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Compliance, Workload, and the Cost of Using the Integrated Management of Childhood Illness Algorithm in Niger

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Abstract

Previous studies have reported that increased compliance with IMCI guidelines is associated with longer client-provider interaction times and lower drug costs. This paper presents the results of a study of the relationship between IMCI compliance and interaction time, drug costs, and workload in 26 health clinics in Niger. Trained observers measured compliance of IMCI-trained nurses using a modified version of the WHO-BASICS Health Facility Assessment. The observers recorded interaction times for 211 child cases of fever, cough, diarrhea, and earache presenting at the clinics in December 1998. Prescription records for these cases were obtained several months later and considered in combination with the IMCI-recommended dose and the unit cost of the drug. The study found compliance rates as follows: 33 percent for assessment, 81 percent for treatment, and 42 percent for counseling. No relationship was found between compliance and drug cost, even for particular diagnoses, although other factors were associated with drug costs. Also, no relationship was found between compliance and interaction time or between average clinic workload and average clinic compliance. Thus, the study counters previous findings, although limitations are described in the text.

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Compliance, Workload, and the Cost of Using the Integrated Management of Childhood Illness Algorithm in Niger

By Edward Kelley, Colette Geslin, Sabou Djibrina, and Maina Boucar

I. Background

The Integrated Management of Childhood Illness algorithm (IMCI) approach to the management of childhood illness combines case management and prevention into an integrated package that is designed to address the major causes of mortality among children—namely diarrhea, pneumonia, measles, malaria, ear infections, and malnutrition. All told, these illnesses account for over 70 percent of both the visits to health facilities and deaths of children under five (Kolstad et al. 1998).

International data show that Niger, with its slim natural resource base and poor health infrastructure, desperately needs improvement in child health. Life expectancy at birth in Niger, 47 years, is one of the lowest on the continent, and the country's child mortality (320 per 1,000 live births) ranked Niger as the country with the highest child mortality in the world at the time of the study (UNICEF 1998). The same UNICEF report states that Niger's annual per capita income is $270.

A. Assessing Technical Quality in a Standards Framework

The Quality Assurance Project (QAP) has worked in Niger since 1993, first under the Quality Assurance Project I and then as a joint project with BASICS (Basic Support for Institutionalizing Child Survival) from 1996 to 1998. This collaborative effort allowed the joint QAP/BASICS project to develop a QA/IMCI model for assessing and improving the quality of child healthcare. This model is based on the IMCI system of training health workers in core skills and the basic concepts of quality assurance (QA), including using data to make decisions and improve health delivery processes.

This report presents findings relative to the quality of IMCI-based child care in Niger and the costs associated with differing levels of quality of care. In this context, quality of care is defined as compliance with standards. Given this definition, the concept of standards is central to our assessment of the quality of child care in Niger. "Standards define quality for a health system or service, they set the level of quality and they provide the basis for measurement of quality against which performance can be compared and assessed" (Wilson and Nicholas 1999).

Most common among the systems for conceptualizing quality assessment is a "trilogy" of structure: inputs, processes, and outcomes. Variations on this model were discussed in the 1950s by authors such as

Abbreviations

ARI	Acute respiratory infection
BASICS	Basic Support for Institutionalizing Child Survival
CFA	Communaute Financiere Africaine (the unit of currency in Niger)
HFA	Health Facility Assessment
IC	Junior nurse
IDE	Regular nurse
IMCI	Integrated Management of Childhood Illness algorithm
IV	Intravenous
ORS	Oral rehydration solution
QA	Quality Assurance
QAP	Quality Assurance Project
TSSI	Senior nurse
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
WHO	World Health Organization

Sheps (1955), who identified four components of hospital quality assessment: prerequisites of or desiderata for adequate care, indexes of elements of performance, indexes of the effects of care, and qualitative clinical evaluations. Donabedian (1982) modified this taxonomy to include three main elements, namely structure, process, and outcome. While research on compliance with standards is a relatively new area in the developing country health literature (Marquez 2001), one review on clinical standards in the developing world found very low compliance levels on average, most between only 30 and 60 percent (Heiby 1998).

