

# Methodology for papers linked to RQ3 and RQ4 data

**Overall study context**

The data collected formed part of the interdisciplinary, mixed methods project Umoya Omuhle: Infection Prevention and Control for Drug-Resistant Tuberculosis in South Africa in the Era of Decentralised Care: A Whole Systems Approach’ (*Umoya Omuhle* can be roughly translated as “good air” in isiZulu). The project is a collaboration between the Universities of Cape Town and Kwazulu-Natal, London School of Hygiene and Tropical Medicine and Queen Margaret University. The project employed a “whole-systems” approach to study nosocomial transmission of DR-TB and IPC implementation in two South African provinces: the Western Cape and KwaZulu-Natal. A whole-systems approach lent itself to understanding the complex health problem of nosocomial TB transmission and considered the social, biological, and infrastructural factors that affect implementation of TB-IPC (Kielmann et al., 2020).

This methodology focuses on the work undertaken in RQ3 and 4 (discussed in detail below). Further data was generated through DR-TB prevalence surveys and clinic ventilation assessments, transmission dynamic and economic cost modelling, and systems dynamic modelling and intervention design (Kielmann et al., 2020).

**Study Sites**

Site Selection and Facility details:

Purposive selection of 12 clinics (six in the Western Cape and six in KwaZulu-Natal provinces). The criteria for clinic selection were rural/urban differences, age of facility, governance structure, facility type (clinic vs CDC), patient headcount/catchment population, the existence of any form of appointment system, whether clinics were purpose-built or not, and the extent of rollout of DR-TB services and integrated care (HIV & TB). We examined material differences in spatial layout, workplace design, and ventilation within PHC clinics and their bearing on infection transmission potential.

**Table 1: Description of WC facilities**

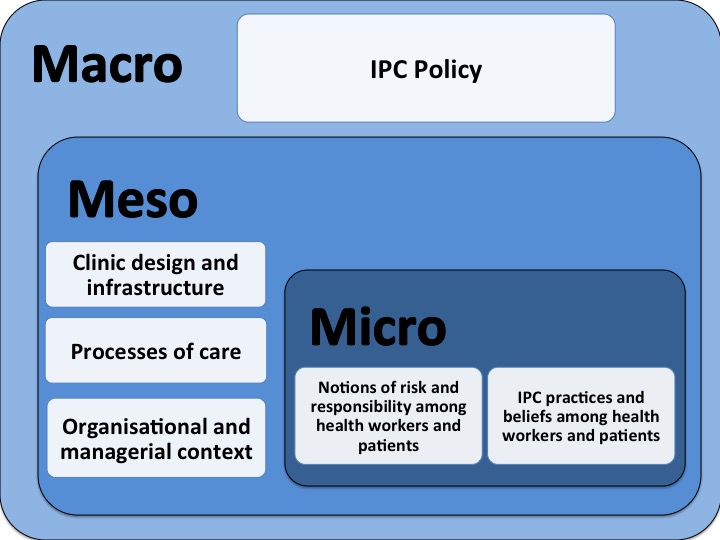
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Facility | Location | Age of infrastructure (time built) | Governance structure | Type of facility (clinic/CDC vs CHC) | Estimated monthly patient headcount |
| 2 | urban | 2012 | City of Cape Town | Clinic | 2500 |
| 1 | Peri-urban township | 2004 | City of Cape Town | Clinic | 1000 |
| 3 | Peri-urban township | 1980s | City of Cape Town | Clinic | 1600 |
| 4 | rural | 1980s | WC Province | CDC | 3615 |
| 5 | urban | 2015 | WC Province | CHC | 3500 |
| 6 | rural | 2007 | WC Province | CDC | 3000 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Facility** | **Location** | **Estimated daily headcount** | **Established in** | Governance structure |
| 1 | Semi-rural | 300 | 1996 | KZN government |
| 2 | Rural | 80 | 1985 | KZN government |
| 3 | Peri-urban | 950 | 2003 | KZN government |
| 4 | Urban | 1000 | 1985 | KZN government |
| 5 | Urban | 300 | 1980s | KZN government |
| 6 | Rural | 80 | 2008 | KZN Provincial Government |

