

Alternate electrification and non-potable water: A health concern for Jamaicans

Tazhmoye V. Crawford

Department of Basic Medical Sciences, University of the West Indies, Mona, Kingston 7, Jamaica, W.I.

Citation: Crawford TV. Alternate electrification and non-potable water: A health concern for Jamaicans. *North Am J Med Sci* 2009; 1: 338-344.

Doi: 10.4297/najms.2009.7338

Availability: www.najms.org

ISSN: 1947 – 2714

Abstract

Background: Research has shown that the absence of electricity and potable water usually result in negative effects on one's health and is more likely to affect women than men. **Aim:** To determine the extent to which alternate electrification and limited potable water, impacts on health. **Materials and Method:** This study is informed by primary and secondary data, representing a sample size of 150 respondents (75 male and 75 female), who were interviewed via a 24-item structured interview schedule during the period 2006-2007, throughout the 14 parishes of Jamaica. In an effort to determine the number of persons to be interviewed, each parish population was divided by the island's population (2,599,334) and then multiplied by 150. Data was analyzed using the statistical package for social scientists 15. **Results:** The respondents of this study who use kerosene lamp as an alternate means to electricity use firewood for cooking (12% male and 15% female). This sometimes result in obstructive pulmonary disease (female 43%; male 21%). The absence of electricity also results in the consumption of improperly stored meat, thus medical implications: paroxysmal abdominal pain (colic), and diarrhea (male 91%; female, 95%). The transporting of firewood, pans of water and laundry via head-loading, sometimes result in back/spinal injury (male, 75%; female, 48%). **Conclusion:** Alternate access to electricity and potable water result in the use of kerosene lamp, firewood and the consumption of non-potable water (often transported on one's head) – causing medical implications such as back/spinal injury, obstructive pulmonary disease, paroxysmal abdominal pain and gastroenteritis.

Keywords: Health, electricity, water.

Correspondence to: Tazhmoye V. Crawford from the University of West Indies, Mona Campus, Kingston 7, Jamaica, W.I; Tel: 1-8763623628 E-mail: crawfordtazhmoye@yahoo.co.uk

Introduction

There are approximately 1.5 billion people in developing countries without access to electricity and 2.5 billion people who are dependent on traditional biomass fuels for cooking and heating [1]. In Jamaica, a lack of access to electricity represents 8% of its household population. The island's electricity supply industry is the Jamaica Public Service Company (JPSCo) which was established in 1923 and currently have a customer-base of 582,000 (92%) - operated under the auspice of Marubeni Corporation (80% shares) and the Government of Jamaica (20% share). The electricity company, which is vertically integrated, owns and operates 28 generating plants, 54 substations, and approximately 14,000 kilometres of distribution and

transmission lines [2].

While it may be argued that modern forms of energy can liberate millions of women and children from the burden of gathering water and fuel-wood [3], the fact is that alternate use of lighting result in approximately two million premature deaths per year, worldwide and more than five million (mostly children) die from illnesses caused from drinking poor quality water [4].

Some 1.1 billion people (18%) of the World's population lacked access to potable water by the end of 2004 [1]. In Jamaica, 400,000 households have access to potable or safe water [5]. The National Water Commission (NWC), Jamaica's state-owned water supply industry, reports that

over 770 billion gallons of potable water was produced [6]. In 2005, the NWC produced approximately 296,454.1 megalitres of potable water. This was 5.8 percent higher than production for 2004 and reflected increased production in the 14 parishes of Jamaica, hence overall access to potable water represents 86.2% [7].

This research investigates the extent to which alternate electrification and limited access to potable water impacts the health of Jamaicans within the age range of 35-49 and greater than 50.

Materials and Methods

This research is informed by primary and secondary data. The former was collected via the use of a structured 24-item interview schedule, while the latter via intense literature review.

The sample size represented 150 respondents (75 male and 75 female) from the 14 parishes of Jamaica. Interviews were conducted during the period 26 February 2006 to 24 September 2007. The respondents involved in the sample were adults, who appeared to be of sound minds and who represented the various levels of education. The respondents were interviewed face-to-face from various locations: the food markets, on the streets (including people travelling from the field, rivers and standpipes with loads on their heads), at home, construction sites and business places.

