
HEALTH CARE ON SMALL ISLANDS

A REVIEW OF THE LITERATURE

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Many agencies have been concerned with the special problems faced by communities living on small islands over the years. The United Nations established Island Developing Countries as a category of countries which required specific attention and assistance in 1976, and reaffirmed this commitment in 1989. Health and health care have been the particular focus of some other agency initiatives. The Commonwealth Secretariat called an expert group to meet on the Special Health Problems of Island Developing and other Specially Disadvantaged Countries, this group reported in 1980. "Caribbean Cooperation in Health" was established by the Pan American Health Organization in collaboration with CARICOM (the Caribbean Community) in 1984. This paper is the first attempt by the World Health Organization to focus on the peculiarities of health and health care services to populations living on small islands worldwide, be they nation states, or offshore parts of larger continental nations.

ABSTRACT

A review of published and unpublished literature pertaining to health care on small islands was conducted. This identified the following:

Small islands have many special features, some of which present challenges to health care planners. Each island occupies a unique niche in the multi-dimensional matrix of size, distance from larger land masses, climate, population, self-reliance, relative wealth, whether the island is a single island or part of an archipelago, and extent of cultural isolation.

Some of the more common problems encountered by island populations are: 1. communication difficulties, leading to insularity, which may be overcome to some extent with technology 2. small population not reaching the critical mass needed to make the provision of specialists or expensive facilities viable, 3. achieving the appropriate balance between island residents being sent elsewhere for treatment, and visiting health care staff being brought in, 4. difficulty recruiting and retaining certain categories of the more highly-trained staff, 5. professional isolation, 6. in the more isolated communities, susceptibility to epidemics of infectious diseases more common in continental populations, and, perhaps, the effects of a low pool of genetic diversity leading to certain genetic disorders (or at least unusual effects).

Desirable features in health care systems on islands include: 1. orientation towards primary care, 2. easy accessibility by island residents 3. practitioners who are generalists, 4. training of non-medical staff to assess when medical attention is needed 5. established channels of communication for expert advice 6. links with larger population centres for training and to avoid professional isolation, 7. regional cooperation, 8. respect for local practices, 9. flexibility in staffing and working arrangements.

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AIM

The aim of this review was to identify and describe those features of small island communities which are of relevance to the planning and provision of health care.

METHOD

In order to identify relevant literature, a search of the electronic databases MED-LINE and POP-LINE was performed, using the most recent CDs available in 1991. As "island" is not a key word used in the medical literature, and searching for "island" in the title only reveals for instance papers about the pancreatic islets of Langerhans, a large number of geographic key words were tried. The most successful in identifying relevant published papers were "Pacific", "Caribbean", "Atlantic" and "Mediterranean". From the list of abstracts so produced, an attempt was made to obtain the papers which seemed to be of most general interest, many of which were Technical reports or unpublished work. The search revealed that a number of authors had published work on various aspects of island health, and visits were made or letters sent to a number of key individuals, specifically requesting any overviews of the general features of health care on small islands of which they were aware. In addition, the library at the World Health Organisation Headquarters in Geneva proved to be a useful resource for such reports. Two publications which merit special mention are: *Special Health Problems of Island Developing and other Specially Disadvantaged Countries* (Commonwealth Secretariat, 1980) and *Sustainable Development and Environmental Management of Small Islands* (Beller *et al*, 1990).

The resulting report which follows does not attempt to be a comprehensive review of all published work on health care on small islands, but rather to cover the range of issues which are relevant, with some brief case studies to exemplify problems and solutions.

INTRODUCTION

All land masses are eventually surrounded by water, albeit frozen water in some places. Humankind has long distinguished between large land expanses or continents and distinct, smaller islands. This review will focus on smaller islands, generally smaller than Iceland with its 103,000 km², although we have not restricted the analysis with any arbitrary definition of a small island. Islands have historically been quite populous places, and to the present day island countries remain significantly more densely populated than continental counterparts of similar economic status (Dommen, 1980). Paradoxically, the populations of island countries are more dispersed, i.e. separated by greater geographical distance, as a consequence of only inhabiting emergent land, which is often separated by expanses of sea, than even remote continental settlements (Dommen, 1980).

Some islands are very close and physically linked to a continent, e.g. Singapore, Bahrain (Hein, 1990b). Many of the world's major cities have developed on islands, and often now cover large areas of the surrounding mainland, for example New York City and Lagos. These islands will also not be covered in this review, which seeks to elucidate how the uniqueness of the island situation, by virtue of its insularity, impinges upon the health and health care systems.

Some would argue that "islandness" is an unhelpful category to use in the context of social analysis and policy, and that the characteristics of islands are characteristics of small countries generally (Selwyn, 1980). Selwyn argues that the notion that islands are somehow different stems from the concerns of naturalists such as Darwin and Wallace, and that to extrapolate from the biological to the social is illegitimate. Brookfield (1990) argues against using "islandness" as a category, and offers "small islands" i.e. smaller than 1000 km² and or with fewer than 100,000 inhabitants as a category of greater utility for analytical and policy purposes.

Whether islands warrant special attention is still hotly debated in forums such as the United Nations General Assembly. In 1976 the General Assembly identified Island Developing Countries (IDCs), as a category of countries which required specific attention and assistance. In a January 1989 meeting the General Assembly reaffirmed its resolutions and those of the United Nations Conference on Trade and Development (UNCTAD), and welcomed the efforts which had been made by IDCs to address their specific problems, including efforts to promote cooperation (UNCTAD, 1990). Background reports prepared for that meeting included:

problems of inter-island transport; improving public sector performance in IDCs through modern information technology; intrinsic disabilities of IDC and national, regional and international measures; and the role and effect of migration in IDCs in respect of their socio-economic development.

In addition proposals for further action were suggested.

However, as recently as 1990, it was interesting to note that the representative of Japan, a nation of 4000 islands, five of which are very large, stated that his country gave special consideration to the least developed countries, but did not subscribe to the idea of giving special consideration to IDCs simply because they were islands (United Nations General Assembly, 1990).

Island status can confer advantages, for instance locational advantage, as displayed by Guam, which has a major international airport and the only fully-serviced container terminal in the Pacific islands, as it is on major international transport routes (Brookfield, 1990). Of course other neighbouring islands cannot share this advantage, as only one major port and airport are needed in the area.

Status of islands

Islands may exist as a single island or part of an archipelago; these islands or archipelagos may be nations, or territories, colonies or other dependencies, or simply part of a larger nation. Many islands or island groups which were formerly colonies, particularly in the Pacific and Caribbean, are now nation states, as recognised by the United Nations. Of 94 countries or territories with populations of less than one million inhabitants identified in the UN Statistical Yearbook 1982, 71 are islands. However, the majority of islands are not nations; China alone has some 5000 islands scattered along its coast, of which 450 are inhabited by a total of 36 million people (Qiulin, 1990). The 216 islands of Greece comprise 19% of its total land area, and house some 14% of the population (Vernicos, 1990). Interestingly, 78 of the smaller islands are no longer settled, but bear numerous buildings and monuments testifying their former glory, despite the majority being smaller than 150 hectares! (Vernicos, 1990). Canada borders three ocean basins, Atlantic, Arctic and Pacific, and all three basins abound with numerous large and small islands, which fall into six (of Canada's 15) ecozones, and several administrative categories, e.g two large islands are provinces, some of the Pacific islands are homelands of the Haida Indians, and the arctic islands are still to a large extent administered by the federal government (Hanson and Lamson, 1990).

In addition, there are a number of island nations which have no continental part, and yet consist of vast areas of land, usually also with many small islands, for example Indonesia, and the Philippines which consists of some 7000 islands, of which about 400 are permanently occupied, and yet the vast majority of the population live on the five larger islands. This review is relevant to the smaller inhabited islands of Japan, the Philippines, Indonesia, etc, but not to the large centres of population.

Environmental features

Islands have relatively large coastlines in relation to their land area. This has both advantages and disadvantages. The proximity of the sea can mean rich food resource. A study of the families of severely malnourished children in Bohol, Philippines, found differences in the diets of island children; viz a shortage of cereals, rootcrops, fresh vegetables, and fruit was evident in the off-shore islands, while meat and fish were lacking in households from the interior (Reynes, 1978). The implications for health services are that nutritional status is likely to be different in remote islands, and where malnutrition occurs, supplements in the form of cereals and carbohydrates are likely to be in greater need than protein foods.

The sea can provide a useful medium for transport - it is often easier to travel the same distance by small boat than trying to cross dense forest or mountain without roads. An important public health aspect of living near the sea is that all children should be taught to swim from an early age. On the arctic island of Grimsey, waste hot water from electricity generation is used for a swimming pool (Oddsson, *pers. comm.*).

However, this proximity to the sea can also mean vulnerability to the ravages of hurricanes, floods, the rising sea level, and pollution such as oil spills, all of which can have devastating effects on the local economy and health.

The major ecological trends in Pacific islands have recently been summarised (Hamnett, 1990):

1. increasing pressure on land and freshwater resources
2. intensification of agriculture
3. loss of native forest
4. river and stream siltation
5. increasing use of coastal areas leading to the degradation of lagoons and harbours.

While some of these trends may be subject to local action, i.e. freshwater saving policies, reforestation, protection of lagoons, and so on, clearly international efforts are required to encourage more sustainable ways of living if human health is not to suffer.

