cancer outcomes

2.5.1. Identification of cause of cancer mortality

Information on the cause of death for deceased participants was obtained from death certificates with the permission of the Ministry of Health, Labor and Welfare. Cause of death is defined according to the International Statistical Classification of Diseases and Related Health Problems, tenth revision (ICD-10)[53] and the end point of the current study was mortality from cancer (ICD-10: C00-C97).

2.5.2. Identification of cancer incidence

Cancer cases were identified through cancer registries and notification from local hospitals in the study areas. Cancer site and histology were coded using the International Classification of Diseases for Oncology, Third Edition (ICD-O-3)[56]. For individuals with multiple cancer diagnoses, only the first recorded event during follow-up was considered.

Localized cancer was defined as cancer that at time of diagnosis had no distant metastases and had not spread to regional lymph nodes or adjacent organs. Screening-detected cancers were defined as cancers detected through screening examination only.

2.6. Assessment of exposure

2.6.1. Coping styles

The main variable of interest in the current study was coping. The Stress and Coping Inventory (SCI) uses 25 items to define one measure of coping: 'Responses to stress' which in turn consists of 25 items used to assess six responses to stress (three positive responses and

three negative responses)[57]. Using an adaptation of questions from the Japanese version of the Stress and Coping Inventory (SCI)[58], we evaluated six coping responses (planning, consulting someone, fantasizing, positive reappraisal, self-blame, and avoidance). The SCI has been validated for use among Japanese college students[58], but has not been validated for use in the JPHC Study population. However, the coping questions have previously been used as the main exposure in a prospective study on suicide in the JPHC Study[59].

Participants responded to one question: '*How do you handle various problems and events that you experience daily?*' by providing the extent to which they used a specified approach, each of which represented a specific coping style: 1. Make a plan and carry it out (planning); 2. Consult with someone (consulting); 3. Hope or fantasize about being able to change it (fantasizing); 4. Endeavor to find the positive side of the situation (positive reappraisal); 5. Blame and criticize yourself (self-blame); 6. Avoid those things and do something else (avoidance). Coping styles were dichotomized from a 5-step Likert-scale, and participants were considered to adopt a specific style if they reportedly used it "Fairly often" or "Extremely often" (in contrast to 'Hardly ever', 'Infrequently', or 'Sometimes').

A network graph (Supplementary Figure 1) shows the correlation structure between the different coping styles for the 57,017 individuals included in the analyses for CVD endpoints.

A correlation matrix for the different coping styles for the 55,130 individuals included in the analyses on cancer end points is available as a supplementary table (Supplementary Table 1).

2.7. Statistical analysis

Statistical analyses were performed using SAS (SAS software version 9.3; SAS Institute Inc., Cary, NC) and the R statistical software (version 3.1.1; R Development Core Team, 2014). The significance level was set as $p < 0.05$.

2.7.1. Covariates for statistical analyses

The present study used age as a continues variable, with the definition of remaining covariates used in the statistical models as follows: gender (man or woman), alcohol consumption (none or occasional, <150, and ≥150 g ethanol/wk.), smoking (never, former smoker, <20 cig./day, >20cig./day), a self-reported history of diabetes (yes/no), total physical activity (leisure time and occupational activity measured in metabolic equivalent (MET) in kcal/kg/h (continuous variable)), body mass index (<18.5 kg/m^2, 18.5-22.9 kg/m^2, 23.0-24.9 kg/m^2, and ≥25 kg/m^2), hypertension (systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg), self-reported use of any prescribed medications by a physician (yes/no), unemployment (yes/no), having undergone screening examination (for men and women: blood pressure, blood test, electrocardiography, fundoscopy, chest radiograph, sputum cytology, gastric photofluorography, gastric endoscopy, faecal occult blood test, barium enema, or colonoscopy; for women: mammography or Papanicolau smear), and living arrangements (living alone (yes/no), living with a spouse (yes/no), living with children (yes/no), living with parents (yes/no), or living with other (yes/no)). Affirmative attendance at screening examiation was defined as having attended at least one of the screenings listed. Hypertension (systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg) was included as a covariate only in analyses on cardiovascular end points. In analyses on cancer end points, body mass index categories were defined as 18.5-22.9 kg/m^2, 23.0-24.9 kg/m^2, and ≥25 kg/m^2, and living arrangements were defined as living alone vs. living with spouse, child, parent or other (yes/no).

2.7.2. Analysis of cardiovascular end points

Person-years of follow up were calculated for each participant from starting point (10-year follow-up questionnaire) to the date of cardiovascular disease diagnosis (for incidence

analysis), the date of cardiovascular death (for mortality analysis), moving out of the study area or end of follow-up period (31 December, 2009), whichever occurred first. For individuals who withdrew from the study or were lost to follow-up, the date of censoring was set as the date of withdrawal or the last confirmed date of presence in the study. For individuals with multiple cardiovascular diagnoses, only the first recorded event during follow-up was considered.

Hazard ratios (HR) and 95% confidence intervals (CI) were used to characterize the relative risk of incidence of MI, stroke or CVD, or cardiovascular mortality associated with coping styles. Cox proportional hazards models were used to estimate HR while controlling for potential confounders as described in the section above. All analyses were stratified on study area. Cancer screening examinations were included in our multivariable model on cardiovascular end points as they have the potential to independently serve as indicators of general health awareness and health conscious behaviour among participants. Interactions were considered between a) a planning coping style and the each of the five remaining coping styles, and b) between coping styles and the relevant demographic variables gender and age.

Multivariable sensitivity analyses which excluded cases in the first three years of follow-up were conducted for all end points to account for the possibility of reverse causation[60].

2.7.3. Analysis of cancer end points

For each participant, person-years of follow up were calculated from the starting point (10-year follow-up questionnaire) to the first date of cancer diagnosis (for incidence analysis), the date of cancer death (for mortality analysis), moving out of the study area or end of follow-up period, whichever occurred first. The date of censoring was set as the date of withdrawal or the last confirmed date of presence in the study for individuals who withdrew from the study

or were lost to follow-up respectively.

The relative risks of cancer incidence and mortality associated with coping styles were characterized using HR and 95% CI. HR was estimated by Cox proportional hazards models while controlling for potential confounders. All cancer analyses were stratified on study area (9 PHC areas).

Additionally, we conducted multivariable sensitivity analyses which excluded cases in the first three years of follow-up.

Longitudinal sub analyses were conducted on the association between coping styles and 1) cancer subtype (gastric, colon, rectal, liver, pancreatic, lung, breast, and prostate), 2) localized cancer at time of diagnosis, and 3) cancers detected through screening, respectively. Multivariable models for localized cancer incidence and screening-detected cancers were not adjusted for screening examination as this variable may lie on the causal pathway between coping and the respective end points.

3. RESULTS

3.1. Cardiovascular disease

3.1.1. Coping styles and baseline characteristics

When comparing excluded (persons from Tokyo/Osaka and non-responders to questions on coping) with included individuals, excluded individuals were more likely to be older, women, hypertensive, unemployed, take medications, live alone, drink less, smoke less, and were less likely to have undergone a health screening examination (data not shown).

The coping styles of positive reappraisal and planning were used by 21.8% and 19.9% of participants respectively, but only 3.9% of respondents actively utilized avoidance (Table 1). The majority of those who used planning (53.2%) were men whereas the highest proportion of women was seen for consulting someone (69.0%).

Individuals who used a planning style had the lowest proportion of never smokers and none/occasional consumers of alcohol, as well as lowest proportion of individuals who were living alone. They also had the highest proportion of past and current smokers, overall consumers of alcohol, and those who lived with a spouse or a parent. Conversely, individuals who used an avoidance coping style had the highest proportion of those who had a BMI ≥ 25 kg/m^2, were unemployed, or lived alone. They also had the lowest proportion of those living with a spouse or parent, and attendance to a health screening examination.

Table 1: Characteristics at starting point for the total population and for subjects according to specific coping styles

Variable	Total population	Planning		Consulting someone		Positive reappraisal		Fantasizing		Avoidance		Self-blame	
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Number of subjects	57,017	11,355	45,662	4732	52,285	12,405	44,612	3915	53,102	2225	54,792	2642	54,375
Proportion of total population (%)	100	19.9	80.1	8.3	91.7	21.8	78.2	6.9	93.1	3.9	96.1	4.6	95.4
Person years of follow-up	448,660	90,280	358,380	37,381	411,280	99,032	349,628	30,776	417,885	17,551	431,110	20,901	427,759
Men (%)	47.3	53.3	45.7	31.1	48.7	46.1	47.6	36.7	48.0	40.5	47.5	38.2	47.7
Age [mean (years ± s.d.)]	60.3 ± 7.4	60.0 ± 7.2	60.4 ± 7.5	59.8 ± 7.5	60.3 ± 7.4	59.8 ± 7.2	60.4 ± 7.5	59.4 ± 7.3	60.4 ± 7.4	60.6 ± 7.5	60.3 ± 7.4	59.3 ± 7.1	60.3 ± 7.4
Smoking status (%)													
Never	63.3	60.0	64.1	74.0	62.3	64.2	63.0	69.0	62.9	66.4	63.2	69.6	63.0
Past	14.4	16.9	13.7	10.6	14.7	14.8	14.3	10.7	14.6	13.1	14.4	11.7	14.5
Current	22.4	23.1	22.2	15.5	23.0	21.1	22.7	20.3	22.5	20.6	22.4	18.7	22.5
Alcohol consumption (%)													
None/Occasional	62.4	57.7	63.6	70.9	61.6	61.5	62.6	65.4	62.2	65.1	62.3	66.0	62.2
<150 g. ethanol /wk.	12.7	14.4	12.2	12.5	12.7	13.7	12.4	13.0	12.6	12.0	12.7	12.0	12.7
≥150 g. ethanol /wk.	25.0	28.0	24.2	16.6	25.7	24.8	25.0	21.6	25.2	22.9	25.0	22.0	25.1
PA mean (MET-hours/day ± s.d.)]	40.9 ± 7.2	41.1 ± 7.1	40.8 ± 7.2	40.6 ± 6.9	40.9 ± 7.2	41.3 ± 7.0	40.8 ± 7.2	41.3 ± 7.3	40.9 ± 7.2	41.3 ± 7.5	40.9 ± 7.2	41.5 ± 7.5	40.9 ± 7.2

Table 1 continued — Coping styles

Variable	Total Population	Planning		Consulting someone		Positive reappraisal		Fantasizing		Avoidance		Self-blame	
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
BMI (%)													
≤ 18.5 kg/m^2	3.4	3.2	3.4	3.9	3.3	3.0	3.5	4.6	3.3	3.9	3.4	4.4	3.3
18.5 – 23 kg/m^2	39.9	39.8	40.0	41.0	39.8	39.3	40.1	40.1	39.9	39.4	40.0	41.3	39.9
23 – 25 kg/m^2	25.8	26.7	25.5	25.2	25.8	26.7	25.5	23.7	25.9	24.0	25.8	23.6	25.9
≥25 kg/m^2	30.9	30.4	31.1	30.0	31.0	31.1	30.9	31.7	30.9	32.7	30.9	30.7	30.9
Hypertension* (%)	35.8	33.7	36.3	32.7	36.1	32.8	36.7	34.6	35.9	36.4	35.7	35.6	35.8
Unemployment (%)	13.6	12.5	13.9	12.1	13.8	11.2	14.3	12.5	13.7	15.2	13.6	12.8	13.7
Screening Examination (%)	86.8	89.1	86.2	90.4	86.5	88.8	86.2	87.3	86.8	85.2	86.9	87.4	86.8
History of diabetes (%)	5.9	5.9	5.9	5.3	5.9	5.6	6.0	6.5	5.8	5.7	5.9	6.4	5.9
Use of prescribed medications (%)	40.6	40.1	40.7	44.4	40.2	38.6	41.1	41.9	40.5	40.1	40.6	44.0	40.4
Living arrangements (%)													
Living alone	6.1	6.0	6.1	6.5	6.1	6.1	6.1	6.7	6.1	7.9	6.0	7.0	6.1
Living with spouse	77.0	80.6	76.2	76.1	77.1	79.3	76.4	75.4	77.2	72.7	77.2	75.1	77.1
Living with children	53.2	52.4	53.4	55.9	52.9	53.0	53.2	55.2	53.0	53.6	53.2	51.9	53.2
Living with parents	15.6	16.1	15.5	15.9	15.6	15.7	15.6	15.7	15.6	13.5	15.7	15.3	15.7
Living with other	11.2	11.2	11.3	13.7	11.0	11.5	11.2	11.6	11.2	12.8	11.2	11.0	11.2

*Hypertension defined as systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90mmHg

Abbreviations: BMI: Body Mass Index; MET: Metabolic Equivalent; PA: Total physical activity; s.d: Standard deviation.

3.1.2. Incidence of MI and Stroke

Mean follow-up time for incidence was 7.9 years. During follow-up, there were 304 MI and 1565 strokes among the 57,017 subjects. The five-year cumulative probabilities of myocardial infarction and stroke occurrence were estimated at 0.34% and 1.64%, respectively. The coping style fantasizing was positively associated with incident CVD (HR=1.26, 95% CI: 1.05—1.52) and stroke (HR=1.24, 95% CI: 1.01—1.53) (Table 2 and Table 4). Exclusion of incident cases occurring in the first three years of follow-up attenuated the significant results, but directions of the association remained unchanged. There was no association between coping styles and incidence of MI (Table 3).

Sub-analyses on incidence of stroke subtypes (Tables 5-7) indicated that fantasizing was positively associated with subarachnoid haemorrhage (HR=1.72, 95% CI: 1.01—2.94) and that a planning style was inversely associated with ischemic stroke (HR=0.82, 95% CI: 0.68—0.99). Three-year sensitivity analyses attenuated the association between fantasizing and subarachnoid haemorrhage, whereas a planning style remained significantly inversely associated with ischemic stroke (HR=0.78, 95% CI: 0.62—0.98).

There were no significant interactions between planning and any of the five other coping styles for any of the incident cardiovascular end points.

Table 2: Cox proportional hazard models for the association between coping styles and incidence of cardiovascular disease (CVD)

Variable			CVD		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	90,280	349	0.90 (0.79-1.03)	0.93 (0.81-1.06)	0.89 (0.76-1.04)
No	358,380	1519	Reference	Reference	Reference
Consulting someone					
Yes	37,381	138	1.03 (0.86-1.24)	1.04 (0.87-1.24)	1.01 (0.81-1.26)
No	411,280	1730	Reference	Reference	Reference
Positive reappraisal					
Yes	99,032	372	0.93 (0.82-1.06)	0.98 (0.86-1.11)	1.05 (0.90-1.23)
No	349,628	1496	Reference	Reference	Reference
Fantasizing					
Yes	30,776	134	**1.28** (1.06-1.55)	**1.26*** (1.05-1.52)	1.11 (0.88-1.40)
No	417,885	1734	Reference	Reference	Reference
Avoidance					
Yes	17,551	69	0.94 (0.73-1.20)	0.92 (0.72-1.17)	1.05 (0.79-1.39)
No	431,110	1799	Reference	Reference	Reference
Self-blame					
Yes	20,901	77	0.96 (0.76-1.21)	0.95 (0.75-1.21)	0.99 (0.75-1.32)
No	427,759	1791	Reference	Reference	Reference

*p<0.05

[*]Model 1 is adjusted for age and gender.

[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and all coping styles.

[‡]Model 3 excludes cases in the first three years of follow-up.

