



**INCLUDING POST-EXPOSURE PROPHYLAXIS TO
PREVENT HIV/AIDS INTO POST- SEXUAL ASSAULT
HEALTH SERVICES IN SOUTH AFRICA: COSTS AND COST
EFFECTIVENESS OF USER PREFERRED APPROACHES
TO PROVISION**

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Executive Summary

Introduction

Rape is a serious human rights and public health issue in South Africa. In the context of high rates of HIV/AIDS in the country the focus on the transmission of HIV after rape has received substantial attention over the past few years. This project was designed to provide information to inform the health service response to rape. The overall study was divided into three complementary components. First, we developed and conducted a discrete choice exercise aimed to quantify women's preferences regarding key aspects of post-sexual assault health service delivery. This was informed by qualitative research carried out in five provinces. The second component of the project was the costing of two sites, one rural and one urban, that routinely provide post-rape care. This data was then used estimate the scale-up costs of providing post-rape services in accordance with the Department of Health's sexual assault policy. The third component of the study was modelling the cost effectiveness of providing post-exposure prophylaxis to prevent the transmission of HIV after rape.

Discrete choice analysis methods

The discrete choice analysis aimed to describe aspects of post-rape health service delivery that would most influence choice of service, the trade offs which women would be prepared to make between different aspects of service delivery, and to compare views of patients who had utilised post-rape services with members of the community who may be future users or may have experienced barriers to service use. The stated preference discrete choice study was conducted at a site in Cape Town and a site in Thohoyandou. A questionnaire was developed that collected information of socio-demographics and attitudes towards health services and health care providers that had emerged from the qualitative research. There were sixteen scenarios where patients chose between two hypothetical health services. Patients who had used post-rape services were asked about the services that they received.

The scenarios were developed to better understand the trade offs that patients would be willing to make between different aspects of the health services. We identified five attributes of the health services for this part of the study. These included how long it would take a patient to travel to the health service; whether post-exposure prophylaxis to prevent HIV after rape was available at the health service, and if so whether an HIV test was required; the number of returns to the hospital for follow up; whether the medical examination was long and extensive, or short and focused on health rather than evidence collection; and counselling skills and attitude of the health care provider. We conducted face-to-face interviews with 319 participants. 152 were from the Cape Town site and 163 were from the Thohoyandou site.

Discrete choice analysis findings

We found that respondents most valued the availability of HIV post-exposure prophylaxis (with an HIV test) and having a sensitive health care provider who could provide counselling. They did not make choices based on travel time. Our findings suggest that patients are willing to trade off access to services (time travelled) for attributes such as HIV post-exposure prophylaxis, counselling and examination rigor. This has very important implications for service provision as it suggests that Provinces should focus on providing services run by health care providers who have received special training in managing patients after rape and understand what being raped means for patients, in settings that are appropriately resourced, rather than seeking to provide the most geographically accessible service.

Completion rates for the HIV-prevention medication regimen was very low in Cape Town (15%) and quite high in Thohoyandou (87%). The low completion rate in Cape Town has been confirmed by other research. It may have resulted from the requirement that women return to the service weekly to collect drugs. Patients prefer to get of all their HIV prophylaxis at the initial visit, as practiced in Thohoyandou. Other factors that may influence completion of the course include the provision of anti-emetics and information, these were provided in Cape Town. Our findings suggest that anti-emetics alone do not result in better compliance, although they reduce the side-effects associated with taking the drugs. In Thohoyandou the home follow-up service provided by the non-governmental organisation sought to meet clients' needs for emotional support in the period after the rape, to reinforce information about medication after the immediate trauma when recall is better, and to promote drug taking. It was accompanied by the provision of food supplements. It seems likely that these interventions account for the high drug regimen completion rates in this setting. Our findings suggest that much more emphasis should be placed on meeting women's emotional needs after rape, especially in the period of days following the initial report, and that information given initially should be reinforced a little while after the immediate trauma.

Reports from the women in our study who had used health services revealed gaps in service provision. All patients interviewed would have been eligible for treatment for sexually transmitted infections. However, fewer patients reported getting drugs for these infections than HIV prophylaxis. Information on drugs and side effects seemed to have often been provided to patients in an ineffective way, so there was a good deal of confusion and gaps in knowledge.

Costing post--rape health services

A detailed cost analysis was completed in these two case study sites (one in Cape Town and the other in Thohoyandou) of post- sexual assault health service provision, the results of which were used in the formulation of a scale up cost model to estimate national costs of implementing new management guidelines for the provision of health care to survivors of sexual assault issued by the National Department of Health in South Africa and to calculate the national costs of programmes whose design was valued most highly by women as found in the discrete choice exercise. Finally these costs were combined with a spreadsheet model estimation of effectiveness of providing HIV PEP measured in cases of HIV averted and life years gained to providing ratios of cost effectiveness over a range of scenarios. This multi-component structure of the project aimed to gather various pieces of complementary information in order to provide a wide scope of guidance to post- sexual assault policy implementation, priority setting and resource allocation. A costing of post-sexual assault health services at the two study sites and then nationally was described including scale up costs of preferred designs as calculated in the discrete choice exercise outlined above. These costs were then restricted to the add-on costs of PEP provision for the cost-effectiveness analysis.

Cost-effectiveness of post--exposure prophylaxis for HIV after rape

The cost-effectiveness of post--exposure prophylaxis for HIV after rape of women and girl-children had not previously been estimated in high HIV prevalence settings. We conducted a cost effectiveness analysis which looked at adding post--exposure prophylaxis to public health services South Africa. A spread-sheet based model of post- rape prophylaxis effectiveness was developed using estimates from research on rape in South Africa, utilisation data from health services, literature review and expert opinion. Costs were obtained from two post--rape health service sites described above. The results were combined to produce estimates of cost per HIV transmission averted and cost per life year gained. Two sets of cost effectiveness ratios were calculated, one assuming no access to a treatment programme for HIV (no ART) and the other assuming universal access and utilisation of the programme when indicated (ART).

Without post-exposure prophylaxis, we estimate that 286 HIV transmissions would occur annually after rape. In the base case scenario, 31 cases could be averted with post-exposure prophylaxis (range 2 – 170). Assuming universal availability of anti-retroviral medication for people with HIV, the base scenario cost per case of HIV averted is US\$ 31 630 ranging from cost saving to \$809,775 per case averted in the sensitivity analysis. Cost per life year gained ranged from a net saving of US\$ 331 per life year gained to US\$46,432 with a base case ratio of US\$1,814 per life year gained. Main drivers of cost effectiveness included rates of timely seeking health services, and completion of the course of prophylaxis.

South Africa can provide HIV post-exposure prophylaxis in a manner that is affordable and even cost saving, but this is critically dependant on improving sexual assault services to support service use and completion of drug courses.

Chapter 1: Background

Rape and HIV in South Africa

Rape is a leading public health and human rights problem in South Africa. Data indicate that in 2002–2003 there were 55 114 cases of rape, or 231 per 100 000 women reported to the police (CIAC, 2006). This figure is unavoidably an underestimate of the total amount of rape as many incidents go unreported. A community-based survey of rape estimated the rate of such incidents at 1,300 per 100,000 women per year (Jewkes & Abrahams, 2003) which is likely to be more accurate. Among its health consequences, rape provides an opportunity for direct transmission of HIV.

Internationally, there has been growing interest regarding the provision of post-exposure prophylaxis of antiretroviral drugs to reduce the risk of HIV infection following rape. This interest has evolved in light of scientific evidence that such drugs can be both safe and effective when used following occupational exposures, such as needle stick injuries to healthcare workers (Cardo et al., 1997), and that they are also effective in animal models of genital tract exposure to HIV (Otten et al, 2000). Given the high prevalence of HIV in South Africa, 28% among women attending antenatal services (DOH, 2005), the policy to provide PEP after rape was implemented in public health services in December 2002. However, the implementation of services has not been uniform throughout the country and reports of unavailable drugs still occur. This raises questions about how health services for rape survivors can be improved.

In South Africa, it is estimated that about one in six women who have been raped attend health services (Jewkes & Abrahams, 2003). Women who have been raped have specific health needs: the prevention of pregnancy, HIV, and other sexually transmitted infections; psychological support; and the management and documentation of injuries (World Health Organization, 2003). Services currently offered in South Africa are of varied quality, and limited resources mean restricted options for how such services are delivered (Christofides et al, 2005; Campbell et al, 2001; Ericksen et al, 2002). Research conducted in industrialised countries and in South Africa has highlighted how use of health services can be a negative and disempowering experience for rape survivors, (Campbell et al, 2001; Resnick et al, 2000; McCauley et al, 1998;) and this may partly explain the low levels of use.

In global efforts to improve services for rape survivors there is a move towards having specialised services with carefully selected, sensitive, trained providers who focus on the *holistic* care of women who have been raped and include extensive collection of physical evidence. (McCauley et al, 1998; Resnick et al, 2000). The South African National Department of Health has developed a new model of rape care policy and clinical management guidelines (Department of Health, 2003) and in the process opened debate about the most appropriate model of care for the country. Garcia-Moreno suggests that patient's experiences need to be taken into account in the design of health services for survivors of sexual violence (Garcia-Moreno, 2002) and to this end the work presented here includes a detailed analysis of South African women's preferences for post-rape care.

One of the barriers to the implementation of comprehensive and specialized services has been the cost implications of running such a service. Adding post-exposure prophylaxis to prevent HIV after rape has the potential to further increase service costs. This report presents detailed costing of two sites, one rural and one urban, providing post-rape care in

South Africa. This data is then used estimate the scale-up costs of providing post-rape services in accordance with the Department of Health's sexual assault policy. The costing and scale-up can facilitate the planning of services, including resource allocation and budgeting. We conclude with a cost-effectiveness analysis of post-exposure prophylaxis to determine the cost per case of HIV averted.

The different aspects of this project are inter-related and inter-dependent. Whilst cost effectiveness in terms of HIV transmissions averted is important, the acceptability to potential users of post- sexual assault health services will determine the number of women presenting to services and returning for follow up care and likely completing the full course of post-exposure prophylaxis. Number of users can also affect the cost effectiveness of any roll out programme to provide PEP in post- sexual assault in South Africa. It is therefore important to integrate investigation of potential users' preferences for differing models of service provision with the analysis of potential costs.

Project Objectives

The studies aimed to:

1. To investigate women's preferences for sexual assault services and understand the trade offs which they would be prepared to make between different aspects of service delivery and to establish the costs of different models of care;
2. To cost post-rape services at an urban and rural site and to estimate scale up costs for providing sexual assault services nationally in accordance with the policy;
3. To determine the cost-effectiveness of post-exposure prophylaxis for sexual assault survivors seeking public health services in South Africa.

Outline of the study and report

The overall study was divided into three complementary components, a discrete choice exercise, costing of delivering post-rape services as outlined in the policy and a cost-effectiveness study. The discrete choice exercise aimed to quantify women's preferences over key aspects of post- sexual assault health service delivery. The development of the questionnaire for this component of the study was informed by extensive qualitative research. This was used to guide possible programme designs that would be most likely to provide the greatest sense of well-being to women and therefore promote their reporting of the assault and access health services.

A detailed cost analysis was completed of these two case study sites (one in Cape Town and the other in Thohoyandhou) of post- sexual assault health service provision, the results of which were used in the formulation of a scale up cost model to estimate national costs of implementing new management guidelines for the provision of health care to survivors of sexual assault issued by the National Department of Health in South Africa and to calculate the national costs of programmes whose design was valued most highly by women as found in the discrete choice exercise. Finally these costs were combined with a spreadsheet model estimation of effectiveness of providing HIV PEP measured in cases of HIV averted and life years gained to providing ratios of cost effectiveness over a range of scenarios. This multi-component structure of the project aimed to gather various pieces of complementary information in order to provide a wide scope of guidance to post-sexual assault policy implementation, priority setting and resource allocation.

The costing of post--sexual assault health services in each of the study sites and then nationally is then described including scale up costs of preferred designs as calculated in the discrete choice exercise outlined in the previous section. These costs are then restricted to incremental costs of PEP provision and placed alongside corresponding scenarios of effectiveness to give ranges of cost per HIV transmission averted and cost per life year gained from full national implementation of PEP provision post--rape in South Africa. Finally the conclusions and recommendations bring the findings of all of the sub components together and present policy implications of the work.

Chapter 2: Women's experiences of and preferences for services after rape in South Africa – a discrete choice analysis

Introduction

Discrete choice analysis of stated preferences measures the preferences of users and potential users over various dimensions of a programme. It has been used in the evaluation of health programmes in many settings (Tesler & Zweifel, 2002; Phillips, Maddala & Reed Johnson, 2002; Lancsar & Savage, 2004; Hanson et al, 2005). It is founded on the assumption that any service can be described by its attributes and that the preference for one service over another is driven by the degree to which it possesses desirable or undesirable attributes (Ryan & Farrar, 2000).

We investigated which aspects of health services after rape are most valued by patients to determine what would influence choice of service and the trade-offs that women would be prepared to make between different aspects of service delivery. We compared the views of women who had used services after rape with those of women from the community who may be future users or may have experienced barriers to using such services in the past.

Methods

Setting

The study was conducted in one rural and one urban site in South Africa. The sites were selected because there was infrastructure in place to support the recruitment of patients. The urban site in Cape Town was primarily located at a regional hospital and the surrounding communities. The service for people who had been raped was established by the Department of Justice and is located at the hospital. There is a full time nurse who is primarily responsible for follow-up visits. Any available emergency department physician carries out examinations. The rural site, a district level hospital, was located in the far north of the country and serves the town of Thohoyandou and the surrounding rural area. A non-governmental organisation has established a trauma centre at the hospital to deal with sex based violence and provides support and counselling. Any doctor at the hospital carried out examinations.

Participants

We interviewed 319 women at the two sites between November 2003 and January 2004. In Cape Town, we recruited 74 women who had used the service and four carers of patients who were too young or could not to be interviewed due to mental disability. In Thohoyandou we recruited 81 patients. We also interviewed 78 comparable women from the community in Cape Town and 82 in Thohoyandou. They were of similar age (plus or minus 5 years) and lived in the same area (living 10 doors away from each service user). No connection was made between the community participant and the service user during recruitment, in this way confidentiality was maintained. They were selected to determine whether potential service users (including those who may have chosen not to use the service) have different priorities from those who actually access services. Women who had survived rape were approached through the health services over the six months before the survey. The examining doctor or nurse in participating services asked them if they would consent to their details being given to a researcher studying quality of services. Those who agreed gave written consent. At the time of the survey, the women were asked again for consent to participate in the study. Though we did not exclude men who had been raped, none were recruited.

