

Health professional feedback on HPV

vaccination roll-out in a developing country

ABSTRACT

Background: Worldwide, Zambia has the highest cervical cancer incidence rates (58.4/100,000 per year) and mortality rates (36.2/100,000 per year). The human papilloma virus (HPV) vaccine is considered a vital preventative measure against cervical cancer, particularly in sub-Saharan countries, such as Zambia. Past research suggests health professionals' experiences with HPV vaccination rollout can have practical implications for effective delivery.

Objective: To explore health professionals' perspectives on the HPV vaccination programme in Zambia.

Methods: Researcher travelled to Zambia and conducted semi-structured interviews with fifteen health professionals working in private, government, and missionary clinics/hospitals. Observation was conducted for triangulation purposes. Thematic analysis was used to analyse the data.

Findings: Five main themes emerged; medical misconceptions about the HPV vaccination, particularly with regards to infertility; fear of the unknown, including possible side effects and inadequate empirical research; need for prior desensitisation to resolve cultural barriers

24 prior to vaccination rollout; a rural-urban divide in health awareness, particularly in relation
25 to cancer vaccines; and economic concerns associated with access to the HPV vaccination for
26 most of the Zambian population.

27

28 **Conclusion:** Overall, the findings indicate that an essential avenue for facilitating HPV
29 vaccination rollout in Zambia is by implementing a pre-rollout community effort that
30 removes or softens cultural barriers, particularly in rural areas. It is also essential to correct
31 erroneous HPV presumptions health professionals may have around infertility. Affordability
32 remains a seemingly intractable hindrance that hampers HPV vaccination rollout in Zambia.

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34 Key words; HPV; vaccination; Zambia; health professionals

35

36 INTRODUCTION

37 Cervical cancer is a major global health problem, rated as the third most common cancer in
38 women [1]. Around 85% of cases occur in developing countries [2, 3]. Zambia in particular
39 has the highest cervical cancer incidence rates (58.4/100,000 per year) and mortality rates
40 (36.2/100,000 per year) worldwide [4]. Today, cervical cancer is the first cause of female
41 cancer in Zambia, and the most common female cancer in women aged 15 to 44 years in this
42 country [5]. Tackling cervical cancer in sub-Saharan countries is difficult, partly because
43 multiple and complex socio-cultural factors contribute to its high mortality rates in these
44 geographical regions [6].

45 HPV (human papilloma virus) infection is extremely detrimental for women in
46 countries like Zambia, where the known adult HIV prevalence rate is 16% [7]. HIV and
47 cervical cancer rates are strongly correlated [3]. HPV infection can double a woman's risk of
48 acquiring HIV as it causes lesions in the cervix and vagina, which act as transmission sites

49 for the virus [8]. Not only are HIV positive women more likely to develop cervical cancer,
50 but once contracted, cervical cancer develops even faster in HIV positive women [8].
51 Although systematic cervical cytology screening programmes are considered an essential tool
52 for addressing cervical cancer in developing countries, research suggests these schemes aren't
53 necessarily feasible in some developing countries [9]. One systematic review suggests lack of
54 resources faced by less economically developed countries, like Zambia, limits women's
55 access to both treatment and screening services, possibly contributing to the high prevalence
56 of cervical cancer in such countries [3]. Knowledge of HPV is poor in many developing
57 regions. For example, a study of 500 women in Sudan found that only 39.2% had heard about
58 the HPV vaccination [10]. A similar investigation in Lebanon reported a knowledge score of
59 just 52.7%, suggesting limited awareness of the vaccine [11]. However, knowledge of HPV
60 appears to be relatively high in Zambia, with one study suggesting 74.7% of adult women
61 have heard about cervical cancer, and 73.3% consider it preventable [12].

