Protocol for Shenzhen Ageing Cohort Study (SZ-ageing): a prospective observational cohort study of elderly disability and cognitive impairment

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ABSTRACT

Introduction The incidence and prevalence of disability and cognitive impairment, which are age-related, increase as China has become an ageing society. This study aims to establish the Shenzhen Ageing Cohort Study (SZ-ageing) to explore the epidemiological situation, risk factors and biomarkers of disability and cognitive impairment among Chinese elderly individuals.

Methods About 3000 participants aged 65 years and older are to be recruited from communities in Shenzhen by using a multistage sampling method. They will receive a baseline investigation between 2022 and 2024. The comprehensive data on disability and cognitive impairment will be collected by using standardised questionnaires, standardised scale assessments, clinical measurements and clinical laboratory tests. Active follow-up surveys with the same content as the baseline investigation will be conducted every 3 years.

Ethics and dissemination Ethics approval has been obtained from the ethics committee of the Shenzhen Center for Chronic Disease Control (SZCCC-2022-001-01-PJ; 21 February 2022). The research findings will be presented at professional conferences and submitted to peer-reviewed journals.

Trial registration number Chinese Clinical Trial Registry (ChiCTR2200060055).

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ All variables involved in Shenzhen Ageing Cohort Study (SZ-ageing) will be repeatedly collected through active follow-up, which can facilitate the tracing of trajectories of healthy ageing.
⇒ SZ-ageing provides comprehensive assessments, allowing meaningful adjustment of various confounders.
⇒ SZ-ageing explores the epidemiological situation, risk factors and biomarkers of disability and cognitive impairment in elderly individuals.
⇒ SZ-ageing is conducted only in one city in China, and the generalisability of findings to other cities in China and other countries may be limited.

INTRODUCTION

China has become an ageing society with 13.5% of the population aged 65 years or older in 2020, which is expected to increase to 22.3% and 26.9% in 2035 and 2050, respectively.[1,2] Ageing has become a serious social problem in China. Population ageing is accompanied by an increased prevalence of various age-related chronic diseases.[1,3] The cost of healthcare for elderly individuals is imposing a heavy financial burden on both the elderly individuals and their families as well as on society as a whole in China.[3] Healthy ageing is of great social significance as it reduces medical expenses and increases the productive engagement of the elderly population. Therefore, the State Council of China issued the outline of the 'Healthy China 2030' plan in 2016, which pointed out the need to achieve healthy ageing.

Disability is commonly defined as a 'difficulty or dependency in carrying out activities essential to independent living, including essential roles, tasks needed for self-care and living independently in a home, and desired activities important to one's quality of life'.[4] Disability and dementia are the leading causes of loss of independence, need for care and death among elderly individuals in China, and hence the main factors affecting healthy ageing.[1] Aihemaitijiang *et al* disclosed an age-dependent increase in disability in performing Basic Activities of Daily Living (BADL) in the Chinese elderly individuals, with 11.19% in 60–79 years of age and 34.24% in 80 years and older.[5] Cognitive impairment includes mild cognitive impairment (MCI) and dementia. A recent national cross-sectional study reported that the overall age-adjusted and sex-adjusted prevalence was 15.5% for MCI and 6.0% for dementia among the Chinese population aged 60 years or older.[6] At present, effective clinical treatments are lacked for disability and dementia.

Consensus has been reached to focus on primary interventions among elderly individuals to prevent disability or cognitive impairment. The key challenge is to accurately identify individuals with a high probability of subsequent disability or cognitive impairment development, who may be suitable for trial inclusion and willing to participate in primary prevention studies. However, no previous studies have assessed systematic risk factors and biomarkers for disability and cognitive impairment among Chinese elderly individuals.[5 7–10]