**Table 2: Description of KZN facilities**

**Conceptual framework**

Research Question 3 asks the question, how do clinic design, organisation of DR-TB and general care, and working practices inhibit or foster IPC? Research question 4 asks the question, what ideas about risk and responsibility underpin health worker and patient narratives of care, and resulting care practices of DR-TB IPC? These two questions are embedded within the meso- and micro-levels of the conceptual framework in the diagram below. Research question 3 focuses on the clinic design and infrastructure, organisation of TB care, management culture and daily work practices within the clinics. Research Question 4 focuses on the risk and responsibility among staff and patients. See the conceptual framework below.



**Research questions and areas of inquiry**

We examined material differences in spatial layout, workplace design, and ventilation within PHC clinics and their bearing on infection transmission potential (data collected through RQ2).Under Research Question 3 we examined:

* + Organizational workflows to understand the relationship between the material features of the clinic and the organisation of care and working practices in the management of DR-TB patients, HIV-positive patients and also the general patient cohort.
  + Clinic mapping, nominal group technique and focus group discussions, observations, and the tracking of patient pathways in facilities, which enabled an understanding of how the spatial and temporal dimensions of processes such as waiting, screening, triage, sputum collection, and moving around the clinic affects transmission dynamics, and inhibits or fosters infection control.
* Under Research Question 4, we explored the:
  + Social environment of infection risk. We located and analysed the predominant discourse and practices regarding DR-TB IPC within the psychological, situational, managerial, and cultural characteristics that influence health workers’ agency and their exercise of rights and responsibilities pertaining to infection control.
  + Localized norms and relations of accountability for IPC (e.g. around harm reduction, occupational health, protection of health workers) among health facility managers and health workers’ as well as in patients’ narrative accounts of preventing and controlling DR-TB in particular.
  + Understandings of infection risk and transmission in relation to mobility within the clinic, as well as in households and social networks.
  + Current provision of leadership around IPC was examined, with a view to understanding what would be required to shift perceptions of IPC from being an isolated clinical governance issue to an ethical problem that encompasses patients’ and health care workers’ rights and obligations of health facilities and HCWs.

**Study Design**

An ethnographic approach was employed to gather data, which allowed us to explore the complexity of clinic systems, and the far-reaching range of factors that can significantly impact TB-IPC within facilities. This included using several specific data collection methods over an extended period of two to 10 days. This allowed for several different parts of the facility to be observed and mapped, and informal conversations or in-depth individual interviews to be conducted with a range of participants, including patients, facility managers, health care workers and other facility staff.

In KZN, approximately 2 ½ -3 subsequent days were spent on average, in which most data was collected in all 6 participating clinics. Subsequently, researchers returned to 3 clinics for more in-depth ethnographic fieldwork to fill any gaps through informal conversations, and to conduct FGDs, patient and HCW interviews.

**Study Population and Sampling**

**Western Cape**

In the Western Cape, there were 24 individual interviews with health workers; four nominal group techniques and focus group discussions of 26 participants (between 6-8 participants per group), and 14 patients interviews (Table 1).

**Table 1: Study participants in the Western Cape**

|  |  |  |
| --- | --- | --- |
| **Facility** | **Participant** | **Audio-taped and transcribed** |
| Facility 1 | Clinic manager01 | Yes |
| Doctor01 | Yes |
| Professional Nurse-TB | No |
| Professional Nurse | No |
| Facility 2 | Clinic manager02 | Yes |
| Professional Nurse01-TB | Yes |
| Counselor01 | Yes |
| Facility 3 | Clinic manager03 | Yes |
| Professional Nurse03-TB | Yes |
| Senior Worker | Yes |
| Counsellor | No |
| Facility 4 | Clinic manager04 | Yes |
| Professional Nurse(Psy) | Yes |
| Professional Nurse02-TB | Yes |
| Professional Nurse | No |
| Facility 5 | Clinic manager05 | Yes |
| Professional Nurse(IPC) | Yes |
| Doctor02 | Yes |
| Clerk | No |
| Professional Nurse | No |
| Facility 6 | Clinic manager06 | Yes |
| Counselor02 | Yes |
| Professional Nurse | No |
| Professional Nurse | No |