Global warming and rising sea level threaten the very existence of low-lying islands such as the Maldives, Tuvalu, Kiribati and Tokelau. It is a tragic irony that such small non-industrialised states which will have to suffer the consequences of industrialisation, when they have benefitted so little from it. The onus lies with international organizations to take action to protect these islands and other low-lying areas, by promoting reduced fossil fuel use and prohibiting substances which damage the ozone layer.

Finite resources

We inhabit a world of finite resources, however, some of the reserves of particular resources are so vast that humankind has until very recently considered them to be unlimited. In the small island situation, one may be more acutely aware of the finite nature of resources. Poor resource endowment is generally recognised as one of the handicaps of IDCs, this being a consequence of smallness and geological formation (UNCTAD, 1990). On many coral atolls, fresh water is a limited and perhaps, limiting resource. Rain water seeps through the vegetation and topsoil to form a layer of freshwater which floats atop the saline water which permeates porous rock from the surrounding sea (Dale *et al.*, 1987). This layer of freshwater, or 'lens', is in very delicate balance; if disturbed the layers mix and do not separate out again (or do so only over a period of many years). There is no simple, cheap way to obtain freshwater from brackish or salt water (Dale *et al.*, 1987), therefore unless care is taken the population of an atoll can find themselves without drinking water, and may have to face the prospect of emigrating.

In the Caribbean island of Marie-Galante the islanders for some 300 years obtained their water from common ponds, which were treated as public property and a public trust (Beller, 1990). Unfortunately modernisation and the adoption of a "new mode of consumption", a more materialistic lifestyle and greater use of pesticides, have rapidly led to degradation of the water. The situation as it stands is unsustainable, and over the next few years planners will have to think seriously about how to rekindle the community spirit which once ensured the water supply.

Exactly how this community spirit and sense of stewardship may be rekindled is a quite a challenge for health planners. Nina Wallerstein's (1992) review of the literature on powerlessness, empowerment and health, may provide some ideas, and health care planners would be well advised to consult this document.

Energy

Reliance on wood and charcoal, the most common indigenous energy resources leads to deforestation (UNCTAD, 1990), but fossil fuel, in particular oil, is rarely found on small islands (with notable exceptions), necessitating the import of such fuels for electricity generation and motor transport (Takahashi and Woodruff, 1990). Although power charges in large systems for many countries lie within the range US\$0.07 to 0.15/kWh, in remote areas power costs are likely to be within the range US\$0.20 to \$2.00, if from a stand-alone diesel generator (Commonwealth Science Council, 1986). Small remote islands where the transport costs are high may find renewable energy sources economically viable. Similarly, lower energy intensive options, such as low-wattage light bulbs, combined heating and power, etc. become the most cost-effective options. For example, a recent programme to improve primary health care in the remoter islands of Indonesia is using solar-powered

refrigerators to maintain the "cold chain" for vaccinations and drugs (United Nations Development Programme and Government of Indonesia, 1991).

Wind is a resource usually in abundant supply around coastlines, and there is great potential for its use. However, capital costs of wind generators are high, and in the islands of Mauritius for instance, they have found that imported fuel is the energy source of choice on Mauritius itself, but on the small island of Rodrigues, some 600 km from Mauritius, wind generators for water pumping have been so successful that they produce an excess which is used for domestic electricity. Such developments are however, capital intensive, particularly in the development phase, and therefore dependent on aid from external agencies (Commonwealth Science Council, 1986).

The extent to which island resources are exploited is also of relevance to health and health care on islands. Hein (1990a) describes eloquently the range of environmental exploitation from Aldabra, Seychelles, which was declared a wild-life sanctuary in the 1960s and has no permanent human habitation, to Nauru, in the South Pacific, where intense phosphate mining is stripping most of the island's topsoil and vegetation, in return for substantial economic return. This is being invested overseas to provide a steady income for the foreseeable future. Similarly, it may be the marine resources which are exploited, depleting fish stocks may not only affect potential food supply but have other deleterious, and as yet unknown, effects on the environment (Hamnett, 1990).

Exploitation may of course be by the islanders themselves, or by foreign powers, such as has happened with the testing of nuclear weapons in the Pacific (Maddocks, 1988). To some extent moves are afoot to safeguard islanders interests, for instance in the demarcation of exclusive economic zones (EEZs). These zones cover vast areas in the Pacific and Indian Ocean (e.g. Mauritius over 1,100,000 km², Kiribati over 3,500,000 km²), but there is less scope for their development in the Caribbean and Mediterranean where there are many small islands in a smaller sea area (Hein, 1990a).

General demographic features of islands

On some islands a substantial part of the present population is descended from "pre-contact" cultures (Hein, 1990a). Examples of these cultures would be the Melanesians and Polynesians, and the inhabitants of the Maldives. But in many islands of the world the local population was imported, often as slave or indentured labour, to support plantation economies. The Atlantic islands did not support indigenous populations, so the present day inhabitants of the Cape Verde islands, São Tomé, St Helena, Ascension island, Tristan da Cunha, the Falkland/Malvinas islands, have generally descended from colonizers or their slaves (Hein, pers.comm.). Some plantation economies were established in previously inhabited areas, to the detriment of the indigenous population, for example the Arawaks, who were completely exterminated soon after the colonization of their island homes, and the Caribs who were decimated, and now remain in only a few areas of Dominica and St. Vincent (Pan American Health Organization, 1986a).

Certain Pacific islands with very ancient cultures have also experienced recent immigrations of peoples from other islands, or continents. In Fiji, British colonialists brought in thousands of indentured Indian labourers to work in the sugar cane fields in the nineteenth century. These Indians prospered, to the point that they now match the Melano-Fijians in number, and have tended to dominate the professions and economic life. However, political unrest led to a military coup in 1987, and measures to ensure Melano-Fijian dominance have been introduced. An unfortunate consequence for the health sector is that one third of Fiji's 350 doctors emigrated in the year following the coup, most of them Fijian-Indians (Cameron, 1989).

In any small population, a relatively modest movement of people can lead to a high percentage change. For instance, over the last generation or so, annual growth rates on most Pacific islands have been very high, over 3% (which leads to a doubling of population in 23 years), (Caldwell *et al.*, 1980), even as high as 4% in French Polynesia and 8% on Norfolk island (Bakker, 1976). Similarly, the tiny population (about 100 inhabitants) of Pitcairn decreased 6%.

Islands may experience huge seasonal population fluctuations, perhaps historically due to fishing seasons, such as the islands of Svalbard and Jan Mayan, Norway, and presently due to tourism. The sex ratio can be quite far from unity during these times, for instance at the only Census (1964) recorded by the United Nations Statistical Office for the island of South Georgia in the south Atlantic, of the 499 inhabitants, only 5 were female (United Nations, 1991).

Fertility control

Most island states have shown a dramatic decline in fertility, and a lower death rate (the so-called demographic transition) earlier than the nearest continental areas over the last few years (Caldwell *et al.*, 1980). The authors argue that this is because islands are in general more Westernised due to having been part of the European maritime system, and retaining colonial links longer than less penetrable continental areas.

As a result of the control of infectious diseases, and particularly malaria, the population in the Solomon Islands rose from 160,998 to 196,708 between 1970-1976 representing an annual rate of growth of 3.4% per annum (United Nations Department of International Economic and Social Affairs, Population Division, 1985).

Mauritius experienced a similar spectacular increase in population after World War II, when malaria was suddenly wiped out, making it one of the most densely populated countries in the world (Brouard, 1964). Mauritius also provides a remarkable example of modern fertility reduction during the period which followed this "boom". Jones (1989) argues that the fertility decline was somewhat hindered by cultural composition, assisted only modestly by ongoing development, but aided significantly by family planning program intervention and by a remarkably wide recognition at government and individual levels of the diseconomies associated with population growth in a congested society.

It would seem a similar pressure occurred in the highly developed, but similarly congested island of Singapore, where "lack of natural resources, inadequate water supply and the virtual absence of agricultural land convey to residents a sense of precariousness and an awareness of environmental limitations. The pressure of population on resources is visible to the naked eye, so to speak, and is reinforced by frequent references to this problem in the press and in government policy announcements" (Fawcett and Khoo, 1980).

In the Gilbert Islands (now Kiribati) family size was formerly often limited by decree of the Island Council of Old Men. Since modern contact, the birth rate has increased and the delicate ecology of the islands can no longer support the people. As the consequences of overpopulation are so easily seen in the Gilberts, modern family planning was adopted with enthusiasm, and only four years after the start of the campaign in 1968 over one third of women aged 15-44 were using reliable contraceptives (Pitchford, 1977).

Pirie (1976) reviewed the Demographic Transition theory as applied to the histories of Melanesia, Polynesia, and Micronesia. He found that although these islands were inhabited fairly recently in historic terms, had few diseases causing mortality other than malaria, and had a climate with few crop failures and almost no natural disasters, that their populations do not experience the cyclical changes

of rapid increase followed by migration or increased mortality one would expect. Instead, evidence exists that such cycles never occurred and the population has remained relatively stable until recent times. Recent research suggests that fertility was not as high as has been assumed and in many Pacific societies was kept in close phase with the prevailing moderate levels of mortality. Post-Western-contact demographic histories are quite variable; but many have suggested that modern fertility control programs will succeed because they are a return to ancient tradition which the spasm of fertility induced by social and political disruption has obscured in recent years (Pirie, 1976).

