



Resilience outcomes and associated factors among workers in community-based HIV care centres during the Covid-19 pandemic: A multi-country analysis from the EPIC program

Marion Di Ciaccio^{a,*}, Nicolas Lorente^{a,b,c}, Virginie Villes^a, Axel Akpaka Maxence^d, Claudia Marcela Vargas Pelaez^e, José Rafael Guillen^f, Ingrid Castillo^g, Cinta Folch^{b,c}, Rokhaya Diagne^a, Lucas Riegel^a, Rosemary M. Delabre^a, Daniela Rojas Castro^{a,h}, the EPIC study group

^a Community-based Research Laboratory, Coalition PLUS, Pantin, France

^b Centre Estudis Epidemiològics sobre les Infeccions de Transmissió Sexual i Sida de Catalunya (CEEISCAT) Departament de Salut, Generalitat de Catalunya, Spain

^c Centro de Investigación Biomédica en Red de Epidemiología y Salud Pública (CIBERESP), Spain

^d Bénin Synergie Plus, Bénin

^e FUNDACIÓN IFARMA, Colombia

^f Red Somos, Colombie

^g CAS, Guatemala

^h Aix Marseille Univ, INSERM, IRD, SESSTIM, Sciences Economiques & Sociales de la Santé & Traitement de l'Information Médicale, ISSPAM, Marseille, France

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ABSTRACT

Introduction: Community health workers (CHW) were integral in the COVID-19 response, particularly concerning services for populations vulnerable to HIV. Little is known regarding the mental health of CHW during the COVID-19 crisis. The objective of this study was to study resilience of CHW working in HIV non-governmental organizations.

Methods: An anonymous online, cross-sectional questionnaire was implemented during 2021 among CHW in Benin, Colombia, Guatemala, and Spain. Three scales were used to assess mental health: the 6-item Brief-Resilience Scale, the 9-item Patient Scale Questionnaire and the 7-item Generalized-Anxiety-Disorder scale. Logistic regression models were used to identify factors associated with “low” resilience vs “normal” or “high” resilience.

Results: Among 295 respondents, the median standardized resilience score was 58.33 (IQR = [50.0–75.0], n = 267), 18.52 (IQR = [7.4–33.3], n = 282) for standardized depression score and 19.05 (IQR = [4.8–33.3], n = 274) for standardized anxiety score. Standardized resilience score was negatively correlated with standardized anxiety score ($\rho = -0.49$, $p < 0.001$, n = 266) and standardized depression score ($\rho = -0.44$, $p < 0.001$, n = 267).

Conclusions: Normal or high level of resiliency in the HIV CHW were observed during the COVID-19 crisis. Self-efficacy, through COVID-19 prevention training, was a factor associated with resilience. Health policy must place CHW at the core of the healthcare system response to Covid-19 and to future health emergencies, as they ensure continuity of care for many diseases including HIV among vulnerable populations.

1. Introduction

On March 11th 2020, the World Health Organization (WHO) declared the COVID-19 global outbreak a pandemic. The heavy consequences that the COVID-19 outbreak has had on healthcare workers

(HW) has been widely documented, both in terms of workload and mental health [1–4]. Indeed, HW have faced an exceptional situation with extreme decisions and pressures regarding how to manage limited resources equally between patients and how to manage their own physical and mental health [5]. In many countries around the world, the

* Corresponding author.

E-mail address: mdiciaccio@coalitionplus.org (M. Di Ciaccio).

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COVID-19 pandemic exacerbated already difficult situations where HW were strained due to lack of sufficient resources, inadequate pay, and poor working conditions [6]. The evidence of a “pandemic within a pandemic” points to the need to look closer at the impact of COVID-19 among HW and identify ways that health systems and structures could provide greater support [6].

Since the start of the crisis, several studies have reported data on the mental health of HW. An online survey based on several mental health scales among HW in a health care institution in the midwestern United States showed that stress was high among HW and that nurses reported higher stress and lower resilience compared to the other HW categories [1]. Furthermore, a rapid review on the impact of COVID-19 on the mental health of HW confirmed that nurses may be at higher risk of adverse mental health outcomes during this pandemic [2]. Another study conducted in Indonesia reported high state and trait of anxiety among almost one third of respondents and more than half had moderate to high levels of state anxiety [4]. This study showed a significant negative correlation between the levels of anxiety and resilience, with high levels of anxiety being associated with lower levels of resilience [4]. In Spain, which had a high number of infections early in the pandemic, one study among HW showed that half of the respondents indicated post-traumatic stress symptoms and that 58.6 % and 20.7 % had a possible anxiety disorder and a severe disorder, respectively [3].

While all these studies focused on HW working in medical centers, few studies have focused on the mental health of community health workers (CHW). CHW cover a great diversity of categories but the common components are being based in the community and being the first point of contact at community level [7]. CHW are notably considered a key part of the health workforce in low and middle income countries [7–11].

Since the beginning of the COVID-19 pandemic, CHW represented a significant part of frontline HW and an integral part of the COVID-19 response at the community level [12,13]. A study which synthesized evidence of roles, experiences, challenges and adaptive strategies of CHW during the COVID-19 crisis demonstrated that CHW strongly contributed in the COVID-19 response mainly through community education and support for people touched by COVID-19 [7]. CHW also faced concerns regarding personal protective equipment, financial incentives and various other challenges such as medical supply chain disruptions, lack of personnel and work overload [7]. The CHW were particularly impacted by governmental restrictions such as lockdowns, curfews and restrictions to travel when carrying out outreach activities [7].

