

Unveiling the Cost-Effectiveness of Chlamydia Screening Strategies: A Systematic Review

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Keywords

Chlamydia screening · Cost-effectiveness · Quality-adjusted life years

Abstract

Background: Cost-effectiveness analyses of preventive screening strategies are paramount for public health to ensure effective resource use, especially for sexually transmitted infections such as Chlamydia, which lead to significant quality-adjusted life years (QALY) loss. **Summary:** This study systematically reviewed EMBASE, PubMed, and SCOPUS databases, from inception to October 2022, Chlamydia infection screening strategies' cost-effectiveness studies analyzing Incremental Cost Effectiveness Ratio (ICER) of QALYs versus no screening. Out of 487 studies, six were included, each employing distinct screening approaches, assumptions, and prevalence and incidence rates. The ICERs varied from USD 2,350/QALY gained with annual screening of women aged 15–24 years to EUR 117,529/QALY gained with women and men screening (age 16–29). **Key Messages:** The results underscore the impact of the different assumptions on ICERs and highlight the importance of precise epidemiology on Chlamydia infections. Studies characteriz-

ing the local population are crucial for accurate cost-effectiveness analysis and public health policy formulation.

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Custo-efetividade das estratégias de rastreio da clamídia: uma revisão sistemática

Palavras Chave

Rastreio de clamídia · Custo-efetividade · Anos de vida ajustados pela qualidade

Resumo

Contexto: Análises de custo-efetividade de rastreios são fundamentais para garantir o uso eficaz dos recursos na prevenção de infeções sexualmente transmissíveis, como a clamídia, que levam à perda de Anos de Vida Ajustados pela Qualidade (AVAQ). **Resumo:** Nesta revisão sistemática, foram recolhidos estudos da EMBASE, PUBMED e SCOPUS (até outubro/2022) que analisaram o custo-efetividade das estratégias de rastreio da infeção por

clamídia através do rácio de Custo-efetividade Incremental (RCI) dos AVAQ. Dos 487 estudos identificados, seis foram incluídos, cada um com diferentes estratégias, pressupostos e taxas de prevalência e incidência que substancialmente variam os RCIs: de \$2.350/AVAQ ganho com rastreio anual de mulheres (idade 15–24) a €117,529/AVAQ ganho com rastreio de mulheres e homens (idade 16–29). **Mensagens-chave:** Os resultados destacam o impacto dos diferentes pressupostos nas RCIs e salientam a importância de conhecer a epidemiologia da clamídia para uma análise precisa de custo-efetividade e formulação de políticas de saúde pública.

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Introduction

Chlamydia infection, caused by the bacteria *Chlamydia trachomatis*, is one of the most commonly reported sexually transmitted infections (STIs) globally, particularly affecting youth [1]. Characterized by its often asymptomatic nature, many individuals with the infection remain undiagnosed and untreated, leading to significant public health challenges. In 2020, there were an estimated 128.5 million new infections worldwide among adults aged 15–49 years, with a higher prevalence in the young [1]. In the European Union, the incidence rate was 73.9 cases per 100,000 population in 2021, and in Portugal, the incidence rate was 8.5 cases per 100,000 population. This discrepancy can be due to accessibility to diagnostic testing, data collection in surveillance systems, and implemented policies [2]. The prevalence of chlamydia infection is higher in young adults and adolescents, which can be attributed to factors such as increased sexual activity, lack of awareness, and insufficient screening [3, 4]. Although infections usually occur with minor symptoms, the consequences of untreated chlamydia can be severe. In women, untreated chlamydia infection can lead to pelvic inflammatory disease (PID), scar tissue formation blocking fallopian tubes, ectopic pregnancy, infertility, and chronic pelvic pain [5]. Reported rates of PID progression vary widely in the literature, ranging from as low as 0.1% to as high as 30% [6, 7]. This variability is due to differences in study populations (e.g., high-risk vs. general population), methodologies, and diagnostic criteria [8]. High estimates are often derived from studies involving high-risk individuals, which may not accurately reflect the

general population [9]. Nevertheless, these complications not only impose a considerable burden on the affected individuals but also result in a loss of quality-adjusted life years (QALYs) [10].