B. Operational Cost Impact of IMCI

One of the persistent criticisms of IMCI since its inception has been the substantial time required for health workers to correctly comply with its assessment, treatment, and counseling guidelines. In this research, we are interested in the cost, or cost savings, from "doing things right." Previous studies indicate that the question of the impact of increased compliance on cost is complex. Formative research in Kenya, Tanzania, and Uganda has highlighted the difficulties that this complex algorithm has caused at the clinic level (Tavrow and Malianga 1997). IMCI's complexity has resulted in dramatic increases in the amount of time that health workers must spend with individual clients (Burnham 1997). In research completed in Uganda, the average time per patient increased 36 percent from 4.6 minutes per consultation to 7.2 minutes (Kolstad et al. 1998). Preliminary analysis of the data from Niger indicates that the average time per consultation in health centers in the Tahoua region is higher, with the average consultation time ranging from 13.4 to 14. 9 minutes (Kelley 1998).[1]

While IMCI has been criticized for its complexity and the burden it places on health workers, evidence from field tests suggests that the algorithm has a significantly positive impact on drug cost savings. Research on pharmaceutical costs in relation to other health budgetary expenditures shows that greater rationalization of drugs has important potential as a cost control measure in resource-poor areas. At the district level, Mills et al. (1993) found that between 24 and 37 percent of district hospital recurrent costs were attributable to medical supplies. Prior to full implementation of IMCI in Bangladesh, research on acute respiratory infection (ARI) and diarrhea protocols showed that drug costs could be reduced significantly by using a structured algorithm for health worker treatment of ARI in children. ARI drug costs were reduced by 52 percent and diarrhea drug costs by 17 percent (Amin et al. 1998). A Uganda study compared the prescription patterns of IMCI users and those of expert physicians and found that the adoption of IMCI prescription guidelines could reduce pharmaceutical costs by more than 50 percent (Kolstad et al. 1998).

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[1] Please note that the authors do not assume that shorter client-provider interactions are either more or less desirable than longer ones. The analysis of the duration of client-provider interactions does not imply a value judgement. Instead, the question of time and compliance is viewed in the context of assessing the impact of a major new program such as IMCI. This assessment focuses on the operational functioning of health clinics in the developing world in an effort to contribute to understanding the success or failure of the program. Assessing the impact of IMCI requires an understanding of its impact on providers' workloads, including how increased consultation time contributes to and may be influenced by workload. In particular, this report analyzes how average consultation times differ between high- and low-performing health workers (as defined by compliance with IMCI).

II. Research Questions

1. Does health worker compliance with IMCI standards differ by diagnosis or by type of health provider, for the different case management functions (i.e., assessment, treatment, and counseling)?

2. What is the relation, if any, between IMCI compliance and drug cost? Do the data in this study confirm previously reported findings that increased compliance is associated with lower drug cost?

3. What is the relation, if any, between IMCI compliance and the amount of time that health workers spend with clients? Do the data in this study confirm previously reported findings that increased compliance is associated with more time per client?

4. Is the workload of health workers associated with IMCI compliance or with time spent with clients? For example, is compliance and time per client lower on busy days or in busy facilities?

III. Methods

The present study builds on a previous study of IMCI compliance in Niger by the QA Project (Kelley et al. 2000; Kelley et al. 2001). The earlier study collected data on health worker compliance with IMCI standards and measured the duration of each IMCI visit in three districts of Niger's Tahoua Department at four different times between June 1997 and December 1998. The data collection methodology used in the earlier study was adapted by the Joint QAP/BASICS project in Niger from the BASICS Health Facility Assessment (HFA) instrument originally developed by BASICS and the World Health Organization (WHO). It involved the use of direct observations, interviews with health workers, interviews with mothers, and physical reviews of the health facilities.

The present study used compliance and duration data obtained in the earlier study's last wave of data collection (December 1998), supplemented with additional data on drug costs and clinic workloads. The present study analyzed the associations among these variables in the December 1998 data set. No trials or external controls were used.

A. The Sample

The sample included 211 IMCI cases attended by 26 different nurse providers in 26 health centers (one provider per center) in three districts of Niger's Tahoua Department. Each district had between 8 and 10 health centers. These districts were selected from a pool of districts affiliated with the joint QAP/BASICS project in Niger. The districts selected were named by the Tahoua Department Ministry of Health as target districts for testing the implementation of IMCI in Niger.[2] Data were collected at all the health centers in a given district.

[2] While the lack of randomization at the district level is a potential threat to the validity of the study's findings, analysis of the demographic profile and the health system in these districts showed that no significant differences existed between the sample and the rest of Niger. However, readers should bear this issue in mind when reviewing the research results.

