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ORIGINAL ARTICLE

Evidence that dirty electricity is causing the worldwide epidemics of obesity and diabetes

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Abstract

The epidemics of obesity and diabetes most apparent in recent years had their origins with Thomas Edison's development of distributed electricity in New York City in 1882. His original direct current (DC) generators suffered serious commutator brush arcing which is a major source of high-frequency voltage transients (dirty electricity). From the onset of the electrical grid, electrified populations have been exposed to dirty electricity. Diesel generator sets are a major source of dirty electricity today and are used almost universally to electrify small islands and places unreachable by the conventional electric grid. This accounts for the fact that diabetes prevalence, fasting plasma glucose and obesity are highest on small islands and other places electrified by generator sets and lowest in places with low levels of electrification like sub-Saharan Africa and east and Southeast Asia.

Keywords

Body mass index, diabetes, diesel generator sets, dirty electricity, fasting plasma glucose, islands, obesity, Oceania, transients

History

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Introduction

Of the 37 children who used inhalers for asthma in a mid-Western US school, only 3 needed the inhalers after the dirty electricity levels were reduced, in an attempt to cure a ''sick building'' syndrome (Braggia, 2008). In researching asthma incidence and its possible connection to electricity, I became interested in disease on islands after learning that the highest asthma rate in the world is in the population of the island of Tristan da Cunha (Zamel et al., 1996). The island's electricity is provided by six diesel generator sets, which are a major source of dirty electricity. I hypothesize that the electricity supplied to residences on the island has high levels of dirty electricity which is causing symptomatic asthma.

In 2011, The Global Burden of Metabolic Risk Factors of Chronic Diseases Collaborating Group published two papers in the *Lancet* funded by the Bill and Melinda Gates Foundation, one on the national, regional and global trends in fasting plasma glucose (FPG) and diabetes prevalence (Danaei et al., 2011) and the other on the global distribution of obesity, measured by body mass index (BMI) (Finucane et al., 2011). Remarkably, the worldwide distributions and trends of diabetes and obesity were nearly identical, favoring the small islands of Pacific Oceania. I hypothesized that the island excess was due to dirty electricity from diesel generator sets used almost universally to electrify small islands and places unreachable by the conventional electric grid.

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Method

The Imperial College, London, interactive website (http://www1.imperial.ac.uk/publichealth/departments/ebs/projects/eresh/majidezzati/healthmetrics/metabolicriskfactors/) has extensive worldwide data on cholesterol, high blood pressure, diabetes prevalence, fasting plasma glucose (FPG) and body mass index. The cholesterol and blood pressure data were unremarkable, but a cursory examination of the diabetes and obesity data showed a strong link with islands. Small islands were identified among the 199 countries ranked for BMI, FPG and diabetes prevalence. A search identified all the countries in the highest and lowest 10 disease rankings for males age 25 plus in 2008. A web search identified the extent of their electrical grids and the sources of their electricity. Wave forms of the electrical output of commercial diesel generator sets were obtained using a Fluke 199 B oscilloscope, and dirty electricity levels in the generators' outputs were measured with a Graham/Stetzer Microsurge meter.

Results

Table 1 shows that 8 of 10 countries in the world with the highest BMIs in 2008 are small islands, 7 in Pacific Oceania (Nauru, Cook Island, Tonga, Samoa, Palau, Marshall Islands, Kiribati) and 1 in the Caribbean (St. Kitts and Nevis). All of these places are electrified by diesel generator sets. Seven of the 10 places with the highest FPG are also small islands in Oceania. Seven small islands in Oceania are also among the 10 places with the highest diabetes prevalence. The Cook Islands, Tonga, Marshall Islands, Palau and Kiribati and Samoa are among the top 10 places for BMI, FPG and

Table 1. Country trends in metabolic risk factors, Males age 25+, 2008.

Ten Highest and Lowest Countries of 199					
Body Mass Index (BMI)		Fasting Plasma Glucose (FPG)		Diabetes Prevalence (A.S.)	
Country	Kg/M^2	Country	mmol/L	Country	Percent
Highest 10 countries of 199:					
Nauru*	33.85	Marshall Islands*	6.9	Marshall Islands*	25.5
Cook Islands*	32.64	Kiribati*	6.8	Kiribati*	23.6
Tonga*	30.97	Samoa*	6.6	Saudi Arabia	22.0
Samoa*	30.38	Saudi Arabia	6.6	Samoa*	21.2
Palau*	30.35	Cook Islands*	6.5	Cook Islands*	20.5
Marshall Islands*	29.37	Palau*	6.3	Palau*	17.5
Kiribati*	29.22	Jordan	6.2	Jordan	17.2
Kuwait	29.15	Tonga*	6.2	Solomon Islands*	17.1
USA	28.64	Kuwait	6.2	Kuwait	17.0
St. Kitts and Nevis*	28.24	Solomon Islands*	6.0	Tonga*	17.0
Lowest 10 countries of 199:					
India	20.99	Central African R.	5.1	Indonesia	6.6
Viet Nam	20.94	Philippines	5.1	Dem. Rep. Congo	6.6
Eritrea	20.90	United Kingdom	5.0	Philippines	6.5
Nepal	20.79	Dem. Rep. Congo	5.0	Timor Leste*	6.4
Zambia	20.70	Timor Leste*	5.0	Malawi	6.4
Timor Leste*	20.61	Myanmar	5.0	Burundi	6.2
Afghanistan	20.63	Rwanda	5.0	Myanmar	6.1
Bangladesh	20.44	Burundi	5.0	Netherlands	6.1
Ethiopia	20.26	Peru	4.9	Peru	5.8
Democratic R. Congo	19.88	Cambodia	4.7	Cambodia	4.7

