Chapter 19
What Lies Beneath Those Urban Settings?
The Value of Bioarchaeology in Understanding the Complexities of Urban Health and Well-Being

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Abstract At the time of writing, the COVID-19 pandemic has been confirmed in nearly five million people and there have been over 300,000 deaths worldwide. This pandemic is caused by a novel virus, but the vulnerabilities that it reveals, including those produced by or associated with urban contexts, and the responses that we as local and global communities have mounted in the face of this crisis are not entirely new. This chapter draws on examples from the current pandemic and examines the urban-rural divide with respect to health that exists today, the actions people took during past pandemics in both urban and rural contexts to prevent the spread of disease, and ongoing international efforts to improve human health and well-being. Though much of the world’s attention is justifiably focused currently on the COVID-19 pandemic, there are important lessons to be learned about how crises, structural inequalities, and variations in health were produced by and affected past populations. The chapters in this volume amply demonstrate how much we can learn about these phenomena through bioarchaeological research in and near urban settings and how much work still remains to be done.

Keywords Rural-urban · COVID-19 · Deprivation · Inequality · Intersectionality · Plague · Tuberculosis · Leprosy · Influenza · Resilience · Adaptation · Mobility · England.

I was honored to be the discussant for the session at the American Association of Physical Anthropologists Annual Meeting in Cleveland, Ohio, USA that preceded...
this volume. I am also pleased to have been asked to write the concluding chapter for this important volume, especially so because urban settings are not places I feel very comfortable in! Having worked on past urban health in a variety of guises over my career and particularly from the mid 1990s, I am aware how informative it is to explore and unravel the myriad risk factors for health in urban settings. I also appreciate the rapid progress that has been made in bioarchaeology, especially over the last 10 years, and we now have such an exciting multidisciplinary and multi-method approach to our discipline that is producing much more insightful conclusions compared to 40 years ago when I entered the world of bioarchaeology! This said, I am hugely impressed at the contributions for this volume. This chapter completes the volume, but it will not cover everything that has come before (you will have to read those chapters!).

Instead, this chapter will consider how urban living has taken over much of the world’s population today, provide a comparison of urban and rural living and health focused mainly on England as a case study, and summarize the push by key global organizations such as the United Nations and the World Health Organization for good health for all. This is followed by a consideration of issues related to work on the bioarchaeology of urbanization and, because space is limited, a discussion of the outcomes of some chapters in this volume. The chapter concludes with a brief mention of some absentees in the volume and their potential value in future research and some of the implications of the volume for understanding urban living today.

19.1 Introduction: COVID 19

I write at a time when the world is experiencing a major pandemic caused by a new coronavirus, COVID-19 (Bedford et al. 2020). Wreaking havoc globally, it induces severe respiratory infections that particularly affect the older generation and those with underlying medical conditions. As of the first of May 2020, over 200,000 deaths have occurred worldwide. As a majority of people live in urban settings, it has been emphasized how these places need to be prepared for the pandemic because emerging infectious diseases “either originate in urban settings, such as the emergence of COVID-19 in Wuhan, China, or rapidly propagate because of urbanisation once they are established, such as outbreaks of SARS in 2003 [severe acute respiratory syndrome causes by a coronavirus: SARS CoV] and Zika virus disease in the Americas” (Lee et al. 2020, p. 527–528).

Urban settings, and particularly cities, are essentially hubs to which people travel for work, trade, and leisure, and while they provide many opportunities for the human species, they also harbor health-related risks. It has therefore been inevitable that cities have, thus far, been more affected by this virus than rural areas. In some respects that may be a “blessing” as even though health care “is inarguably one of the most well-known and widely studied determinants of health” (Zhang et al. 2017, p. 1), access to health care resources and facilities can be limited in rural areas compared to urban areas (e.g., see Brems et al. 2009 regarding two U.S. states with large
rural populations). If we take England as an example of the rural-urban dichotomy, in 2018, 9.5 million people were reported to live in rural areas of England, or 17.0% of the population, and there was a higher proportion of people over 65 years living rurally (24.8% versus 16.8%) (DEFRA 2012). While population density is obviously lower for rural areas and there is more green space, thus not providing the environment for promoting the spread of COVID-19, the population is older and more susceptible, and health care resources are not as plentiful. In the case of COVID-19 there can be concern in rural environments that people coming from towns and cities to access the countryside may overload facilities and resources and compromise parts of the rural economy (see Fig. 19.1).

19.1.1 Urban-Rural Health and Well-being: A Current Perspective from England

When we consider health statistics for England (DEFRA 2019), life expectancy for people born in 2015–2017 was estimated to be 2 years longer and infant mortality was lower for people in rural areas than for those born in urban settings. Based on an Index of Multiple Deprivation (income deprivation affecting children and older people; deprivation in employment, education, skills and training, health and disability, and living environment; crime and barriers to housing and services), people living in rural settings also tended to be less deprived than those in urban environments (DEFRA 2018). However, there was variation within rural areas, and it is important to note that “these statistics are a measure of relative deprivation, not affluence”, and to “recognise that not every person in a highly deprived area will themselves be deprived. Likewise, there will be some deprived people living in the least deprived areas” (DEFRA 2018, p. 1). This could be particularly the case in rural contexts where the underlying area used to determine the index is much more
geographically spread out than in urban areas. This means that small areas of deprivation are less likely to be identifiable amid a relatively affluent area. In urban settlements, “deprivation is more likely to be concentrated in an area and hence more easily reflected in the index” (DEFRA 2018, p. 1). Of course, it would be preferable if equality rather than inequality prevailed across the globe, as this would promote better health overall (Marmot 2015; Wilkinson and Pickett 2009).