Cases included in the study were children between the ages of 2 months and 5 years[3] arriving at the health center on the data collection day who presented with symptoms that are addressed by the IMCI algorithm (hereafter "IMCI cases"). These symptoms included fever, cough, diarrhea, and ear problems. Verbal consent was obtained from each caretaker who brought in a child with these symptoms.[4]

Table 1 Client Gender

Gender of Children	Number (Percentage)
Male	123 (58.3%)
Female	88 (41.7%)
Total	211 (100%)

The average age of children in the study was 19 months: 58 percent male children and 42 percent female (Table 1).

All 26 providers observed were nurses. Ten (38.5 percent) were junior nurses (IC); 15 (57.7 percent) were regular nurses (IDE); and only one (3.8 percent) was a senior nurse (TSSI). On average they had been in their post nearly two years; the vast majority had received a supervision visit within the last six months, and a majority had been formally trained in IMCI (Table 2).

Table 2 Provider Profile

Characteristic	Number (Percentage)
Provider category:	
Junior nurse (IC)	10 (38.5%)
Regular nurse (IDE)	15 (57.7%)
Senior nurse (TSSI)	1 (3.8%)
Total	26 (100%)
Mean time at current post	20.6 months
Range	0–96 months
Received a supervision visit in the last 6 months	21 (80.8%)
Trained in IMCI	16 (61.5%)

B. Definition of Variables

In the earlier study, quality of care was defined as the degree to which health workers complied with the IMCI standards of assessment, treatment, and counseling of sick children and counseling of their caretakers. Compliance was measured by direct observation by a trained observer. The observer assessed each IMCI visit on 158 variables related to various aspects of the client-provider interaction. These variables focused on three primary functions of the IMCI algorithm, namely assessment, treatment, and counseling.[5] For each function, a composite score of the number of tasks completed correctly, divided by total number of tasks (according to IMCI) was created. An overall score for compliance was derived by totaling the number of correct tasks completed across all three functions and dividing that total by the total number of tasks for all three areas.

The duration of each IMCI visit was defined as the duration of the client-provider interaction in minutes and recorded by the observer. Data were collected on health workers' experience levels, frequency of supervision, and general knowledge of IMCI.

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[3] The IMCI algorithm is designed to treat children aged 0 months to 5 years. However, separate guidelines exist for the treatment of children between 0 and 2 months, and these guidelines had not been communicated to health workers in Niger at the time of this study.

[4] Observers reported that no caretakers refused to give verbal consent; written documentation of refusals, if any, was not kept.

[5] A fourth function, diagnosis, was not included in the study analysis because it involved essentially one task useful mainly for analyzing the sensitivity or specificity of health workers' diagnoses.

Several months after the compliance data had been collected, the records of the specific drugs prescribed for each IMCI case in the sample were obtained from a retrospective review of the patient records. Unit costs for each prescribed drug were obtained using local unit costs from the Niger Ministry of Health National Office of Pharmaceutical and Chemical Products. Drug costs per case were derived by multiplying the unit cost of the drug(s) prescribed by the recommended dosage for that drug according to IMCI guidelines.

Workload was defined at the health center level rather than for individual cases or providers. Utilization data were obtained for each health center and used to calculate the average daily workload for the center (average number of patients per day). All patients, not just IMCI patients, were included.

C. Analysis

In the earlier study, compliance and duration data were compiled and entered into EpiInfo for preliminary analysis of key indicators in the field. The data sets from all four time periods (between June 1997 and December 1998) were then converted to SPSS 9.0. Drug cost data for the December 1998 sample were entered directly into the SPSS database containing the compliance and duration data and analyzed using SPSS.

The analysis of the December 1998 data (211 cases) revealed that there were two distinct distributions of drug cost: a high-cost group of 47 cases that involved the use of all the medicines and a low-cost group of the remaining 164 cases. Multivariate analyses of the relationships among compliance, drug costs, and other co-variates and between compliance and duration of visit were performed for the entire group of 211 cases and for the low-cost group of 164 cases. Because of the small sample size, the workload-compliance relationship was analyzed using a Fisher's exact test.

