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The effect of physician training on treatment of respiratory infections: evidence from rural Egypt*

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Abstract

A three-round survey of child mortality, morbidity and treatment conducted in rural lower Egypt in 1990-91 found relatively poor treatment practices for respiratory infections. Only about 56 per cent of children with a respiratory infection received appropriate treatment. Antibiotics were prescribed for more than half of all mild coughs and colds, but were not prescribed for a quarter or more of serious cases. A training program for government physicians conducted midway through the survey improved treatment practice slightly in government facilities. However, training alone is unlikely to improve treatment much. Better supervision, and information campaigns focused directly on mothers, are suggested as necessary components of a successful project.

Introduction

Acute respiratory infections (ARI) kill large numbers of young children in developing countries. UNICEF (1993) estimates that 3.6 million children under age five died worldwide of respiratory infections in 1990. The World Bank (1993) estimates that 18 per cent of the entire burden of disease of children under five in developing countries, with the loss of some 93 million disability-adjusted years of healthy life, resulted from respiratory infections. The great majority of the life-threatening respiratory infections are bacterial in origin, and respond readily to timely treatment with antibiotics. The recommended intervention in low-income settings for combating life-threatening ARI is early case identification by health providers, and early treatment with antibiotics following standard case management (SCM) protocols.

A recent meta-analysis of several field trials of the case management approach to treatment of pneumonia concludes that this strategy can have a substantial effect on infant and child mortality, at least in settings where infant mortality rates are relatively high (Sazawal and Black 1992). Extrapolating from such results to population-based interventions whose primary activity is training of primary health care workers in SCM assumes that health care personnel use correctly the training they are given, both in accurately diagnosing the illness, and in properly treating the sick child. Appropriate treatment involves use of an antibiotic in all cases of suspected pneumonia, often in combination with an antipyretic. Antibiotics are also appropriate for some upper respiratory infections, such as streptococcal

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pharyngitis or otitis media. However, antibiotics should not be used for uncomplicated coughs which are primarily viral in origin.

ARI case management in the Egypt Child Survival Project

Combating acute respiratory infections in children was one of the main components of the Egypt Child Survival Program (CSP), activities of which began in earnest in 1990 (Bermawy et al. 1992). The objectives set for the ARI component were: to reduce mortality from ARI, in particular pneumonia; to reduce the severity and complications of ARI; to reduce inappropriate use of antibiotics and other drugs; and to reduce the incidence of ARI, in particular pneumonia (CSP 1994)[1]. To accomplish the first three goals, the ARI program has used a single strategy of training Ministry of Health primary care physicians and nurses in 'standard case management' (SCM).

This paper examines mothers' reports of case management of respiratory infection in a rural area of Egypt. Fortuitously, training of some health workers in ARI- SCM in this area took place during the course of field work. This training consisted of a two-day course of instruction for primary health care physicians in government clinics and hospitals in the governorate.

The training in SCM consisted of teaching physicians to evaluate signs and symptoms in a specific order so as to be able to categorize children correctly as having very severe disease, severe pneumonia, pneumonia, or no pneumonia: that is, simple cough and cold. Once the child has been correctly categorized, the physician must prescribe appropriate treatment. This includes antibiotics for all severe disease and pneumonia. For simple coughs and colds, no antibiotic should be given; the child should receive only home care. Home care includes keeping the child warm, providing adequate nutrition, increasing the intake of liquids, soothing the throat (preferably with traditional liquids), and watching for any change that would require a return visit to the physician (CSP 1990). The training was exclusively didactic. There were no clinic based exercises.

The data indicate that the program's efforts have had some positive effect, but have made little progress in reducing inappropriate use of antibiotics. The results of the informational and training efforts of another national child health program in Egypt, the recently completed National Control of Diarrheal Diseases Project, provide some interesting parallels with, and useful lessons for, the ARI program.

The Child Survival in Rural Egypt Study 1990-91

The Child Survival in Rural Egypt Study (CSRES) was conducted from 1990 to 1991 to measure childhood mortality and to explore factors associated with differentials and changes therein in a sample of twelve rural villages in Menoufia governorate. Menoufia is regarded as being broadly similar to most other parts of rural Lower Egypt, so the results of the survey are likely to be representative of the 25 million inhabitants of this area (Langsten and Hill, forthcoming a). The twelve villages were chosen for CSRES because they had been randomly selected for an earlier prospective survey conducted from 1979 to 1983. The intention of the earlier survey was to evaluate an integrated social services delivery project implemented throughout Menoufia governorate from 1979 to 1983 (Gadalla et al. 1983).

CSRES itself was a three-round prospective study, with rounds spaced at approximately six-month intervals. The survey covered the entire population of the twelve villages, amounting in the first round to nearly 9,900 households, almost 58,000 people, and more than

[1] The fourth objective had received no programmatic input at the time this research was conducted, and has received relatively little attention since then.