Abbreviations: CI: Confidence Interval; CVD: Cardiovascular disease; HR: Hazard Ratio.

Table 3: Cox proportional hazard models for the association between coping styles and incidence of myocardial infarction (MI)

Variable			MI		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	90,280	65	0.97 (0.71-1.32)	0.99 (0.72-1.35)	0.89 (0.60-1.31)
No	358,380	239	Reference	Reference	Reference
Consulting someone					
Yes	37,381	23	1.11 (0.71-1.73)	1.12 (0.72-1.74)	1.03 (0.58-1.80)
No	411,280	281	Reference	Reference	Reference
Positive reappraisal					
Yes	99,032	68	1.03 (0.76-1.41)	1.09 (0.79-1.49)	1.10 (0.75-1.61)
No	349,628	236	Reference	Reference	Reference
Fantasizing					
Yes	30,776	23	1.41 (0.90-2.22)	1.37 (0.87-2.15)	1.38 (0.79-2.42)
No	417,885	281	Reference	Reference	Reference
Avoidance					
Yes	17,551	7	0.55 (0.26-1.19)	0.54 (0.25-1.16)	0.47 (0.17-1.29)
No	431,110	297	Reference	Reference	Reference
Self-blame					
Yes	20,901	12	0.96 (0.53-1.74)	0.96 (0.53-1.75)	0.83 (0.38-1.81)
No	427,759	292	Reference	Reference	Reference

[*]Model 1 is adjusted for age and gender.
[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and all coping styles.
[‡]Model 3 excludes cases in the first three years of follow-up.
Abbreviations: CI: Confidence Interval; HR: Hazard Ratio; MI: Myocardial infarction

Table 4: Cox proportional hazard models for the association between coping styles and incidence of stroke

Variable			Stroke		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	90,280	284	0.89 (0.77-1.03)	0.91 (0.79-1.06)	0.89 (0.75-1.06)
No	358,380	1281	Reference	Reference	Reference
Consulting someone					
Yes	37,381	115	1.02 (0.84-1.24)	1.02 (0.84-1.25)	1.01 (0.80-1.29)
No	411,280	1450	Reference	Reference	Reference
Positive reappraisal					
Yes	99,032	304	0.91 (0.79-1.05)	0.96 (0.83-1.10)	1.04 (0.88-1.24)
No	349,628	1261	Reference	Reference	Reference
Fantasizing					
Yes	30,776	111	**1.26* (1.02-1.55)**	**1.24* (1.01-1.53)**	1.06 (0.82-1.37)
No	417,885	1454	Reference	Reference	Reference
Avoidance					
Yes	17,551	62	1.01 (0.78-1.31)	0.99 (0.76-1.29)	1.16 (0.86-1.56)
No	431,110	1503	Reference	Reference	Reference
Self-blame					
Yes	20,901	65	0.96 (0.74-1.24)	0.95 (0.74-1.23)	1.03 (0.76-1.39)
No	427,759	1500	Reference	Reference	Reference

*p<0.05;

[*]Model 1 is adjusted for age and gender.

[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and all coping styles.

[‡]Model 3 excludes cases in the first three years of follow-up.

Abbreviations: CI: Confidence Interval; HR: Hazard Ratio.

Table 5: Cox proportional hazard models for the association between coping styles and incidence of intraparenchymal haemorrhage

Variable			Intraparenchymal haemorrhage		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	90,280	95	1.11 (0.86-1.44)	1.17 (0.90-1.51)	1.16 (0.85-1.60)
No	358,380	354	Reference	Reference	Reference
Consulting someone					
Yes	37,381	34	0.93 (0.65-1.34)	0.95 (0.66-1.37)	0.84 (0.52-1.34)
No	411,280	415	Reference	Reference	Reference
Positive reappraisal					
Yes	99,032	93	0.87 (0.67-1.13)	0.88 (0.67-1.15)	0.90 (0.65-1.25)
No	349,628	356	Reference	Reference	Reference
Fantasizing					
Yes	30,776	38	1.40 (0.98-2.01)	1.39 (0.97-2.00)	1.16 (0.72-1.84)
No	417,885	411	Reference	Reference	Reference
Avoidance					
Yes	17,551	23	1.27 (0.82-1.96)	1.24 (0.80-1.91)	1.50 (0.92-2.45)
No	431,110	426	Reference	Reference	Reference
Self-blame					
Yes	20,901	21	0.97 (0.61-1.53)	0.97 (0.61-1.54)	1.06 (0.62-1.83)
No	427,759	428	Reference	Reference	Reference

[*]Model 1 is adjusted for age and gender;
[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and all coping styles.
[‡]Model 3 excludes cases in the first three years of follow-up.
Abbreviations: CI: Confidence Interval; HR: Hazard Ratio.

Table 6: Cox proportional hazard models for the association between coping styles and incidence of subarachnoid haemorrhage

Variable			Subarachnoid haemorrhage		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	90,280	27	0.83 (0.52-1.31)	0.86 (0.54-1.37)	0.95 (0.53-1.70)
No	358,380	133	Reference	Reference	Reference
Consulting someone					
Yes	37,381	14	0.95 (0.54-1.69)	0.95 (0.53-1.68)	0.90 (0.42-1.92)
No	411,280	146	Reference	Reference	Reference
Positive reappraisal					
Yes	99,032	33	0.92 (0.59-1.42)	0.95 (0.61-1.48)	1.25 (0.72-2.16)
No	349,628	127	Reference	Reference	Reference
Fantasizing					
Yes	30,776	18	**1.75* (1.03-2.99)**	**1.72* (1.01-2.94)**	1.18 (0.54-2.56)
No	417,885	142	Reference	Reference	Reference
Avoidance					
Yes	17,551	8	1.15 (0.55-2.39)	1.13 (0.54-2.36)	1.29 (0.51-3.27)
No	431,110	152	Reference	Reference	Reference
Self-blame					
Yes	20,901	10	1.15 (0.59-2.27)	1.18 (0.60-2.31)	1.03 (0.40-2.62)
No	427,759	150	Reference	Reference	Reference

*p<0.05;
[*]Model 1 is adjusted for age and gender;
[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and all coping styles.
[‡]Model 3 excludes cases in the first three years of follow-up.
Abbreviations: CI: Confidence Interval; HR: Hazard Ratio.

Table 7: Cox proportional hazard models for the association between coping styles and incidence of ischemic stroke

Variable			Ischemic stroke		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	90,280	162	**0.80*** **(0.67-0.97)**	**0.82*** **(0.68-0.99)**	**0.78*** **(0.62-0.98)**
No	358,380	794	Reference	Reference	Reference
Consulting someone					
Yes	37,381	67	1.08 (0.83-1.40)	1.07 (0.83-1.39)	1.11 (0.83-1.50)
No	411,280	889	Reference	Reference	Reference
Positive reappraisal					
Yes	99,032	178	0.93 (0.78-1.12)	1.00 (0.83-1.20)	1.08 (0.87-1.35)
No	349,628	778	Reference	Reference	Reference
Fantasizing					
Yes	30,776	55	1.08 (0.81-1.45)	1.06 (0.80-1.42)	0.99 (0.70-1.40)
No	417,885	901	Reference	Reference	Reference
Avoidance					
Yes	17,551	31	0.87 (0.60-1.25)	0.85 (0.59-1.22)	0.99 (0.66-1.48)
No	431,110	925	Reference	Reference	Reference
Self-blame					
Yes	20,901	34	0.91 (0.64-1.29)	0.89 (0.63-1.27)	1.02 (0.69-1.51)
No	427,759	922	Reference	Reference	Reference

*p<0.05;
[*]Model 1 is adjusted for age and gender;
[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and all coping styles.
[‡]Model 3 excludes cases in the first three years of follow-up.
Abbreviations: CI: Confidence Interval; HR: Hazard Ratio.

3.1.3. Mortality

Mean follow-up time for mortality was 8.0 years. During this time, there were 191 and 331 deaths from IHD and cerebrovascular disease respectively. The five-year cumulative probabilities of death from IHD and cerebrovascular disease were estimated, respectively, at 0.20% and 0.33%. In the multivariable analyses (Tables 8-13), none of the coping styles were associated with any of the mortality end points.

There were no significant interactions between planning and any of the five other coping styles for any of the mortality end points.

Table 8: Cox proportional hazard models for the association between coping styles and mortality from cardiovascular disease (CVD)

Variable			CVD		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	91,505	86	0.85 (0.70-1.10)	0.91 (0.70-1.18)	1.02 (0.76-1.37)
No	363,376	436	Reference	Reference	Reference
Consulting someone					
Yes	37,873	38	1.11 (0.79-1.57)	1.06 (0.75-1.50)	1.13 (0.77-1.67)
No	417,007	484	Reference	Reference	Reference
Positive reappraisal					
Yes	100,310	85	**0.75* (0.58-0.98)**	0.82 (0.63-1.07)	0.83 (0.61-1.12)
No	354,570	437	Reference	Reference	Reference
Fantasizing					
Yes	31,265	31	1.12 (0.76-1.64)	1.07 (0.73-1.58)	1.23 (0.80-1.88)
No	423,616	491	Reference	Reference	Reference
Avoidance					
Yes	17,757	25	1.37 (0.91-2.07)	1.32 (0.87-1.99)	1.51 (0.96-2.37)
No	437,124	497	Reference	Reference	Reference
Self-blame					
Yes	21,161	17	0.79 (0.48-1.31)	0.77 (0.47-1.27)	0.56 (0.30-1.08)
No	433,719	505	Reference	Reference	Reference

*p<0.05;
[*]Model 1 is adjusted for age and gender;
[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and coping styles.
[‡]Model 3 excludes cases in the first three years of follow-up.
Abbreviations: CI: Confidence Interval; CVD: Cardiovascular disease; HR: Hazard Ratio.

Table 9: Cox proportional hazard models for the association between coping styles and mortality from ischemic heart disease (IHD)

Variable			IHD		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	91,505	35	1.08 (0.72-1.63)	1.17 (0.77-1.77)	1.50 (0.96-2.35)
No	363,376	156	Reference	Reference	Reference
Consulting someone					
Yes	37,873	9	0.73 (0.37-1.45)	0.72 (0.36-1.43)	0.81 (0.38-1.69)
No	417,007	182	Reference	Reference	Reference
Positive reappraisal					
Yes	100,310	27	**0.59* (0.38-0.94)**	0.66 (0.41-1.04)	0.64 (0.39-1.08)
No	354,570	164	Reference	Reference	Reference
Fantasizing					
Yes	31,265	10	1.07 (0.55-2.11)	1.01 (0.51-1.99)	1.16 (0.56-2.39)
No	423,616	181	Reference	Reference	Reference
Avoidance					
Yes	17,757	9	1.44 (0.72-2.87)	1.40 (0.70-2.78)	1.63 (0.78-3.43)
No	437,124	182	Reference	Reference	Reference
Self-blame					
Yes	21,161	7	1.02 (0.47-2.24)	1.01 (0.46-2.21)	0.86 (0.34-2.18)
No	433,719	184	Reference	Reference	Reference

*p<0.05;
[*]Model 1 is adjusted for age and gender;
[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and coping styles.
[‡]Model 3 excludes cases in the first three years of follow-up.
Abbreviations: CI: Confidence Interval; HR: Hazard Ratio; IHD: Ischemic Heart Disease.

Table 10: Cox proportional hazard models for the association between coping styles and mortality from cerebrovascular disease

Variable			Cerebrovascular disease		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	91,505	51	0.74 (0.53-1.03)	0.79 (0.56-1.10)	0.79 (0.54-1.17)
No	363,376	280	Reference	Reference	Reference
Consulting someone					
Yes	37,873	29	1.34 (0.90-1.99)	1.26 (0.84-1.89)	1.34 (0.85-2.12)
No	417,007	302	Reference	Reference	Reference
Positive reappraisal					
Yes	100,310	58	0.85 (0.62-1.17)	0.92 (0.67-1.28)	0.95 (0.65-1.39)
No	354,570	273	Reference	Reference	Reference
Fantasizing					
Yes	31,265	21	1.14 (0.71-1.82)	1.10 (0.68-1.75)	1.26 (0.74-2.12)
No	423,616	310	Reference	Reference	Reference
Avoidance					
Yes	17,757	16	1.34 (0.80-2.25)	1.27 (0.76-2.13)	1.42 (0.80-2.52)
No	437,124	315	Reference	Reference	Reference
Self-blame					
Yes	21,161	10	0.68 (0.35-1.30)	0.66 (0.34-1.26)	0.42 (0.17-1.03)
No	433,719	321	Reference	Reference	Reference

[*]Model 1 is adjusted for age and gender;
[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and coping styles.
[‡]Model 3 excludes cases in the first three years of follow-up.
Abbreviations: CI: Confidence Interval; HR: Hazard Ratio.

Table 11: Cox proportional hazard models for the association between coping styles and mortality from intracranial haemorrhage

Variable			Intracranial haemorrhage		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	91,505	19	0.69 (0.40-1.18)	0.73 (0.43-1.27)	0.87 (0.46-1.64)
No	363,376	108	Reference	Reference	Reference
Consulting someone					
Yes	37,873	9	1.13 (0.56-2.28)	1.09 (0.54-2.20)	0.85 (0.33-2.16)
No	417,007	118	Reference	Reference	Reference
Positive reappraisal					
Yes	100,310	22	0.84 (0.50-1.41)	0.89 (0.53-1.51)	0.86 (0.46-1.64)
No	354,570	105	Reference	Reference	Reference
Fantasizing					
Yes	31,265	9	1.36 (0.66-2.80)	1.28 (0.62-2.64)	1.71 (0.75-3.87)
No	423,616	118	Reference	Reference	Reference
Avoidance					
Yes	17,757	7	1.59 (0.73-3.48)	1.52 (0.69-3.33)	1.31 (0.47-3.65)
No	437,124	120	Reference	Reference	Reference
Self-blame					
Yes	21,161	4	0.68 (0.24-1.92)	0.65 (0.23-1.83)	0.22 (0.03-1.66)
No	433,719	123	Reference	Reference	Reference

[*]Model 1 is adjusted for age and gender;
[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and coping styles.
[‡]Model 3 excludes cases in the first three years of follow-up.
Abbreviations: CI: Confidence Interval; HR: Hazard Ratio.

Table 12: Cox proportional hazard models for the association between coping styles and mortality from subarachnoid haemorrhage

Variable			Subarachnoid haemorrhage		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	91,505	11	0.71 (0.35-1.42)	0.75 (0.37-1.52)	0.76 (0.33-1.76)
No	363,376	70	Reference	Reference	Reference
Consulting someone					
Yes	37,873	7	1.25 (0.56-2.78)	1.11 (0.47-2.64)	1.71 (0.70-4.15)
No	417,007	74	Reference	Reference	Reference
Positive reappraisal					
Yes	100,310	13	0.82 (0.42-1.59)	0.90 (0.46-1.75)	1.02 (0.46-2.24)
No	354,570	68	Reference	Reference	Reference
Fantasizing					
Yes	31,265	3	0.56 (0.17-1.85)	0.54 (0.16-1.80)	0.51 (0.12-2.22)
No	423,616	78	Reference	Reference	Reference
Avoidance					
Yes	17,757	4	1.45 (0.52-4.06)	1.32 (0.47-3.70)	2.12 (0.74-6.05)
No	437,124	77	Reference	Reference	Reference
Self-blame					
Yes	21,161	3	0.89 (0.27-2.93)	0.89 (0.27-2.92)	0.39 (0.05-2.91)
No	433,719	78	Reference	Reference	Reference

[*]Model 1 is adjusted for age and gender;
[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and coping styles.
[‡]Model 3 excludes cases in the first three years of follow-up.
Abbreviations: CI: Confidence Interval; HR: Hazard Ratio.