Because it is a commonly asymptomatic disease, chlamydia infection can go undetected and untreated. Therefore, early detection through effective screening strategies can be highly relevant to controlling the spread of the infection [11]. Programs of screening have been shown to reduce rates of adverse sequelae in women [12]. The Centers for Disease Control and Prevention recommends chlamydia screening every year for all sexually active women under 25, highlighting the importance of targeted screening in young populations [13]. Chlamydia screening and partner notification in the USA from 2000 to 2015 have been estimated to avert significant cases of PID, chronic pelvic pain, tubal factor infertility, and ectopic pregnancy in women.

Efficient allocation of resources is crucial, as it determines the feasibility and scalability of these initiatives. An economic analysis of chlamydia screening not only involves assessing the direct costs associated with various screening methods but also requires a comprehensive understanding of the long-term financial implications, including the potential savings from preventing advanced health complications. Public health interventions often have cost-effectiveness ratios better than or equivalent to healthcare interventions, demonstrating their potential for saving money in the long run [14]. When considering the implementation of screening programs, these should follow cost-effectiveness analysis, especially considering the barriers to investing in public health [14]. The National Institute for Health and Clinical Excellence (NICE) has been advocating for effectiveness threshold ranges for Incremental Cost-Effectiveness Ratios (ICER) between GBP 20,000 and GBP 30,000 per QALY gained, with other parameters analyzed simultaneously [15].

While extensive research has been conducted on the epidemiology and treatment of chlamydia infection, there remains a notable gap in the literature regarding the cost-effectiveness of chlamydia screening strategies, which can be crucial for the decision-making of designing and implementing screening programs. The primary objective of this systematic review was to assess and compare the cost-effectiveness of various chlamydia systematic screening strategies specifically targeted at the general population with the goal of providing a clear understanding of which strategies offer the most efficient use of resources without compromising the effectiveness of chlamydia detection and prevention.

Table 1. Full search queries used

Embase	('gonorrhea'/exp OR gonorrhea OR 'chlamydiae'/exp OR chlamydiae) AND ('screening'/exp OR screening) AND ('cost-effectiveness analysis'/exp OR 'cost-effectiveness analysis') NOT [review]/lim")
PubMed	("gonorrhea"[MeSH Terms] OR "chlamydia"[MeSH Terms]) AND "cost-benefit analysis"[MeSH Terms] AND "mass screening"[MeSH Terms]
Scopus	("gonorrhea" OR "chlamydia") AND "cost-benefit analysis" AND "mass screening"

Methods

This study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [16] using a PICO-style methodology, as outlined below.

Eligibility Criteria

For eligibility, we included studies assessing the cost-effectiveness of any chlamydial infection systematic screening on the general population above preadolescence, reporting ICER based on QALYs, and comparing screening strategies to a no-screening scenario. To increase sensitivity, the initial screening phase included any mention of cost-effectiveness outcomes related to the screening in abstracts and titles. The subsequent full-text review focused on studies reporting on the specific cost-effectiveness outcome of ICER based on QALYs. Exclusion criteria were screening of individuals aged <15 years; focusing on subpopulations with specific pathological, or social conditions; or assessing multiple STIs without specific chlamydia outcomes, and those with inaccessible full texts.

Search Strategy

Searches were performed from inception until October 2022 on Embase, PubMed and Scopus databases, using an optimized search query, shown in Table 1, using terms pertaining to "Chlamydiae," "Gonorrhea" (an STI closely linked to Chlamydia), "Screening," and "Cost-effectiveness analysis."

Selection of Evidence

Two independent reviewers (E.M. and A.G.) reviewed all titles and abstracts, and if eligible, then full texts for study eligibility. Discrepancies were resolved through consensus and when no consensus was reached, a third author (A.L.) resolved the discrepancy. The reference lists of full-text analyzed studies were examined to identify additional relevant studies.

