Frequent screening for asymptomatic chlamydia and gonorrhoea infections in men who have sex with men: time to re-evaluate?

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There is increasing debate regarding the harms and benefits of frequent asymptomatic screening for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in men who have sex with men (MSM). One concern is that frequent asymptomatic screening could result in increased antimicrobial resistance in an array of sexually acquired infections and other pathogens, due to selection pressure exerted by frequent broad-spectrum antimicrobial usage within some sexual networks. Here, we outline the harms and benefits of frequent *C trachomatis* and *N gonorrhoeae* screening in MSM in high-income settings and propose that screening frequency be reduced. We describe the evidence gaps that should be further explored to better understand the implications of reducing the frequency of asymptomatic *C trachomatis* and *N gonorrhoeae* screening in MSM and the surveillance systems that should be in place to prepare for such changes.

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For more on **treatment guidelines for STIs** see https://sti.guidelines.org.au/ or http://sti.guidelines.org.nz/

Introduction

Rates of sexually transmitted infections (STIs) in high-income settings are approaching levels not seen since the 1970s, with particularly high rates in men who have sex with men (MSM).[1,2] Key factors contributing to this increase include globalisation, social networking, and HIV treatment and prevention strategies, leading to changes in sexual behaviour.[1–3] In addition, there have been numerous changes in STI testing, including recommendations for frequent asymptomatic screening for STIs in populations at high risk (eg, those taking HIV pre-exposure prophylaxis [PrEP] and people living with HIV)[4–7] and widespread implementation of highly sensitive nucleic acid amplification tests into clinical microbiology laboratories,[8] including assays with targets for multiple STIs.[9]

The majority of bacterial STIs in MSM are asymptomatic.[10,11] In general, detection of an STI necessitates action, including antimicrobial treatment, sexual health promotion, and contact tracing.[1] Treatment guidelines for STIs in high-income settings generally include long-acting penicillin (eg, benzathine penicillin) and broad-spectrum antimicrobials, including extended-spectrum cephalosporins (eg, ceftriaxone and cefixime), macrolides (eg, azithromycin), and tetracyclines (eg, doxycycline).[5,12] In contrast to STI treatment, which is largely delivered in the community setting, use of such broad-spectrum agents in hospitals is often strictly regulated and monitored by antimicrobial stewardship programmes.[13]

There is increasing evidence that broad-spectrum antimicrobial use for STIs could be contributing to antimicrobial resistance at the population level due to selection pressure exerted by frequent antimicrobial exposure within some sexual networks. In a 2021–22 outbreak of extremely drug resistant *Shigella sonnei* (resistant to seven antimicrobial classes) in the UK, epidemiological and phylogenetic data suggested that person-to-person transmission occurred in dense sexual networks of MSM, many of whom were on HIV PrEP and had antimicrobial treatment for bacterial STIs in the preceding year.[14] Empirical evidence also suggests that widespread use of antimicrobials commonly used for STI treatment is not only associated with antimicrobial resistance in STI pathogens,[15–18] but also might have other negative effects, with antimicrobial resistance developing in other pathogens and commensals, such as *Staphylococcus aureus* and Gram-negative enteric flora.[19–21] At an individual level, broad-spectrum antibiotics might cause medication-related adverse events and increase the risk of colonisation with multidrug-resistant commensals.[19–21] Antimicrobials also disrupt the microbiome, increasing the risk of complications such as *Clostridium difficile* infection, and might contribute to a range of other diseases, including obesity and asthma.[22,23]

In this context, there is increasing debate regarding the risks and benefits of frequent asymptomatic screening for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in MSM.[24–28] It is timely to revisit the question of whether frequent asymptomatic screening for *C trachomatis* and *N gonorrhoeae* is leading to net benefit or harm in the context of updates to international STI treatment guidelines,[5] the increasing threat of antimicrobial resistance in STIs,[29,30] emerging evidence that increased STI screening might be driving further antimicrobial resistance,[24–28] and the intense strain on health-care resources as a result of COVID-19 and mpox (formerly known as monkeypox).[31,32]

