

Country/

			Current situation (Background of the policy)	National policy		Evaluation (How do you feel about national policy from your own point of view)	Ideal situation (What kind of system do you think is ideal from your own point of view)	
				Current policy	Future policy / National plan (What system the country hopes or plans to have)			
基本データ Basic Data	National data	1-1-1-1	Land area					
		1-1-1-2	Population					
		1-1-2-1	Economy (GDP per capita)					
		1-1-2-2	Market or state-regulated economy					
		1-1-3	Religion (xxxx ...%, xxxx ...%)					
		1-1-4	Industry (Primary industry ...%, Secondary ...%, Tertiary ...%)					
		1-1-5	Urbanization (Urban ...%, Rural ...%)					
		1-1-6-1	Education (Enrollment rate of secondary and tertiary education by sex)					
		1-1-6-2	Education (Illiteracy rate by sex)					
		1-1-7-1	Family norm (Head of the family: Patriarch or Matriarch)					
		1-1-7-2	Family norm (Sharing of house work)					
		1-1-8-1	Number and percentage of the elderly (1950 ~ recent ~ 2050) ≥ 60					
		1-1-8-2	Number and percentage of the elderly (1950 ~ recent ~ 2050) ≥ 80					
	1-1-9	Birth rate						
	高齢者の状況 Situation of the elderly by sex (as much as possible)	1-2-1-1	Economic situation (Average income)					
		1-2-1-2	Economic situation (Labor force participation rate)					
		1-2-1-3	Economic situation (Coverage of pensions)					
		1-2-1-4	Economic situation (Pension age)					
		1-2-2-1	Education level (Enrollment rate of tertiary education)					
		1-2-2-2	Education level (Illiteracy rate)					
1-2-3		Disease structure (The 5 leading causes of death)						
1-2-4		Percentage of those living alone and living with children						
1-2-5		Main caregivers (Spouse, Daughter, Son, Daughter in law or ...?)						
高齢者の社会保障システム Main principles and organization of the social security system for the elderly		制度、政策 法律 Major system, politics and laws regarding the elderly	2-1	Major system, politics and laws regarding the elderly				
	2-2-1		Main provider of care : Informal (family) / Formal					
	介護の状況 The specific situation of elderly long-term care ("LTC")	Main principles and organization of the social security system for the elderly	2-2-2-1	The role of family care (The social norm and real feelings toward the elderly (and their historical change, if possible))				
			2-2-2-2	The role of family care (Gender role)				
			2-2-3	Immigrant care-workers				
			2-2-4-1	Public LTC services (What kind of services are provided and how many people utilized them?) -Care at home by services				
			2-2-4-1-2	Formal care provision by NGO (not private but not public) -Care at home by services				
			2-2-4-2	Public LTC services (What kind of services are provided and how many people utilized them?) -Care in special homes or hospitals				
			2-2-4-2-2	Formal care provision by NGO (not private but not public) -Care in institutional settings(nursing home etc) or hospitals				
			介護の財源 Financing for elderly care	Main principles and organization of the social security system for the elderly	2-3-1-1	Who and how is financing public LTC services (Covered by tax or insurance?)		
	2-3-1-2	Who and how is financing public LTC services (Percentage of copayment)						
	2-3-1-3	Who and how is financing public LTC services (Payer and the amount of premium (In case of insurance type))						
	2-3-2	Sustainability of the public LTC services						
	ケアの質 Quality of care	Main principles and organization of the social security system for the elderly	2-4-1	Standards and/or guidelines				
			2-4-2	View of end-of-life care (Balance between Long life and QOL, view of life and death)				

Country/Name

		Please write freely
3-1	What age do you think is "the elderly" in your country?	
3-2	Your grandparents and great-grandparents -Please show pictures on the presentation if it's OK	
3-3	Episodes that you were glad that someone lived a long life	
3-4	Episodes that you were sad that someone lived a long life	
3-5	How would you feel about the prospect of taking care of your parents in their old age	(Single answer) 1 I would take care of my parents regardless of the circumstances 2 I would take care of my parents if I am financially able to 3 I would leave them to their own resources and/or social security 4 Do not know 5 Refused ----- (Comment)
3-6	Do you want to have your own children take care of you when you become elderly?	(Single answer) 1 Agree 2 Somewhat Agree 3 Somewhat disagree 4 Disagree 5 Do not know 6 Refused ----- (Comment)
3-7	What will give you a sense of security in your (or your parents') old age?	
3-8	What kind of happiness is there in the end of one's life	
3-9	The ideal way to die	

**G30 Special Seminar 2013 Participants**  
**Borderless Challenge toward a Global Aging by Young Power**

	Country	Major	Status
1	Nigeria	International economics	Undergraduate
2	Uganda	School of Social and International Studies	Undergraduate
3	Pakistan	School of Social and International Studies	Undergraduate
4	Japan	School of Science and Engineering, College of Physics	Undergraduate
5	China	College of Policy and Planning Sciences (Management)	Undergraduate
6	Vietnam	Environmental Sciences	Master's student
7	Vietnam	Public Health	Master's student
8	Thailand	Public Health	Master's student
9	Indonesia	Public Health	Master's student
10	Bangladesh	Public Health	Master's student
11	Kenya	Social Systems Engineering	Master's student
12	Morocco (France)	Human Biology	Doctor's student

