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Differences in life expectancy between four Western countries and their Caribbean dependencies, 1980–2014

Soraya P.A. Verstraeten [1,2], Hans A.M. van Oers [3,4], Johan P. Mackenbach [1]

1 Department of Public Health, Erasmus MC, Rotterdam, the Netherlands
2 Institute for Public Health (Volksgezondheid Instituut Curaçao), Ministry of Health, Environment and Nature, Willemstad, Curaçao
3 Public Health and Health Services Division, National Institute for Public Health and the Environment (RIVM), Postbus 1, 3720 BA Bilthoven, The Netherlands
4 Scientific Centre for Transition in Care and Welfare (Tranzo), Faculty of Social and Behavioral Sciences, Department Tranzo, University of Tilburg, Tilburg, The Netherlands

Correspondence: Soraya P.A. Verstraeten, Institute for Public Health (Volksgezondheid Instituut Curaçao), Ministry of Health, Environment and Nature, St. Martinus Center, Willemstad, Curaçao, Tel: +5999 839 2169, e-mail: S.verstraeten@vic.cw

Background: In the Caribbean, life expectancy in politically independent territories has increasingly diverged from that of territories that remained affiliated to their former colonizers. Because these affiliated territories differ in degree of political independence, they are not all governed in the same way. We assessed whether differences in life expectancy trends between Caribbean dependencies and their Western administrators were related to their degree of political independence, and which causes of death contributed to divergence or convergence in life expectancy. **Methods:** Analysis of age-standardized death rates and decomposition of life expectancy differences between France, the Netherlands, UK, USA and their Caribbean dependencies by age and cause-of-death during the period 1980–2014. **Results:** Life expectancy differences between Western countries and their dependencies have generally increased for men and narrowed for women, but trends have been much more favorable in the French- than in the Dutch-administered territories. The strongest contributions to widening gaps in life expectancy between Western countries and their dependencies were from mortality from cardiovascular diseases (ischemic heart disease) and external causes (homicide and traffic accidents). **Conclusion:** Dependencies with a stronger political affiliation to a Western country experienced more favorable life expectancy developments than dependencies that had more autonomy during the 1980–2014 period. The underlying mortality differences with Western countries are largely comparable among Caribbean territories but differ in magnitude, most notably for cardiovascular disease and external causes. This suggests that increases in a territory's political autonomy impairs the diffusion of new knowledge and techniques, and/or reduces government's effectiveness in implementing policies.

Introduction

Since the 1960s, when many Caribbean island territories gained independence, life expectancy trends in the Caribbean have diverged. As a consequence, the Caribbean region currently has the lowest life expectancies and largest between-country disparities in life expectancy of the Americas.[1] Previous studies observed large differences in life expectancy development between dependent and independent Caribbean territories,[2–4] which may be the result of two self-reinforcing mechanisms. On the one hand, the weakening of bureaucracies after decolonization challenge a governments' capacity to influence areas that contribute to population health.[5] On the other hand, affiliation to some of the most advanced countries in the world (France, the Netherlands, UK and USA) likely promotes a process of policy diffusion that is, directly or indirectly, beneficial for population health.[6] In other words, an absence of the disadvantages of sovereignty, and the presence of the advantages of a strong political, cultural and (socio)economic relationship with a prosperous country, probably results in the relatively high life expectancies in affiliated territories. We will refer to 'affiliated territories' and 'dependencies' as neutral terms to describe the political status of Caribbean territories without sovereignty under international law, as indicated by their non-membership of the United Nations (http://www.un.org/en/member-states/index.html).

Life expectancies, however, vary greatly between Caribbean dependencies.[7] Possibly underlying these differences is a gradient