Questionnaire development

The attributes and levels used in the discrete choice analysis were based on results from focus groups held in different parts of the country, expert inputs, and pertinent policy questions. Participative data collection was conducted in five provinces. Two of the groups were conducted in urban areas (Western Cape and KwaZulu Natal, two in peri-urban areas (North West and Limpopo Province) and one in a rural area (Eastern Cape). The purpose of this research was to document priorities and compare the perspectives of different groups. The information obtained will also guide choice of attributes for the conjoint analysis described below.

The groups were recruited through the community and 12 to 18 people were selected to participate in each of these workshops. This allowed for small groups to be created to do the "task" and then feedback to the larger group culminating in the diagramming/ranking exercise¹. There was a facilitator in each group tasked with keeping the discussion on track and asking for motivations. Detailed notes of the small group discussion were taken for thematic analysis (outside of the workshop).

The discussions had two main foci: what are the most important dimensions of quality in post--sexual assault health care? How are these ranked in order of priority? And what are the main concerns about HIV after rape and which factors influence decision-making around taking post--exposure prophylaxis?

Questionnaire content & fieldwork

Trained fieldworkers administered the questionnaire through face-to-face interviews in Xhosa, Afrikaans, and Venda. We collected data on socio-demographic characteristics (including socioeconomic status [Jewkes et al 2006]), attitudes towards rape services, and discrete choice responses from all participants. Participants who had used health services were asked about the actual management that they received including referrals for counselling, treatment received, side effects experienced (if any), information received on side effects, and number of return visits. Table 1 outlines the attributes and their levels. We selected one scenario, with services closely reflecting current levels, as a constant comparator (service A) and then presented 15 choice scenarios between this and service B (table 2 shows an example). We used a pictorial representation of the scenarios to facilitate selection by participants.

¹ Kesby M., 'Participatory diagramming as a means to improve communication about sex in rural Zimbabwe: a pilot study' *Social Science and Medicine*, 50 (2000) 1723-1741. *Participative data collection* is an interactive task-based approach to data collection was undertaken through 'diagramming' & ranking in a participatory workshop. This allowed participants to see the steps of the analysis and to contribute towards it, rather than simply experiencing a group discussion without making explicit the flow of argument. It allowed participants to look at the first level of conclusions of the discussion and then to reflect on and comment on these thus adding to the data collection. It also allowed the facilitator to show pursue different points and dimensions, in a way that participants could follow.

Table 1: Attributes and levels in the discrete choice analysis

ATTRIBUTE	LEVEL
Travel time to service	< 30 minutes; 1 – 2 hours; 3 hours or more
Availability of ARV prophylaxis	No ARVs available; ARV PEP available on HIV negative test result PEP available without HIV test being done
Required returns to the services	No return after initial visit; One return after 3 days 4 returns - once per week for one month
Medical examination	Short Long
Nurse / doctor skills and attitudes	No understanding, no counselling training Understanding but no formal counselling training Understanding and formal counselling training

We included one scenario with all attributes of equal or inferior levels to check that study participants really understood the exercise and were making deliberate choices. We then excluded from any further analysis the 23 participants who did not select the logically better scenario. We excluded respondents who always selected choice A or B, as well as those who obviously failed a test of transitive preferences (which assumes that if bundle A is preferred to B and B is preferred to C then A should be preferred to C) (n=21). Our final analysis included 275 participants (86% of original sample); 135 who had been raped (or a carer responding on behalf of a patient) and 140 community participants, 121 were from Cape Town and 154 were from Thohoyandou.

Table 2: An example of one of the discrete choice scenarios

	Service A	Service B
Time travelled to service	Between 1 and 2 hours	Between 1 and 2 hours
Medication	No HIV prevention drugs available	HIV prevention drugs given without having to have an HIV test
Required returns to hospital	Return once only, three days after your initial visit	No return after initial visit
Medical examination	A short examination that will document physical injuries like bruises, cuts and grazes but the main focus will be on your health	A very extensive examination of your private parts to collect evidence which may result in a greater likelihood of the case going to court
Nurse/Doctor skills and attitude	Doctors or nurses who understand what someone who has been raped is going through but are not trained in counselling	Doctors or nurses have no counselling training or understanding of rape

Data analysis

Data were entered into SPSS 11 (SPSS, Chicago, IL) and analysed in Stata 8.0 (StataCorp, College Station, TX). We used bivariate analysis for social characteristics and health services received by participants. The two sites were compared with χ^2 test for categorical variables and a double sided t test for continuous variables.

Because of the multiple response nature of the data we used a random effects probit model to estimate the benefit function of moving from service A to service B. A likelihood test of $r=0$ showed that this was the correct model to use ($P<0.001$). We expressed attributes with ordinal or categorical levels as dummy variables (all but number of returns to the service required) as we could not be assume linearity, with the benchmark being the level in the comparator scenario (see table 1). Models included variables for the attributes and levels as well as for potential interaction effects with socioeconomic and demographic characteristics and previous service use.

We used likelihood ratio tests to determine coefficients on interaction terms with site, service user, socioeconomic status, and age. Site interactions were significant on all attributes and their inclusion significantly improved the fit of the model ($\chi^2 P=0.001$). We estimated separate models for each site as well as the overall to aid in interpretation.

Results

The median age of the participants was 22 years (range 14.4-66.6 years). Most (96%, $n=150$) had some schooling (mean 10.2 years). Participants in Thohoyandou were younger, more likely to still be in school, and of lower socioeconomic status (measured by having specific items such as a television in the household, ever going without food, and having worked in the past 12 months) than the women in Cape Town (table 3).

Table 3 Socio-demographic characteristics of total sample (women who had been raped and those recruited from community). Figures are numbers (percentages) of participants unless stated otherwise

	Cape Town (n=134)	Thohoyandou (n=159)	P value
Mean age (years)	27.5	23.5	0.002
Ever attended school	128 (98)	150 (96)	0.451
Still in school or college	41 (31)	81 (53)	<0.001
Radio in household	113 (84)	115 (75)	0.061
TV in household	111 (82)	85 (55)	<0.001
Car in household	27 (20)	31 (20)	0.978
Never goes without food	82 (61)	72 (46)	<0.001
Married or cohabiting	92 (61)	121 (78)	0.106

We asked which services the women recruited through health services had received (table 4). Patients in Thohoyandou were significantly more likely to have been referred for counselling. Both sites offered post--exposure prophylaxis for HIV, but this was more common in Cape Town. Service users in Cape Town were much more likely to receive treatment for sexually transmitted infections, emergency contraception, and an anti-emetic. Nausea is a common side-effect of both emergency contraceptives and post--exposure prophylaxis for HIV.

Of those who received antiretrovirals, 40 (87%) in Thohoyandou said that they completed the course of zidovudine (AZT) and lamivudine (3TC) and nine (15%) in Cape Town said

they had completed a course of AZT alone. We were unable to determine whether pill taking was consistent. Most of the patients in Cape Town who did not finish the drugs stopped in the first seven days. It is important to note that in Cape Town survivors had to return to the health service to get a weekly supply of drugs, which may explain why so many women did not complete the course of HIV prophylaxis.

Most women in Cape Town (91%, n=62) had returned at least once to the health facility, mainly for results of the HIV test. In Thohoyandou, 57% (45) returned at least once. Women in Thohoyandou were visited at home by staff from the non-governmental organisation. The most common reason given for not returning was that the woman did not know that she had to, followed by not being able to get money for transport.

Table 5 shows the proportion of participants agreeing with statements on aspects of rape services. Table 6 shows results of the random effects probit models estimated in the discrete choice analysis. The availability of HIV prophylaxis was most important in determining choice of service, and prophylaxis even without an HIV test was preferred to no prophylaxis. The women, especially those from rural areas, strongly preferred to have an HIV test first. Skills and attitudes of the provider were also important, with a lack of

Table 4 Services received at health facility by women who had been raped and used the service, according to site. Figures are numbers (percentages) of participants unless stated otherwise

	Cape Town (n=134)	Thohoyandou (n=159)	P value
Referred for counselling	46 (68)	70 (88)	0.003
Referred to:			
Clinic	5 (11)	0	
NGO	33 (72)	52 (74)	
Social Worker	6 (13)	18 (26)	
Other	2 (4)	0	
Able spontaneously to recall receiving any medication	65 (96)	67 (84)	0.17
Medication they recalled receiving:			
STI medication	29 (71)	18 (29)	<0.001
Emergency contraception	34 (76)	20 (32)	<0.001
Anti-emetic (anti-nausea)	20 (59)	2 (4)	<0.001
HIV prophylaxis	45 (88)	45 (70)	0.021
Can't remember	20	12	<0.001
No of days patients recall taking HIV prophylaxis:			
<7	25 (40)	1 (2)	
8-14	12 (19)	3 (7)	
15-21	13 (21)	2 (4)	
22-27	3 (5)	0	
Complete	9 (15)	40 (87)	<0.001
Reported side effects:			
Headache	20 (32)	25 (39)	0.389
Nausea	25 (39)	28 (44)	0.590
Diarrhoea	5 (8)	12 (19)	0.082
Rash	4 (6)	9 (14)	
Tiredness	23 (45)	25 (56)	
Received information on side effects	36 (55)	34 (51)	0.661
Returned to facility	62 (91)	45 (57)	<0.001
How many times patients returned:			
Once	12 (19)	18 (42)	
2-5	39 (62)	20 (47)	
6-12	11 (18)	4 (9)	

NGO=non-governmental organisation; STI=sexually transmitted infection.

Data missing in some cases

understanding toward the patient being more negative in its influence on potential service use than additional training in counselling on top of a positive attitude. Many participants from both sites, 75 (56%) in Cape Town and 123 (79%) in Thohoyandou indicated that they would be willing to wait three to four hours to see a sensitive healthcare provider (table 5).

Most participants preferred a longer examination that might increase the possibility of the case going to court. This was especially the case among women from the rural area. Participants favoured more returns to the facility (table 5), though the results shown in table 4 suggest that they wanted to return for counselling. Most women (96%, n=277) would return to the facility for counselling, while 8% (n=27) indicated that they would prefer a drug regimen that required follow-up visits.

Table 5 Number (percentage) of all participants (women who had been raped and those recruited from community) who agreed or strongly agreed with various statements

	Cape Town (n=134)	Thohoyandou (n=159)	P value
I would not mind waiting 3-4 hours to see a health worker who is sympathetic and will listen to me	74 (56)	123 (79)	<0.001
I would prefer not to be examined by a nurse because nurses gossip about you	53 (39)	49 (31)	0.162
I want to be given medication that will prevent me getting HIV but only if I can have it without having an HIV test	46 (34)	20 (13)	<0.001
I would prefer a doctor to examine me after rape because they are more skilled than nurses	106 (79)	140 (90)	0.008
I would prefer to travel to a hospital or clinic that is far from where I live where I am sure no one will know me	68 (50)	44 (28)	<0.001
I would prefer a doctor/nurse who is a woman to examine me	102 (76)	107 (69)	0.188
I would like to receive counselling after rape even if it means going back to the hospital	123 (91)	154 (99)	0.002
I would prefer to receive all my HIV/AIDS prevention medication at the first visit to the hospital	119 (88)	147 (94)	0.065
I think that collecting samples from my private parts and writing down my injuries will not help the rapist being found guilty in court	37 (27)	15 (10)	<0.001
The interview was easy or not too difficult	93 (69)	146 (94)	<0.001

Table 6 Results of reduced random effects probit model, overall and by site

Variable	Across sites*		Urban site†		Rural site‡	
	Coeff (95% CI)	P> z	Coeff (95% CI)	P> z	Coeff (95% CI)	P> z
Low travel time (<30 mins)	-0.02 (-0.15 to 0.11)	0.782	0.37 (0.20 to 0.55)	<0.001	-0.62 (-0.85 to -0.39)	<0.001
High travel time (>3 hours)	-0.07 (-0.20 to 0.07)	0.342	0.17 (-0.01 to 0.35)	0.076	-0.28 (-0.53 to -0.19)	0.036
PEP with HIV test	1.71 (1.57 to 1.85)	<0.001	1.52 (1.35 to 1.70)	<0.001	2.36 (2.05 to 2.67)	<0.001
PEP without HIV test	0.70 (0.59 to 0.82)	<0.001	1.05 (0.89 to 1.22)	<0.001	0.33 (0.16 to 0.49)	<0.001
Returns to service	0.14 (0.11 to 0.17)	<0.001	0.06 (0.02 to 0.09)	0.005	0.36 (0.29 to 0.42)	<0.001
Long examination	0.48 (0.39 to 0.58)	<0.001	0.49 (0.36 to 0.63)	<0.001	0.80 (0.62 to 0.97)	<0.001
Providers with no understanding	-0.75 (-0.88 to -0.62)	<0.001	-0.32 (-0.50 to -0.14)	0.001	-0.98 (-1.19 to -0.76)	<0.001
Providers with understanding and training	0.56 (0.40 to 0.73)	<0.001	0.59 (0.37 to 0.81)	<0.001	0.89 (0.58 to 1.20)	<0.001
Constant	-0.13 (-0.33 to 0.08)	0.239	-0.97 (-0.13 to -0.68)	<0.001	0.48 (0.14 to 0.83)	0.006

PEP=post-exposure prophylaxis.

*Likelihood ratio 1533.91, P<0.001 (χ^2); likelihood test of $r=0$: 177.72, P<0.001 (χ^2).†Likelihood ratio 512.77, P>0.001 (χ^2); likelihood test of $r=0$: 67.91, P<0.001 (χ^2).‡Likelihood ratio 1304.87, P<0.001 (χ^2); likelihood test of $r=0$: 39.87, P<0.001 (χ^2).

The overall model shows that participants did not make service preferences based on travel time. Urban interviewees preferred shorter travel times of less than 30 minutes, whereas those from rural areas did not mind travelling slightly longer, though not more than three hours.

Discussion

This is the first study of patients' preferences for attributes of services for people who have been raped. Our findings challenge some of the current assumptions of what is important to users of such services in South Africa. Respondents particularly valued the availability of HIV prophylaxis (with an HIV test) and having a sensitive healthcare provider who could provide counselling. Having a lengthy examination that could influence the legal outcome was also viewed as desirable, especially among rural women. This latter finding was interesting as research from other countries has suggested that examination is a source of stress after rape (World Health Organization, 2003).

Patients seem willing to trade-off access to services (time travelled) for attributes such as counselling, rigour of examination, and HIV prophylaxis. It had been previously thought that access to services was a primary concern and this was reflected in efforts by the Department of Health to integrate services for people who have been raped into the core primary healthcare package (Department of Health, 2005). Research on factors associated with clinical quality of care (Christofides et al, 2005) shows that higher quality of care is associated with a larger case load, which is not found at the primary healthcare level for a relatively uncommon event such as rape. Our findings suggest this model of service provision is also inappropriate in terms of patient preferences.