The role of CHW in HIV care and prevention is essential, particularly in countries or regions where public services were not well adapted and connected to people living with HIV (PLHIV) and to HIV key populations not reached by regular HW and health services because of discrimination [14–16]. The HIV response is unique and historic, with the leadership of communities and people living with HIV as a central component [17]. The COVID-19 pandemic and the subsequent public health measures also impacted HIV/HCV services with consequences on HIV testing and HIV prevention services [18]. Therefore, community-based organizations (CBO) involved in the HIV response and the CHW who work for them, were mobilized at the start of the COVID-19 outbreak to develop and implement innovative actions to maintain the continuity of HIV services (e.g. distribution of ARV, HIV testing) while also undertaking new interventions to respond to the COVID-19 pandemic [19–22]. This dual burden, of responding to both COVID-19 and the need to maintain HIV services, is likely to have had an important impact on CHW. Mental health outcomes among CHW is a major component in the pandemic prevention, preparedness and response approach [17]. One study assessed mental health outcomes among CHW in a community-based HIV center in Mali in 2020 and showed that symptoms of depression, anxiety and insomnia were reported by a large proportion of CHW (71.9 %, 73.3 %, and 77 %, respectively) and highlighted that women were at greater risk of mental health disorders

[23].

This analysis aimed to explore mental health outcomes and factors associated to resilience during the COVID-19 pandemic among CHW working in the HIV field and recruited in a multi-country community-based research program EPIC.

2. Methods

2.1. Data availability

In this article, we report how data were collected and we describe our study sample as well as all measures and statistical analysis used. All information regarding the present analysis are presented in this article. If needed, more information concerning other data collected, analysis codes or research materials are available by contacting the corresponding author.

2.2. Study design

2.2.1. EPIC program

The EPIC research program is a multi-country, cross-sectional and community-based mixed methods program implemented right after the beginning of the COVID-19 pandemic by Coalition PLUS [24].

Coalition PLUS is an international union of community-based organizations involved in the fight against HIV and viral hepatitis. Founded in 2008, Coalition PLUS unites 16 member organizations and over 100 partner organizations in 52 countries. To respect the community-based research approach ([23]), many CBO, members or partners of Coalition PLUS, actively participated at all stages of this research project (objective, general study protocol, data collection tools, implementation, analysis).

The EPIC program aimed to assess the impact of the COVID-19 health crisis among people living with or affected by HIV and viral hepatitis, and people working with these populations in community settings.

To match the diverse themes of interest and target populations of the organizations participating in the EPIC program ($n = 79$ in 32 countries), as well as the specific local COVID-19 restrictions, each organization could adapt the general protocol and decide whether they wanted to implement a qualitative and/or a quantitative survey, targeting one or more key populations and/or CHW.

Two quantitative questionnaires were built to collect data: one targeting people living with or affected by HIV and/or hepatitis, and another targeting CHW. Both questionnaires gave the possibility to the local EPIC teams to select one or more sections depending on the target group(s) and the specific objectives they had. Each section focused on one specific issue (e.g. health care access, sexual behaviors) or on one target group (e.g. sex workers, PLHIV, CHW). However, the only common section to both questionnaires concerned the collection of socio-demographic data. Each local EPIC team was also able to add specific questions that may not be asked in the common questionnaires.

Three qualitative interview guides were available in the general protocol of the EPIC research program to collect information among the different study populations (people living with or affected by HIV and/or hepatitis, CHW, and those being part of both groups). All the interviews made in the framework of the EPIC program (face-to-face or through audio- or video-conference) were recorded, transcribed verbatim.

More detailed information regarding the methodology of the EPIC program is been published elsewhere [25].

2.2.2. CHW study and study population

This analysis focused on quantitative data collected among CHW within the framework of the EPIC program. According to the program design which allowed each organization to focus on their priority

populations during the COVID-19 crisis, a total of 9 organizations in 8 countries (Benin, Burkina Faso, Senegal, Spain, Guatemala, Colombia, Burundi and Malaysia) targeted CHWs. Among them, 5 organizations from Benin, Colombia, Guatemala and Spain used the psychological well-being and resilience sections in their quantitative survey. Therefore, the present analysis focused on psychological well-being and resilience data of CHWs from Benin, Colombia, Guatemala, and Spain which were collected between March and December 2021. CHWs were either employees either volunteers of the CBO participating. These data were collected through an anonymous online questionnaire using the Voxco® survey software and disseminated by the local EPIC coordinators. The questionnaire for CHW included 7 sections: i) Socio-demographic, general impact of COVID-19 and intention to vaccinate against COVID-19, ii) Experience and application of lockdown and/or barrier measures, iii) Representation and perception of COVID-19 risk, iv) Psychological well-being and resilience, v) Impact of the COVID-19 crisis on the structure, vi) Experience of the COVID-19 crisis at work and vii) Relationship with beneficiaries. Sections i), vi) and vii) were mandatory and sections ii), iii), iv) and v) were optional for organizations.

2.3. Description of the 5 organizations included and country health policies

2.3.1. BESYP organization in Benin

BESYP is the national network of LGBTIQ associations, with 20 associations and 18 952 members throughout Benin. The national HIV prevalence is around 1.2 % among in the general population (15–49 years old). HIV prevalence is higher among key populations, 8.5 % [95 % CI 6,8–10,2], 7.0 % [2.1–11.9] and 2.2 % [1.01–3.63] among female sex workers, men who have sex with men (MSM) and people who inject drugs, respectively [26].

LGBTIQI people were particularly stigmatized during the COVID-19 crisis, several media sources reported that they were responsible for the pandemic. For some people, COVID-19 was considered as a divine punishment linked to the deviant behaviors of these populations.

