

Incidence-based disease burden of food- and waterborne infectious agents in Belgium, 2013-2017

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CONTEXT: The disease burden related to symptomatic infections among the general population may guide public health policies. We estimated this based on health-care surveillance data, adjusted for under-ascertainment and underreporting. We expressed it in 'Disability Adjusted Life Years' (DALYs), quantifying the number of healthy life years lost due to infection-related morbidity and mortality.

AIM: We aim to estimate the number of symptomatic cases among the general population and related disease burden, expressed in DALYs, for eleven food- and waterborne pathogens in Belgium during 2013-2017.

Results

Incidence and burden:

- Highest annual burden: *Campylobacter* (5148 DALYs annually)
- Highest burden per case: botulism (371 DALYs/ 100 cases)

Food- and water related burden:

- Highest foodborne burden: *Campylobacter* (3905 DALYs annually)
- Highest waterborne burden: *Giardia* (1424 DALYs annually)

Incidence estimates for 11 pathogens, Belgium 2013-2017.

Pathogen (or disease)	Estimated annual number of cases (mean 2013-2017) (95%UI)	Estimated annual incidence/100.000 inhabitants (mean 2013-2017) (95%UI)
Norovirus	2,403,050 (2,110,679-2,704,362)	21,384 (18,783-24,066)
<i>Giardia</i> spp.	358,707 (83,650-1,354,736)	3192 (744-12,056)
<i>Campylobacter</i> spp.	244,571 (140,839-420,098)	2176 (1253-3738)
<i>Cryptosporidium</i> spp.	156,035 (35,288-583,008)	1389 (314-5188)
<i>Salmonella</i> spp.	51,793 (30,882-85,418)	461 (461-760)
Shiga-toxin <i>Escherichia coli</i>	33,188 (22,970-45,246)	295 (204-403)
<i>Shigella</i> spp.	6304 (5018-7936)	56 (56-71)
Hepatitis A	708 (512-1011)	6.3 (4.6-9.0)
Hepatitis E	119 (104-139)	1.1 (0.9-1.2)
<i>Listeria</i> spp.	124 (108-143)	1.1 (1.0-1.3)
<i>Clostridium botulinum</i>	0.9 (0.8-1.0)	0.01 (0.01-0.01)

95%UI=95% uncertainty interval

DALY estimates for 11 pathogens, Belgium 2013-2017.

Pathogen (or disease)	DALYs/Year (95%UI)	DALYs/100 cases (95%UI)
<i>Campylobacter</i> spp.	5148 (2486-9794)	2 (1-3)
Norovirus	5136 (3700-6810)	0.2 (0.2-0.3)
<i>Giardia</i> spp.	4373 (1017-16,494)	1 (1-1)
<i>Salmonella</i> spp.	2663 (1549-4458)	5 (4-6)
Shiga-toxin <i>Escherichia coli</i>	2199 (1487-3059)	7 (6-7)
<i>Cryptosporidium</i> spp.	564 (128-2109)	0.4 (0.4-0.4)
<i>Listeria</i> spp.	417 (363-485)	337 (324-349)
<i>Shigella</i> spp.	221 (91-419)	4 (2-6)
Hepatitis A	84 (54-129)	12 (9-15)
Hepatitis E	55 (40-75)	48 (36-61)
<i>Clostridium botulinum</i>	3 (2-4)	370 (279-476)

95%UI=95% uncertainty interval

Methods

Data sources:

- Laboratory surveillance data, laboratory tests reimbursement data, general practitioners surveillance data, clinical hospital data, cause specific mortality data, population studies (health interview survey), scientific literature and expert opinions.

Model construction and parameter choices:

- Model parameters included underreporting of positive diagnoses, test sensitivity, proportion of samples analyzed, proportion of samples prescribed and submitted and finally proportion of medical care seeking.
- Disease models used to describe health states (morbidity, duration and outcomes) and based on models described by ECDC (BCoDE) and WHO (FERG).

