WEEKLY EPIDEMIOLOGICAL REPORT
A publication of the Epidemiological Unit,
Ministry of Healthcare & Nutrition
231, de Saram Place,Colombo 01000, Sri Lanka
Tele:(+94-011)2695112,Fax:(+94,011) 2696583,E-Mail:epidunit@sltnet.lk
Epidemiologist:(+94-011) 2681548,E-mail:chepid@sltnet.lk

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Global Climate Change and Health

Climate change poses a major, and largely unfamiliar, challenge. This article describes the process of global climate change, its impacts on human health, and how our societies can lessen those adverse impacts, via adaptation strategies.

In 1969, the Apollo moon shot provided extraordinary photographs of this planet, suspended in space. This transformed how we thought about the biosphere and its limits. Our increasing understanding of climate change is transforming how we view the boundaries and determinants of human health.

While our personal health may seem to relate mostly to prudent behaviour, heredity, occupation, local environmental exposures, and health-care access, sustained population health requires the life-supporting "services" of the biosphere. Populations of all animal species depend on supplies of food and water, freedom from excess infectious disease, and the physical safety and comfort conferred by climatic stability. The world's climate system is fundamental to this life-support.

Today, humankind's activities are altering the world's climate. We are increasing the atmospheric concentration of energy-trapping gases, thereby amplifying the natural "greenhouse effect" that makes the Earth habitable. These greenhouse gases (GHGs) comprise, principally, carbon dioxide (mostly from fossil fuel combustion and forest burning), plus other heat-trapping gases such as methane (from irrigated agriculture, animal husbandry and oil extraction), nitrous oxide and various human-made halocarbons.

The United Nation's Intergovernmental Panel on Climate Change (IPCC) stated: "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."

During the twentieth century, world average surface temperature increased by approximately 0.6ºC, and approximately two-thirds of that warming has occurred since 1975. Climatologists forecast further warming, along with changes in precipitation and climatic variability, during the coming century and beyond. Their forecasts are based on increasingly sophisticated global climate models, applied to plausible future scenarios of global greenhouse gas emissions that take into account alternative trajectories for demographic, economic and technological changes and evolving patterns of governance.

The global scale of climate change differs fundamentally from the many other familiar environmental concerns that refer to localised toxicological or microbiological hazards. Indeed, climate change signifies that, today, we are altering Earth's biophysical and ecological systems at the planetary scale – as is also evidenced by ozone depletion, accelerating biodiversity losses, stresses on terrestrial and marine food-producing systems, depletion of freshwater supplies, and the global dissemination of persistent organic pollutants.

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ancient Egyptians, Mesopotamians, Mayans, and European populations (during the four centuries of the Little Ice Age) were all affected by nature's great climatic cycles. More acutely, disasters and disease outbreaks have occurred often in response to the extremes of regional climatic cycles such as the El Niño Southern Oscillation (ENSO) cycle.

Potential health impacts of climate change

Change in world climate would influence the functioning of many ecosystems and their member species. Likewise, there would be impacts on human health. Some of these health impacts would be beneficial. For example, milder winters would reduce the seasonal winter-time peak in deaths that occurs in temperate countries, while in currently hot regions a further increase in temperatures might reduce the viability of disease-transmitting mosquito populations. Overall, however, scientists consider that most of the health impacts of climate change would be adverse.

Climatic changes over recent decades have probably already affected some health outcomes. Indeed, the World Health Organisation estimated, in its "World Health Report 2002", that climate change was estimated to be responsible in 2000 for approximately 2.4% of worldwide diarrhoea, and 6% of malaria in some middle-income countries. However, small changes, against a noisy background of ongoing changes in other causal factors, are hard to identify. Once spotted, causal attribution is strengthened if there are similar observations in different population settings.

The first detectable changes in human health may well be alterations in the geographic range (latitude and altitude) and seasonality of certain infectious diseases – including vector-borne infections such as malaria and dengue fever, and food-borne infections (e.g. salmonellosis) which peak in the warmer months. Warmer average temperatures combined with increased climatic variability would alter the pattern of exposure to thermal extremes and resultant health impacts, in both summer and winter. By contrast, the public health consequences of the disturbance of natural and managed food-producing ecosystems, rising sea-levels and population displacement for reasons of physical hazard, land loss, economic disruption and civil strife, may not become evident for up to several decades.

Recommendations

The IPCC projects that, as we continue to change atmospheric composition, global average surface temperature will rise by 1.4 to 5.8ºC in this century, along with changes in precipitation and other climatic variables. Research is needed into developing innovative approaches to analysing weather and climate in relation to human health, setting up long-term data sets to answer key questions, and improving understanding of how to incorporate outputs from Global Climate Models into human health studies.

Scientists project changes in extreme climate events that include more hot days and heat waves, more intense precipitation events, increased risk of drought, increase in winds and tropical cyclones (over some areas), intensified droughts and floods with El Niño events, and increased variability in the Asian summer monsoon. Research gaps to be addressed include further modelling of relationships between extreme events and health impacts, improved understanding of factors affecting vulnerability to climate extremes, and assessment of the effectiveness of adaptation in different settings.

