Research Square

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A needs analysis for including One Health in undergraduate health professions curricula in South Africa

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Abstract

Background

Undergraduate health professions education (HPE) in sub-Saharan Africa has been persistently criticised for failing to prepare graduates for the complex, interconnected health challenges facing their communities. The One Health (OH) approach—which recognises the interdependence of human, animal, plant, and environmental health—offers a compelling framework for curricular transformation. However, the extent to which OH principles are embedded in undergraduate HPE in South Africa remains poorly characterised. This study conducted a needs analysis to establish the current status of OH-related content, competencies, and pedagogical strategies at two South African universities, and to identify educator-perceived gaps and priorities for curriculum development.

Methods

A cross-sectional survey was administered to academic staff in undergraduate HPE at two South African public universities—one in Gauteng Province and one in the Eastern Cape Province. The questionnaire assessed current ("have") and desired ("want") curriculum content areas, skills and attitudes, and teaching and learning methodologies related to One Health. Data from 113 respondents were analysed using descriptive statistics.

Results

Interprofessional education and collaborative practice (IPECP) was most commonly reported as embedded in curricula (n = 43; 38%), yet 23 respondents (20%) indicated it was still needed, suggesting uneven integration. Critical thinking and clinical reasoning skills were most widely recognised (n = 54; 48%), while financial and practice management (n = 10; 9%) and technology-driven tools (n = 14; 12%) were least represented. Key content gaps included climate change impacts (want: n = 30; 27%), OH policy and regulatory frameworks (want: n = 29; 26%), multidisciplinary integrative approaches (want: n = 23; 20%), and cultural humility (want: n = 20; 18%), the latter approaching the high-need threshold. Notably, 21 respondents (19%) indicated that none of the listed topics were present in their curricula. Blended and case-based learning were most widely used.

Conclusions

Significant gaps exist in the integration of OH principles within undergraduate HPE at the two participating universities. Priority development areas include climate change and ecosystem health, OH governance and policy literacy, multidisciplinary integration, cultural humility, and expanded interprofessional and technology-enhanced pedagogies. Urgent faculty development is needed to build

awareness and capacity. A structured, consensus-driven approach to curriculum review is warranted, supported by transparent curriculum mapping and broad stakeholder engagement.

Background

The Imperative for Transforming Health Professions Education

Undergraduate health professions education (HPE) in sub-Saharan Africa has attracted sustained and substantive criticism for its failure to adequately address the health priorities of disadvantaged communities [1–3]. This critique extends beyond academic discourse: it reflects a genuine crisis in educational relevance and workforce preparedness. Despite the proliferation of healthcare training institutions across the region, the quality of healthcare outcomes and the capacity of graduates to address community health challenges remain inadequate [4–6]. The core dysfunction lies in a profound misalignment between what students are taught and what their communities need.

Graduates frequently possess discipline-specific clinical knowledge while lacking the critical consciousness required to recognise how social determinants of health, emerging infectious diseases, human-animal-environment interfaces, and climate change fundamentally shape health outcomes [7–10]. These curricula remain locked within traditional professional silos—medicine, veterinary science, nursing, and environmental health operating in isolation rather than integration—producing graduates ill-equipped for the complex, interconnected health challenges that characterise contemporary society.

The Epidemiological Context: Zoonotic Disease in Sub-Saharan Africa

Sub-Saharan Africa has emerged as a significant epidemiological hotspot for zoonotic and vector-borne disease emergence and re-emergence [11]. This is not incidental; it reflects multiple converging vulnerabilities including limited healthcare infrastructure, rapid climate change, habitat fragmentation, intensified wildlife-human interfaces, and cultural practices that facilitate pathogen spillover [11, 12].

In South Africa specifically, recent surveillance has documented a concerning range of zoonotic events: Highly Pathogenic Avian Influenza (HPAI) transmission from farmed ostriches in the Western Cape; Hepatitis A virus, cytomegalovirus, and Epstein-Barr virus spillover from wild baboons in the Cape Peninsula; Flavivirus transmission involving mosquitoes, cattle, and humans in the Free State; Crimean-Congo haemorrhagic fever among occupationally exposed animal handlers, hunters, veterinarians, and informal slaughterers; Marburg virus detection in Egyptian rousette bat colonies in Gauteng with documented spillover potential; Hepatitis E virus emergence linked to undercooked pork consumption; and ongoing Orf virus transmission among ruminant handlers [13, 14]. Epidemiological evidence indicates that approximately 75% of novel emerging infectious diseases in humans originate from

animals, frequently through environmental modification and intensified human-animal contact [15]. This evidence compels a fundamental restructuring of HPE curricula to incorporate One Health principles.

One Health: A Framework for a Sustainable and Healthy Future

Contemporary health challenges operate across scales and sectors that transcend traditional professional and national boundaries. Zoonotic disease emergence, pandemic preparedness, antimicrobial resistance (AMR), food insecurity, climate-related health threats, and complex multi-species disease interactions demand health professionals capable of engaging with global evidence while remaining responsive to local community needs [16, 17]. The concept of One Health (OH) emerged precisely to address the inadequacy of siloed professional approaches in tackling these multifaceted problems [18].

