

Working Conditions and Practice Adaptations among Nurses and Midwives During the COVID-19 Pandemic in Huambo, Angola: A Mixed-Methods Study

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Abstract

Background

Evidence on how nurses and midwives experienced pandemic-related working conditions and practice changes remains limited in Angola. This study examined working conditions, organizational responses, and changes in nursing and midwifery practice during the COVID-19 pandemic in Huambo.

Methods

This convergent mixed-methods study included 309 nursing and midwifery professionals. Data were collected between October 2024 and September 2025 through a self-administered electronic or paper survey eliciting retrospective accounts of pandemic experiences. Structured responses underwent descriptive analysis and exploratory comparisons of additional work completion time by selected workplace conditions. Responses to two open-ended questions underwent thematic analysis. Findings were integrated using the four-stage Pillar Integration Process.

Results

Participants included 267 nursing professionals (86.4%) and 42 midwifery professionals (13.6%); 193 (62.5%) reported hospital employment. Personal protective equipment was unavailable for 92 participants (29.8%), oxygen for 127 (41.1%), and mechanical ventilators for 152 (49.2%). Employer-provided mental health support was absent for 130 participants (42.1%), 126 (40.8%) reported additional time to finish work, 171 (55.3%) reported temporary or permanent redeployment during the pandemic, and 65 (21.0%) reported workplace violence. Exploratory analyses identified no clear association between additional completion time and the four workplace factors examined. Four qualitative themes concerned work reorganization, intensified biosafety and practice adaptation, uneven institutional responses, and fear and altered interpersonal relations. Integration generated three insights: work reorganization was heterogeneous; biosafety became central to practice under uneven material conditions; and organizational support was multidimensional, with provision in one domain sometimes coexisting with gaps in another.

Conclusions

Nurses and midwives in Huambo described varied adaptations to material, organizational, and relational conditions during the pandemic. The findings identify context-specific priorities for preparedness planning, including reliable resources, adaptable staffing, infection-prevention capacity, and coordinated workforce support. The retrospective, non-probability design limits causal inference and population-level generalization.

Trial registration: Not applicable.

Background

Nurses and midwives are central to the functioning of health systems and to maintaining essential services during public health emergencies. The COVID-19 pandemic placed exceptional demands on this workforce, requiring rapid changes in staffing, infection-prevention practices, service organization, and the allocation of material resources. These experiences reinforced that emergency preparedness depends not only on the availability of health workers, but also on whether they are adequately trained, protected, supported, and organized to respond to changing service demands. The continuing importance of a sufficiently resourced and supported nursing workforce is reflected in current global health workforce priorities [1,2].

In May 2025, the World Health Assembly adopted the WHO Pandemic Agreement through resolution WHA78.1, establishing a global normative framework for strengthening pandemic prevention, preparedness, and response [3]. Article 6 emphasizes resilient health systems and the capacity to maintain essential health services, while Article 7 focuses specifically on developing, strengthening, protecting, safeguarding, retaining, and investing in an adequate, trained, and supported health and care workforce. These provisions reinforce the central role of nurses and midwives and highlight the importance of empirical evidence on working conditions, organizational support, resource availability, and professional adaptation to inform future preparedness strategies.

These challenges were particularly relevant across African health systems, where the pandemic intersected with longstanding workforce and resource constraints that varied substantially within and between countries. Multicountry evidence documented context-dependent limitations in access to personal protective equipment and other essential resources among healthcare workers, while supply-chain disruptions further constrained access to medical supplies in many African settings [4,5]. At the same time, countries across the WHO African Region adopted workforce strategies involving training, recruitment or redeployment, worker protection, and other organizational responses [2].

Angola, a Portuguese-speaking country in south-western Africa, emerged from nearly three decades of civil war in 2002 and has rebuilt its health system under chronic underfunding, with public health expenditure of about 2.55% of gross domestic product in 2018 [6], limited population coverage of essential services, and marked inequalities in the subnational distribution of nurses [7]. The system also carries a high burden of communicable diseases such as malaria and tuberculosis [6]. Nursing care in Angola is delivered by several professional groups and qualification levels, including nurses, nursing technicians, and nursing auxiliaries. The framework also differentiates professional categories by educational qualifications, specialization, and career grade [8]. In this study, “nursing professionals” and “midwifery professionals” refer to participants who identified themselves as nurses or as midwives in the survey, irrespective of qualification level. Huambo Province, located in the Central Plateau of Angola, covers an area of 35,771 km² and has an estimated population of 2,691,902 inhabitants distributed across 17 municipalities [9], served by a provincial general hospital, municipal hospitals and a network of primary health centers. Angola confirmed its first COVID-19 cases in March 2020 and declared a state of emergency that month, with successive waves through 2021–2022 [10].

In Angola, COVID-19 placed additional demands on a health system already facing workforce and material-resource limitations. Early analyses identified challenges related to health-system capacity and access to protective and clinical resources, while broader workforce analyses have documented unequal distributions of nursing personnel across subnational settings [6,7]. Recent Angolan evidence also underscores the importance of managerial preparation and institutional structures in shaping nursing leadership and organizational capacity [11].

Despite increasing evidence on the effects of COVID-19 on healthcare workers in Africa, less is known about how working conditions, organizational responses, and changes in everyday nursing and midwifery practice interacted within specific local health-system contexts. Regional and multicountry studies provide important evidence on workforce governance and resource availability, but may not capture how organizational measures were experienced and translated into day-to-day professional practice in settings such as Huambo [2,4]. Examining quantitative indicators alongside professionals' own accounts can provide a more contextualized understanding of how nursing and midwifery work was reorganized during a major public health emergency. To our knowledge, no published study has examined the working conditions of nurses and midwives during COVID-19 in Angola or in other Portuguese-speaking African countries, where health-workforce evidence remains scarce.

Accordingly, this study aimed to examine working conditions, organizational responses, and changes in nursing and midwifery practice during the COVID-19 pandemic in Huambo, Angola, using a mixed-methods approach.

Methods

Study design

We conducted a convergent mixed-methods study linked to the international Global Consortium of Nursing & Midwifery Studies (GCNMS). The quantitative strand consisted of a cross-sectional analysis of structured survey responses, while the qualitative strand comprised thematic analysis of open-ended survey responses. Combining these strands allowed the distribution of reported working conditions to be considered alongside participants' accounts of practice adaptations and organizational responses. Both types of data were collected within the same survey, analyzed separately, and subsequently integrated during interpretation. Reporting was informed by the STROBE statement for the quantitative component [12] and the Good Reporting of a Mixed Methods Study (GRAMMS) recommendations [13]. A mixed-methods approach was chosen because structured indicators alone could not show how organizational measures were experienced in everyday practice, while open-ended accounts alone could not show how widespread the reported conditions were. The two strands were collected concurrently within the same instrument, analyzed separately, and given equal priority in the integration.

