Climate change, asthma and allergies

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Introduction

- "Climate change is potentially the biggest global health threat in the 21st century
- Effects of climate change on health will affect most populations in the next decades and put the lives and wellbeing of billions of people at increased risk
- Climate change will have its greatest effect on those who have the least access to the world's resources and who have contributed least to its cause" (Costello et al.; Lancet 2009; 373:1693-1733)

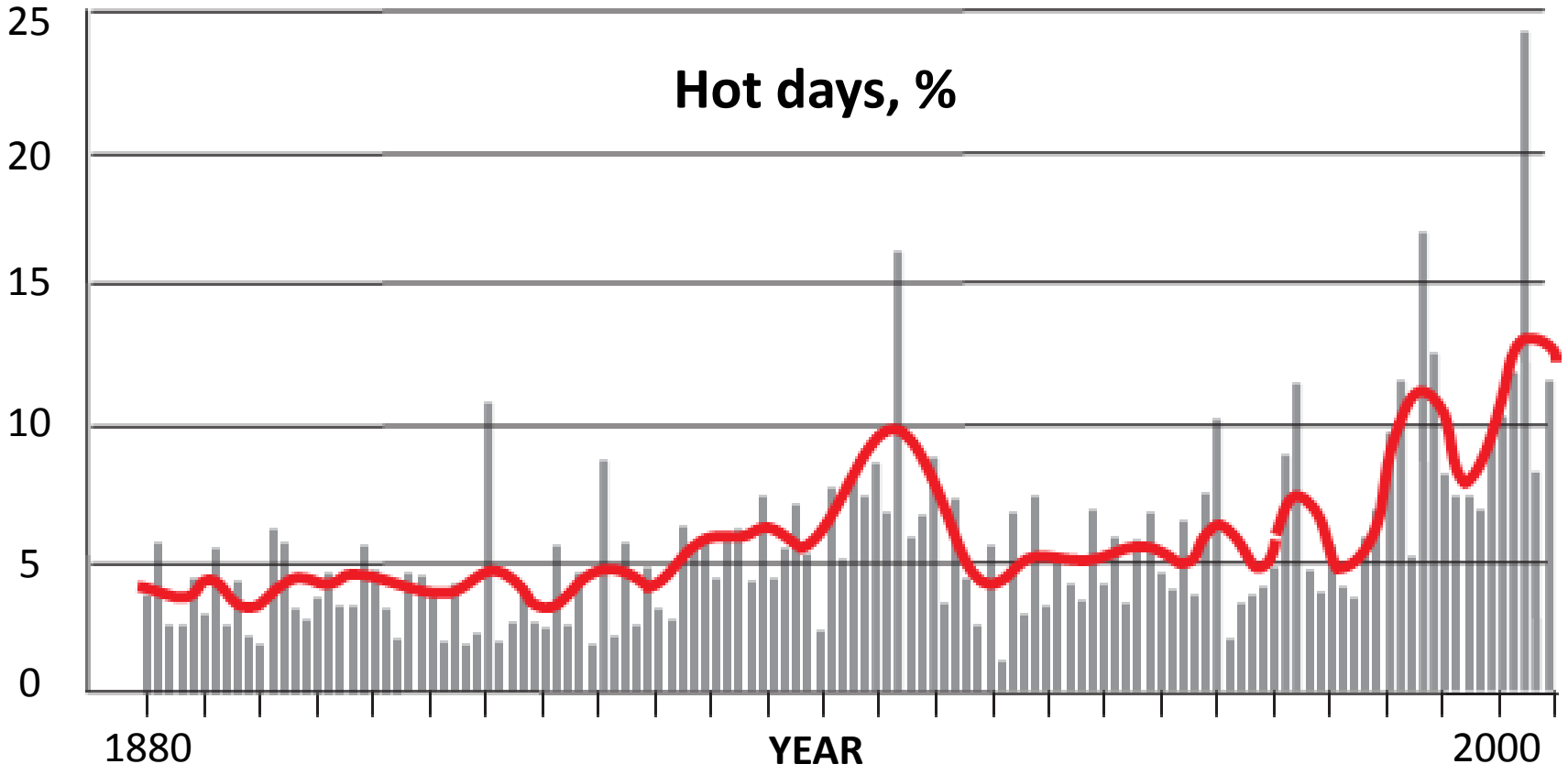
Changing climate

http://kabq.org.au/welcome-to-the-low-carbon-diet/what-is-climate-change

Changing climate and allergic diseases

- Direct effects:
  - An occurrence of extreme weather conditions
    - An increase in the frequency and intensity of summer heatwaves
    - An increase in precipitation
    - An increase in the risks of flood
    - An increase in the occurrence of storms (“thunderstorm asthma”)
    - An increase in the periods of drought
    - Changes in the directions air currents