The roots of OH can be traced back approximately two centuries, evolving through the concepts of 'One Medicine' and 'One World–One Health' before consolidating as the current unifying framework. A definitive contemporary definition was provided by the One Health High-Level Expert Panel (OHHLEP):

"An integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes the health of humans, domestic and wild animals, plants and the wider environment (including ecosystems) are closely linked and inter-dependent. The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for healthy food, water, energy, and air, taking action on climate change and contributing to sustainable development. Implementation from theory to practice includes the 4Cs of Communication, Coordination, Collaboration and Capacity building. Fundamental principles include equity, inclusivity, equal access, parity, socioecological equilibrium, stewardship and transdisciplinarity." [19]

The OH approach extends well beyond zoonotic disease and AMR; it encompasses the full spectrum of prevention, health promotion, and disease management at individual, community, national, regional, and global levels. Its fundamental challenge to the traditional model of isolated professional training is therefore both broad and deep.

Faculty Development and the Human Health Professions' Engagement with One Health

Despite political attention to OH globally, human health professionals—and medical doctors in particular—have been slow to engage [18, 20]. Surveys conducted in low- and middle-income countries (LMICs) consistently find that more than 50% of health professionals have received no training related to OH, and those who have received training report only beginner or intermediate levels of competency [21]. Critical competencies for OH capacity building—including management, health informatics, ethics and values, leadership, interdisciplinary collaboration, and systems thinking—remain largely absent from training

programmes [23]. This pattern underscores the urgent need for interdisciplinary faculty development in HPE institutions.

A major structural barrier to OH implementation remains the limited communication between human and veterinary medicine, agricultural sciences, ecological and environmental sciences, and social, legal, and economic disciplines. Addressing this requires deliberate curricular efforts to integrate ecology and evolution into HPE, promote multidisciplinary lecturing expertise, and emphasise cost-effective collaborative management skills [22]. One promising framework for introducing OH content is through the lens of Sustainable Development Goals (SDGs), where each goal provides a natural vehicle for transdisciplinary problem-solving that spans human, animal, plant, and ecosystem health dimensions [25].

Pedagogical Approaches for One Health Education

Effective OH education demands pedagogical approaches that mirror the collaborative, multidisciplinary nature of OH practice. Interprofessional Education and Collaborative Practice approaches are central to this, though their implementation remains underutilised in many HPE programmes [24]. Multiple active learning modalities have demonstrated value in OH contexts: problem-based learning promotes deep engagement with complex cases; team-based learning cultivates peer learning and communication; Simulation-Based Learning (SBL) allows hands-on rehearsal of OH scenarios such as disease outbreak responses; case-based learning applies theoretical understanding to real-world situations; and community service-learning enables students to apply OH principles in authentic community settings [26]. Each approach carries specific resource and logistical requirements, and their optimal combination in resource-constrained LMIC settings requires further investigation.

The Knowledge Gap: Why This Study is Necessary

Despite mounting evidence for the necessity of OH integration in HPE, critical gaps remain in translating global frameworks into locally appropriate, culturally sensitive, and contextually responsive educational practice. Specifically, how educators within South Africa understand, interpret, and prioritise OH principles for undergraduate curricula remains poorly characterised. The perspectives of faculty regarding the feasibility, necessity, and optimal approaches for OH curriculum integration remain largely undocumented in the South African context. This gap has direct consequences: it limits the capacity of South African institutions to design evidence-informed curricula that simultaneously address region-specific health challenges while preparing students for collaborative, culturally competent, and globally informed practice.

A comprehensive needs analysis – establishing the current status of OH content in undergraduate HPE and eliciting stakeholder perspectives on curriculum development priorities – is therefore essential.

Such analysis provides the evidentiary foundation necessary for subsequent curriculum development through robust, consensus-seeking approaches involving diverse stakeholders.

Research question: What are the perspectives of health professions educators on the need for One Health-related content areas, skills, and pedagogical approaches in undergraduate HPE at two universities in South Africa?

Methods

Aim and Objectives

The primary aim of this study was to conduct a systematic needs analysis of One Health-related education within undergraduate health professions education at two public universities in South Africa. The study applied a gap-based needs analysis framework, operationalising the distinction between current curriculum status ('have') and desired curriculum content ('want') to identify and prioritise areas for development. Specifically, the study sought to document what OH-related content, competencies, and pedagogical approaches are currently present in undergraduate curricula (the 'have'), identify what educators perceive to be absent but necessary (the 'want'), and thereby generate an evidence base to inform the development of integrated, culturally appropriate, and socially responsive curricula for the South African context.

The following objectives were formulated to address this aim:

- To map existing OH-related **content areas, topics, and themes** currently embedded in undergraduate HPE programmes at the two participating institutions (the 'have'), and to identify content areas perceived by educators as absent or insufficiently addressed that should be incorporated into the curriculum (the 'want').
- To document OH-related **competencies, skills, and professional attitudes** currently cultivated within undergraduate training programmes (the 'have'), and to identify competencies and attitudinal outcomes that educators consider necessary for OH practice but that are not yet adequately developed in graduates (the 'want').
- To identify **pedagogical strategies** – encompassing teaching, learning, and assessment methodologies – currently employed to deliver OH-related content and competencies (the 'have'), and to determine which pedagogical approaches educators wish to adopt or expand in order to more effectively support OH learning outcomes (the 'want').

Study Design

A cross-sectional survey design was employed to assess the educational landscape regarding OH in HPE programmes at the two participating institutions. This study forms part of a larger, multi-centre

project aiming to evaluate these themes across health sciences universities in the broader Southern African region.