Data were collected between October 2024 and September 2025; 307 of the 309 questionnaires were completed between April and September 2025. Because data collection occurred after the end of the

public health emergency, participants were asked to report retrospectively on their professional experience during the COVID-19 pandemic as a whole; no specific reference period was imposed, so accounts may refer to different phases of the pandemic.

Setting, participants, and recruitment

The study was conducted in Huambo Province, Angola, and included nursing and midwifery professionals who had worked in professional roles during the COVID-19 pandemic. Participants were recruited using non-probability convenience and snowball approaches. Members of the research team and local professional networks disseminated study invitations through professional and personal networks and digital communication channels. Electronic recruitment was complemented by paper-based questionnaires distributed in health-service settings to facilitate participation where digital access was limited. Eligible participants were nurses or midwives who had worked in any professional role in Huambo Province during the pandemic; professionals who were on vacation, sick leave or other leave throughout the period of interest were excluded. Paper questionnaires were distributed and collected in health-service settings by the Angolan master's-level researchers on the team (HCK, BCNGCS), not by service managers, and were subsequently entered into the Qualtrics database by the research team. The exact numbers of paper and electronic questionnaires were not recorded. Because recruitment relied on snowball sampling, a response rate could not be calculated.

The final analytic sample comprised 309 participants. Partial questionnaire completion was not used as a criterion for excluding participants from the overall study sample; instead, item-specific denominators were used according to the availability and interpretability of each response.

Data collection and measures

Data were collected using a self-administered questionnaire available electronically through Qualtrics XM Survey and, when needed, in paper format. Paper responses were subsequently entered into the digital study database by the research team. The broader GCNMS questionnaire included structured and open-ended items addressing sociodemographic and professional characteristics and multiple aspects of healthcare work during the COVID-19 pandemic. The questionnaire was administered in Portuguese. It comprised a sociodemographic section and a section on professional practice during the pandemic covering seven domains: mental health, workplace response, burnout, economic impacts, migration intention and attrition, care management, and occupational risks. The electronic version displayed one item per screen with expandable text boxes for open-ended items, offered a “prefer not to answer” option for every item, and allowed participants to review their responses before submission. The platform was configured not to record names, e-mail addresses or specific workplace identifiers.

The present analysis focused on variables directly related to working conditions and professional practice, including professional and demographic characteristics, workplace setting, training in personal

protective equipment (PPE), employer-provided mental health support, training to address patients' spiritual, emotional or psychological support needs, availability of essential resources, additional time required to prepare for and complete work, redeployment to another unit or role during the pandemic, exposure to workplace violence, and confirmed COVID-19 infection. Professional characteristics also included years of professional experience, predominant area of care, specialty certification, primary role, employer sector and type of employment.

The qualitative component drew on two open-ended questions designed to capture participants' accounts of pandemic-related changes in professional practice and employer responses. Participants were asked to describe: (1) how their nursing or midwifery practice changed during the pandemic; and (2) how their employer responded to the pandemic, including what was done well and what could have been improved. Open-ended survey questions can provide qualitative accounts within a broader survey, although they offer fewer opportunities for clarification and probing than interviews [14].

Quantitative analysis

Quantitative analyses were conducted using IBM SPSS Statistics, version 29.0. Categorical variables were summarized using absolute and relative frequencies. Percentages based on the full analytic sample (N = 309) retained missing responses, uncertainty, and preference not to answer as distinct categories. For selected indicators, proportions were additionally calculated among participants providing substantive responses, with 95% Wilson confidence intervals without continuity correction. Continuous age data were summarized using the mean and standard deviation and the median and interquartile range. Descriptive comparisons of key indicators between nursing and midwifery professionals and between women and men are presented in Additional file 3; these comparisons are descriptive and were not tested for statistical significance.

No missing data were imputed. Analyses requiring classifiable responses used item-specific denominators. Responses such as "prefer not to answer," "do not know," and missing values were retained in descriptive distributions but excluded from comparisons requiring substantive or dichotomous classification.

Exploratory analyses examined whether reported additional time required to finish work (yes versus no) differed according to four workplace factors: PPE availability, employer-provided mental health support, adequate PPE training, and hospital versus other stated workplace settings. These comparisons were defined during manuscript revision and were not prospectively registered hypotheses. PPE availability was classified as unavailable/rarely available versus sometimes/usually/always available; absence of employer-provided mental health support was compared with partial or adequate support; absence versus presence of adequate PPE training was compared; and hospital settings were compared with other stated workplaces.

Crude prevalence ratios and log-scale 95% confidence intervals are reported for the four primary comparisons. Two-sided Fisher exact tests were used for the four primary comparisons, and p-values were adjusted using the Holm procedure. Confidence intervals were not adjusted for multiplicity. Two sensitivity analyses examined alternative classifications: including “sometimes available” within the lower PPE-availability category and comparing no employer support with adequate support only, excluding partial support. No multivariable model was fitted because the analyses were exploratory and no prespecified causal model or confounder set had been defined for this manuscript.

Qualitative analysis

Open-ended survey responses were analyzed thematically, drawing on the iterative procedures described by Braun and Clarke [15,16]. The analysis began with repeated reading of the responses to support familiarization with the material, followed by inductive coding of content related to working conditions, organizational responses, and changes in professional practice. Related codes were then organized into provisional thematic patterns, which were iteratively reviewed against the original response corpus and refined to strengthen conceptual coherence and fidelity to participants’ accounts. Four interrelated themes were retained to represent the qualitative findings. Themes were developed to capture patterns of meaning across the corpus rather than to quantify response frequency; frequency of occurrence was therefore not used as a criterion for thematic importance. Coding was conducted manually in Portuguese by two Angolan master’s-level researchers (HCK, BCNGCS), with support from two Brazilian doctoral researchers (BCG, SMAF) and under the supervision of JLGS, who has expertise in mixed-methods research. Provisional codes and themes were discussed by the team until agreement on the final thematic structure was reached.

The qualitative corpus comprised 225 response units concerning changes in professional practice and 223 response units concerning employer responses. These figures refer to response units rather than distinct qualitative samples, as participants could provide responses to both open-ended questions. Quotations were translated from Portuguese into English by a translator and verified against the originals by the principal investigator, who is proficient in English; they were lightly edited for readability (spelling and punctuation) while preserving the substance of participants’ accounts. No content was added, and responses from different participants were not combined. The original Portuguese quotations are provided in Additional file 2.