**Patients**

|  |  |  |
| --- | --- | --- |
| **Facility** | **Participant** | **Audiotaped and transcribed** |
| Facility 3 | Patient01(DS-TB) | Yes |
| Patient02 (Childcare) | Yes |
| Patient03 (DR-TB) | Yes |
| Patient04 (DS-TB) | Yes |
| Patient05 (HIV) | Yes |
| Facility 5 | Patient01 (DS-TB) | Yes |
| Patient02 (TBtest) | Yes |
| Patient03(OPD) | Yes |
| Patient04(OPD) | Yes |
| Patient05 (OPD) | No |
| Facility 6 | Patient01 (HIV) | Yes |
| Patient02 (Childcare) | Yes |
| Patient03 (DS-TB) | Yes |
| Patient04 (OPD) | No |

**Nominal group Technique and Focus Group Discussions**

|  |  |  |
| --- | --- | --- |
| **Facility** | **Participant** | **Function at the clinic** |
| WC3 | Professional nurse | CM |
| Enrolled nurse | Clerk |
| Support staff | Clerk |
| Professional nurse | Nurse at the HIV and TB care |
| Professional nurse | Nurse at childcare |
| Senior worker | Cleaner |
| WC5  Managers | Medical doctor | Doctor at infectious disease section (TB) |
| Pharmacist | Pharmacy supervisor |
| Professional nurse | IPC Coordinator and head of emergency unit |
| Professional nurse | Operational manger –HAST programme |
| Administrator | Support Services |
| Administrator | Support Services |
| Professional nurse | Outpatient manager |
| Dentist | Dentist in outpatient |
| WC5  Other staff | Professional nurse | Nurse at outpatient |
| Administrator | Reception |
| Professional nurse | Nurse at Infectious disease section (TB & DR-TB) |
| Professional nurse | Nurse at chronic disease section |
| Enrolled nurse | Nurse at infectious disease section (TB & DR-TB) |
| Administrator | Clerk |
| WC6 | Professional nurse | Nurse at TB room |
| Professional nurse | Nurse at Chronic disease care |
| Professional nurse | Nurse at Chronic disease care |
| Administrator | Nurse at outpatients |
| Enrolled nurse | Integrated care (HIV & TB) |
| Enrolled nurse | Integrated care (HIV & TB) |

**Study participants in the KwaZulu-Natal sites included the following are shown in Table 2.**

**Table 2: Study participants in KZN**

|  |  |
| --- | --- |
| Facility | Available data |
| 1 | 2 Facility Manager (FM) interviews (1 in replacement of focus group discussions (FGD))  5 Patient interviews  3 Health Care Worker (HCW) interviews in replacement of FGDs  1 Thick Case Description (TCD)\* |
| 2 | 1 TCD  1 FM interview |
| 3 | 1 FM interview |
| 4 | 4 Patient interviews  2 interviews (IPC manager and nursing manager)  1 TCD |
| 5 | 1 senior HCW interview (FM was not resourceful, just arrived to do the job) |
| 6 | 7 Patient interviews  1 FM interview  1 TCD |

**Data collection methods**

In each facility, the material differences in the spatial layout, workplace design, and ventilation were explored. During ***unstructured observations***, we paid attention to how people moved or congregated in the clinic space, including paying attention to where folders are collected, where vitals, blood or sputum where taken, as well as where medication was dispensed. We also noted if and where any measures were taken that could encourage or discourage congregation, including streaming or fast-tracking of particular patient groups, or any improvisations in the use or division of space (eg. room divisions or utilization of different spaces within one room for different purposes). We observed all signage and health promotion posters on the walls and where possible, paid attention to the interactions between people in the clinic space, including between staff members, between patients and staff members and amongst the patients.