* = islands; (A.S.) = Age Standardized

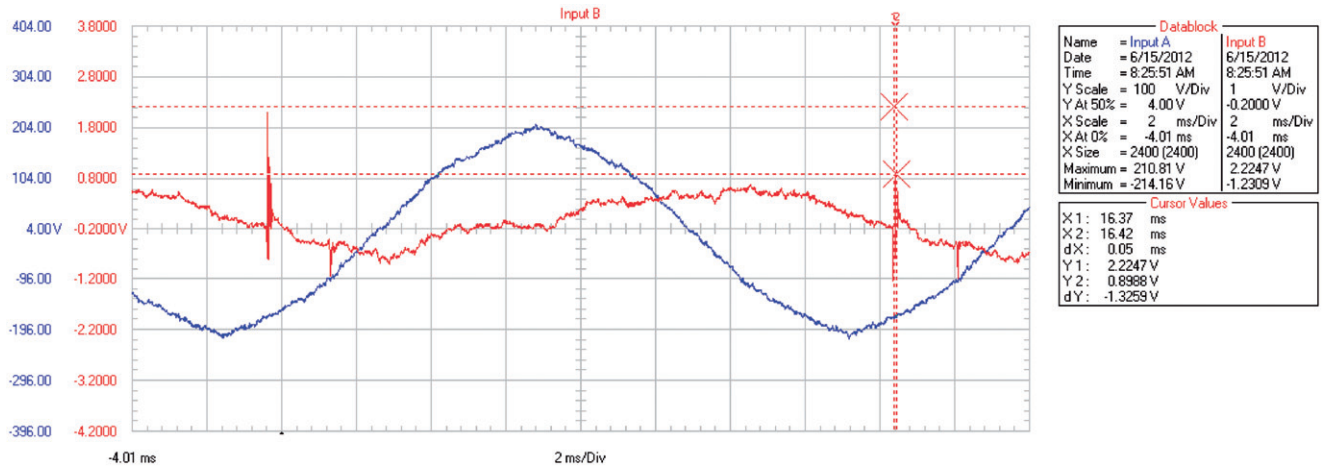

Figure 1. Oscilloscope tracing of electrical output of a Katolight 125 kV diesel generator set.

diabetes prevalence in men in 2008. Because about 13% of the 199 countries listed are small islands, 2.6 islands would be expected in the highest 10 countries when 7 or 8 were observed ($p < 0.001$). The non-islands with high BMI, FPG or diabetes prevalence are Saudi Arabia, Kuwait and Jordan and the United States, All three mid-eastern countries have sizable off-grid populations served by generator sets, and generator sets are also used to electrify portions of the grids in these countries. The high obesity levels in the United States is not surprising, because the United States uses the earth as the major conduit for neutral return currents, allowing dirty electricity to enter homes through conductive water and sewer pipes and through the grid. Diesel generators are also used extensively for back-up power in peak load periods. Many utilities have dozens of standby generators. With the single exception of Timor Leste (East Timor), there are no islands in the 10 places in the world with the lowest BMIs, FPGs or diabetes prevalence. Their electric grid was damaged by wars and only 5% of rural residents of Timor Leste currently have electricity. Most of the other low prevalence places are in sub-Saharan Africa and in east and Southeast Asia, places with a low levels of electrification. The fact that the United Kingdom and the Netherlands are among the low prevalence countries may be due to their grids being of the closed delta type with no use of the ground for current return.

Figure 1 is an oscilloscope tracing of the electrical output of a large commercial diesel generator set. It shows a ''dirty'' wave form and high dirty electricity levels. Two other gasoline-powered generator sets also had ''dirty'' wave forms and high dirty electricity levels (tracings available on request).

Discussion

Dirty electricity is a term coined by the electrical utilities to describe electrical pollution contaminating the 60 Hz and 50 Hz electricity on the electrical grid. It is generated by arcing, sparking and any device which interrupts current flow. On 4 September 1882, Thomas Edison began generating electricity at the Pearl Street plant in Manhattan, New York City. From the beginning, his ''Jumbo'' generators were plagued with brush arcing and commutator wear (Edisonia):

> There was considerable sparking at the copper commutator brushes of the ''Jumbo,'' due to the odd number of commutator bars, necessitated by the form of armature winding employed. . .

This means that dirty electricity was being sent to Edison's customers through the wires that lit their lamps as early as 1882.