8,600 ever-married women 15-49 years of age. Questionnaires focusing on morbidity and treatment were completed for all children currently under five years of age at each round. In the first round there were just over 8,600 such children. Children passing age five between rounds, and out-migrants, were dropped from subsequent data collection. New births and in-migrants under five were added to the pool of eligible respondents. Thus just over 8,900 children were included in the second round and slightly more than 8,700 children in the third round, for a total of just over 26,200 questionnaires completed for children under five. A total of 10,300 children are represented, some with questionnaires completed in all three rounds, some in just one. Refusals to co-operate were extremely rare: fewer than ten during the first round, and fewer than ten more dropped out during the remainder of the work. Details of the study design, and an overview of results are available in Langsten and Hill (1991, 1992).

Of particular relevance here is the monitoring of respiratory infections. At each round the mother or carer of each child was asked whether the child had suffered from any respiratory infection during the two weeks before the interview, and, if so, what health care was sought and what treatments used. This paper examines treatment of 5005 episodes of respiratory infection reported at rounds 1, 2, and 3 of CSRES in children under five, considering sources of care, treatments used, and how the source of care affects treatment. Comparison of data from the first and third survey rounds permits evaluation of the impact of the training that took place at the same time as the second round. Finally, this same data set is used to compare respiratory infection treatment with diarrhoeal disease treatment (Langsten and Hill forthcoming a). There are substantial similarities in the training given and the patterns of treatment for the two diseases: lessons about the effectiveness of physician training emerge from these similarities.

Results

Throughout the analysis that follows we have controlled for the severity of each episode of respiratory infection by differentiating between those cases where the mother reported that the child had only a cough, and those where the child's cough was reported to be complicated by fast or difficult breathing[2]. This division of cases is not entirely satisfactory. Ordinarily, fast or difficult breathing would suggest very serious illness; yet 48 per cent of all cases were reported to have these complications. It appears that these symptoms of serious illness were considerably over-reported by mothers. However, this is the only indicator of severity that is available for all three rounds of data collection: therefore, it is necessary to use it for the analysis.

Before continuing with the analysis it is useful to examine this indicator of severity, complicated cough, in greater detail: the first concern is that it substantially overstates the number of children who are seriously ill. In the third round of data collection we added a number of additional indicators of severity of respiratory infection to the questionnaire. These were: the mother's report of the presence of wheezing and of chest indrawing; of whether the child was listless, or not; and finally, of whether the child's illness was severe or mild. All of these indicators yield a substantially lower proportion of children who would be considered to have serious illness: between 19 and 31 per cent. Nonetheless, the indicator of severity, 'cough only' versus 'cough complicated by fast or difficult breathing' is highly correlated with all of these other indicators. Therefore, though the 'not complicated/complicated' variable overstates the number of serious cases, and this

[2] From 1990 to mid-1991, the SCM courses lasted for two days, and were exclusively didactic. The length of the courses was increased to three days in mid-1991, and to four days in early 1994, to provide time for clinic-based exercises.

overstatement must be considered in the discussion of results below, it is a useful indicator of severity.

Table 1 a
Source of care for respiratory infection[a] by presence of complications, 12 Menoufia villages, 1990-91 (percentages)

	Complicated[b]		
	No	**Yes**	**Total**
Of those seeking care:			
Govt clinic only	15.2	15.8	15.5
Private doctor only	43.1	53.6	48.8
Pharmacy only	20.7	22.3	21.5
Mix of sources	0.5	0.8	0.7
Other	20.5	7.6	13.5
Total	100.0	100.0	100.0
Seeking care	63.8	83.4	73.2
Not seeking care	36.2	16.6	26.8
N	2616	2389	5005

Table 1 b
Source of care for respiratory infection[a] by education, 12 Menoufia villages, 1990-91 (percentages)

	Complicated[b]							
	No				**Yes**			
Educational level:	None	Some Prim	Prim Com Prep	Sec+	None	Some Prim	Prim Com Prep	Sec+
Of those seeking care:								
Govt clinic only	16.4	12.7	23.7	10.9	17.2	14.9	13.9	12.3
Private doctor only	39.3	45.1	38.9	54.3	50.9	55.4	60.2	57.9
Pharmacy only	21.3	18.5	17.6	22.5	23.2	21.1	18.1	22.3
Mix of sources	0.3	0.3	1.5	0.6	1.0	0.6	1.2	0.0
Other	22.6	23.5	18.3	11.6	7.6	8.0	6.6	7.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Seeking care	62.1	63.5	68.9	67.2	81.2	84.5	85.1	87.3
Not seeking care	37.9	36.5	31.1	32.8	18.8	15.5	14.9	12.7
N	1450	510	190	463	1426	414	195	354

[a] In the two weeks preceding each round.
[b] Complicated: No = cough or cold only. Yes = cough or cold complicated by fast or difficult breathing. All three rounds are included.

