amoxycillin (or ampicillin, coamoxycillin), cotrimoxazole or erythromycin for 14 days for otitis media; and the same antimicrobials or doxycycline for 14-21 days for sinusitis.

Analysis

We first assessed drug treatment patterns for URIs, cough and cold, pharyngitis/tonsillitis, otitis media, and sinusitis. We calculated the percentage of patients receiving an antimicrobial prescription; percentage of prescribed treatments consistent with the standard treatment guideline; and cost associated with inappropriate antimicrobial use. We evaluated differences in antimicrobial prescribing by patient and physician characteristics using chi-square tests or Fisher's exact tests for categorical variables and Student's *t*-tests for continuous variables. A difference with a two-sided p-value <0.05 was considered statistically significant. Numerical variables were recoded to categorical variables for univariate and logistic regression analyses.

To examine predictors of antimicrobial prescribing, we developed generalized linear mixed models (Guo and Zhao, 2000) that adjust for clustering of cases by provider. We looked for factors associated with appropriate treatment using separate logistic regression models for viral and for bacterial URI cases. Variables that were associated with antimicrobial prescribing in univariate analyses (p-value < 0.10) were included in the initial logistic regression model; variables were removed sequentially if they were non-significant and their removal did not change the odds ratios of remaining predictors by at least 20%. Odds ratios and 95% confidence intervals were calculated from the final models.

We replaced missing age values (n=6, 0.13%) with median age; seven cases (0.16%) with missing payment status were excluded from the logistic regression analyses. Data were managed and analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows 12.0.0 (SPSS Inc, 2004) and Statistical Analysis Software (SAS) 8.02 (SAS Institute Inc, 1999).

RESULTS

Between January and December 2001, 4,608 adult URI patients visited the study health centers. They accounted for 10.6% of all health center patients, 15.8% of adult patients, and 35.2% of all URI patients. There was no seasonal pattern of cases presenting with URI. Almost all (97.9%) adult URI patients received a prescription, resulting in 4,512 prescriptions for analysis. Patients without a prescription may not have received one or may have filled it at a drug store outside the health center.

Characteristics of patients

Most patients were women and nearly half of the patients were between 18 and 40 years old (Table 1a). More than half of the patients (57.6%) paid for their prescription at the point of service, while the rest received free care or paid a small copay (30 baht, about US$ 0.80) under the national health insurance plan. Nearly all (91.0%) adult URI patients were classified by their diagnoses and symptoms as likely to have viral URIs. Among patients likely to have bacterial URIs, more than three-fourths were diagnosed with pharyngitis. Most (87%) patients did not have other diagnoses at the time of their visit. Those with co-diagnoses mostly had chronic diseases, such as hypertension, heart disease, diabetes, arthritis, gout, and gastrointestinal disease.

Characteristics of physicians

Physicians had an average age of 53 years, half were women, and most had practiced for more than 10 years (Table 1b). Most physicians were general practitioners or trained in public health or family medicine. Only 4 (21%) physicians worked full-time at the health centers.

Pattern of drug prescribing for viral and bacterial URIs

All patients with bacterial URIs received at least one drug, and only 13 (0.3%) patients with viral URI did not receive a drug. As shown in Table 2, physicians treated viral and bacterial URIs differently. For viral URI patients, analgesics/antipyretics and antihistamines were the most frequent symptomatic treatments prescribed, followed by antimicrobial agents. Physicians prescribed antihistamines and vitamins significantly more frequently for viral URI patients. Bacterial URI patients received significantly greater numbers of drugs, injections, antimicro-

Table 1a
Characteristics of patients receiving prescriptions (n=4,512).

Characteristic	No. (%)
Female	3,173 (70.3)
Age: Year, mean±SD	44.91±17.00
18-40	2,060 (45.7)
41-60	1,352 (29.9)
> 61	1,100 (24.4)
Payment	
Self payment	2,595 (57.6)
Free of charge	1,910 (42.4)
Diagnosis	
Viral URIs	4,107 (91.0)
Bacterial URIs	
Pharyngitis/ Tonsillitis	309 (6.8)
Otitis media	89 (2.0)
Sinusitis	7 (0.2)
Co-morbid illness	586 (13.0)

Table 1b
Characteristics of physicians (n=19).

Characteristic	No. (%)
Female	9 (47.4)
Age: Years, mean±SD	53.0±15.5
Full-time practice	4 (21.1)
General practice	13 (68.4)
Years in practice	
>10	15 (78.9)
≤10	4 (21.1)
URI cases treated/ year	
<100	7 (36.8)
101-500	9 (47.4)
>500	3 (15.8)

bials, analgesics/antipyretics, and cough suppressants than patients with viral illness.

Overall, 62.9% of all URI patients received a prescription for an antimicrobial, 60.3% of viral URI patients and 89.4% of bacterial URI patients (91.6% of patients with pharyngotonsillitis, 83.1% with otitis media, and 71.4% with sinusitis). Antimicrobials made prescriptions more costly. Prescriptions for viral URI patients with an antimicrobial cost 43 baht (about US$1.20) more than those without an antimicrobial.

Appropriateness of antimicrobial prescribing

To assess appropriateness of antimicrobial prescribing, we evaluated the type and duration of antimicrobial treatment among patients with common cold, pharyngitis/tonsillitis, and otitis media, who had no other diagnoses and who received an antimicrobial drug. These patients received 16 different antimicrobials, all of which were on the 1999 National Essential Drugs List. Regardless of diagnosis, amoxicillin was the most frequently prescribed antimicrobial. Macrolides (erythromycin, roxithromycin), chloramphenicol, and lincomycin injection were more frequently prescribed for bacterial than for viral URIs.

Only a small proportion of URI patients were treated according to the National Standard Treatment Guideline for Respiratory Diseases (1996). Shaded boxes in Table 3 show appropriate prescribing based on diagnosis. Only 36.4% (1,287) of viral URI patients were treated correctly without antimicrobials. Among URI patients with likely bacterial diagnoses, 14.2% (52) received appropriate oral antimicrobials, 4.0% (11) of those with pharyngitis/tonsillitis and 54.3% (38) of those with otitis media.

The average duration of prescribed oral antimicrobial treatment was 6.3 days for viral URIs and 6.7 for bacterial URIs. When considering appropriateness of indication and duration of antimicrobial prescribing simultaneously, only 1.7% of bacterial URI patients were treated appropriately, 5 (1.8%) patients with pharyngitis/tonsillitis and 1 (1.4%) patients with otitis media.

Factors associated with antimicrobial prescribing

Adjusted for potential physician clustering and potential confounders, several patient and physician characteristics were associated with greater rates of antimicrobial prescribing in viral URIs (Table 4). Male patients and younger patients (under age 60) were significantly more likely to receive antimicrobials for viral URIs than their respective comparison groups (Table 4). Patients who payed for their medicines out-of pocket or were insured under non-national health plans were somewhat more likely to receive antimicrobials than those insured under the national health

Table 2
Drugs prescribed for URI patients.

Drugs prescribed	No. of prescriptions (%)	
	Viral URIs (n=4,107)	Bacterial URIs (n=405)
Antimicrobial	2,477 (60.3)	362 (89.4)[b]
Analgesic/antipyretic	2,983 (72.6)	328 (81.0)[b]
Antihistamine	2,805 (68.3)	135 (33.3)[b]
Mucolytic	1,842 (44.9)	198 (48.9)
Cough suppressant	1,350 (32.9)	175 (43.2)[b]
Vitamin	836 (20.4)	46 (11.4)[b]
Other symptomatic drug[a]	454 (11.1)	70 (17.3)
Mean no. of drugs per prescription	3.20±1.07	3.67±1.26[b]
Injection	63 (1.5)	27 (9.0)[b]
Median cost per prescription (baht)	44.0	76.0
With antimicrobial	59.0	78.0
With no antimicrobial	16.0	16.0

[a] bronchodilators, anti-inflammatory enzymes, (antiseptic) mouth preparations, topical antiseptics.
[b] p-value <0.05

Table 3
Antimicrobials prescribed among antimicrobial recipients[a].

Antimicrobials prescribed	No. of prescriptions (%)[b]		
	Common cold (n=2,247)	Pharyngitis/ tonsillitis (n=275)	Otitis media (n=70)
Penicillin V	54 (2.4)	8 (2.9)	3 (4.3)
Erythromycin	67 (3.0)	3 (1.1)	2 (2.9)
Amoxicillin±clavulanic acid[c]	1,581 (70.4)	196 (71.3)	31 (44.3)
Ampicillin	6 (0.3)	- -	- -
Co-trimoxazole	70 (3.1)	9 (3.3)	5 (7.1)
Dicloxacillin/ Cloxacillin[c]	217 (9.7)	14 (5.1)	23 (32.9)
Roxithromycin[c]	141 (6.3)	37 (13.5)	4 (5.7)
Chloramphenicol ear drop[c]	10 (0.4)	2 (0.7)	25 (35.7)
Doxycycline	17 (0.8)	2 (0.7)	- -
Tetracycline	87 (3.9)	5 (1.8)	- -
Cephalexin	5 (0.2)	1 (0.4)	- -

[a] patients with co-morbid diagnosis excluded.
[b] totals may sum to more than 100% because some patients received >1 antimicrobial.
[c] p-value <0.05 for differences in prescribing across disease categories.
Note: shading indicates guideline-recommended therapy.

plan. Part-time physicians tended to prescribe more antimicrobials but this association was also not statistically significant.

There was little variability in antimicrobial prescribing for bacterial URI patients. Only payment status was a significant predictor of antimicrobial prescribing for bacterial URIs, after adjusting for the health center. Patients paying out of pocket or insured under non-national health plans were more likely to receive antimicrobials than those insured under the national health plan (OR, 2.17, 95% CI, 1.15 – 4.09).

Cost of URI treatment

The average cost of treating bacterial URI

Table 4
Factors associated with antimicrobial prescribing for viral URI patients (n=4,107).

Characteristics	Antimicrobial prescribed (%)	Crude OR (95% CI)	Adjusted OR [a] (95% CI)
Gender			
Male	779 (64.9)	1.41 (1.20 - 1.64)	1.47 (1.26 - 1.72)
Female	1,698 (58.4)	Referent	Referent
Age			
18-40 yr	1,255 (68.9)	3.95 (3.28 - 4.77)	3.62 (2.92 - 4.50)
41-60 yr	734 (59.4)	2.29 (1.89 - 2.78)	2.17 (1.76 - 2.68)
>60 yr	488 (46.5)	Referent	Referent
Payment type[b]			
Self-payment	1,518 (65.5)	1.96 (1.70 - 2.27)	1.19 (1.00 - 1.40)
Free of charge	954 (53.5)	Referent	Referent
Physician employment status			
Part-time	2,041 (62.8)	2.32 (0.84 - 6.41)	2.58 (0.85 - 7.85)
Full-time	436 (51.0)	Referent	Referent

[a] adjusted for gender, age, payment type, and physician employment status; OR denotes odds ratio, CI denotes confidence interval.

[b] patients paying out-of-pocket or patients insured under health plans other than the national health plan are classified as self-pay patients; patients insured under the national health plan are classified as free-of-charge.

was greater than the cost of treating viral URI (80 baht *versus* 46 baht per case, a difference of approximately US$0.85). Patients who received antimicrobials paid 44-53 baht more per prescription than patients who did not receive antimicrobial treatment.

DISCUSSION

Pattern of prescribing for URIs

The vast majority (90%) of URI patients who visited health centers in these two slum areas in Bangkok in 2001 most likely had viral URIs. High rates of prescribing of symptomatic drugs, such as antipyretics/analgesics and antihistamines, for these viral URI patients would be appropriate according to the National Standard Treatment Guideline (1996). However, 60.3% of patients with viral URIs received antimicrobials. In bacterial URIs, antimicrobials were prescribed more frequently than symptomatic drugs to 89% of patients. Antimicrobial prescribing rates for bacterial URIs in these slum communities were similar to those reported from developed countries (Dosh *et al,* 2000; Linder and Singer, 2003). For viral URIs, however, antimicrobial prescribing rates were much higher than those observed in developed countries (9 - 46%) (Dosh *et al,* 2000; Linder and Singer, 2003; Steinman *et al,* 2003).

Appropriateness of antimicrobial prescribing

Based on estimates from the National Standard Treatment Guideline (1999), about 0.5-2.0% of viral URI patients who had high fever, severe cough, and/or abscesses would need antimicrobials. High-risk patients, such as those with HIV/AIDS and intravenous drug users, may also need empirical antimicrobial treatment. Proportions of these high-risk patients may have been underestimated in this study due to underreporting of these co-morbidities. Nevertheless, 60.3% of patients with likely viral URI received antimicrobials, a proportion far higher than expected, implying substantial overuse of antimicrobials for most URI patients treated at these health centers.

Among patients with bacterial URIs who received antimicrobials, selection and duration of antimicrobial treatment were problematic. Antimicrobials that were not recommended by the treatment guideline (amoxycillin-clavulanic acid, cefalexin, ciprofloxacin, chloramphenicol, tetracycline) were prescribed for 85.1% of these patients. About 4% of URI patients received tetracycline or ciprofloxacin, antibiotics which should be very carefully prescribed in women of childbearing age.

The average duration of antimicrobial treatment among bacterial URI patients was 6.7 days and only 18% of patients received antimicrobial treatment for 7-14 days. We cannot assess the appropriateness of failing to prescribe an antimicrobial for 42 patients (10.7%) with bacterial URIs.

Predictors of antimicrobials prescribing

We found different predictors of antimicrobial prescribing for viral and bacterial URI patients. Younger, male patients with viral URIs were more likely to receive antimicrobials than others with viral URIs. This finding agrees with results from some (Linder and Stafford 2001) but not all previous studies (Dosh, 2000; De Sutter *et al,* 2001; Steinman *et al,* 2003). Younger patients are more likely to be infected with Group A β-hemolytic streptococci (GABHS), and some treatment algorithms recommend antimicrobial treatment for younger patients with sore throat (McIsaac *et al,* 1998). It may also be possible that physicians tend to prescribe antimicrobials more frequently because of concern about effects of illness on work loss in this population (Linder and Singer, 2003). Physician age and gender did not influence prescribing patterns, but employment status possibly did. Part-time physicians at the health centers include retired physicians and young medical doctors from other health settings. Because they practice in the community only half a day, 1-3 days per week, they may perceive different prescribing needs than full-time physicians.

Ability to pay may contribute to the decision to prescribe antimicrobials for viral and bacteria URI patients. The recent health system reform in Thailand introduced capitated payment for patients in the national health plan. Physicians may tend to prescribe more drugs for patients who pay out of pocket or are insured in the fee-for-service civil servant medical benefit scheme in order to to compensate for lost health center revenue due to care for patients under the national health plan. This may also represent greater willingness to conform to patient demand for antibiotics when cost is not an issue. Dong and colleagues (1999) also showed that patients with URI in China who paid out-of-pocket received antimicrobials more frequently, although they hypothesized that this might be due to these patients presenting later at health facilities with more advanced illness.

Cost of unnecessary antimicrobial use

Unnecessary prescribing of antimicrobials for viral URIs is a serious and costly problem. It may increase antimicrobial resistance in the community, rendering common antimicrobials ineffective and causing a need for more expensive new antimicrobials. For individuals with viral URIs, the added cost of unnecessary antimicrobial treatment was 43 baht per case. Based on average monthly total income and expenditures per household in the year 2001 from the National Statistical Office (2003), this accounted for 10.8% of daily household income or 13.2% of total daily household expenditures and a total of 106,511 baht expended per year for unnecessary antimicrobial treatment of viral URI patients at the two study health centers.

Study limitations

We need to acknowledge the following limitations of the study. Some cases may be misclassified as viral or bacterial. Physicians note only broad diagnoses in health center registration books, and detailed information such as clinical signs, duration of symptoms, and other clinical information, such as HIV infection and pregnancy, is limited. We may have overestimated the prevalence of viral URI and thus of inappropriate antimicrobial use. Nevertheless, viral URIs are estimated to account for 65-90% of URIs in adults (MoPH, 1996; Therapeutic Guidelines 1998; Dolin 1998; Heikkinen and Jarvinen, 2003), which is consistent with the 91% estimate of viral cases presenting for treatment in our setting.

Our ability to generalize the present findings from health centers in slum areas to other settings in Thailand or elsewhere may be limited. Patterns of prescribing and the factors that influence prescribing in private health care settings or public hospitals may be quite different, due to institutional policies, pharmaceutical company marketing, and access to laboratory facilities. In addition, the high risk nature of our population may influence the propensity to prescribe antibiotics as preventive therapies.

Future research should explore other possible determinants of antimicrobial use, including patients' expectations (Britten and Ukoumunne, 1997), their attitudes towards antimicrobials (Walker *et al,* 2003), and the impact of existing health care policies and regulations.

Conclusion

Patients with viral URIs treated in health centers in these slum communities frequently receive unnecessary antimicrobials and patients with bacterial URIs frequently receive inappropriate antimicrobial treatments. These patterns are likely to accelerate rates of growth of antimicrobial resistance to commonly used antibiotics. From the perspective of patients, this means wasting money for unnecessary and potentially harmful medicines and from the perspective of society this means risking loss of potent antimicrobials through misuse. Interventions to promote more rational use of antimicrobials in these settings are urgently needed. Incorporating findings from the present study, we are currently developing multi-sectoral interventions to improve treatment of URI among adults in these slum communities (Suttajit *et al,* 2003).

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REFERENCES

Anonymous. Therapeutic guidelines: antibiotic. 10th ed. Melbourne: Therapeutic Guidelines Limited, 1998.

Avorn J, Solomon DH. Cultural and economic factors that (mis)shape antibiotic use: The nonpharmacologic basis of therapeutics. *Ann Intern Med* 2000; 133: 128-35.

Bamberger DM, Jackson MA. Introduction: overview of upper respiratory infections. *Semin Respir Infect* 1995; 10: 1-2.

Britten N, Ukoumunne O. The influence of patients' hopes of receiving a prescription on doctors' perceptions and the decision to prescribe: a questionnaire survey. *Br Med J* 1997; 315: 1506-10.

De Sutter AI, De Meyere MJ, De Maeseneer JM, Peersman WP. Antibiotic prescribing in acute infections of the nose or sinuses: a matter of personal habit? *Fam Pract* 2001; 18: 209-13.

Dong H, Bogg L, Rehnberg C, Diwan V. Association between health insurance and antimicrobials prescribing in four counties in rural China. *Health Policy* 1999; 48: 29-45.

Dolin R. Common viral respiratory infections. In: Fauci AS, ed. Harrison's principles of internal medicine. 14th ed. Singapore: McGraw-Hill, 1998: 1100-5.

Dosh SA, Hickner JM, Mainous AG III, Ebell MH . Predictors of antimicrobial prescribing for nonspecific upper respiratory infections, acute bronchitis, and acute sinusitis: an UPRNet study. *J Fam Pract* 2000; 49: 407-14.

Drug Control Division, Ministry of Public Health, Thailand. Current value of antimicrobials drug in year 1990-1998 [Accessed 2004 August 15]. Available from: URL: http://www.app1.fda.moph.go.th/drug/zone_search/files /sea001_ c10.asp 2004

Grand AL, Hogerzel HV, Haaijerruskamp FM. Intervention research in rational use of drugs: a review. *Health Policy Plann* 1999; 14: 89-102.

Guo G, Zhao H. Multilevel modeling for binary data. *Ann Rev Sociol* 2000; 26: 441-62.

Heikkinen T, Jarvinen A. The common cold. *Lancet* 2003; 361: 51-9.

Kunin CM. Resistance to antimicrobial drugs–a worldwide calamity. *Ann Intern Med* 993; 118: 557-61.

Linder JA, Singer DE. Desire for antimicrobials and antimicrobial prescribing for adults with upper respiratory tract infections. *J Gen Intern Med*

2003; 18: 795-801.

Linder JA, Stafford R. Antimicrobial treatment of adults with sore throat by community primary care physicians: a national survey, 1989-1999. *J Am Med Assoc* 2001; 286: 1181-6.

McIsaac WJ, White D, Tannenbaum D, Low DE. A clinical score to reduce unnecessary antimicrobial use in patients with sore throat. *Can Med Assoc J* 1998; 158: 75-83.

Ministry of Public Health (MoPH), Thailand. Standard tratment for respiratory infection diseases. Bangkok: Thailand Agriculture Cooperation Printing, 1996.

Murray S, Del Mar C, O'Rourke P. Predictors of an antibiotic prescription by GPs for respiratory tract infections: a pilot. *Fam Pract* 2000; 17: 386-8.

National Statistical Office (NSO), Thailand. Health and Welfare Survey. [Accessed 2003 September 10]. Available from: URL: http://www.nso. go.th/ thai/ stat/stat_23/toc_4.html, 2000

National Statistical Office Thailand. Core economic indicators of Thailand (1998-2002). [Accessed 2003 September 10]. Available from: URL: http:/ /www.nso.go.th/eng/indicators/core_e.htm, 2003

Okeke IN, Lamikanra A, Edelman R. Socioeconomic and behavioral factors leading to acquired bacterial resistance to antimicrobials in developing countries. *Emerg Infect Dis* 1999; 5: 18-27.

Pechere JC. Patient's interviews and misuse of antimicrobials. *Clin Infect Dis* 2001; 33 (suppl 3): S170-S173.

Radyowijati A, Haak H. Improving antimicrobial use in low-income countries: an overview of evidence on determinants. *Soc Sci Med* 2003; 57: 733-44.

SAS Institute Inc. Statistical Analysis Software (SAS) version 8.2. Cary, NC,1999.

SPSS Inc. Statistical Package for the Social Sciences (SPSS) version 12.0. Chicago, Illinois, 2004.

Steinman MA, Landefeld CA, Gonzales R. Preditors of broad-spectrum antibiotic prescribing for acute respiratory tract infections in adult primary care. *J Am Med Assoc* 003; 289: 719-25.

Suttajit S, Tantipidoke R, Somrongthong R, Sitthi-amorn C. Involvement of civil society in a strategy to reduce the use of antibiotics in the treatment for adults with upper respiratory infections from viral origins at the household and community levels: a comparison study in congested community, Bangkok, Thailand. In: Scientific activities report. Phase I: Formative, Bangkok. 2003.

Walker AE, Grimshaw JM, Armstrong EM. Salient beliefs and intentions to prescribe antimicrobials for patients with a sore throat. *Br J Health Psychol* 2003; 6: 347-60.

World Health Organization. WHO global strategy for containment of antimicrobial resistance. *WHO/ CDS/CSR/DPS/2001.2,* 2001.

FOLK KNOWLEDGE ABOUT AVIAN INFLUENZA AND THE USE OF PERSONAL PROTECTIVE EQUIPMENT: A QUALITATIVE STUDY

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ABSTRACT: Avian influenza (AI) outbreaks in Thailand from January 2004 to December 2005 resulted in 22 human cases, and 14 deaths. Three confirmed cases were reported in Suphanburi Province in 2004, one of whom died. Based on experiences if AI in Suphanburi, this study aimed to assess and describe the nature of local residents' knowledge about AI and identify their perceived benefits and barriers to the use of personal protective equipments (PPE). Four focus group discussions (FGD) with 38 participants in high and low infectivity areas were organized. In addition, ten in-depth interviews in high and low infectivity areas were conducted. Most of these cases were correlated with raising poultry or direct contact with dying poultry. The findings revealed that almost all of the participants perceived the cause of AI to be from wild birds and/or migratory birds. There are differences in local knowledge and beliefs between participants in high and low infectivity areas. The participants in high infectivity areas have more knowledge than the participants in low infectivity areas. Some of the participants in low infectivity areas believed that AI is caused by mosquitoes, wind, air and water. The use of PPE (gloves) is low among participants of all ages and types of poultry owned. Most use plastic bags instead of gloves to handle dying poultry. The benefits of using PPE (gloves, including plastic bags) related more to protection from odors rather than protection from AI transmission. The potential barriers to PPE use were related to cultural factors, lack of knowledge, comfort, availability and cost. This study suggested that public health professionals should promote the use of PPE and hand washing by raising their awareness.

Keywords: Folk knowledge, Avian Influenza, Use of personal protective equipments, Qualitative study

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INTRODUCTION: Avian influenza (AI) outbreaks in Thailand from January 2004 to December 2005 resulted in 22 human cases and 14 deaths1). Chulalongkorn University, comprising the College of Public Health Sciences, Faculty of Veterinary Sciences and Faculty of Medicine in collaboration with the University of Minnesota, USA, has conducted a research project entitled Influenza A Infections at the Human Animal Interface. The project aims to gain better understanding of the epidemiology and transmission of infection in provinces where there have been repeated epidemics, and to achieve more effective disease prevention and control. The project adopted multidisciplinary approaches for data collection, including qualitative, quantitative and laboratory investigation. Suphanburi Province was purposively selected for the study because it was the location of the first human case of H5N1 confirmed by the Ministry of Public Health. Three confirmed cases were reported in 20042), one of whom died. Based on experiences of AI in Suphanburi, this study aimed to assess and describe the nature of local residents' knowledge about AI and identify the perceived benefits and barriers to the use of personal protective equipments (PPE). The World Health Organization recommends the use of Personal Protective Equipment (PPE) and hand washing as effective measures for infection prevention and to control the spread of disease). PPE items include gloves, masks,

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boots and protective clothing. To gain a more in-depth understanding of the folk knowledge and the perceived benefits and barriers to the use of PPE, a qualitative study was conducted. This qualitative study, comprised of focus group discussions (FGD) and in-depth interviews (IDI), is supplementary to a larger study survey and is conducted to improve the understanding of the underlying reasons for reported behaviors and practices related to the use of PPE for avian influenza prevention and control.

MATERIALS AND METHODS: The district and subdistrict selection described here reflects that which was conducted for the larger overhead study. Within Suphanburi Province, participating districts were chosen based upon their outbreak experience during the third wave of highly pathogenic avian influenza A (HPAI) from July through November 20054). Of the six districts that were affected, the two most affected districts (Muang and U Thong) were specifically selected for this study. In each district, one sub-district was identified which had experienced three or more waves of poultry outbreaks (or high infectivity areas) and had the most reported chicken deaths. Within each of these two high infectivity districts, one sub-district was chosen based upon having the greatest number of chicken deaths , as well as the willingness of local health officers to cooperate. Matching on population size and density, number of villages, and agricultural occupations, we selected one more sub-district in each district that had experienced less than two waves of AI poultry outbreaks (or low infectivity areas). For this FGD and IDI sub-study, one high infectivity sub-district (in U Thong District) and one low-infectivity subdistrict (in Muang District) was selected.

Data collection for this study took place in focus group discussion (FGD) and in-depth interviews (IDI). Within the subdistricts, the FGD and IDI participants were recruited using a snowball sampling technique. This technique utilizes referral chains to identify study participants. In this study, participants were identified by local health officers, village health volunteers and village leaders. The criteria for participation in the FGD was currently owning poultry of any kind (July, 2008) or having owned poultry at the time of the H5N1 outbreaks during the third wave of HPAI (July-November 2005).

The question guides for FGDs and IDI were developed based on the Health Belief Model5), as the Health Belief Model has been very influential in the area of health education in Thailand6). The FGD guides were written to explore perceptions of the causes of AI in poultry, the perceived severity of AI, and perceived benefits/ barriers to PPE use. After securing permission from the participants, all conversation during FGDs and IDIs was audio recorded. Transcripts were created from the audio recordings, and the transcriptions were coded to identify emergent themes by the researchers.

RESULTS: Two FGDs in high-infectivity areas and two FGDs in low-infectivity areas were organized. A total of 32 poultry owners participated in FGDs. Eighteen participants (56.3%) were from high-infectivity areas and were between the ages of 37-79 years. Fourteen participants (43.7%) were from low-infectivity areas with and age range of 25-81. Most of them are rice farmers (75.0%). During the study period, almost all of them were raising the poultry. The majority raised backyard chickens. A few of them raised both backyard chickens and ducks. Two of them raised fighting cocks and one raised grazing ducks. Some of the participants stated that they raised backyard chickens for food and for the ritual. The rituals usually related to paying respects or make offerings to god/ghost/spirit for their crop products. For example, informing ghost/spirit for growing rice, for harvest, asking for rain, and so on. These mentioned rituals require that the chicken be steamed with liquor. Therefore the backyard chickens are needed 2-3 times per year. Most of them stated that they refuse to buy chicken from the market as it not fresh enough for the ritual. Most participants' activity related to poultry is feeding. During the AI outbreak, eleven of the participants in the high-infectivity areas and eleven participants in the low-infectivity areas were faced with poultry death.

FGD participants' characteristics

	FGDs		
Sex	High-infectivity area	Low – infectivity area	Total
Male	*8*	*10*	*18*
Female	*10*	*4*	*14*
Total	**18**	**14**	**32**
Age range	37-79 yrs.	25-81yrs.	

Ten IDIs were conducted. Five participants resided in the high AI infectivity areas and were aged between 36 - 59. Another five participants resided in the low AI infectivity areas and were aged between 41-68 years. The participants included six villagers, two village health volunteers and two community leaders. Almost all of them raised backyard chickens. Two of them raised grazing ducks. Most participants' activity related to poultry was feeding. During the AI outbreak, all of them were faced with poultry death.

IDI participants' characteristics

	IDIs		
Sex	**High-infectivity area**	**Low-infectivity area**	**Total**
Male	*3*	*4*	*7*
Female	*2*	*1*	*3*
Total	**5**	**5**	**10**
Age range	*36-59*	*41-68*	

Perceived Causes of AI in Poultry

All of the participants both high and low infectivity areas defined the Avian Influenza (AI) or 'Kai Wad Nok' in Thai, meaning 'Bird Influenza'. Most of them perceived that migratory birds and wild birds were cause of AI in poultry.

> *Male, aged 37 (FGD, high infectivity areas) "Migratory birds fly from place to place, they bring AI, but our chickens, they are at home, therefore the AI cause from the wild bird and migratory bird"*

> *Male, aged 58 (IDI, high infectivity areas): "Bird Flu is the disease that the Asian open bill stork carry the avian flu viruses. These viruses were blown away in the air and our poultries got affected.*

However few of them had no idea about the relation of transmission between a bird and their poultries.

> *Female, aged 53 (FGD, low infectivity areas): ".... I am, sometimes afraid getting infected with AI, however, I have no idea about what are the mode of transmission"*

Interestingly, the participants in the low AI infectivity areas had different perceptions regarding the causation of AI in poultry when compare with the high infectivity areas. For example, they perceived that AI was caused by air, wind, water, mosquitoes and grazing ducks.

> *Male, aged 45 (FGD, low infectivity areas): "AI by wind, when it happen all chicken died with black face. I don't know how it is happen. I just wonder on this disease (AI), it is called 'bird flu' but mostly chicken died.... not birds."*

> *Male, aged 25 (FGD, low infectivity areas): "....migratory birds migrate for food and water around our community. Our chickens in the community were contaminated with the water and secretion of those migratory birds."*

> *Male, aged 70 (FGD, low infectivity areas): "....chicken died due to mosquitoes bite, as I observe most of chickens live in the mosquitoes net safer than the chicken live outside mosquitoes net".*

Perceived Severity of AI

Some participants in the high infectivity areas perceived that AI is a severe disease as it causes massive poultry death. In addition, it leads to death of human beings. However, few believed that AI can be prevented with vaccine.

> *Male, aged50 (FGD, high infectivity areas): "AI is very severe because of massive numbers of bird deaths if it occurs"*

> *Female, aged 47 (FGD, high infectivity areas): "...I am afraid of AI if someone infected, he/she will die"*

> *Male, aged 56 (FGD, high infectivity areas): "...I think AI can be prevented with vaccine"*

In contrast, the participants in the low infectivity areas have less concern about the severity of AI

> *Male, aged 70 (FGD, low infectivity areas): "...I have been raising the chicken for many years so I do not think that I can get infected with AI by contacting the chicken."*

> *Male, aged 58 (IDI, high infectivity areas): "...I am afraid of AI because this disease can kill a flock of chicken or duck so it might kill human as well.*

Few of the participants in the low infectivity areas belief that AI can be prevented with vaccine or "germ killer medicines" (antibiotics)

> *Female, aged 40 (FGD, high infectivity areas): ".... I think AI can be prevented with vaccine or germ killer medicines"*

Use of the Personal Protective Equipments (PPE)

Most of the participants both in high and low infectivity areas did not use gloves with their poultry during the study period in 2008. They also had low awareness of the AI outbreak.

> *Female, aged 48 (FGD, low infectivity areas): "Using gloves is unnecessary for people in upcountry. We live in rural area, we have simple life."*
>
> *Male, aged 70 years (FGD, low infectivity areas): "I didn't use gloves as I think it is not necessary, I didn't touch much the poultry"*
>
> *Male, aged 65 (IDI, low infectivity areas): "I have never used any gloves or mask because I do not touch or contact the chicken directly. I just throw the steamed rice to them (feeding).*

However, the participants in the high infectivity areas mentioned that during the AI outbreak in 2005 some of them used gloves or plastic bags especially for culling and carrying the dead chickens/ducks. Some of them used plastic bags only for their own dying birds, but they did not use for neighbors'. The participants in the low infectivity areas mentioned that they usually used plastic bags instead of gloves. It was used because of smell rather than protection of the AI transmission. Moreover the quality of bags was not assessed, some bags were leaking or torn.

As mentioned earlier, some participants raised backyard chickens for rituals. Those rituals related to paying respects or making offerings to god/ghost/spirit for their crop products. They usually culled their backyard chickens 2-3 times per years. Most of them stated that they did not use gloves or plastic bags. The reasons for not using gloves or plastic bags were that they were unnecessary or that participants perceived that their chickens were free from diseases.

> *Male, aged 62 (IDI, low infectivity areas): "culling my chickens, it is not necessary to use gloves. My chickens are free from disease."*

The benefits and barrier to PPE used

The benefits of using PPE

The majority of participants realized the benefits of the use of PPE. They learnt how to use PPE from the village health volunteers (VHVs), health personal. Interestingly, we found that a few participants used PPE regularly. In addition, a few perceived the benefit of use PPE (gloves or plastic bags) to relate to smell rather than protection of the AI transmission. Participants realized the benefits of using PPE (*gloves or mask)*as it can protect them from AI, however, they did not use it.

> *Male aged 56 (FGD, high infectivity areas): "I covered my hands with plastic bags when I had to carry the dead birds and buried them because I was afraid of the smell."*
>
> *Male aged 45 (FGD, low infectivity areas): "It is good that other people protected themselves by using gloves or mask when they contact their poultries. However, I do not wear any gloves or mask."*

The barriers to use of PPE

The reasons for not using PPE, especially gloves, in both low and high AI infectivity areas related to availability, cost, and complications with use, comfort and not being a normal part of life. Moreover, in the low AI infectivity areas mentioned, participants did not use gloves because of forgetfulness, laziness, unfamiliarity, not being necessary, weather too hot to wear gloves, and not appropriate to the rural culture.

> *Male aged 60 (FGD, low infectivity areas): "Using PPE is complicated. It is not simple way of life for rural people."*
>
> *Male aged 51(FGD, low infectivity areas): "I saw my neighbors wore the gloves when they feed their chicken. They seem worried too much about their hygiene."*
>
> *Male, aged 56 (FGD, low infectivity areas): "I used to wear the gloves whole carrying ducks but it was uncomfortable. Bare hands are more convenient."*
>
> *Female, aged 41 (IDI, low infectivity areas):"It's complicated. We just fed the chicken without touching them. We wanted to use the rubber gloves are difficult to find and costly. However, if we get them for free, we will use them during the outbreak or the campaigns only"*
>
> *Male, aged 45 (FGD, low infectivity areas): "I do not like wearing the gloves or a plastic bag when carrying the chicken because it is too hot but I always wash the chicken blood from my hands after slaughtering…not because of AI awareness."*

Sources of AI information

Most of the participants from both high and low infectivity areas have received AI information from various sources including village health volunteers (VHV), television, newspaper, health office, people talking in the village. However they prefer to get information from VHV or village headmen. In addition, they would like to get more information as they currently have poultry at home and the participants were afraid of the approaching winter. They believed that flu and AI occur during winter.

Limitations

A limitation of this qualitative study is the findings are unable to generalize about a broader population. Therefore, the researchers acknowledge that the findings pertain to our targeted subjects. It means that the experiences of these subjects may not adequately describe the experience of all villagers who raise poultry.

DISCUSSION: AI outbreaks are considered to be threats to national economic growth and, as such, require policy attention and research funds. The Thai Government has made a considerable effort in promoting prevention and control of AI transmission, including health education for poultry owners7). In order to create and implement effective interventions to combat AI transmission, an understanding of local perspectives and responses to AI is needed8). This study employed qualitative interview and focus group methods to gather and describe rural villagers' knowledge of AI and use of PPE. The findings reveal that all participants both high and low infectivity areas defined the Avian Influenza (AI) as 'Kai Wad Nok' in Thai, meaning 'bird influenza'. Most of them perceived that migratory birds and wild birds were cause of AI in poultry. However, a few of them had no understanding of the potential of transmission between wild birds and their poultry. Interestingly, the participants in the low AI infectivity areas had different perceptions regarding the causation of AI in poultry when compared with those in high infectivity areas. For example, they perceived that AI is caused by air, wind, water, mosquitoes and grazing ducks.

Moreover, there are differences in local knowledge and beliefs between participants in high and low infectivity areas. The participants in high infectivity areas have more knowledge than the participants in low infectivity areas. It might be that the participants in the high infectivity areas were often exposed to researchers and health personals during the AI outbreak. This finding is similar to a study in Israel which found that the sense of knowledge was significantly higher in the affected AI areas compared to the nation as a whole9). The participants in the high infectivity areas perceived that AI is a severe disease as it is a cause of massive poultry death and its leads to the death of human beings. In contrast, the participants in the low infectivity areas were less concerned about the severity of AI.