Mixed-methods integration

Quantitative and qualitative findings were integrated using the Pillar Integration Process (PIP), a joint-display technique for developing integrated interpretations [17]. Integration focused on findings directly related to working conditions, organizational responses, and changes in nursing and midwifery practice. Making the purpose, procedures, and interpretive contribution of integration explicit is consistent with the guidance of Fàbregues et al. [18].

The PIP proceeded through four sequential stages: listing, matching, checking, and pillar building. During listing, relevant quantitative data and their conceptual categories were positioned on one side of the joint display, while qualitative categories and selected illustrative excerpts were positioned on the opposite side. During matching, conceptually related findings from the two strands were horizontally aligned, while unmatched or contrasting findings were retained rather than forced into correspondence. During checking, matches and apparent gaps were reviewed against the original quantitative outputs and qualitative response corpus to assess their accuracy and completeness. Finally, during pillar building, the quantitative and qualitative categories were compared and synthesized into higher-order integrated themes positioned in the central column of the joint display. The resulting pillars represented insights generated through integration rather than reproductions of the qualitative themes. Qualitative findings without a direct quantitative counterpart (Theme 4) were retained in the analysis and discussed, but were not forced into a pillar.

Integration was used to identify patterns, heterogeneity, complementarity, and gaps between strands rather than to treat qualitative findings as confirmation of statistical associations.

Ethical considerations

The global GCNMS study protocol was approved by the New York University Institutional Review Board (IRB-FY2020-4440). Data collection in Angola was conducted under this approved multicountry protocol, with institutional and ethical endorsement from the Federal University of Santa Catarina (UFSC), Brazil, which coordinated the Angolan component in partnership with the José Eduardo dos Santos University (UJES), Huambo, within the UJES–UFSC master’s program through which the study was developed. All participants provided informed consent before completing the survey. Electronic participants provided digital consent, while participants completing paper questionnaires provided written consent before data collection. The analytic dataset did not include direct personal identifiers.

Generative artificial intelligence use

Generative artificial intelligence (OpenAI ChatGPT) was used during manuscript development to support language editing, translation and manuscript organization. All AI-assisted outputs were critically reviewed and revised by the authors, who take full responsibility for the accuracy, integrity, and final content of the manuscript.

Results

Participant characteristics

The study included 309 nursing and midwifery professionals working during the COVID-19 pandemic in Huambo, Angola. Of these, 267 (86.4%) were nursing professionals and 42 (13.6%) were midwifery

professionals. Women accounted for 205 participants (66.3%) and men for 98 (31.7%); the remaining responses were classified as “prefer not to answer” (n = 4; 1.3%) or uninterpretable/unspecified (n = 2; 0.6%), as shown in Table 1.

The mean age of participants was 33.6 years (SD 8.8), with a median of 32 years (IQR 27–39.25) and an observed range of 18–60 years. Hospital employment was reported by 193 participants (62.5%). Regarding workplace location, 147 participants (47.6%) reported working in urban settings, 69 (22.3%) in suburban settings, and 35 (11.3%) in rural settings. With respect to educational attainment, 160 participants (51.8%) held a bachelor’s degree (Table 1). Nearly half of the participants (149; 48.2%) had six or fewer years of professional experience, 105 (34.0%) held a specialty certification, 199 (64.4%) were frontline practitioners, and 236 (76.4%) worked for public employers. The most frequent areas of care were labor and delivery, obstetrics or maternal–child health (85; 27.5%), intensive care (47; 15.2%) and general medicine (38; 12.3%) (Table 1).

Table 1
Sociodemographic and professional characteristics of nursing and midwifery professionals, Huambo, Angola, 2024–2025 (N = 309)

Characteristic	Category	n (%) or summary
Professional group	Nursing	267 (86.4)
	Midwifery	42 (13.6)
Gender	Female	205 (66.3)
	Male	98 (31.7)
	Prefer not to answer	4 (1.3)
	Uninterpretable/unspecified	2 (0.6)
Age, years	Mean (SD)	33.6 (8.8)
	Median (IQR)	32 (27–39.25)
	Valid age responses	308
Education	Technical/diploma/associate	57 (18.4)
	Bachelor's degree	160 (51.8)
	Master's degree	21 (6.8)
	Prefer not to answer	55 (17.8)
	Missing	16 (5.2)
Workplace setting	Hospital	193 (62.5)
	Primary or community-based care	29 (9.4)
	Ambulatory/outpatient care	18 (5.8)
	Home health care	4 (1.3)
	Staffing agency	3 (1.0)
	Other	21 (6.8)
	Prefer not to answer	25 (8.1)
	Missing	16 (5.2)
Workplace location	Urban	147 (47.6)
	Suburban	69 (22.3)
	Rural	35 (11.3)
	Prefer not to answer	42 (13.6)

Characteristic	Category	n (%) or summary
	Missing	16 (5.2)
Years of professional experience	0–3 years	64 (20.7)
	4–6 years	85 (27.5)
	7–10 years	23 (7.4)
	11–15 years	29 (9.4)
	16–20 years	34 (11.0)
	21 years or more	17 (5.5)
	Prefer not to answer	41 (13.3)
	Missing	16 (5.2)
Specialty certification	Yes	105 (34.0)
	No	188 (60.8)
	Missing	16 (5.2)
Primary role	Practitioner or frontline worker	199 (64.4)
	Educator	39 (12.6)
	Management/administrator	21 (6.8)
	Other	34 (11.0)
	Missing	16 (5.2)
Predominant area of care	Labor and delivery/obstetrics/maternal–child health	85 (27.5)
	Intensive care unit	47 (15.2)
	General medicine	38 (12.3)
	Intermediate or step-down unit	30 (9.7)
	Public or community health	24 (7.8)
	Emergency department	22 (7.1)
	General surgery or operating room	12 (3.9)
	Other	14 (4.5)
	Prefer not to answer	21 (6.8)

Characteristic	Category	n (%) or summary
Employer sector	Missing	16 (5.2)
	Public	236 (76.4)
	Private	27 (8.7)
	Not-for-profit, non-governmental or other	11 (3.6)
	Prefer not to answer	19 (6.1)
	Missing	16 (5.2)
Type of employment	Full-time	151 (48.9)
	Part-time (< 24 h/week)	46 (14.9)
	Per-diem	49 (15.9)
	Temporary contract	22 (7.1)
	Other	25 (8.1)
	Missing	16 (5.2)

Notes. Percentages use the full sample (N = 309) unless otherwise indicated

Working conditions, organizational support, and occupational exposure

Substantial variation was observed in reported access to resources and organizational support. PPE was reported as unavailable by 92 participants (29.8% of the full sample), oxygen and related equipment by 127 (41.1%), and mechanical ventilators by 152 (49.2%). Each resource item had 288 completed responses and 21 missing responses.