Access to healthcare is not totally free in Benin. The country has a mixed health system where health services are provided by both the public and private sectors. Beninese have access to public health services, but there are associated costs such as consultation fees, examination fees, medicines and other related expenses. Access to care for specific populations, such as PLHIV, is improved by the support from the Global Fund, PEPFAR etc. However, access to healthcare still presents challenges, particularly in terms of indirect costs such as transport, and geographical accessibility in certain remote regions.

2.3.2. CAS, Guatemala

CAS is a clinic specialized in HIV and sexually transmitted infection (STI) testing which provides free and confidential services with spaces free of stigma and discrimination.

HIV prevalence in Guatemala is estimated at 2 % in the general population (15 to 49 years old) [27]. There are no available data concerning HIV prevalence among key populations.

The healthcare system in Guatemala is comprised of a combination of public and private services overseen by the Ministry of Public Health and Social Assistance. It aims for universal coverage but faces challenges in accessibility, quality, and equity. While public health services are accessible to all citizens, rural and indigenous populations encounter barriers due to geographical and cultural factors. Private healthcare options exist, particularly in urban areas, but it can be costly.

2.3.3. Red Somos and IFARMA, Colombia

Red Somos is a social organization that works for the recognition of

diversity, human rights, well-being and sexual and reproductive health through community empowerment, social research, participation and advocacy.

IFARMA is a not-for-profit organization that develops research, consultancy and activism activities focusing on issues of access, use and quality of treatment. IFARMA's main objective is to positively influence public health policies and access to medicines in Colombia.

HIV prevalence in Colombia was approximately 0.7 % in the general population but was much higher among key populations – MSM, sex workers, injection drug users and prisoners (no data published) [28].

The Colombian healthcare system is comprised of two regimes that aim to provide coverage to the entire population (contributory regime and subsidized regime). All formal and retired workers have the obligation to join the system (paying monthly contributions co-financed by their employer), along with independent workers (paying monthly contributions by themselves). System affiliates can freely choose a public or private health provider. For those unable to afford payments, the subsidized regime grants access to public health providers, covering 51.4 % of the population in 2010. The system effectively addresses the needs of impoverished groups but falls short in covering middle-income citizens who lack stability for consistent payments. These individuals, including temporarily unemployed and independent workers, resort to private care during emergencies, incurring out-of-pocket expenses. While the Colombian healthcare system boasts extensive and quality coverage, earning regional recognition, it grapples with significant administrative, social, and economic challenges. These include obstacles like limited access in remote areas, complex processes, prolonged wait times, incomplete treatment provision, and added costs.

2.3.4. CEEISCAT, Spain

CEEISCAT is a technical advisory and support body of the Department of Health for the epidemiological surveillance of HIV and STIs, as well as the monitoring and evaluation of HIV, STI and viral hepatitis epidemics in Catalonia, one autonomous community of Spain.

HIV prevalence in Spain was of 0.2 % (95 % CI: 0.2–0.3) in the general population; no data were published specifically on the key populations [29].

Spain has a public, universal, and free national health system. Each Spanish citizen or resident has the right to access healthcare for free. Although national, the health system technically and economically depends on each autonomous community.

In depth information regarding services provided by the 5 organizations and the COVID-19 contexts are available in Table 3 and 4.

Recruitment methods: The study was based on a convenience sample. The EPIC program was launched at the beginning of the COVID-19 crisis. Feasibility and recruitment needed to be carefully considered at this time. The EPIC program was therefore designed to be flexible and adaptable at the local context in which it is implemented [24]:

2.4.1. Besyp

Questionnaires were administered face-to-face by research assistants in the different health facilities offering LGBTIQI services and in relevant places in Benin. Each research assistant interviewed CHW who were present and volunteered to participate during the recruitment process.

2.4.2. CAS and Red Somos

The questionnaire were sent by email to CHW and then self-administered by the CHW who volunteered to participate.

2.4.3. IFARMA and CEEISCAT

These organizations did not have CHW working for their organizations but they disseminated the questionnaires in their community-

based partners organizations.

IFARMA administered the questionnaires by phone by the coordinator of the EPIC study among CHW of their network (12 CBOs) who volunteered to participate.

The EPIC study in Spain was promoted by members of the CEEISCAT team by means of e-mails sent to the heads of associations or centers that met the study criteria. The e-mail invited the recipients to disseminate the questionnaire online to their workers and/or volunteers. The people/organizations contacted were mainly the National coordination of HIV/AIDS association (CESIDA), centers that are part of the DEVO network (network of community screening centers), CBOs collaborating with CEEISCAT in the response to HIV/HCV throughout Spain (particularly in Andalusia), harm reduction centers.

We did not have a refusal questionnaire.

2.5. Compliance with ethical standards

Each participant organization has had a local ethic approval (CNER: favorable opinion from the Ethics Committee number 31 27/08/2021 (Benin); Comité Institucional de Ética en Investigación No. 008–2021 (Colombia); Comité institucional de etica (CIE) Acta No.98 CIE-REV106/2021 (Guatemala); FEDESALUD: COMITÉ DE ÉTICA No. 1 de 2021 (Colombia); Comitè d'Ètica de la Investigació PI-20–322 (Spain)).

2.6. Patient and public involvement statement

EPIC program was a community-based research program which implied that leaders (through community-based organizations) of populations living with or affected by HIV and/or viral hepatitis were involved in the development, implementation and analysis of the program. Early in the COVID-19 outbreak, CHW warned of the impact of the crisis on HIV services, PLHIV and key populations. The EPIC program was therefore developed to document the impact of the COVID-19 crisis.

The protocol, questionnaires and interview guides were developed in partnership between researchers and members of the communities. Data collection was conducted by members of the CBO and analysis were designed in partnership between researchers and members of the community. CBO were responsible of the results restitution.

Informed consent.