While a few participants used PPE regularly, the use of PPE is low among participants of all ages and types of poultry owned. This is despite the finding that the majority of the participants recognized the benefits of PPE. Knowledge regarding the use of PPE was obtained most frequently from VHVs and health personnel, a finding consistent with several other studies10,11,12). The reported barriers to PPE-use focused around cultural, informational and socio-economic factors. The reasons given for not using PPE, especially gloves, in both low and high AI infectivity areas are that PPE is costly, largely unavailable, complicated to use, uncomfortable and is not a normal part of daily life. Some participants also mentioned they did not use gloves because of forgetfulness or laziness. In some cases, a less costly and more available substitute, such as a plastic bag, was used instead of more traditional form of PPE.

The findings of this study suggest that public health professionals should promote the use of PPE by raising awareness of their uses and benefits. in addition, to improve present health education regarding AI prevention and control, consideration should be extended beyond the health belief model to find innovative approaches to developing education messages for specific local situations. For example, the participants indicated that gloves were not readily available and were costly, so they used plastic bags instead. They also stated that they tried to avoid direct contact with their poultry because they were afraid of AI transmission, however, they never mentioned regular hand washing after contact with poultry. Based upon these findings, a campaign promoting regular hand washing after poultry-related activities, as well as assessment of the integrity of plastic bags (to make sure that there are no holes) could be very effective among some rural Thai people.

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REFERENCES:

1. Ministry of Public Health. 2006. Ministry of Public Health confirms the third case of H5N1 in human of this year. from http://thaigcd.ddc.moph. go. th/ AI _ pressrelease_060925_En.html

2. Bureau of Epidemiology, Ministry of Public Health, Thailand, 2004. Epidemiology report. (Thai version)

3. World Health Organization. 2008. WHO Interim Infection Control Guideline for Health-care Facilities. from:http://www. who.int/csr/ disease/ avian_influenza/ guidelines/infectioncontrol1/en/index.html

4. Department of Livestock Development [DLD]. 2005. Avain Influenza situation and control measures. Retrived March 15, 2007, from http://www.dld.go.th/ home/bird_flu/livestock_by_don/

5. Strecher, VJ., Rosensrtock, IM,. 1997. The Health Belief Model. In: Glanz.K., Lewis et.al. (Eds.), Health Behaviour and Health Education. Jossey-Bass Publishers. USA.

6. Phuanukoonnon S, Brough M, Bryan JH. 2006. Folk knowledge about dengue mosquitoes and contributions of health belief model in dengue control promotion in Northeast Thailand. Acta Trop. 99(1):6-14.

7. Bureau of Epidemiology, Ministry of Public Health, Thailand, 2005. Epidemiology report. (Thai version)

8. Cheungsatiansup K. 2008. Ethnography of epidemiologic transition: avian flu, global health politics and agro-industrial capitalism in Thailand. Anthropology and Medicine 15:53-59.

9. Rami P., Galit A. and Yaron B. 2007. Differences in public emotions, interest, sense of knowledge and compliance between the affected area and the nationwide general population during the first phase of a bird flu outbreak in Israel. Journal of Infection 55: 6. p. 545-550.

10. Miner, S D., 2007. Capacity for Early Detection, Responses to and Practices of Villagers in Relation, Diagnosis and Surveillance of Hihgly Pathogenic Avian Influenza (HPAI) in Suphanburi, Thailand. Master Degree of Public Health. College of Public Health, Chulalongkorn University, Thailand.

11. Yooyim, S. 2007 Knowledge Attitude and Practice for AI prevention and Control among Village Health Volunteer and Villagers , Tumbol Tasoa, Ampure Muang, Uttradit. (Thai version)

12. Maton T., Butraporn P,. 2008. Preventive and Controlling Behaviors of Avian Influenza and Relationship among People in Risk Areas, Song Phi Nong District, Suphan Buri Province. Journal of Public Health. 38; 1. January – April 2008.

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Right Ventricular Electrocardiographic Leads for Detection of Brugada Syndrome in Sudden Unexplained Death Syndrome Survivors and Their Relatives

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Summary

Background: Sudden unexplained death syndrome (SUDS) is a sudden death syndrome in previously healthy Southeast Asian young adults without any structural causes of death. Many SUDS survivors show electrocardiographic (ECG) evidence of RSR' and ST elevation in leads V_1 to V_3, which is similar to the ECG pattern in Brugada syndrome. However, in many cases transient normalization of the ECG does not make diagnosis with standard 12-lead ECG possible.

Hypothesis: To overcome this problem, we utilized the new right ventricular ECG leads to detect the Brugada syndrome in SUDS survivors.

Methods: The subject was a Thai male patient who presented with a SUDS-like syncopal attack. He had cardiac arrest due to idiopathic ventricular fibrillation.

Results: Post-resuscitation standard 12-lead ECG showed no diagnostic features of Brugada syndrome. However, ECG patterns of RSR' and ST elevations typical for Brugada syndrome could be detected at the higher intercostal space leads V_1 to V_3. We observed similar findings in 2 of the other 10 SUDS survivors and 4 of 23 healthy family members.

Conclusions: Our data suggest that these new right ventricular leads ECG may be helpful in detecting Brugada syndrome in SUDS survivors and their relatives.

Key words: Brugada syndrome, sudden unexplained death syndrome, electrocardiography, right ventricle

Introduction

Sudden unexplained death syndrome (SUDS) is characterized by sudden death in previously healthy Southeast Asian young adults during sleep or at rest, without any structural causes of death as ascertained in postmortem study. This syndrome among young male Southeast Asian refugees in the United States has been reported by the Center of Disease Control and Prevention in the last decade.[1] The native people who resided in the northeastern region of Thailand have long recognized the same pattern of death known as "Lai Tai," or dying during sleep. The survivors of SUDS are defined as patients who were apparently healthy before developing sudden cardiac arrest due to idiopathic ventricular fibrillation (VF) but were successfully resuscitated. Presumptive survivors of SUDS are patients who experienced symptoms that reflect the clinical presentation of SUDS: agonal respiration, unresponsiveness after labored respiration during sleep, transient symptoms of distress (e.g., moaning, thrashing, grimacing), and syncope or seizure-like symptoms, but did not have documented cardiac arrest or VF previously.[2]

Previous study in Southeast Asian refugees[3] and a recent study in Thai men[2] showed that VF was the possible cause of cardiac arrest and death in survivors of SUDS. The electrocardiographic (ECG) patterns of RSR' and ST segment elevation in leads V_1 to V_3 are quite common in these survivors[2] and are similar to those found in Brugada syndrome. In 1992, Pedro and Josep Brugada described clinical characteristics of Brugada syndrome in eight otherwise healthy patients who developed sudden and aborted cardiac death due to idiopathic

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VF, and all patients had the ECG markers of RSR' and ST-segment elevation in leads V_1 to V_3.[4] Two ST-segment elevation patterns in Brugada syndrome have been described: "coved" and "saddle-back" types.[5] The ECG manifestations in patients with Brugada syndrome could be transiently normal; thus, a diagnosis detected by standard 12-lead ECG could be missed.[6] These dynamic ECG changes of RSR' and ST-segment elevation (Brugada sign) in leads V_1 to V_3 have also been reported in survivors of SUDS.[7] It was proposed that the heterogeneity of repolarization across the right ventricular outflow tract (RVOT) might contribute to the pathogenesis of these ECG patterns and polymorphic ventricular arrhythmia in Brugada syndrome.[8] We hypothesize that the RVOT repolarization heterogeneity might accordingly occur in survivors of SUDS and might lead to sudden VF. Thus, if the ECG leads for the right ventricle, especially the RVOT region, were utilized, it would be more likely that Brugada syndrome-like ECG patterns would be detected in survivors of SUDS who had transient normalization of ECG in standard ECG leads V_1 to V_3.

Methods and Results

Case Report

A 29-year-old Thai male, a carpenter, was apparently healthy until he suddenly and unexpectedly lost consciousness while reading a newspaper. He was successfully aroused by his wife and brought to King Chulalongkorn Memorial Hospital, Bangkok. During an interview at the emergency room, he became unconscious again and was found pulseless. The ECG monitoring showed VF. He was successfully resuscitated and was transferred to the medical intensive care unit where he was determined to be clinically normal. Blood pressure was 158/72 mmHg, heart rate 76/min, and temperature 36.6°C. Physical examination was normal. The ECG showed a normal sinus rhythm, normal P waves and PR intervals, J point and ST-segment up-sloping elevation in leads V_2 and V_3; the corrected QT interval (QTc) was normal (408 ms) (Fig. 1). To obtain the ECG of the right ventricle and RVOT, we recorded the leads V_1 to V_3 at the intercostal spaces (ICS) higher than standard position: the "$-V_1$, $-V_2$, $-V_3$" represented the leads analogous to V_1, V_2, V_3 at the third ICS; the "$-2V_1$, $-2V_2$, $-2V_3$" represented V_1 to V_3 at the second ICS; at the lower ICS, the "$+V_1$, $+V_2$, $+V_3$" represented the leads analogous to V_1 to V_3 at the fifth ICS; and V_{3R}, V_{4R}, V_{5R} represented standard right precordial leads (Fig. 2). We arbitrarily defined the coved type of Brugada syndrome as an ECG pattern of >0.1 mV downsloping ST-segment elevation with inverted T wave and saddle-back type as a "fat" R' wave (>40 ms), a >0.1 mV of ST-segment elevation and R'/T amplitude ratio >0.75. The RSR' and significant downsloping ST-segment elevation with negative T waves (coved type), which were not present in the initial standard ECG, were revealed in leads $-V_1$, $-V_2$, and $-2V_1$ to $-2V_3$ (Fig. 3). A standard 12-lead ECG taken on the next day showed saddle-back type Brugada syndrome in lead V_2.

The laboratory test, including complete blood count, urinary analysis, blood chemistry, and electrolytes, was normal. Serum potassium was 4.0 mEq/l and magnesium 0.73 mmol/l (normal values = 0.5–1.1 mmol/l). Chest x-ray and echocardiography were normal. All pressure and oxymetry parameters during left and right-sided cardiac catheterization were within normal limits. Coronary angiography revealed normal coronary arteries. Right and left ventriculograms were normal with a ventricular ejection fraction of 68 and 61%, respectively. The electrophysiologic study showed a normal sinus node, a normal atrioventricular (AV) node, and His-Purkinje function without evidence of any accessory pathway. The Brugada sign in leads V_1 to V_3 were provoked by procainamide 10 mg/kg intravenous infusion (data not shown). No arrhythmia was induced with programmed stimulation at the right ventricular (RV) apex and RVOT at 3 cycle lengths (600, 500, 400 ms) with and without isoproterenol. Arrhythmia monitoring was negative. Because the patient refused implantation of an implantable cardioverter-defibrillator (ICD), he was discharged and treated with low-dose metoprolol. The Brugada signs in standard and new right ventricular lead ECGs (after beta

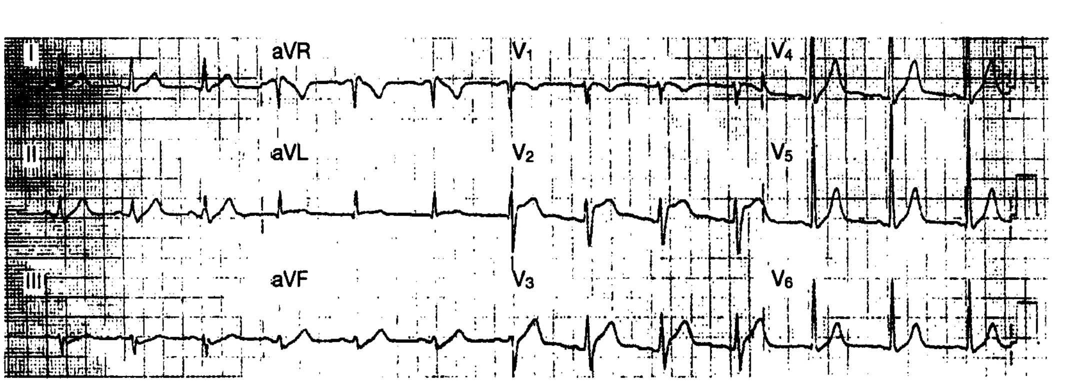

FIG. 1 Initial standard 12-lead electrocardiogram (ECG) of a Thai patient (the case report), post resuscitation from ventricular fibrillation, shows normal sinus rhythm, left ventricular hypertrophy by voltage criteria, normal QTc interval, and J point elevation with upsloping ST elevation in leads V_2 and V_3. No "coved" or "saddle-back" type ECG of Brugada syndrome was observed.

blocker) were not more prominent than the predischarge ECG (without beta blocker) during 1- and 3-month follow-up.

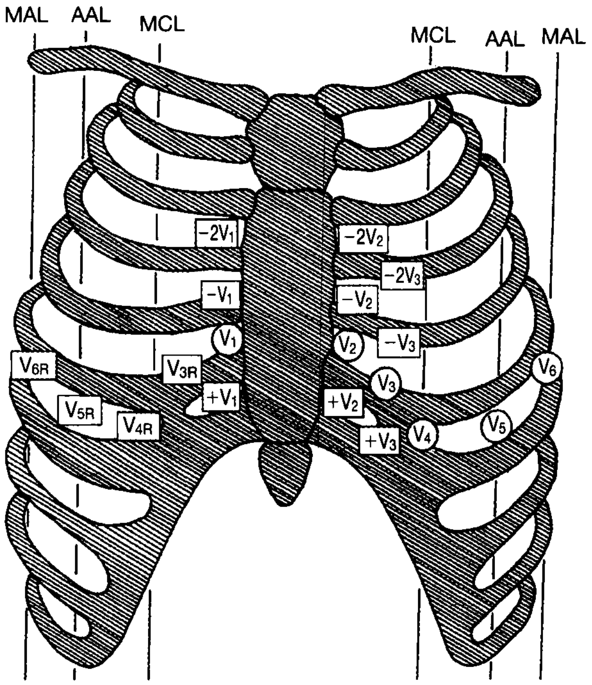

FIG. 2 Standard precordial positions of conventional chest leads V_1 to V_6 (open circles) and the right ventricular electrocardiographic leads: $-V_1$ to $-V_3$, $+V_1$ to $+V_3$, $-2V_1$ to $-2V_3$, and V_{3R} to V_{6R} (open squares) are shown. The lead $-V_1$ is just to the right of the sternum in the third intercostal space; the lead $-V_2$ to the left of the sternum in the third intercostal space; the lead $-V_3$ is one intercostal space higher than standard lead V_3; the leads $+V_1$ and $+V_2$ are just to the right and left, respectively, of the sternum in the fifth intercostal space; the lead $+V_3$ is one intercostal space lower than the standard lead V_3; the leads $-2V_1$ and $-2V_2$ are just to the right and left, respectively, of the sternum in the second intercostal space; the lead $-2V_3$ is two intercostal spaces higher than standard lead V_3; the lead V_{4R} lies in the right midclavicular line (MCL) in the fifth intercostal space; lead V_{3R} is halfway between leads V_1 and V_{4R}; the lead V_{5R} lies in the right anterior axillary line (AAL) in the fifth intercostal space; the lead V_{6R} lies in the mid-axillary line (MAL) in the fifth intercostal space.

Extended Study in Other Survivors of Sudden Unexplained Death Syndrome and Their Family Members

We employed these new 12 right ventricular ECG leads ($-V_1$ to $-V_3$, $-2V_1$ to $-2V_3$, $+V_1$ to $+V_3$, and V_{3R} to V_{5R}) and standard 12-lead ECG in cases of the other three survivors of SUDS and seven presumptive survivors of SUDS (41.5 ± 8.2 years). All but one were male. They had been apparently healthy before the syncopal attack. The three survivors of SUDS had cardiac arrest due to idiopathic VF and the other seven patients had clinical symptoms typically found in SUDS.[9, 10] Two patients (one survivor and one presumptive survivor of SUDS) had coved and/or saddle-back type of Brugada syndrome in leads V_1 to V_3 as well as in leads $-V_1$ to $-V_3$ and $-2V_1$ to $-2V_3$. The other two survivors of SUDS did not have these typical ECG markers in standard leads V_1 to V_3, but did have when placing the recorder at the higher ICS leads (Fig. 4). We also employed these new right ventricular ECG leads together with standard 12-lead ECG to study 23 healthy family members of survivors of SUDS and 40 healthy controls. None had a history of structural heart disease and all showed normal results on physical examination. According to standard 12-lead ECG, as well as right ventricular ECG leads, two family members showed typical coved or saddle-back patterns for Brugada syndrome, and four showed them only by utilizing the higher ICS V_1 to V_3 ($-V_1$ to $-V_3$ and $-2V_1$ to $-2V_3$) ECG leads (Fig. 5), not by standard lead V_1 to V_3 (Table I). We followed up all six asymptomatic family members and did not treat them with any medication or ICD. None of the controls had typical ECG patterns of Brugada syndrome by either method. The coved or saddle-back ECG types could not be detected in lower ICS V_1 to V_3 right precordial leads ($+V_1$ to $+V_3$ and V_{3R} to V_{5R}) in either survivors of SUDS or their relatives.

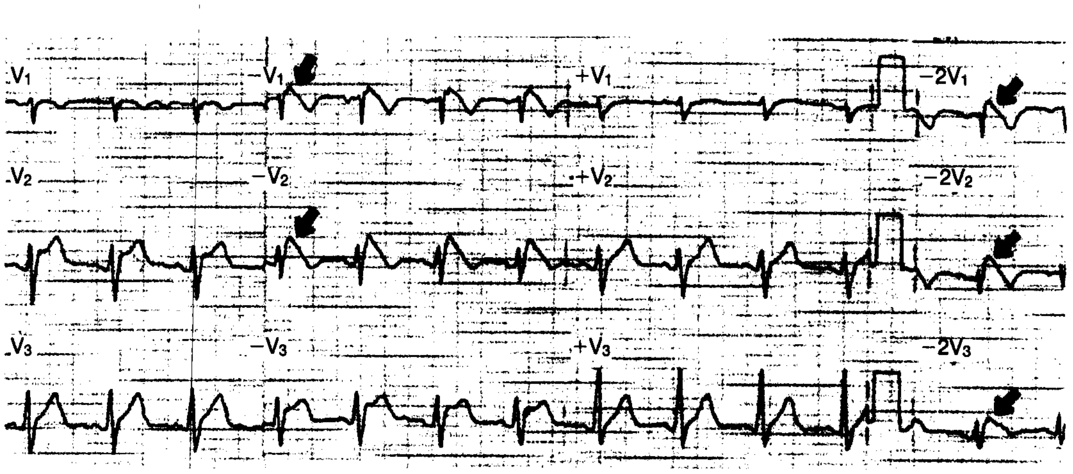

FIG. 3 The initial standard leads V_1 to V_3 of the electrocardiogram (ECG) of the case report did not show the typical RSR' and ST elevation of Brugada syndrome, but when the new right ventricular ECG leads ($-V_1$ to $-V_3$, $+V_1$ to $+V_3$, $-2V_1$ to $-2V_3$, and V_{3R} to V_{5R}) were employed (see Fig. 2), the "coved" types of Brugada syndrome were revealed in leads $-V_1$, $-V_2$, and $-2V_1$ to $-2V_3$ (closed arrow).

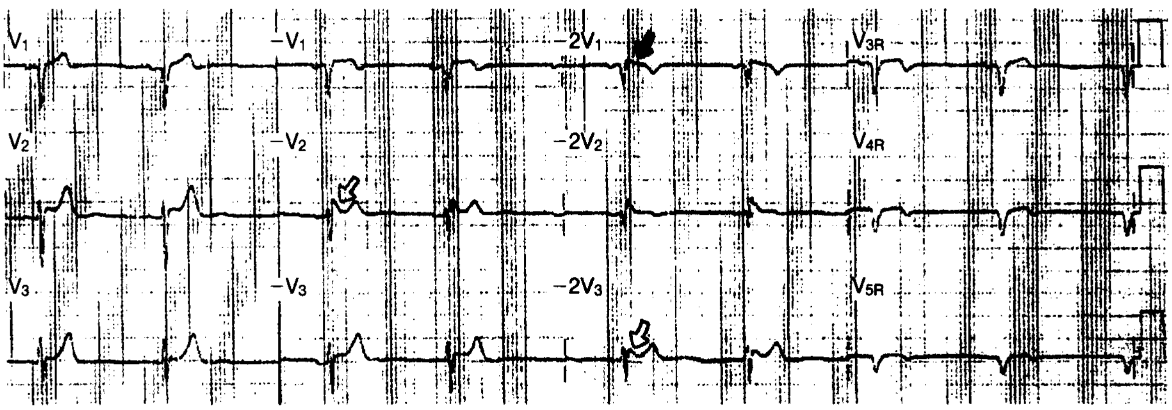

FIG. 4 The electrocardiogram (ECG) of the survivor of sudden unexplained death syndrome (SUDS) exhibits no ECG pattern of Brugada syndrome in leads V_1 to V_3, but reveals the "saddle-back" type in leads $-V_2$ and $-2V_3$ (open arrows) and "coved" type in lead $-2V_1$ (closed arrow).

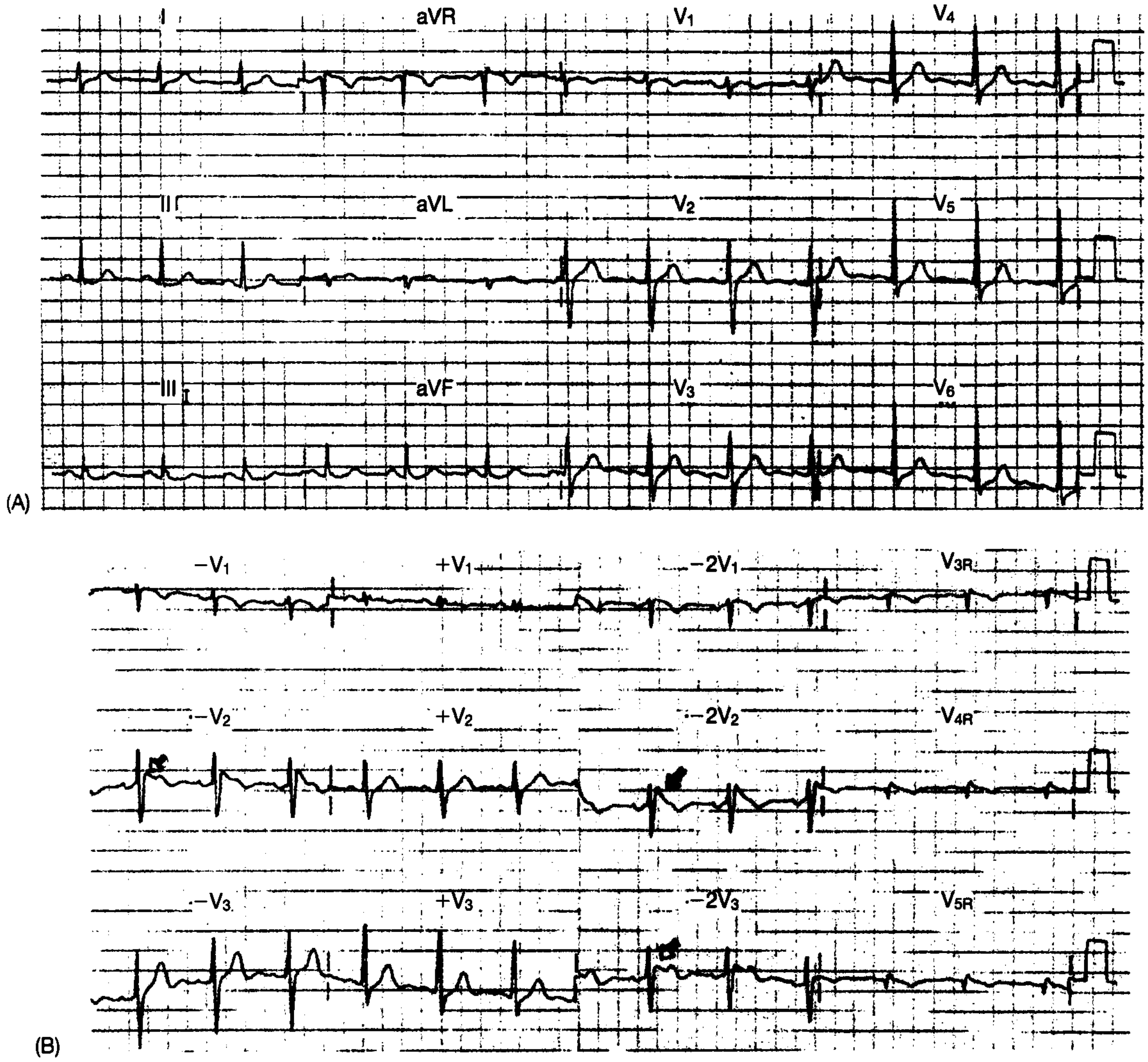

FIG. 5 The electrocardiogram (ECG) of the father of a survivor of sudden unexplained death syndrome (SUDS). (A) Standard 12-lead ECG shows no RSR' and ST elevation of Brugada syndrome in leads V_1 to V_3. (B) Right ventricular ECG leads (detail in text and Fig. 2) exhibit "saddle-back" type in leads $-V_2$ and $-2V_3$ (open arrow) and "coved" type in lead $-2V_2$ (closed arrow).

TABLE I Positive Brugada sign (RSR' and ST-segment elevation) in different sets of electrocardiographic leads

ECG leads	NSUDS & PNSUDS (n = 11)	Family members (n = 23)	Controls (n = 40)
Standard V_1 to V_3, no. (%)	2 (18.2)	2 (8.7)	0 (0)
Higher ICS V_1 to V_3, no. (%)	5 (45.5)	6 (26.1)	0 (0)
Lower ICS V_1 to V_3, no. (%)	0 (0)	0 (0)	0 (0)
Standard V_{3R} to V_{5R}, no. (%)	0 (0)	0 (0)	0 (0)

Abbreviations: ECG = electrocardiographic, NSUDS = near sudden unexplained death syndrome or sudden unexplained death syndrome survivors, PNSUDS = presumptive sudden unexplained death syndrome survivors, Higher ICS V_1 to V_3 = higher intercostal space leads V_1 to V_3 or leads $-V_1$ to $-V_3$ and $-2V_1$ to $-2V_3$ (see Fig. 2), Lower ICS V_1 to V_3 = lower intercostal space leads V_1 to V_3 or leads $+V_1$ to $+V_3$ (see Fig. 2).

Discussion

The ECG pattern of RSR' with ST-segment elevation and inversion of the T wave in leads V_1 to V_3, with or without right bundle-branch block, is a diagnostic hallmark of Brugada syndrome in idiopathic patients with VF.[4] However, this ECG pattern can be transiently normalized; thus Brugada syndrome possibly could be underdiagnosed with the standard ECG.[6] To overcome this problem, a serial standard 12-lead ECG should be performed[2] because of the hourly or daily dynamic changes of this ECG manifestation,[11] or sodium channel-blocking agents such as procainamide can be administered intravenously to unmask the ST-segment elevation in leads V_1 to V_3.[11] The RSR' and ST-segment elevation in Brugada syndrome has been proposed to be a reflection of conduction delay localized in the RV anterior wall and RVOT by isochrone mapping;[12] the ECG recorder position should be extended to cover the sites where abnormal electrical impulse prevails. The more ECG leads we placed for RV and RVOT, the greater was the chance of detecting Brugada syndrome. Therefore, we selected the leads V_1 to V_3 at higher ICS ($-V_1$ to $-V_3$ and $-2V_1$ to $-2V_3$), lower ICS ($+V_1$ to $+V_3$), and right precordial leads (V_{3R} to V_{5R}) for our study.

We report the case of a survivor of SUDS with Brugada sign only in higher ICS leads V_1 to V_3 ($-V_1$ to $-V_3$ and $-2V_1$ to $-2V_3$). The patient was treated with low-dose beta blocker therapy because there is some evidence that sudden unexplained deaths among Thai workers in Singapore were related to stress and emotional problems,[13] and beta blockers may reduce stress and the ventricular arrhythmia threshold. Beta blockers may also provoke the Brugada sign by slowing the heart rate, but this manifestation was not observed in our patient, perhaps because of the smaller dosage.

Our data have shown that the new right ventricular ECG leads could identify Brugada syndrome in 5 of 11 survivors of SUDS and 6 out of 23 of their healthy relatives, whereas the standard 12-lead ECG could do so in only 2 of 11 and 2 of 23, respectively. Thus, these right ventricular ECG leads are more sensitive than the standard 12-lead ECG for detection of Brugada syndrome.

Previous studies[2, 6, 7] have suggested that the dynamic changes of RSR' and ST-segment elevation in Brugada syndrome might relate to the electrical heterogeneity of the right ventricle at different times, and our data demonstrate that these changes might also relate to different sites detected by different ECG leads. These findings may support the hypothesis of electrical heterogeneity at different sites leading to phase 2 reentry as a trigger for idiopathic VF, proposed by Lukas and Antzelevitch.[14]

The secondary R waves (R') may normally be present or increase in amplitude in the higher ICS of leads V_1 and V_2 with an inverted T wave,[15] and can be differentiated from the ECG patterns of Brugada syndrome by ST-segment elevation which is absent in normal patients. The coved and saddle-back ECG patterns in Brugada syndrome look similar to right bundle-branch block and early repolarization patterns, respectively. We observed that the saddle-back type ECG in SUDS survivor had a "fat" R' wave (> 40 ms) which is different from the "tall peak" R' wave in the right bundle-branch block pattern in our healthy controls. The R' wave in the saddle-back type was also as tall as or a little shorter than the T-wave amplitude (R'/T ratio > 0.75), compared with the early repolarization pattern in normal controls. However, sensitivity and specificity of these criteria for Brugada syndrome need to be established in a large population study.

Conclusion

These findings have several clinical implications. First, the results demonstrate that a portion of the Thai population who suffered from acute syncopal attacks similar to SUDS probably are patients with Brugada syndrome. Second, we found that healthy family members of survivors of SUDS had an "occult" ECG pattern of Brugada syndrome as well; under certain conditions, they might develop idiopathic VF and, consequently, sudden death similar to that observed among SUDS victims. The results also support previous observations that about 30–40% of SUDS victims had a history of SUDS attacks in one or more of their family members.[9, 13, 16] Third, to increase sensitivity for detection of subjects at high risk of developing SUDS, especially those who are family members of SUDS victims, the right ventricular ECG leads should be utilized concomitantly with a standard 12-lead ECG. When used in conjunction with the standard 12-lead ECG, the new right ventricular ECG lead method might also enhance the sensitivity for detection of Brugada syndrome. It is conceivable that utilization of this method together with sodium-channel blocker test, as well as serial ECG, will further increase the sensitivity for detecting Brugada syndrome (our unpublished data).

Our new right ventricular ECG lead method is easy to perform, inexpensive, less operator dependent, and suitable for mass screening of patients at high risk of developing SUDS.

We also propose these new right ventricular ECG leads as a screening tool for Brugada syndrome in Thai sudden death survivors.

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References

1. Parish RG, Tucker M, Ing R, Encarnacion C, Eberhardt M: Sudden unexplained death syndrome in southeast Asian refugees: A review of CDC surveillance. *MMWR* 1987;36(no.1 SS):43SS–53SS
2. Nademanee K, Veerakul G, Nimmannit S, Chaowakul V, Bhuripanyo K, Likittanasombat K, Tunsanga K, Kuasirikul S, Malasit P, Tansupasawadikul S, Tatsanavivat P: Arrhythmogenic marker for the sudden unexplained death syndrome in Thai men. *Circulation* 1997;96:2595–2600
3. Otto CM, Tauxe RV, Cobb LA, Greene HL, Gross BW, Werner JA, Burroughs RW, Samson WE, Weaver WD, Trobaugh GB: Ventricular fibrillation causes sudden death in southeast Asian immigrants. *Ann Intern Med* 1984;101:45–47
4. Brugada P, Brugada J: Right bundle-branch block, persistent ST segment elevation and sudden cardiac death: A distinct clinical and electrocardiographic syndrome. A multicenter report. *J Am Coll Cardiol* 1992;20:1391–1396
5. Grace AA: Brugada syndrome. *Lancet* 1999;354:445–446
6. Bjerregaard P, Gussak I, Antzelevitch C: The enigmatic ECG manifestation of Brugada syndrome. *J Cardiovasc Electrophysiol* 1998; 9:109–112
7. Veerakul G, Nademanee K: Dynamic changes in the RBBB and ST elevation in the right precordial leads observed in patients with idiopathic ventricular fibrillation: Evidence of phase 2 repolarization abnormality (abstr). *Circulation* 1996;98(suppl):I-626;3669
8. Alings M, Wilde A: "Brugada" syndrome: Clinical data and suggested pathophysiological mechanism. *Circulation* 1999;99: 666–673
9. Tatsanavivat P, Chirawatkul A, Klungboonkrong V, Munger R, Chaisiri S, Charerntanyarak L, Saowakontha S: Sudden and unexplained deaths in sleep (Lai Tai) of young men in rural north-eastern Thailand. *Int J Epidemiol* 1992;21:904–910
10. Nimmannit S, Malasit P, Chaovakul V, Susaengrat W, Vasuvattakul S, Nilwarankur S: Pathogenesis of unexplained nocturnal death and endemic distal renal tubular acidosis. *Lancet* 1991;338:930–932
11. Gussak I, Antzelevitch C, Bjerregaard P, Towbin JA, Chaitman BR: The Brugada syndrome: Clinical, electrophysiologic and genetic aspects. *J Am Coll Cardiol* 1999;33:5–15
12. Kasanuki H, Ohnishi S, Ohtuka M, Matsuda N, Nirei T, Isogai R, Shoda M, Toyoshima Y, Hosoda S: Idiopathic ventricular fibrillation induced with vagal activity in patients without obvious heart disease. *Circulation* 1997;95:2277–2285
13. Goh KT, Chao TC, Chew CH: Sudden nocturnal deaths among Thai construction workers in Singapore. *Lancet* 1990;335:1154
14. Lukas A, Antzelevitch C: Phase 2 reentry as a mechanism of initiation of circus movement reentry in canine epicardium exposed to simulated ischemia. The antiarrhythmia effects of 4-aminopyridine. *Cardiovasc Res* 1996;32:593–603
15. Marriott HJ: Bundle-branch block. In *Practical Electrocardiography*, 8th ed. (Ed. Marriott HJ), p. 79. Baltimore: Williams & Wilkins, 1988
16. Tungsanga K, Sriboonlue P: Sudden unexplained death syndrome in north-east Thailand. *Int J Epidemiol* 1993;22:81–87

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Priority setting for health research: lessons from developing countries

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Research resources for addressing health problems of developing countries remain disproportionately low compared with the tremendous disease burdens borne by these countries. There is a need to focus these scarce resources on research that will optimize health benefits and lead to equity. This paper reviews processes and methods that have been used for setting research priorities. Past and current processes have focused on expert-driven research agenda, emphasizing scientific autonomy and global analyses. Methods for setting priorities have focused on the metrics of disease burdens, while less attention has been placed on who sets priorities and how choices are made.

The paper proposes a strategy of priority setting, based on lessons learned from essential national health research (ENHR) approaches attempted in several developing countries. With equity in health and development as its goal, the proposed model is demand-driven, and involves multi-dimensional inputs and multiple stakeholders. Various steps of the process are discussed: getting participants involved; gathering evidence and information; determining criteria for priority setting; and implementation and evaluation. The paper concludes with a discussion of the gap between national research priorities and the research agenda set at regional and global levels, an issue that needs to be satisfactorily addressed in the future.

Preface

This paper is a timely review of the issues around research priority setting, especially as they relate to health problems of developing countries. This is one of the major issues to be discussed at the International Conference on Health Research for Development, to be held on 10–13 October 2000 in Bangkok, Thailand. Ten years after the Commission on Health Research for Development reviewed the state of health research in the world, the forthcoming international conference is expected to lead to a new vision and a responsive health research agenda for the next decade. The conference participants will thoroughly review the many initiatives in health research over the last decade, examine possible scenarios and options for international health research cooperation, and discuss new tools and methodologies. In the conference session devoted to priority setting, participants will critically review experiences, gaps in methodology, and lessons learnt. This paper, from the perspective of developing countries, will be an important contribution to this session, and will flow into the overall declaration on the future of health research for the next decade.

The International Conference on Health Research for Development is spearheaded by an international organizing committee from the World Health Organization, the World Bank, the Global Forum for Health Research and the Council on Health Research for Development. Close to 30 other national and international organizations are collaborating on the steering process.

Introduction

Ten years ago, the Commission on Health Research for Development urged countries to undertake essential national health research (ENHR) in order to help correct imbalances in global health and development.[1] In 1992, estimated resources for research on health problems of developing countries amounted to only 4.4% of global research and development (R&D) investment,[2] a marked contrast to the fact that almost 90% of the global disease burden in 1990 was in developing countries.[3] Over the past decade, various strategies to increase the research resources for developing country problems have been attempted by international health bodies and agencies. Yet the latest estimates, according to the Global Forum for Health Research, still stand at an unhealthy '10/90' disequilibrium.[4] These constraints underscore the continuing need to focus on priorities in order to optimize health benefits and impact from scarce research resources.

