Data Quality of Mortality in Chinese Censuses

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Mortality Data and Methodological Approaches in Estimating Mortality in Developing Countries

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Outline

0 Background Info

1 Inconsistency in population accounts

2 Age patterns of death rates

3 Death rates at old age

4 Prospects

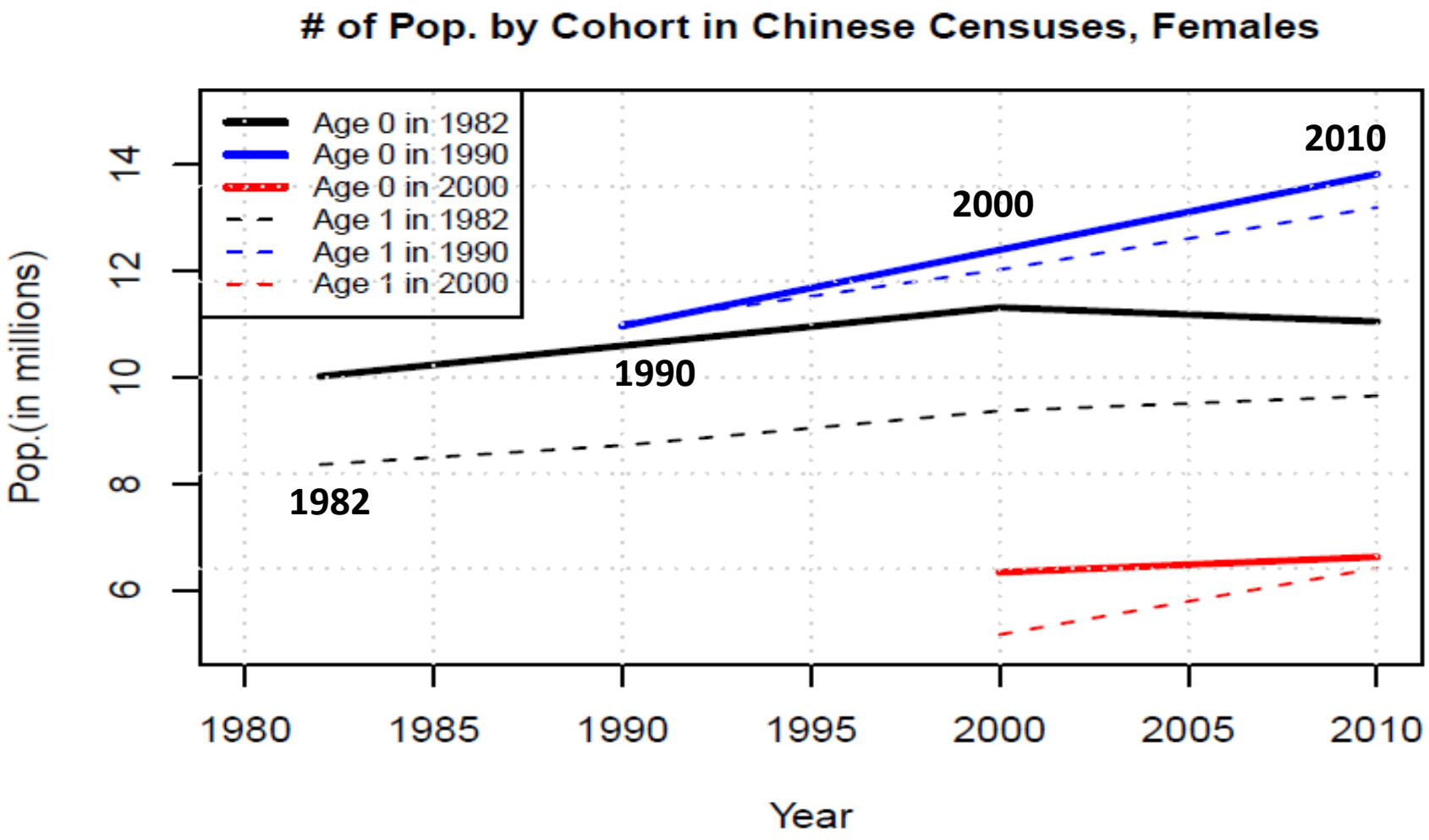
- **Mortality data are imperfect**
- **Two countries have very good data quality of mortality: Japan & Sweden**
- **11 countries with good data quality of mortality**
- **Data quality in most developing countries is not good.**

Chinese Pop censuses and major surveys

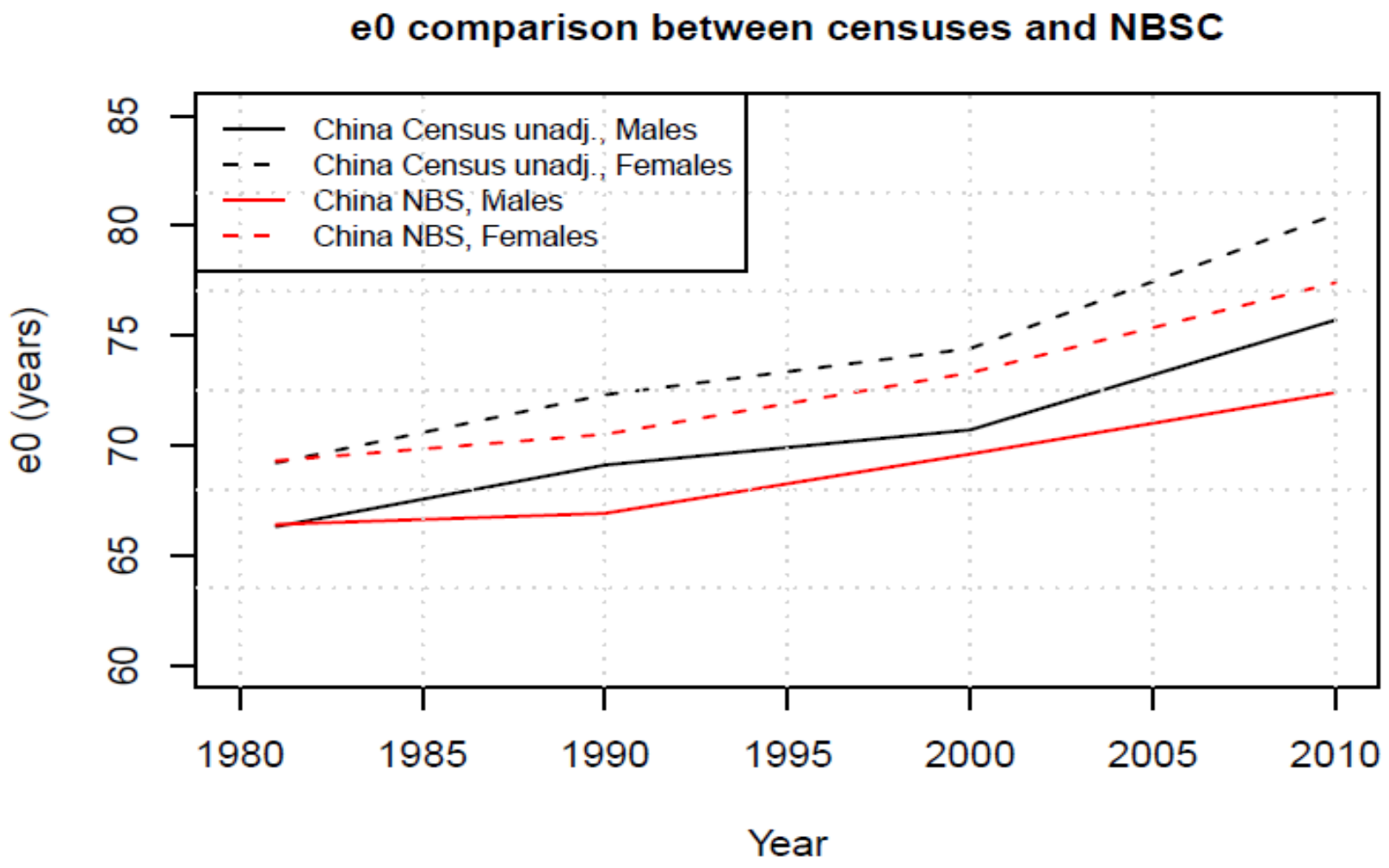
- **Censuses**: 1953, 1964, 1982, 1990 2000, 2010
- **Mini-census (1%)**: 1987, 1995, 2005, 2015
- **APC (1‰)**: 1983 -
- **Surveys on Cause of Death:** 1973-1975, 1990-1992, 2004-2005
- **DSP system (Maternal and Child Mortality Surveillance system)**: 1980-
- **VR:** Ministry of Civil Affairs
- **Household registration system (*Hukou*):** Ministry of Public Security.
- **Various of other surveys:** by governmental organizations and academic institutes on fertility, health…,

