UNITED NATIONS EXPERT GROUP MEETING

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Methodological and Lessons Learned to evaluate the completeness and the quality of vital statistics data from civil registration

Assessing the completeness of death registration in the death notification system in Oman

Using Direct methods (Capture Recapture)

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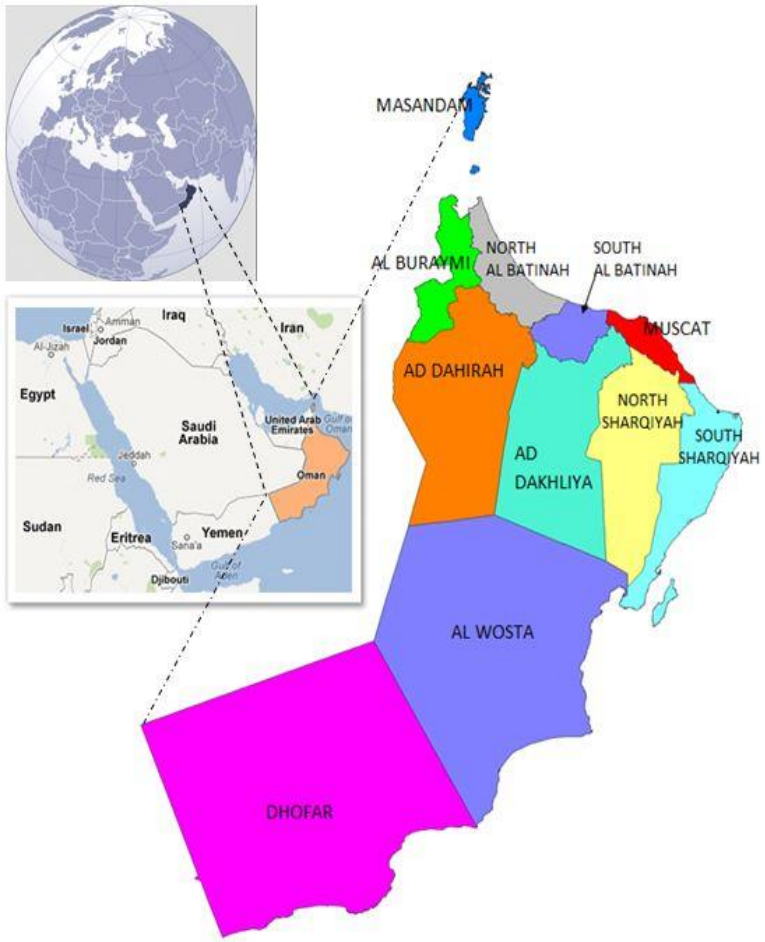
Outline

- Introduction
- Methods and processes
- Results & Key Findings
- Strengths
- Limitations of the study

Introduction: Overview of Oman

- Population is about 4.5 millions; of whom 55%% are Omanis (45% Expatriates)
- Rapid Economic Growth from 1970 along with population growth
- Variation of Population density (from <1 to 350) per sq km