Experiences in priority setting: processes and methods

Processes

The process of research agenda setting, until recently, has been limited, partly because the ideological emphasis has been on 'scientific autonomy'. Thus, resultant research agenda have tended to be expert-driven, largely detached from the public arena, and with insufficient operational emphasis. At the country level, there has been a heavy reliance on the inputs of prominent scientists, members of medical research councils (MRCs) or ministries of science and technology. It is notable, however, that while in the United States, the US National Institutes of Health primarily considers recommendations from leading science and technology experts, it also periodically makes use of user and patient panels to identify health care priorities.

The World Health Organization (WHO) Advisory Committee on Health Research, at both the global and regional levels, depends largely on scientific experts and directors of MRCs. Its special programmes, such as the Special Programme on Research and Training on Tropical Diseases (TDR) and the Special Programme on Research, Development & Research Training on Human Reproduction (HRP), have also made use of expert committees for setting priorities.

The process of health sector reform and WHO's efforts in health systems research, coupled with the World Bank's emphasis on user fees during the mid-1980s, led to a growing research interest on health systems development and cost-effectiveness analysis.[5,6] In 1996, the WHO *Ad Hoc* Committee on Health Research Relating to Future Intervention Options proposed a global research agenda based on a five-step process of priority setting. This involved a great deal of technical expertise and analytic work on burden of disease and cost-effectiveness of health interventions.[5] This has been taken a step further by the Global Forum on Health Research by drawing together various constituencies and networks at the global level in order to address identified research gaps.[4]

Methods

Many models have been used to set priorities for health resource allocation, some of which have been applied to research priority setting. These approaches range from qualitative methods of consensus building to the use of quantitative formulations and prioritisation matrices.[8–10] In recent years, composite indicators have gained prominence in the research priority-setting process because these single measures lend themselves to comparisons across a broad range of diseases and are particularly attractive for cost-benefit analyses of interventions. For example, the disability-adjusted life-year (DALY), a single measure of the disability, premature mortality and relative values of life at given ages, has been used to assess global and regional burden of disease.[11] More recently, another formulation, healthy life-years (HeaLYs), has been proposed to similarly reflect disability and premature mortality, but with improved valuations on the stream of life lost due to disability or death, based on the natural history of the disease, and with discounting calculated separately.[12]

Although useful in advancing methods for rational resource allocation, the extended discussions on burden of disease measures have sidelined other important issues in research priority setting. These include: Who sets priorities and how? What criteria are used to guide prioritization? These questions become all the more important in the light of the continuing observation that priorities for international health research have seldom been developed with the active participation of developing country research leaders and communities.[13]

Priority-setting exercises based on essential national health research (ENHR) approaches have been attempted in several developing countries, among them Benin, Commonwealth Caribbean countries, Guinea, Kenya, Nicaragua, The Philippines, South Africa, and Thailand.[14,15] Table 1 lists general research priority areas identified by some countries. Aside from priorities focusing on important diseases, it is worthwhile to note that all five countries identified the need for research on and for health policy. This may be due to the widespread emphasis on decentralization and health care financing since over a decade ago.

In this paper, we describe lessons learned from the experience of these countries. A framework for priority setting is presented to define the overall approach. We then suggest steps and methods that countries can use to bring stakeholders together and to set priorities for health research. We believe that these processes of self-determination pave the way for a stronger developing country voice in priority setting at the international level and for increasing the allocation of research resources to developing country problems.

Using the ENHR strategy

ENHR, a strategy first espoused by the Commission on Health Research for Development, is an integrated and systematic approach for organizing and managing country-specific and global health research in order to promote health and development on the basis of equity and social justice.[1,16] The framework that we propose for priority setting has the ENHR strategy as its basis and thus has equity in health and development as its goal.

As shown in Figure 1, priority setting in this model is demand-driven, focusing on an analysis of health needs, people's expectations and societal trends. The involvement of different stakeholders is multi-level (i.e. multiple inputs from communities, districts, sub-national and national levels) and multi-dimensional (i.e. quantitative and qualitative scientific inputs, as well as social, economic, political, ethical and management considerations). Consultative group processes, which are strongly featured in this approach, are inclusive, participatory, interactive and iterative.

Who sets priorities?

The participants are those who have a major stake in the goal of equity in health and development. Countries that have used ENHR strategies have identified four general categories of participants: researchers, decision-makers at different levels, health service providers, and communities. However, the country experiences also suggest the need for stronger representation from the private sector (e.g. professional health associations, the pharmaceutical industry), parliamentarians, and potential donors and international agencies.

Table 1. Examples of broad research priority areas identified in selected developing countries[a]

Country	Research priority areas
Caribbean	• Epidemiology of most common diseases • Access to health care facilities • Cost-benefit and outcome measurements of health policies and practices • Effects of environmental, ethnic, economic, social, and behavioural factors on incidence and prevalence of specific diseases
Guinea	• Research capacity strengthening • Malaria, diarrhoea and other priority health problems • Quality and financing of health care, human resources • Traditional health care: quality, collaboration, medicinal plants
Nicaragua	• Mother and child health • Communicable diseases • Drug addiction/alcoholism • Health care financing • Human resources development • Community involvement
Philippines	• Health care delivery • Product research and utilization • Health sector organization and management • Economics of health care
Uganda	• Maternal and child welfare and nutrition • Water and sanitation • Communicable diseases, including HIV/AIDS • Health systems and policy analysis

[a] It should be noted that some research priorities identified by the countries are not mutually exclusive. The above examples are indicative of the beginning process of priority setting, but more work needs to be done to refine and prioritize the research areas and questions.

The participation of a broadened spectrum of stakeholders helps to identify research needs, technical and financial capabilities, information gaps and distortions, the political environment, and the values and ethics of a given society (see Table 2). More importantly, involving major stakeholders in priority setting fosters ownership of both process and output, and facilitates shared responsibility and accountability in the implementation of the research agenda. In addition, when these stakeholders buy into the process, this could translate into cost sharing in research, not only by international agencies but also by the developing countries themselves.

The selection of participants from different groups and perspectives should be done carefully so that the research agenda has sufficient breadth to benefit a large number of stakeholders, but is narrow enough to have meaningful and manageable priorities. Thus an important initial step is to know the participants, who and where they are, their needs and interests, their expectations, and their strengths and weaknesses.

Getting participants involved

Experiences of countries in this review suggest some entry points in which national groups might involve stakeholders in research priority-setting from the outset, for example:

(1) a national ENHR convention or workshop, with participation from communities, researchers, health programme managers and policy-makers; followed by the formation of a task force with tripartite representation to refine the research agenda (e.g. Barbados, Jamaica, Kenya, Nepal, South Africa, Tobago, Trinidad, Uganda and Zimbabwe);
(2) formation of an inter-sectoral and multidisciplinary working group appointed by the Ministry of Health (e.g. The Philippines); or
(3) a research institute or university group which is tasked to develop and propose processes for priority setting; a larger group of participants is then involved in the actual priority-setting process (e.g. Thailand).

Based on experience, a small but representative working group can effectively facilitate the priority-setting process. This core group, in consultation with the larger group of participants, should moderate the extent and nature of participation of different groups or individuals. This may vary according to the nature of the ENHR activity, for example: the collection and analysis of health information, including community situation analysis through participatory action research; people's consultations through focus-group discussions or interviews; consensus building on specific thematic areas; decision-making for determining and applying criteria for priority setting; or translation of priority research areas into specific research programmes and projects.

Involving participants thus generally involves a sequential pattern of consultations, analyses and priority setting at the community and district levels, and aggregation and synthesis of these outputs at the provincial and national levels. Where conflicting priorities arise, several iterations as well as consensus-building processes may be necessary. However, priorities,

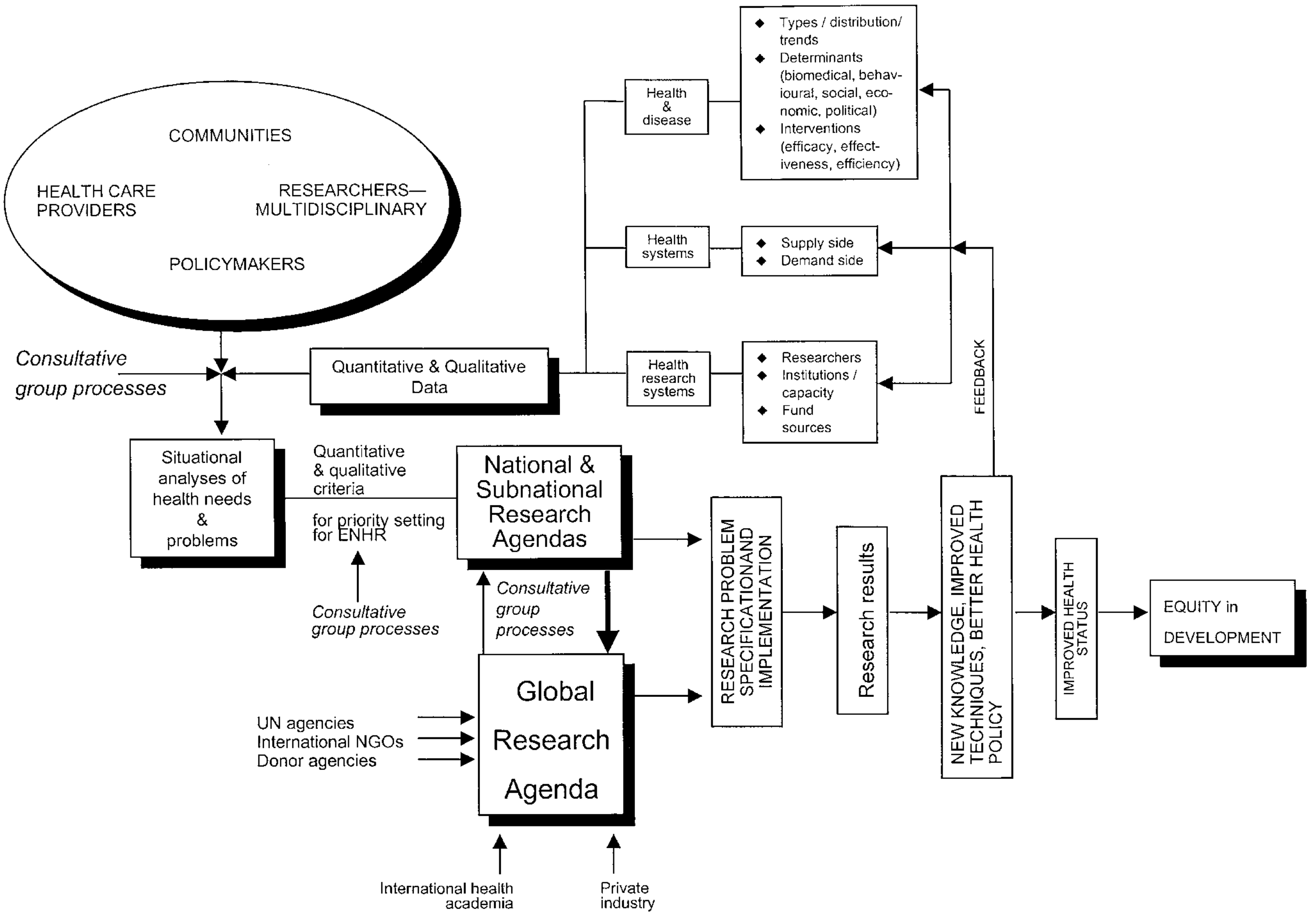

Figure 1. Framework for priority setting using the ENHR strategy

Table 2. Potential functions, roles and responsibilities of various stakeholders in priority setting for health research[a]

Core functions	Principal stakeholders	Roles and responsibilities
Payers	International/regional groups, e.g. multi-lateral organizations, NGOs National science and technology agencies	Mobilize funds in accordance with priority research area Provide international perspectives or technical inputs on health problems
Doers	Ministry/government agencies Academia/university Private sector NGOs	Clearinghouse function Set research policy/agenda Set standards, quality control Technical and ethical reviews Optimize use of resources Package findings for dissemination to various users
Users	Ministry of Health – planners, providers Local government NGOs and people's organizations Research communities – international, national, sub-national	Provide societal and ethical perspectives Arrange Forum to discuss research findings Make decisions balancing evidence and values

[a] All three groups have responsibilities to: (1) participate in priority setting; and (2) advocate for evidence-based policy and action.

especially at the local level, are largely context-sensitive and thus may not always be appropriate at different levels of aggregation.

In some cases, time constraints may necessitate parallel, rather than sequential, consultations for different groups and levels. This is also acceptable, as long as transparency and genuine involvement characterize the priority-setting processes. Acceptance, a sense of ownership, and implementation of the research agenda are perhaps the best indicators of involvement in the process.

Information for setting priorities

Decisions on priorities should be made based on the best available information. Evidence-based situation analysis at the outset can inform the priority-setting process. Three broad categories of information should be gathered and analyzed: the health status in a given setting, the health care system, and the health research system (see Figure 1, quantitative and qualitative data inputs). All three dimensions are important for assessing the main health problems, the supply- and demand-side of health care, and the research resources available to address priority research areas.

Sources of information can be varied; for example, vital registration systems, special surveys, patient records, focus group discussions or informed opinion. Statistical projections on demographic parameters, health determinants and diseases also provide useful information for determining the future impact of health research.

Despite the many sources, the 'lack of data' at the national and sub-national levels of many developing countries is often given as an excuse for arbitrary decisions on research priorities. Countries should begin with what is available, but should build on this to improve the quality of information and to fill important gaps. Because of the iterative nature of the priority-setting process, more and better information is progressively available in succeeding prioritization cycles.

In addressing issues of equity, the situation analysis should specifically cover the concerns of the vulnerable and the disadvantaged. Some countries' experiences (e.g. The Philippines, Benin) have demonstrated that the participation of non-governmental and people's organizations in the priority-setting process is more likely to draw attention to the situation and needs of neglected and marginalized groups.

The packaging and use of information gathered is another key issue. The heterogeneity of stakeholders means that the data will not always be understood in the same way. Thus, the working group coordinating the entire priority-setting process has to pay close attention to the interactions among participating groups. Steps need to be taken to ensure that the import of specialized information is within the grasp of all, including less technically skilled participants. In the same vein, it is important to balance the 'rigorous with the spontaneous'; i.e. to recognize that the information or perceptions or sensitivities expressed by various partners may influence the choice of priorities.

Criteria for setting priorities

A systematic and transparent process of priority setting is important in ensuring that the voice and will of the different stakeholders are heard and respected. Without openness and accountability, the voice of a 'moneyed' or inner circle may subvert the process of consensus building.

Research priorities will depend on a two-step process of, first, selecting criteria for priority setting and, second, selecting research topics from among identified priority problem areas. The countries in this review used one or more criteria from the following categories:

(1) magnitude and urgency of the problem, as suggested from quantitative and qualitative data in the requisite situation analysis;
(2) extent of previous research and the potential contribution of research in discovering, developing or evaluating new interventions;
(3) feasibility of carrying out the research in terms of the technical, economic, political, socio-cultural and ethical aspects;
(4) expected impact of the research, considering both direct and indirect effects, short- and long-term benefits, as well as its implications on issues of affordability, efficacy, equity and coverage.

The above categories could be broken down to as many as 12 distinct criteria. However, experiences at the country level and with a variety of participants show that a manageable core of criteria should be no more than six or seven. At the global level, for instance, the WHO *Ad Hoc* Committee proposed five steps for determining 'best buys' for global R&D, entailing an assessment of the following: the magnitude of the problem; the reasons for the persistence of the problem; the current knowledge base; the cost-effectiveness of potential interventions; and the current level of effort.[5]

The selection of the final criteria will depend on the purpose and level of action of the priority-setting exercise (i.e. global, national, sub-national, village levels, etc.), the availability of information related to the specific criterion, and the ability to define and measure the criteria in a common language or framework. The assignment of equal or differential weights to the criteria should be carefully deliberated upon by the participants until a consensus is reached on the selected criteria and the weights.

In assembling research areas to be considered, efforts should be made to cluster health problems into equivalent and meaningful levels so that priority areas are not chosen merely by the breadth and magnitude of the topics covered under a cluster. In addition, each research area should be specific and explicit enough to provide a common understanding among different stakeholders.

While it may not be necessary for all participants to be involved at every stage of the priority-setting process, the core group should document the processes and results at each stage. Methods for combining results range from addition of scores on simple scales to complex mathematical models or matrices.[9,10,17] The procedures for applying the criteria to the research areas are time consuming, but they enhance acceptance, ownership and implementation of the research agenda as a result of transparent and systematic procedures.

For most countries in this review, these crucial intervening steps leading to the selection of research priority areas and topics were not fully documented, leading to problems of reliability and credibility.

Implementation and evaluation

It remains to be seen whether, in the long term, priority-setting using the ENHR strategy will, in fact, improve the use of limited resources and generate more research funding for problems of the poor. There are intermediate but critical steps to ensure success: effective advocacy and dissemination of the agenda to all stakeholders, especially decision-makers who hold the key to health policy and research resources; implementation of the agenda by researchers, in partnership with other stakeholders; and periodic review and assessment of priorities.

Three important indicators are proposed for evaluation:

(1) Utilization of the research agenda: how extensive was the implementation of the research priorities? How much interest did the research agenda generate among stakeholders?
(2) Involvement of multiple stakeholders: how many groups or constituencies were involved and what were their contributions? Who were not involved?
(3) Do the research priorities address equity in health? For this, one could measure the proportion of researches that address health problems of the poor, the shift of resource flows towards equity-targeted programmes and the identified research priorities, and 'buy-in' from national and international sources.

The outcome and impact of these priority-setting exercises in the developing countries have yet to be fully evaluated. It is important to note, however, that competencies such as priority setting cannot be taken in isolation. Other important factors and competencies must be considered, for example, the country mechanism to support ENHR, advocacy, partnership development, resource mobilization, community participation, and translation of research results into policy and action.

The ENHR strategy and global health research priorities

ENHR includes research that may be country-specific or that may have international import. Individual countries should weigh the resources they direct at key national problems, but should also be well informed about the international health research effort. Common health problems shared with other developing countries may spell out opportunities for collaborative, multi-country research efforts, e.g. the growing problem of anti-microbial resistance, community-based evaluations of impregnated bednets in the control of malaria, behavioural interventions against smoking, or the development of innovative health care financing schemes. A number of middle-income developing countries, like Brazil, Malaysia, South Africa and Thailand, are also in a position to carry out basic research on developing country diseases, such as leishmaniasis, malaria, dengue and tuberculosis. The appropriate mix of country-specific and international health research is an important issue to address in the priority-setting exercise. This provides the national players with some leverage and basis for matching international donor interests with national and local concerns, or for negotiating research areas for assistance.

In addition, the systematic formulation, articulation and dissemination of national research agendas are important inputs to the global research agenda (see Figure 1). There should be efforts towards an upward synthesis of national priorities at the regional and global levels. This is to balance an oft-perceived 'one-sidedness' in global agenda setting. In the short term, hands-on participation of developing country representatives in global task forces devoted to specific initiatives could gradually improve the capabilities of these countries in the analysis, synthesis and articulation of their priorities. For the long term, the biggest challenge is to steadily increase the internal capacity of countries for analyzing their own health problems and needs, setting priorities, designing, implementing and evaluating research and health programmes. International efforts to strengthen countries' research capabilities will redound to the international good, as international databases and global health research priorities become more firmly grounded in country realities.

Endnote

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References

[1] Commission on Health Research for Development. *Health research: essential link to equity in development.* New York: Oxford University Press, 1990.

[2] Michaud C, Murray CJL. Resources for health research and development in 1992: a global overview. In: WHO *Ad Hoc* Committee on Health Research Relating to Future Intervention Options. *Investing in health research and development.* Geneva, Switzerland: World Health Organization, 1996; 213–34.

[3] Murray CJL, Lopez AD. Global patterns of cause of death and burden of disease in 1990, with projections to 2020. In: WHO *Ad Hoc* Committee on Health Research Relating to Future Intervention Options. *Investing in health research and development.* Geneva, Switzerland: World Health Organization, 1996; 33–85.

[4] Global Forum for Health Research. *The 10/90 report on health research 1999.* Geneva, Switzerland: Global Forum for Health Research, 1999.

[5] *Ad Hoc* Committee on Health Research Relating to Future Intervention Options. *Investing in health research and development.* Geneva, Switzerland: World Health Organization, 1996.

[6] The World Bank. *World Development Report 1993: Investing in Health*. New York: Oxford University Press, 1993.

[7] The International Development Research Centre and the World Health Organization. Health Systems Research Training Series. 1991.

[8] Feacham RG, Graham WJ, Timaeus IM. Identifying health problems and health research priorities in developing countries. *Journal of Tropical Medicine and Hygiene* 1989; **92**: 133–91.

[9] Varkevisser CM, Pathmanathan I, Brownlee A. Designing and conducting health systems research projects. Module 3: Identifying and prioritizing problems for research. In: *Health systems research training series*. International Development Research Centre and The World Health Organization, 1991; **2**(Pt 1): 34.

[10] Henshall C, Oortwijn W, Stevens A, Granados A, Banta D. Priority setting for health technology assessment: theoretical considerations and practical approaches. *International Journal of Technology Assessment in Health Care* 1997; **13**: 144–85.

[11] Murray CJL, Lopez AD. Global mortality, disability, and the contribution of risk factors: Global Burden of Disease Study. *The Lancet* 1997; **349**: 1436–42.

[12] Hyder AA, Rotllant G, Morrow RH. Measuring the burden of disease: healthy life-years. *American Journal of Public Health* 1998; **88**: 196–202.

[13] Wolffers I. Demand-driven research and development programmes: their challenges. *Newsletter*, Netherlands supported programmes for development, 1997; **7**: 8–11.

[14] Nuyens Y. *Review of processes, mechanisms and outcomes of priority setting for ENHR*. Geneva, Switzerland: Council on Health Research for Development, 1997.

[15] Sitthi-Amorn C, Chunharas S, Chooprapawan C. *ENHR development in Thailand*. Geneva, Switzerland: Council on Health Research for Development (Document No. 97.6), 1997.

[16] Task Force on Health Research for Development. *ENHR: a strategy for action in health and human development.* Geneva, Switzerland: Task Force on Health Research for Development, 1991.

[17] World Health Organization. *Sexual and reproductive health research priorities for WHO for the period 1998–2003*. Geneva, Switzerland: UNDP/UNFPA/WHO/World Bank Special Programme of Research, Development & Research Training in Human Reproduction, 1997.

Notes on Corporate Authorship

The Working Group on Priority Setting was constituted in February 1997 by the Council on Health Research and Development, an international non-governmental organization devoted to the promotion and support of strategies for essential national health research (ENHR) in developing countries. The Working Group is one of four groups tasked to gather and analyze data derived from country experiences related to ENHR competencies. Members are from research institutes and councils, academic institutions, government agencies and NGOs, as well as from bilateral funding agencies.

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Strengthening health research capacity in developing countries: a critical element for achieving health equity

Chitr Sitthi-amorn, Ratana Somrongthong

Equity in health as the core value of health for all advocated by the Alma Ata declaration has not been achieved. Poverty is widening and inequity prevails.[1] New illnesses have burdened and strained health systems. Rapid growth of private medical services, medical technology, and uncontrolled insurance markets in many developing countries with relatively rapid private sector growth have resulted in unwanted consequences, highlighted by the economic crisis in Asia.[2] The rising number of international organisations and institutions involved in global health has eroded national sovereignty. The migration of health professionals from the public to the private sector and from developing to developed countries has diminished their ability undertake research and implement research findings.[3] It has also limited developing countries' ability to participate in the political debates and decisions on global health governance. Greater support of research for development is needed and health equity must be adopted as a core value.

Defining health research capacity

Health research capacity is the ability to define problems, set objectives and priorities, build sustainable institutions and organisations, and identify solutions to key national health problems.[4] This definition encompasses research capacity at the levels of individuals, research groups, institutions, and nations. Research capacity can broadly be divided into four domains: skills and competencies; scientific activities; outcomes; and impacts on policies and programmes.[5] Measures on process, outcome, and impact are necessary to capture a comprehensive picture of research capacity (fig 1).

The Commission on Health Research for Development identified four components as "essential health research."[7]

- Analysis of the burden of illnesses and their determinants to identify and set priorities among health problems
- Research to guide and accelerate the implementation of research findings to tackle key health problems (for example, the cost effectiveness of preventing death from malaria among poor rural populations[8])
- The development of new tools and methodologies to measure and promote equity (a project to promote trust between the government and rural poor in Brazil resulted in improved maternal and child health[7 9])
- Basic research to advance understanding of disease and disease mechanisms[7] and to develop "orphan" drugs and vaccines.

In addition to carefully targeted programmes and intelligently designed social security systems, participatory research is important to ensure that those who are involved in or affected by the research understand the rationale for the research and the potential benefit that may accrue.[1]

Summary points

Health inequity is widening between and within countries

Research capacity in developing countries is weak

As a result developing countries are unable to participate effectively in national and international health policy development

International and national cooperation and collaboration is needed to strengthen research capacity for health development

Health policy should be informed by a wide range of stakeholders and underpinned by sound evidence

Greater solidarity and commitment to tackling global health inequity is needed

Challenges for the research community in developing countries

The health research community in developing countries faces problems at several levels. At the global level there has been an increase in organisational and institutional players in international health[10] and a subtle but systematic erosion of national sovereignty. In some countries there is evidence that these players have been responsible for fragmentation of research and research capacity building.[11 12]

At the national level, political instability is a problem.[11] Where governments and health ministers are frequently changing, the translation of economic and social development plans to effective national and regional research initiatives is incoherent.[12] Gaps, duplication of effort, and fragmentation of research are common. Priority setting, resource mobilisation and allocation, quality control, and dissemination and utilisation of research findings are similarly impaired.[12]

At the institutional level research units have been over reliant on international funds, which have been diminishing in real terms over the past few years.[11] They have also failed to establish good links to national policymakers, non-governmental organisations, and the public. These two factors have resulted in much research that has not been well geared to addressing national health needs. In addition many research units are struggling to cope with a "brain drain" of basic scientists and clinical researchers to developed countries which offer more opportunities and greater political and financial security.

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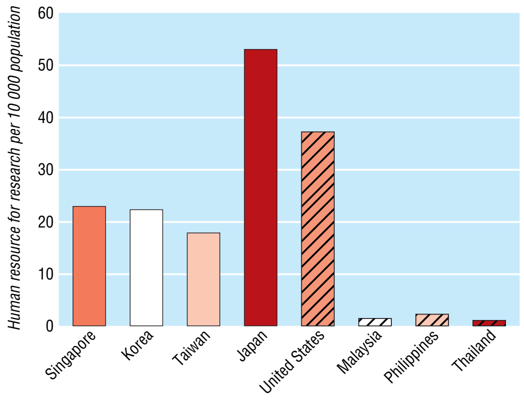

Fig 1 Number of researchers per 10 000 population in developing and developed countries[6]

Supporting research workers

Researchers in developing countries are poorly paid. Many have to work in private practice to make ends meet. Schemes to promote research as a viable career option by giving research awards and supplementing researchers' salaries have been tried but not yet systematically evaluated.[13,14] Intellectual isolation is another problem, although the increasing use of the internet is fostering more exchange between researchers in developed and developing countries. Encouraging researchers to join national, regional, and global networks is another way that isolation may be overcome and motivation increased.

International efforts to strengthen research capacity

Despite the problems outlined above, some international efforts have enhanced the research capacities and the research environment in many developing countries. Notable among these are the special programme of tropical disease research (TDR); the special research programme in human reproduction (HRP) of the World Health Organization; the International Clinical Epidemiology Network (INCLEN), initiated by the Rockefeller Foundation; and the Field Epidemiology Training Program (promoted by Centers for Disease Control).[10,11] The TDR and HRP programmes have been jointly sponsored by the WHO and other UN agencies and are governed by special boards, with the WHO acting as host and day to day manager. Their primary focus is on finding new knowledge and technologies for dealing with selected tropical diseases and with human reproduction (www.who.int/tdr, www.who.int/hrp). The TDR and HRP have contributed significantly to strategic and applied research in Africa, Asia, and Latin America, primarily by providing good training and support of local scientists, and help to promote the uptake of research results by end users (government, non-governmental organisations, private sector, and the public).[5,11]

Successful building of research capacity depends on national governments incorporating capacity building in their national plans. It also needs strong leadership from health professionals, transparent recruitment of research workers (who need to be given adequate support), and good exchange and partnership with reputable units in developed countries.[5] National research systems must also be accountable, operate transparently, and direct their efforts towards defined national health priorities.[5]

National initiatives

Developing countries have also invested in research and have achieved some successes. Before the economic crisis, South East Asian countries poured money into science to create a talent pool that can compete globally.[15] In Thailand, for example, the Thailand Research Fund has supported basic and interdisciplinary research in all branches of science, including basic medical sciences. The fund gives no-bonded research grants to students for PhD studies in Thai universities. Each grant covers not only the student's fees tuition and research allowance but also a budget to pursue elective studies and research and data analysis in any collaborating universities abroad. The efforts will help Thailand to improve its research capacity and university infrastructure (www.trf.org.th). The government also funds the Health System Research Institute.[14–16] These new programmes have highlighted the need for transparency and the importance of rigorous peer review. Other approaches to capacity strengthening include the award of non-bonded research grants to PhD students studies in local universities that have good links to reputable institutions in the North.[14]

PANOS PICTURES

Fig 2 Getting research into practice in rural Thailand

The way forward

In response to growing global health threats (including climate change, AIDS, tuberculosis, malaria, and epidemics of Nippah virus, which causes an encephalitis that is associated with a high mortality) and the transfer of health risk, developing countries and international donors need to invest in health research capacity building. Developing countries must be empowered to participate in debates and decisions about priority setting, regulatory frameworks, and codes of ethics for research collaboration. A good starting point for this is for countries in specific regions to start to cooperate to tackle common regional health problems. Representatives from the region can interact with other regions to reduce global health threats.[17] Mechanisms must be introduced to ensure that investment in research capacity building results in sound equable health governance. Politicians, professional groups, non-governmental organisations, and the public and private sectors must work together at all stages of research development and implementation.

The relative success of agricultural research under the direction of the Consultative Group on International Agricultural Research (CGIAR) may provide a lesson for the health sector.[18] CGIAR has successfully raised awareness of key issues, harnessed the expertise of independent scientific advisory committees, and created great donor solidarity.

Adopting a philosophy of *kalayanamitra* (friends-helping-friends) and intelligent solidarity will help promote a commitment to research to equity in health development.

We thank those who enabled us to participate in several key activities related to research capacity strengthening in developing countries, which form the basis of the argument in the paper; most notable are a special advisor to the Oslo study on the performance of the World Health Organization; the coordinator of the Asian dialogue to raise the Asian voice in health research; a consultant in the study on the cost benefit of the Government investment in health research by the Thailand Rating and Information Services. Special thanks to Drs Kelly Lee and Tessa Richards for making suggestions for revision of the document.

SEAN SPRAGUE/PANOS PICTURES

Fig 3 Vaccination in Bangkok: countries need to cooperate to tackle common regional health problems

1 Gwatkin DR. Health inequalities and the health of the poor: what do we know? What can we do? *Bull WHO* 2000;78: 3-18.

2 Sitthi-amorn C, Janjaroen WS. The bubble in Thailand health care system: a "reform" without plan. Presented at the meeting on efficient and equity oriented health care systems, Halong City, Vietnam, 1999.

3 Sitthi-amorn C. Report of the Asian Forum for Health Research (draft). Manila, the Philippines, February 17-19, 2000. Web Page:161.200.33.29

4 Global Forum for Health Research. *The 10/90 report on health research 2000.* Geneva: Global Forum for Health Research, 2000.

5 Simon J. Indicators for the Measurement of Research Capacity Strengthening Investments. Presented at the WHO meeting on research capacity strengthening in developing countries, Annecy, France, 2000.

6 United Nations Development Programme. *Human development report.* New York: Oxford University Press, 1992, 1993, 1994, 1995, 1996.

7 Commission on Health Research for Development. *Health research: essential link to equity in development.* Oxford: Oxford University Press, 1990.

8 Picard J, Mills A, Greenwood BM. The cost-effectiveness of chemoprophylaxis with Maloprim administered by primary health care workers in preventing death from malaria amongst rural Gambian children aged less than five years old. *Trans R Soc Trop Med Hyg* 1992; 86:580-1.

9 Tendler J, Freedheim S. Trust in a rent-seeking world: health and government transformed in northeastern Brazil. *World Development* 1994;22:1771-91.

10 *Rx for Global Health Cooperation Beyond 2000.* Washington, DC: Overseas Development Council, 1998. (Report from Conference on World Health Cooperation.)

11 Lucas A, Mogedal S, Walt G, Hodne Steen S, Kruse SE, Lee K, et al. *Cooperation for health development: the World Health Organization's support to programmes at country level. Synthesis report.* London: London School of Hygiene and Tropical Medicine, 1997.

12 Thailand Rating and Information Service (TRIS). *Report on the situation of research supported by government funds in Thailand.* Bangkok: Medical Research Council, 2000.

13 Halstead SB, Tugwell P, Bennett K. The international clinical epidemiology network (INCLEN): a progress report. *J Clin Epidemiol* 1991;44:579-89.

14 Mervis J, Normile D. Science in southeast Asia. *Science* 1998;279:1466-76.

15 Thailand Research Fund. Annual Report 2000. www.trf.or.th (accessed DATE).

16 Sitthi-amorn C, Hongvivat T, Boonyuen D. *Evaluation of the health system research institute.* Bangkok: Chulalongkorn University, 1996.

17 Kaul I, Grunberg I, Stern MA, eds. *Global public goods: international cooperation in the 21st century.* Oxford: Oxford University Press, 1999.

18 Perry BD, Randolph TF. Improving the assessment of the economic impact of parasitic diseases and of their control in production animals. *Vet Parasitol* 1999; 84:145-68.

Commentary: Health research and human development in Papua New Guinea

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Because of the enormous health problems they face, less developed nations should give particular support to health related research, but regrettably this is rarely so. Sitthi-amorn and Somrongthong explore the global context of this inadequacy and discuss the elements required to develop research capacity. There are, however, a small number of health research institutes in developing countries that have already created national programmes of essential health research. The Papua New Guinea Institute of Medical Research is such an organisation.

The primary activity of the institute is conducting research into the health problems of the people of Papua New Guinea. Major programmes have been established in respiratory diseases, malaria, malnutrition, enteric diseases, sexual health and women's health, and the quality of this research is internationally recognised; it is raising global knowledge while informing local public health policy.[1]

One of the strengths of the Papua New Guinea Institute of Medical Research is that it has always taken a broader focus than the medical "problem." The studies have brought clinicians, epidemiologists, and laboratory workers together with anthropologists and behavioural scientists and, most importantly, the participating community, to look at disease in context, rather than as a series of isolated "puzzles." The interdisciplinary structuring of the institute is a rare model in medical research, but one which has undoubtedly made its work directly relevant to national health policy.

Building such an institution requires support, both financial and intellectual, and the form of this support is critical to maintaining independence and equity. The Papua New Guinea Institute of Medical Research receives substantial core funding from the national government, an act of foresight in a country that struggles to afford curative care. This is an important moral anchor, compelling the institute to deliver value, in terms of evidence to inform health policy. The use of this support to maintain a strong infrastructure means that the value of the research programme is multiplied through securement of external project funding. Much of this funding flows through collaboration with colleagues overseas, and a network extending through Australia, Europe, and North America allows the institute to benefit from project funding by such agencies as National Institutes of Health, the European Union, and the Wellcome Trust.

Significantly, many of these international colleagues have worked in Papua New Guinea for long periods and have made commitments not primarily based on self interest. Moreover, they have worked under the direction of the national system to help develop a national research institute, with up to date technical competence and with a strong research focus on health problems perceived as important by the community. These collaborations have also created many training opportunities for local scientists at all levels and prevented any feeling of intellectual isolation.

A unique aspect of the institute's international collaborations is that the benefit of partnership extends beyond simple twinning arrangements. The many different groups with long term research interests in Papua New Guinea have formed a "buttressing coalition" that crosses the boundaries of national or scientific interests. These include the Walter and Eliza Hall Institute, the Wellcome Trust Centre for Epidemiology of Infectious Diseases and Case Western University. Under the coordination of the Papua New Guinea Institute of Medical Research, the members communicate with each other to provide collective support for the development of the institute's general research infrastructure. It is certainly a refreshing experience to see scientists trying this alternate model of working, and benefiting as individuals from their contribution to a collective goal.

Government to government development aid funding, particularly from Australia, is an increasingly important source of support for health research in Papua New Guinea. Recognition of research as a critical element of health and human development is a satisfying victory for the committed lobbyists of the regional medical and scientific community. The Papua New Guinea Institute of Medical Research adheres to a simple formula in this respect: "no research without development; no development without research."[2] It is critical, however, that foreign government assistance remains a partnership that supports the agenda of the institute, not a directive that subverts it.

1 Siba PM. The important role of medical researchers in Papua New Guinea. *PNG Med J* 1996;39:271-3.
2 Alpers MP. Research and development. *PNG Med J* 1997;40:115-8.

Commentary: Does strengthening research capacity improve health equity?

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Sitthi-amorn and Somrongthong make the assumption, as do most international experts in public health, that further strengthening the research capacity of scientists and institutions in developing countries is unequivocally worthwhile. It is often stated that this will improve health equity and generate more and better information for national policy makers than has been the case in the past.

Yet after 20 years of activity to strengthen research capacity and millions of dollars of investments, we still know so little about the impact of these efforts. Individual programmes and projects have gone through their usual donor-driven evaluation cycles, but there is little systematic information available to evaluate the investments or inform new initiatives. Many programs count the number of scientists trained, others count the number of studies funded.[1] Most capture the reports and publications that have emerged from the investments, though much of the knowledge is not readily accessible as it never reaches the peer-reviewed published literature. Some have tried to measure the impact of published work by counting the frequency that the work is cited in other literature.[2] The contribution of research capacity strengthening in improving health equity is completely unmeasured and has been little more than a rhetorical, though important, goal statement.

