

# CAMBIO CLIMÁTICO Y SALUD

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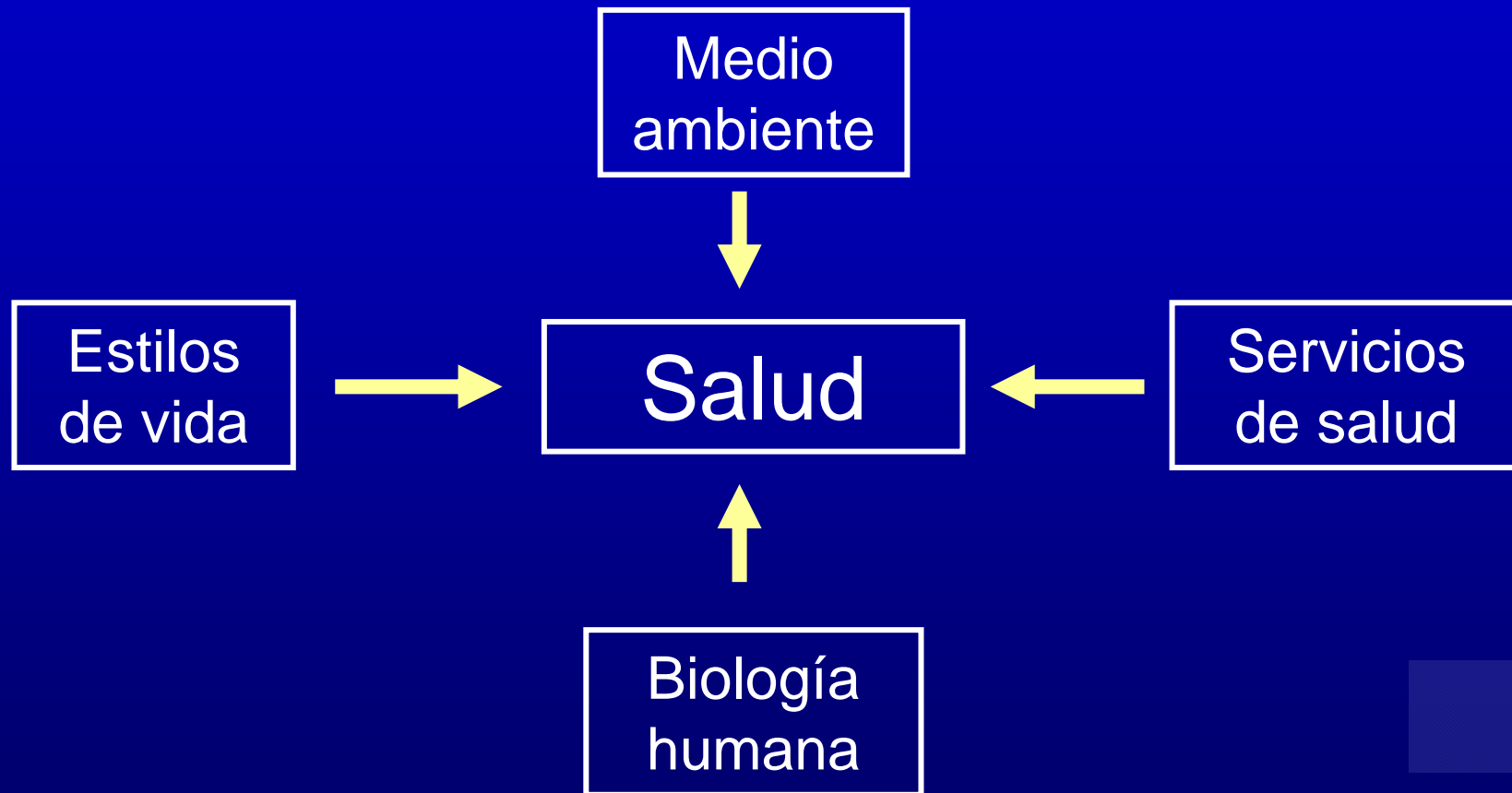
# DEFINICIÓN DE SALUD

Estado de completo bienestar físico, mental y social y no solamente la ausencia de enfermedad.