62

63 *Pilot HPV vaccination programme in Zambia*

64 The HPV vaccine was one of four new vaccines planned to be introduced into the routine
65 immunization system in Zambia (the others comprising the rotavirus vaccine, pneumococcal,
66 and the second dose of measles) [13]. However it has only been introduced on a pilot basis in
67 three districts in the Lusaka province [14]. On 27 May 2013, the pilot scheme was launched,
68 targeting schoolgirls (aged 9 to 13) in grade four. During the initial phase (2013 to 2014)
69 approximately 50,000 girls were targeted [15]. Girls out of school were meant to receive the
70 vaccine through outreach strategies and health centres [15]. Over the course of the pilot
71 programme, from 2013 to 2014, an estimated 33,733 young girls were vaccinated with the
72 full three doses [16]. The international organization Pink Ribbon Red Ribbon is donating an
73 extra 30,000 vaccines [16]. As the HPV vaccine is one of the most expensive recommended

74 inoculations, its success is pivoted upon its affordability in limited resource settings [17]. The
75 Global Alliance for Vaccines and Immunisation (GAVI) have taken steps to increase
76 affordability and access to routine vaccines in low income countries [18]. Zambia was one of
77 the countries approved for GAVI support, although at present the HPV vaccine does not
78 appear to be one of the inoculations subsidised by the GAVI alliance [19].

79

80 *Role of health professionals*

81 It is estimated that about 500 health workers were trained (and 50 clinics involved) in the
82 HPV vaccination programme in Zambia [20]. As Zambia has a doctor-patient ratio of just
83 0.173/1000 [21], and relatively few qualified gynaecologists – currently, there are only 40
84 members of the Zambia Association of Gynaecologists and Obstetricians [22] – how health
85 professionals interact with their female patients, and their role in delivering the HPV
86 vaccination, is an important issue to consider [23]. Health professionals can significantly
87 amplify HPV vaccine uptake, for example by recommending vaccination during routine
88 doctor-patient consultations [24]. It has also been argued that the potential success of the
89 HPV vaccination can be improved if the challenges faced by healthcare providers are
90 understood [25].

91 Some research has explored HPV-related knowledge and attitudes amongst health
92 professionals from developing countries, including African countries [26-28]. For example, a
93 questionnaire-based study of 602 Nigerian healthcare professionals concluded that while they
94 had good knowledge of HPV, their awareness the vaccine was low [26]. Nurses in particular
95 had the lowest level of knowledge about the HPV vaccine, or even its existence. Another
96 quantitative study conducted in a South African hospital reported similar findings [27]. Using
97 self-report questionnaires administered to 345 nurses, this study attempted to determine the
98 factors that affect recommendations of HPV vaccination to patients. They found that the

99 majority of the nurses lacked understanding of HPV infections and vaccinations, but yet were
100 still willing to recommend vaccinations to patients. These findings mirror those of another
101 questionnaire based study of 178 female nurses in Nigeria [28]. The South African study also
102 found that nurses who thought their patients would accept HPV vaccination were more likely
103 to recommend it [27]. The authors concluded that before a HPV vaccination programme
104 could be successful nationwide, nurses needed to receive more education on HPV in general,
105 as well as the HPV vaccination specifically.

106

107 *The present study*

108 Overall, past research has shown that exploring health professionals' knowledge and views
109 on HPV vaccination can yield valuable insights for vaccine implementation [27, 28]. Health
110 workers' perceptions can influence their administration of the HPV vaccine. For example,
111 interviews with 15 health professionals in exploring their views on cervical cancer screening
112 concluded that professionals' perceptions of screening barriers influenced their management
113 goals, practices and decisions surrounding how best to deal with cervical cancer [29]. Despite
114 Zambia being particularly burdened by cervical cancer, and having recently benefited from a
115 HPV vaccination pilot, no such study had been conducted in the region. The fact that Zambia
116 has some of the highest cervical cancer mortality rates in the world emphasises the severity of
117 the issue, and the requirement for health professional feedback on how to more effectively
118 administer the HPV vaccination [4, 5, 30]. The views of health professionals involved in the
119 HPV pilot scheme will be particularly helpful in identifying themes that may impede or
120 facilitate vaccination rollout campaigns in this region. Thus, the current study aimed to
121 address this gap in the literature, by exploring health professionals' experiences of the HPV
122 vaccination rollout in Zambia.