Efforts are under way to address these deficiencies. The research capacity strengthening unit of the World Health Organization's tropical disease research programme and the applied research on child health project, at the Center for International Health at

Boston University, are working together to develop systematic criteria for the evaluating investments in strengthening health research capacity. Their activities have been driven by programme officers' desire to know if the research capacity strengthening investments make sense and spurred by the demands of donor agencies to document the results and impacts of the investments.

Three levels of impact are being measured: on individual researchers, national research insitutions, and the global health research system. Special attention is being paid to develop measurable indicators of the impact of these research investments on improvements in policies and programmes. Linking changes in population health status to specific investments in health research and capacity strengthening is extremely difficult. More progress has been made in developing a consensus on indicators of individual research skill development, research productivity, and individual career development. Measuring improvements in equity still has a long way to go. The Rockefeller Foundation has identified this as one of the subthemes of its health equity programme (www.rockfound.org/programs/healthequity/).

Those of us committed to strengthening health research capacity believe that an honest, systematic evaluation of the impacts of these efforts is becoming increasingly important as global scientific and political imperatives lead us into an era in which more funds will be invested in developing country scientists and institutions. Boosting the quantity and quality of scientific research carried out in developing countries is essential. But it is equally essential that the inevitably limited resources are well spent. This type of honest appraisal is a key element of *kalayanamitra,* or friends-helping-friends.

1 Wrayling S. *Retrospective review of research training grants; PhD graduates 1991-1997.* Washington: UNDP/World Bank/WHO, 1999.
2 Fraser D. *Measuring success in research capacity building: INCLEN as a case study in progress.* Geneva: Global Forum for Health Research, 1999.

Health technology transfer

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Global health relies on biomedical scientists and public health workers to solve infectious disease and other health problems at a local level. Yet investigators in developing countries face tremendous obstacles; scientific isolation, insufficient technical training and research tools, a lack of up to date scientific information, and limited financial, material, and human resources. To build local scientific capacity to monitor and control disease and to promote health, research on locally relevant issues must be supported and sustainable partnerships built to facilitate these efforts. We discuss key elements for transfer of technologies in health research and present two case studies of such programmes.

Summary points

- More funding must be made available to scientists in developing countries and to organisations that support in-country training and research
- Genuine partnership and mutual trust is a prerequisite for the sustainable transfer of technology from developed to developing countries
- Building local scientific capacity and long term North-South and South-South partnerships are important in establishing effective health research programmes
- Research topics should have local relevance and priority, and technology transfer should be participatory, equitable, and sustained
- Autonomous research centres attract funding and reduce administrative burdens

Developing countries need up to date technologies

Though 93% of the world's burden of preventable mortality occurs in developing countries,[1] too little research funding is targeted to health problems of developing countries, creating a dangerous funding differential.[2] In addition, many modern laboratory technologies remain inaccessible in these nations. Both utilitarian and humanitarian arguments can be made for training scientists and health professionals in developing countries in the use of modern laboratory and epidemiological skills. It takes only a day or two for a pathogen to get from any one place on the planet to any other; thus, building capacity in developing countries is a necessary strategy for preventing the global spread of infectious agents.[3] Additionally, as a matter of principle, all countries, especially those with high burdens of disease, should have access to the most effective tools to control their infectious disease problems.

Key elements in technology transfer

Through transferring biomedical technologies and conducting collaborative research in resource poor countries, we have identified key elements in the technology transfer process. In addition to technical issues, successfully implementing a new technology depends on economic support, political cooperation, functional infrastructure, good communication, and an understanding of sociocultural issues, and environmental concerns. Though likely to be beyond the direct control of the investigator, these factors can be

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Details of the case studies are available on the BMJ's website

Globalization and health viewed from three parts of the world

Some health implications of globalization in Thailand

Chitr Sitthi-amorn,[1] Ratana Somrongthong,[2] & Watana S. Janjaroen[3]

In recent years Thailand's economy has become increasingly dependent on international forces (*1*). With this exposure have come advances in health care technology and improvements in living standards, as well as increasing disparities between social groups (*2*) and exposure to health risks from other parts of the world (*3, 4*).

Prior to 1997, when the economy was strong, there was intense competition for a share of the health market. Resources were invested in speculative markets with potential for large expansion. Private hospital beds increased from 8066 in 1982 to 21 297 in 1992 and 34 973 in 1996. The number of specialized doctors in private hospitals increased, leading to shortages in the public sector (*5*). The culture of free enterprise brought with it an enlarged middle class, insurance coverage for hospitalization, tax incentives for private health care, heavy investment in advanced health technology for private sector use, and an internal "brain drain", at the expense of public health (*5, 6*). Aggressive promotion increased the demand for expensive imported medicines and procedures (*7, 8*). The cost of medical care for civil servants and state employees has quadrupled in the last seven years, reflecting the lack of adequate governance in the health care business sector (*5, 9*). Meanwhile the share of the underprivileged in the country's overall wealth was decreasing (*4*). The slump of 1997, followed by devaluation of the baht, and recession with its concomitant negative health impact, reflects the country's overdependence on cheap labour and foreign investment, and consequent inability to control and protect its own economy.

Direct health effects

Perhaps the most important direct effect of globalization on health in Thailand is unequal access to medical care by different social groups. The rise in imported sophisticated technologies has increased costs and necessitated new training. An analysis made in 1996 found that the average cost of medical care per admission was 1558 bahts for health cardholders (rural) and 9981 bahts for civil servants (privileged), a sixfold difference (*10*). If these facilities were treating similar diseases, explanations are needed for the huge variation. The economic gap might create demand unrelated to need and distort market competition. The organization of health service delivery was obscure, and there were no rules governing the payment of providers. Unequal access to care was reflected by unequal health status (*2*). Infant mortality in the poorest regions was twice as high as in the richest ones.

Second, there are increasing problems of environmental pollution. These include inadequate treatment of raw sewage (for instance, in tourist areas), and the notorious air pollution in Bangkok and other big cities (*11*). Environmental degradation and disruption of the ecosystem have led to frequent floods and changes in disease vector behaviour. The construction of a dam in the North-eastern region, financed by a loan from a development bank, has caused natural disasters affecting food production (*12*).

Third, concerns about new infections and the resurgence of old ones have been on the rise. International trade and travel are shaping the patterns of epidemics. The plague scare in India had worldwide reverberations. The nipah virus outbreak in Malaysia caused concerns in Thailand (*13*). Cholera epidemics can inflict enormous costs on a country and this results in attempts to hide them by calling the disease "severe diarrhoea". The costs associated with controlling HIV infection continue to rise. Fears of foot and mouth disease have affected meat consumption. The control of new dangers of this kind will require global cooperation but many aspects of control have to be country-specific.

Fourth, globalization has brought with it unhealthy lifestyles. Health has been damaged by the promotion of fashionable drugs, foods and other consumer products such as tobacco, alcohol, melatonin and Viagra. Fifth and finally, globalization brings with it many concerns about health ethics. For instance, the options for genetic manipulation and the patenting of the technologies will have direct and far-reaching effects on health and social well-being.

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Indirect effects

These direct effects are complemented by indirect ones, which include the economic crisis in Asia. Among many other things, it led to a rise in suicides, malnutrition, abandoned children, low birth weight, and a rise in deaths from preventable diseases such as acute respiratory infections, diphtheria and measles (*14, 15*). These adverse effects were partly due to decreased use of the health services (*14*). Increased poverty and unemployment also led to rising rates of crime, prostitution, migration and drug trafficking (*16*).

Response

These brief notes may be enough to indicate the need for an active response to globalization, rather than mere observation and speculation. In the first place, the world needs a clearly recognized moral authority to uphold the principle of equity in health and social justice (*17*). This authority has to be translated into norms and standards, accountability, measures for resolving conflicts and responding to emergencies, and a mandate to implement them. It needs to focus on key aspects of globalization which have implications for health. These include international capital volatility, drug trafficking, migration, protection of the environment, disease surveillance, and the indifference of market forces to marginalization, famine, suffering and oppression.

Next, the existing international institutions have to be reoriented. They have to re-examine their specific contributions to the overall well-being of the world. To do this they need to give full recognition to the changing context in which they are now working, and to the other actors involved. They must clearly define the roles of all concerned, and establish true partnerships for equitable cooperation, free from the domination of particular countries and companies.

Finally, national institutions have to be reoriented. They have to work out new partnerships between civil society, industry, government and other actors. An important goal here is to empower the public and specific groups in society to make rational choices and to demand accountability from those entrusted with implementing them. Thailand has been through a political transformation highlighted by the drafting of a new constitution. Its current health reform effort focuses on harmonization of living standards, rights, environmental protection, and equity between groups. ■

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1. **Sitthi-amorn K.** *Thailand economic crisis and challenges related to economic structure, politics and governance*. Bangkok, Infinity Press, 1998.
2. **Sitthi-amorn C, Janjaroen W.** The bubble in Thailand's health care system; need for reform and major issues. In: Hung PM et al., eds. *Efficient, equity-oriented strategies for health: international perspectives*. Melbourne, McKellar Renown Press, 2000.
3. *Health research for development: the continuing challenge*. Discussion paper for International Conference on Health Research for Development, Bangkok, 10–13 October 2000.
4. *Regional consultative process, Asia*. Disscussion paper for International Conference on Health Research for Development, Bangkok, 10–13 October 2000.
5. **Bureau of Policy and Plan, Ministry of Health.** *Health in Thailand 1995–96*. Bangkok, Veterans Press, 1997.
6. **Chaudhary V.** Chile's economic boom fails to improve health care. *British Medical Journal*, 1992, **305**: 1113.
7. **Tangcharoensathien V, Supachutikul A.** *Compulsory health insurance development in Thailand*. Paper presented at the International Conference on Economics of Health Insurance in Low and Middle-Income Countries, Antwerp, Belgium, January 1997.
8. **Barnett A, Creese AL, Ayivor ECK.** The economics of pharmaceutical policies in Ghana. *International Journal of Health Services*, 1980, **10**: 479–499.
9. **Barraclough S.** The growth of corporate private hospitals in Malaysia: policy contradictions in health system pluralism. *International Journal of Health Services*, 1997, **27**: 643–659.
10. **Supachutikul A.** *Situation analysis on health insurance and future development*. Bangkok, Thailand Health Research Institute, 1996.
11. **Chretnut GL, Ostro BO, Vichit-Vadakan N.** Transferability of air pollution control health benefits estimates from the United States to developing countries: evidence from the Bangkok Study. *American Journal of Agricultural Economics*, 1997, **79**: 1630–1635.
12. Pak Moon Dam: Pak Moon has a lot to teach the state. *Bangkokpost*, 10 April 2001.
13. *Nipah virus in Malaysia*. Communicable Disease Control Network, Ministry of Public Health, Thailand, 10 April 2001 (http://www.cdcnet.moph.go.th/cdcweb/nipa.htm).
14. **Tae-Arruk P.** *Impact of economic crisis on health of the Thai people*. Bangkok, Health System Research Institute, 2001.
15. **Choprapawon C, ed.** *Health situation of the Thai people*. Bangkok, Health System Research Institute, 2000.
16. **Woodward A, Kawachi I.** Why reduce health inequalities? *Journal of Epidemiology and Community Health*, 2000, **54**: 923–929.
17. **Berlinguer G.** Health and equity as a primary global goal. *Development*, 2000, **42**: 20–21.

Some health implications of globalization in the United Kingdom

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The British Prime Minister in his introduction to a recent government White Paper said, "Globalization creates unprecedented new opportunities and risk" and the White Paper goes on to state that "making globalization work for the world's poor is a moral imperative and a first-order priority for the British Government" (*1*). At the highest level of government, then, globalization, including its impact on health, is seen as a policy imperative, albeit outward-focused, helping to eliminate world poverty.

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The Nuffield Trust, an independent charitable foundation established in 1940, was one of the organizations in the United Kingdom to ask at an early stage — in the context of its programme on "the changing role of the state and the machinery of government for health policy" — whether globalization was extending to health and health care. In 1997 the Secretary of the Trust addressed the Annual Meeting of the Association of Academic Health Centers in Palm Springs on this subject, and in 1998 the Trust supported a delegation drawn from the Royal Colleges, the National Health Service, universities, senior policy-makers, key opinion-leaders and mass media to attend a trilateral conference (UK, USA and Canada) in Washington DC. At the conclusion of the meeting the UK participants saw the need to stimulate UK and international action on globalization and health because of the moral and ethical imperatives for action rather than for primarily national or bilateral interests.

On returning to the UK, the group became the Steering Group for the "Global Health A Local Issue" policy review — an analysis with a view to action — which culminated in a national conference funded by the Trust and held jointly with the Royal College of Physicians on 31 January 2000. The framework adopted was based on the work of Dr Kelley Lee. It describes globalization as a process that is changing the nature of human interaction across many spheres, particularly those of politics and institutions, economics and trade, social and cultural life, and the environment and technology. It is changing the temporal, spatial and conceptual boundaries that separate individuals in society. During the programme 14 seminars and workshops were held and 18 papers were presented (*2*), covering: health and the environment; economy, trade and aid; social and cultural factors; institutional and political issues; uncertainty and global health risks; local perspectives of global health; working with industry for global health; and development of a framework, including a practical model for UK action on global health.

The conference endorsed the framework, following which a number of significant events have taken place: a UK Partnership for Global Health was established; a web site and network contact was established for those interested in the field to exchange contributions (*3*); members of the Partnership contributed to the UK Foresight Report, particularly on trade and health (*4*); members of the Partnership did the research for the UK White Paper on the implications of globalization for the health of the poor, women's health and the caring professions; and a Centre for Health, Environment and Climate Change was established at the London School of Hygiene and Tropical Medicine.

Further areas for policy analysis

Globalization and health is now a priority area for government in the UK. The Nuffield Trust, through its network of influence and its programme of grants, fellowships, seminars and conferences, has played a leading role in bringing this about. Alongside others, it has raised the awareness of senior ministers, policy officials, community leaders, researchers and the Royal Colleges about these issues. It will continue with further research and policy analysis in areas such as those listed in the box. The Nuffield Trust and the UK Partnership for Global Health are also keen to pursue the notion of an international award for responsible globality by international public and private sector organizations through responsibility auditing for health.

Areas for research and policy analysis

- The impact of globalization on the determinants of health in the UK.
- The impact of the UK (its trade, industries, academic and research resources) on global health.
- Health as a foreign policy imperative in the UK. The likely effect of the UK 2001 budget announcement of the government's intention to establish a Global Health Fund with WHO and to introduce a new and special tax credit to help companies contribute to the relief of disease around the world and provide an incentive to accelerate research on the killer diseases in the poorest countries. This was discussed at the G8 meeting in Genoa (July 2000) and incorporated in the communiqué (*5*), announcing the establishment of a new global fund to fight HIV, AIDS and tuberculosis.
- Further integration of domestic and development policy objectives for health. The formulation of a UK Global Health Strategy, building on the government's practice of "joined-up government".

Peter Hain, in his book *The end of foreign policy* (*6*) sketches out a vision for new diplomacy to reflect interconnectedness and the new global interests that have taken shape alongside more traditional national ones. "Perhaps foreign ministries will be named Departments of Global Affairs as the concept of 'foreign' becomes ever harder to define." The task requires the specialized skills of all government departments and the committed and innovative involvement of nongovernment actors in business and civil society. "In the process we will see an end to traditional foreign policy and the evolution of a new foreign policy based upon global linkages recognizing natural limits and embracing global responsibility: a foreign policy for a world in which there is no longer any such place as 'abroad'." ■

1. *Eliminating world poverty: making globalisation work for the poor.* London, Stationery Office, 2000 (*White Paper on International Development, Cm 5006*).
2. www.nuffieldtrust.org.uk/health2/global.htm
3. www.ukglobalhealth.org
4. www.foresight.gov.uk
5. www.g8itali.it/_en/docs/XGKPT170.htm
6. **Hain P.** *The end of foreign policy. British interests, global linkages and natural limits.* London, Fabian Society, Green Alliance and Royal Institute of International Affairs, 2001.

Some health implications of globalization in Kerala, India

K. R. Thankappan[1]

The Indian State of Kerala with a per capita income of around 1% of that of the wealthiest countries, has achieved good health comparable to theirs. For example the infant mortality rate for Kerala in 2000 was 14/1000 live births (*1*) compared with 7/1000 for the USA (*2*). Life expectancy at birth was 76 years for women and 70 for men in Kerala; in the United States these figures were 80 and 74 respectively (*2*). However, Kerala's per capita expenditure on health was only US$ 28 whereas that of the USA was US$ 3925 (*3*). The most important reasons for this good health in Kerala are probably the following: its high level of female literacy (87%); access to health care (e.g. 97% institutional deliveries); a good public distribution system (PDS), which provides essential food items at subsidized rates (the system covers 96% of the population); political commitment (40% of the state budget went to the social sector till recently — 15% to health, and 25% to education); good communication and transport (newspapers, telephones, rural roads); land reforms (land distributed to the poorest and the landless) which helped reducing inequality in land and income; and Christian missionaries who started schools and hospitals, mostly in rural areas (*4*). Overall, the achievements of Kerala seem to result from a relatively fair distribution of wealth and resources across nearly the entire population of the state (*5*).

Globalization as promoted by the World Trade Organization (WTO), the World Bank, the International Monetary Fund and the transnational corporations has created a new world order. One of its major impacts is increasing inequality, which is detrimental to Kerala's health achievements. The Indian government initiated a major economic reform in June 1991 to increase economic growth. Social sector expenditure declined considerably during the first few years of this reform, resulting in stagnation in the development of public sector facilities.

In spite of the high demand for health care, the Kerala government could not increase its hospital beds substantially, for lack of resources for the health sector. During the 10 years from 1986 to 1996, public sector hospital beds in Kerala increased by only 5.5%, from 36 000 to 38 000, while in the private sector there was a 40% increase, from 49 000 to 67 500. Furthermore, the quality of the public health sector decreased because the financial restrictions affected supplies, including drugs, more than the salaries of the well-organized and militant employees (*6*). Taking advantage of this situation, the unregulated private sector in Kerala opened many hospitals with high-tech equipment, thereby increasing the cost of health care. For example, in 1995, 22 out of the 26 computerized tomography scan centres in the state were in the private sector (*6*) and even the small remainder in the public sector is decreasing now. The introduction of user charges in the public hospitals as part of the reform process increased the out-of-pocket expenses of those using public health facilities.

Household health expenditure in Kerala has increased over five times (517%) during a 10-year period of 1987–96. This increase was significantly higher (768%) among the poorest people than among the richest (254%). Even after adjusting for inflation the increase in health expenditure was about 4 times higher than the increase in consumer price index (*7*). The major reasons for this increase in health care costs are the increasing privatization of health care in the state, the increasing and often unnecessary use of technology, and a rise in drug prices. For example, Kerala has one of the highest rates of caesarean deliveries in the world now. Caesarean rates were reported to be 22% of all deliveries in rural areas and 34.5% in urban areas (*8*). The extra cost of caesarean deliveries in the state was estimated to be Rs 25 million (US$ 540 000) in the year 2000. Around 75% of the pregnant mothers had at least one ultrasonography test without any notable change in the management or outcome of pregnancy (*9*).

Another aspect of globalization is migration. Although there had been small-scale migration from Kerala to other Indian states and neighbouring countries since India's independence in 1947, large-scale migration started after the oil boom of the 1970s. The Kerala economy started to stagnate in the early 1970s owing to many factors, including high wage levels compared to those in other states, and well-organized and militant workers creating a less investor-friendly environment. The investors could easily start industries in other states, using cheap labour. Slow growth of the economy and the consequent high unemployment rate (3 times the Indian average) were the push factors for large-scale migration.

International migration has been increasing over the years. In 1998 there were 1.4 million Keralites residing in other countries and another 0.7 million in other states of India. In addition there were 1.65 million Keralites who came back to the state after residing in other countries or other states of India. There were an estimated 6.35 million households in Kerala in 1998, and 40% of them had at least one migrant (*10*). One of the major consequences of migration was the flow of remittances into Kerala, estimated at Rs 4717 million (US$ 876 million) or 10.7% of the domestic product of Kerala in 1998. The total amount of remittances was nearly 3 times the budget support to the state from the government of India (*10*). Better housing and commodities were some of the advantages the

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families of migrants enjoyed compared to those of non-migrants. For example 54% of migrant households had a television set compared with 34% of non-migrant households. The respective percentages for refrigerators were 40 and 13 (*10*). Migration also helped to reduce inequality in the state because a large proportion of migrants were from the poorer classes (*11*). Although the remittances could not be effectively used to promote industries in Kerala there is some evidence of revived growth in the Kerala economy since 1991, mainly in the service sector. The annual growth rate of net domestic product in Kerala for 1991–97 was reported to be 6.05% compared to 2.88% during 1971–90 (*12*).

Kerala has always been a food-deficit state. This deficit has been corrected by an efficient PDS through a widespread network of ration shops in the state. The ration shops, school lunches and agricultural labour pensions were reported to benefit female-supported households more than male-supported ones, reducing one aspect of gender inequality in the state (*5*). During 1986–87, 37% of the rural Keralites depended on PDS for their purchase of rice, the staple diet (*13*). The PDS also worked as a price check in the open market. From 1997, however, as a consequence of the change in the policy of the government of India, arising out of the process of economic reform, it was decided to limit the PDS subsidy to those below the poverty line. Moreover, the hike in prices for PDS announced by the Union Finance Minister of India in his budget speech in February 2000 was described as “a severe blow to the PDS in Kerala threatening its very survival” (*14*).

Since rice cultivation in Kerala was not profitable compared to cash crops like rubber and coconut, farmers converted paddy fields into coconut and rubber plantations. As a result of international trade agreements the importation of edible oil, coconut and rubber has been unrestricted since 1994. Although some import restrictions are still there, India’s agreement to the WTO calls for the removal of all the remaining restrictions by 2005. Kerala is the state most affected by this liberalization because its major agricultural products are coconut and rubber. The price of 100 kg of rubber plummeted from Rs 5204 in 1995–96 to Rs 2994 (a 42.5% reduction) in 1998–99 (*15*). Rubber provides the livelihood of over 750 000 families in the state. The fall in prices of rubber and coconut has severely affected the economy of the state, which will have serious implications for the health of Keralites, especially that of farmers.

In conclusion, globalization challenges the foundations of the Kerala model of low cost health care, which is built on distributive justice**.** How can the people of the state face the challenges of globalization? The decentralization process, which the Kerala government started in 1996 by transferring power and money (40% of the state budget) to the local authorities presents a good opportunity to tackle at least some of the challenges of globalization. The potential for additional resource mobilization from the local community and from the migrants could be realized in the decentralized planning process. Transparency in programme implementation, together with the democratization of planning processes, will enhance people’s participation.

There is enormous potential for further growth in the service sector in a well-educated society like that of Kerala. However there is a need to devise specific measures to make Kerala more investor-friendly and attract investment from within and outside the state including foreign investment for accelerated growth of income. This should be done without sacrificing the welfare gains of the past, and without a market takeover of health, education and welfare, which could price out the poor. ■

1. **Registrar General of India.** Sample registration system. *Sample Registration System Bulletin,* 2001, **35**: 1 (available from Registrar General of India, 2-A Mansingh Road, New Delhi 110 011).
2. **World Bank.** *World development report 2000/2001– attacking poverty.* Washington DC, The World Bank, 2000.
3. **Hypertension Study Group.** Prevalence, awareness, treatment and control of hypertension among the elderly in Bangladesh and India: a multicentre study. *Bulletin of the World Health Organization,* 2001; **79**: 490–500.
4. **Thankappan KR, Valiathan MS.** Health at low cost, the Kerala model. *Lancet* 1998, **351**: 1274–1275.
5. **Franke RW, Chasin BH.** Is the Kerala model sustainable? Lessons from the past, prospects for the future. In: Parayil G, ed. *Kerala – the development experience. Reflections on sustainability and replicability.* London, Zed Books, 2000: 16–39.
6. **Kutty VR.** Historical analysis of the development of health care facilities in Kerala State, India. *Health Policy and Planning*, 2000, **15**: 103–109.
7. **Aravindan KP, Kunhikannan TP, eds.** *Health transition in rural Kerala, 1987–96.* Kerala, Sastra Sahitya Parishad, Kozhikodu*,* 2000: 52–56.
8. **Thankappan KR.** Cesarean section deliveries on the rise in Kerala. *The National Medical Journal of India,*1999, **8**: 297.
9. **Hemachandran K.** *Burden cause and cost of cesarean sections in three city corporations of Kerala* (unpublished MPH dissertation 2001, available on request from Achutha Menon Centre for Health Science Studies, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram, May 2001).
10. **Zechariah KC, Mathew ET, Rajan SI.** Impact of migration on Kerala’s economy and society. *International Migration: Quarterly Review,* 2001, **39**: 63–85.
11. **Prakash BA.** The economic impact of migration to the gulf. In: Prakash BA, ed. *Kerala’s economic development; issues and problems.* New Delhi, Sage, 1999: 134–149.
12. **Subramanian KK, Abdul Azeez E.** *Industrial growth in Kerala: trends and explanations. Working paper No. 310* (available on request from the Centre for Development Studies, Thiruvananthapuram, India).
13. **Nair KN.** Food security and the public distribution system in Kerala. In: Krishnaji N, Krishnan TN, eds. *Public support for food security: the public distribution system in India.* New Delhi, Sage, 2000: 314–330.
14. **Kannan KP.** *Food security in a regional perspective. A view from ‘Food Deficit Kerala’. Working paper No. 304*, 2000 (unpublished paper available on request from Centre for Development Studies, Thiruvananthapuram).
15. **Government of Kerala.** *Economic Review 1999.* Thiruvananthapuram, State Planning Board, 1999.

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Priority setting for health research: lessons from developing countries

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Research resources for addressing health problems of developing countries remain disproportionately low compared with the tremendous disease burdens borne by these countries. There is a need to focus these scarce resources on research that will optimize health benefits and lead to equity. This paper reviews processes and methods that have been used for setting research priorities. Past and current processes have focused on expert-driven research agenda, emphasizing scientific autonomy and global analyses. Methods for setting priorities have focused on the metrics of disease burdens, while less attention has been placed on who sets priorities and how choices are made.

The paper proposes a strategy of priority setting, based on lessons learned from essential national health research (ENHR) approaches attempted in several developing countries. With equity in health and development as its goal, the proposed model is demand-driven, and involves multi-dimensional inputs and multiple stakeholders. Various steps of the process are discussed: getting participants involved; gathering evidence and information; determining criteria for priority setting; and implementation and evaluation. The paper concludes with a discussion of the gap between national research priorities and the research agenda set at regional and global levels, an issue that needs to be satisfactorily addressed in the future.

Preface

This paper is a timely review of the issues around research priority setting, especially as they relate to health problems of developing countries. This is one of the major issues to be discussed at the International Conference on Health Research for Development, to be held on 10–13 October 2000 in Bangkok, Thailand. Ten years after the Commission on Health Research for Development reviewed the state of health research in the world, the forthcoming international conference is expected to lead to a new vision and a responsive health research agenda for the next decade. The conference participants will thoroughly review the many initiatives in health research over the last decade, examine possible scenarios and options for international health research cooperation, and discuss new tools and methodologies. In the conference session devoted to priority setting, participants will critically review experiences, gaps in methodology, and lessons learnt. This paper, from the perspective of developing countries, will be an important contribution to this session, and will flow into the overall declaration on the future of health research for the next decade.

The International Conference on Health Research for Development is spearheaded by an international organizing committee from the World Health Organization, the World Bank, the Global Forum for Health Research and the Council on Health Research for Development. Close to 30 other national and international organizations are collaborating on the steering process.

Introduction

Ten years ago, the Commission on Health Research for Development urged countries to undertake essential national health research (ENHR) in order to help correct imbalances in global health and development.[1] In 1992, estimated resources for research on health problems of developing countries amounted to only 4.4% of global research and development (R&D) investment,[2] a marked contrast to the fact that almost 90% of the global disease burden in 1990 was in developing countries.[3] Over the past decade, various strategies to increase the research resources for developing country problems have been attempted by international health bodies and agencies. Yet the latest estimates, according to the Global Forum for Health Research, still stand at an unhealthy '10/90' disequilibrium.[4] These constraints underscore the continuing need to focus on priorities in order to optimize health benefits and impact from scarce research resources.

Experiences in priority setting: processes and methods

Processes

The process of research agenda setting, until recently, has been limited, partly because the ideological emphasis has been on 'scientific autonomy'. Thus, resultant research agenda have tended to be expert-driven, largely detached from the public arena, and with insufficient operational emphasis. At the country level, there has been a heavy reliance on the inputs of prominent scientists, members of medical research councils (MRCs) or ministries of science and technology. It is notable, however, that while in the United States, the US National Institutes of Health primarily considers recommendations from leading science and technology experts, it also periodically makes use of user and patient panels to identify health care priorities.

The World Health Organization (WHO) Advisory Committee on Health Research, at both the global and regional levels, depends largely on scientific experts and directors of MRCs. Its special programmes, such as the Special Programme on Research and Training on Tropical Diseases (TDR) and the Special Programme on Research, Development & Research Training on Human Reproduction (HRP), have also made use of expert committees for setting priorities.

The process of health sector reform and WHO's efforts in health systems research, coupled with the World Bank's emphasis on user fees during the mid-1980s, led to a growing research interest on health systems development and cost-effectiveness analysis.[5,6] In 1996, the WHO *Ad Hoc* Committee on Health Research Relating to Future Intervention Options proposed a global research agenda based on a five-step process of priority setting. This involved a great deal of technical expertise and analytic work on burden of disease and cost-effectiveness of health interventions.[5] This has been taken a step further by the Global Forum on Health Research by drawing together various constituencies and networks at the global level in order to address identified research gaps.[4]

Methods

Many models have been used to set priorities for health resource allocation, some of which have been applied to research priority setting. These approaches range from qualitative methods of consensus building to the use of quantitative formulations and prioritisation matrices.[8–10] In recent years, composite indicators have gained prominence in the research priority-setting process because these single measures lend themselves to comparisons across a broad range of diseases and are particularly attractive for cost-benefit analyses of interventions. For example, the disability-adjusted life-year (DALY), a single measure of the disability, premature mortality and relative values of life at given ages, has been used to assess global and regional burden of disease.[11] More recently, another formulation, healthy life-years (HeaLYs), has been proposed to similarly reflect disability and premature mortality, but with improved valuations on the stream of life lost due to disability or death, based on the natural history of the disease, and with discounting calculated separately.[12]

Although useful in advancing methods for rational resource allocation, the extended discussions on burden of disease measures have sidelined other important issues in research priority setting. These include: Who sets priorities and how? What criteria are used to guide prioritization? These questions become all the more important in the light of the continuing observation that priorities for international health research have seldom been developed with the active participation of developing country research leaders and communities.[13]

Priority-setting exercises based on essential national health research (ENHR) approaches have been attempted in several developing countries, among them Benin, Commonwealth Caribbean countries, Guinea, Kenya, Nicaragua, The Philippines, South Africa, and Thailand.[14,15] Table 1 lists general research priority areas identified by some countries. Aside from priorities focusing on important diseases, it is worthwhile to note that all five countries identified the need for research on and for health policy. This may be due to the widespread emphasis on decentralization and health care financing since over a decade ago.

In this paper, we describe lessons learned from the experience of these countries. A framework for priority setting is presented to define the overall approach. We then suggest steps and methods that countries can use to bring stakeholders together and to set priorities for health research. We believe that these processes of self-determination pave the way for a stronger developing country voice in priority setting at the international level and for increasing the allocation of research resources to developing country problems.

Using the ENHR strategy

ENHR, a strategy first espoused by the Commission on Health Research for Development, is an integrated and systematic approach for organizing and managing country-specific and global health research in order to promote health and development on the basis of equity and social justice.[1,16] The framework that we propose for priority setting has the ENHR strategy as its basis and thus has equity in health and development as its goal.

As shown in Figure 1, priority setting in this model is demand-driven, focusing on an analysis of health needs, people's expectations and societal trends. The involvement of different stakeholders is multi-level (i.e. multiple inputs from communities, districts, sub-national and national levels) and multi-dimensional (i.e. quantitative and qualitative scientific inputs, as well as social, economic, political, ethical and management considerations). Consultative group processes, which are strongly featured in this approach, are inclusive, participatory, interactive and iterative.

Who sets priorities?

The participants are those who have a major stake in the goal of equity in health and development. Countries that have used ENHR strategies have identified four general categories of participants: researchers, decision-makers at different levels, health service providers, and communities. However, the country experiences also suggest the need for stronger representation from the private sector (e.g. professional health associations, the pharmaceutical industry), parliamentarians, and potential donors and international agencies.

Table 1. Examples of broad research priority areas identified in selected developing countries[a]

Country	Research priority areas
Caribbean	• Epidemiology of most common diseases • Access to health care facilities • Cost-benefit and outcome measurements of health policies and practices • Effects of environmental, ethnic, economic, social, and behavioural factors on incidence and prevalence of specific diseases
Guinea	• Research capacity strengthening • Malaria, diarrhoea and other priority health problems • Quality and financing of health care, human resources • Traditional health care: quality, collaboration, medicinal plants
Nicaragua	• Mother and child health • Communicable diseases • Drug addiction/alcoholism • Health care financing • Human resources development • Community involvement
Philippines	• Health care delivery • Product research and utilization • Health sector organization and management • Economics of health care
Uganda	• Maternal and child welfare and nutrition • Water and sanitation • Communicable diseases, including HIV/AIDS • Health systems and policy analysis

[a] It should be noted that some research priorities identified by the countries are not mutually exclusive. The above examples are indicative of the beginning process of priority setting, but more work needs to be done to refine and prioritize the research areas and questions.

The participation of a broadened spectrum of stakeholders helps to identify research needs, technical and financial capabilities, information gaps and distortions, the political environment, and the values and ethics of a given society (see Table 2). More importantly, involving major stakeholders in priority setting fosters ownership of both process and output, and facilitates shared responsibility and accountability in the implementation of the research agenda. In addition, when these stakeholders buy into the process, this could translate into cost sharing in research, not only by international agencies but also by the developing countries themselves.

The selection of participants from different groups and perspectives should be done carefully so that the research agenda has sufficient breadth to benefit a large number of stakeholders, but is narrow enough to have meaningful and manageable priorities. Thus an important initial step is to know the participants, who and where they are, their needs and interests, their expectations, and their strengths and weaknesses.

Getting participants involved

Experiences of countries in this review suggest some entry points in which national groups might involve stakeholders in research priority-setting from the outset, for example:

(1) a national ENHR convention or workshop, with participation from communities, researchers, health programme managers and policy-makers; followed by the formation of a task force with tripartite representation to refine the research agenda (e.g. Barbados, Jamaica, Kenya, Nepal, South Africa, Tobago, Trinidad, Uganda and Zimbabwe);
(2) formation of an inter-sectoral and multidisciplinary working group appointed by the Ministry of Health (e.g. The Philippines); or
(3) a research institute or university group which is tasked to develop and propose processes for priority setting; a larger group of participants is then involved in the actual priority-setting process (e.g. Thailand).

Based on experience, a small but representative working group can effectively facilitate the priority-setting process. This core group, in consultation with the larger group of participants, should moderate the extent and nature of participation of different groups or individuals. This may vary according to the nature of the ENHR activity, for example: the collection and analysis of health information, including community situation analysis through participatory action research; people's consultations through focus-group discussions or interviews; consensus building on specific thematic areas; decision-making for determining and applying criteria for priority setting; or translation of priority research areas into specific research programmes and projects.