In an effort to determine the number of persons to be interviewed, each parish population was divided by the island's population of 2,599,334 [8] and then multiplied by 150. The number of cases interviewed per parish is noted in Table 1.

Table 1 Distribution of the Sample by Parish

Parish	Population (n = 2,599,334)	Cases (n = 150)
Kingston	95,810	5
St. Andrew	554,241	32
St. Catherine	480,657	28
Clarendon	236,150	14
Clarendon	185,267	11
St. Elizabeth	145,923	8
Westmoreland	138,452	8
Hanover	66,825	4
St. James	174,631	10
Trelawny	72,816	4
St. Mary	111,093	6
Portland	80,025	5
St. Thomas	91,297	5
St. Ann	166,147	10

The objective of the interview schedule was to capture the relevant information that would help to determine the extent to which alternate lighting/electricity and limited access to potable water as public goods, impacts on health and well-being of Jamaicans.

The format of the instrument reflected three overarching considerations, namely: demographic characteristics

(age, gender, educational attainment, area of residence, occupation), socio-economic status (public utility charges and consumers ability to pay, alternate use of public utilities), medical implications (head-loading, back injury, nutritional defects and treatment).

Data was analyzed using the statistical package for social scientists 15.

Results

Table 2 Demographic Characteristics

Variables	Male (n = 75)		Female (n = 75)	
	Number	%	Number	%
Age				
35-39	12	16	12	16
40-44	27	36	32	43
45-49	22	29	28	37
≥50	14	19	3	4
Education				
Pre-primary	19	25	17	23
Primary	20	27	12	16
Secondary	25	33	9	12
Tertiary	11	15	37	49
Occupation				
Farming	30	40	16	21
Medical	4	5	9	12
Administration	9	12	19	39
Teaching	9	12	9	12
Trade	23	31	12	16

Table 2 shows the demographic characteristics of the respondents (35 - ≥50), majority of whom represented the 40-49 age range; attained education mainly at secondary (male = 33%) and tertiary (female 49%) levels. Majority of the male respondents were farmers (40%) and trade workers (31%), while their female counterparts, were mainly administrators/clerical (39%) and also farmers (21%). More female (57%) than male (44%) faced economic constraints, hence non-access to electricity. This is followed by grid network distance (male = 39%, female = 29%) and include communities such as Adeous Valley in St. Thomas; Chesterfield in St. Mary; Chattau in St. Elizabeth; and Rosewell in Clarendon. In addition, some of the respondents refused to maintain electricity service (male = 17%, female = 13%) because of negative experience (frequent billing anomaly, wrongful disconnection, unsatisfactory customer care) with the electricity company, as well as because of not possessing the modern amenity that would require the use of such service (indicated in Table 3). Despite the limited access to electricity, Table 4 shows significant improvement in lighting over the period 1994-2007. To be more specific, the most common form of lighting in Jamaica is electricity, followed by a common substitute: kerosene. The use of kerosene has shown significant decline prior to and over the period of privatization, with its recent statistics showing 6.3 percent in 2007, compared to 11.3 percent at the start of privatization (2001). Other lighting sources (including candles) show fluctuation. The aforementioned evidenced that owing to an increase of electricity service

throughout the island since privatization, the use of kerosene decreases.

Table 3 Limited access, alternate use and head loading

Variables	Male (n = 75)		Female (n = 75)	
	Number	%	Number	%
Electricity				
Economic constraint	33	44	43	57
Grid network distance	29	39	22	29
No desire for service	13	17	10	13
Potable Water				
Economic constraint	27	36	34	45
Hilly terrain	20	27	13	17
Limited standpipes	28	37	28	37
Alternate use of utility				
Spring water	19	25	20	26
River water	6	8	11	15
Trucking/bottle	13	17	13	17
Standpipe	28	37	20	27
Firewood	9	12	11	15
Kerosene lamp	75	100	75	100
Meat storage (salt)	68	91	71	95
Load carrying				
Wood	22	29	11	15
Pan of water	53	71	51	68
Laundry at river	0	0	13	17

On the point of potable water, this is supplied by the National Water Commission of Jamaica. Like electricity, economic constraint was the highest deterrent to accessing potable water, moreover for female-headed households (45%) than male-headed households (36%). This is followed by limited public standpipes (male = 37%, female = 37%) and hilly terrain (male = 27%, female = 17%) - refer to Table 3.