in autonomy caused by the way Western countries govern their dependencies, which varies considerably and also translates into a variety of governance structures on the area of public health. At one end of the autonomy-dependency spectrum, we find Guadeloupe and Martinique. These French departments are considered an integral part of the French Republic. Health system governance on the islands is implemented with oversight from the Ministry of Health in metropolitan France, since 2010 by the 'Agence Régionale de Santé'. Next are the small island territories of the UK: Anguilla, British Virgin Islands, Cayman Islands, Montserrat and Turks & Caicos. All islands have their own constitution, legal system and a democratically elected Government (with the exception of Turks & Caicos during the 2009–12 period). While the island governments are considered to have primary responsibility for the provision of healthcare and public health interventions to their populations, the UK government leads with overall policy through the Department of Health, the Department for International Development and the Health Protection Agency. They pro-actively support the islands to manage their health sector, to work with regional organizations, to prepare for emergencies and to fulfill international responsibilities such as the International Health Regulations.[8] Succeeding these islands are Puerto Rico and the US Virgin Islands, two unincorporated territories of the USA. Whereas Puerto Rico is a self-governing territory based on its commonwealth status, the US Virgin Islands is considered not. Health governance, however, is similarly organized and provided by the local Departments of Health that lead all efforts related to health on the islands. At the other end of the spectrum, we find the constituent countries of the Kingdom of the Netherlands: Aruba, the Netherlands Antilles (which consisted of five island territories and was dissolved in 2010) and Curaçao (the most populous island territory of the former Netherlands Antilles). Similar to the UK islands, the Dutch territories have their own constitutions, legal systems and a democratically elected Government. In contrast to the UK islands, however, the Dutch islands govern their own health sectors and steer their own health policy initiatives.

In this paper, we will assess whether Caribbean dependencies with a greater degree of political independence have less favorable life expectancy trends, as measured by the development over time of the gap in life expectancy with their Western administrators. In order to obtain insight in the factors underlying convergence or divergence of life expectancy we will also determine the contribution of specific age-groups and causes of death to gaps in life expectancy.

Methods

Data

We selected all Caribbean dependencies for which mortality and population data were available during the 1980–2014 period. This excluded one territory of France and four territories of the Netherlands. We obtained mortality data from the World Health Organization mortality database[9] or through a request at the Pan American Health Organization (PAHO) for Curaçao. Data include annual deaths by gender and age in each year, using the ninth or tenth revisions of the International Classification of Diseases. International Classification of Diseases-codes are given in Supplementary Appendix table A1. Demographic data by gender and age were extracted from the United Nations World Population Prospects 2017[10] or, for islands with 2015 populations smaller than 60 000, from the US Census Bureau.[11] In preliminary analyses, we noticed that records concerning certain causes of death were missing in the datasets for Aruba prior to 1995. This involved the E-codes indicating external causes, for which most sub-causes registered an implausible count of zero. We continued analyses as normal and took these omissions into account during the interpretation of the results.

Data analyses

We totaled mortality and population data over 5-year periods to reduce sensitivity to small number fluctuations. For the same reason, we combined all deaths in the five dependencies of the UK. The actual number of data years included per 5-year period varies due to data availability. We corrected deaths for unclassified age and gender, for deaths attributed to ill-defined causes (R00-R99, non-external deaths only) and for under-registration (as determined by comparing the number of deaths with independent estimates from the World Population Prospects 2017 and the US Census Bureau).[12] Based on the corrected numbers of mortality, we calculated age-standardized mortality rates per 100 000 population using direct standardization to the World standard population.[13] We computed life expectancy from abridged life tables and the age- and cause-specific contributions to life expectancy differences by Arriaga's decomposition method[14] and calculated 95% confidence limits using Monte Carlo simulations.[15]

Results

As figure 1 shows, life expectancy in France, UK, USA and the Netherlands has increased steadily since the early 1980s. Life expectancy in their Caribbean dependencies has also increased, but in a less regular pattern. In all Caribbean dependencies, the relative position in male life expectancy with respect to their Western administrators deteriorated. In contrast, the gap in female life expectancy that existed in the early 1980s has improved in all dependencies but Aruba (Supplementary Appendix table A2). In the Caribbean dependencies of France and UK, life expectancy has moved more or less in parallel with that in their administrating countries, and as a result gaps in life expectancy were relatively small or non-existent in the early 2010s. For the UK islands this meant that they lost their initial advantage in male life expectancy relative to the UK. Trends in life expectancy were less favorable in the Caribbean dependencies of the Netherlands and the USA. In Aruba and the Netherlands Antilles, male life expectancy decreased and female life expectancy stagnated during the 1990s, which resulted in a substantial gap in life expectancy with the Netherlands in the early 2010s. A smaller gap in male life expectancy has opened up between Puerto Rico and the USA. Similarly to the trends in the Dutch islands, however, male life expectancy decreased in the US Virgin Islands which resulted in a gap of almost 5 years with the USA in the early 2010s. Remarkably, due to faster increases over the study-period, female life expectancy in Puerto Rico and US Virgin Islands is now higher or comparable, respectively, than that in the USA.