In addition to these unstructured observations, a ***structured observation*** was also undertaken in each facility. This was based on the *Checklist for Periodic Evaluation of TB Infection Control in Health-Care Facilities (*[*World Health Organization, 2015*](#_ENREF_31)*)*. While this checklist called for a tick-box approach, we also paid attention to some other factors that could affect TB-IPC, including if and how a patient appointment system was used, who, where and how patients were triaged, and more generally how people moved through and within the space. Particular attention was also paid to the ventilation of the clinic space, including the number and placement of doors, windows, wind-driven roof turbines, air-conditioning units and paddle-fans, and whether these were being utilised to promote ventilation within the space.

Much of the observational data, including many of the items on the checklist described above, where captured as annotated observations in ***maps*** that were drawn of the facilities. Other details were collected as fieldnotes. ***Thick case descriptions*** were also generated for six of the 12 facilities (3 in each province), where detailed ethnographic observations within facilities were recorded.

In addition to these observational and visual data collection techniques, interviews were conducted with clinic managers as well as selected health care workers involved in TB care. These were sometimes accompanied by a ‘walkabout’ less formal ‘walking interviews’ or slightly more sedentary interviews were conducted one-on-one with patients, facility managers, and health care workers. Open-ended, semi-structured interviews with facility managers and staff centred on gaining insight into TB care at the facility, including TB-IPC practices, perceptions of risk and the more general organisation of space and care. Informal interviews with patients generally explored their reason for and duration of their facility visit.

Within the selected clinics in WC, we purposively sampled HCWs and facility staff who provided or supported TB-IPC services in different sectors. These staff included clinic managers (CMs), who supervised all healthcare activities in each facility, healthcare staff, including doctors, registered and enrolled nurses and HIV/TB & STI (HAST) counsellors, facility administrators and support staff, including clerks and cleaners.

In KZN, clinics and the CHC were purposively sampled, however we used convenience sampling to capture perspectives of all health care staff where possible, depending on who was there on the days of the visit.

**Participant Recruitment**

In WC, an email was sent to clinic managers informing them about the study followed by meetings with healthcare staff where researchers provided more information about the study and responded to any questions. Clinic managers informed researchers about the clinic’s organisation of care including staff profile, work schedules and patient flow. Researchers scheduled appointments with potential participants through face-to-face meetings and emails with hospital staff and face-to-face conversations with patients for their participation in the study.

**Individual Interviews**

Individual interviews provided detail on participants’ role and experiences in relation to TB-IPC within each facility. Questions focused on the nature and provision of services provided to clients, and the current IPC plans and protocols regarding patient management, environmental controls, administrative and governance practices. Participants were also asked about other staff roles and responsibilities, health worker protection, enablers and challenges to implementing IPC measures and individual risk perception and risk management.

**WC Focus group discussions (FGDs) and nominal group technique**

In the Western Cape, further data collection included focus group discussions (FGDs) of six to seven participants that were held in three of the facilities (WC3, WC5 and WC6) to explore enablers and challenges to implementing TB-IPC in more depth. In WC3 two of the participants (professional nurse and cleaner) interviewed individually were also part of the group discussions.

In addition to the FGDs conducted in WC3, WC5 and WC6, four data collection exercises using a nominal group technique were conducted. In these exercises, participants were asked to individually generate and record TB-PIC enablers and challenges for discussion individually. Subsequently, each point was written on flip charts and all participants were collectively asked to rank them, with 4 being the highest and 1 being the lowest score. This collective engagement allowed for the generation of further ideas and discussion about implementing TB-IPC in the clinics, as well as the opportunity for participants to find consensus and prioritise different aspects of TB-IPC. In WC5 with managers, two of the participants (doctor at the TB section and IPC nurse) were also part of the group discussions.

In WC5 with other healthcare staff, the participants were all only interviewed in the group discussions. In WC6 also, participants were all interviewed only in the group discussions (see supporting files, 2 & 3). Each individual interview and focus group discussions lasted between 45minutes and two hours while informal conversations lasted about 20-30 minutes. All interviews and group discussions were conducted in English, audio recorded and transcribed. When necessary, a multilingual research assistant conversant in isiXhosa and Afrikaans served as an interpreter for the first author, who led all interviews and group discussions.

