

INDIRECT COSTS ASSOCIATED WITH SKIN AND SOFT TISSUE INFECTIONS IN CHILDREN: A SYSTEMATIC LITERATURE REVIEW

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INTRODUCTION

- Skin diseases cause significant non-fatal disability worldwide, especially in resource-limited regions. Greater efforts to study the burden of skin disease in low resource settings and policy initiatives towards delivering high quality care are essential in improving the burden of skin diseases. (1)
- Skin and subcutaneous disorders were the 4th leading cause of nonfatal disease burden worldwide in 2010, 2013 and 2016, emphasizing the role of dermatology in the ever-expanding field of global health. (1)
- Acute bacterial skin and skin structure infections (ABSSSIs) have become a challenging medical problem associated with high direct and indirect costs to both the medical system and society. Infections due to bacteria with resistance to previously effective antimicrobials such as methicillin-resistant *Staphylococcus aureus* (MRSA) are increasing in incidence and have led to higher rates of complications, hospitalizations and, on occasion, death. (2, 3)

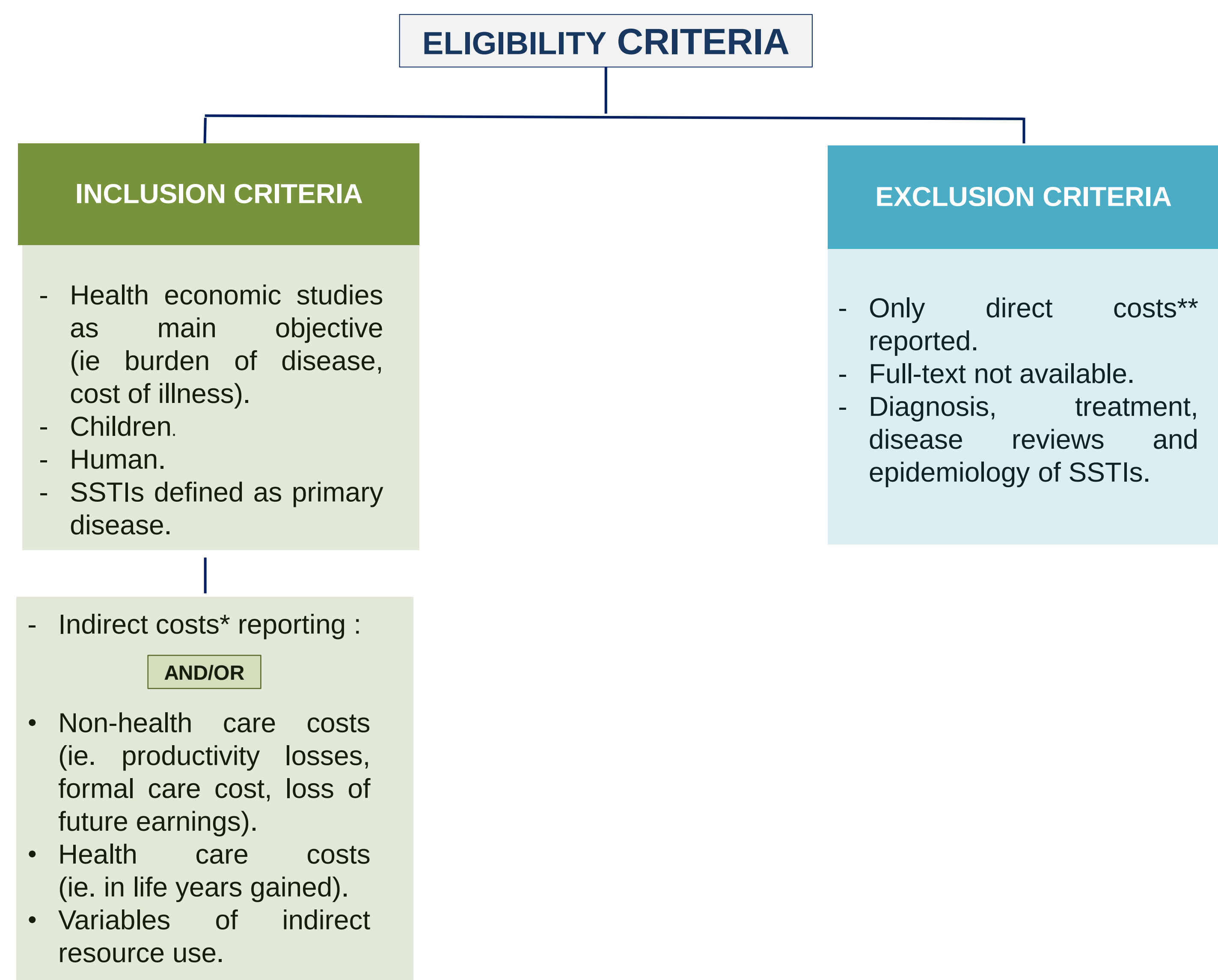
AIM

This Systematic Literature Review (SLR) was conducted to identify any published evidence related to indirect costs associated with skin and soft tissue infections (SSTIs) in children worldwide.

METHODS

- A systematic literature search was conducted through PubMed database in March 2019.
- Thirteen different search strategies were designed combining MeSH vocabulary and free terms, such as: << Skin Diseases, Infectious >>, << Child >>, << Cost of Illness >>, << Soft Tissue Infections >>, << Indirect costs >>, << Staphylococcal Skin infections >> and << Human >>.
- Only primary studies and reviews were included and no time, language or geographic limit was determined. The SSTIs recorded were defined as bacterial, viral, dermatomycoses and parasitic infestations.
- Identified studies were peer-reviewed to assess their inclusion in this project. Variations in authors' opinion were solved through discussion and consensus.

