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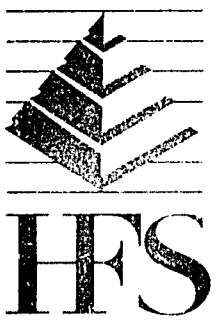

Health

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Technical Note No. 29

A SUPPLY-DEMAND MODEL OF HEALTH FINANCING

An Application to the Ambulatory Health System of Burkina Faso

Submitted to:

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and
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ABSTRACT

This paper describes a quantitative tool, or supply-demand model (SDM) of health care financing, which is intended to serve as an aid in setting fee levels within the ambulatory health system of Burkina Faso. The typical situation that the model is designed to address involves a health facility that covers a fraction of its recurrent costs from self-generated revenues. The model allows the user to explore alternative financing options designed to reduce the facility's dependency on external financing while maintaining (or improving) the facility's utilization an quality of care. The SDM can also be used to trace the impact of a variety of other policies on the financial status of health facilities.

The main body of the paper provides a brief overview of the model, describes the base scenario, presents the results of a series of policy simulations, and provides conclusions and suggested additional applications of the model.

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ACRONYMS

SDM	Supply-Demand Model
CM	Medical Center
CSPS	Health Center
CHR	Regional Hospital

EXECUTIVE SUMMARY

The present paper describes a quantitative tool, or supply-demand model (SDM) of health care financing, which is intended to serve as an aid in setting fee levels within the ambulatory health system of Burkina Faso. The typical situation that the model is designed to address involves a health facility that covers a fraction of its recurrent costs from self-generated revenues. The model allows the user to explore alternative financing options designed to reduce the facility's dependency on external financing while maintaining (or improving) the facility's utilization and quality of care. The SDM can also be used to trace the impact of a variety of other policies on the financial status of health facilities, e.g., increased delegation of tasks to ancillary personnel; use of improved treatment protocols; enhanced quality of care; and the effects of a currency devaluation.

The main body of the paper provides a brief overview of the model (Section 1); describes the base scenario, or "Reference Run" (Section 2); presents the results of a series of policy simulations (Section 3); and provides conclusions and suggested additional applications of the model (Section 4). Readers interested in a thorough discussion of the model should consult Bitran (1993). A description of the data sources used to parameterize the model for Burkina Faso, and of the assumptions made, is included as an appendix.

The paper presents an application of the supply-demand model to two distinct categories of health facilities: medical centers (CM) and health centers (CSPS). Parameters and initial values were selected to make the simulated (focus) facilities typical of facilities in their respective category. Policies were designed to reduce the degree to which each focus facility is dependent on external financing. The outcomes of each policy simulation were compared to those of the model's Reference Run (i.e., the outcomes obtained by using the model to simulate current policies and practices). The following conclusions can be drawn from these policy simulations:

- It is possible to reduce substantially the monthly deficits generated by ambulatory health facilities by recovering drug costs through a fee-for-service policy reform (i.e., simultaneously increasing fees charged for prescription drugs while reducing the percent of clients who do not pay). However, the use of such a fee-for-service policy leads to significant reductions in the utilization of curative care (which is relatively drug-intensive) and results in a situation in which the burden of financing health services falls disproportionately on those who become ill.
- It is possible to achieve the same measure of deficit reduction without significant reductions in health care utilization by combining similar cost recovery policies with social financing (e.g., universal health insurance). Social financing provides the additional benefit of spreading the cost of sustaining health services among the entire population.
- Alternatively, deficit reduction can also be achieved with a fee-for-service policy without significantly affecting levels of health care utilization, if fee changes are combined with measures to reduce the average prescription drug cost per episode of illness (e.g., greater reliance on generic drugs, use of improved treatment protocols). The main disadvantages to such a policy are that the financing burden would still fall mainly on those who

become ill, and most likely, any declines in utilization, however modest, would be concentrated among the poor.

- Impacts of the January 1994 devaluation of the CFA franc pose additional challenges to the financing of health care in Burkina Faso. Policies such as those simulated in the present paper will have to be undertaken in considerable measure merely to offset the strongly negative effects of the recent currency devaluation.

Ultimately, the model can help policymakers determine whether a uniform reform package can be successfully applied throughout the country, or whether the health reform will need to be carried out on a decentralized basis, with each facility or health zone making its own pricing and financing decisions. In doing so, however, the model should be only one of several inputs into an informed decision-making process. Although it provides quantitative and deceptively precise answers to complex questions, the quality of the information any model yields is only as good as the information supplied to it.

INTRODUCTION

The purpose of this paper is to describe a quantitative tool which can be used as an aid in setting fee levels within the ambulatory health system of Burkina Faso. The tool discussed is a previously developed supply-demand model of health care financing.[1] The paper describes an application of this model to the ambulatory health system of Burkina Faso. The main body of the paper provides a brief overview of the model (section 1); describes the base scenario, or reference run (section 2); presents the results of a series of policy simulations (section 3); and provides conclusions and suggested additional applications of the model (section 4). Those interested in a thorough discussion of the model should consult Bitran (1993). A description of the data sources used to parameterize the model for Burkina Faso, and of the assumptions made, is provided as an appendix to this paper.

[1] Ricardo Bitran, "A Supply-Demand Model of Health Care Financing with an Application to Zaire: A Training Tool." EDI Technical Materials, World Bank, 1993.

1.0 OVERVIEW OF THE SUPPLY-DEMAND MODEL

The Supply-Demand Model (SDM) is designed for use as a tool to examine alternative health financing policies in developing countries. The typical situation it is designed to address is that of a facility which covers a fraction of its recurrent costs from self-generated revenues. The model allows the user to explore alternative financing options designed to reduce the facility's dependency on external financing while maintaining (or improving) the facility's utilization and quality of care. Examples of such financing options include:

- increasing fees using either a fee-for-service or fee-per-episode pricing formula;
- extending health insurance under varying reimbursement mechanisms (e.g., capitation, with or without copayments; indemnity, with varying levels of copayments);
- cross-subsidizing preventive care by charging fees for curative care which exceed marginal cost;
- price discrimination, based on income or distance; and
- cost cutting, particularly in the areas of personnel and prescription drugs.

The SDM can also be used to trace the impact of a variety of other policies on the financial status of health facilities, such as: (1) increased delegation of tasks to ancillary personnel; (2) use of improved treatment protocols; (3) enhanced quality of care; and (4) the effects of a currency devaluation.

The SDM requires users to input data on a number of variables, including:

- area and size of the population served by the focus facility;[2]
- distribution of the population in terms of its proximity to the focus facility;
- demographic characteristics (population growth rate, crude birth rate, percent of the population aged 0-4);
- average household income;
- fee levels for services and drugs (including the percent not paying);
- insurance (i.e., coverage, premiums and copayments);
- location and fees of competitors;
- demand elasticities (price, income, distance);
- incidence of illness;
- personnel (average salaries, and personnel time required per unit of service, hours worked per day);

[2] The SDM is a micro model which simulates health sector activity at the level of an individual facility, referred to as the "focus facility." In the present application, focus facilities are limited to the principal ambulatory facilities, medical centers (*Centres medicaux*, or CM) and health centers (*Centres de santé et promotion sociale, or CSPS*).

- unit costs of prescription drugs, laboratory exams and other pharmaceutical inputs;
- initial cost and useful life of fixed capital (e.g., buildings, vehicles, medical equipment, furniture); and
- monthly fuel consumption and fuel price.

The model takes these inputs and calculates the following set of outputs of interest to policymakers and health managers:

- levels of various services produced by the facility (e.g., initial and repeat curative visits, deliveries, pre-natal and pre-school consultations, laboratory exams);
- revenue collected by the facility for each type of service provided, by source of financing (i.e., direct fees, insurance premiums and copayments);
- the facility's market share and utilization rate (i.e., percent of the population's health needs met by the facility), by type of service; and
- facility costs, including salaries, drug and other costs, supervision costs and depreciation.

Summary output measures produced by the model include profit (or loss), operating profit, and various measures of cost recovery (e.g., percent of total costs recovered, percent of recurrent costs recovered, percent of drug costs recovered).

The analytical heart of the model is its demand system, which determines the quantity of services demanded by the population as a function of: (1) illness incidence; (2) population size and distribution; (3) household income; (4) out-of-pocket price; and (5) prices and locations of competitors.[3] Separate demand functions are specified for each of the following service categories: (1) curative care; (2) deliveries; (3) pre-natal care; and (4) pre-school care.[4] At a given fee level, the per capita demand is greater for the insured than for the uninsured population, since the latter pay the full fee whereas the former pay a lower out-of-pocket fee (i.e., the copayment).[5]

Once the quantity of services demanded has been determined, the model calculates facility costs as the sum of fixed costs. Fixed costs include depreciation and salaries; variable costs include the cost of prescription drugs, other pharmaceutical inputs, and laboratory exams.[6]

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[3] Unfortunately, the model does not incorporate any measures of the quality of care, or relate these to demand.

[4] A fifth service category, chronic care, was not implemented in the current application, due to absence of data. In the present application, chronic care is included in the curative care category.

[5] Actually, the model determines demand separately for three categories of consumers (insured population, uninsured paying population, uninsured non-paying population) for each of five population rings (defined on the basis of distance from their place of residence to the health center). The model also allows the average level of household income to differ between the insured and uninsured populations, since the former typically have higher income than the latter.

[6] Variable costs include those costs which vary directly with the quantity of services provided by a facility. In the case of Burkina Faso, variable costs of ambulatory care are dominated by a single item, i.e., the cost of prescription drugs.

Monthly depreciation costs are computed on the basis of straight line depreciation, utilizing input data on the initial cost of investments (i.e., buildings, vehicles, medical equipment, furnishings) and their useful life.

Labor costs are fixed until the demand for labor exceeds current capacity for a particular category of labor (e.g., doctor, nurse), at which point the number of providers in that category is increased by one. For example, in the case of deliveries, the model first calculates the number of deliveries occurring at the facility; second, using information on the number of minutes of birth attendant time required per delivery (input data), it calculates the total amount of birth attendant time required to attend the number of births occurring at the facility; third, based on the number of hours worked per day by birth attendants (input data), the model calculates the number of birth attendants needed (rounded up to the next integer, e.g., 4.4 birth attendants needed = 5 posted); and lastly, it multiplies the number of birth attendants by the average salary of birth attendants (input data).

Variable costs include the cost of prescription drugs, laboratory exams, and other pharmaceutical inputs. For each category of service (e.g., curative care) these are computed as the sum of the number of units of each input (e.g., prescriptions) required per unit of service multiplied by its unit cost.

The SDM is contained in four linked Lotus 1-2-3 (version 2.1 or higher) spreadsheets, which can be run on any IBM-compatible microcomputer with at least 640 kilobytes of memory. A few minor changes were made to the model for the present application. In the original model, as distributed by the World Bank, the user enters only a single parameter to represent the percent of the population not paying for health services. The data for Burkina Faso indicated that the percent of clients not paying varied significantly by type of service. For example, the percent not paying for curative care at a medical center (CM) was much higher (73 percent) than that for deliveries (20 percent). The model was accordingly modified to allow this percentage to vary across service categories. Two additional minor changes were made: (1) an "other salaries" category was added to the model to allow for the salaries of non-medical personnel at CM facilities (e.g., secretary, driver, guard, laborers); and (2) the "office supply" expense category was augmented to become an "all other expenses" category, including such items as maintenance.

The present application of the model includes separate spreadsheet models for the two principal ambulatory health facilities in Burkina Faso: (1) medical centers (CM); and (2) health centers (CSPS). CM facilities, which include at least one doctor on their staff, serve as the first-level referral facilities for CSPS facilities, which are staffed exclusively with nurses and other paramedics. Although the SDM also includes a spreadsheet model for inpatient facilities, this submodel is not used in the present application.

2.0 REFERENCE RUN

This section of the paper discusses the model's Reference Run, which is a description of how the typical CM and CSPS facility operates currently. The assumptions used to produce the model's Reference Run are listed in *Exhibit 2-1* (demand-related assumptions) and *Exhibit 2-2* (supply-related assumptions).[7] The purpose of the Reference Run is to provide a point of comparison for subsequent policy simulations. The assumptions listed in *Exhibits 2-1 and 2-2* are based on typical values observed in surveys of households and facilities in three provinces of Burkina Faso (i.e., Bazega, Gourma, and Seno) and reflect current conditions in a composite of urban and rural settings.[8] For example, the fee levels in *Exhibit 2-1* refer to the fees actually paid by the population residing in these provinces at CM and CSPS facilities, as reported in the household survey. Similarly, the population distribution values refer to those typical of both provinces (i.e., a composite of urban and rural settings), as reported in the household survey. The assumption of zero insurance coverage is also typical of current conditions. We also note that the model's Reference Run assumes the pre-devaluation exchange rate. The effects of the devaluation are estimated in one of the policy simulations. A complete description of the data sources is contained in the appendix.

The output of the model, corresponding to the assumptions contained in *Exhibit 2-1 and 2-2* is provided in *Exhibit 2-3*. The situation depicted in *Exhibit 2-3* is fairly typical of ambulatory facilities in Burkina Faso and in many other developing countries. Levels of utilization are relatively low, particularly for preventive services; and facilities recover only a small proportion of their total costs (i.e., they are heavily dependent on external financing). For example, in the case of the medical center (CM), pre-natal care coverage of pregnant women and pre-school care coverage of children under 5 years of age is only about 2 percent of the needs of the corresponding populations. At the same time, the facility recovers only 9 percent of its total costs and only 17 percent of its prescription drug costs. As indicated above, these Reference Run values serve as a point of comparison for the subsequent policy simulations.

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[7] We note that the values listed in *Exhibits 2-1 and 2-2* are not the only assumptions employed in the model but are rather those which are most amenable to change, either exogenously (e.g., the exchange rate, household income, fees of competitors) or as the result of deliberate policy changes (e.g., the facility's own fees, average cost of prescriptions, amount of personnel time per unit of service). Other assumptions (not listed in *Exhibits 3-1 and 3-2*) include parameters less likely to change (e.g., demand equation parameters) as well as the model's overall structure. A complete discussion of the values assigned to the model's parameters is contained in the appendix; the model's structure is discussed in Bitran (1993).