Study Setting and Institutional Context

The study was conducted at two public higher education institutions in South Africa, selected to represent distinct geographical and demographic contexts. The first institution, located in Gauteng Province, is a comprehensive Health Sciences University serving both urban and peri-urban populations. It offers twelve undergraduate HPE programmes training students for human healthcare, encompassing Medicine, Nursing, Physiotherapy, Occupational Therapy, Radiography, Pharmacy, Human Nutrition, Speech Therapy, Audiology, Dentistry, Oral Hygiene, and Dental Therapy, alongside programmes in Life and Physical Sciences, Mathematics and Computer Sciences, and Psychology.

The second institution, located in the Eastern Cape Province and predominantly serving rural communities, offers five undergraduate programmes: Medicine, Nursing, Medical Sciences, Medical Orthotics and Prosthetics, and the training of Clinical Associates. This targeted programme portfolio reflects a deliberate focus on addressing the specific healthcare needs of rural and underserved populations.

Participants and Sampling

The study population comprised academic staff actively involved in undergraduate HPE at both institutions: Sefako Makgatho Health Sciences University (SMU) in Gauteng Province and Walter Sisulu University (WSU) in the Eastern Cape Province. Invitations were distributed to all eligible staff across all levels of seniority, from junior lecturers to senior professors, using a census sampling approach. A total of 113 academic staff members consented to participate and successfully completed the survey.

Data Collection Instrument

Data were collected using a structured questionnaire (Appendix 1), designed to take approximately 15 minutes to complete. The instrument comprised three sections: (1) a demographic profile capturing professional title, seniority level, institutional affiliation, and undergraduate qualification(s) in which the respondent taught; (2) a current curriculum section assessing topics, skills, and teaching and learning strategies presently employed regarding OH; and (3) a curriculum gaps section exploring topics, skills, and pedagogical strategies respondents believed should be incorporated into their curriculum.

Participants could indicate for each item whether they were already teaching it ('have'), whether they believed it should be included ('want'). The questionnaire was administered electronically via institutional email channels. Hard-copy versions were also made available for staff who preferred manual completion. Digital informed consent was obtained electronically prior to questionnaire access; hard-

copy consent forms were provided for paper-based respondents. All participants received an information sheet detailing the study purpose and their rights as participants.

Data Analysis

Descriptive statistics were used to summarise participant responses. Data were presented as frequencies and percentages to describe the distribution of responses regarding current teaching practices and curriculum gaps across the three domains (content areas, skills and attitudes, and pedagogical strategies). To classify curriculum availability and perceived need across items, a data-driven, quartile-based approach was applied to percentage responses. Interquartile ranges (IQR) were calculated separately for 'have' and 'want' percentages to define three ordinal levels. For the 'have' (current presence) scale: low was defined as ≤8%, medium as 9–20%, and high as ≥21% (Q1=7.75%, Q3=20.25%). For the 'want' (perceived need) scale: low was defined as ≤9%, medium as 10–18%, and high as ≥19% (Q1=9%, Q3=18.25%). Items are categorised throughout the results using these thresholds. Combined scores were computed to assess awareness of participants on a given item.

Table 1. Quartile-based measurement scales for 'have' and 'want' responses

Level	'Have' scale: current curriculum presence (%)	'Want' scale: perceived need (%)
Low	≤ 8%	≤ 9%
Medium	9% – 20%	10% – 18%
High	≥ 21%	≥ 19%

Thresholds derived from interquartile ranges of percentage responses across all items: IQR for 'have' = 12.5 percentage points (Q1=7.75%, Q3=20.25%); IQR for 'want' = 9.25 percentage points (Q1=9%, Q3=18.25%).

Ethical Considerations

Ethical approval for this study was granted by the Sefako Makgatho Health Sciences University Research and Ethics Committee (SMUREC; Project ID: 2028; Reference: SMUREC/M/250/2024:IR) and the Walter Sisulu University Health Sciences Research Ethics Committee (Reference: 241/2024). All participation was voluntary. Responses were anonymised to ensure confidentiality in accordance with the Declaration of Helsinki (1964), as revised in 2022. This study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for cross-sectional studies.

Results

Results are presented in three sections corresponding to the three domains assessed: Section 1 (Content Areas, Topics, and Themes), Section 2 (Skills and Attitudes), and Section 3 (Pedagogical

Strategies). For all sections, items are categorised by the intersection of current availability ('have') and perceived need ('want'), using the quartile-based thresholds defined in the Data Analysis section. The 'Awareness' column represents the proportion of respondents who acknowledged a topic as currently present in the curriculum and as needed.

Participant Characteristics

A total of 113 academic staff members from two South African public universities participated in the study. The majority of respondents (n = 81; 71.68%) were from Sefako Makgatho Health Sciences University (SMU) in Gauteng Province, with the remainder (n = 32; 28.32%) from Walter Sisulu University (WSU) in the Eastern Cape Province. Respondent demographics are summarised in Tables 2–5.

Table 2
Distribution of respondents by institution (n = 113)

Institution	Frequency (n)	Percent (%)	Cumulative (%)
Sefako Makgatho Health Sciences University (SMU)	81	71.68%	71.68%
Walter Sisulu University (WSU)	32	28.32%	100.00%
Total	**113**	**100.00%**	—

SMU: Sefako Makgatho Health Sciences University; WSU: Walter Sisulu University.

