

Climate Information for Public Health Action



Background

An El Niño is predicted to develop later this year and is expected to last through at least February 2015. Based on past experience, this translates to a period of heightened likelihood that extreme weather conditions can occur with associated health impacts. Understanding and monitoring the emerging climatic conditions offers an opportunity to improve regional, national and sub-national health system preparedness that can prevent avoidable negative health impacts attendant with El Niño.

In the last 25 years, there have been six moderate-to-strong El Niño events: 1991-2, 1994-5, 1997-8, 2002-3, 2006-7, and 2009-10. The impacts of El Niño are felt most strongly in the tropics. Previous events have been associated with drier- and hotter-than-normal conditions in some regions and seasons and wetter- and cooler-than-normal conditions in others (Fig. 1). El Niño tends to increase atmospheric temperatures across the tropics, but the local effects will in part be driven by rainfall, since cloud cover tends to increase minimum and decrease maximum temperatures. Thus, El Niño will reinforce maximum temperatures under drier-than-normal conditions and minimum temperatures under wetter-than-normal conditions (Fig. 2).

El Niño and Rainfall

El Niño conditions in the tropical Pacific are known to shift rainfall patterns in many different parts of the world. Although they vary somewhat from one El Niño to the next, the strongest shifts remain fairly consistent in the regions and seasons shown on the map below.

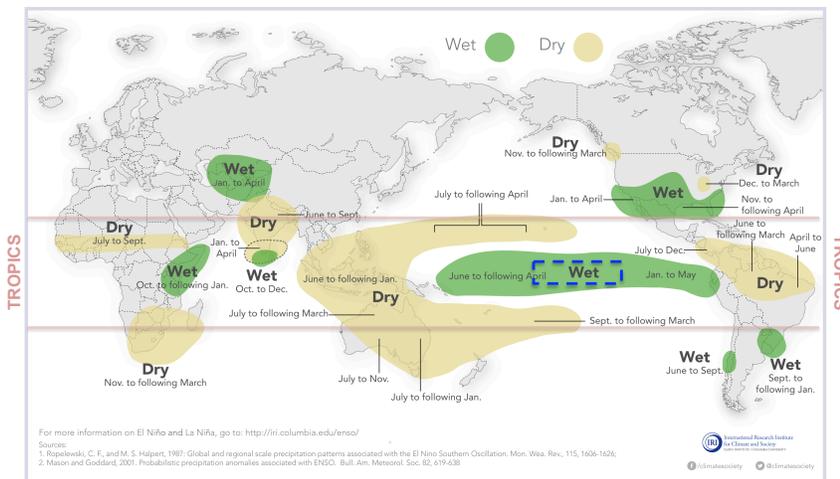


Figure 1. Likely El Niño rainfall impacts

Likely El Niño rainfall impacts, with Niño3.4, a common region used to assess ENSO, highlighted (blue box: Niño3.4 is bound by 120°W - 170°W and 5°S - 5°N). General atmospheric warming occurs throughout the tropics; however, the local temperature effects will also be influenced by rainfall. Adapted from the IRI/IFRC Maproom (<http://iridl.ldeo.columbia.edu/maproom/IFRC/index.html#tabs-3>).

Health impacts associated with El Niño will differ depending on local health vulnerability, capacities and how El Niño influences the local climate. For example, droughts can cause individual heat stress and may significantly diminish hydropower capacity, which can reduce electricity available to health facilities. Flooding and cyclone activity may cause significant loss of life and other health and psychosocial effects. Food insecurity triggered by drought or flooding can increase malnutrition and thus enhance vulnerability to infectious diseases. Damaged sanitation infrastructure can lead to increases in water- and vector-borne infectious diseases. Extended rainfall and floods may destroy roads, hospitals, and clinics, restricting access to healthcare. Poor air and water quality and/or extreme or anomalous weather events can trigger new or exacerbate existing physical and mental health conditions. In addition, displaced populations due to El Niño impacts can contribute to these health consequences.

Examples of Observed Health Impacts of El Niño

Indonesia: widespread drought, high temperatures, and dust impacted food security, fire risk, and air quality.