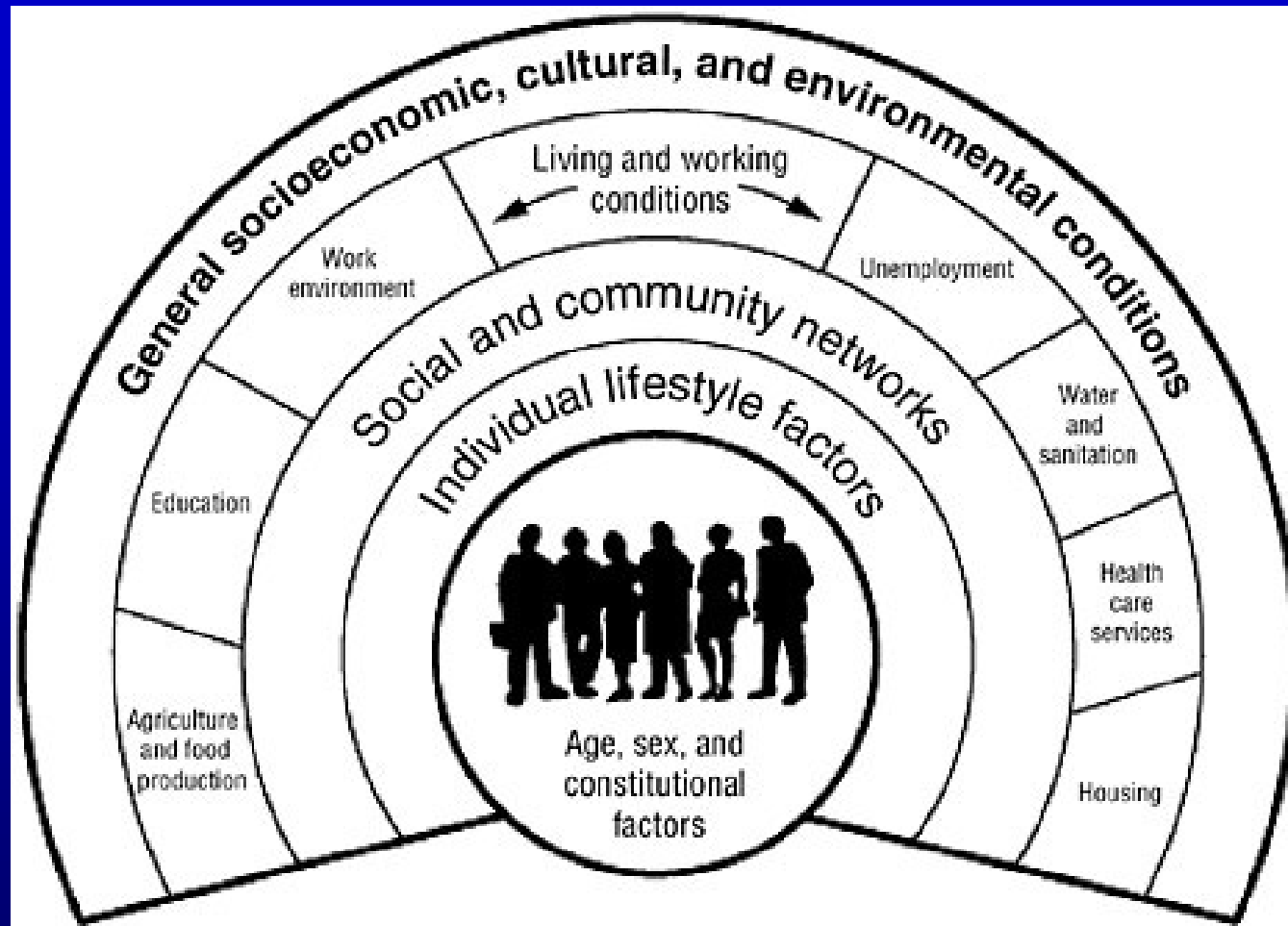
OMS, 1946



# MODELO DE SALUD – LALONDE (1974)



# DETERMINANTES DE LA SALUD



Dahlgren G, Whitehead M. 1991. Políticas y estrategias para promover la equidad social en salud. Estocolmo, Suecia: Instituto de Estudios Futuros.

# CAUSALIDAD EN EPIDEMIOLOGIA

Una causa de una enfermedad es un acontecimiento, circunstancia, característica o combinación de estos factores que desempeña un papel importante en la producción de la enfermedad.

Aquellas condiciones que al ser modificadas mediante una intervención sanitaria, modifican la aparición del daño.

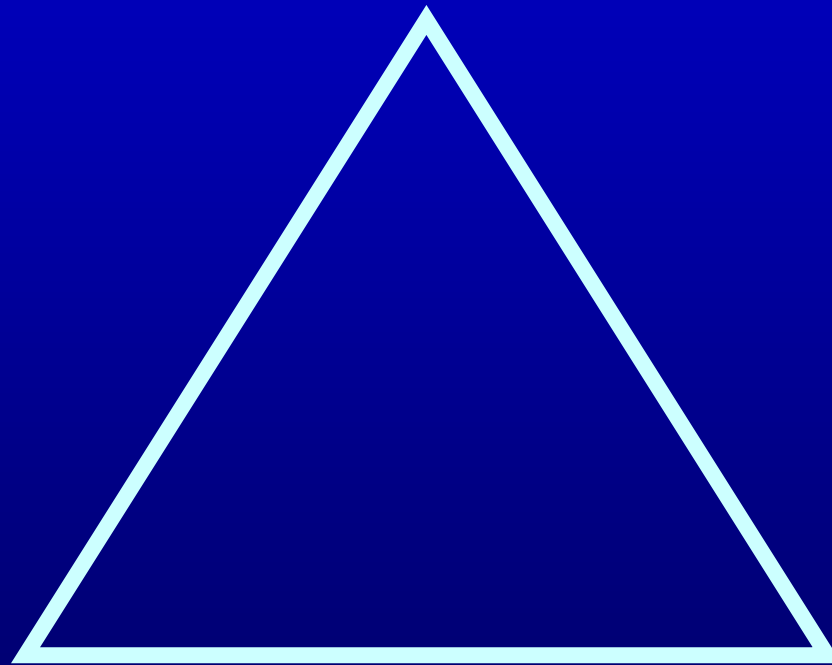
# LA TRIADA EPIDEMIOLOGICA

La Triada Epidemiológica es el modelo clásico de causalidad en enfermedades infecciosas.