Adequate PPE training was reported by 175 participants, whereas 85 (27.5% of the full sample; 32.7% of substantive responses) reported not receiving adequate training. Lack of training to address patients' spiritual, emotional, or psychological support needs was reported by 177 participants (57.3% of the full sample; 68.6% of the 258 substantive responses). Employer-provided mental health support also varied: 130 participants (42.1%) reported no appropriate support, 76 (24.6%) partial support, and 71 (23.0%) adequate support.

Additional time to prepare for work was reported by 108 participants (35.0% of the full sample). Additional time to finish work was reported by 126 (40.8%). Among the 221 participants who provided a yes/no response to the latter item, 57.0% (95% CI 50.4–63.4) reported requiring additional time. Among

those reporting additional completion time, 55 (43.7%) reported less than one additional hour, 33 (26.2%) between one and two hours, and 38 (30.2%) more than two hours. Confirmed COVID-19 infection was reported by 37 participants (12.0% of the full sample; 12.8% of the 288 substantive responses). Four of these participants reported working while infected, including two who reported doing so under threat of employment loss (Table 2). Redeployment to another unit or role during the pandemic was reported by 171 participants (55.3% of the full sample; 68.4% of the 250 substantive responses), permanently for 117 (37.9%) and temporarily for 54 (17.5%). Workplace violence during the pandemic was reported by 65 participants (21.0% of the full sample; 25.1% of the 259 substantive responses); free-text descriptions referred mainly to aggression or threats from patients and family members, hostility from the public who did not believe that COVID-19 existed, and vandalism of health facilities (Table 2). In descriptive comparisons, midwifery professionals reported unavailability of oxygen (30/40, 75.0% vs 115/248, 46.4%) and mechanical ventilators (33/40, 82.5% vs 129/248, 52.0%) and absence of employer-provided mental health support (31/40, 77.5% vs 99/237, 41.8%) more often than nursing professionals, whereas redeployment was reported less often (13/35, 37.1% vs 158/215, 73.5%); differences between women and men were small (Additional file 3).

Table 2

Working conditions, organizational support, resources, work-time demands, and occupational exposure during COVID-19 (N = 309) A. Organizational support and training

Variable	Response	n (%)
Employer-provided mental health support	No	130 (42.1)
	Partial	76 (24.6)
	Yes	71 (23.0)
	Prefer not to answer	27 (8.7)
	Not sure	5 (1.6)
Adequate PPE training	Yes	175 (56.6)
	No	85 (27.5)
	Prefer not to answer	25 (8.1)
	Not sure	3 (1.0)
	Missing	21 (6.8)
Training to address patients' spiritual, emotional, or psychological support needs	No	177 (57.3)
	Yes	81 (26.2)
	Prefer not to answer	25 (8.1)
	Not sure	5 (1.6)
	Missing	21 (6.8)

B. Availability of resources

Resource	Not available	Rarely	Sometimes	Usually	Always	Missing
Evidence-based medications	108 (35.0)	16 (5.2)	84 (27.2)	33 (10.7)	47 (15.2)	21 (6.8)
Personal protective equipment	92 (29.8)	19 (6.1)	82 (26.5)	38 (12.3)	57 (18.4)	21 (6.8)
Intravenous equipment	96 (31.1)	17 (5.5)	79 (25.6)	56 (18.1)	40 (12.9)	21 (6.8)
Oxygen and related equipment	127 (41.1)	18 (5.8)	71 (23.0)	39 (12.6)	33 (10.7)	21 (6.8)
Mechanical ventilators	152 (49.2)	10 (3.2)	71 (23.0)	31 (10.0)	24 (7.8)	21 (6.8)

C. Additional work time and occupational exposure

Variable	Response	n (%)
Additional time required to prepare for work	Yes	108 (35.0)
	No	109 (35.3)
	Prefer not to answer	51 (16.5)
	Not sure	18 (5.8)
	Missing	23 (7.4)
Duration among those reporting additional preparation time (n = 108)	< 1 hour	57 (52.8)
	> 1 to < 2 hours	24 (22.2)
	> 2 hours	26 (24.1)
	Missing duration	1 (0.9)
Additional time required to finish work	Yes	126 (40.8)
	No	95 (30.7)
	Prefer not to answer	53 (17.2)
	Not sure	11 (3.6)
	Missing	24 (7.8)
Duration among those reporting additional completion time (n = 126)	< 1 hour	55 (43.7)
	> 1 to < 2 hours	33 (26.2)
	> 2 hours	38 (30.2)
Confirmed COVID-19 infection	Yes	37 (12.0)
	No	251 (81.2)
	Missing	21 (6.8)
Worked while infected (among n = 37)	No	33 (89.2)
	Yes	2 (5.4)
	Yes, under threat of job loss	2 (5.4)
Redeployed to another unit or role during the pandemic	Yes, permanently	117 (37.9)

Notes. Percentages use the full analytic sample (N = 309), except for explicitly indicated conditional distributions. Missing, uncertain, and preference-not-to-answer responses were retained as separate categories. Resource availability was assessed using the original five response categories. PPE, personal protective equipment.

Variable	Response	n (%)
	Yes, temporarily	54 (17.5)
	No	79 (25.6)
	Prefer not to answer	37 (12.0)
	Missing	22 (7.1)
Experienced workplace violence during the pandemic	Yes	65 (21.0)
	No	194 (62.8)
	Prefer not to answer	39 (12.6)
	Not sure	11 (3.6)

Notes. Percentages use the full analytic sample (N = 309), except for explicitly indicated conditional distributions. Missing, uncertain, and preference-not-to-answer responses were retained as separate categories. Resource availability was assessed using the original five response categories. PPE, personal protective equipment.

Exploratory associations with additional time to finish work

Exploratory analyses showed no clear evidence that additional time required to finish work differed according to PPE availability, employer-provided mental health support, adequate PPE training, or hospital versus other workplace settings. The crude prevalence ratio was 1.00 (95% CI 0.79–1.27) for unavailable or rarely available PPE versus sometimes, usually, or always available PPE; 0.90 (0.70–1.14) for no employer mental health support versus partial or adequate support; 0.86 (0.64–1.14) for no adequate PPE training versus adequate training; and 1.09 (0.83–1.43) for hospital versus other stated workplace settings. All Holm-adjusted p-values were 1.000 (Additional file 1). These analyses were exploratory and unadjusted and should not be interpreted as evidence of equivalence or independent effects.

