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Abbreviations

COVID-19	Coronavirus disease 2019
ERG	External review group
EtD	Evidence to decision
GDG	Guideline development group
GIS	Geographic information system
GOARN	Global outbreak alert and response network
GRADE	Grading of Recommendations, Assessment, Development and Evaluation
HBV	Hepatitis B virus
HIV	Human immunodeficiency virus
PHSM	Public health and social measures
PICO	Population intervention comparison outcome
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analysis
RCT	Randomized control trials
SMS	Short message service
WHO	World Health Organization

Glossary

All terms were defined by the steering group and the guideline development group unless otherwise identified.

Active follow-up: direct interactions taken by a healthcare or public health system with a contact person, which can include direct (routine) check-ins (home visits, telephone calls, text messaging) for symptom screening, prophylaxis after exposure, vaccination, testing and follow-up, treatment referral and support groups.

Catastrophic health spending: out-of-pocket payments greater than 40% of capacity to pay for healthcare, where capacity to pay for healthcare is the total household consumption minus a standard amount to cover basic needs (food, housing, and utilities), according to the WHO Global Health Observatory Indicator Metadata Registry List.

Conditional allocation: when a transfer (financial and non-financial) is provided to cause an individual person to undertake a specific action or behaviour.

Contact: an exposure to an infectious disease that involves interaction with an infected individual or contaminated environment during a given period and in a manner that makes transmission likely, considering the nature of the disease and the context of the contact.

Contact person: someone who has been exposed to an infectious disease pathogen through direct or indirect contact with an infectious person. Risk of exposure may be determined by taking into consideration the mode of transmission, time and duration of exposure, distance from the infectious person, and stage of the disease and severity of symptoms in that person.

Contact tracing: the systematic process of identifying, assessing, managing, and supporting contacts of infectious individuals.

Digital contact tracing: digital tools refer to software, applications, platforms, and devices designed to facilitate specific tasks or processes in the digital realm. In the context of contact tracing, these tools may include “outbreak response, proximity tracing, and symptom tracking tools, which may be combined into one instrument or used as stand-alone tools”, as defined by WHO in Digital tools for COVID-19 contact tracing published in June 2020.

Effectiveness: the ability of the intervention to achieve its intended goals and objectives in real-world settings.

Financial transfers: monetary (cash) provisions intended to support people adhering to public health and social measures (PHSM) implemented to disrupt transmission of infectious diseases. (also see *Conditional allocation* and *Unconditional allocation*)

Incubation period: the period from the time of exposure to an infectious agent to the time of the manifestation of the first symptom or symptoms of the disease.

Intensified contact person identification: in-depth investigations of cases conducted by a public health professional, usually at point of diagnosis or care.

Latent period: the period from the time of infection to the time of becoming infectious.

Manifestation: when changes in biological and physiological parameters occur, but do not necessarily lead to symptoms, for example seroconversion.

Non-financial transfers: non-monetary provisions, such as goods and services, intended to support people and communities adhering to public health and social measures (PHSM) implemented to disrupt transmission of infectious diseases. (also see *Conditional allocation* and *Unconditional allocation*)

Non-intensified contact person identification: short investigation of cases conducted by a public health professional, direct notification by cases, and self-notification by contact persons.

Outbreak: the occurrence of cases of disease in excess of what would normally be expected in a defined community, geographical area or season. Outbreaks are maintained by infectious agents that spread directly from person to person, from exposure to an animal reservoir or other environmental source, or via an insect or animal vector. Human behaviours nearly always contribute to such spread.

Passive follow-up: actions that a contact person could undertake on their own initiative, including self-reporting to public health authorities in charge of contact tracing, self-monitoring, and at-home testing (when testing is relevant).

Serial interval: period between the time of symptom onset in a case and the time of onset in their source case.

Test to release: testing to clear contact persons or have a follow-up period end sooner.

Test to trace: testing to confirm a contact person as a case.

Unconditional allocation: where a transfer is provided to support people in meeting basic needs without any expected change in behaviour or specific activity to be undertaken.

Executive summary

Introduction

The global pandemic of 2020 to 2023 renewed our awareness of the impact a new pathogen can have on humanity. In its aftermath, consideration turned to preparing for the emergence of new pathogens or known pathogens in new contexts, developing response capacities built on what has been learned through the experiences of known disease outbreaks and epidemics.

Through such events, contact tracing has been recognized as an effective tool in stopping new infections by breaking chains of transmission and keeping vulnerable populations safe. Contact tracing is based on the principles of identification, monitoring, and supporting those people identified as contact persons. Its impact, however, is broader as it can also assist with producing a better understanding of the epidemiological characteristics and transmission dynamics of a new pathogen or a known pathogen in a new context, informing decisions around public health and social measures, and improving disease outcomes through early detection and case management.

Purpose, scope, and target audience

Many disease-specific guidelines and interim guidance documents, produced by the World Health Organization (WHO) or national organizations, exist to assist contact tracing efforts. This guideline does not replace those documents, rather it presents a “disease agnostic” guideline with recommendations and definitions that will be available in circumstances where disease-specific guidelines are not applicable. Focusing on contact tracing as an essential response to disease outbreaks allows for improvements to outbreak preparedness, readiness, and response strategies that can reduce the impact of epidemics on affected populations.

This practical guideline establishes definitions for “contact”, “contact person”, “contact tracing” and other associated concepts. It allows for improvement of contact tracing strategies, and provides recommendations attempting to answer some, though not all, questions that arose during the Coronavirus disease 2019 (COVID-19) pandemic, and other outbreaks. The employment of this guideline begins once people have been diagnosed and the potential for transmission exists. It is not, however, intended to assist with case investigation.

This guideline is intended for:

- WHO Member States, to develop subnational and national contact tracing guidance and implement strategies that achieve the desired impact on reducing transmission whilst optimizing public health resources, social and economic cost-benefits, and adhering to ethical principles to ensure respect for individual rights and human dignity;

- subnational and national disease-specific programs within national public health agencies, ministries of health or government structures, to develop adapted guidance and implement actions to respond to outbreaks;

- WHO, to develop outbreak specific emergency contact tracing guidance; and

- other organizations who may participate in contact tracing implementation or research, including nongovernmental and community-based organizations, academic institutions, United Nations agencies, technical networks, etc.

Guideline development methodology

The creation of this guideline and its recommendations adhered to the process described in the *WHO Handbook for Guideline Development 2nd edition*. Accordingly, WHO staff convened a steering group, and formed a guideline development group (GDG). Peer-reviewed studies and existing guidelines were examined and assembled into a systematic literature review to assist the GDG in its consideration in defining key terms. The review was also the foundation of the questions, structured in the population, intervention, comparator, outcome (PICO) format, that would be the basis of the recommendations. Both the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach and WHO-INTEGRATE framework were utilized within the GDG process to consider the PICO questions. An external review group examined this guideline, providing insight and perspective during its revision.

Recommendations

The GDG concluded with the following recommendations:

- WHO suggests in favour of intensified contact person identification over non-intensified contact person identification in populations at risk of infectious diseases. *(conditional recommendation; very low certainty of evidence)*

- WHO suggests in favour of active follow-up of contact persons over passive follow-up of contact persons in populations at risk of infectious diseases. *(conditional recommendation; very low certainty of evidence)*

- WHO suggests that testing be added to contact tracing in comparison to contact tracing alone for contact tracing in populations at risk of infectious diseases. *(conditional recommendation; very low certainty of evidence)*

The GDG did not provide a recommendation on whether contact tracing with conditional/unconditional financial/non-financial transfers versus contact tracing without transfers should be used in populations at risk of infectious diseases, as the evidence did not support a clear, practical and implementable option.

"Focusing on contact tracing as an essential response to disease outbreaks allows for improvements to outbreak preparedness, readiness, and response strategies."

1. Introduction

This chapter includes:

"Contact tracing has long been considered a fundamental strategy to mitigating and controlling outbreaks effectively used for diseases such as tuberculosis and Ebola virus disease."

1.1 Rationale

The need to develop this guideline was identified during the Coronavirus disease 2019 (COVID-19) global pandemic (2020 to 2023). Discussions and examinations arose at local, national and even global levels about how to respond to events of the pandemic's nature, scope, and scale. One of those discussions occurred in June 2020, when the Global outbreak alert and response network (GOARN) convened a global consultation on contact tracing *(1)*, which was considered critical in the control of COVID-19. It convened diverse participants from all WHO regions to review operational experiences of implementing contact tracing strategies during COVID-19. Among other key themes that emerged, it highlighted the need to establish evidence-based definitions and guidance for optimal implementation of contact tracing at different stages of an outbreak, and in which situations it is warranted. These discussions underscored the importance of determining the duration, methodology, resources, and timing of contact tracing efforts amidst large-scale emergencies, while also emphasizing the interconnectedness of contact tracing with public health and social measures (PHSM). Providing additional context on contact tracing within the broader emergency management framework is crucial, especially considering the heightened need for guidelines highlighted during the pandemic, as countries sought evidence-based recommendations from organizations like WHO.

Contact tracing has long been considered a fundamental strategy to mitigating and controlling outbreaks effectively used for diseases such as tuberculosis and Ebola virus disease. While it is a complex intervention that must be sensitive to subtleties and nuances, contact tracing may minimize the outbreak size and reduce loss of human life and economic impact. It should notably be designed and developed to meet contextual, local and cultural needs, conditions, and sensitivities as well as local workforce capacities and limitations in addition to responding to the characteristics of different diseases. In some contexts, contact tracing can benefit from technology for data collection, using digital applications and other online tools. Most importantly, it requires human capacity that is trained and capable of gaining the trust of the communities in which it is working and should be driven by ethical principles.

1.2 Scope and objectives of the guideline

This guideline acknowledges and does not replace other disease specific guidelines and interim guidance documents published by WHO and other organizations.

The ambition for this guideline is to be disease-agnostic and applicable in various contexts and settings. By focusing on contact tracing as an integral intervention, it aims at improving outbreak preparedness, readiness, and response strategies reducing the impact of epidemics on affected populations.

> "The use of this guideline begins once cases have been identified and there is the potential for transmission through those cases' contact persons."

Firstly, it establishes definitions of contact tracing and associated key concepts.

Secondly, it proposes to improve contact tracing strategies during outbreaks of infectious diseases, for which contact tracing is recommended as part of the public health response.

Thirdly, this guideline provides recommendations regarding several but not all questions that arose in a variety of settings during the COVID-19 pandemic as well as several outbreaks.

The use of this guideline begins once cases have been identified and there is the potential for transmission through those cases' contact persons. It is not intended to be used for the purpose of case investigation.

1.3 Target audience

This document aims to be practical. It reports the process and summarizes the evidence reviewed to develop the recommendations for the following:

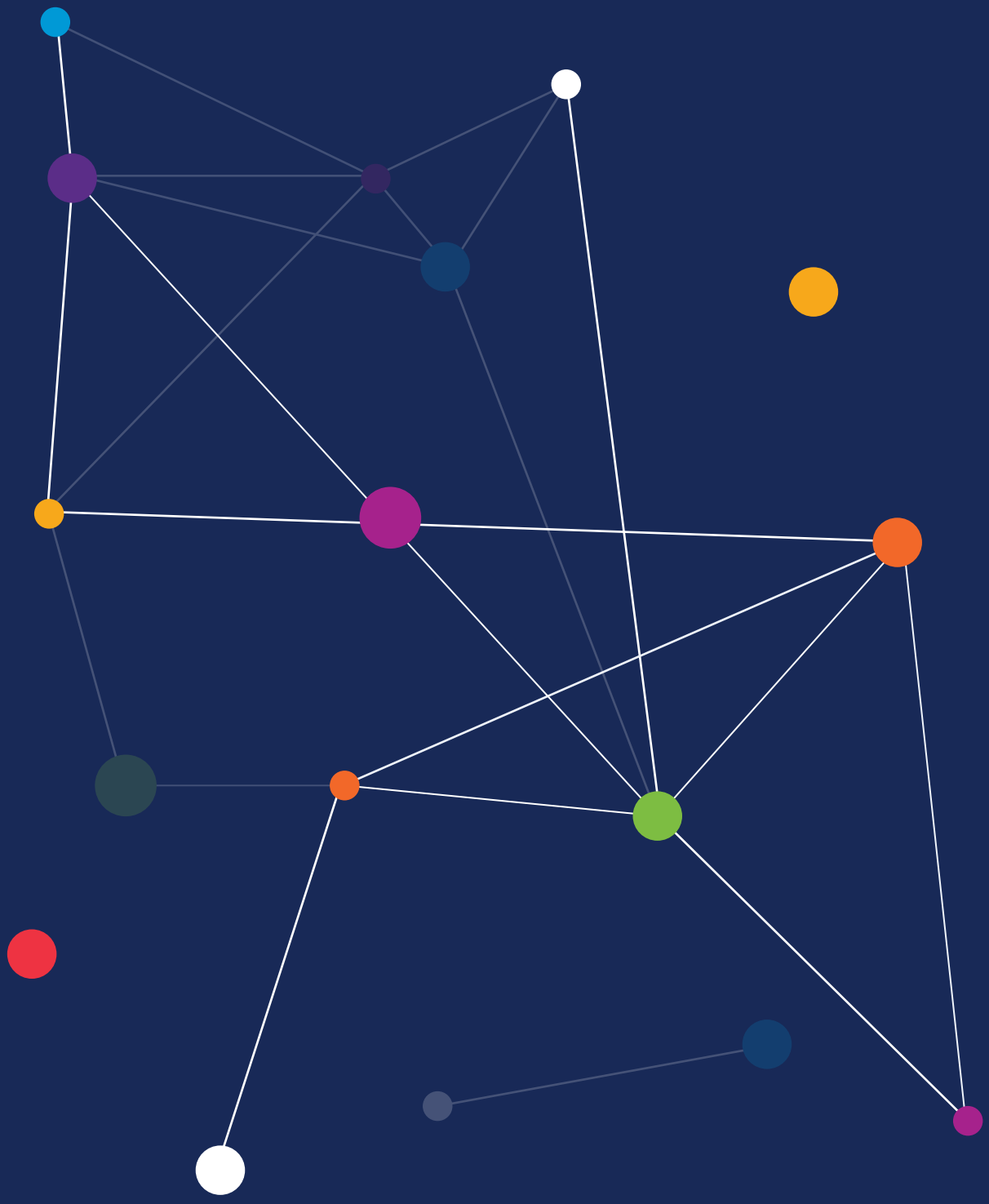
- WHO Member States, to develop subnational and national contact tracing guidance and implement strategies that achieve the desired impact on reducing transmission whilst optimizing public health resources, social and economic cost-benefits, and adhering to ethical principles to ensure respect for individual rights and human dignity;
- subnational and national disease-specific programs within national public health agencies or ministries of health, or government structures to develop adapted guidance and implement actions to respond to outbreaks;
- WHO, to develop outbreak specific emergency contact tracing guidance; and
- other organizations who may participate in contact tracing implementation or research, including nongovernmental and community-based organizations, academic institutions, United Nations agencies, technical networks, etc.

1.4 Use and formats

This guideline offers users definitions of important terms and explanations of key concepts. It gives guidance on the conceptualisation and implementation of contact tracing systems. To aid in readers' understanding, it presents, in separate boxes, real-life examples of tactics used in the field and researched for their efficacy and efficiency. Each example has been referenced to its source study.

This guideline also proposes recommendations, determined by the experts assembled as the GDG, that can be implemented as part of contact tracing strategies. These recommendations are disease-agnostic, meaning they have been prepared to apply in situations of a new pathogen or of a known pathogen in a new context. Disease-specific guidelines may not be relevant in such situations because of the lack of information, evidence, and understood variables of any emerging pathogen. The recommendations contained in this guideline provide users the building blocks to establish contact tracing operations while variables, such as modes of transmission and other factors, are being discovered.

2. Methods



This chapter includes:

"This guideline was developed in accordance with the WHO Handbook for Guideline Development 2nd Edition, and through the procedures of the WHO Guideline Review Committee."

2.1 Guideline development process

This guideline was developed in accordance with the WHO Handbook for Guideline Development 2nd Edition *(2)*, and through the procedures of the WHO Guideline Review Committee.

The recommendations in this guideline were formulated using an evidence to decision (EtD) framework developed through a two-staged process:

1. the review and appraisal of the evidence of effectiveness using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach;

2. complemented by the use of the WHO-INTEGRATE framework that integrates WHO norms and values.

The GRADE approach "is a system of rating the quality of a body of evidence in systematic reviews and other evidence syntheses, such as health technology assessments and guidelines and grading recommendations in healthcare *(4)*." There are seven minimum requirements for using GRADE as outlined by the GRADE working group, and five domains upon which it assesses evidence: risk of bias, imprecision, inconsistency, indirectness and publication bias *(4)*.

The WHO-INTEGRATE framework uses EtD tables to systematically consider a possible intervention. The EtD tables compare and consider eight factors: (i) the balance of desirable and undesirable health effects; (ii) the impact on human rights; (iii) sociocultural acceptability; (iv) consequences upon equity, (v) equality and non-discrimination; (vi) the balance of desirable and undesirable societal implications; (vii) financial and economic considerations; (viii) and the quality of evidence *(5)*.