Table 13: Cox proportional hazard models for the association between coping styles and mortality from ischemic stroke

Variable			Ischemic stroke		
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Model 3[‡] HR (95% CI)
Planning					
Yes	91,505	11	0.76 (0.38-1.60)	0.84 (0.41-1.74)	0.56 (0.22-1.44)
No	363,376	56	Reference	Reference	Reference
Consulting someone					
Yes	37,873	9	1.91 (0.91-4.02)	1.80 (0.85-3.80)	1.88 (0.81-4.41)
No	417,007	58	Reference	Reference	Reference
Positive reappraisal					
Yes	100,310	13	0.91 (0.45-1.82)	1.04 (0.51-2.12)	1.06 (0.46-2.44)
No	354,570	54	Reference	Reference	Reference
Fantasizing					
Yes	31,265	6	1.63 (0.66-4.02)	1.53 (0.62-3.77)	1.76 (0.64-4.80)
No	423,616	61	Reference	Reference	Reference
Avoidance					
Yes	17,757	3	1.09 (0.33-3.56)	0.99 (0.30-3.25)	1.31 (0.39-4.38)
No	437,124	64	Reference	Reference	Reference
Self-blame					
Yes	21,161	1	0.28 (0.04-2.11)	0.28 (0.04-2.08)	0.37 (0.05-2.82)
No	433,719	66	Reference	Reference	Reference

[*]Model 1 is adjusted for age and gender;
[†]Model 2 is additionally adjusted for alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, hypertension, living arrangements, and coping styles.
[‡]Model 3 excludes cases in the first three years of follow-up.
Abbreviations: CI: Confidence Interval; HR: Hazard Ratio.

3.1.4. Gender interactions

Gender interacted significantly with a planning coping style only for the intracranial haemorrhage mortality end point (p for interaction: <0.05) (data not shown). In further gender-stratified analyses, a planning coping style was inversely associated with mortality from intracranial haemorrhage in men (HR=0.46, 95% CI: 0.23—0.92) but not among women.

3.2. Cancer

3.2.1. Coping styles and baseline characteristics

Table 14 shows baseline characteristics of the study population used for analyses on cancer end points. Individuals who used a planning coping style had the lowest proportion of never smokers and none/occasional consumers of alcohol, as well as the lowest proportion of individuals who were living alone or had a BMI ≥ 25 kg/m^2. They also had the highest proportion of past- and current smokers, overall consumers of alcohol, and of those who had attended screening examinations. Conversely, individuals who used an avoidance coping style had the highest proportion of BMI ≥ 25 kg/m^2, unemployed, and living alone. They also had the lowest proportion of attendees to a health screening examination.

Table 14: Characteristics at starting point for the total population and for subjects according to specific coping styles

| Variable | Total population | Coping styles | | | | | | | | | | | |
| | | Planning | | Consulting someone | | Positive reappraisal | | Fantasizing | | Avoidance | | Self-blame | |
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Number of subjects	55,130	10,954	44,176	4504	50,626	11,954	43,176	3729	51,401	2138	52,992	2534	52,596
Proportion of total population (%)	100	19.9	80.1	8.2	91.8	21.7	78.3	6.8	93.2	3.9	96.1	4.6	95.4
Person years of follow-up	523,384	104,884	418,501	43,091	480,293	115,004	408,380	35,574	487,810	20,273	503,112	24,330	499,055
Men (%)	48.5	54.7	46.9	32.1	49.9	47.2	48.8	37.7	49.2	41.6	48.7	40.1	48.9
Age [mean (years ± s.d.)]	60.3 ± 7.4	59.9 ± 7.2	60.4 ± 7.4	60.0 ± 7.5	60.3 ± 7.4	59.7 ± 7.2	60.5 ± 7.5	59.3 ± 7.2	60.4 ± 7.4	60.6 ± 7.5	60.3 ± 7.4	59.4 ± 7.1	60.4 ± 7.4
Smoking status (%)													
Never	62.7	59.3	63.6	73.6	61.8	63.7	62.5	68.5	62.3	65.7	62.6	68.6	62.4
Past	15.0	17.6	14.3	10.9	15.3	15.4	14.9	10.8	15.3	13.4	15.0	12.9	15.1
Current	22.3	23.1	22.1	15.6	22.9	21.0	22.7	20.7	22.4	20.8	22.4	18.5	22.5
Alcohol consumption (%)													
None/Occasional	62.1	57.2	63.3	70.7	61.3	61.2	62.4	65.2	61.9	64.8	62.0	65.3	62.0
<150 g. ethanol /wk.	12.7	14.4	12.3	12.4	12.8	13.8	12.4	12.8	12.7	11.8	12.8	12.4	12.7
≥150 g. ethanol /wk.	25.2	28.4	24.4	16.9	25.9	25.0	25.2	22.0	25.4	23.4	25.2	22.3	25.3
PA mean (MET-hours/day ± s.d.)]	40.9 ± 7.2	41.1 ± 7.0	40.8 ± 7.3	40.6 ± 6.9	40.9 ± 7.2	41.3 ± 7.1	40.7 ± 7.2	41.3 ± 7.3	40.8 ± 7.2	41.3 ± 7.4	40.8 ± 7.2	41.5 ± 7.6	40.8 ± 7.2
BMI (%)													
$18.5 - 23$ kg/m^2	40.7	40.4	40.8	41.9	40.6	39.7	41.0	41.8	40.7	40.8	40.7	42.2	40.7
$23 - 25$ kg/m^2	26.8	27.7	26.6	26.1	26.9	27.7	26.6	24.8	27.0	25.1	26.9	24.8	26.9
≥ 25 kg/m^2	32.5	31.9	32.6	32.0	32.5	32.6	32.4	33.4	32.4	34.1	32.4	33.1	32.4

Table 14 continued

<table>
<tr><td colspan="16" align="center">**Coping styles**</td></tr>
<tr><td>**Variable**</td><td>Overall population</td><td colspan="2">Planning</td><td colspan="2">Consulting someone</td><td colspan="2">Positive reappraisal</td><td colspan="2">Fantasizing</td><td colspan="2">Avoidance</td><td colspan="2">Self-blame</td></tr>
<tr><td></td><td></td><td>Yes</td><td>No</td><td>Yes</td><td>No</td><td>Yes</td><td>No</td><td>Yes</td><td>No</td><td>Yes</td><td>No</td><td>Yes</td><td>No</td></tr>
<tr><td>**Unemployment (%)**</td><td>14.0</td><td>12.5</td><td>14.4</td><td>12.2</td><td>14.2</td><td>11.2</td><td>14.8</td><td>12.7</td><td>14.1</td><td>15.3</td><td>14.0</td><td>12.6</td><td>14.1</td></tr>
<tr><td>**Screening Examination[*] (%)**</td><td>87.0</td><td>89.3</td><td>86.4</td><td>90.7</td><td>86.6</td><td>88.9</td><td>86.4</td><td>87.5</td><td>86.9</td><td>85.5</td><td>87.0</td><td>88.0</td><td>86.9</td></tr>
<tr><td>**History of diabetes (%)**</td><td>6.2</td><td>6.3</td><td>6.2</td><td>5.7</td><td>6.3</td><td>5.8</td><td>6.3</td><td>6.6</td><td>6.2</td><td>6.1</td><td>6.2</td><td>7.0</td><td>6.2</td></tr>
<tr><td>**Use of prescribed medications (%)**</td><td>42.1</td><td>41.5</td><td>42.2</td><td>45.5</td><td>41.7</td><td>40.0</td><td>42.6</td><td>43.5</td><td>41.9</td><td>41.7</td><td>42.1</td><td>46.3</td><td>41.8</td></tr>
<tr><td>**Living alone (%)**</td><td>6.0</td><td>5.7</td><td>6.0</td><td>6.2</td><td>5.9</td><td>5.8</td><td>6.0</td><td>6.1</td><td>5.9</td><td>7.7</td><td>5.9</td><td>6.4</td><td>5.9</td></tr>
</table>

[*]Screening Examination denotes either Blood pressure measurement, Blood test, Electrocardiography, Fundoscopy, Chest radiograph, Sputum cytology, Gastric photofluorography, Gastric endoscopy, Faecal occult blood test, Barium enema, Colonoscopy, Mammography, or the Papanicolau smear;
Abbreviations: BMI: Body Mass Index; MET: Metabolic Equivalent; PA: Total physical activity; s.d. Standard deviation.

3.2.2. Cancer incidence

Mean follow-up time for cancer incidence was 9.5 years. During follow-up time cancer was diagnosed in 5241 of our 55,130 participants. There was no association between coping styles and cancer incidence in the multivariable or sensitivity analyses (Table 15).

There were no significant interactions between planning and any of the five other coping styles for overall cancer incidence.

3.2.3. Cancer mortality

Mean follow-up time for cancer mortality was 9.8 years, with 1632 cancer deaths occurring during follow-up. Positive reappraisal (HR=0.84, 95% CI: 0.72—0.97) was associated with a reduced risk of cancer mortality in the multivariable adjusted models (Table 16). The results remained statistically significant even when excluding individuals who died in the first three years of follow-up (HR=0.83, 95% CI: 0.71—0.98).

There were no significant interactions between planning and any of the five other coping styles for overall cancer mortality.

Table 15: Cox proportional hazard models for the association between coping styles and cancer incidence

Variable			Cancer incidence		
			Model 1[*]	Model 2[†]	Model 3[‡]
Coping styles	Person Years	Cases	HR (95% CI)	HR (95% CI)	HR (95% CI)
Planning			HR (95% CI)	HR (95% CI)	HR (95% CI)
Yes	104,884	1067	1.00 (0.92-1.08)	1.00 (0.93-1.08)	1.01 (0.92-1.10)
No	418,501	4174	Reference	Reference	Reference
Consulting someone					
Yes	43,091	362	0.98 (0.88-1.10)	0.98 (0.88-1.10)	0.97 (0.85-1.10)
No	480,293	4879	Reference	Reference	Reference
Positive reappraisal					
Yes	115,004	1083	0.97 (0.90-1.04)	0.98 (0.91-1.06)	0.99 (0.91-1.09)
No	408,380	4158	Reference	Reference	Reference
Fantasizing					
Yes	35,574	311	1.03 (0.91-1.16)	1.01 (0.90-1.14)	0.93 (0.80-1.07)
No	487,810	4930	Reference	Reference	Reference
Avoidance					
Yes	20,273	196	1.02 (0.88-1.18)	1.01 (0.87-1.17)	1.04 (0.88-1.23)
No	503,112	5045	Reference	Reference	Reference
Self-blame					
Yes	24,330	204	0.93 (0.81-1.08)	0.94 (0.81-1.08)	0.93 (0.79-1.10)
No	499,055	5037	Reference	Reference	Reference

[*]Model 1 is adjusted for age and gender;
[†]Model 2 is adjusted for Model 1, alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, living arrangements, and coping styles
[‡]Model 3 additionally excludes cases in the first three years of follow-up.
Abbreviations: HR: Hazard Ratio; CI: Confidence Interval

Table 16: Cox proportional hazard models for the association between coping styles and cancer mortality

Variable			Cancer mortality		
			Model 1[*]	Model 2[†]	Model 3[§]
Coping styles	Person Years	Cases	HR (95% CI)	HR (95% CI)	HR (95% CI)
Planning			HR (95% CI)	HR (95% CI)	HR (95% CI)
Yes	108,635	299	0.94 (0.82-1.09)	0.97 (0.84-1.11)	1.01 (0.87-1.18)
No	431,887	1333	Reference	Reference	Reference
Consulting someone					
Yes	44,373	103	0.98 (0.80-1.21)	1.00 (0.81-1.23)	1.00 (0.79-1.25)
No	496,149	1529	Reference	Reference	Reference
Positive reappraisal					
Yes	118,890	283	**0.81** (0.70-0.94)	**0.84*** (0.72-0.97)	**0.83*** (0.71-0.98)
No	421,632	1349	Reference	Reference	Reference
Fantasizing					
Yes	36,648	90	1.12 (0.90-1.40)	1.09 (0.87-1.37)	1.05 (0.82-1.36)
No	503,874	1542	Reference	Reference	Reference
Avoidance					
Yes	20,957	49	0.86 (0.64-1.15)	0.83 (0.62-1.11)	0.85 (0.61-1.16)
No	519,565	1583	Reference	Reference	Reference
Self-blame					
Yes	25,005	50	0.81 (0.60-1.08)	0.82 (0.61-1.10)	0.76 (0.54-1.06)
No	515,517	1582	Reference	Reference	Reference

*p<0.05
[*]Model 1 is adjusted for age and gender;
[†]Model 2 is adjusted for Model 1, alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, living arrangements, and coping styles
[‡]Model 3 additionally excludes cases in the first three years of follow-up.
Abbreviations: HR: Hazard Ratio; CI: Confidence Interval

3.2.4. Cancer subtype

In analyses on incidence of cancer subtypes (data not shown), a planning coping style significantly interacted with self-blame for incident colon cancer (p for interaction: <0.05); individuals who adopted a planning coping style as well as blamed themselves for a problem were at reduced risk of colon cancer (HR=0.27, 95% CI: 0.08—0.92). The planning coping style interacted with an avoidance style for incident lung cancer (p for interaction: <0.05), and those who utilized both a planning and avoidant coping styles were at increased risk of the disease (HR=2.52, 95% CI: 1.15—5.53). An avoidant coping style was also positively associated with an increased risk of breast cancer (HR=2.05, 95% CI: 1.35—3.11), with interactions also seen between planning and positive reappraisal and consulting someone, respectively, for breast cancer (p for interactions: <0.05). Whereas women who utilized a planning coping style as well as positive reappraisal were at a reduced risk of disease (HR=0.51, 95% CI: 0.28—0.92) those who utilized both a planning style and consulting someone were at an increased risk of disease (HR=2.61, 95% CI: 1.21—5.65).

Following three-year sensitivity analyses, an avoidance coping style (HR=1.96, 95% CI: 1.22—3.15) and the interaction between planning and positive reappraisal (HR=0.45, 95% CI: 0.23—0.87) remained significantly associated with the risk of incident breast cancer (p for interaction: <0.05). The interaction between planning and avoidance also remained statistically significant for incident lung cancer (HR=3.08, 95% CI: 1.23—7.70) (p for interaction: <0.05).

For mortality end points, fantasizing was positively associated with gastric cancer

(HR=1.66, 95% CI: 1.00—2.76) and consulting someone was positively associated with mortality from rectal cancer (HR=2.47, 95% CI: 1.19—5.13). A planning coping style interacted with positive reappraisal for lung cancer mortality; individuals who reappraised things positively without utilizing a planning style were at reduced risk (HR=0.59, 95% CI: 0.36—0.98) whereas those who utilized both planning and positive reappraisal were at an increased risk (HR=2.26, 95% CI: 1.11—4.63) of lung cancer mortality, respectively.

Following exclusion of cases in the first three years of follow-up, only the respective associations between fantasizing and gastric cancer mortality (HR=1.91, 95% CI: 1.13—3.24), and between consulting someone and rectal cancer mortality (HR=3.27, 95% CI: 1.55—6.91) remained significant.

