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UNCONDITIONAL PROBABILITY OF DYING DUE TO NON-COMMUNICABLE DISEASES ON RISE: CAUSE OF DEATH ANALYSIS FROM 2002 TO 2010

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Introduction

- Non-communicable diseases (NCDs) are leading cause of death in the world
- World Health Organization (2015)
  - 38 million deaths
  - 16 million NCD deaths are premature (< 70 years)

Introduction

- Four groups of diseases account for 82% of all NCD deaths
  - Cardiovascular diseases - 17.5 million
  - Cancers - 8.2 million
  - Respiratory diseases - 4 million
  - Diabetes - 1.5 million

Introduction

- World Health Assembly (2012)
  - Reduce premature NCD mortality
  - Global task to reduce premature mortality by 25% from 2010 to 2025

- Unconditional Probability of Dying between ages 30 and 70 from 4 NCDs
  - Indicator for Global monitoring of progress towards reducing premature mortality from NCDs

Introduction

- Unconditional probability of dying between ages 30 and 70 from 4 NCDs
- Excludes confounding
  - across countries
  - over time due to changes in mortality rates for other competing causes
- Controls for
  - differences in population age structure
  - other competing causes

Introduction

- Four major NCDs considered in PoD
  - Cardiovascular Diseases (CVD)
  - Cancer (CA)
  - Chronic Respiratory Diseases (CRD)
  - Diabetes (DM)

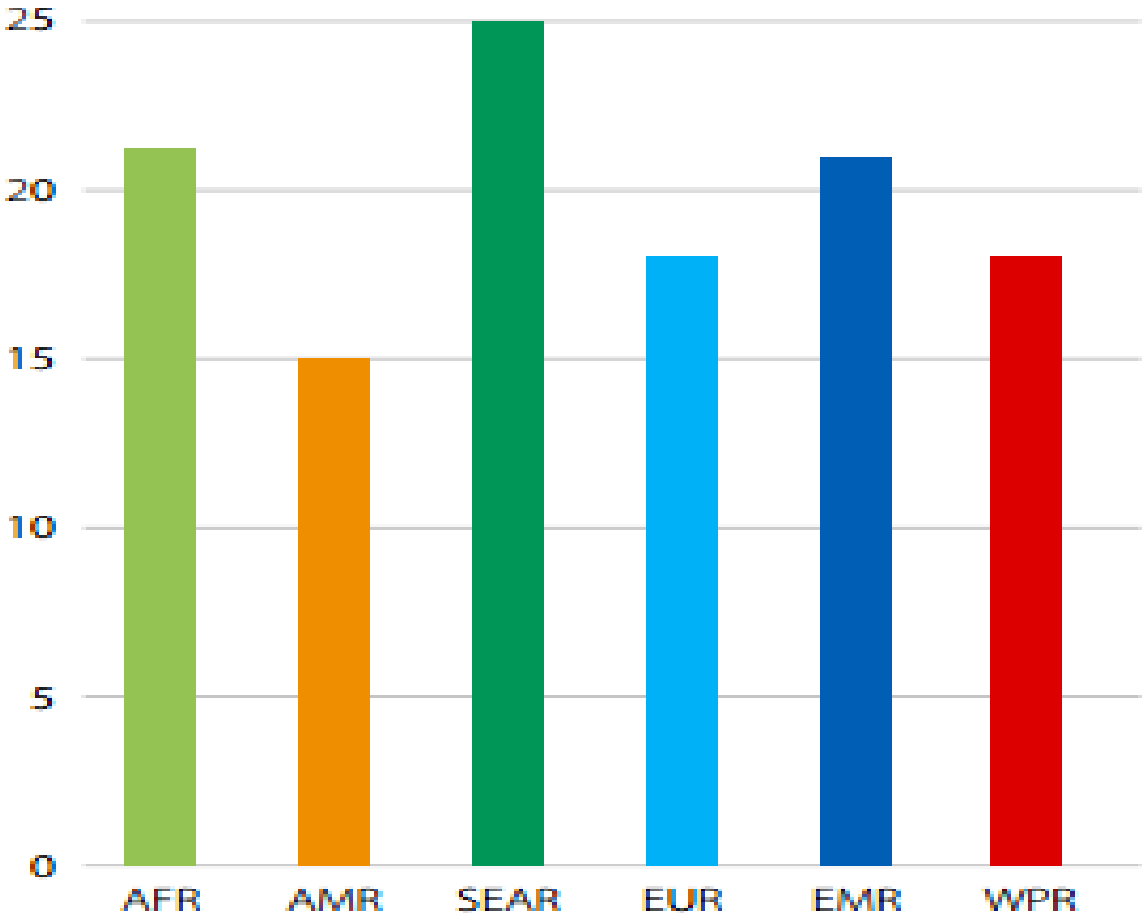
Four selected NCDs	ICD-10 codes and descriptions (data: 2001-2012)
Cardiovascular disease (CVD)	Diseases of the circulatory system (I00-I99)
Cancer (CA)	Malignant neoplasms (C00-C97)
Chronic respiratory disease (CRD)	Other diseases of upper respiratory tract, chronic lower respiratory diseases, lung diseases due to external agents, other respiratory diseases principally affecting the interstitium, suppurative and necrotic conditions of lower respiratory tract, other diseases of pleura and other diseases of the respiratory system (J30-J98)
Diabetes (DM)	Diabetes mellitus (E10-E14)