"This guideline is the result of the guidance, discernment, expertise, and effort of the steering group, the guideline development group (GDG) and the external review group (ERG), along with the systematic review team and methodologist."

2.2 Contributors to the guideline development

This guideline is the result of the guidance, discernment, expertise, and effort of the steering group, the guideline development group (GDG) and the external review group (ERG), along with the systematic review team and methodologist.

Both the GDG and the ERG were selected following an open call for applications. Selections, based on an agreed set of criteria, including expertise, geographical location, and gender, were made by two members of the steering group.

All participants of the GDG and ERG complied with WHO declaration of interest policies for experts, through the completion of the WHO Declaration of Interest form to identify any potential conflict of interest. In addition, the biographies of the GDG members were posted for 14 days, allowing for the disclosure by the public of any perceived conflict of interest. No comments were received. All potential conflicts of interest declared were carefully reviewed by the Responsible Technical Officer in close collaboration with the Compliance, Risk management and Ethics office.

To gain community-level perspective, two members of civil society were invited as observers to the GDG meeting. While not participating in the deliberations and decisions of the GDG, the chairs recognized the observers during certain points of the discussions to provide pragmatic and practical outlook for GDG members to consider.

Annex 1 – Contributors to the guideline development lists steering group, GDG, observers and ERG members and details of the selection process and the declaration and identification of conflict of interest for the GDG and the ERG. Roles and responsibilities of guideline contributors are listed under section 3 of the Handbook, "Contributors and their role in guideline development." *(2)*

2.3 Evidence gathering process

2.3.1 Defining key questions

An initial set of questions were defined by the steering group following a workshop. The GDG reviewed the questions, which the systematic review team finalized based on the availability of evidence contrasting an intervention with a comparator as required by the GRADE tables.

These key questions had two aims. Firstly, to inform discussion around establishing universal definitions of terms and concepts of contact tracing. Secondly, to foster discussions around the specific recommendations proposed for inclusion in this guideline. Questions about definitions were designed to examine how terms, such as "contact", "contact person" and "contact tracing" were defined in published literature, and in practice.

Questions pertaining to the proposed recommendations used the population, intervention, comparison, outcome (PICO) framework through which to examine specific actions.

The final four PICO questions were:

- Should intensified contact person identification versus non-intensified contact person identification be used for in populations at risk of infectious diseases?
- Should active follow-up of contact persons versus passive follow-up of contact persons be used for in populations at risk of infectious diseases?
- Should contact tracing with testing versus contact tracing without testing be used for in populations at risk of infectious diseases?
- Should contact tracing with conditional/unconditional financial/non-financial transfers versus contact tracing without transfers be used for in populations at risk of infectious diseases?

2.3.2 Search strategy

A systematic literature review was undertaken; the results of which were compiled and presented to the GDG for consideration. The aim was to identify, review, and appraise evidence concerning contact tracing definitions and strategies from qualifying published and peer-reviewed literature. To contextualise results from published studies, selected national and international contact tracing guidelines were also included. They were found through traditional (white) and non-traditional (grey) publishing streams available on selected databases (see Annex 2 – Contact tracing guidelines). In doing so, the systematic literature review looked at different contact tracing strategies, how effectiveness may be defined and measured, what factors can influence their effectiveness, and how these strategies were governed with respect to policy, ethics, stakeholder involvement, human and financial resource allocation and data protection.

The review relied upon Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) extension for reporting literature searched in systematic reviews (PRISMA-S) checklist. While model-based evidence is used in public health research and policy development, the reliance on assumptions contributes to risk of bias and indirectness and is generally discouraged in GRADE. Therefore, model-based evidence was excluded from the systematic literature review.

2.3.3 Data extraction

Extracted data were presented in a tabular format that specified publication details, study characteristics, and outcomes of interest. One reviewer assembled the data, with a second reviewer performing a quality check by assessing 20% of the inclusions. Data was extracted from a total of 378 publications.

The predominance of studies from Europe and North America limits generalizability. By WHO region, 112 studies (29.6%) were from Europe, 82 studies (21.6%) from the Americas, 75 (19.8%) from the Western Pacific, 51 studies (13.5%) from Africa, 17 studies (4.5%) from South-East Asia, and 12 studies (3.2%) from the Eastern Mediterranean region.

Moreover, the influence of the COVID-19 pandemic may render some findings less applicable to other epidemics and pathogens with different modes of transmission. Most studies covered COVID-19 (n=179; 47.4%) or tuberculosis (n=101; 26.7%) and were retrospective (n=91; 23.8%) or prospective (n=79; 20.8%).

2.3.4 Formulation of recommendations

The GDG crafted the recommendations, having assessed the evidence gathered through a systematic literature review and engaged in GRADE process. This involved working through the EtD tables, which are based on the WHO-INTEGRATE framework. The EtD tables can be found in Annex 3. An integral part of the preparation of the recommendations were the open discussions among GDG members and input from observers when requested. Rooted in the PICO questions, these deliberations aimed to ensure recommendations were evidence-based, as well as relevant and practical to real-world contexts. Factors such as the ease or complexity of implementing the intervention, the training requirements and the

demand on resources were considered. Ultimately, the panel reviewed the viability of an intervention. Facilitated by the methodologist, the GDG navigated through the process, ensuring a consideration of all factors.

When evidence was scant, GDG members used their professional knowledge and expertise gained from academic and practical experiences garnered throughout their careers. Therefore, their exchanges and reflections on the PICO questions in completing the EtD tables were integral in defining consensus positions for the panel.

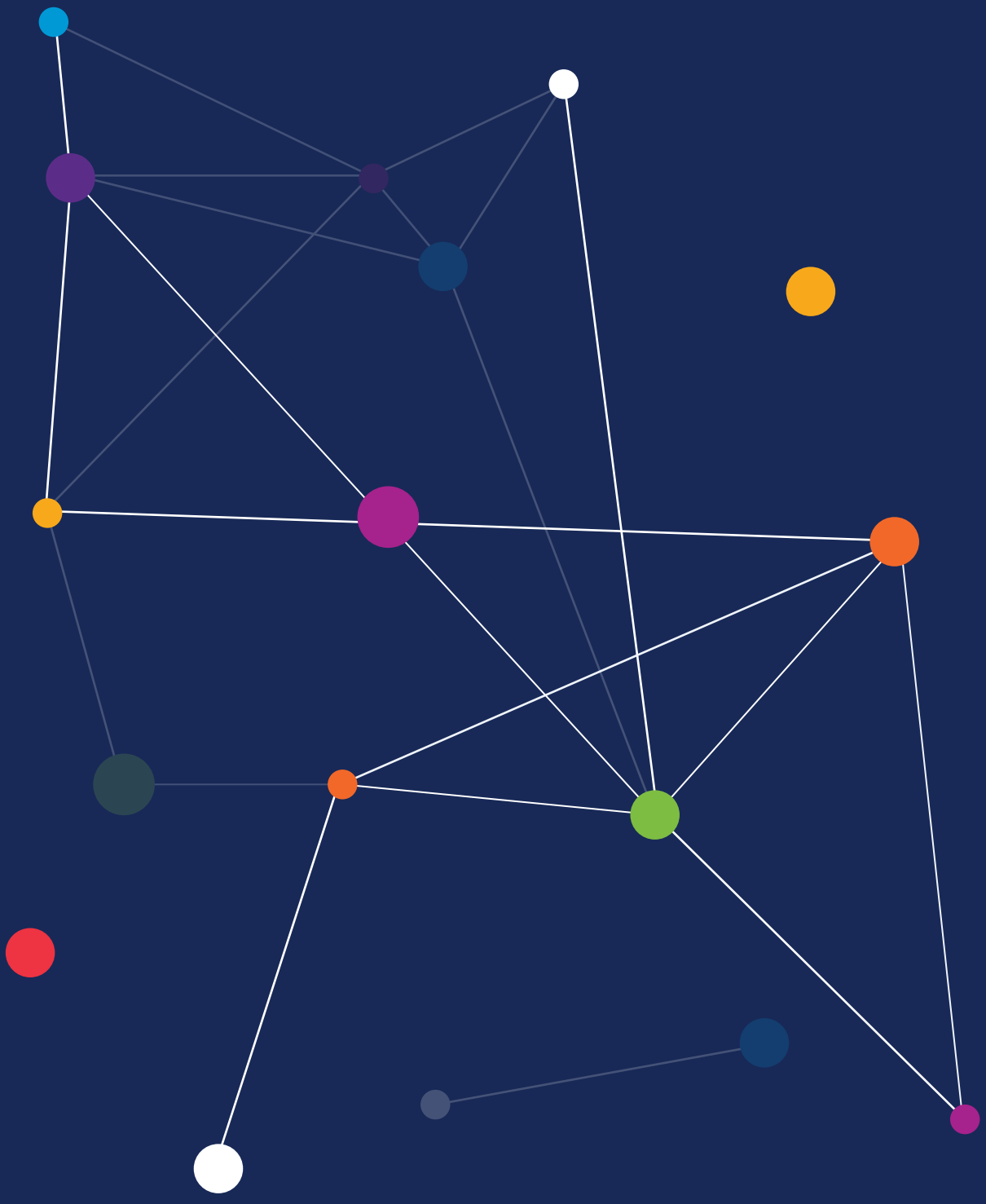
The WHO Handbook for Guideline Development 2nd Edition allows for recommendations to have different strengths, called strong and conditional recommendations.

As defined by the Handbook:

- strong recommendations "communicate the message that the guideline is based on the confidence that the desirable effects of adherence to the recommendation outweigh the undesirable consequences *(2)*."
- conditional recommendations "are made when a GDG is less certain about the balance between the benefits and harms or disadvantages of implementing a recommendation *(2)*."

"When evidence was scant, GDG members used their professional knowledge and expertise gained from academic and practical experiences garnered throughout their careers."

3. Concepts of contact tracing



This chapter includes:

3.1 Objectives

The most common objective of contact tracing is the prevention of new infections by breaking chains of transmission; the early identification and management of cases; and the implementation of PHSM to reduce the spread of infection.

However, contact tracing may achieve several other objectives that are critical to the control of transmission, such as:

- informing populations at risk about their exposure and disease risks, and available prophylactic treatments;
- understanding the epidemiological characteristics and transmission dynamics in the early phases of the emergence of a new pathogen or of a known pathogen in a new context;
- informing decisions on PHSM that are implemented/undertaken by individual people, communities and governments, and monitoring their effectiveness; and
- improving disease outcomes through the early detection and management of new cases.

3.2 Definitions

Understanding of contact tracing and its universal application depends on common terminology, language and set of concepts.

3.2.1 Contact person

Contact is defined as: **an exposure to an infectious disease that involves interaction with an infected individual or contaminated environment during a given period and in a manner that makes transmission likely, considering the nature of the disease and the context of the contact.**

A contact person is defined as: **someone who has been exposed to an infectious disease pathogen through direct or indirect contact with an infectious person. Risk of exposure may be determined by taking into consideration the mode of transmission, time and duration of exposure, distance from the infectious person, and stage of the disease and severity of symptoms in that person.**

When determining who is a contact person, consideration must be given to the following elements that contribute to defining the contact (Fig. 1):

- the mode of transmission of the pathogen;
- the diseases' clinical presentation and epidemiological characteristics (for example, incubation period, infectious period, presence of symptoms);

- the duration of potential exposure;
- the physical distance the individual was from a case (including the presence of protective equipment);
- the susceptibility of the individual (for example, immune status); and
- the type of interaction the individual had with the case.

To define the parameters to be included in the contact person definition, a detailed and evidence-based risk assessment should be carried out. In addition, the sensitivity and specificity of the contact person definition used will be a function of the parameters listed above, the objective of contact tracing, and considered in light of available resources, severity of disease, and contact vulnerability (Fig. 1). Box 1 gives examples of contact definitions used in various contexts with regards to the different elements listed above.

For instance, a contact person living in the same household as a known case is potentially at greater risk of exposure compared to people in less frequent, or random contact. Activities that bring people into greater proximity, even intimacy, can increase the risk of exposure, including types of work, caring for others, and sexual behaviours. Conversely, large gatherings or community events must be recognized for their potential in promoting environments in which disease-causing agents can spread *(6–9)*.

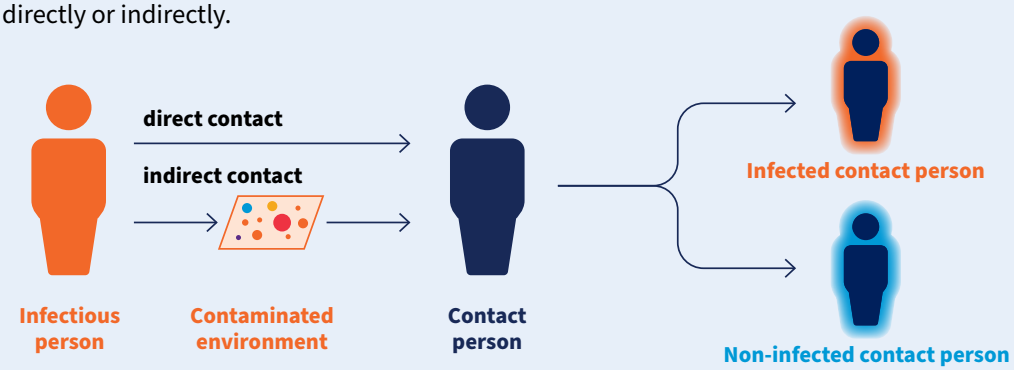
Fig. 1. Considerations when building the contact person definition

This definition, which needs to be established in the early phases of an outbreak, aims to define how to identify people who may have been infected by a sick individual/by a case. The definition changes based on the features of the pathogen concerned, including where, when and how it is transmitted from one person to another.

Defining a contact person

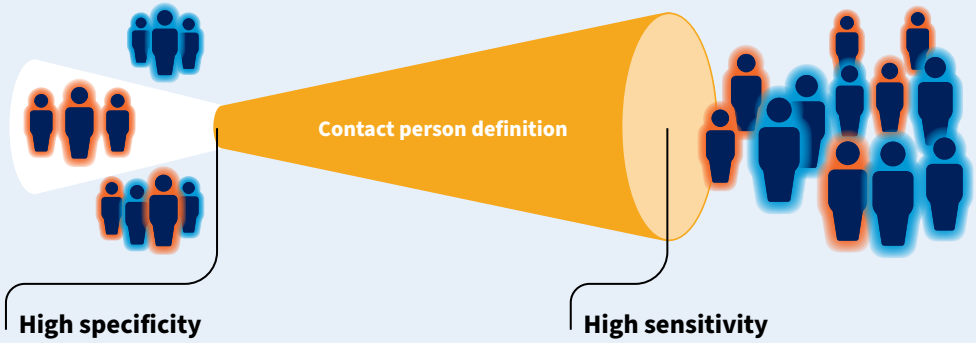
A **contact person** is someone who has been exposed to an infectious disease pathogen through contact with an **infectious person**, either directly or indirectly.

After contact, the contact person may become **infected** with the pathogen concerned, or remain **non-infected**.



Sensitivity vs specificity

Depending on the elements taken into consideration, the contact person definition can be considered more specific or more sensitive.



High specificity

A specific contact person definition is more likely to identify only infected contact persons, but some individuals who are infected may not be identified. This means some contact persons will not be treated and could potentially become sick and infect others.

High sensitivity

A sensitive contact person definition is more likely to identify all contact persons, including those who had contact with an infectious person but were not infected. Non-infected contact persons may be unnecessarily monitored.

Box 1. Examples of disease specific contact person definitions in various contexts excerpted from national guidelines

Elements of a contact person definition	Ebola, Democratic Republic of Congo, 2018 *(10)*	Measles, United Kingdom of Great Britain and Northern Ireland, 2024 *(11)*	Mpox, Pakistan, 2023 *(12)*
The mode of transmission of the pathogen	Direct contact with the secretions of infectious individual, indirect contact with individual's belongings (clothes, sheets)	The transmission route of measles is mostly airborne by droplet spread or direct contact with nasal or throat secretions of infected persons; much less commonly, measles may be transmitted by articles freshly soiled with nose and throat secretions, or through airborne transmission with no known face-to-face contact.	Direct contact and through respiratory droplets (and possibly short-range aerosols requiring prolonged close contact). The mpox virus enters the body through broken skin, mucosal surfaces, or via the respiratory tract.
The diseases' clinical presentation and epidemiological characteristics (for example, incubation period, infectious period, presence of symptoms)	Contact with an infectious individual in the past 21 days (incubation period)	Period of infectiousness: 4 full days before and until completion of 4 full days after rash onset.	The infectious period can vary, but generally patients are considered infectious from the time of symptom onset until skin lesions have crusted, the scabs have fallen off and a fresh layer of skin has formed underneath.
The duration of potential exposure	Not mentioned	• Close contacts including household contact • Face to face contact of any length • More than 15 minutes in a small, confined area, for example room in a house, classroom, 4-bed hospital bay (including healthcare workers)	Mostly direct exposure but mention of "No direct contact but within one meter for at least 15 minutes with an mpox case without wearing appropriate PPE" (medium risk).

