

1 **A new approach to assess the capability of health facilities to provide clinical care for**
2 **sexual violence against women: a pilot study**

3 **Running Title:** Sexual violence signal functions

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23 **Key messages:**

- 24 • Despite the high global prevalence of violence against women, sexual violence has not
25 received sufficient attention as an issue requiring health systems interventions.
- 26 • Several tools have been developed to collect information on health facility preparedness to
27 provide sexual violence response services; however, little guidance exists on how this
28 information can be used to better understand which functions a facility can perform.
- 29 • Using our proposed sexual violence signal functions framework, our findings demonstrate
30 huge gaps in sexual violence service accessibility and availability and point to key steps that
31 policymakers in Zambia can take to maximize coverage and ensure equity in access to care.
- 32 • Integrating our tool with ongoing cross-country health facility assessments would provide
33 evidence for policymakers and donors on where to invest to needs of sexual violence survivors
34 from the global to sub-national levels.

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41

42 **Ethical approval**

43 Ethical approval for this study was obtained from three institutional review boards: the University of
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45 Hygiene and Tropical Medicine (reference: 6407), and the Population Council (reference: 582).

46 **ABSTRACT**

47 Several tools have been developed to collect information on health facility preparedness to provide
48 sexual violence response services; however, little guidance exists on how this information can be
49 used to better understand which functions a facility can perform. Our study therefore aims to
50 propose a set of signal functions that provide a framework for monitoring the availability of clinical
51 sexual violence services. To illustrate the potential insights that can be gained from using our
52 proposed signal functions, we used the framework to analyze data from a health facility census
53 conducted in Central Province, Zambia. We collected the geographic coordinates of health facilities
54 and police stations to assess women's proximity to multi-sectoral sexual violence response services.
55 We defined three key domains of clinical sexual violence response services, based on the timing of
56 the visit to the health facility in relation to the most recent sexual assault: (1) core services, (2)
57 immediate care, and (3) delayed & follow-up care. Combining information from all three domains,
58 we estimate that just 3% of facilities were able to provide a comprehensive response to sexual
59 violence, and only 16% could provide time-sensitive immediate care services such as HIV post-
60 exposure prophylaxis and emergency contraception. Services were concentrated in hospitals, with
61 few health centers and no health posts fulfilling the signal functions for any of the three domains.
62 Only 23% of women lived within 15km of comprehensive clinical sexual violence health services, and
63 38% lived within 15km of immediate care. These findings point to a need to develop clear strategies
64 for decentralizing sexual violence services to maximize coverage and ensure equity in access.
65 Overall, our findings suggest that our proposed signal functions could be a simple and valuable
66 approach for assessing the availability of clinical sexual violence response services, identifying areas
67 for improvement, and tracking improvements over time.

68 INTRODUCTION

69 Sexual violence is defined as “any sexual act, attempt to obtain a sexual act, unwanted sexual
70 comments or advances, or acts to traffic or otherwise directed against a person’s sexuality using
71 coercion,” committed by any person, including an intimate partner, family member, colleague,
72 acquaintance, or complete stranger (World Health Organization, 2012). It can be a traumatic, often
73 stigmatizing event associated with a number of adverse mental and physical health sequelae,
74 including depression, anxiety, alcohol use disorders, physical injuries, unwanted pregnancy, HIV, and
75 sexually transmitted infections (STIs) (Klot *et al.*, 2012; World Health Organization, 2013a). The
76 World Health Organization (WHO) estimates that over one-third of women around the world and
77 46% of women in Africa have experienced some form of violence in their lifetime (World Health
78 Organization, 2013a). Women’s intimate partners are the predominant perpetrators of these
79 assaults—30% of women currently or previously in a relationship have been physically and/or
80 sexually assaulted by their intimate partner; the estimated global prevalence of non-partner sexual
81 violence against women is much lower at 7% (Abrahams *et al.*, 2014). Children also face significant
82 risk of sexual assault, with a recent meta-analysis of studies from 2000 and later estimating that 9%
83 of girls aged below 18 years have experienced forced intercourse (Barth *et al.*, 2013).

