Burden of food-associated diseases in Denmark

Every year, thousands of Danes suffer from food-associated diseases. These diseases include infections caused by microorganisms, long-term outcomes related to chemical exposure, and lifestyle-associated diseases due to inadequate or unbalanced diet. While exposure to chemicals and unhealthy diets usually result in chronic diseases, foodborne infections result in most cases in short-term diarrhea, vomiting and fever. However, some people also experience severe complications that require hospitalisation, and others may have health problems several years after the infection.

Cases of foodborne disease in Denmark are captured and reported by the National Public Health Surveillance (see Statens Serum Institut webpage on surveillance in Denmark). However, only a fraction of the foodborne illnesses occurring in the population each year are identified and reported. For these cases to be identified, several steps have to take place: the ill person must seek medical care; the general doctor must request a sample and submit it to a clinical laboratory to be tested; the causative pathogen must be isolated and identified at the laboratory; and the results must be reported to public health officials. As a consequence, foodborne illnesses tend to be underdiagnosed and underreported, and we estimate that our surveillance figures reveal only the tip of the iceberg that food safety problems represent.

To have a full picture of the impact of foodborne diseases, we use studies that estimate the real incidence of these diseases in the population.

Why do we want to know the burden of foodborne illnesses?

Foodborne illnesses can be prevented as long as we know what is causing them and how we can intervene in the food chain to change the population's current exposure to these causes. Knowledge on the burden of foodborne illnesses is therefore essential to set public health goals, allocate resources, and measure the public health and economic impact of disease.

Our aim is to answer the following questions:

1. How many people suffer from a foodborne illness in Denmark each year?
2. What is the actual public health and economic impact of these illnesses?
3. Which microbial and/or chemical hazards are causing disease?
4. Which foods are responsible for these illnesses?

What's the real burden of foodborne illnesses – how many cases occur?

Because health registers only reveal a small fraction of their public health impact, one of our aims is to estimate the true burden of foodborne illnesses by estimating the total number of illnesses, hospitalizations, and deaths caused by contaminated foods.

In practical terms, we want to re-construct the surveillance pyramid and understand the true number of illnesses in the country. To do this, we use the best data available, which are available from national surveillance or research studies on care-seeking and care-providing behavior.

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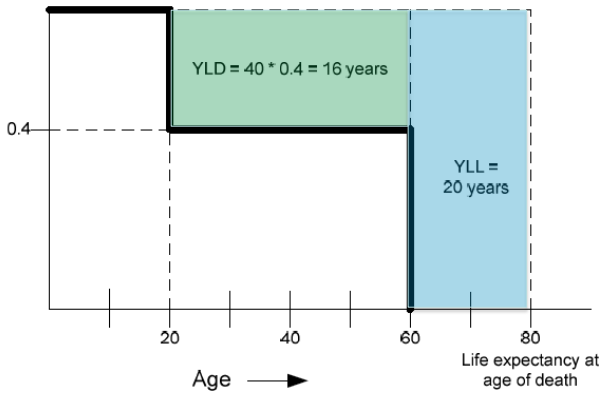
What is the true public health impact of different diseases?

A simple and intuitive way of ranking diseases is based on their occurrence (e.g. incidence) or on the number of deaths that they cause (mortality). However, these disease measures do not provide a full picture of the impact of specific diseases on human health, because severity and duration of the disease are not taken into account, and because morbidity and mortality are not integrated in a single measure. As an example, how can we decide which is a larger public health problem: a high-incidence mild illness that typically lasts around 7 days, or a rare but severe or life-threating condition? How do compare diseases and how do we rank them by public health relevance?

We use Burden of Disease studies to assess the impact of diseases in terms of incidence, severity, duration and mortality in a population. In practical terms, these methods allow us to measure the burden of a disease in the population by accounting for the number of people getting ill each year, as well as on how ill (i.e. the severity of its symptoms) and for how long, and on the number of fatal cases.

