Profile of Health Care Workers in a Context of Instability: A Cross-sectional Study of Four Rural Health Zones in Eastern DR Congo (Lessons Learned)

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Research

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Abstract

Background: The crisis in human resources for health is observed worldwide, particularly in sub-Saharan Africa.

Objective: This study aims to describe the profile of staff working in rural health districts in a context of crisis.

Methods: A cross-sectional study was carried out from May 15, 2017 to May 30, 2019 on 1090 health care workers (HCW) exhaustively chosen from four health districts in Eastern Democratic Republic of Congo (Idjwi, Katana, Mulungu and Walungu). The choice of health districts was based on the crisis context. The health districts were categorized in stable, in transition and unstable. A survey questionnaire was used to collect data. The Chi² test was used for comparison of proportions and the Kruskal-Wallis test for medians. As measures of association, we calculated the odds ratios (OR) along with their 95% confidence interval. The materiality threshold was set at 5%.

Results: The age of all HCW median (Min-Max) was 46 (20-84) years and female was 32%. 96% of HCW do not receive a state salary ; 64% do not receive government allowance for risk. In the stable district HCW were $\leq$ 34 years old [OR = 2.0 (1.5-2.6); p <0.001], the matriculated HCW [OR = 2.0 (1.5-2.7); p <0.0001], those who benefited from national and / or provincial recruitment [OR = 3.9 (2.9-5.4); p <0.001], those who benefit from continuous training [OR = 2.1 (1.5-2.7); p <0.001] and those who receive the local fee-for service [OR = 5.2 (1.9-14.7); p <0.001]. In the unstable district, men [OR = 1.7 (1.1-2.5); p = 0.009], HCW $\leq$ 4 years of seniority [OR = 2.3 (1.6-3.3), p <0.001] and lower level of education [OR = 2.1 (1.5-2.9)]; p <0.001]. The percent of HCW who has monthly income $\geq$ \$ 151 is 21% in the stable zone, 9.2% in the intermediate zones and 0.9% in the unstable zone.

Conclusion:

DR Congo authorities should develop incentive mechanisms to motivate young and trained HCW to work in unstable and intermediate health districts by improving their living and working conditions.

1. Background

The health and well-being of the world's populations are closely linked to the performance of their health systems [1]. This performance in turn depends largely on sufficient, high-quality and motivated human resources. These are essential for providing users with quality health care that meets their individual and collective health status [2, 3]. Therefore, adequate human resource development is an important element in terms of planning, training, management and support for the professional development of health workers at all levels of the health system [3, 4, 5].

In its report on the World Health in 2006, the World Health Organization's (WHO) has mentioned that crisis in Human Resources for Health (HRH) is observed worldwide and particularly in sub-Saharan Africa [3].

This crisis is mainly characterized by staffing problem, training profile, supervision and motivation and non-standard working conditions as well [3, 5, 6, 7]. Developed countries also variously face problems of health workforce supply. In France, the number of health professionals in training is regulated by the health system. However, the existence of a plethora or shortage is rather linked to an unequal geographical distribution between urban and rural areas and a poor distribution between primary and secondary care specialties [8].

In most countries, the training of health professionals benefits from fairly rigorous regulation involving both the academic organizations and the government (Ministry of Health and Ministry of Higher Education), so as to ensure monitoring and control during their work. This makes it possible both to regulate the number of doctors and other working health professionals. It also allows assessing the training quality and ensuring respect for the technical and ethical aspects of their job. [6].

Similarly, standards and procedures for recruiting staff in health structures exist and are generally applied by the regulation bodies: either the Ministry of the Public Service, the Ministry of Planning or the Ministry of Health itself [9].

In the Democratic Republic of Congo, human resource development is one of the six axes of the strategy for strengthening the health system adopted since 2006 and revised in 2010, and a document on staff standards in health zones (districts) has been drawn up [10, 11, 12]. This strategy is operationalized by a health development plan. The sector diagnosis of the 1st and 2nd edition plans identified the main priority problems of human resources for health, in particular the imbalance in the production and inequitable distribution of Human Resources for Health, the low motivation and loyalty of health personnel, the insufficient quality of education for health professionals and the poor development of the skills of health personnel [13, 14]. A national plan for the development of human resources for health has been drawn up in response to the problems identified. This plan aimed at «providing the health sector multidisciplinary, competent, high-performance health teams at all levels of the health pyramid, sufficient quantity and equitably distributed, contributing to the improvement of the state of health of the Congolese population through the provision of quality health care services". One of the proposed solutions is the establishment of a health information system on HRH and the national observatory of HRH. The latter already exists but is not documented [15].

Inside countries in crisis such as the DRC, human resources are an essential pillar of the health system because they are already part of the system and they also allow the health system to function at its best despite the crisis context. Several authors have shown how a staff could help reduce the adverse effects of the crisis on the health system [5, 16, 17,18]. Some countries have used the crisis experience to try to reorganize their health systems. The experience of the Ebola Virus Disease (EVD) response, epidemic in Guinea, provided an opportunity to reorganize the health system by investing in the workforce. A post-Ebola study provided strategic guidelines for promoting the retention of health workers in rural areas (19).

As in most of African countries, the organization of the health system in the DRC is of the pyramidal type and includes three levels: the central level (National Ministry of Health), the intermediate level (Provincial

Health Department) and the operational or peripheral level (the Health Zone) [10–14].

The DR Congo has just completed three decades of crisis and instability. Eastern DRC was the first part to be affected by the crisis with the first Rwanda war in 1994, which led to the Rwandan genocide and dumped 1 million of the refugees in the two Kivu provinces [20]. Other crisis events have followed one another (the 1998 war, the Province crisis, the 2004 crisis in South Kivu, the Kasai Oriental crisis and various movements of insecurity observed in various regions). Thus, Eastern DRC has been considered by some authors as the region at high risk of death, with the highest mortality rate since the Second World War. This crisis, whose number of deaths was initially estimated at 3 million in 2002 [21], woke up various specialists in armed conflict situations. A second study estimated the number of deaths linked to this crisis at 5 million [22]. The country is currently considered as an "unstable country" or "fragile state", and some authors now speak of "mega crisis" [23].

Eastern DRC is still considered as a red zone and some foreign countries do not allow their citizens to visit the region despite the presence of MONUSCO for more than fifteen years [24, 25]. The province of South Kivu is among the three most affected provinces, after North Kivu and Tanganyika. The displacement of populations due to the intensification of violent inter-community conflicts, combined with the looting of healthcare institutions, have contributed to creating a volatile situation that has led to the flight of qualified health workers from the concerned areas [23].

During these various crises, the health system was supported by both international partners and local organizations. Support from the health system was sometimes directed towards the rehabilitation of infrastructure, the supply of equipment and other inputs. This support was sometimes as subsidization of health care for the indigent and displaced populations, or direct remuneration of staff in the form of bonuses [13, 14, 26].