Involving participants thus generally involves a sequential pattern of consultations, analyses and priority setting at the community and district levels, and aggregation and synthesis of these outputs at the provincial and national levels. Where conflicting priorities arise, several iterations as well as consensus-building processes may be necessary. However, priorities,

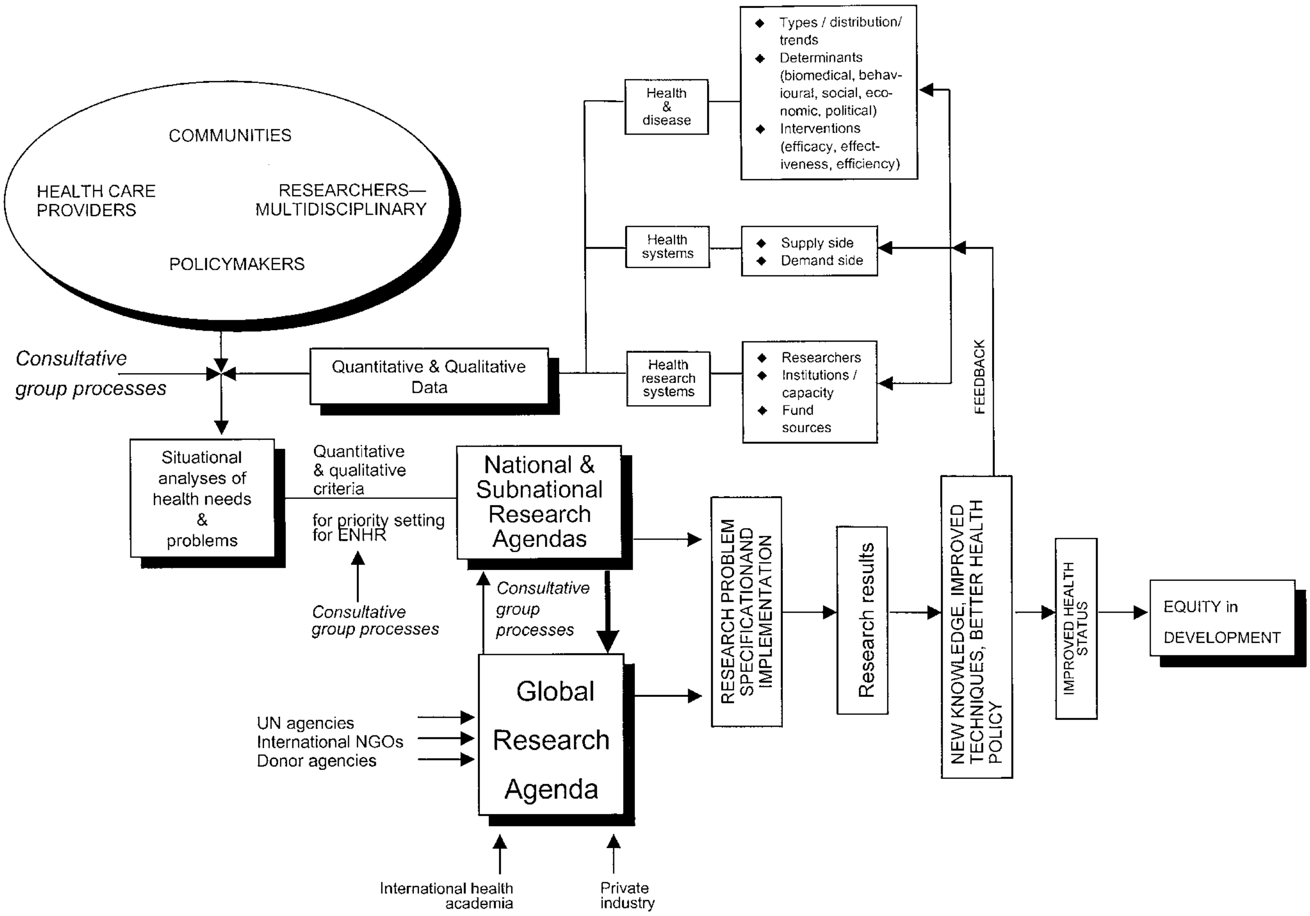

Figure 1. Framework for priority setting using the ENHR strategy

Table 2. Potential functions, roles and responsibilities of various stakeholders in priority setting for health research[a]

Core functions	Principal stakeholders	Roles and responsibilities
Payers	International/regional groups, e.g. multi-lateral organizations, NGOs National science and technology agencies	Mobilize funds in accordance with priority research area Provide international perspectives or technical inputs on health problems
Doers	Ministry/government agencies Academia/university Private sector NGOs	Clearinghouse function Set research policy/agenda Set standards, quality control Technical and ethical reviews Optimize use of resources Package findings for dissemination to various users
Users	Ministry of Health – planners, providers Local government NGOs and people's organizations Research communities – international, national, sub-national	Provide societal and ethical perspectives Arrange Forum to discuss research findings Make decisions balancing evidence and values

[a] All three groups have responsibilities to: (1) participate in priority setting; and (2) advocate for evidence-based policy and action.

especially at the local level, are largely context-sensitive and thus may not always be appropriate at different levels of aggregation.

In some cases, time constraints may necessitate parallel, rather than sequential, consultations for different groups and levels. This is also acceptable, as long as transparency and genuine involvement characterize the priority-setting processes. Acceptance, a sense of ownership, and implementation of the research agenda are perhaps the best indicators of involvement in the process.

Information for setting priorities

Decisions on priorities should be made based on the best available information. Evidence-based situation analysis at the outset can inform the priority-setting process. Three broad categories of information should be gathered and analyzed: the health status in a given setting, the health care system, and the health research system (see Figure 1, quantitative and qualitative data inputs). All three dimensions are important for assessing the main health problems, the supply- and demand-side of health care, and the research resources available to address priority research areas.

Sources of information can be varied; for example, vital registration systems, special surveys, patient records, focus group discussions or informed opinion. Statistical projections on demographic parameters, health determinants and diseases also provide useful information for determining the future impact of health research.

Despite the many sources, the 'lack of data' at the national and sub-national levels of many developing countries is often given as an excuse for arbitrary decisions on research priorities. Countries should begin with what is available, but should build on this to improve the quality of information and to fill important gaps. Because of the iterative nature of the priority-setting process, more and better information is progressively available in succeeding prioritization cycles.

In addressing issues of equity, the situation analysis should specifically cover the concerns of the vulnerable and the disadvantaged. Some countries' experiences (e.g. The Philippines, Benin) have demonstrated that the participation of non-governmental and people's organizations in the priority-setting process is more likely to draw attention to the situation and needs of neglected and marginalized groups.

The packaging and use of information gathered is another key issue. The heterogeneity of stakeholders means that the data will not always be understood in the same way. Thus, the working group coordinating the entire priority-setting process has to pay close attention to the interactions among participating groups. Steps need to be taken to ensure that the import of specialized information is within the grasp of all, including less technically skilled participants. In the same vein, it is important to balance the 'rigorous with the spontaneous'; i.e. to recognize that the information or perceptions or sensitivities expressed by various partners may influence the choice of priorities.

Criteria for setting priorities

A systematic and transparent process of priority setting is important in ensuring that the voice and will of the different stakeholders are heard and respected. Without openness and accountability, the voice of a 'moneyed' or inner circle may subvert the process of consensus building.

Research priorities will depend on a two-step process of, first, selecting criteria for priority setting and, second, selecting research topics from among identified priority problem areas. The countries in this review used one or more criteria from the following categories:

(1) magnitude and urgency of the problem, as suggested from quantitative and qualitative data in the requisite situation analysis;
(2) extent of previous research and the potential contribution of research in discovering, developing or evaluating new interventions;
(3) feasibility of carrying out the research in terms of the technical, economic, political, socio-cultural and ethical aspects;
(4) expected impact of the research, considering both direct and indirect effects, short- and long-term benefits, as well as its implications on issues of affordability, efficacy, equity and coverage.

The above categories could be broken down to as many as 12 distinct criteria. However, experiences at the country level and with a variety of participants show that a manageable core of criteria should be no more than six or seven. At the global level, for instance, the WHO *Ad Hoc* Committee proposed five steps for determining 'best buys' for global R&D, entailing an assessment of the following: the magnitude of the problem; the reasons for the persistence of the problem; the current knowledge base; the cost-effectiveness of potential interventions; and the current level of effort.[5]

The selection of the final criteria will depend on the purpose and level of action of the priority-setting exercise (i.e. global, national, sub-national, village levels, etc.), the availability of information related to the specific criterion, and the ability to define and measure the criteria in a common language or framework. The assignment of equal or differential weights to the criteria should be carefully deliberated upon by the participants until a consensus is reached on the selected criteria and the weights.

In assembling research areas to be considered, efforts should be made to cluster health problems into equivalent and meaningful levels so that priority areas are not chosen merely by the breadth and magnitude of the topics covered under a cluster. In addition, each research area should be specific and explicit enough to provide a common understanding among different stakeholders.

While it may not be necessary for all participants to be involved at every stage of the priority-setting process, the core group should document the processes and results at each stage. Methods for combining results range from addition of scores on simple scales to complex mathematical models or matrices.[9,10,17] The procedures for applying the criteria to the research areas are time consuming, but they enhance acceptance, ownership and implementation of the research agenda as a result of transparent and systematic procedures.

For most countries in this review, these crucial intervening steps leading to the selection of research priority areas and topics were not fully documented, leading to problems of reliability and credibility.

Implementation and evaluation

It remains to be seen whether, in the long term, priority-setting using the ENHR strategy will, in fact, improve the use of limited resources and generate more research funding for problems of the poor. There are intermediate but critical steps to ensure success: effective advocacy and dissemination of the agenda to all stakeholders, especially decision-makers who hold the key to health policy and research resources; implementation of the agenda by researchers, in partnership with other stakeholders; and periodic review and assessment of priorities.

Three important indicators are proposed for evaluation:

(1) Utilization of the research agenda: how extensive was the implementation of the research priorities? How much interest did the research agenda generate among stakeholders?
(2) Involvement of multiple stakeholders: how many groups or constituencies were involved and what were their contributions? Who were not involved?
(3) Do the research priorities address equity in health? For this, one could measure the proportion of researches that address health problems of the poor, the shift of resource flows towards equity-targeted programmes and the identified research priorities, and 'buy-in' from national and international sources.

The outcome and impact of these priority-setting exercises in the developing countries have yet to be fully evaluated. It is important to note, however, that competencies such as priority setting cannot be taken in isolation. Other important factors and competencies must be considered, for example, the country mechanism to support ENHR, advocacy, partnership development, resource mobilization, community participation, and translation of research results into policy and action.

The ENHR strategy and global health research priorities

ENHR includes research that may be country-specific or that may have international import. Individual countries should weigh the resources they direct at key national problems, but should also be well informed about the international health research effort. Common health problems shared with other developing countries may spell out opportunities for collaborative, multi-country research efforts, e.g. the growing problem of anti-microbial resistance, community-based evaluations of impregnated bednets in the control of malaria, behavioural interventions against smoking, or the development of innovative health care financing schemes. A number of middle-income developing countries, like Brazil, Malaysia, South Africa and Thailand, are also in a position to carry out basic research on developing country diseases, such as leishmaniasis, malaria, dengue and tuberculosis. The appropriate mix of country-specific and international health research is an important issue to address in the priority-setting exercise. This provides the national players with some leverage and basis for matching international donor interests with national and local concerns, or for negotiating research areas for assistance.

In addition, the systematic formulation, articulation and dissemination of national research agendas are important inputs to the global research agenda (see Figure 1). There should be efforts towards an upward synthesis of national priorities at the regional and global levels. This is to balance an oft-perceived 'one-sidedness' in global agenda setting. In the short term, hands-on participation of developing country representatives in global task forces devoted to specific initiatives could gradually improve the capabilities of these countries in the analysis, synthesis and articulation of their priorities. For the long term, the biggest challenge is to steadily increase the internal capacity of countries for analyzing their own health problems and needs, setting priorities, designing, implementing and evaluating research and health programmes. International efforts to strengthen countries' research capabilities will redound to the international good, as international databases and global health research priorities become more firmly grounded in country realities.

Endnote

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References

[1] Commission on Health Research for Development. *Health research: essential link to equity in development.* New York: Oxford University Press, 1990.
[2] Michaud C, Murray CJL. Resources for health research and development in 1992: a global overview. In: WHO *Ad Hoc* Committee on Health Research Relating to Future Intervention Options. *Investing in health research and development.* Geneva, Switzerland: World Health Organization, 1996; 213–34.
[3] Murray CJL, Lopez AD. Global patterns of cause of death and burden of disease in 1990, with projections to 2020. In: WHO *Ad Hoc* Committee on Health Research Relating to Future Intervention Options. *Investing in health research and development.* Geneva, Switzerland: World Health Organization, 1996; 33–85.
[4] Global Forum for Health Research. *The 10/90 report on health research 1999.* Geneva, Switzerland: Global Forum for Health Research, 1999.
[5] *Ad Hoc* Committee on Health Research Relating to Future Intervention Options. *Investing in health research and development.* Geneva, Switzerland: World Health Organization, 1996.

[6] The World Bank. *World Development Report 1993: Investing in Health*. New York: Oxford University Press, 1993.

[7] The International Development Research Centre and the World Health Organization. Health Systems Research Training Series. 1991.

[8] Feacham RG, Graham WJ, Timaeus IM. Identifying health problems and health research priorities in developing countries. *Journal of Tropical Medicine and Hygiene* 1989; **92**: 133–91.

[9] Varkevisser CM, Pathmanathan I, Brownlee A. Designing and conducting health systems research projects. Module 3: Identifying and prioritizing problems for research. In: *Health systems research training series*. International Development Research Centre and The World Health Organization, 1991; **2**(Pt 1): 34.

[10] Henshall C, Oortwijn W, Stevens A, Granados A, Banta D. Priority setting for health technology assessment: theoretical considerations and practical approaches. *International Journal of Technology Assessment in Health Care* 1997; **13**: 144–85.

[11] Murray CJL, Lopez AD. Global mortality, disability, and the contribution of risk factors: Global Burden of Disease Study. *The Lancet* 1997; **349**: 1436–42.

[12] Hyder AA, Rotllant G, Morrow RH. Measuring the burden of disease: healthy life-years. *American Journal of Public Health* 1998; **88**: 196–202.

[13] Wolffers I. Demand-driven research and development programmes: their challenges. *Newsletter*, Netherlands supported programmes for development, 1997; **7**: 8–11.

[14] Nuyens Y. *Review of processes, mechanisms and outcomes of priority setting for ENHR*. Geneva, Switzerland: Council on Health Research for Development, 1997.

[15] Sitthi-Amorn C, Chunharas S, Chooprapawan C. *ENHR development in Thailand*. Geneva, Switzerland: Council on Health Research for Development (Document No. 97.6), 1997.

[16] Task Force on Health Research for Development. *ENHR: a strategy for action in health and human development.* Geneva, Switzerland: Task Force on Health Research for Development, 1991.

[17] World Health Organization. *Sexual and reproductive health research priorities for WHO for the period 1998–2003*. Geneva, Switzerland: UNDP/UNFPA/WHO/World Bank Special Programme of Research, Development & Research Training in Human Reproduction, 1997.

Notes on Corporate Authorship

The Working Group on Priority Setting was constituted in February 1997 by the Council on Health Research and Development, an international non-governmental organization devoted to the promotion and support of strategies for essential national health research (ENHR) in developing countries. The Working Group is one of four groups tasked to gather and analyze data derived from country experiences related to ENHR competencies. Members are from research institutes and councils, academic institutions, government agencies and NGOs, as well as from bilateral funding agencies.

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4

Rebuilding Health Systems towards Health Security: Some Essential Indicators

Professor Chitr Sitthi-Amorn

Introduction

Health is a state of complete physical, mental and social well being and not merely the absence of disease. Despite the unprecedented progress in health technologies and economic growth in this century, unnecessary illnesses and early deaths persist in the developing world. Millions of poor children are dying yearly due to malnutrition, preventable illnesses and injuries. Economic benefits have occurred along side wider health disparities between the rich and the poor, the elite and the socially deprived groups, the industrialized and the developing societies.

The world has an unprecedented opportunity to secure health for all if nations put emphasis on strengthening their health systems and not only their health care systems. A strong health system can be represented by a healthy tree. A healthy tree has roots, a trunk, branches, and must survive in the changing atmosphere and environment.

The *root of a healthy tree* is represented by the societal values and principles in building the national health system. In recent years, several trends have emerged in values, health system, including health as the *right* of citizens, access to *quality* services (prevention, promotion, treatment, rehabilitation), development of *evidence-based standards, norms and guidelines*, expansion of the *definition of health to capture the notion of quality of life* and *holism, adequate finance to achieve and sustain universal access* and social justice. The trends and values must be firmly rooted within society and guide the evolution of a strong health system.

The stakeholders in society *form the trunk of the tree*. They include people, both rich and poor, the provider, the government, NGOs, professional organizations as well as the private sector and the health industry. The most important stakeholder is the public and society at large. At times, there can be conflicts between these stakeholder groups. The values of the health system must be debated by these groups and must become the basis of accepted methods of conflict resolution. The role of the government must change from a key provider of services to overseeing the healthy growth and function of the overall health system. Delegation of authority to regions and provinces while maintaining an effective oversight function centrally will be required.

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Professional organizations are expected to capture and assess the dynamics of technological advances and give advice to stakeholders for their adoption, dispersion and rational use. Many more public organizations have been established for special functions such as hospital accreditation, monitoring health professionals' education, and public health services, as well as presenting options for the public. These organizations are expected to have good governance, efficient management, and are expected to explain their decisions to the public and stakeholders. The NGOs have played active advocacy roles for the society.

The public have been better informed and have been entrusted with more responsibility for self care and have been encouraged to make appropriate decisions concerning their health. Public education, incentive packages and legal measures have been updated to facilitate more appropriate choices. Indeed, the actors in health will be diversified and the relationship between them must be nurtured to ensure a healthy trunk of a strong health system.

A health system includes a health building system, disease prevention and health care. Together, they form the **branches** of a healthy tree. A health building system forms the first branch of a healthy tree.

In addition to health promotion, a **health building system** must be based on healthy public policy, including health considerations in development policy. Development policies must take into account health concerns. Energy policy (dam for hydropower), agriculture (use of fertilizer and design of irrigation systems), industry policy (industrial wastes and environmental pollution), and urbanization among others can no longer be considered in isolation from health and the well-being of the public.

A **disease prevention system** forms the second branch of a healthy tree. In recent years, the world has experienced the need for more collaborative efforts to deal effectively by with emerging diseases. Outbreaks of ebola virus, plague, Nippah virus, multi-drug resistant TB and SARS have emphasized the need for nations to have the capacity to protect their people and work with others to protect national and global society.

Finally, an important branch of a healthy tree is the **health care system** which has to be efficient, equitable, of high quality, good self care, amenable to choices for alternative care with elements of consumer protection. With the rapid technological advances in the genomic era, the actors in health must work together and make a nation's health care reflective of the values (the root) of the society.

In this epoch of globalization, a nation's health system does not work in isolation. The healthy tree must not be rigid, but must strive and survive under rapid changes of the environment. The changes include globalization, global advances in sciences, health sector trends, privatization, trade, technology, including drugs (driving up the cost), genome discovery which brings advances and opportunities for mankind but also can have unwanted ethical, legal and social consequences and can create chaos if the knowledge from genome is misused. The global environment, which can benefit as well as threaten health systems is dynamic and moving fast beyond expectation.

The current trend of globalization and cooperation has emphasized economic growth. It is undeniable that economic growth can bring in resources needed to build an advanced health system for securing health. However, economic growth alone is inadequate to build a strong health system. The right understanding of the broad concept of health and the need for a healthy tree concept for building a responsive health system is fundamental to securing health.

Resources from economic growth must be redistributed to increase social opportunities for a nation's citizen, including education, health, and an equitable access to natural resources within the framework of the economy of the country. This will guard against inappropriate competition for the most advanced and expensive high technology and drugs among the public and private sectors. The role of the government and the management of the health system have to change. Good governance through involvement of the most important stakeholders has to be a critical element in defining the new roles as well as setting up good management system.

We propose that the current bias on economic growth through globalization be balanced with an emphasis on a fairer redistribution of economic benefit to increase social opportunities to people across income and household consumption per capital. Social opportunities include education, health, and fair access to natural resources. We argue that economic benefits must be channeled to tackle two specific areas: (1) *strengthening health systems* for health priorities focusing on inequality; and (2) develop *standards to protect health in development policies* including agriculture, industry, energy, and urbanization.

In *strengthening health systems*, economic benefits must be redistributed according to priorities based on relevance, financial and technical feasibility, the acceptability of stakeholders, the utility of results, timeliness, and ethical standards. As resources are scarce, priorities must aim at significant health needs. If resources to deal with the priorities come from the public sector, then the emphasis must be on a fair redistribution of economic benefits towards sector-specific equity objectives, such as equal services for equal needs. The underprivileged must be targeted since the poor can be most hard hit when economic crisis strikes, as demonstrated during the economic crisis in Asia and in many parts of the world.

The challenge is to make the targeting through public channels efficient, i.e., the underprivileged and the main intended beneficiaries are the main receivers of the benefit from the economic deliberations within the environment where there is an increasing pluralism of health care system including the unprecedented growth of private medical services; the use and abuse of increasingly sophisticated medical technology; the inequity of access to health care through the various payment and insurance mechanisms; as well as social changes associated with increased urbanization have led to higher prevalence of drug dependence, AIDS, problems of the elderly and child abuse.

In terms of protecting health while promoting development, *standards* must be developed when development policies are conceived. These include agriculture, industry, energy and urbanization or housing policies. The contemporary modes of industrialization, agricultural practices, energy consumption and urban planning are generating unprecedented occupational and environmental health problems. Development activities can change the ecology affecting the occurrence of emerging and re-emerging diseases. Development can also pollute the environment with toxic wastes. An effective surveillance system must be in place as a preventive measure to deal with unexpected outbreaks of infectious diseases and toxins even when standards are in place.

It is important to develop indicators and benchmarks to track and monitor progress towards the redistribution of economic benefits to secure health. Indicators have to reflect the components of health security within the framework of the changing paradigm at the national, regional and international levels.

Components of health security include health promotion, disease prevention and health care (treatment and rehabilitation) within the framework of rapidly changing technological possibilities and disease profiles at the local and global levels (Garrett L. 1994). **Health promotion** involves healthy environment, adequate nutrition, good lifestyles affected by globalization and international dependency. **Disease prevention** requires control of known infectious and non-infectious diseases, active and passive surveillance of emerging and re-emerging diseases as well as mounting appropriate control in concert with active and passive surveillance information. **Effective health care** refers to access to treatment and rehabilitation of acceptable quality across social classes. Therefore, treatment and rehabilitation involve the development and adaptability of health systems that can ensure access to quality services within the framework of technical possibilities according to current and emerging needs in a most efficient way. This means access to the right service, at the right time without undue delay, at the right level of facility by the right personnel to maximize health gain and minimize disability.

There are at least **four perspectives** to guide health actions for health security: (a) the perspective of the **beneficiaries** of health actions (patients, relatives and family), (b) **the providers** of health, (c) the perspective of **health facilities** and (d) that of the **society**. The beneficiaries of health action want the best services for individuals and their relatives (quality regardless of cost). Health providers seek the most technically desirable and cost effective services to their intended beneficiaries (technical efficiency).

Health facilities must make sure that the services provided are efficient, and the facilities are financially viable. The society must make sure that tax money collected from all is used to provide health to all sectors of the society, rich or poor, men and women. When resources are scarce and finance limited, choices have to be made to strike an appropriate balance between equity, efficiency, quality and social accountability of health actions.

The choice of health actions will depend on the perspectives to be adopted. When there is a conflict between perspectives, the decision must be based on ***the sources of funds and use of resources*** to provide health actions. When resources to deal with a fair redistribution of economic benefits come from the public sector, then the society perspective must be adopted, i.e., equal services for equal needs, healthy public policy, disease surveillance, environmental and food security.

On the assumptions discussed above, we propose some possible indicators to channel the redistribution of economic benefits towards health security using the society viewpoints as described below.

Indicators for health security

A. Health promotion:

(1) **Environmental pollution:** Global environment changes can threaten individual and global health security and harm sustainable development. Environmental changes can lead to emerging

and re-emerging infectious diseases and other health hazards due to ecological changes resulting from population increase, population migration as refugees or for job opportunities, traveling, trade and industrial growth and wastes, acid rain, deforestation, over use of natural resources and urbanization. When forests disappear, wild animals, insects and other living creatures migrate and can spread unfamiliar infections to human beings. In addition to infections, environmental pollution also lead to more asthma and respiratory infections and cancers. Individual nations cannot deal effectively with the environmental problems alone. Indicators include:

(a) Agreements among nations (international, regional, bilateral) to create concerted efforts and standards to reduce environmental pollution, undesirable ecology changes, and overuse of natural resources.

(b) Collective short, medium, and long term plans with milestones and time line to implement and monitor adherence to the agreements and standards among nations.

(c) Periodic forum where the results of the implementation and adherence to the agreements and standards are discussed and plans modified.

At the national level, people in many urban slums, rural areas and refugee camps are suffering from insufficient environmental sanitation essential to disease prevention and child development. This has added to environmental pollution resulting from development policies. Therefore, the indicators for a fair redistribution of economic benefits for health security at the local level include:

(a) The magnitude and trend of resource allocation to built up infrastructure, human capacity, and programmes to improve environmental sanitation and reduce environmental pollution harmful to human health.

(b) The existence of standards and effectiveness of campaigns, incentives, law and law enforcement to reduce environmental pollution resulting from agriculture, industry, energy and housing policies.

(c) The magnitude and trend of adherence to standards in urban and rural areas as well as refugee camps where health problems associated with poor environmental sanitation and pollution still prevail.

(2) Nutrition: Malnutrition remains a widespread problem in the developing countries. Malnutrition can adversely affect the growth and development of children. Pregnant mothers with inadequate nutrition deliver low-birth-weight babies. Unhealthy children and babies have less access to social opportunities needed for human security. Both over- and under-nutrition can make people unhealthy. Food security implies that people in each household have the physical and economic ability to access healthy food (total calories and trace elements) at all times (adequate production, procurement, or acquisition via welfare). It also requires that the country has the ability to have adequate food acquisition (production or procurement) as well as an efficient food storage and supply system. **Food security is therefore a critical element to prevent malnutrition and enhance health and human security.** The indicators for a fair redistribution of economic benefits towards food security include:

(a) The magnitude and trends of resources from economic benefits which are diverted to programmes to ensure adequate production, procurement or acquisition of food to all sectors of the population.

(b) The re-examination of tax barriers and trade agreements between countries can affect food security with implications on health and human security (Fouere T, et al. 2000).

(c) The involvement of countries in negotiating with the World Trade Organization (WTO), World Health Organization (WHO), as well as Food and Agricultural Organization (FAO) to review, amend, implement and monitor tax barriers and trade agreements to guarantee food security for all.

(d) The magnitude and trend of household quintiles (classified by household consumption per capita) that have the physical and economic ability to access healthy food in terms of total calories and trace elements.

(e) The magnitude and trend of anthropometric indicators including weight for height, height for age, weight for age, upper mid-arm circumference using quantitative technique for equity analysis (WB technical report #2).

(3) **Consumer protection** ensures efficacy and safety of consumer products including food, drugs and medical equipments as well as healthy selection of products for consumption. The proposed indicators for redistributing economic benefits for tracking consumer protections are:

(a) The magnitude and trends of resources from economic benefits that are allocated for effective consumer product surveillance systems, including the tracking of the nature and extent of use and abuse of products by various household consumption groups through unethical promotion strategies.

(b) The existence of standards and effectiveness of campaigns, incentives, law and law enforcement to reduce unethical promotion.

(c) The magnitude and trend of complaints and lawsuits for compensation due to poor products by various household consumption groups, urban and rural areas as well as refugee camps.

(4) **Indicators for general health:** Indicators for measurement of general health (as distinct from diseases) may be used to assess the impact of health promotion. These indicators are available such as WHO Quality of Life (QOL) (1995), the World Bank Measurement of Adult Health (WB technical Note #3, accessed 2003), and the "Concentration Curve" and "Concentration Index" (WB technical note #6, 7, 2003). Indicators include medical models, functional models, and self-perceived models. The methodology for comparison of health among different quintiles of wealth (poorest 20%; 2nd poorest; middle; 2nd richest, richest 20%) has been published and is available for use.

B. Disease prevention:

(1) **Surveillance for infectious diseases:** Surveillance is considered a tool for diagnosis of conditions, which can easily become an epidemic and affect many people in the community, a country and across countries. It is an important tool for health security. Surveillance has been traditionally applied to the control of infectious diseases. Now, surveillance will have to encompass the detection of toxins, such as hazardous chemicals, pesticides in human milk and lead in blood of children, as well as genetically modified products. Of particular importance are the diseases transmitted from animals to man such as the outbreak of chicken virus in Hong Kong, Nippah virus in Malaysia and recently the Severe Acute Respiratory Syndrome (SARS). Also, there is an increasing concern about intentional use of infectious agents to

achieve military and political objectives, commonly referred to as bio-terrorism (WHO Report of Executive Board 2000 & 2001).

Surveillance can be active, passive and targeted periodically towards special groups seeking treatment from sentinel sites. To be effective, a surveillance system must be integrated with other measures to orchestrate a control of the spread of diseases under surveillance. Therefore, the role of surveillance is: to monitor secular and long-term trends of diseases and public health issues affecting health security; to provide early warning for disease outbreaks, which threaten health security; to evaluate prevention and control programmes; and to monitor the effect of climate changes which affect emergence and re-emergence of infectious diseases. Effective surveillance of infectious disease has to be international in scope to share information on such diseases as Ebola, Dengue, SARS, outbreak of plague etc.

Three types of surveillance can be used to diagnose the nature and extent of a health problem in a community: active surveillance, passive surveillance and sentinel surveillance. Each has its own sensitivity of detection of health problems and will need different requirements. Most countries only have a passive surveillance system because to maintain an active system would entail sophisticated laboratories. Some infrastructure and human resource requirements will be needed to maintain a sentinel surveillance system.

(a) *Active surveillance: A case study from India:* Plague in India highlights the need for international cooperation and surveillance. In the first 25 years of the century, India lost about 12 million people to plague. The government launched an effective control programme and in the 1950s, plague was mostly under control. In 1959, plague was eliminated from India and in 1966, India declared the eradication of plague. Since then, very little efforts related to the control of plague were carried out. There was no research and laboratory work being done on plague. The lack of laboratory diagnosis during the outbreak in 1994 caused an epidemic of panic. There was a loss of 2 billion US dollars to the Indian economy and probably several billion dollars globally. What should have been a focal public health event turned into a worldwide emergency.

The goals of active surveillance are: a) to detect without delay the introduction of change in incidence of a specific disease agent (active surveillance has to be disease specific although there are also some exceptions); b) to alert pubic health officials early on in the course of the epidemic, i.e., the early warning system (emphasis on pre-epidemic period as opposed to epidemic period); c) to assess the extent of risk transmission of a particular disease; and d) to estimate and monitor the efficacy of control activities. Active surveillance has to be laboratory-based. The case definitions of an active system can vary. These case definitions can be non-specific in the pre-epidemic period and become more specific during the epidemic when the incidence increases. There must be standardized sample collection and reporting. The surveillance tool must be convenient and easily transportable (Cassol S, et al. 1996; Frerichs RR 1994).

When a clear disease definition is not available, syndromes can be used to cover multiple diseases. When a syndromic approach is used, the case definition is very non-specific but can be supplemented later with a more definite diagnostic technique.

Laboratories must be able to: (1) conduct routine surveillance for priority diseases important in the area; (2) focus on epidemic transmissions of priority diseases; (3) recognize new diseases, natural disasters, imported disease and bio-terrorism.

At least the laboratory should be able to conduct surveillance on priority diseases and if it is not capable of detecting the broad spectrum of new and other infections there must be some reference laboratory in the Region such as a WHO reference laboratory where samples can be sent for identification and confirmation. Ideally, every country should have a national laboratory with satellite laboratories at the district and local levels. However, this can be expensive for poor countries. A more efficient way of sharing existing resources is to map out existing laboratory facilities in a region, coordinate sharing and standardization among them and develop new facilities, which might be needed. The WHO reference laboratory should be capable of a wide array of diagnostic capability and WHO can link up with other sophisticated laboratories such as the Center for Disease Control.

Every national laboratory should have some well trained personnel, enough facilities, equipment and basic microbiology. The state-of-the-art technology such as PCR is important but not as important as basic microbiology. A mechanism should exist to ensure quality assurance so that people are confident of laboratory results.

Once an infection has been identified, the standard public health measures must be actively applied such as the identification of individuals, the quarantine, the sanitary regulation, the sacrifice of infection sources in animals, the measures to heighten precautions in individuals before vaccines and definitive treatment becomes available.

(b) *Passive surveillance:* Passive surveillance is most useful to monitor long-term secular trend but insensitive to track the epidemic activities. Most countries have a passive surveillance system. The key components of a passive surveillance system include the use of standardized case definition and a standardized reporting system. Passive surveillance relies on physicians and health officials to report disease from the peripheral and therefore very insensitive for predictability of epidemic activities. Constant communications, reference and referral, political and economic support are all crucial components of an active and passive surveillance systems.

Effective emergency response is a necessary complementary measure to prevent the spread of infectious diseases. Good coordination between epidemiology, laboratory diagnosis and people in the field doing control is critical. Effective control has to be disease-specific and the knowledge about the dynamics of transmission is essential. Further, strong community involvement is needed for sustainability. There has to be a real-time response and timely policy decisions. Therefore, laboratory capability must be credible so that rapid decisions can be taken to respond to the problems in real-time rather than wait until the epidemic spreads or peaks.

(2) Empowering the community to be integrated in surveillance and control: Outreach is an area where public health has often failed. Despite the availability of health education materials for all kinds of diseases and health problems, people usually ignore them. Social scientists and medical anthropologists who know how to communicate with the community should be encouraged to play a greater role in developing health education messages. The use of one

message for all recipients with diverse ethno-social backgrounds is unlikely to succeed. The public must know their responsibility about disease transmission and disease prevention. They cannot rely on the government to do everything. Governments must have an honest assessment of what the epidemiologists have to say and must not hear only what the government wants to hear.

An integrated community-based approach must be based on common ownership and relevant policy decisions and must capitalize on updated technology and instruments available to cope with epidemics and prevent disease. People must have some say in the programme and set the priority. Government officials must not simply go and tell people how to do things. Without community ownership there is no sustainability. Policy decisions have to support the community-based approach.

Therefore, possible indicators for a fair redistribution of economic benefits for health security based on disease prevention include:

(a) *Agreements among nations* (international, regional, bilateral) to create standards and concerted surveillance of infections and toxins as well as effective emergency response, including effective sharing of information, effective surveillance laboratory networks with various degrees of sophistication.

(b) *Collective short, medium, and long term plans* with milestones and time line to implement and monitor adherence to the agreements and standards among nations.

(c) *Periodic forums* where the results of the implementation and adherence to the agreements and standards are discussed and plans modified.

(d) *The magnitude and trend of resource allocation* to develop an effective surveillance system, emergency response and community empowerment to help control disease outbreak and spread of toxic substances.

(e) *The magnitude and trends of disease outbreaks and spread of toxic substances.*

C. Effective care (Treatment and rehabilitation):

When people get sick or become disabled, they must be able to access essential, cost effective and quality care, regardless of the ability or willingness to pay for it. In other words, people's health and their ability to function productively must not be a victim of market forces; and the universal coverage of essential care must be ensured for all. Several lessons have been learnt from the recent economic crisis in Asia. These lessons can be useful to prepare nations to deal with the opportunities and threat of agreements negotiated through the World Trade Organization so that nations can guard against the unwanted consequences on health.

Lessons learnt from the economic crisis

The effect of globalization on health has been affected by the corruption and poor governance in the health system. There have been many non-productive investments and wasteful practices in the health sector. Before the economic crisis in Asia, resources were invested in speculative markets. Since the 1980s and well before the economic crisis, South-East Asia invested in many private hospitals.

In Thailand, for example, private hospital beds increased dramatically over the years, i.e., from 8,066 in 1982 to 21,297 in 1992 and 34,973 in 1996. The number of doctors in private hospitals and the ratio of specialists increased, leading to a shortage in the public sector (Ministry of Public Health; Bureau of health policy and Plan 1997). The culture of free enterprise, the enlarged middle class, the inclusion of hospital insurance in salary packages, and tax incentives for the private health care industry, provided strong inducements for investment in private hospitals, advanced technology, migration of leading specialists from the public to the private sector at the expense of the public sector (Chaudhary V. 1992). Increases in the import of new expensive drugs and wastage due to treatment occurred in response to aggressive pharmaceutical industry promotion and consumers' demands for more expensive medicines and procedures (Ministry of Public Health, Bureau of health policy and Plan 1997; Barnett A. et al. 1980).

Medical care costs provided as "welfare" to government civil servants and those employed in medical enterprises increased sharply from 4,315 million bahts (US$ 108 million) to 16,500 million bahts (US$ 412 million) in 1995, a four-fold increase in seven years. Inadequate management, monitoring and evaluation necessary for good governance and lack of regulation of the corporate health care business sector have prevailed (Barraclough S. 1997).

Due to the crisis many direct health consequences such as an increase in suicides occurred as well as other adverse health effects such as malnutrition, abandoned children, low birth weight among the poor, mortality from acute respiratory tract infections and vaccine preventable diseases including diphtheria, measles and hepatitis (Prida Tae-Arruk 2001; Choprapawon C. 2000.). These adverse health effects were partly due to the lower rates of utilization of services especially by those who had no prepaid insurance (Prida Tae-Arruk 2001). The poor were disproportionately affected by adverse health consequences of the economic crisis. Ironically, such injustice was apparent despite the fact that the public hospitals in the Ministry of Public Health received increased budgets for their poor patients through the "Good Health at Low Cost" programme (Prida Tae-Arruk 2001).

Moreover, free health insurance received by poor people decreased from 19.7% in 1997 to 13.5% in1998 (Prida Tae-Arruk 2001), adding greater inequity in access to health care. The government has recently developed a universal coverage scheme to enhance the social safety net for effective access to treatment and rehabilitation.

The World Trade Organization (WTO) and health

The WTO was established in 1994 to facilitate negotiations leading to rules to liberalize international trade through multilateral trade agreements. Since its inception, more than 140 nations have joined the WTO. Indeed, countries have used the WTO to negotiate guidelines for a relationship leading to economic growth via foreign investment and opportunities to export to larger markets.

There are three key multilateral agreements: the General Agreement on Tariffs & Trade (GATT), the General Agreement on Trade in Services (GATS) and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). The GATT can affect health by trade on health products such as genetically modified foods. The GATS liberalizes markets in service industries including health services and can promote consumers' choices particularly those who have the ability to pay for the services. The TRIPS agreement is relevant to intellectual property rights on drugs and medical equipment.

Therefore, these agreements can affect health in general as well as access to medicines and services in particular. Nations must develop measures to monitor access to services and medicines of people of different social classes as well as the barriers to medicines and services. Tools must be developed to monitor the various interrelated markets. Nations need tools to measure the performance of the finance market (various insurance schemes), the human resource market (human resource mobility in the light of GATS implementation), optimal facility and equipment planning, rational use of drugs and medical commodities, as well as the market for human resource training and education.