3.2.5. Localized cancer and screening-detected cancer

Of the cancers registered in this study, 2563 cases were considered localized and 1782 were considered non-localized cancers at time of diagnosis. None of the coping styles were associated with cancer stage although there was a significant interaction between planning and self-blame (p for interaction: <0.01). Individuals who used both a planning coping style and blamed themselves were at a reduced risk of localized cancer (HR=0.57, 95% CI: 0.38—0.86) (Table 17). No interactions were found between a planning coping style and the remaining five coping styles for non-localized cancers.

A total of 1167 cancers were detected through screening, and 3148 of cancers were non-screening-detected. Utilizing a planning coping style was associated with incidence of screening-detected cancers (HR=1.27, 95% CI: 1.09—1.47) (Table 18). No coping styles

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were associated with non-screening-detected cancers. There were no interactions between planning and any of the other coping styles for either of the screening related cancer end points.

Table 17: Cox proportional hazard models for the association between coping styles and localized/non-localized cancer incidence at time of diagnosis

			Incident Cancer				
Variable			**Localized**			**Non-Localized**	
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Cases	Model 1[*] HR (95% CI)	Model 2[‡] HR (95% CI)
Planning							
Yes	104,884	555	1.03 (0.92-1.14)	1.02 (0.91-1.14)	351	0.97 (0.85-1.11)	0.98 (0.86-1.12)
No	418,501	2008	Reference	Reference	1431	Reference	Reference
Consulting someone							
Yes	43,091	188	1.12 (0.96-1.31)	1.11 (0.95-1.30)	113	0.97 (0.80-1.19)	1.02 (0.83-1.24)
No	480,293	2375	Reference	Reference	1669	Reference	Reference
Positive reappraisal							
Yes	115,004	569	1.08 (0.97-1.21)	1.08 (0.97-1.21)	354	0.97 (0.85-1.12)	0.97 (0.85-1.11)
No	408,380	1994	Reference	Reference	1428	Reference	Reference
Fantasizing							
Yes	35,574	154	0.93 (0.78-1.11)	0.93 (0.78-1.11)	104	1.03 (0.83-1.28)	1.02 (0.82-1.27)
No	487,810	2409	Reference	Reference	1678	Reference	Reference

Table 17 continued

Avoidance							
Yes	20,273	103	1.05 (0.86-1.29)	1.04 (0.85-1.28)	63	0.94 (0.72-1.22)	0.94 (0.72-1.22)
No	503,111	2460	Reference	Reference	1719	Reference	Reference
Self-blame							
Yes	24,330	110	1.19 (0.93-1.52)	1.19 (0.93-1.52)	61	0.80 (0.61-1.05)	0.79 (0.60-1.04)
No	499,055	2453	Reference	Reference	1721	Reference	Reference
Planning*Self-blame	7736	38	**0.57** (0.38-0.87)**	**0.57** (0.38-0.86)**	-	-	-

**p<0.01;

*Model 1 is adjusted for age and gender;

†Model 2 is adjusted for Model 1, alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, living arrangements, coping styles and the interaction between planning and self-blame.

‡Model 2 is adjusted for Model 1, alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, living arrangements, and coping styles.

Abbreviations: HR: Hazard Ratio; CI: Confidence Interval

Table 18: Cox proportional hazard models for the association between coping styles and screening-detected/not screening-detected cancers at time of diagnosis

			Incident Cancer				
Variable			**Screening detected**			**Not screening-detected**	
Coping styles	Person Years	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)	Cases	Model 1[*] HR (95% CI)	Model 2[†] HR (95% CI)
Planning							
Yes	104,884	297	**1.27** (1.09-1.48)**	**1.27** (1.09-1.47)**	594	0.91 (0.82-1.00)	0.91 (0.82-1.01)
No	418,501	870	Reference	Reference	2554	Reference	Reference
Consulting someone							
Yes	43,091	97	1.21 (0.97-1.51)	1.21 (0.97-1.51)	213	0.98 (0.85-1.13)	0.99 (0.86-1.15)
No	480,293	1070	Reference	Reference	2935	Reference	Reference
Positive reappraisal							
Yes	115,004	272	1.01 (0.86-1.18)	1.01 (0.86-1.18)	621	1.03 (0.93-1.14)	1.03 (0.93-1.14)
No	408,380	895	Reference	Reference	2527	Reference	Reference
Fantasizing							
Yes	35,574	78	1.16 (0.90-1.49)	1.16 (0.91-1.50)	170	0.95 (0.81-1.13)	0.96 (0.81-1.13)
No	487,810	1089	Reference	Reference	2978	Reference	Reference

Table 18 continued

Avoidance

Yes	20,273	51	1.10 (0.82-1.48)	1.08 (0.80-1.45)	116	0.94 (0.78-1.15)	0.96 (0.79-1.16)
No	503,111	1116	Reference	Reference	3032	Reference	Reference

Self-blame

Yes	24,330	47	0.84 (0.61-1.15)	0.84 (0.61-1.16)	112	0.91 (0.74-1.11)	0.91 (0.74-1.12)
No	499,055	2453	Reference	Reference	1721	Reference	Reference

**p<0.01

[*]Model 1 is adjusted for age and gender;

[†]Model 2 is adjusted for Model 1, alcohol consumption, smoking status, history of diabetes, total physical activity, prescribed medication use, unemployment, screening examination, body mass index, living arrangements, and coping styles.

Abbreviations: HR: Hazard Ratio; CI: Confidence Interval

4. DISCUSSION

Coping styles, i.e. the way in which an individual deals with problems and stressors may be important for health outcomes. In particular approach- or avoidance-oriented coping strategies may be important for health-related endpoints, yet there are no studies which have investigated the association between coping styles and either cardiovascular disease (CVD) or cancer in a premorbid general population. Our study is thus the first of its kind to address the association of premorbid baseline coping styles with CVD and cancer outcomes using a general population cohort. The results for each end point will be discussed in accordance below.

4.1. Coping and cardiovascular disease

We have found that a fantasizing coping style is associated with a significantly increased risk of incident CVD, stroke and subarachnoid haemorrhage, whereas a planning coping style is associated with a reduced risk of incident ischemic stroke. Following sensitivity analyses which excluded incident cases in the first three years of follow-up, the associations between fantasizing and each of the three end points were attenuated although the directions of results remained unchanged. The exclusion of cases in the first three years of follow-up did not change the association between a planning coping style and the risk of incident ischemic stroke.

Possible interrelations between covariates and their relation to cardiovascular events in premorbid individuals are presented in Supplementary Figure 2. Our findings of associations

between fantasizing and planning coping styles and incident cardiovascular events can, however, be explained without inferring any direct causality in particular when considering a number of important aspects. First, those who have been diagnosed with a disease must relate to additional behavioural variables influencing mortality, like attending follow-up visits, accepting advice from healthcare professionals, and complying with treatment. In fact, increased compliance with clinical appointments in newly diagnosed patients is significantly related to survival independent of severity of illness[61]. This may explain the lack of association between the individual coping styles with any of the mortality end points. Second, it may be important to take into account the contextual nature of coping[24, 28]. Although we have considered coping styles, which could be seen as relatively stable over time, it is possible that, in the wake of a traumatic experience such as stroke, MI or diagnosis of cancer, coping strategies or behaviours may change over time[51]. Such changes could potentially be beneficial and lead to post-traumatic growth and improved lifestyle habits[62]. Patients with active coping styles seem to have a healthier emotional adjustment to their illness[63], and a proactive coping style has been shown to correlate with patient information-seeking and medical decision-making[64]. Moreover, in a case-control study comparing admitted patients with chronic stable angina (CSA) to patients with acute coronary syndrome (ACS), individuals with ACS had significantly higher scores of maladaptive coping strategies than patients admitted with CSA, whereas the opposite was true for scores of adaptive coping strategies, i.e. they were significantly higher in those with CSA compared to patients with ACS[37].

A study which considered coping as a state rather than a trait found that individuals who

adopted an approach-oriented coping strategy were at reduced risk of mortality from CVD[65]. It is therefore conceivable that a single measure of coping style may be insufficient as the exposure for CVD mortality end points, and that the approach-oriented coping styles used in the present study (i.e. planning, positive reappraisal and consulting someone) should instead be considered together rather than in isolation. An individual may at any given time use more than one approach-oriented style to solve taxing problems and the only currently available evidence in large premorbid populations with regards to CVD outcomes[65] indeed points in favour of such an approach to the specific measures of coping used in the present study. Individuals who adopt a premorbid approach-oriented strategy may easier achieve post-traumatic growth following diagnosis, or may change habits as a consequence of undiagnosed symptomatic disease, which in turn relates to minimized risk behaviour and reduced risk of death. This could possibly be explained by a person's attitude toward medical care which has been suggested as a reason for decreased mortality among optimists[66].

The use of a planning coping style was associated with reduced incidence of ischemic stroke. A reason why these associations were not found for MI or CVD-incidence could be that we have adjusted for several behaviours known to be associated with disease initiation, all of which can also be considered as indirect measures of coping. In accordance with previous studies where coping styles were found to be associated with blood pressure[35, 67] and BMI[34], two known risk factors and potential mediators of coping for cardiovascular events, the present study found that individuals using a planning coping style were less likely to be hypertensive, or have a BMI ≥ 25 kg/m^2 than those who used an avoidant coping style. Previous research has highlighted the importance of coping mechanisms for blood pressure

control through its influence on lifestyle factors[67]. Behaviours important for cardiovascular end points, e.g. smoking, alcohol consumption and physical activity have all been associated with both coping styles[19, 68, 69] and stress[70]. Although the multivariable models in this study adjusted for both hypertension and BMI, it may be more accurate to consider stratifying analyses according to these two important risk factors of cardiovascular disease given that they may be on the causal pathway between coping and CVD outcomes. Indeed, previous research has shown that the use of an avoidance coping strategy was associated with an increased risk of IHD mortality only among hypertensive individuals whereas overweight/obese individuals utilizing an approach coping strategy were at reduced risk of both CVD incidence and stroke[65].

An important covariate to consider for disease prevention is the attendance of screening examinations which is central for the detection of disease at an early phase. When adjusting for all the variables included in our analyses on cardiovascular disease, two of the three approach-oriented coping styles (i.e. planning and consulting someone) were significantly associated with attending screening examinations whereas an avoidant coping style was inversely associated with attending screening examinations (data not shown). This suggests that a coping style may play an important role for the participation in general health check-ups. Thus, in a generally healthy population, coping styles, unlike stress which is known to both directly and indirectly affect CVD-risk[9], exert an indirect influence on CVD risk factors[34, 35].

Gender, age and cultural differences may all influence the association between coping styles and cardiovascular outcomes. Studies demonstrate gender differences in coping styles

where women utilize more avoidance coping than men[71]. Moreover, coping may play a different role in men and women's cardiovascular functioning; increased use of avoidant coping is associated with lower systolic blood pressure in men, but an increase in systolic blood pressure in women[35]. Our significant interaction between gender and a planning coping style, and the inverse association observed between a planning coping style and mortality from intracranial haemorrhage in men but not in women thus further indicates that future studies on the association between coping and CVD end points should, when possible, consider gender-stratified analyses. Age may potentially also influence the impact of coping on health outcomes, although we found no significant interactions between age and coping in our study. However, compared to younger people, older individuals use problem-focused coping in perceived controllable situations[72]. They may therefore possibly adopt approach-oriented coping on perceivably controllable health determinants, e.g. weight loss during overweight/obesity[65]. This is another reason in favour of analyses stratified according to risk factors[65]. Finally, there are ethnic differences in coping styles[73, 74] as individuals from Eastern Asian countries may adopt more avoidance coping as part of a collectivistic culture[75]. As such, avoidance must not be synonymous with maladaptive coping in Asian populations. Svensson et al.[65] showed that an avoidance coping strategy was associated with IHD mortality only among hypertensive individuals which indicates that avoidance coping among Japanese not necessarily equates to maladaptive coping unless coupled with a pre-existing CVD risk factor. Future studies conducted on different populations would allow for comparisons of potential intercultural differences in coping with stressors and the importance of these for cardiovascular outcomes.

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4.2. Coping and cancer

Our study is the only study to date to address the association of coping styles with cancer outcomes in a healthy general population. Previous studies have linked coping with survival[41-45] but were conducted in small populations and focused on coping styles in patients already diagnosed with cancer[39-50]. The current large population-based cohort study found that there was a significant association between the use of positive reappraisal and cancer mortality, and between a planning coping style and incidence of screening-detected cancers. These results remained significant despite adjusting for a large number of possible confounders and excluding individuals with a history of cancer or possibility of occult disease (BMI<18.5). Moreover, the inverse association between positive reappraisal and cancer mortality remained significant despite excluding individuals who died in the first three years of follow-up. This minimizes the chance of reverse causation and indeed emphasizes the importance of premorbid coping styles on cancer mortality.

Two explanations have been proposed for the association between coping styles and cancer mortality: biological (direct) and behavioural (indirect)[45]. Psychoneuroimmunology suggests that behaviour can influence immune response[76] with coping affecting the immune system[77-79] as well as the endocrine system[78]. Coping has been suggested to act as a possible moderator[77], or contributor[80] to stress-related immune changes[78, 81-83]. If a psychoneuroimmunological effect that could be translated into a clinical advantage exists, one would expect to see a reduced cancer incidence among individuals who use any of the approach-oriented coping styles (i.e. planning, positive reappraisal or consulting someone) given that positive coping reduces concentration of interleukin-4[79], a cytokine suggested to

promote tumour development[84]. We did not obtain these results probably because immunological changes resulting from approach-oriented coping strategies may be too small to modify the prospect of disease development. Conversely, the strong association between an endogenous opioid neurohormone precursor and incident breast cancer risk[11] suggests that biological effects of psychological stress may be of greater importance for cancer development than the biological effects resulting from specific coping styles. However, the biological effect of a reduced number of CD4+ cells associated with negative coping[79] could be masked by avoidance copers' reluctance to acknowledge disease symptoms and avoiding medical consultations. Such avoidant coping would lead to undiagnosed cancers and reduced cancer incidence even in the presence of a biological effect. Indeed, a recent study has confirmed that there is a significant inverse association between the avoidance coping strategy and cancer incidence when excluding cases in the first three years of follow-up[85].

The associations between a planning coping style and screening-detected cancers may help to explain the found inverse association positive reappraisal and cancer mortality. In a recent study, both of these measures were considered in the definition of an approach oriented coping strategy, a measure which in turn was inversely associated with both cancer mortality and localized as well as screening detected cancers[85]. The results of that study promote the behavioural pathway hypothesis which involves early detection, patient information-seeking and medical decision-making[64] among those utilizing approach-oriented coping. It also indicates that it may be insufficient or inadequate to consider planning and positive reappraisal as isolated measures of coping. Results obtained in previous studies on the association between coping styles, cancer outcome and survival among cancer patients[39-

45] could further be explained by emotional adjustment to existing illness[63], compliance with clinical appointments[61] and minimized risk behaviour with improved lifestyle habits following cancer diagnosis[62]. The additional finding of an inverse association between the combination of planning and self-blame with localized cancer incidence was unexpected, and any attempt to explain the results is highly speculative.

