Chapter 8.

Process and outcome measures for improving the quality and equity of *Helicobacter pylori* screen-and-treat programmes for gastric cancer prevention

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Summary

- A population-based *H. pylori* screen-and-treat programme for gastric cancer prevention should adhere to the principles of an organized screening programme for effective and equitable outcomes across groups.
- The programme should be supported by an information system for data collection and generation of quality indicators.
- Monitoring quality indicators enables ongoing improvements to the efficiency, effectiveness, and safety of a programme.
- An *H. pylori* screen-and-treat programme has the greatest chance of being equitable if the people with highest rates of *H. pylori* infection participate and are successfully treated, and monitoring this is important.

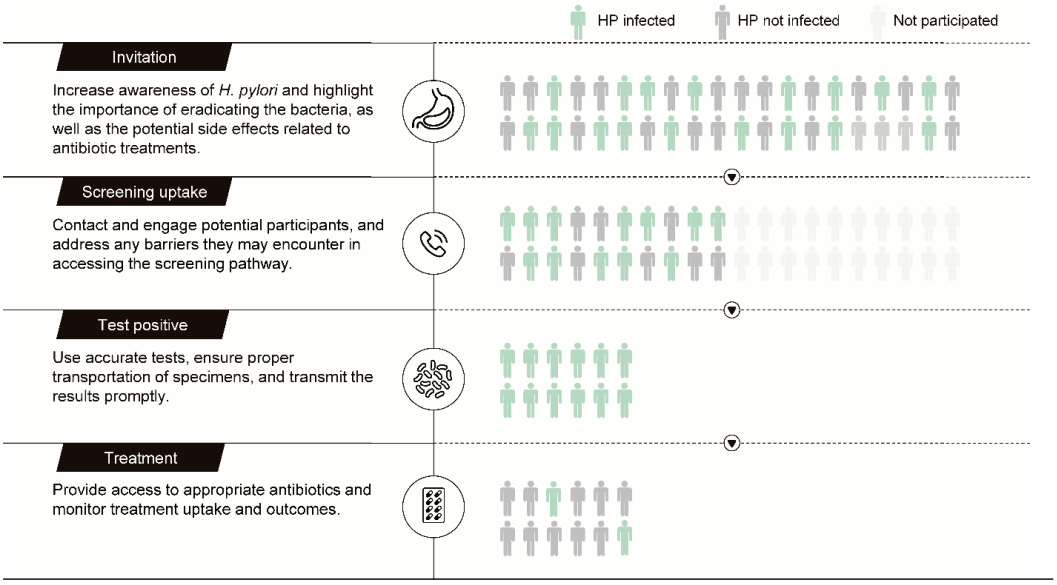

Fig. 8.1. Visual abstract. HP, *H. pylori*.

8.1 Introduction

In 2022, scientists from IARC published an international consensus statement on the essential and desirable criteria for an organized cancer screening programme [1]. According to the World Health Organization, screening programmes are only likely to achieve a high coverage of the at-risk population and deliver the desired impact at the population level when they are implemented using an organized approach [2]. Moreover, organized screening programmes spend health-care resources in a more cost-effective manner [3].

Although the *H. pylori* screen-and-treat strategy for gastric cancer prevention is not formally a cancer screening programme, because it focuses on screening for and treating *H. pylori* infection rather than gastric cancer [4], it has many commonalities with cancer screening programmes. To be effective, both gastric cancer screening and screening for *H. pylori* infection should follow the public health principles of disease screening. Because the goal is cancer prevention, it is logical to use cancer screening programmes as models. An effective *H. pylori* screen-and-treat strategy should adhere to the principles of cancer screening. Members of the advisory board of the IARC Cancer Screening in Five Continents (CanScreen5) project have identified 16 essential criteria for organized cancer screening programmes, which include having a protocol for the screening programme and providing continuing training of service providers [1]. Nine of the 16 criteria are concerned with the quality assessment of the programme, including monitoring and evaluation according to programme indicators. This list underlines the importance of quality assessment and is also applicable for *H. pylori* screen-and-treat strategies.

This chapter describes the required quality indicators that need to be collected to enable diligent quality assessment, monitoring, and evaluation of *H. pylori* screen-and-treat programmes. Centralized information systems play an important role in this process by storing detailed histories of the participants, including screening results, information about follow-up tests, and treatment data, which facilitate the continuity of care (Section 8.2). Quality indicators can be generated based on various follow-up periods before analysis, including short-term indicators (Section 8.3), intermediate-term indicators (Section 8.4), and long-term indicators (Section 8.5). The potential harms associated with screening are explored in Section 8.6. Section 8.7 provides an outline of how monitoring of quality indicators, disaggregated by ethnicity and

socioeconomic position, can be used to improve equitable health outcomes, with real-world examples.

