# 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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# 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 $Chi^2$ 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:**

In terms of standards, in all the health districts the number of doctors was very insufficient with an average of 0.35 doctors per 10,000 inhabitants, however, the number of nurses is sufficient, there is an average of 3 nurses per 5000 inhabitants, the nursing / medical staff (47%) were less represented than the administrative staff (53%). The age of all HCW median (Min-Max) was 46 (20-84) years and female was 32%. 96% of HCW did not receive a state salary; 64% did not receive government allowance for risk. In the stable district HCW were=< 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 benefited 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 =< 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 >= $ 151 is 21% in the stable zone, 9.2% in the intermediate zones and 0.9% in the unstable zone.

**Conclusion:**

The context of instability compromises the performance of the health system by depriving it of competent personnel, so the management of health care workers require some adaptations.

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.


# 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 (18).

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 Kasaï 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 health resources who 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.

The general objective of this study is to analyze the level of application of regulations in terms of planning and management of human resources for health in the 3 health zones in the context of a crisis in order to enable policy makers to provide appropriate solutions.

Specifically, this study aims to:

- assess the process of recruitment of healthcare workers and its impact to the performance of the studied health districts
- compare some socio-demographic and economic characteristics such as age, gender, level of education, and average monthly income in the stable and crisis health zones;
- Assess the treatment of health zone staff in terms of social benefits such as mechanization to the civil service, remuneration, in-service trainingThen better control of human resources in the health system would allow decision-makers to better plan and deploy human resources appropriately.

## 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 1 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%.

## Results

Table 1
Characteristics of Study Health Districts

| | Health Districts | | | | Standard |
|---|---|---|---|---|---|
| Features | Idjwi | Katana | Walungu | Mulungu | |
| Territory | Idjwi | Kabare | Walungu | Shabunda | |
| Population | 294,209 | 236,986 | 285,669 | 170,439 | ≥ 100 000 |
| Area (sqm) | 681 | 400 | 800 | 6.500 | |
| Density (inhabitants/sqm) | 432 | 592 | 357 | 26 | |
| Number of Health Areas | 21 | 18 | 23 | 20 | 10–20 |
| Number of Hospitals | 4 | 2 | 3 | 2 | 1 |
| Number of Agents | 280 | 364 | 165 | 341 | |
| Number of Health Center | 21 | 18 | 23 | 20 | |
| Health coverage (CS /10 000 hab) % | 72% | 75% | 79% | 117% | ≥ 80% |
| Number of doctors | 8 | 10 | 9 | 7 | |
| Number of nurses | 150 | 166 | 179 | 98 | |
| Number of doctors /10000 hab. | 0,27 | 0,42 | 0,31 | 0,41 | 1/10000 |
| Number of nurses / 5000 hab. | 2, 54 | 3,53 | 3,14 | 2,88 | 1/5000 |
| Manager | BDOM[a] | BDOM | State | State | |
| Partner | BDOM, AAP, IRC[b] | BDOM, AAP, LC[c] | LC, AAP | MSF[d], ICRC[e] | |
| Crisis situation | Stable | Post-crisis | Post-crisis | In crisis | |
| Performance of health zones (%) | 75,3* | 79,9* | 58,6* | 52,3* | ≥ 75% |
| Average performance of the Provincial Health Division of South Kivu for the three years covered by the study | | | | 66,1 | |

*Average performance of health zones for the three years concerned by the study (2017-2018-2019). a) BDOM = Bureau Diocésain des Œuvres Médicales (The Diocesan Office of Medical Works), Catholic faith-based. b) IRC = The International Rescue Committee. c) LC = Louvain Cooperation d) MSF = Médecins Sans Frontières (Doctors Without Borders). e) ICRC = International Committee of the Red Cross. AAP = Agence d'Achat des performances.

It emerges from this table that health coverage is beyond standards (≥ 80%) than in the unstable health zone of Mulungu. It is lower in the Idjwi stable zone. This area is still the one with a high number of doctors per 10,000 inhabitants compared to the others despite no area approaching the standards (i.e. at least one doctor per 10,000 inhabitants).