Table 4 Source of electricity per Jamaican population

Year	Sources			
	Electricity	Kerosene	Other	None
1994	70.8	26.9	0.7	2.4
1995	71.5	25.7	0.5	2.3
1996	76.9	21.1	0.8	1.3
1997	78.2	17.9	0.6	3.3
1998	80.4	15.9	0.4	3.3
1999	80.8	14.8	0.5	4.0
2000	86.9	11.2	0.7	1.2
2001	86.1	11.3	0.8	1.7
2002	87.1	10.8	0.6	1.4
2004	89.0	6.9	1.3	2.8
2006	89.0	7.1	0.9	2.0
2007	90.3	6.3	1.5	1.9

Source: Planning Institute of Jamaica [28].

Table 4 also shows alternate use of public utilities (electricity and water) and load carrying. Public standpipe (male = 37%, female = 27%) and spring water (male = 25%, female 26%) were most likely to be consumed by the

respondents who were not in contractual arrangement with the National Water Commission. These individuals (male = 71% and female = 68%) usually transport heavy pans of water on their heads. On the other hand, females were more likely to do their laundry at a nearby river and transport same on their heads (17%). These respondents represented rural communities of St. Thomas (Rowland's Field), Portland (Bibrook, Skibo and Belleview in Portland), St. Catherine (Mountain Path), Trelawny (Freeman's Hall, Stettin, Wirefense, Albert Town and Joe Hut), Westmoreland (Haddoc), St. Mary (Hamstead, Lewis Store and Heywood Hall). The Lewis Store community obtains water in their pipes on average thrice per week, while residents of Heywood Hall get water once in a while. Their alternate means is the pump-hole river. Water is trucked to the Haddoc community approximately thrice per week also. The residents of the above-named communities in Trelawny have to walk many miles to obtain water from standpipes, the quashi river and springs. In addition, the transporting of heavy loads of firewood and pans of water and laundry on one's head, results in the respondents reporting injury to their backs/spine (male = 67%, female = 38%).

Access to potable water through the National Water Commission (Jamaica's state-owned water supply industry) has seen improvements (but with slight fluctuation) over the period 1993-2007. Although such improvement in terms of residents accessing potable water in their home pipes, the use of public standpipes decreases, but shows no significant difference in access to rain, river, spring and pond water. In essence, persons are more likely to access potable water via home pipes and public standpipes (according to Table 5).

With regard to firewood, this was mostly used for cooking outdoor, as well as indoor (especially during rainy season) and was mostly utilized by female (15%) than male (12%), as the respondents possessed neither electricity nor gas stove. Such firewood is also frequently transported via one's head, mainly by male (29%) than female (15%) and was common among residents of Adeous Valley in St. Thomas, Chesterfield in St. Mary, Chattau in St. Elizabeth, Rosewell in Clarendon, and Wirefence, All-sides and Crown Land in Trelawny. In addition, all the respondents used kerosene lamps as an alternate form of lighting. This is owing to economic constraint, grid network distance and the non-desire to absorb electricity service from the Jamaica Public Service Company. Inhalation of kerosene from the lamp resulted in lamp oil poisoning (male = 12%, female = 19%). During the interview, the respondents (kerosene lamp users) complained of having encountered symptoms such as throat swelling, vision problem, breathing restrictions, dizziness, euphoria and gastrointestinal problems (vomiting, blood in stool and abdominal pain). In addition, the use of firewood resulted in asyhma and sinusitis, Obstructive Pulmonary Disease, including emphysema and bronchitis; significantly more in the female (43%) respondents than their male counterparts(21%).The absence of electricity often results in some of the respondents storing their meat via the use of