研究成果の刊行に関する一覧表

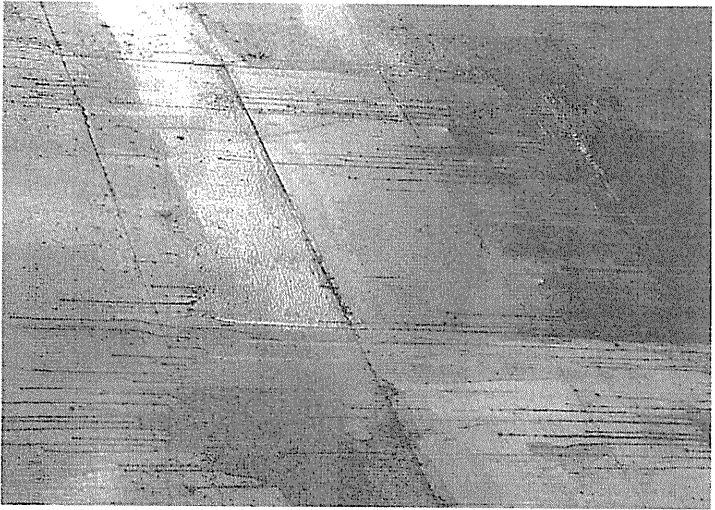
書籍

著者氏名	タイトル	書籍全体の編集者名	書籍名	出版社名	出版地	出版年	ページ
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野口真理子	アフリカ農村社会におけ る高齢者の暮らし：エチ オピア西南部における高 齢者の活動量と生活自立 度の評価から	Zairaichi (京都大 学アフリカ地域 研究資料センタ ー)	Vol. 1	5-13	2013
Noguchi M	Aging among the Aari in rural southwestern Ethiopia: Livelihood and Daily Interactions of the “Galta”	African Study M onograph	Supplemen tary Issue 46	135-154	2013

# ヒューマン・セキユリティ



—ヒューマン・ケアの視点から

松田ひとみ  
大久保一郎  
岩浅昌幸  
柏木志保  
【編集】

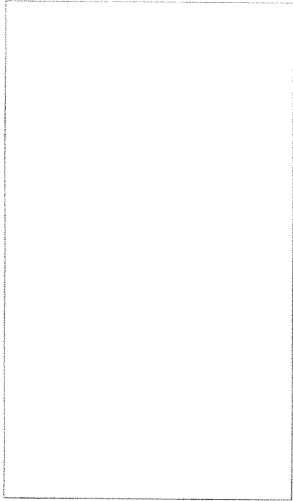
医学評論社

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【編集】

医学評論社



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# 8 グローバルエイジング——アジアの一員として

田宮菜奈子・宮下裕美子

わが国は世界に類をみない超高齢社会を迎えているが、高齢化は現在、先進国だけではなく、発展途上国においても進行している。65歳以上の高齢者数は、2010年に先進国で2億人(全年齢人口の16%)、発展途上国で3.3億人(同6%)だったものが、2050年にはそれぞれ3.4億人(同26%)、11.7億人(同15%)にまで急増する見込みであり、15.1億人の高齢者のうち77%が発展途上国で暮らす状況になる(図8.1)<sup>1,2)</sup>。これまで、発展途上国の高齢者の問題はあまり認識されていなかったが、2012年のWHO世界保健デーのテーマとして「高齢化と健康」が取り上げられたり、国連人口基金(UNFPA)も高齢者問題に取り組み、報告を出したりするなど、近年急速に着目されている。

高齢化、すなわち、より多くの人々が長寿を全うできるようになったという

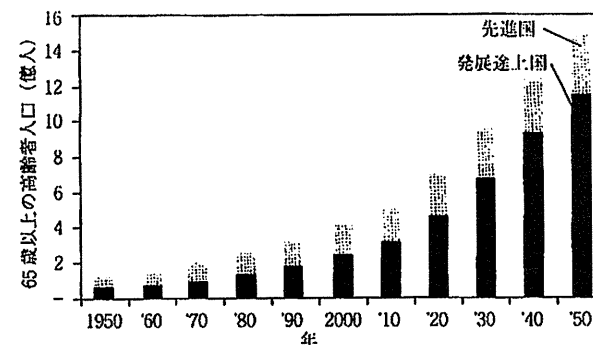


図8.1 先進国・発展途上国における高齢者人口の推移<sup>2)</sup>



# Factors that prolong the 'postmortem interval until finding' (PMI-f) among community-dwelling elderly individuals in Japan: analysis of registration data

Tomoko Ito,<sup>1,6</sup> Nanako Tamiya,<sup>1</sup> Hideto Takahashi,<sup>2</sup> Kentaro Yamazaki,<sup>3</sup> Hideki Yamamoto,<sup>4</sup> Shoji Sakano,<sup>5</sup> Masayo Kashiwagi,<sup>1</sup> Satoru Miyaishi<sup>6</sup>

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## ABSTRACT

**Objectives:** To clarify the factors affecting 'postmortem interval until finding' (PMI-f) among elderly unexpected death cases.

**Design:** Cross-sectional study.

**Setting:** All area of Yamagata prefecture in Japan.

**Participants:** Entering subjects were 5675 elderly cases with age of  $\geq 65$  years selected from all 9002 cases of unexpected death from 2002 to 2007 in Yamagata prefecture between 2002 and 2007. Our final study subjects consisted of 3387 cases sampled with several criteria to assess the factors to prolong PMI-f.

**Primary outcome measures:** The outcome was the postmortem interval until finding (PMI-f) as the time from death until finding the body which we defined in this study.

**Results:** 'Living alone' showed the highest adjusted HR (3.73, 95% CI 3.37 to 4.13), also 'unnatural death' (1.50, 1.28 to 1.75), 'found at own home' (1.37, 1.22 to 1.55) and 'younger subjects' (0.99, 0.98 to 0.99). In the model including interactions with the household situation, we found 'male subjects living alone' and 'female subjects living with family' tended to be found later.

**Conclusions:** PMI-f is an effective outcome for quantitative analyses of risk of bodies left. To prevent the elderly dead bodies left for long time, it is necessary to keep regular home-based contact with elderly individuals living alone.

## INTRODUCTION

In Japan, the population has been ageing at the highest rate in the developed world, and the proportion of people 65 and older was 23% in 2010. It has been projected that about 30% of the total population will be older than 65 in 2050.<sup>1</sup> The low total fertility rate, 1.37 in 2009, is also adding to the rapid changes in the Japanese population structure. In

## ARTICLE SUMMARY

### Article focus

■ Elderly Solitary Death, the case of elderly dead body left for long time and having regrettable post-mortem body change, is the public health issue in ageing society. We tried to reveal the causal relation for the dead bodies left for long time.

### Key messages

■ Our results showed who, how, and how long a time elderly individuals' bodies tend not to be found. This study should help policy makers to identify and counsel of citizens at risk and to assess priorities for their services given limited budgets.

