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# Assessing the costs of organised health programs: the case of the National Cervical Screening Program.

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**Abstract**

Economic evaluations of health care programs are relatively common. However, the costs reported often use budgetary information alone, rather than undertake the potentially more complex task of using a variety of routinely collected data for which adjustments and assumptions will need to be made. Relative to the effort required for an individual-level costing exercise, investigating the costs of a health care program targeted at a population or group is likely to be a more complex and difficult undertaking. This paper describes the process of undertaking a program-level cost analysis, using principles developed to ensure the quality of such evaluations. Documenting the costs of the National Cervical Screening Program is used to illustrate the approach and the difficulties encountered, assumptions made and solutions employed are discussed. Despite the limitations to estimating the costs of health programs identified in this paper, evaluators can take full advantage of the data available by using a systematic description of the program as a basis for costing, testing the assumptions and adjustments needed using the expertise available within a specifically appointed advisory or working group and using sensitivity analysis to provide a greater level of confidence in the results.

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## Introduction

Understanding the costs associated with any health care service or program is necessary for a variety of reasons. While most often associated with the economic evaluation of health care interventions or services, information about costs is also used to document the resource use associated with health conditions or services provided to patients, to compare hospitals or other service providers and, in some states of Australia, as the basis of relative resource weights for payment[1].

One way of estimating the resource use associated with health care provision is by tracking the resource use related to specific patients, a task which usually requires the collection of primary data through a trial or other observational research design. In cases where hospital costs represent an important component of the costs of an intervention, clinical protocols, secondary analysis of hospital cost accounting system information or published sources of cost estimates may also be used[1].

A number of guidelines for the identification, measurement and valuation of costs have been published[2-4]. Such checklists, devised as a means of enhancing the quality of economic evaluations, all recommend that cost analyses should conform to the following principles: the perspective of the costing study should be explicitly stated as this informs the subsequent data collection; units of resource use should first be identified, the amount used measured, and then separately valued (priced); discounting should be applied to adjust for the different times in which costs were incurred and a sensitivity analysis undertaken to test the robustness of the results.

These principles apply to the analysis of both patient-specific and health program costs. However, relative to the effort required for an individual-level costing exercise, investigating the costs of a health care program targeted at a population or group is likely to be a more complex and difficult undertaking. With health programs, greater use will need to be made of routinely collected data, meaning that adjustments and assumptions will be required to compensate for the lack of ideal data. The aim of this article is to use the example of the National Cervical Screening Program (NCSP) of Australia to illustrate the approach used in documenting the costs of a health program, including difficulties encountered, assumptions made and solutions employed. The definition of health program used here is that of a defined and co-ordinated collection of health interventions aimed at addressing the specific needs of a section of the population.