8.2 Information systems

When an *H. pylori* screen-and-treat programme is implemented, data items are generated from different stages of the programme over time. This generally requires an information system to collect the data. Attention should be given to local data protection regulations and rules on obtaining consent from participants for their data to be collected and potentially linked to other data sets. Data can be analysed weekly, monthly, or yearly to generate the quality indicators that assist in auditing and monitoring the performance of the programme, including identifying eligible people, ascertaining screening test results, tracking the follow-up for participants with positive test results, and evaluating the effectiveness of the programme (Fig. 8.2). These indicators should be part of the ongoing quality improvement cycle in which this information is used to improve the performance of the *H. pylori* screen-and-treat programme. These indicators should include measures of the completion of the key steps in the pathway, adherence to best practices within these steps, and timeliness, and they should be measured for the total eligible population and with stratification by key demographic variables.

In the system, emphasis should be placed on ensuring the effective treatment of infections. Screening programmes may initially focus on testing but can face challenges in ensuring follow-up treatment [2]. This includes promptly communicating *H. pylori* test results to individuals who are diagnosed, providing access to the appropriate antibiotics, and monitoring treatment uptake and outcomes. The system should also identify bottlenecks in the screening workflow to ensure that the number of individuals invited does not exceed the available treatment capacity.

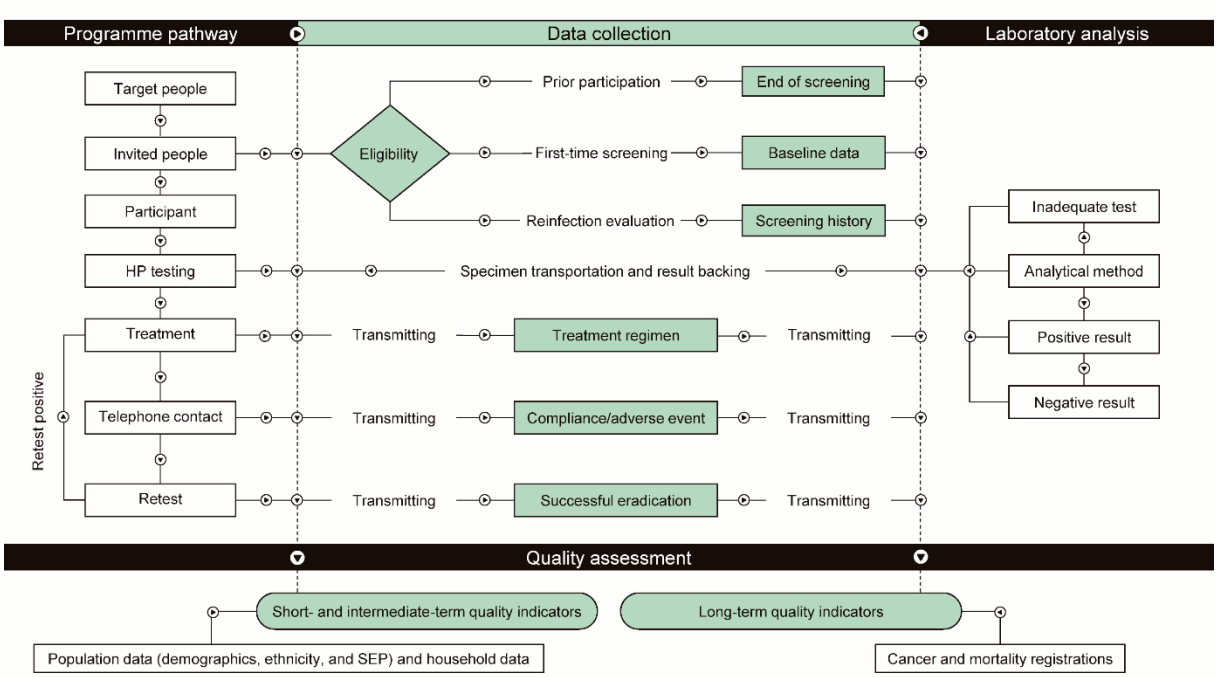

Fig. 8.2. An information system for data collection and generation of screening quality indicators. The system transmits the secure data collected from the *H. pylori* (HP) screening pathway and laboratory analyses to generate quality indicators. This is a real-world example from a population-based *H. pylori* screen-and-treat programme in Indigenous communities [5]. Bottlenecks can be identified when the system generates timely messages for quality control. Stratified analyses can be conducted for individuals who were screened, based on demographic data, geography, ethnicity, and socioeconomic position (SEP). Data can also be collected from individuals who either were not screened or did not adhere to the testing and treatment process, to evaluate the effectiveness of the programme.

H. pylori screening and treatment is a method of infectious disease control for primary prevention of gastric cancer, rather than a direct tool for early cancer detection. If one member of a household is screened and treated and other members are not, there may be a risk of reinfection within the household. Therefore, cascading testing to other household members may be considered when the targeted individual has an *H. pylori* infection (see Chapter 4). Developing such a family-based index-case method may require linking screening data with household data [5]. Information systems can also integrate with local infectious disease surveillance systems to monitor and prevent antibiotic resistance resulting from population-based antibiotic use.

