



## PUBLIC HEALTH

## Human resource requirements for introducing cervical screening — who do we need where?

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The national policy on cervical screening, part of the National Cancer Control Programme for South Africa, indicates that all women over the age of 30 should be screened with repeat smears, to a total of 3 smears, at 10-year intervals.<sup>1</sup> However, implementation nation-wide is slow. Data for rational planning are required. A cervical abnormality prevalence survey in South Africa was published in 2002.<sup>2</sup> While the data are not perfect it is the largest study published, and the proportion of women in each age group, age 30 years and above, is representative of the national South African population (with the exception of the 60+ age group where the study data are less, viz. 6.4% for the study as compared with 14.6% for the total South African population). While the site-specific samples are small, the aggregate data provide reasonable estimates of national prevalence. It is therefore realistic to generalise from these data to the South African population in order to provide data for planning purposes.

### What was done

The published national prevalence survey provides age-specific rates for: squamous intraepithelial lesions, both low grade (LSIL) and high grade (HSIL); atypical squamous cells of undetermined significance (ASCUS); atypical glandular cells of undetermined significance (AGUS); and cytological invasive disease, both squamous and columnar. These age-specific national prevalence rates for the various diagnoses were applied to the age-specific census data<sup>3</sup> for each province (national age-specific rates multiplied by the total number of women per province in that age group for each diagnostic outcome category — table available on request). This calculation provides a likely estimate of the number of women in each province with normal, ASCUS, LSIL, HSIL, etc. Pap smear results. The prevalence survey found that 2% of Pap smears were unreadable using the Bethesda<sup>4</sup> classification and had to be repeated. Repeat Pap smears would also be required

for women diagnosed with LSIL, ASCUS or AGUS. These data were used to calculate the number of women requiring first and repeat Pap smears per province (total number of smears required = total number of women per age group plus repeats required).

The South African screening policy indicates that women should have Pap smears at least once every 10 years. Therefore the annual number of women requiring a Pap smear is the total number in the province divided by 10. To calculate a daily workload it was assumed that there are 200 working days per year.

Published data on posts and facilities in the public sector were used to estimate the number of province-specific personnel available to do Pap smears.<sup>5</sup> It was assumed that only professional nurses would perform Pap smears. However, it is not clear how many of these nursing posts are in fact filled and how many posts are located at primary care sites (clinics and outpatient departments as opposed to district hospital posts for example). In the calculation it was therefore assumed that only one-third of the available posts can be dedicated to cervical cancer screening.

Women requiring referral include all women who have HSIL or invasive disease. It is assumed that resources to provide this service can be developed at regional hospitals and it is possible to estimate the number of patients that each regional hospital would have to see. A significant proportion of these patients can be treated as outpatients.

Laboratory personnel requirements are estimated by dividing the total number of smears per year for the country ( $N = 850\,740$ ) by the number of cytotechnicians available in the public sector, currently approximately 93 people (Dr P Michelow, National Health Laboratory Service — personal communication).

### What was found

Table I indicates the number of first-time and repeat Pap smears that each province would have to do, The number of nurses and the number of Pap smears per nurse per day required to screen the entire South African population in a 10-year period are presented.

Table II shows the number of women, by province, who will require referral for further investigation.

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**Table I. Estimated number of Pap smears and staff to do Pap smears per province**

Province	First Pap	Repeats required	Total Paps	Total Paps per year <sup>†</sup>	Nurses <sup>‡</sup>	Paps/nurse/year	Paps/nurse/day <sup>§</sup>
Eastern Cape	1 230 357	88 087	1 318 444	131 844	1 904	69	0.3
Western Cape	864 278	62 735	927 013	92 701	1 375	67	0.3
Northern Cape	170 085	12 306	182 391	18 239	284	64	0.3
Limpopo	861 222	61 801	923 024	92 302	1 755	53	0.3
Mpumalanga	487 863	35 535	523 398	52 340	786	67	0.3
Gauteng	1 565 086	114 582	1 679 667	167 967	2 693	62	0.3
Free State	517 738	37 573	555 311	55 531	1 001	55	0.3
North West	620 459	45 047	665 506	66 551	1 001	66	0.3
KwaZulu-Natal	1 615 742	116 905	1 732 647	173 265	3 019	57	0.3

\* Includes all LSIL, ASCUS, AGUS and assumes a 2% repeat rate due to unreadable smears.

† Assumes coverage over a 10-year period, therefore total Paps required/10.

‡ This is calculated as one-third of the total number of professional nurse posts in each province.

§ Assumes 200 working days per year.

**Table II. Estimated number of referrals for follow-up and treatment per province**

Province	Total referrals*	Referrals per year <sup>†</sup>	Referrals/day <sup>‡</sup>	Number of regional hospitals in province	Referrals per regional hospital per day	Weekly clinic attendance at each hospital <sup>§</sup>
Eastern Cape	37 981	3 798	19	8	2.4	12
Western Cape	25 518	2 552	13	10	1.3	6
Northern Cape	5 054	505	3	1	2.5	13
Limpopo	26 499	2 650	13	5	2.6	13
Mpumalanga	14 383	1 438	7	5	1.4	7
Gauteng	45 297	4 530	23	12	1.9	9
Free State	15 347	1 535	8	6	1.3	6
North West	18 416	1 842	9	4	2.3	12
KwaZulu-Natal	48 148	4 815	24	9	2.7	13

\* Includes all HSIL and all invasive disease.