At the provincial level, the Provincial Health Department (PHD) of South Kivu has grouped health zones into three categories in 2010 and 2015, according to a number of criteria: developing health zones, health zones in transition and emergency health zones. This categorization included social, economic and political conditions; insecurity or armed conflict, geographical accessibility, etc. [27].

The health institutions involved in the provision of care are either public or private, or they depend on faith-based networks. Two of these faith-based networks are predominant, namely the network of the Catholic Church through the Diocesan Office of Medical Works and the network of the Protestant Church. Although they have a monopoly on the management of resources, are registered to the National Public services and enjoy the same benefits as those in the public sector in accordance with the memorandum of understanding signed by the Ministry of Public Health [10, 14, and 27]. With the new reform of the intermediate level, six working groups have been set up within the PHD, including the human resources working group, which normally has to analyze all the problems related to HHR and propose solutions [11, 28] but up to now this commission is not operational.

The issue of human resources only arises when people have to be assigned or decommissioned by the political authorities. Yet better control of human resources in the health system would allow decision-makers to better plan and deploy human resources appropriately.

Then, this study aims at describing the profile of the health-workers in the 3 rural health zones in a crisis context compared to the stable health zone.

2. Methods

Study design and population

A cross-sectional study was carried out among 1090 healthcare workers in 128 healthcare centers in the four targeted health districts (Idjwi, Katana, Walungu and Mulungu) categorized by the Provincial Health Department into stable, transitional and unstable health districts. These four health districts were selected by convenience to represent critical cases from the other health districts.

The Idjwi health district was considered as the most stable health district in South Kivu where no displaced persons and armed gangs are observed. The Mulungu Health district (HD) is the most unstable in the province. Here internally displaced persons and crisis events are at the upper level of the province.

Intermediate districts are those that have never experienced major crises or which are post-conflict (in transition). Walungu HD is a post-conflict area and KATANA HD is an area that has never experienced major crises.

The Idjwi health district is located in Idjwi territory; the Katana health district in Kabare territory; the Mulungu health district in Shabunda territory and the Walungu health district in Walungu territory (Table 1).

The Idjwi health district is accessible by lake, the Katana and Walungu health districts are easily accessible by road, while in Mulungu health zone accessibility is difficult by road and air [29].

Data collection

An exhaustive paper survey was conducted among 1,090 health workers (medical, paramedical, administrative, and support staff) working in the four health zones. They were distributed as follows: 280 for the Idjwi HD, 364 for Katana, 165 for Mulungu and 341 for the Walungu HD. Thus, the health personnel of 128 structures, including 124 public, church and private integrated health facilities and 4 central offices of the health zones were considered in this study. The survey was conducted by PHD investigators in two stages: from May 15th to July 17th, 2017 for Katana and Walungu; from 1 April 1st to May 30th, 2019 for the Idjwi and Mulungu HDs.

This study included all health workers, doctors, nurses, laboratory technicians, nutritionists, pharmacists, administrative and support staff working in public, church and integrated private health facilities in the health zones of Idjwi, Katana, Mulungu and Walungu who agreed to participate in our study.

Posted, laid-off or suspended health care workers were not considered in the study. The number of agents is listed in table 0 below. The health personnel surveyed all responded to our survey questionnaire.

To categorize the agents of different study areas, we used the classification of agents according to the public services of the Congolese State which distributes agents according to the following categories: Category A (senior officials): Secretary General, Director General, Director; Category B (senior managers): Head of Division and Head of Office; Category C (collaboration agents): 1st Class Administrative Attaché, 2nd Class Administrative Attaché and 1st Class Administrative Agent and Category D (executing agents): 2nd Class Administrative Agent, 1st Class Auxiliary Agent, 2nd Class Auxiliary Agent and the Bailiff.

Data processing and analysis

We used the Excel program for data entry. The data were then exported to Epi info 7 and SPSS 25 for processing and analysis.

The quantitative variables were described by their median following their asymmetric distributions and the qualitative variables in absolute and relative frequencies. The Chi-square test was used for the comparison of proportions and the Kruskal-Wallis test for medians.

To describe the specific characteristics of the different health zones, we made different comparisons between the zones according to the context of the crisis. As an association measure, we used the odds ratios (OR) with their 95% confidence intervals. The materiality threshold chosen is 5%.

Table 1
Characteristics of Study Health Districts

Health Districts				
Features	Idjwi	Katana	Walungu	Mulungu
Territory	Idjwi	Kabare	Walungu	Shabunda
Population	294,209	236,986	285,669	170,439
Area	681sqm.	400 sqm.	800 sqm.	6.500 sqm.
Density	432 inhabitants/sqm	592 inhabitants /sqm.	357 inhabitants/sqm	26 inhabitants/sqm.
No. of Health Areas	21	18	23	20
No. of Hospitals	4	2	3	2
No. of Agents	280	364	165	341
Other Fosa and HC	35	27	30	21
Manager	Catholic faith-based (BDOM)	catholic faith-based (BDOM)	State	State
Partners	BDOM, IRC	BDOM, LC	LC	MSF, ICRC
Type of support	Overall support	Overall support	Strengthening the Health system	Emergency support in SAs in crisis
Socio-economic activities	Agriculture, Livestock and artisanal fishing)	Agriculture, artinsal fishing and small trade	Agriculture, livestock ad small business	Agriculture
No. =Number, sqm = Square meter, BDOM = Bureau Diocésain des Oeuvres Médicales, IRC = International, Rescue Committee, LC = Louvain Cooperation, FOSA = Formation sanitaire, HC = Health Center, MSF = Médecins Sans Frontière				

3. Results

Table 1

(part 1). Socio-demographic characteristics of the respondents according to the Health Districts studied

Variables	ALL n (%)	Mulungu n (%)	Idjwi n (%)	Katana n (%)	Walungu n (%)
Age (years)	46(20–84) *	43(20–84) *	40(22–75) *	50(20–81) *	49(20–81) *
≤ 34	277(26)	32(21)	97(37)	72(22%)	76(24)
> 34	783(74)	124(79)	162(63)	260(78%)	237(76)
Gender					
Male	737(68)	120(77)	192(69)	211(64)	214(68)
Female	341(32)	35(23)	86(31)	121(36)	99(32)
Level of education					
<superior	601(56)	66(40)	88(32)	215(65)	232(74)
Superior	480(44)	98(60)	184(68)	117(35)	81(26)
Facilities					
HDCO	52(5)	7(5)	10(4)	16(5)	19(6)
Hospital (RH + HC)	372(35)	43(28)	103(37)	117(35)	109(35)
Health Center	649(60)	102(67)	163(59)	199(60)	185(59)
Statut of the facilities					
Public	684(65)	142(99)	144(55)	192(64)	206(60)
Other	364(35)	1(1)	116(45)	107(36)	140(40)
Marital statut					
Living alone	189(17)	28(18)	51(17)	56(17)	54(17)
As a couple	919(83)	129(82)	255(83)	276(83)	259(83)
Seniority (years)	10(0–59) *	7(0–19) *	8(0–35) *	13(2–59) *	13(2–59) *
≤ 4	289(28)	61(44)	90(34)	73(22)	65(21)
> 4	758(72)	79(56)	172(66)	259(78)	248(79)
Family residence					
In the working Area	953(88)	137(86)	238(87)	301(91)	277(88)
Out of working area	126(12)	22(14)	37(13)	31(9)	36(12)
Position in the Facilities					