Peru: extreme flooding events damage roads and health facilities as well as increase the incidence of diarrheal diseases

Eastern Africa: widespread economic losses (including agriculture and livestock), extensive destruction of infrastructure (including health facilities), and epidemics of human and animal vector-borne diseases (including Rift Valley Fever and malaria)

Northeastern Kenya: extreme weather, extensive flooding, and associated infectious disease led to catastrophic death rates (>10/100,000/day) in the population following the 1997-8 El Niño.

This report provides information to assist health planners and practitioners in monitoring the vulnerability of communities and providing time-sensitive information for interventions to reduce negative health impacts. We urge health decision-makers to follow El Niño advisories for any new developments and monitor climate/weather forecasts as part of an early warning-early action approach, and as appropriate, create advisories targeting local conditions and/or specific health outcomes. Resources and recommendations for monitoring the situation are presented below.

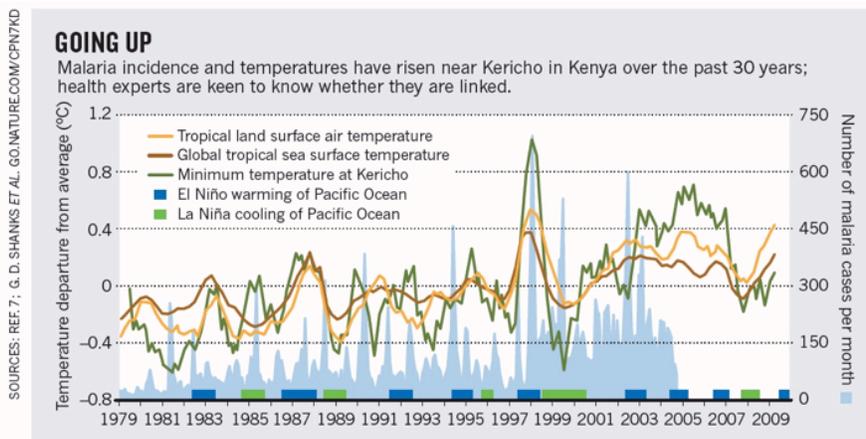


Figure 2. Malaria, ENSO, and temperature in Kericho, Kenya (from Thomson et al., 2011)

Higher-than-normal minimum temperatures are a key feature throughout the tropics during El Niño events. In highland areas of Eastern Africa, where malaria is normally restricted due to cooler temperatures, these increases may result in epidemics of malaria in populations with low or no immunity to the disease (Omumbo et al., 2011). Careful analysis with quality assured relevant data is needed to accurately ascertain such relationships and associated risks.

What is El Niño?

El Niño-Southern Oscillation (ENSO) is a periodic appearance of unusually warm and cool sea-surface temperatures (SSTs) in the central and eastern Pacific Ocean. It is the most prominent known driver of interannual variability in weather and climate around the world. ENSO events are associated with increased probability of drought in some areas and excess rainfall in others, together with temperature anomalies in many regions. El Niño refers to the period of warmer-than-average SSTs in the eastern and central equatorial Pacific Ocean that occurs as part of ENSO. This situation is the opposite of La Niña, which is associated with a cooling of the SSTs in this region. ENSO may also impact the formation of tropical cyclones, suppressing them in the Atlantic Ocean and changing their character in the Northwest Pacific Ocean during an El Niño. Read about El Niño at: <http://www.climate.gov/news-features/understanding-climate/can-we-blame-el-niño>

Once developed, El Niño conditions in the Pacific typically persist for 9-12 months or longer, starting around June and peaking between November and February. Peak impacts do not necessarily coincide

with the peak of the El Niño period: impacts generally occur during a region's main rainy season. Because the progress and strength of the El Niño can be monitored through near-real-time ENSO observing systems, it is possible to generate probabilistic seasonal climate forecasts of the climate months in advance. Such forecasts may be useful for planning for and mitigating health impacts associated with climatic extremes. A major potential benefit of 'El Niño years' is that the climate is likely to be more predictable.