Box 1. (continued) Examples of disease specific contact person definitions in various contexts excerpted from national guidelines

Elements of a contact person definition	Ebola, Democratic Republic of Congo, 2018 *(10)*	Measles, United Kingdom of Great Britain and Northern Ireland, 2024 *(11)*	Mpox, Pakistan, 2023 *(12)*
The physical distance the individual was from a case (including the presence of protective equipment)	Not mentioned	Not mentioned	Mostly direct exposure but mention of "No direct contact but within one meter for at least 15 minutes with an mpox case without wearing appropriate PPE" (medium risk).
The susceptibility of the individual (for example, immune status)	Vaccination status not taken then into consideration	Identification of contact persons in the following order of priority: 1. Immunosuppressed contact persons. 2. Pregnant women and infants less than 12 months. 3. Health care workers. 4. Healthy contact persons.	Not mentioned
The type of interaction the individual had with the case	Touching, caring, kissing, breastfeeding, manipulating dead bodies, touching clothes and sheets of infected individuals without adequate protection	Secondary transmission is higher among close contact persons, such as members of a household or individuals who have close contact with each other over a long period of time, or students in the same classroom.	Face-to-face, skin-to-skin, mouth-to-mouth or mouth-to-skin contact and through respiratory droplets

Once a contact person is identified, risk implications and risk stratification can be considered using the domains provided below.

3.2.1.1 High-Risk contact person

A high-risk contact person is an individual who may be more likely to become infectious, to develop a severe form of the disease, or to infect other individuals. Defining high-risk contact persons benefits:

- human, financial, and resource planning and allocation;
- policy development; post-identification management procedures;
- protecting vulnerable populations; and
- determining priority populations for further efforts, such as minimizing stigma, privacy concerns, and other burdens and harms of contact tracing.

The high-risk contact person definition is community and context specific and will be determined as a function of the following additional domains:

- host vulnerability (for example, age, comorbidity, disease outcome if infected, risk factors for severity); and
- the likelihood of further spread (for example, potential for super-spreader).

The definition of contact person and high-risk contact person may evolve over time as our understanding of an outbreak changes. Typically, all contact persons in the early stage of a high morbidity and/or mortality epidemic or pandemic will be considered. As more information about the pathogen becomes available, the application of these criteria may change.

It is important to prioritize consideration of privacy concerns and to minimize any stigma associated with being identified as a contact person. The need to support contact persons is discussed further in section 3.3.1 Contact person identification.

3.2.2 Contact tracing

Contact tracing is defined as: **the systematic process of identifying, assessing, managing, and supporting contact persons of infectious individuals.**

Contact tracing is initiated during the process of case investigation (see Fig. 2). Case investigation (including the identification of the origin of the infection and mechanism of transmission) is the essential component of outbreak exploration and forms the foundation of contact tracing efforts but lies outside the scope of this guideline. (For more information on Case Investigation, consult the WHO Outbreak Toolkit).

While the terms “upstream” and “downstream” contact tracing have been used in literature and other guidelines, WHO does not distinguish between the two, considering contact tracing to be downstream in its nature and guided by the latent and incubation periods of the pathogen in a given host.

Box 2 gives examples of contact tracing definitions from other guidelines that were considered by the GDG in crafting the definition in this guideline.

Box 2. Examples of disease specific contact tracing definitions in various contexts excerpted from national guidelines

In its discussion on defining the term contact tracing, the GDG considered definitions used in other guidelines, discovered through the systematic literature review. While there are evident differences between the various definitions, they share core rudiments of identification, communication, assessment, and support to those people deemed a contact person.

Some of the definitions considered included:

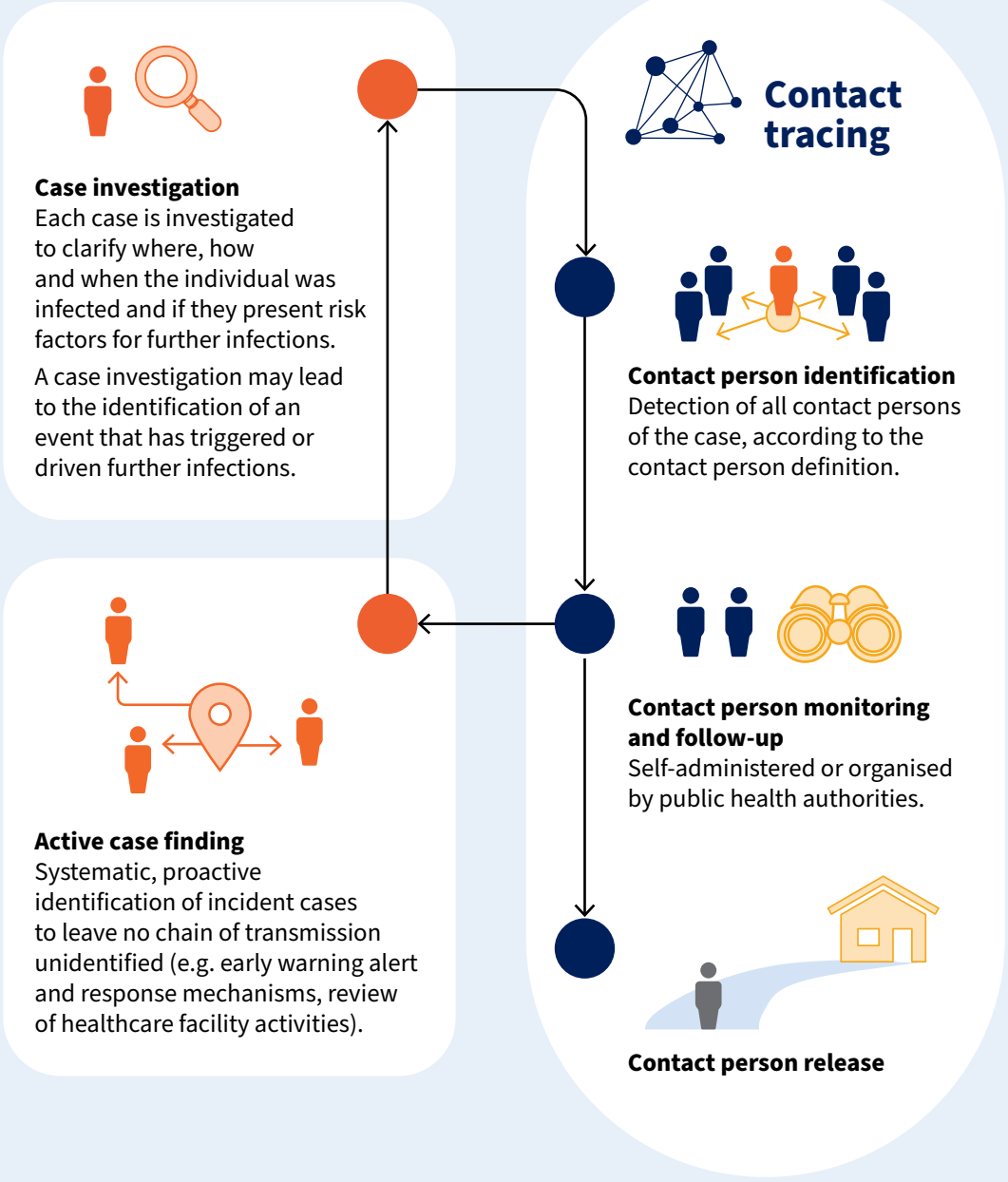
- "Fundamental activities that involve working […] with a patient who has been diagnosed with an infectious disease to identify and provide support to people (contacts) who may have been infected through exposure to the patient. This process presents further transmission of disease by separating people who have (or may have) an infectious disease from people who do not *(13)*.

- "Systematic process of identifying, assessing, and managing people who have been exposed to a disease to prevent onward transmission *(14)*."

- "Contact tracing is a key public health measure to control the spread of infectious disease pathogens, […] allows for the interruption of transmission and can also help people at a higher risk of developing severe disease to more quickly identify their exposure, so they can monitor their health status and seek medical care quickly if they become symptomatic *(15)*."

Fig. 2. The place of contact tracing within the outbreak investigation process

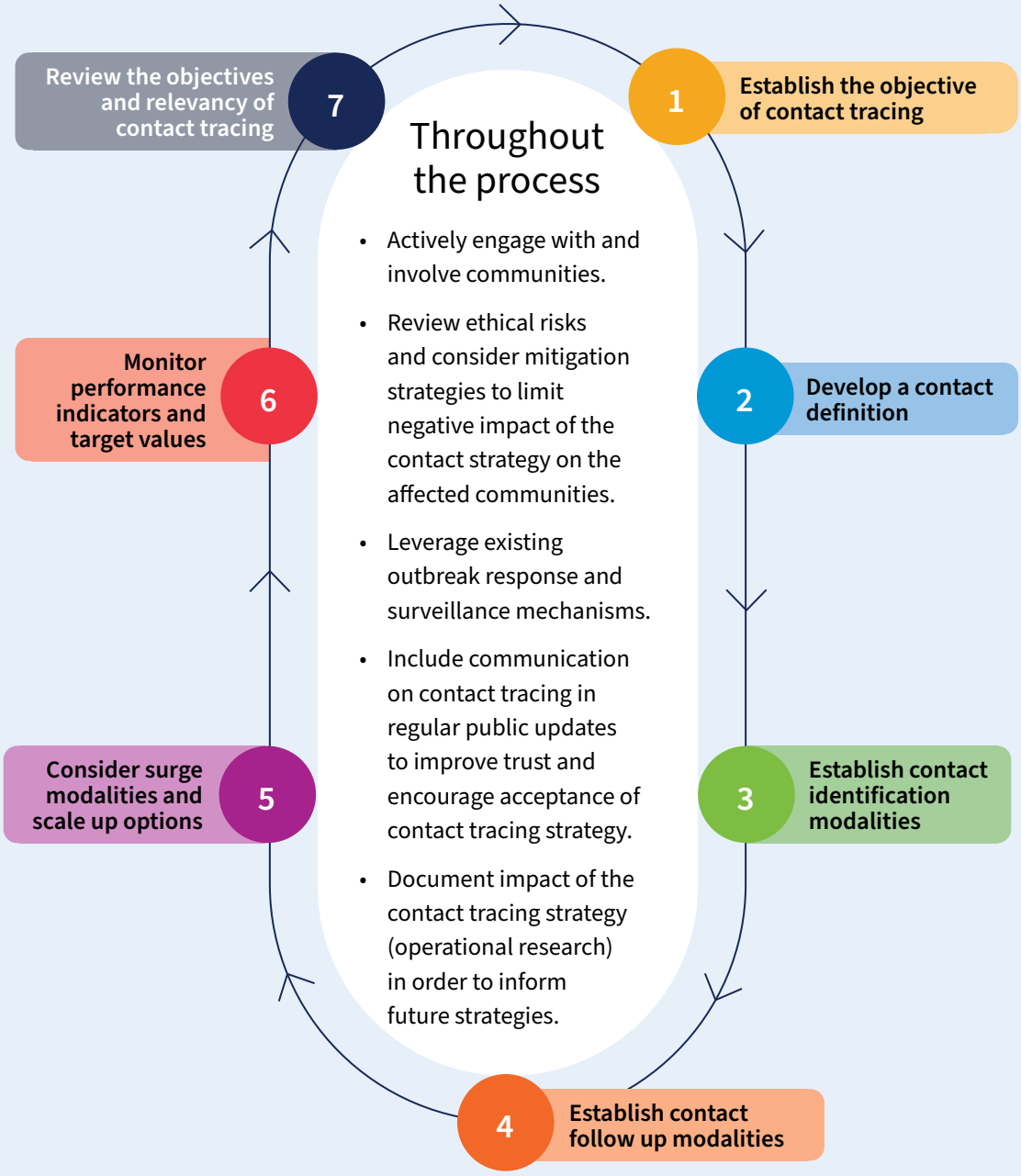
During an outbreak, each case undergoes a case investigation. This investigation seeks to clarify where, how and when the individual became infected and if they present risk factors for further infection. Cases will also be asked about other individuals they might have infected. All contact persons need to be identified, contacted, confirmed and asked to comply with defined measures.



3.3 Steps

The steps of contact tracing are identifying, notifying, monitoring, and supporting people who may have been exposed to an infectious disease with the aim of breaking the chain of transmission (see Fig. 3).

Fig. 3. Steps to develop a contact tracing strategy



Several factors influence implementation of a contract tracing initiative, including:

- the size of an outbreak and the corresponding effort required for contact tracing;
- data management;
- community engagement;
- cultural appropriateness;
- social and cultural sensitivities;
- rapid adaptation;
- ethical considerations (see Box 3), and
- resource allocation.

Box 3. Ethical considerations adapted from the Guidance for managing ethical issues in infectious disease outbreaks (2016) *(16)*

Inclusiveness: all potentially affected individual people should have the opportunity of providing their opinion during all stages of infectious disease outbreak planning and response, either directly or through designated focal points.

Recognition of particular vulnerability: all people must have equal and universal access to services and resources made available during infectious disease outbreaks. However, special attention should be given to ensuring that persons who face heightened susceptibility to harm or injustice during outbreaks are able to contribute to decisions about infectious disease outbreak planning and response. Concerted efforts should be made to include them in community engagement plans. Public health officials should recognize that such persons may not trust government and other institutions. Therefore, alternative communication strategies which take into account the impact of stigmatization and discrimination and the disproportionate burden of outbreak response measures may need to be considered.

Openness to diverse perspectives: communication plans should be designed to facilitate genuine two-way dialogue. Decision-makers should be prepared to recognize and discuss alternative approaches and revise plans based on those discussions.

Transparency: decision-makers should be able to explain to the public the basis for decisions in language that is clear, understandable, and linguistically and culturally appropriate. When decisions must be made in the face of uncertain information, the uncertainties should be explicitly acknowledged and conveyed to the public.

Box 3. (continued) Ethical considerations adapted from the Guidance for managing ethical issues in infectious disease outbreaks (2016) *(16)*

Privacy: contact tracing involves the collection of personal information and sensitive data, raising serious privacy and security concerns. Therefore, it is imperative to implement robust data protection measures, including de-identification, anonymization, and pseudo-anonymization, to prevent the misuse of data. This is particularly crucial for contact tracing applications, where information about users' locations and interactions with others is stored and analysed. Furthermore, it is essential to clarify the methods of data collection, processing, labelling, storage, sharing, and safeguarding. Additionally, consideration should be given to whether the data will be collected from children or vulnerable populations, such as migrants. Safeguards must be in place to protect the privacy and rights of these groups.

Confidentiality: the unauthorized disclosure of personal information collected during an infectious disease outbreak can expose people to significant risk. Adequate protection should exist against these risks, including laws that enshrine the confidentiality of information generated through surveillance activities, and that strictly limit the circumstances in which such information may be used or disclosed for purposes different from those for which it was initially collected. Use and sharing of non-aggregated surveillance data for research purposes must have the approval of a properly constituted and trained research ethics committee.

Voluntariness and assessing the importance of universal participation: this principle emphasizes the importance of respecting contact persons' autonomy and their right to self-determination. It entails encouraging them to participate in contact tracing efforts without coercion. Achieving this requires transparency and the establishment of trust with contact persons. It involves actively involving them in the decision-making process by clearly explaining the benefits at both the individual and public levels. Although public health surveillance is normally conducted on a mandatory basis, it may be appropriate to allow individuals to opt out of certain surveillance activities, such as contact tracing.

Acceptability: high accessibility and public trust are essential for the successful adoption of contact tracing strategies. Achieving this requires making data collection explainable, accountable, and responsible. Additionally, it's important to clarify the principle of beneficence, ensuring that the benefits of contact tracing are clearly communicated and understood.

Other considerations may include the following: informed consent, which can be challenging in the context of public health emergencies such as pandemics; consideration of the public health benefit; fostering solidarity; concerns regarding government surveillance; protecting contacts' rights, dignity, and justice; ensuring fairness and equity; addressing bias and discrimination, among others.