IV. Results

A. Compliance with IMCI Standards

In general, provider performance with IMCI guidelines was weak. The average provider completed only 47 percent of all observed tasks correctly. There was considerable variation in the performance of individual health providers and in how well providers performed the different functions of the algorithm (Table 3). Assessment was lowest, with only about a third of all assessment tasks performed according to IMCI. Counseling was also low: counseling tasks complied with IMCI 42 percent of the time. However, providers did much better on treatment, usually prescribing the right medication when necessary and not prescribing unneeded antibiotics. Assessment compliance was predictive of treatment compliance: among the 208 clients with both functions measured, treatment complied with IMCI 36 percent of the time when assessment was performed correctly, but only 20 percent of the time when assessment was not compliant ($p<0.001$).

Table 3 Mean Compliance for IMCI Functions

IMCI Function	Mean Compliance
Assessment	33%
Counseling	42%
Treatment	81%
All functions	47%

B. Cost of Drugs

Table 4 presents the unit cost of the various medicines along with the frequency that each was prescribed. The costs reflect the cost to the health system of each sick child in terms of pharmaceutical products, not the cost to clients. At 970 CFA, Ringer's IV (intravenous) Solution is by far the most expensive medicine. All other medicines cost 100 CFA or less, except ampicillin (374 CFA), which was prescribed in only eight cases.

Table 4 Unit Cost and Prescription Frequency of Medicines

Type of Medicine	Unit Cost (CFAs)	Number of Prescriptions[1]
Antibiotics		
Ampicillin	374.0	8
Cotrimoxazole	33.8	107
Penicillin	62.0	1
Other	na[2]	2
Quinine	22.1	74
Choloroquine	20.0	167
Aspirin	14.3	159
Vitamin A	37.8	103
Oral rehydration solution (ORS)	100.0	90
Iron	25.3	69
Ringer's IV Solution	970.0	50

Notes: (1) Total sample = 211. (2) "na" = not available

As noted in the Methods section, drug costs were divided into two distinct groups: a high-cost group (47 cases), where every case included Ringer's Solution and most of the other medicines, and a low-cost group (164 cases). In the high-cost group, 46 cases were prescribed a dose of every medicine except antibiotics, and the 47th case prescribed a dose of every non-antibiotic medicine plus ampicillin. For all 211 cases, the average cost per case for pharmaceutical products (including antibiotics, aspirin, ORS, etc.) was 365.2 CFA ($.66).[6] When the 47 high-cost cases are dropped, the average cost is only 126.7 CFA ($.23) among the remaining 164 cases.

The distinctness of the two distributions is apparent by considering their means and standard deviations. The high-cost group (47 cases) has a mean cost of 1197.4 CFA and a standard deviation of 54.5, while the low-cost group (164 cases) has a mean cost of 126.7 CFA and a standard deviation of 160.6. The total drug cost for all 47 high-cost cases (56,278 CFA) is much larger than the total drug cost of all 164 low-cost cases (20,779 CFA). Due to the dominance of, and lack of variation in, the high-cost cases, and the unexplained nature[7] of the prescribing behavior in the high-cost cases, we have analyzed the data for not only all 211 cases but also the 164 low-cost cases.

C. Drug Costs and IMCI Compliance

When we analyzed the relationship of compliance and total drug cost without accounting for co-variates, we found little or no relationship. This was true for both assessment and treatment compliance, for the entire sample of 211, and for the low-cost sample. The association between counseling compliance and drug cost was not analyzed.

In the large data set (n=208; data were missing for 3 of the 211 cases), average total drug cost for the 162 cases in treatment compliance was 380.5 CFA, compared to 331.5 CFA for the 46 cases not in compliance (p=0.53, 2-tailed t-test assuming equal variances). In the low-cost data set (n=161), average total drug cost for the 124 cases in compliance was 132.6 CFA, compared to 112.7 CFA for the 37 noncompliant cases (p=0.51, 2-tailed t-test assuming equal variances). This

[6] Exchange rate $1 = 550 CFA

[7] The 47 high-cost cases were apparently considered to be seriously at risk and in need of Ringer's IV Solution, but we do not have sufficient information to fully understand these cases.

shows that the average cost of medicine is about 15 percent higher in cases that complied with IMCI treatment guidelines than in those that did not, but this difference is far from significant. The results for assessment compliance are similar.

To determine if a significant relationship existed between treatment compliance and drug costs for a particular diagnosis, a regression analysis with interactive terms was completed for the smaller sample (n=164). No relationship was found between treatment compliance and drug cost for patients diagnosed with diarrhea, malaria, pneumonia, or cough.