Variables	ALL n (%)	Mulungu n (%)	Idjwi n (%)	Katana n (%)	Walungu n (%)
Administrative officer	571(53)	84(53)	130(47)	168(51)	189(60)
Medical Doctor and nurse	509(47)	76(48)	145(53)	164(49)	124(40)
*Median (min-max), primary and secondary level, RH = Referral Hospital HC = Health Center, HDCO = Health District Central office, n (%) = number (percentage)					

Table 1 shows the socio-demographic characteristics of the population. In all health districts, subjects over 34 years old were the most represented. The median age was 46 years, the oldest health worker was 84 years old and he was from Mulungu HD. The youngest was 20 years old. Women were the less represented in all health districts especially in Mulungu (23%). 44% of the agents had a high level of education (university or high institute). 68% the Idjwi health district had a high level of education, followed by Mulungu health district (60%). In all health districts, the nursing/medical staff (47%) was less represented than the administrative staff (53%).

96% of health personnel in all health districts do not receive state salary and 64% do not receive the Government bonus. However, 82% of health care workers receive the local bonus and 63% of agents do not have State registration numbers.

Table 1
(part 2). Socio-demographic characteristics of the respondents according to the Health Zones studied
(continued)

Variables	ALL n (%)	Mulungu n (%)	Idjwi n (%)	Katana n (%)	Walungu n (%)
Rank*					
Category c	417(40)	59(37)	95(35)	121(39)	142(47)
category d	628(60)	101(63)	175(65)	190(61)	162(53)
Status in Public Service					
Registered state agent	391(37)	79(49)	119(46)	117(35)	76(24)
non -registered state agent	675(63)	82(51)	141(54)	215(65)	237(76)
Recruitment authority					
central and intermediate level	629(59)	120(73)	85(32)	225(68)	199(64)
other	442(41)	44(27)	177(68)	107(32)	114(36)
Recruitment process					
Job application	491(46)	18(11)	158(59)	173(52)	142(45)
other	588(54)	146(89)	112(41)	159(48)	171(55)
Continuing education					
Have continuing education	205(49)	55(36)	150(56)	129(41)	119(36)
Don't have continuing education	216(51)	99(64)	117(44)	184(59)	213(64)
Promotion since enlistment					
Yes	121(28)	47(29)	74(27)	88(28)	113(34)
No	313(72)	117(71)	196(73)	225(72)	219(66)
Receive state salary					
Yes	16(4)	5(3)	11(4)	18(6)	16(5)
no	411(96)	157(97)	254(96)	295(94)	316(95)
Receive local fee for-service					
Yes	356(82)	83(52)	273(99)	304(97)	295(89)
no	80(18)	76(48)	4(1)	9(3)	37(11)

Variables	ALL n (%)	Mulungu n (%)	Idjwi n (%)	Katana n (%)	Walungu n (%)
Receive the Government allowance for risk					
Receive	158(36)	64(39)	94(35)	18(5)	197(64)
Don't receive	276(64)	99(61)	177(65)	318(95)	112(36)
* according to the categorization of agents in the public service of the DRC (explanation in the methodology), n (%) = number(percentage)					

Table 2.1
Comparison of personnel in the stable health district with other health districts

Comparison of personnel in the stable health district with other health districts								
Idjwi and Mulungu					Idjwi and Katana			
Variables	N	Idjwi	OR(IC95%)	p	N	IDJWI	OR(IC95%)	p
Age (years)								
≤ 34	129	75%	2.3(1.5–3.7)	< 0.001	169	57%	2.2(1.5–3.1)	< 0.001
> 34	286	57%	1		422	38%	1	
Gender								
Male	312	62%	1		403	48%	1	
Female	121	71%	1.5(0.9–2.4)	0.063	207	42%	0.8(0.6–1.1)	0.152
Level of education								
<Superior	154	57%	0.7(0.5–1.1)	0.094	303	71%**	3.8(2.7–5.4)	< 0.001
Superior	282	65%	1		301	39%**	1	
Facilities								
HDCO	17	59%	1		26	38%	1	
Hospital (RH + HC)	146	71%	1.7(0.6–4.7)	0.321	220	47%	1.4(0.6–2.2)	0.419
Health Center	265	62%	1.12(0.4-3.0)	0.826	362	45%	1.3(0.6–2.9)	0.515
Status of the facilities								
Public	286	50%*	117.6(16.2-853.7)	< 0.001	336	57%**	1.4(1.1-2.0)	0.033
Other(Private,Faith-based)	117	1%*	1		223	48%**	1	
Marital status								

<superior = without, primary and secondary level, OR = Odds ratio, 95% CI = 95% confidence interval, HDCO = Health Zone Central office, RH = Referral Hospital, HC = Health Center. *Percentage in Mulungu, ** Percentage in Katana.

	Idjwi and Mulungu				Idjwi and Katana			
Living alone	79	65%	0.9(0.6–1.5)	0.752	107	48%	0.9(0.7–1.5)	0.945
As a couple	384	66%	1		531	48%	1	
Seniority								
< 5 years	151	60%	0.7(0.4-1.0)	0.068	163	55%	1.9(1.3–2.7)	< 0.001
>=5 years	251	69%	1		431	40%	1	
Family residence								
In the work Area	375	63%	1		539	44%	1	
Out of working area	59	63%	0.9(0.6–1.7)	0.910	68	54%	1.5(0.9–2.5)	0.109
Position in the Facilities								
Administrative officer	214	61%	1		298	44%	1	
Medical Doctor and nurse	221	66%	1.2(0.8–1.8)	0.292	309	47%	1.1(0.8–1.6)	0.414
<superior = without, primary and secondary level, OR = Odds ratio, 95% CI = 95% confidence interval, HDCO = Health Zone Central office, RH = Referral Hospital, HC = Health Center. *Percentage in Mulungu, ** Percentage in Katana.								