Table 5 Source of water per Jamaican population

Year	Sources					
	Private - piped in household	Public pipe	Truck/standpipe	Untreated bottle	Rain/River/Spring/Pond	Well/Other
1993	62.3	20.0	-	3.1	11.4	3.1
1994	63.0	20.0	-	2.1	11.4	3.2
1995	63.5	16.5	-	2.9	13.2	4.1
1996	66.8	14.9	-	2.3	12.9	3.1
1997	66.1	15.1	-	3.8	11.4	3.5
1998	65.7	14.2	-	4.4	13.1	2.6
1999	67.6	15.3	-	3.2	10.5	3.5
2000	66.6	13.2	-	3.2	11.7	5.4
2001	70.9	13.1	-	3.3	11.6	1.3
2002	64.5	12.1	1.9	3.3	15.3	3.0
2004	68.2	9.5	1.8	4.1	7.9	2.3
2006	67.8	6.7	2.8	3.9	15.4	3.5
2007	70.2	6.4	2.1	4.0	14.1	3.3

Source: Planning Institute of Jamaica [28]

large quantity of salt (instead of a refrigerator) for preservation. This resulted in nutritional defects such as paroxysmal abdominal pain (colic) and diarrhea (male = 91%, female = 95%). Similarly, the consumption of non-potable/contaminated water caused gastroenteritis among the respondents (female = 89%, male = 61%), who were more likely to use home remedies (cola acumulata, momordica charantia and the first urine in the morning) rather than consult with a medical practitioner.

Discussion

Lack of or limited access to electricity as public good, has the propensity to affect both health and economic well-being of individuals. Take for instance where kerosene lamp is used as an alternate form of lighting, this resulted in kerosene oil poisoning. Consistent with this study, one school of thought discussed the harmful effects in breathing kerosene, especially if it is used for the purpose of lamp, cooking or heating. It was noted that there can be effects on the airways and lungs; eyes, ear, nose and throat; gastrointestinal; heart and blood; nervous system; and skin. Such effects are as a result of Hydrocarbons, substances that contain only hydrogen and carbon [9].

On the point of economic well-being, poor households often pay 10 or 20 times the price paid by connected households with regular service, thus resulting in benefits reaped by those households whenever services are expanded. This is as a result of privatization of the electricity sector [10]. In Guatemala, households with electricity pay less than US\$0.10 per kilowatt hour (kWh) to light up their homes, while those without, tends to rely on candles that cost the equivalent of US\$5 per kilowatt hour [11]. In Port-au-Prince, Haiti, households with piped water connections pay US\$1.00 per cubic meter, but those without pay US\$10 per cubic meter to obtain water from private vendors [11].

Persons without electricity in Jamaica use kerosene oil and candles for lighting. The former costs US\$2.20 per 750 millilitre, while the latter cost US\$0.30 (including general consumption tax of 16.5%) per candle. On average one household would spend US\$18.36 per month (estimating that 750ml x 2 are used per week) for kerosene oil and US\$25.23 for candles (estimating that 3 candles are used per day). Like the case of Guatemala, the use of alternate lighting is more expensive than the average electricity charges (US\$0.27 per kWh in Jamaica). The aforementioned costs could impact on the poor, hence the counter argument against the Neoclassicalist and the Neoliberalist (who argues that privatization lowers prices [12] and that higher electricity charges comes with privatization [13]). This is reflected where there is a steady increase in electricity charges since the privatization of the Jamaica Public Service Company. Charges for electricity went from US\$0.14/kWh at beginning of privatization in 2001 to US\$0.27 per kWh in 2009.

Prices and grid network proximity are two main drivers of electrification. With the absence of modern form of lighting, households are left with no choice but to seek other forms of alternative [14]. However, it should be realized that the Jamaica Public Service Company would not reap economies of scale or economies of scope if it were to effectively employ universal access. This is because each kilometer of wires costs over US\$11,236.00, and thus poses a challenge to equitable access [15] especially in the case of distance from grid network. The Rural Electrification Programme, which is an initiative of the Government of Jamaica (since 1975), provides power on a long-term payment loan basis, where rural houses are being wired and the customers make a deposit of 10% of the total sum of US\$168.54, being the initial payment. The remaining sum is required to be paid on a monthly basis, as part of the electricity bill, which is sent from the Jamaica Public Service Company [16]. Customers are allowed four years to complete payment of the total sum charged. It is imperative to note therefore that the REP

contributes 12% access to electrification, hence 92% overall access to the overall customer base (582,000) of the Jamaica Public Service Company. However, where the remaining 8% lacks access, this could be embraced by the views of the World Bank which states that where the supply of electricity is insufficient and unsustainable, this constitutes “energy/resource poverty,” and thus affects approximately 40 percent of people in the developing world [17]. Such insufficiency and unsustainability are also driven by a lack of capacity to meet electricity cost.