All participants provided written informed consent after reading the study information note by checking a box to participate.

2.7. Scales of resilience and psychological well-being

The 6-item Brief Resilience Scale (BRS) assessed the ability to bounce back or recover from stress [30] with a mean score varying from 1 to 5 (the higher the score, the stronger the resilience). The BRS score was divided into the following 3 categories of resilience [31]: “low” from 1.00 to 2.99 points; “normal” from 3.00 to 4.30 points and “high” from 4.31 to 5.00 points. The 9-item Patient Health Questionnaire (PHQ-9) scale was used to measure depression and its severity [32] with a total score varying from 0 to 27 (the higher the score, the stronger the depression). And finally, the 7-item Generalized Anxiety Disorder (GAD-7) scale was used to assess anxiety [33] with a total score varying from 0 to 21 (the higher the score, the stronger the anxiety).

2.8. Explanatory variables

The sociodemographic component explored the following variables: age, gender identity (multiple choices were possible), educational level (secondary vs. higher education), place of residence (urban vs. semi-urban area), identification with key populations (MSM, PLHIV, women who have sex with women, transgender people, sex workers, people who used drugs, people living with HCV, people living with another chronic disease, migrants) and changes in financial situation due to the COVID-19 pandemic.

The questionnaire also included representation and perception of COVID-19 risk: claims about the virus responsible for COVID-19, health severity of COVID-19 if contracted, risk of being infected with this new virus (“compared to other people in the population of your country - of the same sex, the same age, and in the same state of health as you”) and impact of the COVID-19 crisis on the structure: impact on the functioning and cessation of certain activities. It also included experience of the COVID-19 crisis at work: impact of the health crisis on all work and on the workload, development of new professional skills since the beginning of the COVID-19 health crisis, protection from COVID-19 in the workplace, the need for work in this context, relations with work colleagues since the beginning of the COVID-19 health crisis, impact of work on personal life (7-items: “I had to separate myself from my loved ones so as not to expose them to the virus responsible for COVID-19”; “I was able to train my entourage in preventive actions against the virus responsible for COVID-19”; for example), experiencing discrimination/rejection due to COVID-19 risk from people in public space (as a person working in the health field); and the frequency of exchanges with beneficiaries since the beginning of the COVID-19 health crisis. Time from the beginning of COVID-19 health crisis in months was calculated between the beginning of COVID-19 health crisis of each country and the completion of the questionnaire.

2.9. Statistical analysis

All scores of resilience and psychological well-being were only calculated if at least half of the items contributing to each score was completed (i.e. when more than half of the items are missing, the score is declared missing). All scores were standardized to have scores from 0 to 100 to compare them and each was described using median and interquartile range (IQR). To study the impact of resilience on anxiety and depression, associations between each standardized score of psychological well-being and resilience were performed using Spearman's correlation (ρ). For this analysis, “normal” resilience was grouped with “high” resilience. Explanatory variables were compared between respondents who experienced “low resilience” to those who experienced “normal or higher resilience” using Chi-2 tests for categorical variables and Mann-Whitney tests for continuous variables. Logistic regression models that assess the odds of having “low” resilience compared to “normal” or “high” resilience were used to identify factors associated with “low” resilience. Variables with a p-value < 0.20 in the univariable analysis were considered eligible to enter the multivariable model. A backward procedure based on the Likelihood Ratio Chi-2 test was used to select significant variables for the final model (p-value < 0.05). Stata/SE 16.0 software (StataCorp LP, College Station, USA) was used for all the analyses. Only variables with p < 0.05 in the multivariable model are shown in the respective table. Due to the high correlation with standardized resilience score, standardized scores of psychological well-being were not included as covariables in the analyses.

3. Results

3.1. Description of respondents

Participants were from Benin (n = 56, 21.0 %), Spain (n = 133, 49.8 %), Guatemala (n = 19, 7.1 %) and Colombia (n = 59, 22.1 %). More than a third (35.7 %) identified with MSM, 13.9 % with PLHIV and 24.4 % with other key populations. Median age was 34.0 [IQR: 28.0–44.0], half of CHW were women (50.6 %) and a large majority reported higher education (85.1 %).

3.2. Description of each standardized score of resilience and psychological well-being; and impact of standardized resilience score on anxiety and depression standardized scores

Among 295 CHW respondents in the this study, the median

standardized resilience score was 58.33 (IQR = [50.0–75.0], $n = 267$), 18.52 (IQR = [7.4–33.3], $n = 282$) for the standardized depression score and 19.05 (IQR = [4.8–33.3], $n = 274$) for the standardized anxiety score. The standardized resilience score was negatively correlated with the standardized anxiety score ($\rho = -0.49$, $p < 0.001$, $n = 266$) and the standardized depression score ($\rho = -0.44$, $p < 0.001$, $n = 267$).

3.3. Comparison between respondents who had “low” resilience to those who had “normal” or “high” resilience, $n = 267$, Table 1

Among 267 CHW respondents who responded to the resilience scale, 64 were identified as having “low” resilience (24.0 %) (Table 1). No difference was observed according to age, gender identity and education between participants belonging to the “low” resilience group and the participants belonging to the “normal” or “high” resilience ($p = 0.590$, $p = 0.449$ and $p = 0.470$, respectively). CHW having “low” resilience more often lived in an urban area (36.5 % vs. 26.6 %, $p = 0.146$), more often reported a negative impact of the COVID-19 health crisis on their work overall (80.6 % vs. 71.7 %, $p = 0.163$), less often reported having developed new professional skills since the beginning of the COVID-19 health crisis (61.3 % vs. 71.0 %, $p = 0.150$) and reported being less protected from COVID-19 in the workplace (71.0 % vs. 83.9 %, $p = 0.024$) than CHW who had “normal” or “high” resilience. Participants in the “low” resilience group were also significantly more likely to report being able to train their entourage in preventive actions against the virus responsible for COVID-19 (60.7 vs. 45.7 %, $p = 0.041$), did not have to separate from their loved ones so as not to expose them to the virus responsible for COVID-19 (91.8 % vs. 74.9 %, $p = 0.005$), and more often reported discrimination or rejection due to COVID-19 risk from people in public spaces (42.6 % vs. 23.0 %, $p = 0.011$) or from people in the workplace (20.3 % vs. 10.0 %, $p = 0.108$).

