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

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
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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 length of heat wave, number of days

Maximum heat wave duration in days, 1880–2005 over Western Europe (Della-Marta et al.; J Geophys Res 2007; 112, D15103)
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<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Subgroups</th>
<th>Overall OR (95% CI)</th>
<th>Summer OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>All of Maryland</td>
<td>1.03 (1.00, 1.07)</td>
<td>1.23 (1.15, 1.33)</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>1.04 (1.00, 1.08)</td>
<td>1.24 (1.13, 1.35)</td>
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<tr>
<td></td>
<td>Male</td>
<td>1.02 (0.97, 1.08)</td>
<td>1.22 (1.08, 1.38)</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td>White</td>
<td>1.06 (1.01, 1.11)</td>
<td>1.33 (1.19, 1.49)</td>
</tr>
<tr>
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<td>Black</td>
<td>1.03 (0.98, 1.08)</td>
<td>1.20 (1.08, 1.33)</td>
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<tr>
<td></td>
<td>Hispanic</td>
<td>0.91 (0.75, 1.10)</td>
<td>0.67 (0.41, 1.09)</td>
</tr>
<tr>
<td>Age Group</td>
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<td>0.94 (0.86, 1.02)</td>
<td>1.08 (0.87, 1.34)</td>
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<tr>
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<td>5 to 17</td>
<td>1.01 (0.92, 1.10)</td>
<td>1.36 (1.05, 1.77)</td>
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<tr>
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<td>18 to 64</td>
<td>1.06 (1.01, 1.11)</td>
<td>1.28 (1.16, 1.41)</td>
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<td>65 and over</td>
<td>1.06 (0.99, 1.14)</td>
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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

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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)
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• 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
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- Geophysical events (earthquake, tsunami, volcanic eruption)
- Meteorological events (storm)
- Hydrological events (flood, mass movement)
- Climatological events (extreme temperature, drought, forest fire)

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

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