84 In 2003 and 2013, WHO outlined the clinical services recommended for sexual assault survivors,
85 including psychosocial counselling, emergency contraception, HIV post-exposure prophylaxis (PEP),
86 preventative STI treatment, and termination of pregnancy, where legal (World Health Organization,
87 2003, 2013b). In 2017, two additional guidelines were published: one on how to appropriately tailor
88 these responses to the specific clinical needs of children and adolescents who have been sexually
89 abused, and another providing health workers with a manual for how to design, plan, and manage
90 services for women who have experienced violence (World Health Organization, 2017a, 2017b).
91 Although these documents emphasize the importance of monitoring and evaluating the
92 implementation of these guidelines, there has been no global effort to assess their uptake.

93 Several models to improve health systems responses to violence against women have been
94 developed in response to these guidelines, including but not limited to, integrating intimate partner
95 violence screening with other health services; training health workers on how to appropriately
96 respond to violence against women; improving referral linkages between the health sector and
97 police, legal, and social services; creating one-stop crisis centers where women can access all
98 services related to violence prevention and response; and providing health facilities with pre-packed
99 rape kits to facilitate collection of forensic evidence (Keesbury and Askew, 2010; García-Moreno *et*
100 *al.*, 2014; Colombini, Dockerty and Mayhew, 2017). Despite these efforts to optimize response
101 mechanisms for violence against women, evidence on whether health facilities are prepared to
102 provide clinical care for sexual violence is lacking. A recently published systematic review of the
103 barriers and facilitators to effective health systems responses to intimate partner violence in low-
104 and middle-income countries, which includes sexual violence within intimate relationships, found
105 that a number of studies used qualitative methods to examine health facilities' readiness to provide
106 responses services; however, none examined this quantitatively (Colombini, Dockerty and Mayhew,
107 2017). While some sexual violence intervention studies have reported on key indicators related to
108 health facility infrastructure and quality of care, none have used this to examine the types of care
109 that facilities can provide (Christofides *et al.*, 2005; Khan *et al.*, 2008; Kassa, Hiwot and Abdella,
110 2009; Kim *et al.*, 2009).

111 A number of tools have been developed that can be used to collect information related to the health
112 sector's response to sexual violence. For example, USAID proposed ten indicators for evaluating the
113 impact of health programs addressing violence against women and girls (Bloom, 2008). A 2005
114 report from a WHO study on sexual- and gender-based violence in Liberia contains a 26-item
115 checklist for health centers and a 44-item checklist for referral hospitals (Omanyondo, 2005). In
116 2017, the WHO published a 27-item checklist to assess availability of essential equipment,
117 medicines, and other supplies for examining and caring for women who have experienced violence
118 (World Health Organization, 2017b). The WHO also created a 15-item job aid for health facility in-

119 charges to assess whether their facilities meet the minimum requirements for providing care for
120 women who have experienced violence (World Health Organization, 2017b). More recently, Jhpiego
121 and the United States Centers for Disease Control and Prevention (CDC) developed a comprehensive
122 42-page tool with more than 200 items to assess the availability, readiness, and quality of gender-
123 based violence services in health facilities (Jhpiego *et al.*, 2018).

124 Together, these resources provide a compendium indicators on service readiness inputs; however,
125 they do not offer a framework for distilling and synthesizing this data for the purpose of assessing
126 health facilities' capacity to deliver sexual violence response services (World Health Organization,
127 2017b; Jhpiego *et al.*, 2018). Faced with a similar challenge of how to best monitor global progress in
128 maternal health, in 1997 the United Nations developed process indicators to monitor the availability
129 of emergency obstetric care (EmOC) (UNICEF, WHO and UNFPA, 1997), characterized by the ability
130 to provide certain "signal functions," or essential services that define a health facility's capacity to
131 provide care. Since then, EmOC signal function data have been collected all over the world and used
132 to track progress towards improved availability of services and advocate for increased investment in
133 maternal care. This approach has also been extended to several additional service areas, including
134 abortion, antenatal care, postnatal care, emergency newborn care, and child health (Ntoburi *et al.*,
135 2010; Gabrysch *et al.*, 2012; Nesbitt *et al.*, 2013; Campbell *et al.*, 2016).

136 Our study proposes a set of signal functions that can be used to describe health facilities' readiness
137 to provide clinical care for sexual violence. To illustrate the potential insights that can be gained
138 from using the proposed signal functions, we piloted the approach to assess the availability of sexual
139 violence services in Central Province, Zambia. We also estimated women's proximity to health and
140 police services to examine physical accessibility of multi-sectoral sexual violence services.