The purpose of this review is to present and reappraise the evidence regarding the benefits and harms of frequent asymptomatic screening for *C trachomatis* and *N gonorrhoeae* in MSM in high-income settings (figure). To assess the appropriateness of this practice, available evidence was used to determine if asymptomatic screening for *C trachomatis* and *N gonorrhoeae* in MSM in high-income settings aligns with Wilson and Jungner's ten principles of a public health screening programme (table).[33] Our review excludes screening among men who

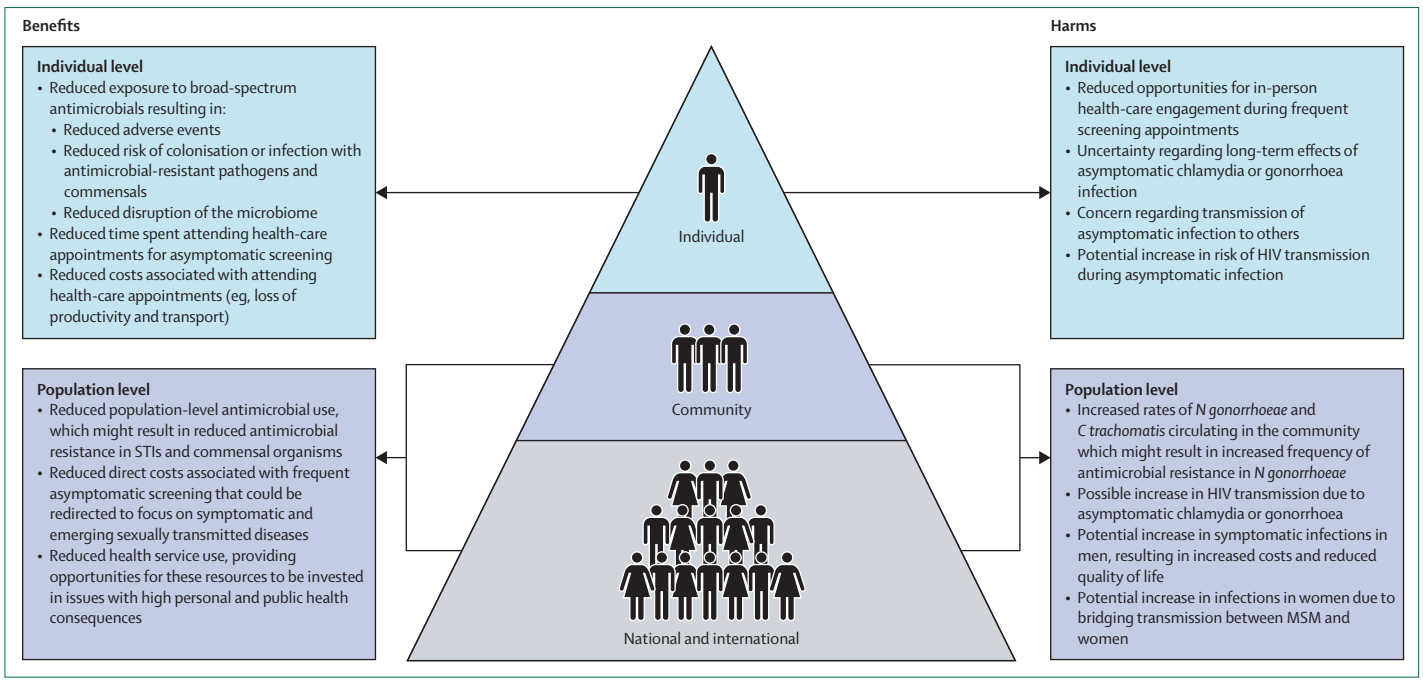

Figure: **Potential benefits and harms of reducing the frequency of screening for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in asymptomatic MSM**
MSM=men who have sex with men. STIs=sexually transmitted infections.

have sex with both men and women, for whom *C trachomatis* and *N gonorrhoeae* can have serious consequences on reproductive and neonatal outcomes in female partners.[34,35] The scope of this review is also limited to high-income settings where highly sensitive screening tests are available, frequent testing is recommended by national policy, and HIV biomedical prevention strategies, such as PrEP, are accessible. It is important to note that STI testing might not be accessible to individuals in many parts of the world, and that over 90% of new *C trachomatis* and *N gonorrhoeae* infections occur in low-income and middle-income settings.[36] Interventions that improve care for this group will have the greatest overall impact on global STI epidemiology. Nevertheless, it is necessary to establish best practice within the high-income context to ensure that the benefits of health programmes in these settings outweigh the harms and that resources are used wisely.