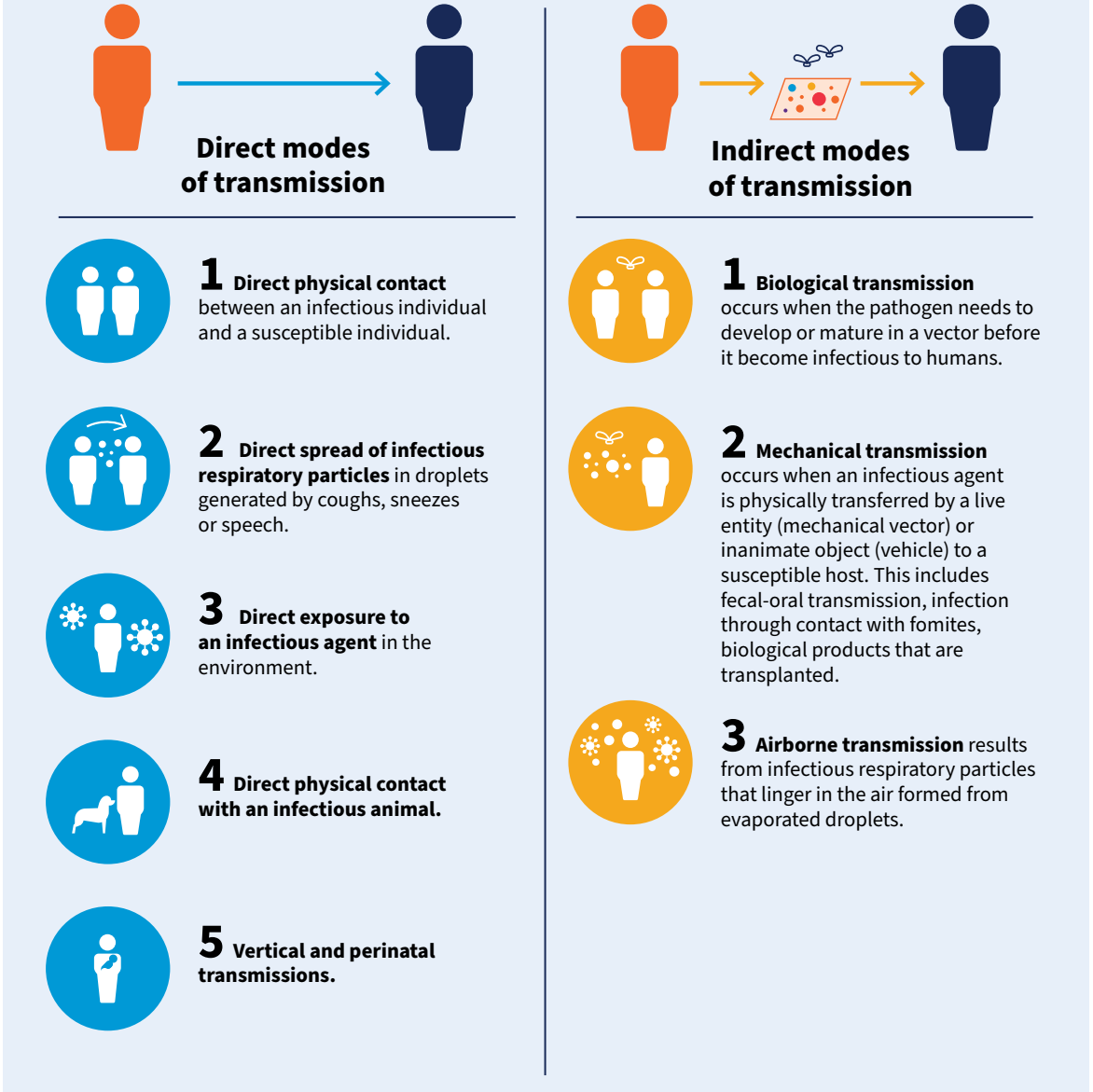
3.3.1 Contact person identification

Contact persons are usually identified during the case investigation through the determination of the interaction of known cases with other people. Potential exposures to known cases are determined based on the pathogen's known or expected modes of transmission (see Fig. 4). Such a determination

can be challenging with new emergent pathogens, or when pathogens have more than one mode of transmission. Further considerations to be included in contact person definition are described in section 3.2.1 Contact person.

Identifying contact persons commonly relies upon methods of case interview by healthcare workers, public health staff, or designated contact tracers, or through electronic surveys filled by cases themselves. Interviews are often conducted during home visits or by telephone, while growing technological advance, applications and other digital tools, such as digital proximity tracing applications, may also be used. Given that these are just emerging, an understanding of their value, limits, and best application is still developing. Medical records can also be reviewed as a means of detecting cases and their potential contact persons. For further information on this point, please consider reviewing WHO guidance on Ethical considerations to guide the use of digital proximity tracking technologies for COVID-19 contact tracing *(19)*.

Fig 4. Modes of transmission of infectious pathogens, adapted from van Seventer and Hochberg, 2017 *(17)*, and WHO *(18)*



Box 4 provides examples of contact person identification methods used in different settings.

Box 4. Examples of contact person identification and considerations excerpted from existing national and WHO regional guidelines

National guidelines for mpox, Pakistan, 2024 ***(12)***
According to the Pakistani National Guidelines for mpox, cases should be interviewed promptly to obtain the names and contact person information of all potential contact persons and identify places where contact with others may have occurred. Contact persons should be notified within 24 hours of identification and advised to monitor their health and seek medical care if symptoms develop. Depending on their exposure level, contact persons will receive an information sheet to regularly update their status and report any symptoms. A rapid response team will contact them daily by phone.

Guidelines for measles and rubella outbreak investigation and response, WHO European Region, 2013 ***(20)***
Persons who have been in contact with cases during their infectious period (for measles: between four days before and four days after the rash onset; for rubella: between seven days before and five days after the rash onset) should be identified and followed up. Contact person investigation should include assessment of their susceptibility to measles/rubella and their overall health status, including pregnancy status and risk factors for severe illness.

Contact tracing during an outbreak of Ebola virus disease, WHO Africa Region, 2014 ***(21)***
Contact person identification is crucial for epidemiologic investigation of suspected, probable, or confirmed cases, including deaths attributed to Ebola virus disease. Contact person identification involves completing a case investigation form to establish the likely source of infection and identify transmission chains. The epidemiologist or surveillance officer should systematically identify potential contact persons by inquiring about the case's activities and the roles of people around the case since the onset of illness.

Key steps for contact person identification include:

- visiting the patient's home to gather information about all individuals who lived with or visited the patient since the onset of illness;
- identifying places and persons visited by the patient, such as traditional healers, churches, and relatives;
- documenting health facilities visited by the patient and health workers who attended to the patient without proper infection control; and
- recording individuals who had contact with the deceased's body from death to burial.

Exposure information must be verified and rechecked during follow-up visits to ensure all transmission chains are identified and monitored for effective outbreak containment.

Being identified as a contact person can mean earlier diagnosis and rapid therapeutic intervention as well as access to prophylactic treatment and vaccination. The consequences, however, may include restriction of movement measures which may lead to the loss of income, from being unable to go to one's job; the inability to attend school; not being able to participate in activities; and deterioration of one's mental health. Such measures need to be carefully considered prior to implementation. While they can be beneficial in certain context and for certain diseases, they may not be the right actions for all diseases.

Discretion is vital to contact tracing. As much as it is possible, the identity of contact persons should remain confidential and should be collected and kept for the sole purpose of public health use only. The use of unique identifiers and codes assigned to individual people may improve privacy.

In some situations, these strategies can be intensified or scaled up to improve efficiency and effectiveness (see section 4.1 Should intensified contact person identification versus non-intensified contact person identification be used in populations at risk of infectious diseases?), including through the development of workforces dedicated to contact person identification.

Once contact persons are identified they should be notified of their exposure. Contact person notification should:

- provide information on the disease and modes of transmission;
- provide guidance on symptom monitoring and what to do if symptoms appear and the illness develops;
- offer instructions/health educate on self-care options for managing symptoms, when and where to seek medical care, where applicable, how to inform healthcare providers of illness onset, other potential measures such as quarantine, isolation, testing, vaccination;
- offer advice on how to avoid transmission in the household while caring for a sick family member;
- inform on available resources to support them, if any, such as income supplements, reimbursements, special assistance; and
- capture contact details of the contact person when follow up activities should be conducted.

The notification ideally should be delivered by trained public health professionals, where and when possible, through communication channels that are most common to the local areas and adapted to the personal impact the announcement may have on the contact person. Those may include home visits (ensuring appropriate precautions that are culturally sensitive while also undertaking steps to protect the health of the messenger), telephone calls, messaging applications, texts, letters, or emails. In some instances, public health professionals may not be available, and trained non-professionals may need to be used.

The privacy and dignity of a contact person must be respected. It is vital to appreciate the influence on people's lives, or that of their families, upon being identified as contacts. There are stigmas associated with identification that can leave lasting impacts, perhaps even traumatizing for some people. Being ostracized from one's community, for example, can have significant negative effects. All reasonable measures should be taken to mitigate the risk of any stigma that may arise and exist from being identified as a contact person. Protection of privacy must also be built into the notification process and systems used to collect and maintain data.

3.3.2 Contact person follow-up and monitoring

The follow-up of contact persons seeks to identify early signs of the disease. Once signs and symptoms associated with the disease appear consistent with the case definition, the contact person may be classified as a case. When available, testing may be proposed, to confirm the diagnosis.

Follow-up monitoring usually lasts from contact notification to first manifestations of the disease (evidenced by symptom onset or positive test when relevant) or until the end of the known incubation period.

Monitoring of contact persons, either by health authorities or contacts themselves, is essential to contact tracing.

Depending on the context, follow up can be conducted by the contact person themself, family or community members. Ideally, however, it is performed by trained personnel. The most common practices for follow-up of contacts are telephone calls or outreach surveys, text messages, and home visits. The frequency of these interactions needs to be planned based on the characteristics of the pathogen and the host, as well as available resources and trained workforce. Box 5 gives examples of contact person follow-up and monitoring recommendations for specific diseases and contexts.

Box 5. Examples of contact person follow-up and monitoring for various diseases and contexts from national and WHO guidelines

National guidelines for mpox, Pakistan, 2024 *(12)*
Contacts should be monitored or should self-monitor daily for signs or symptoms for 21 days (three weeks) from the last contact with the probable or confirmed case or their contaminated materials during the infectious period. Symptoms to watch for include headache, fever, chills, sore throat, malaise, fatigue, rash, and swollen lymph nodes. Contacts should check their temperature twice daily. Anyone with symptoms compatible with mpox virus infection, considered a suspected, probable, or confirmed case of mpox by health authorities, or identified as a contact person of a mpox case and subject to health monitoring, should avoid all travel, including international, until they are no longer a public health risk. Federal and provincial health departments may provide an emergency contact number for assistance.

Guidelines for measles and rubella outbreak investigation and response, WHO European Region, 2013 *(20)*
Persons without a history of laboratory-confirmed measles or rubella, immunization records, or serologic evidence of immunity (IgG antibodies to measles or rubella) should be considered susceptible. High-risk contacts (children under 5, adults, those in crowded environments, and individuals with immunosuppression, malnutrition, or vitamin A deficiency) should be evaluated and given preventive measures. Susceptible, age-eligible contacts with no contraindications should be vaccinated promptly. Vaccination within two days of exposure may modify or prevent symptoms. If needed, a second dose should be administered at least 28 days (four weeks) after the first. There is no upper age limit for measles- and rubella-containing vaccines.

Box 5. (continued) Examples of contact person follow-up and monitoring for various diseases and contexts from national and WHO guidelines

Contact tracing during an outbreak of Ebola virus disease, WHO Africa Region, 2014 *(21)*
The contact tracing/follow-up team is typically the first to learn if a contact person develops symptoms, either through a phone call from the contact person or during a home visit. The team **must not** take the temperature of symptomatic contacts. If symptoms arise, the team should immediately notify the supervisor or alert management desk/call centre, which will complete the Ebola alert case notification form and inform the case management team leader. The ambulance team is then dispatched to assess and/or evacuate the symptomatic contact person to the treatment centre. Close supervision of contact person follow-up is crucial. Local surveillance/community workers should visit and observe contacts daily. Supervisors should rotate with follow-up teams for home visits to ensure proper conduct. Quality checks can include randomly calling contacts to confirm visits. Regular meetings with contact tracing teams should address any issues affecting contact tracing effectiveness. Contacts completing the 21-day (three week) follow-up period should be assessed on the final day. If they are symptom-free, they should be informed that they are discharged from follow-up.

With the growth of technology, applications may become more common contact monitoring tools and may reduce the demand for trained human resources. However, in some contexts, follow-up through human resources will remain preferable, as technological options may not be accessible.

3.3.2.1 Considerations for including testing in the contact tracing strategy

Testing is performed as part of the case identification strategy where testing tools and technologies are available. Within contact tracing strategies, the case identification purpose of testing may be used to clear a contact person. The outcome will determine if the contact person is infected (becomes a case) or not infected.

For diseases where the latent period is shorter than the incubation period, or where infectious individuals may be asymptomatic, testing may be used to differentiate infected contacts from non-infected contacts. For instance, some country settings required contacts to get tested for COVID-19 if they wished for their follow-up period to end earlier

For diseases where only symptomatic individuals may infect others, testing is used as part of the case identification and management strategy (for example, Ebola virus disease), and not as part of the contact tracing strategy.

To manage testing resources, it may be necessary to prioritize testing based on objectives (cases compared to contacts), groups (symptomatic compared to asymptomatic), or population (vulnerable populations).

3.4 Enabling factors and barriers

3.4.1 Practical implementation

3.4.1.1 Human resources

Given that contact tracing can draw from many different groups to assemble multidisciplinary teams, organizing this workforce to be effective and efficient is integral to success. Training can be a unifying basis upon which to establish these teams and a means of achieving efficacy and efficiency. Studies emphasized the value of targeted training and capacity building, especially for new volunteers, for contact tracing and data management *(22–27)*.

Skills to develop for contact tracers can include interview methods, de-escalation techniques, crisis intervention, field safety, confidentiality, and cultural competence. Teams with training are more efficient and beneficial to public health responses, and there are roles, such as epidemiologists, data managers, and administrative staff, that require specialized skillsets *(13–16)*.

The GDG noted the importance of human resources, systemic perspective, and surge capacity for when systems must grow to meet the scale of response required. Members recognized the need for technical expertise, management and administrative support, and operational-level staff.

3.4.1.2 Financial resources

Significant portions of costs associated with contact tracing efforts are attributable to workforces, especially in a manual-based process compared to a digital-based one. These costs include wages and compensation to cover expenses *(32–34)*. Further resources are consumed by expenditures associated with testing and diagnostics, including use of equipment and staff *(35,36)*. Additional costs are presented when there is the use of financial and non-financial transfers for contact persons and cases *(22,23)*.

3.4.1.3 Public health infrastructure

Governance is vital to contact tracing. There are various examples where contact tracing strategies have been attempted at local, sub-national, national levels, and regional levels. The GDG recognized that all aspects of contact tracing require good governance to oversee them, allowing the programmes to run smoothly and earn public trust, regardless of the level or order of government attempting the implementation of a programme. It highlighted various components that governance of contact tracing should contain or reflect, namely leadership, accountability, organization, and capacity for managing priorities and for effective decision-making.

How these aims are achieved can often rely on traditional mechanism, such as statutes, regulations, bylaws, policies, and guidelines. Characteristics beneficial to governance structures can be degrees of decentralization, adaptability, and interoperability with other parts of public health systems.

3.4.2 Uptake by end-users

In a systematic review produced in 2020, Megnin-Viggars *et al.* identified four categories of enablers and five categories of barriers to adherence by the public with contact tracing *(39)*. Those categories, presented and adapted below (Table 1), are taken from this systematic review. A more detailed description of each is available from the review itself.

Table 1. Factors influencing engagement with contact tracing, adapted from Megnin-Viggars *et al. (39)*

Enablers	Barriers
• Collective responsibility • Personal benefit • Co-production of contact tracing systems, when healthcare systems partner with communities • Perception of the system as efficient, rigorous and reliable	• Privacy concerns • Mistrust and apprehension of the government's public health system, including contact tracing systems • Unmet need for more information and support • Fear of stigmatization • Mode specific challenges (which include logistical challenges, technical difficulties, and lack of perceived personal benefit)

A further examination of enablers and barriers to PHSM acceptance can be found in Box 6.

The Operational guide for engaging communities in contact tracing serves as a practical guidance for setting up contact tracing strategies in collaboration with affected communities to ensure the best possible engagement and adherence to contact tracing activities.

Box 6. Enablers and barriers to the implementation of PHSM

Public health and social measures (PHSM) refer to non-pharmaceutical interventions implemented by individuals, communities, and governments to reduce the risk and scale of transmission of infectious diseases by reducing transmission-relevant exposures and/or making them safer *(40)*. Examples include social measures like physical distancing, personal protection like handwashing and mask-wearing, and environmental or international travel and trade measures.

To effectively break transmission chains, PHSM are usually implemented as a bundle of multiple interventions selected according to the epidemiological and country context. However, a disproportionate (excessive or insufficient) implementation of PHSM may result in individuals and societies experiencing unintended negative health, social, and economic consequences that cause a sense of unfairness and leads to an unwillingness to cooperate. For example, the need to quarantine after having been exposed to an infected person may negatively impact mental health and well-being due to feelings of stigmatization, loneliness, and anxiety. Without social protection coverage, such as paid sick leave or unemployment insurance, quarantine and isolation, for those people able to comply, could lead to job loss and financial distress followed by food and housing insecurity. In addition, some people may not have the space necessary to separate from other people in their household during isolation and quarantine.