Introduction

- Lower age limit - 30 years
  - point in the life cycle where the mortality starts to rise in most populations

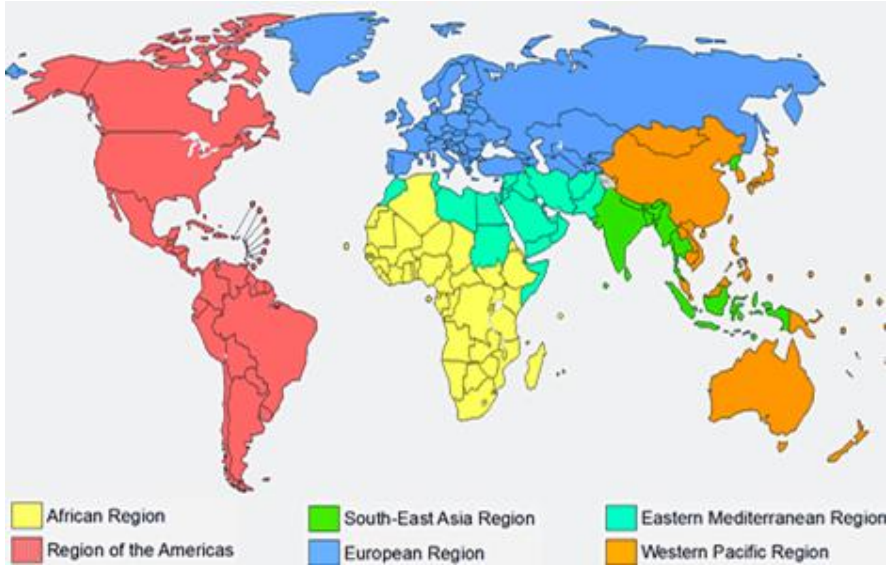
- Upper limit - 70 years
  - average life expectancy at age 30 is 70 years (except African region)
  - cause-specific death rates becomes uncertain at older ages (ill-defined causes)
  - increasing levels of co-morbidity
  - increasing rates of age misstatement in population data sources

WHO Regional estimates for PoD



AFR=African Region, AMR=Region of the Americas, SEAR =South-East Asia Region, EUR=European Region, EMR=Eastern Mediterranean Region, WPR=Western Pacific Region

WHO regions:



WHO Country estimates - 2010

Country	PoD
Iceland	9.5%
Japan	9.6%
Australia	9.9%
United Kingdom	12.4%
United States of America	14.7%
China	19.5%
United Arab Emirates	19.8%
India	26.1%
Russia	30.2%