Changing climate and allergic diseases



Percentage of summer days when maximum temperature exceeds long-term daily 95th percentile, 1880–2005 over Western Europe (Della-Marta et al.; J Geophys Res 2007; 112, D15103)

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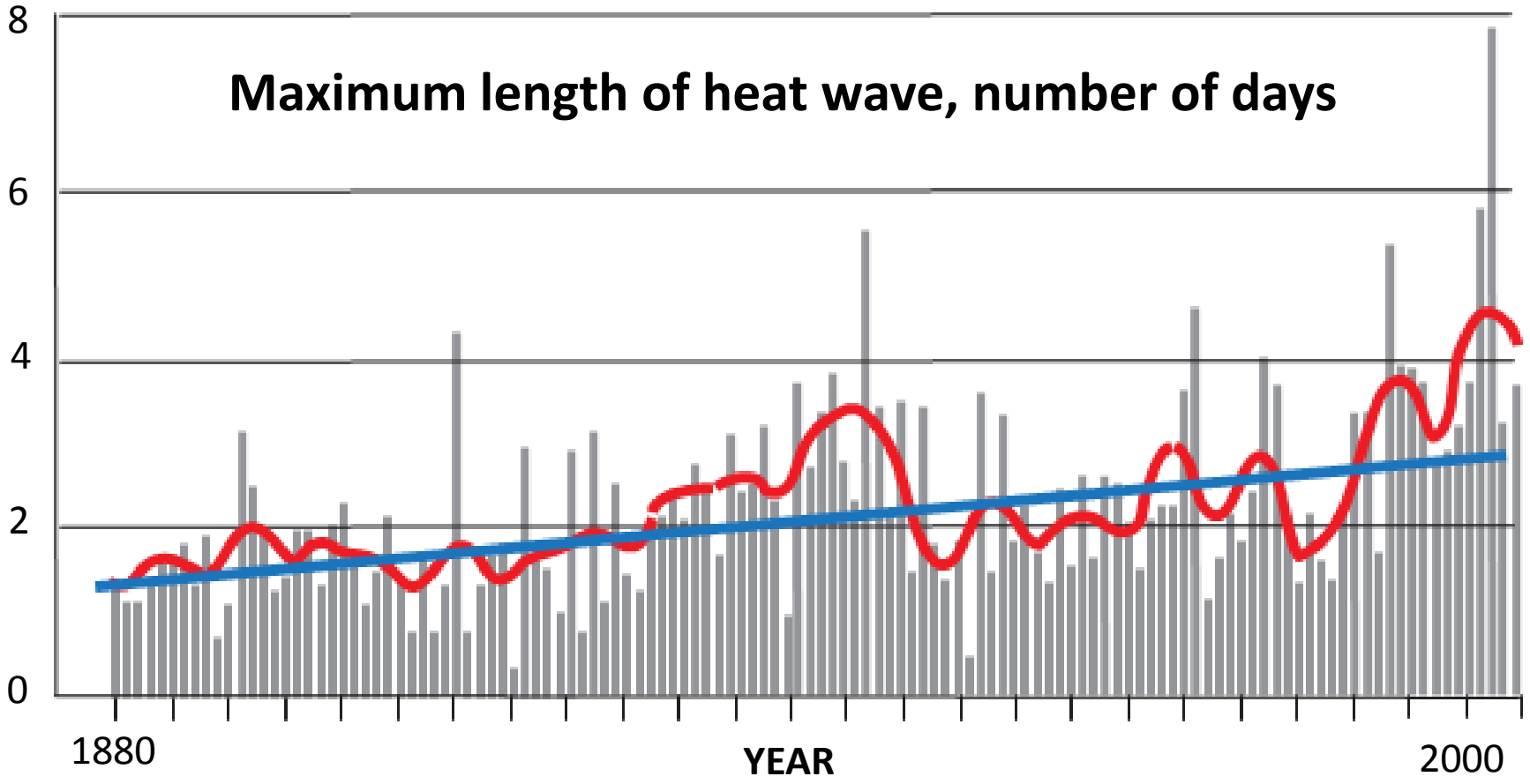
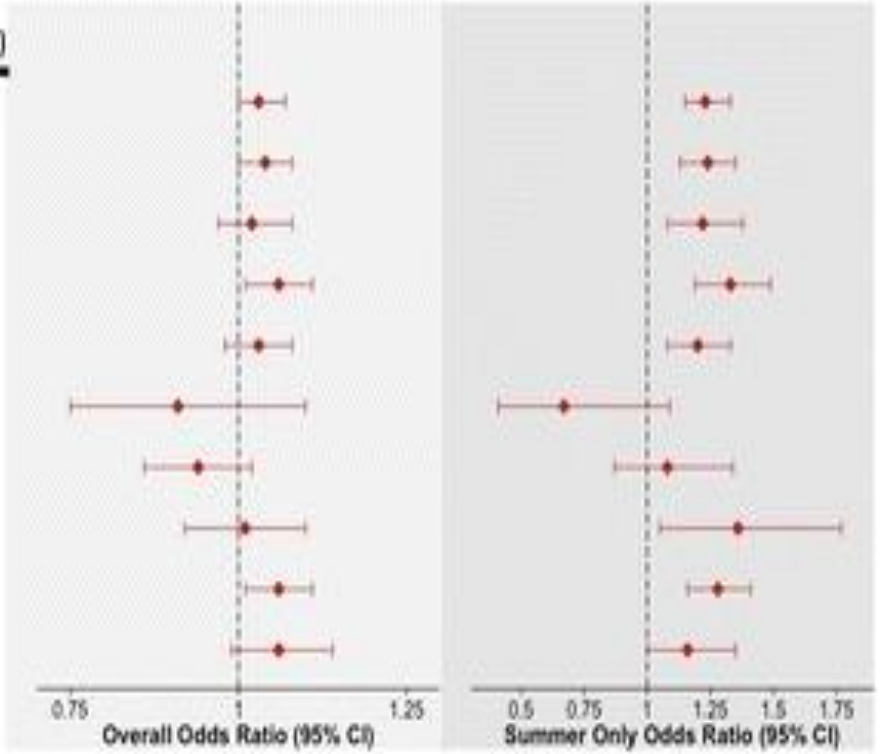