Furthermore, our results may indicate the importance of not only considering localization/screening but also to take into account cancer subtype. A number of interactions between coping styles were seen depending on cancer site; those who utilized both planning and self-blame were at a significantly reduced risk of incident colon cancer. As suggested by Cardenal et al.[40], a self-blaming coping style might indicate that the individual focuses on his/her own responsibility for the origin of the problem. Self-blame may thus, in combination with a planning coping style reduce the risk of incident colon cancer. Individuals who utilized both a planning coping style and avoidance were at an increased risk of incident lung cancer. The combination of planning and avoidance has the potential to be both beneficial and detrimental depending on whether or not either of its components is used appropriately. It is therefore not only a question of knowing *how* to plan, but also a question of *when* it is appropriate in relation to the problem that needs to be addressed. Indeed, when used appropriately, avoidance coping may not necessarily be detrimental with regards to health outcomes, but instead offer emotional respite which provides the necessary energy to tackle the problems using approach-oriented responses[32]. However, if used inappropriately avoidance may instead orientate the individual away from the source of stress and result in emotional numbness and a lack of awareness of the relationship between symptoms and

trauma which may in turn impact treatment and recovery[27]. Indeed, there was a positive association between an avoidant coping style and breast cancer incidence. This is in accordance with previous findings indicating an association between difficult life events and breast cancer development[18], and maladaptive coping styles with breast cancer outcome[42, 43]. Our study also found that, with breast cancer incidence as the outcome, there were interactions between the approach-oriented coping styles; a planning coping style interacted beneficially with positive reappraisal and detrimentally with consulting someone, respectively. Women who used a combination of planning and positive reappraisal were at significantly reduced risk of breast cancer whereas those who used planning and consulting someone were at a significantly increased risk. As discussed in the section on coping styles and CVD above and as shown in the research on coping strategies and cancer outcomes[85], it may be important to consider the three approach-oriented coping styles in combination rather than in isolation. The results of our interactions between coping styles and incidence outcomes of specific cancer subtypes highlight the need for additional research on the topic.

There was a positive association between fantasizing and mortality from gastric cancer. When considering that fantasizing could be a measure representative of avoidance, this finding may be due to the association between avoidance coping and the delay in processing health threats[31], and the disadvantages of using avoidance coping on health outcomes which require action[27]. The found positive associations between a consulting style and mortality from rectal cancer, as well as the results showing that positive reappraisal alone was inversely associated with lung cancer mortality, but a combination of positive reappraisal and planning was positively associated with lung cancer mortality requires additional studies in

order to understand their implication.

4.3. Limitations

There are several limitations in the present study. First, we must consider possible random misclassification; although coping style is a stable measure it was estimated at only one point. In addition, participants have been assigned to specific dichotomous coping styles which may lead to reduced variance and result in skewed or kurtotic scales with limited predictive ability[25]. We may also have underestimated the effect of avoidance coping on incidence and mortality outcomes if individuals who utilize an avoidance coping style are overrepresented among those who were excluded due to non-response on coping questions[86]. Comparisons between excluded and included individuals for CVD end points indicate significant differences between excluded and included participants on important characteristics for CVD. The number of participants who did not respond to all questions on coping and who were excluded from analyses may therefore be considered missing not at random and subsequently limit generalizability. However, the exclusion of non-responders was done intentionally owing to the association between non-response to psychosocial questions and risk of mortality from post-acute myocardial infarction[87]. Future studies could improve response rates through supplementary interviews. Additionally, although the coping questions used in the present studies are validated, they have not been validated specifically for the JPHC Study population which may have led to distorted results. Second, the associations found between coping and cardiovascular disease incidence and mortality and cancer mortality were marginal and we cannot exclude the possibility that they are the

result of chance finding. However, the direction of the associations in analyses which excluded events in the first three years of follow-up warrant further investigation in studies which can offer even longer follow-up times. Third, we have been unable to adjust for education or socioeconomic level, two important variables which can influence the coping repertoire. When including information on education available only for participants from cohort I of this study, associations between coping strategies and our end points were not substantially changed, but they were attenuated due to loss of statistical power owing to a low number of cases. Participants of Cohort I of the JPHC Study are less educated than national samples[88], however this group constitutes only half of the participants of our study and their educational level is not as great of a limitation as the absence of educational information for our entire population. Fourth, we have been unable to adjust for treatment-related factors (for mortality analyses) and immune parameters which are important when considering the direct and indirect mechanisms that may explain the effects of coping on cancer outcomes. Future studies should therefore consider using hierarchical models to determine structural relations between coping styles and treatment-related factors as well as behaviours related to cardiovascular risk such as smoking, drinking, and physical activity. Fifth, we have excluded individuals from Tokyo and Osaka and extrapolation of results to urban areas should be considered with caution. Crude stroke incidence density in the present study is however comparable to other Japanese cohorts such as the Circulatory Risk in Communities Study (CIRCS)[89]. Sixth, there is a possibility that genes may influence and act as confounders on coping styles. It is therefore a limitation that no genetic information was available for the participants of this study. Finally, results may be specific to the Japanese population and may

not be generalizable to other countries or ethnicities.

4.4. Strengths

Despite such limitations, this study is the first study on the association between premorbid

coping styles and CVD and cancer incidence and mortality with a number of strengths. We

have focused on baseline coping in healthy individuals while adjusting for a large number of

confounders associated with incidence and mortality from ischemic heart disease, stroke and

cancer. Furthermore, the findings presented are generalizable to the Japanese general

population as the JPCH Study is the largest study in Japan to collect incident CVD data and

has a large number of endpoints. The size of the JPHC Study, and the large number of

participants have allowed us to present stratified results which could set the direction for

future research on the association between coping and disease incidence and mortality. The

JPHC Study also uses a validated coping questionnaire. Considering the simplicity and

brevity of the coping questionnaire (six questions only), it may be possible to utilize the

questionnaire in various settings to identify individuals who may be at reduced or increased

risk of adverse health outcomes.

5. Conclusion

In a healthy general population, a fantasizing coping style is significantly associated with

increased incidence of CVD, overall stroke, and subarachnoid haemorrhage whereas a

planning coping style is associated with reduced incidence of ischemic stroke. Following

sensitivity analyses excluding the first three years of follow-up, results were attenuated for

the association between fantasizing and the three end points, but not for the reduced risk associated with a planning style and ischemic stroke. A likely explanation for the found associations is the indirect influence of coping styles on CVD risk factors indicating that improved education on stress- management and coping styles may improve lifestyle habits, participation rates in screening programs and compliance with treatment.

Positive reappraisal is inversely associated with overall cancer mortality. Although specific coping styles and their interactions are not associated with overall cancer incidence, they are associated with certain cancer subtypes, localized cancer at time of diagnosis, and with cancers detected through screening. The results of this study may speak in favour of the behavioural hypothesis to explain associations between premorbid coping styles and cancer outcomes.

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Appendix A: Supplementary figures
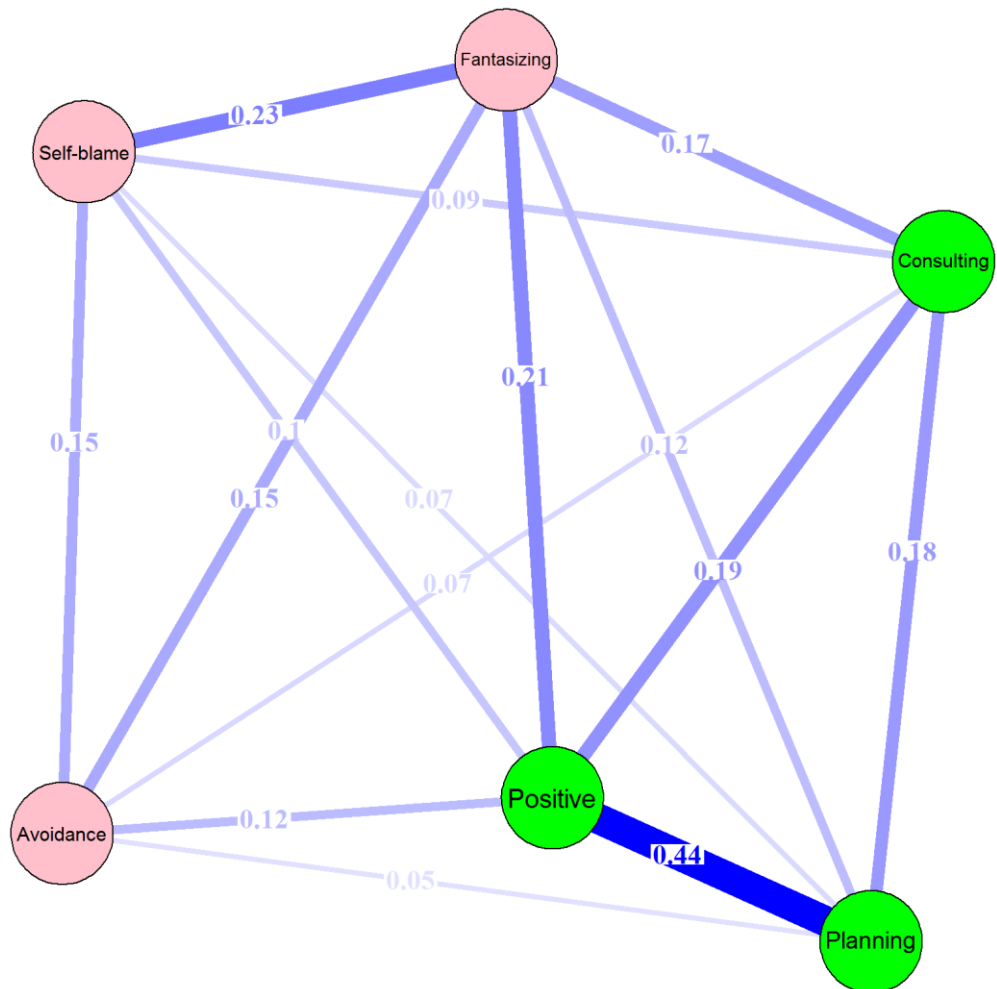
Supplementary Figure 1: Network graph representing correlations between the different coping styles for cardiovascular disease end points. Green nodes represent approach oriented styles and pink nodes avoidance oriented styles.
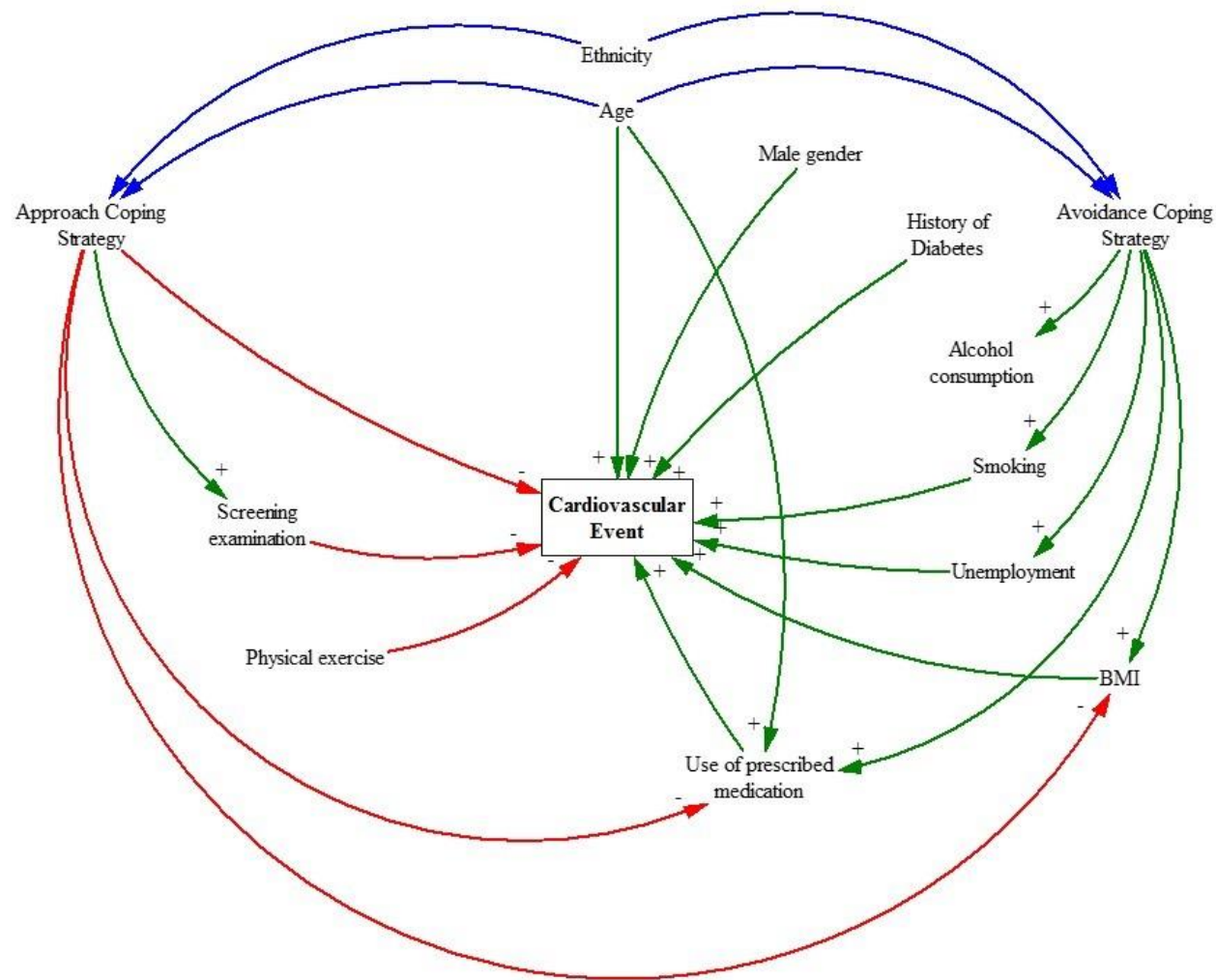
Supplementary Figure 2: Causal graph with possible interrelation between covariates and premorbid coping strategies and their correlation to cardiovascular events. Green arrows=positive association; red arrows=negative association; blue arrows=undetermined association

Appendix B: Supplementary tables

Supplementary Table 1: Correlation matrix for coping styles for analyses on cancer end points

Coping style	Planning	Consulting someone	Positive reappraisal	Fantasizing	Avoidance	Self-blame
Planning	1					
Consulting someone	0.175	1				
Positive reappraisal	0.443	0.188	1			
Fantasizing	0.114	0.170	0.204	1		
Avoidance	0.051	0.070	0.116	0.147	1	
Self-blame	0.064	0.094	0.102	0.226	0.142	1

PHC
STUDY

Health Promotion Questionnaire

If you made an error in your name or address, please correct it with a red pen.

The Ministry of Health and Welfare: The Japan Public Health Center-based prospective Study on Cancer and Cardiovascular Disease Research Group

Kept by Secretariat
National Cancer Center
National Cardiovascular Center

We may call to ask you some questions regarding the contents of what you have filled in. Please provide your phone number below if you do not mind.

☎ [   ] — [   ]

61

Do not fill in

Before starting the questionnaire

The Epidemiology Research Group of the Ministry of Health, Labor and Welfare is working on research on "How can we prevent lifestyle diseases such as cancer, stroke, myocardial infarction, etc.?" In this context,we have carried out the "Health Promotion Questionnaire" twice, mainly in 1990 and 1995, targeting people who were born from 1930 through 1949 who live in cities, towns and villages.

Five years have passed since the survey in 1995, and we are carrying out this third questionnaire to find out whether there have been any changes in lifestyle or health status of people during this interval, and also about details of your diet. We would like to ask your cooperation now that you understand the background of this survey. For those of you who did not participate in the previous questionnaires, we certainly would like to ask your cooperation this time.