## The Australian National Cervical Screening Program (NCSP): a case study in assessing the costs of a health program.

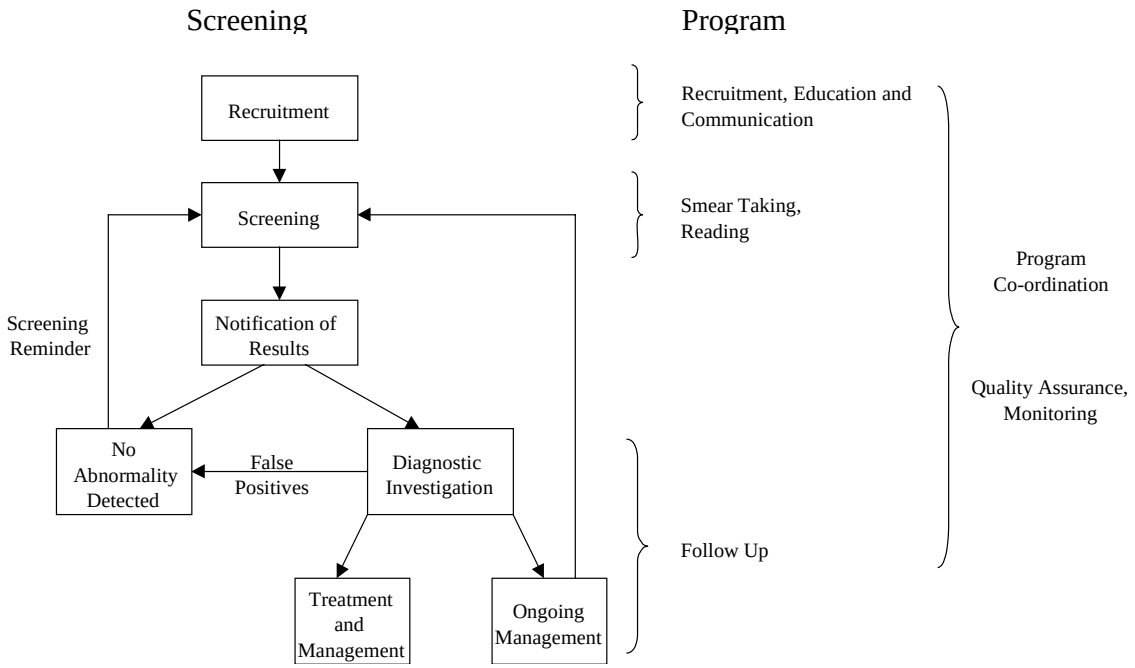
### *Background*

The Australian NCSP, a joint program of the Commonwealth and State/Territory governments, commenced in 1991. The Program operates on the premise that organised regular screening using Pap tests is an effective means of reducing morbidity and mortality associated with cervical cancer. The program aims to achieve these outcomes through encouraging all States/Territories to meet agreed screening targets among eligible women (all women aged 20-69 years). The program was established against a background of existing service delivery with general

practitioners providing most Pap tests. As a consequence, the focus of the program was on changing existing service delivery patterns and women's behaviour rather than establishing new health care services. However, some aspects of the screening program were the direct result of specific funding provided to the NCSP.

A major component of the NCSP is the organisation and management within each State and Territory of a Pap Test Register (PTR). The role of the PTR is to record and monitor the outcome of Pap tests, ensure the appropriate follow-up occurs, remind women when their next Pap test is due and monitor the quality and standard of pathology services. Other aspects of the NCSP such as undertaking health promotion campaigns, establishment of standards and performance measures for the PTRs and for pathology laboratories are also directly funded by the NCSP.

**Figure 1: Screening pathway for NCSP**



The evaluation of costs reported here was commissioned by the National Advisory Committee (NAC) on Cervical Screening, which, at that time, oversaw the Program. Thus, the perspective adopted by the evaluation was that of the Australian health system. The identification, measurement and valuation of the resources consumed by the NCSP followed the pathway outlined in Figure 1. Table 1 provides a summary of the results of the cost analysis.

Table 1. Summary of costs of the NSCP

| **Costs to Government** | **1997** | **1998** | **Total 1997-8** |
|---|---|---|---|
| **Health services coordination – CDOHA** | $1,071,000* | $822,000* | $1,893,000 |
| **Health services coordination - State/ Territory** | $12,715,000 | $12,463,000 | $25,178,000 |
| **Health services provision** | $108,557,000 | $105,443,000 | $214,000,000 |
| **Total cost to government** | **$122,343,000** | **$118,729,000** | **$241,072,000** |

Table 2 provides a more detailed description of the data sources used and assumptions made in order to estimate the costs of the NCSP. All costs are in 1998 dollars and have been inflated or deflated appropriately to adjust for inflation.