Potential benefits of reduced asymptomatic screening in MSM

See Online for appendix

Current STI screening guidelines in MSM in high-income settings are described in the appendix (p 1).[5,12,37–41] In summary, most guidelines recommend sexually active MSM undergo STI screening every 3–6 months, including *C trachomatis* and *N gonorrhoeae* nucleic acid amplification tests at three anatomical sites (ie, oropharyngeal, anorectal, and urine), syphilis serology, and HIV serology (if not known to be HIV-positive).

A substantial proportion of *C trachomatis* and *N gonorrhoeae* infections detected in MSM are asymptomatic and detected through screening, particularly at oropharyngeal and rectal sites.[42,43] Approximately 70% of chlamydia infections detected in MSM are asymptomatic[11] with approximately 90% of rectal and pharyngeal infections being asymptomatic.[8,44] Approximately 80% of gonorrhoea infections detected in MSM are asymptomatic,[11] with approximately 80–90% of rectal and pharyngeal infections being asymptomatic.[8,45] As such, the direct health-related morbidity associated with asymptomatic extragenital *C trachomatis* and *N gonorrhoeae* infections is low, with the major short-term impact of infection on the individual being related to the requirement for treatment and contact tracing.

The ExGen cohort study of 140 MSM in the USA who undertook weekly rectal and pharyngeal swabs for 48 weeks estimated the median duration of carriage of *C trachomatis* to be 6 weeks at pharyngeal sites and 13 weeks at rectal sites,[44,46] and the median duration of carriage of *N gonorrhoeae* to be 16 weeks at pharyngeal sites and 9 weeks at rectal sites.[45,46] Although there were some limitations in this study, including censoring of participants, a substantial proportion of extragenital cases monitored in this study spontaneously resolved; five (63%) of eight pharyngeal *C trachomatis* cases and 13 (41%) of 32 rectal *C trachomatis* cases, and nine (43%) of 21 pharyngeal *N gonorrhoeae* cases and six (30%) of 20 rectal *N gonorrhoeae* cases. In addition, a high number of single-positive specimens (ie, sample positive for *C trachomatis* or *N gonorrhoeae* for 1 week and negative the following week) were observed for each site–organism combination, probably due to