Research on South African health services for people who have been raped has shown that there are gaps in service delivery (Christofides et al, 2005). Reports from the women in our study who had used the service support this finding. All patients interviewed would have been eligible for treatment for sexually transmitted infections. However, fewer patients reported getting drugs for these infections than HIV prophylaxis. Patients seem often not to be given information on drugs and side effects in an effective way. Throughout the country rates of completion of HIV prophylaxis are low (Vetten & Hafferjee, 2004; Kim et al, 2003). The rates from Cape Town are similar to those in Gauteng Province (Vetten & Hafferjee, 2004) and the same as those reported in a case series of all rape cases seen in 2003 in Cape Town (Mugabo et al 2005), though rates in Thohoyandou are much higher. This is paradoxical in face of the high priority apparently given to HIV prevention. In Cape Town it may be because women have to return to the service weekly to collect drugs. Our findings suggest there was considerable attrition over the four weeks. Patients clearly prefer to get of all their HIV prophylaxis at the initial visit, as practiced in Thohoyandou. Other factors that may influence completion of the course include the provision of anti-emetics and information, neither of which was less prevalent in Cape Town. While provision of anti-emetics may support adherence to treatment, our findings suggest that anti-emetics alone do not result in better compliance. Factors that may be more important in Thohoyandou were the home follow-up service provided by the non-governmental organisation and the provision of food supplements.

Contrary to fears expressed by the Department of Health and some commentators, the need to test for HIV before receiving HIV prophylaxis did not seem to deter women from attending services. There was no difference in the views of women who did and did not use the service. Our formative research indicated that the window period for the transmission of HIV was not well understood so testing positive for HIV immediately after rape was thought to indicate transmission during the rape (Christofides et al, 2004). HIV infection after rape

is perceived as less stigmatising than HIV acquired through other forms of sexual contact (Deacon et al, 2004).

The priority that participants place on receiving counselling highlights the need for a holistic service after rape. Other research shows that the mental health needs of patients are often the least well met (Christofides et al, 2005). If services are to offer providers who are sensitive and can provide counselling, changes are needed in service provision and training, and this training should also deal with psychological support skills and providers' attitudes.

Limitations

The study had limitations. The two sites selected were to some extent unusual, which could have influenced findings. Both sites provide more support for patients than is typical within the public health system. The Cape Town site was a special care centre located within a hospital; it had a full time nurse to follow-up patients. At the time of the study there were 18 of these centres throughout the country. The Thohoyandou site had a non-governmental organisation running a trauma centre with the public hospital. They had a network of outreach workers in the community and provided food to patients. Health providers in Cape Town did not approach every patient to participate in the study so we could not determine the refusal rate. As there were no significant differences between patients recruited through health facilities and members of the community, it is unlikely that there was a systematic bias in recruitment of patients.

Participants' preferences may have been influenced by what they had been exposed to in terms of service—for example, in Thohoyandou people are used to travelling to get to the hospital as there is only one hospital in the area. They may therefore be more accepting of this attribute. Other attributes that were not included in the analysis may have been important.

Our method of recruitment may have resulted in selection bias. Because of ethical considerations we could not randomly sample patients from hospital records. Patients who agreed to be contacted by a researcher may have systematically differed from those who refused. In addition, some community members refused to be interviewed, though this was rare.

Conclusion

In conclusion, women who have been raped are willing to travel to services that better meet their needs. They strongly value HIV prophylaxis, having an understanding health provider, and counselling. Our findings support the need for rape services to be holistic and provided by appropriately trained health workers, who have a sympathetic attitude towards rape victims and in facilities that are appropriately equipped. Medication needs to be systematically provided for sexually transmitted infection and prevention of pregnancy and information on known side effects. Support with adherence to treatment is also needed. Our findings would support a view that post-rape health services should be provided in a facility, such as a district hospital, that can see a larger number of cases and have staff who are identified as providing post-rape care, rather than at a primary health care clinic level.

Chapter 3: Costs of case study programmes and national scale up of post- rape health service delivery in South Africa

Cost analyses were undertaken in three phases. Firstly an economic costing from the perspective of the provider was undertaken of two case study programmes of post--sexual assault health service delivery, one in rural and one in urban South Africa. Secondly, a spreadsheet based scaling up model was developed in order to estimate the potential costs scaling up the delivery of broad based post- sexual assault health services to a national level according to recently developed national guidelines (DOH, 2005). Incremental costs of national roll out of PEP provision assuming the existence of these holistic post- sexual assault health care services were then estimated. Each of these analyses, case study site costs, national scale up cost estimation and the incremental costs analysis of adding PEP onto post- sexual assault health services, are presented separately below.

Description of the post--sexual assault services at the two sites

A total economic micro costing of post- sexual assault health service delivery was undertaken from the perspective of the provider at two sites. The first site was an urban-based service situated in Cape Town metropolitan and the second was a rurally situated service in Thohoyandou, Limpopo province. Though one site was urban and one rural both programmes costed were relatively well resourced through significant donor funding.

Cape Town site

The Cape Town site is a government financed post- sexual assault health service attached to the outpatient department of a secondary level hospital in Cape Town Metropole. Post-sexual assault health services are delivered from dedicated rooms attached to the casualty department.

The programme is run by one full time nursing sister, another professional nurse and one victim empowerment / support officer. At least one of the professional nurses is available 24 hours per day 7 days per week. The victim support officer's role is largely confined to support through the court process, though they cover some administrative duties at the Thutuzela care centre on top of this. Doctors are called in from casualty as and when needed to perform medical examinations and provide antiretroviral prophylaxis where indicated. Most survivors of sexual assault come to the service from the police by ambulance and they are also taken home, where possible, after the completion of the visit.

Where major injuries are present the woman is first stabilised in casualty before proceeding to the Thutuzela services. HIV testing is conducted at the initial visit to the service but results provided in a follow up visit three days later. The survivor undergoes a medico legal examination, which takes the doctor approximately one hour to complete, using a standard sexual assault evidence collection kit (SAECK). Kits are provided by the South African Police Service, but a small supply is kept on site in case of shortages. STD treatment is provided and a comfort kit of toiletries, underwear and sweets given to the survivor. A three-day starter pack of AZT (single therapy) is given at first visit.² Where an HIV negative test result is obtained for the survivor a weekly supply of drugs is then given at each of four weekly follow up visits required to collect drugs and for monitoring of progress and responses to the antiretrovirals. This includes follow up liver function tests.³ A further follow up visit is made at 3 months to repeat the HIV and pregnancy tests.

² This is unique to Western Cape Province, the rest of the country provide dual therapy AZT / 3TC in line with national guidelines.

³ These liver function tests are used to monitor side effects of the treatment but are outside of the national guidelines and are therefore not costed in the scale up estimation model.

Women are supported through the court process by the victim empowerment officer and refer for ongoing counselling to the rape crisis centres of Khayelitsha or Mannenburg.

The Thohoyandou site – Limpopo Province

The Thohoyandou site is a subsidised but largely externally funded non-government organisation. The Thohoyandou programme, though in an under resourced area, is larger than the Cape Town programme with a community based advocacy and empowerment programme and a family violence programme being run alongside the post- sexual assault health service delivery.

The empowerment programme involves the use of community based advocacy officers (AOs) who supervise community liaison officers (CLOs) in each of four areas in and around Thohoyandou. The CLOs are recruited as local to a specific small area. It is the role of the community liaison officer to draw up a list of potential target groups or organisations in his or her area and then to systematically run educational workshops and campaigns with each of these groups. These target groups include schools, churches, women's groups etc. The Empowerment branch also includes an "outreach" programme that covers the incubation of smaller NGOs requiring mentoring to successfully start up.

The health and psychosocial support programme covers specifically the support of women who have experienced sexual or domestic violence. There is currently one trauma centre, situated within Thohoyandou itself, at Tshilidzini hospital, but another is planned in the near future. The trauma centre service operates 24 hours a day 7 days per week and is a one-stop centre for women having experienced violence. Until recently, South African Police Service Officers were located at the trauma centre in order for ease of assisting in cases where a report was completed and a case opened against the perpetrator. This has, however ended, and presently women who report to the police after experiencing a rape will be brought by the police to the trauma centre at Tshilidzini or the police come to the centre upon receiving a call from programme staff that they are needed.

Upon first visit a debriefer interviews the woman and if this is a new rape case (i.e. occurred less than 72 hours prior to the visit) will provide pre-test counselling. A doctor and nurse will be called from casualty and generally arrive within 30 minutes of the call. The doctor conducts a medico legal examination and the nurse both supports the doctor and takes bloods for the HIV test. The use of a rapid test means results can be provided quickly and where a negative result is obtained the full month course of PEP drugs are given to the survivor at this first visit. Where it is assessed, however, that the secondary trauma caused by the receipt of the HIV test result is greater than the woman can bear at that time, a three day starter pack of AZT/3TC (Combivir) is given and the woman given a bus ticket to return to the services three days later for a follow up visit including the provision of the remainder of one month's supply of AZT/3TC where a negative HIV test result was returned. In addition, if the test is positive, a follow up visit may be requested so that confirmatory Elisa test results can be given. A comfort kit with soap, toothbrush, pair of underpants, face cloth and a teddy bear are provided to the woman. In addition a bag of fortified maize meal sufficient for one month for the survivor is provided at this first visit. In line with government guidelines the TVEP programme for survivors of sexual assault includes a follow up visit for repeat blood tests at 6 weeks, 3 months and 6 months. In addition an outreach follow up visit is made within a few weeks of the first visit to the trauma centre and a case monitor assists the survivor through the court process. An average of 37 rape survivors reported to the Tshilidzini trauma centre each month. Of these approximately 56% are children 16 years or under. The programme has an operating budget of over 2 million Rand per annum with just over 1 quarter of this going to the operation of the two trauma centres.

Methods

Site visits were conducted between May and October 2003 to collect data on all resource usage associated with the provision of post- sexual assault health services in the two programmes. Cost data collected is detailed in appendix A to this report.

An ingredients based approach was utilised where all resources consumed in the provision of post- sexual assault health services in each site were defined, quantified and then valued in 2003 Rand. These results were inflated to 2004 Rand and also represented in December 2004 US dollars (exchange rate 1USD = 6.5 ZAR).

Buildings costs were calculated on the basic building association of South Africa per metre square cost average nationally. Furniture and equipment costs were determined by taking a capital item audit at each of the sites. In order to get the costs associated with these resources used purely in the delivery of post- sexual assault services, costs were then allocated (where necessary) based on proportion of patient visits or proportional time usage between post- sexual assault service delivery and other programmes. This was the case, for example, in Thohoyandou where the trauma centre provided services to both victims of domestic violence as well as sexual assault. Capital costs were annualised on the basis of a useful life of 20 years for buildings 10 years for furniture and 4 years for equipment with a discount rate of 6%. Training, also a capital cost in that it is expected to produce benefits to the programme for over one year, had an estimated useful life of 3 years.

Staff were asked to complete time diaries over a period of two weeks at each site in order to allocate staff time costs firstly between administration time and patient contact time and then by more detailed activity. Forms were returned by Thutuzela, Cape Town staff but not by TVEP staff in Thohoyandou and so TVEP time estimates are based on a combination of staff interviews complete at the site visit and Thutuzela estimates from the time diary study. Staff time was then allocated per patient visit and is included in the visit cost and the remainder in programme administration staff time.

Variables costs were calculated on the basis of site defined protocols of treatment for each visit for each woman presenting to the service. These included drug treatments, ARVs, STD treatment and pregnancy prevention, laboratory tests, other medical supplies and non medical supplies such as a the comfort kits provided. Variable costs also included the average staff time by staff type input from the time and motion analysis. These costs were calculated per visit for each of the visit types as the cost profiles for each visit were very different. These were initial (first) visit; 1st follow up visit (3 days later); 2nd follow up (2 weeks in Cape Town site / 6 weeks in Thohoyandou); 3rd follow up (3 weeks in Cape Town / 3 months in Thohoyandou); 4th follow up (4 weeks in Cape Town / 6 months in Thohoyandou). These have been divided into initial visit and follow up visit costs in the summary cost tables presented below. The numbers of each visit type to multiply cost per visit to in order to arrive at total costs for that visit type were difficult to obtain. Few reported data series exist on the return rate for each type of visit, and if this is key to determining total scale up costs under differing preferred scenarios of post- rape health service delivery, the collection of such information at a programme level, as well as central consolidation and reporting, should be encouraged.

The cost analysis represents costs as fixed or variable to assist in the national scale up cost estimation. Fixed costs are resource used where the cost of the item is not related to the number of patient visits made to the service (defined as the output for post- sexual assault health services in this project). Variable costs are incurred for items for which costs vary with the number of visits made to the service for example patient level costs such as drugs and medical supplies.

Results

The cost of each programme representing costs of post- rape care are presented in tables 7a and 7b below. As the programmes are so different, comparison in costs between programmes should not be attempted. Key differences exist that will have significant influence on costs. Variable costs representing visit costs represent the bulk of the costs in the Cape Town health service (70.2% of total costs). Main contributors to the higher cost per visit are the laboratory where an HIV Elisa is performed at first visit rather than a rapid test and in addition a VDRL test is ordered to inform STI treatment. Laboratory costs in the averaged costs of follow up visits remain high as in the 3rd follow up visit during PEP ARV completion a CD4, amylase and ALT is performed and at each of the last two follow up visit repeat VDRLs are ordered.

In general, fewer but higher cost staff are utilised in the Thutuzela programme, whereas a greater number of volunteers receiving a stipend are utilised in the Thohoyandou programme. Staff costs are very high in the Thohoyandou programme, but it must be noted that these are economic costs, i.e. the true value of all resource inputs to the provision of the programme. Hence volunteer staff are also valued at the salary they could command in the general market, though they are not paid or only paid a small stipend from the TVEP funding. Volunteers are, however, programme trained staff with no formal qualifications and so in a labour surplus area the stipend closely represents the economic cost. For formally qualified staff such as the social worker, accountant etc, however, market wages are utilised. Thutuzela have three full time staff and casual doctor time brought in from the casualty department. In Thohoyandou, those allocated largely to post- sexual assault and domestic violence care numbered in excess of 25 individuals (including some support staff).

Capital costs are consistently small across both programmes representing only 1.8% - 1.9% of total cost of post- rape health service provision. Some overhead costs that are included in Thohoyandou are omitted from the Thutuzela costing as these were paid centrally by the hospital in which the Thutuzela programme was located and were not able to be obtained. Hence telephone, fax and printing and stationery were the only overhead costs quantified in the Cape Town costing. This also contributes to the difference in costs.