[8] The household survey ("Enquête sur la volonté et la capacité des ménages à payer pour leur santé") was conducted in 1994 jointly by the HFS Project, the Ministry of Health, Social Action and the Family (Directorate of Research and Planning), and the Ministry of Finance and Plan (National Institute of Statistics and Demography). A limited facilities survey of three medical centers (CM) and eight health centers (CSPS) was also carried out in 1994 by the same organizations.

EXHIBIT 2-1 DEMAND-RELATED ASSUMPTIONS OF THE MODEL'S REFERENCE RUN		
	CM	CSPS
Service Fees (FCFA):		
Curative care, Initial visit	592	275
Curative care, Repeat visit	0	0
Delivery	563	760
Pre-natal care, Registration	135	142
Pre-natal care, Consultation	113	140
Pre-school care, Registration	68	71
Pre-school care, Consultation	56	70
Prescription Fees (FCFA):		
Curative care (per episode)	530	379
Delivery	0	0
Pre-natal care	0	0
Pre-school care	0	0
Percent of Clients Not Paying:		
Curative care	73	64
Delivery	20	5
Pre-natal care	58	61
Pre-school care	58	61
Population Served	135,000	15,000
Radius of Service Area (Km)	36	12
Population Distribution (percent):		
0-1 Km	21	26
1-2 Km	19	14
2-3 Km	16	17
3-5 Km	11	15
> 5 Km	33	28
Exchange Rate (FCFA/$)	275	275
Household Income (FCFA/month)	14,220	14,220
Health Insurance:		
Percent of the population insured	0	0
Insurance premium (FCFA/year)	0	0
Copayment (percent of fee)	0	0
Competitors' Fees-Curative Care:		
Other public facilities	1,000	3,000
Traditional healers	1,149	1,149
Home treatment	824	824
Competitors' Fees-Delivery		
Hospital/maternity	1,000	1,000
CSPS (for CM)/CM (for CSPS)	762	563
Competitors' Fees-Prenatal Care:		
Other public facility	350	175
Competitors' Fees-Preschool Care:		
Other public facilities	175	100
Source: See appendix for discussion of data sources.		

EXHIBIT 2-2
SUPPLY-RELATED ASSUMPTIONS OF THE MODEL'S REFERENCE RUN

	CM	CSPS
Unit Cost of Drugs, Laboratory Exams, and Other Pharmaceutical Input (FCFA):[1]		
Curative care (per episode)	2,065	1,150
Delivery	50	50
Pre-natal Registration	40	40
Pre-school Registration	50	50
Supervisory Costs (percent of revenue)	0	0
Average Monthly Salaries of Personnel (FCFA):		
Doctor	107,488	–
Nurse	57,564	57,446
Birth attendant	57,298	41,752
Laboratory technician	41,752	–
Hours Worked per Day:		
Doctor	8	–
Nurse	8	8
Birth Attendant	8	8
Laboratory Technician	8	–
Labor Inputs (minutes/service)-Doctor:		
Curative care, Initial visit	10	–
Curative care, Repeat visit	5	–
Delivery	0	–
Pre-natal consultation	0	–
Pre-school consultation	0	–
Labor Inputs (minutes/service)-Nurse:		
Curative care, Initial visit	45	100
Curative care, Repeat visit	20	50
Delivery	0	0
Pre-natal consultation	0	0
Pre-school consultation	30	60
Laboratory exam	0	120
Labor Inputs (minutes/service)-Birth Attendant:		
Delivery	300	300
Pre-natal consultation	30	30

episode of curative care which it treats, even among paying patients. This discrepancy between the price and marginal cost of curative care alone accounts for a large share of the deficit generated by the CM facility. Another important factor accounting for the simulated CM facility's deficit is the fact that only about 27 percent of its curative care clients pay any fee at all. Among non-paying clients, the CM facility loses FCFA 1,762 for each additional curative care episode it treats.

EXHIBIT 2-3
MONTHLY OUTPUT FROM THE MODEL'S REFERENCE RUN

	CM	CSPS
Services (monthly):		
Curative episodes	614	86
Curative consultations	1,557	209
Deliveries	39	9
Pre-natal registrations	12	7
Pre-natal consultations	118	66
Pre-school registrations	8	7
Pre-school consultations	138	130
Laboratory exams	219	32
Prescriptions	497	64
Market Shares (percent):		
Curative care	3	4
Deliveries	9	16
Pre-natal care	5	37
Pre-school care	3	43
Utilization Rates (percent):[1]		
Curative care	2	3
Deliveries	7	15
Pre-natal care	2	11
Pre-school care	2	13
Revenue-Services (000 FCFA/month):		
Curative care	98	9
Deliveries	17	6
Pre-natal care	7	4
Pre-school care	3	4
Revenue-Prescriptions (000 FCFA/month)		
Curative care	88	12
Deliveries	0	0
Pre-natal care	0	0
Pre-school care	0	0
Source of Revenue (percent):		
Direct fees	100	100
Insurance premiums	0	0
Insurance copayments	0	0
Number of Medical Personnel:		

(continued next page)

EXHIBIT 2-3
MONTHLY OUTPUT FROM THE MODEL'S REFERENCE RUN

	CM	CSPS
Doctors	1	0
Nurses	5	3
Birth attendants	2	1
Lab technicians	1	0
Expenses (000 FCFA/month):		
Personnel	716	214
Drugs	1,271	100
Fuel/Other expenses	282	107
Supervision	0	0
Depreciation	477	104
Profit/Loss (000 FCFA/month):		
Total revenue	213	34
Total cost	2,746	525
Profit (loss)	(2,532)	(490)
Cost Recovery (revenue as a percent of):		
Total cost	8	6
Recurrent cost[2]	9	8
Drugs	17	34

[1] Utilization rates refer to the percentage of individuals in the facility's catchment area population with a given health need who seek care at the facility. For example, the 3 percent utilization rate for pre-natal care from a CM indicates that 3 percent of pregnant women seek pre-natal care from the CM.
[2] Recurrent cost = total cost—depreciation.

3.0 POLICY SIMULATIONS

This section of the paper describes a set of policy simulations which illustrate how the model can be used to evaluate alternative policies designed to decrease health facility dependence on external sources of financing.[9] These policies include:

- ***Fee-for-service policy*** designed to recover the full cost of drugs used by the facility by: (1) increasing the fees charged for prescriptions; (2) reducing the percent of clients who do not pay; and (3) adjusting fees charged for services to encourage the use of preventive care.
- ***Social Insurance Policy*** designed to recover the full cost of drugs used by the facility by: (1) incorporating all of the changes associated with the "fee-for-service policy;" and (2) introducing insurance coverage to the entire population served by each facility.
- ***Drug Cost Control Policy*** designed to reduce the cost to facilities of the prescription drugs they provide to clients by: (1) incorporating all of the changes associated with the fee-for-service policy; and (2) making greater use of generic drugs and of treatment protocols which eliminate unnecessary prescriptions.
- ***Impact of Currency Devaluation*** designed to show the impact on each facility's financial status of the recent devaluation of the FCFA under the assumption that facilities continue current approaches to financing.

The above simulations provide only a sample of the kinds of policy simulations which the model can be used to analyze.

3.1 FEE-FOR-SERVICE POLICY

The fee-for-service policy assumes that: (1) the percent of clients not paying is reduced to 10 percent; (2) fees for services are adjusted to encourage greater utilization of preventive care; and (3) fees charged for prescription drugs are increased so that they not only cover full costs but also cover the costs of the 10 percent who do not pay. The specific changes in assumptions from those of the Reference Run (*Exhibits 2-1 & 2-2* above) to simulate the fee-for-service policy are listed in *Exhibit 3-1*:

The results of the fee-for-service policy simulation are provided in *Exhibit 3-2* (the numbers in parentheses refer to percent changes from the Reference Run). The results can be discussed most easily in terms of the following broad groupings of variables: (1) service utilization; (2) revenue; (3) costs; and (4) deficit and cost recovery. In the area of service utilization, with the fee-for-service policy, both the CM and CSPS focus facilities provide significantly reduced levels of curative care (34 and 21 percent respectively) and significantly increased levels of preventive care (ranging between 8-33 percent and 15-29

[9] Although the focus is on reducing the size of the deficit, the purpose in doing so may be to raise the quality of care, without actually reducing the size of the public subsidy.

percent respectively).[10] These changes are a direct consequence of the simulated increases in the total price paid for curative care (which includes a substantial increase in prescription fees) and the elimination of all fees for preventive care (except for the introduction of a modest charge for pharmaceutical products consumed). The number of deliveries provided does not change at all for the CM facility, whereas the number of deliveries increases by 11 percent for the CSPS facility. Changes in market shares and utilization rates reflect the above changes.

Changes in revenue from services exhibit a pattern quite different from that of the service utilization changes. First, whereas the number of curative visits declines for both the CM and CSPS facilities, revenue from curative care increases by 12 and 33 percent respectively. These increases in revenue occur despite both reduced levels of curative care and reductions in fees charged and are due to the assumed decreases in the proportion of clients who do not pay (from 73 to 10 percent for the CM and from 64 to 10 percent for the CSPS). Despite increased delivery of preventive care, both the CM and CSPS facilities earn zero revenue from these activities as a consequence of the zero fees which are charged under this policy simulation. The amount of revenue from deliveries does not change for the focus CM, whereas it declines by 50 percent for the CSPS (reflecting the fact that the fee charged for deliveries decreases by 61 percent for the focus CSPS while the number of deliveries increases by only 11 percent).

Revenue from curative care prescriptions increases dramatically for both the CM and CSPS facility (by 852 and 550 percent respectively), despite the fact that the number of prescriptions declines significantly (by 34 and 22 percent respectively). The increases in prescription fee revenue reflect not only fee changes but also the substantial decreases in the percent not paying which are assumed to occur as part of the fee-for-service policy reform. Prescription fee revenue from preventive care also increases slightly, as a consequence of the imposition of modest charges for the other pharmaceutical inputs used in providing these services; but the changes are barely perceptible.

Both personnel and drug costs decline significantly for both the CM and CSPS facilities (personnel: -16 and -27 percent respectively;[11] drugs: -34 and -20 percent respectively). Decreased personnel needs (from 5 nurses to 3, in the case of the CM; from 3 nurses to 2, in the case of the CSPS) reflect reduced levels of curative care provided. Similarly, the reductions in drug costs parallel the reductions in curative care episodes treated and, consequently, in numbers of prescriptions.

The fee-for-service policy produces significant overall increases in both CM and CSPS facility revenue (+354 and +179 percent respectively) and significant overall decreases in total cost (-20 and -15 percent respectively), the overall effect of which is to reduce substantially the monthly deficit incurred by both the CM and CSPS focus facilities (-51 and -28 percent respectively). This reduced financial dependency is reflected in various cost recovery indicators: (1) revenue as a percent of total costs (CM: up from 8 to 44 percent; CSPS: up from 6 to 21 percent); (2) revenue as a percent of recurrent costs (CM: up from 9 to 56 percent; CSPS: up from 8 to 28 percent); and (3) revenue as a percent of drug costs (CM: up from 17 percent to 115 percent; CSPS: up from 34 percent to 119 percent).

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[10] The predicted changes in levels of services consumed are a direct consequence of the price elasticities of demand which are assumed to apply to each type of service (see Annex, Table A.9).

[11] Whether the simulated personnel cost declines are actually realized depends on the degree of flexibility in staffing which can be achieved over the long run.

EXHIBIT 3-1 ASSUMPTIONS OF FEE-FOR-SERVICE POLICY SIMULATION				
	CM		CSPS	
	Reference Run	Fee-for-Service	Reference Run	Fee-for-Service
Service Fees (FCFA):				
Curative care, Initial visit	592	300	275	200
Curative care, Repeat visit	0	0	0	0
Delivery	563	500	760	300
Pre-natal care, Registration	135	0	142	0
Pre-natal care, Consultation	113	0	140	0
Pre-school care, Registration	68	0	71	0
Pre-school care, Consultation	56	0	70	0
Prescription Fees (FCFA):				
Curative care (per episode)	530	2,294	379	1,278
Delivery	0	56	0	56
Pre-natal care (per registration)	0	44	0	44
Pre-school care (per registration)	0	56	0	56
Percent of Clients Not Paying:				
Curative care	73	10	64	10
Delivery	20	10	5	10
Pre-natal care	58	10	61	10
Pre-school care	58	10	61	10

EXHIBIT 3-2 RESULTS OF FEE-FOR-SERVICE POLICY SIMULATION				
	CM		CSPS	
Services (monthly):				
Curative episodes	406	(-34)[1]	68	(-21)
Curative consultations	1,029	(-34)	166	(-21)
Deliveries	39	(0)	10	(+11)
Pre-natal registrations	16	(+33)	9	(+29)
Pre-natal consultations	156	(+32)	86	(+30)
Pre-school registrations	9	(+12)	9	(+29)
Pre-school consultations	149	(+ 8)	149	(+15)
Laboratory exams	148	(-32)	27	(-16)
Prescriptions	329	(-34)	50	(-22)
Market Shares (percent):				
Curative care	2	(-33)	3	(-25)
Deliveries	9	(0)	18	(+12)
Pre-natal care	6	(+20)	46	(+24)
Pre-school care	3	(0)	48	(+12)
Utilization Rates (percent):				
Curative care	2	(0)	2	(-33)

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EXHIBIT 3-2
RESULTS OF FEE-FOR-SERVICE POLICY SIMULATION

	CM		CSPS	
Deliveries	7	(0)	17	(+13)
Pre-natal care	3	(+50)	15	(+36)
Pre-school care	2	(0)	15	(+15)
Revenue-Services (000 FCFA/month):				
Curative care	110	(+12)	12	(+33)
Deliveries	17	(0)	3	(-50)
Pre-natal care	0	(-100)	0	(-100)
Pre-school care	0	(-100)	0	(-100)
Revenue-Prescriptions (000 FCFA/month)				
Curative care	838	(+852)	78	(+550)
Deliveries	2	(nd)	0	(0)
Pre-natal care	1	(nd)	0	(0)
Pre-school care	0	(0)	0	(0)
Source of Revenue (percent):				
Direct fees	100	(0)	100	(0)
Insurance premiums	0	(0)	0	(0)
Insurance copayments	0	(0)	0	(0)
Number of Medical Personnel:				
Doctors	1	(0)	0	(0)
Nurses	3	(-40)	2	(-33)
Birth attendants	2	(0)	1	(0)
Lab technicians	1	(0)	0	(0)
Expenses (000 FCFA/month):				
Personnel	601	(-16)	157	(-27)
Drugs	841	(-34)	80	(-20)
Fuel/Other expenses	282	(0)	107	(0)
Supervision	0	(0)	0	(0)
Depreciation	477	(0)	104	(0)
Profit/Loss (000 FCFA/month):				
Total revenue	968	(+354)	95	(+179)
Total cost	2,200	(-20)	448	(-15)
Profit (loss)	(1,233)	(-51)[2]	(352)	(-28)
Cost Recovery (revenue as a percent of):				
Total cost	44	(+450)	21	(+250)
Recurrent cost	56	(+522)	28	(+250)
Drugs	115	(+576)	119	(+250)

nd = not defined (i.e., the Reference Run value is zero)

[1] Numbers in parentheses are percentage changes from the Reference Run (*Exhibit 2-3*).
[2] A negative percentage change implies a decrease in the facility's deficit.