Maximum heat wave duration in days, 1880–2005 over Western Europe (Della-Marta et al.; J Geophys Res 2007; 112, D15103)

Changing climate and allergic diseases

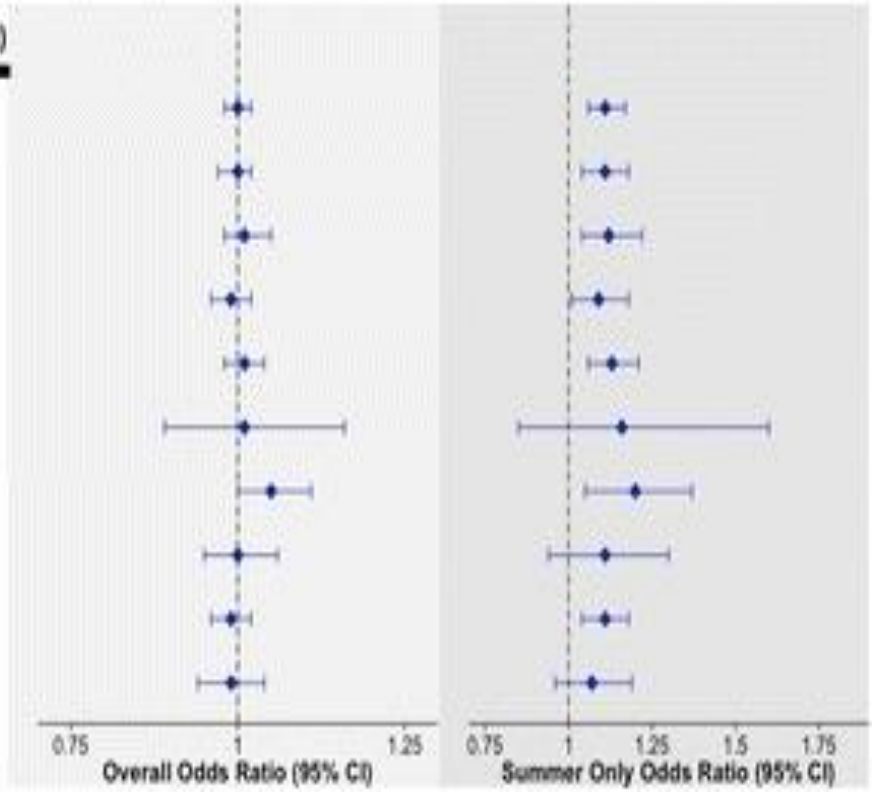
Characteristics	Subgroups	Overall OR (95%CI)	Summer OR (95%CI)
All	All of Maryland	1.03 (1.00, 1.07)	1.23 (1.15, 1.33)
Gender	Female	1.04 (1.00, 1.08)	1.24 (1.13, 1.35)
	Male	1.02 (0.97, 1.08)	1.22 (1.08, 1.38)
Race/Ethnicity	White	1.06 (1.01, 1.11)	1.33 (1.19, 1.49)
	Black	1.03 (0.98, 1.08)	1.20 (1.08, 1.33)
	Hispanic	0.91 (0.75, 1.10)	0.67 (0.41, 1.09)
Age Group	0 to 4	0.94 (0.86, 1.02)	1.08 (0.87, 1.34)
	5 to 17	1.01 (0.92, 1.10)	1.36 (1.05, 1.77)
	18 to 64	1.06 (1.01, 1.11)	1.28 (1.16, 1.41)
	65 and over	1.06 (0.99, 1.14)	1.16 (1.00, 1.35)