† Assumes that the entire population will be covered in 10 years, therefore total referrals/10.

‡ Assumes 200 working days per year, therefore yearly referrals/200.

§ Based on 200 working days, which is on average 40 clinics per year.

Assuming that each technician sees an equal number of smears, data on laboratory personnel indicate that each cytotechnician would have to read 9 147.7 smears per year or 46 per day.

## Limitations

There are clearly some assumptions in this model:<sup>1</sup> (i) it is not sophisticated enough to take into account the number of women who will graduate from the under-30 age group to the screening age group over the 10-year period; (ii) it only allows for one unsatisfactory Pap smear per woman; (iii) it does not include the small percentage of women who after a repeat smear for LSIL require yet another repeat smear within the 10-year period; or (iv) the percentage that will be found to have a higher grade lesion on repeating the smear and therefore require referral. The estimates also assume that women will be

equally distributed between the various regional hospitals. It is assumed that all women will use public sector screening and treatment services, whereas in fact a percentage of the population will use private sector services. The availability of cytological services in the private sector and the potential for the state to contract these services is not taken into account in the model. However, for planning purposes these estimates are based on relatively good data and are more rigorous than many other methods of assessing service needs.

## Discussion

These data show that to achieve 100% coverage of women eligible for screening, over a 10-year period, each nurse would have to perform on average less than one Pap smear per day. It appears that there is sufficient capacity to provide Pap smears at primary care level without placing an undue additional



burden on primary care providers. It is arguable that there is spare capacity and that any potential underestimate in the number of Pap smears required per year could be relatively easily accommodated. For example, it has been assumed that only one-third of professional nursing posts can dedicate some of their time to cervical screening services. It is possible that a greater proportion of these posts are filled and can be used to provide this service. It is most likely that other categories of nursing staff could perform this function. Data from the national prevalence survey indicate that well-trained lay-workers can do good-quality Pap smears. However, this will require Nursing Council rules to be adapted appropriately.

The capacity to read cervical smears at public sector laboratory level is limited. Local guidelines<sup>6</sup> indicate that cytotechnologists reading population-based smears should be expected to screen six smears per hour and to work for no longer than 8 hours per day, i.e. a total of 48 smears per day. Thus if all technologists employed by the state only read cervical smears we would have just enough technologists employed in the public sector. However, they also have other smears to read. Additional posts will have to be established or, in addition, methods of contracting private sector resources could be investigated.

It is interesting to note that because they do not understand the rationale behind the screening programme, some health care providers have incorrectly advocated that women should be screened from the age of 20. Using the same methods as described above but applied to include women aged 20 and above, the annual number of Pap smears required would increase from 85 0740 to 127 5016. This would mean that cytotechnicians would have to read 69 smears per day.

Every regional hospital will be required to run a clinic at least once a week to provide follow-up services for women with cervical abnormalities. Training of providers (either doctors or nurses) in methods of diagnosis and treatment will be necessary and planning to create this resource is urgently required. There is experience in the Western Cape in training staff to provide treatment using a variety of methods and this could be extended to the rest of the country if sufficient planning and funding were made available (Dr L Denny, Department of Obstetrics and Gynaecology, University of Cape Town — personal communication, 2003). Investment in skill development of this kind, to create a cadre of health care providers who can provide this service and ultimately train others, is something that donors are willing to fund. This kind of investment also provides a resource for further on-the-job training of additional personnel and thus does not require ongoing funding. It could also fill a gap until existing curricula are revamped to ensure that graduating doctors and nurses are appropriately trained.

As has been highlighted previously, the relationship between primary and referral sites and good monitoring systems is essential in order for any screening programme to have an

impact on mortality and morbidity<sup>7</sup>. Pilot sites in the Western Cape, Northern Province and Gauteng are providing models of how to set up the health system requirements for cervical screening services (unpublished progress report, submitted to Engenderhealth).

Data to monitor the impact of cervical screening, in particular routine data collection on HSIL rates as well as cancer diagnosis based on population registries (as well as on pathology registries), are essential. Again the beginnings of this already exist in the Cancer Registry, but its capacity and resources need to be extended to include collection of HSIL data.

These estimates indicate that it is within the capacity of the existing health care system to provide Pap smears, and that models exist for getting the other requirements in place (organisation at primary care level, referral systems, providing treatment and data collection). There are various options available for increasing laboratory capacity.

## Moving towards implementation

We have the basic elements in place. The political will to see a national screening programme implemented is required from government, the health sector, the various medical, nursing and allied professions, and professional boards. For example, tertiary care providers can begin to link with regional hospitals by initially treating women who are referred and simultaneously training local staff; programme managers need to develop appropriate budgets and research to inform this is already underway;<sup>8</sup> the Nursing Council needs to assess its rules and regulations governing practice; nursing and medical schools need to tailor their undergraduate and postgraduate curricula to ensure that graduates are appropriately trained to understand the policy, and that they are equipped with the required skills to implement it.

Extending services to provide universal access to cervical cancer screening should neither be under- nor over-estimated. As with all programmatic interventions it is essential to address the system requirements and find mechanisms to ensure that programmes are introduced in such a way as to develop and/or improve overall system capacity.

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3. <http://www.statssa.gov.za/RelatedInverseSites/census96/HTML/CIB/Population/218.htm> (accessed 8 Oct 2002).
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