Another concern is that all these indicators are based on the mother's report, which may differ substantially from the evaluation of the physician examining the child. Certainly, as noted immediately above, mothers overstate the degree that children are suffering from complications of fast or difficult breathing. The more important question is whether the overstatement is affected by the mothers' characteristics in a way that might influence other results. For example, is the accuracy of mothers' reports affected by their educational attainment? Briefly, we do not believe that the mothers' reports are biased in any way that substantively affects the analysis. Throughout the analysis the influence of mother's education is taken into consideration.

The following analysis also differentiates between children treated by physicians at government clinics and hospitals, and by physicians in private practice. This is an important distinction because it is clear in the data and from other studies that doctors in government clinics prescribe differently from those working in private practice. The irony in this situation is that private physicians are, for the most part, the same people as public physicians, but at different times of the day. The exact degree of overlap between public and private doctors is not known. There is, however, general agreement that almost all government physicians have a private practice. The more important question from the point of view of this work is: what proportion of private physicians work in the government sector? This is a critical issue because public physicians receive training in SCM and demonstrate better prescribing behaviour than private doctors. If it can be assumed that most private physicians also work in the public sector, then it can be more confidently asserted that the private physicians have been trained and that physicians actually change their behaviour from one time of the day to another. Unfortunately, there are no concrete data on this question, but most people agree that many private physicians also work in government facilities; whether this means 70 per cent or 90 per cent cannot be specified. The overlap between government and private physicians is discussed at greater length below.

The pattern of sources of care used is very similar to those found in other studies in Egypt, regardless of region or disease (Table 1, top panel). Overall, private physicians are preferred for treatment, with almost half the sick children who go for any treatment being taken to them. Only about 15 per cent of the treated children are taken to government health clinics; even pharmacies are more frequently used sources of care than government clinics. Moreover, when the illness is viewed as serious, the use of private physicians increases substantially, while use of other formal sources of care remains largely unchanged.

There are educational differences in choice of practitioner (Table 1, bottom panel). Among those with simple cough and cold, the better educated are the least likely to get no care or care from other, often informal, sources, and the most likely to go to a private physician. Conversely those with no education are the most likely to get no care or care from other sources. The pattern of differences is similar but the degree of the differences greatly attenuated when the respiratory infection is complicated by fast or difficult breathing.

The effect of education on source of care is further reduced when other background characteristics are controlled (Table 2) using multivariate techniques. Multinomial logistic regression has been used to evaluate the determinants of the sources of care because few cases report using more than one source. The only strongly significant educational effect is that those with no education are less likely than all others to get care from a private physician, but only when the seriousness of the illness has been controlled. Those with some primary education are more likely to use informal sources such as traditional practitioners, friends and relatives, while those with primary complete or preparatory education are more likely to use government health facilities. Other variables also have some effects on source of care used. Males are more likely than females to be taken to private physicians; children in the youngest and oldest age groups are less likely than those in the middle groups to go to government

clinics and pharmacies; the poor and middle wealth groups are less likely to go to a private physician than to other sources or to no source of care.

Overall, the variable with the strongest effect on source of care used is the complications variable. Those whose infection is complicated by fast or difficult breathing are more likely to use each of the formal sources of care. Among these formal sources, private physicians are the most preferred, followed by pharmacies, and then government clinics.

Table 2
Multinomial logit models of likelihood of visiting a source of medical care: 12 Menoufia villages, 1990-91

	Dependent variable categories [a]							
Predictor variables	**Model 1**				**Model 2**			
	1	2	3	4	1	2	3	4
Mother's education								
none	.12	-.22	-.15	.31	.04	-.32**	-.23	.30
prim inc.	.00	-.12	-.29	.43*	-.03	-.17	-.32	.43*
prim. comp./prep	.48*	-.02	-.23	.29	.40	-.13	-.32	.29
secondary/more	-	-	-	-	-	-	-	-
Age of mother								
<25 yrs	-.06	-.11	-.09	.02	-.04	-.08	-.07	.02
25-34 yrs	-.13	-.07	.06	.07	-.13	-.07	.06	.07
35+ yrs	-	-	-	-	-	-	-	-
Child's sex								
male	.07	.21**	.13	-.02	.05	.18*	.10	-.02
female	-	-	-	-	-	-	-	-
Child's age								
[2]1 months	-1.88**	-.63	-1.23*	.01	-1.88*	-.62	-1.22*	.02
2-5 months	-.41	.11	-.69**	.11	-.36	.16	-.64**	.11
6-11 months	-.17	.22	-.34	-.06	-.14	.25	-.31	-.05
12-17 months	-.32	.14	-.22	-.03	-.30	.16	-.20	-.03
18-23 months	-.50*	-.13	-.44*	-.17	-.48*	-.11	-.42*	-.17
24-35 months	-.49**	-.10	-.28*	-.33*	-.47**	-.07	-.26*	-.33*
36-59 months	-	-	-	-	-	-	-	-
Wealth								
Poor	.24	-.41**	-.26	-.19	.20	-.46**	-.29	-.20
middle	.18	-.31**	-.02	-.16	.15	-.36**	-.05	-.17
well off	-	-	-	-	-	-	-	-
Hours/day of television watched								
none or little	-.16	.17	-.17	.18	-.08	.27	-.08	.20
2 or 3 hours	-.15	.08	-.15	.20	-.04	.21	-.04	.21
4 hours or more	-	-	-	-	-	-	-	-
Complicated respiratory infection								
yes	-	-	-	-	1.05**	1.32**	1.11**	.08