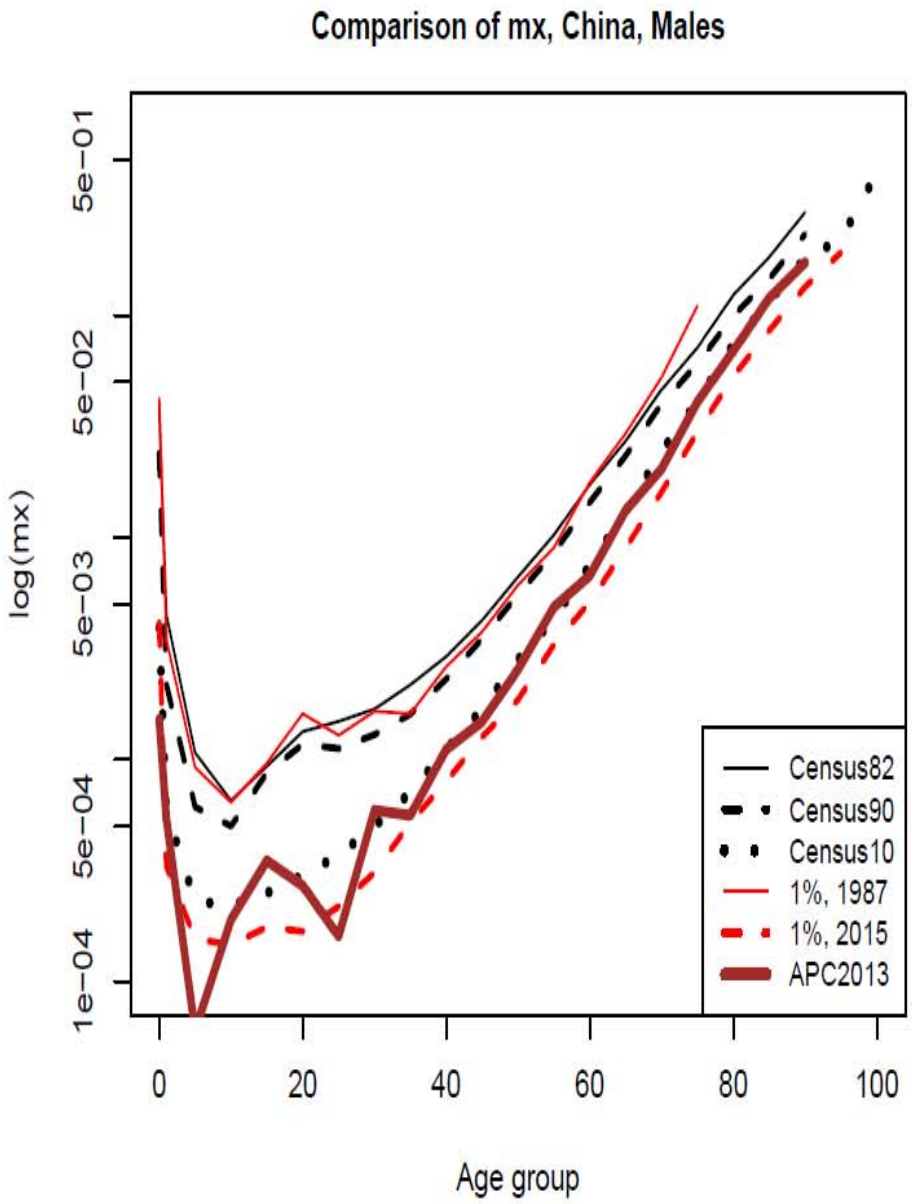
Inconsistency in population accounts

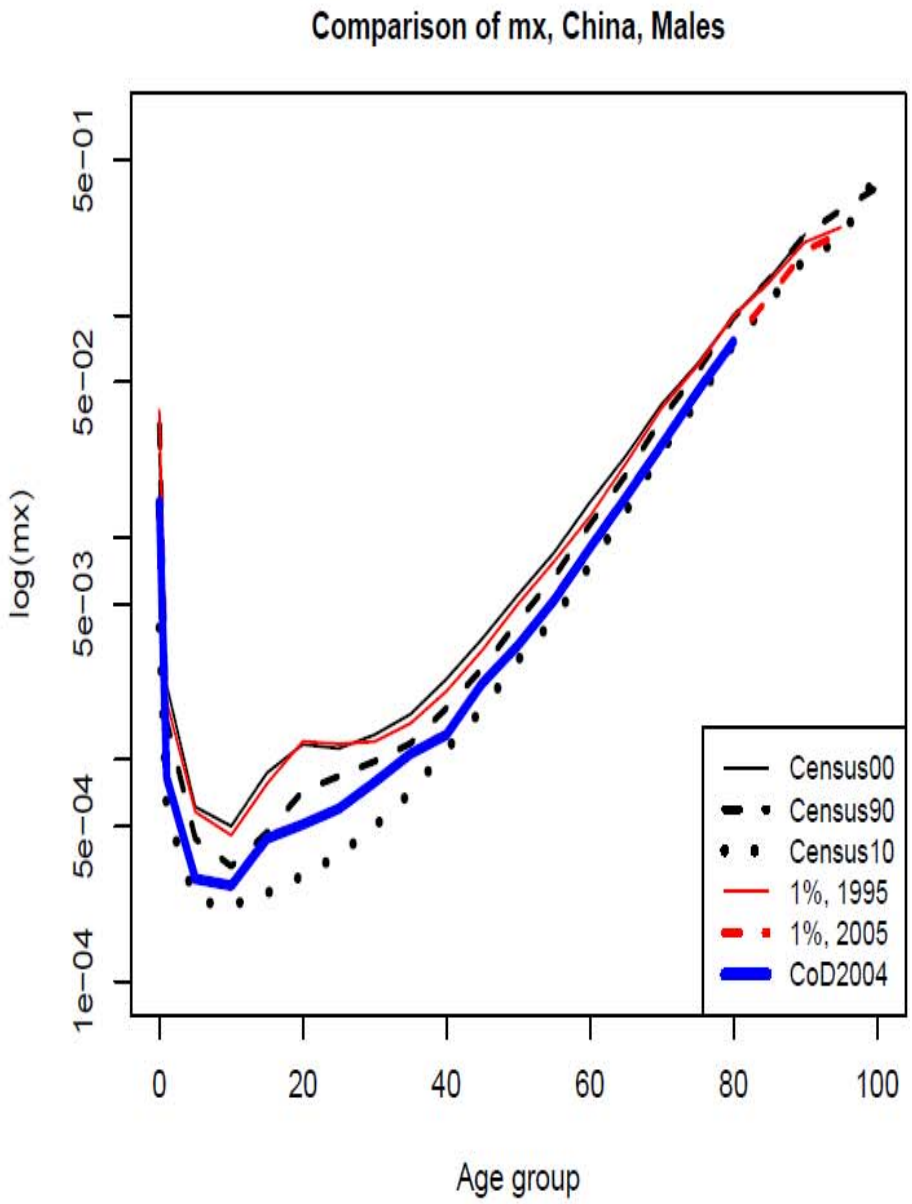
1

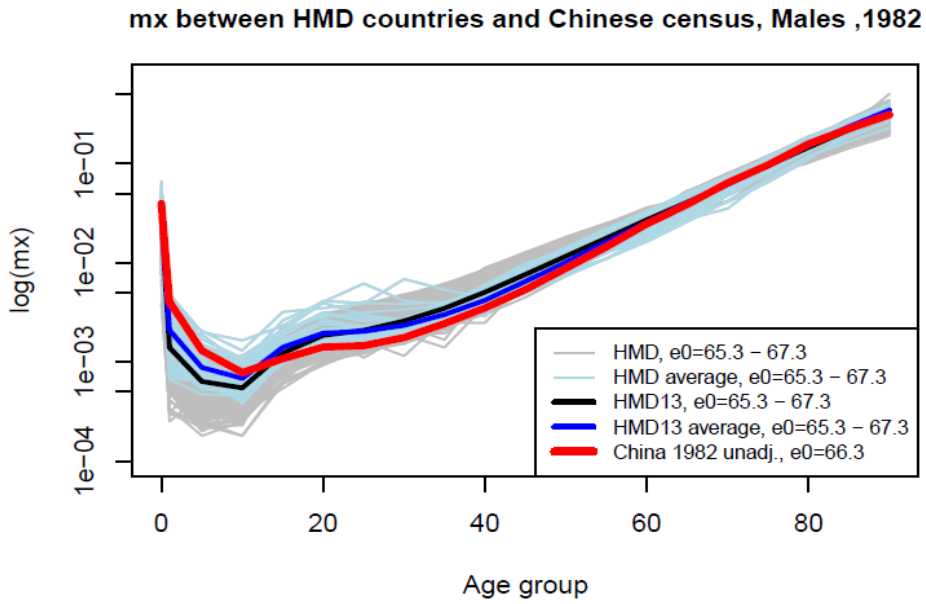


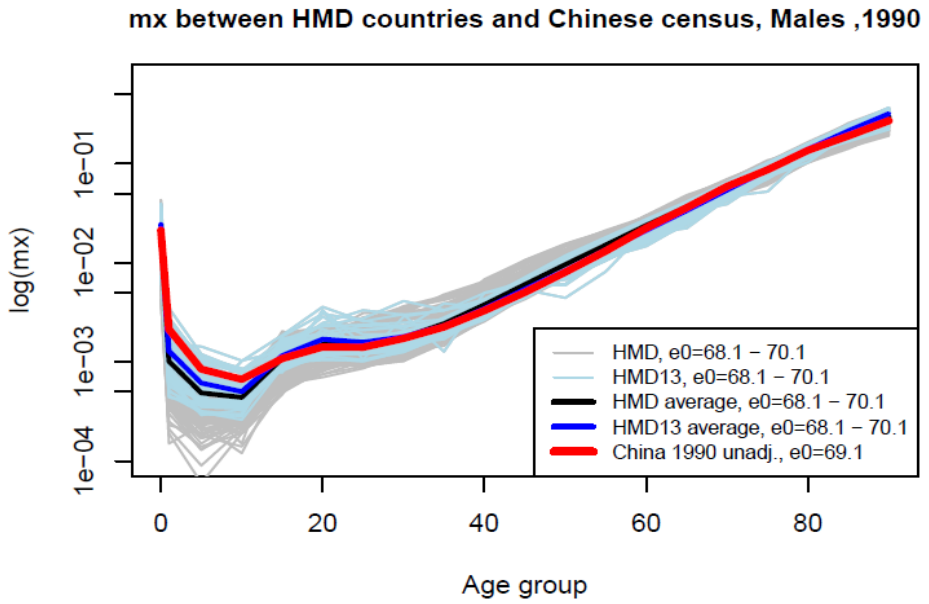
Mortality in censuses

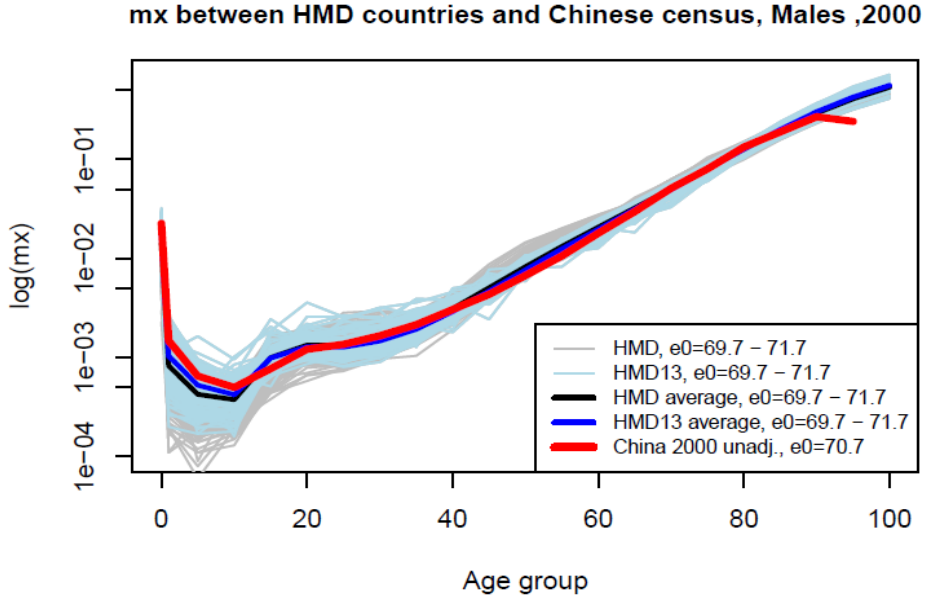


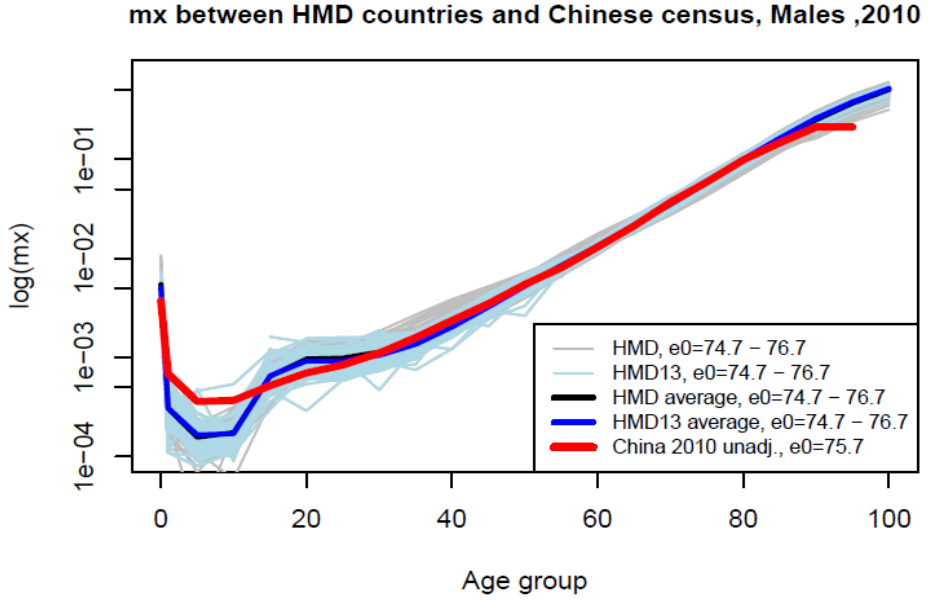

Comparison of mx, China, Males
log(mx)
5e−01
5e−02
5e−03
5e−04
1e−04
0
20
40
60
80
100
Age group
Census82
Census90
Census10
1%, 1987