Infectious diseases, especially those transmitted via insect vectors or water, are sensitive to climatic conditions. Disease incidence data is needed to provide a baseline for epidemiological studies. The lack of precise knowledge of current disease incidence rates makes it difficult to comment about whether incidence is changing as a result of climatic conditions. Research teams should be international and interdisciplinary, including epidemiologists, climatologists and ecologists to assimilate the diversity of information from these respective fields.

The stock of empirical evidence relating climatic trends to altered health outcomes remains sparse. This impedes estimating the range, timing and magnitude of likely future health impacts of global environmental changes. Even so, an initial attempt has been made, within the framework of the WHO Global Burden of Disease 2000 project. Analyzing only the better studied health outcomes, the climate change that occurred since the climate baseline period 1961-1990 was estimated to have caused 150,000 deaths and 5.5 million DALYS in the year 2000.

Stratospheric ozone depletion is essentially a different process from climate change. However, greenhouse-warming is affected by many of the chemical and physical processes involved in the depletion of stratospheric ozone. Also, because of changes in climate (in addition to public information and education campaigns), patterns of individual and community sun exposure behaviour will change – duly affecting received doses of ultraviolet radiation.

Several developed and developing countries have undertaken national assessments of the potential health impacts of climate change, including reference to vulnerable areas and populations. There is a need to standardize the health impact assessment procedures, and tools and methods are being developed. More accurate climate information at the local level, particularly on climate variability and extremes, is needed.

Climate change is likely to affect diseases that are also influenced by other factors. Monitoring to assess climate-change impacts on health therefore requires data-gathering coupled with analytical methods able to quantify the climate-attributable portion of such diseases. Less developed countries should strengthen existing systems in order to provide useful data on climate-sensitive diseases.

Table 1: Vaccine-preventable Diseases & AFP

7th - 13th July 2007 (28th Week)

Disease	No. of Cases by Province								Number of cases during current week in 2007	Number of cases during same week in 2006	Total number of cases to date in 2007	Total number of cases to date in 2006	Difference between the number of cases to date between 2007 & 2006
	W	C	S	NE	NW	NC	U	Sab					
Acute Flaccid Paralysis	01 CB=1	00	00	00	00	00	00	00	01	03	49	73	-32.9%
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00.0%
Measles	00	00	00	00	00	00	00	00	00	01	41	20	+105.0%
Tetanus	01 CB=1	00	00	00	00	00	00	00	01	00	19	33	-42.4%
Whooping Cough	01 GM=1	00	00	00	00	00	00	00	01	03	23	58	-60.3%
Tuberculosis	256	01	40	18	08	09	18	00	350	279	5594	5612	-0.3%

Table 2: Diseases under Special Surveillance

7th - 13th July 2007 (28th Week)

Disease	No. of Cases by Province								Number of cases during current week in 2007	Number of cases during same week in 2006	Total number of cases to date in 2007	Total number of cases to date in 2006	Difference between the number of cases to date between 2007 & 2006
	W	C	S	NE	NW	NC	U	Sab					
DF/DHF*	46	19	08	04	27	08	00	27	129	169	2651	5267	-49.7%
Encephalitis	00	00	01 GL=1	00	00	00	00	00	01	03	124	81	+53.1%
Human Rabies	00	00	00	00	00	00	00	01 RP=1	01	00	35	34	+02.9%

Table 3: Newly Introduced Notifiable Diseases

7th - 13th July 2007 (28th Week)

Disease	No. of Cases by Province								Number of cases during current week in 2007	Total number of cases to date in 2007
	W	C	S	NE	NW	NC	U	Sab		
Chickenpox	10	04	04	01	03	00	09	10	41	1967
Meningitis	02 GM=1 KL=1	00	05 GL=1 HB=1 MT=3	00	01 KR=1	00	04 BD=3 MO=1	13 RP=5 KG=8	25	195
Mumps	04	04	02	02	07	00	01	04	24	832

*__DF / DHF__ refers to Dengue Fever / Dengue Haemorrhagic Fever.
__NA__= Not Available.

Sources:

Weekly Return of Communicable Diseases:
Diphtheria, Measles, Tetanus, Whooping Cough, Human Rabies, Dengue Haemorrhagic Fever, Japanese Encephalitis, Chickenpox, Meningitis, Mumps.

Special Surveillance:
Acute Flaccid Paralysis.

National Control Program for Tuberculosis and Chest Diseases:
Tuberculosis.

Details by districts are given in Table 5.

Provinces: W=Western, C=Central, S=Southern, NE=North & East, NC=North Central, NW=North Western, U=Uva, Sab=Sabaragamuwa.