Migration

Migration tends to be a prominent feature of island life. Typically the island does not offer enough employment or training opportunities for its young people, who tend to seek their fortune in the big cities of the world. Small islands, in common with rural areas, may also offer little cultural interest or cater for minorities, such as homosexuals. The increasing migration from the countryside to cities which is part of global urbanisation is to some extent responsible for population decreases in some island areas (Brigand *et al.*, 1990), for example the Kerkennah archipelago, Greece, and the Maltese island of Gozo (Giavelli and Rossi, 1990). Ex-islanders often aggregate in well-defined areas of large cities, such as the Cape Verdeans who now live and work in Boston, USA (Sandys-Winsch *pers. comm.*). A significant proportion of the Gross National Product of Cape Verde derives from nationals working abroad (United States Bureau of Public Affairs, 1986).

This migration is not entirely one-way however, with older islanders often returning to their island homes in mid-life or for retirement. Very highly-skilled professionals may return to the islands of their birth to find that they can not use their specialist, highly technological skills back home. At the top of the professional pyramid, the business people and lawyers may tend to move back and forth between island and mainland, as long as the island has a large enough economy to support their activities (Dommen, *pers. comm.*).

Significant immigration, both seasonal and permanent is a feature of islands which are exploiting their tourist potential, for example Skiathos, Greece (Giavelli and Rossi, 1990) and Gran Canaria, Spain (O'Shanahan, 1990).

In Indonesia historically 60% or more of the inhabitants of the archipelago have been concentrated on the island of Java, which comprises only 7% of the Indonesian land mass. The Dutch colonial government preferred a policy ("transmigration") which advocated the redistribution of population from Java to the other islands to relieve overpopulation. This policy continued to be favoured until 1966 when official policy shifted emphasis to national family planning programs (Hull *et al.*, 1977). The transmigration programme does continue, but in 1986 was deemed to have "hardly affected population distribution" (Kilapong, 1986).

Within the island of Sri Lanka (a very large island) population redistribution has been achieved by government policy, moving people from densely populated wetlands to dry previously uninhabitable areas, by investment in irrigation and infrastructure. These resettlement areas, however, remain less well served by social and health services (World Bank 1984, report 5218-CE, unpublished).

Migration from islands (and perhaps equally from continental areas) tends to be selective. The

educational attainment of outmigrants tends to be above average in the outer islands of Indonesia (Desbarats, 1989). On average, former Hawaii residents now living on the US mainland were of higher intelligence and educational background than Hawaiian residents who remain living in the islands. Differences were also found for number of children, cross-ethnic marriages, and occupational attainment in males. In addition, parents of US mainland residents scored significantly higher on measures of cognitive abilities and education than parents of current Hawaii residents (Johnson *et al.*, 1989). These findings tend to suggest that migrants within this setting tend to be those who are of higher educational attainment, which is likely to include health professionals.

The movement of highly trained medical and nursing personnel is a specific form of migration with relevance to the provision of health care. In 1989 the Philippine government reduced its health budget by one half, a situation which led health personnel to take on additional jobs or move overseas. The government itself funded a training programme for doctors to convert to nursing so they could work abroad and send home valuable foreign currency (quoted in the report of The Other Economic Summit in the Health Service Journal). This is discussed further under "Recruitment and Retention of Staff".

Economic situation

The remit of this review is so broad that the range of economies runs from those considered by the United Nations to be the amongst the Least Developed Countries (UNCTAD Secretariat, 1990) (e.g. Maldives, Vanuatu) to tourist resorts and tax havens (e.g. Jersey, Cayman Islands).

McElroy and de Albuquerque (1990) identify a history of periodic export booms, subsequent deflation and resource exhaustion, followed by chronic emigration as typical of small island economies. Many islands experience an increasing reliance on foreign aid, or subsidy from within their own country if part of a larger nation.

Special case study - Japan

Within Japan there are many islands which are remote and isolated, and lag behind the mainland in terms of socio-economic progress. In 1953 the "Remote Islands Development Act" was established for the purpose of improving conditions on those islands (Nakajima and Machida, 1990). Three further, more specific Acts have also been passed in the past 30 years to cover the island groups which were occupied after the second World War.

The Remote Islands Development Plans, covering 10 year periods have specific budgets for:

- (i) transport and communication
- (ii) conservation (of natural habit) - this includes disaster preparedness and amelioration
- (iii) promotion of local industry, agriculture and fisheries
- (iv) social and environmental facilities which covers a broad area including water supply, community halls, schools, parks, etc.
- (v) medical and welfare services

This legislation, coupled with policy initiatives, and subsidies to government services and facilities has helped reduce inequalities in income, but the smaller islands still tend to lag behind the mainland; in 1970 islanders' average income was 50% that of mainlanders, and in 1980 it was 61% (Nakajima and Machida, 1990).

The needs of the Japanese islanders are assessed every five years; the most recent enquiry revealed that islanders are anxious for improvement in the following 10 areas, in order of priority:

1. hospitals, 2. prices of commodities, 3. doctors, 4. roads, 5. traffic services between mainland and islands, 6. opportunities for employment, 7. agriculture, 8. traffic services within islands, 9. fisheries, and 10. income. (Nakajima and Machida, 1990).

N.B. Health services rank first and third in the islanders' priorities.

When a bridge, or land connection, is established between the "remote" island and the mainland, the island loses its designation and special privileges; this has happened to 32 Japanese islands to date (Nakajima and Machida, 1990).

Sustainable development in the island setting will often mean greater self-reliance and enhanced community participation. In the Caribbean, subsistence agriculture is minimal in most territories at present, and import bills for food are high and rising; greater than one billion US dollars in 1983. In many cases food imports are subsidised by foreign aid, and therefore subject to conditions imposed by donors. The promotion of local production of fresh vegetables, for instance, should be actively encouraged from a public health point of view, but could also be desirable from an economic point of view.

It is not only food aid which is a vital factor to some island economies, in the late 1970s capital grants from foreign donors accounted for up to 23% of the total government budget of Fiji, and up to 40% of that in Tonga (Newell, 1983). Dependence on external aid has caused some islanders to be reluctant to achieve political independence from the former colonisers, as in for

example the Dutch Antilles.

Public sector employment policies in the Caribbean have been as greatly influenced by the needs to reduce unemployment as by meeting real needs. Public sector expenditure on salaries and wages account for between 45% and 55% of national recurrent budgets on the smaller islands of the Caribbean, and even 40% on the larger islands such as Trinidad and Tobago (International Bank of Reconstruction and Development 1985).

Major disasters

In Dommen's (1980) comparison of islands with continental counterparts, he found that contrary to popular opinion, islands did not seem to be more prone to natural disasters, with the exception of hurricanes (Newell, 1980). However, in the case of many tropical islands which are prone to cyclones, earthquakes and floods, it is not so much the greater frequency of disaster, but in particular in the case of the island developing countries, the insufficient financial, human and physical resources to deal with the consequences which present problems (UNCTAD Secretariat, 1990).

Special case study- Sandwip island, Bangladesh

An example of a natural disaster with particular consequences for the health sector would be that of a cyclone and tidal surge which devastated this low-lying island in May 1985. Within one week a cholera epidemic broke out resulting in over 12,000 cases and 50 deaths (Siddique *et al.*, 1989). This island of over a quarter of a million inhabitants is only 271 km², with only a few kilometres of road, one health centre, and virtually non-existent public water supply and sewerage system. Although certain coastal parts of the island were affected first, the epidemic had covered half the inhabited parts of this island by two weeks. Cholera is an endemic disease in Bangladesh, and has a characteristic seasonal pattern, most pronounced after the monsoon season. However, other areas of Bangladesh did not report an epidemic at this time, and the outbreak occurred when incidence is usually lowest. The precise mechanism which led to the epidemic is unclear, but it seems likely that flooding facilitated contamination of ponds, and the general destruction caused people to resort to pond water for drinking purposes (Siddique *et al.*, 1989). The disaster was the catalyst which led the chronic public health problem of poor sanitation and inadequate safe water to erupt into an acute problem.

January 1, 1990 marked the beginning of the International Decade for Natural Disaster Reduction. This rather ambitious project would include such public health measures as effective disease surveillance to predict epidemics, and the timely immunization of young children against measles before floods are expected, and so on (Holloway, 1991).

The Pacific islands have a long tradition of regional co-operation, particularly after disaster strikes. The islands have different problems depending on their topography, for example after a hurricane, Tonga will have the problem of standing water, with its associated diseases, whereas other steeper islands suffer more from loss of vegetation and shelter (Dommen, *pers. comm.*).

When disaster does strike, health care planners may seize the opportunity to reorganise health services. For instance, Hurricane David destroyed the main hospital and numerous other buildings in Dominica in 1979. Since then a major reorganization has been underway to decentralize services and establish three levels of responsibility, and the delegation of authority to

the district level. A new category of worker, the "primary care nurse" has been adopted, to deal with the problems associated with limited funds, limited promotion prospects and reluctance of highly trained staff to serve rural areas (Carr, 1985).

