

JPFMS: *Study Protocol*

Study protocol and overview of the Kasama Study: Creating a comprehensive, community-based system for preventive nursing care and supporting successful aging

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Abstract This study protocol introduces the Kasama Study, a mid-sized longitudinal study of health, fitness, and physical activity in older people. The study is a challenging research project that discusses the future of the system for preventive nursing care and for supporting successful aging in Japan. In May 2008, we began the Kasama Study with an exercise program of preventive nursing care for community-dwelling older adults. As of March 2016, we have conducted six study projects: 1) the Kasama health checkup for longevity, 2) an all-round exercise class, 3) the volunteer and the circle, 4) an exercise class for men only, 5) an exercise class for improving cognitive and physical function, and 6) the Kasama Iki-iki checklist survey. We describe each project in detail in the present study protocol.

Keywords : Kasama Study, community-dwelling older adults, community-based intervention, community-based health promotion

What is the Kasama Study?

Launched at Kasama City, Ibaraki Prefecture, Japan, in May 2008, the Kasama Study is a mid-sized longitudinal study of health, fitness, and physical activity in older people. The study aims to create a comprehensive, community-based system for preventive nursing care and supporting successful aging (Fig. 1). In addition to research, it has been acknowledged that local communities require social contribution activities conducted by universities, including providing instructions for a variety of exercise trainings for successful aging. Therefore, the Kasama Study can be characterized as a field of practice in which not only research, but also education and social contribution activities are simultaneously conducted.

Before beginning the Kasama Study, the authors il-

lustrated Fig. 2 to explain the hypotheses that the study should demonstrate. Certainly, the study's ultimate goal is to extend healthy life expectancy, which is clearly influenced not only by medical variables, but also by physical, psychological, and cognitive functions. For example, higher levels of walking ability and lower extremity muscle function are undoubtedly associated with a longer healthy life expectancy. To provide a hypothetical example, we ask how an individual can acquire higher-level physical functions. The answer may be by maintaining a high level of physical activity by frequently going outdoors, at least for the last few years. We can also ask how that individual is able to maintain a higher level of physical activity. The answer may be because the person has had many chances to travel, shop, engage in hobbies, and attend various volunteer activities. Furthermore, that individual may have been active because he/she is a sociable person, i.e., maintains a high level of interpersonal inter-