Tiene tres componentes: un agente externo, un huésped susceptible y un medio ambiente que junta al agente y huésped.

# LA TRIADA EPIDEMIOLOGICA

AGENTE



HOSPEDERO

MEDIO AMBIENTE

# LA TRIADA EPIDEMIOLOGICA

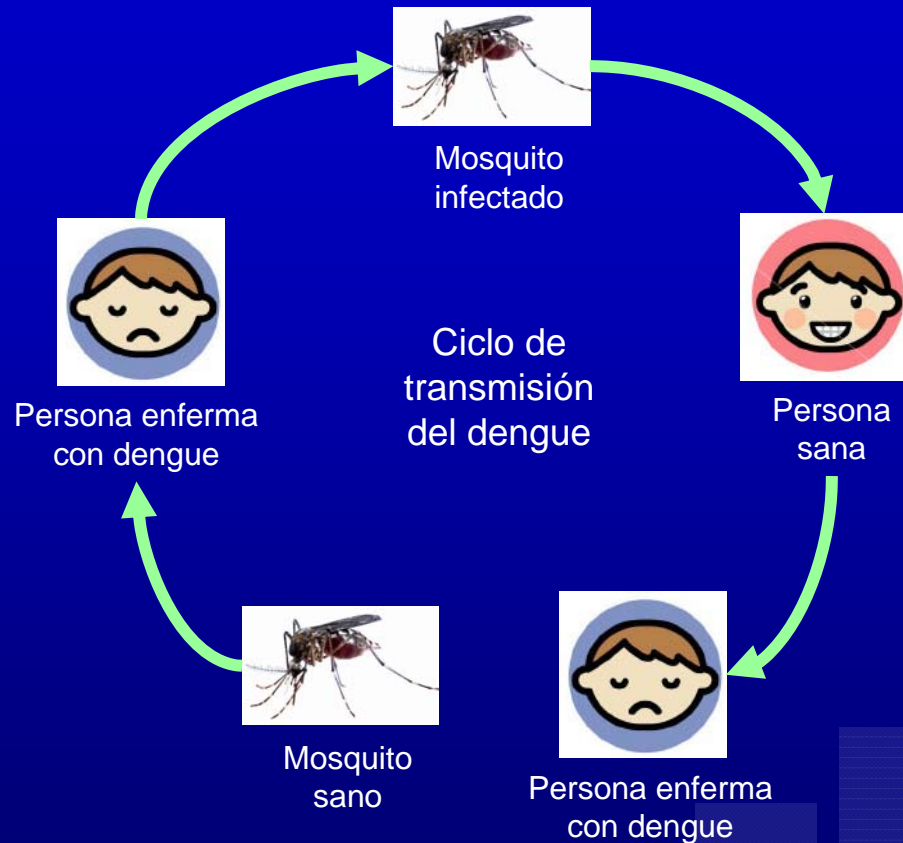
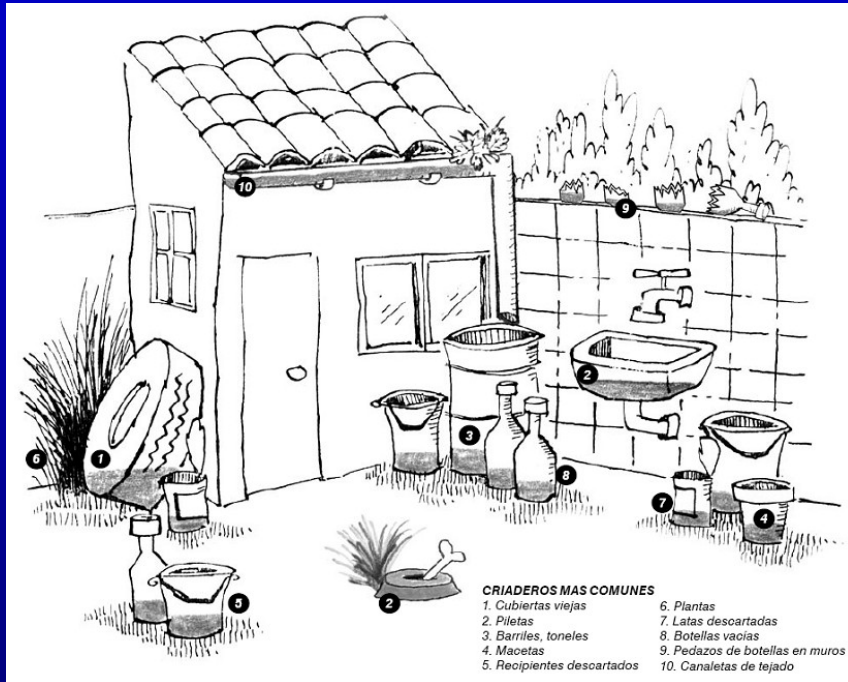
HOSPEDERO