no	-	-	-	-	-	-	-	-
Constant	-.71**	-.57**	.00	-1.25**	-1.16**	-.02	-.47*	-1.27**

Level of Significance: ** Pr. < .01, * Pr. < .05

[a]1. Government health facility
2. Private doctor
3. Pharmacy
4. Other (Traditional practitioners, friends, neighbours, etc.)

When we analyse the treatments the child has received we rely on the mother's report of the type of medicine prescribed by the practitioner. It is widely believed among medical researchers that the terms used in Egypt for each type of medicine, and most importantly for antibiotics, are well understood by most mothers, but we have no way of verifying this belief.

Table 3 a
Treatment of respiratory infection[a] by presence of complications, 12 Menoufia villages, 1990-91 (percentages)

	Complicated[b]		
	No	**Yes**	**Total**
Of those treated			
Used cough syrup	96.3	97.0	96.6
Used cough syrup only	55.2	36.0	45.3
Used antibiotics	39.1	52.9	46.2
Used antibiotics only	0.5	0.4	0.5
Total	100.0	100.0	100.0
Treated	77.2	89.9	83.3
Not treated	22.8	10.1	16.7
N	2592	2376	4968

[a] In the two weeks preceding each round.

[b] Complicated: No = cough or cold only. Yes = cough or cold complicated by fast or difficult breathing. All three rounds are included.

Table 3 b
Source of care for respiratory infection[a] by education, 12 Menoufia villages, 1990-91 (percentages)

	Complicated[b]							
	No				**Yes**			
Educational level:	None	Some Prim	Prim Com/ Prep	Sec+	None	Some Prim	Prim Com/ Prep	Sec+
Of those treated:								
Used cough syrup	95.8	97.4	96.0	96.5	96.5	97.0	97.7	98.2
Used cough syrup only	57.9	56.1	41.7	52.0	38.0	32.9	32.0	34.3
Used antibiotics	35.7	38.7	51.7	44.0	49.8	58.8	55.2	56.9
Used antibiotics only	0.6	0.0	0.0	1.3	0.6	0.5	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Treated	74.6	75.1	80.7	86.1	88.2	89.6	89.6	97.2
Not treated	25.4	24.9	19.3	13.9	11.8	10.4	10.4	2.8
N	1434	506	187	462	1419	414	192	351

[a] In the two weeks preceding each round.

[b] Complicated: No = cough or cold only. Yes = cough or cold complicated by fast or difficult breathing. All three rounds are included.

Virtually every child (96 per cent or more) suffering from respiratory infection who received any medicine at all received cough syrup (Table 3, top panel), irrespective of the severity of the illness. Antibiotics were also widely used, being prescribed for 46 per cent of the children, almost always in combination with cough syrup, and often with some other medicine. Although antibiotics were more commonly used among those who were reported to have complications, they were given to almost 40 per cent of children with only a cough. More than 20 per cent of children were given other medicines: presumably antipyretics, antihistamines, expectorants, and the like; other research has identified an extensive list of medications given to children with ARI (Harrison and Abashawl 1992). A high proportion of the children given other medicines were also given both antibiotics and cough syrup.

The differences in treatment by education are relatively small (Table 3, bottom panel). Those with no education are the least likely to receive antibiotics, whether or not the child's cough was accompanied by complications.

The CSP recommends that children with a cough be given cough syrup ; thus the almost universal use of cough syrups is consistent with recommended practice. Use of other medicines may be appropriate for treating fever or other symptoms, but we do not have adequately precise information about each case to evaluate the appropriateness of such use. Only for antibiotics can we approximate an assessment of whether treatment is appropriate or not. Therefore, the remainder of this paper focuses on use of antibiotics, though occasional mention is made of cough syrup and other medicines.