### Strengths and limitations of this study

■ Our data were based on only one region. However, no study has discussed the causal factors involved in the dead bodies left for long time using the huge data of forensic medicine through several years.

addition to this rapid ageing, dramatic changes in family situations have occurred, affecting several aspects of society and leading to the weakening of the caretaking function traditionally performed by families.

At the same time, solitary death among elderly individuals has appeared as a new social problem related to the ageing society. The phrase 'solitary death' came into use in the mass media's reporting of a case that occurred in Japan during the 1980s in which the skeletal remains of an elderly person living alone was found as a result of the prolonged length of time from death until the finding of the dead body.<sup>2</sup> The Japanese people were shocked by the individual's remarkable postmortem bodily changes.

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## Factors to delay the finding of elderly dead body

Cleaning solitary deaths up has been established as a business for stable incidents of elderly solitary deaths. That unusual job was noticed by foreigners and elderly solitary death was introduced as just a Japanese problem.<sup>3</sup> However, this Japanese issue has been spread over the sea. In Korea, several solitary deaths were reported in 2011.<sup>4</sup> Korean rapid ageing of society with similarity to Japan has also influenced the social function around family.

However, what is 'solitary death' has not been defined clearly yet. Most of articles, which had tried to reveal the 'solitary death,' mentioned that this lack of definition is the biggest problem. One letter article from Japan showed the 35 cases treated as solitary deaths in 8 years from 2000. They showed the association between incident of solitary death and person who found resident's status in the public housing complex.<sup>5</sup> In this report, they defined whether a case is solitary death or not depending on subjective opinion of person who found the case. One study operationally defined solitary death as unexpected death among the people living alone,<sup>6</sup> in the other study, they added the death occurred at their own house on that definition.<sup>7</sup> As a broader definition, there were some articles said solitary death is occurred not only among people living alone.<sup>8,9</sup> One study researched the municipal bodies' practices for solitary death.<sup>10</sup> They revealed that the definition of solitary death was varied.

Under these confused background, many studies tried to explain solitary death with various view points, such as household,<sup>6-8,10-12</sup> age of subject,<sup>6,7,10,11</sup> cause of death,<sup>7,8,10,11</sup> the place where the subject was found,<sup>8,10</sup> or the person who found the subject.<sup>7,8,12</sup> All of these articles dealt with the time spent after the death<sup>6-8,10-12</sup> as main characteristic of solitary death. The death left for long time and making remarkable postmortem bodily change must be avoided and the time spent after the death can be an important view point on solitary death. Therefore, in this study, we focused solely on this time spent after the death and analysed the factors affected on it.

About the time spent after the death, the 'postmortem interval' (PMI) is the essential parameter in forensic medicine. PMI is defined as the time from death until examination. There is one study on this PMI and they showed that the average of PMI was longer among the elderly living alone.<sup>6</sup> However, because our study focused on the *finding* of a dead body, we defined the 'PMI until finding' (PMI-f) as the period from the estimated time of death until the finding of the dead body.

To obtain information about PMI-f, we focused on forensic medical data. Forensic medical data, especially the post-mortem examination (inspection) records, are informative in understanding the circumstances of deaths, including those involving elderly cases with long PMI-f.

On this PMI-f from forensic data, one study has been published. This study treated PMI-f as a categorical variable and presented only descriptive findings.<sup>7</sup> To our knowledge, no study has discussed the causal factors to prolong the finding of the dead body and has analysed

PMI-f as a continuous quantity with Cox regression model. In addition, the household situation has been considered to be the prior factor making the differences in the process of leaving and finding of the dead body according to the literatures reported previously.<sup>6,8,13</sup> Thus, the aim of the present study was to clarify the factors affecting PMI-f among elderly unexpected death cases by elderly people, focusing on the affect by the household situation.

## METHODS

### Definition of PMI-f

We defined the PMI-f as the time from death until finding the body. Thus, PMI-f typically has a positive value. Occasionally, the body is found *earlier* than the estimated time of death such as when a person is found dying and is rushed to the emergency unit of a hospital. In these cases, the death was confirmed by a medical doctor after medical examination.

### Study setting

The subjects, which were registered in Yamagata prefectural police headquarter in Japan, consisted of 9002 cases of unexpected death from 2002 to 2007; they were a subset of the total of 76 788 deaths in Yamagata prefecture between 2002 and 2007.

In Japan, police officers investigate all reported unexpected deaths to determine whether it is criminal case or not. Japanese law mandates that doctors report all unexpected deaths to the police. Even subjects whose death is witnessed (eg, when individuals are rushed to a hospital) are also subject to postmortem examination if the situations are not clear. If necessary, the autopsy is conducted as further examination by forensic pathologist.