8.3 Short-term indicators

Table 8.1 lists a set of recommended quality indicators for evaluating a population-based *H. pylori* screen-and-treat programme. It includes definitions for short-term

indicators, intermediate-term indicators, and long-term indicators and the required data to measure each indicator.

Short-term indicators are measurable outcomes that can be observed and assessed shortly after implementing a programme, to ensure that the programme is operating efficiently and adhering to the required standards. Details related to person, place, and time should be systematically recorded, including information about the individuals involved (e.g. demographics, eligibility criteria, and socioeconomic position), the geographical location of the programme, and the time frame during which the screening activities take place. Accurate documentation of these details facilitates the analyses of the performance of the programme and supports evaluation of its effectiveness.

Invitation coverage

An effective invitation is a critical first step in initiating the subsequent screening and treatment processes. Invitation coverage is an indicator that measures how well the target population is being reached. The population list and contact information should be made available. The quality of these population lists will vary, depending on how the data were collected. Therefore, there will be variability in who the data will and will not capture; for example, the data may not include immigrant populations, people who leave the country, and people who have died. The aim should be to obtain as complete a list as possible, so that the measures of coverage will be as accurate as possible. The process for invitation to screening should enable a high invitation rate to everyone eligible for the screening. This can be a particular concern if the invitation data set has limited coverage or fails to accurately identify certain subpopulations with lower socioeconomic positions and whose contact information is incomplete or inaccurate. Invitation coverage provides a measure of the quality of the register or contact list and can provide an indication of how complete the contact information list is.

When the total population list is unavailable, the proportion of the eligible population invited can be estimated by comparing the number of invitations sent with an estimated target population size. This estimation can be based on methods such as conducting household surveys within the community or collaborating with local organizations, schools, workplaces, and community groups to approximate the size of the eligible population.

Screening participation

Screening participation in its broadest sense provides a measure of the proportion of individuals who take up the invitation to screening. However, the screening participation is also a measure of how successful the programme has been in contacting and engaging participants and in addressing any barriers there may be in accessing the screening pathway. Variations in screening participation (e.g. by region, ethnicity, and socioeconomic position) can indicate the magnitude of the barriers to accessing the programme. Improvements to eliminate barriers require partnership and close engagement with high-risk groups from the outset, and targeted investment to address cost, time, distance, and other barriers [6]. Also, certain test types may have differential acceptability and uptake in different cultural groups; this may need further assessment [7]. The potential side-effects of antibiotic treatments and differences in personal medical histories should be considered, and individuals should make an informed choice and should not be unduly influenced towards participation. To enhance participation in screening, several interventions can be implemented, including general messaging and recruitment strategies, and the impact of these interventions can and should be monitored.

General messaging can increase public awareness of the importance of eliminating *H. pylori* infection for decreasing the burden of associated diseases, such as gastric cancer, peptic ulcer disease, and dyspepsia. The GISTAR study in Latvia (see Chapter 3.5) has shown that only a minority of the general population aged 40–64 years are motivated to participate in interventions for gastric cancer prevention [8]. Communication strategies can be designed to educate the target population and medical professionals and/or to deal with the misbeliefs or barriers related to *H. pylori* infection and gastric cancer prevention. The most frequent reasons reported as barriers to testing included not seeing the benefit of being tested or the need to be tested, and feeling healthy [8].

A range of potential communication tools and channels can be used, including programme websites, television, radio, print and online newspapers, opportunistic conversations with health-care providers, community gatherings and workshops, and social media (Box 8.1). The tools and channels to be used should be selected on the basis of the likely level of reach for the target population, i.e. those at highest risk within a population (to ensure equity), as well as health-care workers in different

health-care institutions, medical communities, scientific and research communities, and policy-makers and decision-makers at the national, regional, and local levels. By carefully selecting the communication channels used, Slovenia increased the rate of participation in colorectal cancer screening from 50% to 66% [9]. Engagement efforts, ideally including co-designed activities, should bring together policy-makers, health-care providers, community members, and the population groups that face the highest barriers to screening.

As an example of this, the invitation letters in the pilot programmes in Slovenia (EUROHELICAN and TOGAS) are labelled and signed by the Community Healthcare Centre (Ljubljana or Maribor) and the Slovenia National Institute of Public Health (see Chapter 3.5). Additional email invitations are signed in the same manner. Communication activities and campaigns may be carried out through mass media and both external and internal advertising spaces, including health institutions and public places. Increased participation can also be achieved by involving famous people and programme ambassadors. In addition, a tailored communication approach should be developed for people with disabilities, including those with visual or hearing impairments.