Clarifying the risk factors and biomarkers of disability or cognitive impairment in elderly individuals will help to identify the population at risk of disability or cognitive impairment, and promote the development of targeted screening and primary intervention measures as many risk factors are modifiable. The Chinese Longitudinal Healthy Longevity Survey (CLHLS) is a community-based longitudinal cohort study established in China since 1998 and has explored several factors associated with disability and cognitive impairment among elderly individuals. However, the CLHLS did not collect blood sample and could not examine biomarkers of disability and cognitive impairment. Although several studies in China, such as the China Health and Retirement Longitudinal Study,[11] the Shanghai Ageing Study[12] and the Healthy Ageing and Biomarkers Cohort Study,[13] have collected blood samples, the number of researches investigating biomarkers of disability and cognitive impairment remains limited. Meanwhile, few studies have collected blood sample at every follow-up and explored the dynamic change in the biomarkers during the development of disability and cognitive impairment. Therefore, we plan to conduct the Shenzhen Ageing Cohort Study (SZ-ageing) targeting the population aged 65 years or older and will collect all variables at every follow-up, to understand the prevalence and incidence of disability and cognitive impairment and systemically explore the risk factors and biomarkers of them.

METHODS AND ANALYSIS
Objectives of SZ-ageing
An overarching objective of SZ-ageing is to advance disability or cognitive impairment research by collecting and analysing high-quality data on late-life activities of daily living (ADL), dementia and MCI and their correlates. The main objective of SZ-ageing are described as follows:

► Collecting high-quality data on late-life ADL and cognitive impairment.
► Enriching epidemiological data through questionnaire survey, physical examination, venous blood specimen and urine specimen collection and assays, ultrasound test, body composition test, grip strength measurement, physical performance test and etc.
► Estimating the prevalence or incidence of disability and cognitive impairment.

► Investigating the determinants and biomarkers of late-life disability and cognitive impairment.
► Developing risk prediction tools for disability and cognitive impairment.

Patient and public involvement
Patients and the public are not involved in the design and recruitment of this project.

SZ-ageing sample and enrolment
Shenzhen, as the first special economic zone of China, attracts a large number of immigrants from other regions across China and even overseas. In Shenzhen, 3.22% of the total permanent population, or 565 217 permanent residents, were 65 years or older in 2020.[14] The sample size was calculated using the following equation:

$$n = \left[Z_\alpha \sqrt{2q\left(1 - q\right)} + Z_\beta \sqrt{p_1\left(1 - p_1\right) + p_2\left(1 - p_2\right)} \right]^2 / \left(p_1 - p_2\right)^2$$

.where p_1 and p_2 indicate the incidence of the outcome of interest in the non-exposed and exposed groups, respectively; q is the mean of p_1 and p_2. Considering that the incidence of dementia is lower than that of disability, we use dementia as the outcome parameter to calculate the sample size. The incidence of dementia in Chinese people aged 65 years or older is estimated to be 3.6% during a 3-year follow-up.[15] Assuming a risk ratio of 2.0, a power of 80% (beta=0.2), an alpha of 5% (0.05), an exposure prevalence of 25% and a follow-up rate of 90%, the cohort study requires a sample size of 2743 to detect a statistically significant effect. Therefore, we decide to recruit 3000 permanent residents aged 65 years or older. A multistage sampling method is used to select study participants in Shenzhen, China. The socioeconomic characteristics of residents in different communities may vary, leading to differences in the prevalence and incidence of disability and cognitive impairment. In the first stage, we have selected 10 community health service centres comprehensively considering participant willingness, health service facilities and ability, number of permanent elderly residents, geographic region and stability of the serving population to improve the representativeness of participants. The community health service centre is the basic health administration unit located in each community, which is responsible for disease prevention, healthcare, promoting recovery in each stage of the health-illness process, health education and medical treatment of all the population in the area under its jurisdiction. In the second stage, we will recruit participants from 10 communities (about 300 elderly individuals per community health service centre) according to the age and gender composition ratio of the elderly population in Shenzhen, from May 2022 to December 2024. The staff of the community health service centres recruit the elderly individuals in their service community to participate in the survey by telephone. The following inclusion criteria are used to recruit study participants: (1) 65 years or older by the time of interview; (2) community-dwelling elders living at home alone or with family or relatives;

(3) volunteering to participate and providing written informed consent; (4) able to cooperate to complete data collection; (5) able to communicate with the interviewers; and (6) having lived in Shenzhen for more than 6 months (permanent residents). The following exclusion criteria are used: (1) living in long-term care institutions and (2) having severe mental diseases.