1%, 2015
APC2013


Comparison of mx, China, Males
log(mx)
5e−01
5e−02
5e−03
5e−04
1e−04
0
20
40
60
80
100
Age group
Census00
Census90
Census10
1%, 1995
1%, 2005
CoD2004

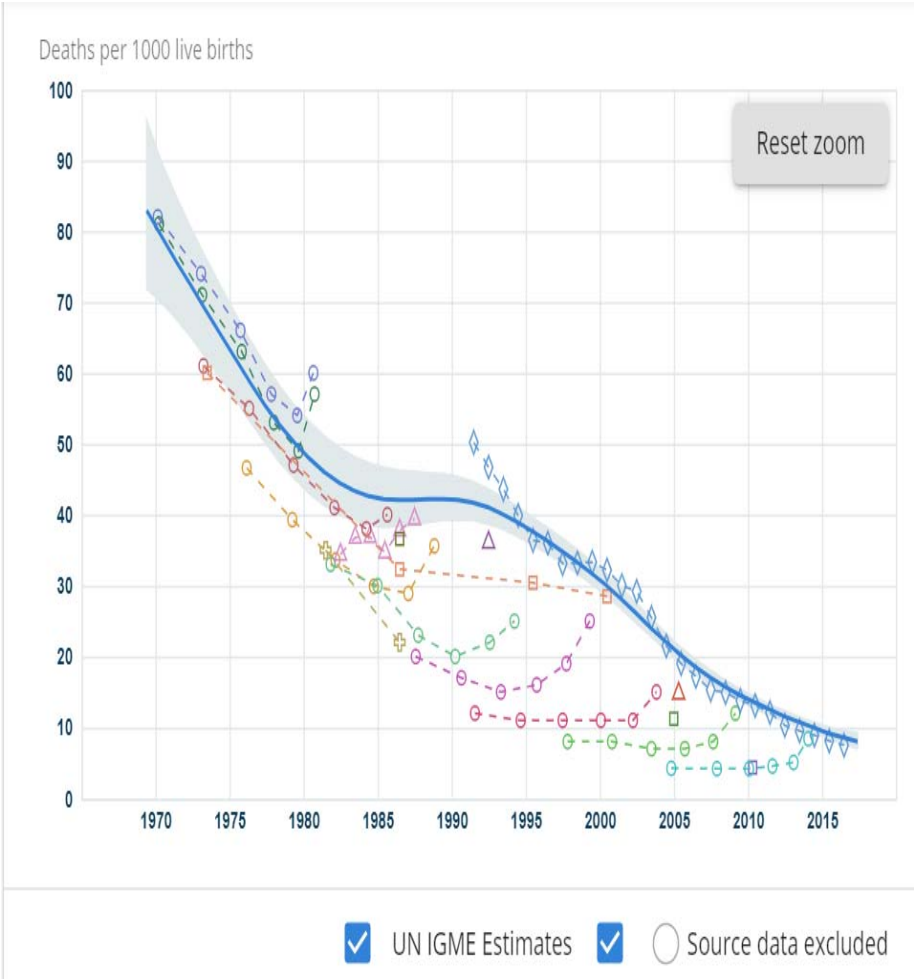

mx between HMD countries and Chinese census, Males ,1982
log(mx)
1e−01
1e−02
1e−03
1e−04
0
20
40
60
80
Age group
HMD, e0=65.3 − 67.3
HMD average, e0=65.3 − 67.3
HMD13, e0=65.3 − 67.3
HMD13 average, e0=65.3 − 67.3
China 1982 unadj., e0=66.3