3.4. Factors independently associated with experiencing “low” resilience vs. “normal or “high” resilience, $n = 257$, Table 2

After adjustment on age, time from the beginning of COVID-19 health crisis to the time of questionnaire completion and the country, the following factors were significantly associated with “low” resilience level (vs. “normal” or “high” resilience): living in an urban area (aOR = 2.29 [1.11;4.72], $p = 0.024$), not having developed new professional skills since the beginning of the COVID-19 health crisis (2.01 [1.03;3.93], $p = 0.041$), not having had to separate from their loved ones so as not to expose them to the virus responsible for COVID-19 (4.69 [1.69;13.00], $p = 0.003$) and experiencing discrimination or rejection due to COVID-19 risk from people in public spaces (2.62 [1.20;5.72], $p = 0.015$) (Table 2).

4. Discussion

This study provides important insights on mental health and resilience outcomes among CHW working in CBO involved in the response to HIV in several countries from European, African, and South American regions. Within the framework of the international community-based research program EPIC, participating CBO prioritized CHW for their study population, signaling an awareness of the impact of the COVID-19 crisis on these workers.

The majority of CHW included in this study (76 %) had a “normal” or “high” resilience score which suggests a certain resilience in the community-based system during the crisis. The depression and the anxiety scores among CHW were negatively correlated with the resilience score. Therefore, resilience maybe a protective factor of adverse mental health outcomes during the COVID-19 crisis. These results were consistent with data previously published in other studies which showed that HW were less likely to report higher anxiety, stress and depression levels if they were resilient (moderate or higher score on the resilience scale) (3,33). Regarding factors associated with the low resilience score

among CHW (compared to “normal” or “high” score), we found that living in urban area, not having acquired professional skills since the beginning of the COVID-19 pandemic, not having been separated from their family members or close relatives to protect them from COVID-19 and having experienced discrimination or rejection due to risk of COVID-19 transmission from people in public spaces were all significantly associated with a low resilience score.

Results indicated that CHW living in rural areas were more resilient than CHW living in urban areas. Although the impact of the COVID-19 crisis seemed to be worse among populations in rural areas in terms of unemployment, overall life satisfaction, mental health and finances [35], other studies among HW are in line with our results. A repeated cross-sectional study which compared the practices and experiences of the COVID-19 crisis between HW working in rural and in urban areas showed that HW in rural areas experience less strain and fewer employee absences from work were reported [36]. Another study conducted among HW indicated that working outside the Madrid metropolitan area of Spain was negatively associated with post-traumatic stress [3]. A study which specifically evaluated the psychological distress among HW according to their working areas showed that more rural HW perceived that their workplace provided active support for their mental health during the COVID-19 crisis and that fewer rural HW were exposed to COVID-19 patients compared to the urban HW [34]. However, no significant differences were found in this study between the two groups concerning the prevalence of mental health issues experienced during COVID-19 and both groups reported similarly high levels of resilience [34]. Therefore, the lower resilience of CHW who worked in urban areas could be explained by a potentially higher exposure to COVID-19 and therefore greater strain on their work which could have decreased their resilience.

The present analysis identified two following factors related to self-efficacy [37,38], defined as a belief and a sense of confidence in whether individuals can use their capacity to achieve tasks. First, acquiring skills during the crisis had been a positive factor associated with resilience. Developing news skills linked with the stressful situation could help CHW “bounce back”. Qualitative data collected in the framework of the EPIC program (data not shown) showed that adaptability skills were acquired in addition to the use of online technologies and COVID-19 prevention training. Through these skills, CHW may have been able to restore the previous level of functioning [30] unlike those who did not develop skills during the crisis. Therefore, acquiring skills during the crisis could have increased their self-efficacy, which was associated with resilience in several studies [39–41]. Second, in the same line, results highlighted that CHW who had not left their loved ones to not expose them to the COVID-19 showed lower resilience. The opportunity to protect their loved ones by leaving home also could be a coping strategy which aimed to reduce stress linked to Covid-19 transmission and thus could be a proxy of self-efficacy. A narrative review on positive aspects of COVID-19 trauma showed that self-efficacy, through coping-strategy, was a predictor of a reduction of post-traumatic symptoms [39]. A cross-sectional study conducted among nurses during the COVID-19 outbreak showed that self-efficacy was negatively correlated with anxiety and that nurses who were not confident to cope with the COVID-19 may have felt more anxious [38]. In the event of future health emergencies, it appears relevant to quickly provide medical training to protect HW and CHW but also to increase their self-efficacy, which may contribute to resilience.

Finally, our results showed a “low” resilience score was associated with reporting discriminations or rejection linked to COVID-19 transmission from people in public spaces.

COVID-19-associated discrimination was defined as “a form of discrimination towards individuals who share social or behavioral characteristics with COVID-19 patients but may not necessarily carry the virus” (Labrague et al., 2021; Liu et al., 2020, p. 482). COVID-19-associated discrimination has already documented among HW [43] and a cross-sectional study conducted among nurses showed a

Table 1

Description and comparison of socio-demographic, behavioral and social characteristics of having “Low” resilience and “Normal” or “high” resilience and factors associated with experiencing “Low” resilience versus “Normal” or “high” resilience, univariable model among EPIC CHW respondents, N = 267.