Standardised questionnaire survey

All participants are invited to receive a free data collection-related medical examination at the selected community health service centres. Table 1 summarises the data collection methods of SZ-ageing, including a questionnaire with face-to-face interviews, standardised scale assessment, clinical measurements and clinical laboratory tests. The standardised questionnaire is administered to collect information on sociodemographic characteristics and health parameters, and face-to-face interviews are conducted 1 hour after blood collection by trained general practitioners of the selected community health service centres. The questionnaire includes seven sections: sociodemographic characteristics, history of drug allergy, lifestyle behaviours, exposure history of occupational disease inductive factors, history of the personal disease (disease category, time of diagnosis and treatment for disease), family history of the disease and other characteristics (table 1).

Standardised scale assessment

All standardised scale assessments are administered by trained staff of the selected community health service centres. The disability in BADL and Instrumental Activities of Daily Living (IADL) is assessed using Katz's Scale and Lawton and Brody's Scale, respectively.[16] Katz's BADL Scale is mainly used to assess the needs of caregivers for long-term care based on self-reported performance levels of six basic abilities: bathing, dressing, continence, toileting, transferring from bed to chair and eating.[17] Lawton and Brody's IADL Scale is used to assess the self-report independent living functions in one's daily life in eight different activities: meal preparation, grocery shopping, housekeeping, laundry, handling money, using the telephone, taking transportation and managing medications.[18] For each domain, participants are considered as disabled if they were unable to perform at least one activity without a given level of help.[5 18 19]

Physical performances, including upper-limb index (eg, handgrip strength) and lower-limb index (eg, Short Physical Performance Battery (SPPB)), have proven to be crucial factors of intrinsic capacity in older adults.[20–22] Substantial evidence shows that physical performances are strong and independent predictors of disability, with satisfactory validity in the older population.[23 24] In this study, the SPPB is administered using standardised methodologies for the instructions, positioning and scoring by the trained staff of the selected community health service centres.[24] To assess the usual walking speed, the participants are asked to walk 2.44 m at their regular pace two

times, from the standing position. The standing balance tests included side-by-side, semi-tandem and full-tandem standing. The participants are timed until they moved, or 10 s had elapsed. To assess the five times sit-to-stand test, the participants are asked to perform five chair stands as quickly as possible. Each subtest is scored from 0 to 4, and the total score is between 0 and 12.[24 25] Participants with a total score of 0–6 are classified into the physical low-performances group, 7–9 into the physical intermediate performance group and 10–12 into the physical high-performances group.[26]

The Mini-Mental State Examination (MMSE) is the most widely applied test for dementia screening and has better diagnostic performance for dementia compared with the Montreal Cognitive Assessment (MoCA).[27] However, the MoCA has better diagnostic performance for MCI compared with the MMSE.[27] We use MMSE and MoCA together to measure the global cognition of participants so as to improve the diagnostic performance for dementia and MCI. The MMSE is a 30-question assessment of cognitive function that evaluates attention and orientation, memory, registration, recall, calculation, language and the ability to draw a complex polygon. The MoCA is another 30-point test covering eight cognitive domains. The MMSE and MoCA scores range from 0 to 30, with higher scores indicating better cognitive function.[28] Cognitive impairment is identified using specific cut-off points of total scores of MMSE and MoCA: MMSE≤19 for illiterate participants, ≤22 for participants with elementary school education and ≤26 for those with middle school education and higher.[28 29] If the MoCA Score is ≤25 for participants, 1 point is added if the education years of the participants are no more than 12 years.[30] Participants suspected to have cognitive impairment after MMSE or MoCA examination are diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, criteria, in a general hospital.[31] In addition, we use the Ascertain Dementia 8-item Questionnaire (AD-8) to assess change in functional performance secondary to cognitive change. The AD-8 is a short questionnaire, completed by a suitable insider who knows the person well.[32]