For the number of nurses, all these areas have an average of 3 nurses per 5000 inhabitants, which is in line with the standards which foresee at least one nurse for 5000 inhabitants.

Two health zones performed very well, namely the Idjwi zone and the Katana zone. The areas with good performance all have in common the Performance Purchasing Agency as Partner (AAP) and are all under the management of the Catholic Church. The Idjwi area is stable and Katana in post-crisis. The areas with poor performance are areas under state management, these are Mulungu and Walungu. Walungu is a post-crisis area and Mulungu is in crisis. The province's average performance over the study period is poor.

Table 2
(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) |
| Status 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 status | | | | | |
| 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) |

*Median (min-max), primary and secondary level, RH = Referral Hospital HC = Health Center, HDCO = Health District Central office, n (%) = number (percentage).

| Variables | ALL n (%) | Mulungu n (%) | Idjwi n (%) | Katana n (%) | Walungu n (%) |
|---|---|---|---|---|---|
| Out of working area | 126(12) | 22(14) | 37(13) | 31(9) | 36(12) |
| Position in the Facilities | | | | | |
| 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).

the Table 2 (part one) 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%); the norms provide for at least 70% of caregivers and at most 30% of administrative staff.

Table 2
(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 Bonus | | | | | |
| Yes | 356(82) | 83(52) | 273(99) | 304(97) | 295(89) |

* according to the categorization of agents in the public service of the DRC (explanation in the methodology), n(%) = number( percentage)

| Variables | ALL n (%) | Mulungu n (%) | Idjwi n (%) | Katana n (%) | Walungu n (%) |
|---|---|---|---|---|---|
| no | 80(18) | 76(48) | 4(1) | 9(3) | 37(11) |
| Receive the Government Bonus | | | | | |
| 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) | | | | | |

The Table 2 (part 2) shows that 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 3
(part 1). Relationship between staff profile and the performance of study health zones

| Variables | HZ with poor performance | HZ with Good Performance | OR (IC à 95%) | P |
|---|---|---|---|---|
| Age (years) | | | | |
| ≤ 34 | 108 | 169 | 1 | |
| > 34 | 361 | 422 | 1,3(1,01– 1,77) | 0,040 |
| Gender | | | | |
| Male | 334 | 403 | 1,3(0,9 – 1,7) | 0,063 |
| Female | 134 | 207 | 1 | |
| Level of education | | | | |
| <superior | 298 | 303p> | 1,6(1,3 – 2,1) | < 0,001 |
| Superior | 179 | 301 | 1 | |
| Facilities | | | | |
| HDCO | 26 | 26 | 1,4(0,8 – 2,6) | 0,211 |
| Hospital (RH + HC) | 152 | 220 | 1 | |
| Health Center | 287 | 362 | 1,1(0,9 – 1,5) | 0,296 |
| Status of the facilities | | | | |
| Public | 348 | 336 | 1,6(1,3 – 2,1) | < 0,001 |
| Private | 141 | 223 | 1 | |
| Marital status | | | | |
| Living alone | 82 | 107 | 1,0(0,8 – 1,4) | 0,768 |
| As a couple | 388 | 531 | 1 | |
| Seniority (years) | | | | |
| ≤ 4 | 126 | 163 | 1 | |
| > 4 | 327 | 431 | 0,9(0,7 – 1,3) | 0,893 |

| Variables | HZ with poor performance | HZ with Good Performance | OR (IC à 95%) | P |
|---|---|---|---|---|
| Family residence | | | | |
| In the working Area | 414 | 539 | 1 | |
| Out of working area | 58 | 68 | 1,1(0,8 – 1,6) | 0,582 |
| Position in the Facilities | | | | |
| Administrative officer | 273 | 298 | 1,4(1,1–1,8) | 0,005 |
| Medical Doctor and nurse | 200 | 309 | 1 | |

