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RESEARCH ARTICLE

The Evolutionary Determinants of Health Programme: Urban Living in the 21st Century from a Human Evolutionary Perspective

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There is a mismatch between our palaeolithic genome and the urbanised Anthropocene world we now inhabit. One consequence is the alarming global rise in 'Western Life-style' diseases and conditions such as obesity, Type 2 diabetes and heart disease. It is suggested here that a better understanding of the 'Evolutionary Determinants of Health and Urban Wellbeing' might materially improve matters. Such an approach concerns ancestral diets, life-style embedded activity regimes, evolutionary-concordant building designs and town plans incorporating urban green space and cleaner air.

Introduction

The town is not our natural habitat. For the first time in human history more people live in cities than in rural settlements: our global urban population of 3.4 billion is set to double by 2050, as we create artificial environments on an unprecedented scale (Rydin et al. 2012: 3, fig 1). Although there are major benefits in urban living which we all enjoy, there are also costs, such as the fatal increase in the 'urban lifestyle' diseases that have become depressingly familiar.

This article focuses on the apparent mismatch between modern urban living and what has been termed our 'palaeolithic genome' (i.e. the genetic material encoded in our DNA which relates to a palaeolithic hunter-gather lifestyle). Heritable traits are passed from one generation to the next via that DNA, and thus our genetic ancestry can be traced directly back to our forebears who emerged between 4.3 and 7.02 million years ago. This was the period when our lineage diverged from that of the chimpanzee and unique attributes of the human phenotype developed, including bipedalism (walking upright) and a larger brain size (see e.g. Itan, Bryson and Thomas 2010). For the last 3 million years or more, we evolved as hunter-gatherers, living off the land in small tribal societies, developing a working relationship with nature. Culturally, society is changing exponentially. Anatomically, however, our genetic evolution is rather slower: we remain much as we were before towns developed, or even before large-scale farming was adopted 5,000–10,000 years ago (Stringer and Andrews 2011: 236–9). However 'civilised' we may now consider ourselves to be,

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biologically we are still nearer to our palaeolithic ancestors.

Given this view there is a dichotomy between the Anthropocene world we currently live in (Zalasiewicz et al. 2010) and the landscape we originated in and adapted to (e.g. Coward et al. 2015). If we are to contain the 'sick-city syndrome', then the lessons of human evolutionary archaeology could become central to the reconfiguration of urban lifestyles and for planning the next generation of cities: they should be based on evolutionary-concordant designs if we are ever to adapt successfully to them.

To help address this challenge, the **Evolutionary Determinants of Health** programme was launched in February 2014 at the 'Urban Paradox' conference held at University College London, and at the associated workshops. These brought together archaeologists, architects, town planners, microbiologists, and academics dealing with transport studies as well as public health, a consortium reflecting the project's multidisciplinary nature (see Marshall et al. forthcoming). Issues raised are discussed in this paper, illustrating the application of evolutionary studies in a modern context, a relatively novel perspective for evolutionary archaeology in general (see e.g. Cochrane and Gardner 2011).

Our programme aims to identify the positive physiological and psychological components of an 'ancestral lifestyle' regarding nutrition, activity regimes, societal issues and engagement with nature (essential for an effective immune system). The next stage is the development of evolutionary-concordant protocols for personal and institutional health behaviours that can be readily adopted in a 21st-century context, as well as urban design and town-planning guidelines, a particular focus for the launch conference.

Urban Wellbeing: Social Determinants of Health v Evolutionary Determinants of Health

Complex social, cultural, political and economic factors contribute to the pronounced health inequalities in our modern urban society, as Professor Sir Michael Marmot's *Social Determinants of Health* team has demonstrated (Marmot and Wilkinson 2006). Good health and enhanced wellbeing tends to improve with social class (Rydin et al. 2012: 1). Those living in the most deprived areas of a city such as Glasgow, for example, have a life expectancy that is 12 years shorter than their neighbours in the more affluent districts. Addressing the social inequalities of health that people are born into requires political, economic and cultural change (Marmot and Wilkinson 2006: 1).