141 **MATERIALS AND METHODS**

142 **Defining sexual violence signal functions**

143 We reviewed the WHO guidelines for the clinical management of sexual violence and the Zambian
144 National Guidelines for the Multidisciplinary Management of Survivors of Gender-Based Violence to
145 develop practical indicators for each essential component of care (World Health Organization, 2003,
146 2013b, 2017a; Government of the Republic of Zambia, 2011). In Table 1, we outline the resulting list
147 of indicators and signal functions for the clinical care of sexual violence survivors. We defined three
148 key domains of clinical sexual violence response services, based on the timing of the visit to the
149 health facility in relation to a penetrative sexual assault.

150 **1. Core services**

151 These core care functions should be available whenever an individual presents to a health
152 facility for services related to sexual assault, regardless of the timing of the visit relative to
153 the assault. This domain includes basic counselling and first-line support, physical
154 examination, and injury care.

155 **2. Immediate care**

156 Immediate care functions are time sensitive and focus on preventing infection with HIV and
157 other STIs and unwanted pregnancy. Immediate care should be available to eligible
158 individuals who present to a health facility within zero to five days of a sexual assault
159 involving oral, vaginal, or anal penetration. HIV post-exposure prophylaxis (PEP) is effective
160 up to 72 hours after the assault, and the emergency contraceptive pill is effective up to 120
161 hours after the assault, though both interventions should be provided as soon as possible
162 (World Health Organization, 2013b, 2017a). Although presumptive STI treatment does not
163 have clear guidelines regarding the timing of administration, it is recommended to be
164 provided at the same time as emergency contraception or HIV PEP in settings where
165 individuals are unlikely to return for follow-up care (World Health Organization, 2013b,
166 2017a).

167 **3. Delayed and follow-up care**

168 Delayed and follow-up care functions focus on managing unwanted pregnancy via
169 terminations (to the extent possible under the law), and testing and counselling for HIV and
170 STIs. Delayed and follow-up care should be available to individuals who either (a) first
171 present to a health facility more than five days after experiencing sexual assault or (b) return
172 to the facility for follow-up care after their initial visit.

173 Within each domain, we identified indicators for the ability to perform key functions (Figure 1, Table
174 1). Although the core services functions should be available whenever immediate care or delayed
175 and follow-up care are provided, we present the results separately for each domain. We defined a
176 facility able to perform all of the functions in each of the three domains as being able to provide
177 “comprehensive care”.

178 **Data sources**

179 *Health facility census*

180 We conducted a health facility census in Central Province, Zambia using the Ministry of Health’s
181 master list of all public and private sector health facilities in the province as a preliminary sampling
182 frame. Combining the 191 functioning facilities on the master list and an additional 26 eligible
183 facilities identified through local medical officers, we had a total of 217 facilities eligible for inclusion
184 in the study. Of these, 11 facilities could not be reached by car due to the condition of the roads
185 during rainy season and 13 declined to participate, leaving a total of 193 facilities.

186 From March to May 2016, trained interviewers assessed each of these facilities using a tablet-based
187 structured questionnaire covering topics related to general infrastructure, staffing, equipment and
188 supplies, and the facility’s capacity to perform various clinical functions. We obtained geographic
189 information system (GIS) coordinates for all included health facilities.

190 As the main purpose of this census was to collect information on capacity to provide termination of
191 pregnancy and post-abortion care services (Cresswell *et al.*, 2018), we reviewed the instrument for

192 questions overlapping with our proposed sexual violence signal functions and added questions as
193 needed to allow us to also study capacity to provide sexual violence response services. Table 2
194 outlines our ability to assess these signal functions using the study's facility census data. Given that
195 the majority of households in Zambia own mobile phones, it is likely that even if there was no
196 facility-owned phone, the health workers had access to a mobile phone that could be used in case of
197 emergency (Central Statistical Office, Ministry of Health and ICF International, 2014). Thus, although
198 the health facility census asked if the facility had a landline or mobile phone, we excluded this
199 question from our analysis as we felt that the phrasing of the question did not adequately assess the
200 facility's capacity to communicate for referrals. Additionally, in the health facility census, we asked if
201 the facility had any staff member trained on how to provide care for sexual violence survivors but
202 did not ask specifically about psychosocial counselling. We were therefore unable to assess the
203 availability of counselling services. The health facility census asked if facilities had a delivery bed
204 rather than a general examination bed or couch; as more than 80% of facilities at all levels had a
205 delivery bed, we used this as a proxy for having an examination bed. Finally, we unintentionally
206 omitted a question on the availability of the hepatitis B vaccination, so we were unable to include
207 this in indicator in our analysis of immediate care availability.

