

## W Non-physician clinicians in 47 sub-Saharan African countries

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Many countries have health-care providers who are not trained as physicians but who take on many of the diagnostic and clinical functions of medical doctors. We identified non-physician clinicians (NPCs) in 25 of 47 countries in sub-Saharan Africa, although their roles varied widely between countries. In nine countries, numbers of NPCs equalled or exceeded numbers of physicians. In general NPCs were trained with less cost than were physicians, and for only 3–4 years after secondary school. All NPCs did basic diagnosis and medical treatment, but some were trained in specialty activities such as caesarean section, ophthalmology, and anaesthesia. Many NPCs were recruited from rural and poor areas, and worked in these same regions. Low training costs, reduced training duration, and success in rural placements suggest that NPCs could have substantial roles in the scale-up of health workforces in sub-Saharan African countries, including for the planned expansion of HIV/AIDS prevention and treatment programmes.

### Introduction

Many nations have a history of health-care provision by staff who are not trained as physicians but who are capable of many of the diagnostic and clinical functions of medical doctors. In the 19th century, the French deployed officers de santé (health officers)<sup>1</sup> for rural medical services; in the 20th century Russian feldshers and Chinese barefoot doctors were active.<sup>2,3</sup> These types of health workers are now known as health officers, clinical officers, physician assistants, nurse practitioners, or nurse clinicians. We will describe them as non-physician clinicians (NPCs). Non-physician clinicians deliver health services in both developed<sup>4,5</sup> and developing countries.<sup>6</sup> For example, more than 300 000 non-physician clinicians practise alongside physicians in the USA.<sup>7</sup>

NPCs were present in sub-Saharan Africa during the colonial era; the British in particular trained health workers known as apothecaries, who dispensed medicines and often assumed additional clinical duties (Kadama P; Ministry of Health, Uganda, and WHO Health Policy and Strategic Planning; personal communication). In Uganda, an African Native Medical Corps was formed in 1918, with training programmes at the government hospital in Mulago.<sup>8</sup> In Kenya, from the 1920s, health workers known as dressers and dispensers were trained to provide basic surgical and medical care, respectively.<sup>9</sup> Agents sanitaire were trained in the Congo and elsewhere in French-speaking colonial Africa.<sup>10</sup>

The rationale for development of NPC programmes before and after independence was the need for personnel to deliver medical services in poorly served regions.<sup>11</sup> But despite the practical benefits of educating Africans for increasingly senior clinical duties, some physicians were concerned that training of such personnel would result in professional dilution.<sup>9</sup> This tension was evident in the titles used to designate African NPCs between the 1920s and 1960s, which included subassistant surgeon, subdispensary attendant, senior native medical assistant, senior African medical assistant, medical assistant, medical auxiliary, and clinical officer.<sup>9</sup>

Ethiopia initiated education of health officers at the University of Gondar in 1954.<sup>12</sup> In countries such as

Mozambique the exodus of physicians during war prompted initiation of NPC cadres.<sup>13</sup> After independence in Ghana, a commitment to primary health care delivery led to the establishment of the Rural Health Service, which trained health-centre superintendents, who were later known as medical assistants.<sup>6</sup> Much of rural health care in northern Ghana is now provided by these medical assistants.<sup>14</sup>

Robust information on national health workforces is not available in many countries. Reasons for this include different data collection agencies for trainees and workers; employment by both governments and non-governmental organisations; the difficulty of tracking retirements, deaths, and emigration; and the cost of maintaining accurate workforce data. To obtain primary data about NPCs, we used a key informant tree, whereby we surveyed individuals in all 47 countries, including officials in ministries of health and education, academicians, health programme directors, local government officials, and members of non-governmental organisations and faith-based organisations. NPC registries were also available in seven countries (Ethiopia, Ghana, Kenya, Malawi, Tanzania, Uganda, and Zambia).

