MAX PLANCK INSTITUTE FOR DEMOGRAPHIC RESEARCH

The trend of sudden death in Japan

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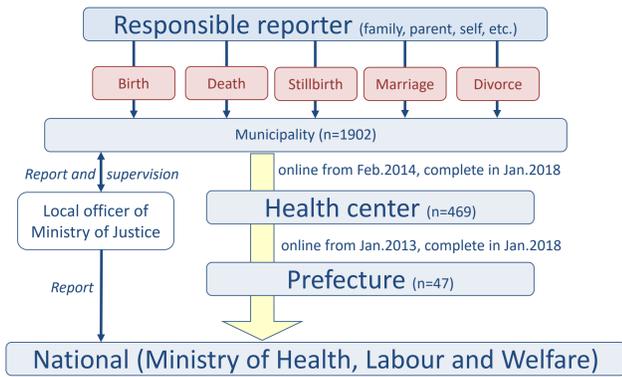## Fig.1 Flow of vital statistics reporting in Japan

Fig.2 Death questionnaire form
https://www.mhlw.go.jp/toukei/chousahyo/index.html#00450011

Cause of death statistics in Japan

【History】Nation-wide cause of death statistics started to be collected since 1875 and the (almost) full coverage was attained within 7 years in 1882. Since the start of vital statistics in 1899, the cause of death followed the ICD (at the time version 1) and it continued up to now, with the latest official publication of the death occurring in 2017, with ICD-10 revision 2013. The flow of data collection and statistics compilation (Fig.1) became online, started in 2003, to be completed for the data of 2018, made the digitized microdata on death certificate (death questionnaire) information (Fig.2) available for research based on the Statistics Act of 2007.

【Data overview】The introduction of online procedure varied by prefecture (Fig.3) but no bias is observed by sex, age, or cause, as the standard deviation of online coverage was very small (Fig.4). The online coverage started from 8.6% in 2003, increased to 96.4% in 2016. Average number of causes has been slightly decreasing from 1.95 in 2003 to 1.79 in 2016. Almost all (98%+) death causes are recorded with the time interval to the death.
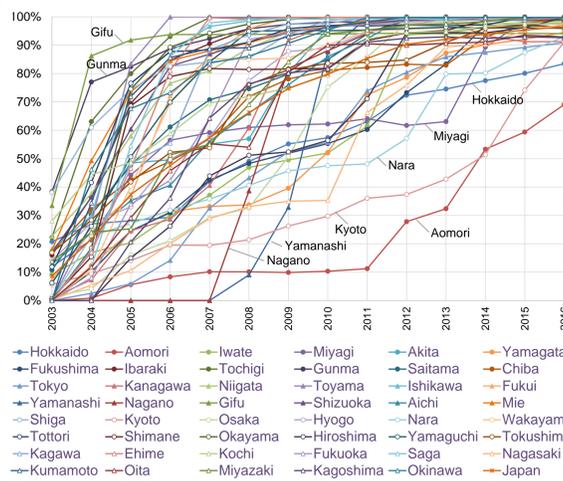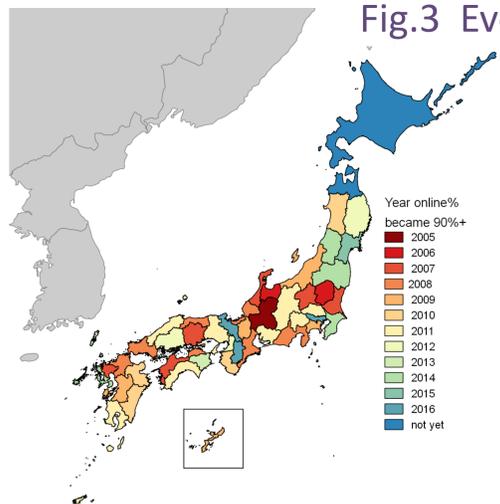
Fig.3 Evolution of coverage by prefecture