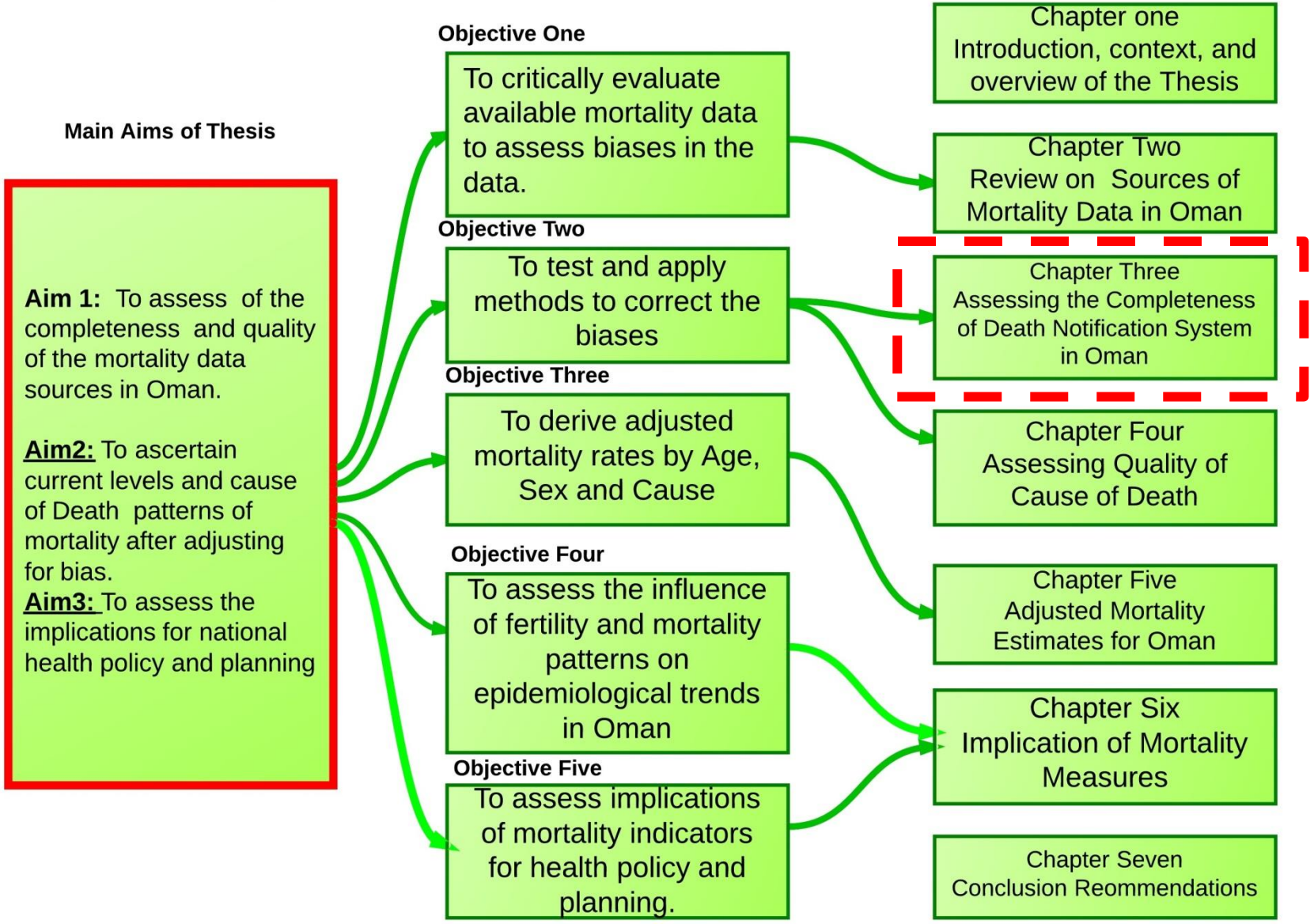


Introduction: Death registration in Oman

- First Census was carried in 1993 followed by two censuses 2003 and 2010
- Mortality module were included in the censuses
- Death notification system introduced in 2004 as part of civil registration system.
- Some secondary sources of death data including medical records at health facilities, and demographic health surveys.

- These are valuable resources for verifying the validity of the mortality data collected by the death notification system.

PhD on : Mortality Patterns in Oman (Demographic and Epidemiological Review)



Why Using capture-recapture for assessing the Completeness of Death Registration

- It has a simple and straightforward logical basis
- The possibility of estimating registration completeness among infants and young children (which is not possible from the indirect methods) is one of the strongest advantages of the method.
- Linkage of two sources of data include the potential to correct specific variables, as well as the potential to complement, merge or integrate other variables of interest into the analysis.
- Capture-recapture can be used to identify deceased's characteristics related to probability of capture by either sources. Such information could be useful for improvement of an ongoing register by identifying subgroups (geographic, age or sex) with a high probability of being missed by the register.