mx between HMD countries and Chinese census, Males ,1990
log(mx)
1e−01
1e−02
1e−03
1e−04
0
20
40
60
80
Age group
HMD, e0=68.1 − 70.1
HMD13, e0=68.1 − 70.1
HMD average, e0=68.1 − 70.1
HMD13 average, e0=68.1 − 70.1
China 1990 unadj., e0=69.1

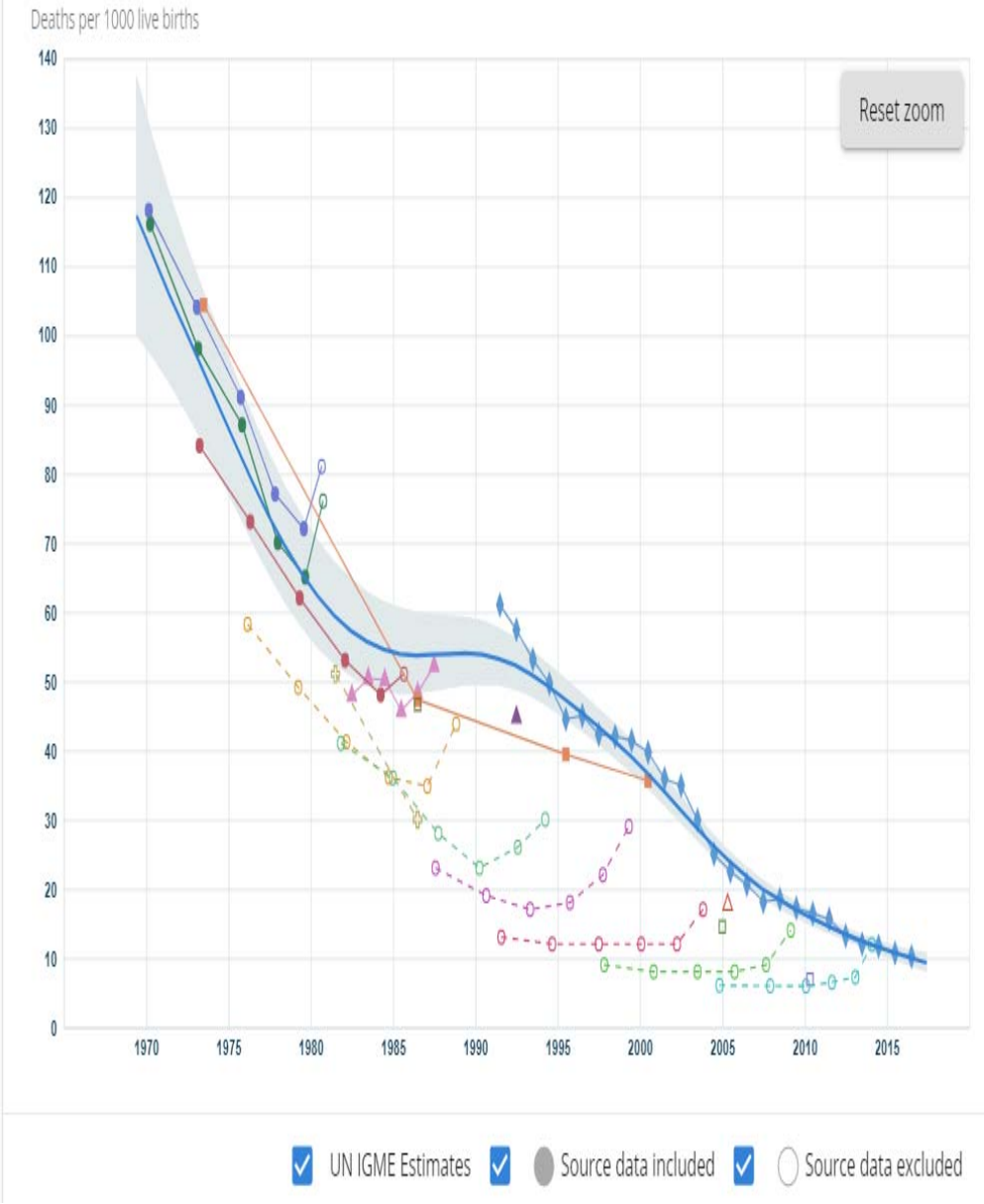

mx between HMD countries and Chinese census, Males ,2000
log(mx)
1e−01
1e−02
1e−03
1e−04
0
20
40
60
80
100
Age group
HMD, e0=69.7 − 71.7
HMD13, e0=69.7 − 71.7
HMD average, e0=69.7 − 71.7
HMD13 average, e0=69.7 − 71.7
China 2000 unadj., e0=70.7


mx between HMD countries and Chinese census, Males ,2010
log(mx)
1e−01
1e−02
1e−03
1e−04
0
20
40
60
80
100
Age group
HMD, e0=74.7 − 76.7
HMD13, e0=74.7 − 76.7
HMD average, e0=74.7 − 76.7
HMD13 average, e0=74.7 − 76.7
China 2010 unadj., e0=75.7

q0

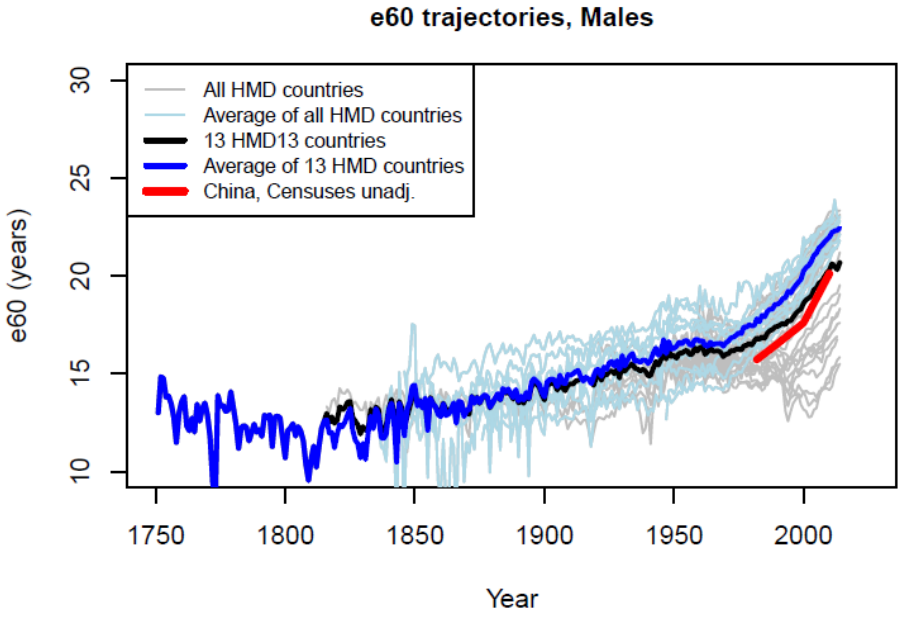

Deaths per 1000 live births
Reset zoom
100
90
80
70
60
50
40
30
20
10
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
UN IGME Estimates
Source data excluded