Quality Assessment

The Consensus Health Economic Criteria (CHEC) list was utilized to assess the methodological quality of economic evaluations. This instrument consists of a 19-item list covering study design, time horizon, perspective, cost evaluation, outcome measurements, discounting, conclusion, generalization, conflict of interest, and ethical issues [17]. Two independent reviewers applied the checklist, and discrepancies were resolved through consensus. If no consensus was reached, a third author resolved the discrepancy.

Presentation of the Results

A data chart was created to extract variables relevant to the review question (Study Design; Model Assumptions; Prevalence and incidence rate; Screening Strategy; Sensitivity ranges; Age range; Cost-effectiveness ICER). The data were extracted by E.M. and A.G. and revised by A.L. in an interactive discussion process. Data management involved End-Note X9.2[®] and Microsoft Excel 2016[®].

Results

A comprehensive search of the Embase, PubMed, and Scopus databases yielded a total of 487 records related to Chlamydia screening and cost-effectiveness analysis. After a thorough screening of titles and abstracts, 75 records were deemed eligible for further evaluation, two of them retrieved from reference lists. Ultimately, six studies met the inclusion criteria and were included in this review. The selection process is shown in Figure 1.

The six included studies are summarized in Table 2. They encompass a range of model assumptions, study designs, prevalence and incidence rates, and screening strategies. Each study evaluated the cost-effectiveness of Chlamydia infection screening in distinct populations and age groups.

The included studies received CHEC scores ranging from 17 to 18, indicating high quality. Detailed