In the following discussion it is assumed that children with complications should be treated with antibiotics. This is not strictly true, especially for our data set, since the level of complications is clearly overstated. We can say with greater confidence that children whose respiratory infection is described as not complicated should *not* receive antibiotics. Appropriate treatment therefore is the sum of the 'not complicated' cases *not* given antibiotics plus the 'complicated' cases *given* antibiotics, whereas 'inappropriate' treatment is the sum of the complicated cases *not* given antibiotics and the not complicated cases *given* antibiotics.

Table 4
Treatment of respiratory infection and percentage of children 'appropriately' treated by presence of complications and source of care, 12 Menoufia villages, 1990-91.

	Govt health facility		Private doctor	
	Complicated[a]		Complicated[a]	
Treatment	**No**	**Yes**	**No**	**Yes**
Used cough syrup	96.9	96.9	98.1	98.8
Used cough syrup only	44.6	27.6	21.2	13.0
Used antibiotics	50.0	63.0	73.2	74.7
Used antibiotics only	1.2	0.6	0.3	0.1

'Appropriately' treated [b]	57.2		55.4	
N	258	319	721	1073

[a]Complicated: No = cough or cold only. Yes = cough or cold complicated by fast or difficult breathing. All three rounds are included.

[b] 'Appropriate' treatment: No antibiotics for an uncomplicated or mild case; Antibiotics for a complicated or severe case.

The overall pattern of treatment is similar regardless of type of practitioner, particularly the universal use of cough syrup. Despite similarities, however, private physicians are far more likely than government doctors to prescribe antibiotics, with the excess use of antibiotics concentrated in uncomplicated cases (Table 4). Private physicians are also more likely to prescribe other medicines, generally in combination with cough syrup or antibiotics.

Despite private physicians' greater use of antibiotics for uncomplicated cases, there is little difference between government and private doctors in the percentage of all cases treated appropriately (57.2 and 55.4 per cent). The private physicians' greater use of antibiotics for mild cases is balanced by the lower use of antibiotics for complicated cases in government clinics. The estimates of level of appropriate treatment are distorted by the overstatement of complicated cases, and the tendency of mothers of children who are more seriously ill to prefer care from private doctors. Nevertheless, consideration of antibiotic use by children without complications clearly indicates that too many antibiotics are being used by all physicians, though particularly by those in the private sector.

In summary, at least 45 per cent of those who go to private doctors receive inappropriate treatment. Even at government clinics the proportion of cases not treated correctly is very high. Of greatest concern is the level of failure to treat serious cases with antibiotics, since such failure may be life threatening. Government health facilities failed to treat 37 per cent of complicated cases with antibiotics, the comparable figure for private physicians being 25 per cent. This may exaggerate the actual risk to life, however, since many of the 'complicated' cases result solely from overstatement of the level of fast or difficult breathing.

Comparing the treatment practices of each source of care during the first round of data collection (before training in SCM) with those of the same source during the third round (after training) gives a rough indication of the impact of the training that took place during the second round (Table 5). At government clinics, in the third round, slightly fewer children without complications were treated with antibiotics, while somewhat more children with complications received antibiotics than in the first round. As a result the percentage of children appropriately treated increased from 59 per cent in round 1 to 65 per cent in round 3. This change is not statistically significant, but it is fairly large, and in the right direction.

Among children treated by private physicians, however, use of antibiotics was unrelated to the severity of the illness in both rounds, though use did increase between rounds. Private physicians gave appropriate treatment to 53 per cent of children in round 1 and 55 per cent in round 3. The slight increase in appropriate treatment is caused by the preference for private physicians among mothers of children who are most seriously ill, combined with the tendency of private physicians to prescribe antibiotics for the vast majority of all children suffering from ARI.

The determinants of the type of treatment chosen have been analysed in greater detail using multivariate techniques. Dichotomous logistic regression has been used to evaluate the determinants of each treatment because there is a great deal of overlap in treatments. Four models were fitted to each treatment. The first two are: (1) background characteristics only, and (2) background characteristics plus perceived severity of the illness. The third model

adds the source of care to model 2. The fourth model specifically tests the impact of CSP training activities, dropping all observations from round 2 and adding a dummy variable marking round 3, plus a series of interactions of round 3 with source of care and episode complications.

The results for all types of treatment are similar. To simplify the presentation, only the results for antibiotics are presented and discussed (Table 6). The risk factors for use of antibiotics include a consistent and fairly strong impact of sex of the child, with males more likely to receive medication. Young children, and those whose mothers have little education, are the least likely to receive antibiotics, though the effect for age of child is not statistically significant. Wealth, based on an index computed from household assets, has only small effects, and seems to work through seeking health care in the first place rather than through treatment obtained (models 3 and 4). Breathing complications, the key indicator of need for antibiotics, increase the likelihood of their use, but only to a modest degree. Source of care is, by far, the most significant risk factor for use of antibiotics. Children taken to either a government clinic or a private doctor are much more likely to receive antibiotics than those who are taken to neither: compared to the latter children the odds of getting antibiotics are about eight to ten times higher among those treated at government clinics and these odds are approximately doubled again for those taken to a private doctor.