123

124 METHODOLOGY

125 Thematic analysis was used as it allows the researcher to explore issues without the
126 constraints that might otherwise be imposed by more structured analytical techniques, such as
127 Interpretative Phenomenological Analysis (IPA) or GT [31]. A total of 15 healthcare
128 professionals (4 males, 11 females) involved in cervical cancer were recruited from several
129 health organisations in Kabwe, and also a private hospital/clinic, government hospital and
130 district health center in Lusaka. Participants consisted of two gynaecologists, one oncologist,
131 and twelve nurses. One professional worked in a private clinic, eight in a government
132 hospital, one in a missionary hospital, one in a district health centre, two in an NGO hospice,
133 and two at a cervical cancer clinic. The health worker (a nurse) from the district health centre
134 was directly involved in running the pilot vaccination programme. Two professionals (nurses)
135 working in Lusaka were parents/ guardians of girls targeted for vaccination. Given that there
136 are only about 40 obstetrician/gynecologists in Zambia [22], finding anyone who knew about
137 the HPV vaccine, or who worked on oncology wards, was a challenge. Health workers in
138 charge of addressing cervical cancer found it hard to suggest who to talk to.

139 A Dictaphone was used to record the (semi-structured) interviews. The device was an
140 Olympus VN- 711PC with 2GB memory (circa 823 hours of recordings), battery life of up to
141 72 hours, and USB connection for fast downloading to a PC. In order for the interviews to be
142 standardized, each participant was asked the same ten core open-ended questions. These are
143 presented in *Table 1*. Ethical approval was obtained from Liverpool John Moores University
144 Research Ethics Committee (UREC), University of Zambia Biomedical Ethics Committee
145 (UNZABREC, Ref. No. 004-06-15), and the Zambian Ministry of Health.

146 *Figure 1* illustrates the key procedural steps. One of the researchers travelled to
147 Zambia to recruit participants. Purposive sampling (specifically snowball sampling) was
148 used. Recruitment was implemented through third-party recommendations (friends, family

149 and acquaintances). Although an hour was allocated for each interview, on average, an
150 interview lasted about 30 minutes. Participants were informed both in the consent form and
151 verbally that they had the right to withdraw from the study at any given time. With
152 gatekeeper's approval, observation of some of the participants' places of work was also
153 conducted. Observation consisted of the researcher taking field notes on the surrounding
154 facilities and the interactions between staff and patients. Overall data collection took
155 approximately 3 weeks.

156 Non-participant unstructured observation was conducted alongside the interviews to
157 verify participants' reports. Following data analysis, some of the participants were contacted
158 via email. They were presented with an outline of the findings, and asked to provide
159 feedback. As the mother of one of the researchers had passed away with cancer, we were
160 aware this might introduce some personal bias during data analysis. Thus, an inductive
161 approach was used in data coding, to ensure it was primarily data-driven. However, it is
162 important to note that the coding of data is never conducted in an 'epistemological vacuum'.
163 Hence, the researchers acknowledged that the extent to which they were able to separate their
164 subconscious thoughts from the analysis was limited [32].

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RESULTS

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Interview data was transcribed using the step-by-step procedure for thematic analysis

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outlined in the literature (see *Figure 2*) [31]. This process included generating initial codes

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(see *Table 2*), then searching for and reviving themes. A total of five overarching themes

181

were derived from the data; ‘medical misconceptions’, ‘fear of the unknown’, ‘prior

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desensitisation’, ‘rural-urban divide’, and ‘economic concerns’.

183

184

Theme 1: Medical misconceptions

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Despite the high-profile launch of the HPV vaccine roll-out in Zambia [15], participants

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expressed misconceptions and myths surrounding the vaccine which translated into a fear of

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the HPV vaccine in the community. Some of these misconceptions were that the vaccine

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causes infertility, illness such as cervical cancer itself, and that it is untested and Zambians

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are being used as experimental trials. Interestingly, one of the healthcare workers also held

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this belief:

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192

"What I have heard about the vaccine, some say that it has been developed to

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reduce the population, to reduce the fertility in a woman, an African woman."