Fig.4 Death data coverage and overview

| Year	Number of death (cases)		Online data %	Data with time interval %	Online% standard deviation			Average number of causes
	Officially published	Matched online data			Prefecture	Age	ICD 1digit	
2003	1,014,951	87,606	8.6%	99.0%	10.8%	2.0%	2.1%	1.95
2004	1,028,602	222,372	21.6%	98.9%	19.6%	2.9%	1.4%	1.94
2005	1,083,796	404,951	37.4%	98.8%	24.8%	2.1%	1.1%	1.93
2006	1,084,450	515,796	47.6%	98.8%	27.8%	1.5%	2.5%	1.92
2007	1,108,334	636,624	57.4%	98.8%	27.9%	1.7%	2.0%	1.91
2008	1,142,407	756,648	66.2%	98.7%	25.7%	2.2%	1.1%	1.90
2009	1,141,865	853,468	74.7%	98.7%	23.3%	1.5%	1.8%	1.89
2010	1,197,012	955,219	79.8%	98.7%	21.7%	1.5%	1.5%	1.87
2011	1,253,066	1,069,258	85.3%	98.4%	19.0%	1.1%	1.6%	1.84
2012	1,256,359	1,134,827	90.3%	98.7%	16.0%	0.6%	2.1%	1.84
2013	1,268,436	1,168,038	92.1%	98.7%	13.8%	0.7%	3.1%	1.83
2014	1,273,004	1,195,345	93.9%	98.8%	10.2%	0.6%	1.6%	1.81
2015	1,290,444	1,230,462	95.4%	98.8%	7.5%	0.6%	1.1%	1.80
2016	1,307,748	1,261,216	96.4%	98.9%	5.4%	0.3%	0.5%	1.79

Fig.5 Sudden death structure by underlying cause
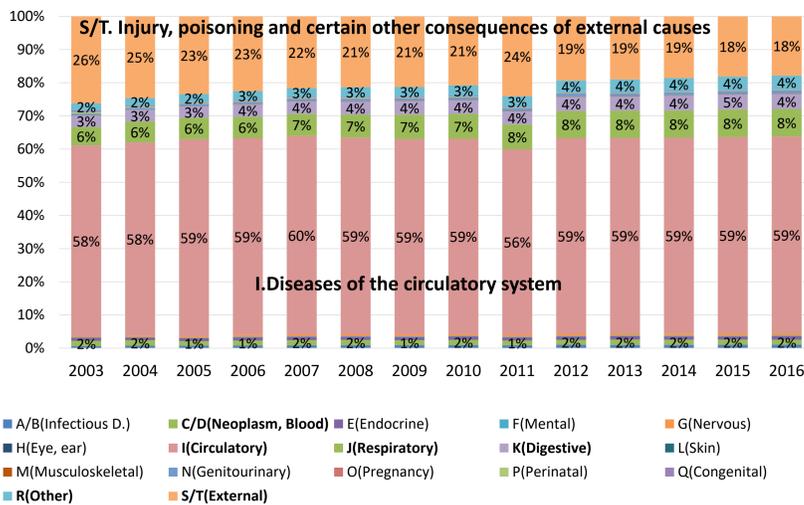
Fig.6 Sudden death proportion to total death
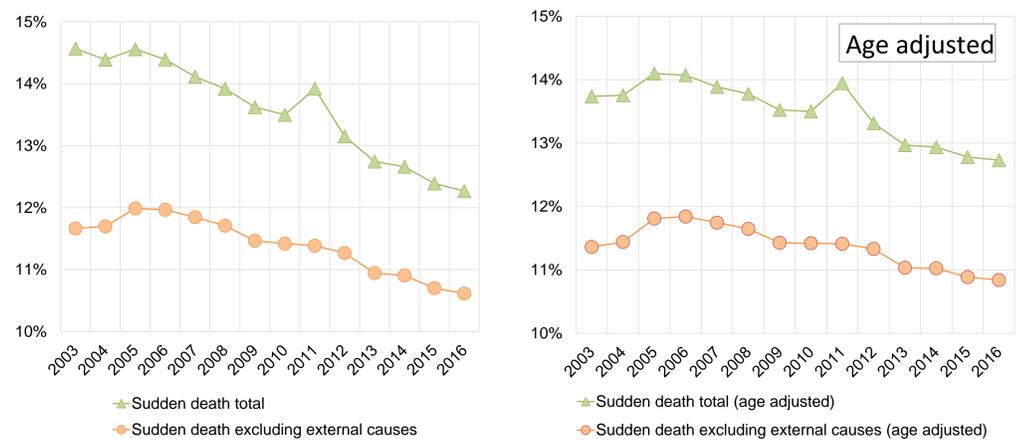
Sudden death structure and trend