	“Low” resilience (n = 64, 24.0 %)	“Normal” or “high” resilience (n = 203, 76.0 %)	Total (N = 267)	P-value	Univariable model (N = 267)	
	n (%)	n (%)	N (%)		OR [95 %CI]	P-value
<i>Age, median [IQR] (for one unit increase)</i>	33.5 [29.5–40.5]	35.0 [28.0–45.0]	34.0 [28.0–44]	0.590	0.98 [0.95;1.01]	0.191
<i>Time in months since the beginning of COVID-19 health crisis, median [IQR] (for one unit increase)</i>	17.5 [14.2–18.8]	15.1 [13.9–18.7]	15.4 [13.9–18.7]	0.183	1.10 [0.97;1.24]	0.138
<i>Identifies as a woman</i>				0.449		
No	29 (45.3)	103 (50.7)	132 (49.4)		1.00 [1.00;1.00]	
Yes	35 (54.7)	100 (49.3)	135 (50.6)		1.24 [0.71;2.18]	0.449
<i>Current educational level</i>				0.470		
Secondary education	11 (17.7)	28 (14.0)	39 (14.9)		1.00 [1.00;1.00]	
Higher education	51 (82.3)	172 (86.0)	223 (85.1)		0.75 [0.35;1.62]	0.471
<i>Country (association/organization name)</i>				0.054		
Benin (BéSYP)	20 (31.2)	36 (17.7)	56 (21.0)		2.18 [1.09;4.35]	0.027
Spain (CEEISCAT)	27 (42.2)	106 (52.2)	133 (49.8)		1.00 [1.00;1.00]	
Guatemala (CAS)	6 (9.4)	13 (6.4)	19 (7.1)		1.81 [0.63;5.21]	0.270
Colombia (Red Somos and IFARMA)	11 (17.2)	48 (23.7)	59 (22.1)		0.90 [0.41;1.96]	0.790
<i>Current place of residence</i>				0.146		
Urban setting/Big city	47 (73.4)	129 (63.5)	176 (65.9)		1.59 [0.85;2.96]	0.147
Semi-urban environment/ Medium or small city/ Rural setting/Village	17 (26.6)	74 (36.5)	91 (34.1)		1.00 [1.00;1.00]	
<i>Role in the CBO</i>				0.479		
Other (director; coordinator etc)	11 (17.2)	34 (16.7)	45 (16.9)		1.00 [1.00;1.00]	
Community health worker	18 (28.1)	43 (21.2)	61 (22.8)		1.29 [0.54;3.10]	0.564
Community non-health worker (peer educator, mediator, psychologist etc)	35 (54.7)	126 (62.1)	161 (60.3)		0.86 [0.40;1.87]	0.700
<i>Identification with MSM</i>				0.732		
No	40 (62.5)	131 (64.9)	171 (64.3)		1.00 [1.00;1.00]	
Yes	24 (37.5)	71 (35.1)	95 (35.7)		1.11 [0.62;1.98]	0.732
<i>Identification with PLHIV</i>				0.708		
No	56 (87.5)	173 (85.6)	229 (86.1)		1.00 [1.00;1.00]	
Yes	8 (12.5)	29 (14.4)	37 (13.9)		0.85 [0.37;1.97]	0.709
<i>Identification with other key populations</i>				0.584		
No	50 (78.1)	151 (74.8)	201 (75.6)		1.00 [1.00;1.00]	
Yes	14 (21.9)	51 (25.2)	65 (24.4)		0.83 [0.42;1.62]	0.585
<i>Change in financial situation compared to the period before the COVID-19 crisis</i>				0.818		
Yes, better off financially or no, it hasn't changed	31 (48.5)	107 (52.7)	138 (51.7)		1.00 [1.00;1.00]	
Yes, it has deteriorated a bit	23 (35.9)	65 (32.0)	88 (33.0)		1.22 [0.66;2.27]	0.528
Yes, it has deteriorated a lot	10 (15.6)	31 (15.3)	41 (15.3)		1.11 [0.49;2.52]	0.797
<i>Claims about the virus responsible for COVID-19</i>				0.048		
<i>“The virus can only be transmitted by people who have symptoms such as fever and cough”</i>						
True / Don't know	3 (5.9)	28 (17.0)	31 (14.4)		1.00 [1.00;1.00]	
False	48 (94.1)	137 (83.0)	185 (85.6)		3.27 [0.95;11.25]	0.060
<i>“The virus can be transmitted by people who do not have symptoms”</i>				0.651		
True	50 (96.2)	157 (94.6)	207 (95.0)		1.00 [1.00;1.00]	

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Table 1 (continued)