We examined a range of other factors and their relationship with drug costs, including: (a) severity of case, (b) diagnosis, (d) caretaker's complaint(s), (d) whether they were given a drug or just prescribed a drug, and (e) getting an injection or not. The results, summarized in Table 5, should be viewed with caution because interactive effects among these many variables were not analyzed and because of the strong effects of the 47 high-cost cases that were included in the analysis.

Table 5 Other Significant Factors in Determining Cost of Care

Factor	Finding
Severity	The more serious the case, as defined by the number of danger signs found per child according to the IMCI standard, the more was spent on drugs ($p<0.031$).
Diagnosis	Diagnosis seems to make a difference. Certain diagnoses had significantly higher costs, including diarrhea, dehydration, and malnutrition ($p<0.005$). Other diagnoses had significantly lower costs, including cough, malaria, and dysentery ($p<0.005$). Using or not using expensive Ringer's IV Solution was a key factor in these results.
Original client complaint	Costs varied according to the number and type complaint (i.e. fever, cough, diarrhea or earache) that the caretaker presented to the provider when arriving with the child. As expected, those arriving with more complaints had higher drug costs. (Pearson correlation coefficient $r = 0.36$ and $p=.000$, for n=164.)
Drugs vs. prescriptions	Whether a child and the caretaker received drugs at the clinic or were given a prescription to obtain drugs at a local pharmacy was a significant factor in overall drug costs. While the official policy in Niger at the time of the research endorsed cost recovery to help ensure the availability of drugs at the health center level, drug availability at the centers was not always ensured. Cases where prescriptions were given had higher overall drug costs than those where drugs were provided at the health center ($p<0.005$).
Use of injections	Receiving an injection or IV therapy (e.g., quinine for severe malaria, intramuscular antibiotic for severe pneumonia, Ringer's IV Solution) was significantly associated with higher overall drug costs ($p<0.005$).

D. Relationships between Time and Compliance

Health workers averaged 14 minutes to complete a client-provider interaction using IMCI, with a 95 percent confidence interval for this average time extending from 12.86 to 15.14 minutes. This average is consistent with the literature and is even slightly above some figures for average time seen in other African contexts of IMCI implementation (Kolstad et al. 1998). The overall index of compliance was used in order to assess the relationship with the client-provider interaction time. While the average duration of the interaction is slightly longer when the provider complies with IMCI, the difference is not significant. Correlation analysis yields a Pearson correlation coefficient (r) of only -0.004, which is not significant ($p = .959$).

This analysis can be extended to the relationship between education level and the duration of consultations for health workers in different categories. As expected, health workers with less training (ICs) took slightly longer with IMCI (15 minutes) than health workers with more training (IDEs and TSSIs), who averaged 13 minutes (Table 6). However, an analysis of variance shows that the two-minute difference is not significant (p = .905).

Table 6 Average Consultation Duration by Health Worker Category

Health Worker Category	Mean Consultation Duration (Minutes)
IC	15
IDE	13
TSSI	13
Total	14

This analysis does not reflect the experience level of health workers. Such an analysis would have compared a health worker's years of experience with the duration of consultations. This analysis may be useful in the future: we observed that the number of years of experience varies considerably within each health category but did not collect data on years of experience for this study.

E. An Alternative Hypothesis: Workload and Compliance Levels

We can also explore an alternative hypothesis: that health workers with more time "available" (because of lower workloads) will be more compliant with IMCI. In order to analyze this, average daily case loads were calculated for each health center in the study during the study time frame. Utilization data were obtained for each health center. Compliance levels were then calculated for these health centers, and each health center was classified as above or below the average utilization level (26 patients per day) and above or below the average overall compliance level (47 percent overall compliance). We constructed a two-by-two table (Table 7) and calculated a Fisher's exact test (one cell contained only one observation, which would make a Chi-square calculation inaccurate). The Fisher's exact test showed no significant relationship between workload and compliance (p = 0.62, two-tailed).

Table 7 Relationship between Workload and Compliance

		Number of Health Centers		
		Average Overall Compliance		
		Less than 47%	47% or More	Total
Average daily patient load	Under 26 patients	5	12	17
	26 or more patients	1	7	8
	Total	6	19	25

Note: Each cell contains the number of health centers. Fisher's exact test showed no significant relationship between workload and compliance.