Table 2.2
Comparison of personnel in the stable health zone (Idjwi) with other health zones

Idjwi and Walungu					Idjwi and (Katana-Walungu)			
Variables	n	Idjwi	OR (IC95%)	P	N	Idjwi	OR (IC95%)	P
Age (year)								
≤ 34	173	56%	1.9(1.3–2.7)	< 0.001	245	40%	2.0(1.5–2.6)	< 0.001
≥ 35	399	41%	1		659	25%	1	
Gender								
Male	406	47%	1		617	31%	1	
Female	185	46%	0.9(0.7–1.4)	0.860	306	28%	1.2(0.9–1.6)	0.347
Level of education								
<Superior	320	73%*	5.9(4.2–8.6)	< 0.001	535	84%**	4.7(3.5–6.4)	< 0.001
Superior	265	31%*	1		382	52%**	1	
Facilities								
HDCO	29	34%	1		45	22%	1	
Hospital (RH + HC)	212	49%	1.8(0.8–4.0)	0.153	329	31%	1.6(0.8–3.3)	0.213
Health Center	348	47%	1.7(0.8–3.7)	0.200	547	30%	1.5(0.7–3.1)	0.283
Status of the facilities								
Public	350	41%	0.8(0.6–1.2)	0.306	542	27%	0.8(0.6–1.0)	0.079
Other	256	45%	1		363	32%	1	

<superior = without, primary and secondary level, OR = Odds ratio, 95% CI = 95% confidence interval, HDCO = Health District Central office, RH = Referral Hospital, HC = Health Center *Percentage in Walungu, ** Percentage in (Walungu-katana)

Idjwi and Walungu				Idjwi and (Katana-Walungu)				
Marital status								
Living alone	105	49%	0.9(0.6–1.5)	0.846	161	32%	0.9(0.7–1.4)	0.881
As a couple	514	50%	1		790	32%	1	
Seniority								
< 5 years	155	58%	1.9(1.4–2.9)	< 0.001	228	39%	1.9(1.4–2.6)	< 0.001
>=5	420	41%	1		679	25%	1	
Family residence								
In the working Area	515	46%	1		816	29%	1	
Out of working area	73	51%	1.9(0.7–1.9)	0.474	104	36%	1.3(0.9–2.1)	0.179
Position in the Facilities								
Administrative officer	319	41%	1		487	27%	1	
Medical Doctor and nurse	269	54%	1.7(1.2–2.4)	0.001	433	33%	1.4(1.1–1.8)	0.024
<superior = without, primary and secondary level, OR = Odds ratio, 95% CI = 95% confidence interval, HDCO = Health District Central office, RH = Referral Hospital, HC = Health Center *Percentage in Walungu, ** Percentage in (Walungu-katana)								

Table 2.3
Comparison of personnel in the stable health zone with other health zones (continued)

Idjwi and Mulungu					Idjwi and Katana			
Variables	n	Idjwi	OR(IC95%)	P	n	IDJWI	OR(IC95%)	p
Rank****								
Category C	154	62%	0.9(0.6–1.4)	0.724	216	44%	0.9(0.6–1.2)	0.355
category D	276	63%	1		365	48%	1	
Status in Public Service								
Registered state agent	198	60%	0.9(0.6–1.3)	0.510	236	50%	1.6(1.1–2.2)	0.009
non-registered agent	223	63%	1		356	40%	1	
Recruitment authority								
central and intermediate level	205	59%*	5.7(3.7–8.7)	< 0.001	310	73%**	4.4(3.1–6.2)	< 0.001
peripheral level and Faith-based	221	20%*	1		284	38%**	1	
Recruitment process								
Job application	176	90%	11.4(6.6–19.8)	< 0.001	331	48%	1.3(0.9–1.8)	0.115
Other***	258	43%	1		271	41%	1	
Continuing education								
Yes	205	73%	2.3(1.5–3.5)	< 0.001	279	54%	1.8(1.3–2.5)	< 0.001
No	216	54%	1		301	39%	1	
Promotion since enlistment								

OR = Odds ratio, IC 95%=95% CI = 95% confidence interval, * Percentage in Mulungu, ** Percentage in katana *** Other = Integration after internship and higher instances recommendation, **** according to the categorization of agents according to the public service of the DRC (explanation in the methodology),

	Idjwi and Mulungu				Idjwi and Katana			
yes	121	61%	0.9(0.6–1.5)	0.778	162	46%	0.9(0.7–1.4)	0.849
No	313	63%	1		421	47%	1	
Receive state salary								
Yes	16	69%	1.4(0.5–3.9)	0.574	29	38%	0.7(0.3–1.5)	0.379
No	411	62%	1		549	46%	1	
Receive local fee for-service								
Yes	356	77%	62.5(22.2–175.9)	< 0.001	577	47%	2.1(0.6–6.6)	0.237
No	80	5%	1		13	31%	1	
Receive the government allowance for risk								
ou	158	59%	0.8(0.6–1.2)	0.337	112	84%	9.4(5.5–16.1)	< 0.001
non	276	64%	1		495	36%	1	
OR = Odds ratio, IC 95%=95% CI = 95% confidence interval, * Percentage in Mulungu, ** Percentage in katana *** Other = Integration after internship and higher instances recommendation, **** according to the categorization of agents according to the public service of the DRC (explanation in the methodology),								

Table 2.4

Comparison of the different characteristics of personnel in the stable health zone (Idjwi) with other health zones, intermediate (Walungu and Katana) and in crisis (Mulungu) according to the emergency classification of the provincial health department (DP) from South Kivu, East of the DRC (continued)

Idjwi and Walungu					Idjwi and (Katana-Walungu)			
Variables	n	Idjwi	OR (ic95%)	p	N	Idjwi	OR (ic95%)	p
Rank****								
Category C	237	60%*	1.6(1.2–2.3)	0.005	358	73%**	1.4(1.1–1.9)	0.032
Category D	337	48%*	1		526	67%**	1	
Status in Public Service								
Registered state agent	195	61%	2.6(1.8–3.8)	< 0.001	312	38%	2.0(1.5–2.7)	< 0.001
Non-registered agent	378	37%	1		593	24%	1	
Recruitment authority								
central and intermediate level	284	70%*	3.6(2.6–5.1)	< 0.001	509	83%**	3.9(2.9–5.4)	< 0.001
peripheral level-confessional	291	39%*	1		398	56%**	1	
Recruitment process								
Job application	300	53%	1.7(1.2–2.36)	0.001	473	33%	1.5(1.1–1.9)	0.008
Other***	283	40%	1		442	25%	1	
Continuing education								
Yes	269	56%	2.3(1.7–3.2)	< 0.001	398	38%	2.1(1.5–2.7)	< 0.001
No	330	35%	1		514	23%	1	
Promotion since enlistment								
Yes	187	40%	0.7(0.5–1.0)	0.080	275	27%	0.8(0.6–1.1)	0.258

OR = Odds ratio, 95% CI = 95% confidence interval, *Percentage in Walungu, ** Percentage in (Walungu-katana), *** Other = Integration after internship and high instances recommendation, **** according to the categorization of agents according to the public service of the DRC (explanation in the methodology),