	Case for asymptomatic screening	Case against asymptomatic screening
The condition should be an important health problem	*C trachomatis* and *N gonorrhoeae* are important public health problems with the potential for long-term sequelae, particularly in women and children	*C trachomatis* and *N gonorrhoeae* at extragenital sites are usually asymptomatic and no direct long-term consequences of disease on the individual are known
There should be an accepted treatment for patients with recognised disease	Treatment with defined antimicrobials is the treatment for patients with recognised *C trachomatis* and *N gonorrhoeae* infection, which reduces complications associated with genital disease	There is increasing evidence that antimicrobial therapy for asymptomatic STIs might be contributing to antimicrobial resistance in STIs and other pathogens; individual-level benefit of antimicrobial therapy for asymptomatic extragenital STIs has not been established
Facilities for diagnosis and treatment should be available	The screening test for asymptomatic *C trachomatis* and *N gonorrhoeae* is the same as that used for diagnosis of symptomatic disease and most screening occurs at facilities that are also equipped to provide treatment	Facilities for diagnosis and treatment are available; however, it is important to recognise that public health and clinical resources are finite, and the resources required to provide screening for asymptomatic *C trachomatis* and *N gonorrhoeae* in MSM could be redirected from other important public health issues
There should be a recognisable latent or early symptomatic stage	There is recognisable latent or early symptomatic disease for both *C trachomatis* and *N gonorrhoeae*; however, many infections are asymptomatic, which is problematic for genital infection in women, in whom asymptomatic infection can cause long-term sequelae	The majority of asymptomatic *C trachomatis* and *N gonorrhoeae* infections in MSM are extragenital, asymptomatic, and not associated with any known long-term sequelae
There should be a suitable test or examination	A suitable test is available for diagnosis of *C trachomatis* and *N gonorrhoeae*, which is the same test used for screening; this test is highly sensitive and specific for *C trachomatis* and *N gonorrhoeae* pathogens	The same NAAT tests used for diagnosis of *C trachomatis* and *N gonorrhoeae* are used for screening; these tests are highly sensitive; however, they might be associated with a proportion of false positive results due to presence of remnant non-viable nucleic acid from spontaneously resolved infections
The test should be acceptable to the population	The test is well accepted in the community; it is minimally invasive and can usually be self-collected	Although an individual test is well accepted, low adherence with asymptomatic *C trachomatis* and *N gonorrhoeae* screening guidelines for MSM suggests that there are barriers to achieving the recommended frequency of screening
The natural history of the condition, including development from latent to declared disease, should be adequately understood	The natural history of *C trachomatis* and *N gonorrhoeae* infections are reasonably well understood at genital sites	Evidence regarding the natural history of extragenital infections is emerging, but evidence surrounding long-term individual health impacts of extragenital infection is sparse
There should be an agreed policy on whom to treat as patients	There is an agreed upon policy to treat all patients in whom *C trachomatis* or *N gonorrhoeae* infections are detected to prevent disease in the individual and reduce transmission in the community	There is an agreed upon policy to treat all patients in whom *C trachomatis* or *N gonorrhoeae* infections are detected; however, further investigation is required to understand the individual and public health impacts of the treatment of asymptomatic *C trachomatis* and *N gonorrhoeae* at extragenital sites
The cost of case-finding should be economically balanced in relation to possible expenditure on medical care as a whole	The cost-effectiveness of case-finding has been predicated on modelling, which suggests that screening will reduce incidence of *C trachomatis* and *N gonorrhoeae* disease; however, this has not been demonstrated in randomised controlled trials or the existing observational literature	The cost-effectiveness of case-finding is not well defined; the main determinant of the cost-effectiveness of screening for asymptomatic *C trachomatis* and *N gonorrhoeae* is whether screening reduces disease prevalence, which has not yet been determined
Case-finding should be a continuing process and not a once and for all project	Case-finding is a continuing process, as infection does not induce natural immunity and reinfection is common; frequent monitoring is recommended due to modelling that suggests this will reduce population-level incidence of infection	Case-finding is a continuing process, as infection does not induce natural immunity and reinfection is common; repeat testing is required; however, available observational data does not provide robust evidence that more frequent screening reduces prevalence of *C trachomatis* or *N gonorrhoeae* compared with annual screening

MSM=men who have sex with men. NAAT=nucleic acid amplification tests. STI=sexually transmitted infection.

Table: **Assessment of the appropriateness of frequent asymptomatic screening for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in MSM in high-income settings, according to Wilson and Jungner's principles of a public health screening programme[33]**

transient colonisation or false positive results. These positive results would have resulted in antibiotic treatment for no reason if detected by routine screening. Short-term spontaneous clearance of *C trachomatis* and *N gonorrhoeae* at urogenital, anorectal, and oropharyngeal sites has also been observed in the clinical setting.[47]

To our knowledge, there are no randomised controlled trials of screening for asymptomatic *C trachomatis* or *N gonorrhoeae* in MSM, and empirical data analysing the individual-level and public health benefits of screening on *C trachomatis* and *N gonorrhoeae* prevalence in MSM are sparse.[48] The US Preventive Services Task Force did a systematic review including data up to May 21, 2020, and concluded there was insufficient evidence to assess the balance of benefits and harms of screening for *C trachomatis* and *N gonorrhoeae* in men,[49] indicating that well designed, robust studies evaluating this practice have not been done. In addition, a systematic review identified 12 observational studies assessing the prevalence of *C trachomatis* and *N gonorrhoeae* infection after the introduction of screening programmes in MSM and found mixed results, concluding there was little

evidence that screening reduced the prevalence of these infections. Importantly, this review found no evidence that more frequent screening reduced the prevalence of *C trachomatis* or *N gonorrhoeae* compared with annual screening.[27]