When it comes to health care (LGE/PHE 2017), 80% of rural residents in England live within 4 km of a doctor’s surgery (compared to 98% in urban settings), 55% of households are within 8 km of a hospital (97% of urban households), and 57% of rural residents live within 4 km of a National Health Service dentist (98% of the urban population). Relevant, too, is the fact that people in rural areas can often have better family and community support by living as part of two- or three-generation households, and thus are less likely to live in care homes (McCann et al. 2014). Nevertheless, the picture is not a “bed of roses” in rural regions. For example, the rural population tends to be older (younger people emigrate for employment and older people immigrate, often for a quieter life), transport networks are inefficient and less plentiful compared to urban settings, digital and online access is a problem because of poorer broadband speeds and telephone networks, house prices are greater, fuel poverty is larger, and rural social networks are breaking down, leading to isolation and loneliness (LGA/PHE 2017, pp. 7–8).

19.1.2 Urban and Rural Settings and COVID-19

Focusing on health and well-being in English rural and urban settings in the context of COVID-19 perhaps emphasizes how challenging the interpretation of data on risk factors for rural and urban community health today can be. Indeed, on May first 2020, the Office for National Statistics reported age-standardized mortality rates involving the coronavirus (COVID-19) (ONS 2020). They were highest in major urban conurbations (i.e., several urban and suburban areas that have merged into a single continuous area) in England, with 64.3 deaths per 100,000 population; this was statistically significantly higher than all other settings, and mortality rates were lowest in rural areas overall (9 deaths per 100,000 population). Deaths involving COVID-19 were more than twice as high in the most deprived areas compared with the least deprived (deaths from the first March to the 17th April 2020). The age-standardized mortality rate of deaths involving COVID-19 in the most deprived areas of England was 55.1 deaths per 100,000 population compared with 25.3 deaths per 100,000 population in the least deprived areas (ONS 2020).
19.1.3 Intersectionality Is Relevant

While we often have detailed data on contemporary populations relating to the impact of rural and urban living on health and well-being, those data are intersectional and reflect the interconnected nature of social categorizations that define identity such as age, gender, and ethnicity/race (Crenshaw 1989). For example, some parts of rural populations may be more mobile (e.g., young women who are key workers) than others (e.g., over 70 year olds who are self-isolating) and come into contact with others who may have the virus through their work. In recent weeks we have also seen reports of patients and care workers from Black, Asian, and minority ethnic groups (BAME) being disproportionately affected by COVID-19, as has been seen in other pandemics: these groups can “vary in behaviours, comorbidities, immune profiles, and risk of infection” (Pareek et al. 2020, p. 1421). The public sector UK government information service further shows that, as of July 2019, London had the smallest percentage of white British people (44.9%), and the North East of England had the highest percentage (93.6%) (https://www.ethnicity-facts-figures.service.gov.uk/uk-population-by-ethnicity/national-and-regional-populations/regional-ethnic-diversity/latest). Overall, 81% of people in England and Wales lived in an urban location. Higher deaths from COVID-19 in London might be expected because of its more diverse population. On the other hand, while the majority of people in the North-East are white, there are large parts of this area that are deprived, and between 2015 and 2019 many parliamentary constituencies in this region became even more deprived (Francis-Devine 2019). Therefore, while it might be expected that the less diverse population of the Northeast might result in fewer people affected by COVID-19, but this is not the case currently. Here, deprivation is playing a large part.

19.1.4 Lockdown and Other Responses

We have seen, in recent months, country border closures (although COVID-19 does not respect borders), social distancing measures, restrictions on people freely moving around, severe effects on the travel industry (how does business continue and how do these restrictions affect our economies?), educational establishments close (education of the next generation is crucial – Armitage and Nellums 2020), and more localization of aid with communities rallying to help, and countries protecting their interests. For example, the largest community quarantine exercise in history was implemented in Wuhan, China, where the virus first emerged (Lee et al. 2020, p. 528), and of course “lockdown” has variously been implemented across the world to prevent the spread of the virus.

The lockdown has similarities to responses to infectious diseases in the past. For example, during the 1918–1919 influenza pandemic, during which 50 million people died globally, public gatherings were banned, streets were disinfected, water
fountains were sterilized, ships were used for quarantining affected people, and the wearing of masks was mandatory. Preventative measures included “carrying garlic, sulphur, cucumbers or potatoes…” (Dobson 2007, p. 182). Segregating people with tuberculosis in sanatoria (or sanitoria) was also practiced, mainly during the nineteenth and early twentieth centuries. Sanatorium means “to heal” and sanitorium means “concerned with health” (Roberts and Buikstra 2003, p. 227). They were often constructed in rural areas in isolated places, near the sea, and at high altitude; fresh air, sunlight, a good diet, and rest were on offer. Not only were sanatoria built to prevent the spread of tuberculosis, they were also “for correcting the moral decay of urban society” (ibid p. 229; see also Bates 1994; Roberts and Bernard 2015). Similarly, in medieval Europe, leprosaria were founded to seclude those with leprosy. They were particularly located in suburban areas of cities in light of “religious belief, practical necessity and political aspiration” (Rawcliffe 2013, p. 323). They required land and a plentiful supply of water to carry out their operations (e.g., gardening and animal husbandry), and they were located on roads that provided them with the opportunity to acquire alms. Nevertheless, as Rawcliffe posits (2013, p. 324): “Our preoccupation with exclusion and marginality, which have become recurrent themes in the historiography of leprosy, tends to obscure some persuasive evidence for integration into urban life.” For example, although social distancing was practiced, people with leprosy in the St. Mary Magdalen religious guild in Southampton, England could “attend” feasts via drinking ale that was reserved for them. The archaeological skeletal record is revealing a similar picture (Roberts, forthcoming-a).