There is however, a more fundamental mismatch which exists between our palaeolithic genome and modern urban living. It is on this and related issues that the Evolutionary Determinants of Heath programme focuses: facing up to the challenge presented by the 'sick city syndrome', the alarming modern rise in obesity, coronary heart disease and Type 2 diabetes and other associated problems and conditions. Unlike the Social Determinants of Health, the Evolutionary Determinants of Health that we are all born with cannot be changed. It is our towns and urban lifestyles that must be changed instead. This report summarises evidence-based research that demonstrates why an evolutionary concordant approach to modern urbanism is essential, and suggests ways in which it might be implemented.

An urban advantage?

The so-called 'urban advantage' – the assumption that those living in towns have greater health benefits than their rural neighbours-should not be considered as a foregone conclusion: not only do 'rich and poor live in different epidemiological worlds even in the same city' (Rydin 2012: 1), but different aspects of living (e.g. diet, levels of physical activity) might be demonstrably more healthy in the country than in contemporary towns. Indeed, for the new urban populations in expanding 18th and 19th-century western conurbations, average age at death actually decreased and levels of infant mortality increased before sanitary conditions began improving in the later decades of that period. In theory, as income *per capita* rises, so too should life expectancy, based on a steady reduction in death rates as well as birth rates. But the global picture is rather more complex. Although stringent public health measures and much improved health services removed many of the initial scourges of city life such as cholera and typhoid, those evils seem to have been replaced by an increasing catalogue of diseases and conditions whose presence and profile were far less significant in the previous era. Many of these new villains are a direct product of our current urban lifestyles, part of a culture of our own making.

It is interesting to list the most common causes of death in an *unurbanised* community living a hunter-gatherer type lifestyle, here taken to broadly represent how humans survived for some 3 million years, and then compare that with modern urban data. It should be stressed that there is (or was) a rich variety of communities living in widely differing environments (Kelly 2013): the example taken here of an unurbanised community is that in the Trobriand Islands of Papua New Guinea. Swedish doctor Staffan Lindeberg led a long-term research project on the island of Kitava, which supports a population of 23,000 enjoying an active lifestyle with a diet of fish, fruit, root and other vegetables with some of the population living to between 60–95 years old. The most common causes of death were neonatal infections, prematurity/low birth weight, malarial infections, accidents or homicide (Lindeberg 2010, 59).

This contrasts noticeably with data collated for the World Health Organisation (WHO) in 2004 (broadly contemporary with the Kitava study) listing the ten most common causes of death in the high-income most urbanised countries. These are (1) coronary heart disease, (2) stroke/cerebrovascular disease; (3) trachea/ bronchus/ lung cancer; (4) lower respiratory infections; (5) chronic obstructive pulmonary disease; (6) Alzheimers/ dementias; (7) colon/ rectum cancers; (8) diabetes; (9) breast cancer; and (10) stomach cancer (Ridsdale & Gallop 2010: 4.1)

It is accepted that we all have to die from some cause some day. Nevertheless, it appears significant that 52.1% of the modern most urbanized global population died of conditions or diseases that were non-existent or rare in the population from Kitava. Death in Papua New Guinea seems to have been caused neither by that top ten, nor by conditions like obesity, osteoporosis and rickets. Arguably a case can be made for a non-urban advantage.

A reverse approach

Modern medical research is often reactive, and tends to target specific diseases, their potential triggers, or the effects and impacts of potential pharmaceutical remedies for particular conditions. It is stressed that major benefits have resulted from this highly focussed approach to the molecular and physiological mechanisms underlying a particular condition. Our project, however, takes a different perspective, looking at the major challenge presented by Western life-style diseases. Our argument is that the genetic make-up of the Kitava population is basically the same as contemporary urban populations, so the profound difference in the most common causes of death between them must reflect significant differences in diet, activities and/or environment. It seems that the more urbanised we become, the more susceptible we are to adverse conditions of our own making.

Instead of considering why and how modern city dwellers contract coronary heart disease, the reverse approach is adopted here: the question we should be asking is why the Kitava population do **not** suffer from that or any of the cancers and conditions that are now all too common. Rather than mounting attacks on these conditions individually, the reverse approach enables all these diseases to be considered as a group: the 'sick city syndrome'. Faster and more effective progress might be made if the root cause of the syndrome is addressed upstream at source, rather than waiting for major flood events downstream.