We investigated the background, role, and status of NPCs in the 47 countries of sub-Saharan Africa (Angola, Benin, Botswana, Burkina Faso, Burundi, Central African Republic, Cameroon, Cape Verde, Chad, Comoros, Côte d'Ivoire, Djibouti, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Republic of the Congo, Rwanda, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Sao Tome & Principe, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe).

### Non-physician clinicians

NPCs cannot be easily delineated from other health workers with a simple legal or practical test, since many categories of health workers have taken on diagnostic and treatment functions that were traditionally the domain of physicians. We defined NPCs as health workers with training beyond the secondary school

level, who have fewer clinical skills than physicians but more than basic nurses. Our definition of NPCs included workers who were trained to deliver a range of personal clinical health services, but excluded those who specialised in health administration, population-health activities, or one clinical activity (eg, only eye care, orthopaedic skills, or anaesthetics). We also excluded health workers who, for reasons of necessity (eg, shortage of health workers in a community) or ambition (eg, desire for recompense), engaged in advanced practices for which they had not been trained.

NPCs were active in 25 of the 47 sub-Saharan African countries we investigated. In countries such as Kenya, clinical officers have become the backbone of the health system, and run most of the health centres; in Malawi, clinical officers provide medical care, do surgical procedures, and give anaesthetics.<sup>15,16</sup> The figure shows that about 80% of both English-speaking countries and Portuguese-speaking countries had NPCs, compared with 30% of French-speaking African countries. Nurses known as *infirmiers* were reported to have served in various expanded capacities in French-speaking countries but did not have the advanced level of training of NPCs in other countries (Van Damme W; Department of Public Health, Institute of Tropical Medicine, Antwerp, Belgium; personal communication).

Neither training of NPCs nor the scope of their role were standardised across sub-Saharan Africa. The role of the NPC did not seem to be based on a specific category of health practitioner in Europe or the USA. The most common titles used for African NPCs were clinical officer and health officer (table 1). Training programmes for NPCs were of two basic types, according to whether they recruited registered nurses or not. Matriculants in nurse-based programmes were experienced nurses who generally received a year of additional didactic education and 6 months of postbasic (internship) training. Non-nurse-based programmes recruited secondary school graduates, who were typically trained for 3 years with 1 additional year of internship experience (table 1). 18 countries had non-nurse based-training programmes. Only seven (Botswana, Ethiopia, Ghana, Lesotho, Rwanda, Seychelles, and Togo) had nurse-based training programmes, and two of these (Ghana and Ethiopia) planned to introduce the direct training approach, to avoid depletion of the scarce ranks of nurses.<sup>17</sup>

All NPCs were trained in basic diagnosis and medical treatment and had prescriptive authority. Some received subspecialty and surgical training in fields such as caesarean sections, orthopaedics, ophthalmology, and hospice care (table 1).<sup>18–20</sup> NPC training programmes relied less on hospitals and advanced technology than did training programmes for physicians. The training was practical and focused on local health challenges and treatment of indigenous disorders.<sup>21</sup> Educational programmes were developed and operated by ministries

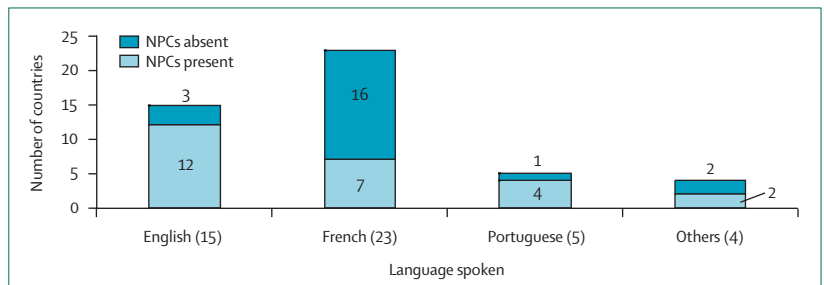


Figure: Number of sub-Saharan African countries with NPCs by universal language

of both health and education; these arrangements varied between countries. Non-governmental programmes did exist, including a clinical officer training programme in southern Sudan that was run by the African Medical Research and Education Foundation (AMREF)<sup>21</sup> and a clinical officer training programme in Uganda that was offered by a private university.<sup>22</sup>

Many NPCs were drawn from rural and poor areas,<sup>23</sup> and trained closer to their geographical origin and eventual place of service than did other health workers, who were educated at largely urban medical institutions. Many key informants mentioned that NPCs were less likely to move, whether within the country or overseas, than were physicians or nurses.