The plague also motivated specific reactions from communities affected by it in the past. Daniel Defoe (1772) describes some of the reactions during the 1665 Great Plague of London, including: people (who were able) fleeing cities for the countryside (as seen in England during COVID-19): “flee early, flee far, return late”; “searchers” seeking out the affected and marking red crosses on the doors of the homes where affected people lived; and remedies being recommended for prevention (e.g., tobacco smoking) and cure (e.g., toad poison and crab’s eyes) (Dobson 2007, p. 8–19). Eyam, a village in Derbyshire, England represents a classic example of a rural population deciding, under the guidance of the Reverend William Mompesson and his predecessor, Reverend Thomas Stanley, that quarantining was the best course of action to prevent spread of the seventeenth century plague from their village to the wider community (Paul 2012; see also https://www.eyamplaguevillage.co.uk/). Families agreed to bury their own dead, not in the churchyard, and worship outdoors. A boundary stone on the outskirts of the village provided a place where money could be left for food that the surrounding communities brought to the village. A similar stone can also be seen at Zennor in Cornwall, also in England that was used in other health crises like cholera. Here a hole was filled with vinegar for money to be “disinfected” when passed from villager to outsider. Out of a population of around 800, 260 people in Eyam died over the course of 14 months (Fig. 19.2); many were poor, as we see today for COVID-19 (see relevant work by Whittles and Didelot 2016).
The COVID-19 pandemic has made us realize that people are not islands, and neither are the cities in which they live. The public have also learnt very quickly that there may be people clearly affected by the disease and showing signs, but also carriers of COVID-19 who are not experiencing symptoms can be transmitting it. That is why contact tracing and surveillance has come into its own during this pandemic (Bi et al. 2020). Health care facilities have been severely stretched, and front-line workers have been placed in very challenging and risky situations while caring for those affected. Finally, behaviors have changed for some (e.g., see Van Bavel et al. 2020) – such as criticism of those in power, lack of trust, increased selfishness, and panic buying. Conversely, but very importantly for overall mental and physical health, air and noise pollution have declined, there is more community spirit, more people exercising and using the available green spaces, and, certainly in the UK, more gardening! The human species has enormous skills for resilience and is extremely good at addressing and adapting to challenges that face it. A good example of research leading to resilience against a contagious disease comes from the nineteenth century and the pioneering work on cholera by the London-based medical practitioner John Snow. He identified that most people who used the Broad Street (Broadwick Street), Soho water pump were dying from cholera and thus identified it as the source of the disease (Rosen 1993, p. 261–262). Over 500 people died in 10 days in 1854 (Howe 1997, p.161), which led to the handle of the pump being removed and cholera declining in the area. If resilience is defined as a person or community’s capacity to rise above adversity, for example in facing a difficult challenge or a disease like cholera, Snow’s contributions to better public health in the nineteenth century remain inspirational.

19.2 Creating and Maintaining Healthy Bodies Today

If the current and unchanged 1948 World Health Organization’s definition of health is “not merely the absence of disease or infirmity but rather a state of complete physical, mental and social well-being” (World Health Organization, 1948, p. 1), it
is easy to see how urban settings create risks for maintaining good health, the latter of which is based on the natural and built environment and the socioeconomic setting, including having adequate food and social and health services. Infectious diseases, non-communicable diseases (NCD) such as cancer, cardiovascular disease, diabetes, dementia and respiratory diseases, and injuries due to accidents and interpersonal violence are the most common health problems in urban contexts today. NCDs can increase in urban areas because of unhealthy diets, lower physical activity, exposure to air pollutants, and the harmful use of alcohol (World Health Organization, 2010a).

In 2000, 189 countries agreed to try to achieve the eight United Nation’s Millennium Development Goals (MDG) by 2015. The Goals were to: eradicate extreme poverty and hunger; achieve universal primary education; promote gender equality and empower women; reduce child mortality; ensure environmental sustainability; and develop a global partnership for development. In 2016, the United Nations built on the momentum generated by the MDGs by launching the 17 Sustainable Developmental Goals (https://www.un.org/sustainabledevelopment/), again all relevant to cities: 1. No poverty; 2. Zero hunger; 3. Good health and well-being; 4. Quality education; 5. Gender equality; 6. Clean water and sanitation; 7. Affordable and clean energy; 8. Decent work and economic growth; 9. Industry, innovation and infrastructure; 10. Reduced inequalities; 11. Sustainable cities and communities; 12. Responsible consumption and production; 13. Climate action; 14. Life below water; 15. Life on the land; 16. Peace, justice and strong institutions; and 17. Partnerships for the goals (World Health Organization, 2016). Clearly, there are challenges to achieving all these goals in towns and cities worldwide.

Over half of the global population lives in urban contexts today, and by 2050 the figure is predicted to rise to almost 70%. In 2010 (a) the World Health Organization noted that: “For the first time ever, the majority of the world’s population is living in cities, and this proportion continues to grow. Putting this into numbers, in 1990 fewer than 4 in 10 people lived in urban areas. In 2010, more than half live in cities, and by 2050 this proportion will grow to 7 out of every 10 people. The number of urban residents is growing by nearly 60 million every year” (World Health Organization, 2010a, p. ix).