Though drug costs appear higher in the Thohoyandou first visit, this is only because drugs are given across follow up visits in Cape Town (and so are represented also in this section of the table) whereas they are generally provided at first visit in Thohoyandou⁴. No difference exists in pricing of drugs though the Cape Town site utilised single therapy AZT versus Thohoyandou's use of AZT / 3TC. The latter comes in the fixed drug combination of Combivir, the African access price of which is actually cheaper than Zidovudine or AZT alone.

⁴ Where the HIV test result could not be returned at the first visit and a 3 day return to gain the test result and get remainder of the drugs occurs, this has still been included as first visit costs as generally it is attempted to provide post- test counselling and the full course of drugs at first visit and only occasionally is an immediate follow on visit required.

Table 7a: Total and average costs of Thutuzela programme – 2004 South African Rand

	Annual Cost	Cost per survivor	Cost per visit	% Total
FIXED - CAPITAL				
Administration	8,322	75	8	1.2%
Medical Care	2,423	22	2	0.3%
Support services	787	7	1	0.1%
Training	1,165	11	1	0.2%
SUB TOTAL	12,697	115	12	1.8%
FIXED - RECURRENT				
Staff - other than direct care	174,644	1,575	168	24.9%
Telephone / fax	10,659	96	10	1.5%
Printing & stationery	11,084	100	11	1.6%
SUB TOTAL	196,388	1,771	189	28%
TOTAL FIXED COSTS	209,084	1,886	201	29.8%
<u>VARIABLE COSTS</u>				
<u>Initial visits</u>				
Staff	88,047	794	222	12.6%
Drugs	34,888	315	88	5.0%
Other medical supplies	35,216	318	89	5.0%
Laboratory	129,834	1,171	328	18.5%
Transport	9,583	86	24	1.4%
Comfort kits	21,519	194	54	3.1%
SUB TOTAL	319,086	2,878	806	45.5%
<u>Followup visits</u>				
Staff	27,735	250	43	4.0%
Drugs	69,258	625	108	9.9%
Other medical supplies	4,226	38	7	0.6%
Laboratory	71,388	644	111	10.2%
SUB TOTAL	172,607	1,557	268	24.6%
TOTAL VARIABLE COSTS	491,693	4,434	1,074	70.2%
TOTAL COSTS	700,778	6,320	1,275	100.0%

Table 7b: Total and average costs of Thohoyandou programme – 2004 South African Rand

	Annual Cost	Cost per survivor	Cost per visit	% Total
FIXED - CAPITAL				
Vehicles	8,733	19	7	0.7%
Furniture	5,995	13	5	0.5%
Non medical equipment	2,716	6	2	0.2%
Medical equipment	621	1	0	0.1%
Training	4,477	10	3	0.4%
SUB TOTAL	22,540	31	10	1.9%
FIXED - RECURRENT				
Staff - other than direct care	777,113	1,735	584	64.9%
Uniforms	2,170	5	2	0.2%
Other overheads	84,170	188	63	7.0%
SUB TOTAL	863,452	1,927	649	72.1%
TOTAL FIXED COSTS	885,993	1,958	659	74.0%
VARIABLE COSTS				
<i>Initial visits</i>				
Staff	96,689	216	216	8.1%
Drugs	64,310	144	144	5.4%
Other medical supplies	26,880	60	60	2.2%
Laboratory	7,997	18	18	0.7%
Transport	3,584	8	8	0.3%
Other non medical supplies	21,235	47	47	1.8%
SUB TOTAL	220,696	493	493	18.4%
<i>Followup visits</i>				
Staff	31,511	70	36	2.6%
Drugs	-	-	-	0.0%
Other medical supplies	-	-	-	0.0%
Laboratory	42,460	95	48	3.5%
Transport	16,346	36	19	1.4%
SUB TOTAL	90,317	165	84	7.5%
TOTAL VARIABLE COSTS	311,012	658	576	26.0%
TOTAL COSTS	1,197,005	2,616	1,235	100.0%

Discussion and Limitations

Cost results are surprising similar across sites given the differing models of provision. The Thohoyandou programme achieved some economies of scope providing a range of services with the staff complement they employ including attending to individuals suffering from domestic violence as well as a community empowerment programme. Administrative staff, equipment and supplies as well as some clinical staff are therefore shared across sub – programmes. The costs shown above in table 1b are representative of the post- rape support component of the overall Thohoyandou programme only.

Though total costs of the programme are slightly higher, Thohoyandou has a higher number of visits being made to its service than the Thutuzela programme and therefore cost per visit is lower. In addition, the return rate to the service and the completion of HIV PEP where applicable is higher in Thohoyandou than in the Thutuzela programme (likely due to the returns weekly for collection of drugs required in the Thutuzela programme) and therefore the cost per survivor covered (defined as the completion of sufficient visits to have completed full course of PEP and be retested for HIV) is significantly lower in the

Thohoyandou programme. Hence although staff costs for example are very high, Thohoyandou fully covers a large number of women with post--exposure prophylaxis, care and counselling and ongoing support and unit costs remain lower.

Return visits in the Thohoyandou programme, although recorded on patient files, are not kept in any database and therefore were not available to the research team. These were estimated on the basis on numbers of first visits, the number of women provided with PEP and the return rate estimated by TVEP trauma centre staff, but may not provide an accurate denominator for the follow up visit costs.

National Scale Up Cost Modelling

These site costs together with the discrete choice stated preference results were utilised to inform the development of a national cost model. Costs included in the national scale up model were based on likely approaches to national roll out as outlined in the Sexual Assault Policy Guidelines (DoH, 2005). These did not therefore include all aspects of the service costed in the site based case study. Additional assumptions were made regarding necessary resources to implement the guidelines though not explicitly stated.

Cost estimates of scaling up expanded post- sexual assault health services as outlined in the national guidelines (DoH, 2005) were first estimated and incremental costs of adding post- exposure antiretroviral prophylaxis to these services extrapolated. Costs are divided into central level which combines provincial and national coordinating centres, site level costs (where the care of sexual assault survivors is directly provided) and patient level costs. Table 8 below outlines the cost items included, their method of calculation and the % assumed to be purely PEP delivery related (for utilisation in the cost effectiveness ratio calculations reported in the next section of this report).

Table 8: Cost items used in national scale up estimation model

COST CATEGORY	COST ITEM DESCRIPTION	COST ITEM CALCULATION	% PEP
Central level fixed costs	Central management – coordinating body	3 individuals at 20% of their time using an average salary of deputy director level	10%
	Chief forensic medical officer	1 per province multiplied by 2004 salary of similar position in Western Cape	0%
	Training costs for central coordinating body	Using cost of training from Western Cape post- sexual assault training course for three people	10%
Site based fixed costs	Training costs	Utilising detailed costing done of WC 5 day training course multiplied by average number of staff per site and annualised over 3 years	10%
	Furniture and equipment costs	From case study site based costing reduced to basic requirements from a public sector site for delivery annualised figure over 4 years	0%
	Building costs	% of sites requiring private room renovation by estimated cost based on per m ² cost from building association of South Africa annualised over 20 years	0%
	Staff costs	2 doctors @ 10% of time; 3 nurses @ 15% of time; admin clerk @ 20% of time	5%
	Overhead costs	Calculated from case study sites and include stationery	5%
Patient level variable cost	Drugs costs	Calculated per visit (1 st , 1 week, 6 week, and 3 month follow up) based on 2004 prices of ARV, STD, Hep B vacc and post- coital contraception as per policy guideline	100% ARVs; 0% other
	Laboratory costs	Calculated per visit (1 st , 3 day, 6 week, and 3 month follow up) as per policy guideline based on 2004 prices of tests	HIV tests only
	Other medical supplies	Includes comfort kit given to survivors, IEC material and sundries such as syringes and needles as costed per visit from case study sites	HIV test related + 25% IEC

Central level costs – management and oversight of programme

The national guidelines for post- sexual assault specify new positions of one chief forensic officer per province. A central coordinating committee was assumed comprised of three government employees at an average salary of 260,000 spending 20% of their time on post- sexual assault health service delivery. 10% of this cost was allocated to the oversight of post- rape prophylaxis delivery.

Site of delivery level costs – fixed cost component

400 sites of post- sexual assault health service provision are estimated as being required to implement the policy (Personal communication, DoH) with 85% of these being clinic-based sites and the remaining 15% based within a hospital setting. At a service delivery site level, guidelines state that survivors must be able to have access to care provision in a private room for post- sexual assault care. An inclusion of building renovation costs to allow for this where estimated to be needed (40% of sites in base scenario analysis) has therefore been made in the costs of scaling up the policy.

Furniture and equipment costs were based on a list of necessary items that used the Cape Town programme as its basis. If desired, this list can be obtained from the authors and is included in the cost model previously supplied to the National Department of Health (NDoH). Training costs were estimated on the basis of a five day course given for 20 participants with different trainer costs per session depending on type of session. These costs were obtained from the Western Cape department of health based on training courses provided for post- sexual assault health service delivery in their province. This included the cost of a locum for an estimated 50% of the participants in each course. In the base case scenario the number of providers requiring training was set at 3 for a clinic based programme and 5 for a hospital based programme (to allow for the greater number of doctors that may be called in to perform an examination from other departments and therefore should be trained).

Staff costs involved in the delivery of the programme at the site (assumed to be fixed in the short run) were based on 2 doctors at 10% of their time, 3 professional nurses at 15% of their time and a 20% full time equivalent administrator. Separate counsellors were not included in the national cost model (although present at Thutuzela and Thohoyandou). Average salaries utilised in government for these staff were applied and staff costs of R144,000 per site resulted.

Printing and stationery, telephone and other overhead costs were estimated on the basis of both Thutuzela costs for the former two cost types (as many additional activities involving these two cost types were performed at Thohoyandou and allocation to post- rape services specifically may not be accurate) and Thohoyandou's general overhead cost (as this was not available from Thutuzela). These costs together came to R40,500 per post- rape health service programme per annum.

Patient level costs – variable cost component

Visit costs (or patient level costs) were divided into each visit type: first visit, 3 day follow up, 6 week follow up and 3 month follow up. Note that these are the only follow ups listed in the national policy and hence base case scenario costs were calculated on this basis (User preferred designs included additional follow ups the costs for which have been added in the next section).

Patient level variable costs include immediate treatment costs such as prophylaxis against STDs and post- coital contraception. Where reporting within 72 hours, a 3 day starter pack of ARVs (Combivir – AZT / 3TC) as per policy is also included. Upon receipt of an HIV negative test for the survivor, the remainder of one months post- exposure ARV prophylaxis would be supplied. A new addition to the policy guideline of HEP B vaccination in the absence of antibodies has also been added to the costs. Regimens and therefore drug costs have been adjusted for pregnancy (affecting STD treatment) and child rapes including age group and therefore estimated body weight (affecting STD and ARV treatment) as per national management guidelines (DOH 2003).

All costs are affected by a variety of uncertain parameters such as the percentage of women reporting to services within 72 hours of the sexual assault and returning an HIV negative test, affecting the total number of survivors that would potentially be initially placed and continued on ARV PEP. Numbers of pregnant women, children of differing ages and numbers presenting without Hep B antibodies also affects drug costs. In addition the proportion of survivors returning for follow up visits affects costs.

A spreadsheet based cost model was therefore devised to be utilised by the Department of Health, where uncertain cost driving parameters can be varied and costs automatically updated for any changes. These parameters and the value used in the base case scenario are listed in table 9 below.

Table 9: Cost driving parameters used in national scale up model and values for the base case scenario ranges

PARAMETER	BASE CASE	RANGE
Number of adult women reporting rape in year	28,228	Nil
Number of child sexual assaults being reported	17,597	Nil
% Breakdown of age groups of children presenting <ul style="list-style-type: none"> • Under 4 years • 4 – 7 years • 8 – 11years • 12 – 17 years 	4.4% 14.4% 12.0% 69.2%	
Presenting within 72 hours <ul style="list-style-type: none"> • Women • Children 	80% 60%	70% - 90% 50% - 70%
Presenting HIV negative <ul style="list-style-type: none"> • Women • Children 	81.5% 96%	72% - 91% 95% - 97%
% presenting pregnant <ul style="list-style-type: none"> • Women • Children 	10% 1%	
% with no present Hep B antibodies <ul style="list-style-type: none"> • Women • Children 	60% 80%	
Total number of services needing to be supplied: <ul style="list-style-type: none"> • Hospital based • Clinic based 	59 341	
<u>Total number of providers requiring training</u> <ul style="list-style-type: none"> • Per clinic • Per hospital 	3 5	
% services requiring development of private rooms	40%	
% survivors returning for 3 day follow up	90%	
% survivors returning for 6 week follow up	36%	
% survivors returning for 3 month follow up	10%	
Number of staff in national coordinating body	3	
% of national coordinating body staff time consumed on rolling out support and monitoring	20%	

Resulting base scenario costs, utilising the parameters above, for national scale up of post-rape health services are presented in table 10. Total cost of scaling up post- rape health

services according to the new national policy would amount to approximately 101 million Rand, or 15.5 million US dollars, in South Africa in the base case outlined above. Approximately 57% of this is made up of staff costs, as is the general case in South African Health services where between 60 and 65% of health delivery costs are related to staffing (Thomas and Muirhead, 2000). Total drug costs come to 10.3 million Rand or 10.2% of total cost with 46% or 4.7 million Rand of this being antiretroviral drugs for the HIV PEP. Laboratory costs across visits amount to 5.7 million Rand or 5.6% of total cost of a nationally scaled up programme.

Annual costs of training that would be required, and we assumed would be provided (and is an important input to the acceptability of services to the women we interviewed – see previous section), amounts to 3.2 million Rand or 3% of total cost. However all capital costs, including training, were annualised and do not reflect the total start up investment that would be required to get provision of services off the ground. Table 10 below shows the total capital costs for infrastructure and training that would be required at the outset to ensure national provision of services at the level of the policy recommendations.