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Fig. 1 Logo of Kasama Study

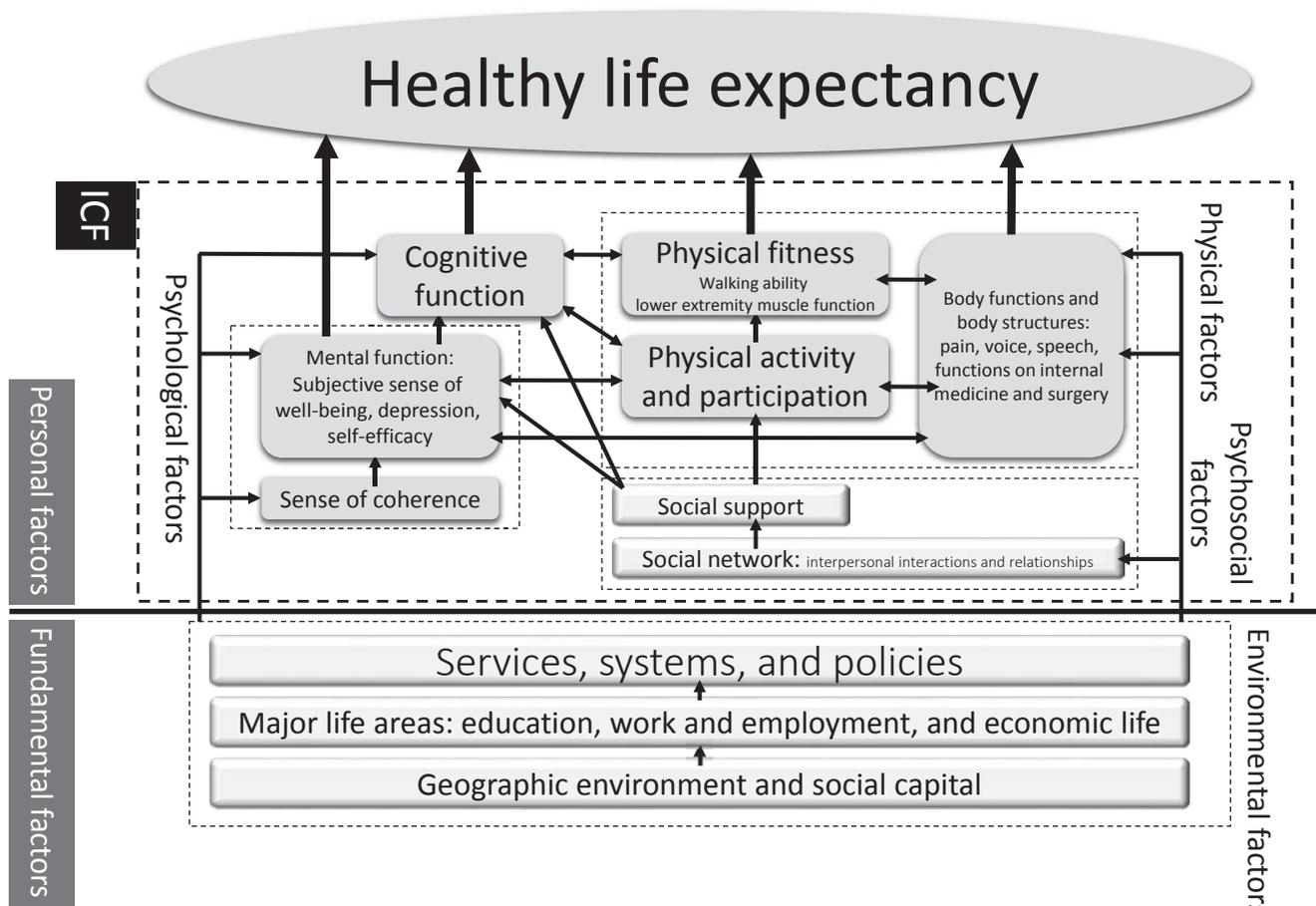


Fig. 2 Pathways of physical, psychological, and social factors in relation to healthy life expectancy

actions and relationships. The above description, however, has focused only on personal factors, but investigating the relationship of health and fitness with environmental factors, such as the geographical environment and social capital, is also necessary.

The Kasama Study is a challenging research project that tests the above hypotheses comprehensively by having young researchers, many under 30 years of age, conduct various types of surveys based on their individual research themes that are in accordance with the Kasama Study's goals. In this review, therefore, we describe the details of the study protocol and provide an overview of the Kasama Study. This series of studies was conducted with the approval of the ethics committee of the University of Tsukuba (Tai 21-25 and Tai 23-36).

Kasama City profile

Kasama City is a relatively small city located in the central region of Ibaraki Prefecture, Japan. As of April 2016, its population was 77,719. Kasama City's aging rate (percentage of the population that is ≥ 65 years of age) is 28.4%¹⁾, slightly higher than that of the Japanese national average (26.8% as of December 2015)²⁾. In March 2006, the city merged three municipalities: Kasama City (former), Tomobe Town, and Iwama Town. Kasama City's total area is approximately 240 km², approximately 20 km north to south and approximately 19 km east to west. A series of hills or mountains (Mt. Yamizo) is located in the northwest region, and Mt. Atago is located in the southwest region. A flat plateau spreads southeast from the northwest, and the Konuma River flows through the city

center from northwest to east.

Kasama City is known for primary industries because forests and farms occupy more than 60% of the city’s area³⁾, and primary industry workers constitute 5.4% of the population³⁾ (national average, 4.2%)⁴⁾. In addition, the city has an attractive sightseeing location, *Kasamainari-Jinja* Shrine, and the well-known ceramic ware called *Kasama-yaki* also attracts tourists. In recent years, urbanization has advanced owing to convenient transportation (trains and motorways), the building of housing estates, and the existence of a neighboring city, Mito City, the prefectural capital. Kasama City conducts various activities and services for health care and considers the promotion of its citizens’ health an important task. For that reason, in 2012, the city initiated a project called Healthy City Kasama Declaration⁵⁾.