DPDHS Divisions: CB=Colombo, GM=Gampaha, KL=Kalutara, KD=Kandy, ML=Matale, NE=Nuwara Eliya, GL=Galle, HB=Hambantota, MT=Matara, JF=Jaffna, KN=Killinochchi, MN=Mannar, VA=Vavuniya, MU=Mullaitivu, BT=Batticaloa, AM=Ampara, TR=Trincomalee, KM=Kalmunai, KR=Kurunegala, PU=Puttalam, AP=Anuradhapura, PO=Polonnaruwa, BD=Badulla, MO=Moneragala, RP=Ratnapura, KG=Kegalle.

Table 4: Laboratory Surveillance of Dengue Fever

7th - 13th July 2007 (28th Week)

Samples	Number tested	Number positive *	Serotypes				
			D_1	D_2	D_3	D_4	Negative
Number for current week	12	07	00	03	04	00	00
Total number to date in 2007	337	28	00	12	09	00	06

Source: Genetech Molecular Diagnostics & School of Gene Technology, Colombo. * Not all positives are subjected to serotyping.

Table 5: Selected notifiable diseases reported by Medical Officers of Health
7th - 13th July 2007 (28th Week)

DPDHS Division	Dengue Fever / DHF*		Dysentery		Encephalitis		Enteric Fever		Food Poisoning		Leptos-pirosis		Typhus Fever		Viral Hepatitis		Returns Re-ceived Timely**
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	%
Colombo	36	715	03	219	00	07	00	40	03	48	05	74	00	01	05	68	**100**
Gampaha	04	278	09	221	00	15	02	43	07	35	02	139	00	10	08	78	**71**
Kalutara	06	180	14	315	00	01	02	33	01	20	03	71	00	01	02	41	**100**
Kandy	14	252	08	167	00	03	00	39	00	07	00	45	01	43	58	1439	**86**
Matale	03	63	02	121	00	06	01	10	03	09	02	30	00	03	01	89	**83**
Nuwara Eliya	02	28	07	174	00	02	02	80	00	366	00	08	00	28	33	320	**100**
Galle	02	56	03	86	01	08	00	12	00	04	01	32	00	18	00	14	**88**
Hambantota	03	33	12	64	00	05	00	18	00	15	01	32	01	33	02	11	**100**
Matara	03	94	06	174	00	08	00	25	00	11	01	111	02	135	00	21	**94**
Jaffna	00	25	00	80	00	02	00	305	00	05	00	00	00	81	00	14	**00**
Kilinochchi	00	01	00	00	00	00	00	03	00	00	00	00	00	02	00	02	**00**
Mannar	00	07	00	14	00	00	01	47	00	00	00	01	00	00	02	07	**25**
Vavuniya	00	12	00	32	00	04	00	11	23	38	00	02	00	00	00	05	**100**
Mullaitivu	00	00	00	09	00	06	00	14	00	00	00	00	00	00	00	04	**40**
Batticaloa	00	61	04	395	00	08	00	14	00	10	00	00	00	22	21	557	**64**
Ampara	00	03	00	61	00	00	00	03	00	00	00	00	00	00	00	15	**14**
Trincomalee	04	49	00	152	00	03	00	14	00	23	01	07	01	07	00	82	**56**
Kurunegala	25	267	16	275	00	03	02	44	02	19	02	18	01	29	03	37	**100**
Puttalam	02	77	10	75	00	10	00	48	00	03	00	15	00	04	00	61	**89**
Anuradhapura	08	99	01	57	00	08	00	17	00	13	00	17	00	18	01	32	**79**
Polonnaruwa	00	41	02	56	00	02	00	07	00	04	00	19	00	00	00	16	**71**
Badulla	01	22	20	357	00	02	01	63	01	08	01	33	04	100	13	175	**93**
Monaragala	00	11	12	212	00	02	00	35	00	10	01	35	01	36	00	22	**100**
Ratnapura	12	143	14	363	00	11	01	40	01	08	00	34	00	13	02	57	**75**
Kegalle	04	131	08	175	00	07	02	32	02	04	01	65	01	17	10	100	**100**
Kalmunai	00	03	04	104	00	01	00	07	01	00	00	00	00	02	02	86	**85**
SRI LANKA	**129**	**2651**	**155**	**3958**	**01**	**124**	**14**	**1007**	**39**	**660**	**21**	**788**	**12**	**603**	**162**	**3353**	**81**

Source: Weekly Returns of Communicable Diseases (WRCD).
***Dengue Fever / DHF** refers to Dengue Fever / Dengue Haemorrhagic Fever.
****Timely** refers to returns received on or before 21 July 2007. Total number of reporting units = 290. Number of reporting units data provided for the current week: 235
A = Cases reported during the current week. **B** = Cumulative cases for the year.

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Comments and contributions for publication in the WER Sri Lanka are welcome. However, the editor reserves the right to accept or reject items for publication. All correspondence should be mailed to The Editor, WER Sri Lanka, Epidemiological Unit, P.O. Box 1567, Colombo or sent by E-mail to chepid@sltnet.lk.

ON STATE SERVICE

Dr. M. R. N. ABEYSINGHE
EPIDEMIOLOGIST
EPIDEMIOLOGICAL UNIT
231, DE SARAM PLACE
COLOMBO 10