Consonant with the findings from the 1992 United Nations Conference on Environment and Development, the Earth Summit shows that females suffer more from a lack of electricity than their male counterparts (especially in terms of obstructive pulmonary disease and nutritional defects) [18]. The views of Karlsson and McDade are that many women spent long hours gathering fuel over long distances, hence their vulnerability to the impacts of deforestation, desertification and ecosystem disruption, incompletely burnt particles from indoor fires, and pollutants such as carbon monoxide, benzene and formaldehyde [18]. The burning of wood can cause the health of women and children to be affected because wood smoke contains gasses, fine liquid and solid particles that when breathed in can be trapped in the lungs. This (according to the authors), could result in lung infections, breathing problems at various levels, runny nose, eye and throat irritations, weaker immune system, headaches, coughs, bronchitis and asthma attacks [18]. As a matter of fact, persons with existing lung diseases such as chronic obstructive pulmonary disease (including bronchitis and emphysema) and asthma are at higher risk of developing breathing problems from wood smoke exposure [18]. The literature specifically states that women and children suffer from higher levels of lung and eye disease than men because they spend more time inside the house and are therefore more likely to be exposed to indoor air pollutants such as soot released into the air when biomass fuels (for example, wood, charcoal, dung, crop residue) are burned for cooking and heating [18]. The World Bank has classified indoor air pollution in developing countries among the four most critical global environmental problems [19].

This study shows that the absence of potable water to individual households also results in persons having to consume water from river, spring, standpipes, thus the propensity for gastroenteritis or nutritional defect. This is because (according to the literature), contaminated water may contain harmful micro-organisms, such as viruses and bacteria such as *Salmonella* or *Campylobacter* and gastro-intestinal parasites such as *Giardia* or *Cryptosporidium* [20]. These harmful micro-organisms, known as pathogens, are not visible to the naked eye and may even be present in clear water. Drinking water containing these microorganisms can cause severe gastroenteritis, possibly lasting for several weeks. Infants, the elderly and people with suppressed immune systems are more likely to be affected [20].

In continuing on the point of nutritional defects, this study

shows that the respondents without electricity would store meat by use of salt, owing to the absence of refrigeration to facilitate proper storage. The respondents reported that where such perishable product becomes contaminated, they would dispose of the contaminated area and consume the remaining portion. This sometimes results in paroxysmal abdominal pain (colic) or what they referred to as “sour” stomach. These respondents applied to themselves as treatment (home remedies), the ingesting of *Momordica charantia* (cerasee) and *Cola acuminata* (bissy), as well as ingesting a teaspoon of their first urine in the morning, while others consulted with medical professionals. These remedies, they claimed, resulted in less than a 48-hour recovery. It should be noted that food poisoning usually take place when the rate of entry of detoxification into the blood stream exceeds the rate of detoxification of the toxic liver. *Cola acuminata* slows down the rate of absorption of the contaminated product in the blood stream and gives the liver more time to detoxify. The reason why *bissy* slows down the system is because it is high in caffeine, which takes the body out of a digestive mode [21]. With regard to the first urine (highest in acidic content), this relaxes the vasospasm of the intestine, hence relieves the respondent’s discomfort from colic or diarrhea [22].

Such public health concern brings home the point that there is a correlation between electricity privatization and the probability of a household owning a refrigerator [23]. This finding was as a result of a 30,000 household survey which was conducted by the Ministry of Health, Jamaica. The author postulated that, by reducing the frequency and duration of electrical power interruptions, privatization may have an impact on the likelihood of food poisoning and the lowering child mortality rates caused by food poisoning [23].

In view of head-loading (that is the transporting of heavy firewood, pans of water and laundry on one’s head), the literature shows that this could impact negatively on the cervical spine, causing a degeneration or annular tear. In the case of this study, more male (67%) than female (38%) experienced back/spinal injury from head-loading. The spinal cord is made up of many small bones called vertebrae and consists of five regions: cervical, thoracic, lumbar, sacrum, and coccyx. The vertebrae are separated and cushioned by intervertebral discs, which act as shock absorbers between the vertebrae, hence help absorb the shock of any unusual load (apart from the weight of the head and upper body) or sudden downward pressure [24].