Information generated from the analysis of the various markets must be collated, integrated, and synthesized to guide the organization of optimal services as well as setting rules to pay providers and facilities to promote equity in health for development. The most important measure is to promote the "Robinhood Rules", in redistribution of resources to increase social opportunities and guard against the reversed Robinhood Rules, which channel public resources to support the for-profit sector.

Indicators for a fair redistribution of economic growth for equity of access in health care include:

(1) The availability and use of tools to analyze various markets: financing, human resource, facilities and equipment, commodities and pharmaceuticals, and education of human resource for health.

(2) The presence of documents which analyze the relationship between the inter-related markets: finance, human resource, facilities and equipment, drugs and commodities, as well as professional education.

(3) The use of evidence-based analysis of inter-related markets for organizing service delivery and setting rules for payment of providers and facilities both in the public and private sectors.

(4) The magnitude and trend of resource allocation for improvement of registration and de-registration of drugs and medical devices.

(5) The differential distribution of health care personnel and facilities between urban and rural areas, between private and public sectors.

(6) The magnitude and trend of resource allocation for development, revision, implementation, monitoring of evidence-based health care guidelines.

(7) The existence of a mechanism to monitor adherence of guidelines as well as the effectiveness of guidelines.

(8) The differential coverage and access to health care services across individuals or household quintiles ranked by their living standards based on individual income and household consumption per capita.

(9) The progressivity of health care payments as measured by out-of-pocket payment for health care services across individuals or household quintiles ranked by their living

standards based on individual income and household consumption per capita (World Bank technical note # 16, accessed June 2003).

(10) The magnitude and trend of resources to address important neglected areas; human resources; accountability; central government functioning; evidence for policy. This would depend on an adequate understanding of the relationship between culture, illnesses and care. (Kleinman, A. 1995).

(11) The "benefit incidence analysis" for assessing the target efficiency of public subsidy, across individuals or households ranked by their living standards based on household consumption per capita (World Bank Technical Note #12, accessed June 2003).

(12) The probability of contacting health system when needed across individuals ranked by their living standards (World Bank Technical Note #13, accessed June 2003)

(13) Mortality, morbidity, and disability rates across individuals ranked by their living standards.

(14) Periodic forums where the results of the above indicators can be discussed.

(15) Documents collated from the meeting between the Ministry of Finance and the Ministry of Health on potential threats from WTO agreements, such as regulations and deregulation by the government on health services as well as public sector subsidies for health services.

Strategies to ensure health security

Strategies at the national level

- *Uphold values of public health with focus on health security:* Equity, social justice, self-sufficiency, and sustainability have been suggested as the key values for public health, and should be upheld (Berlinguer, Giovanni. 2000). The fundamental role of the government in the provision of health security should be revitalized. For example, in Thailand, tax incentives for use of expensive equipment and 25% taxation on essential drugs should be dropped (Bennett S. Tangcharoensathien V. 1994). Guidelines and options are available to guide a wider application of the concept of sustainable development through involving more players in, for example, private sector contracts for primary health care (Palmer N. 2000).
- *Appropriate restructuring involving public health values, health security and new players.* Restructuring the health system requires involvement and commitment of all stakeholders if appropriate technology is to be delivered to desirable targets. Thus, even though effective medicines are available to treat AIDS, control of the disease will not be possible without a robust infrastructure to bring the medicine to those in greatest need: the poor and the underprivileged. The restructuring of health security systems by means of involving both the public and private sectors has been tarnished by inadequate governance which never considered impact in terms of adverse health impacts, but solely on cost containment (Barraclough S. 1997; Palmer N. 2000; Learthiendumrong, J & Tangcharoensathien, V. 1999).

  The key question is what kind of organizational change is optimal for a health system, which can uphold the key public health values focusing on health security and is still cost-effective and affordable by a country. Answering this question requires some hard decisions involving changes in the role of different government ministries, and changes in the roles of both the public and private sectors. Such changes are paralleled by the unsuccessful health system changes attempted in the USA during the first Clinton administration (Brock, DW & Daniels, N. 1994); and the new National Health Service plan now being attempted in England. (The NHS Plan, http://www.doh.gov.uk/nhsplan) One of the keys to effective organizational reform is to create a platform for evidence-based discussions among the main stakeholders. This may result in some degree of wider ownership of the reform agenda and a system of compensations or allowances to reward good performance (Israr SM, *et al.* 2000).

- *Focus on evidence-based decisions.* Several tools and methods are available for knowledge management to aid movement towards better decisions. These tools and methods are needed for estimating demand for health resources based on needs to ensure health security (Abel-Smith B. 1986; Mach EP & Abel-Smith B. 1983). Instruments that are capable of estimating needs, resources, utilization, costs and outcomes of care are essential if the full impact of decisions is to be understood, and public values for health security maintained. Research focusing beyond epidemiology and onto health security systems is needed when financing, incentives for providers, incentives for facilities, acquisition of technology, and the production of human resources are all integral parts of the decision process. Efforts are needed by countries to explore, collate, use and refine these tools and instruments to guide decisions, such as questions about the feasibility of national health insurance purchase cooperatives to foster equity, efficiency and quality of actions towards health security.
- *Empower the intended beneficiaries to participate in evidence-based policy decisions.* Social policies that focus on human development must be the main aim of the public sector, i.e., investment in human capital. To enhance equity, any human development policy should set as a target increasing the social opportunities of all members of society in their access to education, health security, and natural resources. According to Amartya Sen, re-vitalized intended beneficiaries with sufficient opportunities for access to social opportunities will not be content with reliance on welfare but would rather produce quality activities that can compete in any market or can bring in resources (Sen A. 1993; Sen A. 1999). Such users of services will have more freedom to choose and can make more informed decisions, which, in turn, can strengthen the market. Stronger members of the society will increase the efficiency of the market through more freedom of choice. Investing in human capital must involve cooperation of the social, economic and environmental sectors (Woodward A, Hales S, Litidamu N, Phillips D, Martin J. 2000). Improved social opportunities for the voices of the poor to be heard through democratic means are essential to deal with the unwanted consequences of economic or environmental crises, which disproportionately and unfairly affect the poor. Enhanced democracy will make the voice of the poor loud and clear, and it is likely that demands for appropriate "safety nets" and greater fairness in the society will result (Woodward A, Kawachi I. 2000).

A key to success in implementing these strategies and actions lies in a nation's capacities - which include epidemiology, public health focusing on health security – to manage knowledge for good governance. Each country may need to review the kind of expertise, information and management system required for knowledge generation and management to achieve good governance. Good governance is needed for both the health system and the health research system through building strong interactions between the two. Income per capita alone does not ensure health security of the people in a country despite demonstrated relationships between health and economic growth. Some poor countries appear to do things right and have better health at a low GNP than others that do not. This is not to deny the fact that the biggest killer in the developing world remains poverty. It is rather a challenge for nations to make plans using long term goals, intermediate goals and step-by-step measures. Appropriate infrastructure and information system will have to be inputs to logical decisions. The infrastructure and information system will have to focus on development of capacities for knowledge management to facilitate decision-making based on good governance through a check and balance mechanism participated by key stakeholders in a society.

Strategies for the international community

Globalization has moved the world from an era of national concerns to an era of global health. There is an increasing international transfer of health risk such as pollution and epidemics which increasingly threaten the health of countries. Nations are increasingly losing power and capacity to ensure their policies are securing the health of their people.

International development agencies and enterprises need to define clear moral authority and values on the acceptable norms and standards of accountability and compliance, fair conflict resolution as well as negotiated dispute resolution. These should be based on a "level playing field" rather than unilaterally imposed by sanctions. New global health contexts, architecture, rules and regulations are needed to define new ways of cooperation and setting priorities to balance the positive and adverse interactions between economic growth and disease, and between health and wealth.

- *One moral aspect is a concern for equity.* Efforts must be made to enable countries to participate in the opportunities for economic growth but through knowledge management for good governance. Price and profit control might not work as expected if not focused on economic evaluation and good governance (Bloor K, Freemantle N. 1996). Health must be considered a global public good particularly if a concern for equity is to be honoured. The World Health Organization has been exploring ways to partner with the private sector to enhance better equity and security in health (Buse K, Walt G. 2000a; Buse K, Walt G. 2000b).
- Basically, the world is looking for *new rules and new platforms for collective action* and these cannot emerge from nation states. We need global rules for global governance. The new global rules have to go beyond being concerned solely with economic phenomenon (i.e., growth) but have to link with cultural and political processes, which shape the ways people and nations live their daily lives. The use of new electronic media in addition to other means can serve as a platform to transfer information and to engage the attention of stakeholders. Trying to find and to work with a set of rules that satisfies all stakeholders and produce a global agreement is a challenge. But, transparency, accountability and consistency in managing knowledge to make balanced decisions respecting a concern for equity and health security will be fundamental to recast and sustain an effective global health governance infrastructure. The key requirement is for nations and stakeholders to find effective ways of working together, in alliance with public and private, north and south, so that the world can rise to the challenges of health security mankind is facing. Nations and stakeholders must demonstrate their achievements and overcome differences, mistrust, skepticism, and fragmented development efforts.

Suggested reading:

1. Abel-Smith B (1986). The world economic crisis. Part 2. Health manpower out of balance. *Health Policy and Planning* 1(4):309-316.
2. Bang-AT; Bang-RA (1992). Diagnosis of causes of childhood deaths in developing countries by verbal autopsy: suggested criteria. *Bulletin of the World Health Organization* 70 (4): 499-507.
3. Barnett A, Creese AL, Ayivor ECK (1980). The economics of pharmaceutical policies in Ghana. *International Journal of Health Services* 10:479-499.
4. Barraclough S (1997). The growth of corporate private hospitals in Malaysia: policy contradictions in health system pluralism. *International Journal of Health Services* 27:643-659.
5. Barry M (2000). Effect of the U.S. embargo and economic decline on health in Cuba [see comments]. *Annals of Internal Medicine* 132(2):151-154.
6. Bennett S, Tangcharoensathien V (1994). A Shrinking State? Politics, Economics and Private Health Care in Thailand. *Pub Adm & Devel* 14:1-17.
7. Berlinguer, Giovanni (2000). Health and equity as a primary global goal. *Development* 42(4): 20-21.
8. Bloor K, Freemantle N (1996). Lessons from international experience in controlling pharmaceutical expenditure. II: Influencing doctors [see comments]. *British Medical Journal* 312:1525-1527.
9. Brock, DW and Daniels, N (1994). Ethical foundations of the Clinton administration's proposed health care system. *JAMA* 271: 1189-1196
10. Buse K, Walt G (a) (2000). Global public-private partnerships: Part I—A new development in health? *Bulletin of World Health Organization* 78(4):549-561.
11. Buse K, Walt G (b) (2000). Global public-private partnerships: Part II—What are the health issues for global governance? *Bulletin of World Health Organization* 78(5):699-709.
12. Chaudhary V (1992). Chile's economic boom fails to improve health care. *British Medical Journal* 305:1113.
13. Choprapawon C (2000). *Health Situation of the Thai People.* Choprapawon C, editor. Bangkok, Health System Research Institute.
14. The Commission on Health Research for Development (1990). *Health Research: Essential Link to Equity in Development.* Oxford: Oxford University Press.
15. Fouere T, Maire B, Delpeuch F, Martin-Prevel Y, Tchibindat F, Adoua-Oyila G (2000). Dietary changes in African urban households in response to currency devaluation: foreseeable risks for health and nutrition. *Public Health Nutr* 3(3):293-301.
16. Garrett L (1994). *The Coming plague: newly emerging diseases in a world out of balance.* New York: Penguin Books.
17. Israr SM, Razum O, Ndiforchu V, Martiny P (2000). Coping strategies of health personnel during economic crisis: A case study from Cameroon. *Tropical Medicine and International Health* 5(4):288-292.
18. Kleinman, A (1978). Culture, illness, and care: clinical lessons from anthropologic and cross cultural research. *Annals of Internal Medicine* 88(2): 251-8.
19. Learthiendumrong, J and Tangcharoensathien, V (1999). *Claims for Out-patient and Inpatient Services Under the Civil Servant Medical Benefit Scheme 1997.* Nonthaburi, Thailand: Health System Research Institute.
20. Mach EP, Abel-Smith B (1983). *Planning the Finances of the Health Sector: A manual for developing countries.* Geneva: World Health Organization.
21. MacQueen KM, Nopkesorn T, Sweat MD, Sawaengdee Y, Mastro TD, Weniger BG (1996). Alcohol consumption, brothel attendance, and condom use: normative expectations among Thai military conscripts. *Medical Anthropology Quarterly* 10: 402-423.

22. Mills S, Ungchusak K, Srinivasan V, Utomo B, Bennett A (1998). Assessing trends in HIV risk behaviors in Asia. *AIDS* 12 (Suppl B) : S79-86.

23. Ministry of Public Health. Bureau of Health Policy and Plan (1997). *Health in Thailand 1995-1996.* Nonthaburi: Ministry of Health.

24. *National Health Service Plan: A Plan for Investment, A Plan for Reform.* http://www.doh.gov.uk/nhsplan/ (access February 19, 2001)

25. Newbrander W (1997). *Private Health Sector Growth in Asia: Issues and Implications.* Chichester: John Wiley & Sons.

26. Palmer N (2000). The use of private-sector contracts for primary health care: theory, evidence and lessons for low-income and middle-income countries. *Bulletin of World Health Organization* 78(6):821-829.

27. Peckham CS, Dezateux C (1998). Issues underlying the evaluation of screening programmes. *British Medical Bulletin* 54:767-778.

28. Prida Tae-Arruk (2001). *Impact of Economic Crisis on Health of the Thai People.* Bangkok: Health System Research Institute.

29. Rosomoff HL, Rosomoff RS (1999). Low back pain. Evaluation and management in the primary care setting. *Medical Clinic of North America* 83:643-662.

30. Sen A (1993). The Economics of Life and Death. *Scientific American* 268 (5):18-25.

31. Sen A (1999). *Beyond the Crisis: Development Strategies in Asia.* New Delhi: Capital Publishing Company, p.1-46

32. Sitthi-amorn C, Janjaroen W (2000). The Bubble in Thailand Health Care System: Need for Reform and Major Issues. In: Pham Manh Hung, I.Harry Minas, Yuanli Liu, Goran Dahlgren, William C.Hsiao, editors. *Efficient, Equity-Oriented Strategies for Health: International Perspectives-Focus on Vietnam.* CIMH Melbourne: McKellar Renown Press.

33. Smith, G.S (1987). Development of rapid epidemiologic assessment methods to evaluate health status and delivery of health services. *International Journal of Epidemiology* Dec; 16 (4): 556-560.

34. Suparmanto SA, Sundoro T, Stokoe P (1999). The impact of the monetary crisis and the development of a health and social safety-net with a special note on donor participation—real life experiences on the role of health services in public health. *World Hospitals and Health Services* 35(3):14-16.

35. Wadswarth MI, Butterfield BJH and Blaney R (1971). Health and Sickness: the Choice of Treatment. London, Travistock.

36. World Bank. Quantitative Techniques for Health Equity Analysis: Anthropometrics – Technical Note # 2. www.worldbank.org (accessed June 2003).

37. World Bank. Quantitative Techniques for Health Equity Analysis: Adult Health – Technical Note # 3. www.worldbank.org (accessed June 2003).

38. World Bank. Quantitative Techniques for Health Equity Analysis: Concentration curve – Technical Note # 6. www.worldbank.org (accessed June 2003).

39. World Bank. Quantitative Techniques for Health Equity Analysis: The Concentration Index – Technical Note # 7. www.worldbank.org (accessed June 2003).

40. World Bank Quantitative Techniques for Health Equity Analysis: Benefit incidence analysis – Technical Note # 12. www.worldbank.org (accessed June 2003).

41. World Bank Quantitative Techniques for Health Equity Analysis: Inequity in health service delivery – Technical Note # 13. www.worldbank.org (accessed June 2003).

42. WHO (1995). World Health Organization Quality of Life assessment (WHOQOL): Position paper from the World Health Organization. Social Science and Medicine 41(10):1403-1409.

43. WHO Report of Executive Board EB 107/5 November 2000

44. WHO Report of Executive Board A54/9 April 2001

45. WHO Report of Executive Board WHA 54.14 May 2001

46. WHO Report on Health Security Capacity Development. http://www.who.int/csr/ labepidemiology/en (accessed March 26, 2001)

47. Woodward A, Hales S, Litidamu N, Phillips D, Martin J. Protecting human health in a changing world: the role of social and economic development. Bulletin of World Health Organization 2000; 78(9):1148-1155

48. Woodward A, Kawachi I. Why reduce health inequalities? Journal of Epidemiology and Community Health 2000; 54(12):923-929.

5.[illegible]

Information systems and community diagnosis in developing countries[*]

Chitr Sitthi-Amorn

Outline

This chapter outlines the importance of information in the planning, monitoring, and evaluation of health problems, their determinants, intervention options, and evaluation of health intervention in a community. It argues for at least five objectives of the health actions, which determine what types of information are needed. A general framework for information and community diagnosis is given which includes defining the community, agreeing on the indicators, determining the sources and methods of obtaining the information, and using the information to predict the current situation as well as future trends. Each of the sources or methods used for information gathering (routine reports, surveillance, survey and special studies, rapid survey, contact tracing, and vital registration and census) has inherent strengths and weaknesses. Therefore a combination of approaches for collecting information for community diagnosis is necessary. Despite the availability of several approaches to developing an information system, some technological limitations for a community diagnosis exist and are also discussed. Finally, a comparison is made between information systems in developed and developing countries, which partly reflect the different emphasis in the operation of health-care systems as well as differences in available resources for community diagnosis.

Introduction

Information is the basis for planning for a rational allocation of resources to cope with public health problems. Information should shed light on health situations, help to set priorities, appraise options, develop and implement programmes, and monitor and evaluate actions to determine whether they adequately address the situations. Information is the essence of the planning process. Decision-makers balance evidence from information with their values and the imperatives to arrive at the best choices. Information includes what is measured, what is not measured, and what is inherently unmeasurable. Most information systems, which rely on information technology, collect measurable quantifiable information possibly at the expense of less explicit soft and qualitative information. Therefore, an appropriate mix of measurable and intangible information will be needed. Although the information is rarely perfectly accurate, its accuracy can be enhanced through the development of a clear operational definition, training and motivating the enumerators, and interaction with stakeholders to standardize interpretations.

The definition of a community can have many interpretations such as a neighbourhood or a collection of people in similar geographical circumstances. A community also refers to a group of people who share the same stakes and common interests such as trade unions, those who are mobilized around a given activity, or the users of health services. Some have even expanded the definition of a community to include those employed in a workplace, the population of a nation, or a civil society. In this chapter, a community can encompass several interpretations such as a village, subdistrict, district, province, or nation. A fundamental requirement of an information system is to enhance the ability of decision-makers to employ evidence-based actions and enhance their roles in solving problems of a community however defined. A community is not a static entity; therefore any meaningful information system for the diagnosis of community problems requires a dynamic interaction between the members of the community and the managers of information systems. It is important to make the best use of updated information and interpret information into meaningful strategic options that reflect the reality of health and health-care systems in a given community or society. Any information produced should then be fed back to the community to enhance their future involvement. This feedback can then be the driving force in linking information to actions because the community will press for the kind of information they can use.

Public health policy-makers and health-care managers need timely, useful, and balanced information (quantifiable and intangible) for the diagnosis of health needs, their determinants, and trends to achieve effective planning and monitoring of health-care interventions. New challenges to public health have highlighted the importance of community involvement in defining problems and in coping with them. These challenges include globalization and its impacts on environment, the relationship between trade and health, emerging diseases, the market orientation of health-care system, and changes in behaviour and lifestyles. There are several ways to obtain health information for the diagnosis of communities including routine health facility reporting, screening, surveillance, special large-scale surveys, rapid surveys, contact tracing, and census. These methods vary depending on the objectives, investment, and utilities available.

The objectives of public health actions

An overall objective of community diagnosis is to estimate the magnitude of the health problems and their determinants as well as to

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analyse trends and changing paradigms of these problems and determinants. Because the community consists of heterogeneous groups, the overall objective needs to be expanded to include many value-laden issues such as health needs and determinants, equity, responsiveness to expectation, efficiency, protection of individuals, and fairness. The results of community diagnosis can then be used as evidence for discussion among the stakeholders in the community, balancing the values of the various stakeholders in setting priorities and making decisions for resource allocation acceptable to the community. The priorities and decisions for control should take into account not only the current status of health but also the impact that controls may have on health of the future generation.

The priorities and decisions for control depend not only on the indicators used for the diagnosis but also on the expressed or unexpressed values of a health system. Recently, the World Health Organization (**WHO**) suggested some possible value-laden objectives of a health system. Indicators for these value-laden objectives are being developed for better measurements of how well a health system has achieved its objectives. The possible value-laden objectives of a health system include (a) improving average health status and reducing the burden of illnesses, (b) reducing health inequities, (c) responding to the legitimate expectations of individuals, (d) improving the efficiency of health system, and (e) protecting individuals and enhancing fairness (WHO 2000*a*).

Improving average health status and reducing the burden of illnesses

Improving average health status and reducing the burden of illnesses as measured by life expectancy, death rates by age groups, disease or morbidity rates, and the measurement of the burden of illness combining mortality and morbidity are important functions of public health professionals. Indicators for the measurement of risk factors to explain mortality and morbidity have also been developed.

There are changes occurring in the burden of illnesses resulting from population growth both in developing and developed countries. In addition, demographic and epidemiological transitions can influence trends of ill health in a nation or community. Lifestyle changes are associated with illnesses such as cardiovascular diseases and the epidemics of HIV infection and tobacco use. Owing to globalization, there are many things in the future that will change health and the burden of illnesses in a community. The current decline in communicable disease mortality in many areas of the world may reverse due to drug resistance and new pathogens. Therefore, the mortality and morbidity rates from various diseases will be the backbone of information needed for health planning.

Reducing health inequities

Equity is particularly important if planning involves allocation of resources for health from the government budget that comes mainly from taxation. The agencies implementing the plans can be the government or non-governmental organizations supported by the government. In contrast, the private health system does have more responsibility to satisfy individuals who pay for their services, rather than the responsibility for reducing inequities. Therefore, the reduction of health inequities as an indicator does not apply to the private as much as to the government system.

Health inequality is linked to the agenda of poverty and material deprivation. The WHO has developed a set of measures for health inequalities including social, household, and individual differences in health. For example, male life expectancy differs greatly among various regions of the United States. Health inequalities differ between various regions of the world with different stages of human development as exemplified by the health status in Mexico compared with that of the United States and Japan. The distribution of life expectancy at birth estimated from large numbers of small area studies showed that life expectancy is most equally distributed in Japan. In both Mexico and the United States, the distribution of life expectancy between areas was wider, indicating more inequity between population groups. The inequity is particularly significant for men (WHO 2000*a*) Measuring inequalities gives health a central theme in the development agenda.

In terms of investment in research, there is also a 10/90 disequilibrium between global health expenditures for research and the burden of illness (Commission on Health Research for Development 1990). This report found that less than 10 per cent of global health research funds were spent on 90 per cent of health problems in developing countries. Thus, information on these parameters will be needed to plan a more balanced allocation of resources according to needs.

Responding to the legitimate expectations of individuals

The legitimate expectations of individuals reflect an attempt to fulfil their right to health services because they are citizens of a country and community. Legitimate expectations do not include expectations based on self-interest at the expense of the public. Examples of legitimate expectations include the provision of emergency services and services with high public health values such as immunization, preventive and promotive services, and the treatment of infectious diseases.

One measure of the response to the legitimate expectations of individuals is satisfaction with services. Satisfaction has multiple dimensions including access, cost, and quality of care. There is a significant difference in the satisfaction with health systems between countries. Satisfaction with health services in the community can also be compared within regions in countries and between the public and private sectors.

Improving the efficiency of health system

The efficiency of a health system depends on the allocation of resources to services with high public health values (allocative efficiency) and the provision of technically efficient services (technical efficiency) including clinical services. Technical efficiency involves the use of cost-effective services and some form of competition and market mechanism, and therefore can apply readily to the private sector. Measures to improve the efficiency of a health system may be in conflict with measures to reduce inequities. Nevertheless, measures to reduce inequities using public resources must also be efficient. This gives rise to the notions of hierarchy of objectives in community diagnosis. It is difficult to prescribe the optimal mix between equity, efficiency, and satisfaction with services. The challenges are to use the available resources to best achieve health system goals agreed upon by the society.

There are variations in health-care expenditures with respect to the gross domestic product of countries. Thailand spends more on health as a percentage of gross domestic product than Malaysia but has a lower life expectancy and higher infant mortality than Malaysia. Theoretically, the private sector can enhance the efficiency of health care through the provision of good services at a competitive price. However, it is not known whether the changing proportion of the private sector correlates with efficiency (Newbrander 1997) because the public sectors of countries have monitored the pricing and quality of private services with differing levels of rigour. Some information for planning health care has to involve centralized efforts to monitor service standards and to protect the public. Information is needed to monitor financing, provide services at public and private facilities, and to enable the public to make appropriate choices.

Protecting individuals and enhancing fairness

Protecting individuals and enhancing fairness are two important goals of health. Citizens of a country have a right to a certain level of health regardless of whether they are rich or poor. Rights to health promotion services, disease prevention such as immunization, treatment of emergencies, and acute infections are some examples. Governments can involve the stakeholders to determine the level of health all citizens will have within the constraints of limited resources.

Each of the objectives can serve to indicate directions for the development of variables to measure the current health situation as well as to assess changes with time. A good variable has to be reliable, valid, sensitive to change, and credible to the stakeholders.

Although fulfilment of many of these objectives would lead to similar decisions, this may not be true for all cases. For example, coping with inequity by focusing on the health of the underprivileged groups to enhance social justice will require different decisions than improving the average health status of both the élites and the underprivileged groups of the society.

Without clear objectives of the health system, the demand for good information missing in the information system can be used as an excuse not to plan a programme. One important argument for not using information for planning is that information is not accurate and basing a decision on incomplete information can do more harm than good. Therefore, a clear objective will identify the minimum information needed to make decisions. A clear objective will help focus on the improvement of an information system to enhance its utility to meet the objective. A balance can then be struck to see whether a minimum level of useful information exists for the decision. In the case of inadequate information, efforts to collect additional information through a rapid survey or focus group discussions can fill an information gap in planning.

Components of information systems for planning health care

The major components of health care which will need systematic information for planning include information about (a) health situations and needs, (b) the availability of resources to deal with those needs including the various approaches to organizing and financing of the resources, (c) the organization and capacity to take those resources and convert them into services (that is, the performance of the system: efficacy, effectiveness, efficiency, quality, and decision analysis), (d) variation of use, and practice with their implication on equity to access and coverage, (e) the impact on health outcome, and (f) the consequences of health-care financing on politics, the economy, and society as well as on the welfare of the entire population.

The users and contributors of information for health planning can be policy analysts, health-care providers, epidemiologists, social scientists, and economists, among others. The gatherers and users of health information are often different people at different levels of the health-care system. For policy decisions, policy analysts will need information to facilitate policy recommendations. Those who provide health services and have the task of being accountable for the services they provide should also be involved in the development of an information system. The general areas outlined above differ among developed and developing countries, not with respect to the problems themselves but rather to the emphasis given to each of them.

The measurement of needs

With respect to the measurement of needs, it is important to understand current needs, trends, and types of services needed (promotive, preventive, curative, and rehabilitative), including both objective and subjective needs. The differentiation between need, demand, and utilization is also crucial (Box 1).

Health care need

- Current needs:
  - real need versus want
  - effective demand
  - use
  - prioritization

  Trends, for example in AIDS and related conditions, ageing, trade
- Types: promotive, preventive, treatment, rehabilitation
- Validity and objectives of data sources

Real needs are those that require appropriate fulfilment and they may be both felt or unfelt. Demand is generated by felt need, and needs and demands require effective provisions. Effective provisions represent the capacity of the health systems to satisfy the real needs within the technological and other resources of the society. Use is not the same as effective provision although it is easier to measure. This is fundamental to the author's approach to the problem. Utilization reflects the perception of health need, individual reaction to symptoms of ill health, resources that the individual must invest to acquire the service, ability of the facilities to provide the service, and benefits that the providers of service expect to generate. It does not tell us what volume of service is optimal. It is important to know what volume of health services should be consumed, not just how they are actually consumed, to decide upon the likely benefit of a particular investment. Without appropriate data, decision-makers might focus on ineffective provisions without meeting needs. A needs-based system is difficult to establish but is essential to allow people to be more responsible for what they do in terms of their own health.

Current needs only represent part of the picture in planning of health services. The health system has to be more aggressively involved in the trends of diseases such as HIV infection and AIDS, with the emphasis on finding more effective means of delivering educational and other preventive programmes which highlight high-risk activities. With the new industrialized trends of developing countries, occupational diseases will be increasingly important. The current trend of population demographics may require a greater emphasis on the needs of the elderly who may claim a greater share of the funds provided by the various health-care schemes.

In the analysis of the types of effective provision, it is necessary to understand the need to establish a balance between preventive and promotive strategies versus treatment and rehabilitation.

It is important to develop an information system in both developed and developing countries to measure incidence and prevalence of objective and subjective needs as well as the use of specific types of health services to fulfil those needs.

Fulfilment of non-health needs can also lead to health improvement. For example, the role of women in determining the health and life prospects of their children is crucial. It is therefore important to find ways to assure women's health through nutrition, education, gender equality, and health practices. How can social and other non-health interventions interrupt the vicious circle of poverty, health, and the lack of social development? This area will remain important for future research.

Information about the organization and financing of a health service

The organizational arrangements for health-care financing and delivery are also important components of an information system to ensure universal coverage and equity of access.

The organization

Ideally, the structure that should be involved in a health service system are the public health facilities, the private sector, other communities, the workplace, and families and individuals. Major activity is currently occurring in the public sector, particularly the ministries of public health. Information about other components of a health system must also be sought. So-called 'unqualified' personnel or 'minimally trained community-based health-care workers' for workplace communities, family support, and self-care, can be trained to become resources for health-care currently provided by higher level professionals (Box 2).

Appropriate personnel requirement is also an important issue. It is important to identify the appropriate proportion, type, qualifications, and distribution of personnel required to support the health-care financing schemes. How much should currently 'unqualified' personnel be trained to support the system? What is the role of informal care and self-care?

Privatization will not facilitate universal access to health care. It will, however, affect the financing and payment system. More active work and more cross-cultural comparisons are needed in this respect, particularly where more privatization is developing in many countries, including those in Eastern Europe. Information will be needed to monitor the extent to which these trends can alter the basic relationship between patients and health-care professionals resulting in an impact on health and the quality of services as well as on the livelihood of people.

The structure and the organization of a health system

- Structures
  - public: ministries of public health, local government offices
  - private sector
  - workplace
  - home
- Personnel requirement
  - specialist/generalists
  - nurses
  - currently 'unqualified
  - informal care
  - self-care
- Population being served
  - based on workplace
  - based on residence
  - other
- Co-ordination

Finally, although some resources are needed for mounting and co-ordinating an information system, it is important that the proportion of resources allocated to co-ordination not be so substantial as to jeopardize other activities. However, the information base to do such analyses may not exist and therefore may need to be constructed.

Information on financing

The framework for analysis of the financing of health services is depicted in Box 3.

The factors affecting the various sources of health-care financing mechanisms vary between countries. In this complex situation, it is important to resolve questions over who pays, who receives payment,

Financing of health systems

- Who pays?
  - insurance scheme
  - employers
  - government (welfare)
- Pay for how much?
  - total
  - percentage of gross national product
  - trends
- Pay for what?
  - types of services
  - levels of services
  - specific activities
- Pay to whom?
- Basis of payment
  - fees for services
  - capitation
  - co-payment

what is being paid for, who eventually benefits, and how to ensure haring and pooling of the risk of ill health to attain a certain degree of equity.

In order to monitor and determine the appropriate emphasis of the programme, the total amount of payment under the various health-care financing schemes, its trends, the relative proportions of the various schemes, and the percentage of gross national product used for each scheme need to be assessed.

The relative contribution of the various health-care financing schemes for preventive, promotive, curative, and rehabilitative care is also important to guide the setting and monitoring of the appropriate proportion of these various services. Related to these issues is the relative contribution of health-care financing schemes to the various evels of services: primary health care, primary medical care, secondary medical care, and tertiary medical care.

The basis for payment under the health-care financing schemes will be important for determining the rate and the appropriateness of utilization of services.

The alternative models

Each of the alternative models has their strengths and weaknesses. Each of them may be considered appropriate for meeting the needs of health services, depending on the situation. However, there are some common targets of all models of financing. These are equity, efficiency, stability, sustainability, administrative feasibility, health impact, as well as impacts on the socio-economic and political systems of a society. As there are numerous ways of organizing resources, alternative models have to be developed, tested, and compared.

Resource allocation and utilization of services

In allocating resources, it is important to define practice variations and use variations (including issues of acquisition, diffusion, use, and control of access to health technology). Practice variations result from the decisions of providers while use variations are the consequences of consumer behaviour (Box 4).

Variations of service provision can depend on which scheme is used to pay health-care providers (for example, fee-for-service scheme or capitation). The rate of certain procedures might be inappropriately increased if the fee-for-service scheme is adapted to the point that the financing system cannot be sustained because of a greater emphasis on treatment than prevention. In Australia, for example, the rates of obstetric intervention in private patients have been higher than for non-private patients (Roberts *et al.* 2000). The views of specialists differ on whether or not to perform cancer genetic testing and carry out prophylactic hysterectomies when patients prove positive (Matloff *et al.* 2000). If coverage refers to the degree to which effective provision is given to those who have real need, it is not always true that more services lead to more coverage. Conversely, hospitals may avoid providing standard services if they are costly, or may not join the health-care financing schemes programme if a capitation scheme is in place. If the hospitals fail to provide high-cost but already proven efficacious and standard care because the services are too expensive, certain ethical issues may arise. A good information system should be able to identify these issues.

On the one hand, people who are covered by private health-care financing schemes might overutilize health resources because they perceive that it is their right to obtain services. On the other hand, people might underutilize services under certain health-care financing schemes because they may perceive that they are receiving inferior care.

Services that are overutilized might lead to inequitable access to services of other low-income groups. If coverage refers to the degree to which effective provisions are given to those who have real needs for services, it is not always true that more services lead to more coverage.

An information system has to associate appropriate population denominators with the numerators, particularly where the people in a catchment area can use many different financing schemes for the same health condition. In this general area, the topics of national relevance are those of access, equity, and coverage as they relate to factors including income, age, sex, and occupation.

Box 4 Resource allocation and use

- Practice variations among providers
    - special 'track'
    - over or under prescription of technologies
    - provider satisfaction
- Variations among users
    - underuse
    - overuse
    - user satisfaction
- Access, equity, coverage
    - among social insurance clients
    - among clients of other insurance schemes
- Allocative efficiency

Health system performance

Measures of health system performance are becoming increasingly important as the financial demands of health care have put increasing pressures on national economies (Box 5). Although some of the most exciting work is taking place in developed countries, much is happening in developing countries as well. The field of epidemiology has made a great contribution to public health and health-care research. Epidemiology, political mapping, decision analysis, health system economics, and evidence-based practice have helped revolutionize the practices of medicine and public health. Epidemiology, however, supplements but does not replace basic sciences. The major problem for measuring health system performance is the availability of data. Information systems therefore need to be strengthened to be able to track the performance of public health interventions.

Health system performance

- Efficacy
- Effectiveness
- Operative efficiency
- Clinical decision analysis
- Outcome and epidemiology of medical care

It is not only the expensive technology of public health and clinical medicine that is subjected to the analysis of health system performance, but the very inexpensive and moderately priced everyday practices also need to be evaluated. Information systems are needed to track preventive activity such as immunization programmes, screening for chronic diseases, availability of early treatments, and risk factor counselling.

Decision-makers and health providers must have the skill to evaluate their own decisions and practices, and to be more accountable in their decisions. The design of a good information system should empower these practitioners to ask questions about public health interventions. Such an empowerment should lead not only to heightened expectation and demand for quality and accessibility at reasonable cost, but also create an environment in which the information system for public health decisions has reason to grow. A more systematic approach to information systems is needed. Information and technology gaps between developed and developing countries in this area need to be narrowed. Only then can the strategies to define an optimal health care for all be achieved.

It is important to make providers accountable for their services. This requires information support. Information should not be an exercise that can only be performed in university faculties. The task of the specialists in information systems is to make the methods as accessible as possible. The emphasis in much of information system research in the decade ahead will shift from a traditional study of inputs (for example, personnel, facilities, procedures, appliances, drugs, and so on) to the evaluation of health-care output and performances.

Information on health outcomes

Outcomes of care are usually measured using mortality and morbidity rates. While these are important indicators, they do not take into account the impact of illnesses and death on the individuals and their families as well as on the economic and social well being of the society. The death of a child in a family might have very different consequences from the death of the mother; in many societies, such as those in Africa, the death of a mother might lead to the death of other children and disintegration of the whole family. Deaths of young adults have more impact on the production of the society than deaths of the incapacitated elderly. Therefore the definition of outcome of care needs to take into consideration the lifetime consequences of illnesses, impact of illnesses and death on other family members, the well being of society, and productivity (Box 6).

Defining outcomes of care

An exciting feature of health-care analysis is the ability to access information to measure outcome, for example measures of functional health status and well being. This field has previously not received enough attention. More people are doing research on what it means have certain physical limitations. Functional health status is complex and the study of it can provide important information. More research on quantitative measures of well being, including the quality-adjusted life year, is needed. It is hoped that methods will be developed measure these not only in individuals but also in communities.

