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Environment and health: Non-communicable disease mortality trends as early indicators of environmental health threats

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Objective: To characterize and identify trends in disease burden in Suriname by analysing a subset of mortality data from 2004 to 2011. The ultimate objective was to be able to estimate disease burden associated with relevant environmental risk factors.
Design and Methods: Crude and adjusted mortality rate ratios were estimated for the urban districts of Paramaribo, Wanica and Nickerie, ethnic subpopulations (Creoles, Hindustani, Javanese and Maroons) and four leading causes of death: cardiovascular diseases, cancer, deaths due to external injuries and diabetes mellitus.
Results: After adjusting for gender and cause of death, the risk of death from either one of the causes in Paramaribo was four times (RR 4.4, CI 3.1, 6.3) and in Wanica almost two times higher (R 1.8, CI 1.23, 2.55) then in Nickerie. After adjusting for gender and geographical location, the risk of cardiovascular death was four times higher (RR 4.4, CI 4.3, 4.9) compared to diabetes. Cancer (RR 1.9, CI 1.7, 2.0) and deaths due to external injuries (RR 1.8, CI 1.7, 1.9) both showed an almost two-fold higher risk compared to diabetes. After adjusting for age and gender, the risk of death due to all causes was significantly different among the ethnic groups. Compared to the Maroon population, the rate ratios for the Creole, Hindustani and Javanese population were, respectively 1.5 (CI 1.3, 1.7), 1.4 (CI 1.3, 1.6) and 1.2 (CI 1.1, 1.3).
Conclusions: The analysis with basic statistical modelling techniques, effectively controlling for demographic changes across populations over time, revealed statistically significant differences among subpopulations in Suriname.

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Environmental characterization of pesticide contaminated produce of Suriname

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Objective: To propose a research method for characterizing pesticide contamination in vegetables, fruits, medicinal plants and nutraceuticals in Suriname. The hypothesis is that the level of pesticide residues in these products potentially causes adverse health effect.
Design and Methods: The study entails the residue analysis of relevant pesticides in popularly consumed items. The sampling of the items will be conducted randomly at three fresh markets in the districts of Paramaribo and Wanica. It is proposed to conduct the laboratory analysis with gas chromatography mass spectrometry. Statistical analysis will be performed with a suitable software package (*eg* Statistical Package for the Social Sciences). This study is the first phase of a comprehensive community-based environmental health investigation. Phase 2 will consist of a human health assessment including a comprehensive dietary assessment. Based on the results of phases 1 and 2, a risk assessment will be conducted, followed up by biomarker tests to ascertain organ-system function impact in phase 3.
Results: Sixteen indicator items have been chosen: leavy vegetables (tannia, clarion, cabbage), fruit vegetables (eggplant, long yard beans, okra), fruits (bananas, oranges, mangoes), root vegetables/staple-food (cassava, sweet potato, xanthosoma, rice, plantains) and medicinal plants/nutraceuticals (Quassia amara, Saccharum officinarum, Cocos nucifera). Eleven pesticides have been selected, belonging to the organophosphate, organochlorine, neonicotinoid, carbamate and pyrethrin classes.
Conclusions: The environmental characterization is a first step to test the hypothesis, but in order to ascertain the association with adverse health effects it should be followed up by the other phases of the environmental health investigation.

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An integrated approach to pesticide management in Eastern Nickerie District, Suriname: A public health intervention

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Objective: The objective of the integrated pesticide management intervention project (IPMIP) is to develop a community-based participatory, novel and safe pesticide storage, use and disposal intervention that can be sustained by the community. The national incidence of suicide in Suriname has increased from 7/100 000 in 1960 to 25/100 000 in the 2012.

Design and Methods: Phase I of the IPMIP consisted of a needs assessment to characterize community perceptions through focus groups and questionnaires. Key focus group themes were analysed using Atlas Ti. Based upon focus group data, a public health curriculum was developed consisting of modules including public health, pesticides management, mental health and mobile health technology. Community health workers (CHWs) were trained in Phase 2 as pesticide interventionists. Phase 3 examines the effectiveness of mobile health technology-enabled CHWs to promote safe pesticide use.
Results: More than half of the 67 participants (39) reported using pesticides at work and the majority (62) used pesticides at home. Twenty-six participants reported having someone in their family harmed by pesticides. Fourteen CHWs participated in the 10-week training programme and were introduced to mobile health technology as a health education intervention tool. Health messages were tested for content, literacy and ability to solicit participant response.
Conclusion: There was consensus about the overuse and misuse of pesticides. Perception exists that suicide stems from ignored psychosocial problems and limited community support. The unrestricted availability of pesticides is considered a key suicide contributor especially among young adults with family and/or relationship problems.