208 *Police stations*

209 We also collected GIS coordinates for police stations in Central Province to assess women's
210 proximity to police services after an assault. We are missing coordinates for one or more police
211 stations in two districts (Serenje and Chibombo), and therefore only present analyses on geographic
212 access to all ten police stations in four districts (Kabwe, Kapiri Mposhi, Mkushi, and Mumbwa).

213 *Population & geospatial data*

214 We obtained population numbers from the 2010 Zambian Census of Population and Housing and
215 applied growth rates to estimate ward populations for 2016. Geospatial shape files describing the

216 2010 administrative boundaries (Eubank, 2014) were edited to reflect the revised boundaries at the
217 time of data collection in 2016.

218 **Data analysis**

219 We used Stata 14 to assess the proportion of facilities capable of providing clinical sexual violence
220 response services disaggregated by level of care. The Zambian health system is organized into five
221 levels of care: tertiary (national) hospitals, second level (provincial) hospitals, first level (district)
222 hospitals, health centers, and health posts (Ministry of Health, 2012). For the purposes of our
223 analyses, the category “hospital” refers to all three types of hospitals and includes referral facilities
224 that should offer specialized clinical care. While health centers provide preventative and curative
225 primary health care services, health posts primary focus on basic first aid and community-level
226 health promotion.

227 We used ArcGIS 10.2 to calculate the distances between facilities and assess the theoretical
228 coverage of health services and police stations. Shapefiles with the administrative boundaries of the
229 province were combined with census data on population size per ward. We plotted the facility and
230 station GIS coordinates on the map and drew circular catchment areas around each location with
231 radii of 5 km and 15km. We then calculated the proportion of women in each ward living within the
232 catchment areas of the facilities and stations, assuming that the female population was evenly
233 distributed across each ward.

234 Less than 1% of data were missing for all variables included in this analysis. We coded any item with
235 missing information as being unavailable.

236 **RESULTS**

237 **Health facility capacity to provide clinical care for sexual violence**

238 We successfully interviewed 193 (89%) of the 217 health facilities in Central Province, including 10
239 hospitals, 143 health centers and 40 health posts. One hospital and 24 health centers were privately
240 owned faith-based or for-profit facilities; the remaining 163 facilities were government-owned.

241 Only 6% of health facilities were able to perform all of the signal functions in the core services
242 domain. While 90% of hospitals could perform all the core services functions, only 2% of health
243 centers and no health posts were able to offer these services. Most facilities had one or more health
244 professional on call 24 hours per day and 7 days per week, a private room, and could provide
245 physical examination services; however, very few lower level facilities were able to provide sutures,
246 or stitches for injuries (Table 3).

247 Sixteen percent of health facilities were able to provide all three time-sensitive services in the
248 immediate care domain (70% of hospitals, 16% of health centers, and 0% of health posts). The
249 majority of facilities at all levels were able to provide presumptive treatment for a range of common
250 STIs; however, emergency contraception and HIV PEP were less frequently available, particularly in
251 health centers and health posts (Table 3). HIV PEP was available in all hospitals, but only in 55% of
252 health centers and 28% of health posts. Availability of the emergency contraceptive pill was most
253 limited, and the commodity was in stock in only 70% of hospitals, 22% of health centers and 5% of
254 health posts.

255 Less than 8% of health facilities (70% of hospitals, 6% of health centers, and 0% of health posts) were
256 able to provide all three delayed & follow-up care functions. While HIV testing and counselling
257 services were nearly universally available, termination of pregnancy services and STI testing and
258 counselling were each only available in 14% of all health facilities (80-90% of hospitals, 13% of health
259 centers and 0% of health posts).

260 Combining information from all three domains, we estimated that just 3% of all facilities (50% of
261 hospitals, <1% of health centers, and 0% of health posts) were able to provide a comprehensive
262 response to sexual violence, comprising core services, immediate care, and delayed & follow-up

263 care. If we applied stricter signal functions criteria and required each comprehensive care facility to
264 also have a health worker trained in providing clinical sexual violence response services on staff, only
265 one facility was classified as being capable of providing comprehensive services. Further, we found
266 that sexual violence services were largely concentrated at the hospital level, with 81% of health
267 centers and all health posts unable to completely fulfil any of one the three domains of clinical care
268 for sexual violence (Table 4).