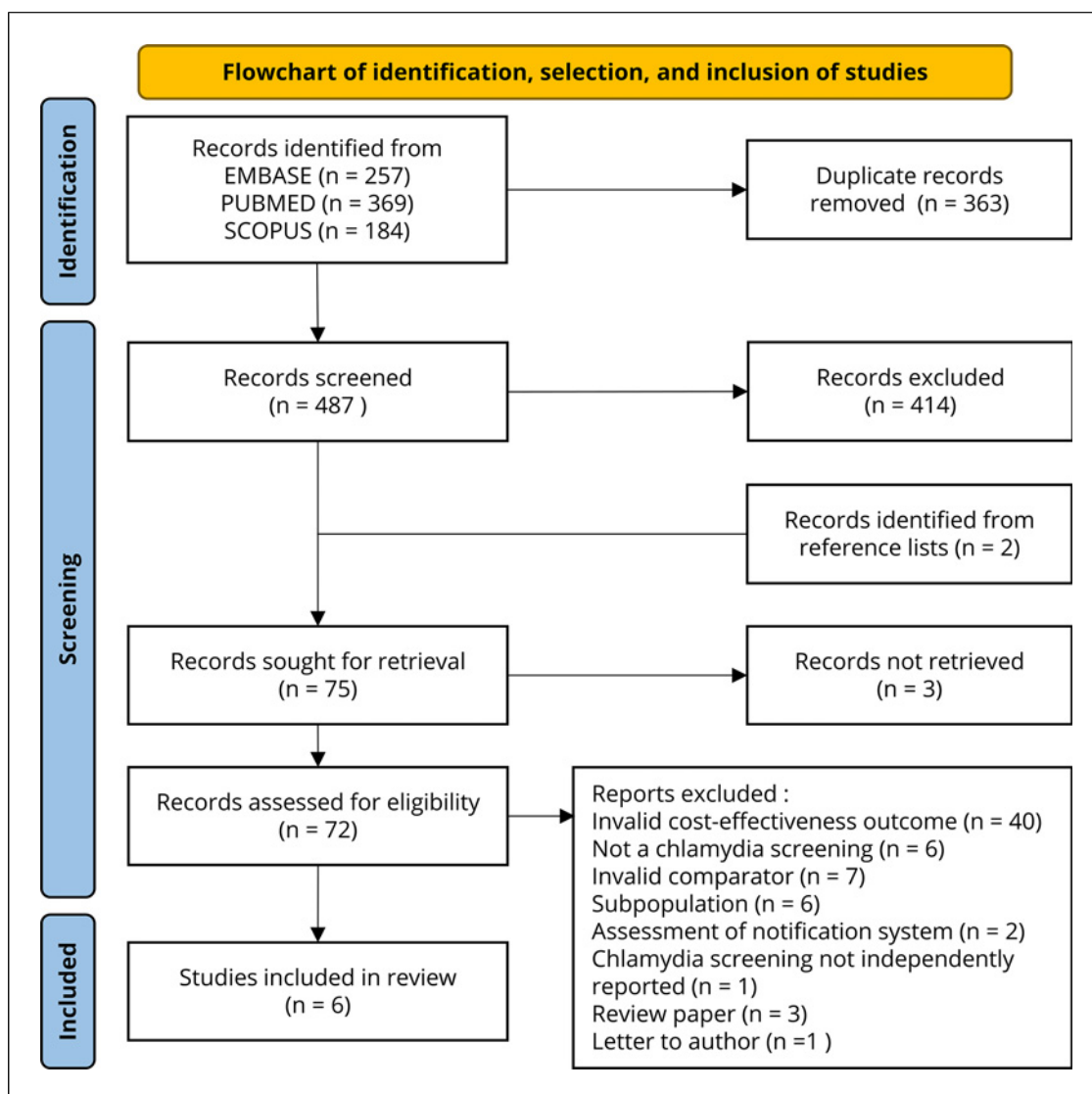


Fig. 1. Flowchart of identification, selection, and inclusion of studies.

information on the quality assessment of each study is presented in the online supplementary material (for all online suppl. material, see <https://doi.org/10.1159/000542685>).

Different studies utilized varied models: Hu et al. [18], Hu et al. [19] and Walleser et al. [20], employed fixed simulated models; Deogan et al. [21] in 2010 employed a fixed simulated model based on a cohort with specific outreach effectiveness; Adams et al. [22] in 2007 and de Wit et al. [23] in 2007, utilized a dynamic simulated model. Walleser et al. [20] and Adams et al. [22] used a health system perspective while the remaining studies used a societal perspective.

The prevalence and annual incidence of Chlamydia infection assumed varied across the studies, ranging from a low disease burden of 2% of prevalence in dynamic models [23] to a 6% annual incidence in static models [18]. Multiple screening strategies were explored across the studies. Annual screening of women was common among several studies, targeting different age ranges (e.g., 15–24, 15–29, 16–29 years). Other strategies included a combined screening of women and men, semestral screenings, and walk-in screenings on specific days annually.

Cost-effectiveness outcomes showed considerable variation across studies with different screening strategies

Table 2. Included studies, design, assumptions, and their cost-effectiveness data

Author, Country	Study design	Model assumptions and range used for sensitivity analysis	Disease prevalence/incidence and range used for sensitivity analysis	Screening strategy ¹	Age range, years	Cost-effectiveness (cost/QALY gained) ¹
Hu, 2004, US	Fixed simulated model Societal perspective Time horizon: lifetime Discount rates: not stated Population simulated Young females Size (♂/♀): 100,000 (0:100%)	Adherence to intervention: 100% (not performed) Natural history - Persistence of infection probability: 30% (0–70%) - PID progression probability: 30% (10–40%) - Ectopic pregnancy probability after PID: 9% (not performed) - CPP probability after PID: 18% (not performed) - Infertility probability after PID: 20% (not performed) - Epididymitis probability: not applicable Others Percentage of women who were notified of a positive test result and returned for treatment: 80%	Annual incidence: 6% (2–33%)	Annual screening of women	15–24	2,350 \$ (Not reported)
				Annual screening of women and semestral screening of previously infected	15–24	2,830 \$ (Not reported)
				Annual screening of women and semestral screening of previously infected	15–29	7,490 \$ (Less 0 \$ to ~200,000 \$)
Hu, 2006, US	Fixed simulated model Societal perspective Time horizon: lifetime Discount rates: 3% Population simulated Young females Size (♂/♀): not stated	Adherence to intervention: 100% (not performed) Natural history - Persistence of infection probability: 30% (0–70%) - PID progression probability: 30% (0.4–40%) - Ectopic pregnancy probability after PID: 4% (2–10%) - CPP probability after PID: 12% (5–20%) - Infertility probability after PID: 9% (5–23%) - Epididymitis probability: not applicable	Annual incidence: 4% (2–33%)	Annual screening of women and semestral screening of after a positive result	15–29	7,180 \$ (Less 0 \$ to more 50,000 \$)
				Biannual screening of women and semestral screening of after a positive result	15–29	6,770 \$ (Less 0 \$ to more 50,000 \$)
				Biannual screening of women and semestral screening of after a positive result	15–24	6,000 \$ (Less 0 \$ to more 50,000 \$)
				Biannual screening of women	15–24	5,660 \$ (Less 0 \$ to more 50,000 \$)