Table 10: Base case costs of scale up of post- rape health services in South Africa (2004 South African Rand)

COST CATEGORY AND INPUT	NATIONAL	PER SITE	PER PATIENT
FIXED CENTRAL COSTS			
Central staff	156,000	390	3
Provincial staff	2,073,600	5,184	45
Training costs of centralised staff (annualised cost)	38,400	96	1
ESTIMATED ANNUAL COSTS - Central	2,268,000	5,670	49
FIXED SITE COSTS - Capital			
Training costs	3,156,235	7,891	69
Medical Equipment	263,665	659	6
Non medical equipment	1,483,405	3,709	32
Furniture	321,937	805	7
Building costs (where private rooms need developing)	366,173	2,289	8
ESTIMATED ANNUAL COSTS - Site based fixed capital	5,591,415	15,352	122
FIXED SITE COSTS - Recurrent			
Staff costs at clinic	57,600,000	144,000	1,257
Printing & stationery	4,240,000	10,600	93
Telephone & fax	4,080,000	10,200	89
Other overhead costs	7,880,000	19,700	172
ESTIMATED ANNUAL COSTS - Site based fixed recurrent	73,800,000	184,500	1,610
HEALTH SERVICE COSTS - VARIABLE			
First visits			
Drug costs	5,253,751	13,134	115
Laboratory costs	5,482,700	13,707	120
Medical supplies	3,278,779	8,197	72
Total first visit costs	14,015,230	35,038	306
3 day follow up visits			
Drugs	4,237,442	10,594	92
Total 3 day visit costs	4,237,442	10,594	92
6 week visits			
Drugs	664,328	1,661	14
Laboratory	154,119	385	3
Medical supplies	27,741	69	1
Total 6 week visit costs	846,189	2,115	18
3 month visits			
Drugs	184,536	461	4
Laboratory	42,811	107	1
Medical supplies	7,706	19	0
Total 3 month visit costs	235,052	588	5
ANNUAL NATIONAL TOTAL COST (Dec 2004 South African Rand)	100,993,329	253,856	2,204
ANNUAL NATIONAL TOTAL COST US DOLLARS (Dec 2004)	15,537,435	39,055	339

Table 11: 2004 Rand cost of start up investments required for scale up of national post-rape health care policy

COST INPUT	2004 RAND AMT
Training costs	8,436,615
Medical Equipment	913,600
Non medical equipment	5,140,000
Furniture	1,356,000
Building costs (where private rooms need developing)	4,200,000
TOTAL START UP COSTS	20,046,215

Scale up costs for user preferred post- rape health care delivery design

Assuming training is included in provision of the national policy implementation as accounted for in the above costs, the only addition to the policy guidelines indicated as preferred from the discrete choice exercise outlined in chapter 2, is an increase in the number of follow up visits to the service. We assume that the tests conducted and medical supplies utilised remain the same and accounted for in the 3 day, 6 week and 3 month visit (as respondents preferred to return for counselling rather than more intermediate drug collections required- see table 5 in chapter 2 of this report). Therefore staff time would be the only additional input required⁵. Staff time required based on allocations per visit in the current model would increase by 2% per nurse per site (who is assumed to do the counselling) and 2% per administrator per site. The costs of one additional follow up visit nationally and the total cost of scale up therefore are outlined in table 12.

Table 12: Costs of adding a user preferred additional follow up visit to national scale up costs – 2004 SA Rand

STAFF TIME INPUT	% increase	Cost per staff	Cost per site	Additional cost to national scale up
Nurse time	2%	3,640	10,920	4,368,000
Administrator time	2%	1,690	1,690	676,000
TOTAL STAFF			12,610	5,044,000
Resulting scale up cost nationally				106,037,329

⁵ If we also assume that in the national programme there is no transport reimbursement for returns to service. We have assumed this in then national scale up model although evidence from the site case studies would suggest that transport funding significantly improves return rates.

Incremental costs of PEP delivery

A number of assumptions were made on the proportion of resource usage including staff time within the delivery of post- sexual assault health services devoted specifically to the provision of PEP. These are outlined in table 9 above. Where costs are related to ARV drugs or HIV test this is straight forward. However it is more complex when it comes to joint costs, resources that are shared between activities in the programme such as staff time and training.

Time allocations were estimated based on time and motion studies conducted at both of the study sites, generalised to estimate that approximately 5% of staff time is spent on PEP delivery. This includes pre- and post- HIV test counselling, explanation of PEP and counselling around its use and provision of drugs. It also includes the cost of follow up visits in which tests for tolerance and repeat HIV tests to ascertain any seroconversion are undertaken. 10% of training costs were allocated to PEP based on one half day of a five day training course to be provided around post- sexual assault health care delivery being devoted to PEP provision. It is also assumed that the first HIV test would be performed whether or not PEP was available but follow-up HIV tests would not and therefore represent an incremental cost of PEP. Obviously the ARVs are incremental costs of PEP provision.

The resulting incremental costs of adding PEP into the package of health care services post-rape are shown in table 13 below. Note that these are already included in the total scale up costing of the post- sexual assault policy above but are represented separately here to provide additional information on costs of providing PEP specifically that are then utilised in the cost effectiveness analysis reported in chapter 4 of this report.

The incremental costs of PEP provision as part of the post- sexual assault health care policy amount to 9.2 million Rand nationally per annum or R357 per women covered with PEP. This represents only 9.1% of total cost of the nationally scaled up post- rape health service delivery.

Table 13: Breakdown of annual incremental costs of PEP provision nationally in South Africa – 2004 Rand

COST CATEGORY / ITEM	INC PEP NATNL	PER SURVIVOR PROVIDED PEP
FIXED CENTRAL COSTS		
Central staff	15,600	1
Training costs of centralised staff (annualised cost)	3,840	0
ESTIMATED ANNUAL COSTS - Central	19,440	1
FIXED SITE COSTS		
Training costs	315,623	12
Staff costs at clinic	2,880,000	112
Printing & stationery	212,000	8
Telephone & fax	204,000	8
ESTIMATED ANNUAL COSTS - Site based fixed recurrent	3,611,623	141
PATIENT LEVEL COSTS - VARIABLE		
First visits		
Drug costs	497,503	19
Laboratory costs	505,167	20
Medical supplies	67,427	3
Total first visit costs	1,070,098	42
3 day follow up visits**		
Drugs	4,237,442	165
Total 3 day visit costs	4,237,442	165
6 week visits		
Laboratory	154,119	6
Medical supplies	27,741	1
Total 6 week visit costs	181,860	7
3 month visits		
Drugs		
Laboratory	42,811	2
Medical supplies	7,706	0
Total 3 month visit costs	50,517	2
TOTAL COST	9,170,980	357
US DOLLARS Dec 2004)	1,410,920	55

Chapter 4: Estimation of the cost effectiveness of ART prophylaxis for the prevention of HIV transmission from rape

Introduction

The previous report section outlined the costs of providing access to post-exposure prophylaxis as part of the new national post-rape health policy. The provision of PEP is aimed at reducing the number of HIV transmissions occurring in the country through preventing at least a significant number of those resulting from rape. Costs alone do not provide information on the size of the HIV transmission reduction and what this means in terms of overall cost effectiveness of the national provision of PEP after rape as an HIV prevention strategy in the country. The following section outlines a cost effectiveness estimation of this roll out.

Ascertaining the effectiveness of post-rape HIV prophylaxis is notoriously difficult as the HIV status of the rapist is rarely known, even if they are incarcerated. In addition, long periods of follow up to confirm any seroconversion amongst rape survivors provided with PEP is often lacking. The justification for the effectiveness of post-rape PEP is often therefore made on estimates of effectiveness arising from studies of post-occupational exposure ARV prophylaxis and modelling used to produce effectiveness results for post-rape PEP specifically to be utilised in cost effectiveness calculations.

Methodological approach

Effectiveness model

A spread-sheet based model of the effectiveness of post-exposure prophylaxis was developed using estimates derived from research on rape in South Africa, utilisation data from health services, literature review and local expert opinion. The parameters for the effectiveness model, their source and sensitivity analysis ranges are presented in Table 14. Due to the uncertainty of many parameters resulting from the dearth of data, most were subjected to one-way and multi-way sensitivity analysis often across a large range of possible values.

There is very little data on perpetrators of rape and specifically no information on the probability that a perpetrator of rape is infected with HIV. The best that can be achieved is an estimation of this based on the likely age-structure of rape perpetrators and the age-specific prevalence rate of these age groups. It is known that in South Africa the risk of raping is higher for younger men (Abrahams et al 2004). In a study in the rural Eastern Cape, 17% of men in the community aged 16-23 years who volunteered for an HIV prevention trial had raped a woman who was not a partner, and the mean age of first rape was 17.0 years (Jewkes et al 2004). Evidence on series of convicted rapists internationally suggests that the age range is very wide, but at least 50% of rapists are under 30 years when they commit the offence (Craissati & Beech 2004; Giotakis et al 2003). Based on this evidence we assume that 65% of rapes are committed by men under 30 years: 15% rapists being 15-19 years and 50%, 20-29 years.

Table 14: - Model parameters, source and sensitivity analysis ranges

Model Parameter	Adults Base (Range)	Children Base (Range)	Source
Total number of rapes reported nationally	28,228 (Not varied)	17,597 (Not varied)	South African Police Service (Oct 2004)
Probability of report in < 72 hours	0.80 (0.70 – 0.90)	0.60 (0.50 – 0.70)	Adults: Vetten and Hafferjee (2004) Children: Data from two rapes services Soweto, Johannesburg (2004) and Vetten and Hafferjee (2004)
Probability of victim being HIV negative at rape	0.815 (0.72 – 0.91)	0.96 (0.95-0.97)	Adults: Meel (2003), Wulfson (2002), Muller (personal communication) Children: HSRC (2002)
Probability of rape perpetrated by multiple assailants	0.30 (0.25 – 0.35)	0.20 (0.15 – 0.25)	Martin, (1999); Swart et al, (1999)
Number of perpetrators where this is >1	3.0 (2.5 – 3.5)	3.0 (2.5 – 3.5)	Martin (1999)
Probability of HIV positive perpetrator	21.38 (14.25– 28.50)	21.38 (14.25– 28.50)	HSRC (2002)
Probability of major trauma associated with rape*	0.25 (0.10 – 0.40)	0.75 (0.65 – 0.85)	Martin (1999), Denny (2002), Sugar (2004), Swart (personal communication)
Probability of minor trauma associated with rape*	0.40 (0.30 - 0.50)	0.21 (0.13 – 0.29)	Martin (1999), Denny (2002), Sugar (2004), Swart (personal communication)
Probability of no trauma associated with rape*	0.35 (0.30 – 0.40)	0.04 (0.02 – 0.06)	Martin (1999), Denny (2002), Sugar (2004), Swart (personal communication)
HIV transmission risk – major trauma	0.015 (0.006–0.024)	0.015 (0.006–0.024)	No trauma P (trans) adjusted by multiplication factor matched to anal sex as reported in De Grurrola et al (1989)
HIV transmission risk – minor trauma	0.0024 (0.0018-0.0.0030)	0.0024 (0.0018-0.0.0030)	No trauma P (trans) adjusted by multiplication factor matched to needle stick injuries (Ippolito et al, 1993)
HIV transmission risk – No trauma	0.0012 (Not varied)	0.0012 (Not varied)	Gray et al (2001) adjusted for age distribution of rape perpetrators (SAPS 2004)
Probability of full PEP course completion by survivor	0.50 (0.15 – 0.85)	0.50 (0.15 – 0.85)	Christofides et al (2005)
Probability of transmission prevention - full course PEP completion	0.90 (0.80 – 0.90)	0.90 (0.80 – 0.90)	CDC (1995)

Rape is associated with a range of high risk sexual practices (Jewkes et al 2002, Malamuth 1998), thus rapists are quite likely to have a higher age-specific HIV prevalence than the general population of men. Taking the age-specific HIV prevalence of men in 2002, we can conclude that if rapists had the same HIV prevalence as the general population, their HIV prevalence would be 14.25% (HSRC 2002). If associated high risk sexual practices substantially influence their risk of infection, rapists could have up to twice the risk of the general population, i.e. 28.5%. A mid-point estimate is used in the medium risk model.

Since the HIV risk of men and women are related, we assume that where the HIV prevalence in men is higher, the HIV prevalence in women will also be higher. This has implications for the number of potential new HIV transmissions resulting from rape.

The probability that a woman will become HIV infected during an act of rape depends also on the transmission risk. The risk of HIV transmission from a single unprotected act of consensual sex is estimated as 0.0001 – 0.002 in European, north American and Thai heterosexual couples (Downs & De Vicenzi 1996, Peterman et al 1988, Royce et al 1997, Mastro & Kitayaporn 1998, Nicolosi et al 1994, De Vicenzi et al 1994, Duerr et al 1994) and was found to be 0.0011 (95% CI 0.0008-0.0015) in Rakai in a population infected with a fairly high prevalence of STDs (Gray et al 2001). Since the Rakai estimate is derived from a population with a similar profile of sexually transmitted diseases as that in South Africa, and male-to-female transmission is usually more effective than female to male, we have used this risk estimate for our model. In Rakai, transmission risk varied substantially with age and was higher among younger people. In estimating the transmission risk for South African rapists we have used the age-specific transmission risks from Rakai and applied them to our assumed population.

The high rate of multiple perpetrator rapes in South Africa increases the probability of transmission with each assault carrying with it the probability of an HIV infected assailant and transmission. We have used an average of 3 perpetrators applied to the proportion of rapes being perpetrated by more than one assailant (P = 30% for adult and 20% for child rape) based on case series reported by Martin (1999) (Range 2.5 – 3.5).

Injury associated with rape

The degree of trauma associated with rape also influences the risk of transmission. The proportion of rapes that would have 'visible trauma' included those with lacerations and abrasions visible to the naked eye, and anal penetration (as we estimate these have the same transmission risk). A preliminary analysis of the first 460 women seen and treated for rape during an 18-month period at Groote Schuur Hospital and GF Jooste Hospital in Cape Town found 65% had vulvar or vaginal injuries, 5% lacerations and 8% had anal penetration (Denny 2002). Previous series have found a lower level of genital trauma. Martin (1999) reported this in 37.7% of cases, however, it was mostly contusion or hyperaemia. The proportion with any laceration in her data was no more than 4%, which is very similar to that found in Sugar's North American series (2004), and much lower than the 35% found in the (possibly biased – Swart L personal communication) Johannesburg series of Swart et al (unpublished).

Colposcopy has greatly enhanced the identification of vaginal injuries after rape. A case series in California revealed genital tears or abrasions in 52% of cases on colposcopy (Slaughter et al 1997). These women's transmission risk from an HIV infected perpetrator would have been elevated. Research from the United States indicates that, perhaps contrary to expectations, genital injury is not more common with multiple assailants (Sugar et al 2004, Cartwright 1987) and anal penetration does not result in visible injury in the majority of cases (Sugar et al 2004). We have assumed that a proportion of women have injuries visible with the naked eye (p = 25% in adult women and 75% in girl children in the base case), but more will have those visible with magnification that will elevate their HIV risk but not by as much as the visible injuries do (p = 40% adults and 21% children in base case). A sizeable proportion of women will have no breach to their vaginal mucosa or skin. We assume that children, because they are smaller and more likely to have hymenal tears (Slaughter et al 1997), are at elevated risk of injury.

Table 15 shows the basis for the estimate of transmission risk assuming that a rapist has HIV which was used in the model. After adjustment for the expected age distribution of perpetrators and their likely age-specific transmission risk and the transmission risk entailed in rape with different degrees of injury, the average risk of HIV transmission in rape is estimated to be 0.017.