It is important to note that the results in *Exhibit 3-2* assume that no policy changes are undertaken by the facility's principal competitors. One consequence of this assumption is that the facility carrying out such a fee-for-service reform loses a significant share of its curative care clients to its competitors, including other public sector facilities, while gaining significant numbers of preventive care clients (see changes to market shares in *Exhibit 3-2*). Such an outcome might occur, for example, if public facilities became completely autonomous, pursuing their own independent pricing and cost recovery strategies. Under circumstances in which this is not the case, however—for example, if all public facilities were to undertake similar reforms—the outcomes would be different.[12]

3.2 SOCIAL INSURANCE POLICY

One problem with the simulated outcomes of the fee-for-service policy is that there is decreased utilization of health facility. Moreover, it is reasonable to expect that much of this decreased utilization is concentrated in the poor. Another problem is that costs are borne unevenly by the population, with those who become ill carrying a greater share of health costs than the rest of the population. Since the poor also become ill more often than others, this approach to financing health services tends to be inequitable. An alternative approach is to have all members of the population pay a per capita health insurance premium (e.g., FCFA 300 per year) entitling them to use all levels of the public health system (i.e., CSPS, CM, CHR) for a copayment of 25 percent of the standard fee. The relatively low copayment would not discourage utilization to the same extent as the standard fee, and the use of a premium (a capitation fee) would ensure that the burden of financing the system (apart from government subsidies) would not fall exclusively on those who experienced illness in a given year.[13] The social insurance policy simulation assumes that such a system is in place, along with all of the reforms introduced in connection with the fee-for-service policy (see *Exhibit 3-1*). The social insurance policy assumes that FCFA 100 of the premium revenue collected is provided to the nearest CSPS facility, FCFA 100 is provided to the CM which supervises that CSPS, and FCFA 100 is provided to the nearest regional hospital (CHR). The assumptions of the social insurance policy, in addition to those of the fee-for-service policy (*Exhibit 3-1*), are listed in *Exhibit 3-3*.

The results of the social insurance policy simulation are provided in *Exhibit 3-4* (the numbers in parentheses again refer to percent changes from the values of the Reference Run, i.e., *Exhibit 2-3*). The main differences between the social insurance policy and the fee-for-service policy are with respect to: (1) service utilization; (2) level and source of revenue; and (3) level and composition of costs. In the case

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[12] In an unreported simulation in which public sector competitors were assumed to impose similar fee changes (on a percentage basis), the impact on service utilization of the fee-for-service policy was greatly attenuated. In the case of the CM (CSPS) facility, for example, levels of curative care decreased by only 28 (9) percent, compared to 34 (21) percent in *Exhibit 3-2*. As a consequence, revenue increased more than was the case in *Exhibit 3-2* (CM: up 392 percent, as compared to 354 percent in *Exhibit 3-2*; CSPS: up 215 percent, as compared to 179 percent). Although cost decreases (particularly for drugs) were less than in *Exhibit 3-2*, the overall deficit was slightly lower in this unreported simulation (CM: FCFA 1,223 as compared to FCFA 1,233; CSPS: FCFA 351 as compared to 352).

[13] One disadvantage of a capitation payment, however, is that it tends to favor the population which lives closest to health facilities. This problem can be addressed either by: (1) charging a lower capitation fee to those residing in underserved areas; or by (2) allowing membership to be voluntary for those living in underserved areas.

of service utilization, curative services are sharply higher with insurance as compared to the fee-for-service policy (CM: the number of curative consultations is 1597, compared to only 1029; CSPS: 213 curative consultations, compared to 166) and are even higher than in the Reference Run (CM (CSPS): Curative episodes treated are 14 (8) percent higher). The level of preventive care is also higher with insurance (e.g., the number of pre-natal consultations for the CM (CSPS) is 173 (94), compared to 156 (86) with the fee-for-service policy). Similarly, the monthly number of deliveries is higher for the CM as compared to both the fee-for-service policy and the Reference Run (43, versus 39), but it is unchanged for the CSPS (10 for both the insurance and fee-for-service policies, as compared to 9 in the Reference Run).

Total monthly revenue is sharply higher with insurance, as compared to the fee-for-service policy (CM: FCFA 1,586,000, compared to 968,000; CSPS: FCFA 161,000, compared to 95,000); but all of this revenue comes from insurance premiums (CM (CSPS): 71 (78) percent) and copayments (CM (CSPS): 29 (22) percent) rather than from direct services. However, costs are also sharply higher in the social insurance policy simulation as compared to the fee-for-service simulation (CM (CSPS): FCFA 2,926,000 (534,000) with insurance, compared to FCFA 2,200,000 (448,000) with the fee-for-service policy), due to higher personnel and prescription drug costs. Drug costs are even higher (CM (CSPS): +14 (+9) percent) with insurance than in the Reference Run.

EXHIBIT 3-3
ADDITIONAL ASSUMPTIONS OF THE SOCIAL INSURANCE POLICY[1]

	CM		CSPS	
	Reference Run	Insurance Policy	Reference Run	Insurance Policy
Health Insurance:				
Percent of the population insured	0	100	0	100
Insurance premium (FCFA/yr)[2]	0	100	0	100
Copayment (percent of fee)	0	25	0	25

[1] Assumptions of fee-for-service policy (*Exhibit 3-1*) are also assumed to apply.
[2] Total premium of FCFA 300 assumed to be shared equally between CSPS, CM and CHR.

EXHIBIT 3-4
RESULTS OF THE SOCIAL INSURANCE POLICY SIMULATION

	CM	CSPS
Services (monthly):		
Curative episodes	701 (+14)	93 (+8)
Curative consultations	1,597 (+3)	213 (+2)
Deliveries	43 (+10)	10 (+11)
Pre-natal registrations	18 (+50)	10 (+43)
Pre-natal consultations	173 (+47)	94 (+42)
Pre-school registrations	11 (+37)	12 (+71)
Pre-school consultations	191 (+38)	207 (+59)
Laboratory exams	252 (+15)	36 (+12)
Prescriptions	568 (+14)	69 (+8)
Market Shares (percent):		
Curative care	4 (+33)	4 (0)
Deliveries	10 (+11)	19 (+19)

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EXHIBIT 3-4 RESULTS OF THE SOCIAL INSURANCE POLICY SIMULATION		
	CM	CSPS
Pre-natal care	7 (+40)	50 (+35)
Pre-school care	4 (+33)	63 (+47)
Utilization Rates (percent):		
Curative care	3 (+50)	3 (0)
Deliveries	8 (+14)	18 (+20)
Pre-natal care	3 (+50)	16 (+45)
Pre-school care	2 (0)	21 (+62)
Revenue-Services (000 FCFA/month):		
Curative care	53 (-46)	5 (-44)
Deliveries	5 (-71)	1 (-83)
Pre-natal care	0 (-100)	0 (-100)
Pre-school care	0 (-100)	0 (-100)
Revenue-Prescriptions (000 FCFA/month)		
Curative care	402 (+357)	30 (+150)
Deliveries	1 (nd)	0 (0)
Pre-natal care	0 (0)	0 (0)
Pre-school care	0 (0)	0 (0)
Source of Revenue (percent):		
Direct fees	0 (-100)	0 (-100)
Insurance premiums	71 (nd)	78 (nd)
Insurance copayments	29 (nd)	22 (nd)
Number of Medical Personnel:		
Doctors	1 (0)	0 (0)
Nurses	5 (0)	3 (0)
Birth attendants	2 (0)	1 (0)
Lab technicians	1 (0)	0 (0)
Expenses (000 FCFA/month):		
Personnel	716 (0)	214 (0)
Drugs	1,451 (+14)	109 (+9)
Fuel/Other expenses	282 (0)	107 (0)
Supervision	0 (0)	0 (0)
Depreciation	477 (0)	104 (0)
Profit/Loss (000 FCFA/month):		
Total revenue	1,586 (+645)	161 (+373)
Total cost	2,926 (+7)	534 (+2)
Profit (loss)	(1,340) (-47)	(373) (-24)
Cost Recovery (revenue as a percent of):		
Total cost	54 (+575)	30 (+400)
Recurrent cost	65 (+622)	37 (+362)
Drugs	109 (+541)	148 (+335)

The fact that the increase in facility revenue is considerably greater than the increase in facility costs, relative to the Reference Run, results in a significant decline in facility deficits (CM (CSPS): -47 (-24) percent, relative to the Reference Run). However, this decline in facility deficits is smaller than that which occurs with the fee-for-service policy (CM (CSPS): -51 (-28) percent). The percent of total and recurrent costs recovered is higher, however, with insurance than with the fee-for-service policy (CM (CSPS): 54 (30) and 65 (37) percent respectively with insurance, compared to 44 (21) and 56 (28) percent with fee-for-service).

Again, however, it is important to note that the results presented in *Exhibit 3-4* assume that no policy changes are undertaken by the facility's principal competitors. If, for example, it is assumed that a similar policy reform were put into practice by other public facilities (i.e., equivalent fee increases together with 25 percent copayments), the results would be different from those presented in *Exhibit 3-4*. According to the results of an unreported simulation, the increases in service utilization are less under these conditions, with the number of deliveries and pre-natal care actually decreasing for the CM, and unchanging or increasing only moderately, for the CSPS. Although revenue declines somewhat, as compared to the results in *Exhibit 3-4*, reductions in costs (particularly prescription drugs) more than compensate for the declining revenue, so that the level of facility losses actually declines modestly for both the CM and CSPS facilities.[14]

3.3 DRUG COST CONTROL POLICY

In the Reference Run (*Exhibit 2-3*) prescription drugs account for 46 (19) percent of total facility costs for the CM (CSPS) facility. The fee-for-service policy (*Exhibit 3-2*) recovers these costs by charging fees sufficient to cover not only prescription drug costs but also the drug costs of those not paying for services (assumed to be 10 percent of the population). Unfortunately, the fee-for-service policy results in reduced levels of utilization, particularly of the relatively drug-intensive curative health care. The drug cost control policy simulation considers the effects of two mutually reinforcing policies designed to reduce prescription drug costs per episode of illness: (1) the substitution of generic drugs for specialty drugs; and (2) training of health workers in the use of improved treatment protocols, which serve to reduce the number of unnecessary and/or inappropriate prescriptions. In addition to the assumptions of the fee-for-service policy simulation (*Exhibit 3-2*), the drug cost control policy simulation assumes that prescription drug costs per episode of illness are reduced by 50 percent and that prescription drug fees are set at a level sufficiently high to ensure full recovery of these reduced drug costs, including those incurred by non-paying clients. The assumptions of the drug cost control policy simulation, in addition to those of the fee-for-service policy simulation (*Exhibit 3-1*), are provided in *Exhibit 3-5*.

The results of the drug cost control policy simulation are presented in *Exhibit 3-6*. The principal difference of this simulation from the earlier fee-for-service policy simulation is that the utilization of curative care services does not decline as sharply with drug cost control (CM (CSPS): curative episodes treated decline by only 9 (6) percent with drug cost control compared to 34 (21) percent in its absence). The reason is that, with drug cost control, fees charged for prescriptions do not have to rise as much to recover drug costs as they do in the absence of drug cost control (CM: FCFA 1170, compared to FCFA 2294; CSPS: FCFA 661 versus FCFA 1278), and the lower total price per episode for curative care results in a much smaller reduction in demand.

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[14] The reason for this change, which at first may appear surprising, is that the facility recovers only 25 percent of its marginal costs (the copayment) for each unit of service it delivers, so that any decline in utilization rates with a fixed premium improves the facility's financial performance.

EXHIBIT 3-5 ADDITIONAL ASSUMPTIONS OF THE DRUG COST CONTROL POLICY[1]				
	CM		CSPS	
	Reference Run	Drug Cost Control	Reference Run	Drug Cost Control
Prescription Fees (FCFA):				
Curative care (per episode)	530	1170	379	661
Unit Cost of Drugs, Laboratory Exams, and Other Pharmaceuticals (FCFA):[2]				
Curative care	2,065	1,052	1,150	661

[1] The other assumptions of the fee-for-service policy (*Exhibit 3-1*) are also assumed to apply.

[2] This unit cost is derived by multiplying the number of prescriptions and laboratory exams per unit of service by their unit cost, adding the unit cost of other pharmaceutical inputs.

Revenue from curative care services also increases more in the drug cost control policy simulation than in the fee-for-service policy simulation (CM (CSPS): +53 (+67) percent, compared to +12 (+33) percent), reflecting the effects of the assumed sharp reduction in the percent of clients not paying in both simulations, together with the fact that the decreases in utilization of curative services are less marked with drug cost control. Total revenue increases dramatically in the drug cost control policy simulation (CM (CSPS): +567 (+300) percent) but by considerably less than in the fee-for-service policy simulation (CM (CSPS): +852 (+550) percent), reflecting both the increase in prescription drug fees and the reduction in the percent of clients not paying, as well as the fact that the increase in prescription fees is less with drug cost control, as compared to the fee-for-service policy simulation. However, in the case of the CM, the decline in total costs is sufficiently larger with drug cost control (-27 percent, as compared to -20 percent in the fee-for-service policy simulation) that the resulting percentage decline in the facility's monthly deficit is the same (-51 percent) in both simulations. In the CSPS facility, however, costs do not decline as much in the drug cost control policy simulation as in the fee-for-service policy simulation (due to the absence of any decline in personnel costs in the former), with the result that the overall decline in the facility's monthly deficit (-17 percent) is less than in the fee-for-service policy simulation (-28 percent).