Qualitative findings

The qualitative component focused on open-ended responses describing changes in professional practice during the pandemic and employers' responses to the pandemic. Four interrelated themes described how nursing and midwifery work was reorganized and experienced during the pandemic.

Theme 1. Reorganizing work under staffing and resource constraints

Participants described changes in staffing, work schedules, workload, and the allocation of personnel during the pandemic. In some services, reductions in staffing were accompanied by increased work demands:

"The pandemic led to reductions in work groups and teams, increasing the workload." (P227)

Similar accounts described reduced staffing within shifts, doubled shifts, or additional work responsibilities. Resource limitations, particularly in relation to PPE and other materials, were also reported. These accounts are consistent with the high proportion of participants who reported temporary or permanent redeployment (55.3%).

“My employer did not respond adequately to the pandemic because it did not provide a sufficient amount of personal protective equipment. In addition, it did not provide an isolation area for patients who tested positive for COVID-19.” (P188)

These experiences, however, were not uniform. Other participants described reduced working hours or lower patient demand. Thus, the pandemic altered the organization of work in different directions depending on workplace circumstances.

Accounts of reduced activity included:

“Work shifts were reduced.” (P167)

“Professional practice improved because there was more time to devote to patients; demand decreased and care improved.” (P104)

Theme 2. Intensifying biosafety and adapting care practices

Participants described an intensification of biosafety practices. Participants referred to greater use of PPE, hand hygiene, environmental cleaning, distancing, screening, and stricter infection-prevention procedures. For some, practices that had previously been intermittent became routine:

“My nursing practice changed because, before COVID-19, I did not usually use biosafety equipment unless the situation was serious. Now I use personal protective equipment constantly to protect myself.” (P149)

Changes also affected patient flows and the organization of clinical care:

“The changes affected how materials were handled, and patients had a specific flow to follow because of the high level of disease transmission.” (P97)

Participants also described mandatory screening, epidemiological surveillance, distancing, and changes in close-contact care. Midwifery participants described intensified hygiene measures and mandatory mask use during labor and delivery. These accounts indicate that biosafety extended beyond the use of protective equipment to encompass patient flows, clinical routines, and patterns of interpersonal contact.

For example:

"During the COVID-19 pandemic, as midwives we redoubled hygiene practices, and prevention measures were introduced, such as mask use by women in labor and by health professionals." (P182)

"My work in the delivery room — you cannot imagine how hard it was to hear everywhere about transmission by contact; the patient wants to hold you, take off your mask, grab you. That situation was a big problem for me." (P157)

Theme 3. Experiencing uneven institutional responses

Employer responses were described as heterogeneous and multidimensional. Participants reported provision of PPE, training, isolation or testing areas, hygiene measures, psychological support, and encouragement of teamwork. At the same time, the same workplaces could present important deficiencies in other domains. Logistical and employment-related limitations were also reported:

"My employer created conditions to deal with the pandemic. However, transportation was not provided for employees." (P101)

Other accounts referred to delayed salaries, absence of risk allowances, staffing shortages, or incomplete PPE provision. Conversely, some participants described adequate psychological support, sufficient protective materials, and effective teamwork. Organizational support was therefore experienced across multiple domains rather than as a single uniformly positive or negative response.

Illustrative accounts of these contrasting domains included:

"The institution did not pay the risk allowance. During the pandemic, we put our own children at risk." (P112)

"The good points of my employer related to compliance with biosafety rules. The negative points were the reduction in staff and a drastic reduction in salary." (P2)

"What it did well: it provided training and psychological and moral support for all staff." (P83)

Theme 4. Working with fear, uncertainty, and altered interpersonal relations

Changes in clinical practice occurred in the context of uncertainty about infection and altered interpersonal contact. Participants described fear of becoming infected and, in some cases, concern about transmitting the infection to family members:

"As a professional, nothing changed, but sometimes the fear of becoming infected was stronger." (P155)

"The way we cared for patients changed considerably. There was greater protection through biosafety measures, and stress and panic because of the fear of becoming infected and of transmitting it to my family." (P248)

Uncertainty also related to patients' infection status and to changing work conditions. Participants described distancing between colleagues, reduced physical contact, and changes in customary interpersonal interactions. Some also referred to prolonged confinement during the pandemic:

"During the pandemic, we were confined for a long time." (P172)

Thus, infection prevention changed not only technical procedures but also proximity and interaction within nursing and midwifery work.

Integration of quantitative and qualitative findings

Quantitative and qualitative findings were integrated using the Pillar Integration Process. Following the listing, matching, and checking stages, three higher-order integrated themes were generated during pillar building (Table 3). The pillars represent insights arising from comparison and synthesis of the two strands rather than reproductions of the qualitative themes.

Table 3

Pillar Integration Process integrating quantitative and qualitative findings on nursing and midwifery work during COVID-19

QUAN data	QUAN categories	PILLAR BUILDING THEMES	QUAL categories	QUAL illustrative excerpts
Redeployed temporarily or permanently: 171/309 (55.3%). Additional time to finish work: 126/309 (40.8%); additional preparation time: 108/309 (35.0%). Exploratory analyses showed no clear association between additional completion time and PPE availability, employer-provided mental health support, PPE training, or hospital employment.	Reported redeployment and additional preparation and completion time	Pandemic work was reorganized unevenly rather than through a uniform pattern of overload	Staffing reductions; increased workload; altered shifts; contrasting experiences of reduced shifts or lower demand	"The pandemic led to reductions in work groups and teams, increasing the workload." (P227)
Adequate PPE training: 175/309 (56.6%); no adequate PPE training: 85/309 (27.5%). PPE unavailable: 92/309 (29.8%); oxygen unavailable: 127/309 (41.1%); mechanical ventilators unavailable: 152/309 (49.2%). Confirmed COVID-19 infection: 37/309 (12.0%).	Variable preparedness, resource availability, and reported infection	Biosafety became an organizing principle of practice under uneven material conditions	Intensified use of PPE and hygiene measures; patient-flow reorganization; screening and surveillance; distancing; adaptations in close-contact care; uncertainty about infection	"Before COVID-19, I did not usually use biosafety equipment unless the situation was serious. Now I use PPE constantly to protect myself." (P149) "The changes affected how materials were handled, and patients had a specific flow to follow because

Notes. QUAN = quantitative; QUAL = qualitative; PPE = personal protective equipment. Quantitative percentages are based on the full analytic sample (N = 309). The PIP was developed through listing, matching, checking, and pillar-building stages. The central pillars represent higher-order insights generated through integration and do not reproduce the qualitative themes. Illustrative quotations were translated from the original Portuguese responses and linked to participant identifiers.