**+`Table 2. Expanded description of activities and costs of the NSCP**

| Costs to Government | Units | Annual expenditure $'000s | Annual expenditure $'000s | Estimation assumptions and other comments |
|---|---|---|---|---|
| Committee support/Projects monitoring | N/A | 315 | | Maximum level of detail that could be supplied |
| Salaries and Administration | N/A | 321 | | |
| Communication activities | N/A | 186 | | |
| **Total health services coordination – DOHA** | | | **822** | A |
| Coordination of the program | N/A | 1,802 | | From 7 of the 8 States and Territories |
| Monitoring and evaluation | N/A | 364 | | From 7 of the 8 States and Territories |
| Registry functions | N/A | 4,367 | | From all of the States and Territories |
| Education | N/A | 970 | | Only available from 3 States/Territories |
| Recruitment of women | N/A | 3,250 | | From all of the States and Territories |
| Other | N/A | 1,710 | | From 5 of the 8 States and Territories |
| **Total health services coordination (State/ Territory)** | | | **12,463** | B |
| GP/Specialist smear-taking | 1,616,656 + 311,040 = | 36,199 | | Annual counts of total smears[1] (in private and public laboratories respectively) multiplied by weighted |

| | | | | |
|---|---|---|---|---|
| | 1,927,696[1] | | | GP/specialist fee[2] (= $28.89), and adjusted for multi-cause attendances (estimated that for every 20 consultations including a Pap smear, 13 (65%) consultation fees could be attributed to the taking of the Pap smear [3]. |
| Pathology (Cytology) examination of smears | 1,927,676[1] | 30,313 | | Counts of total smears[1], multiplied by pathology fee (85% of $18.50 MBS fee) of $15.73 |
| Patient episode initiation (PEI) fee claims | 1,266,623 | 8,613 | | Counts of the number of PEI fees claimed[1], multiplied by the PEI fee (85% of $8 MBS fee) of $6.80 |
| Total cost of Pap smears | | 75,125 | | |
| Medical procedures | various MBS items | 9,169 | | Summing the counts of diagnostic services provided[1], multiplied by 85% of the relevant MBS fee |
| Specialist consultations | 160,317 | 8,837 | | Number of different medical procedures carried out[1], multiplied by fee specialist for a specialist consultation of $55.12 (= 85% of $64.85) |
| Histopathology tests | various MBS items | 3,054 | | Number of examinations of three different levels of complexity/biopsy sample type[1], multiplied by 85% of the relevant MBS fee |
| Hospital costs | various MBS items | 9,257 | | Hospital and anaesthesia costs[1] by MBS code or DRG (excluding expenditures relating to chemotherapy, radiotherapy and palliative care) |
| Total diagnosis and management | | 30,318 | | |
| **Total health services provision** | | | **105,443,000** | C |
| **Total cost of the NCSP** | | | **118,729,000** | (= A + B + C) |

Sources:
[1] Health Insurance Commission (HIC) MBS claims data
[2] AIHW internal document
[3] BEACH Study (*Bettering the Evaluation And Care of Health*, rolling survey of general practice activity)

*Identification*

The activities of the NCSP can be divided into two broad and several sub-categories. At the broadest level, activities can be separated in those associated with co-ordination and health service provision and, within these, into various sub-categories (see Table 2, Column 1). In relation to co-ordination, both DOHA and State/Territory resources were deployed to administer, coordinate and monitor screening, while State/Territory resources were also used to recruit women to the program, fund the operation of the PTR and develop and implement education activities aimed at providers and consumers. The provision of cervical screening and follow-up services to women is the responsibility of State/Territory governments. Health services covered by the NCSP included smear taking, smear reading, diagnosis, management and follow-up of screen-detected abnormalities.

*Measurement*

Once the categories and sub-categories of the NCSP were identified, information was sought from both the DOHA and each State and Territory regarding the units of activity undertaken within each of the functions of the Program. Measurement of resource use includes documenting the source(s) of data, including how the number of units of activity was calculated. Often, data on the volume of activity associated with a category or sub-category were not available, thus expenditure or budgetary information was the only source of information obtainable. When this occurred every effort was made to include only those costs attributable to the program itself or at least to note where joint production occurred. Further, due to differences between the States and Territories in the operation of the NCSP, the same data were not available for all categories of expenditure (see Column 5, Table 1).