	Idjwi and Walungu				Idjwi and (Katana-Walungu)			
No	415	47%	1		640	31%	1	
Receive state salary								
Yes	27	41%	0.8(0.4–1.9)	0.696	45	24%	0.8(0.4–1.6)	0.479
No	570	45%	1		865	29%	1	
Receive local fee for-service								
Yes	568	48%	8,6(3,0–24,3)	< 0,001	872	31%	5,2(1,9–14,7)	< 0,001
No	41	10%	1		50	8%		
Receive the government allowance for risk								
Yes	291	68%*	3,3(2,4–4,7)	< 0,001	309	30%	1,1(0,8–1,4)	0,693
No	289	39%*	1		607	29%	1	
OR = Odds ratio, 95% CI = 95% confidence interval, *Percentage in Walungu, ** Percentage in (Walungu-katana), *** Other = Integration after internship and high instances recommendation, **** according to the categorization of agents according to the public service of the DRC (explanation in the methodology),								

Table 2 shows comparison of the different characteristics of personnel from the stable health district (Idjwi) to other health districts, intermediate (Walungu and Katana) and in crisis (Mulungu).

Health care workers ≤ 34 years old were 2.3 times more likely to be in the Idjwi HD (than in the Mulungu HD) [OR = 2.3 (1.5–3.7); $p < 0.001$], 2.2 times more likely to be in the Idjwi HD (than in the Katana HD) [OR = 2.2 (1.5–3.1); $p < 0.0001$] and 1.9 times more likely to be in the Idjwi HD (than in the Walungu HD) compared to > 34 years old [OR = 1.9 (1.3–2.7); $p < 0.001$].

The $<$ superior level of education were 3.8 times more likely to be in the Katana HD (than in the Idjwi HD) [OR = 3.8 (2.7–5.4); $p < 0.0001$] and 5.9 times more likely to be in the Walungu HD (than in the Idjwi HD) compared to the superior [OR = 5.9 (4.2–8.6); $p < 0.001$]. (Table 2.2).

Public status was 1.4 times more likely to be in the Katana health HD (than in the Idjwi HD) compared to other status. [OR = 1.4 (1.1–2.0), 0.033]. (Table 2.2).

Doctor & Nurse were 1.7 times more likely to be in Idjwi HD (than in Walungu HD) [OR = 1.7 (1.2–2.4); $p < 0.01$] and 1.4 times more likely to be in Idjwi HD (than in Walungu HD) [OR = 1.4 (1.1–1.8), $p = 0.024$]. (Table 2.2).

The < 5 years seniority were 1.9 times more likely to be in the Idjwi HD (than in the Katana HD) [OR = 1.9 (1.3–2.7); $p < 0.001$] and 1.9 times more likely to be in the Idjwi HD (than in the Walungu HD) compared to ≥ 5 years [OR = 1.9 (1.4–2.9); $p < 0.001$].

Category C were 1.6 times more likely to be in Walungu HD (than in Idjwi HD) compared to Category D [OR = 1.6 (1.2–2.3); $p = 0.005$]. (Table 2.4)

The registered agent were 1.6 times more likely to be in the Idjwi HD (than in the Katana HD) [OR = 1.6 (1.1–2.2); $p = 0.009$] (Table 2.3) and 2.6 times more likely to be in the Idjwi HD (than in the Walungu HD) compared to the other agents [OR = 2.6 (1.8–3.8); $p < 0.001$]. (Table 2.4).

The central and intermediate recruitment were 5.7 times more likely to be in the Mulungu HD (than in the Idjwi HD) [OR = 5.7 (3.7–8.7); $p < 0.0001$](Table 2.3), 4.4 times more likely to be in the Katana HD (than in the Idjwi HD) [OR = 4.4 (3.1–6.2); $p < 0.001$] and 3.6 times more likely to be in Walungu HD (than in Idjwi HD) compared to other agents [OR = 3.6 (2.6–5.1); $p < 0.001$].

Recruitment applications were 11.4 times more likely to be in the Mulungu HD (than in the Idjwi HD) [OR = 11.4 (6.6–19.8); $p < 0.001$] (Table 2.3) and 1.7 times more likely to be in the Walungu HD (than in the Idjwi HD) compared to the other agents [OR = 1.7 (1.2–2.36); $p < 0.001$].

Continuing education was 2.3 times more likely to be in the Idjwi HD (than in the Mulungu HD) [OR = 2.3 (1.5–3.5); $p < 0.001$], 1.8 times more likely to be in the Idjwi HD (than in the Katana HD [OR = 1.8 (1.3–2.5); $p < 0.001$](Table 2.3) and 2.3 times more likely to be in the Idjwi HD (than in the Walungu HD) compared to others [OR = 2.3 (1.7–3.2); $p < 0.001$].(Table 2.4)

By comparing the stable district (Idjwi HD) and the intermediate districts (Walungu and Katana HD), ≤ 34 -year old were twice as likely to be in the Idjwi health district (as in the inner Walungu and katana districts) compared to > 34 years old [OR = 2.0 (1.5–2, 6); $p < 0.001$], (Table 2.2) The < superior level of education were 4.7 times more likely to be in the intermediate health districts (than in the Idjwi health district) compared to the superior [OR = 4.7 (3.5–6, 4); $p < 0.001$],The < 5 years seniority were 1.9 times more likely to be in the Idjwi Health district (than in the Intermediate HD) compared to ≥ 5 years [1.9 (1.4–2.6); $p < 0.001$], Category C were 1.4 times more likely to be in intermediate HD (than in Idjwi HD) compared to Category D [OR = 1.4 (1.1–1.9); $p = 0.032$], the registered agent were 2.0 times more likely to be in the Idjwi HD (than in the intermediate HD) compared to the other agents [OR = 2.0 (1.5–2.7); $p < 0.0001$], (Table 2.4) the central & intermediate recruitments were 3.9 times more likely to be in the Idjwi HD compared to the other agents [OR = 3.9 (2.9–5.4); $p < 0.001$], the recruiting applications were 1.5 times more likely to be in the Idjwi HD compared to the other agents [OR = 1.5 (1.1–1.9); $p = 0.008$], the continuing education were 2.1 times more likely to be in the Idjwi HD(than in the Intermediary HDs) compared to others [OR = 2.1 (1.5–2.7); $p < 0.001$], receiving the local Bonus were 5.2 times more likely to be in the Idjwi HD (than in the Intermediate HDs) compared to others [OR = 5.2 (1.9–14.7); $p < 0.001$]

Table 3

Comparison of the different characteristics of personnel from the unstable health zone (Mulungu) to the transition health zones (Walungu and Katana) on the one hand and of all the other zones on the other hand (stable and intermediate), in the province of South Kivu, East of the DRC