The differences in male life expectancy between Caribbean dependencies and their administrating countries have been decomposed by age and cause-of-death after combining the populations and deaths of the dependencies of each Western country, both for the earliest and the latest available time period. In the top of figure 2, we again see that life expectancy differences have generally increased for men: the difference between the top and bottom column is always negative. The magnitude of this increase differs greatly between Caribbean dependencies (France: 1.0 years, UK: 2.8 years, USA: 2.2 years, the Netherlands: 4.4 years). When considering age-specific contributions to life expectancy differences, we observe similarities in the direction of the changes during the study-period. In all Caribbean dependencies, infant mortality trends have been more favorable than in their Western administrator. For young and elderly men the opposite is true and the gap between Western countries and dependencies has become larger. In all dependencies except the French, mortality trends among middle-aged men have been unfavorable compared to their Western administrators.

When considering cause-specific contributions to male life expectancy differences, we see that the strongest contributions are from diverging trends in cardiovascular diseases and external causes

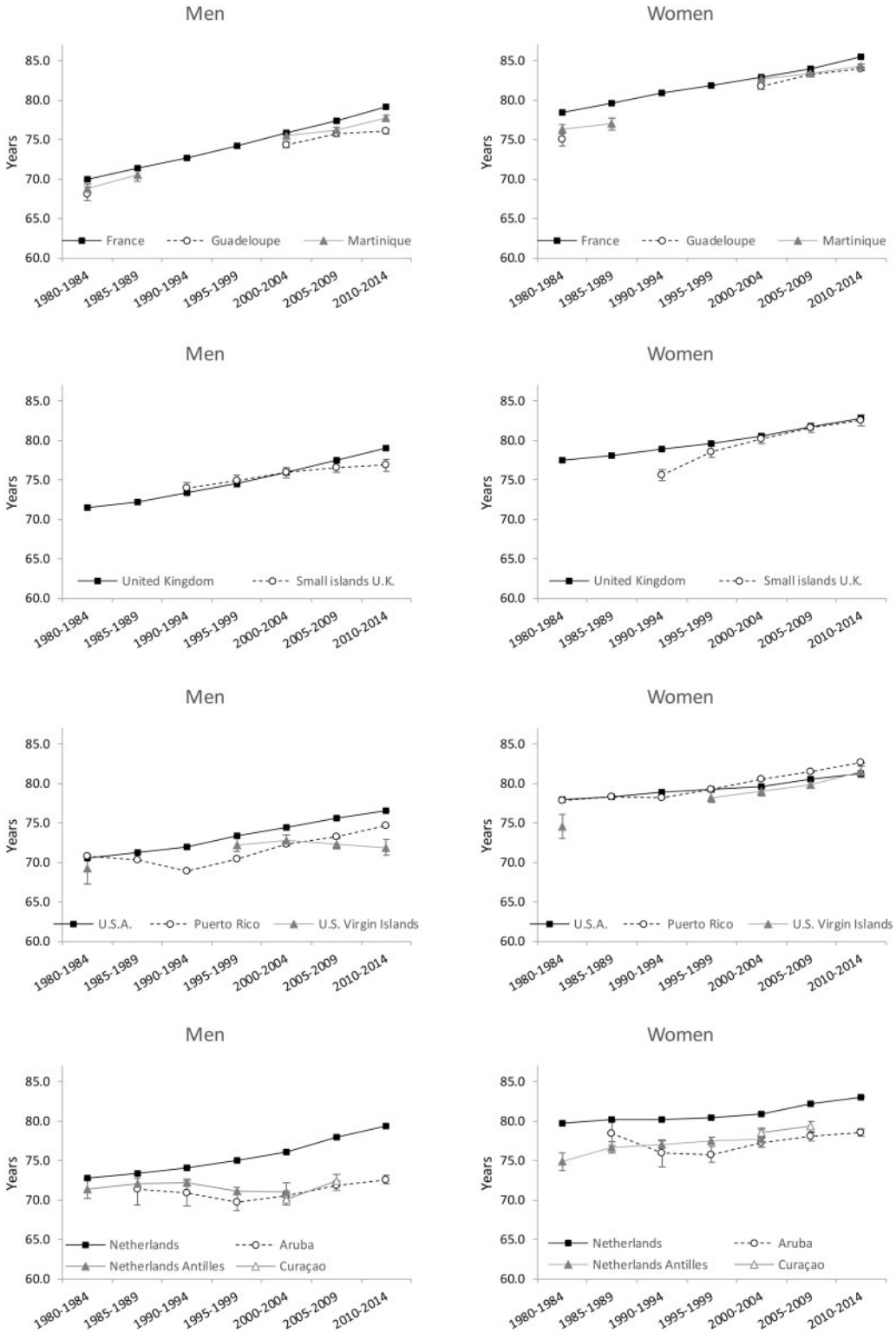

Figure 1 Life expectancy at birth in Western countries and their Caribbean dependencies, 1980–2014

(Supplementary Appendix table A3). The cardiovascular mortality gap has increased in all Caribbean dependencies except the French, with the greatest increases seen in the Dutch territories. Within this category this is mainly caused by ischemic heart diseases, whose initial advantage in the dependencies almost completely disappears during the study-period. Next in magnitude are changes in external causes, whose contribution to life expectancy differences with Western countries increased in all dependencies, but again most strongly in the Dutch territories. The leading causes in this category are transport accidents and homicide. Additional causes that had a smaller contribution to the increasing gap in male life expectancy are neoplasms (prostate and lung cancer), diabetes and infections (HIV/AIDS).

Differences in female life expectancy between Western countries and their dependencies decreased over the study-period (Supplementary Appendix figure A1), but the magnitude of these