Data for training costs, including tuition and living expenses, were difficult to obtain because of variable government subsidies. However, information gathered from five countries showed that these costs were about US\$1000–2000 per year, and therefore \$3000–6000 for a 3-year training programme (table 2). In general, NPCs were trained in less time and with less cost than were physicians.<sup>24</sup> The authority to practise was usually granted to NPCs by a national professional body (often the Medical Council), in conjunction with the Ministry of Health.

NPC programmes were well established in former British colonies in which preindependence training of African health workers was common. Uganda, Kenya, and Malawi were the countries with the greatest number of practising NPCs and the highest ratio of NPCs in relation to population density (table 3).<sup>25</sup> Most NPCs worked under the nominal supervision of physicians, especially in urban areas. Comparison of NPC density with physician density showed that some countries with very low physician densities, such as Uganda, Rwanda, and Malawi, had compensated by training greater numbers of NPCs. In nine countries, which were mainly in English-speaking east Africa, numbers of NPCs equalled or exceeded numbers of physicians.

Training of more NPCs figured prominently in health workforce plans of many sub-Saharan African nations. The Zambian government planned to increase the number of NPCs from 1000 to 2600.<sup>26</sup> Ethiopia has been using a flooding and retention strategy to increase the numbers of health officers and health extension workers in the country,<sup>27</sup> and has started an accelerated training

programme that will produce 5000 health officers by 2010.<sup>17</sup> AMREF planned to increase the number of its graduates in southern Sudan from 30–40 to 100 per year.<sup>28</sup> Lesotho wanted to raise the annual graduation rate of nurse officers by 42%,<sup>29</sup> and South Africa was opening

programmes at its medical colleges to produce 100 physician assistants every year from 2007.<sup>30</sup> Ghana, which has had a tradition of NPCs but a small training capacity, has committed to double its output of medical assistants in the next 2 years (Adjase T; Director,