On this basis we need to reconfigure our diet, our activity regimes and our social and urban environment so that our palaeolithic genome is persuaded into operating 'as normal', rather than continuing to endure the (literally) unnatural demands made upon it that have such devastating consequences for our health. Once the effective healthy differences between the 'ancestral' lifestyle and the modern urban lifestyle have been identified, then evolutionary-concordant lifestyles can be devised. Proxy behaviours and simulated environments can then be introduced to our 21st century towns, allowing us to enjoy the benefits of urbanisation while reversing such evils as the rising obesity epidemic with all its many associated problems. Personal and institutional health behaviours coupled with more evolutionary-concordant public health programmes are therefore being developed, building wherever possible on current initiatives and relevant research already in the public domain.

Ancestral diets

The environmental niches that herbivores, carnivores and omnivores inhabit are reflected in their different physiologies and digestive systems and in the foods they are specifically designed to collect and consume. It is assumed that our general nutritional needs remain largely the same as they were 3 million years ago, and thus a modern urban diet with a high volume of over-processed foods and added sugars, places an undue burden on our digestive systems and consequently upon the National Health Service. Adopting a proxy 'ancestral diet' is obviously good for you, but the powerful negative message should also be stressed: **not** adopting such a regime is demonstrably bad for you.

One of the first major scientifically-compiled studies to advocate the positive health benefits of an ancestral 'native' diet over a modern one was published by the American dentist Weston Price in 1938: although the central focus was on dentition and dental diseases, it ranged over other related issues and five continents (Price 1938). In the UK, the rationing of food -including sugar- during the Second World War imposed what has been described as 'a virtual peasant diet' on an entire population (Zweiniger-Bargeilowska 2000: 37). Home grown fruit and vegetables, however, were not rationed, and by 1952 the nation as a whole was actually healthier than it was in the 1930s. In the West, the period following the deprivations of the war witnessed a major expansion in food production and processing, coupled with a general consensus that *more* food – from whatever source- was the key to good living. But not everyone agreed: the North American gastroenterologist Dr. Walter L. Voegtlin who studied Colitis, Crohn's disease and Irritable Bowel Syndrome, suggested that a diet based on that enjoyed by ancient hunter-gatherers would cure many of the ills he faced in his surgery (Voegtlin 1975). By 1985, that message had been progressed by physicians S.Boyd Eaton and Melvin Konner from Emory University (e.g. Eaton et al. 1985 283–9; Eaton and Konner 1989; Konner and Eaton 2010: 594–602). Perhaps the most comprehensive study inspired by Eaton and Konner's influential work was the *Kitava Study* initiated in 1989 by Staffan Lindeberg (Lindeberg 2010 58–63). This monitored an island population with no incidence of stroke, ischemic heart disease, diabetes or obesity (Lindeberg and Lundh 1993). Lindeberg's comparison of the Pre-agricultural diet with modern dietary regimes, supported by no less than 2034 references, mounts a highly persuasive argument in favour of the former (Lindeberg 2010).

Not only has medical research increasingly focused on the benefits of such diets over the last quarter century but, just as importantly, so too has the detailed evidence that underpins that work. Our knowledge of a variety of ancestral dietary regimes has been clarified and expanded through extensive archaeological as well as anthropological research on all continents and in differing environments (e.g. Aiello and Wheeler 1995; Brothwell and Brothwell 1998; Stanford and Bunn 2001; Ungar 2006; Gremillion, 2011; Kiple and Kriemhild 2012: 11–71; Cohen 2012; Wing 2012).

Evidence of excessive quantities of sugars (particularly refined sugar) do not figure in the human bioarchaeological record, for example. By contrast, research strongly suggest that our physiology was and still is designed to collect, eat and digest a daily complement of fresh food, vegetables and fruit: the evidence-based research discussed here implies that our digestive systems have not yet evolved beyond that of the hunter-gatherer. To take one example: a study of 65,226 individuals included in the *Health Surveys for England* from 2001 to 2008 (Oyedobe et al. 2014) investigated the value of eating not just five but at least seven portions of fresh fruit and vegetables a day: this was linked to a 42% lower risk of death from all causes, a 31% lower risk of heart disease or stroke and a 25% lower risk of cancer. It was the vegetables that seemed to provide greater protection against disease with each daily portion reducing the overall risk of death by 16%, a salad portion by 13%, and each fruit portion by 4% (Oyedobe 2014). While this study shows that eating more vegetables increases the chance of a longer life, it also demonstrates that the more a diet diverges from an assumed palaeolithic norm, the shorter that life is likely to be.