In a study of the cervical spine of African head-bearers, it is revealed that load bearing on the head, produced radiographic degenerative signs, much stiffness in the neck and pain [25]. It is further noted that head-loading imposes a considerable amount of strain to the axial skeleton. The cervical spine, being the most cranial and mobile part of the vertebral column, may be susceptible to spondylosis or disc degeneration in head-loading. It also creates a shift in the degeneration from the fifth intervertebral disc space to higher levels and alters the pattern of degenerative

changes of the cervical spine [26]. Consonant with this argument, the literature also points out that the axial strain of load-carrying on the head exacerbates degenerative change in the cervical spine [27].

Conclusion

The findings of this study reveal that where electricity and potable water are limited or absent and persons resort to alternative means such as the use of kerosene lamp, firewood, river, spring, etcetera, these tend to result in medical implications such as euphoria, vision problems, asthma, sinusitis, obstructive pulmonary disease, paroxysmal abdominal pain (colic), diarrhea, gastroenteritis *inter alia*. Similarly, where wood and water are being transported via head-loading, this also has health repercussions such as back/spinal injury. It means therefore, that alternate electrification and non-potable water have a negative impact on the health and well-being of individuals in Jamaica.

Acknowledgement

Appreciation is hereby extended to the following individuals for providing invaluable opportunities to making this paper a success: (1) the team of the Office of Utilities Regulation: Messrs. J.P. Morgan (Director General), Ansord Hewitt (Company Secretary), Ms. Marie James, Messrs. Franklyn and Richard Brown (Public Utility Specialists); (2) the JPSCO's team: Messrs. Winsett Thomas (Head of Industrial Relations) and Sam Davis (Government and Regulatory Affairs Personnel); (3) the Rural Electrification Programme's Chief Engineer, Mr. Samuel Marshall; (4) University lecturers: Professors Donovan A. McGrowder, Balfour A.B. Spence, Clifford Griffin and Wendy Grenade; (5) University Librarians: Mesdames Norma Davis and Audrey Chambers; and (6) my family: Messrs. Cornelius, David and Oshane Crawford, James Walcott, Bertram Millwood (former Deputy Commissioner of Police), Mesdames Cynthia Melhado-Grey, Veronica Palmer-Bryan, Drs. Keith Rivers, Odette Morgan and Joan Rawlins and Rev. Clarence and Gloria Archer