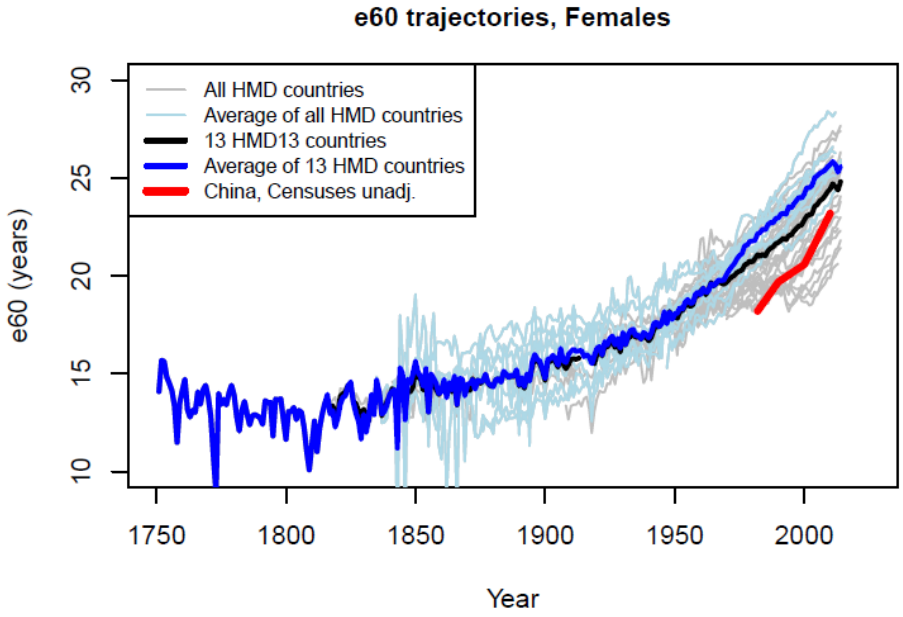
5q0

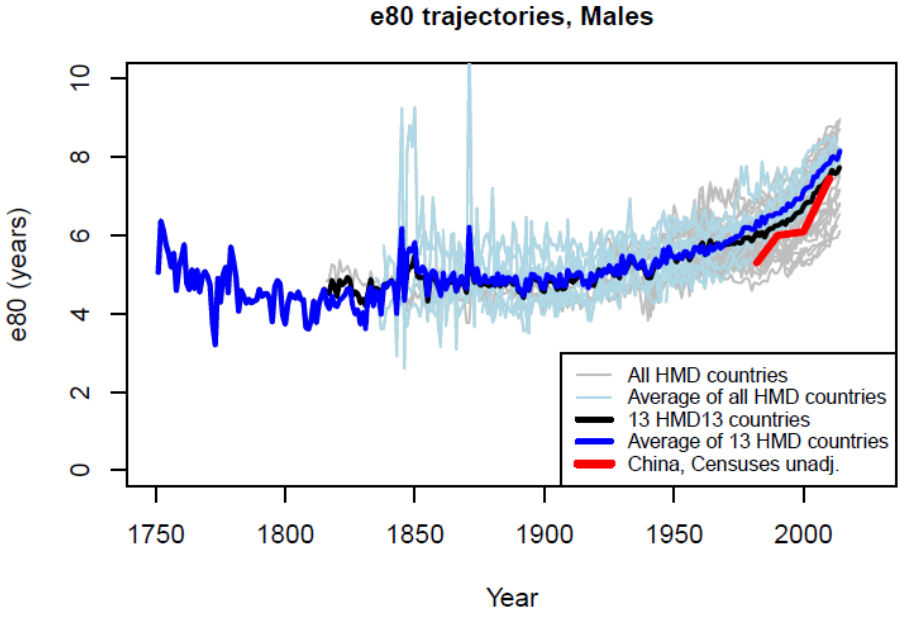

Deaths per 1000 live births
Reset zoom
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
UN IGME Estimates
Source data included
Source data excluded

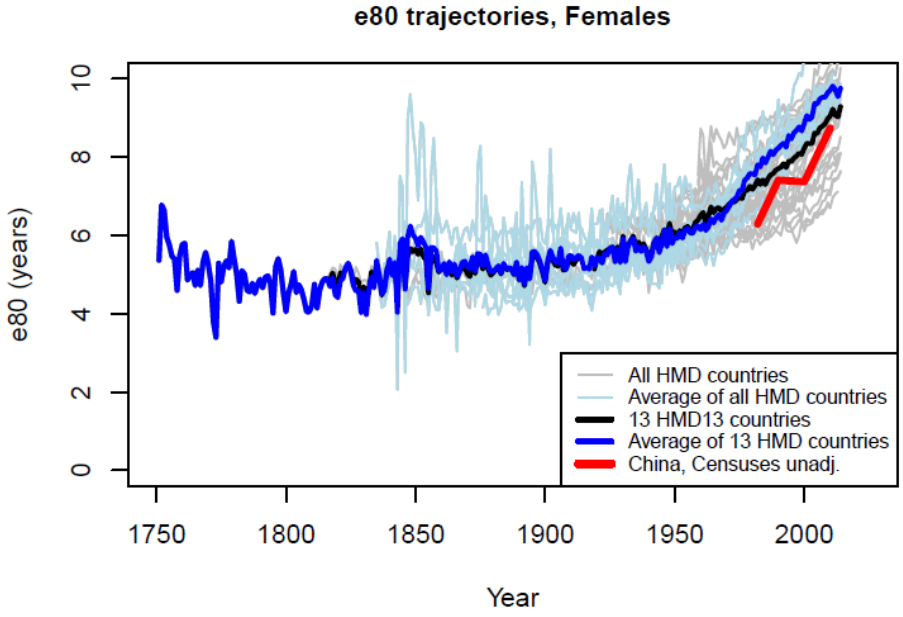
Sex Ratio of m0 in Census and DSP, China

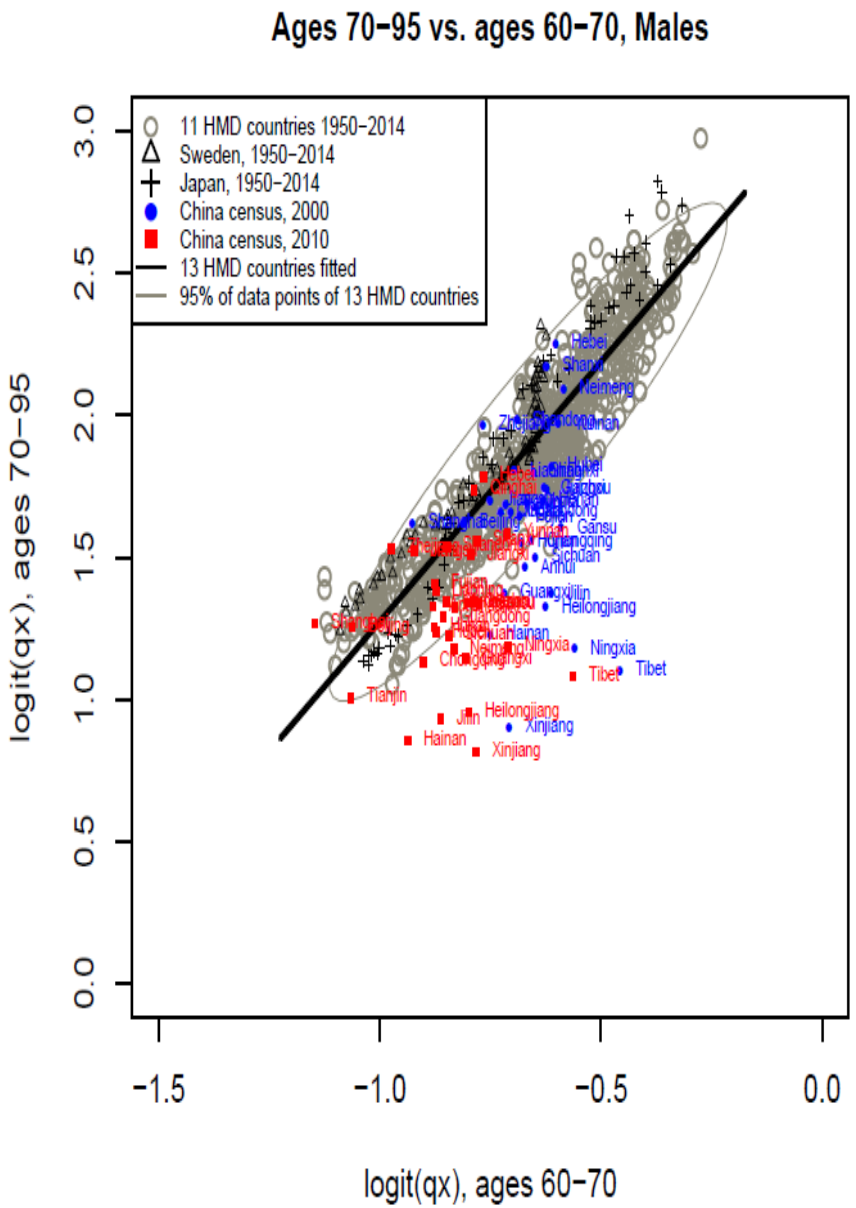
	DSP	Census
1990	1.05	0.89
2000		0.70
2010	1.34	0.95