Two self-reported screening measures are used for anxiety and depression: the 'Generalized Anxiety Disorder Scale-7 (GAD-7)' and 'Patient Health Questionnaire-2 (PHQ-2)'. The scales assess the frequency of related symptoms, with answering options ranging from 0 (never or not at all) to 3 (almost every day).[33 34] We consider an individual to screen positive for anxiety or depression when the sum of both items is higher than a certain score on GAD-7 (≥5) or PHQ-2 (≥3).[33 34] The sleep quality is measured using the Pittsburgh Sleep Quality Index (PSQI).[35 36] The PSQI consists of four items to measure participant' sleep quality, with higher scores indicating worse sleep quality (0–5: sleep quality is very good; 6–10: sleep quality is good; 11–15: sleep quality is bad; and 16–21: sleep quality is very bad). Frailty is evaluated with the FRAIL Scale (Fatigue, Resistance, Ambulation,

Table 1 Summary of the data collection methods in SZ-ageing

Data collection methods	Measurements	Variables
Standardised questionnaires survey		
	Sociodemographics	National ID, name, date of birth, age, sex, current address, permanent residence address (Hukou address), nationality, preretirement occupation, educational level, marital status and type of medical insurance
	History of drug allergy	Penicillin, sulfanilamide, streptomycin and other drugs
	Lifestyle behaviours	Dietary behaviours, physical activity, smoking habits, alcohol habits
	Occupational disease inductive factors exposure history	Dust, radioactive substance, physical agent and hazardous chemical substances
	History of personal disease	Hypertension, diabetes, coronary heart disease, chronic obstructive pulmonary disease, malignant tumour, cerebrovascular disease, kidney disease, heart disease, vascular disease, eye disease, neurological diseases, tuberculosis, hepatitis and occupational disease
	Family history of disease	Hypertension, diabetes, coronary heart disease, chronic obstructive pulmonary disease, malignant tumour, stroke, severe mental diseases, tuberculosis, hepatitis and congenital malformation
	Others	Genetic history, history of surgery, history of trauma, sedentary behaviours and self-rated health status
Standardised scale assessments		
	Activities of daily living assessment	Katz Basic Activities of Daily Living Scale and Lawton's Instrumental Activities of Daily Living Scale
	Physical performances assessment	Short Physical Performance Battery
	Cognitive function assessment	Mini-Mental State Examination, Montreal Cognitive Assessment, self-reported Ascertain Dementia 8-item Questionnaire
	Anxious assessment	Generalized Anxiety Disorder Scale-7
	Depress assessment	Patient Health Questionnaire-2
	Sleep quality assessment	Pittsburgh Sleep Quality Index
	Frailty assessment	The FRAIL Scale (Fatigue, Resistance, Ambulation, Illnesses, and Loss of Weight)
Clinical measurements	Physical examinations	Height, weight, body mass index, waist circumference, blood pressure; the inspection–palpation–percussion–auscultation approach is used to find visual abnormalities in the eyes, pharyngeal, oral cavity, thorax, lung, heart, liver, spleen, skin, lymph gland and limbs
	Others	Abdominal colour Doppler ultrasound (liver, gallbladder, pancreas, spleen, kidney), ECG examination, body composition examination, handgrip strength measurement, ultrasound bone mineral density examination of calcaneus
Clinical laboratory tests	Hepatic function	Total bilirubin, direct bilirubin, indirect bilirubin, alanine aminotransferase (ALT), aspartate aminotransferase (AST), ALT/AST, AST/ALT, alkaline phosphatase, glutamine transpeptidase, total protein, albumin (ALB), globulin (GLB) and ALB/GLB
	Kidney function	Urinary microalbumin, urinary creatinine, serum creatinine, serum urea, $\beta2$ microglobulin and serum uric acid
	Serum lipids	Total cholesterol, triglyceride, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, apolipoprotein A1 and apolipoprotein B
	Tumour biomarkers	Carcinoembryonic antigen and alpha fetoprotein

Continued

Table 1 Continued

Data collection methods	Measurements	Variables
	Others	Blood routine examination, urine routine examination, fasting plasma glucose, fasting insulin, glycated haemoglobin A1c, 25 hydroxyvitamin D, Apolipoprotein E, lipoprotein A and homocysteine