Age group	Age-specific HIV prevalence (HSRC 2002)	Estimated proportion of rape perpetrators	Age specific transmission risk (Gray et al 2001)	Age adjusted HIV transmission risk
15-19yrs	4.00%	15%	0.0013	0.000195
20-24 years	8.00%	25%	0.0013	0.000325
25-29 years	22.00%	25%	0.0017	0.000425
30+	14.4%*	35%	0.00075	0.0002625
All ages				0.0012075

* for men aged over 24 years

Table 15: Calculations of HIV transmission risk

Finally the effectiveness of a two drug regimen of post--exposure prophylaxis after rape is not known due to the HIV status of the perpetrator generally remaining unknown. AZT alone had an effectiveness of 80% when used after needle stick injury (CDC 1995). We estimate the effectiveness of AZT and 3TC as 80%, 90% and 100%. We have estimated completion of the prescribed drugs based on data from health services. There is a very wide range in course completion rates, from 15% to 87%, (base case P = 50%), (Christofides et al 2006), with the lower end of this range supported by data from clinics in Gauteng province (Vetten and Hafferjee, 2004) and the Western Cape (Christofides 2006).

HIV transmissions averted in women and girl children calculated in the model were combined to produce total transmissions averted. Life years gained were calculated using the difference between the average age of rape (23.0 years (CIAC Oct 2004)) plus duration of life should HIV have been contracted both with and without antiretroviral treatment and the average life expectancy of females in South Africa (WHO 2004).⁶

Costs

Costs were used from the national scale up modelling, specifically the incremental costs of adding HIV post--exposure prophylaxis provision, described in the previous section. Those parameters influencing both cost and effectiveness were matched in the calculation of a variety of scenarios of incremental cost and effectiveness of PEP provision. One-way and multi-way sensitivity analysis on a number of these parameters was performed resulting in 10 scenarios of cost effectiveness. A high, low and mid (base) case scenario of cost effectiveness was drawn from these.

Results

Table 16 presents the results of the base as well as low and high estimates of cost effectiveness for post--exposure prophylaxis after rape. The number of HIV transmissions that could be averted through post--exposure prophylaxis ranges from 1.65 – 170. This equates to between 0.6% and 59.4% of the HIV cases estimated as potentially resulting from rape. An estimated 667 life years would be gained from providing post--rape HIV post-

⁶ This figure will include the impact of HIV on life expectancy but this is suitable given that the woman is still at continual risk of transmission through other routes.

-exposure prophylaxis in the absence of anti-retroviral treatment in the base case (range 36 – 3,692) and 536 (range 29 – 2,963), with total access to such treatment for those infected with HIV according to national guidelines.

Table 16: Low, medium and high estimates of cost effectiveness PEP for HIV post- rape in South Africa

	Base (medium) estimate		Low estimate		High estimate	
Number of transmissions averted	30.71		1.65		169.90	
Cost per HIV transmission averted (2004 South African Rand)	R 298,597		R 5,356,537		R 55,507	
Cost per HIV transmission averted (Dec 2004 US dollar)	\$45,938		\$824,083		\$8,540	
Assumption regarding national ART programme access	No ART access	ART access	No ART access	ART access	No ART access	ART access
Net cost per HIV transmission averted (2004 Rand)	R275,597	R205,597	R5,333,537	R5,263,537	R32,507	(R37,493)
Net cost per HIV transmission averted (2004 US dollar)	\$42,400	\$31,630	\$820,544	\$809,775	\$5,001	(\$5,768)
Life years gained	667.41	535.64	35.82	28.75	3,691.90	2,963.03
Cost per life year gained (SAR)	R13,741	R17,121	R246,504	R307,141	R2,554	R3,183
Net cost per life year gained (SAR)	R12,683	R11,789	R245,446	R301,808	R1,496	(R2,150)
Cost per life year gained (US\$)	\$2,114	\$2,634	\$37,924	\$47,252	\$393	\$490
Net cost per life year gained (US\$)	\$1,951	\$1,814	\$37,761	\$46,432	\$230	(\$331)

Estimates of scaled up incremental post--exposure prophylaxis provision costs for 2004 range from R 8.276 million to R 10.146 million (US\$ 1.273 – \$1.561) for 2004. Savings arising from the averting of lifetime HIV related health care service utilisation arising from one case of HIV have been netted against this cost, both assuming no anti-retroviral therapy is provided, as well as anti-retroviral therapy being provided, with estimate of these taken from a recent report by Cleary et al (2004).

Discussion

In a country with a high prevalence of both rape and of HIV there is a wide range in the number of HIV transmissions that can be averted each year by post--exposure prophylaxis after rape and a wide range in the cost per case averted. We have shown that in a plausible worst case scenario the number of transmissions averted could be extremely low and the costs per case averted very high. In the best case scenario, nearly two-thirds of transmissions after rape could be averted, and it would be cheaper to do this than provide the medical treatment for the preventable HIV infections. The base case scenario would prevent a modest number of cases (11% of the total) at a cost that is affordable for a middle income country. The overall low risk of HIV after rape suggests that realistic

assessment of risk of women in this regard after rape should be an important part of case management.

One of the components of the model that was particularly influential in the limited impact of the programme in the worst case scenario was the assumed completion rate for the medicines of 15%. This is the level that is currently reported in many facilities. Our findings indicate that at this level very few cases of HIV are averted. Previous research on sexual assault services in South Africa (Christofides, 2005) has shown that service provision is highly variable, but in many cases services are highly unsatisfactory. Services that deliver post-exposure prophylaxis often emphasise compliance in a manner that is punitive rather than supportive. This work has spurred the Department of Health to develop a new sexual assault policy and clinical management guidelines for the service (2005). Our model suggests that improving sexual assault services is vitally important; unless post-exposure prophylaxis is provided in the context of a high quality comprehensive service that supports compliance the programme is likely to be almost completely ineffective. This is both a waste of resources and violates women's rights to be able to protect themselves from HIV transmission during rape.

Not surprisingly, our findings show that in a country like South Africa this intervention, in all but the worst case scenario, is more cost-effective than in low prevalence settings. Estimations from the United States of cost per HIV transmission averted after sexual or drug use exposures range from US\$ 70,000 to US\$ 191,200 (Pinkerton et al 1998; Lurie et al 1998; Pinkerton et al 2004b).

Limitations

Cost-effectiveness modelling is not an exact science. There may have been bias in the costing caused by the choice of facilities for cost estimations. They were thought to be better services and, although we have excluded costs of non-standard items of expenditure, there could be a small over-estimation of the costs of service provision. The costs have also changed quite rapidly over the last 12 months as the costs of anti-retroviral drugs have been reduced, and this change may continue. Cheaper drugs mean that both the cost of post-exposure prophylaxis and ARVs for the treatment of patients who seroconvert as a result of the rape. Changes in costs could influence the cost-effectiveness model. The data used in effectiveness model was incomplete and so inevitably a possibility that some of the assumptions be incorrect. We hope that we have been sufficiently generous in the sensitivity analysis to capture the likely margins of error, but it is possible that we have not succeeded for all parameters. Our scenarios may also have been unduly influenced by the important area of medical uncertainty as regards the effectiveness of less than 4 weeks of drugs. In the absence of information we have assumed no effectiveness for shorter periods, but this may be over conservative.

Conclusion

In conclusion, the provision of post-exposure prophylaxis after rape has been substantially motivated by human rights concerns: women and children who have been raped should not be subject to the additional violation of acquiring HIV, when it can be prevented. We have shown that South Africa may be able to provide post-exposure prophylaxis for HIV in a manner that is affordable, and possibly even cost-saving. However, this is critically dependant on improving sexual assault services and providing an environment that encourages people to come forward timeously for care and supports drug course completion. Without this, the service is far from cost-effective and prevents an unacceptably low proportion of rapes. We would suggest that providing high quality health services for raped women and children is essential for safeguarding women's human rights, as well as being sound public health policy.

Chapter 5: Recommendations and conclusions

Findings support the need for holistic post-rape health services, provided by appropriately trained providers, which include both counselling and medical treatment to prevent pregnancy, sexually transmitted infections and HIV, as well as information (provided on first contact with services and reinforced a day or two later) about the side effects of medication, anti-emetic drugs to prevent nausea, and non-judgmental support with adherence.

Since post-exposure prophylaxis for HIV is affordable it should be provided as part of comprehensive post-rape care, however doing so does neither meet women's post-rape medical needs, nor address her human rights needs, if levels of regimen completion are so low that most women do not take enough of the tablets to secure protection from HIV infection. We need to look at ways to improve health-seeking behaviour and services if we are to realise the maximum benefit from PEP. It seems likely that providing extra support to women after the initial visit is important in this regard. We need to respond to patients preferences in how services are delivered and address other barriers to seeking care after rape to increase the proportion of survivors who present to health services. Providing a supportive environment in this way will encourage patients to adhere to post-exposure prophylaxis, and will increase the cost-effectiveness of PEP from current levels.

Recommendations

Services

- Services should be provided by appropriately trained health workers who understand rape and are equipped to provide post-rape counselling
- Services should continue with their policy of providing post-exposure prophylaxis for HIV after rape to those with negative HIV tests, and the medication should be supplied for the 4 weeks after the HIV status has been established.
- Patients want health care providers who are sensitive. This means that the selection of providers who provide post-rape care is critical if services are to better meet the needs of patients. Training that addresses health care provider attitudes is also important.
- Post-rape health services must maintain comprehensive care and not become 'PEP services'. Appropriate management of STDs as well as pregnancy prevention is also essential.
- Information on how to take medication and the side-effects of all medication should be explained to the patient with appropriate information that they can take home. This should be reinforced by a phone call the following day and should include a phone number they can call for further information and assistance.
- Anti-emetics should be provided routinely to patients when they receive either PEP or emergency contraception.
- Counselling services need to be available and counsellors need adequate training in the management of patients after rape.
- When a patients test HIV positive after presenting at the health service, they should be referred to ART services for a CD4 count to determine whether they are eligible for treatment.
- HIV positive patients should be referred for ongoing counselling

- Health services should have a standardized information systems for keeping records of patients that present after rape, including numbers of patients testing HIV at presentation and seroconversions that occur in patients over the subsequent three months.

Planning

- Budgeting needs to be informed by the scale-up costing estimates presented in this report.
- Allocation of human resources needs to be carefully considered.

Monitoring, evaluation and research

- Research is needed to monitor the implementation of the new Sexual Assault Policy and Clinical Management Guidelines of the Department of Health and to develop and evaluate approaches to improve service delivery
- Effectiveness of post-exposure prophylaxis to prevent transmission of HIV needs to be studied. Research should also focus on the impact of PEP is effectiveness if doses are missed or if the medication is stopped prematurely.
- Research is needed into strategies for supporting adherence to medication in different settings.
- Research is needed on the role of medico-legal evidence in the outcome of rape cases.

References

- Abrahams N, Jewkes R, Hoffman M, Laubscher R (2004) Sexual violence against intimate partners in Cape Town: the risk of HIV/AIDS Bulletin of the World Health Organisation. 82: 330-337.
- Campbell R, Wasco SM, Ahrens CE, Sefl T, Barnes HE. Preventing the "second rape:" Rape survivors' experiences with community services providers. *J Interpers Violence* 2001;16:1239-259.
- Cartwright PS (1987) Factors that correlate with injury sustained by survivors of sexual assault. *Obstetrics & Gynaecology* 70, 40-46.
- Centres for Disease Control: Case control study of HIV seroconversion in health care workers after percutaneous exposure to HIV-infected blood-France, United Kingdom, and United States. January 1988-August 1994. *MMWR* 1995, 44: 929-933.
- Christofides NJ, Jewkes, RK, Webster N, Penn-Kekana L, Abrahams, N, Martin LJ. "Other patients are really in need of medical attention"—the quality of health services for rape survivors in South Africa. *Bull World Health Organ* 2005;83:495-502.
- Christofides NJ, Jewkes RK, Muirhead D, Penn-Kekana L, Conco DN. *Including PEP into post- sexual assault health services in South Africa: costs and cost effectiveness of user preferred approaches to provision*. Pretoria, South Africa: Medical Research Council, 2004.
- Cleary S, Boule A, McIntyre D, Coetzee D (2004) Cost effectiveness of Antiretroviral Treatment for HIV Positive adults in a South African Township. Health Systems Trust. Durban.
- Craissati J, Beech A (2004) The characteristics of a geographical sample of convicted rapists. *Journal of Interpersonal Violence* 19(4), 371-388.
- Deacon H, Stephney I, Prosalendis S. The social context and history of stigma in South Africa. Second African Conference on the Social Aspects of HIV/AIDS. Cape Town, May 2004:9-12.
- De Grurrola V and et.al., Infectiousness of HIV between male homosexual partners. *J Clin Epidemiol*, 1989. 42: p. 849-856.
- De Vicenzi I, for the European Study Group on Heterosexual Transmission of HIV. A longitudinal study of human immunodeficiency virus transmission in heterosexual couples. *N Eng J Med* 1994;331: 341-6.
- Denny L, et al. The challenge of providing PEP to survivors of Rape: Preliminary analysis of Standard Sexual Assault examination Form used at Groote Schuur Hospital and G. F. Jooste Hospital from 1998 to 2001. in First South African Gender Based Violence and Health Conference. 2002. Johannesburg.
- Department of Health. *Sexual assault clinical management guidelines*. Pretoria: Department of Health, 2003.

Department of Health (DOH). *The primary health care package for South Africa—a set of norms and standards*. November 2005. www.doh.gov.za/docs/policy-f.html.

Downs A and Devicenzi I, Probability of heterosexual transmission of HIV: relationship to the number of unprotected sexual contacts. *J Acquir Immune Defic Syndr Hum Retrovirol*, 1996. 11: p. 388-395.

Duerr A, Xia Z, Nagachinta T, Tovanbutra S, Tansuhaj A, Nelson K, Probability of male-to-female transmission among married couples in Chiang Mai, Thailand. 10th International Conference on AIDS, Yokohama, Japan, August 1994 (abstr).

Ericksen J, Dudley C, McIntosh G, Ritch L, Shumay S, Simpson M. Clients' experiences with a specialized sexual assault service. *J Emerg Nurs* 2002;28:86-90.

Garcia-Moreno C. Dilemmas and opportunities for an appropriate health-service response to violence against women. *Lancet* 2002;359:1509-14.

Giotakios O, Bourtsoukli P, Paraskeyopoulou T, Spandoni P, Stasinou S, Boulougouri D, Spirskou E (2003) Prevalence and risk factors of HIV, hepatitis B and hepatitis C in a forensic population of rapists and child molesters. *Epidemiology & Infection* 130, 497-500.