EXHIBIT 3-6 RESULTS OF DRUG COST CONTROL POLICY		
	CM	CSPS
Services (monthly):		
Curative episodes	557 (-9)	81 (-6)
Curative consultations	1,413 (-9)	197 (-6)
Deliveries	39 (0)	10 (+11)
Pre-natal registrations	16 (+33)	9 (+29)
Pre-natal consultations	156 (+32)	86 (+30)
Pre-school registrations	9 (+12)	9 (+29)
Pre-school consultations	149 (+8)	149 (+15)
Laboratory exams	201 (-8)	31 (-3)
Prescriptions	451 (-9)	60 (-6)

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EXHIBIT 3-6 RESULTS OF DRUG COST CONTROL POLICY		
	CM	CSPS
Market Shares (percent):		
Curative care	3 (0)	3 (-25)
Deliveries	9 (0)	18 (+12)
Pre-natal care	6 (+20)	46 (+24)
Pre-school care	3 (0)	48 (+12)
Utilization Rates (percent):		
Curative care	2 (0)	3 (0)
Deliveries	7 (0)	17 (+13)
Pre-natal care	3 (+50)	15 (+36)
Pre-school care	2 (0)	15 (+15)
Revenue-Services (000 FCFA/month):		
Curative care	150 (+53)	15 (+67)
Deliveries	17 (0)	3 (-50)
Pre-natal care	0 (-100)	0 (-100)
Pre-school care	0 (-100)	0 (-100)
Revenue-Prescriptions (000 FCFA/month)		
Curative care	587 (+567)	48 (+300)
Deliveries	2 (nd)	0 (0)
Pre-natal care	1 (nd)	0 (0)
Pre-school care	0 (0)	0 (0)
Source of Revenue (percent):		
Direct fees	100 (0)	100 (0)
Insurance premiums	0 (0)	0 (0)
Insurance copayments	0 (0)	0 (0)
Number of Medical Personnel:		
Doctors	1 (0)	0 (0)
Nurses	4 (-20)	3 (0)
Birth attendants	2 (0)	1 (0)
Lab technicians	1 (0)	0 (0)
Expenses (000 FCFA/month):		
Personnel	658 (-8)	214 (0)
Drugs	589 (-54)	50 (-50)
Fuel/Other expenses	282 (0)	107 (0)
Supervision	0 (0)	0 (0)
Depreciation	477 (0)	104 (0)
Profit/Loss (000 FCFA/month):		
Total revenue	757 (+255)	67 (+97)
Total cost	2,006 (-27)	475 (-10)
Profit (loss)	(1,249) (-51)	(408) (-17)
Cost Recovery (revenue as a percent of):		
Total cost	38 (+375)	14 (+133)
Recurrent cost	50 (+456)	18 (+125)
Drugs	129 (+659)	134 (+294)

3.4 IMPACT OF CURRENCY DEVALUATION

The model's Reference Run assumes that the pre-devaluation exchange rate of $1=FCFA 275 applies. As a consequence of the devaluation of January 1994 the current value of the FCFA has been cut approximately in half (i.e., $1=FCFA 550). It is important to determine how the ambulatory health system is likely to be affected by such a major policy change. The effects of a devaluation on the health system can be divided into two stages. In the first stage, the effects are limited to those costs of the system which are denominated in foreign exchange, i.e., prescription drugs and other imported pharmaceutical inputs, fuel, and depreciation of fixed capital. In the second stage, as domestic prices and incomes gradually change in response to the devaluation (i.e., inflation), personnel and other domestic costs may be affected, as well as household income and the level of fees charged by health facilities. Until the secondary effects of a devaluation have worked themselves out completely, in terms of its impact on domestic prices and incomes, one can only speculate about the magnitude of second stage effects.

The assumptions used to simulate both the stage one and stage two impacts of the January 1994 currency devaluation are listed below in *Exhibit 3-7*. The only change in assumptions for the stage one impact simulation is with respect to the exchange rate, i.e., from $1=FCFA 275 to $1=FCFA 550. In stage one, as noted above, the impact is expected to be limited to the cost of items which are imported (i.e., drugs, fuel and capital equipment). In stage two, however, the impact of subsequent domestic price and income adjustments is simulated as well. It is assumed that domestic prices and incomes (including salaries of health workers and other facility expenses) increase by 50 percent.[15] In addition, it is assumed that health facilities (including competitors) raise the fees of their services by 50 percent and the fees charged for prescription drugs (which are imported) by 100 percent.

EXHIBIT 3-7
ASSUMPTIONS OF THE CURRENCY DEVALUATION SIMULATION

	CM		CSPS	
	Reference Run	Devaluation	Reference Run	Devaluation
STAGE ONE				
Exchange Rate (FCFA/$)	275	550	275	550
STAGE TWO				
Service Fees (FCFA):				
Curative care, Initial visit	592	888	275	412
Delivery	563	844	760	1,140
Pre-natal care, Registration	135	202	142	213
Pre-natal care, Consultation	113	169	140	210
Pre-school care, Registration	68	102	71	106
Pre-school care, Consultation	56	84	70	105
Prescription Fees (FCFA):				
Curative care (per episode)	530	1,060	379	758

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[15] See, for example, J. Perrot, "La santé dans les pays la zone franc face à la Dévaluation du FCFA," World Health Organization, Geneva, January 1994.

EXHIBIT 3-7 ASSUMPTIONS OF THE CURRENCY DEVALUATION SIMULATION				
	CM		CSPS	
	Reference Run	Devaluation	Reference Run	Devaluation
Household Income (FCFA/month)	14,220	21,330	14,220	21,330
Competitors' Fees-Curative Care:				
Other public facilities	1,000	1,736	3,000	5,364
Traditional healers	1,149	1,995	1,149	2,054
Home treatment	824	1,430	824	1,473
Competitors' Fees-Delivery:				
Hospital/maternity	1,000	1,500	1,000	1,500
CSPS (for CM)/CM (for CSPS)	762	1,143	563	844
Competitors' Fees-Prenatal Care:				
Other public facilities	350	525	175	262
Competitors' Fees-Preschool Care:				
Other public facilities	175	262	100	150
Average Monthly Salaries of Personnel:				
Doctor	107,488	161,232	-	-
Nurse	57,564	86,346	57,446	86,169
Birth attendant	57,298	85,947	41,752	62,627
Laboratory technician	41,752	62,628	-	-
Other Salaries (FCFA/month)[1]	164,000	246,000	0	0
Other Domestic Expenses (FCFA/month)	182,000	273,000	27,000	41,000

[1] Refers to the combined salaries of non-medical personnel.

The results of the currency devaluation impact simulation are presented in *Exhibit 3-8* (stage one) and *Exhibit 3-9* (stage two). The stage one impact is limited to the direct effects of the currency devaluation on foreign exchange-related costs of health facilities, i.e., drugs and other pharmaceuticals, fuel and capital goods. As *Exhibit 3-8* shows, the stage one impact of the devaluation is limited to these cost items. Drug and depreciation costs increase by 100 percent for both the CM and the CSPS facility, whereas the combined fuel/other expenses category increases by 35 (CM) and 75 (CSPS) percent, reflecting the fact that fuel costs increase by 100 percent while other (domestic) input costs are assumed to remain constant. The result is that total costs increase sharply for both facilities (CM (CSPS): +67 (+54) percent), resulting in even larger percentage increases in the size of each facility's monthly deficit (CM (CSPS): +73 (+58) percent). All cost recovery indicators also worsen significantly for both facilities.

The stage two impact of the devaluation (*Exhibit 3-9*) is much more complicated, reflecting the fact that many prices and incomes are assumed to change as an indirect consequence (i.e., inflation) of the devaluation (refer to *Exhibit 3-7*). The simulated impact is also somewhat different between the CM and CSPS facilities. It is convenient to discuss the simulation results in *Exhibit 3-9* in terms of the following broad groupings of variables: (1) service utilization; (2) revenue; (3) costs; and (4) deficit and cost recovery.

In the case of service utilization, the stage two impact of devaluation reflects the simultaneous operation of both income and price effects (i.e., household income and facility fees are both assumed to increase with inflation). In the case of the CM facility, the positive income effect dominates: levels of all services (except deliveries) increase. In the case of the CSPS facility, however, the price effect dominates: levels of all services either remain unchanged from the Reference Run or decline. Since competitors' fee levels are also assumed to rise, the stage two impact leaves the CM facility with increased market share in three of four service categories (except deliveries). The CSPS facility sees a decline in its market share for curative services (from 4 percent to 2 percent), no change in its share of deliveries, and increases in its shares of the pre-natal and pre-school care markets (+3 and +12 percent respectively).

Both service and prescription fee revenue increases sharply for the CM facility (total revenue increases by 88 percent), reflecting both the increased levels of utilization and the assumed fee increases. Overall revenue also increases significantly for the CSPS (+38 percent), although there is no change in revenue for curative care services.

Costs increase sharply for both facilities (CM (CSPS): +94 (+50) percent). In the case of the CM, all cost categories increase at least as much as the assumed stage one and stage two price and wage changes. For example, personnel costs increase by 50 percent (reflecting the assumed increase of 50 percent in domestic prices and wages); whereas depreciation costs increase by 100 percent (reflecting the direct effect of the devaluation on the cost of imported capital goods). The cost of drugs, however, increases by 122 percent, reflecting both the direct effects of the devaluation on cost per prescription and the increase in the number of prescriptions (+11 percent). In the case of the CSPS, however, the increases in personnel and drug costs (+10 and +46 percent) are less than the assumed price and wage changes, due to the lower volume of curative care which is provided as a stage two consequence of the devaluation.

The overall monthly deficit of both facilities worsens, becoming FCFA 4,919,000 for the CM (up 94 percent from the Reference Run) and FCFA 742,000 for the CSPS (up 51 percent from the Reference Run). As a consequence, two of the three cost recovery indicators worsen somewhat for the CM (a third is unchanged); only one of the three cost indicators worsens (slightly) for the CSPS (the others are unchanged). The overall conclusion is that the combined first and second stage effects of the devaluation are to worsen considerably the degree of external financial dependency of both the CM and CSPS facilities, but only to worsen slightly their relative cost recovery performance. This conclusion is reached despite the fact that both facilities are permitted to raise their service fees along with the rate of domestic inflation and their prescription drug fees at the same rate as the currency devaluation. The problem is that the absolute size of the deficit per unit of service increases as a consequence of both the devaluation and the resulting domestic inflation. Devaluation therefore poses a daunting challenge to the financial viability of Burkina Faso's ambulatory health system.

EXHIBIT 3-8 SIMULATED IMPACT OF THE CURRENCY DEVALUATION-STAGE ONE		
	CM	CSPS
Services (monthly):		
Curative episodes	614 (0)	86 (0)
Curative consultations	1557 (0)	209 (0)
Deliveries	39 (0)	9 (0)
Pre-natal registrations	12 (0)	7 (0)
Pre-natal consultations	118 (0)	66 (0)
Pre-school registrations	8 (0)	7 (0)
Pre-school consultations	138 (0)	130 (0)
Laboratory exams	219 (0)	32 (0)
Prescriptions	497 (0)	64 (0)
Market Shares (percent):		
Curative care	3 (0)	4 (0)
Deliveries	9 (0)	16 (0)
Pre-natal care	5 (0)	37 (0)
Pre-school care	3 (0)	43 (0)
Utilization Rates (percent):		
Curative care	2 (0)	3 (0)
Deliveries	7 (0)	15 (0)
Pre-natal care	2 (0)	11 (0)
Pre-school care	2 (0)	13 (0)
Revenue-Services (000 FCFA/month):		
Curative care	98 (0)	9 (0)
Deliveries	17 (0)	6 (0)
Pre-natal care	7 (0)	4 (0)
Pre-school care	3 (0)	4 (0)
Revenue-Prescriptions (000 FCFA/month)		
Curative care	88 (0)	12 (0)
Deliveries	0 (0)	0 (0)
Pre-natal care	0 (0)	0 (0)
Pre-school care	0 (0)	0 (0)
Source of Revenue (percent):		
Direct fees	100 (0)	100 (0)
Insurance premiums	0 (0)	0 (0)
Insurance copayments	0 (0)	0 (0)
Number of Medical Personnel:		
Doctors	1 (0)	0 (0)
Nurses	5 (0)	3 (0)
Birth attendants	2 (0)	1 (0)
Lab technicians	1 (0)	0 (0)
Expenses (000 FCFA/month):		
Personnel	716 (0)	214 (0)
Drugs	2,542 (+100)	200 (+100)
Fuel/Other expenses	382 (+35)	187 (+75)
Supervision	0 (0)	0 (0)
Depreciation	954 (+100)	207 (+99)
Profit/Loss (000 FCFA/month):		
Total revenue	213 (0)	34 (0)

(continued next page)

EXHIBIT 3-8 SIMULATED IMPACT OF THE CURRENCY DEVALUATION-STAGE ONE		
	CM	CSPS
Total cost	4,594 (+67)	808 (+54)
Profit (loss)	(4,380) (+73)	(774) (+58)
Cost Recovery (revenue as a percent of):		
Total cost	5 (-37)	4 (-33)
Recurrent cost	6 (-33)	6 (-25)
Drugs	8 (-53)	17 (-50)

EXHIBIT 3-9 SIMULATED IMPACT OF THE CURRENCY DEVALUATION-STAGE TWO		
	CM	CSPS
Services (monthly):		
Curative episodes	681 (+11)	63 (-27)
Curative consultations	1,717 (+10)	152 (-27)
Deliveries	35 (-10)	9 (0)
Pre-natal registrations	14 (+17)	6 (-14)
Pre-natal consultations	141 (+19)	63 (-4)
Pre-school registrations	10 (+25)	7 (0)
Pre-school consultations	172 (+25)	122 (-6)
Laboratory exams	243 (+11)	24 (-25)
Prescriptions	552 (+11)	46 (-28)
Market Shares (percent):		
Curative care	4 (+33)	2 (-50)
Deliveries	8 (-11)	16 (0)
Pre-natal care	6 (+20)	38 (+3)
Pre-school care	4 (+33)	48 (+12)
Utilization Rates (percent):		
Curative care	3 (+50)	2 (-33)
Deliveries	7 (0)	15 (0)
Pre-natal care	3 (+50)	11 (0)
Pre-school care	2 (0)	12 (-8)
Revenue-Services (000 FCFA/month):		
Curative care	163 (+66)	9 (0)
Deliveries	24 (+41)	10 (+67)
Pre-natal care	11 (+57)	6 (+50)
Pre-school care	6 (+100)	5 (+25)
Revenue-Prescriptions (000 FCFA/month)		
Curative care	195 (+121)	17 (+42)
Deliveries	0 (0)	0 (0)
Pre-natal care	0 (0)	0 (0)
Pre-school care	0 (0)	0 (0)
Source of Revenue (percent):		
Direct fees	100 (0)	100 (0)
Insurance premiums	0 (0)	0 (0)
Insurance copayments	0 (0)	0 (0)
Number of Medical Personnel:		
Doctors	1 (0)	0 (0)