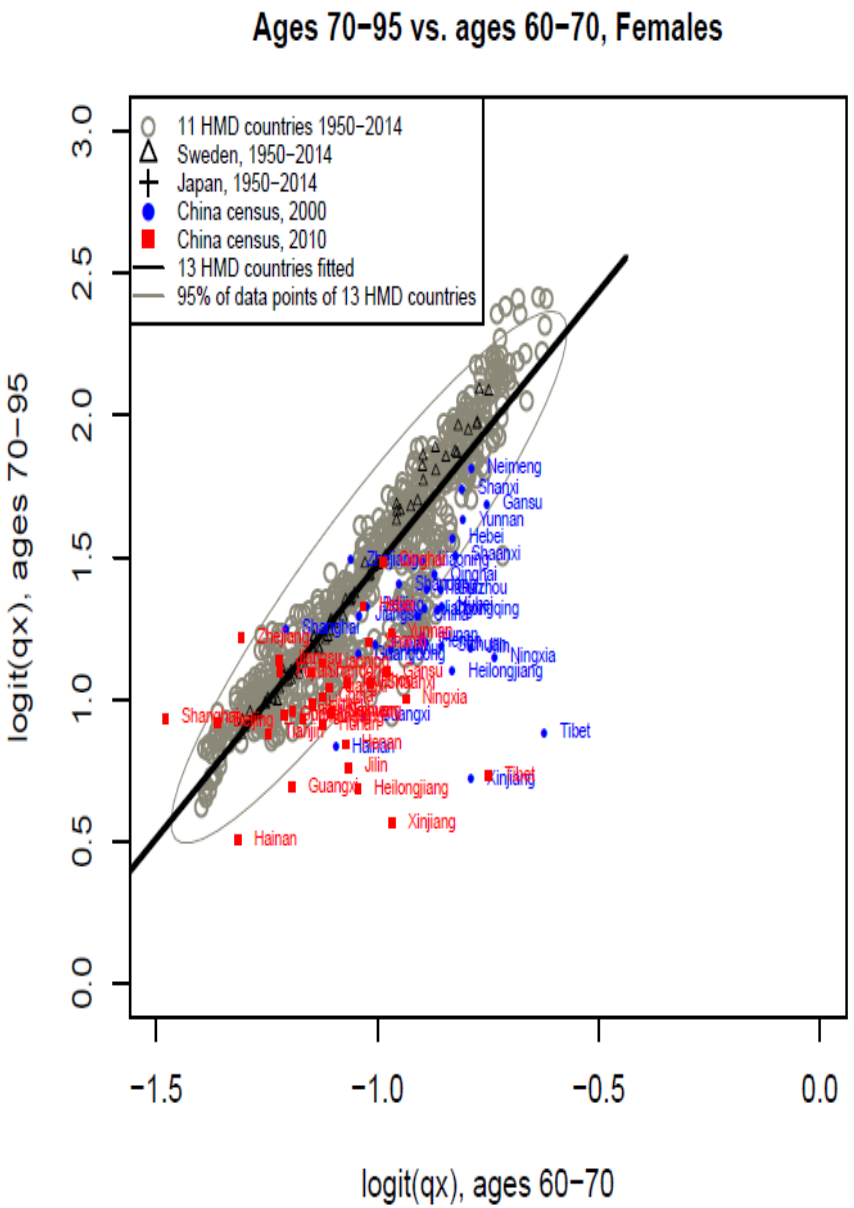

e60 trajectories, Males
All HMD countries
Average of all HMD countries
13 HMD13 countries
Average of 13 HMD countries
China, Censuses unadj.
e60 (years)
10
15
20
25
30
1750
1800
1850
1900
1950
2000
Year


e60 trajectories, Females
All HMD countries
Average of all HMD countries
13 HMD13 countries
Average of 13 HMD countries
China, Censuses unadj.
e60 (years)
10
15
20
25
30
1750
1800
1850
1900
1950
2000
Year


e80 trajectories, Males
All HMD countries
Average of all HMD countries
13 HMD13 countries
Average of 13 HMD countries
China, Censuses unadj.
e80 (years)
0
2
4
6
8
10
1750
1800
1850
1900
1950
2000
Year


e80 trajectories, Females
All HMD countries
Average of all HMD countries
13 HMD13 countries
Average of 13 HMD countries
China, Censuses unadj.
e80 (years)
0
2
4
6
8
10
1750
1800
1850
1900
1950
2000
Year