**Logistical considerations**

WC

Data collection in rural clinics were particularly difficult because of the distance (3-5 hours’ drive) researchers had to travel. On one of the occasions, we had to use public buses that operated on fixed schedules. In some cases, internet connectivity to back-up collected data was not always stable. Researchers prepared supplementary data storage systems, such as encrypted- laptops, to prevent data loss. Collection of healthcare workers’ data proceeded with little or no problems. The health workers were stationary and they submitted days and times that they were less busy to be interviewed by researchers. Most of these interviews were carried out in the staff’s offices or consultation rooms. In addition, the initial meeting that researchers had with the clinic managers and some of the staff members helped researchers to gain easy access to healthcare staff. Patients’ data collection was particularly difficult because there was hardly any extra space in some clinics to hold the interviews away from other participants. Most importantly, some patients were concerned not to lose their positions in the queues if they stepped out to speak to researchers. Some patient interviews could not be recorded because of the noise in some areas of the clinic. However, this was expected hence informal conversations and observations were part of the methods used for data collection. Most healthcare staff’s individual interviews lasted for 30 minutes to an hour, FGDs and nominal technique for an hour, while patient interviews were shorter – about 20-30 minutes. Most patients did not engage with researchers for longer periods, either because of the short duration they spend waiting for their treatment (e.g TB/DR-TB patients that are fast-tracked) or simply not willing to speak for long.

KZN

We worked in a team of 2-4 researchers, all female, of which 3 were local South Africans, two black SA RAs, white SA co-investigator, and one white European research fellow. Local language proficiency ranged from full and diverse to basic isiZulu icebreakers.

Because of the distance to the rural clinics and CHC, we stayed overnight in a nearby accommodation. Our initial visits were for 3 days, and we were at the clinic site from the early mornings to late in the afternoon, sometimes until closing time. When we returned to the three sites for more in-depth work, we also stayed in nearby accommodation. We announced our visits via email correspondence, after that was confirmed, we showed up at the clinic and made arrangements for any interviews/FGDs in phase 2.

It was feasible in the clinics selected to find acceptable places to conduct patient interviews; we found quiet spaces which were often outside. In some cases, HCWs helped us to identify patients that could be interviewed; in other cases, we were able to approach patients from different streams of care (purposive) based on their consent and the time they had available to their next point of care (convenience). Patients in the queue were asked to keep the patient’s space and also HCWs were informed of the interviews happening.

The initial phase of clinic visits was critical in building good relationships for Phase 2 methods and our ability to speak to everyone we wanted to speak to. We offered refreshments (home-baked goods, crisps and juice) in way of welcome and building relationships of mutual acceptance.

However, we had some difficulty, particularly in one clinic, in convening HCWs for small FGDs, it was questionable whether this was an issue of willingness or competing priorities. In other situations, we made sure we had repetitively informed and followed up with the clinic-level gatekeeper to mobilise everyone needed for the FGDs. We benefited from established good relationships in the first phase of data collection/three-day ethnography. We introduced a photovoice exercise during the first of the two FGDs (at 2 PHCs), but this failed to generate sufficient uptake, so we decided not to pursue it further.

**Data Management and Analysis**

All semi-structured interviews were audio-recorded and transcribed verbatim. All data, including the visual and textual data generated through fieldnotes and interview transcripts were loaded onto the secure platform Sharepoint, housed at the London School of Hygiene and Tropical Medicine.

Researchers in both provinces created ‘thick case descriptions’ from each of the 3 clinics that were visited for more in-depth observation. These focused not only on capturing physical and environmental features of the clinic, organisational structures, but also on discursive and material strategies, prevailing ideologies, and the dynamics of power relations in clinical settings. These thick case descriptions contain ample field notes providing researchers’ reflections on the context of IPC and are meant to aid analysis of the interview data.

Interview data were initially coded using a broad “bucketing” approach to categorise data into broad themes including: community context, infrastructure, use of space, management, service delivery and IPC.

**Ethical review and approval for this study was provided by:**

* + The University of Cape Town’s Faculty of Health Sciences Human Research Ethics Committee (#165/2018).
  + The City of Cape Town (Ref:23940)
  + The Western Cape Government (ref:WC\_201806\_001)
  + The University of KwaZulu-Natal…BREC Ref no: BE 082/18