“ *This stocktaking of vulnerabilities and risks associated with floods, droughts or extreme temperatures can provide early warning of negative health outcomes that could result in, or promote, early action to reduce vulnerability and manage health consequences better.* ”

Summary of emerging 2014 El Niño conditions

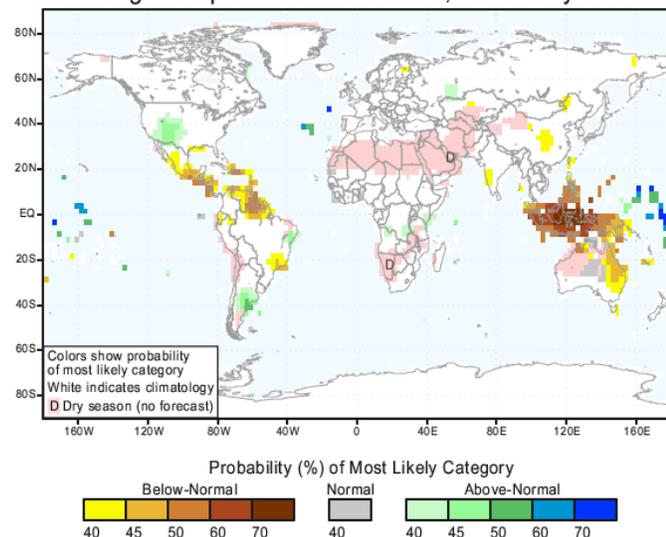
18 July 2014: The oceanic precursors of El Niño emerged in March-April 2014, and both the atmospheric and ocean aspects of El Niño are forecasted to emerge in late August-September and increase to weak-to-moderate strength by the end of September. Currently, there is an approximately 75% probability of El Niño conditions developing by October-December.

Global climate prediction centers like the IRI and NCEP-CPC anticipate that the current El Niño will be of weak-to-moderate strength. However, a very weak or a strong event is still possible. Furthermore, the strength of an El Niño provides only a rough indication of how widespread and severe the associated impacts are likely to be on a global level and is less certain as an indicator of impacts on a local or regional level. It is therefore important to monitor the seasonal forecasts (Fig. 3) and real-time conditions for your area of interest. The forecast incorporates factors from both El Niño and other elements of the climate system and its confidence increases with shorter lead times. Information about the latest IRI El Niño briefing can be found at: <http://iri.columbia.edu/news/june-2014-climate-briefing-el-nino-likely-to-develop-this-summer/>. Tools for monitoring updates on the strength of the El Niño can be found at: <http://iri.columbia.edu/enso>. Follow #ENSOQandA and #IRIForecast on Twitter to monitor updates.

Figure 3. Current Seasonal Precipitation Forecast

This global map shows where and how likely it is to be unusually wet or dry for the next three-month season during the current El Niño event. The probabilities indicate the likelihood of rainfall being above, near average or below average. Higher probabilities show increased likelihood for that category, but not how extreme the wet or dry conditions are likely to be. These probabilities apply over large areas and should not be used to predict local conditions at the sub-national level. The prediction period largely covers the dry season in some areas (indicated by pink shading). These interactive maps are updated regularly and are available on IRI's web site. Forecasts are available at this site on a monthly basis. To access the forecasts go to: <http://iri.columbia.edu/our-expertise/climate/forecasts/>

IRI Multi-Model Probability Forecast for Precipitation for August-September-October 2014, Issued July 2014



Note the high probability of drought in South-Southeast Asia.

Recommendations for Action

Monitoring emerging climatic conditions offers the opportunity to improve risk management and disease surveillance. With integrated surveillance systems and early warnings, health risks can be better identified and anticipated, so that effective action is taken to reduce vulnerability and mitigate disasters. The following actions are recommended for health professionals:

1. Understand and assess how El Niño can alter health risks in your area

Review the evidence on which populations or geographic regions are generally vulnerable to climate variability (e.g. flooding or drought-induced food insecurity), and how El Niño events have been observed to affect health in the past. To establish the likelihood of various health impacts, analysis of historic climate and health data and El Niño events (or associated SSTs) is needed. Research, climate impact assessments, historical epidemiological surveillance, or health vulnerability, adaptation, and emergency risk assessments may provide this background, such as the example provided in Figure 2, which details ENSO events, regional and local temperature and their relationship to malaria epidemics in Kenya. Sub-populations, such as people with disability, aged persons, pregnant women, children, and those with chronic health conditions, should be identified as their health status contributes to greater health risks. Preparedness and response planning can greatly benefit from the creation of risk maps indicating the most likely risk areas at the sub-national level. Consult with external experts, as needed, to learn from experiences in other countries or regions. Sharing information and accessing the latest scientific knowledge will help ensure that the health risks associated with El Niño events are managed in the most effective way possible.