Objectives

- To assess the trend in unconditional probability of dying between ages 30 and 70 from 4 NCDs in Sri Lanka from 2002 to 2010

Methods

- The life table method
- Age-specific death rates for the combined four causes
- 5-year age groups 30-34, 35-39,…, 65-69

Methods

Calculation steps

1. Age-specific mortality rate from 4 NCDs
2. Probability of death in each 5-year age range
3. Probability of death from age 30 to age 70

Methods

- Age-specific mortality rate from 4 NCDs (${}_5M_x$)

$$ {}_5M_x = \frac{{}_5D_x \; from \; 4 \; NCDs}{{}_5P_x} $$

${}_5D_x$ = number of deaths occurring to persons aged x to x + n

${}_5P_x$ = number of persons aged x to x + n alive at the mid-point of the period

Methods

- Probability of death in each 5-year age range (${}_5q_x$)

$$ {}_5q_x = \frac{5 \text{ x } {}_5M_x}{1 + 2.5 \text{ x } {}_5M_x} $$

${}_5M_x$ = Age-specific mortality rate from 4 NCDs ages and x and x + n

${}_5q_x$ = Probability of dying between exact ages and x and x + n

Methods

- Probabilty of death during age 30 to 70 $({}_{40}q_{30})$

$$ {}_{40}q_{30} = 1 - \prod_{x=30}^{65} (1 - {}_{5}q_{x}) $$

${}_{5}q_{x}$ = Probability of dying between exact ages and x and x + n

Data

- Mortality data were obtained from Registrar General Department of Sri Lanka.
  - For 2002, 2003, 2004, 2005, 2009 and 2010
  - Period between 2 census (2001 and 2011)

- Deaths between ages 30 and 70 from 4 NCDs were considered for the analysis

Results

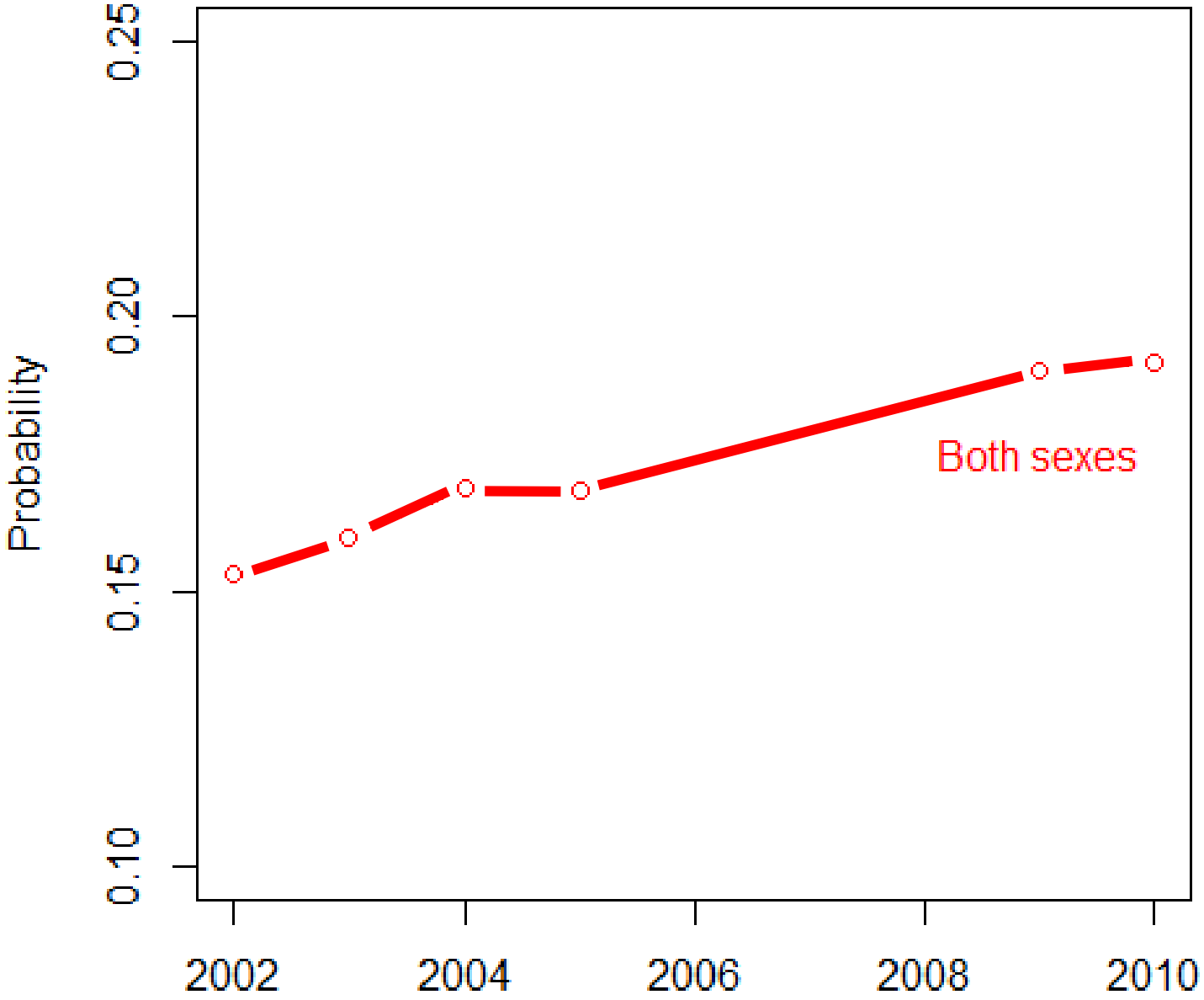
	All age groups		
Year	Mid-year population	Total deaths from 4 NCDs	Death rate (per 1000)
2002	18,921,000	42,485	2.25
2003	19,173,083	45,350	2.36
2004	19,433,360	47,856	2.46
2005	19,643,474	49,013	2.49
2009	20,476,000	60,880	2.97
2010	20,675,000	62,565	3.03
Increase	9.2%	47.2%	34.6%