Progress of the Kasama Study

In May 2008, we began the Kasama Study with an exercise program of preventive nursing care for community-dwelling older adults (all-round exercise class). To date (March 2015), we conducted six study projects: 1) the Kasama health checkup for longevity, 2) an all-round exercise class, 3) the volunteer and the circle, 4) an exercise class for men only, 5) an exercise class for improving cognitive and physical function, and 6) the Kasama Iki-iki checklist survey. Fig. 3 shows the Kasama Study’s progress and the number of participants in each project. After the second all-round exercise class was completed, the circle was initiated according to the wishes of the participants who completed the class. In 2009, to support and develop the activities of the circle, we began a project for training volunteers who have skills to manage circles and provide exercise instruction. Additionally, we have conducted health checkups for the circles’ volunteers and participants every year since 2009. In 2009, we also held the first annual Kasama health checkup for longevity. We initiated three projects in 2013: an exercise class targeting only middle-aged and older men, an exercise class for improving cognitive and physical function aimed at developing a novel exercise program for persons with mild cognitive impairment, and the Kasama Iki-iki checklist survey in conjunction with a municipal screening project for pre-frail older adults. We describe each project in detail in this chapter’s subsequent sections.

Annual follow-up study on the Kasama health checkup for longevity

The Kasama health checkup for longevity is an open cohort study begun in 2009. The cohort’s participants consist of people aged 65 to 85 years, randomly drawn from the Basic Resident Registration Network System, or “Juki Net”. The cohort study’s examinations serve as a baseline, and follow-up surveys are conducted annually from

July to August. As baseline subjects, we selected 213 participants from 1200 randomly drawn people in 2009, 183 participants from 900 drawn people in 2010, 174 participants from 900 drawn people in 2011, 118 participants from 800 drawn in 2012, and 71 participants from 400 drawn in 2015. In total, 759 baseline participants (18.1%) from 4200 were drawn from the 2009 to 2012 and 2015 surveys. For the 2013 and 2014 surveys, only follow-up examinations were conducted.

In these checkups, the main variables include physical performance⁶⁻¹⁵⁾, physical activity^{6,9,16-22)}, cognitive function¹¹⁾, foot posture^{10,15)}, psychological status^{17,19,21-24)}, sleep status^{19,20)}, and social networks^{17,22,23)} (Table 1). Additionally, objectively-built environmental attributes were assessed using a geographic information system^{25,26)}. Although the sample size of this cohort study is smaller than other relevant cohort studies, this study has the advantage of assessing various physical performance tests including reaction time⁹⁾, postural sway^{10,15)}, ground reaction force in sit-to-stand movement^{7,13)}, and cognitive function¹¹⁾. The information obtained has been used as control data for all-round exercise classes and voluntary group exercise activities²⁷⁾ in addition to regular cross-sectional and longitudinal studies.

Summary of the all-round exercise class

The all-round exercise class is a daycare physical strength program that began in May 2008. Its purpose is to improve physical and cognitive functions and mental health and to prevent falls in older adults. The class, offered three times a year, is held once a week for 11 weeks, and consists of a 90-minute exercise program and a 30-minute lecture about health. Participants live independently and are aged 65 or older, including people with a high risk of future decline in basic or advanced activities of daily living. Participants were recruited through local advertisements or invited by municipal employees. The exercise program consists of a warm-up activity for 15 minutes, square-stepping exercise (SSE)²⁸⁾ for 40 minutes, a recreational activity for 20 minutes, and a cool-down period for 15 minutes. SSE is performed on a thin felt mat (250 × 100 cm) divided into 40 small squares (25 × 25 cm). The exercise technique includes forward, backward, lateral, and oblique steps, with step patterns progressively becoming more complex. A previous study showed that SSE improves physical and cognitive functions^{29,30)} and reduces the risk of falling³¹⁾. In April 2013, we added resistance training called brown rice dumbbell exercises³²⁾ and the Locomo exercise³³⁾. We evaluated physical fitness^{34,35)}, physical activity^{34,35)}, cognitive function³⁶⁾, depression³⁷⁾, and social networks³⁷⁾ at baseline and after the program (Table 1).