An even more difficult task was determining which services provided to women were associated with treatment initiated following an abnormal smear, rather than ongoing management of other cervical abnormalities. This is because most routinely available data sources, such as Medicare Benefit Schedule (MBS) claims data, do not record the reason/s for particular procedures.

Two methods are available to estimate the total number of services provided under the NCSP and it was important to select the method that would provide the most accurate information. One method involves applying NHMRC Treatment Guidelines to the number of women screened and estimating the number of services which should be provided for abnormal Pap test results[5(1)] However, this method assumes that treatment guidelines are closely followed and that each part of the treatment process can be identified. A second method involves the use of Health Insurance Commission (HIC) data to identify total service provision, and then make assumptions about the proportion that resulted from abnormal Pap test results. However, with this method, any services provided in the public sector for which no claim is submitted to the HIC would not be included in these counts (e.g. in public hospitals).

As no prior information was available about which method would provide the most accurate information, a comparison was undertaken. The results of this comparison suggested that using the treatment guidelines method would be likely to underestimate the resources used by the NCSP. Therefore, HIC data were used to estimate the

[1] The 1994 NHMRC guidelines used here have since been rescinded and replaced with *Screening to Prevent Cervical Cancer: Guidelines for the Management of Asymptomatic Women with Screen Detected Abnormalities* (NHMRC 2005).

number of activities undertaken. Due to deficiencies in these data, additional means of estimating some health service resource use were also necessary. For example, estimating the number of hysterectomies performed for cervical cancer, the number of colposcopies performed in relation to cervical abnormalities and which MBS code to use for histopathology all required specific investigation to ensure that the most reliable data were used. Key assumptions were tested using sensitivity analysis.

*Valuation*

As far as possible, standard methods should be employed to value the resources used (e.g. as defined in PBAC's 'Manual of resource items and their associated costs')[6]. This will not present a problem if items such as health care technologies (e.g. drugs, procedures etc) or health care professionals' time are being valued: MBS prices, AR-DRG costs, allied health costs and outpatient costs can be calculated. However, these methods (and the categories of costs which they use) have been developed for use with patient-specific data. They assume that most, if not all units of resource use can be disaggregated at the level of the patient using micro or bottom-up costing. This approach is not practically feasible for evaluating some or all resources used by health care programs, and thus more reliance will need to be placed on macro or top-down costing. In this approach, routinely collected financial and administrative data are used to estimate costs and expenditures. Where such information is not available, budget information may provide the most accurate data available with which to estimate how resources are allocated across different aspects of a program.

As the NCSP operates on a two-year reporting cycle (that is, it is recommended that women with normal smears are screened every two years), two years of financial data

were required for the evaluation. Financial data were received for 1997/98 and 1998/99 (either fiscal or financial) for seven of the eight States and Territories. In order to generate a complete set of data for two years, expenditure in one State/Territory was estimated by deflating expenditures for 1998/99 using the Australian CPI[7].

To estimate the costs to government of health service provision, a price was applied to each of the services provided. Due to lack of specific data some inferences were necessary. A key inference was that each instance of a reported service to read a cervical smear was associated with a corresponding smear-taking service (and thus the cost of this service). The price of medical services, and diagnostics was obtained from the MBS[8]. Hospital costs of treatment were estimated using the National AN-DRG 1998/99 case-weighted costs for the appropriate DRG (http://www.health.gov.au/casemix/committee/acccmain1.htm, accessed January 2004).