269 **Physical accessibility of health and police services**

270 We estimated that 85% of women in Central Province lived within 15km of a health facility of any
271 level (regardless of its ability to provide sexual violence response services), and 31% lived within
272 5km. Despite the majority of women living within 5km or 15km of a health facility, only 11% and 23%
273 lived within 5km and 15km of comprehensive clinical sexual violence health services, respectively
274 (Table 5). Immediate care was the most commonly available domain; still, only 38% of women lived
275 within 15km of these services. Approximately 29% and 31% of women lived within 15km of a facility
276 offering core services and delayed & follow-up care, respectively.

277 In the four districts with geographic coordinates for police stations, 41% of women lived within 15km
278 of a police station, and 25% lived within 5km (Table 5). Availability of clinical sexual violence services
279 in these four districts appeared to be higher than in Central Province as a whole, with 33% of women
280 living within 15km of a facility offering comprehensive care; 40% living within 15km of core services;
281 48% living within 15km of immediate care; and 43% living within 15km of delayed & follow-up care.

282 In terms of physical access to multi-sectoral sexual violence services, we found that 33% of women
283 in the selected districts lived within 15km of both a police station and comprehensive clinical sexual
284 violence services, and only 17% lived within a 5km radius of both services. Additionally, nearly 40%
285 of women in these districts lived within 15km of a police station and either core services, immediate
286 care, or delayed & follow-up care.

287 In terms of proximity of police stations to health services for referrals, we found that while the
288 median distance from a police station to any health facility was 0.5km, the median distance to a
289 facility capable of providing comprehensive services was 5.9km (Table 6). The median distance
290 between a police station and a facility capable of fulfilling the signal functions for any of the
291 individual core services, immediate care, and delayed and follow-up care domains was between one
292 to two kilometers.

293 **DISCUSSION**

294 This paper (a) proposes a set of signal functions that can be used to evaluate health facilities'
295 readiness to provide clinical care for sexual violence and (b) demonstrates how they can be applied
296 by presenting the results of a pilot study conducted in Central Province, Zambia using this
297 framework. In this discussion, we will first give an overview of the findings and policy implications of
298 the study in Zambia then use our experience from the pilot to discuss the value and challenges of
299 this methodological approach as well as recommendations for improvement.

300 **Availability and accessibility of sexual violence response services in Zambia**

301 Previous studies in Zambia and other low- and middle-income countries suggest that sexual violence
302 survivors often fail to receive timely and adequate health and police services following an assault
303 due to a number of barriers, including poor provider attitudes, fear of stigma, low quality of care,
304 lack of transportation, and unofficial fees (Christofides *et al.*, 2005; Omanyondo, 2005; Keesbury,
305 Zama and Shreeniwas, 2009; Casey *et al.*, 2011; García-Moreno *et al.*, 2014; Zama *et al.*, 2015;
306 Mathur *et al.*, 2018). Despite this growing literature on the barriers to using clinical sexual violence
307 services, there is comparatively less research that systematically examines whether health facilities
308 are adequately equipped to provide high quality care and which services are geographically
309 accessible to survivors of sexual assault. The few studies that have reported on various aspects of
310 health facility preparedness for sexual violence response services found that health facilities often
311 lack fundamental components for quality care such as clear protocols; a private space for

312 examination; providers trained in the management of sexual violence cases; commodities including
313 emergency contraception and HIV PEP; and tools for forensic evidence collection (Christofides *et al.*,
314 2005; Omanyondo, 2005; Khan *et al.*, 2008; Kassa, Hiwot and Abdella, 2009; Casey *et al.*, 2011).
315 These challenges are exacerbated in conflict areas, where risk of sexual violence tends to be high,
316 availability of sexual violence response services is limited, and access general health care is
317 compromised (Rybarczyk *et al.*, 2011; Tunçalp *et al.*, 2015). This study builds upon this body of work
318 by synthesizing information on the availability of these inputs to assess which sexual violence
319 response service functions a health facility can perform, and pairing this information with geospatial
320 data to examine the geographic distribution of sexual violence response services and population-
321 level access to care. Our findings from Central Province, Zambia suggest that even if a woman
322 overcomes all of the barriers to seeking medical care after a sexual assault, she will have difficulty in
323 accessing services as recommended due to inadequate facility preparedness, particularly at the
324 lower levels of care, and the limited geographic availability of time-sensitive post-sexual violence
325 services.