Health outcomes

- Definition
  functional status
  well being
- Health status measures
  single index from aggregates
  utilities
  preferences

Health status measurement

Far more attention needs to be spent than previously on health status measurements including (a) the aggregation of various health indicators into single indices, (b) deriving the utilities and preferences for various health states, (c) the measure of possible health states across the various health conditions, (d) the measure of health status in children and the elderly (most of the current measures of health status apply to adults), and (e) evaluation of clinical treatments and changes in health-care delivery.

Information of development policies affecting health

A public health system is very different from a health-care system. The public health system needs to provide information on development policies that can affect health. These include policies on the macro-economy, agriculture, energy, and housing (Box 7).

Development policies affecting health

- Macroeconomic
- Agriculture
- Industrial
- Energy
- Housing

Planning a public health system requires information on the ecology and environment, schools, workforce, social care, housing, and alternative energy sources in addition to information about the performance and integration of various levels of health care as described above. Public expenditures and subsidies to stimulate macroeconomic growth may be done at the expense of support for essential drugs, employment programmes for the poor, and so on. Agricultural development can exploit land use, which can change biodiversity and thereby promote emerging diseases and resistant strains of micro-organisms. Agricultural development can also affect the short- and long-term health of migrants and local people through the use of pesticides and acute poisoning. Improvement in irrigation systems can change the lifecycle of vectors and complicate water-borne diseases. An information system to monitor work safety and pollution should go along with the development of industrial policy. To promote safe energy, information is needed on the sources of energy (for example, the effect of hydropower on deforestation and health), consumption of energy for cooking, household use, transport, and pollution standards by industries, and pricing policy related to the use of safe energy. Information on housing policy can cover issues such as health problems in slums and government housing, safety of ise buildings, availability of public services, cost of rent ired to cost of food, and hygiene standards.

general framework for community gnosis

ing the community

irst task to define health and disease burden in a given unity is to define the target community. This can be a country, ice, district, or state, but might be a more defined geographical , such as an urban inner city, or a socially defined group, such as communities, women in the reproductive age range, pregnant ers, infants, young adults, or the elderly. The target population d be broad enough to cover all subgroups relevant for the ment of health situations outlined by the objectives such as of access to care. If the target population is not well defined at utset, there could be a tendency for the subgroups from whom re easily obtained to be over-represented. For example, disease ns from hospital data under-represent those who have limited to hospitals.

lth indicators

lefinition of indicators is a pre-requisite for the development of fective information system in community diagnosis. Indicators to reflect the kind of decisions which will be needed to estimate urden of illness and the strategies for control.

tive and negative health

ly, health indicators should reflect both the positive and negative cts of health status. The new definition of health by the WHO ides the physical, mental, social, and spiritual aspects of health. y attempts have been made to develop measures of quality of life proxy of positive health (e.g. the WHO quality of life instrument nymous 1995)). Positive health measures have not been widely in developing countries partly due to cultural influence on the ctations of people. Poor people in developing countries are more y to accept the limitation and be satisfied with poorer health than counterparts in wealthier countries.

ood health tends to be unnoticed until obvious symptoms from ases have occurred. The concept of the 'burden of risk' can be ght to the attention of public health officers if there is a method to lify the course of presymptomatic illness. Thus screening for ertension is an essential public health tool because of the sibility of modifying the course of hypertension and preventing ke. Screening for diseases can be a part of community diagnosis if a -effective intervention is available for modifying the course of the ase once identified at screening.

n most developing countries, health information systems are cipally oriented towards negative aspects of health because of the tive ease of their measurement. People will seek help from the lth-care system when they become ill. The main health indicators expressed in terms of crude age-adjusted or age-specific mortality s (such as infant mortality rates, mortality for children under 5, or ternal mortality rates), disease-specific morbidity rates, and life ectancy at birth. Mainly because diseases have different natural tories and impacts, other indicators have been developed. Examples include potential years of life lost, quality-adjusted life years gained, disability-adjusted life years, healthy life years lost, and disabilities and quality of life index (Murray and Lopez 1996; Hyder and Morrow 1998). Debate has continued over the assumptions that these measures make, such as the relative values of time lived at different ages and the application of discounting rates over time. Many maintain that the implications of age weighting and discounting are unacceptable. Those who disagree with allotting relative values to time find it difficult to trade healthy years by giving less weight to future generations in favour of the present generation. Those who agree with age weighting and discounting feel that such methods of weighting and discounting are consistent with the necessary allocation of resources, for reasons of cost-effectiveness, and with avoidance of giving less value to childhood death. In view of this debate, it is important for developing countries to focus on the development of information that can measure mortality and morbidity rates with some degree of certainty. These standard indicators can later be transformed to calculate other newer indicators after agreement has been reached over the various methods.

Sources of information and the methods that can be used for community diagnosis

Information for community diagnosis can come from many sources (Box 8). Examples include routine reporting from health facilities, surveillance, screening, special surveys, contact tracing, vital registration, and a combination of several methods including using qualitative information to define variables and continued surveys of the nature and extent of the problems once the variables are defined.

The details of these approaches are addressed in the next section.

Sources of information and methods for community diagnosis

- Routine reporting from health facilities
- Surveillance including active, passive, and sentinel surveillance
- Screening
- Special surveys
- Rapid surveys
- Contact tracing
- Vital registration
- A combination of several methods

Trend analysis

Information can be gathered and analysed for changes over time. Trends in the health status of a nation and a community involve demographic transition, urbanization, education expansion, changing status of women, economic transformation, politics, technological innovation, and global integration including the international transfer of risk (for example, pollution and global epidemics), trade liberalization, and shared learning leading to accelerated development and interdependencies. Assessing trends can be done in terms of health situations, burden of illnesses, and risk behaviours (Ungchusak *et al.* 1996; Kitsiripornchai *et al.* 1998; Mills *et al.* 1998), and can be used to assess the effectiveness of an intervention (Muller *et al.* 1995).

Characteristics of community diagnosis

The basis of community diagnosis is to learn whether the community has achieved the objectives proposed by the policy and programmes in use. There are several desirable characteristics for community diagnosis:

- ability to address important problems amenable to practical control
- ability to identify most of the target health events
- adequacy in reflecting changes in distribution of events over time, place, and person
- having a clearly defined population, data collection, data flow, analysis, interpretation, and feedback
- orientation towards appropriate action
- being participatory, uncomplicated, sensitive, timely, and inexpensive.

Sources of information and methods for community diagnosis

Routine reporting system

In developing countries, death registrations are incomplete and disease notification is unreliable. The information most readily available is from health facilities such as clinics and hospitals. The number or proportions of patients who seek care are commonly presented to indicate the burden of illness. This method has particular appeal because of its simplicity and low cost. Routine reporting from hospitals and health facilities can give useful information on the health status and burden of illness of a target catchment area to plan and monitor health services if survey information is not available or gives incomplete information. For example, the burden of illnesses and priority ranking of disease in Ghana has been based mainly on the routine information obtained from hospital facilities (Ghana Health Assessment Project Team 1981).

Information from routine reporting of the HIV seroprevalence among heroin users derived from different regions of a country can shed light on the rate of HIV infection at an early stage of infection (Table 1).

Information from the routine report of a key facility for the treatment of drug-dependent patients of Thanyarak Hospital (Thailand) indicated that the spread of HIV seroprevalence among drug users occurred first in the central region of Thailand including Bangkok, followed by the north, the south, and the northeast.

Routine reporting from health facilities has frequently been used to identify disease trends for health problems associated with stigmatization such as drug dependence and HIV/AIDS as shown in Fig. 1.

When the information obtained from male addicts in one facility (that is, among new cases, revisited cases, and non-heroin addicts) was analysed, the seroprevalence among the new cases showed a declining trend (Fig. 2). Conversely, the seroprevalence rates among the old cases and the non-heroin addicts (not injecting) were stable. These trends suggested a possible change in the behaviour of the new cases of heroin injectors, which may have been due to a successful campaign by the authorities.

Similarly, the routine reporting of the hill tribes people seeking treatment for drug dependence at the key Northern Drug Dependence Treatment Center (Thailand) showed a constant increase in the proportion of heroin users among this traditional people who used to smoke opium over the years as shown in Fig. 3. There was a rising trend of the percentage of injecting drug users among the hill tribespeople, indicating a shift in drug use pattern from opium smoking to heroin use first by smoking and later via injection. The higher percentage of injecting drug users compared with the percentage of heroin users since 1992 suggested that the hill tribespeople also injected other drugs.

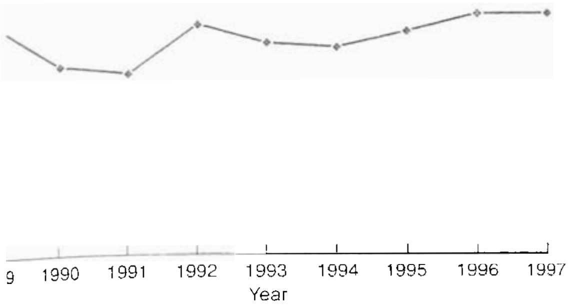
The increase in the percentage of heroin users seeking treatment has corresponded with an increase in HIV-positive prevalence among the hill tribe population up to 1994 as shown in Table 2. Despite the limitations discussed below, routine reporting can generate useful information for planning if analysed and interpreted with care.

Limitation of routine reporting: measuring utilization of services versus health needs

In developing countries, events reported depend on the use of facilities. This gives rise to a distorted picture of health problems in the community since many who need services do not have access to health facilities due to geographical, financial, cultural, and other barriers, or when the coverage of the population by such services is incomplete. It has been demonstrated that between one-third and two-thirds of diabetic and hypertensive people in a community either did not know that they had the diseases or did not seek hospital care (Wadsworth *et*

Table 1 Provinces with HIV seropositive drug users classified by region (Thanyarak Hospital: December 1987 to December 1988)

	Number of provinces with HIV+ addicts and total number of HIV+ addicts per region			
	Central region	**Northern region**	**Northeastern region**	**Southern region**
Oct–Dec 1987	8	1	–	–
Jan–Mar 1988	15	8	–	1
Apr–Jun 1988	21	10	4	2
Jul–Sep 1988	23	11	7	6
Oct–Dec 1988	25	13	8	8
HIV+ cases (*n*)	603	103	11	32



ercentage of HIV-positive people among injecting drug users d from routine reporting data from drug dependence treatment at the Thanyarak Hospital, July 1989 to December 1997. (Data Poshyachinda 1997, personal communication.)

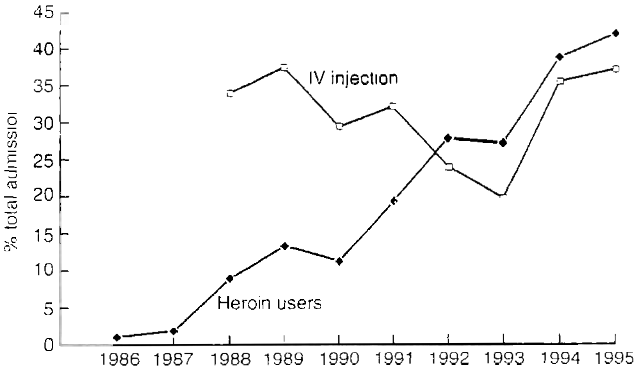


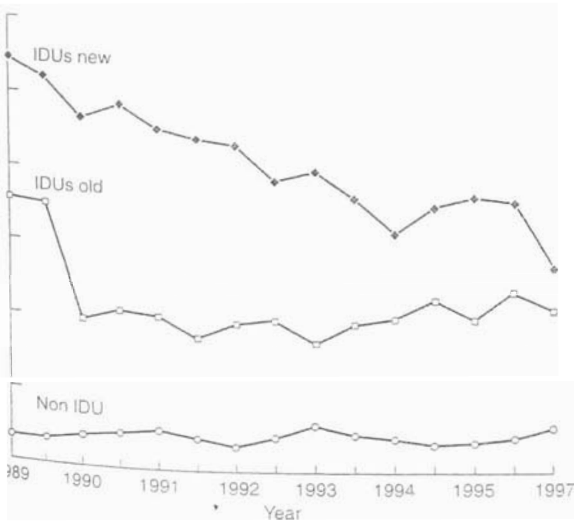
Fig. 3 The percentage of heroin users and the percentage of injecting drug users among the hill tribespeople seeking care at the Northern Drug Dependence Treatment Centre (Thailand): 1986 to 1995. (Data from V. Poshyachinda 1997, personal communication.)

1; Sitthi-Amorn *et al.* 1989). In addition, because the services ed by the various levels of health care are uncoordinated due to eferral systems, one patient could seek care from several places erefore be counted many times, leading to an overestimate of rden of illnesses. Many factors can affect why patients use or do e services including the reputation of health facilities, difficulty ss to facilities, and client perception of the seriousness of their Thus, in using routine reporting, it must be remembered that formation available is not perfect and that the information l may not be obtainable. A review of the information system e done periodically to ensure that the information system es the information desired for planners to meet the defined ves of the health system.

tine reporting is most useful in capturing most cases if a ion produces severe symptoms, and if the natural history of the ion is long enough to permit seeking treatment. Thus, a n of routine hospital records can be used to produce cancer registries capturing most cancer cases in a community because most patients with cancer will have severe enough symptoms before death to seek treatment from health facilities. Conversely, a large proportion of myocardial infarction patients will die outside health facilities and therefore the records from health facilities alone will underestimate the true magnitude of the burden of illness from this condition. Likewise, reports from health facilities will underestimate cases of diarrhoea since many people only have mild symptoms and will not seek care.

The methods for detection of specific diseases between health facilities can create biased estimates in a routine reporting system. For example, differences in the incidence, prevalence, and mortality from coronary heart disease are observed between and within countries. In addition to the differing levels of risk factors between communities, these differences are also believed to be related to the different application of technology in health-care facilities. Medical care for acute myocardial infarction has changed significantly in the past decades, with the development of new methods for diagnosis and treatment. Although widely known, these technologies are not consistently applied for reasons of availability and cost, as well as local medical cultures and traditions (Luepker and Herlitz 1999).

To cope with the difference between utilization of major health facilities and the actual health need, an extended network of health



Percentage of HIV-positive people among new injecting drug users, ission cases of injecting drug users, and non-injecting drug users, Thanyarak Hospital, July 1989 to December 1997. (Data from yachinda 1997, personal communication.)

Table 2 HIV seropositive prevalence among hill tribe heroin and opium users (Northern Drug Dependence Treatment Centre, 1992 to 1995)

	HIV seroprevalence[a] (%)			
	1992	**1993**	**1994**	**1995**
Heroin				
Smoking	4.6 (388)	4.4 (387)	14.1 (199)	8.1 (346)
Injecting	20.6 (92)	24.3 (74)	55.3 (99)	37.3 (204)
Opium users				
Smoking	2.3 (1274)	3.2 (951)	7.1 (451)	2.5 (710)
Injecting	–	–	–	5.9 (51)

[a] Number in sample given in parentheses

facilities may be involved in community assessment of the nature and extent of a particular disease. Primary care doctors can play a major role in the identification of health problems, and the entry of patients into the health-care system. Patients with diseases such as acute low back pain usually recover within a short period of time, and in most cases major diagnostic studies are not required. The chances of these patients having significant pathology necessitating surgical or other forms of sophisticated intervention may be less than 1 per cent. Therefore, the patients may not seek treatment from major health centres. The involvement of primary health-care doctors can thus contribute to a better estimate of the burden of this illness (Rosomoff and Rosomoff 1999).

Outreach based on the samples defined in a health facility can also be used to determine the possible source of community infections. For example, in determining whether secondary cases of tuberculosis resulted from those dying in health facilities, a retrospective review of all cases of tuberculosis reported within a specified period was combined with a prospective evaluation of the molecular characteristics of new tuberculosis cases. The study revealed that cases of tuberculosis diagnosed after death did not appear to be significant sources of tuberculosis in the community (DeRiemer *et al.* 1999).

Efforts should be made to improve the quality of routine systems and to make use of innovative analyses of routine information because of the simplicity and potential usefulness of routine reporting systems (Kitayaporn *et al.* 1994, 1996*a*,*b*; Mastro and Kitayaporn 1998). Unfortunately, in many countries, significant progress in this direction is not expected. Therefore it is important to supplement routine reporting systems with other methods of estimating the burden of illnesses including screening, surveillance, special surveys, rapid surveys, and contact tracing.

Surveillance

Surveillance is considered a tool for community diagnosis of diseases which have the potential to become an epidemic, thus affecting many people in the community or internationally. Surveillance has been traditionally applied to the control of infectious diseases. The new paradigms of public health require that surveillance include the detection of toxins, hazardous chemicals, and genetically modified products. Of particular importance are the diseases transmitted from animals to humans, such as the outbreak of chicken influenza virus in Hong Kong and nipah virus in Malaysia. The influenza strains transmitted from birds to humans can cause widespread infection. Thus, surveillance has to be supplemented with strategies to detect the transmission of species-specific infections, which occur between humans and animals.

Depending on the nature of the diseases, surveillance can be active, passive, or targeted periodically towards special groups seeking treatment from sentinel sites. To be effective, a surveillance system must be integrated with other measures to take control of the spread of diseases under surveillance. The role of surveillance is:

- to monitor' secular and long-term trends of diseases and public health issues
- to provide early warning for disease outbreaks
- to evaluate prevention and control programmes
- to monitor the effect of climate changes

Effective surveillance of infectious disease has to be international in scope to monitor and share information on such diseases as Ebola, dengue, and plague.

Three types of surveillance can be used to diagnose the nature and extent of a health problem in a community: active surveillance, passive surveillance, and sentinel surveillance. Each of these types has its own sensitivity of detection of a health problem and has different requirements. Most countries have only passive surveillance systems because maintaining an active system is very costly and often requires some sophisticated laboratory support. Considerable infrastructure and human resources are required to maintain a sentinel surveillance system.

Traditionally, the main use of surveillance systems has been to monitor epidemics of infectious diseases. Recently, surveillance has been increasingly used to detect toxins, such as pesticides in human milk and lead in the blood of children, as well as deficiencies of trace elements such as vitamin A, zinc, folic acid, and iodine in adults.

The world has recently seen increases in diseases and epidemics in others that were once controlled. Since the middle of the twentieth century, antibiotics combined with improved sanitation, housing, nutrition, and vaccines have led to a dramatic drop in many infectious diseases that once killed millions (WHO 2000*b*). By the early 1960s, infectious diseases began to be controlled and these campaigns were so successful that many predicted their potential eradication. This created complacency among public health officials, policy-makers, and the public, which led to many policy and technical problems such as a decline in political and economic support for infectious disease programmes. This has led to the development of drug-resistant microbes, resistant vector strains, and the re-emergence of diseases once under control. There has been a decay of infrastructures and a shortage of trained personnel to deal with major infection control. One of the most important problems has resulted from the neglect of prevention in favour of using the 'magic bullet' or the 'high-technology/quick-fix' solution.

In addition to the relative neglect of comprehensive infectious disease control, other factors also contributed to the re-emergence of infection. These factors include an unprecedented world population growth since the Second World War, unplanned urbanization, uncontrolled deforestation, and agricultural practices such as reclaiming land which bring people closer to infective agents to which they have not previously been exposed. Changes in the pattern of biodiversity and environment may promote the transmission of emerging infections from animals to humans (zoonosis) such as Hong Kong chicken influenza virus and the recent outbreak of nipah virus in pigs. The emergence of new infectious diseases can also result from changes in irrigation systems, sexual practices, organic transplants (resulting in immunocompromised host), consumer goods (tin and plastic containers as breeding sites for mosquitoes), vehicles (tyres as breeding sites for mosquitoes and other vectors), commerce, and travel. These changes in practices and lifestyles are ideal mechanisms of constantly redistributing pathogens around the world.

Other factors include genetic changes in aetiological agents such as influenza (change in strains), development of antibiotic-resistant microbes and insecticide-resistant vectors, and an increase in vector-borne disease in general (through various hosts). These pos arios will need more research before scientists can fully under- d the influence of genetic factors of micro-organisms on trans- ion potential.

:limate changes are imputed to help spread infectious disease but ıg evidence to support this notion has yet to be found. The El ɔ phenomenon has been imputed to have caused the spread of gue in Indonesia and Thailand. Since dengue epidemics can be ed by many factors, the relative contribution of climate to the ad of diseases still needs to be clarified. Thus research is needed to whether the degree of efforts to strengthen surveillance systems is led in areas where more severe climate changes occur.

surveillance can give information for policy-makers to act on ch will help to reverse the trend of infectious diseases. Regulations controls should be targeted at population growth, urbanization, deforestation. Stronger emphasis must be placed on strengthen- public health policy and public health rules that have been egulated to give more rights to individuals but consequently, might m the public at large. A better balance between individual rights the good of the community must be established.

The public health infrastructure (including surveillance systems) many countries, particularly in the developing world, must be proved, including personnel and laboratory facilities to deal with major infectious diseases.

A key strategy is to rethink disease prevention from the public lth standpoint, emphasizing disease prevention that includes such itegies as general hygiene, vaccines, vector control, public outreach, l education.

Surveillance systems for effective infectious disease prevention ist provide information to promote:

:ffective emergency responses to outbreaks of disease

public and professional outreach to communicate important nformation effectively to key stakeholders such as the public, doctors, and government officials

effective community-based preventive strategies.

tive surveillance: a case study from India

igue in India is a useful example to highlight the need for ernational co-operation and surveillance. In the first 25 years of the entieth century, India lost about 12 million people to plague. The vernment launched an effective control programme, and in the 50s plague was mostly brought under control. In 1959, plague had en eliminated from India, and in 1966, India was declared plague e. Subsequently, very little effort related to the control of plague was rried out. There was no laboratory doing diagnostic work for plague. August 1994, an outbreak of pneumonic plague began in aharashtra and moved into the city of Surat by September. The rveillance system did not pick it up. No one knew about it, not even e WHO. People started dying of pneumonic types of haemorrhagic seases in Surat, an industrialized city of several million people. Some octors consulted their old books and realized that it could be neumonic plague. They sent samples to the laboratory for diagnosis, ut the laboratory could not diagnose it. This created confusion, ncertainties, and a lack of confidence among medical communities. eople panicked and 500 000 people fled the city of Surat. The WHO ontacted the United States Centers for Disease Control (CDC) for ssistance in identifying the microbes because it had the only nctional plague diagnostic laboratory in the world. The CDC sent references and diagnostic kits to 15 countries in Southeast Asia and Europe. The WHO and the CDC were working blind and had to assume the worst. People from Surat fled to Madras, Bombay, and other cities worldwide, spreading the problem. There were reports about the spread in New Delhi and Pakistan, and the CDC worked with the WHO to intensify surveillance. Fortunately, rumours about the spread to other countries worldwide proved to be a false alarm and there were no cases identified from countries outside India. In retrospect, it was discovered that there was an outbreak of plague in Maharashtra and a few cases in Surat. There was no transmission to Bombay, New Delhi, Madras, and Calcutta. The lack of laboratory diagnosis capability had caused an epidemic of panic. There was a loss of 2 billion American dollars from the Indian economy and probably several billion dollars from the global economy. What should have been a focal public health event turned into a worldwide emergency. The WHO is not a policing organization and its actions are limited if countries do not want to co-operate.

The goals of active surveillance include:

- to detect without delay the introduction of change in incidence of a specific disease agent: active surveillance has to be disease specific although there are some exceptions
- to alert pubic health officials early about the epidemic—an early warning system (the emphasis is on the pre-epidemic period as opposed to the epidemic period)
- to assess the extent of the risk of transmission of a particular disease
- to estimate and monitor the effectiveness of control activities.

Active surveillance usually has to be laboratory based. The case definitions of an active system can vary. Case definitions can be non-specific in the pre-epidemic period but become more specific during the epidemic as the incidence increases. There must be standardized sample collection and reporting. The surveillance tool must be convenient and easily transportable (Frerichs *et al.* 1994; Cassol *et al.* 1996*a*,*b*).

When a clear disease definition is not available, syndromes can be used to cover multiple diseases. For example, although the basic diagnosis of dengue has to be laboratory based, a syndromic approach may also be used to increase case detection. The syndromic approach for dengue consists of three surveillance systems: clinic doctors, fever alert, and sentinel hospitals. When a syndromic approach is used, the case definition is very non-specific but should later be supplemented with more definite diagnostic techniques. In the case of dengue, the clinics and the hospital will be asked to submit to the laboratory information on a quarter of their viral syndromes every week. Fever alert allows blood to be taken for laboratory confirmation within 24 hours. Hospital deaths of all viral syndromes should similarly be laboratory confirmed and ideally autopsied (difficult in many countries). Individually, none of the three approaches is sensitive but collectively they become so. Clearly, the laboratory is critical to this type of effort.

The laboratory must be able to (a) conduct routine surveillance for priority diseases important in the area, (b) focus on epidemic transmissions of priority diseases, and (c) recognize new diseases, natural disasters, imported diseases, and bioterrorism.

At a minimum the laboratory should be able to conduct surveillance on priority diseases. If it is not capable of detecting the broad spectrum of new and other infections there must be some reference laboratory in the region such as a WHO reference laboratory where samples can be sent for identification and confirmation. Ideally, every country should have a national laboratory with satellite laboratories at the district and local levels. However, this can be beyond the means of poor countries. A more efficient way of sharing existing resources is to map out existing laboratory facilities in a region, co-ordinate sharing and standardization among them, and develop new facilities, which might be needed in the region. WHO reference laboratories should be capable of a wide array of diagnostic procedures. The WHO can also link up with other sophisticated laboratories such as the CDC in the United States.

Every national laboratory should have some well-trained personnel, enough facilities, equipment, and basic microbiology capacity. State-of-the-art technology such as the polymerase chain reaction assay is important but not as important as basic microbiology, which has frequently been ignored. The capacity to perform polymerase chain reactions at the expense of basic microbiology is a mistake because sophisticated equipment inappropriately used can create data that are misleading.

A mechanism should be in place to ensure quality assurance so that people have confidence in laboratory results.

Once an infection has been identified, the standard public health measures must be actively applied such as the identification of individuals, implementation of quarantine, implementation of sanitary regulations, the sacrifice of infectious sources such as animals, and measures to heighten precautions by individuals at risk. With acute emerging virus infections, there might not be time to develop vaccines and to find a treatment. In such cases, public health precautions will be the key coping measures. With bacterial infections, available antibiotics can be resorted to, some of which may be helpful.

Another example to highlight the importance of the laboratory is the concern for yellow fever. Yellow fever is a time bomb. An increase of yellow fever has occurred in Europe and the United States. This means that it can also be taken to Asia, and might remain there undetected because of insufficient laboratory capability. In the 1930s, there were major epidemics of yellow fever in Latin America. In 1947, the Pan American Health Organization implemented an *Aëdes aegypti* eradication programme to control the epidemics of yellow fever and dengue. By 1970, they had eradicated cases in much of Central and South America but they then abandoned the programme. *Aëdes aegypti* began to reinvade tropical America. There is the highest risk in 50 years for the occurrence of yellow fever in urban areas. If urban yellow fever begins to occur in Latin America with 300 million people, it will spread to other urban areas, particularly those with populations of over 1 million. This may also happen in Asia owing to ease of transport and travel. When this happens, the medical and public health communities might impute the illness to dengue, malaria, or leptospirosis. Therefore, the laboratory must be able to distinguish yellow fever from other diseases so health professional can react quickly and appropriately.

Passive surveillance

Passive surveillance is most useful for monitoring long-term secular trends but is relatively insensitive to tracking epidemics. Most countries have a passive surveillance system. The key components of a passive surveillance system include the use of standardized case definitions and a standardized reporting system.

Passive surveillance relies on doctors and health officials to report diseases and therefore is very insensitive for predicting epidemics. Constant communications, reference, and referral, together with political and economic support, are all crucial components of both active and passive surveillance systems.

Effective emergency response: a necessary complementary measu surveillance An effective emergency response is an important element necessary for the effective prevention of the spread of infectious diseases. Good co-ordination between epidemiologist, laboratory personnel, and professionals in the field is critical. Effective control has to be disease specific. Knowledge about the dynamics of transmission is essential. Furthermore, there must be strong community involvement for sustainability and a real-time response and timely policy decisions. Even when a surveillance system has predictive capability, many policy-makers do not believe the surveillance data and, as a result, do not respond to the data quickly enough. Therefore, laboratory capability must be credible and understandable so that rapid decisions are made in real time rather than after the epidemic spreads or peaks.

Outreach: empowering the community to be integrated in surveillance diagnosis and control Outreach is an area where public health has failed. Despite the availability of health education materials by public health specialists for all kinds of diseases and health problems, people usually ignore them. Social scientists and medical anthropologists who know how to communicate with the community should be encouraged to play a greater role in developing health education messages. The use of the 'scatter-gun' approach, having one message for all recipients with diverse ethnosocial background, is unlikely to succeed. Education messages should be targeted at different groups, particularly the medical community (epidemiologists and doctors who must be well versed in diagnosis, treatment, and disease prevention), who use them to reach the public. The public must accept their own responsibility and not rely on the government to do everything. Government officials must make an honest assessment of what the epidemiologists have to say and must not have 'selective hearing', for example questioning epidemiological data to protect local tourism.

An integrated community-based approach must have common ownership and an emphasis on disease prevention. The approach must take advantage of all the updated technology and instruments available to cope with the epidemic and prevent disease. People must have a role in the programme and in setting the priorities of the programme. Government officials must not simply tell people how to do things. Without community ownership there is no sustainability. Policy decisions have to support a community-based approach.

Sentinel surveillance

A sentinel surveillance system can help to identify rapidly changing health problems in a country or community (Box 9).

Selecting sentinel sites

- Not necessarily representative sites
- Likely to identify problems
- High enough case load
- Staff capacity and willingness
- Data reliable
- High-quality diagnostic capabilities

good example is surveillance for HIV/AIDS to monitor the iveness of intervention programmes in Thailand.

sentinel surveillance, the main objective is not to achieve sentativeness of a health problem or an epidemic of the entire lation. Rather, the objective is to track an approximate pattern or of the situation on which to base interventions. Sentinel illance allows monitoring of trends in specific groups within the nunity. Thus in Thailand, monitoring the year of first use of n can provide an estimate of when the next heroin epidemic may . Sentinel surveillance has been able to monitor the pattern of nfection among the people engaging in high-risk activity such as addicts, commercial sex workers, those infected with sexually nitted diseases, expectant mothers, and military conscripts kesorn *et al.* 1998).

ie results of sentinel surveillance must be interpreted with care. ritical factor is the issue of population change among different les to estimate the magnitude of health problems. A prevalence of r cent of HIV-positive people among drug addicts may give the ssion that the situation of HIV spread has been stabilized. New of HIV-positive people among military recruits can give a better ate of the trend in HIV-related problems in a country or nunity. However, the interpretation may be invalid if the rate of nfection equals the rate among the addicts who disappeared from etection of the sentinel surveillance system either through tion or death.

ning

bjective of a screening programme is to detect health problems at ly stage and link the problems with services which are effective in fying the natural history of the diseases or to prevent cases with ic diseases such as HIV infection from spreading infection to nfected contacts.

ie target for screening can be the general public as well as those ed in high-risk activity. Genital chlamydial infection is a non sexually transmitted infection that is often asymptomatic, associated with long-term morbidity in many women. Early ion can be diagnosed reliably using non-invasive methods and d effectively with antibiotics. Screening for genital chlamydial ion in high-risk settings, such as genitourinary medicine and ion clinics, has already been documented (Stephenson 1998). ning in the wider community also needs to be evaluated since nydial infection is widely distributed among young sexually people who may have little contact with health services. Studies progress to assess the acceptability of different screening aches for both women and men in the community, and to are the performance of newer diagnostic techniques. The ffectiveness of community-based screening for reducing mor- needs to be evaluated empirically in randomized trials to rage a coherent, evidence-based screening policy (Stephenson

vestments in national screening programmes should be based on its to the people who are found to be positive who can then be intervention treatment or monitoring. Ideally, the evidence of benefits should be strong such as evidence from a randomized ol trial. In the United Kingdom, a national programme to screen orn infants for phenylketonuria was introduced in 1969, ved in 1981 by a similar programme for congenital hypothyroid- Decisions to start these national programmes were informed by evidence from observational studies. Subsequent national registers of diseases were used to measure the impact of the screening programmes. Differences and changes in infrastructure and standard instruments for screening within and between screening facilities over time can result in inconsistent policies and inequitable access to effective screening services, as well as to problems in the comparability of information. More recent developments in tandem mass spectrometry have made it technically possible to screen for several inborn errors of metabolism in a single analytical step. However, the availability of the instrument should not prompt decisions for screening. In fact, for each of these conditions, evidence is required that the benefits of screening outweigh the harm, ideally informed by evidence from randomized controlled trials. Setting a priority on what conditions should be formally evaluated can be an important challenge to the public health, clinical, and scientific communities (Dezateux 1998). Screening programmes have the potential to reduce the burden from mortality, morbidity, and disability, and to improve quality of life and livelihood, but they also have the potential to cause harm. A set of criteria will be needed to identify worthwhile screening programmes, develop strategies, and mount effective implementation that is agreed upon by stakeholders. A much more critical approach to screening is now being adopted. Efforts are being made to ensure that new programmes of proven benefits that are acceptable to the public, are effectively and equitably implemented in the community particularly if the resources from such a screening programme come from taxation. This issue will stimulate further discussion and debate among important stakeholders (Peckham and Dezateux 1998).

In developing an expensive screening programme, one criterion is to redefine the unacceptable by the stakeholders particularly the community. For example, the community might decide that it is unacceptable to have children infected with HIV. If so, couples will be encouraged to be screened and counselled for HIV infection if they decide to have a child. It is imperative to strengthen the community-based programme. Unless healthy populations and healthy communities decide to be involved, screening programmes will not be very effective. The communities must be encouraged to help providers and decision-makers help themselves.

Survey and special studies

The objective of a special survey is to gain insight into the nature and extent of a problem in a defined community. The problems to be surveyed may be suggested by information from routine reporting and the surveillance system. Surveys and special studies can answer a particular question relevant to a community when routine systems cannot yield adequate information for action. Members of the community can be involved in such a survey not only as collectors of data or joint explorers of local conditions but also as partners in interpreting the data and in determining systematically how to manage a problem. The community can also shed light on the cultural meaning attached to a disease or a condition (MacQueen *et al.* 1996; Van Landingham *et al.* 1997). An understanding of the survey results as seen from the standpoint of the people will enhance an understanding of the problem and improve the dissemination of the results of surveys to the community and thus empower the community groups. Primary health care workers can be the most important group to engage in the dissemination of information to the individuals. In the Philippines, health-care workers learn to identify the mosquitoes responsible for the spread of malaria and help conduct and read blood smears.

One example of a survey is to assess whether universal condom use to reduce the spread of HIV infection was effective as suggested by routine surveillance (Mastro and Limpakarnjanarat 1995). A survey was conducted and showed that a low rate of condom use occurred in lower social class commercial sex workers, construction workers, and poor truck drivers. The seroconversion rates of HIV among these sex workers was shown to be on the rise (Sawanpanyalert *et al.* 1994; Mastro and Limpakarnjanarat 1995; Kilmarx *et al.* 1998). Many commercial sex workers did not use condoms if they were entertaining 'regular customers', if they drank, or if they believed that healthy people had no risk of HIV transmission (Vanichseni *et al.* 1993). The special survey was an important supplement to the information gathered from routine surveillance for designing effective control strategies.

A special survey was also conducted among housewives in Thailand to clarify the reasons for a rise in HIV infection in pregnant women. The survey showed that there was a significant difference in attitude between the Thai housewives who were HIV positive and those who were HIV negative. Those who were HIV positive were not confident at discussing HIV disease with their partners. They were also less likely to tell their partners first if they were infected (Suwanagool *et al.* 1995). Special surveys also helped to clarify the risk of perinatal transmission (Shaffer *et al.* 1999), and the rate of discordance of HIV status between pregnant women and their partners (Siriwasin *et al.* 1998). This special study helped to design a public health campaign aimed at addressing the increase in HIV prevalence among pregnant women discovered from the sentinel surveillance system.

Training of interviewers and enumerators for valid data collection is required for epidemiology studies. Qualitative data to identify variables meaningful to a community, reflecting their voices, and bringing in the human dimension of a problem can be a powerful complement to epidemiological surveys which highlight differences between groups. Therefore, public health surveys and special studies have embraced methods from the social sciences in the identification of variables for surveys as well as the interpretation, dissemination, and use of results.

Large-scale health surveys conducted by government agencies, which record information on a large number of health-related variables, are available for analysis. The information can be applied to estimate demographic profiles associated with possible lifestyles and biochemical determinants of diseases. It can also estimate the probability of receiving some clinical services and screening according to the type of health insurance, the probability of receiving a digital rectal examination, and the effectiveness of community intervention to encourage positive lifestyles such as smoking cessation (Graubard and Korn 1999). Special studies which follow cohorts can detect changes in epidemics and behavioural factors (Limpakarnjanarat *et al.* 1999).

Rapid surveys

The objective of a rapid survey is to collect information required to make decisions to cope with urgent health problems when the true nature and extent of the problem is unknown. Large surveys are usually expensive and cannot be done frequently or timely enough to assess or evaluate health problems in a specific area. Furthermore, it is unwise to infer the results of a large general population survey for local planning (Smith 1989). A rapid survey can be used to collect population-specific information on health situations, on possible determinants of disease, and on knowledge, perceptions, and cultural aspects of illnesses. A typical rapid survey can be carried out by sampling 30 clusters of seven to ten respondents (or households), each covering 200 to 300 household interviews (Henderson and Sunaresan 1982; Frerichs and Tar Tar 1989). These methods have been used to assess the status of immunization, family planning, and use of antenatal services.