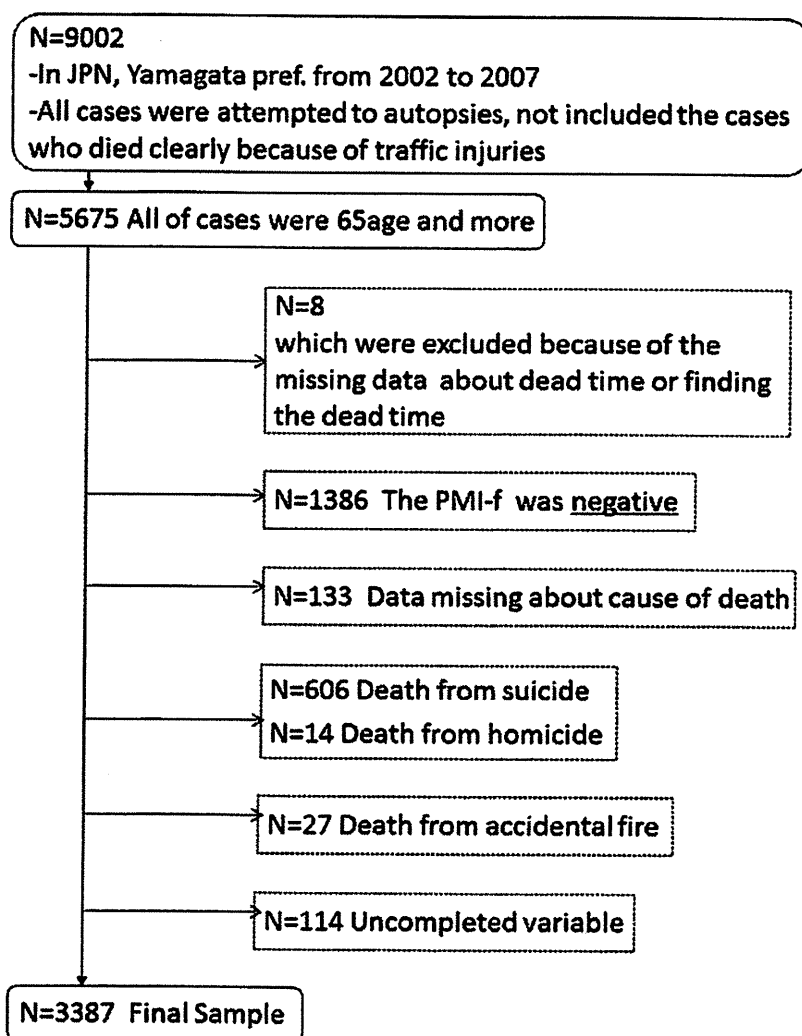
Consent for use of the data was approved by Yamagata prefectural police headquarter after a formal application and explicit pledge to randomise all data and remove any individual identifiers to protect the privacy of the personal data supplied. Ethical considerations were examined in accordance with Japanese epidemiological guidelines for secondary data analysis. Our study was approved by the official ethical review board of University of Tsukuba and Yamagata University.

We used the following six criteria for selecting subjects in that order shown in figure 1.

1. Age of  $\geq 65$  years ( $n=5,675$ ) were included.
2. The subject whose PMI-f was zero or positive was included. Eight subjects were excluded because of missing data about the death or time of finding the body, and 1386 subjects were excluded because their PMI-f was less than zero.
3. Unclear cause of death ( $n=133$ ) were excluded.
4. The cases involving suicide ( $n=606$ ) and homicide ( $n=14$ ) were excluded because the PMI-f was influenced by human intentions or actions and these cases could not meet the situation of solitary death.
5. Accidental fire ( $n=27$ ) were excluded. Notification of the accident and PMI-f tended to be much shorter in



Figure 1 Sampling for final subjects.



cases of accidental fire than in other accidental deaths because of the resulting fire and smoke.<sup>8</sup>

6. Availability of complete data regarding the variables in our analytical model; 114 subjects were excluded because of incomplete data.

### Variables

We used data about the following characteristics of the subjects; age at death, sex and household situation. In the autopsy, the police officers make the inquiry about subjects' living situation into subjects' relatives, neighbourhoods or any persons concerned, and make the official records of autopsy. The cause of death was classified as the natural death or the unnatural death from accident. We also analysed data about the relationship between the subjects and the person who found them and the place at which they were found.

### Statistical analyses

First, we summarised the characteristics of the subjects in terms of exact numbers and proportions (table 1).

Second, we prepared Kaplan-Meier estimates with the generalised Wilcoxon test between the two categories of sex, household situation, cause of death, the place at which the subject was found, and the person who found the subject (results not shown). All the explanatory variables except for age were treated as dichotomous for purposes of simplicity. A Cox regression was conducted to establish the factors that prolonged the PMI-f with adjusting for the explanatory variables. We checked proportionality in the Cox model by the linearity of the log-log plot of the variables.

To assess the affect by the household situation, we created the product terms of the household situation to estimate the influence of interactions and analysed the models stratified by the household situation.

We used a significance level of 0.05 throughout this study. All analyses were conducted using the SAS software (V.9.1; SAS Institute Inc, Cary, North Carolina, USA).

### RESULTS

Our final study sample consisted of 3387 cases. Characteristics of the study sample are presented in

**Factors to delay the finding of elderly dead body****Table 1** Characteristics and situations in which study subject died and was found

Variables	n (%)
Age	
65≤, <75	957 (28.3)
75≤, <85	1565 (46.2)
85<	865 (25.5)
Sex	
Male	1892 (55.9)
Female	1495 (54.1)
Household situation	
Living alone	659 (19.5)
Living with family	2728 (80.5)
Variables related to how study subject died	
Cause of death	
Natural death	3143 (92.8)
Cardiac problems	2390 (76.0)
Brain hemorrhage	441 (14.0)
Others	312 (9.9)
Unnatural death	244 (7.2)
Drowning	70 (28.7)
Falling from a height	61 (25.0)
Suffocation	57 (23.4)
Hypothermia	20 (8.2)
Poisoning	3 (1.2)
Others	33 (13.5)
Place at which the subject was found	
Indoors	3073 (90.7)
At own home site	2766 (90.0)
In hospital	224 (7.3)
At hotel	55 (1.8)
At relative's home	7 (0.2)
In vehicle at own home	2 (0.0)
In hut in mountain or forest	1 (0.0)
Others	18 (0.6)
Outdoors	314 (9.3)
In water*	100 (31.8)
On own property	63 (20.1)
In mountain or forest	44 (14.0)
On street	26 (8.3)
In vehicle on street	13 (4.1)
In hospital	2 (0.6)
At relative's home	3 (1.0)
Others	63 (20.1)
Person who found the subject	
Not family member	803 (23.7)
Neighbour	176 (21.9)
Passer-by	90 (11.2)
Others	537 (66.9)
Family member	2584 (76.3)
All	3387

\*In a river, pond, lake, body of water used for industrial or agricultural purposes or a reservoir.

table 1. Over 70% of all cases were older than 75 years of age, and the maximum age was 101. In 659 cases (20%), the subject lived alone. Most dead bodies were found by family members (76%). The distribution of PMI-f is shown in table 2. The maximum PMI-f was 365 days. This was the one case which was older than 75,

female, natural death and found at own home by her family member. The PMI-f in 96 cases (3%) was zero. The distribution of PMI-f was concentrated around less than 1 day (87%). Among 49% of subjects living alone, their PMI-fs were more than 1 day.