Odds Ratios (ORs) and 95 % Confidence Interval (95 % CI) for Exposure to Extreme Heat Events and Risk of Hospitalization for Asthma in Maryland Between 2000 and 2012, adjusted for extreme precipitation event (Soneja et al.; Environmental Health 2016; 15:57)

Changing climate and allergic diseases

Characteristics	Subgroups	Overall OR (95%CI)	Summer OR (95%CI)
All	All of Maryland	1.00 (0.98, 1.02)	1.11 (1.06, 1.17)
Gender	Female	1.00 (0.97, 1.02)	1.11 (1.04, 1.18)
	Male	1.01 (0.98, 1.05)	1.12 (1.04, 1.22)
Race/Ethnicity	White	0.99 (0.96, 1.02)	1.09 (1.01, 1.18)
	Black	1.01 (0.98, 1.04)	1.13 (1.06, 1.21)
	Hispanic	1.01 (0.89, 1.16)	1.16 (0.85, 1.60)
Age Group	0 to 4	1.05 (1.00, 1.11)	1.20 (1.05, 1.37)
	5 to 17	1.00 (0.95, 1.06)	1.11 (0.94, 1.30)
	18 to 64	0.99 (0.96, 1.02)	1.11 (1.04, 1.18)
	65 and over	0.99 (0.94, 1.04)	1.07 (0.96, 1.19)