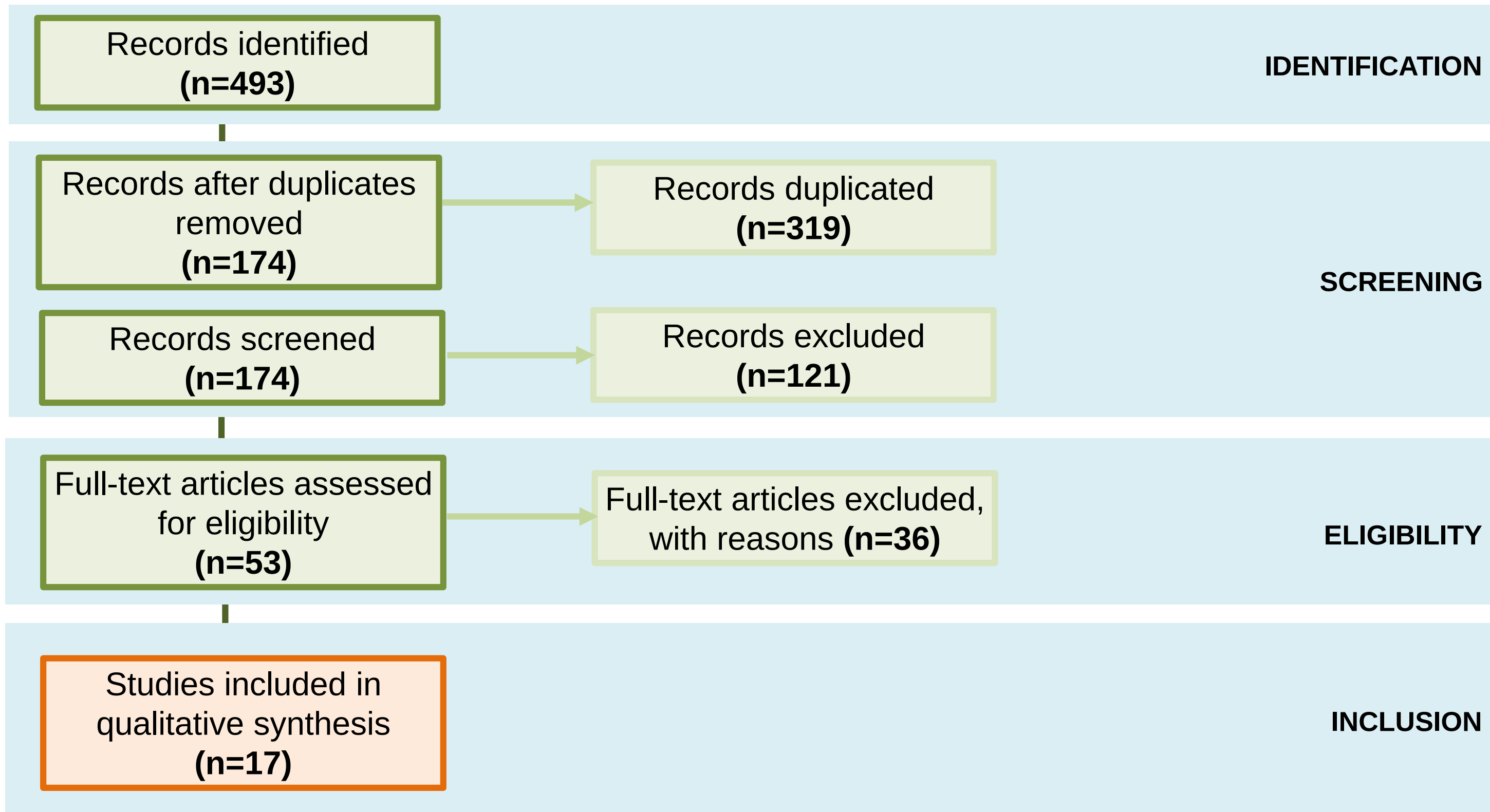
Inclusion and exclusion criteria



*The expenses incurred from the cessation or reduction of work productivity as a result of the morbidity and mortality associated with a given disease.
**Costs associated with medical resource utilization, which include the consumption of inpatient, outpatient and pharmacological services within the health care delivery system.

RESULTS

Of the 493 records identified initially, 17 publications were Reviewed.



- 7 studies did not report separated results for indirect costs in children vs. total population, so results have not been detailed in the table below.