QUAN data	QUAN categories	PILLAR BUILDING THEMES	QUAL categories	QUAL illustrative excerpts
				of the high level of disease transmission.” (P97)
Employer-provided mental health support: 130/309 (42.1%) no, 76/309 (24.6%) partial, 71/309 (23.0%) yes. Lack of training to address patients’ spiritual, emotional, or psychological support needs: 177/309 (57.3%).	Variation across distinct dimensions of institutional support	Organizational support was multidimensional: provision in one domain could coexist with substantial gaps in another	Material support; infection-prevention support; psychosocial support; managerial support; staffing; transportation and logistical support; remuneration and employment conditions	“My employer created conditions to deal with the pandemic. However, transportation was not provided for employees.” (P101) “My employer did not respond adequately to the pandemic because it did not provide a sufficient amount of PPE...” (P188)
<i>Notes. QUAN = quantitative; QUAL = qualitative; PPE = personal protective equipment. Quantitative percentages are based on the full analytic sample (N = 309). The PIP was developed through listing, matching, checking, and pillar-building stages. The central pillars represent higher-order insights generated through integration and do not reproduce the qualitative themes. Illustrative quotations were translated from the original Portuguese responses and linked to participant identifiers.</i>				

The integrated findings indicated variation in material, organizational, and relational conditions. Accounts of staffing reductions and increased workload coexisted with reports of reduced shifts or lower demand. The four exploratory quantitative comparisons did not identify clear associations with additional completion time; they did not establish that workplace conditions were unrelated to work demands. Biosafety featured in accounts of changes to clinical practice despite variable access to training and resources. Organizational support was multidimensional, with provision in one domain sometimes coexisting with deficiencies in another. The joint display brings these patterns and contrasts together without assuming causal relationships between them.

Discussion

This mixed-methods study provides a contextualized account of how nursing and midwifery work was reorganized and adapted during the COVID-19 pandemic in Huambo, Angola. Integration of the quantitative and qualitative findings generated three main insights. First, pandemic work was reorganized unevenly rather than through a uniform pattern of increased workload. Second, biosafety

became an organizing principle of professional practice, although training and material resources were not consistently available across participants' workplaces. Third, organizational support was multidimensional, with adequate responses in one domain sometimes coexisting with important gaps in another. Taken together, these findings portray pandemic nursing and midwifery work as a process of continuous adaptation to differing combinations of material, organizational, and relational conditions.

The first integrated finding qualifies a uniform interpretation of pandemic-related workload. Additional time to finish work was reported by 40.8% of the full sample and additional preparation time by 35.0%. These indicators describe time requirements and should not be treated as comprehensive measures of workload. Qualitative accounts described reduced teams, doubled shifts, and increased workload, alongside reduced shifts or lower demand. The exploratory analyses did not identify clear associations between additional completion time and the four workplace factors examined. The confidence intervals nevertheless remained compatible with differences in either direction. Heterogeneity is therefore supported by the contrasting qualitative accounts, rather than inferred from statistically non-significant results. Staffing arrangements, service organization, and patient demand offer possible explanations, but their contributions were not tested. The quantitative finding that more than half of participants were redeployed, temporarily or permanently, is consistent with the qualitative accounts of reorganized teams and shifts and indicates that reorganization of the workforce was a widespread rather than exceptional experience in Huambo.

Such heterogeneity is consistent with evidence from the WHO African Region. Ahmat et al. documented that 15 African countries, including Angola, incorporated health workforce activities into COVID-19 response plans, including training, worker protection, recruitment or mobilization, and decentralized coordination, while the specific measures varied across settings [2]. At the broader workforce level, Kiptulon et al. identified supportive work environments, leadership, adequate staffing and resources, employment conditions, remuneration, and predictable human-resource management among important influences on nurse retention in sub-Saharan Africa [19]. This evidence provides a basis for considering several organizational dimensions when interpreting the accounts from Huambo, without attributing the reported experiences to a single cause.

Evidence on organizational interventions during COVID-19 similarly indicates that workload needs to be considered within the broader work environment. Zink et al., in a systematic review of organizational interventions addressing work stress among inpatient nurses, identified high workload, understaffing, and lack of medical resources among recurrent reasons for intervention, while the responses frequently involved changes to work organization and, in several studies, multilevel approaches combining organizational and person-oriented components [20]. The findings from Huambo add an important contextual dimension through participants' contrasting accounts of increased work demands and reduced shifts or patient volume.

The second integrated finding concerns the centrality of biosafety to changes in professional practice. Participants repeatedly described more consistent use of PPE, strengthened hand hygiene, distancing,

screening, epidemiological surveillance, and changes in the movement of patients and materials through services. In maternity and obstetric care, infection-prevention requirements also affected practices characterized by close physical interaction. These accounts indicate that biosafety during the pandemic extended beyond the application of individual protective measures and became embedded in how nursing and midwifery work was organized, how patients moved through services, and how professionals approached physical proximity and clinical contact.

At the same time, the quantitative findings showed that technical preparation and material availability were not equivalent dimensions of preparedness. Although 56.6% of participants reported adequate PPE training, 29.8% reported PPE as unavailable, while oxygen and mechanical ventilators were reported as unavailable by 41.1% and 49.2%, respectively. These findings should not be interpreted as demonstrating that training was ineffective or that material shortages nullified professional preparation. Rather, they indicate that knowledge and material capacity constitute distinct but interdependent components of preparedness. Training can strengthen professional capacity, but its translation into safe practice also depends on access to appropriate resources, organizational routines, and occupational protection. Midwifery professionals, who worked mainly in maternity services, reported unavailability of oxygen and ventilators and absence of employer-provided mental health support considerably more often than nursing professionals (Additional file 3). With only 40 midwifery participants this comparison is descriptive, but it suggests that critical-care resources and support measures may have been concentrated in COVID-19 units, leaving maternity services comparatively under-resourced.

A qualitative study in Ghana described preparedness in terms of targeted training, the involvement of experienced nurses, and ongoing information seeking and sharing [21]. These findings help situate the reports from Huambo within regional discussions of professional preparation. However, the present study did not assess training quality or demonstrate whether training changed infection risk or clinical practice.