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Methods of decontamination and disposal of infectious waste at the National Public Health Reference Laboratory, Guyana

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Objectives: To assess the degree and priority of action taken to minimize the risk posed by potential hazards. The study was undertaken to find out the sterility of treated waste that was sent out into the environment from national public health reference laboratory (NPHRL).
Design and Methods: A prospective study was carried out at NPHRL which targeted waste emanating from the Microbiology and Tuberculosis Departments. A steam sterilizer was used to assess the sterility of waste before disposal and the conditions that may affect the sterility of waste were examined. Waste loads of 6.8 kg, 4.5 kg and 2.3 kg were processed on different days. Thermal and biological data were obtained using a chemical indicator (autoclave tape) and a biological indicator containing spores of *Geobacillus stearthermophilus*, respectively.
Results: Heat transfer was more efficient when waste was tested in stainless steel containers and single polypropylene autoclave bags rather than double. Growth of bacteria from residue was seen after exposure times of 10 and 15 minutes at 121 °C. Growth of *Geobacillus stearthermophilus* was observed in waste processed in autoclave bags even after a cycle of 121 °C for 45 minutes.
Conclusion: Decontamination of infectious waste by autoclaving at 121 °C for 10 minutes is insufficient because conditions such as composition of waste, volume of waste, type of container used, and orientation in the autoclave contribute a great deal to the effective heat transfer during the autoclaving process. It is recommended that waste be processed in smaller amounts in stainless steel containers and composition of waste load be standardized.

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Evaluation of Surinamese medicinal plants for their potential wound healing properties in embryos of the zebrafish *danio rerio*

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Objectives: Preparations from *Momordica charantia* L, *Psidium guajava* L, *Lantana camara* L, *Aloe vera* (L) Burm f, *Cinnamomum cassia* (Nee s and T Nees) Farw and *Solanum melongena* L are popularly used in Suriname for treating wounds. In this study, aqueous extracts from these plants have been evaluated for their effects on the regeneration of the amputated caudal tail fin, as well as total sub-intestinal vessel and body length of zebrafish embryos.
Design and Methods: Embryos from amputated wildtype (AB) and Tg (fli1a:EGFP)y1/+ zebrafish were exposed to serial dilutions of the plant extracts. The effects of the extracts on the regeneration rate of the caudal fin were determined at 48 hours post-fertilization (hpf) by comparing the longitudinal distance of the fin growth with that of sham-operated embryos; those on their total sub-intestinal vessel and body length were assessed at 96 hpf by microscopic examination.
Results: Up to 10^{-4} g/mL, none of the plant extracts improved the regeneration rate of the amputated caudal fin or increased total sub-intestinal vessel or body length of the embryos. On the contrary, exposure to the *L camara* extract at 10^{-5} and 10^{-4} g/mL led to decrease of the total sub-intestinal vessel length of more than 50% and almost 100%, respectively.
Conclusions: None of the samples evaluated in this study displayed wound healing or pro-angiogenic properties under the experimental conditions applied. However, the *L camara* preparation may possess interesting anti-angiogenic characteristics. Cell culture studies to verify this

suggestion using human umbilical vein endothelial cells are in preparation.

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The effectiveness of aloe vera against common pathogenic bacteria at the Georgetown Public Hospital Corporation

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Objectives: To test aloe vera extract against common bacterial pathogens to determine its bacterio-static or bactericidal properties.
Design and Methods: Five organisms were investigated *ie Staphylococcus aureus, Streptococcus pyogenes, Escherichia coli, Pseudomonas sp and Salmonella sp* Samples were obtained from the Georgetown Public Hospital Corporation (GPHC). All were tested against aloe vera extract. The growth of each organism when subjected to the aloe vera extract was observed and recorded.
Results: The results showed that when the bacteria (*Staphylococcus aureus, Streptococcus pyogenes, Escherichia coli, Pseudomonas sp and Salmonella sp)* were subjected to the aloe vera extract, there was a 42% average reduction in the growth rate. The reduction rate obtained for each organism was as follows: *Staphylococcus aureus* was 30%, *Streptococcus pyogenes* was 43%*, Escherichia coli* was *62*%*, Pseudomonas sp* was 43% and *Salmonella sp* was 34%. The gram-negative organisms showed an average reduction of 46%, whereas, the gram-positive bacteria showed an average of 36%, which clearly indicated that the gram-negative organisms were more susceptible to the aloe vera extract.
Conclusion: This research established a 42% growth reduction in the bacteria tested. This indicates that the bacteriostatic qualities of the aloe vera extract would be effective against minor bacterial infections for both gram-positive and gram-negative organisms. This organic approach can be used to lessen the economic cost of treating minor infections in developing countries as well as developed countries.