Despite modelling studies suggesting that more frequent screening and detection of *C trachomatis* and *N gonorrhoeae* in MSM who are at high-risk would reduce the incidence of these infections over time,[50–52] this reduction has not been shown in practice, with the incidence of *C trachomatis* and *N gonorrhoeae* continuing to increase in MSM in high-income settings, despite most international guidelines recommending screening every 3–6 months.[1] Paradoxically, a study comprising two large online surveys for MSM done in Europe in 2010 and 2017 showed that high country-level asymptomatic screening rates were positively associated with symptomatic *C trachomatis* and *N gonorrhoeae*.[53] Notably, as they were from a retrospective cross-sectional study design based on self-reported data, these findings are subject to multiple potential biases and confounding. However, the authors suggested that there might be biological plausibility to these findings due to the arrested immunity hypothesis that early diagnosis and treatment of asymptomatic infections might result in a paradoxical increase in the risk of symptomatic disease because of reduced protective immune responses stimulated by asymptomatic carriage.[53]

A concern regarding asymptomatic screening for *C trachomatis* and *N gonorrhoeae* in MSM is that frequent exposure to broad-spectrum antimicrobials for treatment of asymptomatic infection might result in individual-level and population-level harm. Drug-resistant *N gonorrhoeae* has been deemed a critical threat to public health by the US Centers for Disease Control and Prevention and WHO.[29,54] Ecological studies have shown an association between population-level antimicrobial usage and antimicrobial resistance in *N gonorrhoeae*.[16,18,55] The most robust of these studies incorporated standardised antimicrobial susceptibility data and antimicrobial consumption data from 24 countries involved in the European Gonococcal Antimicrobial Surveillance Programme. This study showed a positive correlation between the consumption of extended-spectrum cephalosporins and the gonococcal minimum inhibitory concentration of extended-spectrum cephalosporins, and a positive correlation between the consumption of fluoroquinolones and the prevalence of gonococcal resistance to ciprofloxacin.[16]

Ecological studies have also shown a positive correlation between STI screening intensity and increased gonococcal minimum inhibitory concentration of extended-spectrum cephalosporins.[56,57] Importantly, data collected from ecological studies are inherently limited as it is not possible to link individual-level exposure to antimicrobials or STI screening intensity to increased antimicrobial resistance, nor can ecological studies adequately control for confounding factors. However, further studies have shown that recent individual-level exposure to antimicrobials for STI treatment and recurrent episodes of gonorrhoea are associated with subsequent infection with *N gonorrhoeae* strains that are more resistant to first-line therapies, including extended-spectrum cephalosporins and azithromycin (evidenced by raised minimum inhibitory concentration to these agents).[15,58]

Economic evaluations of STI testing have used methods such as cost-effectiveness (ie, measuring major outcomes averted, such as pelvic inflammatory disease or infertility) and cost-utility analyses (ie, measuring quality-adjusted life-years).[59] Given the absence of randomised trial evidence on the effectiveness of screening in MSM, the high rate of asymptomatic infection, and the low risk of complications in men, the applicability of these measures to assess the value of an asymptomatic screening programme in MSM is questionable. Direct costs of frequent asymptomatic screening for *C trachomatis* and *N gonorrhoeae* are substantial, with annual STI screening for MSM aged 15–64 years in the USA costing an estimated US$1·3 billion in 2014, with almost $750 million attributable to *C trachomatis* and *N gonorrhoeae* testing.[60] When increased four-fold to account for screening every 3 months, as per current guidelines, the total amounts to approximately $3 billion. Notably, these estimates exclude return clinic visits, treatment or follow-up services, and the indirect costs borne by the client (eg, transport to appointments and loss of productivity). Removing the need for frequent screening might enable redirection of finite clinical and public health resources, such as an improved focus on primary prevention and treating and monitoring clinical disease. This reappraisal of resource utilisation is particularly important in the context of the impact that COVID-19 and mpox have had on clinical and public health capacity.