Box 8.1. Monitoring and evaluation of communication activities

Social media platforms can reach a vast audience, allowing for the dissemination of information about the importance of *H. pylori* screening, its benefits, and how to access services. Continuous monitoring and evaluation of communication activities is essential, because these are ongoing processes. Indicators may include data on click-throughs, retention, shares, and others. Feedback is collected regularly, using the built-in measuring systems of social media channels. For example, social media analytics tools can show the reach and engagement of a post. Meta Business Suite measures activities on Facebook and Instagram, and X (Twitter) Analytics measures tweets, engagement, and impressions. The use of different social media channels enables evaluation and constant feedback. Analytical tools, process evaluation, and feedback reciprocally enhance each other.

Recruiting strategies may include sending invitation letters, providing explanatory leaflets, using secure messaging, using mobile applications, making telephone calls,

and giving face-to-face presentations. If there is a functioning postal system, the invitation letter should contain relevant information about the purpose and goals of the programme, along with basic information about the positive aspects of the *H. pylori* screen-and-treat strategy for gastric cancer prevention. The stakeholders should collaborate to design and implement a screening programme to ensure that public messaging reaches groups with different socioeconomic positions equitably [10]. There is evidence that having the invitation letter signed by a health professional and sending text messages or telephone reminders can improve screening coverage overall and for underserved populations [11–12]. The information leaflet, which includes key messages about the programme, gastric cancer, *H. pylori* infection, and the importance of treatment, should be distributed to identified stakeholders and project partners. Co-designing programme information resources with participants is important to ensure that the messages will reach those at the highest risk [10].

If the postal system is limited, alternative methods of delivery of invitations should be considered. A health-care provider's mobile application provides convenience through features such as easy appointment scheduling, access to screening services, and timely reminders [13]. Telephone outreach and face-to-face presentations may yield a higher participation rate than mailed letters, but this can also be the most expensive approach in terms of human resources [14] and so it may be reserved for individuals who have not responded to multiple previous contact attempts. Conferences and symposiums for scientific, medical, research, and governmental audiences should be used to disseminate the project results and inform the attendees about the project's goals during its implementation.

Screening participation may vary depending on the type of tests used; this is influenced by factors such as preparation requirements, cultural perceptions, and costs (see Chapter 5). For example, in a screening trial in Taiwan (China), the participation rate was 50% when the *H. pylori* stool antigen test was combined with the faecal immunochemical test (FIT) [15–16], whereas the screening participation could reach 80% when ^{13}C-urea breath tests were used in Indigenous communities [5]. When serology tests are used for screening, the proportion of participants who miss confirmatory testing should be evaluated.

Testing indicators

Testing indicators include the test positivity rate and the rate of inadequate tests (Table 8.1). Despite the high diagnostic accuracy of ^{13}C-urea breath tests and monoclonal stool antigen tests, inadequate testing can occur (see Chapter 5). When individuals providing breath samples are not coached on the optimal exhalation technique or are incapable of executing it, the sample may have an insufficient CO_2 concentration for the ^{13}C-urea breath test [5]. The *H. pylori* stool antigen test can be affected by inadequate faecal sampling and improper temperature conditions during specimen transportation and the time before analysis, leading to false-negative results [17]. The test positivity rate may indicate whether the programme is reaching those who would benefit most, and it can serve as a guide for appropriate resource allocation [5, 18]. Because *H. pylori* is an infectious disease that is often transmitted within families, the programme may contact family members of individuals with positive test results, to increase the likelihood of test positivity [5, 19]. It is also important to provide counselling at the time of testing about the significance of treating *H. pylori* infection.

Table 8.1. Recommended quality indicators for evaluating a population-based *H. pylori* screen-and-treat programme

Quality indicators[a]	Required data[b]	Definitions[c]
Short-term indicators		
Invitation coverage	(1) Number of people invited to screening (2) Number of eligible people	Proportion of people who receive an invitation among the eligible people
Screening participation	(1) Number of participants (2) Number of invited people	Proportion of participants among the people invited
Test positivity rate	(1) Number of test positives for *H. pylori* (2) Number of participants	Proportion of test positives among participants
Rate of inadequate tests	(1) Number of inadequate test results (2) Number of *H. pylori* tests	Proportion of inadequate test results among participants
Rate of missed confirmatory testing	(1) Number of missed confirmatory tests (2) Number of *H. pylori* serological tests	Proportion of missed confirmatory testing among participants receiving *H. pylori* serological tests

Table 8.1. Recommended quality indicators for evaluating a population-based *H. pylori* screen-and-treat programme (continued)