Crude and adjusted HRs and 95% CIs for increasing of PMI-f were shown in table 2. In the crude models, the four variables with significant HRs were age, household situation, the place at which the dead body was found, and the person who found the dead body. The adjusted risk of living alone was the highest of all independent variables (HR 3.73, 95% CI 3.37 to 4.13). In the adjusted model, younger age (0.99, 0.98 to 0.99), unnatural death due to an accident (1.50, 1.28 to 1.75) and found at one's own home (1.37, 1.22 to 1.55) were also significant risk factors that delayed the finding of bodies.

The results of the model including interactions are also shown in table 2. Living alone showed the strongest influence (2.34, 1.64 to 3.33) also in the fully adjusted model including interactions. Other variables related to long PMI-f: age (0.99, 0.98 to 0.99), male (0.89, 0.82 to 0.96), unnatural death (1.45, 1.24 to 1.72) and finding at own home (1.32, 1.14 to 1.52). Significant interactions of the household situation (=living alone) were observed among male (1.31, 1.10 to 1.56) and finding at one's own home (1.47, 1.06 to 2.05).

The HRs of the multivariate model with interactions, 0.89 for sex, 2.34 for household situation and 1.34 for their interaction, mean that the males of living alone prolong the median PM-f 0.92 day, the males with family shrink it 0.01 day, and the females of living alone prolong it 0.29 day, with the reference of the females with family, which are obtained by transforming these HRs to median PM-f days in the model (not shown in table). The stratified analysis in table 3 showed the significant relations with longer PMI-f, among subjects living alone, finding at own home (1.99, 1.48 to 2.67), unnatural death (1.72, 1.02 to 2.91), male (1.23, 1.04 to 1.44), younger age (0.97, 0.96 to 0.98) in the adjusted model shown in table 3. Among subjects living with family, sex of male related shorter PMI-f (0.92, 0.85 to 0.99) as opposed to the case in living alone.

**DISCUSSION**

We assessed the factors affecting PMI-f using Cox regression models on forensic medical data. These results showed that living alone was the single most influential factor contributing to delays in finding elderly dead body. Other factors included death attributable to external causes, and younger age. We also considered interactions between household situation and other the independent variables, and found additional effects on delays in finding the dead body. These interactions may be interpreted in a multicausal model and our model referred to more empirical conclusion. To our knowledge, this is the first published study to conduct

Table 2 Distribution of postmortem interval until finding (PMI-f) and HRs

Variables	n	PMI-f (days)				Univariate models		Multivariate model		Multivariate model with interactions	
		Median	IQR	Q1	Q3	HR	95% CI	HR†	95% CI†	HR‡	95% CI‡
Age						0.98	0.97 to 0.98	0.99	0.98 to 0.99	0.99	0.98 to 0.99
65≤, <75	957	0.17	0.57	0.03	0.60						
75≤, <85	1565	0.13	0.40	0.02	0.42						
85≤	865	0.10	0.26	0.02	0.28						
Sex											
Male	1892	0.12	0.36	0.02	0.38	0.96	0.90 to 1.03	0.93	0.87 to 1.00*	0.89	0.82 to 0.96
Female	1495	0.15	0.41	0.03	0.44	1.00		1.00		1.00	
Household situation											
Living alone	659	1.00	2.54	0.46	3.00	3.92	3.58 to 4.31	3.73	3.37 to 4.13	2.34	1.64 to 3.33
Living with family	2728	0.08	0.23	0.01	0.24	0.24		1.00		1.00	
Cause of death											
Unnatural death	244	0.07	0.40	0.00	0.40	0.89	0.78 to 1.02	1.50	1.28 to 1.75	1.46	1.24 to 1.72
Natural death	3143	0.13	0.37	0.03	0.40	1.00		1.00		1.00	
Place at which the subject was found											
At own home	2766	0.16	0.40	0.04	0.44	1.53	1.40 to 1.67	1.37	1.22 to 1.55	1.32	1.14 to 1.52
Not at own home	621	0.03	0.23	0.00	0.23	1.00		1.00		1.00	
Person who found the subject											
Not family member	803	0.19	0.98	0.00	0.98	1.40	1.29 to 1.52	1.02	0.92 to 1.13	1.04	0.90 to 1.19
Family member	2584	0.13	0.29	0.03	0.32	1.00		1.00		1.00	
All			0.13	0.38	0.02	0.40					
(interaction terms§)											
Living alone and male										1.31	1.10 to 1.56
Living alone and unnatural death										1.12	0.64 to 1.96
Living alone and finding at own home										1.47	1.06 to 2.05
Living alone and not finding by family member										0.93	0.75 to 1.14

\*p=0.0515.

†Age, sex, household situation, person who found the subject, cause of death and place at which the subject was found.

‡Age, sex, household situation, person who found the subject, cause of death, place at which the subject was found and interactions.

§Reference of interaction term is others.



## Factors to delay the finding of elderly dead body

Table 3 Distribution of postmortem interval until finding (PMI-f) and HRs stratified by household situation