Characteristics of the selected publications

Author, Year & Country	Pathogen & Group	Study design	Children age	Indirect costs and/or related variables collected
Bardach et al. 2012, Latin America & the Caribbean (4)	Varicella, Herpes zoster Viral	Systematic literature review and Meta-analysis	<15 years	- Number of workdays lost: outpatients (0.27 days; 4.84 days of duration); inpatients (5-15 days; 5-9.7 days of duration). - Societal cost (number of workdays lost) was estimated to be more than 1.5 \$ billion annually in the US (2011 US\$).
Counahan et al. 2007, Australia (5)	Lice infestation Parasitic	Cross-sectional survey	5-12 years	- Number of schooldays lost (not specified in number).
Giglio et al. 2018, Argentina (6)	Varicella Viral	Multi-center, retrospective chart review	1-12 years	- Number of workdays lost: outpatients (7.8 days); inpatients (4.8 days). - Total cost for productivity loss: outpatients (207 \$; 2015 ARS/US\$); inpatients (143.2 \$; 2015 ARS/US\$).
Gur et al. 2009, United States of America (7)	Lice infestation Parasitic	Cost-effectiveness analysis	3-12 years	- Number of schooldays lost (1 day). - Time of children home care/formal care (9 h/day). - Average wage of formal care (10 \$/h; 2008 US\$). - Total home care cost/formal care (90 \$; 2008 US\$). - Time lost due to medical visits (1 h). - Time lost due to treatment shopping time (0.5 h). - Average wage for parents (28.11 \$/h; 2008 US\$).
Hansen et al. 2004, United States of America (8)	Lice infestation Parasitic	Review	Not specified	- Number of schooldays lost (20 days). - Number of workdays lost (20 days). - Average wage for parents (136 \$/day). - Total cost for productivity loss (2,720 \$).
Meszner et al. 2017, Hungary (9)	Varicella Viral	Multi-center, retrospective chart review	1-12 years	- Number of workdays lost: outpatients (3.6 days); inpatients (2.5 days). - Total cost for productivity loss: outpatients (108.4 EUR; 2015 HUF/EUR); inpatients (182 EUR; 2015 HUF/EUR). - Total combined direct and indirect cost: outpatients (160.6 EUR; 2015 HUF/EUR); inpatients (736 EUR; 2015 HUF/EUR).
Pollack et al. 2015, United States of America (2)	SSTIs Bacterial	Review	<18 years	- Societal cost: 7,070-20,489 \$, depending on patient age. - Annual burden to society: 1.4-13.8 \$ billion on US society, depending on the CA-MRSA definitions and incidences.
Rice et al. 1992, United States of America (10)	Impetigo Bacterial	Cost-effectiveness analysis	3 months-16 years	- Number of schooldays lost (1.2-6.5 days). - Average schooldays cost (22.63 \$/day; 1989 US\$). - Number of workdays lost (0.2-1.3 days). - Average wage for parents (59.3 \$/day; 1987 US\$).
Wright et al. 2013, United States of America (3)	Subcutaneous abscesses Bacterial	Retrospective, comparative case review	<18 years (average <4 years)	- Average reduction of indirect hospital costs (traditional packing techniques vs. minimally invasive ones): 385 \$ (2,488 \$ vs. 2,103 \$); p<0.001.
Wysocki et al. 2018, Poland (11)	Varicella Viral	Multicenter, retrospective chart review	1-12 years	- Number of workdays lost: 4.7 days. - Total cost for productivity loss: outpatients (190.8 EUR; 2015 PLN/EUR); inpatients (238.9 EUR; 2015 PLN/EUR). - Total combined direct and indirect costs: outpatients (245.5 EUR; 2015 PLN/EUR); inpatients (1,198.1 EUR; 2015 PLN/EUR).

CA-MRSA: Community-associated methicillin-resistant *Staphylococcus aureus*; EUR: Euros; HUF: Hungarian Forint; PLN: Polish Zloty; SSTIs: Skin and soft tissue infections.

- **Bacterial SSTIs:** schooldays lost due to impetigo varied from 1.2 to 6.5. Working parents and school-age children were less likely to alter their daily activities in case of taking topic antibiotic (p<0.04). Besides, the estimated productivity losses related to community-associated MRSA (CA-MRSA) in children <15 years old were 6,806 \$ (2011 US\$), based on impetigo, cellulitis and folliculitis.
- **Varicella:** total cost for productivity loss in caregivers was estimated for outpatient and inpatient children from 1 to 12 years old. Results were 190.8 EUR and 238.9 EUR (Poland), 108.4 EUR and 182 EUR (Hungary), 207 \$ and 143.2 \$ (Argentina) respectively (2015 currency).
- **Pediculosis:** the estimated proportion of children that missed school in Australia was high (up to 30%). The related parental wages lost were estimated as 20 days of work in the US (2,720 \$).

CONCLUSIONS

- The burden of SSTIs is a multidimensional concept that encompasses psychological, social and financial consequences on the patients, their families and on society. In children, this impact is greater, both because of their fragility and the resources that they need.
- The economic burden of SSTIs is highly relevant but underestimated due to the lack of studies, especially for bacterial SSTIs. Quantifying SSTIs burden could help motivate, plan for and promote investment in relevant interventions to reduce transmission and infection incidence, as well as early identification and appropriate treatment before they progress.

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