Quality indicators[a]	Required data[b]	Definitions[c]
Referral rate to treatment	(1) Number of participants referred for treatment (2) Number of test-positives for *H. pylori*	Proportion of participants referred for treatment among those who test positive
Rate of antibiotic prescriptions	(1) Number of participants prescribed antibiotic treatment (2) Number of participants referred for treatment	Proportion of participants prescribed antibiotic treatment among *H. pylori*-positive participants referred for treatment
Successful eradication rate	(1) Number of successful eradications (2) Number of participants prescribed antibiotic treatment	Proportion of successful eradication among participants prescribed antibiotic treatment
Adverse event rate	(1) Number of serious adverse events (2) Number of participants treated for *H. pylori*	Proportion of serious adverse events among the treated participants
Rate of stopping treatment because of adverse events	(1) Number of participants stopping treatment because of adverse events (2) Number of participants treated for *H. pylori*	Proportion of treated participants who stop treatment because of adverse events
Intermediate-term indicators		
Screening coverage	(1) Number of people who participate in the screening test (2) Number of eligible people	Proportion of eligible individuals who participate in screening
H. pylori prevalence	(1) Number of people with *H. pylori* infection (2) Number of eligible people	Proportion of people with *H. pylori* infection among eligible people
H. pylori reinfection rate	(1) Number of people with *H. pylori* reinfection (2) Number of people who have been successfully treated for *H. pylori* (3) Follow-up time	Rate of people with *H. pylori* reinfection among people who have been successfully treated during a follow-up period (per 100 person-years or 1000 person-years)
Long-term indicators		
Gastric cancer incidence rate	(1) Number of eligible people newly diagnosed with gastric cancer (2) Number of eligible people (3) Follow-up time	Rate of newly diagnosed gastric cancer during a follow-up period (per 100 000 person-years)

Table 8.1. Recommended quality indicators for evaluating a population-based *H. pylori* screen-and-treat programme (continued)

Quality indicators[a]	Required data[b]	Definitions[c]
Gastric cancer mortality rate	(1) Number of eligible people whose death was related to gastric cancer (2) Number of eligible people (3) Follow-up time	Rate of death related to gastric cancer during a follow-up period (per 100 000 person-years)

[a] Stratify the indicators by population subgroup, and establish benchmarks tailored to different populations.
[b] The numerator is (1), and the denominator is (2) or (2) × (3).
[c] The definition is equal to (1) divided by (2), or (1) divided by (2) × (3) when follow-up time is required.

Treatment indicators

Treatment indicators include several key measures: the proportion of individuals referred for treatment among those who test positive, the proportion of antibiotic prescriptions adhering to guidelines that are given to people who are referred for treatment, the proportion of successful eradication among people who were prescribed antibiotic treatment, the proportion of serious adverse events among the treated participants, and the proportion of treated participants who stop treatment because of adverse events.

About 30% of participants who test positive for *H. pylori* may not seek treatment, because of the absence of symptoms, concerns about the pill burden associated with treatment, and worries about potentially needing an endoscopy because of their positive *H. pylori* test results [16]. Antibiotic treatments for *H. pylori* infection are the core elements of gastric cancer prevention (see Chapter 6). Successful eradication is generally reported based on the intention-to-treat (all patients who were prescribed medication) and per-protocol (those who used ≥ 80% of the prescribed medication) principles [20]. Substantially lower eradication rates can be identified in some subpopulations as a result of high prevalence of antibiotic resistance [5, 21]. Disparities in antimicrobial resistance may be addressed by revising the first-line therapy and offering bespoke treatment regimens for any identified target populations. Consideration should also be given to monitoring disparities in the completion of treatment and any barriers to treatment completion, including variations in the presence of adverse events and the acceptability of treatment, in relation to the predefined quality benchmarks (Box 8.2). Adverse events related to the treatment can be common and include abdominal pain, diarrhoea, dyspepsia, and poor appetite, but serious adverse events are generally rare.

Box 8.2. Quality benchmarks

Quality benchmarks for screening programmes help programme managers to understand typical performance levels and identify areas for improvement. These benchmarks are established from guidelines and recommendations from relevant health-care organizations, previous studies, or experts in the field, along with the analysis of historical data from previous programmes. For example, the *European guidelines for quality assurance in colorectal cancer screening and diagnosis* established the quality benchmarks for colorectal cancer screening [22]. Communities can assess whether their screening programmes align with current best practices and whether they are designed to achieve optimal health outcomes. Continuous knowledge updates are vital to determine the most effective performance levels while maintaining an optimal balance between benefits and harms [23].

8.4 Intermediate-term indicators

Intermediate-term indicators are measurable outcomes that reflect the progress and impact of a programme over the medium term; this can provide insights into the effectiveness of the programme before the long-term outcomes can be measured. These indicators may include screening coverage, *H. pylori* prevalence, and *H. pylori* reinfection rate (Table 8.1). Screening coverage is defined as the proportion of eligible individuals who participate in screening. It is considered an intermediate-term indicator because it reflects the extent of participation by the target population in the screening programme, and it serves as a step towards achieving the long-term health outcomes. As screening coverage increases, the prevalence of *H. pylori* infection (the proportion of eligible individuals with *H. pylori* infection) typically declines [24]. With repeated screenings, particularly among a subset of participants who have been successfully treated for at least 2 years, the *H. pylori* reinfection rate can be evaluated and expressed per 100 person-years or 1000 person-years. It can be as low as < 1 per 100 person-years, particularly when lifestyle education is also provided to reduce the risk of *H. pylori* transmission [5, 25]. Reinfection rates may be higher in high-risk communities; for example, very high reinfection rates have been reported in Alaska [26]. Higher reinfection rates associated with ethnicity and socioeconomic position may lead to prioritizing family-based or community-wide invitation approaches in a programme [5].