Since the 1979 Wertheimer–Leeper study (Wertheimer and Leeper, 1979), there has been concern that exposure to power frequency (50/60 Hz) electromagnetic fields (EMFs), especially magnetic fields, may contribute to adverse health effects including cancer. Until recently, the most commonly used exposure metric in EMF studies has been the time-weighted average of the power frequency (50 and 60 Hz) magnetic field. However, the low risk ratios in most studies (<3.0) suggested that magnetic fields might be a surrogate for a more important metric. In 2008, dirty electricity was shown to be a potent universal carcinogen in a cohort study of teachers (Milham and Morgan, 2008) at a California middle school. Cancer incidence analysis of the teacher population showed a positive trend of increasing cancer risk with increasing cumulative exposure to high-frequency voltage transients measured on the classroom's electrical wiring, with high risk ratios (>9.0) for a number of cancers. The attributable risk of cancer associated with this exposure was 64%. A single year of employment at this school increased a teacher's cancer risk by 21%.

Dimmer switches, compact fluorescent lights, computers, copy machines, all transmitters, including cell towers, and all devices containing switching power supplies generate dirty electricity. Dirty electricity generated by electrical equipment in a building is distributed throughout the building on the electric wiring. Dirty electricity generated outside the building enters the building on electric wiring and through ground rods and conductive plumbing. In recent years in the United States, nearly 80% of neutral return currents travel to the substations via the earth, carrying an increasing load of dirty electricity. Dirty electricity in building wiring is measured with a simple plug-in Graham/Stetzer Microsurge meter (Graham, 2005), which measures the average magnitude of the rate of change of voltage as a function of time (dV/dT). This preferentially measures the higher frequency transients. Dirty electricity has been associated with diabetes (Havas, 2008), asthma (Sbraggia, 2003), attention deficit hyperactivity disorder (ADHD) (Milham, 2011) and cancer (Milham and Morgan, 2008).

Although much attention has been paid to the obesity and diabetes epidemics recently, there is good evidence that both epidemics started at the beginning of electrification in the United States. Most large cities in the United States and the world had electricity by 1900. In the United States, the great distances and the expense slowed rural electrification. It took until 1956 for US farms to reach urban and rural non-farm electrification levels. Both populations were covered by the US vital registration system. The US census of population, 1930, 1940 and 1950 contained information on residential electrification. In 1940, urban (electrified) death rates were much higher than rural (unelectrified) rates for cardiovascular diseases, malignant diseases, diabetes and suicide. Rural death rates were significantly correlated with level of residential electric service by state for most causes examined. Between 1900 and 1960, the death rates from all of the so-called diseases of civilization, including diabetes increased steadily in the United States. I hypothesized that the 20th-century epidemic of the diseases of civilization, including cardiovascular disease, cancer and diabetes and suicide, was caused by some facet of electrification (Milham, 2010).

There is no historical vital record source for BMI, but Komlos and Brabek (Komlos and Brabek, 2010), using historical data from the West Point military academy and The Citidel military academy in Charleston SC, showed that there was very little change in cadet weight in the 19th century, but that 18-year-old men had a body weight increase of 13 kg (28.5 pounds) during the 20th century, with half of the increase occurring in those born before World War II. The 1920–1939 Citidel birth cohort was 7 kg heavier than the 1870–1909 birth cohort. Before World War II, the major source of dirty electricity was generator and motor brush arcing and arcing and sparking from bad electrical connections. Microwaves were not invented until shortly before World War II. There is some recent evidence that EMF exposure from cell towers, which generate both microwaves and dirty electricity, affects both neurotransmitters and adrenal hormones (Buchner and Eger, 2011; Eskander et al., 2012), which can impact blood sugar, appetite and obesity.

Testing the hypothesis

The three commercial generator sets I have access to have dirty wave forms and high dirty electricity levels in their electrical output. The islands in Oceania with high levels of FPG, diabetes and BMI should all have high levels of dirty electricity in their generator outputs. The more generators operating in a power plant, the higher the output dirty electricity levels should be, because the parallel electrical connection of multiple generators should make their dirty electricity additive. The populations of one or more of these islands should be examined before and after a clean-up of residential dirty electricity with capacitive filters and followed for a generation. Long-term follow-up is required because childhood leukemia (Greaves, 2003), asthma (Li et al., 2011) and obesity (Li et al., 2012) have all been associated with *in utero* EMF exposure. Symptoms associated with EMF and dirty electricity exposures should improve rapidly, and type 2 diabetics should use less insulin.

The Old Order Amish in the United States and Canada, a Mennonite sect who live without electricity and therefore with low levels of dirty electricity exposure, gives a strong

indication of the sort of mortality and morbidity improvement that is possible. Their type 2 diabetes prevalence rates (Hsueh, 2000) and cancer rates (Westman, 2010) are about half those of the non-Amish. There is no ADHD and little obesity in Amish children (Ruff, 2006).

I conclude that the epidemics of diabetes and obesity are caused by exposure to dirty electricity.

Declaration of interest

I declare no conflicts of interest.

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