It is notable that the world’s cities cover an area that is 3% of the Earth’s surface, but cities use 60–80% of energy and produce 75% of carbon emissions, and a growing majority of people live in them. Goal 3 (Good health and well-being) aims to ensure healthy lives and promote well-being at all ages, which is considered essential for sustainable development, as “the main asset of cities is the health of its citizens” (World Health Organization, 2019, p. 42). While this is relevant to cities, it is also relevant to the current COVID-19 pandemic through which the world’s population is living (and I am writing). Debates about removing lockdowns on people to kick-start economies again come with warnings that the virus may re-surge. Having good health is the most precious thing humans can have; without good health more difficulties can develop. A healthy population is essential to maintaining a healthy economy, and this applies to both past and present urban settings. Urban living has both benefits and costs. Clearly, towns and cities are an attraction for the
human population because they provide a hub of opportunities that rural living does not. Indeed, rural to urban migration for work is common in some parts of the world (Fig. 19.3; e.g., Wang et al. 2010). However, urban settings rely on rural areas for many things that keep them functioning, for example food and water and raw materials like wood and quarry products for building like stone (Gebre and Gebremedhin 2019). Generally speaking though, in urban contexts there are more employment opportunities, there tend to be better social and health care services and education opportunities, better infrastructure for healthy living, and more economically driven possibilities, such as trade. However, urban contexts have high population densities that challenge their capacity to maintain a healthy environment. Cities concentrate environmental risks for health. They can harbor air, water, soil, and light pollution and poor sanitation provision. Further, not all people are equal in how they live; one in three urban dwellers live in crowded slums, mostly in lower-income countries (World Health Organization, 2010a, b, p. 98). Different groups such as women, the elderly, and people with disabilities may also experience poorer living conditions. These risk factors also intersect to amplify poor health outcomes.

Studies comparing health between rural and urban settings today generate varying conclusions, but these are driven by the methods and samples used, where the study is done, and how urban and rural are defined (Riva et al. 2009, who studied London, Other Cities, Semi-rural areas; and Villages). The picture can be complex. For example, a study of people in affluent and deprived areas of urban and rural Scotland between 1979 and 2001 found that there was an increase in inequalities for both men and women between 1981 and 2001 (largest in remote rural Scotland) (Levin and Leyland 2006). However, male health inequalities were higher in urban areas. In 2001, female health inequalities were higher in remote rural areas than

Fig. 19.3 Marketplace in Nepal, bringing rural people into urban environments with their produce; image courtesy of the author
urban areas, and inequalities amongst the 65 plus-year-olds in 2001 were greater in remote rural Scotland than urban areas for both males and females.

A straightforward comparison of urban and rural health both past and present is extremely complex. For example, we cannot be certain that all people reside/resided in those environments for the whole of their lives. While we know that people move around frequently in our globalized world today, it is only through increasing research in bioarchaeology using isotope analysis that we have come to appreciate that people were much more mobile in the past than we had previously appreciated (e.g., see Evans et al. 2006; Groves et al. 2013; Meiger et al. 2019; Müldner et al. 2010). Indeed, “migration has a deep history, dating back to the very origins of our species” (Campbell and Crawford 2012, p. 1). Mobility pattern data show that, like today, people moved between rural and urban environments, probably to access better opportunities during their lives (e.g., see Lankila et al. 2013). Wells and Stock (2012; see also Roberts 2018, pp. 213–214) list potential reasons for migration, including economic drivers, for colonization, as a result of slavery, for marriage, to invade a place, for business/work, and for leisure; mobility may also be determined by the seasons (e.g., migrant agricultural workers). Migration may also be one way or two ways, can take varying amounts of time to achieve, and may be permanent or temporary. Migration of people can further promote the transmission of infections (Mokrousov 2012), as we have already seen: for example taking new strains of a disease to a population whose immune systems are not resistant. Like the transition to sedentary life from hunting and foraging in the first epidemiological transition (Roberts 2015; Roberts, forthcoming-b), there was no strict dichotomy between...
rural or urban environments in the past as we see today. Related to this situation, pathogens move too and do not respect modern day borders (Vineis 2017) - or even the transitional areas between urban and rural - whether those are physical borders like mountains or actual borders that are controlled by humans. As we have seen in recent times with the COVID-19 virus, if the conditions are conducive for transmission and infection, no border control will stop it. Further, people in the past probably regularly moved from space to space as they do today and experienced transitional spaces that were neither wholly urban, or rural, and many lived in suburban areas of towns and cities (Fig. 19.4).

19.3 The Bioarchaeology of Urbanization: What Is on Offer?

Shifting focus to past communities, where the archaeological and historical record can be very fragmentary, presents greater challenges for interpreting the relative risks for health and well-being in urban and rural communities. However, having a “here and now” basis for discussions is essential and Chap. 1 more than adequately sets the scene for the bioarchaeology to come. Nevertheless, as Chap. 1 says, it is not possible to wholly apply what we know of urban living today onto the past. Yet this volume does provide a number of fascinating and diverse (pre-modern) “case studies” where the generated data and their interpretation can be considered and compared with what we know today about urban settings. Bioarchaeology overall has produced many studies of morbidity and mortality in urban settings, many of which are referenced and described in the chapters in this volume.

A large majority of archaeological sites are in current urban settings (see above), and therefore the majority of skeletons available for study derive from urban contexts. The added value of those contexts is that there is the opportunity to use historical sources to aid in interpretation of the skeletal data. In more recent times and with increases in modern development, bioarchaeologists have also welcomed the excavation of more post-medieval cemeteries in Europe in contexts where individual biographies may exist in historical sources and can thus be compared with the skeletal data collected (e.g., in London). A good example is Christ Church, Spitalfields, where many of the coffins of the crypt burials preserved plates documenting the name of the person, and their age at, and date of, death (Molleson and Cox 1993). There are also increasingly available documented urban skeletal collections from the late nineteenth/early twentieth century with medical records associated with individuals (e.g., Coimbra, Portugal: Cunha and Wasterlain 2007).

It is therefore fitting that The Bioarchaeology of Urbanization volume has been produced because urbanization has variously touched, is touching, and will touch so many people in the years to come. Through understanding the impact of urban living on people today, we can reach back in time and apply that knowledge to appreciating the benefits and risks of past urban domains on the morbidity and mortality of our ancestors, through their skeletal remains. Bioarchaeologists are therefore perfectly placed to provide perspectives on urban living in the past and how that
knowledge might be relevant to, and indeed used for, informing the present challenges the world’s population faces as more people live in cities, in addition to thinking about the future where the intensity of urban living will increase.