Variables	Comparison between unstable and intermediate zones				Comparison between unstable zones and stable / intermediate zones			
	N	Instable	OR(IC95%)	p	N	Instable	OR(IC95%)	P
Age (year)								
≤ 34	180	18%	1.2(0.8–1.8)	0.514	277	12%	1.4(0.9–2.2)	0.083
> 34	621	20%	1		783	16%		
Gender								
Male	545	22%	1.8(1.8–2.7)	0.006	737	16%	1.7(1.1–2.5)	0.009
Female	255	14%	1		341	10%		
Level of education								
<superior	513	87%*	3.4(2.3–4.8)	< 0.001	601	89%**	2.1(1.5–2.9)	< 0.001
Superior	296	67%*	1		480	80%**	1	
Facilities								
HDCO	42	17%	1		52	13%		
Hospital (RH + HC)	269	16%	0.9(0.4–2.3)	0.911	372	12%	0.8(0.4–1.9)	0.690
Health Center	486	21%	1.3(0.6–3.1)	0.506	649	16%	1.2(0.5–2.7)	0.666
Status of the facilities								
Public	540	26%	88.1(12.3–634.0)	< 0.001	684	21%	95.1(13.2–682.9)	< 0.001
other	248	0%	1		364	0%		
Marital status								
Living alone	138	20%	1.1(0.7–1.7)	0.816	189	15%	1.1(0.7–1.7)	0.780
As a couple	664	19%	1		919	14%		
Seniority								

	Comparison between unstable and intermediate zones				Comparison between unstable zones and stable / intermediate zones			
<=4 years	199	31%	2.8(1.9–4.2)	< 0.001	289	21%	2.3(1.6–3.3)	< 0.001
> 4 years	586	13%	1		758	10%		
Family residence								
In the working Area	715	19%	1		953	14%		
Out of working area	89	25%	1.4(0.8–2.3)	0.214	126	17%	1.3(0.8–2.1)	0.359
Position in the Facilities								
Administrative officer	441	19%	1		571	15%	1	
Medical Doctor and nurse	364	21%	0.9(0.6–1.3)	0.516	509	15%	0.9(0.7–1.4)	0.919
<superior = without, primary and secondary level, OR = Odds ratio, IC95%= 95% Confidence Interval, HDCO = Health District Central office, RH = Referral Hospital, HC = Health Center. *Percentage in intermediate, **Percentage in (stable/intermediate)								

Table 3.1

Comparison of the different characteristics of personnel from the unstable health zone (Mulungu) to the transition health zones (walungu and katana) on the one hand and of all the other zones on the other hand (stable and intermediate), in the province of South Kivu, East of the DRC (after)

Variables	Comparison between unstable and intermediate zones				Comparison between unstable zones and stable / intermediate zones			
	N	Instable	OR(IC95%)	p	N	instable	OR(IC95%)	P
Rank***								
Category c	322	18%	0.8(0.5–1.1)	0.173	417	14%	0.9(0.6–1.2)	0.389
category d	452	22%	1		627	16%		
Status in Public Service								
Registered state agent	272	71%*	1		391	80%**		
Non- registered state agent	534	85%*	2.3(1.6–3.2)	< 0.001	675	88%**	1.8(1.3–2.6)	< 0.001
Recruitment authority								
central and intermediate level	544	22%	1.4(0.9–2.1)	0.070	629	19%	2.1(1.5–3.1)	< 0.001
other	265	17%	1		442	10%		
Recruitment process								
Job application	333	95%*	7.7(4.6–12.9)	< 0.001	491	96%**	8.7(5.2–14.4)	< 0.001
other	476	69%*	1		588	75%**		
Continuing education								
Yes	303	18%	0.9(0.6–1.3)	0.530	453	12%	0.7(0.5–1.0)	0.660
No	496	20%	1		613	16%		
Promotion since enlistment								
Yes	248	19%	0.9(0.6–1.3)	0,530	322	15%	0.9(0.7–1.3)	0.719
No	561	21%	1		757	15%		

	Comparison between unstable and intermediate zones				Comparison between unstable zones and stable / intermediate zones			
Receive state salary								
Yes	39	13%	0.6(0.2–1.5)	0.246	50	10%	0.6(0.2–1.6)	0.301
No	768	20%	1		1022	15%		
Receive local fee for service								
Yes	682	88%*	13.0(8.4–20.2)	< 0.001	955	91%**	15.9(10.5–24.4)	< 0.001
No	122	38%*	1		126	40%**		
Receive the government allowance for risk								
Yes	279	23%	1.3(0.9–1.8)	0.155	373	17%	1.8(0.9–1.8)	0.171
No	529	19%	1		706	14%		
OR=Odds ratio, 95% CI = 95% Confidence Interval, *Percentage in Intermediate, **Percentage in (stable / intermediate), ***according to the categorization of agents according to the public service of the DRC (explanation in the methodology),								

Tables 3 shows the comparison of the different characteristics of personnel from the unstable health district (Mulungu) to the transition health districts (Walungu and Katana) on the one hand and from all the other districts on the other hand (stable and intermediate), in the province of South Kivu.

These tables show on the one hand, compared to the unstable districts (Mulungu) and the intermediate districts (Katana and Walungu) that:

The following characteristics are more likely to be in the unstable district than in the intermediate districts: male [OR = 1.8 (1.8–2.7); $p = 0.006$], public status of facilities [OR = 88.1 (12.3–634.0); $p < 0.001$] and ≤ 4 years Seniority [OR = 2.8 (1.9–4.2); $p < 0.001$], <superior **Level of education** [OR = 3,4(2,3–4,8); $p < 0.001$] (Table 3)..

The following characteristics are more likely to be in the intermediate zones than the unstable zone, Non-registered agent [OR = 2.3 (1.6–3.2); $p < 0.001$], job application [OR = 7.7 (4.6–12.9); $p < 0.001$], receive local bonus [OR = 13.0 (8.4–20.2); $p < 0.001$] (Table 3.1)

Tables 3 & 3.1 comparing on the other hand, the unstable district (Mulungu) to all the other districts (intermediate and stable) this study showed that:

The following characteristics are more likely to be in the unstable district than in all the other districts (intermediate and stable), male [OR = 1.7 (1.1–2.5); $p = 0.009$], ≤ 4 years Seniority [OR = 2.3 (1.6–3.3), $p < 0.001$] and Level < superior of education [OR = 2.1 (1.5–2.9); $p < 0.001$]. (Table 3)

The following characteristics are more likely to be in other areas than in the unstable area: Non-registered state agent [OR = 1.8 (1.3–2.6); $p < 0.001$], central and intermediate level [OR = 2.1 (1.5–3.1), $p < 0.001$], job application [OR = 8.7 (5.2–14.4); $p < 0.001$], receive local fee for-service [OR = 15.9 (10.5–24.4); $p < 0.001$] (Table 3.1).