Illnesses, and Loss of Weight), which has been validated for the assessment of frailty status in older community dwellers.[37] The scale comprises of five items: fatigue, resistance, ambulation, illness and loss of weight.[35] One point is attributed to each item, and the total score ranges from 0 to 5. Participants were categorised as followes: robust (0), prefrail (1–2) and frail (3–5).[37]

Clinical measurements

Anthropometric examinations are performed in the morning on participants who had fasted overnight, following which body measurements are conducted by trained general practitioners of the selected community health service centres. Calibrated electronic sphygmomanometers (HEM7121, OMRON Healthcare, Japan) are used to measure blood pressure. The measure methods for blood pressure, height, weight, body mass index (BMI) and waist circumference are described elsewhere.[38] Abdominal colour Doppler ultrasound (liver, gallbladder, pancreas, spleen and kidney) is conducted by trained general hospital ultrasound doctors of the selected community health centres. Twelve-lead resting ECG measurements are then performed on all participants by trained staff of the selected community health service centres. The inspection–palpation–percussion–auscultation approach is used to find visual abnormalities in the eyes, pharyngeal, oral cavity, thorax, lung, heart, liver, spleen, skin, lymph gland and limbs.

The visceral fat and fluid imbalances in each segment of the body and the phase angle for a cellular indicator of cell integrity are measured by bioelectrical impedance analysis using a body composition analyser (Haikang H-Key350; Beijing Sihai Huachen Technology). The test protocols for the body composition analyser are described elsewhere.[39] The body segments are analysed, including body composition (intracellular water, extracellular water, total body water, total body percentage, muscle mass, fat-free mass, body weight, body fat, body fat percentage, protein mass, waist-to-hip ratio, minerals mass, BMI, basal metabolic rate and visceral fat area), segmental oedema analysis (extracellular water of trunk, left upper limb, right upper limb, left lower limb, right lower limb/total body water and extracellular water/total body water), segmental muscle analysis (left upper limb, right upper limb, trunk, left lower limb and right lower limb), body shape analysis (according to BMI and body fat percentage) and segmental fat analysis (left upper limb, right upper limb, trunk, left lower limb and right lower limb).

Handgrip strength is outstanding as a measure of general health and is often estimated in screenings of normal motor function.[40] The handgrip strength is assessed using the CAMRY hydraulic hand dynamomete (EH101, Zhongshan Camry Electronic, China) by trained staff of selected community health service centres, which had an adjustable grip to account for varying hand sizes. The following standardised testing position for measuring handgrip strength is used: participants stand with the arm fully extended, forming an angle of 30° to the trunk. The research team conducts a demonstration, and the elderly individuals perform some familiarisation trials. During handgrip strength measurement, the participants are asked to grip the dynamometer using maximum strength and to hold the grip for 3 s. The elderly are encouraged to reach the best score possible. Each participant performs two attempts with each hand, with 1 min rest between attempts. The maximum score in kilograms for each hand is recorded and the largest handgrip strength is used in the analyses.

The bone mineral density of the right calcaneal bone of the participants is measured using the OsteoPro (OsteoPro Smart, B.M.Tech.Worldwide, Korea). This study uses the manufacturer's Asia reference database for bone mineral density already installed in OsteoPro software. The cut-off values for categorising participants as having osteopenia or osteoporosis in this study use the WHO criteria.[41] A T score of ≥−1.0 was defined as normal; a T score between −1.0 and −2.5 as osteopenic; and a T score of ≤−2.5 as osteoporotic.[41] The OsteoPro software also provides a Z score of the bone mineral density, which is obtained by comparing with the reference mean matched for sex, age and weight. The OsteoPro has a provision for the input of the biodata of the participants. The biodata comprises of the name of the participant, date of birth, sex and side of the calcaneal bone to be tested. Once the input of the biodata is made and the participant is tested, the OsteoPro automatically generates the T and Z scores and depicts whether the participant is normal or osteopenic, or osteoporotic.