|               | Clinician name                | Basic entrance requirement   | Preservice education (years) | Internship duration | Scope of practice   | Practice locale |
|---------------|-------------------------------|------------------------------|------------------------------|---------------------|---|-----------------|
| Angola        | Clinical officer              | Secondary school             | 3                            | NA                  | Medicine, minor surgery, obstetrics ( but no caesarean section)   | Urban and rural |
| Burkina Faso  | Clinical officer              | Secondary school             | 3                            | NA                  | Medicine, minor surgery   | Urban and rural |
| Botswana      | Nurse clinicians              | RN with experience           | 1                            | None                | Medicine, obstetrics (but no caesarean section)   | Urban and rural |
| Cape Verde    | Health officer                | Secondary school             | 3                            | 1                   | Medicine  | Urban and rural |
| Ethiopia      | Health officer                | BS or RN*                    | 3                            | 1                   | Medicine, minor surgery, obstetrics including caesarean section   | Urban and rural |
|               |                               | Secondary school             | 3                            | 1                   | Medicine, minor surgery, obstetrics including caesarean section   | Urban and rural |
| Gabon         | Clinical officer              | Secondary school             | 3                            | 1                   | Medicine  | Urban and rural |
| Ghana         | Medical assistant             | RN with 3–5 years experience | 1                            | 0.5                 | Medicine, obstetrics (but no caesarean section)   | Mostly rural    |
|               |                               | Secondary school             | 3                            | 1                   | Medicine, minor surgery, obstetrics including caesarean section   | Mostly rural    |
| Guinea-Bissau | Clinical officer              | Secondary school             | 3                            | NA                  | Medicine  | Urban and rural |
| Kenya         | Clinical officers             | Secondary school             | 3                            | 1–1.5               | Medicine, minor surgery, orthopaedics, dermatology, anaesthesia, otolaryngology                           | Urban and rural |
| Lesotho       | Nurse officers                | RN with 5 years experience   | 1                            | 1                   | Medicine, obstetrics (but no caesarean section), public health  | Urban and rural |
| Liberia       | Physician assistant           | Secondary school             | 3                            | 1–1.5               | Medicine, obstetrics (but no caesarean section)   | Rural           |
| Malawi        | Clinical officer              | Secondary school             | 3                            | 1                   | Medicine, minor surgery, obstetrics including caesarean section, orthopaedics, dermatology, ophthalmology | Urban and rural |
| Mauritius     | Community health care officer | Secondary school             | 3                            | 1                   | Medicine, obstetrics (but no caesarean section)   | Mostly rural    |
| Mozambique    | Clinical officer              | Secondary school             | 2.5                          | 1–1.5               | Medicine, minor surgery, obstetrics including caesarean section, dermatology, public health               | Urban and rural |
| Rwanda        | Nurse clinician               | RN with experience           | 1                            | None                | Medicine, obstetrics (but no caesarean section)   | Mostly rural    |
| Senegal       | Health officer                | NA                           | NA                           | NA                  | Medicine only but can take additional courses to train in minor surgery, obstetrics or others             | Urban and rural |
| Seychelles    | Nurse clinician               | RN                           | 1                            | None                | Medicine  | Urban and rural |
| Sierra Leone  | Community health officer      | Secondary school             | 2                            | 0.5                 | Medicine, obstetrics (but no caesarean section)   | Mostly rural    |
| South Africa  | Physician assistant           | Secondary school             | 3                            | NA                  | Medicine  | Rural           |
| Sudan         | Clinical officer              | Secondary school             | 3                            | None                | Medicine only but can take additional courses to train in minor surgery, obstetrics or others             | Rural           |
| Tanzania      | Assistant medical officer     | 3 years experience           | 2                            | None                | Medicine, minor surgery, obstetrics including caesarean section, orthopaedics, dermatology, anaesthesia.  | Urban and rural |
|               | Clinical officer              | Secondary school             | 3                            | None                | Medicine, obstetrics (but no caesarean section)   | Urban and rural |
| Togo          | Medical assistant             | RN†                          | 2                            | NA                  | Medicine, minor surgery obstetrics (but no caesarean section), ophthalmology                              | Urban and rural |
| Uganda        | Clinical officer              | Secondary school             | 3                            | 2                   | Medicine, hospice care  | Urban and rural |
| Zambia        | Clinical officer              | Secondary school             | 3                            | 1–1.5               | Medicine, obstetrics (but no caesarean section) anaesthesia, orthopaedics                                 | Mainly rural    |
| Zimbabwe      | Health officer                | Secondary school             | 2–3                          | 2                   | Medicine, obstetrics (but no caesarean section)   | Urban and rural |

NA=data not available. BS=Bachelor of Science. RN=registered nurse. \*Now starting to enrol from secondary school. †Midwives, hygiene assistants, and massage therapists could also enrol if they had 5 years' experience.

Table 1: NPC training, entrance requirements, scope of practice, and practice locale in the 25 sub-Saharan African countries with NPCs

|          | Training cost per year<br>(tuition plus room and board) | Length of training<br>(years) |
|----------|---|-------------------------------|
| Ethiopia | \$1200–1500 per year                                    | 3                             |
| Ghana    | \$4000 per year   | 1                             |
| Malawi   | \$2000 per year   | 3                             |
| Tanzania | \$1300–2000 per year                                    | 3                             |
| Zambia   | \$1000–1500 per year                                    | 3                             |

§=US\$. \*Only one of these countries (Ghana) has a nurse based training programme; the rest are non-nurse based programmes.