Variables	n	PMI-f (day)				Univariate models		Multivariate model	
		Median	IQR	Q1	Q3	HR	95% CI	HR†	95% CI†
Living alone (n=659)									
Age						0.97	0.96 to 0.98	0.97	0.96 to 0.98
65≤, <75	245	1.61	3.30	0.53	3.83				
75≤, <85	315	0.99	2.56	0.44	3.00				
85≤	99	0.61	1.44	0.36	1.80				
Sex									
Male	343	1.19	2.81	0.46	3.27	1.29	1.11 to 1.51	1.23	1.04 to 1.44
Female	316	0.87	1.56	0.46	2.02	1.00		1.00	
Cause of death									
Unnatural death	17	1.61	2.03	0.45	2.48	1.00	0.62 to 1.61	1.72	1.02 to 2.91
Natural death	642	1.00	2.54	0.46	3.00	1.00		1.00	
Place at which the subject was found									
At own home	600	1.08	2.50	0.50	3.00	1.74	1.33 to 2.28	1.99	1.48 to 2.67
Not at own home	59	0.27	1.94	0.00	1.94	1.00		1.00	
Person who found the subject									
Not family member	337	0.98	2.54	0.46	3.00	0.95	0.82 to 1.11	0.94	0.82 to 1.08
Family member	322	1.08	2.54	0.46	3.00	1.00		1.00	
Living with family (n=2728)									
Age						0.99	0.99 to 1.00*	0.99	0.99 to 1.00*
65≤, <75	712	0.08	0.24	0.01	0.25				
75≤, <85	1250	0.08	0.23	0.01	0.24				
85≤	766	0.08	0.19	0.02	0.21				
Sex									
Male	1549	0.08	0.22	0.01	0.23	0.93	0.86 to 1.00*	0.92	0.85 to 0.99
Female	1179	0.09	0.22	0.02	0.24	1.00		1.00	
Cause of death									
Unnatural death	227	0.06	0.33	0.00	0.33	1.17	1.02 to 1.35	1.35	1.02 to 2.91
Natural death	2501	0.08	0.21	0.02	0.23	1.00		1.00	
Place at which the subject was found									
At own home	2166	0.10	0.21	0.03	0.24	1.17	1.06 to 1.28	1.32	1.14 to 1.51
Not at own home	562	0.02	0.20	0.00	0.20	1.00		1.00	
Person who found the subject									
Not family member	466	0.01	0.19	0.00	0.19	0.87	0.79 to 0.97	0.94	0.82 to 1.08
Family member	2262	0.10	0.21	0.03	0.24	1.00		1.00	

\*p&lt;0.05.

†Age, sex, person who found the subject, cause of death and place at which the subject was found.

statistical analyses with estimated models to reveal factors related to PMI 'until finding.'

The analyses demonstrated that living alone was the strongest predictor of delays in finding elderly dead bodies; the risk was about four times higher in this group than in those living with family. This finding suggests that elderly subjects living alone were isolated and contactless. One study surveyed survival after falling among people living alone in San Francisco.<sup>13</sup> Of 387 people, 90 were left un-rescued for an average of 18 h after becoming helpless in their own homes and died. Citizens living alone were difficult to find if they fell down. In Japan, the proportion of community-dwelling elderly individuals living alone is increasing with ageing. The proportion of elderly individuals living alone among whole elderly people was 13.8% in 2000 and 16.4% in 2010.<sup>14</sup> This high risk to left the dead body for long time in living alone became an urgent public health issue.

We found the contrary results regarding sex between household situations (living alone or with family). 'Male subjects living alone' and 'female subjects living with family' tended to prolong their PMI-f. Male elderly people, in general, are said to have poor social relation. Thus, their dead bodies should be difficult to be found by their neighbourhoods or friends. However, among the subjects living with family, male subjects tend to be found their dead bodies than female subjects. In cases of male people, their family member will make more effort to seek. This might be due to the presence of spouse. In Japan, the life expectancy is longer in female people than in male<sup>15</sup> and the age of a husband used to be older than his wife.<sup>15 16</sup> It is suggested that the number of female widows were greater than male.

Interaction between living alone and dying at one's own home showed effect on PMI-f. This interaction showed the situation that elderly individual's home could be a risk factor to make them more isolated. This risk

indicates the need for automatic alarm-and-notification systems. Some municipalities provide such systems connected to local rescue services.<sup>17</sup> If accidents occur, the systems can notify to rescue services. In addition to these systems, an important first step in preventing solitary death is to raise public awareness of the likelihood that elderly people living alone may become helpless and isolated in their homes within a community.

Regarding the causes of death included in our model, unnatural causes (eg, drowning, suffocation and falling) were associated with the fact that they are found later. It is natural that the people who were under medical care with some internal diseases can be found earlier. In contrast, external accidents happen suddenly, and therefore it is difficult for relatives to find the dead bodies. In reality, the biggest single cause of incapacitation that was left alone was reported to be a fall.<sup>13</sup>

In our adjusted model, younger individuals' deaths were found later. This suggests that accidents may have had a bigger impact on younger elderly than older individuals because the former may have been less concerned about death. The situation in which an individual dies and her/his dead body is found can be affected by her/his life and relationships while alive, especially in cases of unfortunate accidents. With a little of individual's concern and correspondence about her/his possibility of death, the people around her/him also can less take care of her/him death and find the dead body later.

We found differences between the crude and adjusted models with regard to significant variables. The identity of the person who found the dead body did not affect the PMI-f in the adjusted model. This indicates that who found the dead body depended on other factors and so that there was no directive this variable's association to PMI-f.

Our present study had several limitations. Variable settings were based on the official record written about the living and dying among the subjects by police officers. Variables including basic characteristics and other components were confirmed to be recorded. Those records were based on the inquires by the police office; however, the accuracy of the information was not secured and it is difficult to assess the validation retrospectively. All of our study subjects were the cases that were reported as unexpected deaths and that were examined by police officers. This reporting system abides by law with compulsion for medical doctors. However, there should be unexpected deaths that are not reported and not performed autopsies. For example, if the doctors have known the family and attended the elderly before, they may not report the unexpected death. If such underreported cases were present, our PMI-f should be longer than actual one because PMI-f in such cases may not be so long. Other situations also may present. Our results should be captured under this limitation.

The PMI-f was analysed as an outcome in our multivariate model for the first time. Our results showed who,

how, and how long a time elderly individuals' bodies tend not to be found. These findings can provide the basis for more effective measures to prevent the phenomena of solitary death among elderly individuals; the delays in finding the bodies of elderly individuals that lead to regrettable postmortem changes. This study should help policy makers to identify and counsel of citizens at risk and to assess priorities for their services given limited budgets. Future studies should evaluate interventions designed to prevent solitary death among elderly individuals and this PMI-f could be a useful quantitative indicator.

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**Contributors** All authors conceived the protocol of this study, especially KY contributed in data collections, SS gave advices from the viewpoint of governments and SM coordinated our study group. TI and NT performed the study and analyses the data together with biostatistician HT. TI, NT, HT, KY, HY and SM co-wrote the paper. All authors discussed the results and commented on the manuscript.

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## Factors that prolong the 'postmortem interval until finding' (PMI-f) among community-dwelling elderly individuals in Japan: analysis of registration data

Tomoko Ito, Nanako Tamiya, Hideto Takahashi, et al.