Assumptions of the method

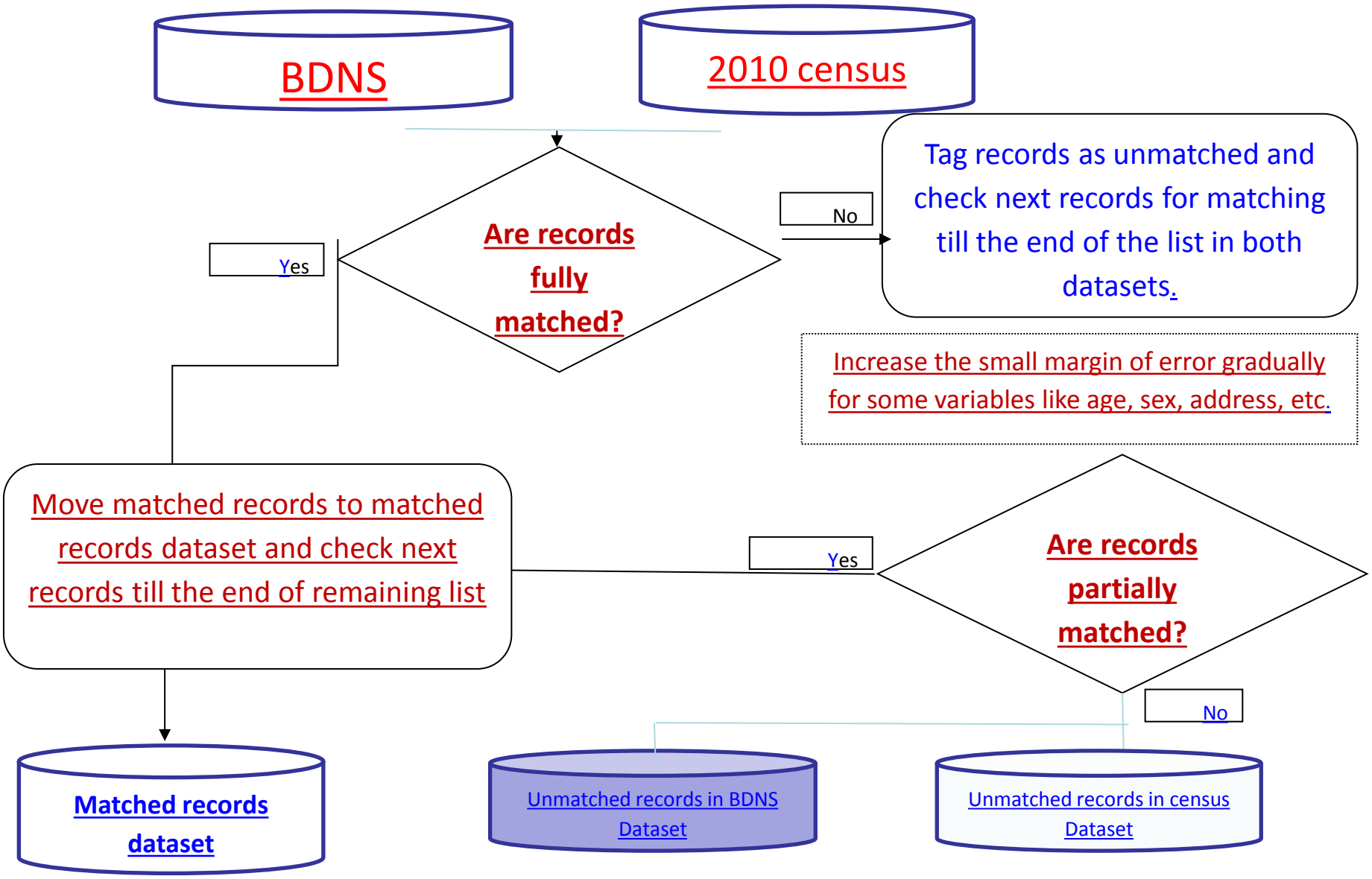
- Independent Sources
- Same time period
- Closed populations
- homogeneity of capture probability

Birth and Death Notification system (BDNS)

Mortality module of 2010 Census.

		Census 2010		
		Yes	No	Total
Birth and death notification system	Yes	(M)	(C)	(M+C)
	No	(D)	(X)	
	Total	(M+D)		(N)

Study Procedures



Study Procedures

Define the matching variables

Variable	BDNS database	Census 2010 database
Notification number	√	
Reported institution	√	
Name of deceased	√	
Name/tribe name of applicant*	√	√
Governorate/region	√	√
Wilayat (district)	√	√
Town/village	√	√
Locality or compound		√
Sex	√	√
Date of death	√	√
Age at death	√	√
Date of birth	√	

Study Procedures

Initial data quality assessment

Items	Birth and death notification system database	Census
Total records	6,039	5,400
Missing date of death	0	0^
Duplicates	3	19
Missing age	652	0
Missing sex	18	0
Missing governorate	457	0
Missing Wilayat	535	0
Missing nationality	18	0
Missing Wilayat and governorate	457	0
Records used in matching	6,036	5,381

Study Procedures

Matching process: Phase One (Exact Matching)

	Number of records
Matched records in the first round	568 (9.5%)
Not matched from birth and death notification system database	5468
Missing age	500
Missing governorate	435
Missing wilayat	502
Missing village/locality	1022

- Missing Values
- Frequent spelling mistakes
- Small differences in the age at death, or in the date of death
- Small difference in the sex of some neonates deaths.