This volume takes a deep time and long-term perspective (7000 years), and addresses urban living in locations on four of our seven continents. No work of this scale has explored the consequences of living in an urban environment on how humans adapted and how urban living impacted health and well-being in such a broad manner. This volume reflects how the authors have all engaged with the published literature that discusses the trials, tribulations, and benefits of being an urban dweller today. First, and important as a starting point, some comment on definitions of living environments is necessary. I say important because when it comes to comparisons of data in bioarchaeology, we must surely have some handle on what it means to be an urban or rural dweller with respect to morbidity and mortality. That said, concepts of urban and rural across time and space are highly variable, and scholars focusing on the past (and present) do not necessarily use the same definitions.

As the introduction to this volume says, “definitions of ‘city’, ‘urban’, ‘urbanism’ and ‘urbanization’ may vary, and… many scholars recognize that rather than there being a strict urban-rural dichotomy, there is a continuum of settlements patterns between those two ends of the spectrum”’. Definitions used in ancient and current contexts will of course vary if we wish to compare past and present impacts on urban (and rural) living, and those settings will encompass similar and different risk factors for the health and well-being of their dwellers, past and present. Disentangling those risk factors from each other in the archaeological record is of course a challenge for bioarchaeologists who often deal with a fragmentary record of our ancestors. Each site of focus can vary in what evidence is available, and even working in historic contexts may not provide the documentary evidence that might help to nuance what can be learnt (e.g., see Mitchell 2017 on the use of historical records).

Here is an example of modern definitions for rural and urban for England and Wales that were published in 2004 and updated in 2016 (see Bibby and Brindley 2011; LGA/PHE 2017). The definitions adopt a settlement-based approach and whether they are sparse (<10,000 population): town and fringe, town and fringe in a sparse setting, village, village in a sparse setting, hamlets and isolated dwellings, hamlets and isolated dwellings in a sparse setting. This is a rather crude classification as many rural settings contain villages and hamlets that may contain much less than 10,000 people. Both sparseness and the rural nature of settlements appear to affect poverty levels and consequently the health of people in rural areas. As noted, however, “Population profiles of different rural areas can, therefore, be very diverse in relation to their level of affluence and their health outcomes” (LGA/PHE 2017, p. 9). This may be seen in different types of farming communities (arable versus animals), coastal places where tourism and fishing are the mainstay of the economy, and commuter villages near to cities or towns.

If we take a recent definition of settlements for the purposes of a big data project on health in the past, we find the following categories used: rural, small city, town,
rural, major city, and mega city (Steckel et al. 2019). These are defined as follows: village (n = <1000 people); town (n = 1000–10,000); small city (n = 10,000–25,000); major city (n = 25,000–100,000); and mega city (n = 100,000+). Coders of skeletal data for the central database from each site in the project were required to assign the category of settlement that best fitted their site(s). This should make it easier to compare data between this project and others if the same definitions for varying sizes and complexities of settlements are used (also see this volume for some rural/urban comparisons of health). Although I have not looked in detail at the bioarchaeology literature, I suspect that nuanced descriptions and discussion of the terms rural and urban do not feature highly, as they did not in my early publications on air quality and health. In Lewis et al. (1995), p. 500) we defined urban and rural very simply from a dictionary: “urban pertains to a population living in a city or town with its own government and administration, who generally find employment within developing industries. Rural relates to a population living in the countryside and practicing agriculture (Hanks 1979, p. 1277). My later paper did not even define urban and rural (Roberts 2007). In Roberts and Cox (2003), where we documented health over time in Britain, each chapter from the time of the first evidence of urban living (Roman period) was prefaced with evidence from the archaeological record for those urban settings; see also Roberts and Cox (2007) where urban and rural were very cursorily examined as risk factors for health. I also used the data from Roberts and Cox (2003) to compare the early rural (mid-fifth to mid-eleventh centuries AD) and later medieval urban (mid-eleventh to mid-sixteenth centuries AD) periods, finding that people buried in the early period were healthier (Roberts and Cox 2007). My own studies illustrate the problems of not defining what is meant by urban and rural, not necessarily always providing information about the details of the urban and rural settings being examined, and essentially taking the easy way out; reviewers should have picked up on the journal papers’ deficiencies at the very least! In the current volume, it is therefore good to see that authors were asked to define what urbanization was for the population under consideration.

Defining what is meant by a settlement means that it makes urban-rural comparisons of data (e.g., regarding the relationships between urbanization and health) in this volume with other research a little easier. This is in spite of definitions of urban and rural varying across time and place, and “the specific components of urbanization...are likely to have comparable implications for human health across populations, even though the pace of change, and the combination of components that change, may be unique to a given population” (McDade and Adair 2001, p. 69). These authors also recommended that studies should “identify the most important aspects of change that go into defining the range of urban and rural landscapes in a given context.” (ibid). Further, as bioarchaeologists, we should also think very carefully when we accept a designation of urban or rural, or anything in between. Unless there is 100% certainty of those designations for a settlement in the past, corroborated by different lines of evidence (e.g., historical and archaeological data), we need to remember that particularly for urban settlements they may not be as urban as we imagine. How urban is urban and how urbanized does a population have to be before its environment affects population health?
More detail is clearly required to know what we as bioarchaeologists are dealing with when interpreting our data from urban or rural contexts. We must therefore use different lines of evidence and appropriate methods. For example, it is not only archaeology and anthropology we should turn to; evolutionary thought (including genetic susceptibility and risks), medical anthropological research (some living populations perhaps living in ways very similar to our ancestors), and medical geographical research (looking at health according to locale, including ecology) can help us develop our datasets and unlock hidden meanings (Emch et al. 2017; McElroy and Townsend 2018; Nesse and Williams 1994). We can also utilize historical data, where applicable, and medical historical information in particular. The latter are especially useful when thinking about cross-cultural, temporally defined concepts of disease and its management (Porter 1997).

