Climate Change and the Environment

Chairpersons: D Ramdath, S Persaud

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The impact of climate change on human health and the environment: Implications for environmental health research, policy and practice in the Caribbean

M Lichtveld, P Ouboter, F Abdoel Wahid, J Wickliffe, C Alcala, W Zijlmans
Tulane University, New Orleans, USA, Anton de Kom University of Suriname, Scientific Research Centre Suriname; Academic Hospital Paramaribo, Suriname
Email: mlichtve@tulane.edu

Objectives: To assess the levels of key developmental neurotoxicants in environmental exposure sources including fish and produce and the impact of climate change on the deposition, accumulation and bioavailability of these neurotoxicants, and to examine the potential influence of climate change on exposures associated with chemical-mediated vector control strategies to interdict mosquito-borne infectious diseases.

Design and Methods: Mercury **(**Hg) contamination was assessed in sediments and fish in gold and non-gold mining areas in Suriname. Hair Hg levels were analysed in pregnant women and children. Pesticide residue concentrations were measured in frequently consumed produce and compared to levels in produce from other Caribbean countries. Mosquito coils to control vector-borne diseases including, Zika were analysed for the presence of environmental contaminants.

Results: Mercury concentrations: bottom sediments (0.14−0.35 ug Hg/g); frequently consumed predatory fish (0.17−1.64 ug Hg/g), 75% of fish being above World Health Organizations (WHO's) safe consumption level of 0.5 ug Hg/g. Mean hair Hg: 2.0−7.0 ug/g in women and children. Residues exceeding the European Union (EU) maximum residue levels (MRLs): lambda-cyhalothrin (1.08 µg/g) in Chinese cabbage (EU MRL 1.00 µg/g), endosulfan (0.07 µg/g) in Tannia (EU MRL 0.05 µg/g) and lindane (0.03 µg/g) in Tannia (EU MRL 0.01 µg/g). The EU samples from Caribbean countries showed similar results. Endosulfan and lindane are banned globally. Preliminary analysis of mosquito coils: average total lead (Pb) 14.6 µg for small coils; 104.2 µg for large coils.

Conclusions: Climate change can impact food security through influencing transport and use of environmental contaminants increasing the risk of exposure to levels which may adversely impact human health. Chemical-mediated vector control may result in unintended exposure in vulnerable populations.

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Differences in association of physical activity and high blood pressure between urban and rural areas in Suriname: The Suriname health study

SM Baldew, ISK Krishnadath, JR Toelsie
Department of Physical Therapy, Department of Public Health, Department of Physiology, Faculty of Medical Sciences; Anton de Kom University of Suriname
Email: sergio.baldew@uvs.edu

Objective: To describe the association between high blood pressure (HBP) and physical activity (PA) across urban and rural areas in Suriname.

Methods: The Suriname health study was a nationwide cross-sectional study on non-communicable diseases risk factors among the population age 15–65 years, based on the World Health Organization Steps guidelines. Blood pressure was measured three times and PA was assessed with the Global Physical Activity Questionnaire. The prevalence of HBP and PA and their association were assessed in the urban and rural areas.

Results: The prevalence of HBP was 26.4% in the total population with small difference between the areas. It increased with age and was equal among men and women. Almost 40% of the population met the PA recommendations with a decrease with age among men and not among women. Compared to the rural areas, a lower percentage within the urban coastal area met the recommendations. The unadjusted OR for PA in relation to HBP was 0.7 in men ($p < 0.05$) overall and in the urban area. The OR approached 1 as we adjust for age and body mass index. No associations were observed in women.

Conclusion: The association between recommended PA and HBP was different in the several areas and between genders. Among men, age did influence this association. The factors influencing the association of PA and HBP need to be investigated in more detail.

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Rising sea-level and its implications for Guyana

P Singh
Pan American Health Organisation/World Health Organisation Georgetown, Guyana
Email: singhpri@paho.org

Objective: To examine the rise in sea-level and its implications for the people of Guyana.

Design and Methods: This paper utilized secondary data and review of research conducted by Omatoyo Kofi Dalrymple from the University of South Florida, and Tash Van Doimen and Evan Persaud from the University of Guyana.

Results: Torrential rain would cause inundation of parts of the Coastland, as evidenced by the country's worst natural disaster, during 2005. The total amount of rainfall exceeded 60 inches from 24 December 2004 to 31 January 2005, with one night's rainfall amounting to seven inches. This resulted in severe flooding and Regions Three, Four and Five declared as disaster areas. Thus, sea-level rise of 0.19 m from 1901–2010 and a further estimated 0.1 m rise between 2006–2016 shows that the rate of shoreline recession may increase in areas not protected by seawalls. Mangrove trees are particularly vulnerable due to coastal squeeze resulting from a combination of sea-level rise, inland flooding and human pressures.

Conclusion: Large parts of coastal lands along the East and West Banks of the Demerara river and the East Bank of the Essequibo river will be threatened by salt-water inundation resulting from global mean sea-level rise. Therefore, Guyana needs to develop flood prevention and mitigation strategies; future studies can benefit from extending existing coastal sea-level rise and shoreline change datasets.