With respect to academic seniority, Lecturers constituted the largest group (n = 48; 42.48%), followed by Senior Lecturers (n = 23; 20.35%) and Heads of Department or Unit (n = 20; 17.70%). Professors (full, associate, and adjunct) represented 7.96% of the sample (n = 9), while Junior Lecturers accounted for 15.04% (n = 17), indicating meaningful representation from early-career academics. Deans and Directors of Faculty or School represented the smallest group (n = 3; 2.65%). A further five respondents (4.42%) identified in an ‘Other’ category, encompassing specialised academic and curriculum support roles including Curriculum and Teaching-Learning Specialist, Postdoctoral Research Fellow, and Instructional Designer.

Table 3
Distribution of respondents by academic seniority level (n = 113)

Seniority Category	Frequency (n)	Percent (%)
Dean / Director of Faculty or School	3	2.65%
Head of Department / Head of Unit	20	17.70%
Professor (full, associate, adjunct)	9	7.96%
Senior Lecturer	23	20.35%
Lecturer	48	42.48%
Junior Lecturer	17	15.04%
Other (CUTL; Postdoctoral Fellow; Instructional Designer; Short Learning Programme Coordinator)	5	4.42%

Note: Total frequency selections (n = 125) exceed total respondents (n = 113) as participants could select multiple seniority designations. Percentages reflect the proportion of respondents selecting each category.

Respondents were involved in teaching across a broad spectrum of undergraduate health professions programmes (Table 4). The most frequently represented disciplines were Medicine and Surgery (n = 43; 38.1%), Nursing (n = 25; 22.1%), Dentistry (n = 22; 19.5%), Emergency Care/Medicine (n = 21; 18.6%), Oral Hygiene (n = 14; 12.4%), and Dental Therapy and Radiography (n = 13 each; 11.5%). Moderately represented fields (6–10%) included Physiotherapy, Psychology, Human Dietetics/Nutrition, Speech Language Therapy, Occupational Therapy, Pharmacy, Public Health/Community Development, Audiology, and Medical Associates. Several fields had very low representation (≤ 3%), including Agriculture and Natural Resources, Complementary/African Traditional Medicine, Optometry, Social Work, Environmental Health, and Occupational Health and Safety. Biomedical Engineering, Podiatry, Sports Medicine, and Veterinary Sciences had no respondents, reflecting the human health focus of the two participating institutions.

Table 4
Undergraduate programmes taught by respondents (n = 113; multiple selections permitted)

Undergraduate Programme	Frequency (n)	% of Respondents
Medicine and Surgery	43	38.1%
Nursing	25	22.1%
Dentistry	22	19.5%
Emergency Care / Medicine	21	18.6%
Oral Hygiene	14	12.4%
Dental Therapy	13	11.5%
Radiography	13	11.5%
Psychology	12	10.6%
Human Dietetics / Nutrition	11	9.7%
Speech Language Therapy / Pathology	11	9.7%
Occupational Therapy	10	8.8%
Pharmacy	10	8.8%
Public Health / Community Development	8	7.1%
Audiology	7	6.2%
Medical Associates	7	6.2%
Physiotherapy	9	8.0%
Environmental Health	3	2.7%
Occupational Health and Safety	3	2.7%
Agriculture and Natural Resources	2	1.8%
Complementary / African Traditional Medicine	1	0.9%
Optometry	1	0.9%
Social Work	1	0.9%
Other (including Medical Orthotics and Prosthetics, Anatomy, Educational Technology)	11	9.7%
None of the above	8	7.1%

Percentages represent the proportion of respondents indicating involvement in each programme. Multiple selections were permitted; totals therefore exceed 100%.

Regarding the academic year levels at which respondents reported teaching OH-related content, Year 3 was most frequently cited (n = 42; 37.2%), followed by Year 1 (n = 37; 32.7%) and Year 2 (n = 34; 30.1%). Notably, 27 respondents (23.9%) indicated that OH-related content did not appear in any year level of their teaching, consistent with the content gap findings reported in Section 1 below. Of the 113 respondents, 43 (38.1%) expressed willingness to participate in future curriculum development activities related to OH.

Table 5
Academic year levels at which OH-related content is taught (n = 113; multiple selections permitted)

Academic Year Level	Frequency (n)	% of Respondents
Year 1	37	32.7%
Year 2	34	30.1%
Year 3	42	37.2%
Year 4	29	25.7%
Year 5	16	14.2%
Year 6	15	13.3%
Level 7 and higher (postgraduate)	8	7.1%
None of the above	27	23.9%

Multiple selections were permitted. Percentages reflect the proportion of respondents selecting each year level.

Section 1: One Health-Related Content Areas, Topics, and Themes

Overview of Findings

Content areas were classified using the quartile-based percentage thresholds defined in the Data Analysis section (Table 1): high current presence (‘have’) ≥ 21%, medium 9–20%, low ≤ 8%; high perceived need (‘want’) ≥ 19%, medium 10–18%, low ≤ 9%. Full data for all 30 items are presented in Table 6.

Medium to High Availability and High Need (Have ≥ 9%, Want ≥ 19%)

Interprofessional education and collaborative practice (IPECP; Item 26) was the most widely reported as already embedded (n = 43; 38%), yet 23 respondents (20%) indicated it was still needed, yielding the highest awareness score (58.4%). Global health and global burden of disease (Item 5) showed the highest 'have' score among conceptual OH topics (n = 36; 32%), alongside moderate ongoing demand (n

= 24; 21%). One Health broader awareness and systems thinking (Item 1; have: n = 20, 18%; want: n = 32, 28%), disaster and emergency response (Item 8; have: n = 20, 18%; want: n = 25, 22%), and diversity and inclusivity (Item 22; have: n = 23, 20%; want: n = 22, 19%) also fell into this medium-to-high-availability quadrant. The persistence of 'want' responses for topics already reportedly taught is a notable finding, likely reflecting siloed delivery, uneven curriculum integration, or variable faculty awareness of cross-disciplinary content.