The prospect of suffering negative consequences from complying with PHSM can decrease people's acceptance, uptake and adherence to those measures, which in turn affects their lives and will likely become less acceptable *(41)*. As a result, the effectiveness of these measures will be reduced. In the context of contact tracing, this could mean that identified cases may be reluctant to disclose their contact persons or that potential contact persons might be hesitant to adhere to recommendations on testing and quarantine practices to avoid mental health, financial and social repercussions.

It is hence crucial to take a holistic view of PHSM implementation, weighing benefits in terms of outbreak mitigation or containment against health, social and economic costs for individuals and society as a whole *(42)*. A balanced PHSM implementation package therefore includes context-specific interventions to reduce transmission, enabling functions such as risk communication and community engagement, and mitigation measures such as social protection policies and programs and community-based interventions to alleviate the burden arising from outbreak response actions. In the situation of active case finding and contact person identification, where possible and pragmatic, concrete mitigation measures could be considered, including paid sick leave, unemployment insurance, cash transfers, home grocery/food delivery, psychosocial support and rental subsidies or eviction bans. These options may be achievable for some jurisdictions, but not all. The PHSM decision and implementation process should further be guided by a strong focus on equity considerations and a commitment to involving affected communities and implemented with multisectoral coordination.

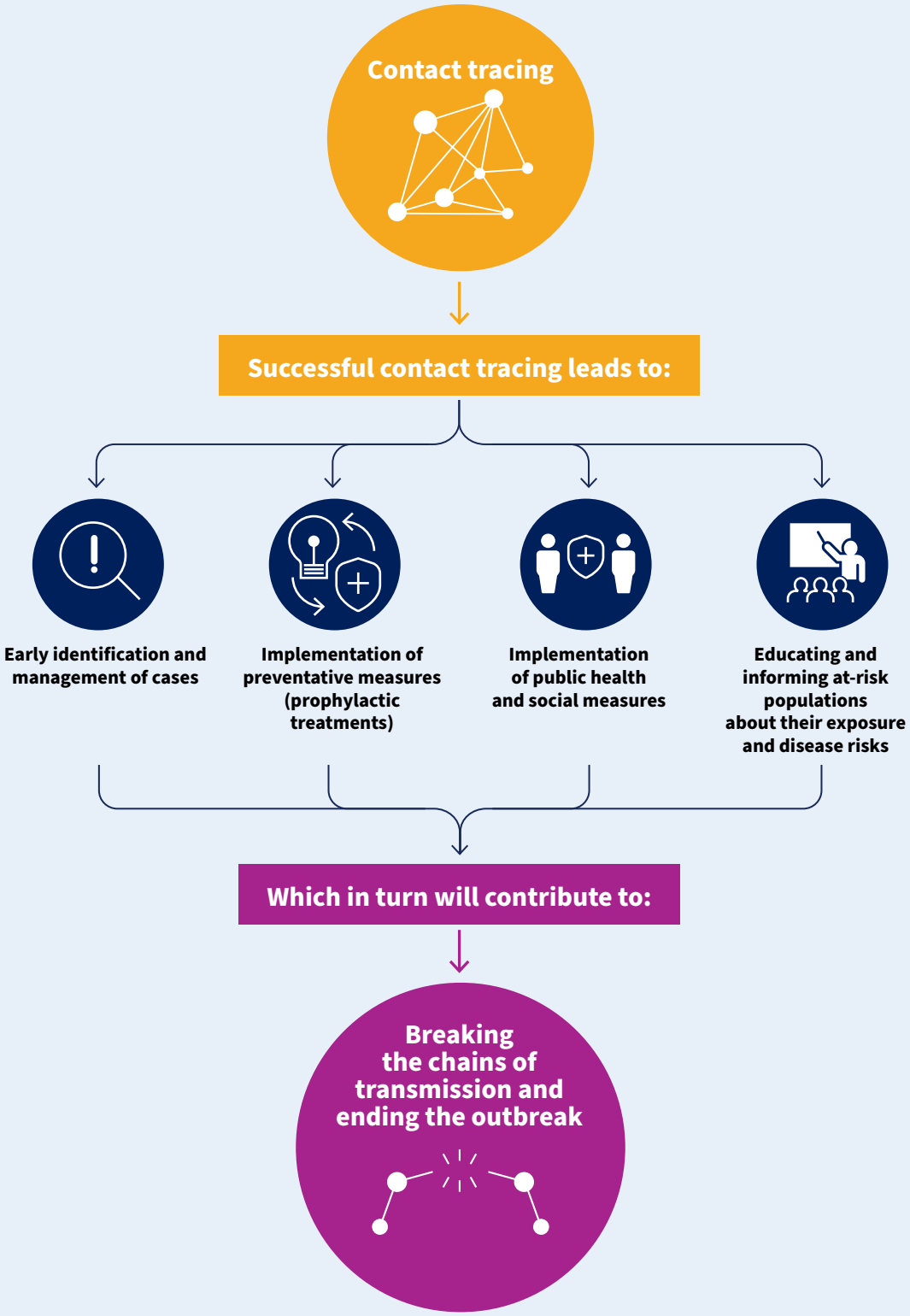
3.5 Measures of effectiveness

The effectiveness of contact tracing is challenging to measure because of its indirect effect on key epidemiological indicators, such as reproduction rate or attack rates. Rather contact tracing informs measures (such as information of contact persons or provision of prophylaxis) that will influence the measurable impact (see Fig. 5).

For instance, being identified as a contact person may present a learning opportunity: awareness of the disease and modes of transmission can be increased, and knowledge and understanding of resources to mitigate the risk of subsequent spread of the pathogen and how to access them can be improved. If the information and communication material is successfully developed, disseminated and used, then it is more likely that contact persons who become symptomatic will know to enter the healthcare system early for diagnosis and care both to protect their close contacts and to benefit from early management of the disease. This may contribute to the decline in further disease transmission and improved disease burden control and prevention outcome.

Fig. 5. Contact tracing: the indirect impacts

The effects of contact tracing on outbreak dynamics are indirect, but still significant.



Metrics measuring effectiveness of contact tracing can be grouped into four categories: input and process, output, outcome, and impact *(43)*.

Box 7 gives examples of calculation for some of these indicators.

Input and process indicators measure the resources used, and activities carried out during the implementation of contact tracing. These may encompass:

- Human and financial resources invested, including salaries, trainings, tools, laboratory services.
- Timeliness of contact tracing: those may be defined as time between key milestones of the contact tracing process such as time from exposure of contact person to identification of contact person, time from identification to notification and initiation of follow-up, or time from exposure to time of the time of exposure to implementation of prevention measures. These timeline measures can also be used to improve the performance of contact tracing programs and their processes.
- Contact person identification: the absolute number of contacts identified by case is an indicator that has been used in past outbreaks (COVID-19 and Ebola virus disease outbreaks). However, to date the literature shows no evidence for the establishment of a standard number of contacts per identified case by mode of transmission. Those are context- and disease infection-specific and should be established by using appropriate network analysis methods.
- Proportions of known contact persons that were notified/followed/screened/tested (if applicable) may be used to assess the performance of the contact tracing process.

Overall, the most common process indicator used is the proportion of cases that were known as contact persons when they were detected as case.

Output indicators measure the immediate results of the intervention. These may encompass:

- Proportions of known contact persons that adhered to contact-tracing processes may be used to measure the contact tracing strategy's capacity to efficiently inform the number and quality of the response measures applied to contact persons.
- Attack rate among second degree contact persons (for example, contacts of contacts).
- Proportion of cases reported among known contact persons.

Outcome indicators assess the short-term and long-term effects of contact tracing.

Impact indicators measure the broad community-level changes to which contact tracing may have contributed. Outcome and impact indicators may encompass interruption of transmission chains, significant reduction in the number of new cases, and fatalities. Those effects and changes are difficult to attribute to contact tracing only as other concurrent response activities and PHSM may also have contributed to these effects.

Box 7. Calculation of example contact tracing performance indicators

Indicator	Information needed	Calculation	Target value
Time from identification of case to notification of contact person	Time of identification of case (T_{ID_Case}) Time of notification of contact person ($T_{Notif\_Contact}$)	t= $T_{Notif\_Contact}$ - T_{ID_Case}	Tend towards 0 These indicators refer to the timeliness of the contact tracing strategy, from the investigation of newly reported cases to the identification and notification of contact persons. The sooner a contact person is informed of their status, the likelier the chain of transmission of the disease is broken.
Time from exposure to case to notification of contact person	Time of exposure to case (T_{Exp}) Time of notification of contact person ($T_{Notif\_Contact}$)	t= $T_{Notif\_Contact}$ - T_{Exp}	
Time from identification of contact person to notification and initiation of follow up	Time of identification of contact person ($T_{ID\_Contact}$) Time of notification of contact person ($T_{Notif\_Contact}$) Time of initiation of contact person monitoring ($T_{Monitoring\_Contact}$)	t= $T_{Notif\_Contact}$ - $T_{ID\_Contact}$ t= $T_{Monitoring\_Contact}$ - $T_{ID\_Contact}$	
Number of contacts identified by case	For each case, how many individuals were counted as contact persons according to the contact person definition	None	No target has been set. This will depend on the context and each individual case's social networks.
Proportions of known contacts that were notified/followed/ screened/tested	Number of known contacts (N_{Known}) Number of contacts notified/followed/ screened/tested ($N_{Notif\_Contact}$/ $N_{Folllowed}$/ $N_{Screened}$/ N_{Tested})	p= $N_{Notif\_Contact}$ / N_{Known}	Tends towards 1 Ideally, all contact persons should undergo the relevant processes/steps required by the contact tracing strategy.
Proportion of cases that were known as contacts when they were detected as case	Number of cases who were known contacts ($N_{Cases\_Contact}$) Total number of cases (Tot_{Case})	p= $N_{Cases\_Contact}$ / Tot_{Case}	Tends towards 1 This measures the sensitivity of the contact tracing strategy, including the contact person definition. Ideally, all cases are known contact persons at time of detection. This means all the transmission chains are known and monitored.

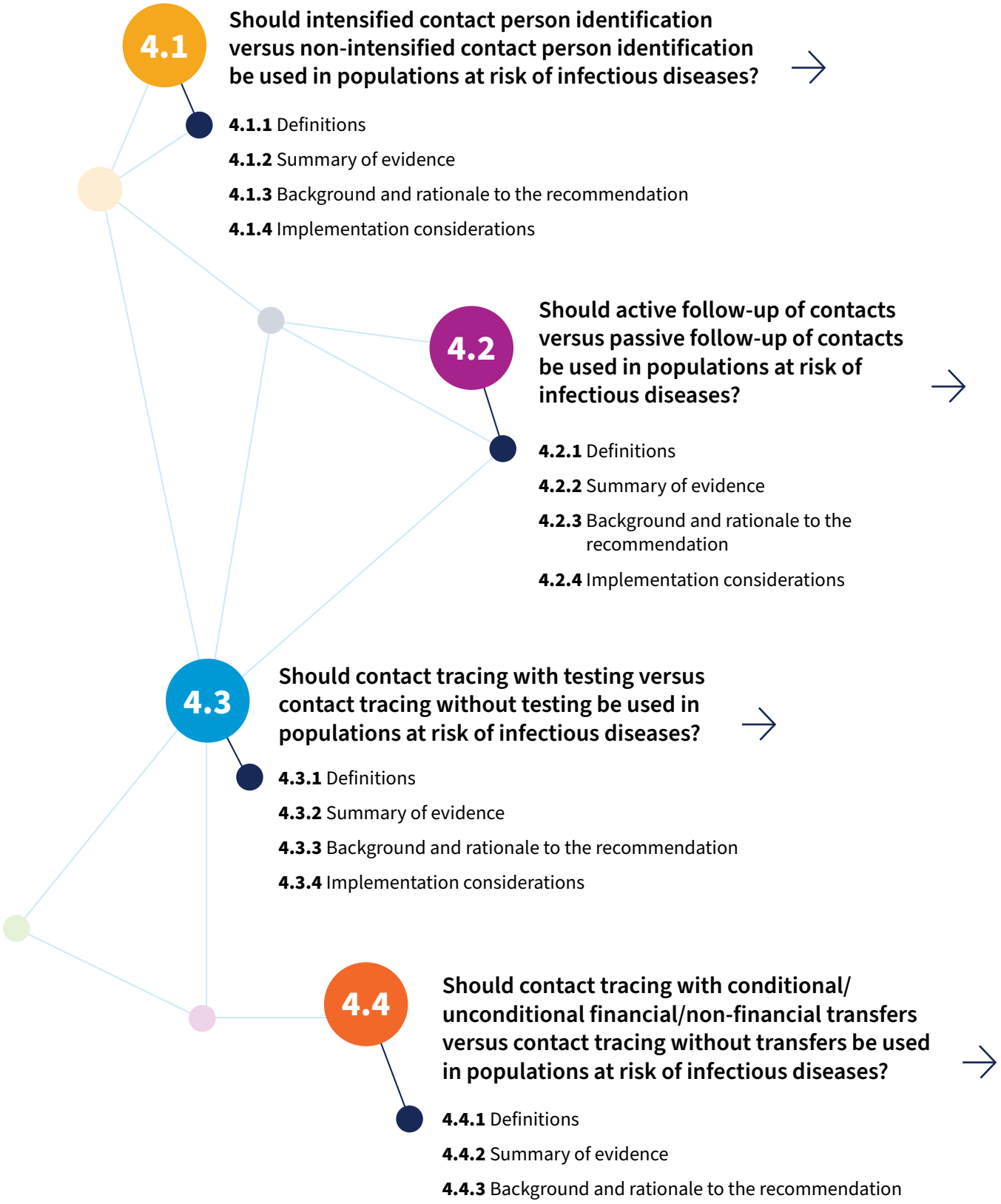
Box 7. (continued) Calculation of example contact tracing performance indicators

Indicator	Information needed	Calculation	Target value
Proportion of cases reported among known contacts	Number of known contacts who became a case ($N_{Contact\_Case}$) Number of known contacts (N_{Known})	$p = N_{Contact\_Case} / N_{Known}$	Tends towards 1 This measures the specificity of the contact tracing strategy, including the contact person definition. Ideally, the contact tracing strategy only identifies infected contacts.
Attack rate among second degree contacts	Number of known contacts of contacts (N_{Known_COC}) Number of cases who were contacts of contacts (N_{Cases_COC})	$AR_{Sec} = N_{Cases\_COC} / N_{Known\_COC}$	Tends towards 0 An efficient contact tracing strategy will identify contact persons early, ideally, before infected contacts may infect others. This will reduce the attack rate among contact persons of contact persons.

Although attempts were made to establish benchmarks of such metrics for contact tracing in specific diseases, no globally agreed upon standards have been determined to date. Context specific standards should be developed.

4. Evidence and recommendations

This chapter includes:



4.1 **Should intensified contact person identification versus non-intensified contact person identification be used in populations at risk of infectious diseases?**

- **4.1.1** Definitions
- **4.1.2** Summary of evidence
- **4.1.3** Background and rationale to the recommendation
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4.2 **Should active follow-up of contacts versus passive follow-up of contacts be used in populations at risk of infectious diseases?**

- **4.2.1** Definitions
- **4.2.2** Summary of evidence
- **4.2.3** Background and rationale to the recommendation
- **4.2.4** Implementation considerations

4.3 **Should contact tracing with testing versus contact tracing without testing be used in populations at risk of infectious diseases?**

- **4.3.1** Definitions
- **4.3.2** Summary of evidence
- **4.3.3** Background and rationale to the recommendation
- **4.3.4** Implementation considerations

4.4 **Should contact tracing with conditional/ unconditional financial/non-financial transfers versus contact tracing without transfers be used in populations at risk of infectious diseases?**

- **4.4.1** Definitions
- **4.4.2** Summary of evidence
- **4.4.3** Background and rationale to the recommendation

4.1 Should intensified contact person identification versus non-intensified contact person identification be used in populations at risk of infectious diseases?

WHO suggests in favour of intensified contact person identification over non-intensified contact person identification in populations at risk of infectious diseases.

(conditional recommendation; very low certainty of evidence)

4.1.1 Definitions

The following definitions are offered for clarity:

Intensified contact person identification refers to in-depth investigations of cases conducted by a public health professional, usually at point of diagnosis or care.

Non-intensified contact person identification refers to short investigation of cases conducted by a public health professional, direct notification by cases, and self-notification by contact persons.

4.1.2 Summary of evidence

There were seven studies identified that compared effectiveness between intensified contact person identification and non-intensified contact person identification. Of those studies, one was a randomized controlled trial (RCT) *(44)*, which was judged to have a high risk of bias. All others were nonrandomized studies *(36,45–49)* and determined to have a serious risk of bias. Two studied COVID-19 *(44,48)*, two studied chlamydia *(47,49)*, two studied tuberculosis *(36,46)*, and one studied hepatitis B virus (HBV) *(45)*.