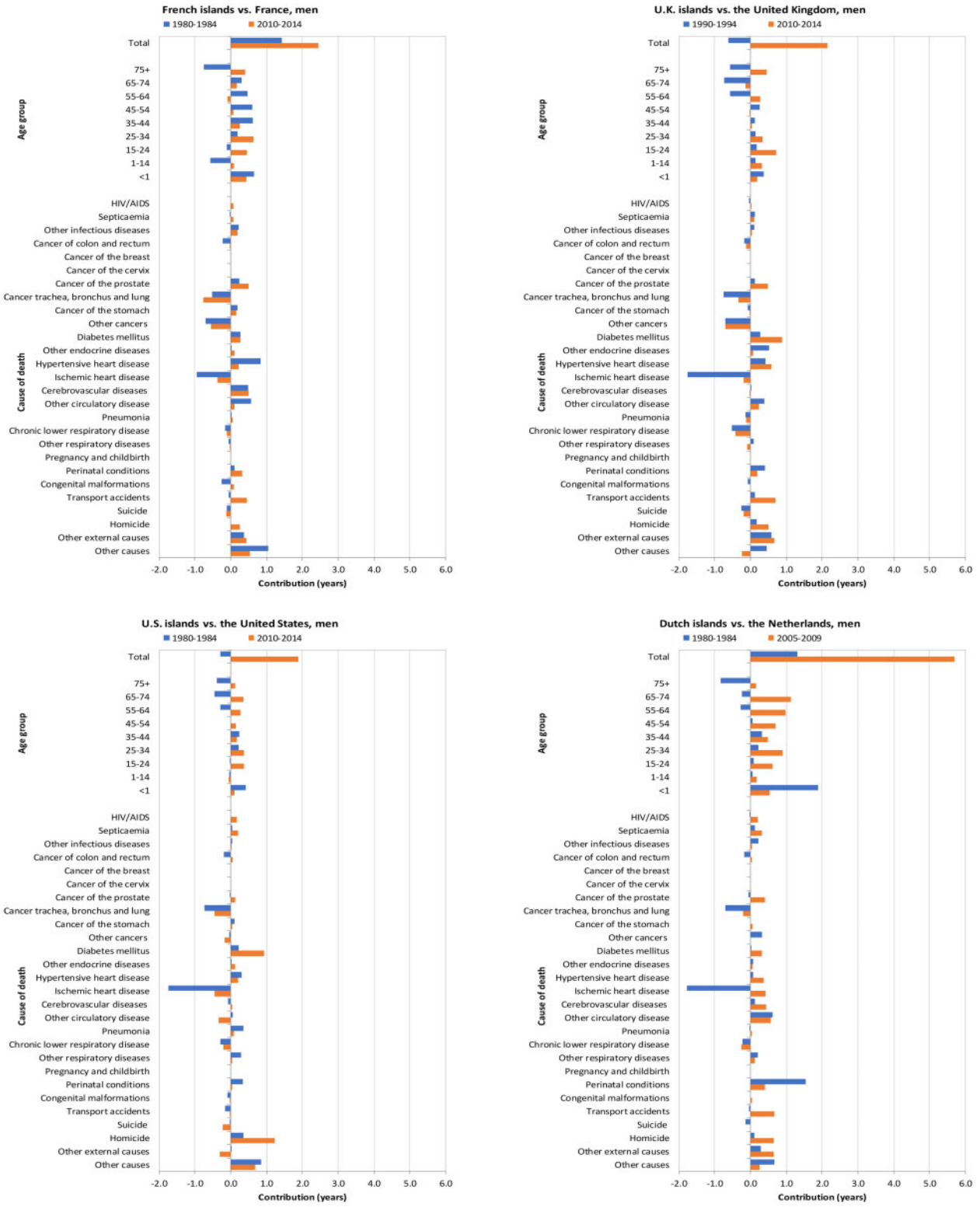

Figure 2 Contribution to life expectancy difference between Western countries and their Caribbean dependencies, earliest vs. latest available time period, men

gains are relatively modest (France: −1.2 years, UK: −3.0 years, USA: −1.5 years, the Netherlands: −1.6 years). Relative to developments in Western administrators, trends in cardiovascular mortality have been more favorable in all dependencies except the Dutch. For external mortality, the gap between Western countries and their dependencies remained similar to the beginning of the study-period, but increased in the Dutch territories. Additionally, the impact of mortality from diabetes increased in all dependencies except the French islands. These contributions are, however, small relative to those that occurred in favor of female life expectancy convergence between Caribbean dependencies and Western administrators.

Finally, we look at trends in age-standardized mortality from cardiovascular diseases and external causes. As figure 3 shows, male mortality from cardiovascular diseases decreased steadily in