(continued next page)

EXHIBIT 3-9 SIMULATED IMPACT OF THE CURRENCY DEVALUATION-STAGE TWO		
	CM	CSPS
Nurses	5 (0)	2 (-33)
Birth attendants	2 (0)	1 (0)
Lab technicians	1 (0)	0 (0)
Expenses (000 FCFA/month):		
Personnel	1,073 (+50)	235 (+10)
Drugs	2,818 (+122)	146 (+46)
Fuel/Other expenses	473 (+68)	201 (+88)
Supervision	0 (0)	0 (0)
Depreciation	954 (+100)	207 (+99)
Profit/Loss (000 FCFA/month):		
Total revenue	400 (+88)	47 (+38)
Total cost	5,319 (+94)	789 (+50)
Profit (loss)	(4,919) (+94)	(742) (+51)
Cost Recovery (revenue as a percent of):		
Total cost	7 (-12)	6 (0)
Recurrent cost	9 (0)	8 (0)
Drugs	14 (-18)	32 (-6)

4.0 CONCLUSIONS

This paper has reported on a set of policy simulations carried out with a Supply-Demand Model (SDM) of health financing applied to the ambulatory care sub-system of Burkina Faso's health system. The SDM was applied to two distinct categories of health facilities: medical centers (CM) and health centers (CSPS). Parameters and initial values were selected to make the simulated (focus) facilities typical of facilities in their respective category. Policies were designed to reduce the degree to which each focus facility is dependent on external financing. The individual policies simulated, either singly or in combination, included:

- rationalization of the fee structure for services to encourage increased utilization of preventive services;
- increases in prescription drug fees sufficient to recover completely the facility's prescription drug costs;
- reduction in the percent of clients not paying for services or drugs;
- social financing of health services by means of a capitation payment in combination with modest copayments; and
- control of drug costs through increased use of generic drugs and training of health workers in the use of improved treatment protocols.

In addition, the effects of the recent currency devaluation were simulated.

The outcomes of each policy simulation were compared to those of the model's Reference Run (i.e., the outcomes obtained by using the model to simulate current policies and practices). A number of conclusions can be drawn on the basis of these policy simulations:

- It is possible to reduce substantially the monthly deficits generated by ambulatory health facilities by recovering drug costs through a fee-for-service policy reform (i.e., simultaneously increasing fees charged for prescription drugs while reducing the percent of clients who do not pay). However, use of such a fee-for-service policy leads to significant reductions in the utilization of curative care (which is relatively drug-intensive) and results in a situation in which the burden of financing health services falls disproportionately on those who become ill.
- It is possible to achieve the same measure of deficit reduction without significant reductions in health care utilization by combining similar fee changes with social financing (e.g., universal health insurance). Social financing provides the additional benefit of further spreading the cost of sustaining health services among the entire population.
- Alternatively, deficit reduction can also be achieved with a fee-for-service policy without significantly affecting levels of health care utilization if fee changes are combined with measures to reduce the average prescription drug cost per episode of illness (e.g., greater reliance on generic drugs, use of improved treatment protocols). The main disadvantages to such a policy are: (1) that the financing burden would still fall mainly on those who become ill; and (2) the likelihood that any declines in utilization, however modest, would be concentrated among the poor.

- The recent currency devaluation poses an additional challenge to the financing of health care in Burkina Faso. Policies such as those simulated in the present paper will have to be undertaken in considerable measure merely to offset the strongly negative effects of the recent currency devaluation.

The present paper provides only an illustration of how the Supply-Demand Model can be used as a health reform policy tool in Burkina Faso. Additional work with the model might be most usefully directed to the following areas:

- refining the parameter estimates which have been put into the model as new and better data become available and as additional research (e.g., demand analysis) is completed;
- increasing the range of policy simulations, including the simulation of new combinations of policies (e.g., fee reform coupled with both insurance and drug cost control);
- using the model to simulate the impact of policies in a variety of settings (e.g., different provinces; urban versus rural areas; high-income versus low-income areas); and
- simulating the effects of improvements in the quality of care.

Ultimately, the model can help policy-makers determine whether a uniform reform package can be successfully applied throughout the country or whether the health reform will need to be carried out on a decentralized basis, with each facility or health zone making its own pricing and financing decisions. In doing so, however, the model should be only one of several inputs into an informed decision-making process. Although it provides quantitative and deceptively precise answers to complex questions, the quality of the information any model yields is only as good as the information supplied to it.

APPENDIX

DATA SOURCES AND PARAMETER ESTIMATES

The purpose of these notes is to summarize the data sources used in parameterizing the Supply-Demand Model of health care financing for Burkina Faso. The model consists of several linked Lotus spreadsheets, comprising two submodels: one for ambulatory health facilities and one for inpatient facilities. Each submodel contains a complete modeling of both the supply and demand factors determining patterns of utilization, revenues and costs in a representative facility. The Burkina Faso application of the model was limited to the ambulatory submodel. Separate spreadsheet models were prepared for typical CM and CSPS facilities (referred to as the focus facilities). The CM facility is larger than the CSPS, serving a larger population over a larger service area. CMs have at least one physician; CSPS facilities are staffed only by paramedics.

Data Sources

The primary data sources used in parameterizing the model are two surveys conducted jointly with the Government of Burkina Faso through the HFS Project: (1) the 1994 HFS Burkina Household Survey ("Enquête sur la volonté et la capacité des ménages à payer pour leur santé"); and (2) the 1994 HFS Burkina Facilities Survey. The HFS Burkina Household Survey was administered to 1,870 households in three provinces (Bazéga, Gourma and Sénɔ). The sample was drawn from 54 zones, or clusters. Three different questionnaires were used: (1) a Household Questionnaire, which collected information on the characteristics of household members, the household's sources of income, and the head of household's willingness to pay for health services; (2) a Curative Care Questionnaire, administered to each household member reported to have been ill during the two-week period preceding the date of interview; and (3) a Preventive Care Questionnaire, administered to women pregnant at some time during the preceding 12 months. Both the Curative and Preventive Care Questionnaires asked respondents where they went to receive care, the time and travel costs involved in getting there, the number of visits made, and the amount paid for consultations, drugs and laboratory examinations.

The 1994 HFS Burkina Household Survey recorded 11,799 residents present at the time of the interview, of whom 1,576 were reported to have been ill during the preceding two weeks. Of the 1,574 ill who responded to the Survey's Curative Care Questionnaire, 373 (23.6 percent) sought treatment outside the home, 277 of whom (17.6 percent) visited public health facilities.

The 1994 HFS Burkina Facilities Survey was administered to one CM and to two or three CSPS facilities in each of the three provinces included in the HFS Burkina Household Survey (a total of 11 facilities were visited). The HFS Burkina Facilities Survey, which is described in Derrienic (1994), collected information on facility staffing, the presence and condition of capital equipment, the presence of selected medications (including the number of weeks they were out of stock), service utilization, recurrent expenses and fees charged.[16]

The inputs for each of the spreadsheet models (i.e., the parameters and initial values) are entered into a series of tables. The following discussion is organized around the data inputs required by each table.

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[16] Yann Derrienic, "Trip Report for Burkina Faso," HFS Project, Abt Associates, March 12, 1994.

TABLE B-1: POPULATION DISTRIBUTION, FEES, DRUG EXPENDITURES AND MISCELLANEOUS PARAMETERS

This table requires data inputs in the form of: (1) the distribution of the population in terms of the distance of their place of residence to the focus health facility; (2) fees charged by the facility for services and prescriptions; (3) the size of the population served by the facility; (4) the local currency and exchange rate; (5) mean household income; (6) health insurance coverage and characteristics; (7) percent of the population not paying for services; and (8) the cost of supervision.

1. POPULATION DISTRIBUTION (I.E., PERCENT OF THE POPULATION LIVING WITHIN 0-1 KM, 1-2 KM, 2-3 KM, 3-5 KM, AND 5+ KM OF THE HEALTH CENTER)

The 1994 HFS Burkina Household Survey asks all respondents to the Curative Care Questionnaire to provide information about various health facilities, including CMs and CSPSs. Question 429 asks the respondent to estimate the distance from her(his) home to the first health facility visited. There are two problems in using the responses to this question as a basis for estimating distance of residence to the nearest health facility. First, the sample is too small in the case of CM facilities (only 26 respondents visited CMs). Second, the responses are limited to those actually visiting the facilities. If distance from a facility is inversely related to the likelihood of visiting it, estimates of the population distribution based on data limited to the responses of those who actually visited facilities would be biased toward increased proximity to the facility.

Alternatively, Question 465 asks all respondents to provide an estimate of the time required to get to the closest of several different categories of facility (even though they might not have used the facility). Since the model requires input in the form of distance (not travel time), it was necessary to convert the travel time estimates into estimates of distance. Unfortunately, no information was provided on the means of transportation to be used in connection with responses to Question 465. However, Question 434 provided travel time estimates corresponding to the responses provided to Question 429 (i.e., distance to the first facility actually visited), together with information on the travel mode actually used (Question 430). The observed relationship between travel time, distance, and mode of travel was used to convert the travel time responses to Question 465 into estimates of distance.[17] The resulting estimates of the distribution of the respondents, in terms of distance from place of residence to CMS and CSPS facilities, is provided below:

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[17] Two regressions were estimated for the two dominant travel modes (i.e., travel by foot and by motorscooter or bicycle): (1) in the case of respondents traveling on foot, distance (meters) was regressed on reported travel time (minutes), yielding a slope estimate of 38 meters per minute of travel time ($t = 18.2$; $R^2 = .63$); (2) in the case of those using motorscooters or bicycles, distance (kilometers) was regressed on travel time (minutes), yielding a slope estimate of 0.097 kilometers per minute ($t = 10.4$; $R^2 = .46$). The results of these regressions were used to convert the time responses to Question 465 into distance estimates. In making these conversions it was assumed that responses to Question 465 referred to the same travel modes reported to have been used in Question 430.

PERCENTAGE DISTRIBUTION OF POPULATION SERVED BY CM AND CSPS FACILITIES BY DISTANCE OF RESIDENCE TO CLOSEST FACILITY							
	0-1 Km	1-2 Km	2-3 Km	3-5 Km	5+ Km	Total	N
CM	21.4	18.6	15.7	11.4	32.9	100.0	140
CSPS	26.4	14.1	16.8	14.6	28.2	100.0	220
Source: 1994 HFS Burkina Household Survey (Curative Questionnaire)							

In addition to the HFS Burkina Survey, the following information on facility location relative to population served is available:

1) ***Statistiques Sanitaire 1991*** (p.68) provides data from facility service statistics on initial consultations by distance of place of residence to facility visited by province, a portion of which is reproduced in the exhibit below:[18]

PROVINCE	0-4 Km (percent)	5-9 Km (percent)	10 = Km (percent)	NUMBER OF CONSULTATIONS
Bazéga	62.6	27.7	9.7	64,531
Boulgou	75.9	15.2	8.9	66,058
Gourma	55.1	19.6	25.3	78,686
Séno	70.2	13.0	16.8	56,920
Entire Country	68.9	18.6	12.5	2,140,963
Source: Statistiques Sanitaires 1991, p.68.				

2) Bekele (1991, p.18)[19] provides some interesting additional information with respect to the Garango health zone: The Garango Medical Center (CM) is located in Garango town, which includes 80 percent of the population served by that CM. Health centers (CSPS) are "located on the average at distances of 5 to 8 Kms of each other.": There are exceptions, however; and he provides data for one CSPS (Komtoega) which is very rural, serving a more broadly distributed population (which is reflected in the fact that 25 percent of its clients come from 5+ Kms). Bekele also tells us that the facilities are located as closely as possible to population centers or concentrations.

3) The "Enquête Démographique et de Santé 1993" (1993 DHS)[20] included a community survey in which well-informed members of the community (i.e., the survey cluster) were asked a series of questions, including the distance and travel time to nine categories of

[18] Ministère de la Santé, de l'Action Sociale et de la Famille, *Statistiques Sanitaires 1991*, Secrétariat Général, Direction des Études et de la Planification, Ouagadougou (July 1993).

[19] Abraham Bekele, "Data Analysis of the Boulgou Cost Recovery Study," MCD International, Washington, DC (May 30, 1991).

[20] Institut National de la Statistique et de la Démographie, *Enquête Démographique et de Santé, Burkina Faso 1993*, Oagadougou: 1994.

health facility. The responses were tabulated for the respondents to the larger survey, according to the cluster in which they resided. The percentage distributions for CM and CSPS facilities are provided in the exhibit below. These data indicate that health facilities are considerably further away than either the HFS Burkina Survey or the MOH service statistics would indicate. However, it should be pointed out that the DHS data (reported below) are based on the responses of informed individuals, not the respondents themselves, and refer to distances to health facilities from the center of the survey cluster, instead of from a client's place of residence.

PERCENTAGE DISTRIBUTION OF FEMALE RESPONDENTS BY DISTANCE FROM SURVEY CLUSTER OF RESIDENCE TO NEAREST HEALTH FACILITY						
	0-4 Km	5-14 Km	15-29 Km	30+ Km	NR	Total
CM	18	13	19	44	6	100
CSPS	30	29	21	12	9	100
Source: Enquête Démographique et de Santé 1993 (DHS)						

***Conclusion*:** The model's reference run uses the 1994 HFS Burkina Household Survey estimates presented in the exhibit above as initial estimates of the geographical distribution of the population served by the two categories of facility (CM, CSPS). These initial values can be modified in policy simulations to simulate the effects of improved access to services.