Table 2 (continued)

Author, Country	Study design	Model assumptions and range used for sensitivity analysis	Disease prevalence/incidence and range used for sensitivity analysis	Screening strategy ¹	Age range, years	Cost-effectiveness (cost/QALY gained) ¹
Walleser, 2006, Australia	Fixed simulated model Healthcare system perspective Time horizon: 25 years Discount rates: 5% Population simulated Young females visiting GP Size (♂/♀): not stated	Adherence to intervention: not stated Natural history - Persistence of infection probability: 30% (not performed) - PID progression probability: 10% (4–16%) - Ectopic pregnancy probability after PID: 1.2% (0.3–2.1%) - CPP probability after PID: 3% (0.75–11%) - Infertility probability after PID: 1% (0.2–6%) - Epididymitis probability: not applicable	Initial prevalence: 2.8% (0.7–17%) Annual incidence: 3.2% (0.1–13.5%)	Annual screening of women	16–25	2,968 AU\$ (Less 0 AU\$ to 677,156 AU\$)
Adams, 2007, UK	Dynamic simulated model Healthcare system perspective Time horizon: 10 years Discount rates: 3.5% Population simulated Heterosexual young females and males Size (♂/♀): 40,000 (50%:50%)	Adherence to intervention: 50% (1.4%–70%) Natural history - Persistence of infection probability: not stated - PID progression probability: 10% (1–30%) - Ectopic pregnancy probability after PID: 7.6% (not performed) - CPP probability after PID: not used - Infertility probability after PID: 10.8% (not performed) - Epididymitis probability: 2% (not performed) Others - Effective partner notification of 50% (20–50%)	Initial prevalence: 3.2% (not performed)	Annual screen of women	18–25	18,476 £ (4,960 £ to 139,219 £)
				Annual screen of women and if they changed partner in < 6 months	18–25	28,212 £ (8,834 £ to 206,685 £)
				Annual screen of women and men	18–25	27,269 £ (7,899 £ to 643,037 £)

Table 2 (continued)

Author, Country	Study design	Model assumptions and range used for sensitivity analysis	Disease prevalence/incidence and range used for sensitivity analysis	Screening strategy ¹	Age range, years	Cost-effectiveness (cost/QALY gained) ¹
Deogan, 2010, Sweden	Fixed simulated model based on cohort Societal perspective Time horizon: 30 years Discount rates: 3% Population simulated Young females and males	Adherence to intervention: 10% (5%–35%) Natural history - Persistence of infection probability: not stated - PID progression probability: 20% (10–20%) - Ectopic pregnancy probability after PID: 6% (not performed) - CPP probability after PID: 16.5% (not performed) - Infertility probability after PID: 20.5% (not performed) - Epididymitis probability: 4.1% (not performed)	Prevalence: 5% (1–10%)	One day per year walk-in screening of women and men	15–29	8,346.05 € (Less 0 € to 22,052 €)
				One day per year walk-in screening of women	15–29	10 810.77 € (Less 0 € to 21,015 €)
				One day per year walk-in screening of men	15–29	6,085.35 € (2,522 € to 2,675,025 €)
de Wit, 2015, Netherlands	Dynamic simulated model Societal perspective Time horizon: 10 years Discount rates: 4% for costs and 1.5% for effects Population simulated Young females and males Size (♂/♀): not stated	Adherence to intervention: 16% (16%–30%) Natural history - Persistence of infection probability: not stated - PID progression probability: 10% (not performed) - Ectopic pregnancy probability after PID: 7.7% (not performed) - CPP probability after PID: 15% (not performed) - Infertility probability after PID: 12% (not performed) - Epididymitis probability: 2% (not performed)	Prevalence: 2% (not performed)	Annual screening of women and men	16–29	117,529 € (7,456 € to 155,239 €)
			Prevalence: 3.4% (not performed)	Annual screening of women and men	16–29	79,239 € (6,134 € to 110,020 €)