AGENTE



MEDIO  
AMBIENTE


# LA TRIADA EPIDEMIOLOGICA



# FOCO NATURAL (PAVLOVSKY, 1939)

Ambiente natural en el que se puede desarrollar una enfermedad endémica, teniendo ciertas características como: perfil geográfico y ecológico definido, brotes estacionales y la intervención de la fauna local como fuente de infección.

Se refiere a un área en la que las condiciones existentes favorecen la transmisión, diseminación y permanencia de una enfermedad infecciosa.



# FOCO NATURAL



Valle interandino



Selva amazónica



Bosque seco ecuatorial

# FOCO NATURAL

## Componentes de un foco natural

1. Agentes patógenos
2. Reservorios
3. Vectores
4. Animales enfermos
5. Animales susceptibles o receptores
6. Hombre (reservorio o huésped susceptible)

# FOCO NATURAL

Condiciones para el mantenimiento de un foco

1. Circulación en espiral del agente
2. Condiciones apropiadas del medio ambiente

# CAMBIO CLIMÁTICO Y SALUD

El cambio climático es una amenaza emergente para la salud pública.

Causa defunciones y enfermedades debidas a desastres naturales tales como olas de calor, inundaciones y sequías.

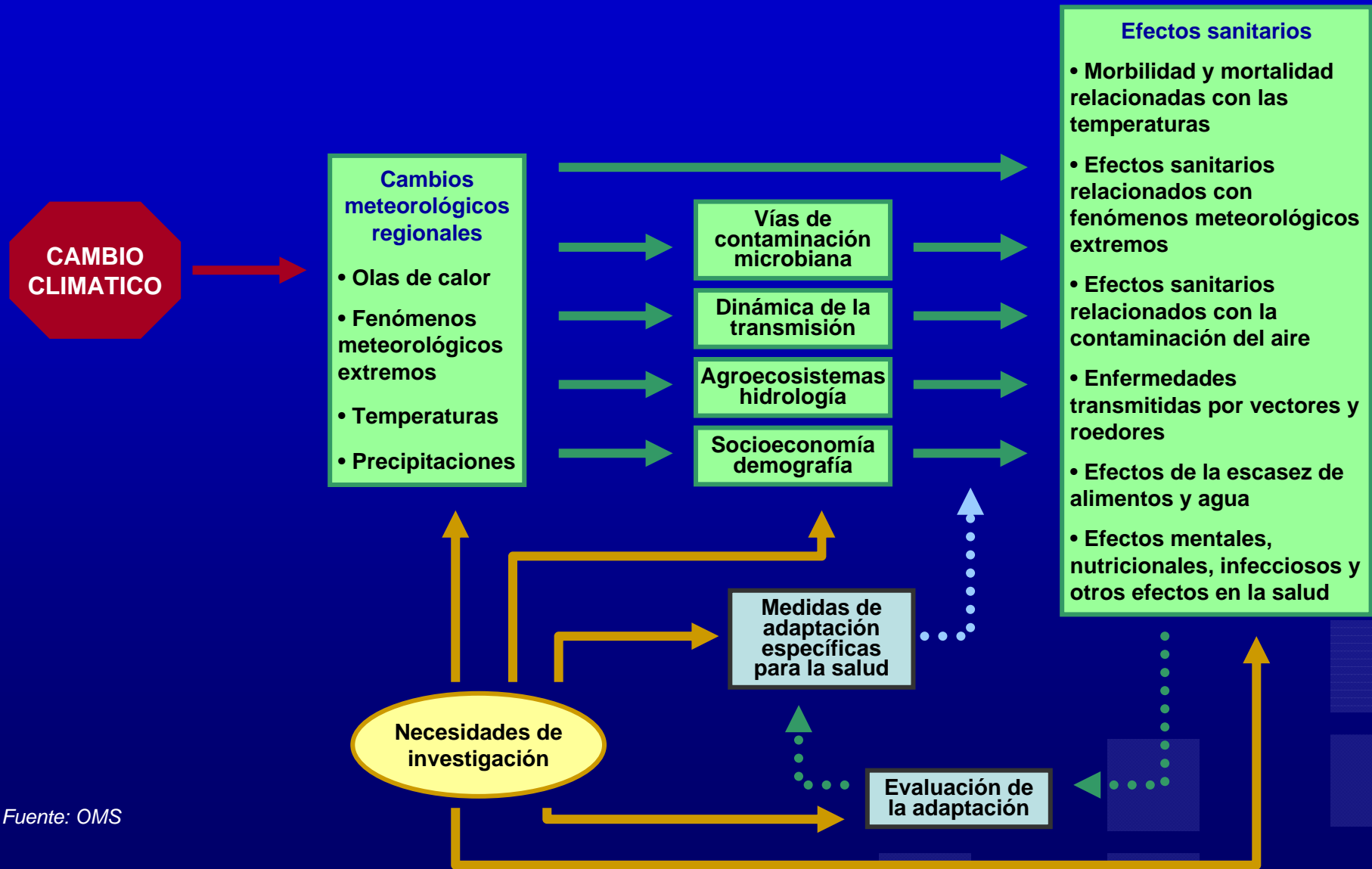
Enfermedades importantes son muy sensibles a los cambios de temperatura y pluviosidad (enfermedades transmitidas por vectores, malnutrición, diarreas).