**Table 2: Reported training cost per year for NPCs in selected sub-Saharan African countries\***

Kintampo Rural Medical Assistant Training School, Kintampo, Ghana; personal communication). Sierra Leone planned to augment the number of its community health-care officers from 167 to 500.<sup>31</sup>

In almost all countries with NPCs, they were reported to play prominent roles in HIV/AIDS treatment programmes. Malawi, Ethiopia, Tanzania, Zambia, and Uganda were building their antiretroviral treatment strategies around NPCs.<sup>32–35</sup> Many informants reported that NPCs had a useful and well accepted role in antiretroviral treatment, and were leaders in HIV/AIDS treatment campaigns (Schouten E; HIV/AIDS Coordinator, Ministry of Health, Malawi; Lemma W, Special Advisor on HIV/AIDS to the Minister of Health, Ethiopia; both personal communication).

In some countries, physicians have opposed the development of NPC programmes because of concerns about competition, inadequate supervision, and redundancy of care.<sup>36,37</sup> They have raised the possibility that NPCs could masquerade as physicians and do work for which they were not trained. Financial competition can also be an issue (eg, in Nigeria, unemployment among physicians has contributed to opposition to NPC programmes from the medical establishment).<sup>38</sup> In some countries, leaders of the nursing community have resisted training of NPCs on the basis that their work has negatively affected the role of nurses.<sup>6</sup>

## Discussion

NPCs were working in 25 of the 47 countries we surveyed in sub-Saharan Africa. All 25 of these countries with NPCs ranked among the 36 African countries that are recognised by WHO to have a critical shortage of health workers.<sup>39</sup> Nine countries had the same or greater numbers of NPCs as physicians, suggesting that they relied heavily on NPCs' contributions to health systems. Many countries were training increasing numbers of these workers.

The growing HIV/AIDS epidemic and the health targets established by the Millennium Development Goals have brought global attention to the shortage of health workers in sub-Saharan Africa, and the necessary challenge of scaling-up the health workforce.<sup>39,40</sup> Several

attributes of NPCs commend them to the attention of policy makers, public-health officials, and educators who aim to address such workforce shortages. First, NPCs provide a wide and varying span of clinical services, and in addition to basic primary care some do specialised work such as caesarean sections, ophthalmology, orthopaedics, and minor surgery. NPCs have also been given an increasingly pivotal role in the implementation and maintenance of antiretroviral treatment campaigns. Second, NPCs can be educated in less time and with less cost than can physicians. Compared with medical training, NPC programmes accepted individuals with lower levels of schooling, trained them for a shorter period, and were less reliant on hospitals and advanced technology. Third, the training was practical, and focused on local and indigenous health challenges. Many NPCs were recruited from rural and poor areas, and usually trained closer to their geographical origin and eventual place of service than did those who received medical education at largely urban institutions. Therefore, their presence has been especially important for deployment of health care to rural and hard-to-serve regions.