V. Discussion

By examining the relationship between compliance and the cost of care (including both drug and time costs), this study attempts to examine the impact of IMCI on these two aspects of healthcare delivery in a developing country setting. Research reviewed in the Background section suggests that using IMCI can significantly increase the time required to care for the child while reducing drug costs. This section discusses the implications of the findings in this study that do not support the earlier research.

A. Impact of Compliance on Drug Costs

No relationship was found between IMCI compliance and total drug costs in this data set, even within specific diagnoses. This study counters previous reports finding that increased IMCI compliance resulted in lower drug costs (Amin et al. 1998; Kolstad et al. 1998). We believe that deeper analysis is called for to determine the conditions under which increased compliance does and does not reduce drug costs.

However, this study found that drug costs were related to other factors, especially diagnosis. Somewhat surprisingly, diarrhea, dehydration, and malnutrition had higher drug costs than malaria and pneumonia. The reason is that drugs used to treat these three conditions, especially ORS and Ringer's IV Solution, cost much more in this setting than many of the antibiotics (quinine, chloroquine, and cotrimoxazole) used to treat infectious diseases. Logical links exist between the severity of the child's illness and higher drug costs and between the use of an injection and higher drug costs.

It is puzzling, and perhaps disturbing, that drugs costs vary depending on whether or not the client was specific with the complaint. Under normal circumstances, we would expect that providers prescribing practices would vary according to the actual presence or absence of illness, as determined by their assessment. Also troubling, although not unexpected, is the relationship between drug costs and the source of the medicine: drugs cost more when purchased at the local pharmacy than at the health center. Possible reasons for this include: (a) the more expensive drugs called for by IMCI in Niger are in short supply and therefore frequently unavailable at health centers, despite cost recovery and stock management efforts, and (b) the connection could be at the prescribing practice level, where more expensive drugs tend to be given as prescriptions irrespective of their availability at health centers.

These findings must be viewed with care because of several assumptions made in the analysis. First, only the names of the prescribed medicines were obtained from the patient records for each case: the prescribed dosage and amount paid were not obtained. Instead, the dose was assumed to equal that recommended by IMCI, and the standard per unit cost used by the Ministry of Health was assumed to apply for all drug purchases. Thus, of the three factors for calculating the drug cost for a case (type of drug, dose, and cost per dose), only one was actually measured for each case. Second, the high cost and frequent use of Ringer's IV Solution in combination with all other medicines except antibiotics raises concerns, even though the results were the same with and without these cases.

B. Compliance, Interaction Time, and Workload

No significant relationship was found between compliance and client-provider interaction time in the data set, although interaction time was slightly longer when providers complied with IMCI than when they did not. Previous studies report that compliance is associated with a significantly longer time (Burnham 1997; Kolstad et al. 1998).

Similarly, no relationship was found between average compliance at a clinic and average workload at the clinic. However, the small sample size limited our ability to identify statistically significant relationships.

C. Client Costs and IMCI Compliance

Finally, one area that this study did not attempt to specifically explore is the impact that IMCI has on clients and on costs to clients. While analyzing how changes in average consultation time influences clients' opportunity costs is a possible area for research, the difficulty of making

reasonable assumptions about the value of clients' time and how waiting time is valued in different settings makes this research problematic. More straightforward is the relationship between IMCI referral standards and clients' costs. A strength of the IMCI protocol, according to the design of WHO, is the clear set of rules within the algorithm on when to refer sick children to a higher level of care. From personal observations in Niger, these rules of referral are rarely followed. When asked, providers frequently respond with the difficulties associated with clients' following referral instructions, including returning home (possibly several hours' walk or an expensive bush taxi ride), discussing the situation with the spouse (usually the husband), collecting food for the trip and the stay at the referral facility, and making another taxi ride to the referral site (also possibly several hours away.) When interviewed, 72 percent of providers stated that they had had a situation that warranted not referring a child, even though his or her clinical state indicated referral. Providers often prefer to keep a child who is not deathly ill at the health center under observation until it is very clear that there is no improvement in the child's health. Reasons given by providers include: parents' lack of money (24 percent of responses), the lack of transportation (16 percent), and parents' refusal to go (14 percent). This results in major discrepancies between the number of children who should be referred (according to standards) and those who are. For instance, the data indicate that in June 1998, only 15 percent of children (4 of 22) who should have been referred actually were. In December 1998, this percentage was even lower: 8.6 percent (6 out of 64 children).