Lifestyle embedded activities

The evolutionary determinants of health are also concerned with modern health problems caused directly by diminishing activity levels in urban cultures. Research conducted in North America addressed the question of how much less active modern populations are than in the past. The activity levels of four groups of school children were compared: one from a town, another from a neighbouring rural community in Saskatchewan; the results from these two groups were set against two other groups of children who were often leaner, stronger and with less evidence of obesity. They were from an Old Order Mennonite community with a lifestyle that had changed little over the last 60 years and from an Old Order Amish farming community where ownership of cars, bicycles, tractors and telephones was still not permitted, representing a lifestyle commonplace a century ago. The study showed that modern lifestyles are often associated with pronounced lower levels of moderate- and vigorous-intensity physical activity. Although this shortfall could be made up with eg additional sports, it was noted that the prime difference seems to be the physical nature of lives dependent on many manual chores. It was these lifestyle-embedded physical activities -rather than jogging or organised sport- that most readily provided the levels of exercise required for a normal healthy life (Eslinger 2010: 296–303).

Extending that debate, Professor James O'Keefe's team from the University of Missouri have discussed elements of ancient hunter-gatherer activity regimes relevant for evolutionary-concordant modern urban lifestyles. The report included observations from Professor Kim Hill, (Arizona State University) who worked with the Ache hunter-gatherers of Paraguay and the Hiwi foragers in Venezuela (O'Keefe et al. 2011: 472–478). It concluded that the human race is genetically adapted for a life of routine light to moderate activity essential for survival (walking, lifting, carrying, bending, climbing), rather than for long sedentary periods. The actual tasks accomplished in a normal hunter-gatherer's day could vary, depending on the level of hunger, seasonality, weather or terrain. Nevertheless, it seems that the typical daily distance covered by human locomotion would be in the range of three to ten miles. The necessary daily activities would require an average energy expenditure of between 3,000 and 5,000 kilojoules, up to five times greater than many modern sedentary adults (Cordain et al. 1998).

Given those physical demands, the observed hunter-gatherer groups were usually lean and rarely obese: this reduced trauma to their joints and minimized diet-induced inflammation.

A body designed for a life of regular walking, bending, lifting, and carrying heavy loads (wood, water, food, children) needs to undertake such activities regularly: if the skeleton is not so used then it becomes susceptible to e.g. osteoporosis (O'Keefe et al. 2011).

Most walking and running in the Palaeolithic would have been done barefoot in the open air (thus benefitting from additional vitamin D) rather than in the confines of an air-conditioned gym. Such ancient activity can be contrasted with urban jogging on concrete in expensive, restrictive running shoes. Given the increasing occurrence of conditions such as shortening and stiffening of the tendons and foot ligaments, ankle sprain, Achilles tendonitis, hamstring tears and lower back pain, questions need to be asked about the overall health benefits of such modern artificial exercise (e.g. Leiberman et al. 2009).

Urban greenspace

The issues of outdoor exercise lead directly to the discussion of urban greenspace and biophilia (our apparently instinctive love of nature). We cannot all live in a rural wilderness, so how can that most artificial of environments, the town, be reconfigured to better fit our biology? The role that parks, gardens, allotments, sports fields, tree-lined avenues and window boxes play in our urban lives is of major significance. There is evidence to suggest that urbanisation leads to rising rates of psychosis and depression (Sundquist et al. 2004). Professor Mathew White (University of Exeter) suggests this problem may relate to the 'detachment from the kinds of natural environments people evolved in and are best adapted to' (White et al. 2012: 1; Maas, et al. 2009: 967–973). White's study suggested that individuals felt a greater sense of wellbeing in urban areas with more greenspace; conversely, those in less green areas showed higher levels of mental distress and lower life-satisfaction ratings. Increasing the amount of greenspace in urban settings would thus have marked aggregate health benefits (White et al. 2013: 920–928).