19.4 This Volume

The studies in the book are divided into three “urban sections”: 1. Early (4000 BC-660 CE), 2. Premodern (tenth-seventeenth centuries), and 3. Industrial (eighteenth - nineteenth centuries). These sections and chapters also reflect the timing of the first and second epidemiological transitions (Barrett et al. 1998). The first is characterized by the transition to farming about 10,000 years ago: increased social complexity, higher population densities, a change in diet, permanent settlements, and closer contact with animals. This transition went hand in hand with challenges to public health (more refuse, poor quality water, air and sanitation, vermin), and the potential for harvest failure and a less balanced diet. This transition set the stage for later periods where urban living became the norm and the risk factors for health above continued and population density grew, notwithstanding that urban settings had their advantages, as discussed earlier. The second epidemiological transition began in the Western world in the mid-eighteenth century and lasted until the twenty-first century, and encompassed industrialization and the harnessing of steam, coal, and water power, with increasing intensification of agriculture with developments in mechanization (Harper and Armelagos 2010). Populations increased, infections declined, and non-communicable diseases increased (e.g., cancer, diabetes, cardiovascular disease, and dementia). Eventually mortality rates fell and longevity increased.

Most of the chapters in this volume focus on the consequences of urbanization on health and well-being, while around one-third directly compare urban data with that from rural contexts. The fact that around two-thirds of the chapters do not compare urban with rural data may illustrate that urban excavations and their accompanying datasets are more available than rural datasets. Urban environments do tend to be more of a focus than rural regions for archaeological fieldwork in advance of modern developments. For example, see Roberts and Cox (2003) where data from skeletons from urban contexts were much more available than information from...
rural settings (74% of a total of 34,797 skeletons dating back to and including prehistory).

The spread of studies across the globe, from the United States and Canada to Japan in East Asia, includes a majority from Europe, with several studies of sites in Britain and Denmark, and one each from the Middle East (Petra), South Asia (India), and Southeast Asia (South Korea). In terms of timescale, three are focused on early “urban centers,” and seven each are included in “medieval and post-medieval cities” and “industrial cities.” It is noteworthy that the number of “industrial” studies perhaps reflect a focus that has developed in bioarchaeology for engaging with skeletons from this period and sites that have contemporary historical records, thus providing a rich dataset for interpretation.

Methodologically speaking, the majority of the chapters are focused on the analysis of skeletons (and two on parasite analysis). Analysis is usually macroscopically based, but a number use stable isotope data to explore diet or mobility (e.g., Chaps. 2, 5, 6) and DNA analysis to establish kinship and diagnose disease (Chap. 6), both methods that have been available to bioarchaeology for some time now (e.g., see Brown and Brown 2011: Chaps. 11 and 15; Katzenberg and Waters-Rist 2019; Nieves-Colón and Stone 2019). The two chapters on parasite analysis (industrial sites in Canada and South Korea – Chaps. 4 and 12) reflect the increasing research in this field in bioarchaeology (e.g., see Reinhard and Camacho 2018).

While the chapters include sites with a range of longitudes and latitudes (from 60 degrees to 30 degrees north), beyond the urban-rural dichotomy we have several other contexts represented: many sites near expanses of water, often beneficial for trade (e.g., Sigtuna in Sweden (Chap. 6); St Mary Spital on the River Thames in London (Chap. 15); Seoul in South Korea (Chap. 4); Horsens in Denmark (Chap. 8); the sites of Cedyinia, Slaboszewo, and Lekno in a lakeland area of Poland (Chap. 10); the Atlantic coast of Nova Scotia (Chaps. 11 and 12); the Gulf of Mexico coast (Chap. 11); Lisbon in Portugal (Chap. 14); Osaka in Japan (Chap. 18)), on islands (e.g. Ærø and Odense, Denmark (Chap. 7), a military outpost (Sct. Alberts, Denmark (Chap. 7)), and a monastic community (Øm Kloster, Denmark (Chap. 7)). Around half the chapters had present urban-rural comparisons where appropriate rural data existed for their study.

It is pleasing to see thematic approaches to the data in this volume (Roberts 2018, pp. 168–196). Key themes of interest that are approached by the authors of the chapters include the quality of living environments (e.g., Chap. 4: South Korea; Chap. 12: Nova Scotia), indoors and out, including a focus on air quality in Chap. 15: London; Chap. 6: Sweden; and Chap. 10: Poland, work (e.g., Chap. 15: London; Chap. 16: England and Wales; Chap. 6: Sweden), industrialization (e.g., Chap. 13: London; Chap. 14: Britain, Italy, and Portugal), mobility (e.g., Chap. 6: Sweden; Chap. 2: Britain), trade (e.g., Chap. 16: England and Wales), diet and economy (e.g., Chap. 5: London), intensification of urbanization on health (e.g., Chapters 7 and 8: Denmark; Chap. 14: Britain, Italy, and Portugal), survivorship (e.g., Chap. 9: Poland), status (e.g., Chap. 17: Petra, Jordan; Chap. 14: Britain, Italy, and Portugal; Chap. 2: Britain; Chap. 11: North America), and funerary behavior (Chap. 3: Indus civilization diversity). Naturally, we must not forget the
intersectional nature of these themes and how this can affect final datasets (e.g., see Gowland et al. 2018 where rates of metabolic and dental disease were the same at an urban and rural site, and there was more evidence of rural growth disruption and respiratory disease). Finally, Chap. 16 interrogates nineteenth century historical records from England and Wales in its attempt to consider the impact of urbanism on health.