Table 5.
Treatment of respiratory infection and percentage of children 'appropriately' treated by symptoms, source of care, and round of data collection, 12 Menoufia villages, 1990-91.

Treatment from government health facility				
	Round 1		**Round 3**	
	Complicated[a]		**Complicated[a]**	
Treatment	**No**	**Yes**	**No**	**Yes**
Used cough syrup	96.2	96.6	100.0	100.0
Used cough syrup only	47.2	26.2	59.7	27.0
Used antibiotics	43.4	60.4	40.3	69.7
Used antibiotics only	0.9	0.0	0.0	0.0
'Appropriately' treated[b]	58.8		65.2	
N	106	149	72	89
Treatment from pivate physician				
	Round 1		**Round 3**	
	Complicated[a]		**Complicated[a]**	
Treatment	**No**	**Yes**	**No**	**Yes**
Used cough syrup	98.3	99.1	95.9	99.2
Used cough syrup only	25.3	18.6	17.6	11.6
Used antibiotics	67.9	66.7	77.1	76.9
Used antibiotics only	0.3	0.2	0.6	0.0

'Appropriately' treated[b]	52.7		54.6	
N	293	430	170	242

[a] Complicated: No = cough or cold only. Yes = cough or cold complicated by fast or difficult breathing.

[b] 'Appropriate' treatment: no antibiotics for an uncomplicated case; antibiotics for a complicated case.

Net of background characteristics, complications, and source of care, overall use of antibiotics is basically unchanged in round 3, though children treated by a private physician were more likely to be given antibiotics at round 3 than at round 1. The more interesting changes, however, took place in treatment patterns at government facilities. The odds ratio for the government facility - round interaction is substantially (though not significantly) below unity, while the odds ratio for the additional interaction with episode complications is significantly above one. The implication is that children taken to a government facility at round 3 (after physician training) were more likely to be given antibiotics for complicated episodes, and less likely to be given antibiotics for mild infections than had been the case at round 1 (before physician training).

Discussion

The CSP physician training aimed at improving pneumonia case identification and, once identified, at improving case management. The data do not address the issue of diagnosis, but suggest that treatment was, at best, improved only modestly by the training program. Other studies also show that both diagnosis and treatment are frequently flawed, even after physicians have been trained in SCM (El-Mougi 1990; Bermawy et al. 1992; Harrison and Abashawl 1992; Harrison et al. 1993).

In our data, over 70 per cent of children with ARI received care from a formal source — public or private doctor, pharmacy, or some other practitioner — or from a friend or neighbour. Among those given treatment, the private physician is the preferred source, particularly when the illness is complicated or viewed as severe. The preference for private physicians is supported by two recent ethnographic studies examining treatment of respiratory infection in two other governorates of Egypt (cited in Bermawy et al. 1992), and by two nationwide surveys (SPAAC 1992; Mohamed 1992). In our study, about 85 per cent of all children with ARI were given some treatment. Among those treated, almost all got cough syrup, close to half were given antibiotics, and more than 20 per cent got some other medicine.

Though overall patterns of treatment are similar whether the child is taken to a government health clinic or to a private doctor, there are some differences. The most important of these is that private physicians are much more likely to use antibiotics. This disparity in use of medicines is greatest in the case of children whose respiratory infection is *not* complicated by fast or difficult breathing. Thus private physicians are less likely than government clinics to give appropriate treatment. These patterns, seen clearly in Table 4, are reinforced by the multivariate analysis for use of antibiotics that controls for a number of background characteristics of the child and of the child's mother or carer (Table 6).

A consistently significant result in Table 6 is that boys are more likely to be given antibiotics than girls. This difference does not seem to arise from differences in the severity of the disease (whether real or perceived), since the odds ratio for boys receiving antibiotics relative to girls hardly changes when the 'respiratory infection complicated' variable is introduced in model 2. Nor do the source of care (model 3) or training variables or

interactions affect the odds ratio, though its significance is reduced slightly. Thus, even allowing for other variables in the model, boys are more likely than girls to be given antibiotics, though the effect ceased to be significant once source data were controlled (Langston and Hill, forthcoming Table 11).

The impact of training

The CSP's strategy for reducing mortality from ARI, improving diagnosis of respiratory disease and increasing antibiotic use for pneumonias, relies solely on short training courses to teach physicians standard case management (SCM). Our results indicate that the training that occurred during the second round of CSRES data collection improved the treatment given by government health facilities, though the impact is modest and not statistically significant. The proportion of children appropriately treated increased from 59 to 65 per cent. In the multivariate analysis, the strongly positive and significant coefficient for the interaction term identifying third round cases that are complicated by breathing difficulties and treated at government clinics (Table 6, model 4) implies that there was a strong and significant effect on the use of antibiotics in the third round for cases treated at government clinics. Despite modest improvement in treatment practices by government doctors, there was no improvement among private physicians; indeed, prescription of antibiotics by private physicians increased from round 1 to round 3 for both complicated and uncomplicated cases. Overall, appropriate treatment increased from 53 per cent at round 1 to 55 per cent at round 3.