194

Participant J (L: 88-89)

195

196

"They were saying if they give those vaccines to young girls, maybe those young

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girls they won't get pregnant in the future, it will prevent them from getting

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pregnant, so those are beliefs that they have." Participant F (L: 16-18)

199

200 **Theme 2: Fear of the unknown**

201 It appears that health workers not directly facilitating the pilot programme were not given
202 HPV vaccine training [20]. Thus suggesting that the informing of the healthcare workers on
203 the vaccine was neither nationwide nor continuous. While most participants were in support
204 of the vaccine, some had fears of the side effects and felt that not enough research had been
205 done on it. This lack of knowledge even led to open rejection of the vaccine for one
206 participant:

207

208 *"I am telling you, about this vaccination, me I am against about it."* Participant D
209 (L: 3)

210

211 In addition, although parents were meant to have been given information on the vaccine by
212 the teachers or nurses that visited the schools [15], it was apparent that this was not always
213 the case. For some of the nurses, this lack of information affected their preparedness to allow
214 their child to be vaccinated or recommend it to the community.

215

216 *"I feel they haven't done much work on it for them to even start giving a vaccine.*

217 *And this is why I wasn't comfortable for my daughter to have the vaccine."*

218 Participant I (L: 2-8)

219

220 *"The females what they think about it, the others think that it is the wrong thing,*

221 *they are scared, others they accept, but most of them they are scared. When the*

222 *children tell their parents they want to give us this vaccine, most of the parents they*

223 *were refusing saying ‘no us we don’t know about this drug’, so they refuse.”*

224 Participant M (L: 19-22)

225

226 Participants noted a lack of information on the HPV vaccine, contributing to the illusion not
227 much research has been done on it. This perceived knowledge deficit seemed to affect their
228 ability to deliver accurate vaccine information, and willingness to discuss the vaccine with
229 patients, and the community. It appears professionals in Kabwe were not given such
230 information as the pilot was carried out in the Lusaka district alone. However, even
231 participants from Lusaka reported that information had not been disseminated specifically to
232 them.

233

234 **Theme 3: Prior desensitisation**

235 Participants highlighted a need for specific cultural barriers to be addressed prior to rollout, to
236 make the whole community (including health professionals) more receptive to the vaccine.
237 This need for preliminary desensitisation was due to the cultural issues that were discussed,
238 such as females’ reliance on male or elder’s permission to vaccinate their children. During
239 the pilot children were sent home with consent slips, and parents were asked to sign them.
240 Obtaining consent may be problematic if significant males or elders are not educated on the
241 vaccine. Some participants felt that they have less influence over their patients than the males
242 or elders in the society.

243

244 *“The cultural background, that a woman should seek permission from her*
245 *husband, whether she should take her daughter for the vaccine. So those are*
246 *cultural issues that will always be there.” Participant K (L: 155-158)*

247

248 *“But with education we should include the male folk because mostly we side line*
249 *them, because they also play an important role, because if them the male folk*
250 *understand, it will be easy to encourage the wife or the mother to the child or the*
251 *daughter, it will be very easy.” Participant J (L: 122-125)*

252

253 **Theme 4: Rural-urban divide**

254 Participants perceived differences between the rural and urban communities in terms of
255 education levels. This lack of education in the rural communities in turn was perceived to
256 create challenges in delivering health education, and getting them to understand the need for
257 vaccinations.

258

259 *“When you speak to people with less education, or low education, they really*
260 *don’t understand why it is important. They even don’t understand what it means*
261 *to have cancer in the uterus and why the uterus is important. Or what it means to*
262 *have cancer. Because it is just lack of knowledge, lack of education.” Participant*
263 *G (L: 82-89)*

264

265 **Theme 5: Economic concerns**

266 The cost of the HPV vaccine was seen to be a barrier to vaccination for most of the Zambian
267 population. Participants stressed that if introduced in Zambia, the vaccine needs to be offered
268 for free, or at a reduced cost. It was also noted that the availability and promotion of the
269 vaccine would need to be sustained, especially as it is a multi-dosed vaccine. Issues regarding
270 access to the vaccine were also highlighted, especially by professionals located far away from
271 participating schools or health centres (e.g. cost of transport).

272

273 *“Because money is hard to come by in the current situation that there is, money*
274 *is very difficult to come by, and there are only a few in formal employment, a*
275 *large group they don’t have anything to do. So they can’t even be willing to spare*
276 *that pin (ZMK 1) on a vaccine, they would rather spend that on food.” Participant*
277 *L (L: 48-51)*

278

279 DISCUSSION

280 The main findings can be summarised as follows: (a) HPV vaccine education is needed for
281 health professionals; (b) concerns about unknown side effects and insufficient research may
282 dampen uptake; (c) resolving cultural hindrances prior to vaccine rollout is essential; (d)
283 increasing HPV education levels in rural communities is necessary, and (d) economic issues
284 need to be addressed. The implication that rural populations are especially vulnerable to low
285 HPV vaccination uptake (due to lack of education, and access to health care), and that the
286 cost of the vaccine is a major barrier, is consistent with past research [33].