2. PRICES FOR FIRST AND REPEAT VISITS

The model requires, as inputs, the prices charged for first and repeat visits for the following categories of services: (1) curative; (2) deliveries (no repeat visits); (3) pre-natal; (4) pre-school; and (5) chronic. The 1994 HFS Burkina Household Survey provides information on fees paid for: (1) curative care (Curative Care Questionnaire); and 2) delivery and pre-natal care (Preventive Care Questionnaire). However, the Curative Care Questionnaire does not provide sufficient information on the nature of the health problem for which services were sought to distinguish chronic care from other curative care (as needed by the model), nor does the Preventive Care Questionnaire provide any information on care of pre-school children.

It is also important to note that not all clients pay a fee. For example, of the 26 clients who reported having visited a CM for curative care, only 7 reported paying a fee. Of the 129 who reported visiting a CSPS, only 46 reported paying a fee. The information discussed below is based on fees recorded for clients **who paid a fee**. The model also requires input on the proportion of clients who pay (see discussion under item 13 below).

The available data on fees are as follows:

Curative Care: Fees paid for each curative care visit were recorded in the Curative Care Questionnaire (Question 446), allowing a distinction to be made between the fee for a first visit and that for a follow-up visit. Only 26 respondents (out of a total of 1,574 respondents) visited CM facilities for curative care during the two-week reference period, making a total of 57 visits,

or 2.2 visits per client (12 of 26 clients made only one visit; the remaining 14 clients made a total of 31 repeat visits). A total of 129 clients visited CSPS facilities, making a total of 295 visits, or 2.3 visits per client (52 of 129 clients made only one visit; the remaining 77 clients made a total of 166 repeat visits). The average fee paid for an initial visit was FCFA 592 for CM facilities and FCFA 275 for CSPS facilities.[21]

Most of the respondents reported fees of zero for repeat visits. This was true for all repeat visits to CM facilities (out of 31 repeat visits). In the case of CSPS facilities, a non-zero fee was reported for only two of 166 repeat visits (i.e., two cases of a reported fee of FCFA 300).

Deliveries: Data on fees paid for deliveries were recorded in the Preventive Care Questionnaire (Question 510). In the case of CM facilities, 8 of 10 clients reported paying a fee, with a mean of FCFA 563 (7 of 8 respondents reported paying a fee of FCFA 500). In the case of CSPS facilities, 54 of 57 respondents reported paying a fee, with a mean fee of FCFA 760. It is interesting to note that the proportion paying any fee is considerably higher for deliveries than for curative care.

Pre-natal Care: The Preventive Care Questionnaire records both the fee paid per consultation (Question 518), as well as the fee paid for registration (i.e., to purchase a *carnet prenatal*) (Question 516). In the case of CM facilities, all 28 pre-natal care clients reported paying a registration fee, with a mean reported fee paid of FCFA 135. Eight clients also reported paying a separate fee for consultations, the average of which was FCFA 113. In the case of CSPS facilities, 175 of 182 clients reported paying a registration fee (two of whom reported paying a fee in kind); the mean fee paid was FCFA 142. Fifty-seven of these clients also reported paying for consultations, with an average reported fee of FCFA 140 per consultation. Again, the percentage of clients paying a fee for pre-natal care is considerably higher than that for curative care.

Pre-school Care: Unfortunately, there is no information in the HFS Burkina Household Survey on fees charged for pre-school care. It is interesting to note, however, that children tend to pay a lower fee than adults for curative services. For example, fees for an initial visit averaged FCFA 432 for an adult, as compared to FCFA 293 for a child (age under 15), across all providers. It is probably unrealistic to assume, therefore, that the fee for pre-school care is equal to that of some adult category (e.g.. curative care, pre-natal care).

Chronic Care: There are no data in the HFS Burkina Household Survey which make it possible to separate chronic illness from acute illness. Accordingly, it was decided not to retain a separate category for chronic care but instead to include it in the curative care category. This problem is discussed more fully below (under *Table 2.1*, item 1).

The fee estimates obtained from the 1994 HFS Burkina Household Survey are reported below (together with reported client payments for prescriptions, discussed in the following section):

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[21] The sample mean for CMs is based on only 6 reported initial fees paid, one of which was FCFA 2,000. With this extreme value deleted, the sample mean fee is only FCFA 310. Similarly, of the 21 initial fees reported at CSPS facilities, one (an in-kind payment) was FCFA 2,800. With this extreme value deleted, the sample mean fee is only FCFA 149.

FEES CHARGED BY CM AND CSPS FACILITIES AND PRESCRIPTION EXPENDITURES (1993 FCFA)				
	First Visit	Repeat Visit	Drugs	Total Expenditure
CM				
Curative	592	0	530	1,122
Deliveries	563	-	(0)	563
Pre-natal	135[1]	113	(0)	-
CSPS				
Curative	275	0	379	654
Deliveries	760	-	(0)	760
Pre-natal	142[1]	140	(0)	-

Source: 1994 HFS Burkina Household Survey

[1] The "first visit" fee for pre-natal care refers to the fee charged for registration; the "repeat visit" fee refers to the fee charged for a consultation.

In addition to the 1994 HFS Burkina Household Survey, the following additional information is available on fees:

1) Data are available from the Boulgou Cost Recovery Study (Bekele, 1991, *Table E-1*, p.26) on fees: (1) Nothing was charged at the Health Centers (CSPS) for consultations, but a fee of FCFA 300 was charged at the Medical Center (CM) for consultations "not referred" from a lower level. (2) A fee of FCFA 200 was charged for a referred delivery, while a fee of FCFA 300 was charged for a non-referred delivery at a Health Center (higher fees of FCFA 300 and 500 were charged for corresponding services at the Medical Center). Daily fees of FCFA 50 (100 at the Medical Center) were charged for the first 7 days of hospitalization at a Health Center.

2) Data from the 1994 HFS Facility Survey (Derrienic, 1994) provide additional information on fees charged. The three CM facilities reported charging no fee for consultations by a physician; no corresponding information on fees charged for paramedical consultations was collected for CSPS facilities. The average of the fees reportedly charged by the three CM facilities included in the survey for a *carnet de vaccination* was FCFA 67, whereas the average of the fees reportedly charged by the eight CSPS facilities was FCFA 36. Presumably, this is the registration fee charged for pre-school care. All three CM facilities in the survey reported charging a fee of FCFA 300 for a delivery; six of the eight CSPS facilities reported charging the same fee, whereas one reported charging a fee of FCFA 200 and another (Koubri, reportedly the best equipped) reported charging a fee of FCFA 1,000.

Conclusion: For the model, we can use the estimates from the HFS Burkina Survey (i.e., the data presented in the above exhibit), since these are estimates of what clients currently pay. Based on the limited available information on fees charged for pre-school care, we can assume that the fee charged is equal to one-half the fee charged for pre-natal care. The policy simulations will focus on introducing alternative assumptions concerning fees (e.g., fees similar to those charged in the Boulgou Cost Recovery Study), tracing out their implications for levels of utilization, revenue and costs.

3. PRESCRIPTION EXPENDITURES PER VISIT

The model requires information on prescription drug expenditures incurred by clients for each category of service (e.g., per episode of illness).

The 1994 HFS Burkina Household Survey (Curative Care Questionnaire) also provides information on prescription drug expenditures by clients in connection with each curative care visit (Question 448). Of 374 respondents who visited any type of health facility during the reference period, 223 (60 percent) reported receiving a prescription in connection with their visit. Of the 193 respondents who reported paying for their care, 65 (34 percent) reported that the cost of their prescriptions was included in the price of their care. Six paid prescriptions were reported by respondents in connection with the 57 visits to CM facilities. These averaged FCFA 530 per patient (26 patients), or FCFA 2,297 per paid prescription. Fifty-eight paid prescriptions were reported in connection with the 295 visits to CSPS facilities. These averaged FCFA 379 per patient (129 patients), or FCFA 843 per paid prescription. These estimates are reported in the above exhibit, along with the reported fees.[22]

Unfortunately, the Preventive Care Questionnaire does not provide any information on prescription drug expenditures in connection with deliveries, pre-natal, or pre-school care.

In addition to the 1994 HFS Burkina Household Survey, the following sources provide additional information on drug costs:

1) Bekele (1991, pp.18-23) reports that, among a random sample of 1,033 clients of four health facilities in Boulgou Province, 650 (63 percent) received prescriptions, of whom 45 percent had them filled at the local pharmacy within one week. The average prescription cost was FCFA 1,764, or FCFA 500 per patient.

Conclusion: We will use the drug expenditure data from the 1994 HFS Burkina Household Survey for curative care, as reported above. For lack of information to the contrary, we shall assume that drug expenditures are zero for deliveries, pre-natal and pre-school care.

4. RADIUS OF THE HEALTH AREA

The model requires the user to specify the radius of each focus facility's service area.

According to information furnished by Bekele (1991, pp.18, 29) for Boulgou province (Garango zone) the effective radius of CSPSs is about 5 Kms and that of CMs is about 15 Kms. However, the data in *Statistiques Sanitaire* 1991 (pp.17-18) on the coverage of health facilities by province (relative to both area and population) suggest that CSPSs serve a radius of about 12 Kms, while CMs serve an area with a radius of about 36 Kms.

Conclusion: Since the national data indicate that Boulgou is relatively well-endowed, we adopt 12 and 36 Kms respectively for CSPS and CM service radii.

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[22] It is also interesting to note that the reported cost of children's (under 15 years of age) prescriptions was only about one-half that of adults: FCFA 897 versus FCFA 1639.

5. POPULATION

The model requires an estimate of the total population served by each facility.

According to *Statistiques Sanitaires 1991* (p.1), the population of Burkina was 9,375,813 in 1991. In the same year, there were 68 CMs, implying that the average population served was 137,880 for CMs. There were 705 CSPSs (including 117 dispensaries and maternities), implying that the average population served was 13,299. *Statistiques Sanitaires 1991* (p.14) also provides data showing that the ratio of population served was higher in 1986, i.e., 149,709 persons per CM and 15,184 persons per CSPS.:

According to Bekele (1991), the health zone served by the Garango CM was about 125,000, while each of its 9 CSPS served an average population of 13,889.

The HFS Facilities Survey (Derrienic, 1994) provides information on the population served by 3 CM and 8 CSPS facilities. For one of the CMs, the reported population served was 102,980, whereas it was only 20,371 for a second (no estimate was provided for the third CM). For the CSPS facilities, the range for the six facilities for which estimates were available was from 8,000 to 42,000, with a mean of 20,919.

Conclusion: We shall assume that a CM serves a population of 135,000 and a CSPS serves a population of 15,000.

6. CURRENCY

The currency unit is the FCFA, which is used in most Francophone West African countries. Until January 10, 1994, the FCFA was fixed relative to the French Franc, at a rate of 50 FCFA = 1 FF. Since that date, it has been fixed (at least temporarily) at a rate of 100 FCFA = 1 FF.

7. EXCHANGE RATE

Derrienic (1994) provides an exchange rate of 585 FCFA = $1. However, this follows the major devaluation in January. Prior to the devaluation. the exchange rate was approximately 275 FCFA = $1. We will use the pre-devaluation exchange rate of FCFA 275 = $1 for the model's Reference Run, since most of the revenue and expense data refer to the pre-devaluation period. The implications of the recent devaluation are simulated using the model (see text). Unfortunately, we know little at this point about the ultimate effects of the devaluation on domestic incomes and prices.

8. HOUSEHOLD INCOME PER MONTH

The Household Questionnaire of the 1994 HFS Burkina Household Survey provides an estimate of 14,220 FCFA per month. However, this estimate is a pre-devaluation estimate. It is as yet unclear what the effect of the devaluation will be on future household income levels.

9. RATIO OF HOUSEHOLD INCOME OF INSURED TO NON-INSURED POPULATION

We can set this at an arbitrary value of 1.0, since there is no information about insurance for the population in question.

10. INSURANCE PREMIUM/YEAR

This parameter is set to zero initially, but it is varied as a policy parameter (see text).

11. PERCENT OF THE POPULATION INSURED

This parameter is set to zero initially, but it is varied as a policy parameter (see text).

12. COPAYMENT PAID BY INSURED POPULATION

This parameter is set to zero initially, but it is varied as a policy parameter (see text).

13. PERCENT NON-PAYING

Data on the percent of clients not paying for services are available in the Curative and Preventive Care Questionnaires of the 1994 HFS Burkina Household Survey. They are reported below:

PERCENT OF CLIENTS NOT PAYING FOR SERVICES (PERCENT)		
	CM	CSPS
Curative Care	73	64
Deliveries	20	5
Pre-natal Carnet	0	1
Pre-natal Consultation	71	68
Source: 1994 HFS Burkina Household Survey		

As mentioned in the text, the model was revised to allow the percent not paying to vary according to the type of service. In the case of Curative Care and Deliveries, therefore, the above percentages were entered directly into the model. In the case of Pre-natal Care, however, the model requires a single "percent not paying" to be entered for both registration and consultancies, despite the fact that the survey data indicate that the percentages vary greatly between them. Accordingly, the model was used to find the single percentage (58 percent for CM, 61 percent for CSPS) which, given the simulated mix of registrations and consultancies, would produce the same amount of revenue as would be obtained with the separate percentages provided above. These weighted percentages were used in the model, not only for Pre-natal Care but also for Pre-school Care (for which no information was available).

14. SUPERVISORY EXPENDITURES

The purpose of this parameter is to reflect the share of a facility's revenue which needs to be paid to a central organization (e.g., the home office of an NGO) for supervisory services. For example, an NGO clinic may need to remit some of its fees to its home office. In the context of a public sector facility, this parameter can serve as a policy variable referring to (one minus) the proportion of user fee revenue which the facility can retain for its own use. The parameter can be set to zero initially, implying that all user fee revenue is retained by the facility.

TABLE A-1: EPIDEMIOLOGICAL AND DEMOGRAPHIC DATA

This table requires data inputs on: (1) disease prevalence (chronic and acute); and (2) demographic characteristics (population growth rate, crude birth rate, percent of the population 0-5 years of age).

1. PREVALENCE OF CHRONIC ILLNESS (CASES PER 1000 PEOPLE PER YEAR)

There is no information in the 1994 HFS Burkina Household Survey that allows one to classify illness episodes as chronic or acute. It is possible to calculate a variable determining the length of time between the date of the interview and the date on which an illness episode began. However, there is no way to determine how long the illness continued. Questions on the date of last treatment and whether the sick person plans to seek continued treatment were only asked of those who sought treatment. In addition, there is no information on whether illnesses are recurring, which is another category of chronic illness (together with illnesses of long duration).