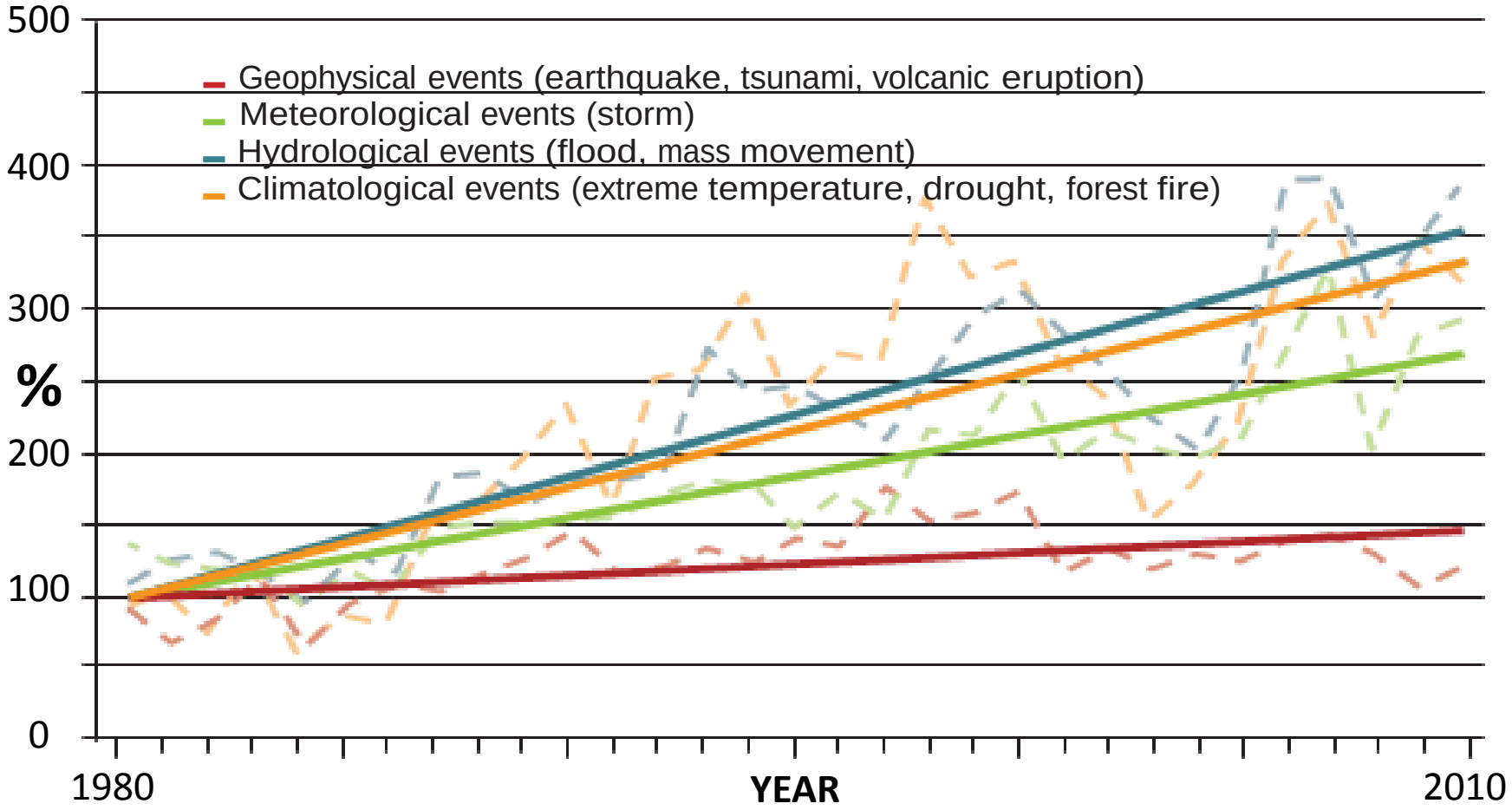


Odds Ratios (ORs) and 95 % Confidence Interval (95 % CI) for Exposure to Extreme Precipitation Events and Risk of Hospitalization for Asthma in Maryland Between 2000 and 2012, adjusted for extreme heat events (Soneja et al.; Environmental Health 2016; 15:57)

Changing climate and allergic diseases

- Indirect effects:
  - Air quality
    - An increase in the tropospheric ozone concentrations
    - An increase in the photosynthetic activity and plant growth
    - An increase in the burden of aeroallergens
  - Soil erosion; desertification
    - An increase in the burden of particles
  - Forest fires
    - An increase in the burden of particles

Changing climate and allergic diseases



Trends in different types of natural catastrophe worldwide, 1980–2012 (1980 levels set at 100%; data from Munich Re NatCatSERVICE**)**

Changing climate and allergic diseases

- Climate change is predicted to affect the health of allergic people:

  1) An increase in the premature mortality and acute morbidity due to heatwaves

  2) An increase in the prevalence of cardiac and respiratory episodes due to rise of ground-level ozone concentrations

  3) Changes in the prevalence of respiratory symptoms and diseases due to episodes of transboundary long-range air pollution

  4) Temporal and spatial changes in the distribution of allergens and vector-borne infections (ERS Position Statement; Eur Respir J 2009; 34:295-302)

  5) Decrease in the severity of symptoms and the use of medication among people suffering atopic eczema (Byremo et al.; Allergy 2006; 61: 1403-1410)