Study Procedures

Matching process: Phase Two 49.5%

Based on the observations from phase one, it was decided to first apply the following generic criteria to the existing dataset, and repeat matching exercise.

1. A band of 5 years was applied to the age at death for Adults (i.e. differences in age of up to 5 years for a record which is matched on all other variables was considered a match).
2. A variation of one month in the date of death for records matched on all other variables was considered a match.
3. Spellings of village names in both the birth and death notification system database and the census datasets were corrected to ensure uniformity.
4. Cases of neonatal deaths that were matched on all other variables besides gender were considered a match.

Study Procedures

Matching process: Phase Three

Based on the observations from phases one and two :

1. **521 records** (with missing key variables) were returned to the notifying health institutions in order to obtain updated information on the missing variables.
2. **Tribe name** was used to infer the *wilayat*/village of residence (tribe names can be mapped on to known *wilayat*/villages).
3. **Health Institution** was used to infer the missing address variable for the deceased.

Study Procedures

Matching process: Phase Three

Based on the observations from phases one and two :

When the age of the deceased was missing, one of several strategies was employed.

1. **Occupation** of the deceased was ‘student’, the age was inferred to be between 5 and 19 years.
2. **Name** was recorded as ‘son of _____’, ‘daughter of _____’, or even ‘baby of ____’, this was taken as an indication that the deceased was an infant, given the Omani custom of naming only a few weeks following birth.
3. **Cause of death** was used to fix the age (e.g. if the cause was ‘birth asphyxia’ or ‘congenital anomaly’, the age was presumed to be that of an infant. If the cause was ‘senility’ or ‘dementia’, the deceased was presumed to be from an older age group).

Study Procedures

Matching process: Phase Three 49.5%

In Summary

1. If a record with missing age from the birth and death notification system dataset was similar in all other aspects (e.g. date of death, gender, detailed address) to a record from the census, and the cause was marked as ‘senility’, then the age of deceased recorded in the census was used to update the age in the birth and death notification system dataset, and the record was deemed as matched
2. Finally, scrutiny of the remaining unmatched records indicated that there were several records among the elderly which were matched on several variables but not age; however, the age recorded in each dataset was within a band of 10 years.