287 Even with the support of organisations like GAVI’s support, access to the
288 vaccine remains a problem. However, economic barriers highlighted by participants were
289 focused primarily on the cost of service users accessing the vaccine, rather than its delivery.
290 Given that Zambia has a per capita income of about \$1,700, and 70% of the population live
291 below in poverty, many women may be unable to afford the cost of transportation to distant
292 participating schools or health centres [20]. Possible solutions include local training
293 programmes for doctors and nurses in remote areas, village-based screening, and use of
294 mobile hospitals [20].

295 Various studies have highlighted the need for improved HPV awareness in less
296 economically developed countries [10, 11, 34]. Medical knowledge may affect the support
297 provided by some health professionals [35, 36], but not others [27]. This seems to suggest the

298 relationship between knowledge of the vaccine and support for its rollout locally is complex.
299 Health professionals attitudes are informed by factors beyond medical knowledge, such as
300 past vaccination experiences [26]. Of particular interest here was the scepticism in the
301 vaccine's safety and efficacy, despite the high profile launch of the vaccination programme
302 [15]. Scepticism may discourage some health professionals from supporting its rollout [36].
303 Lack of information on the vaccine influenced beliefs in its safety, as well as willingness to
304 recommend or discussed it with patients, correlating with past research [35]. Overall, the
305 medical knowledge of some health professionals was a problem. Thus, it may be essential
306 that health workers in this part of the world (including those not directly involved in
307 administering the vaccine) are made aware that the HPV vaccine's safety has been approved
308 by relevant international health authorities, and that there is published supporting evidence
309 [37]. Even so, merely presenting existing research may not be sufficient 'proof' of the
310 vaccine's safety for some. Apart from lack of vaccine literacy, there are some health
311 professionals who will remain weary of the vaccine, due to the lack of longitudinal studies
312 indicating its long-term effects [38]. Although this concern is understandable, as mentioned
313 before, in countries so burdened by cervical cancer the rewards of a vaccine arguably
314 outweigh the risks for the time being.

315 Other studies have highlight various cultural hindrances to vaccination rollouts in
316 developing countries, based on health professional feedback [26-28]. However, the present
317 emphasis on the authoritative control Zambian men have over women's health decision
318 making (e.g. screening and vaccination) is unique to this study. This finding offers a unique
319 insight into culture-specific barriers to the HPV vaccine in Zambia. Health professionals may
320 be able to help address the issue, by using routine doctor-patient consultations, or local
321 community outreach initiatives, to encouraging male patients to play a more constructive role
322 in facilitating vaccination programmes. The misconception that the HPV vaccine causes

323 infertility is also a concern, seemingly associated with the gender-specific nature of HPV
324 vaccination rollouts. Making the vaccine seem exclusive to women may fuel suspicions that it
325 is being used as a form of population control by the government [39]. Thus, it may be helpful
326 for health professionals to advise male patients to get vaccinated against HPV, as this has
327 been shown to deflate such rumours [39]. Research suggests the general acceptability of the
328 HPV vaccination in some African communities may be diminished by rumours,
329 misunderstands, and fear about possible side effects (e.g., infertility), in addition to
330 insufficient education about the vaccine [40]. To increase acceptance of the HPV vaccination
331 in Zambia, health professionals need to find ways to educate local communities, not just
332 about the importance of the HPV vaccination in cancer prevention, but also its role in the
333 promotion of reproductive health (HPV infections are implicated in problematic reproductive
334 functioning) [41].

335 Overall, despite the introduction of the HPV vaccination programme in Zambia,
336 health professionals involved in the rollout harbour multiple concerns that may diminish their
337 willingness to support the scheme. Perhaps, most worryingly, some professionals (nurses,
338 more so than doctors) have misconceptions about the vaccine that may denote deficits in
339 medical training, and/or deeper socio-cultural factors transcending professional knowledge.
340 These findings have implications for other developing countries, where knowledge of the
341 HPV virus is inadequate, such as Sudan [10], and Lebanon [11]. Efforts to improve
342 knowledge levels will have limited effectiveness if the health professionals responsible for
343 running the necessary educational schemes are themselves poorly informed about the virus,
344 and/or harbour misconceptions that discourage them from supporting vaccination
345 programmes.