If you are willing to participate this time, please read the "Instructions on How to Filli in the Questionnaire" below and answer the questions beginning on the following page.

Instructions on How to Fill in the Questionnaire
1. As much as possible, please fill in this questionnaire by yourself.
2. Please fill in the given space (the oval circles) that apply with a black pencil, or enter a number or letter in the box.. If you choose "Other" in the multiple choice selections, please fill in specific details in the parentheses.
3. Please use an HB, B or H graphite pencil.
4. Please do not use a fountain pen or ballpoint pen.
5. If you have any corrections, please erase them entirely with an eraser.
6. Please do not fill in anything in the blank spaces.
   (example for filling in the mark)

Good Example		Bad Example	outside the oval	too narrow	too short
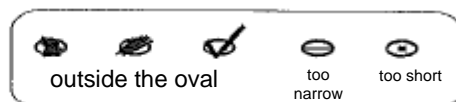
For example, please fill it in as shown below if you currently smoke cigarettes, and if you started smoking at age 20.

Currently, do you smoke cigarettes?

I smoke	○ I quit	○ I do not smoke

At what age did you quit smoking cigarettes?

[ ] years of age

From what age did you start smoking?

| 2 0 | years of age

From what age did you start smoking?

[ ] years of age

Please mark the month when you answered this questionnaire.						
○ January	○ February	○ March	○ April	○ May	○ June	
○ July	○ August	○ September	○ October	○ November	○	
		December				

What is your gender?	○ Male	○ Female

Have you been told <u>by your healthcare provider</u> that you have any of the following diseases, or have you had any of the following operations? If there is a disease or operation that applies, please mark the general time frame for that.

Disease		Time Frame when First Diagnosed		
		1989 or Before	1990 - 1994	1995 or After
Cancer	Stomach Cancer	○	○	○
	Colon Cancer	○	○	○
	Lung Cancer	○	○	○
	Liver Cancer	○	○	○
	Breast Cancer	○	○	○
	Uterine Cancer	○	○	○
	Other Cancer ( )	○	○	○
Cardiovascular Disease	Stroke (cerebral hemorrhaging, cerebral infarction, subarachnoid hemorrhage)	○	○	○
	Myocardial Infarction	○	○	○
	Angina Pectoris	○	○	○
Other Diseases	Diabetes	○	○	○
	Cataracts	○	○	○
	Stomach Ulcers	○	○	○
	Stomach Polyps	○	○	○
	Duodenal Ulcers	○	○	○
	Colon Polyps	○	○	○
	Chronic Hepatitis or Cirrhosis of the Liver	○	○	○
	Gall Stones	○	○	○
	Urethral Stones or Kidney Stones	○	○	○
	Gout	○	○	○
	Hip Fracture, except from traffic accident or work accident	○	○	○
	Arm or Wrist Fracture, except from traffic accident or work accident	○	○	○
Diseases other than those written above ( )		○	○	○

Endoscopic Surgery		Time Frame when First Having Endoscopic Surgery		
*Endoscopic surgery is to cut out mucous membranes or polyps, etc. with a stomach camera, stomach fiber or colon fiber, etc.		1989 or Before	1990 - 1994	1995 or After
Site	Stomach	○	○	○
	Colon	○	○	○
	Endoscopic Surgery on Other Site ( )	○	○	○

Surgery		Time Frame when First Having Surgery		
*Not including endoscopic surgery		1989 or Before	1990 - 1994	1995 or After
Site	Stomach	○	○	○
	Colon	○	○	○
	Gallbladder (Gall Stones)	○	○	○
	Breast	○	○	○
	Uterus	○	○	○
	Ovaries	○	○	○
	Lung	○	○	○
	Liver	○	○	○
	Surgery on Other Site ( )	○	○	○
	Do not fill in ●			

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Currently, is there a medicine that is prescribed by your healthcare provider and that you take periodically?

○ Yes   ○ No ———→ To the Next Question

↓

If "Yes," please mark all that apply.

○ Hypertension Medicine   ○ Medicine to Lower Cholesterol
○ Diabetes Medicine   ○ Gout Medicine   ○ Other ————→

Fill in the name of the medicine
Mark Not Necessary ○ ○ ○ ○ ○

Is there any dietary health supplement that you have been taking with the frequency of once or more a week continually for one year or more?

○ Yes   ○ No

↓ Please fill in the product name or type, frequency, time period for each dietary health supplement modeled after the example.

↓ to the next page

Dietary health supplements here mean those non-food things taken in the form of tablets or powders, liquids, etc. like those written below.
< Examples of Dietary Health Supplements >
Vitamin agents:
    Multivitamins (alinamin A, etc.), vitamin B (chocola BB, etc.), vitamin C (Hi-C, etc.), vitamin E (juvelux, etc.), etc.
Mineral agents:
    Calcium, iron, etc.
Drink agents:
    Lipovitan D, Fibe-Mini, etc.
Extracts from Food Products:
    Agaricus, propolis, turmeric, liver oil, etc.

(Example) If you have continually been taking "Hi-C S" once daily for 8 years, or "Lipovitan D" 1 - 2 times a week for 2 years, please fill it in as follows.

Whether Taken or Not	Product Name or Type	Frequency						Time Period				
		1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	Once daily	2 - 3 times daily	4 times or more daily	1 - 2 years	3 - 4 years	5 - 9 years	10 - 19 years	20 years or more
●	Hi-C S	○	○	○	●	○	○	○	○	●	○	○
●	Lipovitan D	●	○	○	○	○	○	●	○	○	○	○
○		○	○	○	○	○	○	○	○	○	○	○

＊＊＊

Whether Taken or Not	Product Name or Type	Frequency						Time Period				
		1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	Once daily	2 - 3 times daily	4 times or more daily	1 - 2 years	3 - 4 years	5 - 9 years	10 - 19 years	20 years or more
○		○	○	○	○	○	○	○	○	○	○	○
○		○	○	○	○	○	○	○	○	○	○	○
○		○	○	○	○	○	○	○	○	○	○	○
○		○	○	○	○	○	○	○	○	○	○	○
○		○	○	○	○	○	○	○	○	○	○	○
○		○	○	○	○	○	○	○	○	○	○	○

About how tall are you currently?	About how much do you weigh currently?
100 digit 10 digit 1 digit (round off the fractions) cm	100 digit 10 digit 1 digit (round off the fractions) kg

About how much did you weigh when you were around 20 years old?	100 digit 10 digit 1 digit (round off the fractions) kg

Do you currently smoke cigarettes?

○ I smoke	○ I quit	○ I do not smoke

How old were you when you quit?

☐ years of age

From what age did you start smoking?

☐ years of age

At what age did you start smoking?

☐ years of age

How many cigarettes do you smoke a day?

☐ cigarettes

How many cigarettes did you smoke a day?

☐ cigarettes

Would you like to quit smoking?
(Please mark one)
- ○ I would
- ○ I would like to reduce the number I smoke
- ○ I would not

Why is it that you stopped smoking?
(Please mark one or more)
- ○ Because it damaged my health
- ○ Because it was not good for my future health
- ○ Because it bothered the people around me
- ○ Because there are more restrictions on where I can smoke in public
- ○ Because of economic reasons
- ○ Other

Why is it that you do not smoke?
(Please mark one or more)
- ○ Because I have not been so healthy
- ○ Because it does not fit my own character
- ○ Because it is not good for my future health
- ○ Because it bothers the people around me
- ○ Because of economic reasons
- ○ Other

About how often did you have the opportunity to inhale second-hand smoke (one hour or more per day) at home, the work place, stores, etc?

At the age of 10	○ hardly ever	○ 1 - 3 days per month	○ 1 - 4 days per week	○ almost every day
At the age of 30	○ hardly ever	○ 1 - 3 days per month	○ 1 - 4 days per week	○ almost every day
Currently	○ hardly ever	○ 1 - 3 days per month	○ 1 - 4 days per week	○ almost every day

Do not fill in   ● ●

Do you think you are tolerant of alcohol?			
○ Tolerant	○ Normal	○ Intolerant	○ I do not know

When you drink alcohol, does your face quickly become red?			
○ It does	○ Somewhat	○ It does not	○ I do not know

Currently, do you drink alcohol?

○ I do	○ I quit	○ I do not

At what age did you quit drinking alcohol?

[   ] years of age

Why do you drink?
(Please mark one)

○ Because I like it
○ To socialize

Why is it that you quit drinking alcohol?
(Please mark one or more)

○ Because it damaged my health
○ Because it did not fit my character
○ Because it was not good for my future health
○ Because the number of drinking opportunities decreased
○ Because of economic reasons
○ Other (   )

Why do you not drink alcohol?
(Please mark one or more)

○ Because I have not been so healthy
○ Because it does not fit my own character
○ Because it is not good for my future health
○ Because I do not have drinking opportunities
○ Because of economic reasons
○ Other (   )

To the next page

How frequently do you drink? (For a person who quit, please provide information of the time when you were drinking)

○ I hardly ever drink　　　○ 1 - 3 days a month　　　○ 1 - 2 days a week
○ 3 - 4 days a week　　　○ 5 - 6 days a week　　　○ I drink every day

Please choose the most usual combination that you drink in one day.

> (Example) If normally after drinking one large bottle of beer you drink 2 go of Japanese sake, in the "Beer" area fill in "1 bottle" and in the "Japanese Sake" area fill in "2 go," and in the "Shochu or Awamori," "Whiskey," and "Wine" areas, fill in "I do not drink."

Japanese Sake　　　1 go (180ml)
○ I do not drink　○ less than 0.5 go　○ 1 go　○ 2 go　○ 3 go　○ 4 go　○ 5 - 6 go　○ 7 go or more

Shochu or Awamori　　　1 go undiluted (180ml)
○ I do not drink　○ less than 0.5 go　○ 1 go　○ 2 go　○ 3 go　○ 4 go　○ 5 - 6 go　○ 7 go or more

Beer　　Large bottle (633ml) (Please make the conversion at medium bottle or 500ml can, 0.8 of a bottle; small bottle or 350ml can, 0.6 of a bottle)
○ I do not drink　○ less than 0.5 bottle　○ 1 bottle　○ 2 bottles　○ 3 bottles　○ 4 bottles　○ 5 - 6 bottles　○ 7 bottles or more

Whiskey　　　Single (30ml)
○ I do not drink　○ less than 0.5 glass　○ 1 glass　○ 2 glasses　○ 3 glasses　○ 4 glasses　○ 5 - 6 glasses　○ 7 bottles or more

Wine　　　Glass (100ml)
○ I do not drink　○ less than 0.5 glass　○ 1 glass　○ 2 glasses　○ 3 glasses　○ 4 glasses　○ 5 - 6 glasses　○ 7 bottles or more

Questions about Your Dietary Life

Now some questions about your diet will follow.

Recalling your diet over the past one year, please answer with average frequencies and amounts.

If you answer all the items, a detailed nutritional calculation of your normal dietary life can be made, so we will be able to report to each of you individually at a later date whether you have a nutritional balance, or whether your vitamins are enough, etc.

There are a lot of questions, and this may be difficult for you, but we ask you to please complete it to the end.

We are going to ask you about "rice (cooked rice)."

About what size rice bowl do you eat with?
- ⬭ Small rice bowl　　⬭ Normal rice bowl (female)　　⬭ Normal rice bowl (for male)
- ⬭ Donburi/large rice bowl

About how many bowls do you eat <u>in 1 day</u>, combining breakfast, lunch and dinner?
- ⬭ Less than 1 bowl　　⬭ 1 bowl　　⬭ 2 bowls　　⬭ 3 bowls　　4 bowls
- ⬭ 5 bowls　　⬭ 6 bowls　　⬭ 7 - 9 bowls　　⬭ 10 bowls or more

Do you eat vitamin-enriched rice?
- ⬭ No　　⬭ I rarely eat it　　⬭ I sometimes eat it　　⬭ I often eat it　　⬭ I always eat it

Do you mix in wheat?
- ⬭ I do not mix it in　　⬭ I rarely mix it in　　⬭ I sometimes mix it in　　⬭ I often mix it in
- ⬭ I always mix it in

Do you mix in millet or Japanese hie?
- ⬭ I do not mix it in　　⬭ I rarely mix it in　　⬭ I sometimes mix it in　　⬭ I often mix it in
- ⬭ I always mix it in

We are going to ask you about "miso soup."

How frequently do you eat it?
- ⬭ I hardly ever eat it　　⬭ 1 - 3 days a month　　⬭ 1 - 2 days a week　　⬭ 3 - 4 days a week
- ⬭ 5 - 6 days a week　　⬭ I eat it every day

About how many cups do you eat <u>in 1 day</u>, combining breakfast, lunch and dinner?
- ⬭ Less than 1 cup　　⬭ 1 cup　　⬭ 2 cups　　⬭ 3 cups　　⬭ 4 cups
- ⬭ 5 cups　　⬭ 6 cups　　⬭ 7 - 9 cups　　⬭ 10 cups or more

How do you season it?
- ⬭ Fairly diluted　　⬭ Somewhat diluted　　⬭ Normal　　⬭ Somewhat thick　　⬭ Fairly thick

---

Do not fill in　●

Recalling your diet over the past one year, please fill in average frequencies and amounts.

Example of how to fill it in

If you eat beef steak about 2 times a month, and the amount you eat per time is about half a slice, then fill it in as follows.

Name of Food Item		Less than once a month	1 - 3 times a month	1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	Once daily	2 - 3 times daily	4 - 6 times daily	7 times or more daily	Estimated Amount Per Time	Estimated Amount Per Time — Less (half or less) than the estimated amount	Same as the estimated amount	More (1.5 time or more) than the estimated amount
Beef	Steak	○	●	○	○	○	○	○	○	○	1 steak slice (about 150g)	●	○	○
	Grilled (grilled meat, etc.)	○	○	○	○	○	○	○	○	○	5 thin slices (about 100g)	○	○	○

If you hardly ever eat beef steak (less than once a month), fill it in as follows.

Name of Food Item		Less than once a month	1 - 3 times a month	1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	Once daily	2 - 3 times daily	4 - 6 times daily	7 times or more daily	Estimated Amount Per Time	Estimated Amount Per Time — Less (half or less) than the estimated amount	Same as the estimated amount	More (1.5 time or more) than the estimated amount
Beef	Steak	●	○	○	○	○	○	○	○	○	1 steak slice (about 150g)	○	○	○
	Grilled (grilled meat, etc.)	○	○	○	○	○	○	○	○	○	5 thin slices (about 100g)	○	○	○

Do not fill in anything in the estimated amount.