Table 6
Logistic regression analysis of likelihood of using antibiotics for respiratory infection, 12 Menoufia villages, 1990-91.

	Used antobiotics			
Predictor variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Mother's education				
None	0.70**	0.67**	0.64**	0.66**
Prim incomp	0.83	0.82*	0.80	0.85
Prim comp/ prep	1.04	0.99	0.87	0.79
Secondary/ more[a]				
Child's sex				
Male	1.20**	1.17**	1.19*	1.23*
Female				
Child's age				
0-1 month	0.51*	0.53*	0.54	0.47
2-5 months	0.86	0.89	0.63**	0.74
6-17 months	1.03	1.04	0.83	0.79
18-35 months	0.95	0.97	0.92	0.81
36-59 months				
Wealth				
Poor/middle	0.87	0.86*	0.99	0.99
Well off[a]				
Respiratory infection complicated				
Yes	-	2.05**	1.39**	1.32**
No[a]	-	-	-	-
Source of care				

Government facility	-	-	10.68**	8.14**
Private physician	-	-	23.04**	14.73**
Neither[a]				
Training evaluation variable				
Round 1[a]	-	-	-	-
Round 3	-	-	-	1.07
Interaction 1[b]	-	-	-	0.65
Interaction 2	-	-	-	1.57*
Interaction 3	-	-	-	2.60**

Level of Significance: ** Pr. < .01, * Pr. < .05

[a] Omitted category.

[b] Interaction 1 - Round 3 and Government Health Facility.
Interaction 2 - Round 3 and Private Physician.
Interaction 3 - Round 3 and Government Health Facility and Complicated ARI.

A health facility survey in five Egyptian governorates (including Menoufia) early in 1991 also found that antibiotics were overused (Harrison and Abashawl 1992), as had a similar, earlier study in another governorate (Harrison et al. 1993). The performance of trained physicians was somewhat better than those without training in both classifying and correctly treating sick children, but the differences were not statistically significant. More importantly, the performance of all physicians, whether trained or not, was poor. Just 38 per cent of trained physicians correctly classified more than 50 per cent of respiratory infection cases, and only 31 per cent gave the correct treatment to more than half of the cases seen.

Our results suggest a somewhat higher level of appropriate treatment than was found in the clinic evaluations, probably primarily because of the relatively crude nature of our indicator of serious illness and of the appropriateness of the treatment. Despite the relatively favourable situation revealed by our data, a large proportion of children still receive inappropriate treatment, and it is clear that the CSP training in SCM had, at best, a small impact. It is evident from these results that much more needs to be done to improve the management of ARI in Egypt.

Public and private physicians

The overlap between public and private physicians has been discussed above, yet throughout the analysis a distinction has been made between public and private physicians. This is an important distinction because private physicians are the preferred source of care, particularly when the illness is severe, and the treatment practices of private physicians are very different from those of the doctors in government health facilities, as has been shown. Private physicians prescribe more drugs, and specifically more antibiotics, than do the government physicians. Moreover, the training that took place at the time of the second round improved the treatment practices of the government doctors, while treatment given by private physicians was no better in the third round than in the first.

Again, this is an ironic situation since private physicians are, to a large (although unknown) degree, the very same people as public physicians, but at different times of the day. Assuming substantial overlap, the clear implication is that a physician prescribes in one way when working at the government health clinic, and very differently when at private practice. This further indicates that, even though at least a proportion of doctors know the recommended treatment, and give it when working at the health centre, they prescribe additional medicines known to be unnecessary when at their private clinics.

Unfortunately, we have no data to examine the reasons for this behaviour. Two explanations are often suggested. First, doctors may gain financially from prescribing

medications. If this motivation operates in Egypt at all, it is said to be unusual. The alternative explanation is that mothers want, and insist on, 'serious' medicine that will 'cure' the illness. Though antibiotics have no useful effect on viral respiratory infection, mothers may not know or believe this. Antibiotics are viewed as 'serious' medicine, however, and a physician wishing to build or sustain a practice will want to satisfy patients that they are receiving the best possible treatment. This sort of problem is believed to be common in Egypt, and has been mentioned in health programs in other parts of the world (Cherian et al. 1988; DeClerque et al. 1992).