The impact of the recommendation to screen for *C trachomatis* and *N gonorrhoeae* every 3 months on the individual should also be acknowledged. This impact includes the individual cost of quarterly attendance at health services, the real or perceived stigma associated with the recommendations for frequent screening, and the resulting community perception that certain populations might be responsible for high rates of STIs. Despite recommendations for frequent screening for asymptomatic STIs in MSM, screening rates are suboptimal, even in populations who are at higher risk (eg, those taking HIV PrEP and people living with HIV).[61,62] This finding suggests that the current level of recommended screening is not acceptable to a substantial proportion of the affected population.[61,63]

Potential harms of reduced frequency of asymptomatic screening in MSM

There are several potential harms that need to be carefully considered and sufficiently mitigated before

implementing reduced *C trachomatis* and *N gonorrhoeae* screening. First, reducing the frequency of asymptomatic *C trachomatis* and *N gonorrhoeae* screening might reduce the opportunities for health-care engagement and health promotion, including immunisation and condom use. However, as syphilis and HIV screening will still be recommended every 3 months for MSM, frequent opportunities for health-care engagement would be available and could be offered in more innovative ways. Studies have shown a diverse range of preferences for delivery of HIV and STI testing, ranging from self-testing to clinic services.[63] For example, rather than requiring a clinic appointment, asymptomatic screening for syphilis and HIV could be done at a laboratory service, which has been shown to reduce health service use without reducing the rate of screening, disease incidence, or quality-of-life scores.[64] Clinical review might only be required annually or semi-annually for those who wish to attend health-care services less frequently when using this model. Alternatively, reviews every 3 months could be done via telehealth, with specimen collection for HIV and syphilis testing done at a more local and accessible location.[63]

Second, the long-term effects of asymptomatic *C trachomatis* and *N gonorrhoeae* carriage in men are unknown. Despite having no overt clinical disease, inflammatory changes associated with infection could have local and systemic effects on the health of the individual.[65] Evidence also suggests that *C trachomatis* and *N gonorrhoeae* infections are associated with an increased risk of HIV transmission.[66] Although this association is prone to bias and confounding,[66] it is important that programmes undertake a population-specific risk assessment that considers the prevalence of HIV and access to effective HIV prevention strategies, such as PrEP, when considering reducing the frequency of screening for *C trachomatis* and *N gonorrhoeae* in their population. Notably, HIV PrEP is highly efficacious despite high rates of chlamydia and gonorrhoea in MSM taking PrEP.[67] Importantly, the concept of withholding antimicrobial therapy despite detection of a potential pathogen is not novel in the field of bacterial infectious diseases. For example, guidelines recommend not screening for or treating asymptomatic bacteriuria (except in specific populations, such as pregnant women and those undergoing invasive urological procedures) due to an absence of clinical benefit and the risk of driving antimicrobial resistance.[68] Similarly, guidelines recommend against antimicrobial therapy for most mild cases of symptomatic gastrointestinal pathogens, such as non-typhoidal *Salmonella enterica*, due to restricted benefit, increased risk of adverse events, and risk of prolonged shedding.[69]

Third, by reducing the frequency of asymptomatic screening for *C trachomatis* and *N gonorrhoeae*, the rates of these organisms circulating in the community are likely to increase. This rate increase might represent a risk for increasing frequency of antimicrobial resistance in *N gonorrhoeae* due to transmission of resistance genes from non-gonococcal organisms, particularly at the oropharynx. However, a substantial proportion of *N gonorrhoeae* infections are concentrated within sexual networks of highly sexually active MSM.[70] By removing frequent exposure to broad-spectrum antimicrobials due to treatment of asymptomatic STIs, selection pressure for antimicrobial-resistant organisms within these networks might be reduced. Furthermore, reducing antimicrobial exposure might promote the survival of commensal *Neisseria* spp that can inhibit *N gonorrhoeae*.[71] In addition, immune responses triggered by exposure to *C trachomatis* and *N gonorrhoeae* could result in short-term immunity that attenuates clinical disease, which might be bolstered by reduced treatment of asymptomatic disease.[53] Given the complex interplay of transmission dynamics, organism plasticity, host immune responses, and microbiome interactions involved in *N gonorrhoeae* infection, it will be difficult to predict the response to the proposed change in practice despite the most sophisticated models. Robust systems to mitigate any unintended consequences should, therefore, be in place for the period following any change in frequency of screening, including enhanced surveillance for antimicrobial-resistant *N gonorrhoeae* and nimble public health systems that are prepared to respond to any observed increases in antimicrobial resistance.