# CAMBIO CLIMÁTICO Y SALUD

Las repercusiones del clima en la salud humana no se distribuirán uniformemente en el mundo.

Las poblaciones de los países en desarrollo, en particular los pequeños Estados insulares, las zonas áridas y de alta montaña y las zonas costeras densamente pobladas se consideran especialmente vulnerables.

# CAMBIO CLIMÁTICO Y SALUD



# CAMBIO CLIMÁTICO Y SALUD

CLINICAL MICROBIOLOGY REVIEWS, Oct. 2002, p. 757-770  
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Vol. 15, No. 4

## Effects of Global Climate on Infectious Disease: the Cholera Model

Erin K. Lipp,<sup>1,2</sup> Anwar Huq,<sup>1,3</sup> and Rita R. Colwell<sup>1,3\*</sup>

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# CAMBIO CLIMÁTICO Y SALUD

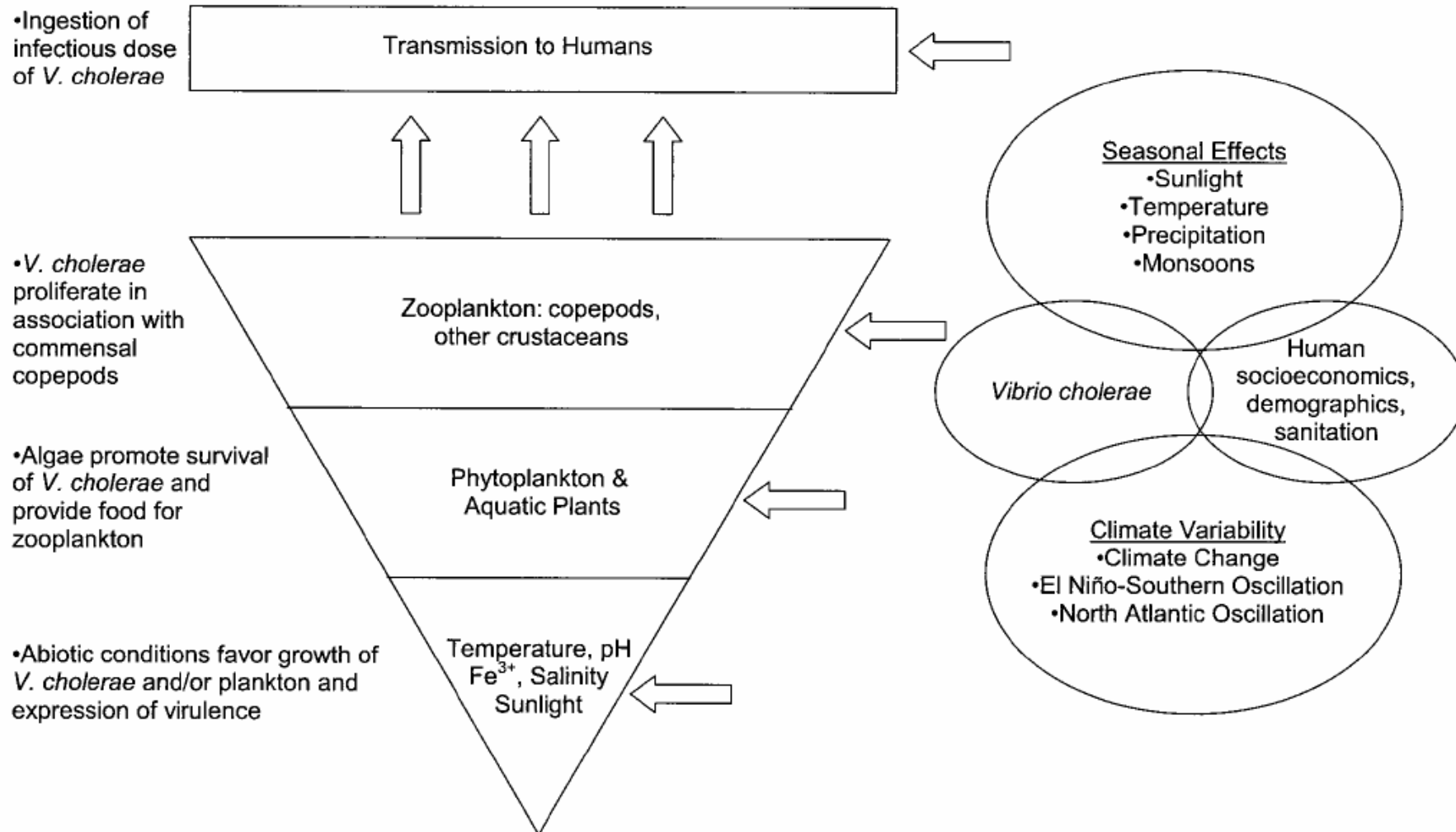


FIG. 1. Hierarchical model for environmental cholera transmission (modified from Colwell and Huq [30]).

# CAMBIO CLIMÁTICO Y SALUD

TABLE 1. Influence of environment, climate, and weather on cholera and *V. cholerae* dynamics

Factor	Climate and/or weather drivers	Influence(s)	Representative reference(s)
Temperature	Seasons, interannual variability	Growth of <i>V. cholerae</i> , phytoplankton blooms, infection by temperate phages	90; Lipp et al., Abstr. 101st Gen. Meet. Am. Soc. Microbiol.
Salinity	Seasons, monsoons, ENSO, sea level rise	Growth of <i>V. cholerae</i> , seroconversion, expression of cholera toxin	111, 148, 151
Sunlight	Seasons, monsoons, interannual variability	Survival of <i>V. cholerae</i> , phytoplankton blooms, induction of CTX $\phi$	47, 109
pH	Seasons, interannual variability (phytoplankton growth)	Growth of <i>V. cholerae</i>	22
Fe <sup>3+</sup>	Precipitation (runoff), atmospheric deposition (NAO)	Growth of <i>V. cholerae</i> , expression of cholera toxin	125, 126
Exogenous products of algal growth	Seasons, monsoons, interannual variability in light, nutrients	Survival of <i>V. cholerae</i>	80, 144