8.5 Long-term indicators

Long-term indicators are measurable outcomes that assess whether the programme has achieved its ultimate goal; they primarily include gastric cancer incidence and mortality rates (see Chapter 2 for the summaries of explanatory clinical trials). These rates, which incorporate a time component, are calculated based on the incidence of newly diagnosed gastric cancer cases and deaths related to gastric cancer during the follow-up period (Table 8.1). Data can be obtained through cancer registries and death registries to minimize the loss to follow-up. Reductions in the gastric cancer mortality rate from *H. pylori* screening and treatment are observed after decreases in the gastric cancer incidence rate, because of the primary prevention nature [24, 27].

When the programme is continued for about 5–10 years, depending on the baseline incidence rates, gastric cancer outcomes can be evaluated using various approaches (Fig. 8.3). In the context of a population-based programme operating as part of health-care policy or public health initiative, gastric cancer outcomes can be compared between individuals who were invited to participate in the *H. pylori* screen-and-treat approach and those who were not invited. Comparisons can also be made between participants who completed the *H. pylori* screening and non-participants, as well as between individuals with *H. pylori* infection in whom the infection was successfully eradicated and those who remain untreated or experience unsuccessful treatment. Evaluations of programme effectiveness may need to account for non-adherence to the invitation, resulting from self-selection bias, as well as variations in the baseline characteristics of the participants [16].

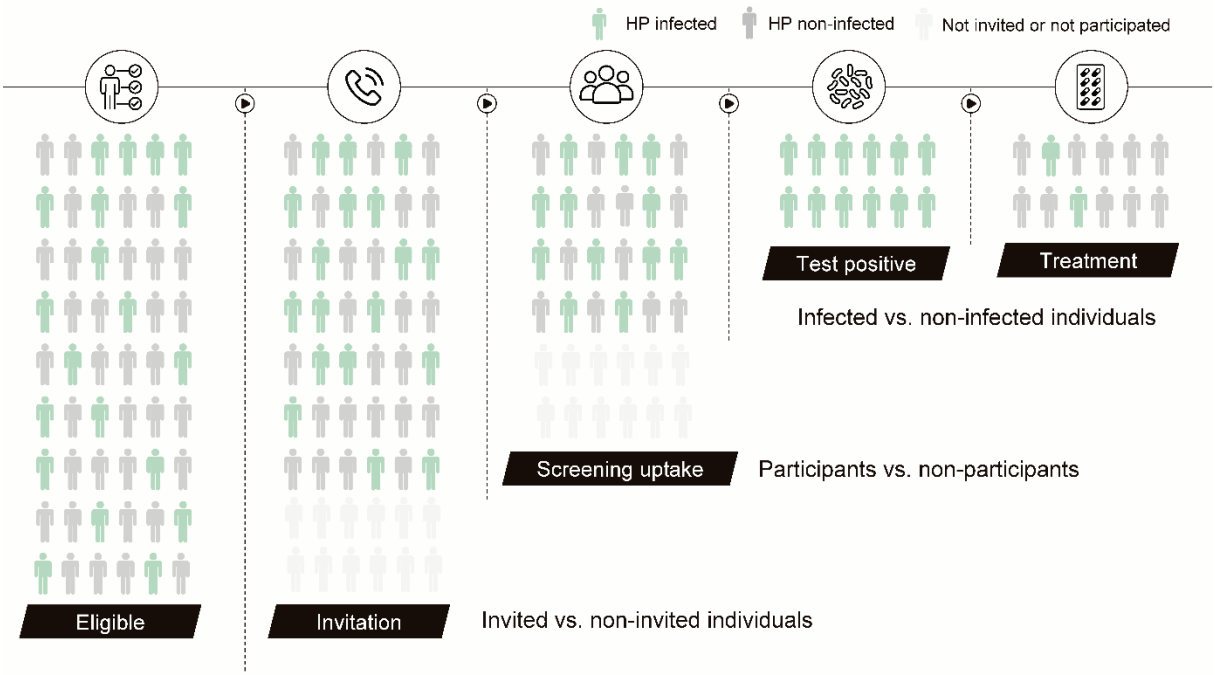

Fig. 8.3. Outcome evaluations for gastric cancer incidence and mortality rates in a population-based screen-and-treat programme for *H. pylori* (HP) infection. This is an example from a pragmatic clinical trial [16]. The assessment can be conducted at several levels within the screening intervention pathway, including comparisons between individuals who were invited and those who were not invited, between participants and non-participants, and between patients who have been successfully treated for *H. pylori* infection and those who still have *H. pylori* infection.