RH = Referral Hospital HC = Health Center, HDCO = Health District Central office, n (%) = number (percentage). HZ = Health Zone

The characteristics of agents working in areas with poor performance are [for any characteristic we give the odds ratio (OR) of the category in relation to the poor performance, its confidence interval (IC à 95%) and the degree of significance (p)], the age of the agents {age de plus de 34 ans [OR(IC à 95%) = 1,3(1,01–1,77),p = 0,040)]}, their level of education {the low level [1,6(1,3 – 2,1), p < 0,001])}, the Status of the facilities {Public [ OR(IC à 95%) = 1,6(1,3 – 2,1),p < 0,001]}, the position in the facilities {administrative officer [ OR(IC à 95%) = 1,4(1,1–1,8),p = 0,005]}, the Category according to the public services of the Congolese {Category c [ OR(IC à 95%) = 1,3(1,103-1,7), p = 0,044]}, the status in public service {non-registered state agent [OR(IC à 95%) = 1,4(1,1–1,8),p = 0,015])}, the recruitment process {recruitment processes other than job application [OR(IC à 95%) = 2,4(1,9 – 3,1),p < 0,001]}, the continuing education {the agents who don’t have continuing education [OR(IC à 95%) = 1,7(1,3 – 2,1),p < 0,001]}, receive local bonus { no receive local bonus [OR(IC à 95%) = 13,3(7,4–23,9),p < 0,001]}.

Table 3
(part 2). Relationship between staff profile and the performance of study health zones

| Variables | HZ with poor performance | HZ with Good Performance | OR (IC à 95%) | P |
|---|---|---|---|---|
| Rank* | | | | |
| Category c | 201 | 216 | 1,3(1,03 – 1,7) | 0,044 |
| category d | 263 | 365 | 1 | |
| Status in Public Service | | | | |
| Registered state agent | 155 | 236 | 1 | |
| non -registered state agent | 319 | 356 | 1,4(1,1– 1,8) | 0,015 |
| Recruitment authority | | | | |
| central and intermediate level | 319 | 310 | 1 | |
| other | 158 | 284 | 0,5(0,4 – 0,7) | < 0,001 |
| Recruitment process | | | | |
| Job application | 160 | 331 | 1 | |
| other | 317 | 271 | 2,4(1,9 – 3,1) | < 0,001 |
| Continuing education | | | | |
| Have continuing education | 174 | 279 | 1 | |
| Don’t have continuing education | 312 | 301 | 1,7(1,3 – 2,1) | < 0,001 |
| Promotion since enlistment | | | | |
| Yes | 160 | 162 | 1 | |
| No | 336 | 421 | 0,8(0,6 – 1,0) | 0,110 |
| Receive state salary | | | | |
| Yes | 21 | 29 | 1 | |

RH = Referral Hospital HC = Health Center, HDCO = Health District Central office, n (%) = number (percentage).

| Variables | HZ with poor performance | HZ with Good Performance | OR (IC à 95%) | P |
|---|---|---|---|---|
| no | 473 | 549 | 1,2(0,7 – 2,1) | 0,553 |
| Receive local Bonus | | | | |
| Yes | 378 | 577 | 1 | |
| no | 113 | 13 | 13,3(7,4–23,9) | < 0,001 |
| Receive the Government Bonus | | | | |
| Receive | 261 | 112 | 1 | |
| Don't receive | 211 | 495 | 0,8(0,6 – 1,0) | 0,058 |
| RH = Referral Hospital HC = Health Center, HDCO = Health District Central office, n (%) = number (percentage). | | | | |

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 aims at:

- Assessing the process of recruitment of healthcare workers and its impact to the performance of the studied health districts
- comparing some socio-demographic and economic characteristics such as age, gender, level of education, and average monthly income in the stable and crisis health zones;
- Assessing the treatment of health zone staff in terms of social benefits such as mechanization to the civil service, remuneration, in-service training

It takes into account the crisis context that has characterized this province for several decades..

