

The global burden of nontyphoidal Salmonella invasive disease: a systematic analysis for the Global Burden of Disease Study 2017

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Background





Methods

- Systematic review and meta-analysis
- **Case definition:** culture confirmed NTS infection of a normally sterile site (blood, cerebrospinal fluid, pleural fluid, peritoneal fluid, joint fluid, etc.)
- PRISMA guidelines¹
- DisMod-MR²
 - Integration with GBD
 - Covariates malaria incidence, SDI, water sanitation
- Incidence, mortality, HIV-attributable fraction
- Health gap metrics (YLL, YLD, DALYs)







Nonfatal input data

256 geography-years of data







GBD Compare







GBD versus other estimates

• Two previous studies reported iNTS burden estimates, and both produced estimates for the year 2010:

Study	Estimated cases, 2010
Ao <i>et al</i> , 2015	3.4 million (2.1 to 6.5)
GBD 2017	622 thousand (490 to 800)
Kirk <i>et al</i> , 2015 (WHO)	597 thousand (?)





Age-standardized incidence rates, both sexes, 2017





Incidence rates by geographical location, 2017







Case fatality data

• 252 geography-years of data







Number of deaths by year

	Global deaths (thousands)			
Year	Males	Females	Both	
1990	22.4	20.4	42.8	
	(12.3, 37.9)	(11.4, 34.9)	(23.6, 72.7)	
1995	25.4	23.2	48.6	
	(14.1, 41.9)	(13.0, 38.8)	(27.0, 81.0)	
2000	31.1	27.9	59.1	
	(17.2, 51.7)	(15.7, 45.9)	(32.7, 97.5)	
2005	38.9	35.9	74.8	
	(22.6, 62.1)	(20.8, 58.2)	(43.3, 120)	
2010	34.8	32.8	67.6	
	(20.1, 56.8)	(19.1, 53.7)	(39.2, 110)	
2017	31.0	28.1	59.1	
	(17.4, 51.9)	(16.0, 46.6)	(33.3, 98.1)	





Case fatality: GBD versus other estimates

Study	Published	GBD 2017
Ao <i>et al</i> . Global	20% (3 to 40%)	14.5% (9.2 to 21.1%)
WHO: Sub-region A, HIV - WHO: Sub-regions B-E, HIV -	4.3% (3.9 to 6.6%) 10% (5 to 20%)	5.2% (2.5 to 9.3%) 12.0% (7.4 to 18.0%)





Age-standardized mortality rates, both sexes, 2017









All age HIV PAFs, by location, 2017





Results

Health gap metrics

	YLDs		YLLs		DALYs	
Year	Number	Rate	Number	Rate	Number	Rate
	(thousands)	(per million)	(thousands)	(per million)	(thousands)	(per million)
1990	1.75	0.30	2,994	501	2,996	501
	(1.00 to 2.74)	(0.17 to 0.47)	(1,626 to 5,217)	(273 to 867)	(1,629 to 5,219)	(273 to 868)
1995	2.09	0.35	3,422	559	3,424	560
	(1.18 to 3.26)	(0.20 to 0.53)	(1,890 to 5,937)	(310 to 965)	(1,892 to 5,939)	(310 to 965)
2000	2.64	0.42	4,201	676	4,203	676
	(1.51 to 4.07)	(0.24 to 0.65)	(2,322 to 7,174)	(373 to 1,152)	(2,324 to 7,176)	(374 to 1,153)
2005	3.49	0.54	5,326	836	5,329	836
	(2.06 to 5.44)	(0.32 to 0.85)	(3,107 to 8,723)	(488 to 1,371)	(3,111 to 8,726)	(488 to 1,371)
2010	3.16	0.47	4,848	732	4,851	732
	(1.81 to 5.03)	(0.27 to 0.75)	(2,744 to 8,117)	(415 to 1,234)	(2,746 to 8,122)	(415 to 1,235)
→ 2017	2.73	0.38	4,261	617	4,264	617
	(1.55 to 4.29)	(0.22 to 0.61)	(2,382 to 7,379)	(347 to 1,076)	(2,385 to 7,382)	(347 to 1,076)



Summary

- Global burden of iNTS is substantial
 - 534,600 cases
 - 59,100 deaths
 - 14.5 % case fatality
 - 24.3% deaths attributable to HIV
 - 4.3 million DALYs
- Geographic variation
 - sub-Saharan Africa
 - areas with low SDI
- Host-specific risk factors
 - age: children <5 years, elderly
 - HIV co-infection



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Thank you. Questions? andrea.parisi@anu.edu.au



Model overview





Nonfatal input data files

Input data	GBD 2017
Overall data sources	256 geography-years
Case notifications	48 geography-years
Clinical trial	21 geography-years
Surveillance - facility	87 geography-years
Surveillance - other/unknown	82 geography-years
Survey - longitudinal	18 geography-years