Recent evidence from sub-Saharan Africa reinforces this distinction. Nakatana et al., in a 2026 scoping review of occupational health hazards and management practices among nurses in public healthcare facilities in four sub-Saharan African countries, identified resource shortages, inadequate training, weak safety infrastructure, staffing problems, and insufficient emergency preparedness as interconnected workforce challenges. Although interventions such as PPE provision, infection-control measures, and occupational training were present in many settings, their implementation remained fragmented [22]. The findings from Huambo similarly suggest that preparedness should not be reduced to whether training occurred; professionals also require the material and organizational conditions through which infection-prevention knowledge can be consistently applied.

The prominence of biosafety adaptations also illustrates how the pandemic reshaped the relational dimensions of nursing work. Participants described uncertainty about patients' infection status, fear of occupational infection, concern about transmission to family members, distancing between colleagues, and altered physical interaction with patients. These findings are not interpreted here as measures of

anxiety, depression, or other mental health outcomes, which were beyond the qualitative scope of this analysis. The accounts suggest that perceived occupational risk influenced everyday clinical encounters. For nurses and midwives, infection prevention required simultaneous attention to technical safety and to the interpersonal consequences of limiting proximity in forms of care that often depend on direct physical and relational engagement.

Midwives in Tanzania similarly described workplace difficulties, emotional distress, and social isolation during the pandemic [23]. In Huambo, accounts of fear and altered interpersonal contact suggest that infection prevention also affected professionals' experiences of proximity in care. These responses do not establish effects on patients' experiences or clinical outcomes.

Gender also warrants consideration in interpreting workforce experiences. Women represented 66.3% of this sample, but the analyses did not compare experiences by gender or systematically examine unpaid care responsibilities. Concerns about family transmission should therefore not be attributed specifically to women. The State of the World's Nursing 2025 identifies gender equity as a workforce policy priority [1], supporting further research on how occupational and domestic responsibilities intersect in this context. Structural gender inequalities in the health workforce, including the concentration of women in frontline roles with limited representation in decision-making, have been documented across countries [24]. In this sample, descriptive comparisons between women and men showed small differences in reported resource availability, support and infection (Additional file 3).

The third integrated finding provides an important refinement of the concept of organizational support. Quantitatively, participants differed considerably in their assessments of employer-provided mental health support. The qualitative findings showed that such variation extended across multiple organizational domains. Employers could provide PPE, training, hygiene measures, testing or isolation arrangements, managerial encouragement, or psychosocial support while, sometimes within the same account, failing to provide adequate staffing, transportation, remuneration, risk allowances, or other forms of support. Organizational support was therefore not a binary characteristic of workplaces but a multidimensional configuration of material, managerial, psychosocial, logistical, and employment-related conditions.

Nurses caring for patients with COVID-19 in Uganda also described demanding working conditions alongside institutional support and opportunities for professional learning [25]. This comparison highlights how accounts of support and adversity can coexist. In Huambo, the qualitative findings broaden the interpretation of the structured mental health support item by identifying other domains that mattered to participants; they do not imply that these domains were measured quantitatively or experienced in the same way across institutions.

Recent nursing studies provide additional support for this interpretation. In ten Brazilian university hospitals, Horvath et al. found that the nursing care product during the COVID-19 pandemic was predominantly assessed positively, while performance varied across dimensions of care and organizational conditions [26]. Such findings illustrate how favorable assessments in some areas can

coexist with weaknesses in others. In the Angolan context, Tchivala et al., in a study with 113 nurse managers from hospitals in Luanda, identified academic preparation for management, appointment without prior training, development of managerial competencies, professional requirements, and institutional criteria for managerial positions as relevant components in the construction of nurses' managerial roles [11]. Together with the present findings, these studies reinforce that organizational capacity depends on material resources as well as management, workforce organization, leadership preparation, and institutional support. More broadly, crisis-management research has emphasized that healthcare organizations may need to reconfigure multiple resources and operational capabilities simultaneously during major disruptions [27].

The accounts also portray professionals as active participants in adapting care. Nurses and midwives described reorganizing routines and applying infection-prevention practices under variable institutional conditions. These accounts make professional adaptation visible, but do not establish that care quality was maintained or that resource constraints were overcome. Future research could examine which organizational arrangements enable such adaptations to be sustained safely.

Two further findings deserve attention. One in five participants reported workplace violence during the pandemic, mostly aggression or hostility from patients, family members and the public, including disbelief in the existence of COVID-19; violence against health workers increased during the pandemic in several countries and is a dimension of working conditions that preparedness planning rarely addresses [28,29]. In addition, four participants reported working while infected, two of them under threat of losing their jobs. Although few, these reports point to employment conditions in which presenteeism may be coerced rather than chosen, an issue that labor protection and preparedness planning in Angola should address [30].

These findings also raise questions about workforce sustainability beyond the acute COVID-19 response. Evidence on nurse retention in sub-Saharan Africa identifies both financial and non-financial dimensions of employment, including work environments and professional development [19]. The present study did not measure retention intentions or subsequent departures. It nevertheless identifies organizational concerns that can inform future research linking emergency preparedness with longer-term workforce experiences.

This interpretation is also consistent with the State of the World's Nursing 2025, which situates nursing workforce development within interconnected domains including education, employment, regulation, working conditions, leadership, and service delivery [1]. For Huambo, the present findings suggest that investment in nursing preparedness should similarly bring together workforce organization, material resources, professional development, occupational protection, and organizational support rather than approaching these dimensions independently.

The findings also have implications for nursing and midwifery education and continuing professional development. Reports of adequate PPE training alongside variable resource availability support considering educational and material needs together, although their individual-level overlap was not

examined here. Continuing education in infection prevention and occupational health should be linked to the practical conditions in which learning is applied. Research on occupational hazards and preparedness in sub-Saharan Africa provides a broader context for these priorities [22]; the present study does not establish the effectiveness of particular educational interventions.

Angola's National Contingency Plan for COVID-19 established a multisectoral response framework that included workforce training, infection prevention and control, strategic reserves of medical supplies, human resource mobilization, and coordination across national, provincial, and municipal levels [31]. The findings of this study provide context-specific evidence on how nurses and midwives in Huambo experienced working conditions and institutional support during the pandemic. However, the retrospective design and the focus on participants' reported experiences do not allow for a formal assessment of the implementation or effectiveness of the national plan, the attribution of shortcomings to specific institutions, or conclusions about whether particular provisions were implemented. Rather, the findings identify dimensions of pandemic preparedness and workforce support that could be more explicitly addressed in future planning.