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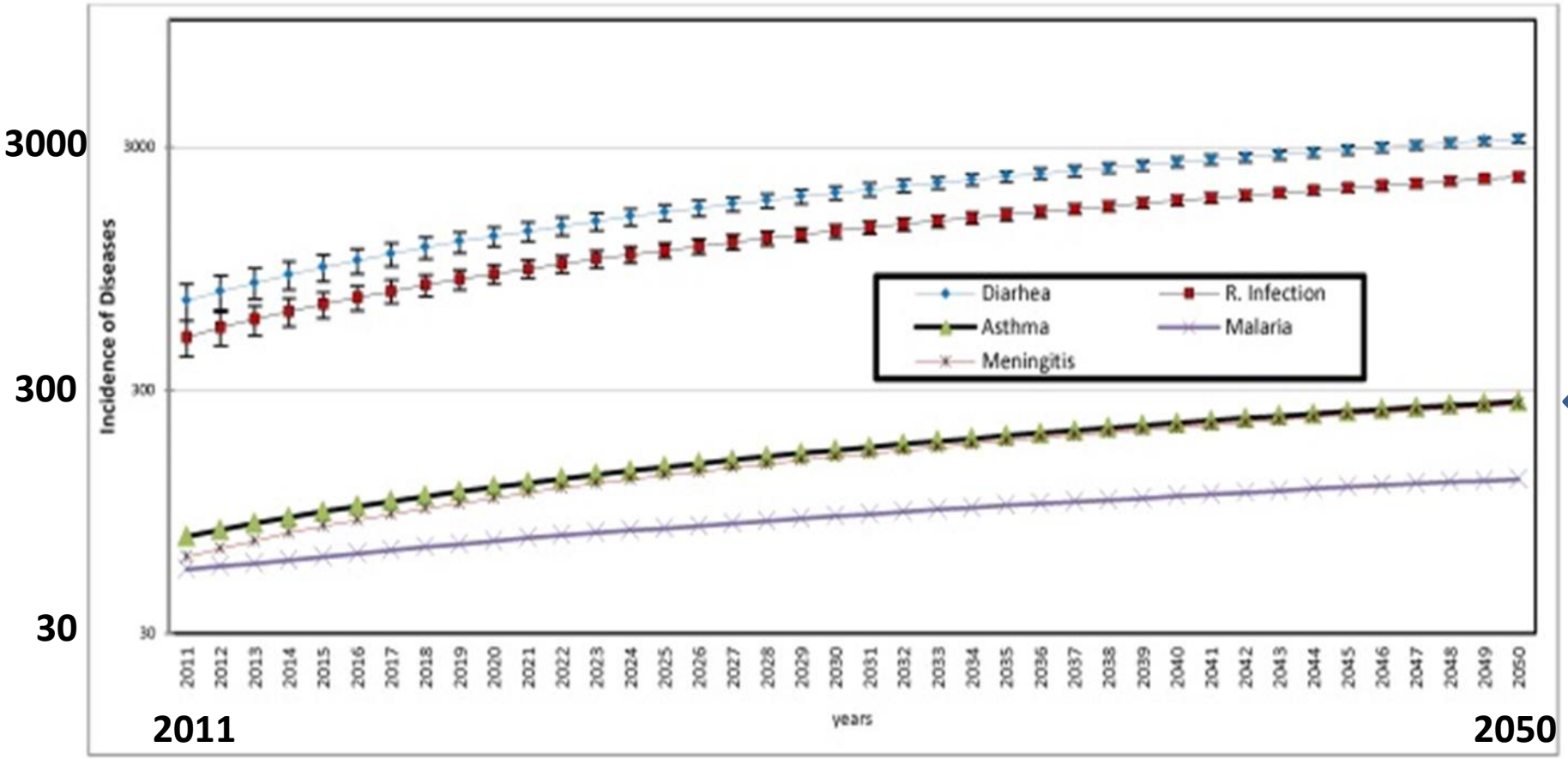
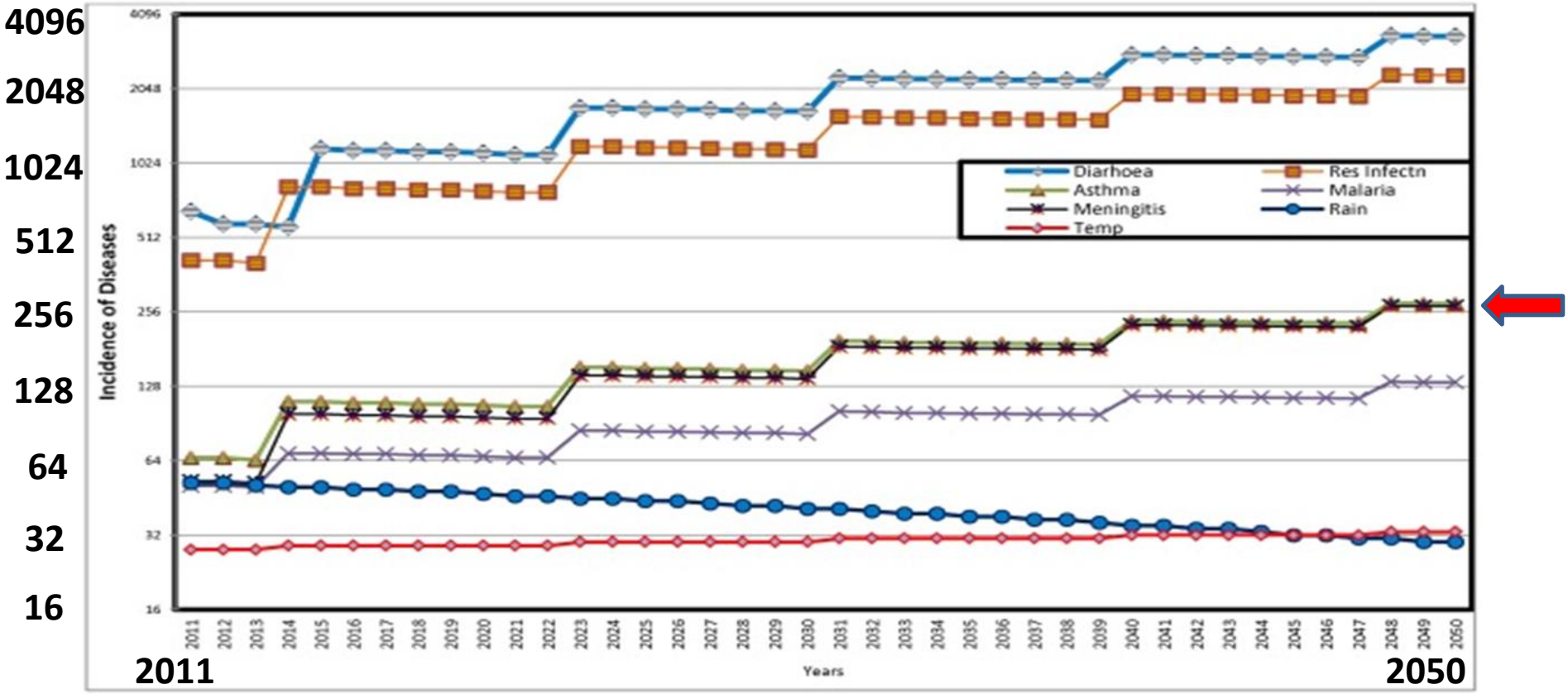


