The disease burden of peanut allergy in Denmark measured by Disability-Adjusted Life-Years (DALYs)

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The disease burden of peanut allergy in Denmark measured by Disability-Adjusted Life-Years (DALYs)

To the Editor,

Peanut allergy (PA) can result in life-threatening reactions and has negative impact on the quality of life (QoL). The prevalence of PA has increased, especially in Western countries. To monitor public health and identify ways to improve it, it is relevant to provide evidence on the burden of various diseases. Traditional indicators of public health impact are prevalence, incidence and mortality. However, they do not comprehensively reflect the burden of disease, including living with PA, as they do not account for the years living with disability due to a disease. Several metrics convey disease burden, including Disability-Adjusted Life-Years (DALYs) developed in the 1990'ies and applied by the World Health Organization for the Global Burden of Disease (GBD) study.¹ DALYs are a composite measure of population health that combines mortality and morbidity of diseases, the latter computed by weighting the duration of a disease with a Disability Weight (DW) that accounts for the health-related QoL (HRQoL)(Figure 1). Allergy has not been included in the GBD study and only one study has estimated the disease burden of PA in Western countries in terms of DALYs.² An estimate of the disease burden of PA is not published for Denmark, nor for any other country.

We estimated the disease burden of PA in Denmark, a Nordic European country with a publically financed health care system, by applying Danish PA prevalence data in a model based on the natural history of PA. PA

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caused a disease burden of 906.2 DALYs in 2016 (95% UI: 512.8 – 1429.6) (Figure 2). Persistent PA contributed with more than 97% of the total disease burden whereas fatal PA represented less than 0.5%. This estimate may be considered conservative, as the prevalence was based on clinically confirmed PA in individuals in two Danish cohorts, and did not include the prevalence of individuals with suspected allergy, who may experience the same level of psychosocial impairments. The mean DALYs per case of PA were estimated to be 3.4 DALYs (95% UI 2.7 – 4.2), indicating that any individual living with PA loses on average 3.4 years of healthy life (See supplementary material for details on methods).

DWs indicate the relative severity of a given disease and are available for a range of diseases from the GBD study, but have not been derived for PA. We assumed a proxy DW based on existing DWs of other diseases³ and on reported HRQoL of food allergy in comparison with other diseases.⁴ Scenario analyses showed that the disease burden of PA was up to 1,055 DALYs if the DW is assumed to lie somewhere between the DW of uncomplicated diabetes mellitus type 1 (DM1) and asthma, and up to 5,115 DALYs if it is assumed that the DW lies somewhere between DM1 and rheumatoid arthritis (RA) (Figure 2). For comparison, the disease burden reported for 2016 in Denmark were 6,874 for DM1, 13,285 for asthma and 5,210 DALYs for RA. Data on the BoD of some food-associated diseases are available for Denmark, and the disease burden of *Salmonella* spp. and *Campylobacter* spp., foodborne pathogens receiving much public attention, were estimated to 492 and 1,709 DALYs, respectively.⁵

In conclusion, we advocate for national specific estimates of disease burden of PA in terms of DALYs, as such estimates are the most comprehensive to reflect the public health burden, and allow for tracking changes in the epidemiology of the disease over time, both within or between countries or regions. They are useful for comparison of the health impact of similar diseases, e.g. if our model was extended to other food allergies like tree nut, wheat, milk etc., but also for comparison of the impact of otherwise non-comparable diseases e.g. foodborne or non-communicable diseases. Lastly, DALYs may be used for evaluation of the public health impact of management strategies both pro- and retrospectively.

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Dr. Pires has nothing to disclose.

Dr. Bøgh has nothing to disclose.

Figure 1. Disability-Adjusted Life-Years (DALYs) are conceptualized by that any person is expected to live a full life (x-axis) in perfect health (y-axis). If a person falls ill, time lived with disease is adjusted by a disability weight (DW), indicating disease severity. The DW ranges from perfect health (0) to death (1). Blue-shaded area represents years lived with disability (YLD). Red-shaded area represents years of life lost (YLL) due to

premature death compared to expected age of death. DALY are the sum of YLL and YLD. DALYs caused by a disease in a population are the sum of DALYs attributed to each diseased person. The figure is not a specific representation for peanut allergy.

Figure 2. Mean disability adjusted life years (DALYs) estimated in the baseline model and scenario analyses. Error bars represent the 95% uncertainty interval. Scenario 1 and 2 estimated the impact of changing mean age of death from 32 to 15 years and a zero risk of peanut allergy-induced fatal anaphylaxis, respectively. Scenario 3-5 investigated the impact of the disability weight being equal to uncomplicated diabetes mellitus type 1, asthma and the mean of rheumatoid arthritis and Crohn's disease, respectively.