Model variables are reported with ranges used for sensitivity analysis in brackets. If no sensitivity analysis is performed for a variable, it is stated as “not performed.” CPP, chronic pelvic pain; PID, pelvic inflammatory disease; QALY, Quality-adjusted life years.

¹Incremental cost-effectiveness ratios (ICR) of screening strategies when compared to no screening are reported with sensitivity analysis results between brackets. When screening is cost-saving when compared to no screening reported ICER is as less 0 €/€ per QALY gained.

and age ranges. For instance, Hu et al. [18] suggested that the most cost-effective strategy was with annual screening of women aged 15–24 years with a cost of USD 2,350 per QALY gained. On the contrary, Wit et al. [23] proposed the least cost-effective strategy with an annual screening of women and men ages 16–29 years at EUR 117,529 per QALY gained.

Considering the annual screening of women for Chlamydia infection, a strategy used across multiple studies but with varying assumptions and prevalence/incidence rates, cost-effectiveness outcomes varied considerably. Hu et al. [18] proposed annual screening of women (Age 15–24) costs USD 2,350 per QALY gained with an annual incidence of 6%, PID progression probability of 30% and adherence to screening of 100%. Adams et al. [22] 2007 proposed an annual screen of women ages 18–25 years and showed a cost of GBP 18,476 per QALY gained with a prevalence of 3.2%, PID progression probability of 10%, and adherence rates of 50%.

Considering annual screening of women with semestral follow-up screening after a positive result shows varying cost-effectiveness depending on assumptions and incidence rates. Hu et al. [18] proposed this strategy for women aged 15–24 years, costing USD 2,830 per QALY gained, with a prevalence of 6%, PID progression probability of 30%, and adherence to the screening of 100%. For women aged 15–29 years, the cost was USD 7,490 per QALY gained [18]. Hu et al. [19] suggested a similar strategy for women aged 15–29 years, costing USD 7,180 per QALY gained with an annual incidence rate of 4%, PID progression probability of 30%, and adherence to the screening of 100%.

If annual screening is considered for both women and men, cost-effectiveness changed considerably with different assumptions. De Wit [23] proposed annual screening of women and men aged 16–29 years, with costs ranging from EUR 79,239 to EUR 117,529 per QALY gained, with prevalences between 2% and 3.4%, PID progression probability of 10%, and adherence rates of 16–30%. Adams et al. [22], for women and men aged 18–25 years, showed a cost of GBP 27,269 per QALY gained with a prevalence of 3.2%, PID progression probability of 10%, and adherence to the screening of 50%.

Considering biannual screening just for women for Chlamydia infection, Hu et al. [19] proposed that for women aged 15–24 years, the cost per QALY gained was USD 5,660, (for an incidence rate of 4%, PID progression probability of 30%, and adherence to the screening of

100%). When including semestral screening after a positive result, the cost was USD 6,000 per QALY gained [19]. Sensitivity analyses conducted by the studies revealed that the parameters with the most significant impact on cost-effectiveness were prevalence and incidence rates [18–20], the probability of progression to PID and other chronic complications [19, 20], the persistence of infection in static models [18, 19], and adherence to the screening protocol [23].

Discussion

The systematic review identified six studies that met the inclusion criteria, each employing various model assumptions, screening frequencies, and target demographics. There was considerable heterogeneity regarding models' assumptions (PID and chronic complications progression probabilities, adherence to screening), prevalence/incidence rates, and screening strategy which resulted in ICER ranging between USD 2,350 to as high as EUR 117,529.

A substantial range in cost-effectiveness outcomes for a seemingly similar screening strategy (annual screening of women) can be seen due to differing prevalences/incidence rates and varying model assumptions. The costs per QALY gained fluctuate significantly across studies, indicating the importance of precise assumptions for cost-effectiveness analyses of screening strategies, and revealing the complex interplay of factors that influence the cost-effectiveness of Chlamydia screening.