Ages 70−95 vs. ages 60−70, Males
11 HMD countries 1950−2014
Sweden, 1950−2014
Japan, 1950−2014
China census, 2000
China census, 2010
13 HMD countries fitted
95% of data points of 13 HMD countries
logit(qx), ages 70−95
logit(qx), ages 60−70
0.0
0.5
1.0
1.5
2.0
2.5
3.0
−1.5
−1.0
−0.5
0.0
Hebei
Shanxi
Neimeng
Gansu
Sichuan
Anhui
Guangxi
Jilin
Heilongjiang
Hainan
Ningxia
Tibet
Tianjin
Xinjiang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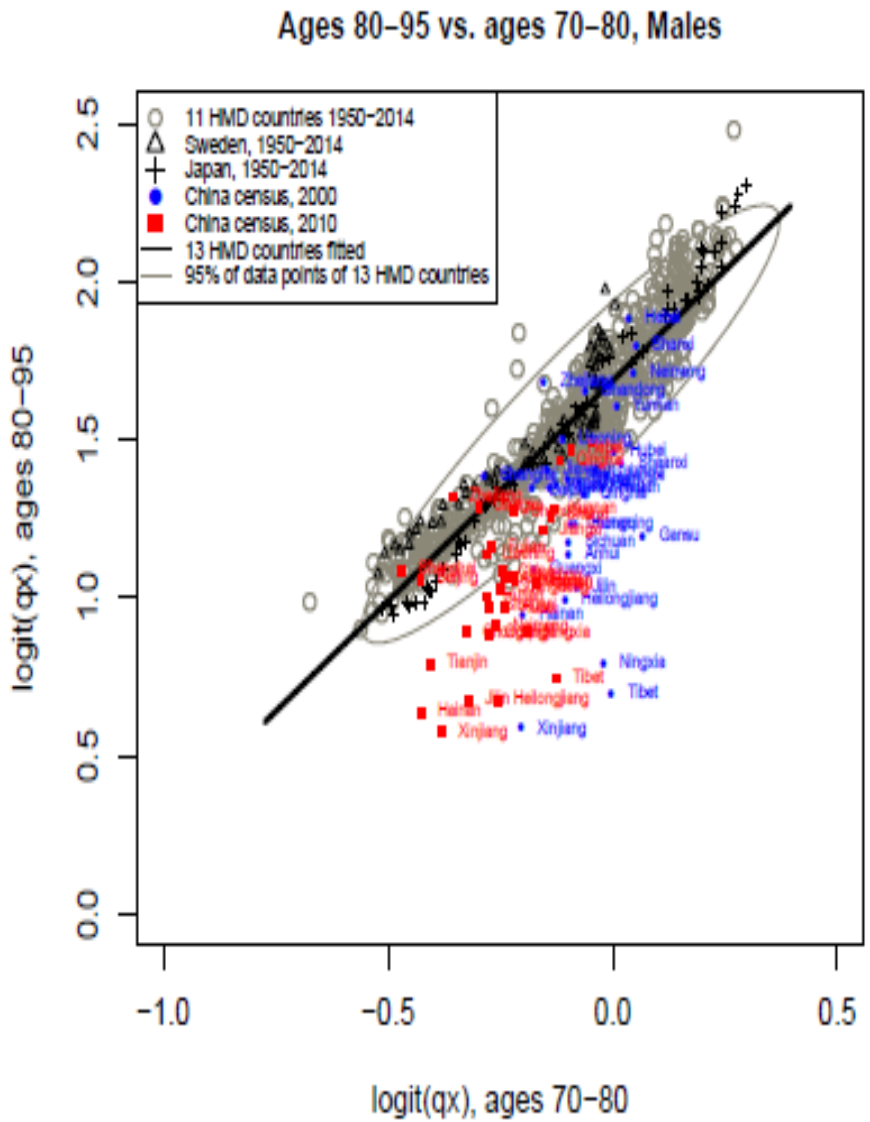
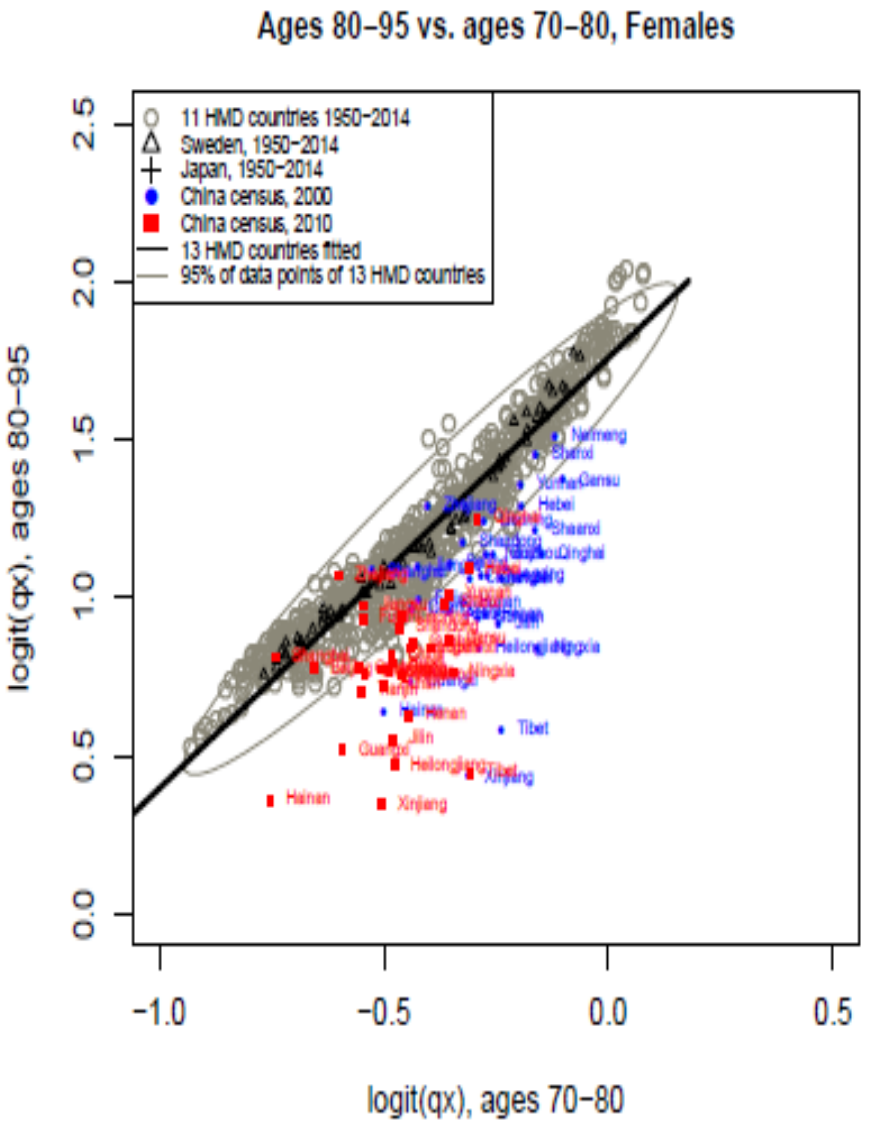
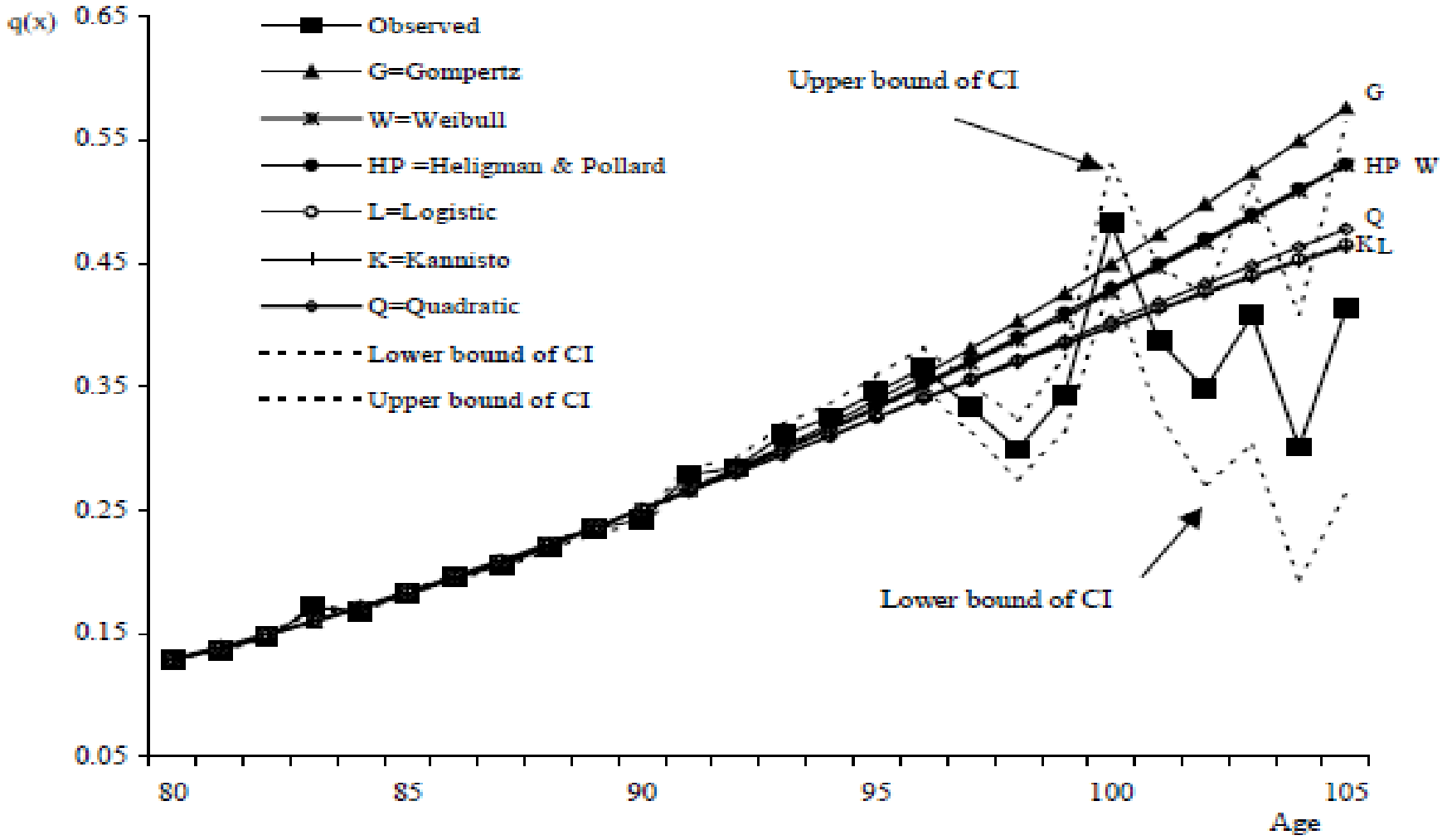
logit(qx), ages 70−95
logit(qx), ages 60−70
0.0
0.5
1.0
1.5
2.0
2.5
3.0
−1.5
−1.0
−0.5
0.0
Neimeng
Shanxi
Gansu
Yunnan
Hebei
Ningxia
Heilongjiang
Tibet
Hainan
Jilin
Guangxi
Xinjiang

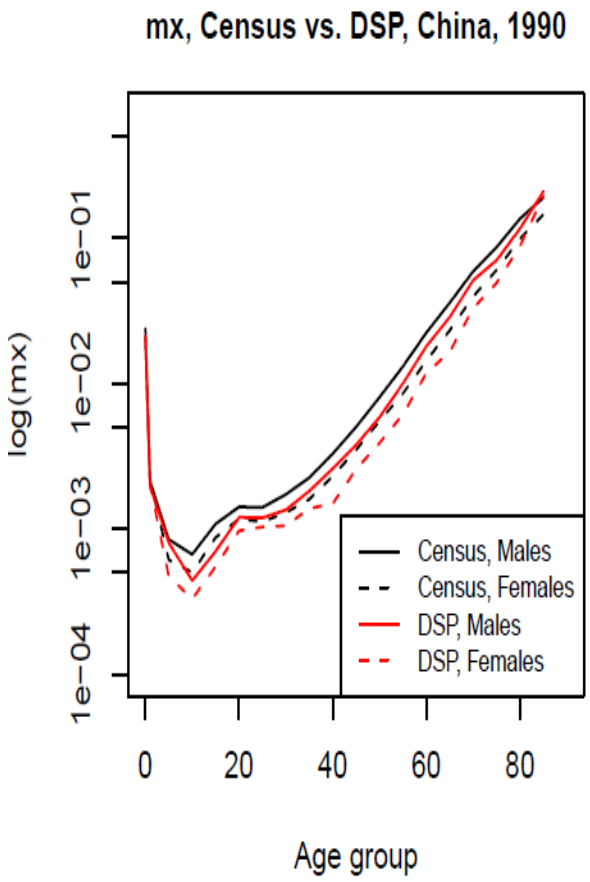

Ages 80–95 vs. ages 70–80, Males
11 HMD countries 1950–2014
Sweden, 1950–2014
Japan, 1950–2014
China census, 2000
China census, 2010
13 HMD countries fitted
95% of data points of 13 HMD countries
logit(qx), ages 80–95
logit(qx), ages 70–80
0.0
0.5
1.0
1.5
2.0
2.5
−1.0
−0.5
0.0
0.5
Tianjin
Ningxia
Tibet
Tibet
Jilin
Heilongjiang
Hainan
Xinjiang
Xinjiang
Gansu