Clinical laboratory tests

Fasting blood (one ethylene diamine tetraacetie acid (EDTA) anticoagulant tube 2 mL, one EDTA anticoagulant tube 5 mL, one promoting coagulation tube 5 mL, one lithium-heparinised tube 5 mL) and urine samples (10 mL) are collected at the selected community health service centres. Participant's venous blood samples are taken after at least 8 hour of overnight fasting.
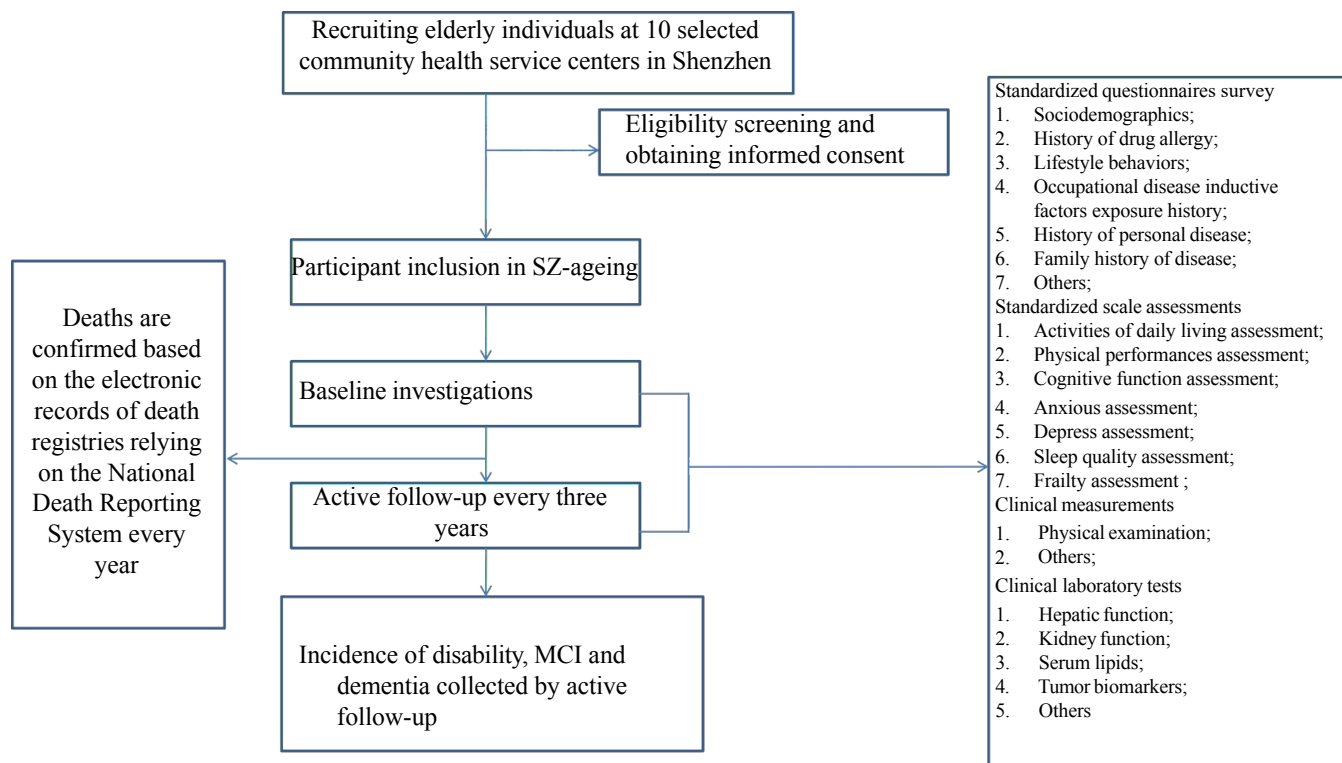
Figure 1 Flow chart of Shenzhen Ageing Cohort Study (SZ-ageing). MCI, mild cognitive impairment.

Participants are instructed on how to obtain a clean catch urine specimen. One EDTA anticoagulant tube (2 mL) or one promoting coagulation tube (5 mL) fasting blood or urine samples (10 mL) are analysed at the clinical laboratories of Shenzhen Center for Chronic Disease Control. All the laboratories involved have successfully completed a standardisation and competency programme. The internal and external quality control programmes are routinely performed to ensure the accuracy and stability of the measurements. Laboratory assessments provide valuable information regarding hepatic function, kidney function, serum lipids, tumour biomarkers and other clinical laboratory indicators (table 1). The blood specimens in one EDTA anticoagulant tube (5 mL) or one lithium-heparinised tube (5 mL), and the resting blood specimens in the EDTA anticoagulant tube are centrifuged at 3000 rpm for 10 min at 4°C after clinical laboratory analysis to separate plasma, white blood cells and red blood cells. The resting urine specimens and the resting serum are also subpacked. All subpacked specimens are stored at −80°C for further use.