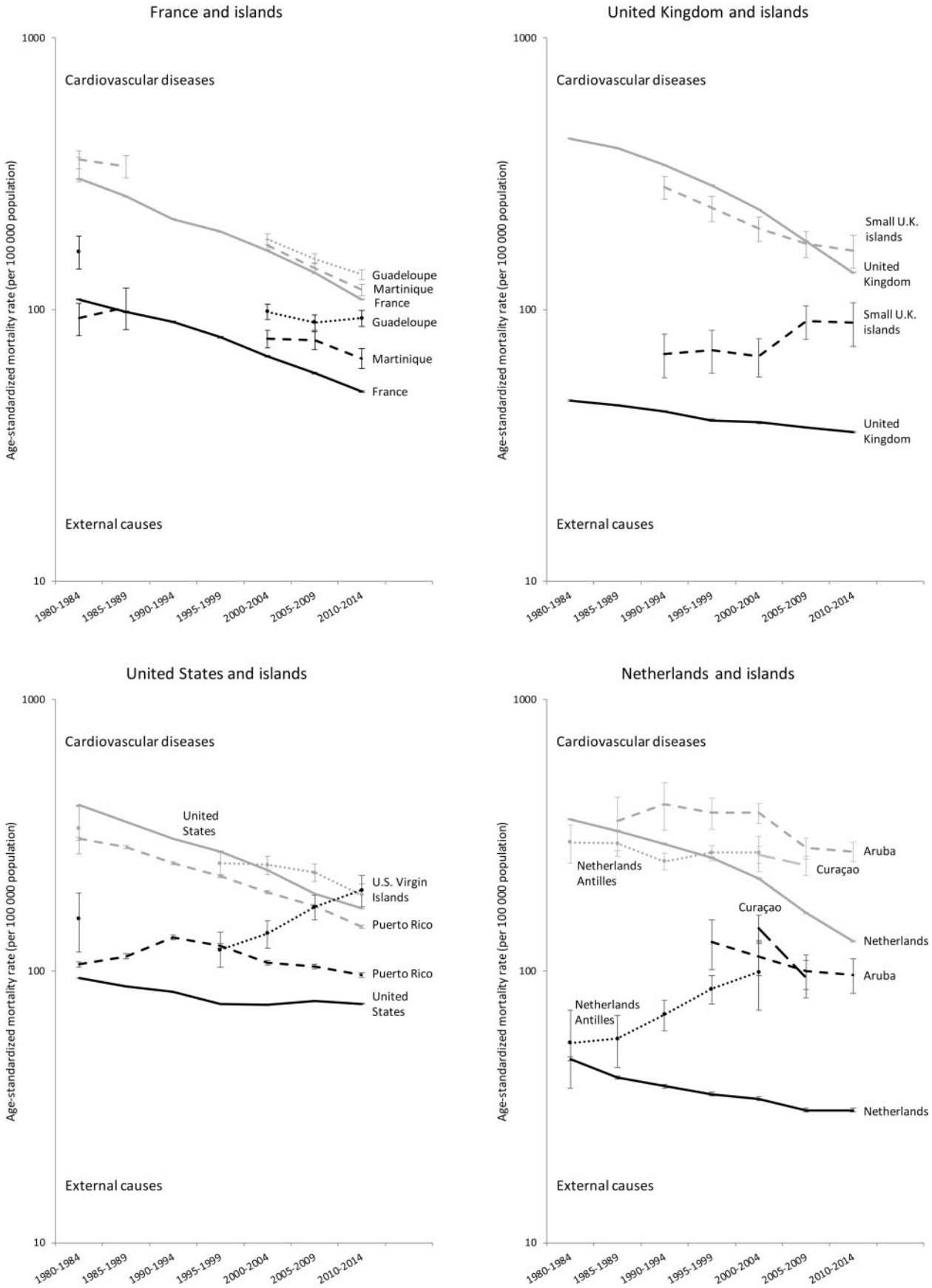

Figure 3 Trends in age-standardized mortality rates from cardiovascular diseases and external causes in Western countries and their Caribbean dependencies, 1980–2014, men

Western countries since the early 1980s. In the dependencies of France, UK and USA, cardiovascular mortality trends largely followed those of their Western administrator. In stark contrast, cardiovascular mortality has poorly improved in the Dutch dependencies. For women, trends in cardiovascular mortality are similar (Supplementary Appendix figure A2). Male mortality trends from external causes show large differences between the Western countries and their dependencies (figure 3). In the Netherlands Antilles/Curaçao, Puerto Rico and the US Virgin Islands, this was due to dramatic increases in homicide mortality during the study-period. Transport accidents are the main contributor to external mortality in Guadeloupe, Martinique, Aruba and the UK islands, and an important additional contributor to external mortality in the Netherlands Antilles/Curaçao (Supplementary Appendix table A4). Differences in female mortality from external causes between Western countries and their dependencies are relatively small (Supplementary Appendix figure A2).

Discussion

Limitations

This analysis is subject to several limitations. The most obvious relates to the availability and quality of mortality data in Caribbean territories. Ideally, all data years would be available for all dependencies, but this was not the case. To make best use of the available data, we pooled the data in 5-year periods, but may consequently have missed less pronounced trend changes. We corrected registered deaths for data inadequacies and incompleteness using PAHO methods.