Estimating the costs of GP-provided services presented another challenge. There is no way to identify from HIC data which visits to a GP or medical specialist involve a Pap test and having a Pap test will not always be the only reason for consulting a doctor. Thus, because multiplying the number of Pap tests performed by the price of a medical practitioner visit is likely to overstate the cost of medical practitioner visits attributable to the provision of Pap tests, a single service equivalent weighting factor was calculated and used to adjust the number of services performed for multiple purpose visits[9]. It was also necessary to take into account that the price of a Pap test (i.e the MBS fee) varies according to the length of the service provided and who

provides the service and that under the MBS, pathologists are also paid a patient episode initiation (PEI) fee[9]. This payment is in part a reimbursement for the physical collection and transportation of cervical smears from the location at which the smear has been taken to the location at which it is to be read. As this work was undertaken prior to the introduction of the Practice Incentive Payments and the service incentive payments introduced by the Commonwealth in 2001, these fees are not included in this analysis[10].

*Sensitivity analysis*

As mentioned earlier, sensitivity analysis was applied to assess the impact of key assumptions, particularly where there was any uncertainty around their estimation. Key areas where sensitivity analysis was used include the fee for a medical consultation for the purpose of a Pap test, the number of cervical cautery procedures; the percentage of diagnostic procedures that attracted an additional specialist fee; the number of hysterectomies performed for cervical cancer or pre-cancer; and the appropriate MBS code for histopathology of biopsy tissue. As the sensitivity analysis did not greatly change the results, the main estimates (e.g. the total cost of the program) can be relied upon with confidence.

## Discussion

This paper has illustrated a method for analysing the cost of health programs using the National Cervical Screening Program as an example. The methods and results outlined indicate the level of success achieved in following the recommended guidelines for costing and where modifications were required. Overall, it was possible to broadly follow the suggested procedures although adjustments were needed to account for missing data, lack of detail of data from different years and many

assumptions were necessary to calculate some aspects of the costs of service provision. Costs were collected for a specified two-year period and a sensitivity analysis was performed.

The epidemiology of cervical cancer and its pre-cursors represent a complex disease process and providing a national, coordinated response in a country such as Australia with a Federal system of government and division of responsibilities in terms of health service delivery is also complex. To further complicate matters, large multi-activity programs like the NCSP often operate across several different agencies involved in either program co-ordination or service provision.

Such complexity makes it challenging to collect data from different organizations that report their activities and expenditure in different ways (e.g. variation between States/Territories in the way they reported expenditure in relation to the coordination of local programs, health promotion and recruitment of women). In addition, it will often be the case that data are available for some agency's activities (e.g. MBS-rebated items available from the HIC) but not others (e.g. the number and cost of taking Pap smears in public hospitals or by State-employed nurses working in rural areas). As well, the program of interest may only be part of a particular organisation's activities and resource use data may not be recorded in sufficient detail to easily estimate how much is attributable to program-related activities. This means that the evaluator is forced into using a "top-down" or macro-costing approach in which an estimate of the proportion of overall activity and therefore expenditure related to the program is made (as happened here with GP visits, hysterectomies, colopscopies as well as much of the co-ordination activities).

## Conclusion

Despite the limitations to estimating the costs of health programs identified in this paper, there are several ways in which evaluators can take full advantage of the data available. First, by using a systematic description of the program as a basis for costing, constructive information about where resources are being deployed can be demonstrated even in the most multi-faceted of programs. Second, the wide range of assumptions and adjustments needed in a cost analysis of a health program are best tested using the expertise available within a specifically appointed advisory or working group. Finally, using sensitivity analysis to assess the robustness of uncertain assumptions and data provides a greater level of confidence in the results.

In addition to the assessment of costs, the study results identified where more consistent and detailed data collection would improve future monitoring and evaluation. First, some inconsistencies were identified in the classification and reporting of some abnormalities. Such differences meant that assumptions had to be made regarding the classification of abnormalities, creating unnecessary barriers to successful monitoring and evaluation at a national level. The 2005 NHMRC guidelines have rectified this problem[11]. Second, in examining health service utilization resulting from the detection of cervical abnormalities, the number of colposcopies undertaken in relation to cervical abnormalities and the lack of routinely available data on the reasons women have hysterectomies were identified as issues which would benefit from further investigation.

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