High Availability and Medium Need (Have ≥ 21%, Want 10–18%)

A cluster of topics was reported as relatively well-established in curricula but for which a meaningful proportion of respondents still expressed need. These include disease outbreaks, epidemics, and pandemic response (Item 6; have: n = 37, 33%; want: n = 16, 14%), organisation of health services (Item 19; have: n = 25, 22%; want: n = 19, 17%), socio-economic and cultural barriers to health (Item 21; have: n = 24, 21%; want: n = 16, 14%), disparity and equity (Item 23; have: n = 23, 20%; want: n = 16, 14%), population health (Item 18; have: n = 20, 18%; want: n = 19, 17%), and community-environment diagnosis and reporting (Item 20; have: n = 23, 20%; want: n = 11, 10%). The coexistence of 'have' and 'want' responses for the same topics is consistent with a pattern of partial or discipline-specific integration rather than comprehensive, programme-wide embedding.

Low to Medium Availability and High Need (Have ≤ 20%, Want ≥ 19%)

Items in this category represent the most actionable curriculum gaps – content areas with limited current presence but strong demand for inclusion. Climate change impacts on health (Item 2; have: n = 9, 8%; want: n = 30, 27%) and One Health policies, legal requirements, and regulations (Item 29; have: n = 11, 10%; want: n = 29, 26%) emerged as the highest-priority unmet needs. Multidisciplinary integrative approaches to OH (Item 25; have: n = 7, 6%; want: n = 23, 20%) and cultural humility – encompassing self-critique, recognition of bias, privilege awareness, and respectful engagement (Item 28; have: n = 11, 10%; want: n = 20, 18%) – also fall within this priority quadrant. Green and sustainable energy (Item 3; have: n = 7, 6%; want: n = 11, 10%) represents a moderate unmet need.

Low Availability and Low Need (Have ≤ 8%, Want ≤ 9%)

A distinct cluster of topics was characterised by both limited current inclusion and relatively lower expressed demand. Growing human-animal interfaces and interactions including animal-assisted therapies (Item 11; have: n = 2, 2%; want: n = 7, 6%), bio-surveillance and cross-border outbreak studies (Item 7; have: n = 4, 4%; want: n = 12, 11%), biodiversity loss and ecosystem collapse (Item 17; have: n = 4, 4%; want: n = 13, 12%), conflict and refugee health (Item 9; have: n = 5, 4%; want: n = 14, 12%), and trans-sectoral teamwork and collaboration (Item 27; have: n = 8, 7%; want: n = 15, 13%) fall within this quadrant. Importantly, 21 respondents (19%) indicated that none of the listed topics were currently included in their curricula, and 13 (12%) indicated they did not want any of them included (Item 30).

Table 6

One Health-related topics and content areas: current curriculum presence ('have') and perceived need ('want') among academic staff (n = 113)

Topic / Content Area	Have n = 113	Have %	Want n = 113	Want %	Awareness (n = 113)
1. One Health: broader awareness, systems thinking, awareness of the bigger picture	20	18%	32	28%	46.0%
2. Impact of climate change on health	9	8%	30	27%	35.5%
3. Green/sustainable/alternative energy	7	6%	11	10%	15.9%
4. Food security, mass agriculture, and pre- and post-production food safety and hygiene	12	11%	10	9%	19.5%
5. Concepts of global health and global burden of disease	36	32%	24	21%	53.1%
6. Disease outbreaks, epidemics, pandemics, and healthcare response	37	33%	16	14%	46.9%
7. Bio-surveillance, country-specific or cross-border/regional outbreak studies	4	4%	12	11%	14.2%
8. Disasters and healthcare response (floods, droughts, bushfires, earthquakes, tsunamis)	20	18%	25	22%	39.8%
9. War/times of conflict and refugee health and wellness	5	4%	14	12%	17.4%
10. Epidemiologic problems involving human, animal, plant, and environmental components	23	20%	10	9%	29.2%
11. Growing human–animal interface and interaction (e.g., animal-assisted therapies)	2	2%	7	6%	8.0%
12. Zoonotic and emerging zoonotic diseases	12	11%	12	11%	21.2%
13. Impact of environmental health on human and animal health	13	12%	10	9%	20.4%
14. Prevention to improve health at the individual level (human, animal, plant, environment)	20	18%	8	7%	24.8%
15. Prevention to improve health at the community level (human, animal, plant, environment)	23	20%	9	8%	28.3%
16. Prevention to improve health at the societal level (human, animal, plant, environment)	15	13%	9	8%	21.2%

Topic / Content Area	Have n = 113	Have %	Want n = 113	Want %	Awareness (n = 113)
17. Impact of biodiversity loss and ecosystem collapse on health	4	4%	13	12%	15.0%
18. Population health, care, and welfare	20	18%	19	17%	34.5%
19. Organisation of health services	25	22%	19	17%	38.9%
20. Community–environment diagnosis, prevention, and reporting of common societal problems	23	20%	11	10%	30.1%
21. Socio-economic or cultural barriers to health and healthcare, and their mitigation	24	21%	16	14%	35.4%
22. Diversity and inclusivity (race, gender, religion, age, sexual orientation, nationality)	23	20%	22	19%	39.8%
23. Disparity and equity (equal access, non-discrimination)	23	20%	16	14%	34.5%
24. Human civil rights and/or animal rights and ethics	14	12%	9	8%	20.4%
25. Multidisciplinary integrative approach to One Health concerns	7	6%	23	20%	26.5%
26. Interprofessional education and collaborative practice (IPECP)	43	38%	23	20%	58.4%
27. Trans-sectoral teamwork and collaboration	8	7%	15	13%	20.4%
28. Cultural humility (self-critique, bias, privilege, respect)	11	10%	20	18%	27.4%
29. Policies, legal requirements, and regulations related to One Health	11	10%	29	26%	35.4%
30. None of the above	21	19%	13	12%	30.0%