|               | Total number<br>of NPCs | NPCs per<br>100 000 people | Physician per<br>100 000 people <sup>26</sup> |
|---------------|-------------------------|----------------------------|---|
| Angola        | NA                      | –                          | 7.7   |
| Burkina Faso  | NA                      | –                          | 3.9   |
| Botswana      | 88                      | 5.3                        | 28.7  |
| Cape Verde    | NA                      | –                          | 17.1  |
| Ethiopia      | 776                     | 1.1                        | 2.8   |
| Gabon         | NA                      | –                          | 2.6   |
| Ghana         | 432                     | 1.8                        | 3.5   |
| Guinea-Bissau | NA                      | –                          | 16.6  |
| Kenya         | 4152                    | 11.9                       | 13.2  |
| Lesotho       | 164                     | 8.1                        | 5.4   |
| Liberia       | 120                     | 3.9                        | 2.3   |
| Malawi        | 2900                    | 22.2                       | 1.1   |
| Mauritius     | 154                     | 12.4                       | 85  |
| Mozambique    | 981                     | 4.9                        | 2.4   |
| Rwanda        | 444                     | 5.1                        | 1.8   |
| Senegal       | NA                      | –                          | 7.5   |
| Seychelles    | NA                      | –                          | 132.4   |
| Sierra Leone  | 284                     | 4.7                        | 7.3   |
| South Africa  | 100*                    | –                          | 69.2  |
| Sudan         | 90                      | 0.2                        | NA  |
| Tanzania      | 1200†                   | 3.2                        | 3.2   |
| Togo          | NA                      | –                          | 4.0   |
| Uganda        | 6000                    | 21.2                       | 4.7   |
| Zambia        | 1000                    | 8.6                        | 6.9   |
| Zimbabwe      | NA                      | –                          | 13.9  |

NA= data not available. \*2007 data. †Data for assistant medical officers; data for clinical officers not available.

**Table 3: NPCs and physicians per 100 000 head of population for sub-Saharan countries with NPCs**

Last, the absence of standardisation between NPC training programmes in African countries represents both a drawback and a potential benefit. A standard model, with a common professional definition for NPCs, would facilitate the dissemination of NPC programmes to other regions, and could also aid in assessment of the quality and competency of NPCs. At the same time, the variable and home-grown nature of NPC programmes is consonant with a focus on local medical issues. Introduction of a standardised model for training and practice (such as exists in medicine and nursing) could cause the NPC workforce to be depleted by opportunities in European and US health-work markets, where demand for the services of African doctors and nurses has become established.<sup>41,42</sup>

Although training and support for NPCs is less costly than for physicians, the necessary funds for education and salaries are still substantial. In the context of limited resources, some workforce strategists consider investments in community health workers (village workers with local and minimal training) to be the most effective and rapid approach to building health-worker capacity.<sup>43</sup> This approach has much to commend it, but the shortage of senior clinicians (doctors and nurses) around whom programmes of prevention and treatment could be built remains an impediment to the scale-up of all primary care and anti-retroviral treatment plans. Augmentation of NPC training and deployment strategies would, in many settings, provide a stable platform for increased use of community health workers.

Challenges to the scale-up of NPC programmes include opposition from some physicians, who are concerned about financial and professional competition and redundancy of care,<sup>37</sup> and from some nursing organisations, which have resisted the training of nurses for advanced practice on the grounds that NPC programmes will negatively impact the role of nursing.<sup>6</sup> Other medical professionals have opposed NPC initiatives on the basis that NPCs have insufficient expertise and are only “half-baked doctors”, and that the system is reminiscent of colonial times.<sup>44</sup> Such concerns warrant country-by-country discussions, factoring in health-service needs, economic considerations, and historical legacies.

Insufficient faculty and training sites can also pose problems for scale-up of NPC programmes. Targeted investments in faculty and training might be necessary, and early collaboration with medical and nursing faculties could provide transitional and catalytic support for new programmes. Costs for training new NPCs and supporting them once practising should be considered by the aid agencies and governments in sub-Saharan Africa that plan to expand NPC programmes as part of health-workforce strategies.

All these discussions can benefit from the wide and growing global literature that documents the effectiveness of NPC programmes for augmentation and extension of the work of physicians.<sup>45,46</sup> National

tracking systems for health workers will need to be improved. The costs of training NPCs and supporting them in practice should be rigorously compared with equivalent costs for physicians. We also need to understand the barriers to development of NPC programmes in specific countries. Delineation of the scope of NPCs’ practice in different countries, both legally and in practice, would help set the agenda for further investments in NPC programmes.

#### Contributors

Both authors participated in the design, research, and writing of this manuscript, and have seen and approved the final version.

#### Conflict of interest statement

We declare that we have no conflict of interest.

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