4.1.2.1 Contact person identification

The available evidence suggested intensified contact person identification (see Box 8) resulted in more contact persons identified per index case: 12.14 (using cognitive interview); 8.01 (using control protocol) *(44)*; 8.4 (home visits); 2.5 (telephone interviews) *(46)*; 2.2 (nurse-led); 2.1 (self-controlled); 2.1-2.16 (verbal advice, contact cards, midwife-led); 1.6–2.37 (verbal advice) *(45)*.

4.1.2.2 Proportion of contact persons reached

In a nonrandomized study, more contact persons were identified through the intensified measure of tracers being present in an emergency department (162 out of 197, 83%), compared to the non-intensified measure of tracers using a COVID-19 extended form (2 683 out of 3 441, 78%) *(48)*.

4.1.2.3 Proportion of contacts testing positive

A nonrandomized study examining contact tracing of tuberculosis contact persons showed more contact persons tested positive through intensified actions (phone interviews and home visits, 6.4%) compared to only home visits (0.3%) *(36)*.

Box 8. Examples of interventions to intensify contact person identification in the studies

In a 2021 RCT conducted in the USA through a series of interviews, the authors compare using a standard contact tracing interview for COVID-19 contact persons with a cognitively informed interview protocol. Specifically, the enhanced interview was based on a type of questioning known as a "Cognitive Interview," which employs cognitive techniques to improve memory retrieval *(44)*.

For a study conducted between 2015 and 2017 across Greater Manchester and East England, the enhancement was a nurse-led management of HBV contact persons, which saw the nurses undertake three specific tasks: tracing all contact persons of diagnosed HBV cases, regular follow-up with contact persons to ensure testing and vaccination, finally, ensuring appropriate referral for those contact persons diagnosed with HBV *(45)*.

A 2012 study, examining contact tracing between 2001 and 2003 and 2004 and 2006 in in Vila Nova de Gaia, Portugal, allowed researchers to compare the national standard tuberculosis interviews used between 2001 to 2003, which were conducted by telephone, to interviews, after 2004, conducted at contact persons' homes or workplaces *(46)*.

A 2019-published study analysed routine tuberculosis contact person identification in Myanmar, comprising home visits and symptom screening, was supplemented by programme nurses conducting follow-up telephone calls inviting contact persons to be screened *(36)*.

The enhancement assessed in a 2022-published study was having contact tracers present in emergency departments in Snohomish County, Washington, USA, at the point of diagnosis, when COVID-19 cases were confirmed *(48)*.

Contact tracing in Sweden was investigated in a 2005 paper where the intervention was using specially trained midwives and, additionally, genotyping for tracing chlamydia contact persons. While genotyping did add valuable information, the authors concluded, it was not necessary to achieve the improved contact person identification results *(49)*.

4.1.3 Background and rationale to the recommendation

The limited availability and the very low certainty of evidence caused the GDG to conclude with a conditional recommendation. Members judged the balance of health effects to be variable, and alignment with human rights and sociocultural acceptability as probable. It viewed the impact of intensification on health equity, equality, and non-discrimination as probably positive, with societal implications favouring the intervention. The panel found that the financial implications and affordability would depend on setting and could not be judged, based on the lack of evidence available.

The discussion of the GDG reflected several principles: that intensified contact person identification measures should only be considered when ongoing measures being used are insufficient in identifying contact persons during an outbreak. The capacity of those initial measures, which are context-specific and resource-dependent, can alter over the course of an outbreak. Community engagement is essential to implement any contact person identification methods, especially intensified measures. Communication strategies aimed at informing the public are required to explain the risks associated with an outbreak and the reasons why intensified measures are being implemented. As with any degree of contact person identification, sociocultural considerations, equity, equality, privacy and data protection must be built into the programme from the outset.

4.1.4 Implementation considerations

The GDG emphasized the importance of community engagement, for example, through engaging with trusted community leaders, and risk communication to have any intensification accepted by impacted populations. Contact person identification intensification occurs in addition to other transmission reducing efforts. Decisions to intensify efforts should be guided by an understanding of, and sensitivity to, the potential impact of these measures on the socioeconomic realities of societies. Therefore, a decision to intensify and how to intensify should be tailored to the type of infection and the local context and any barriers. Furthermore, a decision to intensify is dependent on a specific evaluation of the cost-effectiveness of available resources for a given intervention, compared to other possible activities, in the context. It could also be necessary to intensify for a specific sub-set of the population: those individuals who are more likely to have severe health outcomes, for example, or those contact persons who have high-risk exposures, or could expose larger numbers of people.

4.2 Should active follow-up of contacts versus passive follow-up of contacts be used in populations at risk of infectious diseases?

WHO suggests in favour of active follow-up of contact persons over passive follow-up of contact persons in populations at risk of infectious diseases.

(conditional recommendation; very low certainty of evidence)

4.2.1 Definitions

To help facilitate the implementation of this recommendation, the GDG defined the following terms, and provided examples of possible actions.

Active follow-up are direct interactions taken by a healthcare or public health system with a contact person, which can include direct (routine) check-ins (home visits, telephone calls, text messaging) for symptom screening, prophylaxis after exposure, vaccination, testing and follow-up, treatment referral and support groups.

Passive follow-up are actions that a contact person could undertake on their own initiative, including self-reporting to public health authorities in charge of contact tracing, self-monitoring, and at-home testing (when testing is relevant).

4.2.2 Summary of evidence

There were seven studies identified that compared effectiveness between active follow up with contact persons versus passive follow up: three were RCTs *(50–52)*. Of these studies, two had low risk of bias *(50,51)* and one had a high risk of bias *(52)*. There were four nonrandomized studies identified, which were all judged to have severe risk of bias *(36,45,53,54)*. Three were related to tuberculosis *(36,52,54)*, two to COVID-19 *(50,53)*, and one each to HBV *(45)*, and chlamydia, respectively *(51)*. The studies examined a range of potential interventions (see Box 9), which did cause the GDG to raise concerns about the indirectness of the evidence relative to the intent of the PICO question.

4.2.2.1 Identification of additional cases

Evidence included a study suggesting no significant difference in yield of confirmed tuberculosis diagnoses between a home visit (1.5% [intervention]) and a clinic visit (1.1%), which was standard of care in the country (control), or in human immunodeficiency virus (HIV) diagnoses (2.0% [intervention] versus 1.8% [control]) *(52)*. Another study shows 17 additional tuberculosis cases detected through active follow up of home visits, symptom screening among household contact persons and follow-up telephone calls, and only 1 additional case in the control group, of home visits and symptom screening among household contact persons *(36)*.

4.2.2.2 Case referral to specialists

Nurse-led management and contact tracing of chronically infected individuals with HBV led to a 14% increase in case referrals to specialists (86% before the intervention, 99.7% after the intervention) *(45)*.

4.2.2.3 Contact person testing

While one study showed no significant difference in completion of tuberculosis evaluation at 14 days (14% intervention of home-based, short message service [SMS]-facilitated, household evaluation by healthcare workers versus 15% [control of in-clinic evaluation]) *(52)*, another study, of HBV using nurse-led management and contact tracing of chronically infected individuals with HBV, showed an increased proportion of contact persons tested, from 34% (pre-intervention) to 72%-94% (post-intervention) *(45)*. A third study demonstrated more contact persons were tested with geographic information system (GIS)-linked contact tracing and community surveillance compared to community surveillance alone (653 vs. 86 248) *(53)*.

4.2.2.4 Treatment Initiation

A study showed that with additional training of healthcare workers on administering isoniazid preventative therapy (IPT) in asymptomatic household contact persons, (aged <6 years) and correct documentation in the register, IPT initiation improved from 19% (pre-intervention) to 61% (post-intervention) *(54)*. The proportions of contactable partners considered treated within 6 weeks of index diagnosis of genital chlamydia were 39/111 (35%) for telephone assessment of partner(s) plus standard partner notification, 46/100 (46%) for community pharmacist assessment of partner(s) plus routine standard patient referral, and 46/102 (45%) for standard patient referral *(51)*.

4.2.2.5 Vaccination

Nurse-led management and contact tracing of chronically infected individuals with HBV led to significant increased vaccination rates (of at least three doses), from 77% (pre-intervention) to 92% (post-intervention) *(45)*.

4.2.2.6 Access to Social Services

A “high-touch” contact tracing model (integrating social services with disease investigation, providing continued support and resource linkage for clients from structurally vulnerable communities) led to an 8.4% increase in social services use (0.8%–15.9%, 95% confidence interval) and a non-significant 4.9% increase in uptake rate (-0.2%–10.0%) compared to the control group (no “high-touch” contact tracing) *(50)*.

Box 9. Examples of contact person follow-up interventions

A cluster RCT examined COVID-19 contact tracing in 2021, in Santa Clara County, California, USA, where the intervention was "high touch" contact tracing, in which social services were combined with disease investigation so that contact persons from vulnerable communities received support while being monitored *(50)*.

Researchers compared accelerated partner therapy to routine partner notification (cases notifying their own partners) for Chlamydia cases in a RCT set in London, and south-east England, United Kingdom of Great Britain and Northern Ireland, between 2011 and 2013. Two forms of accelerated partner therapy were tested: accelerated partner therapy hotline, where routine partner notification was combined with telephone assessments of partners, and accelerated partner therapy pharmacy, in which community pharmacists conducted assessments of partners in addition to partner notification *(51)*.

In an RCT in Kampala, Uganda, the intervention involved was an SMS-based system and home visits to tuberculosis household contact persons, compared to the standard care, which was clinic visits. This strategy consisted of community health worker-initiated tuberculosis evaluation at home, including HIV testing and sputum collection, transportation of sputum to clinics for tuberculosis testing, and communication of testing results and follow-up instructions to contacts by automated SMS texts. Initiating testing in the household adds further complexity to contact investigation, and the feasibility and effectiveness of such services is unknown. Therefore, researchers sought to determine whether this strategy could increase the proportion of contact persons completing tuberculosis evaluation and receiving new tuberculosis diagnoses and treatments *(52)*.

For a prospective study, the authors looked at the introduction of an IPT register and card to improve the adherence of healthcare workers to programmatic guidelines in southern India, between November 2009 and January 2010 *(54)*.

4.2.3 Background and rationale to the recommendation

This recommendation is conditional as the availability and certainty of evidence was rated as very low, however, the GDG concluded the balance of health effects favoured active follow up when feasible. The panel perceived active follow-up was probably in accordance with universal human rights. Members discerned sociocultural acceptability and the intervention's influence on equity, equality, and non-discrimination as variable due in part to the limited and varied intervention studied, recognizing the impact that some measures could have in communities or on individual people. They determined the balance of societal impacts of the intervention as probably favouring active follow-up; a similar determination was made regarding financial and economic considerations. Finally, consensus existed amongst the members regarding the feasibility of implementation as probably yes.

In discussion of this PICO question, the GDG again saw the value and importance of community engagement. One way of doing this suggested by members was to engage local, trusted leaders in contact

tracing efforts, and specifically in follow-up activities. Identification of such leaders should be based on current contextual knowledge. Members believed there to be two potential benefits: leaders could provide insights into the community that would increase the sociocultural awareness of the initiative. Secondly, leaders could help in building trust and confidence of the community in the initiative. Parallel strategies might be needed for marginalized community members or those in lower positions of power, who may not be connected to local leaders. Similarly, members recognized the need of using and supporting local staff, in more decentralized healthcare systems, where they will be known in local populations, compared to using headquarter staff. To do so may require capacity building and training of local staff.

The panel also discussed the challenge of balancing the right of individual people in complying with measures associated with being a contact person, and the right of a community to remain safe, a balance defined in the International Health Regulation (2005) *(55)*. Members noted this tension is problematic and the distinction can lead to conflicts. When a community's health is aligned with and dependent on the overall goal of disrupting transmission chains, members did recognize the community's right to safety may be more important at certain points in an outbreak.

Also, members debated the issue of costs and cost effectiveness for active and passive follow up. The ability to provide guidance or a determination was limited by the lack of evidence on costs that qualified through the GRADE process. Intuitively, some members believed such measures would be cost effective, but did find it difficult to make any conclusive determination. A common opinion was that quick initiation of contact tracing, amongst other initiatives, could end an outbreak sooner, which would be the most cost-effective outcome.

4.2.4 Implementation considerations

The GDG agreed that the following factors are important to consider when instituting follow-up activities:

- When relevant, identifying high risk contact persons (see section 3.2.1.1 High-Risk contact person) is essential in the development and implementation of active follow-up activities, as it may allow for the prioritization of resources.

- When being designed, active follow-up programmes should:
  - consider severity of disease, mode of transmission and transmissibility, and outbreak phase, and
  - integrate sociocultural, ethical, economic, and legal parameters.

- Active follow-up programmes should be planned for early intervention to capture and maximize benefits of effectiveness and cost effectiveness.

- Communication strategies are essential for stakeholder engagement and explaining level of risk to the public.

- Community and stakeholder engagement are essential to the success of active follow-up, though this should be designed based on current contextual information.

- Active follow-up measures may have negative effects on contact persons, such as stigma, ostracization, mental health issues, and financial and livelihood limitations.

4.3 Should contact tracing with testing versus contact tracing without testing be used in populations at risk of infectious diseases?

WHO suggests that testing be added to contact tracing in comparison to contact tracing alone for contact tracing in populations at risk of infectious diseases.

(conditional recommendation; very low certainty of evidence)

4.3.1 Definitions

The GDG believed the following terms were important to distinguish:

Test to release: testing to clear contact persons or have a follow-up period end sooner.

Test to trace: testing to confirm a contact person as a case.

4.3.2 Summary of evidence

There were no observational studies that compared contact tracing with testing to contact tracing without testing.

4.3.3 Background and rationale to the recommendation

The conditional nature of the recommendation stems from the very low certainty in evidence, but through discussion and sharing of experiences, the GDG did find the balance of health effects favours testing. Further the panel found that intervention probably is in accordance with universal human rights and sociocultural acceptability. While members thought the equity, equality and non-discrimination influence was variable, the societal implications were believed to favour the interventions. Financial and economic considerations were perceived to be probably favourable to contact tracing with testing, though feasibility was viewed as variable and there was no specific evidence on cost-effectiveness provided in the systematic literature review.

While members concluded contact tracing with testing is preferable to contact tracing without testing, it recognized that testing gives rise to numerous questions that need to be answered. Defining the objective of testing is as important as is determining the consequences of results: what will happen to those who test positive, for example. Inherent difficulties include false-positive and false-negative results and asymptomatic cases. Costs and who should bear those costs are other relevant factors. Challenges that can be anticipated are resource or logistical considerations, how to administer tests, the impact and burden on health systems, timeliness of test results, test availability, and test quality. Like other recommendations, the members touched on the importance of communication and community engagement.

Notwithstanding these important factors, the GDG did concur that, from experience, testing can have a beneficial impact in identifying cases and thereby impeding transmission.

4.3.4 Implementation considerations

The decision to add testing to contact tracing is often complex and should be based on consideration of the pathogen, phase of the outbreak, transmissibility, and test characteristics. Testing may not be practical, possible, or advisable for all diseases. (see section 3.3.2.1 Considerations for including testing in the contact tracing strategy)

Additional considerations include health system capacity and the potential burden and impact, feasibility, cost, cost effectiveness, opportunity costs, ethics, equity, sociocultural acceptability, stigma, and overall societal impact, and the relation to other public health measures. When conditions are met, testing should accompany contact tracing.

Furthermore,

- Establishing the priority population for testing is important: for example, asymptomatic, pre-symptomatic, confirming diagnosis made on clinical symptoms.
- Emphasis should be on the equitable distribution and timely access to testing at no cost to the contact persons.
- Vulnerable individuals and those populations that may be high risk (see section 3.2.1.1 High-Risk contact person), should be prioritized in contact tracing and testing efforts.
- The design of contact tracing and testing strategies should be established with community engagement and effective communication strategies to inform the public.
- The purpose and consequences of the results of testing (e.g., freedom of movement versus quarantine) need to be considered, along with appropriate communication to the community, which should include bi-directional communication (for example, listening and addressing community concerns as well as sharing information).
- An additional consideration should be the timely access to treatment following a positive test result.

4.4 Should contact tracing with conditional/ unconditional financial/non-financial transfers versus contact tracing without transfers be used in populations at risk of infectious diseases?

No recommendation: the GDG did not provide a recommendation for this question as the evidence did not support a clear, practical and implementable option.

(no recommendation; very low certainty of evidence)

4.4.1 Definitions

The GDG agreed on the definitions of the following relevant terms and concepts to provide clarity:

Conditional allocation: when a transfer (financial and non-financial) is provided when an individual person undertakes a specific action or behaviour.

Financial transfers: monetary (cash) provisions intended to support people adhering to PHSM implemented to disrupt transmission of infectious diseases. (also see *Conditional allocation* and *Unconditional allocation*)

Non-financial transfers: non-monetary provisions, such as goods and services, intended to support people and communities adhering to PHSM implemented to disrupt transmission of infectious diseases. (also see *Conditional allocation* and *Unconditional allocation*)

Unconditional allocation: where a transfer is provided to support people in meeting basic needs without any expected change in behaviour or specific activity to be undertaken.