Results

	Age group 30 – 70 year		
Year	Mid-year population	Total deaths from 4 NCDs	Death rate (per 1000)
2002	8,070,000	22,779	2.83
2003	8,179,297	23,995	2.93
2004	8,309,920	25,321	3.05
2005	8,399,848	25,410	3.03
2009	8,755,000	29,659	3.39
2010	8,842,000	29,933	3.39
Increase	9.6%	31.4%	19.8%

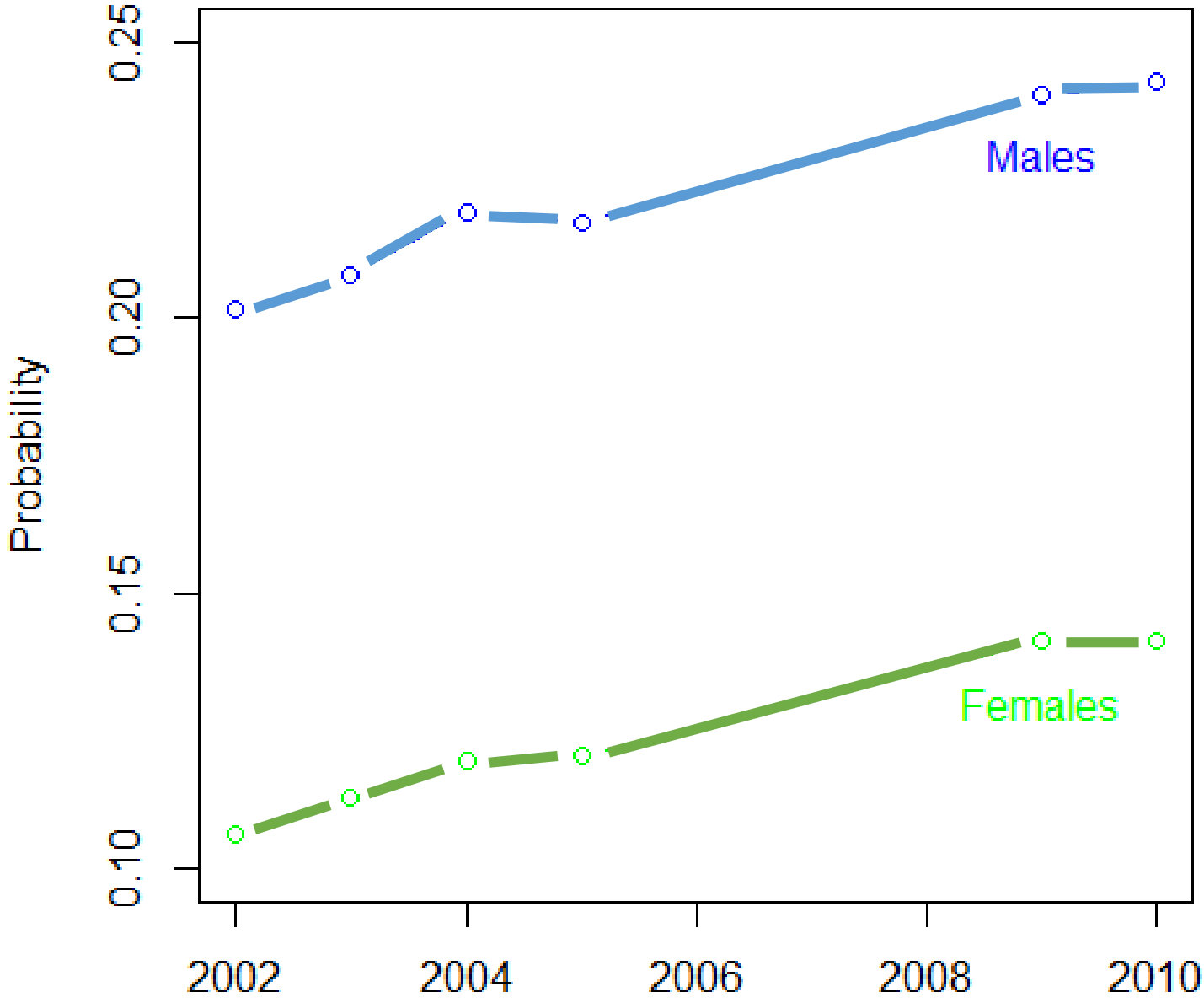
Results

Year	PoD
2002	15.3
2003	15.9
2004	16.9
2005	16.8
2009	19.0
2010	19.1
% increase	3.8%