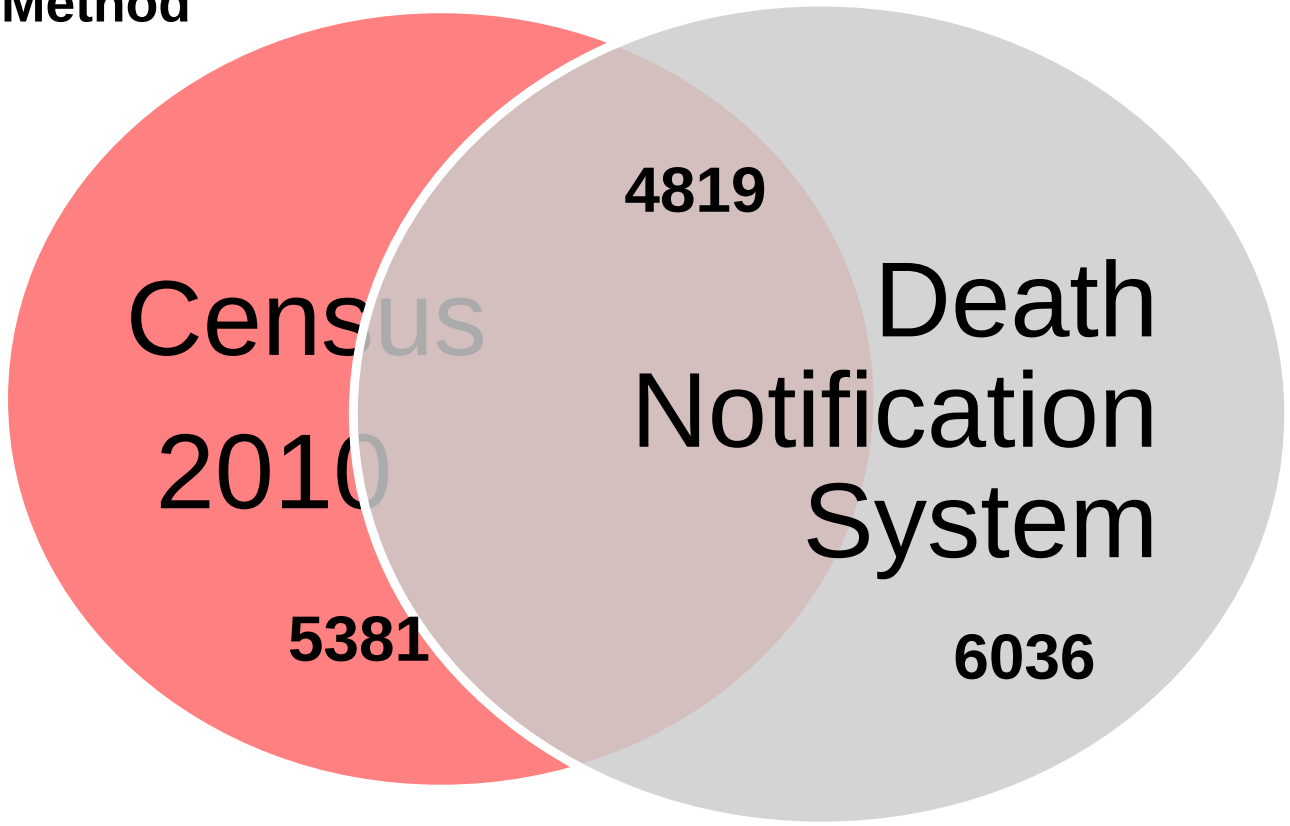
Study Procedures

Matching process: Phase Three

	Number of records
Matched records in first, second and third	4,819 (79%)
Not matched	1,217
Reasons for un-matched records*	
Missing age	192
Missing governorate	163 + 5 (residing abroad)
Missing wilayat/village	179
Under-recorded events in census	650

Results

Capture-Recapture Method



Census 2010	Matched Records	Death Notification system
5381	4819	6036

Results

Sex / Age Group	Total records Census	Total records in B&D	Matched Records	Found in BD but not found in census	Found in census but not found in BD	Estimated missing in both	Estimated deaths
Males							
0 - 4	475	369	322	47	153	22	544
5-14	137	83	79	4	58	3	144
15-24	278	252	248	4	30	0	282
25-44	364	388	334	54	30	5	423
45-64	686	794	675	119	11	2	807
65-84	963	1385	948	437	15	7	1407
85+	335	331	306	25	29	2	362
Grand Total	3238	3628	2912	716	326	80	4034
Females							
0 - 4	341	296	248	48	93	18	407
5-14	94	60	60	0	34	0	94
15-24	92	83	79	4	13	1	97
25-44	162	155	148	7	14	1	170
45-64	399	442	379	63	20	3	465
65-84	728	982	699	283	29	12	1023
85+	327	314	294	20	33	2	349
Grand Total	2143	2408	1907	501	236	62	2706