Chitin	Seasons, monsoons, zooplankton blooms (following phytoplankton)	Growth of <i>V. cholerae</i> , attachment to exoskeletons	71, 117

# CAMBIO CLIMÁTICO Y SALUD

## Malaria resurgence in the East African highlands: Temperature trends revisited

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Edited by Burton H. Singer, Princeton University, Princeton, NJ, and approved February 10, 2006 (received for review October 12, 2005)

**The incidence of malaria in the East African highlands has increased since the end of the 1970s. The role of climate change in the exacerbation of the disease has been controversial, and the specific influence of rising temperature (warming) has been highly debated following a previous study reporting no evidence to support a trend in temperature. We revisit this result using the same temperature data, now updated to the present from 1950 to 2002 for four high-altitude sites in East Africa where malaria has become a serious public health problem. With both nonparametric and parametric statistical analyses, we find evidence for a significant warming trend at all sites. To assess the biological significance of this trend, we define a dynamical model for the population dynamics**

if so, whether the observed magnitude of change is of potential biological significance.

In this paper, we revisit the existence of trends for the four highland sites in the same monthly temperature records but now updated to incorporate the last 5 years to the present. A nonparametric analysis that decomposes the variability in the data into different components reveals that the dominant signal in three of the sites and the subdominant signal in the fourth one correspond to a warming trend. These components are all statistically significant, differing from those expected for red and white noise. We then address the question of whether the signal of warming by  $\approx 0.5^\circ\text{C}$  is biologically significant using tempera-