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## アフリカ農村社会における高齢者の暮らし —エチオピア西南部における高齢者の活動量と生活自立度の評価から—

野口真理子

### 背景と目的

近年、アフリカにおいても高齢者の急速な増加が懸念されている。国際連合は、サハラ以南アフリカにおける60歳以上人口が、2050年には1億6千万人に達すると推計している。これは2005年の値の約4倍にあたる[UN 2012]。Apt[1997]は、公共の医療や福祉サービスを受けることが難しいアフリカの農村において、大家族を軸とした伝統的社会関係が壊れつつあり、高齢者が脆弱な存在になっていると論じている。またCohen & Menken [2006]は、アフリカの高齢者の生活状況に関するデータの絶対的不足を指摘し、各地域における長期的、実証的な研究の積み重ねと比較検討の必要性を強調している。奥宮 [2007]は、フィールド医学の観点から、老化がすべての人に必ず起こる普遍的現象であることを確認しながらも、老いの在り方は一様ではないことを指摘している。主として医学の分野では、これまで高齢者の生活状況を把握するための一手段としてADL (Activities of Daily Living) やQOL (Quality of Life) といった指標がもちいられてきたが、近年この指標が、さまざまな地域で、高齢者の生活状況を把握または比較するために利用され始めた [石根ら 2007]。本論は、エチオピア西南部農村を事例に、人間の活動量を計測する機器アクティカル (Mini-Mitter Co. USA) と、ADLをもとに筆者が調査地の状況に照らし合わせて改変した調査票をもちいて、高齢者の一日の活動内容および活動量の記録分析と、彼ら高齢者の生活自立度の評価により、アフリカにおける高齢者の日常生活の実態を描きだすことを目的とする。

### 調査地概要

調査地は、エチオピア南部諸民族州、南オモ県、南アリ郡、M村Z地区である(図1)<sup>(1)</sup>。この地域にはアフロ・アジア語族のオモ系言語であるアリ語を話す、アリ (Aari) という人びとが多く居住する。

アリの人びとは、古くからエチオピア起源のバショウ科作物エンセーテを中心とする農耕を営んできたといわれている。出自は父系をたどる。近年は相続や居住において双系的なふるまいがみられることもある [Gebre 1995]。調査のおもな対象は、M村にある10地区のうちのひとつZ地区に居住するガルタ (*galta*) と呼ばれる人びとである。ガルタとは、アリ語で年長者を指す。2009年に筆者がお

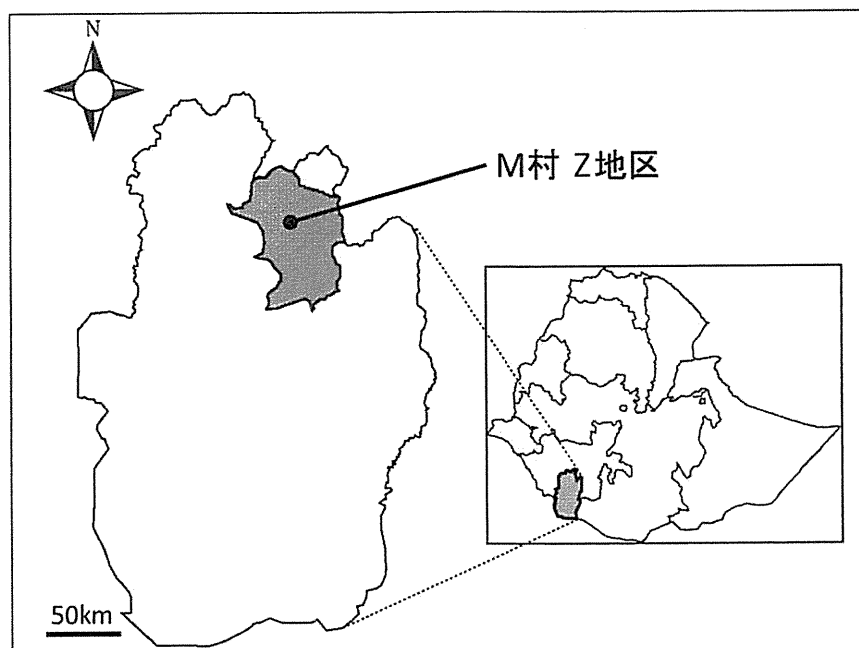


図1. 調査地地図

表1. Z地区男性高齢者の居住状況

No.	推定年齢*	世帯構成員数 (本人含む)	子ども有無
1	88	2	無
2	85	6	有
3	85	2	無
4	75	3	有
5	75	2	有
6	70	7	有
7	70	2	有
8	65	4	有
9	60	2	無
10	60	3	有

表2. Z地区女性高齢者の居住状況

No.	推定年齢*	世帯構成員数 (本人含む)	子ども有無
11	87	2	無
12	77	1	無
13	75	1	無
14	70	2	有
15	65	1	有
16	60	2	有

\* 推定年齢：調査対象とした高齢者の年齢は、ライフステージの段階、政治体制、さらに近隣に暮らす同世代の人びととの出生順なども考慮に入れて推定した。

こなった世帯調査によると、72世帯292人が居住するZ地区において、ガルタと呼ばれている人は13世帯16人であった。

本論では、ガルタを高齢者と呼ぶことにする。すべての男性高齢者が、配偶者もしくは子ども・孫と共に世帯を構えているのに対し（表1）、女性高齢者の半分はひとり暮らし（独居世帯）であった（表2）。男性の場合、ある程度高齢であっても若い妻をむかえて子どもをもつことが可能であること（例えば表1；No.6）がひとり暮らしの男性高齢者がいない背景のひとつと考えられる。妻とは別居していても、85歳男性（表1；No.2）のように、彼の娘世帯が同居している事例もあった。その一方で、調査をおこなった3人の独居女性の場合、2人は、再婚後子どもが産まれないまま夫が亡くなり、それからひとりで暮らしている（表2；No.12, 13）。残りの1人は、夫が亡くなった後、子どもが成人して新たに世帯を構えたことにより結果的にひとり暮らしをしていた（表2；No.15）。Z地区では、どの世帯もすぐ隣に他の世帯が居住しており、物理的に孤立した世帯はない。次節では、Z地区のガルタのなかでもA氏（表1；No.4）をとりあげて、高齢者の生活の実態を描きだしていく。