Fig. 3 Flow of Kasama Study

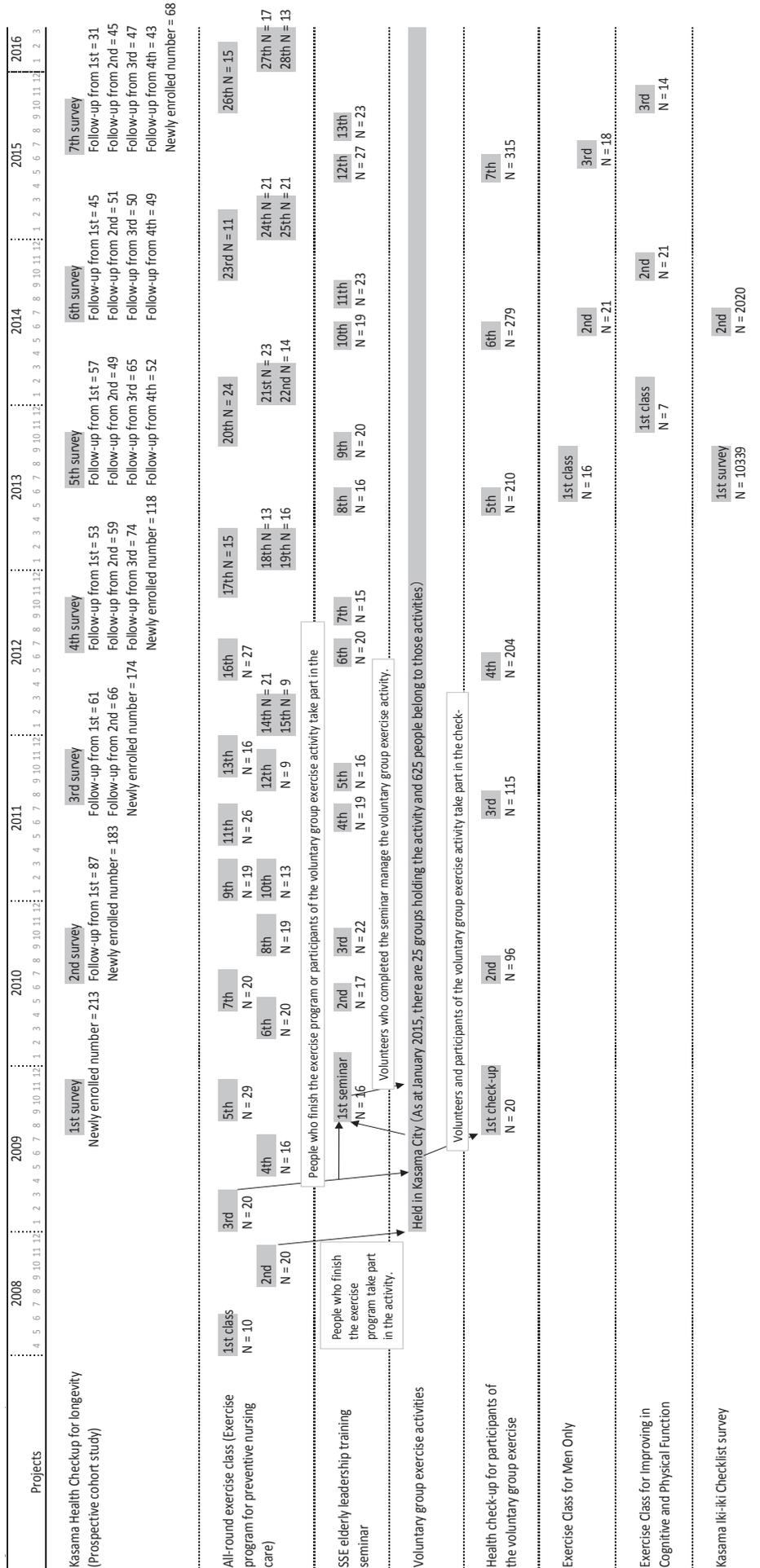


Table 1. Measures included in the six study projects

Instruments (domains)	Study projects						Ref.
	Kasama Health Checkup for longevity	All-round exercise class	Health checkup for participants of the voluntary group exercise activity	Exercise Class for Men Only	Exercise Class for Improving in Cognitive and Physical Function	Kasama Iki-iki Checklist survey	
Cognitive functions	✓	✓	✓	✓	✓	✓	42)
-Five-cognitive function test (verbal memory, attention, word fluency, visuospatial cognition, associate learning)							
Physical activity	✓	✓	✓	✓	✓	✓	43,44)
-Physical Activity Scale for the Elderly (leisure-time physical activity, household physical activity, work physical activity)							
-IPAQ-Short (walking, moderate-intensity PA, vigorous-intensity PA)						✓	45)
-Sedentary behavior (watch television, use of computer)		✓				✓	
-Pedometer, accelerometer (daily step counts, physical activity)							
S/leep	✓	✓	✓	✓	✓	✓	46,47)
-Pittsburgh Sleep Quality Index (sleep quality, sleep latency, sleep duration, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, daytime dysfunction)							
Psychological status	✓	✓	✓	✓	✓	✓	48,49)
-Geriatric Depression Scale (sense of coherence scale)							50)
-Sense of Coherence Scale							51)
-Generalized Self-Efficacy Scale							
Social networks	✓	✓	✓	✓	✓	✓	52,53)
-Lubben Social Network Scale (family networks, friends networks, interdependent social supports, living arrangements)							
-Lubben Social Network Scale - 6 (family networks, friends networks)		✓	✓				54,55)
Physical performance tests	✓	✓	✓	✓	✓	✓	
A) Grip strength (muscle strength)							
B) Single-leg balance with eyes open (balance)							
C) Functional reach (balance)							
D) Sit-and-reach (flexibility)							
E) Standing time from a long-sitting position (lower extremity function)							
F) 5-time sit-to-stand (lower extremity function)							
G) Ground reaction force in a sit-to-stand (lower extremity function)							
H) Timed up and go (lower extremity function)							
I) 5-m habitual walk (lower extremity function)							
J) Hand working with pegboard (hand dexterity)							
K) Trail making peg test (hand dexterity)							
L) Simple reaction time (reaction speed)							
M) 4-way choice reaction time (reaction speed)							