� ✂ *

Name of Food Item		Less than once a month	1 - 3 times a month	1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	Once daily	2 - 3 times daily	4 - 6 times daily	7 times or more daily	Estimated Amount Per Time	Estimated Amount Per Time — Less (half or less) than the estimated amount	Same as the estimated amount	More (1.5 time or more) than the estimated amount
Beef	Steak	○	○	○	○	○	○	○	○	○	1 steak slice (about 150g)	○	○	○
	Grilled (grilled meat, etc.)	○	○	○	○	○	○	○	○	○	5 thin slices (about 100g)	○	○	○
	Stir-Fried (vegetable stir-fry, etc.)	○	○	○	○	○	○	○	○	○	3 thin slices (about 60g)	○	○	○
	Stewed (curry or stew, etc.)	○	○	○	○	○	○	○	○	○	3 pieces 2 - 3cm-diced (about 50g)	○	○	○
Pork	Stir-Fried (vegetable stir-fry, etc.)	○	○	○	○	○	○	○	○	○	3 thin slices (about 60g)	○	○	○
	Fried (port cutlet, etc.)	○	○	○	○	○	○	○	○	○	1 pork cutlet (about 100g)	○	○	○
	Stewed (curry or stew, etc.)	○	○	○	○	○	○	○	○	○	3 pieces 2 - 3cm-diced (about 50g)	○	○	○
	Boiled (boiled kakuni or Okinawan name: rafty, etc.)	○	○	○	○	○	○	○	○	○	2 slices (about 60g)	○	○	○
	Soups (pork soup or Okinawan name: chumi soup, etc.)	○	○	○	○	○	○	○	○	○	2 thin slices (about 40g)	○	○	○
	Pork liver (Nirareba stir-fry, etc.)	○	○	○	○	○	○	○	○	○	2 slices (about 40g)	○	○	○

Recalling your diet over the past one year, please fill in average frequencies and amounts.

Name of Food Item		Less than once a month	1 - 3 times a month	1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	Once every day	2 - 3 times every day	4 - 6 times every day	Estimated Amount Per Time	Less (half or less) than the estimated amount	Same as the estimated amount	More (1.5 time or more) than the estimated
Chicken	Grilled (yakitori, etc.)	○	○	○	○	○	○	○	○	2 skewers of yakitori (about 70g)	○	○	○
	Stir-Fried (vegetable stir-fry, etc.)	○	○	○	○	○	○	○	○	5 slices (about 60g)	○	○	○
	Boiled	○	○	○	○	○	○	○	○	2-3cm dices (about 50g)	○	○	○
	Fried (karaage, etc.)	○	○	○	○	○	○	○	○	3 pieces (about 50g)	○	○	○
	Chicken liver (yakitori, etc.)	○	○	○	○	○	○	○	○	1 skewer of yakitori (about 30g)	○	○	○
Roast Ham		○	○	○	○	○	○	○	○	1 normal slice (about 15g)	○	○	○
Wieners and Sausages		○	○	○	○	○	○	○	○	2 pieces (about 30g)	○	○	○
Bacon		○	○	○	○	○	○	○	○	1 strip (about 20g)	○	○	○
Canned Luncheon Meet		○	○	○	○	○	○	○	○	1/8 can (about 40g)	○	○	○
Milk	Low-fat milk	○	○	○	○	○	○	○	○	1 200cc-glass	○	○	○
	Normal milk	○	○	○	○	○	○	○	○	1 200cc-glass	○	○	○
Eggs		○	○	○	○	○	○	○	○	1 medium (about 50g)	○	○	○
Cheese		○	○	○	○	○	○	○	○	1 slice of sliced cheese (about 20g)	○	○	○
Yogurt		○	○	○	○	○	○	○	○	1 container (about 120g)	○	○	○
Salted cod, salted mackerel, salted salmon		○	○	○	○	○	○	○	○	1 slice of fish meat (about 70g)	○	○	○
Dried fish (open dried flavor)		○	○	○	○	○	○	○	○	1 piece (about 50g)	○	○	○
Canned tuna (sea chicken flakes)		○	○	○	○	○	○	○	○	1/4 can (about 20g)	○	○	○
Salmon or trout		○	○	○	○	○	○	○	○	1 slice of fish meat (about 70g)	○	○	○
Bonito or tuna		○	○	○	○	○	○	○	○	4 raw slices (about 60g)	○	○	○
Yellowtail or kingfish		○	○	○	○	○	○	○	○	4 raw slices (about 60g)	○	○	○
Cod or flounder		○	○	○	○	○	○	○	○	1/2 slice (about 40g)	○	○	○
Bream (Red Sea bream, Okinawan name: gurkun, Okinawan name: machi, etc.)		○	○	○	○	○	○	○	○	1 slice (about 70g)	○	○	○
Horse mackerel or sardines		○	○	○	○	○	○	○	○	1 fish (about 80g)	○	○	○
Pike or mackerel		○	○	○	○	○	○	○	○	1 fish (about 80g)	○	○	○
Dried whitebait		○	○	○	○	○	○	○	○	2 tablespoonfuls (about 10g)	○	○	○
Cod roe or salmon roe		○	○	○	○	○	○	○	○	1/4 sac (about 20g)	○	○	○
Eel		○	○	○	○	○	○	○	○	1/2 fish (about 50g)	○	○	○
Squid		○	○	○	○	○	○	○	○	3 raw slices (about 50g)	○	○	○
Octopus		○	○	○	○	○	○	○	○	1/3 tentacle (about 50g)	○	○	○
Shrimp		○	○	○	○	○	○	○	○	2 Taisho shrimp (about 40g)	○	○	○
Clams or freshwater clams		○	○	○	○	○	○	○	○	10 shucked pieces of meat (about 20g)	○	○	○
Snails		○	○	○	○	○	○	○	○	10 shucked pieces of meat (about 20g)	○	○	○
Fish cake		○	○	○	○	○	○	○	○	1/6 tube (about 20g)	○	○	○
Fish paste		○	○	○	○	○	○	○	○	2 slices (about 20g)	○	○	○

Do not fill in ●   ●

Estimated Amount of Vegetables (full size)

If the amount you eat per time is about the same as in the photograph, please fill in "Same." If it is more than what is in the photograph (1.5 times or more), please fill in "More," and if less (less than half), please fill in "Less."

(a) Carrot, 1/4 carrot
     (about 50g)

(b) Spinach, 2 bunches
     (about 50g)

(c) Pumpkin, 4 - 5cm cube
     (about 40g)

(d) Cabbage, 1/2 medium-sized leaf
     (about 30g)

(e) Radish, 2-cm-thick round slice
     (about 80g)
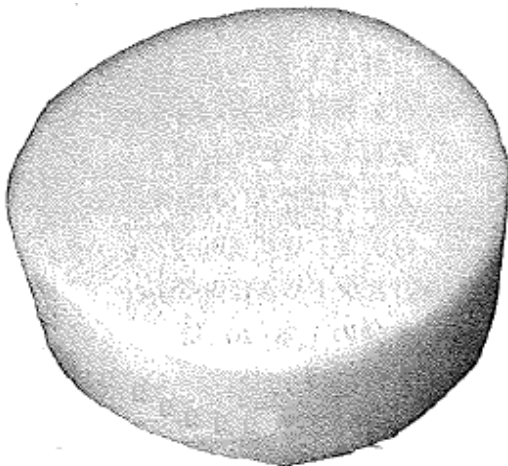
For the following vegetables, please refer to the photographs on the page on the left, and fill in the frequency or amount you eat in the season when they are available on the market.

| Name of Food Item | Less than once a month | 1 - 3 times a month | 1 - 2 times a week | 3 - 4 times a week | 5 - 6 times a week | Once daily | 2 - 3 times daily | 4 - 6 times daily | Estimated Amount Per Time | Estimated Amount Per Time | | |
										Less (half or less) than the estimated amount	Same as the estimated amount	More (1.5 time or more) than the estimated
Carrot	○	○	○	○	○	○	○	○	Refer to photograph (a)	○	○	○
Spinach	○	○	○	○	○	○	○	○	Refer to photograph (b)	○	○	○
Pumpkin	○	○	○	○	○	○	○	○	Refer to photograph (c)	○	○	○
Cabbage	○	○	○	○	○	○	○	○	Refer to photograph (d)	○	○	○
Radish	○	○	○	○	○	○	○	○	Refer to photograph (e)	○	○	○

For the following vegetables and fruits, please fill in the frequency or amount you eat in the season when they are available on the market.

	Food Item	Less than once a month	1 - 3 times a month	1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	Once daily	2 - 3 times daily	4 - 6 times daily	Estimated Amount Per Time	Less	Same	More
Tsukemono Pickles	Takuwan	○	○	○	○	○	○	○	○	3 slices (about 30g)	○	○	○
	Green-leafed tsukemono (Nozawana, leaf mustard)	○	○	○	○	○	○	○	○	1 small tsukemono plate (about 30g)	○	○	○
	Dried plums	○	○	○	○	○	○	○	○	1 medium plum (about 8g)			
	Chinese cabbage	○	○	○	○	○	○	○	○	1 small tsukemono plate (about 30g)	○	○	○
	Cucumbers	○	○	○	○	○	○	○	○	1 small tsukemono plate (about 30g)	○	○	○
	Eggplant	○	○	○	○	○	○	○	○	1 small tsukemono plate (about 30g)	○	○	○
Green peppers		○	○	○	○	○	○	○	○	1 pepper (about 30g)	○	○	○
Tomatoes		○	○	○	○	○	○	○	○	¼ tomato (about 50g)	○	○	○
Green onions		○	○	○	○	○	○	○	○	¼ stalk (about 20g)	○	○	○
Leeks		○	○	○	○	○	○	○	○	2 leeks (about 20g)	○	○	○
Edible chrysanthemums		○	○	○	○	○	○	○	○	1/3 bunch (about 30g)	○	○	○
Rape		○	○	○	○	○	○	○	○	1 stalk (about 20g)	○	○	○
Broccoli		○	○	○	○	○	○	○	○	3 stalks (about 30g)	○	○	○
Onions		○	○	○	○	○	○	○	○	¼ onion (about 50g)	○	○	○
Cucumbers		○	○	○	○	○	○	○	○	1/3 cucumber (about 30g)	○	○	○
Eggplant		○	○	○	○	○	○	○	○	1 eggplant (about 60g)	○	○	○
Chinese cabbage		○	○	○	○	○	○	○	○	1/3 medium leaf (about 30g)	○	○	○
Burdock root		○	○	○	○	○	○	○	○	¼ root (about 40g)	○	○	○
Bean sprouts		○	○	○	○	○	○	○	○	¼ bag (about 25g)	○	○	○
Haricot verts		○	○	○	○	○	○	○	○	6 beans (about 30g)	○	○	○
Lettuces		○	○	○	○	○	○	○	○	1 medium leaf (about 10g)	○	○	○
Chingensai (Okinawan name: pak-choi)		○	○	○	○	○	○	○	○	1 stalk (about 70g)	○	○	○
Leaf mustard (Okinawan name: shimana)		○	○	○	○	○	○	○	○	2 stalks (about 70g)	○	○	○

Do not fill in ● ●

For the following vegetables and fruits, please fill in the frequency or amount you eat in the season when they are available on the market.

Name of Food Item	Less than once a month	1 - 3 times a month	1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	Once daily	2 - 3 times daily	4 - 6 times daily	Estimated Amount Per Time	Estimated Amount Per Time		
										Less (half or less) than the estimated amount	Same as the estimated amount	More (1.5 time or more) than the estimated
Bitter melon (Okinawan name: goya)	○	○	○	○	○	○	○	○	1/2 melon (about 100g)	○	○	○
Swiss chard (Okinawan name: nsubana)	○	○	○	○	○	○	○	○	2 stalks (about 100g)	○	○	○
Sponge gourd (Okinawan name: nabera)	○	○	○	○	○	○	○	○	1 gourd (about 100g)	○	○	○
Mugwort (Okinawan name: fuchiba)	○	○	○	○	○	○	○	○	1 head (about 10g)	○	○	○
Papaya	○	○	○	○	○	○	○	○	1/4 papaya (about 50g)	○	○	○
Mandarin oranges	○	○	○	○	○	○	○	○	2 oranges (about 140g)	○	○	○
Other citrus types (Hasssaku, iyokan, oranges)	○	○	○	○	○	○	○	○	1/2 of one (about 75g)	○	○	○
Apples	○	○	○	○	○	○	○	○	1/2 apple (about 85g)	○	○	○
Persimmons	○	○	○	○	○	○	○	○	1/2 persimmon (about 80g)	○	○	○
Strawberries	○	○	○	○	○	○	○	○	5 berries (about 75g)	○	○	○
Grapes	○	○	○	○	○	○	○	○	10 large grapes (about 100g)	○	○	○
Melons	○	○	○	○	○	○	○	○	1/4 prince melon (about 60g)	○	○	○
Watermelon	○	○	○	○	○	○	○	○	1/8 melon (about 1200g)	○	○	○
Peaches	○	○	○	○	○	○	○	○	1/2 peach (about 65g)	○	○	○
Nashi pears	○	○	○	○	○	○	○	○	1/2 pear (about 80g)	○	○	○
Kiwi fruit	○	○	○	○	○	○	○	○	1/2 kiwi (about 50g)	○	○	○
Pineapple	○	○	○	○	○	○	○	○	1/8 pineapple (about 130g)	○	○	○
Banana	○	○	○	○	○	○	○	○	1 banana (about 75g)	○	○	○
Mango	○	○	○	○	○	○	○	○	1/2 mango (about 75g)	○	○	○

Recalling your diet over the past one year, please fill in average frequencies and amounts.

Name of Food Item	Less than once a month	1 - 3 times a month	1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	Once daily	2 - 3 times daily	4 - 6 times daily	Estimated Amount Per Time	Less	Same	More
Bread types (including pastries also)	○	○	○	○	○	○	○	○	1 piece of 6 slices (about 60g)	○	○	○
Udon	○	○	○	○	○	○	○	○	1 donburi bowlful (about 250g)	○	○	○
Soba	○	○	○	○	○	○	○	○	1 donburi bowlful (about 200g)	○	○	○
Okinawa soba	○	○	○	○	○	○	○	○	1 donburi bowlful (about 200g)	○	○	○
Ramen	○	○	○	○	○	○	○	○	1 donburi bowlful (about 220g)	○	○	○
Mochi cakes	○	○	○	○	○	○	○	○	1 commercially marketed cake (about 50g)	○	○	○
Japanese confections (Daifuku, manju)	○	○	○	○	○	○	○	○	1 confection (about 70g)	○	○	○
Cakes	○	○	○	○	○	○	○	○	1 slice small cake (about 70g)	○	○	○
Biscuits and Cookies	○	○	○	○	○	○	○	○	2 cookies (about 25g)	○	○	○
Chocolate	○	○	○	○	○	○	○	○	1/2 chocolate bar (about 25g)	○	○	○
Peanuts	○	○	○	○	○	○	○	○	20 peanuts (about 20g)	○	○	○

Recalling your diet over the past one year, please fill in average frequencies and amounts.