[12] Compared to Western countries, mortality data of Caribbean dependencies had more inadequacies and were more incomplete, except in Puerto Rico and the US Virgin Islands (Supplementary Appendix table A5). With the PAHO corrections we have minimized the effects of data quality issues as much as possible.

The corrections, however, assumed that misclassified and missing deaths from the vital statistics followed the same distribution as recorded deaths and did not differ by age, gender and cause-of-death. These assumptions were, however, not met in the mortality registration of Aruba prior to 1995, in which several external causes were omitted. Although this has led to an underestimation of the total mortality and external causes in particular, we judge it unlikely that our conclusions are mainly attributable to this registration bias, as the results during this period are generally consistent with the years after 1995.

Another limitation is that many Caribbean territories have experienced population losses caused by large-scale emigration.[16] This may plausibly have effected mortality patterns, because migrants are often well-educated and young.[17] The assumption that population declines have influenced life expectancy trends was tested in an additional analysis (Supplementary Appendix table A6). We found that the largest fluctuations in population size occurred in Aruba, Curaçao and the UK islands. In Curaçao, the population mainly declined in the 1980–2014 period, while in Aruba and the UK islands it mainly increased. Since unfavorable life expectancy trends were found in both Aruba and Curaçao, we have no indication that population declines have influenced life expectancy developments in these territories.