Contact tracing

Contact tracing is particularly useful when information from routine systems and surveillance suggests the need for a clarification of the pattern of the spread of diseases (Box 10). It is also useful to estimate acute illness episodes and disease problems among illegal migrants and mobile ill-defined populations such as tourists and migrant workers. The purposes of contract tracing (community visiting team) are to confirm the diagnosis, determine the extent of secondary transmissions, and estimate the pattern of risk behaviours.

Purpose of contact tracing

- Confirm diagnosis and find causes
- Behaviour risk estimates
- Estimate magnitude of problems
- Identify possible control measures
- Identify where/to whom to apply control measures
- Recommend control measures

Contact tracing can lead to more cases contacting the patients who failed to come to receive service from the health-care system and thus increases the validity of the estimates of the magnitude of problems. In addition, better targeting of control measures can be a desirable outcome, leading to increased efficiency of the health system.

Contact tracing was carried out for heroin users seeking treatment from Samutprakarn Hospital in Thailand (Table 3) to identify the magnitude of needle-sharing behaviours among the confirmed addicts.

Through contact tracing, drug use and needle sharing were identified as a mode of spread of HIV infection from the urban to rural

Table 3 Drug use and travel pattern of 731 injecting heroin users treated at Samutprakarn Hospital

Ever travel and stay over night in other province	38.9%
Reasons for travelling	
Holiday/sociocultural ceremonies	45.6%
Occupational/personal business	39.5%
Visiting friends/relatives	16.8%
Drug injection while travelling	59.5%
Needle sharing	24.7%
Borrowed from someone	6.3%
Lent to someone	10.6%
Borrowed from and lent to someone	7.8%

result gave rise to the design of a prevention programme educing needle sharing among addicts during travel. ıcing could also document the spread of HIV infection victs through needle sharing in prisons.

ional travel can be one of the major modes of transmission imates of contacts of tourists with sex workers, beach boys, ge parlour attendants through surveys and contact tracing arify the magnitude and pattern of disease transmission *al.* 1993). Migration also occurs across borders for jobs in n, factories, logging, and commercial sex work (Asian enter for Migration 1999).

tration and census

ration relies on the requirement by law to report health uding birth and death. These figures can be obtained from l statistical offices and relevant departments such as health, ucation, and the ministry of interior. Many countries also dic censuses every 10 years.

are examples in developing countries where events are orted due to the lack of quality assurance of the reporting en to document all deaths. For example, the accuracy of nd infant mortality rates in most developing countries is le. The perinatal and infant mortality rates in a rural district d as measured from surveys were compared with the official o assess accuracy. All stillbirths and 45 per cent of infant re unregistered (Lumbiganon *et al.* 1990).

tion, the inaccurate enumeration of deaths and inadequate ertification of deaths in developing countries limits the infer the cause of death, particularly in those occurring ospital or clinical settings. In Thailand, the causes of were defined only in about 40 per cent of all deaths. Verbal nd lay reporting have been used as methods for estimating of death (Snow and Marsh 1992; Kleinman 1978) through ered from relatives and friends. Verbal autopsy has been ed for the diagnosis of causes of child mortality. Standard ve been developed for the diagnosis of common causes of mortality to allow a comparison of the results of different ang and Bang 1992). Such standard criteria will be needed to lata on cause-specific mortality for evaluating disease e and for targeting, monitoring, and measuring the impact ntions.

ation of several methods: an example

nic disciplines for community diagnosis have both strengths nesses. To solve a public health problem adequately requires om several disciplines and approaches either through g multidisciplinary teams or training public health rs to move beyond disciplinary boundaries.

ıbination of several methods has been used to understand the s of HIV infection in Thailand. An epidemic among drug predicted by routine reporting from various drug depen- atment centres (Ministry of Public Health 1997). In addition. nformation from drug dependency treatment facilities a the spread of the epidemic from Bangkok to the pro the urban to rural areas. Different incidence rates emic s geographical areas at any point in time. The population c regional areas, such as the hill tribes drug

discussed above, most likely occurred at different times from 1987 to at least 1995 if not after (Beyrer *et al.* 1997). HIV infection in non-injecting drug users consistently persisted due to sexual behaviour. Contact tracing showed that travelling, needle sharing, and imprisonment interfere with intervention efforts to stop the spread of HIV infection. Periodic special surveys showed that a reduction of risk behaviours such as needle sharing could be achieved in a relatively short time with timely implementation of appropriate interventions. They also documented the epidemiological evolution of HIV-1 subtypes B and E among heterosexuals and injecting drug users in Thailand (Limpakarnjanarat *et al.* 1998; Poshyachinda 1993*a,b*). Moreover, routine reporting and sentinel surveillance supported the notion that the prevalence among injecting drug users in the rural population and minority groups was still low when preventive interventions were introduced. Nonetheless, the prevalence in these populations increased to the level of Bangkok and the central region.

Sentinel surveillance has demonstrated the development of infective pools of HIV infection among intravenous drug users and commercial sex workers in Thailand. Special surveys and contact tracing among the clients of sexually transmitted disease clinics and among the migrant workers helped clarify the transmission among the high-risk and socially deprived groups. Also, through the sentinel surveillance of pregnant women visiting antenatal clinics, military conscripts, blood donors, and outpatient clinics, the epidemic was shown to have spread from the infective pool and high-risk populations to the general population, and subsequently demonstrated the reduction of the rate of the epidemic through effective control (Fig. 4). The story of an information system and various methods for community diagnosis of HIV infection has emphasized the need for a combination of approaches to understand the evolution of a public health problems as well as the effectiveness of control measures. It also showed the value of various types of information system in explaini aspects of epidemics leading to effective control.

Finally, the information system and attempt at co diagnosis will only be possible if done in concert w commitment and effective administration and plan ances the evidence and values collected from diff within the society (Phoolcharoen *et al.* 1998*a*,

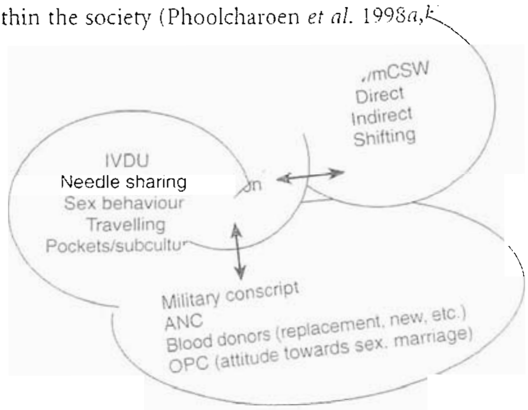


Fig. 4 Model of transmission of HIV infection in Thailand derived from various methods of community diagnosis. IVDU, intravenous drug user; STD sexually transmitted disease; CSW, commercial sex worker; ANC, antenatal clinics; OPC, outpatient clinics.

Technological limitations of information systems and community diagnosis

Even if the data for community diagnosis are valid, methodological advances are still needed to help set priorities for health needs.

Estimates of lifetime effects on individuals with particular health problems

Many health measures such as person years of life lost, healthy days of life lost, disability-adjusted life years, and quality-adjusted life years attempt to introduce time dimensions to the evaluation of health and diseases. These measures are not likely to correspond to social preferences and social investment in the individuals before death occurs. The social preferences probably vary between cultures and therefore an attempt to make global estimates using common measures might not be valid to compare burden of illness. Particular care must be used if these measures affect the allocation of resources across countries.

Effects of health problems of individuals on their relatives

The loss of the main source of income through death is not equivalent to the death of a dependent in a family. Therefore, deaths will not be equal among members of a household depending on many factors. These include the changes in social status caused by widowhood or orphanhood, changes in the dependency ratios of the household, and the reallocation of work responsibilities between household members. Other significant factors are the reallocation of domestic responsibilities, changes in major sources and the levels of income of the household in which deaths occur, changes in ownership and indebtedness, and expenditure due to medical bills or funeral costs.

Therefore, the community needs to be consulted to see whether the community diagnoses accurately reflect their perceptions of the values given to deaths and illnesses, particularly when decisions on the allocation of limited resources will be based on such a diagnosis.

Universities have a definite role in helping to overcome the technological limitations of information as well as to guide and direct the society with respect to appropriate community diagnosis and appropriate control measures. Academics should meet the challenge and accept responsibility not only by teaching and in-depth research but also by advocating the most appropriate methods for community diagnosis in the light of limited resources.

Information systems of developed and developing countries

In developed and developing countries, mortality reporting, registrations of some diseases (such as cancer), routine reporting, and census data have been the main sources of information used to estimate the burden of health problems. These generally have been supplemented by household surveys and periodic population-based survey such as the National Health Examination Survey, the National Health and Nutrition Examination Survey, the Health and Welfare Survey, contact tracing, and several population surveillance syst notifiable diseases.

However, the most significant difference between the informati systems of developed and developing countries is the accuracy routine statistics, particularly with respect to the cause of mor Thus, in Thailand, data collected for cause of death suffered fr under-reporting. In addition, nearly half of the reported deaths we classified under ill-defined causes (Samutharaks *et al.* 1997). Eve when deaths occur in hospitals, only a small percentage underg autopsy (less than 10 per cent for large hospitals in Thailand). In som developed countries, linking records of repeat events occurring individuals has been used to reduce the errors in recording the caus deaths, dramatically reducing validity problems (Archeson 1966). to the validity of morbidity data, even Western countries have vari notification of infection, with poorer notification for milder infecti (Benjamin 1968). For diseases like cancer with a much longer natu history, most patients are likely to be registered.

The chief challenge of information systems in developed countri is how to ensure that the pressure of new but untested technology do not dictate the acquisition of high-technology equipment to track operation of managed care. Recently, large budgets have been allo to information systems in large health-care networks such as Kaiser-Permanente's Northern California Region ($1 billion o 7 years), Health Care Sacramento ($27.5 million over 5 years), Sutler Health ($150 million over the next 7 years) (Morrissey 19 How much the gain in health will mirror the extent of the increase the efficiency of service delivery remains to be investigated. Moreo there is a tendency for further investment in telemedicine and expansion of fibre-optic capacity. This trend will complicate information systems are used to track the allocation of resources appropriate reimbursement for patient care. Whether the increm increase in the investment in information systems will produ proportional gain in health of the community is a valid and as unanswered question.

Developing countries must not be trapped into investing in h technology for sophisticated information systems beyond their ne Some guidelines might be useful for decisions on the effe information system projects. Firstly, the involvement of the sys users from the beginning is desirable for establishing a clear realistic goal. Secondly, a complete review for existing solutions be in place before deciding on investing in high technology. Th some assurance of adequate support and continuity from the ve must be obtained since developing countries will be very depen on the support system. Finally, the reality of the organizat constraints on the systems must be taken into account, for exam the adequacy of human resources to operate the system. Therefo is important to 'think big' (holistic manner), 'start small' (adop evolutionary not a 'big bang' approach), and 'act rationally' accord to the need to advance the objectives of the health-care system (1994).

However, developing countries must invest in resources to ca essential information on health problems and trends (the reso used, utilization, costs, and outcomes of public health problems decide whether an investment in health care will yield the out described in the objectives of the health-care system. An inform system is not for gathering information via sophisticated technol It is for giving evidence to stakeholders to solve health problems an accepted method of conflict resolution.

References

Anonymous (1995). The World Health Organization quality of life assessment (WHOQOL): position paper from the World Health Organization. *Social Science and Medicine*, 41, 1403–9.

Archeson, R. (1966). *Medical record linkage*. Oxford University Press.

Asian Research Center for Migration (1999). *Recent trends in international migration in Asia*. Chulalongkorn University Printing House, Bangkok.

Bang, A.T. and Bang, R.A. (1992). Diagnosis of causes of childhood deaths in developing countries by verbal autopsy: suggested criteria. *Bulletin of the WHO*, 70, 499–507.

Benjamin, B. (1968). *Health and vital statistics*. Allen and Unwin, London.

Beyrer, C., Celentano, D.D., Suprasert, S., *et al.* (1997). Widely varying HIV prevalence and risk behaviours among the ethnic minority peoples of northern Thailand. *AIDS Care*, 9, 427–39.

Cassol, S., Weniger, B.G., Babu, P.G., *et al.* (1996*a*). Detection of HIV type 1 env subtypes A, B, C, and E in Asia using dried blood spots: a new surveillance tool for molecular epidemiology. *AIDS Research in Human Retroviruses*, 12, 1435–41.

Cassol, S.A., Read, S., Weniger, B.G., *et al.* (1996*b*). Dried blood spots collected on filter paper: an international resource for the diagnosis and genetic characterization of human immunodeficiency virus type-1. *Memorias do Instituto Oswaldo Cruz*, 91, 351–8.

Commission on Health Research for Development (1990). *Health research: essential link to equity in development*. Oxford University Press.

DeRiemer, K., Rudoy, I., Schecter, G.F., Hopewell, P.C., and Daley, C.L. (1999). The epidemiology of tuberculosis diagnosed after death in San Francisco, 1986–1995. *International Journal of Tuberculosis and Lung Disease*, 3, 488–93.

Dezateux, C. (1998). Evaluating newborn screening programmes based on dried blood spots: future challenges. *British Medical Bulletin*, 54, 877–90.

Frerichs, R.R. and Tar Tar, K. (1989). Computer-assisted rapid surveys in developing countries. *Public Health Reports*, 104, 14–23.

Frerichs, R.R., Silarug, N., Eskes, N., *et al.* (1994). Saliva-based HIV-antibody testing in Thailand. *AIDS*, 8, 885–94.

Ghana Health Assessment Project Team (1981). A quantitative method of assessing the health impact of different diseases in less developed countries. *International Journal of Epidemiology*, 10, 73–80.

Graubard, B.I. and Korn, E.L. (1999). Analyzing health surveys for cancer-related objectives. *Journal of the National Cancer Institute*, 91, 1005–16.

Henderson, R.H. and Sunaresan, T. (1982). Cluster sampling to assess immunization coverage: a review of experience with a simplified method. *Bulletin of the WHO*, 60, 253–60.

Hyder, A.A. and Morrow, R.H. (1998). Steady state assumptions in DALYs: effect on estimates of HIV impact. *Journal of Epidemiology and Community Health*, 53, 43–5.

Kilmarx, P.H., Limpakarnjanarat, K., Mastro, T.D., *et al.* (1998). HIV-1 seroconversion in a prospective study of female sex workers in northern Thailand: continued high incidence among brothel-based women. *AIDS*, 12, 1889–98

Kitayaporn, D., Uneklabh, C., Weniger, B.G., *et al.* (1994). HIV-1 incidence determined retrospectively among drug users in Bangkok, Thailand. *AIDS*, 8, 1443–50.

Kitayaporn, D., Kaewkungwal, J., Bejrachandra, S., Rungroung, E., Chandanayingyong, D., and Mastro, T.D. (1996*a*). Estimated rate of HIV-1-infectious but seronegative blood donations in Bangkok, Thailand. *AIDS*, 10, 1157–62.

Kitayaporn, D., Tansuphaswadikul, S., Lohsomboon, P., *et al.* (1996*b*). Survival of AIDS patients in the emerging epidemic in Bangkok, Thailand. *Journal of AIDS and Human Retrovirology*, 11, 77–82.

Kitsiripornchai, S., Markowitz, L.E., Ungchusak, K., *et al.* (1998). Sexual behavior of young men in Thailand: regional differences and evidence of behavior change. *Journal of AIDS and Human Retrovirology*, 18, 282–8.

Kleinman, A. (1978). Culture, illness and care: clinical lessons from anthropologic and cross-cultural research. *Annals of Internal Medicine*, 88, 251–8.

Limpakarnjanarat, K., Ungchusak, K., Mastro, T.D., *et al.* (1998). The epidemiological evolution of HIV-1 subtypes B and E among heterosexuals and injecting drug users in Thailand, 1992–1997 12, 1108–9

Limpakarnjanarat, K., Mastro, T.D., Saisorn, S., *et al.* (1999). HIV-1 and other sexually transmitted infections in a cohort of female sex workers in Chiang Rai, Thailand. *Sexually Transmitted Infection*, 75, 30–5.

Luepker, R.V. and Herlitz, J. (1999). Differences in the treatment of acute myocardial infarction between regions of countries and the impact on prognosis. *Journal of Cardiovascular Risk*, 6, 77–87.

Lumbiganon, P., Panamonta, M., Laopaiboon, M., Pothinam, S., and Patithat, N. (1990). Why are Thai official perinatal and infant mortality rates so low? *International Journal of Epidemiology*, 19, 997–1000.

MacQueen, K.M., Nopkesorn, T., Sweat, M.D., Sawaengdee, Y., Mastro, T.D., and Weniger, B.G. (1996). Alcohol consumption, brothel attendance, and condom use: normative expectations among Thai military conscripts. *Medical Anthropology Quarterly*, 10, 402–23.

Mastro, T.D. and Kitayaporn, D. (1998). HIV type 1 transmission probabilities: estimates from epidemiological studies. *AIDS Research in Human Retroviruses*, 14 (Supplement 3) S223–7.

Mastro, T.D. and Limpakarnjanarat, K. (1995). Condom use in Thailand: how much is it slowing the HIV/AIDS epidemic? *AIDS*, 9, 523–5.

Matloff, E.T., Shappell, H., Brierley, K., Bernhardt, B.A., McKinnon, W., and Peshkin, B.N. (2000). What would you do? Specialists' perspectives on cancer genetic testing, prophylactic surgery and insurance discrimination. *Journal of Clinical Oncology*, 18, 2484–92.

Mills, S., Ungchusak, K., Srinivasan, V., Utomo, B., and Bennett, A. (1998). Assessing trends in HIV risk behaviors in Asia. *AIDS*, 12 (Supplement B), S79–86.

Ministry of Public Health (1997). *Health in Thailand 1995–1996*. Bureau of Health Policy and Planning, Ministry of Public Health, Nonthaburi.

Morrissey, J. (1995). Building networks to stay competitive. *Modern Healthcare*, August 21, 150–4.

Mulhall, B.P., Hu, M., Thompson, M., *et al.* (1993). Planned sexual behaviour of young Australian visitors to Thailand. *Medical Journal of Australia*, 158, 530–5.

Muller, O., Sarangbin, S., Ruxrungtham, K., Sittitrai, W., and Phanuphak, P. (1995). Sexual risk behaviour reduction associated with voluntary HIV counselling and testing in HIV infected patients in Thailand. *AIDS Care*, 7, 567–72.

Murray, C.J. and Lopez, A.D. (1996). The incremental effect of age-weighting on YLLs, YLDs, and DALYs: a response. *Bulletin of the WHO*, 74, 445–6.

Newbrander, W. (1997). *Private health sector growth in Asia: issues and implications*. Wiley, Chichester.

Nopkesorn, T., Mock, P.A., Mastro, T.D., *et al.* (1998). HIV-1 subtype E incidence and sexually transmitted diseases in a cohort of military conscripts in northern Thailand. *Journal of AIDS and Human Retrovirology*, 18, 372–9.

Peckham, C.S. and Dezateux, C. (1998). Issues underlying the evaluation of screening programmes. *British Medical Bulletin*, 54, 767–78.

Phoolcharoen, W. (1998). HIV/AIDS prevention in Thailand: success and challenges. *Science*, 280, 1873–4.

Phoolcharoen, W., Ungchusak, K., Sittitrai, W., and Brown, T. (1998). Thailand: lessons from a strong national response to HIV/AIDS. *AIDS*, 12 (Supplement B), S123–35.

Poshyachinda, V. (1993*a*). Drugs and AIDS in Southeast Asia. *Forensic Science International*, 62, 15–28

Poshyachinda, V. (1993*b*). Drug injecting and HIV infection among the population of drug abusers in Asia. *Bulletin of Narcotics*, 45, 77–90.

Roberts, C.L., Tracy, S., and Peat, B. (2000). Rates for obstetric intervention amongst private and public patients in Australia: population-based descriptive study. *British Medical Journal*, 321, 137–41

Rosomoff, H.L. and Rosomoff, R.S. (1999). Low back pain. Evaluation and management in the primary care setting. *Medical Clinics of North America*, 83, 643–62.

Samutharaks, B., Wecharak, P., Kongkamned, R., and Sitthi-amorn, C. (1997). *Quantitative assessments of disease impact on society: a conceptual approach to prioritization and agenda setting of health problems for policy determination in Thailand.* College of Public Health, Chulalongkorn University, Bangkok.

Sawanpanyalert, P., Ungchusak, K., Thanprasertsuk, S., and Akarasewi, P. (1994). HIV-1 seroconversion rates among female commercial sex workers, Chiang Mai, Thailand: a multi cross-sectional study. *AIDS*, 8, 825–9.

Shaffer, N., Roongpisuthipong, A., Siriwasin, W., *et al.* (1999). Maternal virus load and perinatal human immunodeficiency virus type 1 subtype E transmission, Thailand. Bangkok Collaborative Perinatal HIV Transmission Study Group. *Journal of Infectious Disease*, 179, 590–9.

Siriwasin, W., Shaffer, N., Roongpisuthipong, A., *et al.* (1998). HIV prevalence, risk, and partner serodiscordance among pregnant women in Bangkok. Bangkok Collaborative Perinatal HIV Transmission Study Group. *Journal of the American Medical Association*, 280, 49–54.

Sitthi-amorn, C., Chandraprasert, S., Bunnag, S.C., and Plengvidhya, C.S. (1989). The prevalence and risk factors of hypertension in Klong Toey slum and Klong Toey government apartment houses. *International Journal of Epidemiology*, 18, 89–94.

Smith, G.S. (1989). Development of rapid epidemiological assessment methods to evaluate health status and delivery of health services. *International Journal of Epidemiology*, 19 (Supplement 4).

Snow, B. and Marsh, K. (1992). How useful are verbal autopsies to estimate childhood causes of death? *Health Policy and Planning*, 7, 22–9.

Stephenson, J.M. (1998). Screening for genital chlamydial infection. *British Medical Bulletin*, 54, 891–902.

Suwanagool, S., Chaiyakul, P., Ratanasuwan, W., Pechthanom, L., and Chaisilwattana, P. (1995). HIV-1 infection among low income women attending a Siriraj sexually transmitted disease clinic: sociodemographic differentials. *Journal of the Medical Association of Thailand*, 78, 355–61.

Ungchusak, K., Rehle, T., Thammapornpilap, P., Spiegelman, D., Brinkmann, U., and Siraprapasiri, T. (1996). Determinants of HIV infection among female commercial sex workers in northeastern Thailand: results from a longitudinal study. *Journal of AIDS and Human Retrovirology*, 12, 500–7. (Erratum *Journal of AIDS and Human Retrovirology*, 18, 192 (1998)).

Van Griensven, G.J., Limanonda, B., Ngaokeow, S., Ayuthaya, S.I., and Poshyachinda, V. (1998). Evaluation of a targeted HIV prevention programme among female commercial sex workers in the south of Thailand. *Sexually Transmitted Infection*, 74, 54–8.

Vanichseni, S., Des Jarlais, D.C., Choopanya, K., *et al.* (1993). Condom use with primary partners among injecting drug users in Bangkok, Thailand and New York City, United States. *AIDS*, 7, 887–91.

Van Landingham, M., Grandjean, N., Suprasert, S., and Sittitrai, W. (1997). Dimensions of AIDS knowledge and risky sexual practices: a study of northern Thai males. *Archives of Sexual Behaviour*, 26, 269–93.

Wadswarth, M.I., Butterfield, B.J.H., and Blaney, R. (1971). *Health and sickness: the choice of treatment.* Tavistock Publications, London.

WHO (World Health Organization) (2000*a*). *The world health report 2000: health systems—improving performance.* WHO, Geneva

WHO (World Health Organization) (2000*b*). *The world health report on infectious diseases.* WHO, Geneva.

Wyatt, J.C. (1994). Clinical data systems. 3. Developing and evaluating clinical data systems. *Lancet*, 344, 1682–8.

PRESCRIPTION PATTERN FOR TREATMENT OF HEMORRHOIDS UNDER THE UNIVERSAL COVERAGE POLICY OF THAILAND

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Abstract. The Universal Coverage Policy (UCP) or "30 Baht Scheme" was launched in Thailand in 2001. The policy caused a cutback in the budgets of all public hospitals and health service centers. Traditional medicine was then viewed as an alternative to save costs. This study examines whether this had any influence on hemorrhoid treatment prescription patterns, ratio of traditional/modern medicine, or the cost of hemorrhoid treatment after the UCP was implemented at a community hospital. The traditional medicine prescribed was Petch Sang Kart and the modern alternative was Proctosedyl. All hemorrhoid prescriptions at a community hospital from October 2000 to January 2003 were surveyed. Segmented Regression Analysis was applied to evaluate prescription trends, the ratios between the types of medicine, and the hemorrhoid treatment cost. A total of 256 prescriptions were analyzed. The average number of traditional medicine prescriptions per month were more than modern medicine (41 *versus* 16). During the study period, the trend of modern medicine use and the treatment cost was decreased ($p<0.01$). The ratio of traditional/modern medicine increased 0.2 times ($p=0.02$).

INTRODUCTION

Hemorrhoidal problems are common, affecting millions of men and women in the United States and elsewhere (Digestive Disease Statistics, 2003). A large database survey conducted in the United States and England found a prevalence of about 4%, with approximately 10 million people in the United States alone reporting symptoms associated with hemorrhoids. In general, the development of symptoms before age 20 was usual. About half of all people by age 50 have hemorrhoids to some extent (Faccini *et al*, 2001). Women may begin to have hemorrhoids during pregnancy. Johanson and Sonnenberg (1990) asserted that hemorrhoidal disease is most frequent in ages 45 to 65 in both genders, and declines thereafter. Hemorrhoids usually do not pose a danger to health, however, chronic bleeding from hemorrhoids may lead to anemia.

In Thailand, the perception is that hemorrhoid are a minor, temporary problem. In most cases, hemorrhoid symptoms resolve spontaneously within a few days. There is a lack of database information on the nature and extent of hemorrhoids in Thailand. Clinical data from Mae On Hospital (2002) suggests that it is a significant problem.

The Universal Coverage Policy (UCP) or "30 Baht Scheme" for each visit or admission was launched in Thailand in 2001(Towse and Mills, 2004). The policy has effected budget allocations to health service centers and public hospitals. The hospital has to reduce the cost of treatment, due to increasing demand and a constrained budget. Some hospitals have implemented this policy by prescribing traditional medicines to lower the cost of treatment under the UCP. Mae On Hospital is a 10-bed community hospital in Chiang Mai. It launched its policy of using traditional medicines in 1994. In 1995, a traditional medicine center at Mae On Hospi-

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tal was established for alternative treatment and cost-reduction. The traditional medicines used include Andrographis Paniculata, Cissus Gradrangularis Linn., (Petch Sang Kart), Curcuma Longa Linn. and Galic, produced by the local people at Mae On Hospital. In addition, well-trained traditional medicine specialists from the Ministry of Public Health supervise the local people from time to time to ensure the quality of the medicines.

This study aimed to assess the trends of hemorrhoid prescription writing, by comparing the number of traditional and modern medicines prescribed, and comparing the ratio of the medicines, and the cost of hemorrhoid treatment before and after the UCP implementation at Mae On Hospital. Petch Sang Kart and Proctosedyl are the traditional and modern medicines prescribed to patients with hemorrhoids. In order to explore the impact of the UCP on hemorrhoid treatment, the average number of prescriptions before and after policy implementation was observed monthly.

MATERIALS AND METHODS

Design

Interrupted time-series design with retrospective data collection.

Study site

Mae On Hospital was chosen to observe the trends of traditional and modern medicines, and the cost of treatment. Petch Sang Kart is a traditional medicine, and Proctosedyl is a modern medicine prescribed to patients with hemorrhoids. This study was carried out over 28 months, 12 months before and 16 months after implementation of the UCP.

Methods

All hemorrhoid prescriptions at Mae On Hospital during October 2000 to January 2003 were collected. The trends of prescriptions, cost of traditional and modern medicines were compared before and after the universal coverage scheme. The total number of hemorrhoid prescriptions during the study period was 256. Over 60 % of the prescriptions were female. The patients were between 10 and 81 years old, with an average age of 46 (SD= 15.21). Most of the patients received traditional medicine; half of them received both traditional and modern medicines. The number of drugs prescribed per visit per month was examined to observe the prescription pattern. Segmented Regression Analysis was applied to identify changes, including gradual changes over time due to the UCP.

The units analyzed were the monthly mean number of medicines, the ratio between the mean number for traditional/modern medicine, and the average monthly cost of treatment. The average number of medicines per visit per month was calculated from the total number of medicines prescribed during that month, and divided by the total number of hemorrhoid patients during that same month. The ratio of traditional to modern medicines was from the average number of Petch Sang Kart per visit per month divided by the average number of Proctosedyl per visit per month. The average cost of hemorrhoid treatment per visit per month was calculated from the total cost of hemorrhoid treatment per month divided by the total number of hemorrhoid patients per month.

RESULTS

Medicine prescription per visit per month

The average number of medicines per visit per month during the study period indicated changes in prescribing patterns (Fig 1). The trend lines for Proctosedyl and Petch Sang Kart had different patterns of change. The trend line for Proctosedyl, both pre-and post-policy, did not change much, and remained stable, while the line for Petch Sang Kart was unstable. The number of Petch Sang Kart prescriptions per visit per month was higher than Proctosedyl's.

Ratio of medicine prescriptions per visit per month

The prescription pattern ratio of the average number of traditional medicine/modern medicines prescribed per visit per month is shown in Fig 2. The trend line was unstable pre-and post-UCP, and the ratio was high for the 18th month and at the end of the study (8.1 times and 7.9 times, respectively).

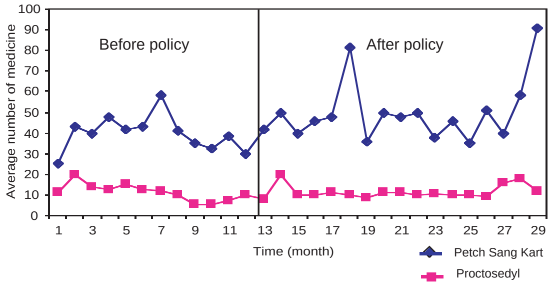

Fig 1–The average number of medicines per visit per month.

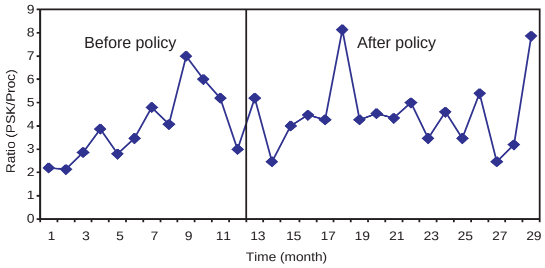

Fig 2–The ratio of medicine prescriptions per visit per month.

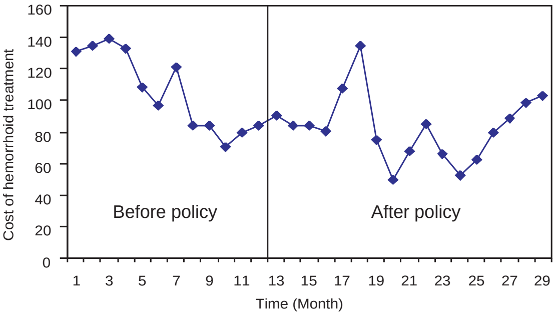

Fig 3–The average cost of hemorrhoid treatment per visit per month (baht).

Cost of hemorrhoid treatment

Fig 3 presents the average cost of hemorrhoid treatment per visit per month. The trend of the cost of treatment declined before UCP implementation. At the starting point of UCP implementation, the cost of hemorrhoid treatment was higher than at the end of the pre-policy period.

Segmented Regression Analysis

Segment Regression Analysis was applied to analyze the average number of medicines per visit per month, the ratio of the medicines, and the average cost of hemorrhoid treatment per visit per month (Table 1). At the beginning of the observation period, the average number of suppositories of Petch Sang Kart and Protosedyl per visit per month were 41.76 (95% CI: 25.43 to 58.09) and 16.77 (95% CI: 12.66 to 20.88), respectively. The average number of Proctosedyl suppositories decreased by 0.85 of a suppository ($p<0.01$). The ratio of traditional/modern medicine was 2.12 (95% CI: 0.26 to 3.97) and increased by 0.2 times ($p = 0.02$).The average cost of hemorrhoid treatment was 145.95 baht per visit per month (95% CI: 122.71 to 169.21). The cost significantly decreased by 6.11 baht during the observation time ($p<0.01$).

DISCUSSION

Segmented Regression Analysis is a tool to assess the prescription pattern and cost of the treatment. This analysis is appropriate to study effects of intervention conduced as part of a randomized trial as well as interventions that constitute a natural experiment. It also allows the researchers to control baseline levels and trends, and to assess how much the UCP changed the outcome of interest. Wegner *et al* (2002) asserted that Segmented Regression Analysis required data on continuous or counted outcome measures, summarized at regular, and evenly spaced intervals. Thus the prescription pattern of hemorrhoid treatment in the community hospital was observed before and after the UCP.

According to the recommendation of Wegner *et al* (2002), a number of time points before and after the policy and a number of observations at each point in the time series are sufficient to conduct segmented regression analysis. There was some missing data. The outliers were corrected by averaging the data. The Durbin-Watson statistical test for autocorrelation of the error term in the regression model showed no problems with autocorrelation (the value was 2.05), indicating an adjustment for autocorrelation was not required.

The results reveal that Petch Sang Kart was prescribed more than Proctosedyl during the study period. The trend of traditional medicine

Table 1
Segmented Regression Analysis of the average number of medicines per visit per month, ratio of medicine, and the average cost of hemorrhoid treatment per visit per month.

Medicine	b (slope)	95% CI	p-value
Traditional medicine (Petch Sang Kart; PSK)			
Constant	41.76	25.43 to 58.09	<0.01
Time points in months (1-29)	-0.32	-2.54 to 1.89	0.76
Implication of policy (0=before, 1=after)	4.92	-14.79 to 24.64	0.61
Time points in months after policy implementation	1.12	-1.46 to 3.70	0.38
R^2= 0.19			
Modern medicine (Proctosedyl)			
Constant	16.77	12.66 to 20.88	<0.01
Time points in months (1-29)	-0.85	-1.41 to -0.29	<0.01
Implication of policy (0=before, 1=after)	3.91	-1.06 to 8.87	0.12
Time points in months after policy implementation	0.97	0.32 to 1.62	<0.01
R^2=0.29			
Ratio of medicine (PSK/Proctosedyl)			
Constant	2.12	0.26 to 3.97	0.02
Time points in months (1-29)	0.29	0.04 to 0.54	0.02
Implication of policy (0=before, 1=after)	-1.16	-3.40 to 1.08	0.29
Time points in months after policy implementation	-0.27	-0.56 to 0.02	0.66
R^2= 0.21			
Cost of treatment			
Constant	145.95	122.71 to 169.21	<0.01
Time points in months (1-29)	-6.22	-9.37 to -3.06	<0.01
Implication of policy (0=before, 1=after)	15.66	-12.41 to 43.73	0.26
Time points in months after policy implementation	5.75	2.08 to 9.42	<0.01
R^2=0.52			

use was not different between the pre-policy and post-policy periods, while the level and trend of Proctosedyl use declined. Regarding the doctors' prescription, they prescribed 30 suppositories of Petch Sang Kart or 10 suppositories of Proctosedyl. Many factors were related to the prescription pattern, such as the number of doctors, treatment experience, and medical practice. The doctor was the most important factor influencing the prescription pattern. Some patients were prescribed Petch Sang Kart longer than the regular prescription due to the long distance between patient's house and the hospital. However, we found that there was only one doctor prescribing medicine in this manner at Mae On Hospital. Therefore, the main confounding was eliminated. Since the doctors tried to replace some modern medicine with traditional medicine, the ratio of medicine increased from the staring point through the end of the observation period (p=0.02). The cost of hemorrhoid treatment decreased from the staring point through the end of the observation period (p<0.01).

The average number of modern medicines, and the cost of hemorrhoid treatment has decreased. While the ratio of traditional/modern medicine has increased. This study demonstrates that modern medicine for treating hemorrhoids has had reduced use with an effect on the cost of treatment.

On initiation of the traditional medicine project at Mae On Hospital, traditional medicine for hemorrhoids was not known to the patients. However, most of the patients were satisfied with the traditional medicine after taking it because it is from the local wisdom. Traditional medicine is now requested to reduce the symptoms from hemorrhoids.

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REFERENCES

Digestive Diseases Statistics. National Digestive Disease Information Clearinghouse 2003. [Cited 2005 Apirl 26]. Available from: URL: www.niddk.nih.gov

Faccini M, Zuccon W, Caputo P, Gavezzoli D, Manelli A, Bonandrini L. Hemorrhiods: epidemiology and correlation with chronic constipation. *Ann Ital Chir* 2001; 72: 337-9 (in Italian). [Cited 2005 Apirl 26]. Avaliable from: URL: www.ncbi.nlm.nih.gov

Johanson JF, Sonnenberg A. The prevalence of hemorrhoids and chronic constipation. An epidemiology study. *Gastroenterology* 1990; 98: 380-6.

Mae On Hospital. Annual report. 2002 (In Thai).

Towse A, Mills A, Tangcharoensathien V. Learning from Thailand's health reforms. *BMJ* 2004; 328: 103-4. [Cited 2005 Apirl 25]. Available from: URL: www.bmj.com

Wegner AK, Soumerai, SB, Fhang F, Ross-Degnan D. Segmented regression analysis of interrupted time series studies in medication use research. *J Clin Pharm Ther* 2002; 27: 299-309.