Frequency of the follow-up of participants

As shown in figure 1, active follow-up (same as the baseline survey) every 3 years is also used to obtain outcomes including the incidence of disability, MCI and dementia through face-to-face interviews. Also, in the following stage, all participants in SZ-ageing will be followed up via linkage to the electronic records of death registries relying on the National Death Reporting System. Details on vital status and cause of death (including the underlying cause of death and contributing cause of death, date of death and place of death) will be obtained through the data linkage. The data linkage will be carried out annually. When participants in the cohort are lost to follow-up or dead, we will recruit new participants from the same community as these participants to keep the sample size relatively stable over time. The newly recruited participants will be matched to the lost or dead participants 1:1 by sex and age at baseline (±1 year).

Quality control measures

Shenzhen Center for Chronic Disease Control performs the overall project review and validation. The district centre for chronic disease control provides technical guidance and participates in the field of quality control. The research investigators are trained at the centre for chronic disease control by its staff member every year and conduct tests to ensure standardised quality. The training contents include the purpose of this study, how to properly administer questionnaires, the standard measurement methods, the importance of standardisation and the study procedures. Working manuals containing questionnaire techniques, standardised scale assessment techniques, clinical measurement techniques, blood or urine sample collection and packing techniques, and clinical laboratory test requirements are distributed to all the investigators. After each investigation, trained investigators check the integrity and logical errors of each questionnaire. The missing information is entered and logical errors are corrected, when participants come to the selected community health service centre to get

their medical examination report. Data from each questionnaire is entered into the computer by two integrators independently using EpiData software (V.3.2). All information is double checked for the validity.

ETHICS AND DISSEMINATION

SZ-ageing has been registered in the Chinese Clinical Trial Registry (ChiCTR2200060055). The researchers have obtained ethics approval from the ethics committee of the Shenzhen Center for Chronic Disease Control (SZCCC-2022-001-01-PJ). All procedures are performed following ethical standards, and written informed consent is obtained from all participants after informing them about the objectives, benefits, medical items and confidentiality agreement of personal information. Although we have no immediate plan to make the data freely available in the public domain, we welcome collaboration from all over the world. The research findings will be presented at professional conferences and submitted to peer-reviewed journals. All the results presented in this study will be from group data; therefore, individual participants will not be identifiable.

MAIN STRENGTHS AND WEAKNESS OF SZ-AGEING

The main strengths of this study are described as follows: First, comprehensive data (a comprehensive scope of assessments) is collected by including a broad range of variables, all of which will allow meaningful adjustments of various confounders when the complex interrelationships of factors are dissected and modifiable risk factors for disability and cognitive impairment are identified. Second, all laboratory analyses are centrally conducted by the clinical laboratories of the Shenzhen Center for Chronic Disease Control, which is equipped with requisite skills and facilities, thereby eliminating interlaboratory assay. Third, our research teams include a variety of different-grade medical institutions and public health institutions and are responsible for providing technical guidance and implementation of the elderly health management project of the National Basic Public Health Service in Shenzhen. Therefore, our research teams have extensive experience and resources in implementing the SZ-ageing cohort study. The collaboration of different-grade medical institutions and public health institutions ensures the quality and sustainability of our research. Fourth, all variables are repeatedly collected through active follow-up, which facilitates the tracing of trajectories of healthy ageing. Finally, a citywide population of community-dwelling Shenzhen elderly individuals is included.

One weakness of the study is that this study is conducted only in one city in China, and the generalisability of findings to other cities in China and other countries may be limited. In addition, the high mobility of the elderly population in Shenzhen may result in a high rate of loss to follow-up. Therefore, we select permanent elderly individuals to improve the follow-up rate. Meanwhile, we try to reinterview all the elderly individuals lost to follow-up in each wave.

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