References

1. World Energy Outlook (2006:724). "Energy for Cooking in Developing Countries". Paris: International Energy Agency.
2. Davis S. (2006), in Crawford, T. (2007). "The Privatization of the Electricity Sector. The Case of the Jamaica Public Service Company: A Governance and Public Policy Perspective". PhD Dissertation. Sir Arthur Lewis Institute of Social and Economic Studies. University of the West Indies.
3. Global Environment Facility (2002:57), in United Nations (2002). Economic and Social Council. Substantive Issues Arising in the Implementation of the International Covenant on Economic, Social and Cultural Rights. General Comment No. 15 (2002). The right to water (Articles 11 and 12 of the International Covenant on Economic, Social and Cultural Rights).
4. Grusky S. (2001), in Crawford T, Duncan N, McGrowder D, Crawford A, Gordon L, Bourne P. "The Implications of Utility Access on Gender: The Case of Jamaica". *Euro J Soci Sci* 2009; 8(4), 614-625.
5. Planning Institute of Jamaica. Jamaica Survey of Living Conditions. Kingston: Planning Institute of Jamaica, 2006.
6. National Water Commission. Annual Report. Kingston: National Water Commission, 2004.
7. Planning Institute of Jamaica. Jamaica Survey of Living Conditions. Kingston: Planning Institute of Jamaica, 2005:15.10.
8. The Population Census. Jamaica Country Report. "Distribution – The Total Population and Exchange between 1991 and 2001 by Parish." Jamaica: Statistical Institute of Jamaica, 2001:3.
9. University of Wisconsin. "Health Information". Wisconsin: University of Wisconsin, School of Medicine and Public Health, 2009.
10. Estache A, Gómez-Lobo A, Leipziger D. "Utilities Privatization and the Poor: Lessons and Evidence from Latin America." *World Development*, 2001; 29(7), 1179-1198.
11. Dubash N. (2002). *Power Politics: Equity and Environment in Electricity Reform*, Washington, DC: World Resources Institute.
12. Zhang Y, Kirkpatrick C, Parker D. (2002:8). *Electricity Sector Reform in Developing Countries: An Econometric Assessment of the Effects of Privatization, Competition and Regulation*. Working Paper Series, Paper No. 31 (October 2002). Manchester: Centre on Regulation and Competition.
13. Crawford T. *The Impact of Electricity Privatization on Social Welfare of Rural Residents in Jamaica*. Trinidad and Tobago: Organization of Caribbean Utility Regulators; 2008; 6.
14. Estache A, Foster V, Wodon Q. (2001:43). *Accounting for Poverty in Infrastructure Reform. Learning from Latin America's Experience*. Washington DC. The World Bank Institute.
15. Marshall S. (2004:259), in Crawford T. (2007). "The Privatization of the Electricity Sector. The Case of the Jamaica Public Service Company: A Governance and Public Policy Perspective". PhD Dissertation. Sir Arthur Lewis Institute of Social and Economic Studies. University of the West Indies.
16. James-King E. (2003). "Rural Electrification Programme (REP) to Fast Track Programme." *The Gleaner*. (15 January 2003).
17. Energy Sector Management Assistance Programme Report. "Peri-Urban Electricity Consumers – A Forgotten but Important Group: What can we do to Electrify Them?" A Review of the Energy Sector Management Assistance Programme [ESMAP] Rural Energy and Renewable Energy Portfolio. Washington DC: Joint publication, UNDP/World Bank/EXMAP, April, 2004.

18. Karlsson G, McDade S. (2001). *Generating Opportunities: Case Studies on Energy and Women*. New York: UNDP.
19. Aguilar L. (1999). "Gender Makes the Difference." Energy. In collaboration with the Community Conservation Coalition: WWF, Conservation International, The Nature Conservancy, CHEMONICS, Population Reference Bureau, and the United States Agency for International Development.
20. Rural and Regional Health and Aged Care Services Division (2007:2). *Guidelines for the Use of Non-Potable Water in Food Businesses*. Australia: Rural and Regional Health and Aged Care Services Division, Victorian Government Department of Human Services.
21. Johnson P. (2007), in Crawford T. (2007:178). "The Privatization of the Electricity Sector. The Case of the Jamaica Public Service Company: A Governance and Public Policy Perspective". PhD Dissertation. Sir Arthur Lewis Institute of Social and Economic Studies. University of the West Indies.
22. Gordon L. (2007), in Crawford T. (2007:218). "The Privatization of the Electricity Sector. The Case of the Jamaica Public Service Company: A Governance and Public Policy Perspective". PhD Dissertation. Sir Arthur Lewis Institute of Social and Economic Studies. University of the West Indies.
23. Gonzalez-Eiras M, Rossi M. (2007:16-17). *The Impact of Electricity Sector Privatization on Public Health*. Washington DC., Universidad de San Andrés: Inter-American Development Bank.
24. Occupational Safety and Health Bureau (n.d:2). *Preventing Back Injuries*. Prepared for Montana Employers. MT: Occupational Safety and Health Bureau.
25. Echarri J, Forriol F. Influence of the type of load on the cervical spine: a study on Congolese bearers. *Spine J* 2005; 5(3): 291-296.
26. Joosab M, Torode M, Prasada Rao P. "Preliminary findings on the effect of load-carrying to the structural integrity of the cervical spine". *J Surg Radiol Anat* 1994; 16(4).
27. Jäger, H. J., Gordon-Harris, L., Ulrich-Martin M., Friedrich Goetz, G. and Mathias, K.D. "Degenerative change in the cervical spine and load-carrying on the head". *J Skele Radiol* 1997; 26(8).
28. Planning Institute of Jamaica. *Jamaica Survey of Living Conditions*. Kingston: Planning Institute of Jamaica, 2008.