HEALTH CARE

Health information

The most basic health information, that is records of births and deaths, for each nation and territory, is collected by the United Nations statistical office for inclusion in their demographic yearbook. Each nation submitting data is also asked to provide an estimate of completeness of the data. For those nations which consist of one, or very few, distinct islands, and which are relatively developed, health information can potentially be of high quality. Examples of such would be Malta/Gozo and Mauritius/Rodrigues. The clear boundaries make demarcation of the resident population relatively straightforward. However, very few islands come into this category, the quality of demographic data gathered on the Italian and Greek islands varies from "fairly acceptable" to "very poor" (Merlino, 1981). The reasons for poor data quality to some extent may be one of aggregation, that is, the pooling of data within one administrative region including island and mainland areas. Island groups with clear identities are more likely to have high quality data separated out for their island regions, e.g the Balearic and Canary Islands of Spain, which are regionally administered.

The fluctuations in island populations as discussed in the previous section have an impact on health information. For example, the tourism which is a major factor on many islands can greatly affect, for example, attendances at Accident and Emergency Departments. There is potential for error in the estimation of rates, if events are expressed rate over the permanent resident population, rather than using the transient population as a denominator.

Even in highly developed affluent nations one can find a dearth of local data, for example, the Isle of Man, which is a Dependency of the British Crown, although not part of the United Kingdom, was found not to compile and publish statistics of notifications of infectious diseases, not to calculate life expectancy, and not even to monitor the extent to which specialist services in the UK were used until recent changes in UK legislation made such monitoring essential (Liverpool University Health Planning Consortium 1991).

Health research on islands

The clearly demarcated boundaries which islands possess, and the fact that some islanders can be easily identifiable by continental populations [by virtue of their language, accent, or names (Bojholm and Stromgren, 1989)] have led many researchers to use island populations for epidemiological studies. "Island populations have a great deal to offer the medical geneticist, ranging from the curiosity value of their individual diseases to the elucidation of the genetic contribution to aetiologies of specific disorders and the understanding of the complexity of morbidity patterns" (Roberts and Beighton, 1986). Examples include:

Multiple sclerosis in the Shetland Islands (Cook *et al.* , 1988), Prevalence of cardiovascular diseases in the Kingdom of Tonga (Sawata *et al.* , 1988), Prevalence of hepatitis B surface antigen and antibody in the Cook Islands with reference to difference in rates between islands (Hiraiwa *et al.* , 1987). High frequency of beta thalassaemia in a small island population in Melanesia (Bowden *et al.* , 1987). Geographic patterns of parkinsonism-dementia complex on Guam 1956 through 1985 (Zhang *et al.* , 1990). Evidence of immunity induced by naturally acquired rotavirus and Norwalk virus infection on two remote Panamanian islands (Ryder *et al.* , 1985).

Islands may be used as models, the continents in microcosm; Vittachi (1977) suggested that an 'island approach' could be used in larger countries to break up

problems into manageable size. He cites the areas which had shown the greatest fertility declines from the mid-sixties to the mid-seventies as Singapore, Hong Kong, Barbados, Mauritius, Sri Lanka, Cuba, Trinidad and Tobago, Fiji, Costa Rica, and Chile, and goes on to describe the factors associated with their success:

- 1) geographical accessibility;
- 2) high literacy;
- 3) political will;
- 4) equal opportunities for education for women and new economic roles;
- and 5) distribution of economic gains to all through free education, medicine and health care, and greater opportunity.

He does not make the point that the territories he cites also had some of the earliest family planning programs. In Mauritius, fertility rates dropped with the availability of family planning but with an increase in unemployment and economic and political uncertainty (Anonymous, 1979, Jones, 1989) as described in greater detail earlier.

In the overview of the recent book "Sustainable Development and Environmental Management of Small Islands", Hess (1990) suggests that although small islands may not profitably be considered continents in microcosm, island futures might be likened to global futures in microcosm. Taking this theme into the realm of health care, a model care package for AIDS sufferers, largely based in the community, which was developed in San Juan, Puerto Rico (population 500,000) is suggested as capable of transposition to larger areas, namely the Dominican Republic and Brazil (Kouri *et al.*, 1991). The implication is that if the model is tried and works in the small geographic area, it will work in the larger area. It is likely, however, that much more than the geography will need to be taken into account, and perhaps certain caution is needed before extrapolating findings from small unique situations to larger areas.

Health Care Budgets

The budget available for the provision of health care is obviously related to a much greater extent to the national economy in which an island finds itself than to its geography. Nevertheless, we might expect that islands would have to spend more to achieve the same the provision of services which mainland communities enjoy for any given economic status, due to the diseconomy of scale and transport problems alluded to above. It is likely that all machinery and all drugs would have to be imported to most small islands.

The Caribbean islands tend to be small, and have small budgets available for health services. The largest proportion of expenditure, as in almost any health service, is for personnel. This achieves the desirable social goal of creating much employment for a given investment. However, during recession when budgets may retract, the impact on services can be "huge - the physical plant breaks down, essential supplies become short and there is a fall in morale among the staff as their ranks are eventually reduced" (Pan American Health Organization, 1986a). The problems imposed by small size and a fragile economy often based on one or two export crops and a limited resource base have been addressed to some extent by regional economic cooperation, in the formation of such bodies as CARICOM (the Caribbean Community).

Differences in health care budgets between the different regions of Spain however, show that both island regions, the Balearics (Balears) and the Canaries (Canarias), fall within the national distribution, slightly above the median spending level, lower than Madrid (Somoza *et al.*, 1990). Both the Balearics and the Canaries have doctor consulting rates which fall within the national range (Enriquez and Poyatos, 1990) and achieve a 96% coverage of their population with health care services, which again is within the mainland distribution of coverage (Somoza *et al.*, 1990). This would tend to suggest then, that if a certain threshold population is achieved, perhaps supported by a larger infrastructure (for bulk purchasing, trade agreements and so on) that neither small size nor insularity will of necessity lead to a much greater expenditure on health care.

Health Care Systems

As Taylor (1989) has pointed out, health services serve two distinct functions, the first being the humanitarian function of caring for the sick, and the second that of preventing illness and disability in populations. Both functions are desirable, and what any society would strive to provide. The relative mix of the two is an outcome of historic and economic factors, coupled with prevailing attitudes of health professionals and patients (Taylor, 1989). The unique features to be sought in health care systems on islands might include:

Primary Health Care

Increasingly governments are appreciating the health gain which can be achieved from shifting the focus away from highly expensive hospital care and shifting orientation towards primary care. In the developing world much co-ordination is still needed between governments and non-governmental organizations (NGOs) - a new programme formulated by the Indonesian government and the United Nations Development Programme (UNDP) to better serve the remote islands of Indonesia has the three following aims:

- (i) identification and development of appropriate health interventions relevant to the geographical remoteness of various islands, as well as local traditional values,
 - (ii) strengthening existing health information from both government and NGOs to provide primary health care
 - (iii) community development
- (United Nations Development Programme and Government of Indonesia, 1991).

Special case study - Kiribati

A good example of what can be achieved is that of Kiribati. In 1978 the health status of the population of Kiribati was described as one of the worst of the Pacific region. This was attributed to the inappropriate delivery of vertical programmes; a legacy of the colonial system, limited resources and shortage of trained staff. Since adopting the primary care approach in 1981 morbidity has decreased, as has hospital utilisation, and uptake of family planning has continued to increase. Communities have been facilitated to identify their own health needs, and by mainly voluntary effort have tackled problems on a number of fronts, e.g. building latrines and improving water supply, gardening for better nutrition and imposing penalties for the abuse of alcohol (Tira, 1988).

A commonly faced problem (not specific to islands!) is that there is disagreement over what exactly primary care¹ is, e.g. The Chief Medical Officer of the Solomon Islands in his guide to

¹ The Alma Ata Conference in 1978 endorsed the goal of Health for All by the Year 2000, and declared primary health care to be the mechanism for achieving this goal. The eight elements of Primary Health Care, as defined by WHO are: education, food supply and nutrition, water supply and basic sanitation, maternal and child health, immunisation, prevention of endemic diseases, treatment of common diseases, and the provision of essential drugs.

the newly recruited ex-patriot doctor describes the confusion between "first-contact" care, and Primary Health Care (PHC) which would involve a much broader range of activities including health education, community participation and health promotion (Baker, 1982). In the Kiribati example above, difficulties were encountered with senior staff in the Ministry of Health not appreciating the concept and principles of the Health For All strategy (Tira, 1988). As Finau (1988) suggests in a recent editorial in the New Zealand Medical Journal, health professionals may oppose primary health care as they believe that it will decrease their income, status and influence.

Ideally, a graded hierarchy of regional service would consist of small local units for primary and personal preventive care, intermediate units for mass public health services and special care to back up the general care of the local unit, and regional centres for more specialised care (Terris, 1989). Such a system is in operation in the Caribbean island nation of Dominica (Government of Dominica, 1989). These regional centres might be located off-island, on another island e.g. Jamaica serves much of the Caribbean, or on a nearby continent e.g. Miami similarly serves the Caribbean for specialist services. Such a system clearly relies upon "Regional co-operation" (see later).

Taylor's (1983) description of the prospects and constraints of the prevention and control of non-communicable disease in Pacific Islands would apply to many other island states. Community-wide strategies for reducing levels of risk factors generally do not require large medical staff numbers, and often would be beneficial to other areas of island life, for instance promoting the consumption of local food. Malnutrition in the Pacific arises partly because local production of fish and other foods is strongly export-orientated and imported foods are often of inferior nutritive value (Kent, 1987).