> ***Conclusion***: Under these circumstances, it was decided not to distinguish between chronic and acute illness but instead to combine them into a single curative component.

2. CURATIVE ILLNESS EPISODES PER PERSON PER YEAR

The 1994 HFS Burkina Household Survey provides information on each episode of illness during the two-week period which preceded the interview. It also provides information on the date of onset of each illness and the date of the interview. From these data it is possible to calculate the number of illness episodes which began during the two weeks preceding the survey. There were 1,118 episodes from a population base of 11,795 persons resident at the time of the survey. This implies an annual rate of illness episodes of 2.32 cases per person. Data from the 1994 HFS Burkina Household Survey also indicate that 17.6 percent of those taken ill eventually visit public health facilities, corresponding to a rate of 408 episodes of illness seen annually at public health facilities per 1000 population.

Independent estimates of the number of illness episodes per person per year can also be developed from service utilization data at government facilities, together with estimates of the proportion of illness episodes which result in visits to government facilities (which may be obtained from the 1994 HFS Burkina Household Survey):

1) The Ministry of Health (1992, p.28) reports that 30 percent of the population visits its facilities annually. However, *Statistiques Sanitaires 1991* (p.67) reports a total of

2,245,744 new curative visits at health facilities during 1991 (the number of repeat visits is reported as 3,407,488, or 1.6 repeat visits per initial visit). If, as in the 1994 HFS Burkina Household Survey, this represents only 17.6 percent of all illness episodes, these data on new visits imply 12,759,909 illness episodes for the entire population, or only 1.36 illness episodes per person (compared to the above estimate of 2.32). Of these, it is interesting to note, 33 percent were children under the age of 5 years, 21 percent were children 5-15 years, and 46 percent were adults (evenly distributed between males and females).

2) USAID/Ouagadougou (1989)[23] reports that approximately 260 persons per 1000 inhabitants visited health facilities in five project provinces (including two of the three provinces included in the 1994 HFS Burkina Household Survey—Bazéga and Gourma), with an average of 2.4 visits per patient. It goes on to say that this is less than the national average of 310 visits per 1000 inhabitants.

Conclusion: We shall assume that there are 2.32 curative illness episodes per person per year.

3. NET POPULATION GROWTH RATE

Statistiques Sanitaire 1991 (p.1) provides an estimate of the annual population growth rate of 2.68 percent. However, the World Bank (1994)[24] reports that the population growth rate may have accelerated to 3 percent.

Conclusion: We shall assume a population growth rate of 2.7 percent.

4. CRUDE BIRTH RATE

Statistiques Sanitaire 1991 (p.2) provides an estimate of the crude birth rate of 5 percent (i.e., 50 per thousand). USAID/Ouagadougou (1989) reports the crude birth rate at the time of the 1985 National Population Census to have been 49.6. The World Bank (1994) reports a crude birth rate of 47 per 1,000 in 1990. Ross et al. (1993, *Table 2*)[25] report a UN estimate of 46.7 per 1000 population for the period 1990-95.

Conclusion: We shall assume that the crude birth rate is 47 per thousand.

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[23] USAID/Ouagadougou Project Paper for the Family Health and Health Financing Project (undated, but c.1989).

[24] Staff Appraisal Report, Burkina Faso, "Population and AIDS Control Project" May 31, 1994.

[25] John A. Ross, W. Parker Mauldin and Vincent C. Miller, *Family Planning and Population: a Compendium of International Statistics*. New York: The Population Council, 1993.

5. PERCENT OF THE POPULATION 0-5 YEARS OF AGE

Statistiques Sanitaire 1991 provides an estimate of 18.78 percent of the population under age 5 (p.2).

TABLE A-2: INVESTMENT AND FUEL COSTS

This table requests inputs on: (1) value and useful life of buildings and equipment (investment); and (2) fuel consumption.

1. LABELS OF INVESTMENT ITEMS

In addition to buildings, categories of investment include: (1) motor vehicles/ambulances (CM only); (2) motorscooters and bicycles; (3) refrigerators and cold chain equipment; (4) medical equipment (e.g., microscope, scales); and (5) furniture and office equipment (e.g., beds, typewriters).

2. USEFUL LIFE

We assume buildings have a useful life of 10 years and that all other capital equipment has a useful life of 5 years.

3. INVESTMENT VALUE

Buildings: The Ministry of Health (1992, pp.37-39)[26] estimates that the construction cost of a CSPS facility (including housing for personnel): is FCFA 25,538,830. At the 1993 exchange rate ($1 = 275 FCFA), this would be $92,868. Unfortunately, it is not yet known what the impact of the 1994 devaluation will be on construction costs. The same source also provides annual depreciation estimates for both CM and CSPS facilities. Assuming the same rates of depreciation apply to both categories of facility, the annual depreciation rate of 4.5 percent implies that the construction cost of a CM facility would be FCFA 79,731,452 ($289,933, at the 1993 exchange rate.

The World Bank (1994, p.114) estimates that the construction cost of a CM is $112,600.[27] Unfortunately, no estimate of the construction cost of a CSPS is provided, although the cost of renovating one is estimated to be $3,500.

Conclusion: We assume that construction costs are $112,600 for a CM and $36,067 for a CSPS. The latter estimate is obtained by multiplying the World Bank estimate of the construction cost of a CM by the Ministry of Health's estimate of the ratio of annual depreciation of a CSPS to that of a CM.

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[26] Ministère de la Santé de L'Action Sociale et de la Famille, "Document National sur le Renforcement des Soins de Santé Primaires au Burkina Faso," Comité Préparatoire de l'Initiative de Bamako, Octobre 1992.

[27] World Bank, Staff Appraisal Report for the Burkina Faso Health and Nutrition Project, Report No. 12416-BUR (March 1, 1994).

Other Capital Items: Exhibits from an unidentified document entitled "Matériel et Équipement des Formations Sanitaires" provide lists of equipment and unit prices for CM and CSPS facilities in 1983 prices. This information is summarized below:

ESTIMATED USEFUL LIFE AND COST OF CAPITAL EQUIPMENT FOR CM AND CSPS FACILITIES, 1983 PRICES		
	Useful Life	Investment ($US)
CM:		
Vehicle/Ambulance	5	$20,460
Motorscooters/Bicycle	5	1,002
Refrig./Cold Chain	5	4,575
Medical Equipment	5	6,173
Furniture/Office Equipment	5	7,587
Total		$39,797
CSPS:		
Motorscooters/Bicycle	5	$ 626
Refrig./Cold Chain	5	1,124
Medical Equipment	5	997
Furniture/Office Equipment	5	1,810
Total		$ 4,557

The World Bank (1994, p.114) also provides estimates of medical equipment costs ($3,620) and cold chain equipment ($2,560) which are assumed to apply equally to CSPS and CM facilities. These estimates, it should be noted, are in current prices (the above estimates are in 1983 prices).

Conclusion: We shall use the estimates provided in the exhibit above, inflating them by 20 percent to compensate for price increases in U.S. dollars since 1983.

4. FUEL CONSUMPTION

The model requires information on monthly fuel consumption, in the form of liters per month and cost in US $ per liter. The HFS Facilities Survey (Derrienic, 1994, Annex G) provides data on petrol consumption in liters, together with an estimate of the current cost per liter (FCFA 400). The estimated annual consumption of a CM is 251 liters (FCFA 100,400) and of a CSPS, 201 liters (FCFA 80,400).

Meeus et al. (1991, p.37)[28] reports monthly estimates of fuel consumption of FCFA 16,500 for one CM (or FCFA 198,000 annually) and FCFA 2,700-3,550 (or FCFA 32,400-42,600 annually) for a set of CSPS facilities.

Conclusion: We shall assume that monthly fuel costs are FCFA 100,400 for a CM and FCFA 80,400 for a CSPS.

[28] Wilma Meeus, Bineta Ba, Alexandre Tiendrebeogo, Daouda Nignan, "Rapport d'évaluation de l'étude sur le recouvrement des coûts des services de santé dans la zone sanitaire de Garango province du Boulgou Burkina Faso," June 1991.

TABLES A.3.1–A.3.5: PRICES AND DISTANCES TO COMPETITORS

These tables request information, for each of the focus facility's principal competitors, on: (1) the average total price it charges clients (including medications); and (2) its distance from the focus CM or CSPS facility.

1. PRINCIPAL COMPETITORS

Curative Care: The principal competitors of CM and CSPS facilities for curative care include other public sector facilities (other CMs and CSPSs, as well as hospitals and dispensaries), NGOs, the commercial sector (i.e., for-profit providers) and traditional healers. However, apart from a few large towns, the only effective competitors to public sector facilities (apart from other public facilities) are traditional healers.[29] In addition, according to the 1994 HFS Burkina Household Survey, a high proportion of the population, when ill, seeks care at home, involving home visits of providers and/or the use of medications purchased from pharmacies and other sources.[30] The home treatment option is important in the case of curative care, and is distinctly different from the no-treatment option usually considered to be the alternative to visiting a health facility. Accordingly, we assume that for curative care the primary competitors of a CM are other public facilities (i.e., hospitals, CSPS facilities, dispensaries), traditional healers, and home treatment. Similarly, we assume that for curative care the primary competitors for a CSPS are other public facilities (i.e., CM facilities, hospitals, dispensaries), traditional healers, and home treatment.

Deliveries: The principal competitors to CM and CSPS facilities for deliveries are other public sector facilities (i.e., other CMs and CSPSs, hospitals and maternities).

Pre-natal Care: The principal competitors to CM and CSPS facilities for pre-natal care are other public sector facilities (i.e., other CMs and CSPSs, hospitals, maternal/ child health centers (CSMI), and maternities).

Pre-school Care: We have no information on pre-school care competitors. Expectations are that they consist of other public sector facilities (i.e., other CMs and CSPSs, hospitals, and maternal/child health centers).

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[29] *Statistiques Sanitaire 1991* reports (pp. 12-13) that, apart from some small sellers of pharmaceutical products (depots), the commercial sector is mostly concentrated in Ouagadougou and Bobo Dioulasso (the two largest cities). Unfortunately, I could find no information on the extent or location of NGO providers (e.g., Catholic mission facilities). However, Derriennic (p. 10) mentions that one of the CSPSs in his sample (Koubri), which has a solid cost recovery program, "was able to prosper in close proximity to a non-profit, confessional health facility run by the brothers of the Abbey of Koubri."

[30] According to the survey, 84 of the 1,574 respondents to the Curative Care Questionnaire received treatment at home from one or more health providers, for which 34 of them paid an average of FCFA 697. In addition, 624 respondents treated themselves at home (including 34 of those who were also treated at home), 523 of whom paid for their medications, spending an average of FCFA 1,017. Among the 674 respondents who pursued home treatment (including those who paid nothing) the mean expenditure was FCFA 824.

2. COMPETITORS' PRICES

Curative Care: The 1994 HFS Burkina Household Survey (Curative Care Questionnaire) provides information on the average total fees paid (i.e., initial and follow-up visits plus prescriptions) for curative services in connection with each episode of illness. These data are provided in the exhibit below:

TOTAL PRICE (INCLUDING PRESCRIPTIONS) PAID TO PUBLIC FACILITIES (CHR, CM, CSPS) AND TRADITIONAL HEALERS		
FACILITY	TOTAL PRICE (FCFA)	N
CHR	2,900	34
CM	4,661	7
CSPS	1,355	41
Traditional Healer	1,149	48
Home Treatment	824	674
Source: 1994 HFS Burkina Household Survey (Curative Care Questionnaire)		

Deliveries: The 1994 HFS Burkina Household Survey (Preventive Care Questionnaire) provides the following data on the average fee paid to various categories of: facility for a delivery:

PRICE PAID FOR DELIVERY, PRINCIPAL COMPETITORS OF CM AND CSPS FACILITIES		
FACILITY	PRICE (FCFA)	N
CHR	1,688	38
CM	563	8
CSPS	760	54
Maternity	3,092	33
Source: 1994 HFS Burkina Household Survey (Preventive Care Questionnaire)		

Pre-natal Care: The 1994 HFS Burkina Household Survey (Preventive Care Questionnaire) provides data on fees paid for pre-natal registrations (i.e., a *carnet de santé)*, as well as the fee paid (if any) and number of pre-natal consultations made by recently pregnant respondents. These data were used to calculate the following estimates of the total price (registration + consultations) paid to various categories of facility for pre-natal care:

TOTAL PRICE PAID FOR PRE-NATAL CARE, PRINCIPAL COMPETITORS OF CM AND CSPS FACILITIES		
FACILITY	TOTAL PRICE (FCFA)	N
CHR	1,137	33
CM	203	28
CSPS	274	172
CSMI	886	67
Maternity	260	237
Source: 1994 HFS Burkina Household Survey (Preventive Care Questionnaire)		

Pre-school Care: There is no information available on fees charged for pre-school care. Accordingly, we continue to assume that the fees charged are one-half of those charged for pre-natal care.

3. PROXIMITY OF COMPETITORS

Bekele (1991, p.18) reports on the location of health facilities in the Garango health zone of Boulgou Province: "...the health zone of Garango is fairly well saturated with health centers. Health centers are located on the average at distances of 5 to 8 Kms of each other. For instance, there are three health centers within a radius of less than 8 Kms from Garango.": On the other hand, Bekele notes that other facilities "are located deep in the interior at 15 and 27 Kms away from Garango."

Distance of competitors from the target facilities can be estimated roughly from data in *Statistiques Sanitaires 1991* (pp.17-18). The average CM covers a territory with a radius of 36 kilometers. The average CSPS covers a territory with a radius of 12 kilometers. There are 8.6 CSPS facilities on average for each CM. The average CSPS should be about 10 kilometers from the closest CM. However, the average CM is probably about 5 kilometers from the **closest** CSPS. Unfortunately, we have no information on either the location of traditional healers or the location of maternities or maternal/child health clinics. We assume that they are approximately the same average distance as hospitals (about 50 kilometers) from CM and CSPS facilities.