Interpretation

Our findings suggest that the way that Western countries govern their dependencies has strongly influenced life expectancy trends during the 1980–2014 period. Life expectancy developments in Caribbean dependencies that had relatively low levels of autonomy, Martinique, Guadeloupe and the UK islands, ran relatively in parallel with that in their administrator countries. In contrast, the US territories with more autonomy, Puerto Rico and the US Virgin Islands, experienced declines in male, and developments more similar to the US in female life expectancy. The constituent countries of the Kingdom of the Netherlands, Aruba and the Netherlands Antilles/Curaçao experienced declines in male and stagnation in female life expectancy. This shows that territories with a stronger political affiliation experienced more favorable life expectancy developments.

Our conceptual model focuses on two macro-level explanations of health disparities between affiliated and more autonomous Caribbean states: stronger political affiliation increases a government's capacity to influence determinants of population health (i.e. the ability to implement and enforce policies) and facilitates diffusion of the knowledge and tools necessary to implement effective policies. We see these 'upstream' factors as defining the context in which 'downstream' determinants of population health develop, such as medical practice, prevention campaigns and the health behaviors of individuals, which more directly impact risks of mortality.

Decomposition of male life expectancy differences between Western countries and their dependencies point to the important contribution of mortality from cardiovascular diseases and external causes. The underlying patterns of trend changes relative to their Western administrators are similar among Caribbean states and possibly reflect common region-specific drivers, such as a high prevalence of obesity and other non-communicable disease risk factors[18] and a strong presence of the international drug trade and weapon trafficking[19] that involves corrupt governmental officials.[20] We also find, however, that Caribbean dependencies differ in the magnitude of trend changes, again with more favorable trends in the French- than in the Dutch-administered territories.

Unlike other islands, Dutch dependencies did not experience substantial improvements in cardiovascular mortality, which is in line with the high levels of uncontrolled hypertension that were measured during a recent health survey in Curaçao.[21] This suggests that the third epidemiological transition, characterized by progressive declines in cardiovascular mortality,[22] is delayed in the Dutch dependencies. In the Netherlands, cardiovascular mortality has gradually declined since its peak in the late 1950s (women) and early 1970s (men).[23] This suggests that the Dutch Caribbean populations have not fully taken advantage of advancements in prevention and treatment of cardiovascular diseases and their underlying causes.

The contribution of external causes to life expectancy differences between Western countries and dependencies has also increased, most strongly in Dutch (both genders) and US (men only) territories. In the Netherlands Antilles/Curaçao, Puerto Rico and US Virgin Islands, this divergence was due to sharp rises in homicide, which gave these territories the dubious distinction of being among those with the highest homicide rates in the world.[24] Transport accidents are the main contributor to external cause mortality in Aruba and an important additional contributor to external cause mortality in the Netherlands Antilles/Curaçao. Just like after decolonization,[5,25] increases in a dependency's autonomy may weaken bureaucracies and subsequently challenge its government's capacity to address organized crime and to implement and enforce traffic regulations.

The less favorable trends for men than for women suggest that men are more sensitive to the negative effects of political sovereignty. While we have no specific data to shed light on this intriguing finding, we note that the life expectancy declines in former USSR countries after the economic and political shocks caused by the fall of communism were also largely limited to men.[26] Somehow, men seem to respond differently to unfavorable social or economic conditions than women, with a greater tendency to engage in potentially lethal behavior. In the case of the Caribbean, economic shocks are likely to be of less importance for the explanation of our findings. While life expectancy trends

have been least favorable in the Dutch and US territories, we did not find an indication of reduced economic growth in these territories relative to those of France and UK (Supplementary Appendix table A7).

As far as we are aware, our study is the first attempt to explore the role of political conditions on life expectancy developments in Caribbean dependencies. We recognize that the current political status of these dependencies is in many aspects comparable to the colonial era, and could in fact be seen as a continuance of the asymmetrical power relationship with a former colonizer, as is regularly echoed in political rhetoric.[27,28] Contemporary literature points to the benefits of late colonialism largely outweighing its disadvantages,[29–32] while also demonstrating that Caribbean people in Western countries experience negative treatment based on their skin color,[33,34] and are disproportionally disadvantaged for factors that contribute to their health.[35,36] Considering the duality of these cultural dynamics, with sustainable development on one side, and social stigmatization on the other, it may then not be too surprising that the populations of many former colonies are hesitant to allow more 'Western' influences in their internal affairs, yet currently struggle to move forward as well.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Key points

- Life expectancy trends have been much more favorable in the French- than in the Dutch-administered territories.
- Our results suggest that differences in life expectancy development between Caribbean dependencies partly result from differences in governance by their Western administrators.
- Stronger collaborations between Caribbean dependencies and their Western administrators could lead to population health gains.