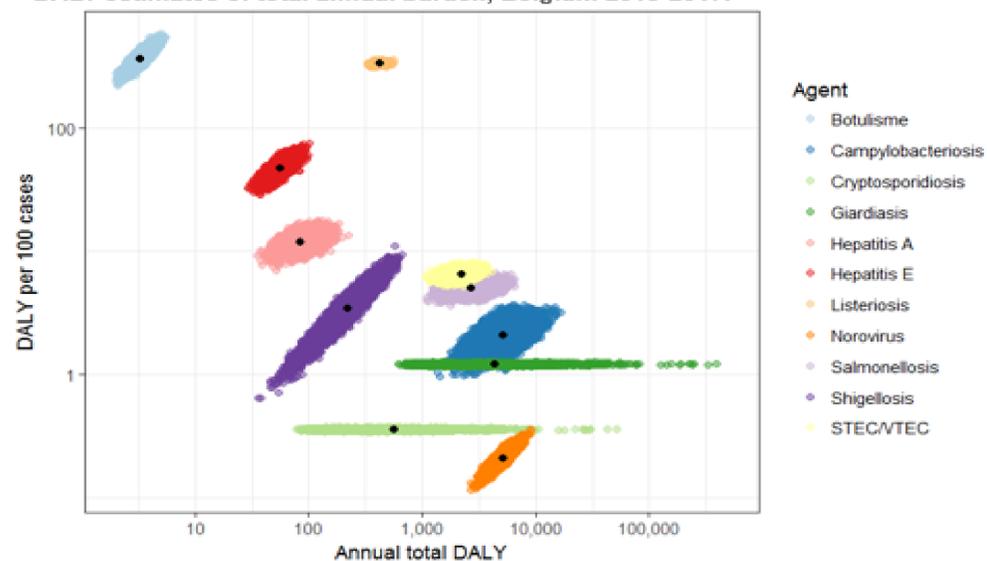
Data analysis:

- Quantification of DALY per case and for the population. Source attribution proportions based on results of WHO expert elicitation.
- Monte Carlo simulations to account for uncertainty around incidence estimates.
- SAS (7.1) and R (3.4.1) used for data analysis.

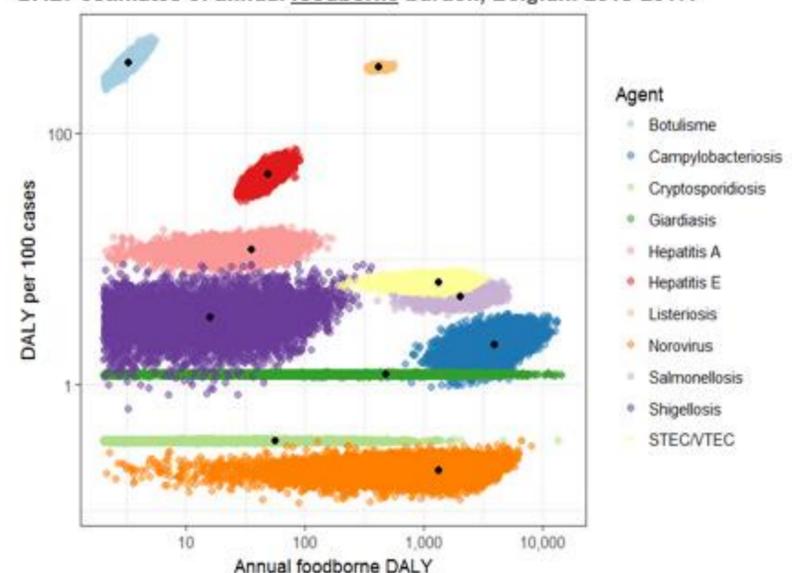
Conclusions & recommendations

- Considerable burden related to food- and waterborne diseases.
- Comparable burdens for viral, bacterial and parasitic agents.
- Preventive food safety measures may focus on *Campylobacter* & *Salmonella*, with highest food-attributable burdens.
- Public health priority may be considered for *Listeria*, *E. coli* & *Salmonella*, with considerable 'per case' and total burden.

DALY estimates of total annual burden, Belgium 2013-2017.



DALY estimates of annual foodborne burden, Belgium 2013-2017.



Limitations and recommendations

- Data gaps were identified concerning population wide studies in Belgium, therefore the multiplication factors and DALY estimates have sizable uncertainty ranges.
- The results for mild diseases depend strongly on the assigned disability weights, therefore the burden related to Norovirus might be misestimated compared to the burden of other analysed pathogens.
- We recommend that possible future population studies not only focus on the incidence, but also on morbidity variables.

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