Gray RH, Wawer MJ, Brookmeyer R, Sewankambo NK, Serwadda D, Wabwire-Mangen F, Lutalo T, Li X, van Cott T, Quinn TC; Rakai Project Team. Probability of HIV-1 transmission per coital act in monogamous, heterosexual, HIV-1-discordant couples in Rakai, Uganda. *Lancet*. 2001 Apr 14;357(9263):1149-53.

Hanson K, McPacker B, Nakamba P, Archard L. Preferences for hospital quality in Zambia: results from a discrete choice experiment. *Health Econ* 2005;14:687-701.

HSRC (2002) Nelson Mandela/HSRC Study of HIV/AIDS Household Survey 2002, HSRC Pretoria.

Human Right's Watch. *South African violence against women and the medico legal system*. New York/Washington: Human Right's Watch, 1997.

Ippolito G, et al., *The risk of occupational HIV in health care workers*. *Archive of Internal Medicine*, 1993. 153:: p. 1451-1458.

Jewkes R, Abrahams N. The epidemiology of rape and sexual coercion in South Africa: an overview. *Soc Sci Med* 2002;55:1231-44.

Jewkes R, Nduna M, Levin J, Jama N, Dunkle K, Khuzwayo N, et al. (2006) A cluster randomised controlled trial to determine the effectiveness of Stepping Stones in preventing HIV infections and promoting safer sexual behaviour amongst youth in the rural Eastern Cape, South Africa: trial design, methods and baseline findings. *Trop Med Int Health* 11, 3-16

Jewkes R, Nduna M, Levin J, Jama N, Khuzwayo N, Duvvury N, Koss M (2004) Rape of women: risk factors for raping and association with HIV risk behaviours XVth International Conference on AIDS, Bangkok, Thailand, July 2004 (abstr).

Kim JC, Martin LJ, Denny L. Rape and HIV post--exposure prophylaxis: addressing the dual epidemics in South Africa. *Reprod Health Matters* 2003;11:101-12.

Lancsar E, Savage S. Deriving welfare measures from discrete choice experiments: inconsistency between current methods and random utility and welfare theory. *Health Econ* 2004;13:901-7.

Lurie P, Miller S, Hecht F, Chesney M, Lo B Post-exposure prophylaxis after nonoccupational HIV exposure. *JAMA* 1998; 280(20): 1769-1773.

Martin L (1999) Violence against women: an analysis of the epidemiology and patterns of injury in rape homicide in Cape Town and in rape in Johannesburg. Unpublished MMed Forensic Pathology Thesis, University of Cape Town.

Mastro TD, Kityaporn D HIV type 1 transmission probabilities: estimates from epidemiological studies. *AIDS Res Hum Retrovirol* 1998;14 (Suppl 3):S223-27.

McCauley J, Yurk RA, Jenckes MW, Ford DE. Inside Pandora's box: abused women's experiences with clinicians and health services. *J Gen Intern Med* 1998;13:549-55.

Meel BL Prevalence of HIV in the rape victims in Transkei. Paper presented at the 2nd South African Gender-based Violence and Health Conference, Indaba Hotel, Fourways, 7-9 May 2003.

Mugabo P, Sahabodien A, Mahlobo H, Phillips A, Makiti S, Africa D, Mbalo M, (2005) management of HIV infection in rape survivors in the Cape Metropole region. Paper presented at the 3rd South African Gender-based Violence and Health Conference, 16-18 October, Stellenbosch, South Africa.

Nicolosi A, Leite MLC, Musicco M, Arici C, Gavazzeni G, Lazzarin A for the Italian study group on HIV heterosexual transmission. The efficiency of male-to-female and female-to-male transmission of human immunodeficiency virus: a study of 730 stable couples. *Epidemiology* 1994; 5:570-75.

Padian N, Shiboski SC, Jewell NP Female-to-male transmission of human immunodeficiency virus *JAMA* 1991;266:1664-7.

Peterman T, et al., Risk of HIV transmission from heterosexual adults with transfusion associated infections. *JAMA*, 1988. 259: p. 55-58.

Pinkerton SD, Holtgrave DR, Bloom FR Cost-effectiveness of post--exposure prophylaxis following sexual exposure to HIV. *AIDS* 1998;12:1067-1078.

Pinkerton SD, Martin JN, Roland M, Katz MH, Coates TJ, Kahn JO Cost-effectiveness of post--exposure prophylaxis after sexual or injection-drug exposure to Human Immunodeficiency Virus *Arch Intern Med* 2004; 164:46-54.

Pinkerton SD, Martin JN, Roland M, Katz MH, Coates TJ, Kahn JO (2004b) Cost-effectiveness of HIV post- exposure prophylaxis following sexual or injection drug exposure in 96 metropolitan areas in the United States. *AIDS* 2004; 18:2065-2073.

Phillips K, Maddala T. Reed Johnson. F Measuring preferences for health care interventions using conjoint analysis: an application to HIV testing. *Health Serv Res* 2002;37:1681-705.

Resnick H, Acierno R, Holmes M, Dammeyer M, Kilpatrick D. Emergency evaluation and intervention with female victims of rape and other violence. *J Clin Psychol* 2000;56:1317-33.

Royce RA, Sena A, Cates W, Cohen MS Sexual transmission of HIV. *N Eng J Med* 1997; 336:1072-78.

Ryan M, Farrar S. Using conjoint analysis to elicit preferences for health care. *BMJ* 2000;320:1530-3.

Slaughter L, Brown CVR, Crowley S, Peck R (1997) Patterns of genital injury in female sexual assault victims. *American Journal of Obstetrics and Gynaecology* 176(3), 609-616.

Sugar NF, Fine DN, Eckert LO (2004) Physical injury after sexual assault: findings of a large case study. *American Journal of Obstetrics and Gynaecology* 190(1),

Swart L , Gilchrist A, Butchard A, Seedat M, Martin L. (1999). Rape Surveillance trough district surgeons offices in Johannesburg, 1996-1998: Evaluation and prevention Implications. Institute of Social and Health Sciences. University of South Africa.

Suffla S, Seedat M, Nascimento A. *Evaluation of medico-legal services in Gauteng: implications for the development of best practices in the after-care of rape survivors*. Pretoria: Institute for Social and Health Sciences and Centre for Peace Action, University of South Africa, 2001.

Tesler H, Zweifel P. Measuring willingness-to-pay for risk reduction: an application of conjoint analysis. *Health Econ* 2002;11:129-39.

Thomas S and Muirhead D (2000) National Health Accounts: Public Sector Report: Health Economics Unit, University of Cape Town and Centre for Health Policy, University of the Witwatersrand. National Health Accounts Project for Department of Health South Africa.

Vetten L, Haffejee S. *Factors affecting adherence to post--exposure prophylaxis in the aftermath of sexual assault: key findings from seven sites in Gauteng Province*. Johannesburg, South Africa: Centre for the Study of Violence and Reconciliation, 2004.

World Health Organization (WHO). *Guidelines for medico-legal care for victims of sexual violence*. Geneva: World Health Organization, 2003.

Wulfson A. Paper presented at the 1st South Africa Gender-based Violence & Health Conference, Muldersdrift Johannesburg 17-19 April 2001

Appendix A: FURTHER INFORMATION ON THE METHODS USED IN THE DISCRETE CHOICE EXPERIMENTS AND FURTHER RESULTS

Background to Discrete Choice Experiments

Discrete choice experiments (DCE) can be used to quantify preferences of a group of people over various characteristics of a good or service. It is one approach used in conjoint analysis (CA) where an assumption is made that any good or service can be described by a series of characteristics it may have and the degree to which it possesses each desired characteristic. In discrete choice analysis generally the characteristics are termed attributes and the differing degrees of each attribute possible are termed levels. For example, a washing liquid's attributes may be described as length of effect, level of residue, degree of biodegradability, type of packaging and price. Each possible choice of washing up liquid will have different levels of each of these attributes and buyers will buy the product that possesses high levels of the attributes most important to them.

Discrete choice analysis involves the presentation of a series of possible scenarios of programme design where each scenario contains differing levels of each attribute. Respondents are asked to make a series of choices between possible scenarios of service delivery or product. The aim is to describe aspects of services that are most important (or utility bearing in economics terminology) to respondents and to estimate the trade offs that people would be willing to make between these attributes. It can then be used to estimate the overall utility or sense of well-being or welfare that differing combinations of attributes, or in other words potential design of a programme, can produce.

Conjoint analysis (CA) and DCE have roots in mathematical psychology and was first applied in marketing research as well as transport and environmental economics. More recently it has been increasingly used in health programme evaluation to gain quantitative insight into the preferences of potential users and therefore the welfare that may be derived in a population from differing aspects of health service delivery. In this way it allows consideration of both the process and outcome of health programmes. A large number of health related CA studies to date have been conducted in high income settings. Few studies, however, have been conducted in a developing country setting (Hanson et al, 2004; Lake, unpublished study).

Methodology of the DCE

The development and conduct of a DCE involves five main steps. Firstly the attributes of the service, programme or outcome to be included must be determined. Secondly appropriate levels on each of the attributes need to be chosen. Both of these first steps are often determined by literature review, focus group discussions or interviews, clinical trial or other research project data and / or policy relevance.

Attributes used in this study are listed in table 1 (above). The travel time attribute was included to gauge whether a clinic based site for delivery of post- sexual assault health services may be more practical for travel time reasons than being based at a hospital site involving longer travel time for women post- sexual assault which may not be desirable under such traumatic circumstances. In one of the case study post- rape health services, returns to the service for collection of drugs each week for four weeks was required and a notable drop off in attendance occurred meaning non-completion of a full course of PEP. On the other hand, continued follow up and counselling was an important aspect arising from the focus group discussions. The number of returns required to the health service was therefore also included as an attribute. Two similar items arose from the focus group

discussion relating to the skills and attitudes of providers and it was unclear when women discussed counselling as very important to them whether a trained counsellor is what was desired or simply a provider that had an understanding and supportive attitude. This may have significant implications for scale up both in terms of trained staff already available and the cost and logistical considerations of training sufficient numbers of providers to enable wide spread provision of post- rape health care. Provider skills and attitudes were therefore included as an attribute. The length of examination was included as a quality of clinical care attribute. Finally the availability of ARV PEP was high on the policy agenda at the time of the study and particularly whether the drugs should be provided only to women showing an HIV negative test result or whether this secondary trauma should be avoided and women given the one month course of PEP at the first visit without requiring an HIV diagnosis.

The next step in the conduct of a discrete choice experiment is the choice of scenarios. In a discrete choice format pair-wise scenarios of possible service designs are presented to respondents. A choice is then made by the respondent which scenario they would choose (and occasionally an option of neither is made available). However the number of possible scenarios is a function of the number of attributes and levels. These give rise to a number of scenarios far greater than respondents can process (suggested to be a maximum of 16 (Ryan & Farrar 2000)). These are reduced using a factorial design that reduces the number of scenarios to the minimum required to ensure that coefficients on each attribute can be measured (giving an indication of the importance of that attribute in determining choice of service).

In this case respondents chose between two post- rape health services. The 5 attributes and their levels described in table 3.1 above give rise to a possible 162 scenarios (34×21) with the number of [possible scenarios being a function of the number of attributes and levels through the formula $L1A1 \times L2A2 \dots$. In this study SPSS Orthoplan procedure was used to reduce the possible number of scenarios to 16 using an orthogonal main effects design. A constant comparator scenario was randomly chosen and all other scenarios compared with this given a total of fifteen pair-wise choices to be completed. These were presented as two hypothetical post- sexual assault health services, service A and service B.

An example of a conjoint question faced by the respondents is shown in Table 2 (above). An additional scenario where all levels on attributes for service B were the same or better than service A was added as a check of consistency of preferences (that respondents are choosing logically). A choice of service A on this scenario may suggest that respondents do not understand the questions and therefore the inclusion of their responses may jeopardize the validity of the results. Finally the preferences over the designs must be elicited from respondents.

Further details on data analysis

Attributes for which the levels taken are ordinal or categorical were represented by dummy variables where the benchmark comparison took the level of the comparator scenario A. For example travel time was represented as two dummy variables $LOWTRAV = 1$ if travel time is less than thirty minutes and a dummy variable $HIGHTRAV = 1$ if travel time is 3 hours or more. The attribute is represented in this way so that inferences can be made as to the change in utility in moving between each of the levels on the attribute. It cannot be assumed that the benefit associated with a reduction in travel time from over three hours to between 1 to 2 hours would be the same as the benefit associated with a reduction in travel time from between 1 to 2 hours to less than 20 minutes. The coefficient on $LOWTRAV$ would be expected to be positive (indicating a positive benefit associated with a

reduction in travel time from between 1 to 2 hours down to less than thirty minutes). On the other hand the coefficient on HIGHTRAV would be expected to be negative (indicating a decline in benefit associated with an increase in travel time from between 1 to 2 hours up to 3 hours or more). Dummy variables were also created for the representation of drug availability and skills and attitudes of the providers.

All participants with inconsistent responses (n=44 or 13.8% of sample) were excluded from any further analysis. Inconsistency is the term applied when the pattern of preferences or choices do not follow a logical format within an individuals responses on a particular scenario or across the scenarios presented to them. One scenario as a check of consistency was included where all attributes were of equal or better level on service B than service A. Where respondents did not choose service B there responses on all scenarios were excluded from the analysis. In addition patterns of responses were examined for consistency, particularly due to the unexpected significance of the constant term in the Cape Town model – see later. San Miguel et al (1998) discuss the notion of transitivity, one of the foundational principles (or axioms) of utility theory, and how this can be applied to consistency checking of DCE responses. Transitivity essentially says that for preferences to be consistent and logical assumption must be able to be made that if A is preferred to B and B is preferred to C then A must be preferred to C. Responses across scenarios can be assessed for their obedience to this principle and respondents failing this test assumed to have mental fatigue or not understand the questions sufficiently. Responses from 12 interviews were removed on this basis. Our final analysis included 275 participants, 121 from Cape Town and 154 from Thohoyandou.

Interaction effects were included with site, whether a service user or not, socio-economic status and age to measure whether any of these factors had a modifying effect on preferences. Socio-economic status was measured by a wealth index which used principal components analysis to weight responses to six items. These were

1. Ownership of a television
2. Ownership of a radio
3. Ownership of a car
4. Whether their household goes without food often, sometimes, seldom or never.
5. Whether the household has meat often, sometimes, seldom or never
6. The difficulty that would be experienced if R100 had to be found to pay for health care for someone of the household

A factor score was produced combining the weighted values of these items and then divided into three equal groups. Variables Socvar1 being the group of lowest socio-economic status and the benchmark comparator in the development of dummy variables and Socvar2 being the middle group and Socvar3 being of highest socio-economic status. Age was categorised into under and over 25 years of age.