In that this analysis was clearly not the focus of the investigation and cost recovery was only in place for the final data collection, data were collected on complete client costs (transport, charges, and other costs) only for the December 1998 data collection. However, even if we compare only transport charges, which were collected on three dates, it appears that average client transportation costs increased from 35.95 CFA in October 1997 ($ .07) to 304.41 CFA in June 1998 ($ .55) to 421.86 CFA in December 1998 ($ .76). This is an increase of over 91 percent in 14 months, a period when inflation was approximately 3.4 percent (UEMOA, 2002). In addition, in December 1998, when measurements were taken of total client costs, including charges and other costs such as food and drinks, average client costs were 916.24 CFA or $ 1.67 per visit: a third of per capita weekly income.

It seems that referral patterns with IMCI do not influence overall client costs. However, it is extremely difficult to draw conclusions about this issue because of low referral rates and the need for more complete data on client costs. The impact of encouraging compliance with IMCI's referral standards is likely to be problematic in Niger. Research should measure the impact of referrals on households. In this preliminary analysis, the percentage of cases referred dropped from 3.5 percent (4 of 113) in June 1998 to 0.5 percent (6 of 211) in December 1998.

This report sheds light on a number of key IMCI implementation issues. To date, there has been a fair amount of research on IMCI and its ability inform health providers to correctly assess, diagnose, and treat sick children. While IMCI itself is based on a substantial body of research about the sensitivity and specificity of the criteria, far less research has been done on how IMCI affects health workers and how health workers perform with the algorithm.

References

Amin, S., A.H. Baqui, S. Manaf, and Z. Quayyum. 1998. Reducing drug costs through rationalization of diarrhoea and ARI case management. Presentation at the Annual Conference of the National Council on International Health (NCIH), Arlington, VA.

Burnham, G. 1997. Trip report from a consultancy carried out on behalf of BASICS-Zambia (August 10–23). BASICS: Arlington, VA.

Donabedian, A. 1982. *Explorations in Quality Assessment and Monitoring, Vol. 1: The Definition of Quality and Approaches to Its Assessment.* Ann Arbor, MI: Health Administration Press.

Heiby, J. 1998. Quality improvement and the Integrated Management of Childhood Illness: Lessons from developed countries. *Joint Commission Journal on Quality Improvement* 24(5): 264–79.

Kelley, E. 1998. Quality Assurance Project Trip Report: IMCI Operations Research Implementation (December). Bethesda, MD: Quality Assurance Project.

Kelley, E., Djibrin, S., Boucar, M., and Geslin, C. 2001. Improving performance with clinical standards: The impact of feedback on compliance with the Integrated Management of Childhood Illness algorithm in Niger, West Africa. *International Journal of Health Planning and Management* 16:195–205.

Kelley, E., Geslin. C., Djibrin, S., and Boucar, M. 2000. The impact of QA methods on comliance with Integrated Management of Childhood Illness algorithm in Niger. *Operations Research Results* 1(2). Bethesda, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.

Kolstad, P.R., G. Burnham, H. Kalter, N. Kenya-Mugisha, and R. Black. 1998. Potential implications of the Integrated Management of Childhood Illness (IMCI) for hospital referral and pharmaceutical usage in western Uganda. *Tropical Medicine and International Health* 3(9):691–99.

Marquez, L. 2001. Helping healthcare providers perform according to standards. *Operations Research Issue Paper* 2(3). Bethesda, MD: Published for the U.S. Agency for International Development (USAID) by the Quality Assurance Project.

Mills, A., J. Kapalamula, and S. Chisimbi. 1993. The cost of the district hospital: A cost study in Malawi. *Bulletin of the World Health Organization* 71:329–39.

Sheps, M.C. 1955. Approaches to the quality of hospital care. *Public Health Reports* 9:877–86.

Tavrow, P., and L. Malianga. 1997. Quality Assurance Project II Trip Report: November 1997. Bethesda, MD: The Quality Assurance Project.

UEMOA (Union Économique et Monétaire Ouest Africaine.) 2002. Internet archives available from: http://www.izf.net/ izf/Institutions/Situation/AfriqueOuest/archivesihpc/ ihpcdec98.htm.

UNICEF. 1998. The State of the World's Children, 1998. New York: Oxford University Press.

Wilson, N., and D. Nicholas. 1999. Standards and Monitoring. Bethesda, MD: University Research Corporation.