326 WHO guidelines highlight the importance of providing all-inclusive clinical sexual violence response
327 services within the same health facility and, to the extent possible, the same visit, given the high
328 likelihood of loss to follow-up if multiple facility visits are required (World Health Organization,
329 2013b, 2017a). Similarly, the Zambian national guidelines state that care should preferably be
330 provided within the same facility; however, they also recommend that women should be referred to
331 higher-level facilities for psychosocial counselling, surgical procedures, pediatric services, and
332 obstetrical or gynaecological care as needed (Government of the Republic of Zambia, 2011). We
333 found that while all hospitals in Central Province were equipped to provide some sexual violence
334 response services, only half could provide comprehensive care as suggested by guidelines.

335 Additionally, all health posts and 81% of health centers could not fulfil the criteria necessary for any
336 of the sexual violence service domains. Although the basic care functions of the core services

337 domain should ideally be available in all facilities at all times, very few lower level facilities were able
338 to injury care requiring sutures, or stiches.

339 We also found that very few women lived within close proximity to any clinical sexual violence
340 response services. Less than one in four women lived within 15km of comprehensive services, and
341 60-70% of women lived further than 15km away from a facility offering at least one domain of
342 clinical sexual violence services. Our results therefore suggested that in order to receive appropriate
343 clinical care, most sexual violence survivors in the province must bypass the health facilities closest
344 to them and instead seek care at a tertiary facility. In addition to the distance and transportation
345 barriers associated with hospital-based care, seeking sexual violence response services at tertiary
346 facilities may also present survivors with increased costs, longer waiting times, and challenges
347 navigating a larger facility. Additionally, even in facilities with the theoretical capability to provide
348 comprehensive sexual violence response services, health providers were unlikely to have received
349 any training in the medical management of such cases. This implies that when women seek care
350 from facilities well equipped to provide sexual violence response services, they may still encounter
351 poor quality services and incomplete care due to lack of appropriate training.

352 The scarcity of the emergency contraceptive pill in health centers and health posts is particularly
353 concerning, considering that it can be administered by lower-level providers and would help to avoid
354 unwanted pregnancies and subsequent abortions in a setting where pregnancy terminations are
355 restricted, often sought from unsafe sources, and lead to high rates of severe abortion-related
356 complications (Owolabi *et al.*, 2017).

357 These disparities in service capability by facility level bring into question the feasibility of existing
358 global guidelines, and whether they should be adjusted to better align to the reality of health
359 systems constraints in many low- and middle-income settings. To avoid loss to follow-up and ensure
360 that sexual violence survivors receive all of the services that they need, the WHO recommends that
361 facilities at all levels should ideally be equipped to provide a complete package of services equivalent

362 to our domains of core, immediate, and delayed & follow-up care (World Health Organization,
363 2013b, 2017a). However, in contexts similar to our study province, comprehensive care is
364 concentrated at the hospital level, and it may be infeasible to improve all facilities to this standard
365 with limited resources. Overall, our findings point to a need for these global guidelines to be tailored
366 to these resource-constrained settings by involving a diverse set of country-level policymakers in the
367 guideline development process and using available evidence from health facility assessments in low-
368 and middle-income countries to assess which sexual violence services can realistically be provided at
369 different levels of the health system. The conceptual groupings of core, immediate, and delayed &
370 follow-up care may be particularly useful for health systems that are far from achieving
371 comprehensive capacity in all facilities, and offer useful information for developing a phased
372 approach to facility upgrades. Given the low availability of injury care services, one priority for
373 decentralizing care might be to ensure that all lower level facilities are capable of performing all of
374 the functions in the immediate care domain as well as the staffing, privacy, and physical examination
375 functions of the core services domain with referral to higher level care for treatment of injuries and
376 other services as needed. Similarly, although emergency contraception and HIV PEP commodities
377 can be stored and provided at health posts and centers with accompanying clinical algorithms for
378 administration by lower-level health workers, they are often absent. Another decentralization
379 strategy might therefore be to prioritize making these services available in lower-level facilities with
380 referral to hospitals for additional laboratory testing or more advanced treatment protocols as
381 needed.

