Universal antiretroviral treatment: the challenge of human resources

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The World Health Organization's (WHO) 2009 report *Towards universal access: scaling up priority HIV/AIDS interventions in the health sector* documents a remarkable increase in the number of people receiving antiretroviral treatment (ART) worldwide – from 3 million in 2007 to 4 million in 2008 – creating hope that, with sustained energy, universal ART coverage might be achievable.[1] At the same time, the report emphasizes many challenges in delivering ART on such a massive scale. One challenge – the number and types of human resources that will be required in the future to achieve universal coverage – deserves attention from a new perspective. But before we think about the future, we must first try to understand the past.

There are four possibilities for how past increases in ART coverage could have been achieved: (i) increased inflow of human resources for health into a country's health system, (ii) decreased outflow of human resources, (iii) task-shifting from highly-skilled to less-skilled health workers, or (iv) internal shifting of human resources from the general health systems to ART programmes.[2]

The first possibility seems least likely. According to a study by Hirschhorn et al.,[3] one to two physicians are required to deliver ART to 1000 patients in developing countries. Provision of ART to one million more ART patients in 2008 thus implies a worldwide net addition of 1000 to 2000 physicians to the global ART workforce. More than 80% of these physicians would have been added in sub-Saharan Africa, where WHO estimates the number of people receiving ART increased by 825 000. A net gain of 800–1600 physicians in sub-Saharan Africa in 2008 seems improbable, since it has been estimated that each year only a few thousand physicians in total graduate from medical schools in the region.[2] A recent article by Kinfu et al. on health worker training in 12 countries in sub-Saharan Africa concludes that "in at least 6 of the 12 countries, pre-service training is insufficient to maintain absolute numbers [of physicians, nurses and midwives] even at their current levels".[4] It thus seems more likely that the large increase in ART coverage in the region coincided with decreased outflow of health workers, significant task-shifting or internal shifting of human resources within health-care systems.[5]

The large-scale delivery of ART could have mitigated the negative impact of HIV on health workers themselves. In some sub-Saharan African countries, sizeable proportions of health workers are HIV-infected. It seems plausible that health workers were among the first patients who benefited from improved ART availability in many sub-Saharan African countries, decreasing their morbidity, absenteeism and mortality. Furthermore, ART programmes in many developing countries are commonly supported by aid organizations (e.g. the United States President's Emergency Plan for AIDS Relief and Médecins Sans Frontières) that offer salaries that are higher than local levels as well as facilitate collaborations with renowned academic institutions. It is plausible that many of the physicians and nurses working today in ART programmes in sub-Saharan Africa would have emigrated from the region had they not been offered these attractive positions.

Within ART programmes, tasks may have shifted increasingly from physicians to nurses and from nurses to ART treatment counsellors. The 2009 WHO report found that 63% of countries in sub-Saharan Africa "had developed policies to address human resource shortages through task-shifting strategies".[1] However, there is still not enough evidence on the overall extent to which task-shifting has occurred and whether it was an ad hoc response to acute staffing shortages or followed formal guidelines and policies. And, despite encouraging results from Lesotho, Mozambique and Rwanda, it is not clear how much task-shifting can occur without reducing quality of care.

Lastly, substantial numbers of physicians may have left the general health system to work in ART programmes. While there is evidence for such "internal brain drains", the overall size of such movements and their impact on the delivery of primary health care and on population health has not been assessed.

There are other possible explanations for how the increase in ART coverage in 2008 has been achieved. ART delivery programmes may have had underused physician capacity before 2007, or the productivity of ART delivery could have increased. However, both explanations seem improbable; the first because there is no evidence on record of excess physician capacity, and the second because using the 1:1000 patient/physician ratio, there would have to have been very large annual productivity increases – 33% if no new physicians were added, 23% if 250 were added, 14% if 500 were added, and 7% if 750 were added to the current global ART workforce.

Regardless of how the jump in ART coverage from 33% to 42% reported by WHO was achieved, future increases in ART coverage will become increasingly difficult: All else being equal, the larger the number of people receiving ART now, the lower their average mortality, and so the larger the total number of people who will need treatment in the future. In other words, ART programmes will fall victim to their own success – the more successful they are at reducing HIV-related mortality, the more difficult they will find it to scale up. We have investigated this question more formally in previous work.[6] Using a mathematical model, we find that estimates of human resource requirements that ignore the "feedback effect" from current ART coverage to future ART need significantly underestimate the future requirements to achieve universal ART coverage. For instance, while estimating the size of the

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ART workforce required for providing universal coverage in sub-Saharan Africa within 10 years, we compare a model with feedback to a model without feedback. Our results show that the feedback effect alone implied that 2.45 times more health workers (compared to the non-feedback case) will need to be added to the system every year to achieve universal coverage in 10 years, assuming constant productivity.

It is possible that there will be countervailing factors that mitigate the "victim of our own success" problem. For instance, ART coverage may reduce HIV incidence by lowering viral load in treated individuals and thus reducing the average risk of HIV transmission per unprotected sex act. Other ART-induced changes, however, may increase incidence. For example, all else being equal, increased survival of HIV-positive people due to ART will increase HIV prevalence and thus the probability that an HIV-uninfected person has sex with a person who is HIV-infected. Moreover, HIV-infected people may become sexually more active as their health improves due to ART, and HIV-uninfected people may increase their sexual risk behaviour because ART reduces the negative consequences of HIV infection. The net of these effects of ART coverage on HIV incidence is currently unknown.

Similarly, it is possible that the number of health workers required to provide high-quality ART to 1000 patients may decrease over time and with increasing scale of ART programmes. Knowledge about how to take antiretroviral medicines and how to deal with the side-effects of ART may spread through the population as more patients gain treatment experience, in turn reducing interaction times between patients and health workers. Technological advances, such as combination pills or improved patient management systems, and increasing health worker experience in providing ART could further reduce the health worker-to-patient ratio required for quality ART. New treatments, such as a therapeutic vaccine, may improve ART efficacy and decrease the need for patient follow-up visits. Finally, depending on the nature of a country's general health-care system, more efficient organizational models of care may evolve, such as integration of vertical ART programmes into general health systems or increased participation of the private sector in ART delivery. Although such hypothesized counter-factors are distinct possibilities, they are not prudent bases for policy and planning.

There is thus a great need to document and study how past increases in ART coverage have been achieved, for instance, by assessing health worker performance using surveys of ART facilities.[7] However, such research alone is not enough. Some of the most important factors determining the long-term progress towards universal coverage – such as "victim of our own success" mechanisms – may only become apparent with time and as ART coverage increases. The challenge of predicting future need through the study of past outcomes is exacerbated by uncertainties around the definition of ART need (such as increases in the CD4 count threshold for treatment eligibility) and ART-related health problems (such as widespread viral resistance). Health policy-makers need to anticipate these factors with the aid of models, allow for significant uncertainty in their ART strategies, and set realistic expectations for the magnitude of resources required for universal ART coverage. ■

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