Conclusion: The following assumptions were made concerning the full prices charged by and locations of competitors in the model. In most cases, they reflect the data presented above. However, in a few cases, it was necessary to use other values in order to obtain reasonable initial values for the model. One reason such adjustments were necessary is that the model does not currently provide any way to reflect differences in the quality of care (perceived or actual); and differences in quality between providers can affect the choice of provider as well as differences in price and location.

MODEL ASSUMPTIONS: TOTAL PRICE AND AVERAGE DISTANCE OF COMPETITORS		
COMPETITOR	TOTAL PRICE (FCFA)	AVERAGE DISTANCE FROM FOCUS FACILITY (meters)
CM		
Curative Care:		
Other public facility	1,000	5,000
Traditional healer	1,149	4,000
Home treatment	824	2,500
Delivery:		
Hospital/maternity	1,000	2,500
CSPS	762	5,000
Pre-natal Care:		
Other public facility	350	5,000
Pre-school Care:		
Other public facility	175	5,000
CSPS		
Curative Care:		
Other public facility	3,000	5,000
Traditional healer	1,149	4,000
Home treatment	824	2,500
Delivery:		
Hospital/maternity	1,000	2,500
CM	563	5,000
Pre-natal Care:		
Other public facility	175	5,000
Pre-school Care:		
Other public facility	100	5,000

TABLE A.4.1: PHARMACEUTICAL PRODUCTS AND LABORATORY EXAMS: AVERAGE PURCHASE PRICE

This table requires data on the cost to the facility of: (1) prescription drugs; (2) laboratory exams; and (3) other pharmaceutical products.

1. DRUG COSTS PER PRESCRIPTION

The Ministry of Health (1992, p.28) estimates that the average cost to the facility of a prescription is FCFA 2,500 at a CM and FCFA 1,500 at a CSPS. Bekele (1991, p.23) reports that the average price paid for a prescription received from three CSPS facilities was FCFA 1,764. Assuming that the average gross profit margin would be 18.9 percent (Bekele, 1991, *Table B.1*), the average cost per prescription was FCFA 1,431.

Conclusion: We assume that the average cost of a prescription is FCFA 2,500 at a CM and FCFA 1,500 at a CSPS.

2. LABORATORY EXAMS

We have no direct information on the materials cost to the clinic of laboratory examinations. However, Bekele (1991, p.24) provides fee schedules for lab tests in the Boulgou project zone. These are FCFA 200 and 150 for urine and stool tests at CM facilities and FCFA 150 and 100 for the same tests at CSPS facilities. For lack of more information, we shall assume that the unit materials cost of a typical laboratory exam at both CM and CSPS facilities is FCFA 100.

3. OTHER PHARMACEUTICAL PRODUCTS

We have no direct information on the cost of other pharmaceutical products in connection with various types of visits. We assume that curative and pre-natal visits impose unit (i.e., per visit) other pharmaceutical costs of FCFA 5, whereas delivery and pre-school visits are assumed to have unit other pharmaceutical costs of FCFA 50 in both CM and CSPS facilities.

TABLE A.4.2: NUMBER OF LABORATORY EXAMS AND PRESCRIPTIONS PER UNIT OF SERVICE AT HEALTH CENTERS

This exhibit requires data inputs on the number of prescriptions and laboratory exams given per unit of service.

There are data in the 1994 HFS Burkina Household Survey (i.e., Curative Care Questionnaire, Questions 448 and 450) on the number of examinations and prescriptions for curative care. However, as noted above, there is no information on the number of prescriptions or exams for other types of care.

1. NUMBER OF PRESCRIPTIONS

According to the 1994 HFS Burkina Household Survey, 21 of 26 clients of CM facilities (81 percent) and 96 of 129 clients of CSPS facilities (74 percent) reported receiving a prescription.

Bekele (1991, p.19) reports that, among a random sample of 1,033 clients of one CM and three CSPS facilities, 63 percent received prescriptions.

> ***Conclusion***: We shall assume that 0.81 (0.74) prescriptions are provided per episode of illness at a CM (CSPS) and that no prescriptions are provided in connection with deliveries, pre-natal or pre-school care.

2. NUMBER OF LABORATORY EXAMINATIONS

According to the 1994 HFS Burkina Household Survey, among 49 paying clients of CM and CSPS facilities (no information on lab tests was collected from non-paying clients), 17 (35 percent) reported lab tests. We shall assume that this same percentage applies to pre-natal care but that neither deliveries nor pre-school care involve lab tests.

TABLE A.5.1: MINUTES OF PERSONNEL REQUIRED PER UNIT OF SERVICE, BY PERSONNEL CATEGORY

This table requires information on labor inputs required from each personnel category (e.g, doctor, nurse, birth attendant, laboratory technician) to perform each of the following types of services: (1) Curative Consultation (first and repeat visit); (2) Delivery; (3) Pre-natal Consultation; (4) Pre-school Consultation; and (5) Laboratory Exam.

There is very little information available from which to estimate personnel time required per unit of service. The Ministry of Health (DEP) has informally communicated the following estimates: (1) an average of 10-15 minutes of a doctor's time should be required for initial and repeat curative consultations; (2) 15 (5) minutes of a nurse's time should be required for an initial (repeat) curative consultation; (3) 120 (15) minutes of a birth attendant's time is required for a delivery (pre-natal consultation); and (4) 10-15 minutes of a nurse's time is required for a pre-school visit. No information was available on laboratory technician time per laboratory exam.

Conclusions: The above estimates were utilized in initial simulations. However, it was discovered that, given the average number of service units provided by typical CM and CSPS facilities, the above estimates implied staffing needs which were considerably lower than the actual staffing patterns at typical CM and CSPS facilities. Accordingly, it was decided to use time input estimates which would be consistent with actual staffing patterns for the model's Reference Run. These values, it should be noted, incorporate both direct service delivery time and indirect time spent in record-keeping, annual leave, sick leave and all other activities of health workers. The assumptions on labor inputs are as follows:

MINUTES OF PERSONNEL TIME REQUIRED PER UNIT OF SERVICE REFERENCE RUN ASSUMPTIONS		
	CM	CSPS
Doctor:		
Curative consultation, Initial	10	–
Curative consultation, Repeat	5	–
Nurse:		
Curative consultation, Initial	45	100
Curative consultation, Repeat	20	50
Pre-school consultation	30	60
Laboratory exam	–	120
Birth Attendant:		
Delivery	300	300
Pre-natal consultation	30	30
Laboratory Technician:		
Laboratory exam	45	–

TABLE A.5.2: PERSONNEL NECESSARY TO MEET DEMAND, SALARIES, LABOR COSTS

This table requires data inputs on monthly salaries and hours worked per day for each category of health provider (e.g., doctor, nurse, birth attendant, laboratory technician).

1. SALARIES

The Ministry of Health (1992, p.39) reports the annual personnel cost of a CSPS facility staffed by four paramedical staff to be FCFA 1,716,000, or FCFA 35,750 monthly per worker. The same source estimates the annual personnel budget for a CM facility staffed by 1 doctor + 14 paramedicals and support staff to be FCFA 11,528,824, or FCFA 64,049 monthly per worker. Assuming that the paramedicals and support staff working in a CM receive the same average salary as the paramedicals working in a CSPS, these estimates imply that the average monthly physician salary is FCFA 460,235, or almost 13 times the average salary of a paramedical.

USAID/Ouagadougou provided the following salary estimates of public sector health personnel:

GROSS MONTHLY SALARIES OF PUBLIC SECTOR HEALTH PERSONNEL	
CATEGORY (Grade)	GROSS MONTHLY SALARY (FCFA)
Physician (A1)	107,488
State Nurse (B1)	72,843
Registered Nurse (C1)	57,742
Midwife (B1)	72,843
Assistant Midwife	41,752
Itinerant Health Agent	41,752
Unskilled Worker (D3)	36,422
Unskilled Worker (E1)	31,980
Source: USAID/Ouagadougou	

The Ministry of Health (1992, pp.34-35) provided information on staffing patterns of CM and CSPS facilities, as follows:

STAFFING PATTERNS OF CM AND CSPS FACILITIES		
	CM	CSPS
TECHNICAL STAFF:		
Doctor	1	
Registered Nurse (d'Etat)	1	1
Midwife (d'Etat)	1	
Laboratory Technician	1	
Practical Nurse (Brevetes)	3	1
Auxiliary Birth Attendant	1	1
Itinerant Nurse	1	1
Operating Room Attendant	1	
NON-TECHNICAL STAFF:		
Secretary/accountant	1	
Laborers	2	
Driver	1	
Guard	1	
Source: Ministry of Health (1992, pp.34-35)		

The salary data and staffing patterns from the above two exhibits were combined to obtain the following weighted average estimates of monthly salaries of doctors, nurses, birth attendants and lab technicians:

AVERAGE MONTHLY SALARIES OF FACILITY PERSONNEL		
	CM	CSPS
Doctor	107,488	–
Nurse	57,564	57,446
Midwife	57,298	41,752
Laboratory Technician	41,752	–
Other (non-technical)	32,864	–

Conclusion: The estimates in the exhibit above were used in the model (although the estimate of the doctor's salary is unusually low).

2. HOURS WORKED

We have no data on average hours worked for various categories of health personnel. We assume that all personnel work 8 hours per day.

TABLES A.6.1–A.7.2: MONTHLY DEMAND, UTILIZATION, REVENUE AND COSTS

This series of tables provide outputs (i.e., no inputs are required).

TABLE A.8: HEALTH CENTER MONTHLY INCOME STATEMENT

This table requires input data on average monthly expenses for all other items (i.e., other than salaries, pharmaceuticals and fuel) for each type of facility. There are several sources of information on such expenses:

1) The Ministry of Health (1992, pp.37-39) reports annual other expenses for CM and CSPS facilities (FCFA 2,184,536 and FCFA 322,839 respectively), corresponding to monthly estimates of FCFA 182,045 (CM) and FCFA 26,903 (CSPS).

2) The 1994 HFS Facilities Survey (Derrienic, 1994) provides an estimate (in post-devaluation FCFA) of annual other expenses for a CM and a CSPS facility (FCFA 4,411,940 and FCFA 737,090 respectively), corresponding to monthly estimates of FCFA 367,662 (CM) and FCFA 61,424 (CSPS) respectively.

3) Meeus et al. (1991, p.37) provide estimates of monthly other expenses of FCFA 83,500 for a CM and FCFA 49,953 for CSPSs.

Conclusion: We shall assume monthly other expenses to be FCFA 182,000 (CM) and FCFA 27,000 (CSPS).

TABLE A.9: DEMAND EQUATIONS

Work on estimating price and distance elasticities of demand is ongoing, using data from the 1994 HFS Burkina Household Survey. As an interim measure, the demand equation parameters were given values which would predict service utilization patterns for each focus facility (and its competitors) which are similar, in terms of levels and proximity of clients' place of residence, to those observed in the two HFS Burkina Surveys (i.e., household and facility) and in data on facility utilization reported by Bekele (1991, p.29). The values of these parameters are as follows:

DEMAND EQUATION PARAMETERS				
	CURATIVE CARE	DELIVERIES	PRE-NATAL CARE	PRE-SCHOOL CARE
CM				
CONSTANTS:				
Focus facility	1.00	1.50	0.50	0.05
Competitors	3.500	3.50	5.00	5.00
COEFFICIENTS:				
Price	-0.001	-0.001	-0.004	-0.007
Distance	-0.0002	-0.0002	-0.001	-0.001
Price x Distance	0.00000005	0.00000005	0.00000005	0.00000005
Sigma	0.50	0.50	0.50	0.50
Mu	-0.44	-0.60	-0.32	-0.52
CSPS				
CONSTANTS:				
Focus facility	1.00	2.50	0.01	0.01
Competitors	3.50	3.50	1.50	1.50
COEFFICIENTS:				
Price	-0.001	-0.001	-0.005	-0.02
Distance	-0.00003	-0.00003	-0.001	-0.001
Price x Distance	0.00000005	0.00000005	0.00000005	0.00000005
Sigma	0.50	0.50	0.50	0.50
Mu	0.40	-0.60	-0.32	-0.52

The above parameter values correspond to the following price, income and distance elasticities for the Reference Run. It is noted that these are broadly similar to those obtained from demand studies in countries facing similar circumstances.[31] They are also broadly consistent with price, distance, and income elasticities estimated for curative care in a recent econometric demand analysis using data from the Solenzo medical district in northwestern Burkina Faso.[32]

[31] See, for example, Emmanuel Jimenez, *Pricing Policy in the Social Sectors: Cost Recovery for Education and Health in Developing Countries*, World Bank, 1987; and Paul Gertler and Jacques van der Gaag, *The Willingness to Pay for Medical Care: Evidence from Two Developing Countries*, World Bank, 1990.

[32] Rainer Sauerborn, Adrien Nougtara and Eric Latimer, "The Elasticity of Demand for Health Care in Burkina Faso: Differences Across Age and Income Groups," *Health Policy and Planning* 9(2):185-92, 1994.

PRICE, INCOME, AND DISTANCE ELASTICITIES OF DEMAND MODEL REFERENCE RUN			
	PRICE	INCOME	DISTANCE
CM:			
Curative	-0.31	0.17	-0.10
Deliveries	-0.15	-0.01	-0.09
Pre-natal	-0.42	-0.12	-0.47
Pre-school	-0.41	-0.06	-0.48
COMPETITOR # 1:			
Curative	-0.22	0.08	-0.08
Deliveries	-0.15	0.30	-0.05
Pre-natal	-0.18	0.03	-0.08
Pre-school	-0.13	0.01	-0.06
COMPETITOR # 2:			
Curative	-0.24	0.19	-0.07
Deliveries	-0.14	0.14	-0.06
COMPETITOR # 3:			
Curative	-0.15	-0.05	-0.06
CSPS:			
Curative	-0.18	-0.44	-0.01
Deliveries	-0.18	0.17	-0.01
Pre-natal	-0.40	0.01	-0.33
Pre-school	-0.61	0.00	-0.30
COMPETITOR # 1:			
Curative	-0.70	1.23	-0.01
Deliveries	-0.18	0.34	-0.01
Pre-natal	-0.43	0.04	-0.29
Pre-school	-0.91	0.03	-0.32
COMPETITOR # 2:			
Curative	-0.22	-0.08	-0.01
Deliveries	-0.09	0.03	-0.01
COMPETITOR # 3:			
Curative	-0.15	-0.31	-0.01