4.4.2 Summary of evidence

There were two RCTs found through the literature review that compared the effectiveness between offering transfers and not offering transfers, both of which were judged to have no serious risk of bias *(38,50)*. The evidence shows a non-significant increase in two specific metrics.

4.4.2.1 Access to social services

The contact tracing strategy with incentives increased the referral rate to social services by 8.4% (95% confidence interval, 0.8%–15.9%) and the uptake rate by 4.9% (-0.2%–10.0%) *(50)*.

4.4.2.2 Treatment initiation

No improvement in treatment initiation with incentives, ratio for facility-based screening to household-based or incentive-based: 1.06 (95% CI 0.80–1.3, p=0.70) *(38)*.

4.4.3 Background and rationale to the recommendation

The availability and quality of certainty of evidence was judged to be very low, but the GDG did complete an EtD table for this question. It recognised that the balance of health benefits and harms probably favoured the intervention. In following the GRADE table, the panel considered if transfers are in accordance with universal human rights, which it determined they were, and probably acceptable to key stakeholders. Members concurred that transfers would have a positive impact on health equity, equality, and non-discrimination, if made on an equitable basis. The balance of desirable and undesirable societal implications and the financial and economic considerations were considered unknown to the panel due to the lack of evidence. They judge the feasibility of implementing the intervention as variable, given the potential demand on financial resources of such a programme.

In attempting to arrive at and write a recommendation, the GDG, which included a health economist amongst its ranks, struggled to find appropriate language to reflect its thinking on this question, and to provide a practical approach for users of this guideline in the use of transfers. Certain principles were evident and unanimously supported by members: the GDG agreed no contact tracing measure should cause any member of a society to experience financial hardship. Where used, transfers should be aimed at ensuring that contact persons do not face catastrophic healthcare spending *(56)*. There are “essentials” (bed, bread, and bath) required by all persons that cannot be denied and should not be put at risk of loss because of PHSM. Fair access or provision of these essentials was viewed as not merely necessary but essential to achieve the aims of a contact tracing strategy.

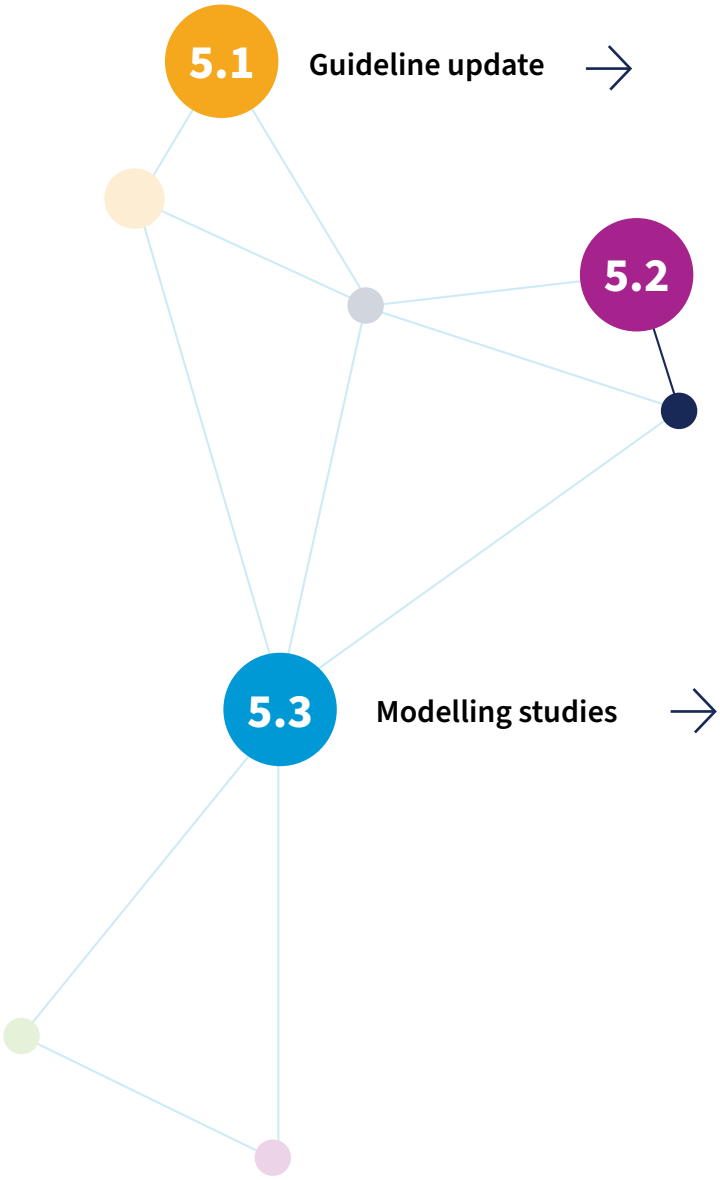
The panel, however, also recognized the dichotomy, or dilemma presented by providing transfers. While they can provide social protections, or help maintain standards of living, concerns were expressed for their potential to increase inequities within societies. Members discussed the possibility that supports would give some people greater advantages who would not need them and the practicalities of means testing. The panel recognized that adherence to any PHSM draws upon a person’s sense of social responsibility, leading to some speculation that there could be those people who may be offended by being offered financial remuneration. And while it can promote social cohesion through commitment to a common goal, members raised the prospect that some marginalized groups may feel excluded. Members also discussed the drain of financial resources that transfer programs could put on health systems. Another concern was that for some countries the funding comes from outside sources, which is reduced or rescinded once the project is over. Further, the panel debated the impact of paying or not paying contact tracers themselves.

While the amount of evidence for this PICO question is small, some data does exist. The GDG, however, found that the available data varies and does not give a strong indication for either the intervention or the comparator. There are positive examples when transfers were beneficial, but there are also examples when they did not work. Therefore, it was difficult to draw any conclusions.

The GDG attempted to draft a recommendation for this question, as evidenced by the EtD table, and did initially agree on a recommendation. But upon reflection, members decided that the rationale was not strong enough to support a recommendation and chose not to provide one.

5. Guideline update and research priorities

This chapter includes:



"WHO will support and encourage the development of pre-approved and ethically cleared protocols for observational studies on contact tracing in the context of an outbreak."

5.1 Guideline update

WHO will continue to monitor research developments in contact tracing, particularly for questions in which the certainty of evidence was found to be low or very low. Should the guideline merit an update, or if there are concerns about the validity of the guideline, WHO will coordinate the updating of the guideline, following the formal procedures of the WHO handbook for guideline development *(2)*. As the guideline nears the 10-year review period, WHO will be responsible for conducting a search for appropriate new evidence.

5.2 Research priorities

5.2.1 Randomised control trials

There is the need for more RCT-based evidence in the contact tracing literature to increase the certainty of the data supporting decision making. Cluster RCTs, and pragmatic RCTs may also be considered and would help to provide more information and a better understanding of benefits and harms with little or no confounding. There is precedent for these scientific approaches in the literature *(57,58)*. Nonetheless, WHO will support and encourage the development of pre-approved and ethically cleared protocols for observational studies on contact tracing in the context of an outbreak.

5.2.2 Measures of effectiveness of contact tracing

As mentioned in section 3.5 Measures of effectiveness, developing methods to establish context-specific benchmarks for contact tracing strategies, including input, process, output, outcome, and impact metrics, is critical to support countries in the distribution of resources to contact tracing and in measuring its effectiveness.

5.2.3 Cost-effectiveness and cost-benefit

Exploring the cost-effectiveness of contact tracing strategies would support decision making processes. A context specific economic evaluation may be required to examine whether intensified identification, active follow up, testing, and incentives are both cost-effective and affordable. The need for economic and financial analysis should, however, depend on the scale of contact tracing programme being developed. In cases of small-scale outbreaks, overall expenditures may be low and contact tracing may prevent substantial costs realized if a disease were left to spread unabated. However, for routine contact tracing of endemic diseases at a population level, the additional actions conditionally recommended above may incur substantial expenditures depending on context. More research is required to determine the cost-effectiveness of contact tracing strategies.

5.3 Modelling studies

While modelling studies were excluded from the search of the systematic literature review, due to concerns for risk of bias and indirectness (as noted in section 2.3.2 Search strategy), they are routinely used to estimate the population impact of contact tracing and to inform disease control strategies. Additionally, countries may choose to employ them to support decisions about adopting the conditional recommendations above. Modelling studies are useful in public health as they allow counterfactual situations to be presented and considered, which cannot be done through other approaches like RCT. It was the GDG's belief that modelling studies be considered in updates of this guideline and that experts in modelling studies be added as members of future GDGs.

"A context specific economic evaluation may be required to examine whether intensified identification, active follow up, testing, and incentives are both cost-effective and affordable."

6. Guideline use

This chapter includes:

"Systematic training of contact tracers is vital to ensuring the effectiveness of contact tracing and epidemic containment."

6.1 Plans for guideline dissemination

The guideline will be available to all on the WHO official website. The guideline will be introduced to Members States, through WHO regional and country offices. It will also reach a wide audience through international partners, health ministries, collaborating centres, academic institutions, other United Nations agencies, and nongovernmental organizations.

6.2 Plans and considerations for implementation

In global outbreaks, international collaboration is essential to achieve better world-wide outcomes in contact tracing in high-risk populations. Yet, many of the recommendations will have very different implications for their operationalization, depending on context and type of infection or pathogens. As such, Member States and their partners, including WHO, should develop detailed operational guidance to assist governments and implementing organizations to recognize what is needed from health systems to implement effective contact tracing strategies. The operational guidance should be provided in the form of handbooks, educational materials, tools for decision-making, and guidelines for monitoring and evaluation.

Finally, systematic training of contact tracers is vital to ensuring the effectiveness of contact tracing and epidemic containment. Contact tracers should gain knowledge and skills in infection prevention and control, motivational interviewing techniques, de-escalation techniques, crisis intervention, confidentiality, field safety and cultural competence, amongst others.

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Annexes

Annex 1. Contributors to the guideline development

WHO Steering group

The Steering Group included contact tracing experts from both headquarters and regional offices.

They contributed to defining the scope of the guidelines and the PICO questions. A selected few members supported the project team by reviewing the applications for GDG and ERG positions and the declaration of interest. Finally, they reviewed the guidelines.

Name	Department/Unit	Region
Claire Blackmore	Infectious hazard management	European Region
Marie-Amélie Degail	Surveillance systems	Headquarters
Tshewang Dorji	Health information management	South-East Asia Region
Nina Gobat	Country readiness strengthening	Headquarters
Sara Hollis	Alert and response coordination	Headquarters
Ana Hoxha	Alert and response coordination	Headquarters
Avinash Kanchar	Global Tuberculosis Programme	Headquarters
Anaïs Legand	Health emergency interventions	Headquarters
Ramona Ludolph	Epidemic and pandemic preparedness and prevention	Headquarters
Yamuna Mundade	Unitaid	Headquarters
Patricia Ndumbi	Surveillance systems	Headquarters
Joao Rangel de Almeida	Health emergency interventions	Headquarters
Mahmoud Sadek	Health information management	Eastern Mediterranean Region
George Sie Williams	Health information management	African Region

Guideline development group

The guideline development group (GDG) consisted of a broad group of relevant experts in the field and end users of, and persons affected by, the recommendations.

A call for Expressions of Interest was published on 23 February 2023 and interested applicants were given 12 March 2023 to apply. A total of 65 applications were received. They were reviewed by four project and steering group members who selected the final 16 members.

All GDG members completed and submitted a WHO Declaration of Interests form and signed confidentiality undertakings when offered the position and again prior to attending the in-person GDG meeting.

A first virtual GDG meeting was held on 31 May 2023, at which the GDG primarily discussed the PICO questions. A second in-person meeting was held 11–14 December 2023 during which the GDG was presented with the evidence, which was reviewed and discussed, and final recommendations agreed upon by consensus.

Finally, the GDG reviewed the draft guideline.

The selected members of the GDG included:

Name	Affiliation	Region	Conflict of interest declared	Conflict of interest management
Aasim Ahmad (co-chair)	Aga Khan University	Eastern Mediterranean Region	None declared	None identified
Hilary Bower	Public Health Rapid Support Team	European Region	Employment within the past 4 years by a commercial entity or other organization with an interest related to the subject of the meeting or work	None identified
Iya Saidou Condé	Mcking Consulting Corporation	African Region	None declared	None identified
Aristide Dionkounda	Africa One Health University Network	African Region	None declared	None identified
Tove Lysa Fitzgerald	Central Coast Public Health Unit	Western Pacific Region	None declared	None identified
Marc Ho	Ministry of Health – Singapore	Western Pacific Region	Held an office or other position, paid or unpaid, where interests related to the subject of the meeting or work were represented or a position related to the subject of the meeting or work was defended	None identified

Name	Affiliation	Region	Conflict of interest declared	Conflict of interest management
Zobaidul Haque Khan	DAI Global, LLC	Region of the Americas	None declared	None identified
Noriko Kitamura	National Institute of Infectious Diseases, Japan	Western Pacific Region	None declared	None identified
Claudio A. Méndez	Universidad Austral de Chile	Region of the Americas	None declared	None identified
Masdalina Pane	National Research and Innovation Agency (BRIN)	South-East Asia Region	Employment and consulting within the past 4 years by a commercial entity or other organization with an interest related to the subject of the meeting or work	None identified
Joren Raymenants	University KU Leuven, Belgium & Melbourne University	European Region & Western Pacific Region	None declared	None identified
Megan Schmidt-Sane	University of Sussex	European Region	None declared	None identified
Anja Schreijer (co-chair)	Pandemic & Disaster Preparedness Center, Erasmus Medical Center	European Region	None declared	None identified
Maria Tseroni	National and Kapodistrian University of Athens	European Region	None declared	None identified
Anna Vassall	Department of Global Health at LSHTM Amsterdam Institute for Global Health and Development (AIGHD)	European Region	None declared	None identified
Alexandra Woodward	The Association of State and Territorial Health Officials	Region of the Americas	None declared	None identified

Observers

Two observers from the WHO Civil Society Taskforce for tuberculosis were invited to the GDG workshop held in Berlin, Germany, in 2023. They both signed confidentiality undertakings when offered the position.

Their role was to provide civil society and community perspectives to the discussion with the GDG.

Name	Department/Unit	Region
Paran Sarimita Winarni	Pejuang Tangguh (PETA)	South-East Asia Region
Muhammed Amir Khan	Association for Social Development (ASD)	Eastern Mediterranean Region

External review group

A call for Expressions of Interest was published on 27 February 2024 and interested applicants were invited to apply by 11 March 2024. A total of 57 applications were received before the deadline. The applications were reviewed by two project team members and two steering group members. Thirteen applicants were selected to be part of the external review group (ERG).

All ERG members completed and submitted a WHO Declaration of Interests form and signed confidentiality undertakings when offered the position.

The ERG reviewed the draft guidelines for clarity, presentation of the evidence, and implementation. Their comments were incorporated as appropriate. ERG members could however not change the recommendations decided upon by the GDG.