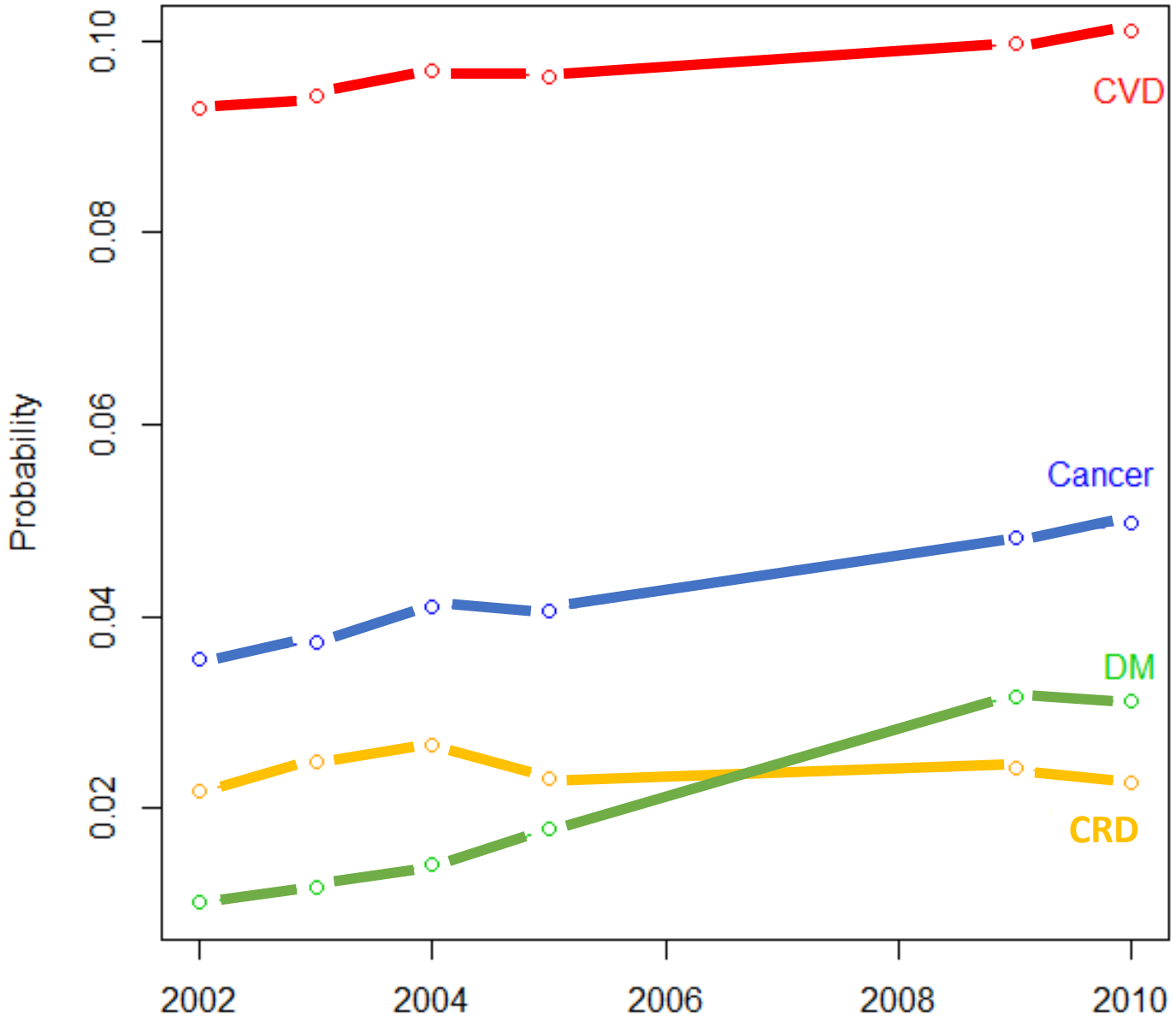
Results

	PoD	
Year	Males	Females
2002	20.1	10.6
2003	20.8	11.3
2004	21.9	11.9
2005	21.7	12.0
2009	24.1	14.1
2010	24.3	14.1
% increase	4.2%	3.5%



Results

	PoD			
Year	CVD	CA	DM	CRD
2002	9.3	3.5	1.0	2.2
2003	9.4	3.7	1.2	2.5
2004	9.7	4.1	1.4	2.7
2005	9.6	4.1	1.8	2.3
2009	10.0	4.8	3.2	2.4
2010	10.1	5.0	3.1	2.3
% increase	0.8%	1.5%	2.1%	0.1%



Discussion

- UPoD in Sri Lanka is 19.1
  - Relatively lower in SEA region
  - Lower compared to neighboring India
  - Higher compared to developed countries

- From 2002 to 2010;
  - UPoD have rose from 15.3 to 19.1
  - Males showed higher mortality compared to females

Discussion

- Major diseases
  - CVD increased from 9.3 to 10.1
  - CA increased from 3.5 to 5.0
  - DM increased from 1.0 to 3.1
  - CRD remained around 2.3

Conclusion

- If the same trend continues over the next decade we would expect more premature deaths in the age group 30 to 70
- Therefore achieving 25% reduction in mortality in 2025 could be challenging for Sri Lanka

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Thank you