	“Low” resilience (n = 64, 24.0 %)	“Normal” or “high” resilience (n = 203, 76.0 %)	Total (N = 267)	P-value	Univariable model (N = 267)	
	n (%)	n (%)	N (%)		OR [95 %CI]	P-value
False / Don't know	2 (3.8)	9 (5.4)	11 (5.0)		0.70 [0.15;3.34]	0.652
<i>Health severity of COVID-19 if contracted</i>				0.588	1.00 [1.00;1.00]	
Very serious or quite serious	22 (41.5)	62 (37.3)	84 (38.4)			
Neither serious, not serious or not very serious or not serious at all				0.734	0.84 [0.45;1.58]	0.588
<i>Risk of being infected with this new virus (compared to other people in the population of your country - of the same sex, the same age, and in the same state of health as you)</i>						
More important	23 (43.4)	62 (37.3)	85 (38.8)		1.00 [1.00;1.00]	
Roughly equivalent	22 (41.5)	76 (45.8)	98 (44.8)		0.78 [0.40;1.53]	0.471
Less important	8 (15.1)	28 (16.9)	36 (16.4)		0.77 [0.31;1.93]	0.578
<i>Structure affected by the COVID-19 health crisis</i>				0.219	1.00 [1.00;1.00]	
Extremely affected or very affected	13 (52.0)	35 (33.3)	48 (36.9)			
Quite affected				0.163	0.45 [0.17;1.20]	0.110
Not very affected or not affected at all						
<i>Impact of the COVID-19 health crisis on work overall</i>				0.425	1.00 [1.00;1.00]	
Negative	50 (80.6)	142 (71.7)	192 (73.8)			
Not much change/Positive				0.150	0.61 [0.30;1.23]	0.165
<i>Impact of the COVID-19 health crisis on the workload</i>						
Much more work or more work	41 (66.1)	121 (60.5)	162 (61.8)		1.00 [1.00;1.00]	
The same or less work or much less work				0.448	0.78 [0.43;1.43]	0.426
<i>Since the beginning of the COVID-19 health crisis, development of new professional skills</i>						
No	24 (38.7)	58 (29.0)	82 (31.3)		1.55 [0.85;2.80]	0.151
Yes				0.024	1.00 [1.00;1.00]	
<i>Protection from COVID-19 in the workplace</i>						
Completely or very protected or protected	44 (71.0)	167 (83.9)	211 (80.8)		1.00 [1.00;1.00]	
Not very or not at all protected				0.441	2.13 [1.10;4.16]	0.026
<i>In the context of this COVID-19 health crisis, perception of the necessity of their work</i>						
Totally necessary or necessary	56 (91.8)	188 (94.5)	244 (93.8)		1.00 [1.00;1.00]	
Little or not at all necessary or don't know				0.441	1.53 [0.51;4.58]	0.451
<i>Relations with work colleagues since the start of the COVID-19 health crisis</i>						
Better	14 (23.0)	55 (27.6)	69 (26.5)		1.00 [1.00;1.00]	
As before (no change)				0.441	1.18 [0.59;2.36]	0.643
Worst						
No				0.790	1.80 [0.71;4.54]	0.212
<i>Since the beginning of the COVID-19 health crisis, impact of work on personal life</i>						
“I was able to train my entourage in preventive actions against the virus responsible for COVID-19”				0.041	1.00 [1.00;1.00]	
No						
Yes				0.790	1.83 [1.02;3.28]	0.043
<i>“I was afraid of exposing my loved ones to the virus responsible for COVID-19”</i>						
No				0.790	1.00 [1.00;1.00]	
Yes						
No				0.790	0.93 [0.52;1.64]	0.790
Yes						

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Table 1 (continued)

	“Low” resilience (n = 64, 24.0 %)	“Normal” or “high” resilience (n = 203, 76.0 %)	Total (N = 267)	Univariable model (N = 267)	
	n (%)	n (%)	N (%)	P-value	OR [95 %CI] P-value
<i>“I had to separate myself from my loved ones so as not to expose them to the virus responsible for COVID-19”</i>				0.005	
No	56 (91.8)	149 (74.9)	205 (78.8)		1.00 [1.00;1.00]
Yes	5 (8.2)	50 (25.1)	55 (21.2)		0.27 [0.10;0.70] 0.007
<i>“I had more time for my personal life”</i>				0.342	
No	49 (80.3)	148 (74.4)	197 (75.8)		1.00 [1.00;1.00]
Yes	12 (19.7)	51 (25.6)	63 (24.2)		0.71 [0.35;1.44] 0.344
<i>“I had less time for my personal life”</i>				0.800	
No	45 (73.8)	150 (75.4)	195 (75.0)		1.00 [1.00;1.00]
Yes	16 (26.2)	49 (24.6)	65 (25.0)		1.09 [0.57;2.10] 0.800
<i>“My work has had an impact on my psychological well-being”</i>				0.398	
No	43 (70.5)	151 (75.9)	194 (74.6)		1.00 [1.00;1.00]
Yes	18 (29.5)	48 (24.1)	66 (25.4)		1.32 [0.70;2.49] 0.398
<i>“My work has created tensions with my close entourage”</i>				0.619	
No	57 (93.4)	182 (91.5)	239 (91.9)		1.00 [1.00;1.00]
Yes	4 (6.6)	17 (8.5)	21 (8.1)		0.75 [0.24;2.32] 0.620
<u>Experienced discrimination/rejection due to COVID-19 risk:</u>					
<i>From people in public spaces</i>				0.011	
Totally agree or agree	26 (42.6)	45 (23.0)	71 (27.6)		2.48 [1.31;4.70] 0.005
No opinion	8 (13.1)	35 (17.9)	43 (16.7)		0.98 [0.41;2.36] 0.968
Disagree or totally disagree	27 (44.3)	116 (59.2)	143 (55.7)		1.00 [1.00;1.00]
<i>From people in the workplace</i>				0.108	
Totally agree or agree	12 (20.3)	19 (10.0)	31 (12.4)		2.34 [1.04;5.25] 0.040
No opinion	10 (17.0)	34 (17.9)	44 (17.7)		1.09 [0.49;2.41] 0.833
Disagree or totally disagree	37 (62.7)	137 (72.1)	174 (69.9)		1.00 [1.00;1.00]
<i>From my close circle</i>				0.266	
Totally agree or agree	18 (30.5)	43 (22.5)	61 (24.4)		1.38 [0.71;2.68] 0.349
No opinion	6 (10.2)	33 (17.3)	39 (15.6)		0.60 [0.23;1.54] 0.287
Disagree or totally disagree	35 (59.3)	115 (60.2)	150 (60.0)		1.00 [1.00;1.00]
<i>Frequency of exchanges with the beneficiaries of your structure since the start of the COVID-19 health crisis</i>				0.339	
Much more or more frequent	19 (31.2)	66 (33.7)	85 (33.1)		1.00 [1.00;1.00]
Same frequency	21 (34.4)	49 (25.0)	70 (27.2)		1.49 [0.72;3.07] 0.280
Less or much less frequent	21 (34.4)	81 (41.3)	102 (39.7)		0.90 [0.45;1.81] 0.770

significant and negative correlation between COVID-19-associated discrimination and resilience [42].