Likelihood ratio tests were used to test coefficients on interaction terms with site, service user, socio-economic quintile and age. Site interaction coefficients were significant and site had a significant effect on benefit associated with all attributes and improved model fit overall ($P < 0.0001$). Separate models for the rural (Thohoyandou) and urban (Cape Town – Thutuzela) sites were estimated as well as a combined model. With other interaction effects a stepwise approach was used where model fit was tested with and without groups of interactions using likelihood ratio tests. A final model was used where to remove any remaining interaction effects would involve significant loss of efficiency in model estimation.

Further results of the discrete choice exercise

The regression coefficients of the attributes in the random effects probit model can be used to make a number of different types of interpretations. Firstly, statistically significant coefficients show the attributes that are of most important to the women interviewed. Secondly, the signs on the coefficients show whether the utility increases or decreases with changes in the attribute. Thirdly the relative size of the coefficients on each of the attributes can indicate the relative importance of each attribute. Finally, the ratio of a pair of coefficients indicates the amount of one attribute the respondents are willing to give up for the service to have a unit increase in the other attribute, this is known as the marginal rate of substitution or MRS.

The constant in this case represents the direction of preference if all attributes were of the same level, i.e. the implicit preference of one service over the other with no additional information other than the title. In some cases where medical or surgical management of health condition form the choices represented by the attributes (see eg Ryan, 1996) or home versus hospital care (Longworth 2000) it may be reasonable that a preference for one approach over the other would exist even without consideration of the levels on attributes. In our case, however, where only the labels service A and service B are used it, the expectation of the constant would be that it would not be significantly different from zero. This is the case in this overall model.

Many of the patterns in preferences illustrated in the overall model and described above, however, mask significant differences between sites. The estimation of separate models allows for easier interpretation of coefficients and determination of significant attributes. Table A1 below shows the results for each site. Preferences exhibited in Thohoyandou over different aspects of potential post rape health service design were on the whole expressed more strongly than among Cape Town respondents. This is particularly the case for provision of PEP only after an HIV test which is overwhelming in the Thohoyandou site versus a slight preference for this shown in the Cape Town model. Cape Town respondents placed a higher emphasis on trained counsellors than the understanding attitude shown by the higher positive coefficient on the training level of the provider attribute than the negative coefficient on the lack of understanding level in table 4.5 above. The opposite was true of Thohoyandou women where the provider attitude rather than training would be more likely to determine choice of service, though a trained provider in addition to having an understanding attitude was, not surprisingly, the most preferred scenario in both sites.

Thohoyandou respondents preferred a slightly higher travel time as indicated by the significant negative coefficients on both the low and high travel time variables whereas women from Cape Town preferred short travelling times. This may in part reflect experience as city dwellers with a high supply of health facilities may be used to lower travelling times than rural women with lower access to services. It may also be that rural participants know that health facilities are usually in a town and would prefer to travel to a place with where other tasks can be completed. The responses shown in table 3 would not tend to support a suggestion that confidentiality preserved by distance is the main concern in Thohoyandou.

Table A1: Results of site specific random effects probit models

MODEL ATTRIBUTE / VARIABLE	Cape Town (urban) Site			Thohoyandou (rural) site		
	Coeff	CI	P> z	Coeff	CI	P> z
Low travel time (< 30 mins)	0.3740	0.1986, 0.5494	0.000	- 0.6228	- 0.8533, -0.3924	0.000
High travel time (> 3 hours)	0.1656	-0.0171, 0.3483	0.076	- 0.2763	- 0.5338, -0.1873	0.036
PEP with HIV test	1.5212	1.3454, 1.6970	0.000	2.3557	2.0467, 2.6648	0.000
PEP without HIV test	1.0524	0.8850, 1.2197	0.000	0.3249	0.1565, 0.4934	0.000
Returns to service	0.0547	0.0164, 0.0930	0.005	0.3572	0.2914, 0.4230	0.000
Long examination	0.4922	0.3551, 0.6292	0.000	0.7945	0.6170, 0.9721	0.000
Providers with no understanding	- 0.3189	-0.5010, -0.1367	0.001	- 0.9754	- 1.1899, -0.7608	0.000
Providers with understanding and training	0.5880	0.3690, 0.8069	0.000	0.8879	0.5775, 1.1983	0.000
Constant	- 0.9692	-0.1263, -0.6757	0.000	0.4828	0.1394, 0.8262	0.006
		LR	P > χ^2		LR	P > χ^2
Likelihood ratio		512.77	0.00001		1304.87	0.00001

Coefficients resulting from the estimation of the expanded model below shown in table A2 would suggest that socio-economic status has an effect over and above that of site particularly with respect to the provision of PEP only after an HIV negative test result. Preference for the ARVs after a test increased as socio-economic status moved from the lower group to mid level and higher level categories. In addition respondents in the highest socio-economic group were less likely to be worried about formal training of providers versus their understanding attitude.

Table A2: Expanded random effects model with significant interactions included.

ATTRIBUTE / VARIABLE	Coeff	CI	P> z
Low travel time (< 30 mins)	0.2365	0.0518, 0.4213	0.012
High travel time (> 3 hours)	-0.0396	-0.2107, 0.1314	0.650
PEP with HIV test	1.0877	0.7969, 1.3784	0.000
PEP without HIV test	0.9275	0.7693, 1.0857	0.000
Returns to service	0.0553	0.0168, 0.0937	0.005
Long examination	0.3634	0.2340, 0.4929	0.000
Providers with no understanding	-0.5549	-0.7237, -0.3861	0.000
Providers with understanding and training	0.4539	0.2358, 0.6720	0.000
Site*Low travel time	-0.4059	-0.6481, -0.1637	0.001
Site*High travel time	0.2494	0.0127, 0.4861	0.039
Site*PEP with HIV test	1.1514	0.7898, 1.5131	0.000
Site* PEP without HIV test	-0.4125	-0.6290, -0.1959	0.000
Site*Returns to service	0.3467	0.2683, 0.4251	0.000
Site*Long examination	0.6876	0.4925, 0.8827	0.000
Site* Providers with no understanding	-0.0766	-0.2890, 0.1357	0.479
Site* Provider understanding and training	1.2037	0.9458, 1.4615	0.000
Age*Low travel time	-0.1421	-0.3166, 0.0324	0.110
Soc2*PEP with HIV test	0.4128	0.0642, 0.7614	0.020
Soc3*PEP with HIV test	0.4397	0.1004, 0.7791	0.011
Soc3* Provider understanding and training	-0.3909	-0.6088, -0.1730	0.000
Constant	-0.4082	-0.6384, -0.1781	0.001
		LR	P > χ^2
Likelihood ratio (constant only model)		1883.54	0.0000
Likelihood ratio versus fully expanded model		22.19	0.3305

Again, however, these two way interactions disguise some important differences in the way socio-economic status interacts with the site in which respondents reside. To ease interpretation, a model with socio-economic interactions was estimated in each site. The socio-economic index was once again calculated within a site (so that differences preferences within a site could be related to differences in socio-economic status within that same site). As for the across site model, the factor scores produced through principal components analysis of the responses to the six socio-economic questions were banded into three groups. The lowest socio-economic group was represented by the code 1 and is the comparator in the dummy representation of the socio-economic categories.

Table A3 shows the site models estimated with interactions with socio-economic status level. It should be noted that for Thohoyandou the socio-economic interactions did not significantly improve the model and hence the reduced model is preferred, however the coefficients on some attributes were significant. Parameter estimates, confidence intervals and P values are however shown in the table below for both site models for consistencies sake. In both sites the preference for PEP only after returning and HIV negative test result increased with socio-economic status. In addition, as may be expected, the highest socio-economic group in Cape Town have a stronger preference for lower travel times compared with the group of lowest socioeconomic status. This pattern was not repeated in Thohoyandou, however, where women preferred to travel further to services at all levels of socio-economic status.

Table A3: Inclusion of socio-economic interactions across sites

MODEL ATTRIBUTE / VARIABLE	CAPE TOWN			THOHOYANDOU		
	Coeff	CI	P> z	Coeff	CI	P> z
Low travel time (< 30 mins)	0.3308	0.0887, 0.5729	0.007	-0.4383	-0.7987, -0.0779	0.017
High travel time (> 3 hours)	0.2362	-0.0284, 0.5007	0.080	-0.3331	-0.6818, 0.0155	0.061
PEP with HIV test	1.2395	0.9803, 1.4986	0.000	2.4148	1.9023, 2.9272	0.000
PEP without HIV test	0.9942	0.7387, 1.2498	0.000	0.6363	0.3364, 0.9362	0.000
Returns to service	0.0412	-0.0204, 0.1028	0.190	0.3315	0.2290, 0.4341	0.000
Long examination	0.4605	0.2579, 0.6630	0.000	0.7507	0.4857, 1.0157	0.000
Providers with no understanding	-0.3212	-0.5705, -0.0719	0.012	-1.2080	-1.5408, -0.8752	0.000
Provider training and understand	0.9043	0.6105, 1.1981	0.000	0.7481	0.3348, 1.1614	0.000
Soc2* Low travel time	0.5908	0.2010, 0.9806	0.003	-0.2006	-0.6444, 0.2432	0.376
Soc2* High travel time	-0.0808	-0.4590, 0.2973	0.675	-0.0036	-0.4093, 0.4021	0.986
Soc2* PEP with HIV test	1.0823	0.5547, 1.6100	0.000	0.1499	-0.5905, 0.8904	0.691
Soc2* PEP without HIV test	0.2484	-0.1544, 0.6513	0.227	-0.3200	-0.6918, 0.0519	0.092
Soc2*Returns	-0.0718	-0.1751, 0.0315	0.173	-0.0220	-0.1628, 0.1189	0.760
Soc2*Long exam	-0.0118	-0.3195, 0.2959	0.940	-0.0499	-0.3897, 0.2898	0.773
Soc2*Provider no und	-0.3691	-0.7715, 0.0334	0.072	0.3876	-0.0001, 0.7754	0.050
Soc2*Provider training	-0.2570	-0.6600, 0.1460	0.211	0.2652	-0.1878, 0.7183	0.251
Soc3* Low travel time	-0.1283	-0.4439, 0.1873	0.426	-0.4761	-1.0228, 0.0705	0.088
Soc3* High travel time	-0.1149	-0.4733, 0.2435	0.530	0.3707	-0.1412, 0.8825	0.156
Soc3* PEP with HIV test	0.4064	0.0275, 0.7852	0.036	-0.2099	-0.9844, 0.5646	0.595
Soc3* PEP without HIV test	0.1195	-0.2306, 0.4695	0.504	-0.7163	-1.1543, -0.2782	0.001
Soc3*Returns	0.0771	-0.0143, 0.1685	0.098	0.2435	0.0526, 0.4344	0.012
Soc3*Long exam	0.1842	-0.0924, 0.4607	0.192	0.5021	0.0515, 0.9527	0.029
Soc3*Provider no und	0.1833	-0.1387, 0.5052	0.265	0.2570	-0.1858, 0.6998	0.255
Soc3*Provider training	-0.5989	-0.9521, -0.2458	0.001	0.3495	-0.1890, 0.8879	0.203
Constant	-1.0255	-1.3286, -0.7224	0.000	0.4539	0.1044, 0.8035	0.011
		LR	P > χ^2		LR	P > χ^2
LR versus reduced model		56.98	0.000		24.80	0.073

Calculation of overall utility scores of preferred designs

Table A4 below shows the calculation of overall utility scores for the least and most preferred design across sites.

All respondents		Scenario			
Attribute	Attribute coefficient	Standard scenario attribute levels	Alternate scenario attribute levels	Difference in attribute levels	Attribute score
Constant	-0.1246	0		0	-0.1246
Low travel time	-0.0184	0	0	0	0.0000
High travel time	-0.0659	0	0	0	0.0000
PEP with HIV test	1.7129	0	1	1	1.7129
PEP without HIV test	0.7034	0	0	0	0.0000
Returns to service	0.1413	1	4	3	0.4239
Long examination	0.4832	0	1	1	0.4832
Providers no understanding	-0.7502	0	0	0	0.0000
Provider with understanding and training	0.5631	0	1	1	0.5631
UTILITY SCORE					3.0585

Table A4 Utility score calculation for most preferred post- rape health care delivery design – across sites

Table A5 Utility score calculation for most preferred post- rape health care delivery design –Urban

Urban respondents		Scenario			
Attribute	Attribute coefficient	Standard scenario attribute levels	Alternate scenario attribute levels	Difference in attribute levels	Attribute score
Constant	-0.9692	0		0	-0.9692
Low travel time	0.3740	0	1	1	0.3740
High travel time	0.1656	0	0	0	0.0000
PEP with HIV test	1.5212	0	1	1	1.5212
PEP without HIV test	1.0524	0	0	0	0.0000
Returns to service	0.0547	1	4	3	0.1641
Long examination	0.4922	0	1	1	0.4922
Providers no understanding	-0.3189	0	0	0	0.0000
Provider with understanding and training	0.5880	0	1	1	0.5880
UTILITY SCORE					2.1703

Table A6 Utility score calculation for most preferred post- rape health care delivery design –Rural

Rural respondents		Scenario			
Attribute	Attribute coefficient	Standard scenario attribute levels	Alternate scenario attribute levels	Difference in attribute levels	Attribute score
Constant	0.4828	0		0	0.4828
Low travel time	-0.6228	0	0	0	0.0000
High travel time	-0.2763	0	0	0	0.0000
PEP with HIV test	2.3557	0	1	1	2.3557
PEP without HIV test	0.3249	0	0	0	0.0000
Returns to service	0.3572	1	4	3	1.0716
Long examination	0.7945	0	1	1	0.7945
Providers no understanding	-0.9754	0	0	0	0.0000
Provider with understanding and training	0.8879	0	1	1	0.8879
UTILITY SCORE					5.5925

Preferences in the Cape Town are more evenly divided between attribute levels and hence a lower overall utility score can be achieved from any one delivery design as fewer women within the community prefer any one scenario of post- rape health service delivery. Preferences in Thohoyandou are far more homogeneous with certain aspects of services being commonly preferred across respondents. This is seen in the higher coefficients on most of the variables in the tables above. Hence a high utility score of 5.59 is achieved by having a design that includes these commonly preferred levels on each attribute. Ultimately however, the only difference in design is that would be location of services where Cape Town respondents clearly prefer to attend a provider that is located within a shorter travelling time. As any urban area is more densely populated than an area like Thohoyandou this is most likely to be the case no matter at what level of the health service post- rape care was located within anyway. Hence the user preferred scenario costed in the following section of this report is that of the overall model in table 3.8 above where services are on average a mid travelling time away, where PEP is given after a negative HIV test result, four returns to the service for follow up are required, a long genital examination is performed and providers have not only a general understanding of the needs of rape victims but are formally trained in this and related counselling and support.