Disease burden is often quantified in terms of disability-adjusted life years (DALYs), which combine the burden due to both death and morbidity into one index. A DALY can be understood as the loss of "one year of perfect health", and the disease burden is a measure of the difference between the actual health status due to a specific foodborne problem and the ideal situation, where all live a long and healthy life without this specific problem. Data from national databases, and results from national and international research projects are used as input to simulations models.

DALY = YLL + YLD



If we think this graph represents the life of an individual, we can see he/she is born with a perfect state of health, and that 20 years later a given event (e.g. a food-associated disease) leads to a decrease of his/her quality of life of around 60%. The person lives in this new

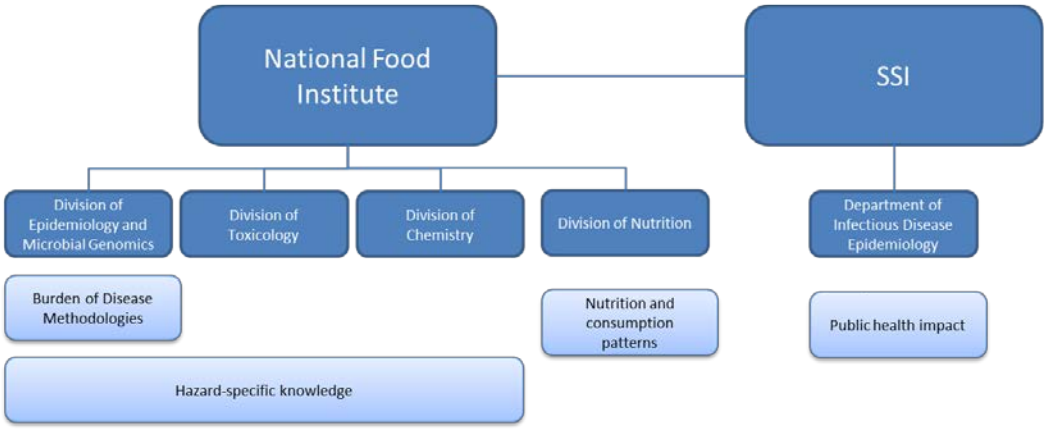
health state for another 40 years, at which point dies prematurely. We calculate the burden associated of this disease for this individual (total DALYs) by summing the years of life lost due to living with disability (YLD) with the years of life lost due to premature death, when compared with the life expectancy in the population (YLL).

What is the economic impact of foodborne diseases in Denmark?

To assess the total economic impact of foodborne diseases in the country, we apply cost of illness (COI) studies, which measure all costs related to a given disease in the population. These include the costs related to the resources used within the healthcare sector, to the resources used by patients and their families, to productivity losses due to work absence of patients and care givers, and other non-health care costs indirectly related to illness. COI methodologies allow us to link burden of disease estimates with economic impact measures, thereby providing a more complete picture of the full impact of a disease in the population.

What are we doing about it?

We are currently working across the National Food Institute's divisions to estimate the burden of several food-associated diseases. In collaboration with the Statens Serum Institute (www.ssi.dk) and other Danish institutions, we have established the Food Burden Task Force to establish Burden of Disease projects and plan future research studies. We also collaborate with other national and international institutions for ad-hoc projects.



And how do we estimate which sources are more important?

After estimating the public health impact of different foodborne diseases, regulators and industry need to implement effective interventions to improve food safety. To identify these and allocate resources, they need to know the major food sources of illness. By attributing the estimated number of foodborne illnesses to particular sources (e.g. animals and foods), we can target measures to prevent food contamination and set goals for improvement.

Read more on Source attribution of foodborne diseases

In parallel to Burden of Disease and Source Attribution projects, the National Food Institute has established a working group to compare risks and benefits of various food-associated diseases. The projects are interlinked, sharing data sources and methodologies, and taking advantage of the interdisciplinary competences of our Institute.

Read more about Risk Benefits