A further problem with regard to local food is that of ciguatera poisoning. This phenomenon is caused by a toxin in the flesh of fish which have eaten certain plankton, and seems to be associated with certain forms of environmental degradation, for example sea pollution caused by aluminium smelting in Australia. The frequency of ciguatera poisoning has been particularly high in the areas of the Marshall Islands and in French Polynesia that have been most affected by nuclear tests. Because of their fear of ciguatera poisoning the islanders have abandoned their traditional food sources (Maddocks, 1988).

The Marshall islands in the Pacific were the site of US atomic tests in the 1940s and 1950s. Western-style hospitals (one 85 bedded, the other 35 bedded) were set up to provide follow-up care for the 8000 residents directly affected by nuclear fall-out, and general care for the population. In the late 1980s the hospital administrator noted that the most prevalent health problems were those caused by poor nutrition (Western junk food) and infectious diseases spread by poor sanitation, emphasising the need for primary care (Hume, 1988).

A medical school has been established on San Vincent, Grenadines to train large numbers of doctors, chiefly from the United States, but also from Nigeria and various other countries. Cadavers are imported from Guyana, as the local population is too small to provide sufficient numbers. The locals tend to be in favour of such medical schools, as they bring in medical expertise which would otherwise never be encountered in such a small and remote area (Hein pers. comm.). There is a danger that such a development may be at the cost of failure to develop primary care.

Comprehensive health care may have been preceded in many areas by family planning initiatives or programmes. For example, in Indonesia, the family planning program was extended to the

villages in 1975 through the establishment of village contraceptive distribution centres (VCDC) and subvillage family planning groups. Later, integrated projects in family planning, parasite control and nutrition were implemented in two pilot areas (Anonymous, 1979). Since accepting the Health for All 2000 strategy in 1981, many nations have demonstrated increasing commitment to primary health care. The government of the Maldives increased the health sector budget from 6% of GNP in 1989 to 13% in 1991, and the entire increase is in primary health care (WHO unpublished).

Accessibility

In a paper prepared for the Commonwealth Secretariat into the Special Health Problems of Island Developing and other Specially Disadvantaged Countries, Newell (1980) suggested that special emphasis be given to those areas where significant parts of the population live in communities of 2000 or less and where reasons of geography prevent access to a secondary health care facility by more than 24 hours of travel, or only at prohibitive cost. He suggested training and supporting at least one resident in how to treat the "usual" conditions, and communication with medical and pharmaceutical support staff to manage the "exceptional" - with recourse to transfer to secondary facilities for the rare acute emergencies.

Maternal mortality in the 10 regions of Greece during the period 1973-82 was compared (de SanJose-Llangueras *et al.*, 1988). In Greece as a whole, maternal mortality declined, but the standardized maternal mortality ratios (SMRs) of 2 regions were significantly raised; Thrace and the Aegean Islands. Regions with the highest proportion of hospital births had the lowest SMRs; topographical factors, in the case of the Aegean Islands and Epirus, may have influenced maternal mortality by adversely affecting maternity service usage and availability (de SanJose-Llangueras *et al.*, 1988).

There were estimated to be over 103,000 tourist beds on the island of Gran Canaria, Spain, in 1985, of which 80% are located in the south of the island. At least two million visitors came to the eastern Canary Islands in 1987 (O'Shanahan, 1990). This has very important ramifications as to where to site a new district general hospital on the island of Gran Canaria, with competition between the localities with large tourist sectors and the other sectors. The resident population has grown very rapidly in the southern part of the island from 50,000 in 1960 to 120,000 in 1981 and is projected to reach 180,000 in 2000. To help inform the island's health care planners accessibility to each of the potential sites has been estimated in a number of ways, including calculating the distance in kilometres, minutes of travel and cost in pesetas (O'Shanahan, 1990).

Generalist/specialist balance

A review of the emergency medical services on the small Italian island of Ponza led the authors to reaffirm the importance of having experienced generalist physicians to work in isolated communities, as even with an Air Rescue Service, the delays and risks involved, let alone prohibitive cost, meant that immediate non-specialist attention was of greater benefit than potential specialist care later (Crucitti *et al.*, 1983).

When specialist anaesthetic services are not available, it is common to use local anaesthetics (including epidural and spinal anaesthetic) to avoid complications, for example, in Tuvalu only 10% of surgical cases receive a general anaesthetic (Leppaniemi, 1990). When a general anaesthetic is required, it is safer to use ether than the modern halogenated anaesthetics which require compressed oxygen and expensive machinery (Apelgren *et al.*, 1985). It is also

recommended that a good library as a reference for medical and other staff is indispensable when specialists are not available to give advice (Apelgren *et al.*, 1985).

A unique programme to train and support hospital-based rehabilitation generalists on Pacific islands has been successful. Prior to this, referral off-island for physiotherapy or occupational therapy was the only (very costly) option in most of Micronesia, with little or no follow-up. The purpose of the programme is to provide a stable corp of indigenous rehabilitation "technicians" to evaluate and treat people with uncomplicated physical disabilities. No specific educational requirements are prerequisites, but the health services of the islands involved must guarantee to employ the technician once trained. Any adaptive aids used must be culturally appropriate, and the training takes place largely on the trainees island, and in the hospital where they will be working to ensure that the training bears close relation to the actual practice (Hartung *et al.*, 1989).

Communication difficulties

In 1985 the First World Telecommunications Conference held in Arusha, Tanzania, issued the Arusha Declaration, which as the Alma Ata Declaration called for Health for All by the year 2000, called for easy reach of telephone and other telecommunication services for the whole of mankind (sic) by early next century. The achievement of this aim could have very great benefits for the health of communities, both in the form of two-way communication (for consultation, continuing education, administration and coordination and for social interaction) and in one-way communication such as mass media (for health education messages).

Small islands must bear the increased costs of transport; they suffer this problem more acutely than small countries within continents where costs of airports and deep water ports can be shared with neighbouring countries. Remote island dwellers were found to pay up to 20% more for goods than people in major island port towns (Couper, 1990). During the 19th Century many small islands enjoyed fairly good shipping services, if somewhat *ad hoc* in nature, and this tended to continue until the 1970s. However, modern shipping is largely conducted in very large vessels carrying containerised cargo, and visits to small islands are no longer economically viable, or in some cases even possible (Couper, 1990).

Therefore, Ministries of Health may increasingly find that they have to finance transport to remote areas, or at least contribute to a service run by another government ministry or private firm. A new programme to strengthen primary health care in the remote areas of Irian Jaya and Maluku, Indonesia, is for instance to include providing a fleet of small boats with outboard motors and the crews to run and maintain these boats (UNCTAD, 1990). Also in Indonesia, cooperation between health facilities and licensed radio organizations (including amateur radio, search and rescue, police and fire service radio) has proven very helpful for medical and administrative purposes.

The Commission of the European Communities (EC) is sponsoring a project through it's AIM (Advanced Informatics in Medicine) programme, entitled "Telematics to support medical personnel administering first aid and/or emergency care in remote areas". A system is currently in operation between Sismanoglion Hospital in Athens, and three other units, one located on the island of Paros, some 120 km from Athens. The existing Greek telecommunication network is utilised, and medical images (for example X-rays) of sufficiently high quality can be transferred over one to two minutes for compressed images, and eight to 15 minutes for non-compressed images. With the resolution possible in the current system, distant physicians can reach the same diagnosis as can be made from the original film in the vast majority of cases (Commission of the

European Communities, 1990).

Communication channels

It is vitally important that non-medical staff are trained to assess when medical attention is needed, and that channels of communication are established for expert advice.

Special case study - Grimsey island, Iceland

Dr Olaffur Oddsson, who formerly provided care to the population (about 120 residents) of Grimsey, north of Iceland, advises that it is important to have a key person on the island who will take a look at anyone who is ill and speak directly to the medical officer on the telephone. He also stresses the importance of the medical officer always answering the telephone when calls come in from that individual, to ensure continuity. Doctor visits to the island should be regular on a set day, so that the population know and can rely on that visit. He also advised that the decision to move people by boat or air ambulance should be made by a doctor whenever possible, to ensure rational use of this very expensive resource. Drug supply is a critical issue, and the doctor responsible for care should choose drugs and method of administration carefully to match the skills of the local population (e.g. whether or not injections can be given).

In the study of emergency care on Ponza, cited earlier, a telephone link with a polyclinic and therefore use of a special computer in Rome, enable diagnosis and appropriate therapy to be commenced without the patient, who may be too ill to be moved safely, leaving the island (Crucitti *et al.*, 1983).

Reliable non-medical personnel, such as the village teacher, can often provide a link in the communication chain. For instance, the local school may be used as a drug distribution centre, especially for vertical programmes such as malaria control, where wide coverage with one or two drugs is to be achieved (Andaman and Nicobar report, WHO, unpublished).