## 高齢者の日常生活

### 高齢者の日常的な活動の種類と活動量：A氏の事例から

A氏は、75歳（推定年齢）の男性で、50歳の妻と、12歳の四男と一緒に生活している。A氏の長男は、隣の地区に住居を構えて第一夫人とともに暮らしていたが、近年Z地区内に第二夫人をむかえてからは、隣の地区とZ地区両地区間を行き来して生活している。次男と三男は、それぞれZ地区内に住居を構え、A氏と日常的に関わりあいをもちながら生業活動を営んでいる。二人の娘はすでに婚出し、四男は2008年から村内の小学校に通っている。

#### A氏と世帯構成員の日常活動

筆者は、大雨季の終わりである8月27日から9月4日まで、1日おきに計5日間（120時間）<sup>2)</sup>にわたり、A氏と、世帯構成員である妻、そして四男の活動を観察し、彼らの活動を以下の6つに分類した。①睡眠、②食事、③農作業（畑や家畜に関する仕事をおこなっている時間）、④家事（料理や食品加工、洗濯や掃除などをおこなっている時間）、⑤社会活動（接客、訪問目的の外出など、世帯構成員以外の人と会う・接する時間）、⑥その他／不明（①～⑤のいずれにも分類できないような活動）。

A氏は、起きている時間（60.3時間）のうちおよそ半分（25.5時間）を農作業に、約4分の1（13.7時間）を社会活動に費やしており、家の外で過ごす時間が非常に長いことがうかがえる（図2）。A氏は、農作業の時間の約8割（20.5時間）を家畜に関する仕事（牛の搾乳や牧草地での家畜のつなぎかえ）に費やしており、

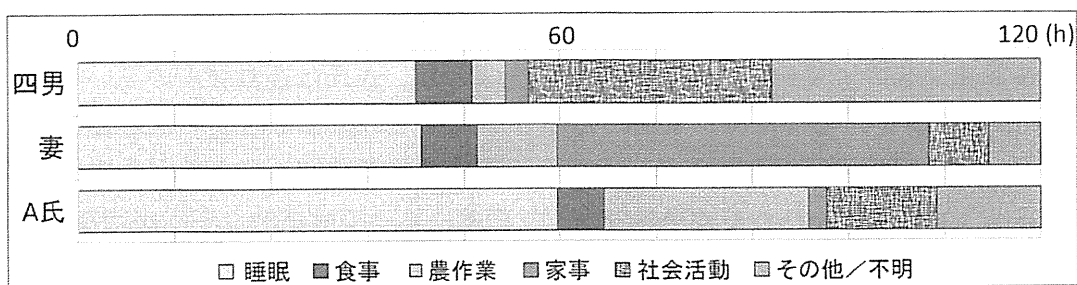


図 2. A 氏と同居家族の 5 日間 (120 時間) の活動状況

残りの 2 割の時間で畑に関わる仕事 (トウモロコシの脱粒作業, 播種のための準備など) をおこなっていた. 社会活動の時間では, 労働力の手配に関わること (牛犁耕作や収穫物の運搬・売却のための人出) や週 2 回開催される村の定期市 (A 氏の住居から約 2 km)<sup>(3)</sup> へ外出するところを観察した. A 氏は, 夕方から夕食までのあいだ仮眠をとることも多く, そのため他の 2 人よりも長い睡眠をとっていた.

A 氏の妻は, 起きている時間のうち, 料理や庭畑における農作業 (おもに自家消費のための収穫作業), 掃除, 洗濯など, 家事に費やす割合が高かった. 彼女の社会活動は, 定期市での買い物, 冠婚葬祭, 地区集会への参加といった, 必要最低限の外出のみであった<sup>(4)</sup>.

*A 氏と世帯構成員の活動量*

日常活動の観察と並行して, A 氏と世帯構成員 2 人に対して, アクティカル (Mini-Mitter Co. USA) という機器を約 2 週間着用してもらい, 彼らの活動量を記録した<sup>(5)</sup>. 解析には Actical Software Ver. 2.10 を使用し, 収集した全データのうち連続して計測できた 10 日間分のアクトグラム (歩行活動量) を分析検討した.

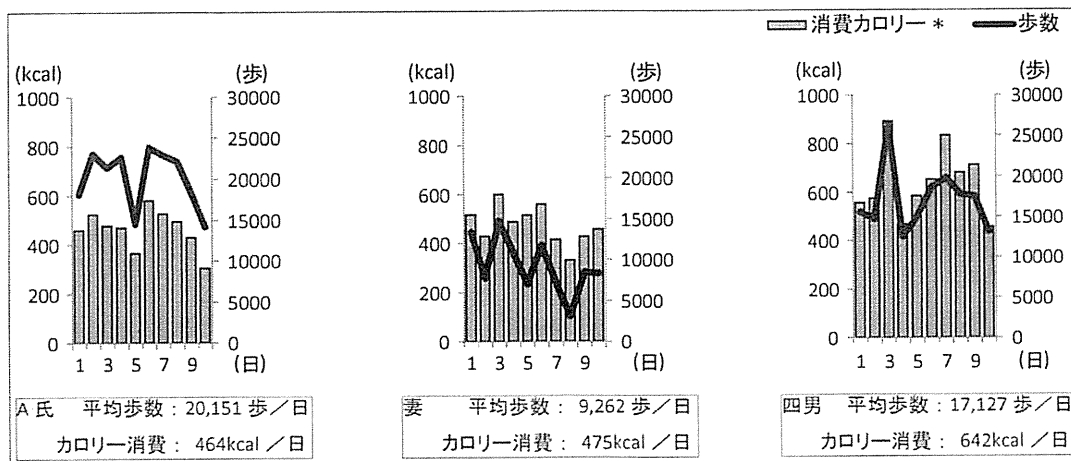


図 3. A 氏と同居家族それぞれの連続 10 日間の歩数と消費カロリー (kcal)

\* 基礎代謝は除く.