# CAMBIO CLIMÁTICO Y SALUD

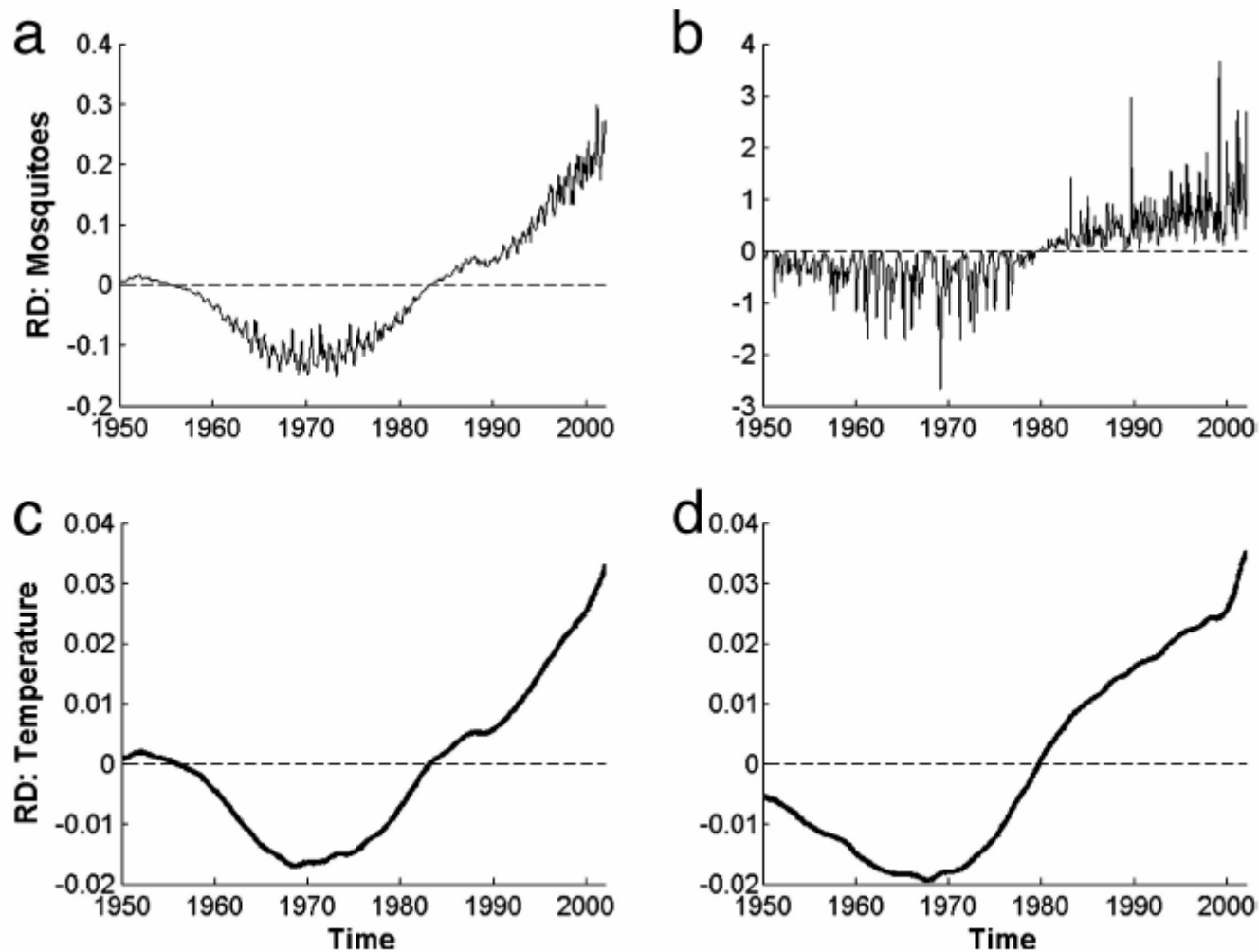


Fig. 3. RD in mosquito abundances (a and b) and temperature (c and d) for two sites, Kericho (a and c) and Kabale (b and d). For mosquito abundances,

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## Australia's Dengue Risk Driven by Human Adaptation to Climate Change

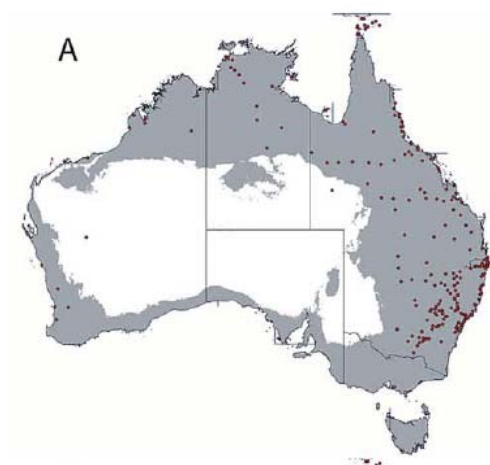
Nigel W. Beebe<sup>1,2\*</sup>, Robert D. Cooper<sup>3</sup>, Pipi Mottram<sup>4</sup>, Anthony W. Sweeney<sup>1</sup>

<sup>1</sup>School of Biological Sciences, University of Queensland, St Lucia, Queensland, Australia, <sup>2</sup>CSIRO Entomology, Long Pocket Laboratories, Indooroopilly, Queensland, Australia, <sup>3</sup>Australian Army Malaria Institute, Gallipoli Barracks, Enoggera, Queensland, Australia, <sup>4</sup>Communicable Diseases Branch, Queensland Health, Brisbane, Queensland, Australia

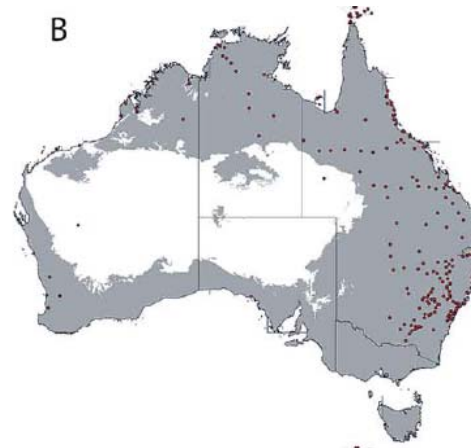
### Abstract

**Background:** The reduced rainfall in southeast Australia has placed this region's urban and rural communities on escalating water restrictions, with anthropogenic climate change forecasts suggesting that this drying trend will continue. To mitigate the stress this may place on domestic water supply, governments have encouraged the installation of large domestic water tanks in towns and cities throughout this region. These prospective stable mosquito larval sites create the possibility of the reintroduction of *Ae. aegypti* from Queensland, where it remains endemic, back into New South Wales and other populated centres in Australia, along with the associated emerging and re-emerging dengue risk if the virus was to be introduced.