But was that simply because healthier, more affluent people lived near parks? The research by Richard Mitchell and Frank Popham (University of Glasgow) worked with a database selected from the UK records of 40,813,236 persons below retirement age. Significant positive associations were recorded for all of them, regardless of income, when proximity to greenspace was measured against all causes of death and against circulatory diseases, but were especially marked in relation to those of low socio-economic status. Urban 'environments which promote good health may be the key in the fight to reduce health inequalities' (Mitchell and Popham 2008: 1658: see also Wheeler et al. 2015).

Why should living near a 'natural' environment be so closely associated with long term health benefits? The answer lies in the remarkable research synthesized by UCL's micro-biologist Professor Graham Rook and his colleagues. Their explanation, going deeper than landscape appreciation and its temporary psychological uplift, focuses on a key component of our wellbeing. In addition to close consideration of our nutritional and activity regimes, continuing good health also requires an effective immune system. Rook has shown that it is from direct contact with plants and animals that we derive the macro-organisms, and communities of micro-organisms (microbiota) that live and thrive on our skin or in the gut. We are not born with them: they are all derived from the external environment after birth, from the soil, from plants, from animals, from the air or from contact with other humans. For millennia they have been invading and inhabiting humans and their predecessors and, crucially, have co-evolved roles in the regulation of the human immune system. Some were benign, others were potentially harmful, but needed to be tolerated if the benefits were to be experienced. These tiny organisms work together to provide our own individual ecosystem service: without them, our susceptibility to allergies, autoimmunity and inflammatory bowel disease is greatly increased (Rook 2013).

The very process of urbanization itself can be detrimental to our body's ability to fight infection and disease. Epidemiological research has now shown that children exposed to farms and farming environments have increased protection against the development of asthma and allergies in childhood, when compared to those living in less rural environments (von Mutius and Vercelli 2010: 861–8). For those born in towns in high-income countries, it seems that many will face increases in chronic inflammatory disorders, caused partly by the failure of the immune system to respond appropriately. This seems to be because an urban child's immune system, having had exposure only to a modest range of microorganisms, will not have 'learned' to recognize or differentiate between beneficent strains or harmful pathogens. The poorly-educated immune system thus makes inappropriate responses to what it wrongly thinks are attacks on the individual, which can lead to autoimmune diseases such as multiple sclerosis. Such incorrectly identified attacks on otherwise harmless allergens can trigger allergic disorders such as hay fever, while those in the gut can precipitate ulcerative colitis or Crohn's disease (Rook 2012: 2).

This research provides a major reason why towns (or more correctly, reduced engagement with nature in an urban environment) could be bad for our physical health: we still need the microorganism that only animals, plants, trees and soil can provide. Growing up in a city that has concreted over the good earth and filled its buildings with artificially conditioned air will not support the immune system. On the other hand, living close to urban greenspace, gardening, walking outdoors, growing up with pets, could ensure that we absorb sufficient microbiota to support a robust immune system. Graham Rook makes particular mention of pets, noting that the exposure of humans, especially children, to animals such as dogs 'seems to provide some protection against allergic sensitization and allergic disorders' (Rook 2012: 4). He argues that humans have coevolved with canine microbiota ever since the domestication of the dog, and possibly even earlier than that.

Planning a city for humans

As far as our palaeolithic genome is concerned, we are still hunter-gatherers. To function effectively, our digestive system still needs fresh food and water, since it cannot accommodate over-processed foods or too much added sucrose. Our lungs still need fresh air and cannot cope with diesel particulates and toxic emissions. Our physiology still requires regular daily exercise and our immune system needs regular contact with plants and animals. Those are just some of the key evolutionary determinants of health that must be taken into serious consideration on an individual level – the personal protocol. That said, town planners and architects also have a responsibility here, since the built environment can be made to reflect those immutable determinants of health and social wellbeing in its building design, its greened streets, the provision of urban greenspace, and how the town plan itself must place human locomotion (rather than the car) at its heart.

Every breath we take

A key evolutionary determinant of our health concerns our lungs and respiratory system. Designed for clean, fresh air, they cannot cope with polluted conurbations, especially those with major industrial complexes and too many cars, or indeed, the burning of fossil fuels. When London's homes were heated by coal fires, it was infamous for its 'pea-soupers', its foul toxic fogs. The *Great Smog* which blanketed the city in December 1952 was unprecedented, however, causing the death, directly or indirectly, of at least 12,000 people. This was the catalyst for the Clean Air Act of 1956, introducing 'smoke control areas' in cities where only smokeless fuels could be burned. The major movement away from solid fuels for domestic heating to a greater reliance on electricity and gas had begun.