Participants' reports of the unavailability of personal protective equipment, oxygen, and mechanical ventilators, alongside accounts of intensified biosafety practices, highlight the importance of considering resource availability not only in terms of planned supplies and protocols, but also in relation to distribution, access at the point of care, and continuous monitoring. These accounts do not establish whether or why specific shortages occurred; they nevertheless underscore the relevance of preparedness arrangements that connect infection prevention guidance with supply-chain management and local service capacity. Similarly, reports of redeployment and additional time required to complete work point to the value of workforce planning that explicitly addresses staffing distribution, competencies, workload, supervision, and continuity of essential health services.

The findings also suggest that workforce protection should be approached as multidimensional. Participants described institutional support in some domains alongside gaps in others, including transportation, remuneration, risk allowances, staffing, and psychosocial support. Reports of workplace violence and fear of occupational infection further highlight areas that future preparedness plans could address more explicitly, including occupational safety, violence prevention and response, accessible mental health and psychosocial support, and mechanisms for monitoring and accountability. These findings should not be interpreted as evidence that specific institutional obligations were neglected or that particular measures were not implemented. Instead, they illustrate the range of material, organizational, employment-related, and psychosocial conditions through which pandemic response was experienced by the health workforce.

These implications are relevant to the broader policy direction articulated in the WHO Pandemic Agreement, particularly Article 6 on preparedness, readiness, and health system resilience and Article 7 on the health and care workforce [3]. The present study does not evaluate the Agreement or assess Angola's compliance with its provisions. Rather, these articles provide a complementary normative

framework for interpreting the study's findings and considering their implications for future preparedness planning. In this context, the experiences reported by nurses and midwives in Huambo offer context-specific evidence to inform plans that more explicitly define responsibilities, resource-monitoring arrangements, workforce organization, occupational protection, psychosocial support, and accountability mechanisms. Further research and formal policy evaluations would be needed to determine how preparedness measures are implemented and how they affect workforce well-being and health system outcomes.

The contribution of integration was to connect the distribution of reported conditions with accounts of how work changed and how organizational responses were experienced. The PIP made these connections and contrasts visible [17]. For example, the quantitative mental health support item captured one domain, whereas the qualitative accounts identified several additional forms of support. Similarly, accounts of reduced demand qualified a uniform interpretation of additional work time. These integrated interpretations are context-specific and do not establish causal pathways or individual-level relationships between all findings in the joint display.

Strengths and limitations

The mixed-methods design allowed quantitative descriptions of working conditions to be considered alongside professionals' accounts of changes in practice and organizational responses. Inclusion of nurses and midwives across service contexts broadened the perspective beyond a single clinical unit. The PIP made the steps from separate analyses to integrated interpretations explicit and retained contrasting accounts rather than requiring agreement between strands.

Several limitations should be considered when interpreting these findings. Participants were recruited through non-probability approaches, which limits population-level generalizability to the nursing and midwifery workforce in Huambo or Angola more broadly. Data were collected in 2024–2025 and therefore relied on retrospective accounts of experiences during the COVID-19 pandemic; recall, subsequent professional experiences, and hindsight may have shaped participants' descriptions of earlier working conditions. The cross-sectional design precludes temporal or causal inference, and the exploratory quantitative associations were crude, restricted to classifiable responses, and not intended to identify independent determinants of additional work time. Missing, uncertain, and preference-not-to-answer responses reduced the denominators for several variables and may have introduced selection within specific analyses. The reported confidence intervals do not account for possible similarities among participants working in the same institution or recruited through the same professional networks. They also do not address the selection bias inherent in non-probability recruitment. Because no fixed reference period was specified, participants may have recalled different phases of the pandemic. Variation in the interval between these experiences and data collection may have affected recall and comparability across responses. The items on redeployment and workplace violence were single survey questions and did not capture the duration of redeployment or the type and source of violence in a structured way.

The qualitative component also has methodological constraints. It drew on two open-ended survey questions rather than in-depth qualitative interviews, limiting opportunities for probing, clarification, and further exploration of emerging interpretations. The numbers of responses to the two open-ended questions represent response units and should not be interpreted as separate qualitative samples, because participants could respond to both questions. Finally, the qualitative analysis was intentionally focused on changes in professional practice and employers' responses; other dimensions of pandemic experience, including broader emotional, family, social, or economic consequences, were not systematically explored.

Resource availability was self-reported across different service settings. The absence of equipment, particularly mechanical ventilators, cannot by itself establish an unmet clinical need in every setting. The survey categories did not distinguish non-availability from non-applicability to the respondent's service. Finally, the pooled findings should not be interpreted as profession-specific estimates for midwives or as descriptions of current working conditions.

Conclusions

Nurses and midwives in Huambo reported heterogeneous changes in work organization, intensified biosafety practices, and uneven institutional support during the COVID-19 pandemic. Integrating survey distributions with open-ended accounts showed how reported support could coexist with gaps in other organizational domains and how increased work demands could coexist with reduced shifts or lower demand. These findings identify priorities for context-sensitive preparedness planning, while the retrospective, non-probability design limits causal and population-level inference.

Preparedness planning should consider reliable resources, adaptable staffing, infection-prevention capacity, and coordinated support for nurses and midwives. Further research is needed to evaluate how these measures operate together and whether they improve workforce and care outcomes.

Abbreviations

CI

confidence interval

GCNMS

Global Consortium of Nursing & Midwifery Studies

GRAMMS

Good Reporting of a Mixed Methods Study

IQR

interquartile range

IRB

Institutional Review Board

PIP

Pillar Integration Process

PPE

personal protective equipment

PR

prevalence ratio

SD

standard deviation

STROBE

Strengthening the Reporting of Observational Studies in Epidemiology

WHO

World Health Organization.

Declarations

Ethics approval and consent to participate

The GCNMS protocol was approved by the New York University Institutional Review Board (IRB-FY2020-4440). Data collection in Angola was conducted under this protocol with institutional endorsement from the Federal University of Santa Catarina (UFSC) in partnership with the José Eduardo dos Santos University (UJES). All participants provided informed consent before participation.

Consent for publication

Not applicable. Quotations are anonymized, and participants consented to the use of their responses in scientific publications.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

HCK: conceptualization, investigation (data collection in Angola), formal analysis (qualitative), interpretation, writing – original draft. BCNGCS: investigation (data collection in Angola), formal analysis (qualitative), interpretation, writing – review and editing. BCG and SMAF: formal analysis (qualitative support), writing – review and editing. JLGS: conceptualization, methodology (mixed-methods design and integration), supervision, interpretation, writing – review and editing. AS: conceptualization and coordination of the GCNMS multicountry study, writing – review and editing. MHSS, AGS, MGRM and MTSB: interpretation, writing – review and editing. All authors read and approved the final version of the manuscript.

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Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due to privacy and ethical restrictions but are available from the corresponding author on reasonable request.

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Supplementary Files

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