# Relationship between recruitment process and the performance of studied health zones

Our study shows that the recruitment process other than job application [OR(IC à 95%) = 2,4(1,9 – 3,1),p < 0,001] was associated to the poor performance of the health Zone. These findings are in agreements with a study conducted in Nigeria by Ekwoaba et al.2015 that concluded that the more objective the recruitment and selection criteria, the better the organization's performance ($X2 = 20.007$; $df = 4$; $p < 0.05$)

### Overall situation of staff in health zones in relation to the standards of the Ministry of Health

Our study shows an insufficient number of doctors compared to the standards of the Ministry of Health, in the DRC it is planned at least 1 doctor per 10,000 inhabitants, however in the study health zones we observed an average of 0, 35 doctor for the same population [11]. The average of this ratio in the South Kivu province is 0.7 and that of the DRC country is 0.9 [28]. On the other hand, we observed an average of 3 nurses for 5,000 inhabitants, which is within the standards which provide for at least one nurse for the same number of inhabitants. Our results are similar to those found by Mba RM at all in Cameroon in 2011 in a study entitled "Maintain the presence of nursing staff in rural health facilities in Cameroon" in which they observed a shortage of medical staff in rural areas with a ratio respectively of one doctor for 47,956 and 61,873 inhabitants in the North and Far North region of Cameroon [30]. In fact, more than half of doctors are concentrated in the 3 urban health zones in which living and safe conditions are acceptable with the possibility of offering paid services in private clinics and therefore increasing. Their income. The WHO in its 2006 world health report reveals similar geographic disparities in other parts of the world. [3].

On the other hand, for the sufficient number of nurses, although similar in the study by Mba RM et al [30], in the DRC and particularly in the health zones under examination could be explained by the proliferation of nursing training schools in rural areas. Indeed, for electoral reasons most politicians have negotiated and obtained the opening of schools and nursing training institutes in their communities, but the quality of training remains low.

This study shows a disproportion between the number of nursing staff and administrative staff ranging from 47% and 53% respectively, which is outside the standards of the DRC Ministry of Health which provide for 70% of nursing staff against 30% of administrative staff [11]. The WHO World Health Report made the same observation in the majority of low-income countries [3]. In the case of the DRC, this situation is explained by the non-retirement of the agents by the Government, the aging agents no longer being able to work, others are recruited in their place but the former are still on the list and continue to show up for service to keep their benefits still hoping for retirement.

As for the level of performance, two health zones performed very well, namely the Idjwi zone and the Katana zone. The areas with good performance all have in common the Performance Purchasing Agency (AAP) as a technical and financial partner and are all under the management of the Catholic Church. The Idjwi health zone is stable and Katana is emerging from the crisis. The areas with poor performance are areas under state management, they are Mulungu and Walungu. The latter is a post-crisis area and Mulungu is in crisis. The province's average performance over the study period is low (66.1%), with the standard set at ≥ 75% [28].

Studies (Peerenboom, Peter Bob, et al. 2014; Yolaine Glèlè Ahanhanzo, et al 2016) have shown the effectiveness of PBF in increasing the performance of health services through improving the governance of the health system and increasing the motivation of health personnel [31, 32]. Moreover, in a country in crisis with weak governance like the DRC, we still find a little more seriousness in the institutions managed or co-managed with the Churches in which certain management rules are required such as the system..

# 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 [34]. 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]. Wilson NW et al found the same results in a study on A critical review of interventions to redress the inequitable distribution of healthcare professionals to rural and remote areas [37]

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 [35] 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 [36], 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 [35] 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. [35] 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. [35], 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 workers in transition districts do not have a state registration number.

# 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 [39], 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

There is a shortage of medical staff and a high proportion of administrative staff compared to caregivers in all of the 4 rural health zones under study.

Specifically 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. Informal recruitment is associated to poor performance of the health districts.

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 context of instability compromises the performance of the health system by depriving it of competent personnel, so the management of health care workers require some adaptations.

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.