Alternatively, with sufficient screening coverage, programme effectiveness can be estimated by comparing gastric cancer incidence and mortality rates before and after the initiation of the programme. Historical trends can also be accounted for by using a natural history model to project the trends in gastric cancer incidence and mortality before the programme (see Chapter 9). This projection generates expected rates without intervention, which can then be compared with the observed outcomes (see Chapter 3.10).

Monitoring long-term outcomes by demographic variables is crucial to understand whether an *H. pylori* screen-and-treat programme is meeting its equity goals. These goals include achieving equal or better access and participation in all groups compared with the most privileged groups. The long-term aim is to reduce gastric cancer incidence and mortality rates to be as low as those in the most privileged groups. This may require progress to be measured directly against measures of equity through the absolute differences and relative risks of incidence and mortality. The programme may also yield benefits in the prevention of peptic ulcer disease and

other *H. pylori*-related diseases, which can be evaluated in a similar manner using hospital electronic health records or health insurance databases [24, 28]. In a well-functioning programme, the current inequities in rates of peptic ulcer disease and gastric cancer in the target population would be expected to be reduced in the long term. In regions such as the high-risk population living in the Matsu Islands (see Chapter 3.10), an *H. pylori* screen-and-treat programme has been implemented and reached the stage of evaluating long-term outcomes for gastric cancer [24].

8.6 Exploring the potential harms

Concerns about the potential harms of *H. pylori* screening mainly revolve around the effects of antibiotic use (see Chapters 2 and 7), because an intervention based on antibiotic treatment will increase antibiotic use [29]. Potential harms may include the impact on the digestive tract because of changes in gastric acidity, alterations in the diversity of gut microbiota, and the development of antibiotic resistance. The oesophagus is presumed to be the most susceptible site for acid reflux, and the colorectum is presumed to be the most susceptible site for changes in the gut microbiota. However, the associations between treatment of *H. pylori* infection and the risk of cancer at these sites have not yet been supported by observational studies [30–34] or population-based randomized trials [16, 35]. Antibiotic treatment for *H. pylori* infection may affect the gut microbiota [36], although research suggests that these changes are temporary and the gut microbiota largely return to the pre-treatment state over time [33, 37].

The increasing trends of antibiotic resistance are a global concern because of high selection pressure from the increasing use and misuse of antibiotics. Gathering data on *H. pylori* resistance from endoscopic biopsies and stool samples may offer the advantage of selecting the antibiotic regimens with the highest eradication rates (e.g. > 90%) while minimizing the population's exposure to less-effective antibiotics [38–39]. When new *H. pylori* eradication regimens are developed, their potential to induce the gut resistome may be considered. Monitoring general increased antibiotic resistance in any bacteria, in addition to *H. pylori*, in the population may involve tracking the number of individuals who present with resistant bacterial strains overall, the number of hospitalizations for infectious diseases in the population, and the number of deaths from infectious diseases in the general population.

8.7 Real-world examples of monitoring to improve equitable outcomes

Monitoring all the quality indicators outlined in this chapter by a range of demographic variables (e.g. geographical region, age, sex, race or ethnicity, socioeconomic position, homelessness and other housing factors) is important to assess the reach, quality, and timeliness across the screening pathway and to implement quality improvement activities where required. This is also necessary to ensure equitable health outcomes (Box 8.3) and programme effectiveness. To monitor by demographic variables, these variables must be accessed through existing data sources or collected as part of the screening programme. To meet standard quality requirements, screening requires strategies to overcome barriers related to cultural differences, administrative challenges, geographical constraints, and economic disparities. Equity recognizes that people with different levels of advantage require different approaches and resources to obtain equitable health outcomes [40].

Box 8.3. Cancer health inequalities and cancer inequities

Cancer health inequalities refer to the differences in risk factors, cancer incidence, cancer stages at diagnosis, and treatment outcomes among different population groups. Differences can be associated with factors such as geographical location, race or ethnicity, socioeconomic position, access to health-care services, education level, and environmental factors. For example, elevated gastric cancer incidence and mortality rates are found in almost all Indigenous peoples relative to the corresponding non-Indigenous populations in the same region or country. Cancer inequities are those differences that are unnecessary and avoidable but are also considered to be unfair and unjust [41].

The incidence of gastric cancer and the prevalence of *H. pylori* infection are disproportionately higher in people with lower socioeconomic positions [42–43], Indigenous populations [5, 44–46], other ethnic groups [45, 47], and immigrants from areas with higher prevalence of *H. pylori* infection [48]. These same groups frequently experience some of the greatest barriers to accessing organized screening and health care [5, 24, 49]. They are often not well served by the existing health system and may have historically low rates of participation in screening. Yet the same high-risk groups have the most to gain by participation in a population-based *H. pylori* screen-and-treat programme, in terms of reduced risk of gastric cancer.