The increase in frequency of screening strategy (from biannual to annual screening) increases the ICER in all included studies [19, 23]. The same happens when the maximum age of the included participants increases [18, 19]. When comparing studies, a higher prevalence/incidence leads to a decrease in ICER [23]. This happens since an increase in the prevalence means that fewer participants need to be tested to find a positive case. This is the explanation for the increase in ICER when the age increases, as older ages have a lower prevalence of chlamydia [24]. It may also explain why an increase in frequency leads to a higher ICER since fewer cases happen in 1 year than in 2 years (and thus a lower prevalence). In the studies that included men, screening both men and women proved to have a higher ICER than just screening women in two of the studies [21–23]. However, screening just men appears to have a lower ICER than just screening women, when comparing the same strategy to women [21]. The

increase in screening in women with previous infections also resulted in a higher ICER [18, 19]. The same holds if the frequency of screening increases with a change in partner [22].

As stated previously and supported by the sensitivity analysis, model assumptions such as the prevalence/incidence rate of Chlamydia infection in the screened population, the probability of PID progression, and adherence to screening play crucial roles in determining the cost-effectiveness of the screening strategy. Regarding the probability of PID progression, an estimated risk of 30% appears to be too high because, as stated previously, it is based on studies of patients at higher risk for complications compared to the general population [25–27]. This likely leads to an underestimation of ICERs when using those values. According to Wit et al. [23] adherence significantly impacts the cost-effectiveness of screening strategies. Although screening adherence depends on several factors, screening rates for the general population in the USA in 2022 ranged between 48.3% and 55.8% [28]. When critically examining the adherence rates of 100% and the high probability of PID progression of 30% used by Hu et al. [18, 19], it becomes evident that these assumptions may lead to an underestimation of the ICERs. A high PID progression probability of 30% (the upper end of reported values) increases the expected number of PID cases prevented by screening, thereby exaggerating the health benefits and making the screening program appear more cost-effective than it might be with more conservative estimates [28]. In contrast, the lower adherence rate, coupled with the low rates of chronic complications in de Wit's model compared to other studies, might contribute to the higher ICER observed.

Regarding the impact of different perspectives, the societal perspective often results in a more favorable (lower) ICER by accounting for a broader range of costs and benefits. In contrast, the health system perspective typically yields a more conservative (higher) ICER by focusing solely on direct medical costs and benefits within the healthcare system [29]. Due to the significant heterogeneity among the included studies, it is challenging to determine the extent to which this variability influenced the different ICERs. As for modelling techniques used, static models are easier to manipulate and exhibit less uncertainty in predicting disease trajectories within individuals. They focus on the uncertainty of disease outcomes following the acquisition of infection rather than the uncertainty surrounding the acquisition of infection. In contrast, dynamic models incorporate transmission dynamics and population effects, offering a more comprehensive view of the intervention's impact. How-

ever, these models are more complex and introduce new assumptions, increasing uncertainty and variability in ICER estimates, due to the intricate interplay of factors affecting transmission and outcomes [30, 31]. This increased uncertainty, coupled with other reasons already discussed, might further contribute to the disparity seen in ICER results between studies such as de Wit et al. and Adams et al. [22, 23] when compared to similar strategies in the other studies.

Another possible reason for higher ICERs in the later studies could be inflation, which increases not only the cost of the strategies but also the cut-off to consider a strategy cost-effective [32]. Given the lack of organized information regarding chlamydia infection, our systematic review provided important insights regarding the factors that influence the cost-effectiveness of organized screening strategies. To our knowledge, only one recent systematic review tackled the issue [33]. Nevertheless, this review lacked focus regarding information that is crucial to policymakers, namely a description of the screening strategy and key elements that are crucial to making decisions, namely the prevalence of the disease in the population and models' assumptions.