Professional isolation

Professional isolation is common in the more highly-trained staff who work on small islands. Oberoi (1989) asserts that Pacific islanders who go to Australia and New Zealand to train in specialties such as anaesthetics will experience conditions far more sophisticated than they are likely to experience at home for many years, so that although they may receive a better training, it is not always relevant to their home environment and may lead to frustration on return. This has led to a policy in the past (e.g. in the Fiji School of Medicine) of encouraging the most highly ambitious young medical students (or potential students) to go elsewhere, as the investment in their training was to some extent wasted if the newly-qualified doctors sought employment off the island. In addition, the best "Fiji-doctors" were those who had the personal qualities which enabled to cope with doing very little when very little could be done (Dommen, *pers. comm.*)

Links with larger population centres for training, consultation and social interaction help to avoid professional isolation. For example, in the case of anaesthetics in the Pacific islands, Oberoi (1989) suggests (a) organising regular visits of senior teaching staff from Australia and New Zealand to various teaching centres, (b) accepting qualified anaesthetists working in the small Pacific states as members of the Australian or New Zealand Society of Anaesthetists (c) providing short-term locums for Pacific island anaesthetists in Australia/NZ, and (d) encouraging

anaesthetists from Pacific islands to present papers related to the conduct of anaesthesia in their local circumstances. The Report of an Expert Group into "Special Health Problems of Island Developing and Other Specially Disadvantaged Countries" (Commonwealth Secretariat, 1980) stated that significant numbers of specialists working in Sydney would welcome the opportunity to spend two or three months in various Pacific islands while the specialists from those countries attended refresher courses abroad.

In the United Kingdom, the post for a Director of Public Health in the Western Isles (Scotland) recently advertised was linked to an academic appointment at the University of Glasgow as an incentive to applicants. Six months later, however, the post was still unfilled.

Traditional medicine

Respect for local practices is a desirable feature of all health systems, although not all effective health systems have integrated traditional medicine, for example in Cuba where almost exclusively modern scientific medicine is now universally available (Terris, 1989). Well-meaning foreign donors may not understand the maintenance cost of beds and equipment they donate to e.g. Pacific island cultures, let alone the disturbing social implication that sleeping on the floor is bad and nonprogressive (Finau, 1988).

Pedersen and Baruffati (1985) conclude their review of "Health and traditional medicine cultures in Latin America and the Caribbean" by stressing the need for closing the gap between the social and medical sciences in order to reach a better understanding of the health needs of the population. They call for work towards the creation of a bio-sociocultural model in an attempt to enrich health care systems qualitatively in the development of more humane and efficient interventions, both in the clinical field as in the field of health policies and strategies (Pedersen and Baruffati, 1985).

Traditional medical service is coexistent with modern medicine in Fiji, and might play an extremely important role in providing health care for rural communities in the same way as modern medicine (Tomari *et al.*, 1989). Traditional birth attendants and healers have been trained, local treatments are used, and many other practical and culturally sensitive ideas have been employed in a project covering 250 islands in the Sulu Archipelago, Tawi Tawi, Philippines (American Public Health Association, 1979). In the 1970s in the Philippines, 70% of the population lived in rural areas, but 65% of physicians lived in urban areas, and almost all hospitals were in metropolitan Manila (Opilas, 1977). The Philippine government sanctioned the traditional birth attendants (hilots) particularly in areas where paramedical workers are not available as long ago as 1955. The Philippines Department of Health and the WHO initiated a training program for 9000 selected hilots, to enable them to handle maternal and health situations in rural areas in the absence of physicians or nurses. In 1974 a survey identified more than 31,000 hilots, who assisted about 40% of all births in the islands (Opilas, 1977).

Using readily available, and therefore culturally familiar equipment when possible is desirable. For instance, some rehabilitation technicians in the Pacific have used bamboo poles to construct parallel bars to assist paraplegic people to move around their homes and garden plots (Hartung *et al.*, 1989). Similarly natural shallow water ponds can be used for hydrotherapy, and waste plastic bottles filled with sand used as weights (Hartung *et al.*, 1989).

Flexibility

Flexibility in staffing and working arrangements is vital in small remote areas. This may mean staff taking on more responsibility than would be expected in people in similar positions in less remote areas (as in Lasqueti, described below) or the authorities making special cases for the island situation (as in the Scottish islands in the last century).

Lasqueti is a small island in the Gulf of Georgia, Canada, with a population of around 350 permanent residents (increasing to 1000 in the summer). There are no doctors on the island which is served by a foot passenger ferry 5 days a week; there are no major roads on the island, and most of the homes do not have indoor plumbing or telephones. A registered nurse who is resident on the island is paid by the local health insurance organization (Medical Services Plan of B.C.) as the first point of contact for the residents should they have a major or urgent illness. MSP will only enter such an arrangement with a nurse practitioner when there is no doctor in the area (Bergkvist, 1985).

In the last century, Britain introduced the Poor Law (Amendment) Act of 1845, which allowed for proper medical attendance of the poor, and encouraged the appointment of a medical officer to care for 'paupers'. However, money had to be raised from the local parish (local government level) to meet that from central funds. This system was most readily taken up in the parish of Westray on the Orkney islands, Scotland, where the doctor received an inordinate amount of money to care for the one official pauper - the understanding being without this subsidy, the doctor could not afford to remain and provide care for this remote population (Hamilton, 1987).

Radical social policies have been notable in the north of Scotland - an area of remote highlands and numerous small islands. The Highlands and Islands Medical Scheme was such a radical initiative; started in 1912, it long predated the National Health Service in Britain, but ensured full coverage of its isolated catchment population. This policy was adopted as a response to the migration from remote areas to lowland urban areas which meant that it was difficult to support a desirable number of doctors (Hamilton, 1987).

An interdisciplinary approach and co-operation in research projects is seen as essential for the rational management of small islands by some authors (Giavelli and Rossi, 1990). Similarly, "one of the advantages of small states is that at the Cabinet level the distribution of responsibility is such that several ministries/departments are allocated to one minister, which facilitates the intersectoral collaboration that is fundamental to the politico-administrative structure" (Pan American Health Organization, 1986b).

Balance between on-island provision and sending islanders elsewhere

The appropriate balance between island residents being sent elsewhere for treatment, and visiting health care staff being brought in, will depend on the individual circumstances. In the first ten years of Tuvalu's independence, 29% of the surgery was performed by visiting surgeons (Leppaniemi, 1990), while one per cent of surgical patients were sent abroad. It is estimated that in this population of 8500, one patient per year will require treatment abroad. Teams of visiting surgeons and anaesthetists are considered to be of most value for services such as ophthalmology (Leppaniemi, 1990).

French Polynesia, made up of 118 islands in 5 archipelagoes, has undergone major social changes in the last 30 years. The population has increased and urbanized, from 58,200 in 1946 to 180,700 in 1986, doubling between 1966 and 1986, with a 3% annual growth rate in the last 10 years. Tahiti's population reached 70% of French Polynesia's total population by 1983. Levels of health

care have improved for certain sectors of the population, but health service allocation is inequitable. Although Tahiti has 70% of the population, it has 82% of the physicians, 96% of the chemists, 78% of the dentists and 85% of the hospital beds of French Polynesia. Medical evacuations from the surrounding islands to Tahiti were seen as the solution to making health care accessible to the rest of the population in spite of the high cost in the early 1970s (Temporary Commission on Population Stabilization: State of Hawaii, 1972).

The health service of the Andaman and Nicobar islands, India, estimate that of their population of just under 200,000, about 200 will require transfer to the mainland for treatment during the course of a year (WHO, unpublished). Most of these cases will go by boat, but a few emergencies are sent by air, costs being met from a discretionary fund of the Lieutenant Governor.

Regional Cooperation

Regional cooperation is often found to be the best option for reinforcing the efforts of small and disadvantaged countries, or of small populations not reaching the critical mass needed to make the provision of specialists or expensive facilities viable. These problems apply equally to other public services such as education, and frequently island groups form consortia for the provision of e.g. tertiary education (the Universities of the South Pacific and the West Indies) The report of an expert group into the special health problems of island developing countries in 1980 stressed the importance of communicating decisions taken at regional level downwards from the ministries of health, and of a clearly identifiable "regional presence" in each of the individual countries (Commonwealth Secretariat, 1980). The same group had found that once established, functional cooperation for health purposes tended to continue despite setbacks to regional cooperation in other fields, and that donor agencies were inclined to respond favourably to requests for assistance with regional schemes.

The future of the Fiji School of Medicine (FSM) has been the subject of much debate in the last two years; principally the extent to which it should exist as a regional facility, and the extent to which it is solely to serve the residents of Fiji. Four models have been suggested (which could be appropriate in other island areas):

- (i) FSM as a directorate of the Fiji Ministry of Health
- (ii) FSM as an institution jointly owned by international organizations (such as UNDP, WHO, etc)
- (iii) FSM as an institution jointly owned by the governments in that region of the Pacific i.e. a truly regional institution
- (iv) a transitional model, aiming to achieve (iii) eventually, but maintaining links with the Fijian Ministry of Health in the interim period.

Recruitment and training of personnel

Great difficulty is often experienced recruiting certain categories of the more highly-trained staff, a problem which may lead to radical solutions. The Andaman and Nicobar islands in the Indian Ocean suffered a chronic shortage of medical personnel, particularly specialists, to the extent that 20 posts remained unfilled for a number of years. To overcome this the Island's administrators appealed to the (Indian) mainland government, and are now sent medical staff from the Defence Services on rotation (WHO, unpublished).