N) Hand-held dynamometer (lower extremity strength)							
O) Arm curl (upper extremity strength)							
Body characteristics	✓			✓			
-Bioelectrical impedance analysis (body composition)							
-Foot posture (foot deformity)							
Frailty	✓						
-Kihon Checklist (activities of daily living, physical strength, nutritional status, oral function, houseboundness, cognitive function, depression risk)							41)
Others						✓	
(sleep, subjective health, the distance to the location where you want to go from home, participation in community activity, subjective measures of the built environment awareness of preventive care exercises, life-space and main mode of transportation, presence of exercise companions, presence of someone to talk to)							

Summary of voluntary group exercise activities and training volunteers for instructing SSE

We have held SSE elderly leadership training seminars since September 2009 to train elderly volunteers, called SSE leaders, who manage voluntary group exercise activities; they provide technical and emotional support for community-dwelling elderly to engage in SSE²⁷⁾. One course is comprised of weekly training seminars over a period of 5 weeks. Each seminar lasts 120 minutes, and two courses are held each year. Training seminars consist of lectures and practical training for instructing and supporting exercise and discussions about ideal volunteer activities or instructing SSE. Participants who complete an SSE course receive certification as an SSE leader. Up to the time of this writing, we have trained 253 volunteers.

In Kasama City, voluntary group exercise activities with the primary purpose of practicing SSE are held either two or four times a month for 90–120 minutes per session at communal facilities such as community centers and gymnasiums. Trained volunteers manage the sessions. In 2016, 32 groups held sessions, and 702 community-dwelling older people, including 193 volunteers, participated in these sessions. Once a year since 2010, we have conducted health checkups for these participants and investigated the effects of exercise activities on general health (e.g., physical and cognitive functions, physical activity, depression, and social networks). Since 2010, seminars for upgrading volunteer skills have been held to help volunteers improve their ability to instruct and support exercise.