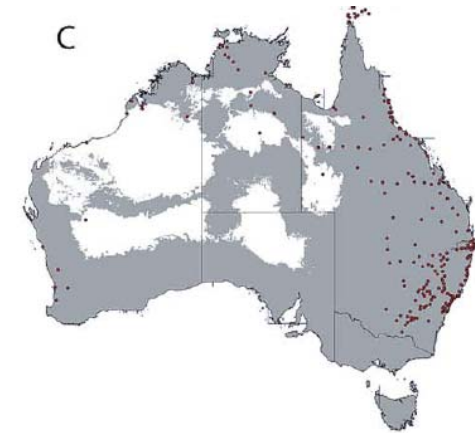
# CAMBIO CLIMÁTICO Y SALUD



1995



2030



2050

# CAMBIO CLIMÁTICO Y SALUD

Research | Environmental Medicine

## The Effect of Heat Waves on Mental Health in a Temperate Australian City

*Alana Hansen,<sup>1</sup> Peng Bi,<sup>1</sup> Monika Nitschke,<sup>2</sup> Philip Ryan,<sup>1</sup> Dino Pisaniello,<sup>1</sup> and Graeme Tucker<sup>2</sup>*

<sup>1</sup>Discipline of Public Health, School of Population Health and Clinical Practice, Faculty of Health Sciences, The University of Adelaide, Adelaide, South Australia, Australia; <sup>2</sup>South Australian Department of Health, Adelaide, South Australia, Australia

**OBJECTIVE:** The goal of this study was to identify mental, behavioral, and cognitive disorders that may be triggered or exacerbated during heat waves, predisposing individuals to heat-related morbidity and mortality.

**DESIGN:** Using health outcome data from Adelaide, South Australia, for 1993–2006, we estimated the effect of heat waves on hospital admissions and mortalities attributed to mental, behavioral, and cognitive disorders. We analyzed data using Poisson regression accounting for overdispersion and controlling for season and long-term trend, and we performed threshold analysis using hockey stick regression.

**RESULTS:** Above a threshold of 26.7°C, we observed a positive association between ambient temperature and hospital admissions for mental and behavioral disorders. Compared with non-heat-wave periods, hospital admissions increased by 7.3% during heat waves. Specific illnesses for which admissions increased included organic illnesses, including symptomatic mental disorders; dementia; mood (affective) disorders; neurotic, stress related, and somatoform disorders; disorders of psychological development; and senility. Mortalities attributed to mental and behavioral disorders increased during heat waves in the 65- to 74-year age group and in persons with schizophrenia, schizotypal, and delusional disorders. Dementia deaths increased in those up to 65 years of age.

**CONCLUSION:** Our results suggest that episodes of extreme heat pose a salient risk to the health and

making the climate ideal for the study of the health effects of heat waves.

We obtained morbidity data for the Adelaide metropolitan area for the period 1 July 1993 to 30 June 2006 from the South Australian Department of Health (Adelaide, South Australia, Australia). We accessed principal hospital discharge diagnoses using the Integrated South Australian Activity Collection (ISAAC), an official collection of admitted patient activity in the state's public and private hospitals (Government of South Australia 2002). Data relating to individuals who resided outside of the Adelaide metropolitan area were excluded from the study. We obtained mortality data for the period 1 July 1993 to 22 December 2004 from the Australian Bureau

# CAMBIO CLIMÁTICO Y SALUD

**Table 3.** Details of mental and behavioral mortalities associated with heat waves.

Diagnosis	Group	IRR	95% CI
All MBDs	65–74 years	2.395	1.165–4.922
Dementia	15–64 years	5.058	1.205–21.232
	Males 15–64 years	12.731	2.064–78.516
Disorders due to psychoactive substance use	Females, all ages	3.098	1.342–7.155
	Females 15–64 years	3.211	1.297–7.948
Schizophrenia, schizotypal, and delusional disorders	All ages	2.079	1.045–4.138
	≥ 75 years	2.111	1.018–4.380
	Males, all ages	4.051	1.386–11.840
	Males ≥ 75 years	5.255	1.752–15.758

# CONCLUSIONES

- La salud es el resultado de una compleja interacción de factores, siendo el medio ambiente uno de sus principales determinantes.
- Cambios en las condiciones medio-ambientales favorecen la multiplicación y mantenimiento de agentes y vectores, aumentando la morbilidad y mortalidad.
- Se favorece también la aparición de enfermedades emergentes y re-emergentes
- Los cambios climáticos pueden afectar la presentación de enfermedades no infecciosas.

Gracias por su atención

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