Section 2: One Health-Related Skills and Attitudes

Overview of Findings

This section examined nine skill and attitude domains considered relevant to OH and interprofessional practice. Full data are presented in Table 7.

Well-Established Skills (High 'Have' Scores)

Critical judgment, clinical reasoning, critical thinking, problem-solving, and decision-making (Item 3) constituted the most widely recognised skill set currently taught, with 54 respondents (48%) reporting it

as present in their curriculum. Professional identity formation, encompassing values and professionalism (Item 4), was the second most widely reported (n = 51; 45%). These findings confirm that foundational professional and cognitive skills are relatively well-embedded across the participating programmes. Community-based project management (Item 9; n = 39; 35%), records management (Item 8; n = 37; 33%), and advocacy and lobbying (Item 1; n = 28; 25%) also showed substantial current presence.

Skills with the Greatest Unmet Need

The skills with the largest 'want' frequencies – representing the greatest perceived shortfall – were financial and practice management (Item 5; have: n = 10, 9%; want: n = 37, 33%), managing infrastructure, equipment, and physical resources (Item 7; have: n = 15, 13%; want: n = 38, 34%), and community-based project management (Item 9; have: n = 39, 35%; want: n = 31, 27%). Managing interprofessional and transdisciplinary teams and human resources (Item 6; have: n = 28, 25%; want: n = 27, 24%) showed both moderate current presence and moderate demand, suggesting partial but uneven integration. The awareness scores for critical thinking (70%) and professional identity formation (65%) were the highest overall, confirming their foundational status while also revealing remaining gaps.

None of the Above

Twenty-three respondents (20%) indicated that none of the listed skills were currently present in their curricula, while 14 (12%) indicated they did not want any of them included. As with the content area findings, this signals the need for targeted faculty development to build foundational OH competency awareness.

Table 7
One Health-related skills and attitudes: current curriculum presence ('have') and perceived need ('want') among academic staff (n = 113)

Skill / Attitude	Have n = 113	Have %	Want n = 113	Want %	Awareness (n = 113)
1. Advocacy and/or lobbying	28	25%	21	19%	43%
2. Bio-surveillance, evidence-based practice, research, scientific methods, scholarship	26	23%	20	18%	41%
3. Critical judgment, clinical reasoning, critical thinking, problem-solving, decision-making	54	48%	25	22%	70%
4. Professional identity formation (values, professionalism)	51	45%	23	20%	65%
5. Financial and/or practice management	10	9%	37	33%	42%
6. Managing interprofessional and/or transdisciplinary teams and human resources	28	25%	27	24%	49%
7. Managing infrastructure, equipment and/or other physical resources	15	13%	38	34%	47%
8. Records management, recording, documenting, and reporting	37	33%	25	22%	55%
9. Community-based project management	39	35%	31	27%	62%
10. None of the above	23	20%	14	12%	33%

Section 3: Pedagogical Strategies – Teaching, Learning, and Assessment Methods

Overview of Findings

This section assessed twelve teaching and learning methodologies relevant to OH and interprofessional education. Full data are presented in Table 8.

Currently Employed Pedagogies

Case scenarios and case discussions (Item 7) were the most widely used teaching strategy (n = 61; 54%), followed by big group blended learning – combining virtual/online and face-to-face delivery (Item 3; n = 56; 50%). Simulation and simulated practicals (Item 8; n = 39; 35%) and small group blended learning (Item 6; n = 40; 35%) were also commonly reported. Community-based projects involving active engagement with community members (Item 11; n = 28; 25%) and interprofessional education and collaborative practice (Item 10; n = 32; 28%) showed moderate current use. Big group face-to-face only

(Item 2; n = 23; 20%) and big group online only (Item 1; n = 19; 17%) were the least favoured delivery formats, consistent with a broader shift towards active and blended learning.

Pedagogies Most Needed

Technology-driven tools – including robotics, 3-D printing, and high-fidelity mannequins (Item 9) – generated the greatest unmet demand (want: n = 47; 42%), despite the lowest 'have' score among active learning modalities (n = 14; 12%). IPECP (Item 10; want: n = 34; 30%) and community-based projects (Item 11; want: n = 31; 27%) were the next most requested pedagogies. Simulation/simulated practicals (Item 8; want: n = 30; 27%) also showed substantial unmet demand. The high awareness for case-based learning (66%) and big group blended learning (66%) suggests these are the most widely recognised – and valued – approaches across both dimensions.

None of the Above

Eleven respondents (10%) indicated that none of the listed teaching methodologies were currently used in their programmes, and 13 (12%) indicated they did not want any of them incorporated.