Fourth, by reducing screening in men at high risk, there might be a risk of bridging transmission from men to women, in whom infertility and neonatal infection could occur. Analysis of phylogenetic and epidemiological data from Australia shows bridging transmission of *N gonorrhoeae* occurs between MSM and women.[72] Excluding men who have sex with both men and women from changes to screening, and educating these individuals and their health-care providers on the importance of adhering to more frequent screening is crucial to mitigating this risk. Notably, identification of these individuals might be challenging and additional training of health-care providers might be required to enable appropriate risk assessment and counselling of individuals who might be at risk of transmitting *C trachomatis* and *N gonorrhoeae* to women. In addition, enhanced surveillance for symptomatic disease in both men and women would be required in the period following any change in frequency of screening.

Finally, the potential psychosocial impacts of this practice might be detrimental. At the population level, there might be a perception of health-care inequity for high-risk populations that might already be marginalised on the basis of their sexual practices. Community engagement will be key to understanding the effect of any changes to current recommendations. Potential concerns from such individuals could include the

Panel: **Recommendations for further research activities**

- Acceptability: qualitative research involving key stakeholders, including the affected community, community advocacy groups, clinicians, and public health authorities, is needed to assess the acceptability of reducing screening frequency for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in asymptomatic men who have sex with men (MSM)
- Modelling: modelling studies that simulate contemporary real-world data, including dynamic sexual networks, symptomatic and asymptomatic disease at different anatomical sites, and the risk of antimicrobial resistance development are required to better inform the potential impacts of reduced frequency of *C trachomatis* and *N gonorrhoeae* screening in asymptomatic MSM
- Effectiveness: randomised controlled trial evidence evaluating the effectiveness of quarterly screening for MSM on prevalence and incidence of *C trachomatis* and *N gonorrhoeae* in this population is needed; such trials should also evaluate key data, such as HIV transmission, antimicrobial resistance, and adverse events
- Education: before implementation, educational campaigns are needed to ensure that populations at high risk for bridging transmission to women clearly understand the recommendation to continue frequent screening for *C trachomatis* and *N gonorrhoeae*; in addition, education of MSM and their health-care providers regarding the harms of frequent screening and the rationale for reduced screening recommendations would be required before any change was implemented
- Clinical disease monitoring: all studies should monitor for increased rates of symptomatic disease in both men and women in the period after any change in recommended screening frequency
- Resistance monitoring: all studies should investigate the development of resistance in bacterial sexually transmitted infections and commensal organisms after any change in recommended screening frequency
- Antimicrobial usage assessment: all studies should assess the usage of antimicrobials in the population before and after any change in recommended screening frequency
- Cost-effectiveness: cost-effectiveness analyses incorporating appropriate differential costs between asymptomatic and symptomatic infection are required to better understand the impact of reduced screening frequency for *C trachomatis* and *N gonorrhoeae* in asymptomatic MSM

psychosocial consequences of having an undiagnosed STI and the potential personal health impacts of this, unwittingly transmitting an STI to a partner, and awareness that undiagnosed STIs might be more likely to be present in their sexual network.[63] Importantly, individual requests for *C trachomatis* and *N gonorrhoeae* testing should not be denied, although individual-level counselling regarding the advantages and disadvantages of screening would be recommended.

What is needed to reduce asymptomatic screening?