Related to those themes, various categories of health problems are considered, for example “stress” markers (e.g., Chap. 11: North America; Chap. 14: Britain, Italy, and Portugal; Chap. 13: London; Chap. 9: Poland), co-morbidities (e.g., leprosy and tuberculosis – Chap. 7: Denmark), oral health (e.g., Chap. 17: Petra, Jordan; Chap. 8: Denmark), joint disease (Chap. 9: Poland), respiratory disease (e.g., Chap. 15: London; Chap. 6: Sweden; Chap. 10: Poland), and parasitic infection (Chap. 4: South Korea; Chap. 12: Nova Scotia). Chapters also consider the effects of the intrinsic nature of the human body on health and well-being, such as age (e.g., Chap. 18: weaning ages in pre-modern Japan), gender (e.g., Chap. 14: Britain, Italy, and Portugal; Chap. 5: dietary variation in London), and immune function (e.g., Chap. 15: vitamin D effects and lung function; e.g., Chap. 17: dental disease). We must also not forget that there are psychological aspects to health that we never directly see in bioarchaeology (e.g., see Ogden 2007). We should further remember that people can experience several health problems at the same time (co-morbidities: Nowakowska et al. 2019), and age, gender, ethnicity, immune system strength, and a person’s genetic makeup together will predispose them to particular health problems (intersectionality). For example, specific age and gender groups experience particular diseases (e.g., diseases of childhood and of men or women, respectively), different ethnic groups are more predisposed to specific health problems (e.g., see Quiñones et al. 2019), and people carry genes that make them more or less susceptible or resistant to certain diseases (Jackson et al. 2018). Further, we may be analyzing skeletons where there is clear evidence for a particular disease, but we do not know if that person was experiencing any other diseases that did not affect the skeleton or that the person died before bone damage occurred. Of course, ancient DNA analysis might identify diseases not visible in the bones, as has been the case for infections that do not affect the skeleton anyway (e.g., the plague), but analysis has also highlighted diseases in the skeleton that had not caused bone changes at the time of death (e.g., tuberculosis).

To conclude this chapter I now highlight three observations from the volume in relation to important aspects of urban settings, both past and present. Firstly, migration and immigration: Chap. 2 (Redfern) covers a lot of ground in an overview of urbanization in Roman Britain. It is fortunate that Britain has generated much bioarchaeological research for this period, including stable isotopic work. This has led to more nuanced interpretations of what life was like in Britain at that time. In particular, Redfern discusses the importance of now knowing how mobile the population was both inside Britain but also from outside Britain and what implications that had for urban settings. Mobility patterns linked to evidence of disease are a useful resource in tracking transmission of infections, as noted by Richards and Montgomery (2012); see also Redfern et al. 2018 where migrants are noted to have
transformed patterns of disease). Redfern et al. (2018) also found that non-British people fared relatively poorly with respect to risk of mortality compared to regional locals. In a similar study, but this time on an early medieval population from Bamburgh, England, stature and other indicators of health status indicated differences in quality of life between local and migrant groups. The non-local people buried there were healthier than the locals (Groves et al. 2013). It is important that we do not forget the osteological paradox when trying to infer health and well-being from skeletal remains (Wood et al. 1992), but clearly interpreting studies of this kind is very challenging indeed, as noted (Roberts et al. 2012). Nevertheless, it is essential to consider data related to migration in urban (and rural) settings, which may come from not only stable isotope analysis but other archaeological evidence such as exotic diseases not expected for the location, ancient mitochondrial DNA, material culture, and normal variation seen in the skeleton (e.g., non-metric traits and metrical data).

Second, provision of food: Chap. 5 (Walter et al.) in their carbon and nitrogen stable isotope analysis study of people buried in the cemetery of St Mary Spital (Connell et al. 2012) find dietary variation. What is interesting here is wide variation in carbon and nitrogen values. When linking the data to the occurrence of the Black Death, there was an observed steep decline in variation. They linked this decline to either famine pre-Black Death or changes in imports to the city. Importantly, adults had higher nitrogen but men and women showed no differences. Of relevance here is food security in urban environments, both past and present, which was highlighted, too, in the early weeks of the COVID-19 crisis. The crisis has also encouraged more people to start to grow or grow more of their own food, thus showing how humans can readily adapt to challenges that present themselves. Food is an essential component of staying alive in any setting, but urban environments can, on the one hand be a plentiful source of a great variety of food, but it can also suffer shortages and less variety due to changes in supply of those sources as a result of crises.