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Investigating the correlation between selected crop production and climatic parameters: Implications for food security in Guyana

D Deonarine
PAHO/WH, Georgetown, Guyana
Email: deonaridha@paho.org

Objective: To investigate the correlation between crop production and climatic parameters.

Design and Methods: A simple regression technique was used to assess the correlation between the variable. Time series data were utilized to determine the trends in the production of crops and climatic parameters.

Results: The results of joint-effect of the climatic parameters on production of the selected food crops for the period Q1 2013 to Q4 2015 shows that the four climatic parameters jointly accounted for 46% of variance in cassava production, 42% in rice production, 40% in bora production, 31% and 30% in pineapple and coconut production, respectively and 23% in plantain production.

Among the four climatic parameters studied, minimum temperature has the highest influence on the variances of the crops of 37% (cassava). Sunshine hours are an important factor for pineapple, rice, coconut and cassava accounting for 19%, 16%, 14% and 12% of the quarterly variations of their production respectively.

Conclusion: The results have demonstrated that joint climatic parameters have a positive correlation with production. However, it is important to note that the period of observation is minimal and there is now more frequent variability of climatic patterns. As is evident, climate variability is occurring and it is expected to continue to have negative impacts on food security. This does not augur well since food security has a direct link to health.

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The association of rainfall and temperature anomalies with childhood Type 1 Diabetes

ES Tull, HN Yarandi
Inter-American Center for Public Health Improvement, Christiansted, US Virgin Islands
Email: drmirt@yahoo.com

Objective: Previous epidemic-like surges in childhood Type 1 diabetes mellitus (DM) incidence that were reported in the US Virgin Islands in 1984 and 2005 occurred within 12–18 months after an outbreak of dengue fever. This study examined if 1) annual incidence rates of childhood Type 1 DM are associated with rainfall and temperature anomalies and 2) if an outbreak of dengue fever in 1995 was followed within 12−18 months by a previously unreported surge in childhood Type 1 DM.

Design and Methods: Registry data on annual Type 1 DM incidence in children aged ≤ 19 for the years 1980 to 2005 were compared to corresponding annual data on rainfall and temperature anomalies (deviation from normal level in inches and Celsius, respectively) using second-order response surface polynomial (SORSP) modelling, contour plot and Poisson regression analysis.

Results: In the SORSP analysis, rainfall anomaly ($F = 3.79$, $p = 0.03$), temperature anomaly ($F = 5.16$, $p = 0.004$), and the cross product of rainfall and temperature ($F = 11.24$, $p = 0.003$) predicted annual Type 1 DM incidence rates. In the contour plot, the highest rates corresponded with the highest deviation from normal rainfall and lowest deviation from normal temperature. Poisson regression modelling indicated that temperature anomaly was not associated with Type 1 DM incidence independent of rainfall anomaly. As predicted, there was a surge in Type 1 DM cases within 12–18 months of the 1995 dengue fever outbreak.

Conclusions: Epidemic-like surges in childhood Type 1 DM cases occur in the US Virgin Islands when climactic conditions produce above normal rainfall in conjunction with below-normal temperatures.

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Results of an awareness project in safe pesticide use for 5th and 6th graders at primary schools in Nickerie

R Ramjatan, WB Hawkins, D Mans, T Graafsma, A van Sauers, MY Lichtveld
Regional Health Services (Stg RGD), Nickerie; Tulane University School of Public Health and Tropical Medicine, Department of Global Environmental Health Sciences, New Orleans, Louisiana; USA; Medical Faculty, ADEK University; Institute for Graduate Studies and Research (IGSR), ADEK University; Ministry of Agriculture, Animal Husbandry and Fisheries, Paramaribo, Suriname
Email: ramjatanradha@gmail.com, e-mail: mlichtve@ tulane.edu

Objective: To raise the awareness in safe pesticide use among 5th and 6th graders at all primary schools in Nickerie, Suriname.

Design and methods: The target population was 1184 pupils from all the 25 primary schools in Nickerie. A powerpoint presentation in safe pesticide use was designed at a 5th grader's level. This project was executed by 25 trained community health-workers (CHWs). Every session was preceded by a pre-test and was finalized by a post-test, to analyse and measure the knowledge gained on this population in safe pesticide handling. An approval from the Ministry of Education and Culture (MINOWC) was required as this project was executed during school hours.

Results: We reached 88.5% of the population. Knowledge about exposure to pesticides increased from 0.7% to 50.6%, while knowledge about pesticide handling increased from 58% to 62.8% and from 39% to 70.3% regarding two questions about this subject. Knowledge about disposal increased from 40.8% to 81.1%. Knowledge about the health risks to pesticide exposure increased from 47.3% to 95.4% and from 29.7% to 63.2% regarding two questions about this subject. Knowledge about the purchase of pesticides by minors increased from 88.7% to 96.4%. General pesticide knowledge increased from 90.1% to 95.8% and from 67.7% to 88.3%, respectively, concerning two questions about this subject. Knowledge about pesticide storage decreased slightly from 95.9% to 94.6%.

Conclusion: A majority (88.5%) of the targeted population got an increase in awareness and knowledge about safe pesticide use, which can be translated back to their community.