In contrast to Yao et al. [33], whose systematic review identified 25 relevant studies focused on the general population, our study's methodology yielded a smaller set of 6 papers. This discrepancy primarily stems from our emphasis on cost-effectiveness analysis using ICER of QALYs, which excluded studies employing alternative economic evaluation methods such as cost-utility or cost-benefit analyses, and outcomes such as major outcomes averted. These methods could potentially offer different insights into the economic value of Chlamydia screening strategies, highlighting additional benefits or costs that our approach did not capture.

While acknowledging the importance of other forms of economic evaluation, a focus on cost-effectiveness analysis has its merits [34]. QALYs serve as a comprehensive measure that integrates both the quantity and quality of life into a single metric. Major outcomes averted as an outcome have limited use for direct comparison as its definition varies across studies. The use of ICER of QALYs also aligns with established criteria used by health agencies and policymakers worldwide. For instance, NICE in the UK uses ICER of QALYs as a benchmark to inform funding decisions for healthcare interventions [15]. Given budget constraints in healthcare, cost-effectiveness analysis provides additional practical insights into which interventions provide the most health benefit for the available resources. By focusing our review on these outcomes, we

ensure clarity and relevance in evaluating screening strategies.

Despite these strengths, all the evidence included in this systematic review was from studies on high-income countries. This generalizes middle-income countries and low-income countries harder since the prevalence of the disease is higher in these countries [35]. The same holds true for older people since studies only included screening strategies for a maximum age of 29 years, underscoring the prevalence of chlamydia in older people [36]. The assertion of studies that proclaim screening to be cost-effective is undermined by the reliance on assumptions that result in underestimated ICERs. A significant portion of the variability of assumptions stems from the scarcity of robust evidence and consensus within the literature. Considerable heterogeneity among studies in terms of methodologies, population demographics, and economic evaluation frameworks further complicates the ability to draw universal conclusions and apply findings broadly.

It is important to note that the authors identified a relevant study by Rönn [37] during the review writing process. Ideally, this would have prompted a reevaluation of the search strategy to include the period not covered. Since this reevaluation was not conducted, the existence of this study must be acknowledged, although its inclusion would not significantly alter the conclusions of this review.

The importance of this systematic review lies in providing insights for healthcare policymakers and practitioners. The findings have the potential to guide the allocation of resources in a manner that maximizes public health outcomes considering the efficiency of the options. Ultimately, this research could pave the way for more effective, efficient, and tailored chlamydia screening programs, leading to better health outcomes for young individuals and a potential reduction in the overall burden of the disease on the healthcare system. Future research should focus on less tackled realities, namely strategies for screening chlamydia and the cost-effectiveness in middle- and low-income countries, and assess the importance of screening in older populations, and in populations where the prevalence of the disease is higher.

Conclusion

The findings from our review are particularly valuable for healthcare policymakers and practitioners aiming to allocate resources efficiently to maximize public health

benefits. Our systematic review offers crucial insights into the cost-effectiveness of chlamydia screening strategies, highlighting the significant impact of model assumptions such as prevalence rates, adherence to screening, and chronic complication probability on ICER outcomes. The wide range of ICERs observed underscores the necessity for precise and consistent assumptions, as assertions that screening is universally cost-effective are undermined by reliance on assumptions that may underestimate ICERs. The scarcity of robust evidence and consensus in literature complicates the ability to draw universal conclusions. These results emphasize the need for accurate epidemiological data on chlamydia infections and localized studies to inform effective and precise cost-effectiveness analyses and public health policy formulation.

Statement of Ethics

Ethical approval for this study was not required. As a systematic review, this study did not require recruiting participants or collecting personal, sensitive, or confidential information. It also did not use participant-level information from other studies, only aggregated data from published investigations.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Emídio Mata and António Angélico-Gonçalves: Screened, reviewed, and conducted data collection for the systematic review. Additionally, they contributed to the study design and manuscript drafting. Ana Rita Leite: Contributed significantly to the study design, manuscript writing, and discussion. Diogo Queiroz Almeida: Reviewed the work thoroughly, provided critical input, and contributed considerably to the manuscript preparation.

Data Availability Statement

No primary data were used. All the secondary data used was extracted from published papers which are properly identified in the references.

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