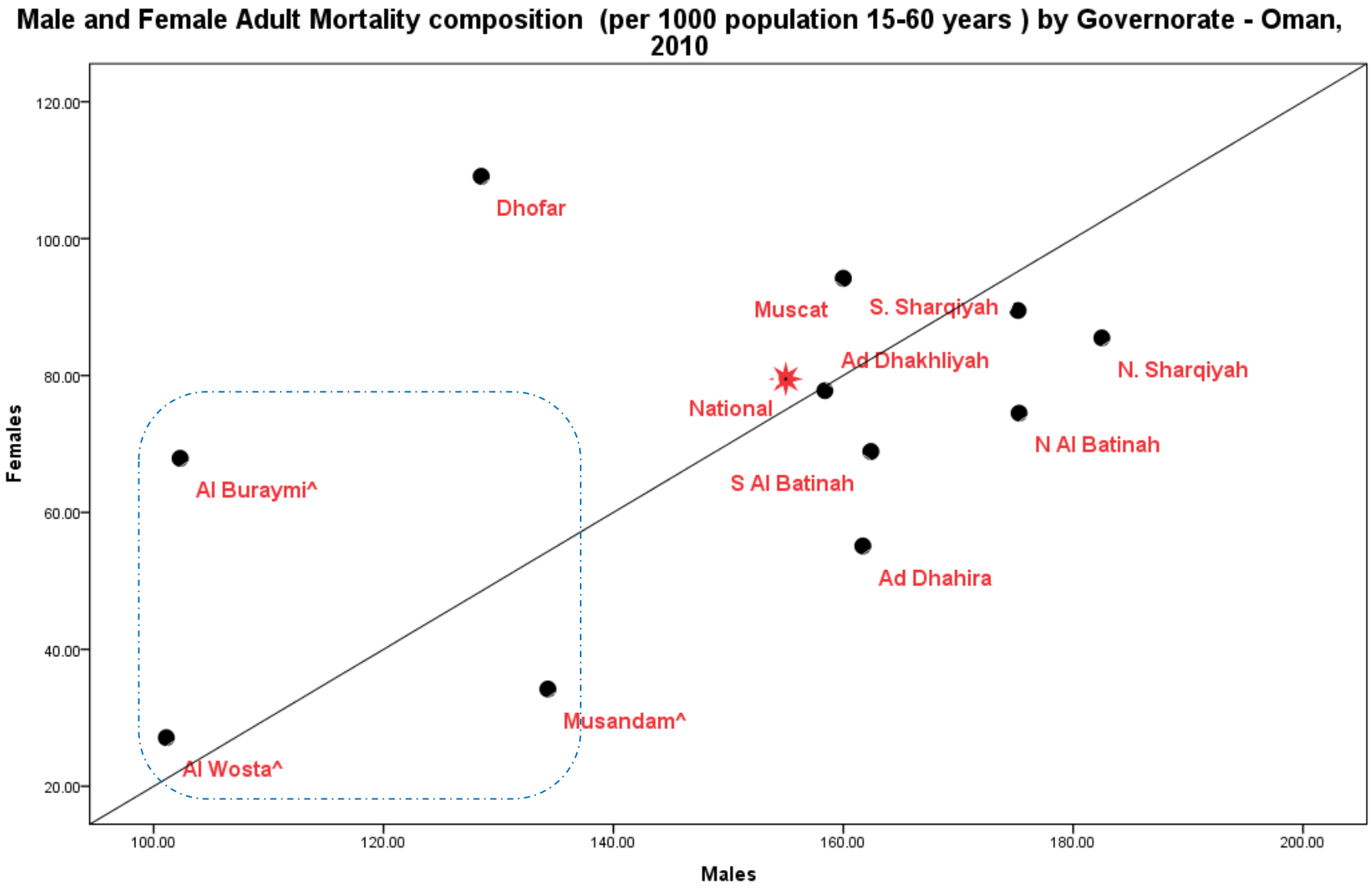
Death Registration completeness Rates Broad Age Groups

Age Group	Males (%)	Females (%)
0 - 4	68	73
5-14	58	71
15-24	89	85
25-44	92	91
45-64	98	95
65-84	98	96
85+	91	90
Grand Total	90	89

Life Expectancy at birth and adult mortality By Sex based on Raw Death notification and Adjusted deaths

	Raw Death Data		Study Findings		Global Burden of disease study2010 (IHME)		Wold health Organization (WHO)		World Bank	
	M	F	M	F	M	F	M	F	M	F
a) Life expectancy at birth	75.2	81.9	73.4	79.7	73.8	78.9	70	76	74	78
c) The adult mortality rate, 15 and 60 years (per 1,000)	150	77	157	82	139	86	157	78	122	76
c) Under five mortality rate	13.4	11.6	21.3	17.3	11.1		12		11.9	10.7
b) Life expectancy at age 60	22	26	21	24	NA		15	19	NA	NA

Adult Mortality variation among governorates



Key Conclusion

- Direct methods have greater plausibility for the context of Oman
- Underreporting of death in Oman now estimated around 10%
- Life expectancy estimates more confident, useful for economic and epidemiological analysis
- The main age group for premature mortality of Oman population is in Adulthood (15-60 years).

Strengths

- The Study Covered all Omani Population
- It provided completeness rates of death registration across different age groups, Geographic distribution.
- Easy to be repeated in future and it can suggest the required changes and interventions needed into mortality module of coming census 2020.
- It has highlighted on the defects of BDNS and suggest the changes required to overcome such incompleteness of reporting or overcome missing fields of the notifications (enforcement, validation etc.)

Limitations

- Missing data/errors in some of the key matching variables, such as date of birth and address in the birth and death notification system.
- Slight differences in some variables, particularly in the census, (e.g. date of death, date of birth). These differences are probably due to recall bias where the relative is required to recall details of the deceased.
- The name of the deceased is missing in the census data set (this has been resolved as described previously in the matching process) although it would be increase the reliability if it included in future.
- It covers Omani nationality since the Mortality module in the censes was only for Omanis.

Thank you