Summary of the exercise class for men only

Exercise classes, held by municipalities in preventive nursing care for older adults, aim to improve locomotor function. Since the majority of participants are female, in most cases, considering methods to encourage greater participation among males is vital. From our experience in outreach activities, we inferred that gender differences exist for purposes of exercise practice. Male participation would likely increase if men-only classes were provided. Thus, since June 2013, we have held a daycare program for improving locomotor function aimed only at men. We offer 90-minute sessions conducted once a week for 11 weeks. Municipal employees recruit older men possibly needing long-term care by approaching them directly or by distributing public relations brochures. The exercise program comprises brown rice dumbbell exercises³²⁾ (strength training) as a main exercise, recreation, and SSE (aerobic exercise). Brown rice dumbbell exercises require participants to use “dumbbells” that are made of 300 g of unpolished rice sewn into cotton cloth. There are 12 types of strength exercises that aim to improve muscular function of the entire body, and participants perform 10 to 15 repetitions of each exercise. These exercises are reputed

to maintain participant life-activity capacity. Additionally, since June 2014, a 15-minute lecture on health has been included.

Summary of the exercise class for improving cognitive and physical function

An exercise class for improving cognitive and physical function has been conducted on a trial basis to develop a novel preventive care program for older adults with cognitive decline. This class focuses on dementia prevention, and therefore, its characteristics differ from those of the all-round exercise class. Two intervention programs were offered once a week, for a 5-week period in 2013, and for an 11-week period since 2014. Each session lasts 120 minutes, including warm-up (10 minutes), dual task training (combination of aerobic exercise and cognitive task [15 minutes], e.g., calculation while walking), SSE (40 minutes), recreation for facilitating participants' communication (15 minutes), brown rice dumbbell exercises (resistance training, 20 minutes), and cool-down (10 minutes). The main measured variables were cognitive function, physical function, mental state, social network, and self-efficacy (Table 1). Based on the results of the Kasama health checkup for longevity, we encouraged older adults with reduced cognitive function to participate in the program. Additionally, older adults with very mild cognitive decline or without cognitive decline were also permitted to join when there were few participants since this program was a trial.

The advantage of this intervention program is adopting multiple exercises effective for cognitive function^{38,39)}, for example, SSE, resistance training, and dual task training. Furthermore, because mental state is an important factor in dementia prevention⁴⁰⁾, this program includes recreation to improve participant mental state (depression and self-efficacy).

Summary of the Kasama Iki-iki checklist survey

The Kasama Iki-iki checklist is an inventory survey for Kasama City residents aged 65 years and older who have not been certified as needing care. This self-administered mail survey evaluates the general health and living environment of older adults, and then early intervention is conducted to prevent the need for long-term care. In 2013, we sent a questionnaire to 16,870 older people who live in Kasama City, and received 10,339 responses (61.3% response rate). In 2014, the survey was administered to 3549 older people who live in the Iwama area, a part of Kasama City. We received responses from 2020 older people (56.9% response rate). We evaluated demographic characteristics (e.g., age, gender, living arrangements, education, economic status, and clinical history), risk for long-term care (e.g., physical and cognitive functions and depression) using the Kihon checklist⁴¹⁾,

sleep, physical activity, neighborhood environment, and participation and/or awareness of Kasama City’s group exercise activities (Table 1). If any data were incomplete with respect to demographic characteristics or the Kihon checklist, we conducted a follow-up telephone survey. As previously described, we conducted the Kasama health checkup for longevity, including comprehensive measurements such as physical and cognitive functions (measured by objective methods), psychological status, and social networks^{17,22,23}. Connecting data from the Kasama health checkup for longevity to the Kasama Iki-iki Checklist survey makes it possible to obtain more objective and varied information on participant health status.

Conclusion

The Kasama Study has been trying to address pioneering challenges that affect the future of preventive nursing care and for supporting successful aging in Japan. Since 2008, evaluating the Kasama Study has produced seven doctorate degrees and 15 master’s degrees, and 34 original articles have been published, thus indicating the study’s academic value. Simultaneously, however, because only one small laboratory conducts this study, the authors must recognize some of its weak points, including less research funding and a shortage of human resources compared with representative Japanese cohort studies, for example, the Hisayama Study by Kyusyu University, the Longitudinal Study of Aging by the National Institute for Longevity Sciences, and the Kusatsu Study by the Tokyo Metropolitan Institute of Gerontology.

Details of the Kasama Study’s research outcomes will be introduced in another report in which young researchers briefly describe new findings that are in accordance with the Kasama Study’s final goals.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this article.

Acknowledgments

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years without the deep understanding of Kasama City’s mayor and collaboration with its administrative officers. We thank them for their significant efforts.

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