Our results showed similar results in terms of mental health and resilience score among CHW as reported among HW in previously published research. CHW and HW were also exposed to the same COVID-19-associated discrimination.

Although the results of this global study were based on CHWs who worked in different countries, data concerning resilience did not seem to differ according to country (adjusted variable on country of residence was not significant in the model). Moreover, the study aimed to evaluate resilience among a sample of CHWs and not to provide a comparison between countries. These results could support emerging needs in terms

of pandemic prevention, preparedness and response [17].

Our study has several limitations. Although our results were adjusted on the country, we had a small country sample size. Therefore, the relationship between structural factors and individual mental health outcomes could not be studied. Our results were not representative of all CHW living in those countries and the recruitment method did not allow to compare CHW who accepted to participate in the study with those who refused. Computer literacy and availability also could have impacted the profile of respondents in this study.

The majority of CHW who participated in this study worked in organizations in the Coalition PLUS network; Coalition PLUS provided support, if needed, during the COVID-19 crisis. This could have affected

Table 2

Factors independently associated with experiencing “Low” resilience versus “Normal” or “high” resilience, multivariable model (N = 257).

	Multivariable Model (N = 257)	
	aOR [95 % CI]	P-value
Age, median [IQR] (for one year increase)	0.97 [0.94;1.01]	0.106
Time in months between the beginning of COVID-19 health crisis of each country and the completion of the questionnaire, median [IQR] (for one month increase)	0.88 [0.63;1.23]	0.460
Country (association name)		
Benin (BéSYP)	2.23 [0.41;12.24]	0.357
Spain (CEEISCAT)	1.00 [1.00;1.00]	
Guatemala (CAS)	2.21 [0.22;21.82]	0.498
Colombia (Red Somos and IFARMA)	0.72 [0.19;2.65]	0.617
Current place of residence		
Urban setting/Big city	2.29 [1.11;4.72]	0.024
Semi-urban environment/ Medium or small city/ Rural setting/Village	1.00 [1.00;1.00]	
Since the beginning of the COVID-19 health crisis, development of new professional skills		
No	2.01 [1.03;3.93]	0.041
Yes	1.00 [1.00;1.00]	
Since the beginning of the COVID-19 health crisis, impact of work on personal life: “I had to separate myself from my loved ones so as not to expose them to the virus responsible for COVID-19”		
No	4.69 [1.69;13.00]	0.003
Yes	1.00 [1.00;1.00]	
Experienced discrimination/rejection due to COVID-19 risk from people in public spaces		
Totally agree or agree	2.62 [1.20;5.72]	0.015
No opinion	0.87 [0.34;2.21]	0.762
Disagree or totally disagree	1.00 [1.00;1.00]	

their resilience. Additionally, we did not have a baseline resilience score (i.e., before the COVID-19 crisis) to compare our results. It is possible that CHW with “low” resilience score already had low(er) resilience before the COVID-19 crisis. Finally, due to the flexible nature of the EPIC program, certain sections of the questionnaire were not mandatory as to not overburden respondents during COVID-19 crisis. This, in turn, limited the number of countries that could be included in this analysis and in general, limits the themes that could be explored in other multi-country statistical analyses.

Our study focused on the resilience at an individual-level, however, to be efficient, resilience should also be considered at the system-level. Individual adaptation with a stressful environment is time-limited and individual coping strategies will be minimized in such a context [6]. The focus on resilience at individual level should not downplay structural issues [6].

However, despite these limitations, this study provides important evidence concerning CHW experiences of COVID-19 crisis.

5. Conclusion

The present study showed a large majority of “normal” or “high” resilience scores among CHW and the protective effect of resilience on mental health outcome measured, highlighting the resilience in the HIV community-based system during the COVID-19 crisis. Associated factors with a “low” resilience score showed the necessity to train CHW to increase their skills and their feeling of self-efficacy involved in the resilience process. The community-based health systems, and public/private health systems, should pay special attention to CHW, in the same manner as HW, regarding their mental health and overall well-being.

These systems should not only recognize the important role of CHW in public health responses against HIV and other infectious diseases, but also provide a supportive environment in which these frontline workers can be protected and thrive.

CRedit authorship contribution statement

Marion Di Ciaccio: Writing – review & editing, Writing – original draft, Conceptualization. **Nicolas Lorente:** Project administration. **Virginie Villes:** Writing – review & editing, Methodology, Formal analysis. **Axel Akpaka Maxence:** Project administration, Investigation. **Claudia Marcela Vargas Pelaez:** . **José Rafael Guillen:** . **Ingrid Castillo:** Project administration, Investigation. **Cinta Folch:** Project administration, Investigation. **Rokhaya Diagne:** Data curation. **Lucas Riegel:** Supervision, Project administration. **Rosemary M. Delabre:** Writing – review & editing, Validation, Supervision, Methodology, Conceptualization. **Daniela Rojas Castro:** Writing – review & editing, Project administration, Methodology, Funding acquisition, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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