382 WHO guidelines also advocate for coordinated action and linkages between sectors when
383 responding to cases of sexual violence (World Health Organization, 2013b, 2017a). The Zambian
384 national guidelines have operationalized this by stipulating police officers should accompany sexual
385 violence survivors who have not received any health services to the nearest health facility. Using
386 data from four districts in Zambia (with relatively higher geographic coverage of clinical sexual
387 violence response services compared to the province at large), we found that less than 40% of

388 women lived within 15km of a police station and a health facility offering at least one domain of
389 sexual violence care. It appears that police stations tend to be geographically situated near health
390 services; thus, it is important for hospitals to be well prepared to provide clinical services for sexual
391 violence survivors, and for police officers who handle sexual violence cases to routinely refer them
392 to the nearest hospital for care. However, because both police stations and hospitals tend to be
393 located in the district centers, women living in more rural and inaccessible areas likely face greater
394 challenges accessing sexual violence services.

395 Lastly, given our finding on the low proportion of facilities with providers trained on how to respond
396 to cases of sexual violence, this study also highlights a critical need to conduct national in-service
397 trainings on the guidelines for existing health workers as well as to incorporate the training materials
398 into pre-service training curricula.

399 **Methodological insights: using the signal functions approach to assess health facilities' readiness**
400 **to provide sexual violence services**

401 To our knowledge, this is the first study to apply the signal functions approach to clinical care for
402 sexual violence, and the first to assess women's proximity to health facilities and police stations for
403 sexual violence response services. Our experience with implementing the pilot study in Zambia
404 suggests that our sexual violence signal functions offer a practical and simple approach to
405 monitoring availability and accessibility of sexual violence response services that could easily be
406 integrated with more general, routine health facility assessments. Although a number of tools have
407 been developed to evaluate health facility preparedness to provide sexual violence services, there
408 are limited available examples of such tools being implemented in practice and lack of guidance on
409 how the large amounts of data generated from these assessments can be transformed into useful
410 information for decision-making (Omanyondo, 2005; Bloom, 2008; World Health Organization,
411 2017b; Jhpiego *et al.*, 2018). In developing these signal functions, we carefully selected a subset of
412 all necessary inputs that would be indicative of a health facility's capability of providing essential

413 sexual violence response services. This concise, comparatively short list of indicators provides a
414 feasible option for monitoring changes over time, especially in the context of routine data collection.
415 Additionally, rather than tracking individual inputs, such as the proportion of facilities that have latex
416 gloves in stock, our approach instead proposes a framework for using information on these inputs to
417 better understand each facility's potential readiness to perform certain functions, such as providing
418 basic injury care. By reporting on women's geographic access to both health facilities and police
419 stations and the distances between these services, our study also provides new, multi-sectoral
420 insights into the spatial distribution of sexual violence response services.

421 While the pilot helped us to demonstrate the rich information that this approach can generate, we
422 also identified key issues that must be reconsidered and refined in future iterations of this sexual
423 violence signal functions framework, perhaps through a Delphi exercise to gain expert consensus
424 (Hsu and Ohio, 2007). Developing signal functions can be challenging, as it requires achieving a
425 careful balance of measuring essential components of care and providing information that is
426 interpretable and actionable. For instance, when deciding on the final composition of our signal
427 functions, we debated whether having a health provider trained in the medical management of
428 sexual violence cases should be a core function. While this is an essential element for good quality
429 sexual violence response services in theory, we felt given the reality that very few providers in our
430 setting have been exposed to this type of training, including it as a component of our signal
431 functions would be less informative than examining the availability of human resources more
432 generally. This is because the findings would simply show that no facilities were prepared to offer
433 core services, and does not point to any clear recommendation apart from the need to train more
434 health workers. As the need for additional training is given in this context, we thought it would be
435 more useful to assess the proportion of facilities that have already have the necessary staffing to
436 provide sexual violence response services and should be prioritized for health worker trainings.

437 In addition to helping refine which components of care should be included in the sexual violence
438 signal functions framework, an expert review process and/or a future validation study would also be
439 helpful for refining *how* we measure the included indicators. For example, we ultimately chose to
440 exclude referral capacity from our analysis, as we felt that the way we asked the question in the
441 health facility census did not adequately capture what we were really interested in measuring.
442 Having additional input on this and other included measures would help to strengthen the
443 framework.