Table 8
Teaching and learning methodologies: current use ('have') and perceived need ('want') among academic staff (n = 113)

Teaching/Learning Methodology	Have n = 113	Have %	Want n = 113	Want %	Awareness (n = 113)
1. Big group: virtual/online ONLY	19	17%	14	12%	29%
2. Big group: face-to-face ONLY	23	20%	8	7%	27%
3. Big group: BLENDED (virtual/online and face-to-face)	56	50%	19	17%	66%
4. Small group: virtual/online ONLY	16	14%	8	7%	21%
5. Small group: face-to-face ONLY	19	17%	9	8%	25%
6. Small group: BLENDED (virtual/online and face-to-face)	40	35%	22	19%	55%
7. Case scenarios and/or case discussions	61	54%	14	12%	66%
8. Simulation/simulated practicals	39	35%	30	27%	61%
9. Technology-driven tools (robotics, 3-D printing, high-fidelity mannequins, etc.)	14	12%	47	42%	54%
10. Interprofessional education and/or collaborative practice	32	28%	34	30%	58%
11. Community ACTION projects (active engagement with community members)	28	25%	31	27%	52%
12. None of the above	11	10%	13	12%	21%

Discussion

This needs analysis reveals both encouraging areas of existing OH-related content in undergraduate HPE at two South African universities and significant gaps that warrant targeted curricular transformation. The findings are discussed in relation to the broader literature, and their implications for curriculum development, faculty development, and health professions education policy are examined.

The Gap Between Awareness and Integration

One of the most striking patterns in the data is the co-occurrence of high 'have' and high 'want' responses for the same items. For example, IPECP was both the most frequently reported as already taught (n = 43; 38%) and among the most frequently identified as still needed (n = 23; 20%). Similarly, disease outbreak preparedness and global health content showed this pattern. This paradox suggests that these topics may be taught in isolated disciplinary contexts, perceived as present by some faculty

while invisible to others, or insufficiently integrated longitudinally and horizontally across programmes. Siloed curriculum delivery – where each discipline teaches content within its own silo without cross-disciplinary awareness or coordination – is a well-documented barrier to effective IPECP and OH implementation [24].

These findings are corroborated by Ossebi et al.'s [23] observation that even in contexts where some OH-related training exists, it rarely reaches the depth of competency required for meaningful collaborative practice. A critical implication is that curriculum mapping – making the full curriculum transparent and accessible to all academic staff across disciplines and year levels – could reveal existing opportunities for integration and reduce duplication, while exposing genuine gaps [25].

Priority Curriculum Gaps: What Is Needed but Absent

The most actionable findings are those items characterised by low current availability but high expressed need. Climate change and health (Item 2; want: 27%), OH policy and regulatory frameworks (Item 29; want: 26%), multidisciplinary OH integration (Item 25; want: 20%), and cultural humility (Item 28; want: 18%) emerge as the most pressing curriculum development priorities. These findings are grounded in the OHHLEP definition's emphasis on the 4Cs – Communication, Coordination, Collaboration, and Capacity building – and its foundational principles of equity, inclusivity, and transdisciplinarity [19].

The low awareness of bio-surveillance, human-animal interface, and ecosystem health topics is particularly concerning given South Africa's documented burden of emerging zoonotic diseases [13, 14]. This reinforces the argument made by Daszak et al. [15] that approximately 75% of emerging infectious diseases originate at the animal-human interface, yet this interface remains largely invisible in current HPE curricula. The practical implication is that graduates are entering clinical practice without the conceptual tools to recognise, investigate, or respond to zoonotic health threats – a workforce gap with direct public health consequences.

Skills and Attitudes: Management Competencies as an Emerging Priority

The high demand for financial and practice management, infrastructure management (n = 37; 33%), and interprofessional team leadership skills (n = 38; 34%), reflects an evolving understanding of the health professional's role. Graduates increasingly need to function not only as clinicians but as systems navigators, resource managers, and interprofessional collaborators. This finding resonates with the global call for HPE to produce graduates with 'transformative competencies' that extend beyond technical clinical skills [1, 6]. The relatively strong foundation in critical thinking, clinical reasoning, and professional identity formation provides a basis upon which these broader management and collaborative competencies can be built.

Pedagogy: The Case for Technology-Enhanced and Interprofessional Learning

The high demand for technology-driven tools (n = 47; 42%) and interprofessional education modalities (n = 34; 30%) reflects educators' aspirations for more sophisticated, realistic, and collaborative learning environments. The widespread current use of case-based learning and blended delivery offers a solid pedagogical foundation [26]. Building on this, the deliberate introduction of OH case scenarios involving zoonotic disease, environmental health, and community-based challenges – approached from multiple professional perspectives simultaneously – would represent an evidence-based and relatively resource-efficient pathway to deeper OH integration [24, 27].

Simulation-based learning (SBL) for OH competencies holds particular promise in resource-constrained LMIC contexts, as it allows complex interprofessional scenarios – such as disease outbreak response or community environmental health assessments – to be rehearsed in a controlled setting before students encounter them in clinical placements [27]. Community service-learning, while logistically demanding, offers perhaps the most authentic OH learning environment and the strongest opportunity to cultivate civic responsibility alongside technical competence [28].

The Critical Role of Faculty Development

A recurring and sobering finding across all three sections is the proportion of respondents who indicated that none of the listed items were present in their curricula (19% for content, 20% for skills, 10% for pedagogy, respectively) or who did not want any of them included (12% for each: content, skills, and pedagogy). This pattern is consistent with the findings of Sikkema et al. [20] and Nguyen et al. [21] that more than half of health professionals in many LMIC settings have received no OH-related training. If faculty have not themselves been exposed to OH principles, it is unsurprising that they neither recognise OH-related content in their curricula nor advocate for its inclusion.