346 Although research suggests widespread acceptance of HPV vaccine in Zambian
347 women [12], the present findings nevertheless suggest a dire need for better understanding

348 amongst health workers of the role of the vaccine in advancing reproductive health.
349 International organisations involved in vaccination rollout programmes (e.g., GAVI) should
350 forge closer collaborative ties with Zambian (and other African) universities, to assist with
351 developing new, or improving existing community educational programmes, to help correct
352 rumours and misconceptions [18]. It is also necessary to identify and resolve cultural barriers
353 around male authority, prior to offering the vaccination to female patients. While the present
354 findings reflect experiences of health professionals, rather than the patients themselves, the
355 key role played by the former in delivering vaccination services means their views can have a
356 direct effect on patient outcomes [29]. Health professionals working in developing countries
357 such as Zambia should recognise their own medical misapprehensions about HPV
358 vaccination, and the reluctance of males and elders in local communities to support
359 vaccination rollouts.

360

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365

366 CONFLICT OF INTEREST STATEMENT

367 There is no conflict of interest

368

369 REFERENCES

370 [1] Ladner J, Besson MH, Rodrigues M, Audureau E, Saba J. Performance of 21 HPV
371 vaccination programs implemented in low and middle-income countries, 2009-2013. BMC
372 Public Health. 2014;14:670.

373 [2] White HL, Mulambia C, Sinkala M, Mwanahamuntu MH, Parham GP, Moneyham L, et
374 al. 'Worse than HIV' or 'not as serious as other diseases'? Conceptualization of cervical cancer
375 among newly screened women in Zambia. *Soc Sci Med.* 2012;74:1486-93.

376 [3] De Vuyst H, Alemany L, Lacey C, Chibwasha CJ, Sahasrabudde V, Banura C, et al. The
377 Burden of Human Papillomavirus Infections and Related Diseases in Sub-Saharan Africa.
378 *Vaccine.* 2013;31:F32-F46.

379 [4] Parham GP, Mwanahamuntu MH, Kapambwe S, Muwonge R, Bateman AC, Blevins M,
380 et al. Population-Level Scale-Up of Cervical Cancer Prevention Services in a Low-Resource
381 Setting: Development, Implementation, and Evaluation of the Cervical Cancer Prevention
382 Program in Zambia. *Plos One.* 2015;10.

383 [5] HPV Information Centre. Human Papillomavirus and Related Diseases Report -
384 ZAMBIA. Barcelona: Institut Català d'Oncologia; 2016.

385 [6] Zetola NM, Grover S, Modongo C, Chiyapo SP, Nsingo-Bvochora M, Narasimhamurthy
386 M, et al. Collision of three pandemics: The coexistence of cervical cancer, HIV infection, and
387 prior tuberculosis in the Sub-Saharan country of Botswana. *Journal of Global Oncology.*
388 2016;2:47-50.

389 [7] Kalima M, Lishimpi K, Meza JL, Watanabe-Galloway S, Msadabwe SC, Mwaba CK, et
390 al. Observed and Expected Incidence of Cervical Cancer in Lusaka and the Southern and
391 Western Provinces of Zambia, 2007 to 2012. *Int J Gynecol Cancer.* 2015;25:98-105.

392 [8] Ng'andwe C, Lowe JJ, Richards PJ, Hause L, Wood C, Angeletti PC. The distribution of
393 sexually-transmitted Human Papillomaviruses in HIV positive and negative patients in
394 Zambia, Africa. *Bmc Infect Dis.* 2007;7.

395 [9] Duraisamy K, Jaganathan KS, Bose JC. Methods of detecting cervical cancer. *Advance in*
396 *Biological Research.* 2011;5:226-32.