Table 4
Monthly income by occupation and level of education of respondents

Monthly income by function held in the structure (\$)					
Median (Min - Max)					
	Mulungu	Katana	Walungu	Idjwi	P-value*
Medical doctor	167(55–355)	217 (60–779)	387 (83–805)	273 (167–1033)	< 0.001
Administrative	51 (5–90)	30 (7-211)	40 (7-250)	40 (4-402)	0.050
Nurses	52 (6-115)	50 (7-1000)	63 (10–250)	70 (7-183)	< 0.001
* Kruskal-Wallis					

This Table 4 compares the median monthly salaries of health zone personnel in the different zones studied according to the type of agents. It revealed that overall, the median of agents' salaries is statistically different according to the type of agents (< 0.001). Doctors and nurses have different median wages (< 0.001) in the different areas studied. Doctors in Mulungu HD have the lowest median salary of all areas whereas the highest Doctor's salary is found in Walungu Health district.

Graphique I: Monthly income of respondents by study area (chi-square test, $P < 0.001$)

These results in Graph I indicated that it was in the Idjwi health district (stable) where we found a high proportion (21.20%) of health workers with a monthly income greater than or equal to \$151 compared to other health districts ($p < 0.001$). In the Mulungu Health district (unstable), their monthly income was very low (0.90% of $< \$151$) versus 9.4% in the Katana health district and 9.2% in the Walungu health district (in transition).

Discussion

This study describes the profile of staff in rural health zones in South Kivu, eastern Democratic Republic of Congo. It takes into account the crisis context that has characterized this province for several decades. We conducted a cross-sectional study in four districts selected according to the crisis context following the classification of health zones by the Provincial Health Department of South Kivu. The Idjwi health district was chosen as stable, Katana and Walungu as intermediate and Mulungu as in crisis. Our findings showed that agents over 34 years of age were the most represented. Women were the least represented in all the health districts but the lowest proportion was in the unstable district. In all districts, administrative staff was the most represented comparing to nursing and medical staff. 96% of the health staff did not receive a government salary and 64% did not receive a government allowance for risk. 63% of staff do not have a state registration number. With regard to the characteristics of the health districts, our results show that the characteristics of the agents found in the stable districts are 34 years old or younger, those with a registration number, those who have benefited from central and/or intermediate recruitment, those who receive continuous training and those who receive the local bonus. Our results also show that it is in the Idjwi health district (stable) where we have a high proportion of health workers with a higher monthly income than in the other districts. In the unstable district; men, staff with less than or equal to 4 years of seniority and those with a lower level of education are more likely to be in the unstable districts than in all the other districts,.

This study, which is one of the rare studies that addresses this issue in the context of crisis in the DRC, will be a reference for future analyses of health personnel and a standard commodity for support programs. This will also enhance decision-makers' actions in order to ensure equitable and efficient health personnel coverage despite the crisis context.

Socio-demographic characteristics of the respondents according to the Health districts studied

Our results showed some difference between Study Areas in terms of age of staff and seniority. Health care workers over 34 years of age were the most represented, especially in unstable districts .This shows the homogeneous nature of the agents in the African context where retirement policies are not applied in all countries. This shows that young people coming directly from school are not quickly enrolled in the employment system. Our data also showed that it is in unstable and/or intermediate areas where we have older people than elsewhere. As a result of the persistent armed conflicts, since young people are generally better able to leave the unstable area in search of places offering the best security conditions, older people find themselves competitive in this area. This is agreement with findings of Rohini Jonnalagadda Haar and Leonard S. Rubinstein [39] and Patrick Ilboudo G. et al [33], in the Burkina Faso Health Workforce Survey 2014, regarding the age of health care workers. According to them, the majority of workers were between 27 and 57 years old. Gautier and Wane in Chad corroborated our results and found that the majority of workers were between 31 and 45 years old [34].

Moreover, our data showed that agents in unstable districts, although they are the oldest, they have less years of experience (least seniority) compared to the other districts (less than 4 years). This shows that it is difficult to keep the same agents longer in high-risk areas. In the Democratic Republic of the Congo (DRC), a study conducted by Rishma M. et al. showed that the majority of agents have a median age of 6 years, and the study conducted by Patrick Ilboudo G. et al. showed that the majority of agents had about 10 years of experience [33]. However, these results are consistent with those found in Papua New Guinea, [35] where a significant proportion of agents had less than six years experience (44%). It is also important to note that in developing countries, state institutions are very weak in terms of their capacity to manage and control their own resources.

For gender, our data showed that men are about twice as likely to be in the unstable district as women. In the African context in general, some cultures do not encourage women to work, especially in conflict areas. In the context of insecurity and instability, women are exposed to more violence and harassment than men. This may explain the low proportion of women in at-risk areas [36] .

Our study showed that it is in the unstable district that we find more agents with a lower level of education. They are about twice as likely to be in the unstable district as those with higher education. This can be explained by the fact that as an unstable district in terms of security, the selection criteria will not be the same as in stable ones. It should be noted that there are other areas where there are several private facilities or humanitarian organizations that attract the best agents because they often offer the best salaries. A study conducted in Papua New Guinea on health care workers in rural areas [34] is not in agreement with our study. This study showed that 82% of the workers interviewed achieved a higher level of education before beginning the training related to their health sector position. However, our results are close to those found by a cross-sectional study of the sources of income of frontline health workers in the Democratic Republic of Congo [37], which shows that the majority of health workers are secondary school graduates, with only 30% having a higher level of education and university. The age range was between 30 and 40 years, 90% of the staff were nurses and only 4% doctors.

The study shows that the majority of the health workers in our study area were married and this in all the health districts. Results of a study on rural health workers conducted in Papua New Guinea [34] do not differ from our results in terms of civil status, where the majority of the workers were married (81%).

With regard to the status of the structures, it can be seen that 100% of the facilities in the Mulungu HD (unstable) are state-owned. This could be explained by the fact that private and religious individuals always choose to invest in stable, secure environments where the population can afford health care costs. Joyasuriya R et al.[34] in their study show that 50% of respondents worked in public facilities and 40% in church-owned facilities, compared to only about 3% in the private sector. The study shows that the majority of staff live with their respective families in all the health districts. This is explained by the fact that recruitment is done locally in most cases, regardless of the hiring authority. For Joyasuriya R et al. [34], almost all of the agents work in their districts. However, accommodation is provided to 68% of them and 57% lived in the same complex as the health facility.

The results of the study reveal that 47% of the agents are administrative staff. Doctors and nurses are more in the stable district than in the intermediate one. The results of our study differ slightly from the results of the 2015 Country Profile Study on Human Resources for Health in the Democratic Republic of Congo [37] which revealed that at the national level, administrative staff represents 38.4%.