To assess current risks, it is important to promote dialogue between health actors, incorporating health emergency management committees, partner organizations at all levels, national meteorological agencies, and disaster management organizations. National climate and health working groups may be created to provide an appropriate forum for discussion.

2. Develop strategies and activate emergency preparedness measures

Rather than focusing on predicting specific impacts, risk management strategies must identify and prepare for the multi-scale and diverse sources of national and local vulnerability to climatic extremes, and the potential of cascading interconnected impacts that can be triggered by El Niño events. Most countries have specific plans designed to reduce the impact of climate-related hazards (e.g. droughts or floods), such as disaster risk reduction strategies, evacuation or epidemic preparedness plans, emergency response plans, etc. These plans will need to be reviewed against emergency risks, including the influence of El Niño on health hazards, by the mandated agencies. If national climate experts and meteorological services identify a high likelihood of dangerous conditions (e.g. a heavy flood season), health authorities are encouraged to activate emergency preparedness efforts in advance, such as reviewing contingency plans, medical stocks, the availability of essential personnel, and the functioning of response systems. Particular attention should be paid to the preparedness of hospitals and health clinics to avoid damage and to provide emergency health response in disasters.

Given the uncertainties associated with any climate forecast, the implementation of 'no regret' strategies (those that are beneficial to health whether or not the specific predicted climate event occurs) should be prioritized. In particular, in areas where El Niño may be associated with diminished health risks, diligence in disease control **should not be reduced in any way**.

This global health bulletin can be utilized as a basis to develop more targeted documents concerning regional climate effects and specific health consequences for your locality.

3. Follow climate and weather forecasts for July 2014-March 2015 to monitor developments in this year's El Niño event

Scientists will have a better sense of the likely magnitude of this event over the coming months, which can provide helpful information for regions that tend to experience the same type recurring of impacts during El Niño events. It is extremely important to follow the forecasted climate for your region as a standard of good practice for health preparedness. Additional information is available from regional climate centers, in the IRI Maproom (<http://iridl.ldeo.columbia.edu/maproom/ENSO/>) and by searching #ENSOQandA on Twitter.

The best guidance for seasonal mean climate is from regional forecasts, that in addition to ENSO consider many aspects of the dynamic climate system, and are available 3-6 months in advance of the season of interest. Some national meteorological services can provide forecasts on multiple timescales (seasonal, monthly, weekly, daily, etc.) and information about how the current El Niño and other climatic influences are likely to affect rainfall or temperature in your area. These forecasts should indicate how likely your region is to experience rainfall or temperature anomalies (e.g. below-average, near normal, or above-average) (Fig. 3). Daily weather forecasts with a lead-time of 2-5 days give reliable information on extreme events that can be used to mitigate local disasters. Health decision-makers are encouraged to also understand how good (skillful) the forecasts are for particular locations, seasons, and time periods. Follow the forecasts from local climate services, the IRI (<http://iridl.ldeo.columbia.edu/maproom/IFRC/index.html>), and by searching #IRIForecast on Twitter.

Expected Climate Impacts for 2014-15

Africa: El Niño events are usually associated with drier conditions in Southern Africa and parts of the Sahel and wetter conditions in Eastern Africa. Impacts for the latter are expected during the short rainy season of October-December and are likely to persist into early 2015.

Asia Pacific: Below-normal rainfall is forecasted for much of South and Southeast Asia, particularly Indonesia, the Philippines, and the western equatorial Pacific from June 2014-January 2015.