【Definition】Using the available death data with multiple causes and its time interval to death, sudden death is defined as deaths with any of the time interval to death of any cause mentioned is within 1 day (24 hours), based on the existing researches on the sudden death in Japan.

【Methods】Since the original data on the time interval is written by doctors by various way, the description was normalized to numerical value with day as unit. The maximum time interval of all causes mentioned in I.a,b,c or II is equal or less than 1 was selected as sudden death. The death with no time interval information (less than 2% of the cases) or with unknown time interval are not the sudden death but included in the denominator.

【Results】The most (56% to 60%) sudden death occurred with the underlying cause of I. Diseases of the circulatory systems, followed by S/T external causes (18% to 24%)(Fig.5). Small but steadily, the J (Respiratory) and R(Other) causes are increasing. Except for 2011 when the Great East Japan Earthquake occurred, the proportion of sudden death is decreasing since 2005, for both including and excluding external causes, and age adjusted or not (Fig.6). Women tends to die less suddenly except for old age from 70 to 94 years and middle aged men (20 to 54 years old) face higher risk of sudden death which is not caused by the external causes (Fig.7). Infant 0-4 proportion is high. Sudden death proportion varies by prefecture (Fig.8). Although there is no correlation between the proportion of sudden death excluding external causes and that of external causes, the prefecture rankings are similar between 2008 to 2016, the prefectures with high proportion of sudden death in 2008 remain to be so in 2016.

【Conclusion】Sudden deaths can be more easily prevented and effective measures should be taken according to the realities revealed by the data. In addition to the S/T(External causes) and SIDS(Sudden Infant Death Syndrome) with which various prevention measures are underway, further efforts to reduce the sudden death caused by I(Circulatory) is necessary. The sudden death of middle age male and old age female should be properly identified by more detailed causes. Increasing sudden death caused by J(Respiratory) and old women suggests the increased death by dysphagia/choking caused by dementia but should be ascertained by detailed causes. The persistent level of sudden death by prefecture might be due to the age-structure but the differential analysis might find way for better interventions. The declining trend of sudden death is a good sign and it should be continued.
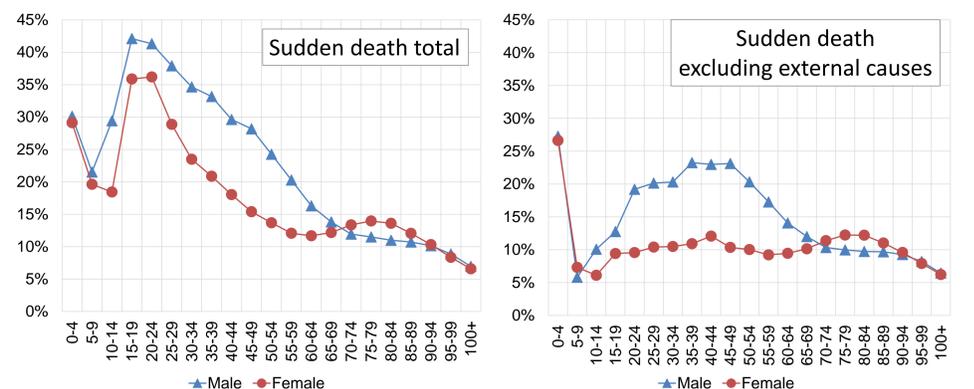
Fig.7 Sudden death % by sex and age, 2016

Fig.8 Sudden death proportion by prefecture, 2016