"In the Caribbean, it is recognised that territories with populations of 50,000 to 120,000 need a basic comprehensive hospital service. In most cases it is difficult to recruit a medical administrative officer from among the citizens, and they have had to rely on retired expatriate

officers. Many of these are not experienced medical administrators, have found local problems insurmountable, have not been able to appreciate the local situation and susceptibilities and have retired into the job for the contract period. Governments must consider what they want from these posts, and consider whether it is essential for these functions to be performed by a medical doctor. Training must not be equated with short courses. In most of these territories there is provision of a consultant general surgeon, a gynaecologist/ obstetrician, a physician, an anaesthetist, and sometimes, a paediatrician. Problems arise when one of the officers is on leave; second officers, who are not necessarily as highly qualified should be able to cover. In obstetrics and paediatrics the officer should have responsibility for maternal and child health of the community, and not be restricted to the hospital service. The three main problems for hospital services in territories of this size are:

- (a) providing adequate cover in the main disciplines
- (b) providing service in more specialist areas, e.g ENT, ophthalmology and dermatology
- (c) providing reasonable diagnostic facilities." (Annamunthodo, 1980).

Special case study - Leyte, Philippines

The Institute of Health Sciences was established on the island of Leyte in the Philippines in 1976 for the specific purpose of training health personnel for work in the depressed and underserved areas on the islands of Leyte and Samar (Bonifacio, 1979). The Institute differs markedly from other medical institutions in terms of recruitment policies, training procedures, and goals. The key elements in the program include 1) the recruitment of students from the depressed areas ultimately to be served by the program; 2) a ladder type of training program which permits students to progress through various levels of medical service certification from health worker to physician; and 3) the punctuation of academic training with periods of in-service work back in the student's community of origin. It is expected that most of these individuals will elect to return to the depressed areas because 1) the trainees grew up in low income, rural families unlike their counterparts at other institutions; 2) the trainee's ties with his village of origin are constantly reinforced by the in-service training built into the program; 3) the students are accorded high prestige in their communities; and 4) the Institute instills in the students a sense of social responsibility.

Distance education

Distance education has the potential of widening opportunities for people who cannot get to a school or higher educational establishment, and brings in resources from outside, however the lack of feedback and possible isolation are discouraging (Bacchus and Brock, 1987). A successful example of distance education of health workers is provided by the University of the West Indies Distance Teaching Experiment (UWIDITE). This project links the 3 main campuses of the University (Mona, Jamaica; St Augustine, Trinidad; Cave Hill, Barbados) to each other and to the University's extramural departments in Antigua, Dominica and St Lucia. Communication between Jamaica and Trinidad is via INTELSAT satellite, while the other centres are linked by microwave, UHF and tropospheric scatter systems. Each centre has a studio equipped with microphones, speakers, telephone headset, switching unit, slow scan TV unit for transmitting still pictures, and telewriter for transmitting written messages. The system is in regular use as a means of holding two- (or more) way meetings between individuals or groups in the studios, and in the educational field as a means of holding tutorials, training courses in a variety of subjects (e.g. reproductive health) or case discussions (Jewsbury and Deering, 1986).

The Nurse Education Centre on the island of Guernsey, Channel islands, is linked to the Solent School of Nursing in the UK via an audio-visual link which allows nursing students to actively participate in lectures as they are being given (Williams, *pers. comm.*). Such high technology, and therefore expensive, communication media may not be an option to many islands with a Third World economy, but the principles of regular communication, even if by letter or the occasional radio contact, remain as pertinent.

OTHER SPECIAL FEATURES WHICH AFFECT HEALTH

Strategic position

Historically, there are numerous instances of the military of world powers using islands for strategic purposes. A recent example which affected the health of one small population was that of the atoll of Diego Garcia, whose 1800 inhabitants were deported to Mauritius in the 1960s by the British government in preparation for a US military base. The displaced islanders, or *Ilois*, were abandoned in poverty and forced to adopt a completely different life-style (Madeley, 1985). Similarly the inhabitants of Kwajalein in the Marshall Islands suffered as much as those of Eniwetok, not from fall-out but from being displaced from their homes and crowded onto nearby Ebeye so the USA could continue to test nuclear weaponry in the lagoon (Maddocks, 1988).

This military presence may arguably have advantages. During the 1956-1976 period the (British) Royal Air Force occupied an air staging station which resulted in an increase in material and health prosperity, mostly affecting Hittadu Island, a Maldivian Island (Ree and Dyson, 1979). The demographic data reveal that during the period of access to Royal Air Force medical technology, a rapid increase of population occurred on Hittadu. Although the Maldivian population on the other atolls also increased during this period, it did so at a slower rate. The presence of the Royal Air Force was associated with a rapid increase in economic welfare in addition to population growth. "The withdrawal of RAF facilities, without replacement by an alternative system of care, will probably lead to an increased mortality" (Ree and Dyson, 1979).

Small islands have relatively large coastlines, often with numerous inlets and bays, which renders them particularly vulnerable to penetration and attack. Several of the Indian Ocean states, Maldives, Seychelles and Comoros have been subject to mercenary attack (Searwar, 1990). There is likely to be little the health sector can do about this vulnerability *per se*, but establishing broad-based primary health care with a strong emphasis on health education and empowerment of communities may enable them to survive such intrusions with less resultant health damage.

Acculturation

Due to the insularity of island life, islanders often maintain a "traditional" way of life to some extent. The Shetland Islands (UK) home to a rural, isolated North Sea community of fishing, farming and knitting, became home to the largest oil port in Europe in 1984. A study was mounted to assess the impact of this change on the mental health of the community, and no significant increase in symptoms was found, but alcohol consumption increased in the young men as their income increased (Voorhees *et al.*, 1989).

The consumption of high levels of alcohol is perceived to be a common behaviour of the small islands of the British Isles. A lifestyle survey of the tiny Isles of Scilly, comparing it to the nearest part of the British mainland, Cornwall, found a higher proportion of men and women drinking above the British national recommended sensible levels (Miles, 1991). A similar survey in the Isle of Man found that although half of the respondents thought that people on the island drank quite heavily, in fact a smaller proportion reported drinking above the British "safe" levels than the British population (Pearson and Dawson, 1991). Policy makers on such small islands need to be aware of the health consequences of excess alcohol consumption, and consider whether to use price control to restrict consumption.

Micronesians and Polynesians appear to have a genetic susceptibility to diabetes which is unmasked by environmental factors associated with "modernisation" such as changes in diet and

exercise (leading to obesity) and possibly "stress". Melanesians have a relatively lower prevalence of diabetes, even under similar environmental conditions to those which are associated with the disease in other Pacific ethnic groups (Zimmet *et al.*, 1980). A study in 1974 showed six Solomon island societies to show the lowest prevalence of clinical evidence of coronary heart disease than that recorded in virtually any other population (Page *et al.*, 1974). However the island groups who had modified their traditional diet to include more meat, salt and tinned goods did show higher levels of serum cholesterol and uric acid than those with a traditional diet (Page *et al.*, 1974). Such cultural change has a very direct relevance to the changing pattern of morbidity in such areas, and health care and other government planners will have to be prepared for a shift from a largely infectious disease pattern of morbidity amenable to vertical control measures, to an approach centred more on health promotion for the control of non-communicable disease.

Isolation

In the more isolated communities contact with outsiders, frequently European sailors, in populations lacking previous exposure to certain infectious pathogens (such as measles) led to grave epidemics in the past. For instance in the Pacific islands, tuberculosis, measles and diphtheria were unknown prior to the first European visits in the sixteenth century. Leprosy is commonly thought to have been introduced during the 19th century and can still be considered as a public health problem in Vanuatu (Montaville and Bouree, 1989) and other Pacific islands.

Tristan da Cunha is one of the most isolated islands in the world, being in the middle of the South Atlantic some 3000 km west of Capetown. It supports a population of less than 250 inhabitants, in seven families. An epidemic of "hysteria" struck the island in 1937, which was chronicled by visiting Norwegian doctors and a sociologist. They suggested that the isolated monotonous life, regulated by many unwritten laws and moral codes, which the islanders lead may predispose to hysteria, and that such behaviour satisfies a hunger for events (Rawnsley and Loudon, 1964).

This very isolation can however be an advantage, it has been estimated that 80% vaccination coverage of two years olds against Pertussis in St Lucia in the Caribbean would eradicate the disease by reducing the available herd to the pathogen to a level beyond which it can be sustained (Cooper and Fitch, 1983). Vineyards on Mediterranean islands were sheltered from the pest Phylloxera which destroyed the continental grape harvest for several decades, giving the islands a considerable economic advantage until the pest finally arrived and destroyed the crop completely (Vernicos, 1990).

The Cubans have adopted a somewhat controversial approach to (allegedly) control the spread of the AIDS virus, in that residents are compulsorily tested and then quarantined if found positive (Bayer and Healton, 1989).

The social isolation which some small islands experience may attract certain types of people. In the developed countries such as Canada and New Zealand, it is often those seeking an "alternative" lifestyle, perhaps rejecting some of the technology and values of mainstream society, who move to such areas. This may affect the type of health services which are appropriate. On Great Barrier Island, New Zealand, the permanent population of about 800 people are served by a part-time general practitioner with one practice nurse, and 1.8 full-time equivalent public health nurses, who are also midwives. Mental health services are provided by a visiting therapist

(Sinclair, *pers. comm.*).

It has been suggested over many years, that the effects of a low gene pool may lead to certain genetic disorders in island populations, or even genetic strengths. High rates of outmigration and low rates of marriage between islanders and non- islanders have been found to lead to a small effective population size in a small Japanese island (Masaki and Koizumi, 1988). Similarly on a small Caribbean island high rates of celibacy and emigration reduce the gene pool to only 40% of what it could be (Leslie *et al.*, 1981). This situation leads to an increased likelihood of genetic drift in the remaining population.