This underscores the primacy of faculty development as a prerequisite for sustainable curriculum change. Until educators across all disciplines develop a foundational understanding of OH, its relevance to their specific disciplinary context, and its implications for collaborative practice, curriculum transformation will remain superficial and piecemeal. Faculty development programmes should be interprofessional in design, contextually grounded in South African health challenges, and longitudinally reinforced through communities of practice, mentorship, and structured curriculum development processes.

Implications for Curriculum Development and Policy

Taken together, these findings support a multi-level response. At the institutional level, curriculum review and transformation processes should be initiated using collaborative, consensus-driven methodologies – such as modified Delphi approaches – involving academic staff from across disciplines, student representatives, community stakeholders, and policymakers [29]. Curriculum mapping platforms should

be developed and maintained to ensure transparency and facilitate horizontal and vertical integration of OH content. New or revised short courses and interprofessional modules addressing identified gaps – particularly in climate change, OH governance, cultural humility, and multidisciplinary integration – should be developed with attention to resource constraints and diverse disciplinary contexts.

At the national level, alignment between OH curriculum content and South Africa's national health priorities, the National Development Plan [30], and relevant international frameworks (including the SDGs and the OHHLEP strategic framework) [31, 32], should be sought. The Health Professions Council of South Africa (HPCSA) and allied regulatory bodies should consider incorporating OH competencies into accreditation standards and exit-level outcomes for health professions programmes.

Limitations

Several limitations of this study should be acknowledged. First, the study was conducted at only two South African universities, limiting the generalisability of findings to the broader national and regional context. A multi-institution, nationally representative survey is needed to confirm and extend these findings. Second, the survey relied on self-report, and respondents' assessments of 'have' and 'want' are subject to confirmation bias, social desirability bias, and variable interpretations of item definitions. Efforts to mitigate these biases – including clear participant information sheets, anonymisation, and extended data collection periods—were implemented but cannot fully eliminate these limitations. Third, the cross-sectional design precludes causal inference and cannot capture dynamic curriculum change over time. Fourth, the absence of seniority-level and discipline-level disaggregation in the current analysis limits the ability to identify specific faculty subgroups most in need of development support; such analyses will be reported in subsequent work. These limitations are inherent to survey-based educational needs analyses and are acknowledged as contextual constraints on interpretation rather than fundamental methodological flaws.

Conclusions

This needs analysis has generated the first systematic and educator-informed evidence base on the current status of One Health integration in undergraduate health professions education in South Africa. The findings reveal both areas of relative strength – including foundational professional and critical thinking skills, global health content, and blended and case-based pedagogies – and significant, actionable gaps in climate change and ecosystem health, OH governance and policy, multidisciplinary integration, cultural humility, and advanced interprofessional learning modalities.

The persistence of 'want' responses even for topics reportedly already taught confirms that siloed curriculum delivery, rather than outright content absence, is a central barrier to effective OH integration. This points to the need not only for new content but for transformed approaches to curriculum governance, design, and delivery. Transparent curriculum mapping, interprofessional short courses and modules, and community-engaged learning opportunities are practical and evidence-aligned strategies for bridging identified gaps.

Most critically, the substantial proportion of faculty who reported no familiarity with OH-related topics – and who did not want them in the curriculum – underscores that faculty development is not supplementary but foundational to sustainable curriculum change. Without investment in building educator awareness, understanding, and commitment to OH principles, even the most carefully designed curriculum reforms will fail to reach students.

This study provides the evidentiary platform for the next phase of this research programme: a multi-stakeholder, consensus-driven curriculum development process engaging health professions educators, students, community members, policymakers, and professional bodies across South Africa and the broader Southern African region. The ultimate goal is an integrated, contextually responsive, and equitable One Health undergraduate curriculum that prepares the next generation of health professionals for the complex, interconnected health challenges they will face – and that communities they serve urgently need them to address.

Abbreviations

AMR
Antimicrobial resistance
CBL
Case-Based Learning
HPAI
Highly Pathogenic Avian Influenza
HPCSA
Health Professions Council of South Africa
HPE
Health Professions Education
IPECP
Interprofessional education and collaborative practice
LMICs
Low- and Middle-Income Countries
OH
One health
OHHLEP
One Health High-Level Expert Panel
PBL
Problem-Based Learning
SBE
Simulation-Based Learning
SDGs
Sustainable Development Goals
TBL

Team-Based Learning

Declarations

Ethics Approval and Consent to Participate

Ethical approval was granted by the Sefako Makgatho Health Sciences University Research and Ethics Committee (SMUREC; Project ID: 2028; SMUREC/M/250/2024:IR) and the Walter Sisulu University Health Sciences Research Ethics Committee (Ethics Reference: 241/2024). All participation was voluntary, and informed consent was obtained from all participants prior to data collection. The study was conducted in accordance with the Declaration of Helsinki (1964), as revised in 2022. This study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for cross-sectional studies.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request. The questionnaire is available online at: https://docs.google.com/forms/d/1uarQXSgGJ9ai1t7AUg0EX728uA3FlepTV2VUYWmXHNY/preview

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

GCB conceptualised the research study, LHM, GCB, KN, AA, HH, developed the protocol and collected data at SMU. OA, EBB, MK, collected data at WSU, SM analysed and interpreted data, all authors produced the manuscript and approved its publication.

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Supplementary Files

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- Appendix1surveyOneHealthandInclusivity.pdf