Whether the harms of frequent asymptomatic screening for *C trachomatis* and *N gonorrhoeae* in MSM will outweigh benefits is unknown, but the ongoing threat of antimicrobial resistance is so great that action needs to be taken. To help guide this action, there are several evidence gaps that should be explored to better understand the implications of reducing the frequency of asymptomatic screening for *C trachomatis* and *N gonorrhoeae* in MSM (panel). First, qualitative research in partnership with key stakeholders and communities affected by the proposed changes will be pivotal to understand the acceptability and psychosocial effect of reducing the frequency of screening and identify what would be needed to allay concerns about less frequent screening. Second, quantitative research, including modelling of the potential effect of the proposed change on symptomatic disease, antimicrobial usage, antimicrobial resistance, and health-care costs, will inform policy makers, health-care providers, and clinicians of the expected results of these changes. Finally, robust and timely monitoring systems must be in place, with increased surveillance in the period after any guideline change for (1) increases in symptomatic disease, both in MSM and those at risk for serious sequelae (eg, women and neonates), (2) increases in asymptomatic *C trachomatis* and *N gonorrhoeae* in women, (3) increases in *N gonorrhoeae* antimicrobial resistance and *C trachomatis* and *N gonorrhoeae* treatment failure, (4) and outbreaks of emerging sexually acquired bacterial pathogens that might have been masked by broad-spectrum antimicrobial treatment of asymptomatic *C trachomatis* and *N gonorrhoeae*.

Another important consideration is that the use of doxycycline as a biomedical prevention strategy for STIs, including *C trachomatis* and *N gonorrhoeae*, might lead to revised recommendations regarding STI prevention and behavioural change in MSM in the near future. Early studies suggest that doxycycline prophylaxis might result in reduced rates of asymptomatic STIs, particularly *C trachomatis* and syphilis; however, there are ongoing concerns that doxycycline as STI prophylaxis will be yet another driver of antimicrobial resistance.[73] If reduced frequency of *C trachomatis* and *N gonorrhoeae* screening and introduction of doxycycline prophylaxis in MSM are implemented concurrently, ascertaining the effect of each intervention on STI incidence and antimicrobial resistance will be difficult. A staged implementation of these strategies would, therefore, be required to monitor the safety and effectiveness of each intervention. Ultimately, a well designed randomised trial to investigate the effect of quarterly screening on *C trachomatis* and *N gonorrhoeae* prevalence and resistance in MSM in high-income settings is required.

Conclusion

We have outlined the harms and benefits of frequent *C trachomatis* and *N gonorrhoeae* screening in MSM, and whether the current approaches are doing more harm than good is unclear. However, given ongoing concerns about antimicrobial resistance, reassessing the rationale for screening guidelines and their potential harms and benefits is crucial. This reassessment is particularly important when there might have been substantial advances in scientific understanding, new biomedical practices, and behavioural changes. Reducing the frequency of asymptomatic screening for *C trachomatis* and *N gonorrhoeae* to annually, the current recommendations for syphilis and HIV serology every 3 months would not change, nor would the recommendations for the testing and treatment of symptomatic STIs and the testing and immunisation strategies for hepatitis A and B. Delayed diagnoses of syphilis, HIV, and viral hepatitis or a missed opportunity for immunisation have unacceptably high personal, maternal–fetal, and public health consequences, and changes to the frequency of screening for these infections is not recommended. The resources saved by reducing asymptomatic screening for *C trachomatis* and *N gonorrhoeae* could be invested into strategies to improve primary prevention, detection, and management of these infections.

Reducing the frequency of screening for *C trachomatis* and *N gonorrhoeae* should be considered by policy makers, public health practitioners, and clinicians. Public health guidelines could be adjusted according to the epidemiological context of each country, informed by the health settings and acceptability of current and proposed practices. Qualitative research regarding the acceptability of current and proposed screening practices and quantitative assessment of the impacts of the change, including increased surveillance for clinical outbreaks and antimicrobial resistance, are key to informing the acceptability and safety of this proposal. Importantly, health access and equity are crucially important, and no one should be denied access to screening for *C trachomatis* and *N gonorrhoeae* when this is requested.

Contributors

JSH and DAW conceived and designed the study and provided overall supervision for the work. EW undertook the literature review, wrote the first draft of the manuscript, and designed the figures. All authors provided critical review and revision of the text and approved the final version for publication.

Declaration of interests

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