It is not only high levels of sulphur that are anathema to our ancient lungs, however, since they are also unable to cope with traffic fumes from diesel engines. The Department of Environment, Food and Rural Affairs report *Air pollution in London in the last 2 years to April 2014* shows that the emissions of nitrogen dioxide and the tiny diesel particulates from diesel-powered vehicles have risen steadily over last 15 years. It goes on to suggest that 29,000 premature (that is, avoidable and unnecessary) deaths in Britain may have been caused by such emissions. That is over twice the number of deaths attributed to the 'Great Smog' of 1952. Diesel fumes also raise the risk of heart attack and stroke as well as exacerbating asthma attacks and have been implicated in the development of lung cancer and tumours of the bladder (WHO 2012).

Recent work at Kings College London paints an even worse picture. A study based on work in Tower Hamlets and Hackney suggests that air pollution is responsible for permanently stunting the growth of children's lungs, while another shows that, where pregnant mothers are living in the more polluted areas, the damage actually starts in the womb. Toxic particles and gases emitted by diesel engines appear to be the principal culprits (Leake 2014). Regrettably, the increase in diesel vehicles on London's roads has been a significant contributor to poor air quality since a diesel vehicle will emit on average 22 times as much particulate matter and at least four times as much nitrogen oxides (NOx ie NO and NO_2) as a petrol equivalent (TfL RTF 2013). It has been calculated that the majority of NOx comes from road transport, mainly from cars (28%), heavy goods vehicles (18%), buses (16%), large goods vehicles (9%) and taxis (3%) (TfL 2014). Nitrogen dioxide (NO_2) concentrations still widely exceed European Union (EU) limit values on roads in inner and central London, a grim picture that is replicated in many large, densely-built conurbations in Europe (TfL 2014 fig 13). Measures being taken to render London's air more evolutionary-concordant by reducing the offending emissions include fitting filters to London buses, and retrofitting or retiring older buses and taxis (TfL 2014: 32–41).

Human locomotion

It is now clear that regular physical activity in fresh air in a green or greened environment is an essential component of a normal evolutionary-concordant lifestyle. As part of the continuing programme to promote activity levels, a series of guidelines has been published (NICE 2008a; 2008b; 2009; 2010; 2012). These reports detail how regimes involving lifestyle-embedded activities such as walking and cycling might be better built into the urban environment (e.g. PHE and LGA 2013; TfL 2014). This requires more than just updating Ebenezer Howard's treatise on Garden Cities, first published in 1902, in an age before the automobile ruled. Settlements today are very different animals, in scale, function and population density. It is not only poor dietary choices that can lead to poor long-term health, since most of us also need to lead less sedentary lives. What is clear is that the design of our public transport system, our buildings, our streets and our townscapes can significantly help us achieve that goal, and getting back to the levels of daily exercise that our palaeolithic physiology demands. Walking or cycling for at least part of the daily route to work and back would be a simple solution to reducing weight and health problems while providing significant psychological uplift (e.g. Martin et al. 2014). If such a programme were adopted on a city-wide basis it would also reduce car travel, traffic congestion, air pollution, carbon dioxide and diesel emissions, noise levels and road traffic accidents.

A Transport for London report has also calculated that if Londoners chose **not** to adopt an evolutionary-concordant regime of 150 minutes of physical activity per week, then such abnormal behaviour could lead to 4,104 more premature deaths; 1,528 extra cases of coronary heart disease; 778 more cases of breast cancer; 474 more cases of colorectal cancer and 44,620 more cases of Type 2 diabetes (TfL 2014: 75).

To encourage such major cultural changes, modifications to the townscape are required: city centres with wider pavements, pedestrianised routes, well-designed shared spaces, or parks, quieter or greened back streets, with good street lighting and closed-circuit television at night time, all of which promote walkability. Roads that pass through shopping centres should have traffic calming measures or a 20mph speed limit. Many cities are now implementing designated cycle networks (with the attendant cycle racks, signage and major road crossing points), and work has begun on extending that principle to pedestrians. In Wales, Cardiff is developing its *Walkable Neighbourhood Plan*, identifying a network of streets and parks that serve key local destinations to positively encourage walkers (*Keep Cardiff Moving* website), a programme developed as part of the *Active Travel (Wales) Act*. The associated guidelines (Welsh Government 2014) appeared in the same year that Lucy Saunders and her team published their highly impressive Transport Action Plan for London (TfL 2014).