Projected distribution of diseases 2011 to 2050 in Limpopo Province, South Africa; (Thompson et al.; Int J Environ Res Public Health 2012; 9(3):831-854)

Changing climate and allergic diseases



Predicted Distribution of Diseases with Influence of Climatic Parameters 2011 to 2050 in Limpopo Province, South Africa (Thompson et al.; Int J Environ Res Public Health 2012; 9(3):831-854)

Changing climate and allergic diseases

- Data linking changes in environmental variables and changes in incidence and prevalence of allergic diseases are lacking
  - The role of temperature (hot), humidity, wind and rainfalls is still unclear
  - There are more evidence about the effect of indirect consequences of climate change on allergic diseases (D'Amato et al.; World Allergy Organization Journal 2015; 8:25)

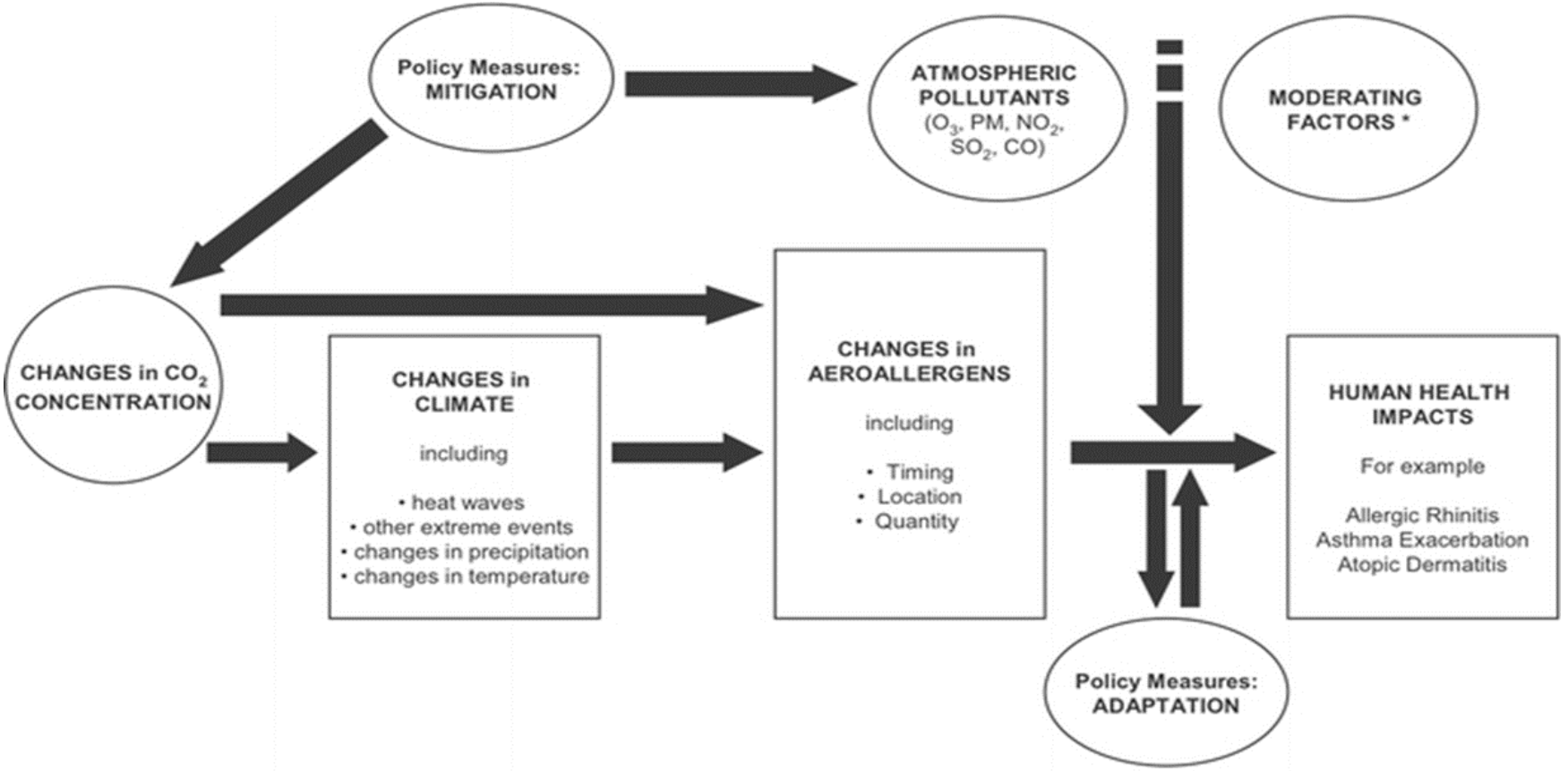
What decision makers should know?

- If the progress of climate change is not prevented
  - Probably, larger proportion of allergic people will suffer from (more severe) symptoms
    - The risk of allergic diseases will increase?
  - The burden of more frequent and severe symptoms
    - will load down the health care system and
    - increase the future cost of medication
  - As a societal consequence
    - Decrease in ability to function / work efficiency / productivity
    - Increase in sick leaves
    - Overall decrease in the level of well-being
    - Increase in societal costs and the burden of public health

What decision makers should do?

- Guidance
  - Implementation of international conventions
  - Updating and implementation of national legislation; dissemination of guidelines
- Emission control
  - Energy production, housing, transportation, agriculture and waste management
  - Research, education, monitoring / warning systems, evaluation and guidance
  - Promotion of environmentally sustainable practices
- Land use
  - Planning, zoning, construction, landscaping
  - Target: ”fitness-promoting environments” and “healthy buildings”
- Closer collaboration and communication with different interest groups
  - Consideration of expert opinions in decision making
  - Multisectorial / multidiscipline approaches and actions
- Secure the accessibility of health care services and medication

Control



Modified from *Bernard et al. 2001*

* **Moderating Factors** are non-climate factors that may affect health outcomes, such as standards of living, health care access, and public health infrastructure

(According to Reid & Gamble; EcoHealth 2009; 6:458–470)