- 397 [10] Almobarak AO, Elbadawi AA, Elmadhoun WM, Elhoweris MH, Ahmed MH.
398 Knowledge, Attitudes and Practices of Sudanese Women Regarding the Pap Smear Test and
399 Cervical Cancer. *Asian Pac J Cancer Prev.* 2016;17:625-30.
- 400 [11] Dany M, Chidiac A, Nassar AH. Human papillomavirus vaccination: Assessing
401 knowledge, attitudes, and intentions of college female students in Lebanon, a developing
402 country. *Vaccine.* 2015;33:1001-7.
- 403 [12] Liu FW, Vwalika B, Hacker MR, Allen S, Awtrey CS. Cervical cancer and HPV
404 vaccination: Knowledge and attitudes of adult women in Lusaka, Zambia. *J Vaccines Vaccin.*
405 2012;3.
- 406 [13] DEFEATDD. Zambia national rotavirus vaccine rollout: New collaborative approaches
407 to accelerating vaccine introduction into resource-poor countries - the case of rota
408 introduction in Zambia. Seattle: PATH; 2013.
- 409 [14] Ntalasha H, Malungo JR, Merten S, Simona SJ. Influence of Food Supplements on
410 Testing for HIV and Aids and Adhering to Treatment in a Resource Poor Rural Setting: A
411 Case of Chivuna, Southern Zambia. *Science.* 2015;3:314-20.
- 412 [15] World Health Organisation. Human Papilloma Virus (HPV) vaccine introduced in
413 Zambia. Geneva, Switzerland: World Health Organisation; 2015.
- 414 [16] Asante E. Zambia – HPV Vaccines for All Washington, DC 20036 Pink Ribbon Red
415 Ribbon; 2016.
- 416 [17] Lazcano-Ponce E, Stanley M, Munoz N, Torres L, Cruz-Valdez A, Salmeron J, et al.
417 Overcoming barriers to HPV vaccination: non-inferiority of antibody response to human
418 papillomavirus 16/18 vaccine in adolescents vaccinated with a two-dose vs. a three-dose
419 schedule at 21 months. *Vaccine.* 2014;32:725-32.
- 420 [18] Youngblood R. GAVI injects new life into HPV vaccine rollout. *Lancet.* 2013;381:1688.
- 421 [19] GAVI. GAVI alliance support. Geneva: GAVI; 2016.

422 [20] Kapambwe S. Project to programme: Zambian experience. Paris: World Cancer
423 Congress; 2016.

424 [21] World Health Organisation. Density of physicians (total number per 1000 population,
425 latest available year). Geneva: World Health Organisation; 2015.

426 [22] Zambia Association of Gynaecologists & Obstetricians. ZAGO Fully paid up Members.
427 Lusaka: Zambia Association of Gynaecologists & Obstetricians; 2015.

428 [23] Cermak M, Cottrell R, Murnan J. Women's knowledge of HPV and their perceptions of
429 physician educational efforts regarding HPV and cervical cancer. 2016-08-
430 16T13:24:39Z2010-08138-003PIMain2010_05xmlFully
431 PublishedYN20135209101007/s10900-010-9232-
432 yEnglishengYY020Electronic0100Journal0110Peer Reviewed Journal36. 2010;35.

433 [24] Hofstetter AM, Rosenthal SL. Factors impacting HPV vaccination: lessons for health
434 care professionals. *Expert Rev Vaccines*. 2014;13:1013-26.

435 [25] Bynum SA, Staras SAS, Malo TL, Giuliano AR, Shenkman E, Vadaparampil ST.
436 Factors associated with Medicaid providers' recommendation of the HPV vaccine to low-
437 income adolescent girls. 2016-08-16T13:24:39Z2013-34153-001PIMain2014_01xmlFully
438 PublishedYN24064282101016/jjadohealth201308006EnglishengYY020Electronic0100Journ
439 al0110Peer Reviewed Journal3600Journal ArticleJOURarticleBynum, Shalanda ADepartm.
440 2014;54.

441 [26] Audu BM, Bukar M, Ibrahim AI, Swende TZ. Awareness and perception of human
442 papilloma virus vaccine among healthcare professionals in Nigeria. *J Obstet Gynaecol*.
443 2014;34:714-7.

444 [27] Hoque ME, Monokoane S, Van Hal G. Knowledge of and attitude towards human
445 papillomavirus infection and vaccines among nurses at a tertiary hospital in South Africa. *J*
446 *Obstet Gynaecol*. 2014;34:182-6.