South America: Wetter-than-normal conditions are expected in the eastern and central equatorial Pacific until January 2015. Drier-than-normal conditions are forecasted to occur in northern South America through March 2015.

IRI provides monthly forecast updates and regional rainfall forecast maps for monitoring here: <http://iri.columbia.edu/our-expertise/climate/forecasts/>. See Figure 3 for the current IRI Global Precipitation Forecast.

4. Monitor weather/climate/environmental data in real-time

Up-to-date information on the actual rainfall/temperature situation along with environmental factors (e.g. dust, vegetation greenness, water bodies, etc.) may be obtained from national meteorological services, other appropriate agencies, or via the Internet from reliable sources (see links below). Current and forecast information is always best understood in the context of historical data to highlight deviations from the expected conditions for a particular location. Monitoring information is a critical complement to disease surveillance and can extend the lead-time of preparedness efforts before health impacts occur. Policy makers and practitioners (e.g. hospital and emergency response personnel, local health officials) must be able to access historical data and monitored information in a timely manner to incorporate into

routine decision-making. Relevant information is available in the IRI Maproom: <http://iridl.ldeo.columbia.edu/maproom/Health/index.html>.

5. Activate nationally and locally prepared communication and response plans

Experience suggests that El Niño events and their potential impacts on society may be ignored or oversensationalized by the media. It is essential to work with national meteorological agencies to establish clear and consistent messages that keep both response agencies and the public informed about potential rainfall and temperature anomalies, and keep the risks in perspective (given other societal challenges and the uncertainties associated with climate forecasts). Coordinated communications about health risks associated with El Niño can improve health outcomes and the cost-effectiveness of interventions by targeting support at the right time to the communities that need the greatest protection.

When the above monitoring and forecasts indicate that your locality is likely to be affected by El Niño, appropriate preparedness measures should be implemented. Activation of response plans will need to be considered. Climate-related disasters, such as floods, can be of rapid onset, and become geographically widespread within a short time period. Early coordination in the health sector by government, private, community, and international agencies can provide immediate financial, technical and logistical support, particularly in high-risk areas or zones already experiencing compound crises.

6. Monitor and evaluate the effectiveness of interventions that use climate information in their design and execution

Assessing the impact of intervention efforts in response to El Niño advisories and seasonal climate forecasts is important to best prepare for future ENSO events and ensure the greatest efficiency and effectiveness of their implementation. Coordination of this information between multiple agencies will allow for successful communication between the health, climate, and other societal sectors. Intervention evaluation will support evidence-based policy, improve national and local health system preparedness, and prevent avoidable negative health impacts associated with future El Niño events at the global, regional, and national levels.

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Available climate monitoring resources

1. IRI's El Niño forecasts:
<http://iri.columbia.edu/our-expertise/climate/forecasts/enso/>
2. WMO El Niño/La Niña Updates Archives
http://www.wmo.int/pages/prog/wcp/wcasp/enso_updates.html
3. IRI's seasonal rainfall forecasts
<http://iri.columbia.edu/our-expertise/climate/forecasts/seasonal-climate-forecasts/>
4. Links to Additional Information
 - WHO fact sheet on Climate and Health
<http://www.who.int/mediacentre/factsheets/fs266/en/>
 - Centro Internacional para la Investigación del Fenómeno de El Niño
<http://www.ciifen.org/>
 - Climate and Infectious Diseases, Louise Kelly-Hope and Madeleine C. Thomson
<http://tinyurl.com/Kelly-Hope-Thomson-2008>
5. IRI's interactive map room on El Niño-associated rainfall probabilities
http://iridl.ldeo.columbia.edu/maproom/ENSO/Climate_Impacts/ENSO_PRCP_Prob_TS2p1.html
6. WHO Emergency Risk Management Guidelines
 - Emergency risk management for health
<http://www.who.int/hac/techguidance/preparedness/en/>
 - Disaster risk management for health fact sheets
<http://www.who.int/hac/techguidance/preparedness/factsheets/en/>
 - Tools for humanitarian health action
<http://www.who.int/hac/techguidance/tools/en/>
 - Safe Hospitals
<http://safehospitals.info/>

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