Name of Food Item	Less than once a month	1 - 3 times a month	1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	Once daily	2 - 3 times daily	4 - 6 times daily	Estimated Amount Per Time	Estimated Amount Per Time		
										Less (half or less) than the estimated amount	Same as the estimated amount	More (1.5 time or more) than the estimated
Tofu (ingredient of miso soup)	○	○	○	○	○	○	○	○	5 cubes (about 20g)	○	○	○
Tofu (fried tofu, or cold or cut into cubes)	○	○	○	○	○	○	○	○	1/4 tofu cake (about 75g)	○	○	○
Yushi dofu	○	○	○	○	○	○	○	○	1 soup bowlful (about 150g)	○	○	○
Freeze-dried Takano tofu or shimi tofu	○	○	○	○	○	○	○	○	1/2 slice (about 60g)	○	○	○
Deep-fried tofu or thick-fried tofu	○	○	○	○	○	○	○	○	1/2 slice (about 60g)	○	○	○
Fried auburaage tofu	○	○	○	○	○	○	○	○	1 miso soup bowlful (about 2g)	○	○	○
Natto	○	○	○	○	○	○	○	○	1 small cup (about 50g)	○	○	○
Satsuma sweet potatoes	○	○	○	○	○	○	○	○	1/6 potato (about 40g)	○	○	○
Potatoes	○	○	○	○	○	○	○	○	1/3 potato (about 50g)	○	○	○
Taro	○	○	○	○	○	○	○	○	1 taro (about 30g)	○	○	○
Konnyaku pressed vegetables, shirataki konnyaku noodles	○	○	○	○	○	○	○	○	about 2 oden pieces (about 50g)	○	○	○
Shiitake mushrooms	○	○	○	○	○	○	○	○	1 mushroom (about 20g)	○	○	○
Enoki mushrooms	○	○	○	○	○	○	○	○	1/4 stalk (about 20g)	○	○	○
Shimeji mushrooms	○	○	○	○	○	○	○	○	1/4 stalk (about 20g)	○	○	○
Wakame seaweed or kelp	○	○	○	○	○	○	○	○	1 small bowlful (about 20g)	○	○	○
Hijiki sea vegetable	○	○	○	○	○	○	○	○	1 small bowlful (about 20g)	○	○	○
Nori dried seaweed (roasted seaweed or flavored seaweed)	○	○	○	○	○	○	○	○	5 sheets of flavored nori (about 2g)	○	○	○

Please answer with average frequencies and amounts of what you use at the dining table.

Butter to put on bread	○	○	○	○	○	○	○	○	amount to spread on 1 piece of bread (about 8g)	○	○	○
Margarine to put on bread	○	○	○	○	○	○	○	○	amount to spread on 1 piece of bread (about 8g)	○	○	○
Jam or marmalade to put on bread	○	○	○	○	○	○	○	○	amount to spread on 1 piece of bread (about 8g)	○	○	○
Dressing	○	○	○	○	○	○	○	○	1 tablespoonful (about 10g)	○	○	○
Mayonnaise	○	○	○	○	○	○	○	○	1/2 tablespoonful (about 7g)	○	○	○
Sauce	○	○	○	○	○	○	○	○	1 teaspoonful (5g)	○	○	○
Ketchup	○	○	○	○	○	○	○	○	1 teaspoonful (6g)	○	○	○

Do not fill in ● ● ●

How frequently do you drink the following beverages?

Beverage Name	Less than once a week	1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	A cup or glass daily	2 - 3 cups or glasses daily	4 - 6 cups or glasses daily	7 - 9 cups or glasses daily	10 cups or glasses or more daily
Soybean milk	○	○	○	○	○	○	○	○	○
Japanese tea (green sencha tea)	○	○	○	○	○	○	○	○	○
Japanese tea (coarse bancha tea or brown-rice genmaicha tea)	○	○	○	○	○	○	○	○	○
Oolong tea	○	○	○	○	○	○	○	○	○
Black tea	○	○	○	○	○	○	○	○	○
Coffee (other than canned coffee)	○	○	○	○	○	○	○	○	○
Canned coffee	○	○	○	○	○	○	○	○	○
Soup	○	○	○	○	○	○	○	○	○
Lactic acid beverages (Yakult, etc.)	○	○	○	○	○	○	○	○	○
100% fruit-juice orange juice	○	○	○	○	○	○	○	○	○
100% fruit-juice apple juice	○	○	○	○	○	○	○	○	○
Tomato juice	○	○	○	○	○	○	○	○	○
Soft drinks (colas, etc.)	○	○	○	○	○	○	○	○	○
Drink tonics (Lipovitan D, etc.)	○	○	○	○	○	○	○	○	○
Drinking water (tap water or well water)	○	○	○	○	○	○	○	○	○
Drinking water (marketed or water purifier)	○	○	○	○	○	○	○	○	○

For people who drink black tea or coffee, do you add sugar or milk?

		I do not add them	Half spoonful	1 spoonful	2 spoonfuls	3 or more spoonfuls
Black tea	Sugar	○	○	○	○	○
	Milk	○	○	○	○	○
Coffee	Sugar	○	○	○	○	○
	Milk	○	○	○	○	○

How frequently do you eat breakfast?

○ Less than once a month	○ 1 - 3 times a month	○ 1 - 2 times a week	○ 3 - 4 times a week	○ 5 - 6 times a week	○ I eat it everyday

How frequently do you eat out? (Count bento boxed lunches and onigiri bought at stores as eating out)

○ Less than once a month	○ 1 - 3 times a month	○ 1 - 2 times a week	○ 3 - 4 times a week	○ 5 - 6 times a week	○ I eat it everyday

How frequently do you eat instant foods? (ramen, cup noodles, packaged foods, etc.)

○ Less than once a month   ○ 1 - 3 times a month   ○ 1 - 2 times a week   ○ 3 - 4 times a week   ○ 5 - 6 times a week   ○ I eat it everyday

---

How frequently do you eat stir-fried foods (stir-fried vegetables, etc.) cooked in oil?

○ Less than once a month   ○ 1 - 3 times a month   ○ 1 - 2 times a week   ○ 3 - 4 times a week   ○ 5 - 6 times a week   ○ I eat it everyday

---

How frequently do you eat "deep-fat fried foods (fries, tempura, etc.)" cooked in oil?

○ Less than once a month   ○ 1 - 3 times a month   ○ 1 - 2 times a week   ○ 3 - 4 times a week   ○ 5 - 6 times a week   ○ I eat it everyday

---

How much fat on the meat do you eat?

○ I eat hardly any of it   ○ I eat about 1/3 of it   ○ I eat about half of it   ○ I eat about 2/3 of it   ○ I eat almost all of it

---

How much soup of the ramen, udon or soba do you eat?

○ I eat hardly any of it   ○ I eat about 1/3 of it   ○ I eat about half of it   ○ I eat about 2/3 of it   ○ I eat almost all of it

---

Do you usually put salt on your food at the dining table?

○ I do not   ○ I rarely put it on   ○ I sometimes put it on   ○ I generally put it on   ○ I always put it on

---

Do you usually put soy sauce on your food at the dining table?

○ I do not   ○ I rarely put it on   ○ I sometimes put it on   ○ I generally put it on   ○ I always put it on

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Please choose the oil you use most and mark only one.

○ Vegetable oil (prepared oil)   ○ Safflower oil (benibana oil)   ○ Corn oil   ○ Soybean oil   ○ Rapeseed oil or canola oil

○ Olive oil   ○ Other

	Raw	Boiled	Grilled	Deep-Fat Fried	Stir-Fried	Other
Please mark only one as the preparation method you use most often.						
For meats?	○	○	○	○	○	○
For fish?	○	○	○	○	○	○
For vegetables?	○	○	○	○	○	○

How do you most often eat steaks and grilled meats?

○ Close to raw (rare) ○ Somewhat close to raw ○ Medium ○ Somewhat well grilled ○ Well grilled (well done)

How frequently do you eat grilled fish?

○ I hardly ever eat it ○ 1 - 3 times a month ○ 1 - 2 times a week ○ 3 - 4 times a week ○ 5 - 6 times a week ○ I eat it everyday

When you eat grilled fish, do you eat the burned parts?

○ I hardly ever eat them ○ I eat about 1/3 of them ○ I eat about half of them ○ I eat about 2/3 of them ○ I eat almost all of them

Currently, whom do you live with? Please mark all of the people that you live with.

○ Spouse ○ Child ○ Parents ○ Other ○ I live alone

Has your work changed in the last 5 years?

○ It has not changed ○ I changed jobs ○ I retired and currently do not work

What is your current work? If it changes because you work more than one job or seasonally, please mark all that apply.

○ Agricultural industry ○ Forestry industry ○ Fishing industry ○ Office work ○ Self-employed
○ Specialty work ○ Housewife ○ Unemployed ○ Other

We are going to ask you about how you moved your body during the last one year.

Compared to other one-year time periods such as a busy farming season, etc., has there been a particularly busy time period in which the way you moved your body during work time greatly changed? If there has been, please answer about that time period.

○ No such period ○ Less than 1 month ○ 1 month or more to less than 2 months ○ 2 months or more to less than 3 months
○ 3 months or more to less than 4 months ○ 4 months or more to less than 5 months ○ 5 months or more to less than 6 months

How many hours do you work in a day? Please answer including time for commuting and housework. For persons who had a particularly busy time period, please answer for that time period also.

	Less than 1 hour	1 hour or more and less than 3 hours	3 hours or more and less than 5 hours	5 hours or more and less than 7 hours	7 hours or more and less than 9 hours	9 hours or more and less than 11 hours	11 hours or more
Normal time period	○	○	○	○	○	○	○
Busy time period	○	○	○	○	○	○	○

Please tell us about the breakdown of your work time for a normal 1 day period within the last 1 year. Please answer including time for commuting and housework.

Breakdown of work time	None	Less than 1 hour	1 hour or more and less than 3 hours	3 hours or more and less than 5 hours	5 hours or more and less than 7 hours	7 hours or more and less than 9 hours	9 hours or more and less than 11 hours	11 hours or more
Sitting time during commute, work, housework, etc.	○	○	○	○	○	○	○	○
Standing time during commute, work, housework, etc.	○	○	○	○	○	○	○	○
Walking time during commute, work, housework, etc.	○	○	○	○	○	○	○	○
Time when doing physical work that need strength	○	○	○	○	○	○	○	○

We are going to ask you about how you moved your body during your free time. Last year, when you did the following things, how frequently did you do them and for how much time per occasion?

How you moved your body during free time	Frequency					Time per occasion					
	Less than once a month	1 - 3 times a month	1 - 2 times a week	3 - 4 times a week	Almost every day	Less than 30 minutes	30 - 59 minutes	1 to less than 2 hours	2 to less than 3 hours	3 to less than 4 hours	4 hours or more
Walking leisurely on a stroll, etc.	○	○	○	○	○	○	○	○	○	○	○
Walking briskly such as a power walk	○	○	○	○	○	○	○	○	○	○	○
Light- or medium-degree exercise like golf, croquet, puttering around the garden, etc.	○	○	○	○	○	○	○	○	○	○	○
Intense exercise like tennis, jogging, aerobics, swimming, etc.	○	○	○	○	○	○	○	○	○	○	○

Do not fill in   ●   ●

During the last 1 year, how much sleep have you normally been getting?					
○ 5 hours or less	○ 6 hours	○ 7 hours	○ 8 hours	○ 9 hours	○ 10 hours or more

How frequently do you have a bowel movement?				
○ Less than 3 times a week	○ 3 - 4 times a week	○ 5 - 6 times a week	○ Once daily	○ 2 or more times daily

What kind of stool do you usually have?					
○ Diarrhea	○ Soft stool	○ Normal stool	○ Hard stool	○ Particularly hard stool	○ I repeatedly have diarrhea and constipation

Are you regular in your everyday life?	
	○ I am regular ○ I am not regular

It is known that psychological and social factors are related to promoting health maintenance and the onset and passage of illnesses. Below we will ask you about some matters thought to be related to health status. Please do not over-think them and mark <u>respectively only one </u>that applies to you.

How do you handle various problems and events that you experience daily? Please answer about those respective frequencies.

How you handle them	Hardly ever	Infrequently	Sometimes	Fairly often	Extremely often
Make a plan to resolve them and carry it out	○	○	○	○	○
Consult with someone	○	○	○	○	○
Hope or fantasize about being able to change it	○	○	○	○	○
Endeavor to find the positive side of the situation	○	○	○	○	○
Blame and criticize yourself	○	○	○	○	○
Avoid those things and do something else	○	○	○	○	○

Normally, how much do you lead your life suppressing feelings of anger and sadness and the actions that accompany them?	Hardly ever	Infrequently	Sometimes	Fairly often	Extremely often
Please answer about the frequency with which you suppress feelings and actions	○	○	○	○	○
Please answer about how much you do this for these reasons (1) because it fits the situation and surrounding feelings, common sense and customs	○	○	○	○	○
(2) because I do not understand my own feelings and expressing them is difficult	○	○	○	○	○
How often does it become painful for you to suppress your feelings and actions?	○	○	○	○	○

How frequently do you talk with people on a daily basis?					
○ Less than once a month	○ 1 - 3 times a month	○ 1 - 4 times a week	○ Almost every day	○ Everyday with several people	○ Everyday with many people

Do you have the following kind of confidence about your life?	I do not think this at all	I think this a bit	I generally think so	I completely think so
I think that my own life has good prospects to some degree.	○	○	○	○
I think that in life whatever happens, it will work out.	○	○	○	○
Life is worth living meaningfully.	○	○	○	○

How long does it take for you to fall asleep after you get into bed?				
○ Less than 10 minutes	○ 10 - 29 minutes	○ 30 - 59 minutes	○ 1 hour or more and less than 2 hours	○ 2 hours or more

When you are asleep at night, do you ever fully wake up?				
○ Less than once a month	○ 1 - 3 times a month	○ 1 - 4 times a week	○ Almost everyday	○ Several times a day

Do you ever wake up early in the morning and cannot get back to sleep?			
○ Less than once a month	○ 1 - 3 times a month	○ 1 - 4 times a week	○ Almost everyday

Do not fill in ● ●

If you have had any tests in the past one year, please mark <u>all of them</u>.				
○ Blood pressure measurement	○ Blood test	○ Electro-cardiogram	○ Fundoscopy	○ Chest X-ray
○ Sputum cytological examination	○ Stomach X-ray	○ Gastric endoscopy	○ Occult blood test	○ Intestinal X-ray
○ Intestinal endoscopy	○ Breast X-ray	○ Uterine cytological examination		

If you have had your blood pressure or blood cholesterol measured in the past one year, please fill in the values at that time (if there were multiple times, the most recent values).

Upper blood pressure number			Lower blood pressure number			Cholesterol number		
100 digit	10 digit	1 digit	100 digit	10 digit	1 digit	100 digit	10 digit	1 digit

How is the current state of your daily life? Please choose 1 from among the following 9 multiple choices that you think best applies and mark it.

I do not particularly have any physical disability ⟶ ○ 1

<You have some physical disability, but you can lead your daily life pretty much by yourself and get out on your own efforts>

I go out using transportation facilities ⟶ ○ 2

I go out only in the neighborhood ⟶ ○ 3

<You can lead your life indoors generally by yourself, but do not get out without assistance>

I get out with assistance, and during the day I mostly lead my life away from bed ⟶ ○ 4

Getting out is infrequent, and even during the day I lead my life going to sleep and getting up ⟶ ○ 5

<You need some kind of assistance to lead your life indoors, and even during the day you mainly lead your life in bed, but you can maintain a sitting position>

I get into my wheelchair by myself, and I have my meals and toilet activities away from bed ⟶ ○ 6

I get into my wheelchair with assistance ⟶ ○ 7

<I spend the day in bed, and I need assistance in my toilet activities, meals, and changing clothes>

I turn over in bed on my own strength ⟶ ○ 8

I do not even turn over in bed on my own strength ⟶ ○ 9

We are asking these only of women.

Currently, do you take female hormone medications?　○ No　　○ Yes

Currently, do you have menses (menstruation)?

○ Yes　　　○ I have had menopause naturally　　　○ I have had menopause surgically, etc.

For persons who have had menopause, at what age did you have menopause?

○ Age 39 or under　○ Age 40 - 44　○ Age 45 - 49　○ Age 50 - 54　○ Age 55 - 59　○ Age 60 or over

Who filled this in?	○ Self　　　○ Representative

This is the end. We would appreciate it if you would check once more that you have not omitted anything. Thank you very much for your cooperation spending a long time on this.