The island of Sanday, one of the Orkney islands, Scotland, had a population of 2250 in 1861, but this steadily declined, to only 750 in 1961. Ironically, despite the population decrease, greater genetic heterogeneity is found in the present day than last century. This is due to fewer consanguineous marriages and greater migration (Brennan, 1981).

However, there is little documented evidence of either of these genetic effects (reduced or increased gene pool) having an impact on the health of island populations, most studies merely speculate that differences found between island and continental populations may be due to genetic factors. It is unlikely that "genetic factors" associated with island life will have any impact on the provision of health care services.

Kinship networks and resistance to outside influence

It is difficult to formulate and evaluate policies on their own merits when islands have small populations and extensive kin networks (Hein, 1990b). Nepotism tends to be common. A nurse practitioner living in an island community of only 350 people finds it especially difficult to maintain confidentiality (Bergkvist, 1985).

Special case study - Isle of Man, British Isles

The Isle of Man (population 70000) which is one of the British Isles, but not part of the UK, has a health service very closely modelled on the UK system. Almost all medical staff were trained in the UK. Although excellent trade links exist between the Isle of Man and distribution of goods such as drugs is probably better than to many remote rural areas of the UK, the drug bill (as paid by the health service) per capita on the island is significantly higher (10% higher) than the highest cost district in England and Wales (Liverpool University Health Planning Consortium, 1991). Interestingly, the population of the Isle of Man report better general health than the British population (Pearson and Dawson, 1991). The reasons for the excess drug costs are not known, but may be influenced by the lack of restrictions on prescribing from the Isle of Man government, or by the continuing education for general practitioners on the island being provided solely by lectures sponsored by pharmaceutical companies. Restrictive policies are perceived to be unpopular by the health service management and politicians, who tend to know personally and be influenced by the general medical practitioners.

Tight-knit island communities can exert strong social pressure; the Banjars (hamlets or

subvillages) of the densely populated island of Bali (population 2.3 million) have, for centuries, been managing their own economic, religious and social affairs. Since 1974, they have successfully promoted and monitored a family planning program which has resulted in a remarkable behavioural and demographic transition for the island. The simple procedure they have adopted is to record the family planning status of each Banjar member in the Banjar registration book along with other data on new births, miscarriages and number of children in the family. Visual devices, in the form of maps (showing locations of all eligible couples) displayed in each Banjar hall are utilized to facilitate record-keeping. Colour coded boxes show the contraceptive status of eligible couples and reveal which couples are adequately protected and which ones need another visit from the family planning fieldworker. Comments of fellow villagers lead nonconformists to visit family planning clinics. Awards are given to Banjars judged most effective in providing family planning services to its people (Meier, 1979). The Balinese experience would not be acceptable in many societies, but serves as an example of how social pressures can be used to promote health. Similar social pressures have been utilised in Indonesian family planning programs (Williams, 1986).

Isolation can bring strategic advantage which some islands have exploited. For example, pirates and smugglers historically used small offshore bases where they could be relatively safe from the authorities, and to this day drug smuggling continues to be a problem in the Caribbean. Mauritius has recently introduced the death penalty for drug trafficking, in a move similar to that employed by Malaysia, in an attempt to prevent "leakage" from drug trafficking into their own population.

Public demand and expectations

The demand for health care depends on cultural norms, for instance, on the Swedish island of Bornholm, population 50,000, there was no psychiatric ward or hospital until 1961, and people with mental illness were cared for at home (Bojholm and Stromgren, 1989). In the British Isles, the Isle of Man with a population of 70,000 built a large institution at the end of the last century, with 300 beds in its prime, for the care of the mentally ill and mentally handicapped (Liverpool University Health Planning Consortium, 1991). This institution was still in existence in 1991 despite radical changes in policy for the care of the mentally ill and mentally handicapped.

Much of the Caribbean receives radio and television broadcasts from the United States; this has an effect on the attitudes, behaviour and expectations of the population. This has important repercussions for health education, but also for acute care services, where there may be public demand for the high technology services seen on foreign media, and less public demand for primary care. It is important that health care planners recognise this phenomenon and take steps to counter misinformation about the causes of ill health, and stress the importance of the eight elements of primary health care (education, food supply and nutrition, water supply and basic sanitation, maternal and child health, immunisation, prevention of endemic diseases, treatment of common diseases, and provision of essential drugs).

RECOMMENDATIONS

Environmental recommendations

1. Unique situations require careful assessment and unique solutions. Some consideration of the environmental consequences, if not formal environmental impact assessments, should become a standard part of the planning process.
2. The ecological problems confronting many islands at present require local action (reafforestation, protection of local harbours, reduction of demand on freshwater supplies, etc) and international action (protection of the ozone layer, reduced fossil fuel consumption, etc).
3. Lower energy intensive options, and the development of wind and wave power are often the most cost-effective in remote areas.
4. Sustainable development and the promotion of self-reliance, especially for fresh food, is desirable both from economic and health perspectives.
5. Use of "appropriate technology", such as local anaesthesia (including epidural and spinal anaesthesia) in preference to general anaesthesia; use of simple ether in preference to modern halogenated anaesthetics which require compressed gases, etc. High technology equipment requires adequate servicing if it is to remain safe, and such servicing needs trained personnel and the timely supply of spare parts when required.

Personnel recruitment and training recommendations

6. Health care planners need to be aware of the large population fluctuations possible in small islands, and in particular to plan for large seasonal variations associated with seasonal work and tourism.
7. Health care professionals are likely to be a mobile sector of the community, and special efforts must be made to recruit and retain staff. Where exceptional difficulties arise in recruiting staff, recourse may be made to using e.g. military medical personnel on rotation.
8. The importance of having experienced generalist physicians should be stressed. These generalists each having an area of special interest, perhaps spending a short time abroad working with a specialist, is one way of attaining a degree of specialist cover in such areas as ophthalmology, dermatology, etc.
9. Training and use of traditional healers and births attendants is a very cost-effective way of achieving population coverage in remote areas.
10. Flexibility in staffing and working arrangements, including hours of work, emergency cover, qualifications required for post, can alleviate some of the problems encountered in filling posts in difficult areas. Ministries of health should seriously consider whether a medically-trained person is required for posts such as senior administrators. The skills needed should be the criteria used in selecting candidates, not necessarily formal qualification, which may in any case not provide suitable training for the post.

11. A ladder-type of training arrangement which permits students to progress through various stages of health worker, perhaps to physician, may be found suitable in the island setting, both for retaining staff, and obtaining an indigenous health service staff.
12. Links between specialist posts on the island and suitable academic institutions helps prevent professional isolation, and provides support and social interaction, and perhaps helps reduce the impact of small powerful vested interests on the island which may be acting counter to the public health.
13. It is strongly recommended that a good library as a reference for medical and other staff be provided when specialists are not available to give advice.

Cooperation

14. Diseconomies of scale can be offset to some extent by "regional cooperation", this may take the form of bulk purchasing agreements for pharmaceutical products and medical equipment, joint training initiatives, etc. Such regional cooperation must involve a clearly identifiable regional presence in each of the individual countries/islands which cooperate.
15. Greater coordination between governments and non-governmental organizations to provide comprehensive primary health care is still required.
16. The impact of natural disasters can be mitigated by adequate disaster preparedness, including regional support networks.

Lifestyle

17. Cultural change (be it "westernization" or urbanisation) will bring change in the pattern of morbidity, and may unmask a genetic predisposition to illnesses not encountered with traditional cultural patterns, as is the case with diabetes and coronary heart disease in the Pacific. Health care planners must be aware of this potential.
18. Community-wide strategies for reducing risk factors of non-communicable diseases generally do not require large medical staff numbers, and can be beneficial to many areas of island life.

Communication and transport recommendations

19. Ministries of health may increasingly find they have to finance transport to remote areas, in order to ensure equitable delivery of health care services. Cooperation with other public, private and voluntary and non-governmental organizations is essential to maximize the health gain from this investment.
20. Accessibility to secondary care should be given special consideration in communities of 2000 people and less where reasons of geography prevent attention within 24 hours of travel. Training and supporting at least one resident in how to treat the "usual" conditions, and a communication network for medical and pharmaceutical backup for "exceptional" conditions should be the minimum. A distribution centre for essential drugs should also be located with such a responsible person.

21. Communication links are one of the most vital aspects of health care systems in remote areas. The media of communication will depend on finances available, radio is a low cost option suitable to most areas, often in collaboration with local police radio. Recent advances in telematics now mean that medical images can be sent along existing telecommunication lines, enabling distant diagnosis and expert opinion.
22. Distance education (correspondence courses, tele-communication links, etc) can help overcome geographical barriers to further education and specialist training.

Other recommendations

23. Those setting up health information systems, and responsible for collecting vital statistics should ensure that information is disaggregated to island level, to allow better health needs assessment and service planning.
24. Many authors have suggested using islands as models or 'pilots' for projects which could later be expanded in large continental areas. It is recommended that caution be exercised in the extrapolation of findings from small unique situations to larger areas.
25. It is unlikely that any genetic factors resulting from island life (small gene pool) will result in any significant health problems, or have any impact on the provision of health care.

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