447 [28] Makwe CC, Anorlu RI. Knowledge of and attitude toward human papillomavirus
448 infection and vaccines among female nurses at a tertiary hospital in Nigeria. *Int J Womens*
449 *Health*. 2011;3:313-7.

450 [29] Mwaka AD, Wabinga HR, Mayanja-Kizza H. Mind the gaps: a qualitative study of
451 perceptions of healthcare professionals on challenges and proposed remedies for cervical
452 cancer help-seeking in post conflict northern Uganda. *BMC Fam Pract*. 2013;14:193.

453 [30] Kapambwe S, Sahasrabuddhe VV, Blevins M, Mwanahamuntu MH, Mudenda V,
454 Shepherd BE, et al. Implementation and Operational Research: Age Distribution and
455 Determinants of Invasive Cervical Cancer in a "Screen-and-Treat" Program Integrated With
456 HIV/AIDS Care in Zambia. *J Acquir Immune Defic Syndr*. 2015;70:e20-6.

457 [31] Braun V, Clarke V. Using thematic analysis in psychology. 2016-08-
458 16T13:24:39Z2006-06991-002PIMain2006_04xmlFully
459 PublishedYN101191/1478088706qp063oaEnglishengYY050Print0100Journal0110Peer
460 Reviewed Journal3600Journal ArticleJOURarticleBraun, Virginiavbraun@aucklandacnzDe.
461 2006;3.

462 [32] Patton MQ. Two decades of developments in qualitative inquiry: A personal,
463 experiential perspective. 2016-08-16T13:24:39Z2003-05113-001PIMain2002_08xmlFully
464 PublishedYN101177/1473325002001003636EnglishengYY050Print0100Journal0110Peer
465 Reviewed Journal3600Journal ArticleJOURarticlePatton, Michael QuinnMQPa. 2002;1.

466 [33] Thomas TL, DiClemente R, Snell S. Overcoming the triad of rural health disparities:
467 How local culture, lack of economic opportunity, and geographic location instigate health
468 disparities. *Health Educ J*. 2014;73:285-94.

469 [34] Hussain S, Nasare V, Kumari M, Sharma S, Khan MA, Das BC, et al. Perception of
470 human papillomavirus infection, cervical cancer and HPV vaccination in North Indian
471 population. *PLoS One*. 2014;9:e112861.

472 [35] Hopkins TG, Wood N. Female human papillomavirus (HPV) vaccination: Global uptake
473 and the impact of attitudes. *Vaccine*. 2013;31:1673-9.

474 [36] Wamai RG, Ayissi CA, Oduwo GO, Perlman S, Welty E, Welty T, et al. Awareness,
475 knowledge and beliefs about HPV, cervical cancer and HPV vaccines among nurses in
476 Cameroon: An exploratory study. *Int J Nurs Stud*. 2013;50:1399-406.

477 [37] Goncalves AK, Cobucci RN, Rodrigues HM, de Melo AG, Giraldo PC. Safety,
478 tolerability and side effects of human papillomavirus vaccines: a systematic quantitative
479 review. *Braz J Infect Dis*. 2014;18:651-9.

480 [38] Oscarsson MG, Dahlberg A, Tyden T. Midwives at youth clinics attitude to HPV
481 vaccination and their role in cervical cancer prevention. *Sex Reprod Healthc*. 2011;2:137-42.

482 [39] Leader AE, Weiner JL, Kelly BJ, Hornik RC, Cappella JN. Effects of information
483 framing on human papillomavirus vaccination. *J Womens Health (Larchmt)*. 2009;18:225-33.

484 [40] Turiho AK, Okello ES, Muhwezil WW, Harvey S, Byakika-Kibwikas P, Meya D, et al.
485 Effect of School-based Human Papillomavirus (HPV) Vaccination on Adolescent Girls'
486 Knowledge and Acceptability of the HPV Vaccine in Ibanda District in Uganda. *Afr J
487 Reprod Health*. 2014;18:45-53.

488 [41] Souho T, Benlemlih M, Bennani B. Human Papillomavirus Infection and Fertility
489 Alteration: A Systematic Review. *Plos One*. 2015;10.

490