Active buildings

Planning a town that encourages and facilitates physical activity is not just about external spaces, streetscapes and the public realm, but also concerns the internal workplace design. There is clear evidence that an abnormal sedentary office life is linked to increased health risks. The pioneering study of the comparative health of 31,000 sedentary bus drivers and their far more active bus conductor colleagues published over 60 years ago made this point tellingly (Morris et al. 1953). But bus driving is not the only job that requires sedentary postures for long periods, as a recent publication report on the effects of sitting occupation on the health of over 10,000 men and women in England and Scotland shows. For example, over a 12-year period, 754 deaths were reported, and analysis demonstrated that, compared to those in standing or walking occupations, there was a higher risk of mortality from all causes, and from cancer for women, in sitting occupations (Stamatakis et al. 2013).

Too many city workers spend their day in largely indoor sedentary occupations (NICE 2008b), unlike their active hunter-gatherer predecessors. Employers as well as employees have a vested interest in increasing activity levels in the work place, and this can be done in a variety of ways. Much attention has been given to making more use of the stairs rather than the elevator or escalator, for example (Webb and Eves 2006; Webb and Eves 2007: 114–119). The very design of the building has a major part to play here: in many offices, the lift shaft is centrally-placed in the foyer, in clear sight of the front door, while the stairwell is tucked away to one side. In an evolutionary-concordant office, a grand staircase would occupy pride of place in the foyer, with light-filled landings replete with seating, artwork and plants. The low-fat office would also develop less sedentary working practices (e.g. Smith et al. 2013) and have cycle racks and showers to further encourage active travel.

A similar approach can be taken with the design of schools, in the size and format of classrooms, the relationship of indoor to outdoor space, the length of lessons, facilities for physical activities and the amount of time per day spent being sufficiently active. A study of classrooms in seven UK schools has shown that the design can have a very significant impact on the learning rates of primary school pupils (Barrett et al. 2013). Windows, and our connection with the outside world are also crucial. A seminal study in a suburban Pennsylvanian hospital showed that the time patients needed for recovery was reduced by up to 8.5% if they were in rooms with windows affording a suitably therapeutic green view (Ulrich 1984: 420–421). Further research in a Korean hospital showed that patients recuperating in wards with windows orientated to the sunny southeast recovered faster than those in rooms looking to the more shady northwest (Choi et al. 2011: 65–75). Clearly, effective building design needs to consider many aspects of our palaeolithic genome.

Although there is no space to consider them fully here, there has also been study of the hunter-gatherer mindset, with consideration of the psychological aspects underpinning tribal societies and hunting groups. These issues still resonate today in our large poly-tribal conurbations and impact on issues such as the concepts of community and consequently on aspects of the town planning of neighbourhoods.

In conclusion

Town-planning from a human evolutionary perspective therefore needs to take a wide overview. Evolutionary-concordant health behaviours need to be identified and encouraged at all levels, personal and institutional, and subsequently through policy and practice. These approaches need to be adopted by the 'Healthy Cities' movement, a project promoted by the World Health Organisation, that gained 1,300 urban centres as members in 29 countries in its first 30 years (Rydin et al. 2012: 6): they also need to be promoted through the local Health and Wellbeing Boards (Health and Social Care Act 2012), through national Public Health programmes, as well as through better town planning and active building designs.

Tomorrow's cities and urban societies would be healthier if configured or reconfigured on evolutionary-concordant principles, working with our palaeolithic genome rather than against it. The challenge is both real and imminent, as urbanisation increases globally at an unprecedented pace. The human race first adapted to living in forests, valleys, deserts, jungles, mountains and open plains. But can it take the next step in its evolutionary progress, and adapt more successfully to such an extensive urbanised environment of its own making? To open this crucial debate, the studies discussed in this paper promote co-ordinated approaches to an evolutionary-concordant urban future. Towns may not be our natural habitat, but we can make them our optimal one.

Competing Interests

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