The results of the study show that in relation to the status of civil servants (registered agent, New Unit, No status), registered agents have twice the risk of being in the stable district. This is because administrative procedures seem to be more respected. It is probably due to the context of insecurity leading to both the flight of agents and the use of available agents who have not yet completed administrative formalities. A qualitative study among these agents and their employers would be necessary to understand the reason why some of the morkers in transition districts do not have a state registration number.

The Recruitment Process, Capacity Building and Method of Paying Staff

The results of the study show that, compared to the authorities involved in recruiting agents, those who obtained their jobs after an application for employment are about eight times more likely to be in intermediate districts. As we can see in the unstable district, a small seniority of the agents got their job after an applying for it because of the context of instability.

As a district in transition, the intermediate districts would have a greater need for agents to ensure their stability. For the unstable district(Mulungu), 84.1% of the agents are hired per application and test. In the transitional district of Katana (district with a partner), recruitment by recommendation from higher authorities occupies a slightly higher proportion than in other districts. The study on the Human Resources for Health Country Profile for the Democratic Republic of Congo shows that in the DRC, recruitment is either focused on degrees(or diploma) and institutions which issued them or by competitive examination. Recruitment is based on qualifications for candidates who hold a diploma issued or recognized as equivalent by the National Education system and who are specially prepared for that career, as long as the number of candidates does not exceed the number of jobs available. Recruitment is carried out on a competitive basis when the number of vacancies to be filled is less than the number of participants. In this case, only successful candidates who are ranked in order of merit may be appointed. It is within the framework of recruitment by degree (or diploma) that the recommendations are used as we showed in this study. This way of doing things tends to erase the normal recruitment process and to perpetuate familiarity, nepotism, tribalism, for being at a given position in the health sector.

The results of the study reveal that the continuous training of agents has the risk of being in the stable district twice. The Observatory for Human Resources for Health (HRH) in the DRC, in its study on the Human Resources for Health Country Profile of the Democratic Republic of Congo, states that in the DRC the Ministry of Health organizes thematic training within the framework of specific programs. These

trainings are also organized in provinces. However, there are central trainers who supervise provincial trainers. In addition to this internal organization, the Ministry of Health uses higher and university education in the training of specialists. Our results show that this training is more beneficial than for agents working in stable areas. The accessibility and the geographical stability and security of stable areas will be factors that would promote the organization of training for agents in unstable or transitional areas as well.

For the local salary (premium or bonus), agents in the stable district are more likely to receive this premium than agents in intermediate and unstable districts. This difference with respect to the collection of the local premium could be explained by the socio-economic disruptions (wars and rural exodus) that the populations of these two areas have experienced over the past few years; these disruptions do not allow the health facilities to maximize incomes to ensure the premium for all agents. In addition, the unstable districts are mostly rural areas where the majority of the population is very poor. Demographic data show that more than 80% of the rural populations in the DRC live on less than a dollar a day and the majority of people who use traditional medicine are more observed in rural areas [38].

Our results then show that 96% of health personnel do not receive a government salary and 64% do not receive a government bonus. Our results are superior to those found by the cross-sectional study of the sources of income of frontline health workers in the Democratic Republic of Congo [37], showing that one-third of nurses received no form of government payment and only 18% who received both an occupational hazard allowance and a salary.

Monthly Income of Workers by Occupation and Level of Education

Our results show that physicians are the staff with the highest income compared to other agents. They then show that the incomes of physicians and nurses are distributed differently in the study areas ($p < 0.001$). Our data corroborate with those of Patrick Ilboudo G. et al [33], also showing a difference in median income between staff according to the position held ($p = 0.0321$), their study then shows that the median income for all health staff is 295.2 (59.4-797.4) \$ while for doctors it is 369 (59.4–646.2) \$. Maria Paola B. et al [34], also show in their study that in the DRC, the median monthly income of doctors is \$785 with a maximum of \$4,815; administrative staff has \$166 and a maximum of \$1,396 while nurses have a median income of \$101 and a maximum of \$2,908. Rishma M., et al [36], in the cross-sectional study of the sources of income of frontline health workers in the Democratic Republic of Congo, also shows that in the DRC, monthly income from all sources was \$85, but the average was almost double(\$165). The highest median monthly income was for non-clinical work outside the facility (\$119), followed by government wages (\$58). The lowest median monthly income came from per diems (\$9) and informal payments (\$9).

Our data show that there are more agents with more than \$151 (21%) in the stable district, while in the intermediate one this proportion is less than 10% and less than one percent in the unstable district. This difference can be explained by the low use of health services by the population due to the rural exodus and wars. This would explain the low income maximization in unstable or transitional district [39].

Limitations of the study

Despite its multiple advantages, some limitations are recognized. First, the study was conducted in only four of the thirty-four health districts in South Kivu province. Although not representative, the inclusion of three categories of health districts, including emergency, transitional (with and without partners), and stable, allowed us to understand this profile in the province. Second, the analysis on human resources was limited only to their use, which normally required studying production, use, and retirement as well. Thirdly, other aspects that seem to be important for human resources but not taken into account are the level of satisfaction of health workers, retention, working conditions including benefits, housing, allowances, etc., the consideration of other sources of income besides state salary, state and local bonuses, and finally the workers' assessments of security crises and their impact on the performance of their tasks. Finally, this study is a retrospective one which is subject to selection bias.

Conclusion

This study shows that unstable (emergency) health districts use older staff with less seniority than other zones; there are also more men, staff with lower levels of education and most of them do not have a State registration number. Staff in stable health districts benefits more from continuing education (capacity building) than those in unstable (crisis) health districts, and in terms of salary, they earn more, with a high monthly income.

Other studies would be more important to deepen the analysis on human resources by considering parameters not studied in this work, such as the production of human resources, the agents' level of satisfaction and their attitude towards the security crisis.

The State should develop incentive mechanisms to motivate young and trained personnel to work in unstable health areas, including improving their living conditions and working conditions.

List Of Abbreviations

DR: Democratic Republic of

DRC: Democratic Republic of Congo

BDOM: Bureau Diocésain des Œuvres Médicales

EVD: Ebola Virus Disease

HD: Health District

HRH: Human Resources for Health

HDCO: Health District Central office

PHD: Provincial Health Department

IRC: international Rescue Committee

LC: Local committee

MSF: Médecins Sans Frontières

RH: Referral Hospital

HC: Health Center

WHO: World Health Organization

Declarations

Ethics approval

This study was approved by the Ethics committee of the Catholic University of Bukavu, DR Congo.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request

Competing interest

The authors declare that they have no competing interests

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Authors' Contributions

CM and GBB: designed the protocol of the study, supervised the data collection and edited the final manuscript

LC, SM and AN contributed in data collection in the 4 targeted health districts

DGM,AM, MC, AN and BK: contributed in data analysis and drafting the work

Other authors interpreted data and contributed in the enrichment of the manuscript

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Figures

Figure 1

Graphique I: Monthly income of respondents by study area (chi-square test, $P < 0.001$)