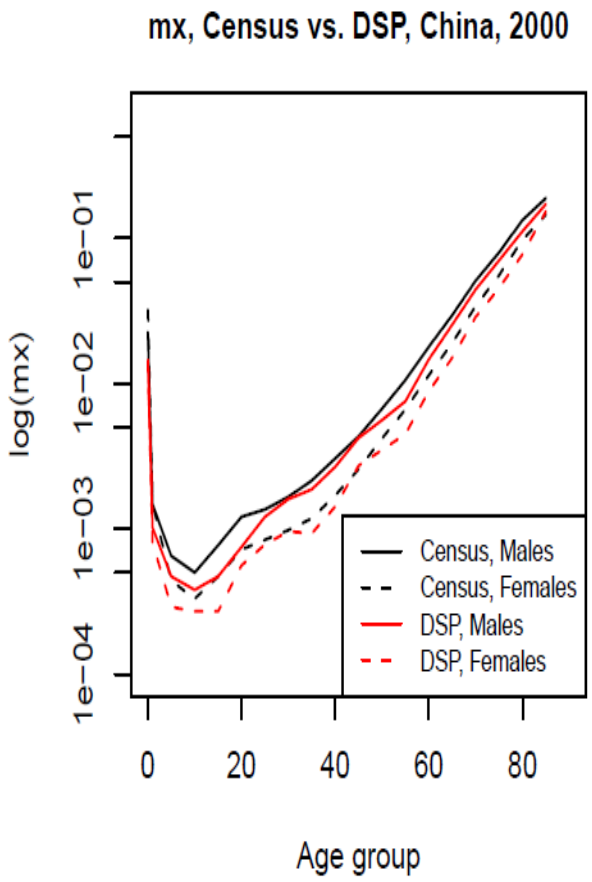

Ages 80–95 vs. ages 70–80, Females
11 HMD countries 1950–2014
Sweden, 1950–2014
Japan, 1950–2014
China census, 2000
China census, 2010
13 HMD countries fitted
95% of data points of 13 HMD countries
logit(qx), ages 80–95
logit(qx), ages 70–80
0.0
0.5
1.0
1.5
2.0
2.5
−1.0
−0.5
0.0
0.5
Hainan
Xinjiang
Tibet
Gansu
Hebei
Shaanxi
Ningxia
Heilongjiang
Jilin

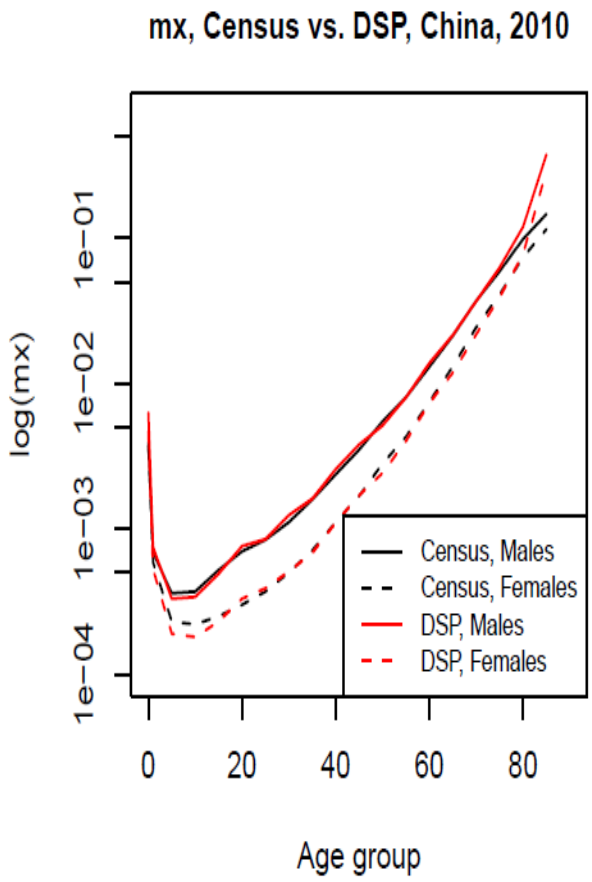
Han Chinese, Males, 1990 census

Source: Zeng and Vaupel (2003)




mx, Census vs. DSP, China, 1990
log(mx)
1e−04
1e−03
1e−02
1e−01
0
20
40
60
80
Age group
Census, Males
Census, Females
DSP, Males
DSP, Females


mx, Census vs. DSP, China, 2000
log(mx)
1e−04
1e−03
1e−02
1e−01
0
20
40
60
80
Age group
Census, Males
Census, Females
DSP, Males
DSP, Females


mx, Census vs. DSP, China, 2010
log(mx)
1e−04
1e−03
1e−02
1e−01
0
20
40
60
80
Age group
Census, Males
Census, Females
DSP, Males
DSP, Females

Source: Zhou & Yin(2016)

Death cases reporting in China during 2004-2015

Year	reported number of deaths	Number of counties	Reporting rate	Garbage code rate	Crude mortality rate in DSPs	Mortality rate released by National statistics Bureau	Infant mortality rate in DSPs	Infant Mortality rate released by National statistics Bureau
2004	437,430	2422	82.58	20.05	6.08	6.42	11.32	21.5
2005	702,296	2295	78.25	24.68	6.08	6.51	11.32	19.0
2006	937,995	2308	79.45	22.13	5.25	6.81	9.31	17.2
2007	1,399,764	2385	81.63	14.07	5.60	6.93	9.02	15.3
2008	2,212,693	2593	84.16	7.06	5.75	7.06	8.00	14.9
2009	2,479,811	2615	84.74	5.82	5.83	7.08	6.06	13.8
2010	2,943,629	2695	87.33	5.56	5.75	7.11	5.51	13.1
2011	3,400,136	2695	87.33	5.10	5.76	7.14	5.82	12.1
2012	3,991,660	2818	91.08	6.26	5.96	7.15	6.32	10.3
2013	4,927,460	2903	93.6	5.96	5.60	7.16	4.70	9.5
2014	5,599,933	2900	93.4	3.70	5.87	7.16	4.80	8.9
2015	6,096,558	2916	93.6	3.58	5.84	-	4.80	

Under-reporting rate of death for China CDC DSP field surveys 2009-2011

Ages	2009	2010	2011	Total
0-5	17.4(76/438)	22.0(89/405)	19.6(64/326)	19.6
5-14	21.2(54/255)	17.8(48/270)	18.2(45/248)	19.0
15-44	13.9(372/2669)	14.4(345/2394)	13.8(327/2363)	14.1
45-64	14.1(960/6833)	12.1(827/6836)	11.6(818/7055)	12.6
65+	13.0(2623/20186)	12.2(2541/20910)	11.5(2404/20909)	12.2

No. of under-reported cases/No. of total death cases

Source: Guo et al. (2015): Table 4.

Underestimation rate of mx in the 2010 census

	Urban & rural combined		Urban		Rural	
	Males	Females	Males	Females	Males	Females
0	74.4	69.0	58.4	56.9	75.0	68.0
1-4	23.9	17.5	23.4	17.6	25.0	18.2
5-14	23.7	3.7	13.5	0.4	28.5	7.7
15-44	17.8	18.3	17.1	16.5	17.9	19.1
45-59	13.7	13.6	12.9	14.2	14.1	13.2
60-69	13.9	14.2	13.2	13.6	14.3	14.7
70-95	18.6	23.1	18.1	22.1	18.8	23.8
95+	41.8	36.1	44.3	37.3	37.9	34.7
Total	**20.4**	**19.1**	**18.6**	**17.9**	**20.9**	**19.8**

Source: Xiong, Gu, Zeng (under review)

- **For China, modelling approaches are needed, but DSP assessments are more reliable.**

- **For China, a long way to go to upgrade to an acceptable level or to a country with good data quality**

- **Combined different sources & models**

- **To be included in HMD?**
  - **Good news**
  - **Challenges**