Name	Affiliation	Region	Conflict of interest declared	Conflict of interest management
Fayez Abdulrazeq	University of Zurich	European Region	None declared	None identified
Olusola Aruna	UK Health Security Agency	European Region	None declared	None identified
Haitham Bashier	Eastern Mediterranean Public Health Network	Eastern Mediterranean Region	None declared	None identified
Geneviève Boily-Larouche	Independent Expert	Region of the Americas	Consulting within the past 4 years by a commercial entity or other organization with an interest related to the subject of the meeting or work	None identified

Name	Affiliation	Region	Conflict of interest declared	Conflict of interest management
Jizzo Bosdriesz	National Institute for Public Health and the Environment	European Region	Research support, including grants, collaborations, sponsorship and other funding, within the past 4 years by a commercial entity or other organization with an interest related to the subject of the meeting or work	None identified
Melissa Boyette	National Center for HIV/AIDS, Viral Hepatitis, STD and TB Prevention Centers for Disease Control and Prevention (CDC)	Region of the Americas	Employment/consulting within the past 4 years by a commercial entity or other organization with an interest related to the subject of the meeting or work	None identified
Egbuna Hyacinth Chukwuebuka	Ministry of Health, Owerri, Imo State, Nigeria	African Region	None declared	None identified
Luqman Hakeem	Centre for Public Policy Research	Eastern Mediterranean Region	None declared	None identified
Karishma Krishna Kurup	Centre of Universal Health	European Region	None declared	None identified
Abiodun Ogunniyi	Nigeria Centre for Disease Control and Prevention	African Region	None declared	None identified
Nneka Orji	Menzies Institute for Medical Research	Western Pacific Region	None declared	None identified
Alberto Mateo Urdiales	Istituto Superiore di Sanità	European Region	None declared	None identified
Stephanie Wheeler	Australian National University	Western Pacific Region	None declared	None identified

Annex 2. Contact tracing guidelines

Disease	Document name	Publisher (year)	Geography
General			
	WHO Guidelines on Ethical Issues in Public Health Surveillance	WHO (2017)	Global
	Guidance For Managing Ethical Issues in Infectious Disease Outbreaks	WHO (2016)	Global
	Contact Tracing Knowledge Hub (PAHO)	PAHO (since 2021)	Americas
Disease specific guidelines			
COVID-19	Considerations for implementing and adjusting public health and social measures (PHSM) in the context of COVID-19: interim guidance, 30 March 2023	WHO (2023)	Global
	COVID-19 Contact Tracing Workforce Estimator	Fitzhugh Mullan Institute for Health Workforce Equity: The George Washington University (2023)	USA
	Australian National Disease Surveillance Plan for COVID-19, version 3.1	Australian Government Department of Health (2022)	Australia
	Contact tracing and quarantine in the context of COVID-19: interim guidance, 6 July 2022	WHO (2022)	Global
	Contact tracing and quarantine in the context of the Omicron SARS-CoV-2 variant: interim guidance, 17 February 2022	WHO (2022)	Global
	Contact tracing in the context of COVID-19: a case study from Oman	Journal: BMJ Global Health (2022)	Middle East
	COVID-19 Contact tracing: country experiences and way forward	ECDC (2022)	Europe
	Meeting Report: COVID-19 Contact tracing: country experiences and way forward	WHO, EURO (2022)	Europe

Disease	Document name	Publisher (year)	Geography
	The ASEAN Protocol of Cross Border Contact Tracing and Rapid Outbreak Investigation	Ministry of Health, Republic of Indonesia, German Cooperation, GIZ, ASEAN (2022)	South-East Asia
	Considerations for the Implementation and Management of Contact Tracing for Coronavirus Disease 2019 (COVID-19) in the Region of the Americas	PAHO, WHO (2021)	Americas
	Considerations for COVID-19 surveillance for vulnerable populations	WHO (2021)	Western Pacific Region
	Contact tracing in the context of COVID-19: interim guidance, 1 February 2021	WHO (2021)	Global
	Contact tracing in the European Union: public health management of persons, including healthcare workers, who have had contact with COVID-19 cases – fourth update	ECDC (2021)	Europe
	Indicator framework to evaluate the public health effectiveness of digital proximity tracing solutions	WHO, CDC (2021)	Global
	GOARN global consultation on contact tracing for COVID-19, 9-11 June 2020	WHO (2021)	Global
	Operational guide for engaging communities in contact tracing	WHO, IFRC, GOARN, UNICEF (2021)	Global
	Risk Communication and Community Engagement for Contact Tracing in the Context of COVID-19 in the Region of the Americas	PAHO, WHO (2021)	Americas
	Risk communication and community engagement for COVID-19 contact tracing: interim guidance	WHO (2021)	Europe
	Toward a Common Performance and Effectiveness Terminology for Digital Proximity Tracing Applications	Journal: Frontiers in Digital Health (2021)	Global
	A Coordinated, National Approach to Scaling Public Health Capacity for Contact Tracing and Disease Investigation	Association of State and Territorial Health (2020)	USA
	Contact tracing : part of a multipronged approach to fight the COVID-19 pandemic	CDC (2020)	USA
	Digital contact tracing for pandemic response: ethics and governance guide	Johns Hopkins University Press (2020)	USA

Disease	Document name	Publisher (year)	Geography
	Digital tools for COVID-19 contact tracing	WHO (2020)	Global
	Ethical considerations to guide the use of digital proximity tracking technologies for COVID-19 contact tracing: Interim guidance, 28 May 2020	WHO (2020)	Global
	Ethical Framework for Assessing Manual and Digital Contact Tracing for COVID-19	Journal: Annals of Internal Medicine (2020)	USA
	Ethics and informatics in the age of COVID-19: challenges and recommendations for public health organization and public policy	Journal of the American Medical Informatics Association (2020)	USA
	Ethics of instantaneous contact tracing using mobile phone apps in the control of the COVID-19 pandemic	Journal of Medical Ethics (2020)	UK
	Flattening the curve on COVID-19: How Korea responded to a pandemic using ICT	The Government of the Republic of Korea (2020)	Korea
	Guidance: Contact Tracing for COVID-19	IFRC (2020)	Global
	Interim Guidance on Developing a COVID-19 Case Investigation & Contact Tracing Plan: Overview	CDC (2020)	USA
	Key metrics for COVID-19 Suppression: a framework for policy makers and the public	Harvard Global Health Institute (2020)	USA
	Mobile applications in support of contact tracing for COVID-19: A guidance for EU/EEA Member States, 10 June 2020	ECDC (2020)	Europe
	Monitoring and evaluation framework for COVID-19 response activities in the EU/EEA and the UK: interim guidance, 17 June 2020	ECDC (2020)	Europe
	National Contact Tracing Review	Australian Government (2020)	Australia
	Rapid Audit of Contact Tracing for Covid-19 in New Zealand	Ministry of Health (New Zealand) (2020)	New Zealand
	Rapid Contact Tracing Training Course Mapping and Recommendations for New Course Development - Summary Report	CORE Group (2020)	Global
	Resolve to Save Lives: COVID-19 Contact Tracing Playbook	Vital Strategies (2020)	USA

Disease	Document name	Publisher (year)	Geography
	Technical Guidance on contact tracing for COVID-19 in the World Health Organization (WHO) African region	WHO (2020)	Africa
	Testing, contact tracing and community management of COVID-19 (Partners in Health (PIH) 2020)	Partners in Health (2020)	Global
	Tracking and tracing COVID: Protecting privacy and data while using apps andbiometrics	Organisation for Economic Co-operation and Development (OECD) (2020)	Global
	Case Investigation and Contact Tracing Training: Facilitator Guide	Government of Nepal, Ministry of Health and Population (NR)	Nepal
	COVID-19 contact tracing playbook	Resolve to Save Lives (2020)	Global
	Guia de vigilância epidemiológica Covid-19: Emergência da saúde pública de importância nacional pela doençapelo coronavírus 2019 - Covid-19	Ministry of Health of Brazil (2022)	Brazil
	Australian national disease surveillance plan for COVID-19	Australian Government, Department of Health and Aged Care (2023)	Australia
Ebola	Ebola virus disease contact tracing activities, lessons learned and best practices during the Duport Road outbreak in Monrovia, Liberia, November 2015	Journal: PLoS Neglected Tropical Diseases (2015)	Africa
	Implementation and management of contact tracing for Ebola virus disease	WHO and CDC (2015)	Countries with confirmed outbreak
	CDC methods for implementing and managing contact tracing for Ebola virus disease in less-affected countries	CDC (2014)	Global
	Contact Tracing During an Outbreak of Ebola Virus Disease	WHO, AFRO (2014)	Global
Hepatitis C	Contact tracing for hepatitis C: The case for novel screening strategies as we strive for viral elimination	Journal: International Journal of Drug Policy (2019)	USA

Disease	Document name	Publisher (year)	Geography
Leprosy	Minimal essential data to document contact tracing and single dose rifampicin (SDR) for leprosy control in routine settings: a practical guide	Journal: Leprosy Review (2018)	Unclear
Mpox	Surveillance, case investigation and contact tracing for mpox (monkeypox): interim guidance, 22 December 2022	WHO (2022)	Global
Tuberculosis	Chapter 11: Tuberculosis contact investigation and outbreak management (from Canadian Tuberculosis Standards - 8th Edition)	Journal: Can. J. Respir (2022)	Canada
	WHO operational handbook on tuberculosis: module 1: prevention: infection prevention and control	WHO (2020)	Global
	WHO operational handbook on tuberculosis: module 2: screening - systematic screening for tuberculosis disease	WHO (2022)	Global
Tuberculosis and meningococcal disease	Development of a risk assessment tool for contact tracing people after contact with infectious patients while travelling by bus or other public ground transport: a Delphi consensus approach	Journal: BMJ Open (2013)	EU countries

Annex 3. Summary of judgements and evidence profiles

Should intensified contact person identification versus non-intensified contact person identification be used in populations at risk of infectious disease?

Patient or population: populations at risk for infectious diseases

Setting:

Intervention: intensified contact identification

Comparison: non-intensified contact identification

Outcome № of participants (studies)	Relative effect (95% CI)	Anticipated absolute effects (95% CI)			Certainty
		non-intensified contact identification	intensified contact identification	Difference	
Contact identification № of participants: (1 RCT)	For COVID-19: • intensified (using cognitive informed instructions*): 12.14 contacts identified per index case • non-intensified (using a control protocol): 8.01 contacts identified per index case				●●○○ Low[a,b]
Contact identification № of participants: (4 non-randomised studies)	Contacts per index case for TB: • intensified (home visits + phone): 8.4 • non-intensified (phone interviews): 2.5 Contacts per index case for HBV: • intensified (nurse-led contact tracing): 2.2 • non-intensified (self-controlled contact tracing): 2.1 Contacts per index case for chlamydia: • intensified (verbal advice and contact cards or midwives-led): 2.1 – 2.26 • non-intensified (verbal advice or no midwives): 1.6 – 2.37				●○○○ Very low[a,b,c,d]
Proportion of contacts reached № of participants: (1 non-randomised study)	For COVID-19: • intensified (tracers were present in the ED): 83% (162/197) • non-intensified (tracers using an extended COVID-19 reporting form): 78% (2,683/3,441)				●●○○ Low[a,b,c]

Outcome № of participants (studies)	Relative effect (95% CI)	Anticipated absolute effects (95% CI)			Certainty
		non-intensified contact identification	intensified contact identification	Difference	
Proportion of contacts testing positive № of participants: (1 non-randomised study)	For TB: • intensified (phone interviews + home visits): 6.4% • non-intensified (phone interviews): 0.3%				●●○○ Low[b,c]
Incidence reduction – not reported					
Cases or deaths averted – not reported					

* **The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval

GRADE Working Group grades of evidence

High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.

Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

Explanations

a. Risk of bias for missing data is high for contact tracing strategies because the true number of contacts is likely unknown.

b. A confidence interval was not provided thus it is not possible to know the precision of the effect.

c. The majority of the evidence is derived from purely descriptive observational studies that lack rigorous control for potential confounding factors or other robust methodologies which limit the ability to establish causal relationships between contact tracing interventions and observed outcomes.

d. The following studies investigated different infections with different modes of transmission. *Cognitive instructions including '1. Take your time and provide as much information as you can; 2. Do not guess, but you can provide information you are not 100% sure; 3. You are the expert in this situation; 4. This will take a while; 5. This is not an easy task; 6. If the question is repetitive, this is purposeful'

Should active follow-up of contacts versus passive follow-up of contacts be used in populations at risk of infectious diseases?

Patient or population: populations at risk for infectious diseases

Setting:

Intervention: active follow-up of contacts

Comparison: no active follow-up of contacts

Outcome № of participants (studies)	Relative effect (95% CI)	Anticipated absolute effects (95% CI)			Certainty
		no active follow-up of contacts	active follow- up of contacts	Difference	
Identification of secondary cases № of participants: (1 RCT)	• Comparing standard in-clinic TB evaluation (control) with home-based, SMS-facilitated household TB evaluation via community health workers (HCWs) (intervention), there was no significant difference in yield of confirmed TB diagnoses (1.5% (intervention) versus 1.1% (control)) or HIV diagnoses (2.0% (intervention) versus 1.8% (control)) (Davis et al 2019).				●●●○ Moderate[a]
Identification of secondary cases № of participants: 0 cases 0 controls 0/0 exposed 0/0 unexposed (2 non-randomised studies)	• Active follow-up of TB contacts (home visits + symptom screening among household contacts + follow-up telephone calls by programme nurses inviting all contacts to be screened) resulted in 17 additional cases detected. Only 1 additional case among contacts was detected in the control group (home visits + symptom screening among household contacts) (Myint et al 2019). • Nurse-led enhanced management and contact tracing of chronically infected individuals with Hepatitis B led to 18 newly detected HBV cases (Beebeejaun et al 2021).				●○○○ Very low[b,c,d]
Case referrals to specialists № of participants: (1 non-randomised study)	• Nurse-led management and contact tracing of chronically infected individuals with Hepatitis B led to 14% increased case referrals to specialists (86% before intervention, 99.7% after the intervention) (Beebeejaun et al 2021).				●●○○ Low[d,e]
Contact testing № of participants: (1 RCT)	• Comparing standard in-clinic TB evaluation (control) with home-based, SMS-facilitated household TB evaluation via community health workers (HCWs) (intervention), there was no significant difference in completion of TB evaluation at 14 days (14% (intervention) versus 15% (control) (Davis et al 2019).				●●●○ Moderate[a]

Outcome № of participants (studies)	Relative effect (95% CI)	Anticipated absolute effects (95% CI)			Certainty
		no active follow-up of contacts	active follow- up of contacts	Difference	
Contact testing № of participants: (2 non-randomised studies)	• Nurse-led management and contact tracing of chronically infected individuals with Hepatitis B led to an increased proportion of contacts tested, from 34% (pre-intervention) to 72%-94% (post-intervention (Beebeejaun et al 2021). • More contacts were tested with GIS-linked contact tracing and community surveillance compared to community surveillance alone (653 vs. 86, 248; Kenu et al. 2022)				●●○○ Low[d,e]
Treatment initiation № of participants: (1 non-randomised study)	• With additional training of health care workers (HCWs) on administering isoniazid preventative therapy (IPT) in asymptomatic household contacts, (aged <6 years) and correct documentation in the register, IPT initiation improved from 19% (pre-intervention) to 61% (post-intervention) (Rekha et al 2013).				●●○○ Low[d,e]
Treatment initiation № of participants: (1 RCT)	• The proportions of contactable partners considered treated within 6 weeks of index diagnosis were 39/111 (35%) for telephone assessment of partner(s) plus standard partner notification, 46/100 (46%) for community pharmacist assessment of partner(s) plus routine standard patient referral, and 46/102 (45%) for standard patient referral (Estoucort et al. 2015)				●●●○ Moderate[d]
Vaccination № of participants: (1 non-randomised study)	• Nurse-led management and contact tracing of chronically infected individuals with Hepatitis B led to increased vaccination rates (of at least three doses), from 77% (pre-intervention) to 93%-94% (post-intervention (Beebeejaun et al 2021).				●●○○ Low[d,e]
Access to social services № of participants: (1 RCT)	• A 'high-touch' contact tracing model (integrating social services with disease investigation, providing continued support and resource linkage for clients from structurally vulnerable communities) led to an increased rate of social services use by 8.4% (95% confidence interval, 0.8%-15.9%) and the uptake rate by 4.9% (-0.2%-10.0%) compared to the control group (no 'high-touch' contact tracing) (Lu et al 2023).				●●●○ Moderate[a]

* **The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval

GRADE Working Group grades of evidence

High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.

Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

Explanations

a. Confidence intervals cross null effect.
b. In Myinth et al 2019, the authors did not discuss any confounding variables, such as TB incidence, patient demographics and access to phone.
c. Studies were conducted for different diseases across different settings and may not be comparable or generalisable.
d. Confidence intervals were not reported, thus it is not possible to determine the precision of the effect.
e. No adjustment for potential confounding in the outcome analysis.

Should contact tracing with testing versus contact tracing without testing be used in populations at risk of infectious diseases?

Patient or population: populations at risk for infectious diseases

Setting:

Intervention: contact tracing with testing

Comparison: contact tracing without testing

Outcome № of participants (studies)	Relative effect (95% CI)	Anticipated absolute effects (95% CI)			Certainty
		contact tracing without testing	contact tracing with testing	Difference	
Proportion of cases that were contacts – not reported					
Identification of secondary cases – not reported					
Cases or deaths averted – not reported					
Incidence reduction – not reported					

* **The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval

GRADE Working Group grades of evidence

High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.

Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

Should contact tracing with conditional/unconditional financial/non-financial transfers versus contact tracing without transfers be used in populations at risk of infectious diseases?

Patient or population: populations at risk for infectious diseases

Setting:

Intervention: contact tracing with conditional / non-conditional financial incentives / social supports / reimbursements

Comparison: contact tracing without incentives

Outcome № of participants (studies)	Relative effect (95% CI)	Anticipated absolute effects (95% CI)			Certainty
		contact tracing without incentives	contact tracing with conditional / non-conditional financial incentives / social supports / reimbursements	Difference	
Access to social services № of participants: (1 RCT)		• The CT strategy with incentives increased the referral rate to social services by 8.4% (95% confidence interval, 0.8%-15.9%) and the uptake rate by 4.9% (-0.2%-10.0%) (Lu et al 2023)			●●●○ Moderate[a]
Treatment initiation № of participants: (1 RCT)		• Treatment initiation ratio for facility-based screening to household- based or incentive-based: 1.06 (95% CI 0.80–1.3, p=0.70) (Hanrahan et al. 2019)			●●○○ Low[b]

* **The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval

GRADE Working Group grades of evidence

High certainty: we are very confident that the true effect lies close to that of the estimate of the effect.

Moderate certainty: we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low certainty: our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.

Very low certainty: we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.

Explanations

a. For the uptake rate, the confidence interval includes the null effect.

b. The study included contacts that received incentives and those that did not receive incentives in their analysis.