# 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

### Funding

Not applicable

### 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

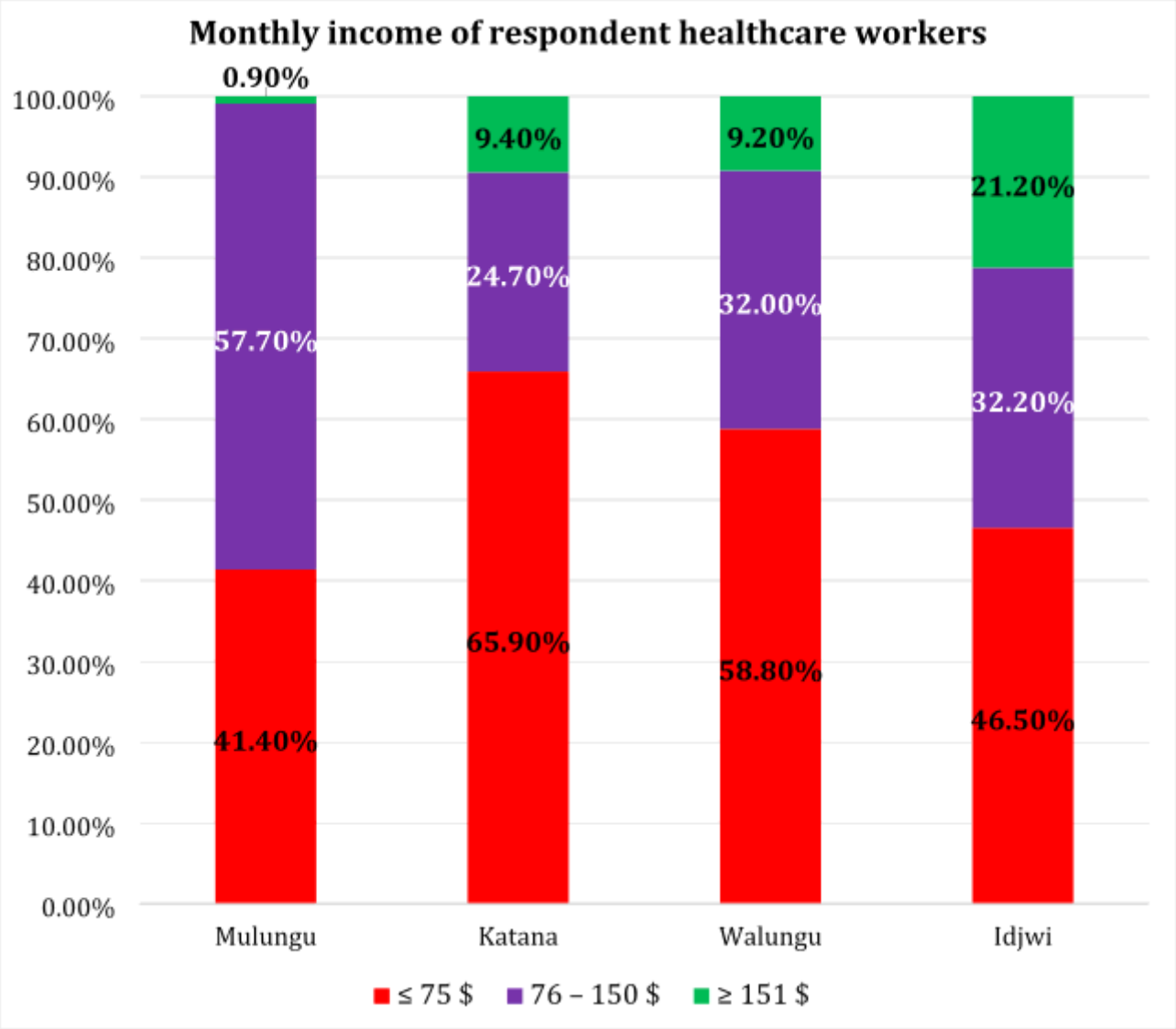


**Figure 1**

**Monthly income of respondents by study area (chi-square test, P<0.001)**