Whatever the explanation, it is clear that brief training in proper diagnosis and treatment does not ensure that respiratory infection in children is properly treated. Not only must the physician know and be convinced of the proper treatment, but so must the client. There must also be effective incentives to encourage proper diagnosis and appropriate treatment, as well as mechanisms to limit unnecessary use of antibiotics.

The CSP, like other programs (Tupasi et al. 1988), is planning a media campaign to teach mothers and carers the early signs of pneumonia, and to urge them to take their children to a trained physician. But this approach, though important, may also be inadequate. In addition, it may be necessary to educate mothers directly about the signs the doctor should be checking to make a correct diagnosis and about the role of antibiotics and other medicines in the treatment of ARI.

Parallels with the National Control of Diarrheal Diseases Project

The National Control of Diarrheal Diseases Project (NCDDP) was implemented in Egypt from 1983 to 1992, and has been described as the most successful USAID-supported oral rehydration program (USAID 1988). The success of NCDDP was primarily in increasing the use of oral rehydration, and was achieved mainly by directing messages straight to mothers. Like CSP, NCDDP sought to rationalize the use of drugs by reducing the amount of antibiotics used for simple, acute diarrhoea, and by eliminating the use of other medicines such as antidiarrhoeals. Like the ARI program, this change in drug use was to be brought about solely through the training of physicians working in government health facilities. NCDDP made a conscious policy decision not to deal with drug use in the public service announcements aimed at mothers, which as a result focused primarily on symptoms of dehydration and use of oral rehydration (Miller 1992). No effective mechanisms to monitor and enforce responsible performance were implemented.

The similarities in antibiotic use for diarrhoea and respiratory infection are striking. In both cases, CSRES found that 45 to 46 per cent of treated children were given antibiotics. Use was greater when the diarrhoea was severe (56 per cent) and when the respiratory infection was complicated by fast or difficult breathing (53 per cent). For both illnesses, private physicians, the preferred source of care, were substantially more likely to prescribe antibiotics than were the doctors in the government clinics.

Despite the success of NCDDP in increasing use of oral rehydration salts (ORS) and altering feeding practices during diarrhoea, inappropriate use of antibiotics and other drugs remained very high at the end of project efforts (Langsten and Hill, forthcoming b). Other reports on NCDDP also document the lack of success in changing the way physicians prescribed drugs for diarrhoea (Miller 1992). This failure raises serious questions about the ability of short physician training courses to alter significantly the use of antibiotics in treating respiratory infection in the absence of sustained incentive or sanction programs.

Use of antibiotics

It is sometimes argued that excess use of antibiotics is not a serious problem for an ARI control program. The main concern is to treat a high proportion of seriously ill children, even

at the cost of substantial overtreatment of mild cases. At the level of the individual child, this argument is persuasive, but at the level of the health system it is much less compelling. First, the indiscriminate use, and particularly incomplete use, of antibiotics is likely to hasten the emergence of microbe strains resistant to front-line drugs. Second, in a resource-constrained health sector, money spent on unnecessary antibiotics is money not spent on other interventions. The cost-effectiveness of standard case management would be substantially reduced by such wasteful drug use, calling into question the priority that should be given to ARI programs. Third, over-use of drugs may reduce a provider's ability to follow up cases and monitor compliance. Evidence from Egypt suggests that only one half of patients complete the prescribed course of treatment, and a similar proportion fail to return to the doctor for a check-up on completion of the prescribed course (SPAAC 1992). Prescribing antibiotics for a child who does not need them is a lesser evil than failing to prescribe antibiotics for a child who does need them, but it is still an evil, at least at the health system level..

Conclusion

Acute respiratory infections are among the most important causes of early child mortality in the developing world. In the absence of effective vaccines to protect children against such infections, ARI control programs are currently based on standard case management, consisting largely of early detection of pneumonias and their early treatment with antibiotics. The Child Survival Project in Egypt has used short training courses of physicians in standard case management as its main mechanism for ARI control. Data from a longitudinal survey in rural lower Egypt show that training modestly improved ARI treatment patterns in government clinics, but just increased antibiotic use for all respiratory infections, regardless of complications, by private physicians.

In order to increase standard case management substantially, implementation strategies must combine a number of features. First, the training of physicians must focus on practice rather than theory, and provide for regular follow-up and additional training; participants' performance must be evaluated on the basis of observation rather than written examination. Second, appropriate incentives and sanctions need to be introduced to reduce over-prescription of antibiotics for mild coughs and colds. It is not clear what these incentives or sanctions should be, since they are likely to be setting-specific, but they should include better supervision and quality control in government facilities. Third, efforts must be made to educate mothers to improve the recognition of warning symptoms that indicate the need to consult a physician, and to understand that antibiotics are essential for the treatment of some respiratory infections but are inappropriate for others. Greater emphasis on these three areas will allow ARI control programs to realize a higher proportion of their theoretical potential to improve child health in developing countries at low cost.

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