Third, air quality and respiratory health. Three chapters variously focus on the impact of poor air quality on our urban and rural ancestors’ respiratory systems (Chaps. 6 (Kjellström), 10 (Krenz-Niedbała & Łukasik), and 15 (Boyd)). The bioarchaeology of respiratory health as seen in maxillary sinuses and on rib surfaces really has not been much of a consideration, with very few studies in general (e.g., sinusitis: Boocock et al. 1995; Lewis et al. 1995; Merrett and Pfeiffer 2000; Panhuysen et al. 1997; rib lesions: Lambert 2002; Nicklisch et al. 2012; Roberts et al. 1994; Santos and Roberts 2006). Perhaps this is because these are delicate areas of the body and in archaeological skeletons they can often be damaged and fragmentary. However, with the global focus on the impact of poor indoor and outdoor air quality on health in both the developed and developing world (Fig. 19.5), bioarchaeology is beginning to look at this health problem more (see examples of the many modern studies: Fuller 2018; Lee 2019; and see http://www9.who.int/airpollution/en/). Clearly, many variables in the urban environment can predispose people to respiratory problems, including workplaces (Roberts et al. 2016). The chapters in this volume provide some interesting data, with Kjellström’s chapter (6)
showing that men in her study were more likely exposed to greater pollution in the workplace than women. Krenz-Niedbala and Łukasik (Chap. 10) focused on sinusitis, rib lesions, and damage to ear bones in the skeletons of people less than 20 years of age in proto-urban and rural settings (see also Krenz-Niedbala and Łukasik 2016). It is good to see this combination of markers of respiratory stress (see also Bernofsky 2010; Davies Barrett 2018), but it is rare in bioarchaeology for ear bones to be studied (but see Bruintjes 1990; Collins 2019; Dalby et al. 1993). Boyd’s (Chap. 15) idea to study sinusitis and rib lesions in middle and upper class populations of suburban and urban London reflects that this city has a documented history of poor air quality over a long period of time (Brimblecombe 1987). This remains so to this day but is improving (Font et al. 2019), and COVID-19 is temporarily helping. Data were collected from the Wellcome Osteological Research Database curated by the Center for Human Bioarchaeology at the Museum of London. Boyd’s effort to examine the link between respiratory disease and vitamin D deficiency is welcomed and aligns with approaches that other bioarchaeologists are also developing. For example, Mays et al. (2018) have focused on the link between latitude and D deficiency, with one of the conclusions being that in the Roman city of Ostia, Italy multi-storied buildings likely prevented UV light reaching buildings and streets. It is also well known today that there is a high risk for TB to occur in those settings (Lai et al. 2013). As vitamin D deficiency is very much linked to tuberculosis, this makes sense (Kearns 2014; also see Snoddy et al. 2016). While Boyd found that rates of respiratory stress were similar both within and outside London (similar hazards), it is unfortunate that only two individuals were identified with vitamin D deficiency and therefore the paucity of data meant that this strand of the research could not be followed.
I am sure more studies addressing each of the three themes will be seen in future bioarchaeological literature. I should add that there were three notable absences in discussions in the chapters. For example, the impact of climate and weather patterns on urban settings, and consequently morbidity and mortality, is not a particular focus for any chapter. The bioarchaeology of climate change is an increasing interest (e.g., Harrod and Martin 2014; Robbins Schug 2011; Scott and Hoppa 2019), and we know that climate change will and is already impacting food and water security, is leading to droughts and weather events like storms, and is raising sea levels (Barrett et al. 2015). Cities are already planning for adapting to climate change (Carter et al. 2015), and approaching the bioarchaeology of urban living through climate change could perhaps explore this link in the future.

Another area that saw little discussion was the links we see today between urban health, race, ethnicity and ancestry, although these terms do need defining when used (Ali-Khan et al. 2011). Race is defined as “biological differences (such as skin color) between groups assumed to have different biogeographical ancestries or genetic makeup”, ethnicity as “a complex multidimensional construct that reflects biological factors, geographical origins, historical influences, as well as shared customs, beliefs, and traditions among populations that may or may not have a common genetic origin” (Mersha and Abebe 2015, p. 2), and ancestry as “a general connection to people or things in the past…… in a genetic context they have a more specific meaning…… the individuals from whom you are biologically descended….. information about them and their genetic relationship to you” (Mathieson and Scally 2020, p. 1). Linked to definitions of ancestry is that “there are three distinct concepts–genealogical ancestry, genetic ancestry, and genetic similarity–[that] are frequently conflated…only the first two are explicitly forms of ancestry” (ibid). This can make the use of the terms challenging in bioarchaeology but work in this vein incorporated into a bioarchaeology of urbanization would be welcomed.

Finally, as noted in Chap. 1, Barnes et al. (2011) document an allele (SLC11A1 1729 + 55del4) in the Old World (modern data) linked to natural resistance to intracellular pathogens, including both leprosy and tuberculosis; both infections are seen in medieval urban settings in Europe. Long histories of living in urban settlements were suggested to confer increasing resistance to developing infections. It may also indicate why some infections declined as urban living continued (e.g., leprosy). It would be beneficial to do more research in this area to confirm this finding in the archaeological record.

19.5 Concluding Remarks

To conclude, in terms of implications for the present, we have some significant outcomes from this volume. Redfern (Chap. 2) notes that intra- and inter-site variation is the most significant implication in her study, showing that urban centers have been very diverse for a long time. In relation to Redfern’s work, Kjellström (Chap. 6) makes the point that diasporic social relationships show the importance of social
inclusion of diverse populations in urban contexts. Robbins Schug (Chap. 3) shows that on the basis of Indus civilizations, urban community dynamics are key to migrant flows and are relevant to planning for a changing climate. Gamble (Chap. 8) also reveals that populations in the past, as today, may experience an unstable climate, population migration and economic changes. Again related to mobility, Scott et al. (Chap. 11) explain how concepts of the healthy migrant today can be challenged through study of the past. Walter and colleagues’ research (Chap. 5) is relevant to understanding changing diets in both medieval and modern urban contexts and how food shortages can contribute. Kelmelis et al. (Chap. 7) illustrate how population dynamics and cultural practices in urban and rural communities affect the role played by infections, including zoonoses. Fonzo et al. (Chap. 12) and Shin et al. (Chap. 4) in their parasite analyses, show how past parasite infection data may inform urban planning today to promote a safe environment in which to live (e.g., good sanitation measures, access to health care, limiting overcrowding), and how these infections might be prevented in the future. Ives and Humphrey’s (Chap. 13) research demonstrates variability in patterns of both childhood skeletal growth and adult bone loss. Related to this research, Reedy’s work (Chap. 14) on childhood morbidity and mortality in the nineteenth and twentieth centuries show the real impact of urban living on this age cohort. Finally, Crane-Kramer and Buckberry (Chap. 16) in their interrogation of nineteenth century historical records for deaths and causes of deaths regionally in England and Wales, show that there can be variation in health differences when different urban and rural (and mixed) regions are considered; this sort of information is relevant when interpreting health in the past where our data and contextual information are often fragmented and certainly not as plentiful as historical records.

Moving forward, Wood et al. (1992) of course remains relevant to our future research, and this is acknowledged in over half of the chapters in this volume. All bioarchaeological research also needs to consider standard methods for data collection so that data can be reliably compared. It is anticipated that this volume will be the basis for future studies on the bioarchaeology of urbanization, which will extend into other parts of the world.

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