Equity in access into and through screening can be achieved by system change and by designing equity into the programme, not only by individual behaviour change [50]. To successfully introduce and develop the screen-and-treat approach from an equity perspective requires effort, expertise, and engagement with the populations of interest. The aim is a participant-centred approach that is “easy” for people, in which all interactions, including invitation, testing, treatment, and follow-up, are accessible and culturally safe. Enrolling individuals who are experiencing homelessness in screening for infectious diseases may require tailored strategies to address challenges such as unstable living conditions, limited access to health care, and mistrust of medical systems [51].

Other axes should also be considered for monitoring, particularly where they are correlated with *H. pylori* infection and its sequelae; examples are rurality, region, sex, and other factors. Pertinent demographic information in line with the agreed equity

goals of the programme should be collected from the outset, so that quality indicators can be reported across ethnicity, socioeconomic position, and other appropriate variables [5, 46].

The Indigenous people living in Taiwan (China), which include 16 ethnic groups, are Austronesian and constitute about 600 000 individuals, accounting for 3% of the population of the island. There are 55 designated Indigenous townships traditionally inhabited by Indigenous peoples, with similar historical and cultural characteristics. The age-standardized incidence rate of gastric cancer is about 23 per 100 000 person-years overall, and the rate among Indigenous people is almost double that among non-Indigenous people residing in the same regions. Since 2018, a population-based *H. pylori* screen-and-treat programme has been implemented, targeting individuals aged 20–60 years who reside in 17 Indigenous townships [46]. Although the programme aimed to increase enrolment among Indigenous people, it is open to both Indigenous and non-Indigenous individuals, to ensure equal access to screening.

In 2023, this programme expanded to 55 Indigenous townships. By the end of 2024, about 30 000 participants were included [5]. This expansion can be attributed to the endorsement of Indigenous health providers in the programme, funding support for screening and treatment, monitoring of quality indicators, use of telemedicine for instant consultations, and increased awareness through various approaches, including social media platforms, telephone contacts, and face-to-face invitations [5]. The benchmark was set at 60% for the *H. pylori* screening participation rate, 40% for the test positivity rate, 60% for the referral rate to treatment, and 80% for the successful eradication rate. The average performance achieved was 80% for screening participation, 44% for test positivity rate, 83% for referral rate to treatment, and 91% for successful eradication rate, with greater variability in the screening participation and test positivity rates between townships. The test positivity rate among Indigenous individuals (~60%) was notably higher (by 2–3-fold) than that in their non-Indigenous counterparts living in the same township. Consequently, the test positivity rate in each township may reflect the effectiveness of the invitations and the level of screening participation among Indigenous individuals.

In Aotearoa New Zealand, the *H. pylori* in Aotearoa New Zealand (ENIGMA) Study (see Chapter 3.11) is investigating the prevalence of *H. pylori* infection by inviting, in equal numbers, Māori people (the Indigenous population), Pacific people,

and individuals from other ethnic groups aged 12–69 years from across the country to be screened and treated for *H. pylori* infection. Participants have a serology test at their local laboratory and are invited to do a stool antigen test if the result of the serology test is positive. The study will report ethnic differences in rates of contact or invitation, participation (for serology and stool antigen tests), seropositivity, treatment, eradication, retesting, adverse effects, and antibiotic resistance. The treatment pathway is being delivered by a Māori health-care provider and has been designed in partnership with this provider to enable a culturally centred approach to be taken. An earlier cost–utility analysis compared the cost–effectiveness of the *H. pylori* screen-and-treat approach by ethnicity and showed a much greater cost–effectiveness for Māori people than for non-Māori people [52]. Current research aims to inform the design of a wider screen-and-treat pilot study in New Zealand, to address the unfair and avoidable high rates of gastric cancer among Māori people and Pacific people.

8.8 Conclusions

Population-based *H. pylori* screening and treatment is a multistep process. To ensure its effectiveness, it is necessary to assess a range of quality indicators at each stage and to facilitate the continuous monitoring and improvement of overall performance. Advances in information technology enable the timely collection and assessment of the recommended process and outcome measures, to ensure consistently high screening standards across regions and groups with varying gastric cancer burdens and health-care infrastructure. It is particularly important to increase public awareness about the significance of eliminating *H. pylori* infection to reduce the burden of associated diseases, such as gastric cancer, peptic ulcer disease, and dyspepsia. Effective programmes are designed in partnership with high-risk groups; these programmes invest in improving participation within these populations from the outset, and they are also responsive to the differences identified through programme monitoring, such as inequities in the rates of invitation, participation, eradication, and programme outcomes. An *H. pylori* screen-and-treat programme has the greatest chance of being equitable, effective, and efficient if the people with the highest rates of *H. pylori* infection participate and are successfully treated. This requires attention across the screen-and-treat pathway to ensure that all interactions are accessible and culturally safe.

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