444 Beyond the need to further validate and gain expert consensus on the composition of the sexual
445 violence signal functions, there are additional limitations to consider. First, central to the signal
446 functions method is the assumption that given the availability of a certain set of inputs, a facility
447 should be capable of providing a particular service or set of services. The selected indicators do not
448 represent every individual input recommended for the provision of clinical sexual violence response
449 care, but rather a carefully selected group of indicators that can provide a snapshot assessment of
450 whether a facility is capable of providing care. While some indicators are verified by the presence of
451 certain equipment and commodities, others, such as the functions in the delayed and follow-up care
452 domain, are only reported by the staff member being interviewed. Further, the availability of
453 commodities does not necessarily mean that they will be made available in the event that a sexual
454 violence survivor presents at a facility. Thus, in practice, a facility's theoretical capability to offer
455 services as measured by the presence of signal functions does not necessarily mean that appropriate
456 care is actually provided when needed. We are therefore likely overestimating the proportion of
457 women with access to sexual violence services. Additionally, our geospatial analysis relies on the
458 assumption that the population of women is evenly spaced within each ward. In rural wards where
459 populations tend to be concentrated in certain areas, this may mean that we have over- or
460 underestimated the proportion of the population within 5km or 15km of a health facility or police
461 station. We also estimated proximity to health facilities and police stations using straight-line
462 distances, which may underestimate actual travel time given that often routes are less direct.

463 Finally, due to data availability, we only included police stations in our geospatial analyses and
464 excluded police posts, which tend to be located in less central areas of a district. Although police
465 posts may expand the geographic reach of police services, they tend to be much smaller, sparsely
466 staffed, and less likely to have a victim support unit or any private space to deal with sensitive
467 matters compared to police stations. Thus, while excluding police posts from our analysis may
468 underestimate access to police services generally, we feel that in most cases, sexual violence
469 survivors are likely to bypass their local police post or have their case referred to the nearest police
470 station for processing.

471 Despite these challenges, experiences from our pilot of the proposed sexual violence signal functions
472 suggest that the framework is useful and has the potential to inform the development of health
473 systems guidelines and improve monitoring of service capability and access. Additionally, our
474 analysis of the physical locations of both police and health services demonstrates how geospatial
475 data can be used to monitor the accessibility of sexual violence services and feasibility of referrals
476 across multiple sectors. Much of the information required to use the proposed sexual violence signal
477 function indicators is already captured in existing tools for routine multi-purpose health facility
478 readiness assessments, such as the Service Provision Assessment (SPA) and Service Availability and
479 Readiness Assessment (SARA), which have been conducted across a number of low- and middle-
480 income countries (MEASURE DHS, 2012; World Health Organization, 2013c) (Appendix 1). Adapting
481 these instruments to capture information on sexual violence signal functions would facilitate
482 comparisons between countries and over time. Our findings on the geographic distribution of sexual
483 violence response services also highlight the value in using geospatial data to monitor equity in
484 physical access to care. Geographic coordinates are routinely collected for the SPA and SARA;
485 however, these often survey a sample of facilities rather than all facilities in a country. To ensure
486 that this information is available and up-to-date for all health facilities, governments could consider
487 incorporating the collection of geographic coordinates and reporting on indicators related to the

488 provision of sexual violence responses services through their health management information
489 systems.

490 **CONCLUSIONS**

491 Using signal functions appears to be a simple and valuable approach for assessing the availability of
492 clinical sexual violence response services and identifying areas for improvement. Much of the
493 relevant information is already captured on routine multi-purpose health facility assessment tools
494 such as the SPA and SARA; however, facilities' capacity to provide sexual violence care is not
495 currently tracked or reported. Given the usefulness of this approach, we recommend that these
496 instruments be modified to enable more accurate assessment of sexual violence service availability.
497 Extensive changes are not needed: a few minor changes and additions to these tools, such as asking
498 about the availability of psychosocial counselling and the hepatitis B vaccination, will allow for better
499 tracking of sexual violence service availability globally and over time. It will also provide additional
500 evidence where needed on the importance in investing in the health systems to adequately meet
501 the needs of sexual violence survivors.

502 **ABBREVIATIONS**

503 EmOC: emergency obstetric care

504 GIS: geographic information system

505 HIV: human immunodeficiency virus

506 PEP: post-exposure prophylaxis

507 SARA: Service Availability and Readiness Assessment

508 SPA: Service Provision Assessment

509 STI: sexually-transmitted infection

510 SV: sexual violence

511 WHO: World Health Organization

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