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Socioeconomic inequalities in suicide mortality in European urban areas before and during the economic recession

Carme Borrell[1,2,3,4], Laia Palència[2,3,5], Marc Marí Dell'Olmo[2,3,6], Joana Morrisson[7], Patrick Deboosere[8], Mercè Gotsens[3,9], Dagmar Dzurova[10], Claudia Costa[11], Michala Lustigova[10], Bo Burstrom[12], Maica Rodríguez-Sanz[2,3,4,13], Lucia Bosakova[14,15], Nicolas Zengarini[16], Klea Katsouyanni[17,18], Paula Santana[11]

1 Agència de Salut Pública de Barcelona, Barcelona, Spain
2 CIBER Epidemiología y Salud Pública (CIBERESP), Madrid, Spain
3 Institut d'Investigació Biomèdica (IIB Sant Pau), Barcelona, Spain
4 Department of Experimental and Health Sciences, Universitat Pompeu Fabra, Barcelona, Spain
5 Service of Health Information Systems, Agència de Salut Pública de Barcelona, Barcelona, Spain
6 Service of Environmental Quality and Intervention, Agència de Salut Pública de Barcelona, Barcelona, Spain
7 Institute of Health Equity at the Research Department of Epidemiology and Public Health, University College London, London, UK
8 Department of Sociology, Interface Demography, Vrije Universiteit Brussel, Brussels, Belgium
9 Service of Prevention and Attention of Drug Use, Agència de Salut Pública de Barcelona, Barcelona, Spain
10 Department of Social Geography and Regional Development, Faculty of Science, Charles University, Prague, Czechia
11 Department of Geography and Tourism, Centre of Studies in Geography and Spatial Planning (CEGOT), University of Coimbra, Coimbra, Portugal
12 Department of Public Health Sciences, Karolinska Institutet, Stockholm, Sweden
13 Unit of Research, Training and Communication, Agència de Salut Pública de Barcelona, Barcelona, Spain
14 Department of Health Psychology, Medical Faculty, P. J. Safarik University in Kosice, Kosice, Slovak Republic
15 Olomouc University Social Health Institute (OUSHI), Palacky University in Olomouc, Olomouc, Czech Republic
16 Department of Public Health, University of Turin, Turin, Italy
17 Department of Hygiene, Epidemiology and Medical Statistics, Medical School, National and Kapodistrian, University of Athens Medical School, Athens, Greece
18 Department of Population Health Sciences, and Department of Analytical, Environmental & Forensic Sciences, School of Population Health & Environmental Sciences, King's College, London, UK

Correspondence: Carme Borrell, Agència de Salut Pública de Barcelona, Plaça Lesseps 1, 08023 Barcelona, Spain, Tel: +34 93 238 4545, Fax: 34 93 2173197, e-mail: cborrell@aspb.cat

Background: Few studies have assessed the impact of the financial crisis on inequalities in suicide mortality in European urban areas. The objective of the study was to analyse the trend in area socioeconomic inequalities in suicide mortality in nine European urban areas before and after the beginning of the financial crisis. **Methods:** This ecological study of trends was based on three periods, two before the economic crisis (2000–2003, 2004–2008) and one during the crisis (2009–2014). The units of analysis were the small areas of nine European cities or metropolitan areas, with a median population ranging from 271 (Turin) to 193 630 (Berlin). For each small area and sex, we analysed smoothed standardized mortality ratios of suicide mortality and their relationship with a socioeconomic deprivation index using a hierarchical Bayesian model. **Results:** Among men, the relative risk (RR) comparing suicide mortality of the 95th percentile value of socioeconomic deprivation (severe deprivation) to its 5th percentile value (low deprivation) were higher than 1 in Stockholm and Lisbon in the three periods. In Barcelona, the RR was 2.06 (95% credible interval: 1.24–3.21) in the first period, decreasing in the other periods. No significant changes were observed across the periods. Among women, a positive significant association was identified only in Stockholm (RR around 2 in the three periods). There were no significant changes across the periods except in London with a RR of 0.49 (95% CI: 0.35–0.68) in the third period. **Conclusions:** Area socioeconomic inequalities in suicide mortality did not change significantly after the onset of the crisis in the areas studied.