



## Improving the prognosis of health care in the USA

Alison P Galvani, Alyssa S Parpia, Eric M Foster, Burton H Singer, Meagan C Fitzpatrick

Lancet 2020; 395: 524–33

Center for Infectious Disease Modeling and Analysis, Yale School of Public Health, New Haven, CT 06510, USA (Prof A P Galvani PhD, A S Parpia MPH, E M Foster); Emerging Pathogens Institute, University of Florida, Gainesville, FL, USA (B H Singer PhD); and Center for Vaccine Development and Global Health, University of Maryland School of Medicine, Baltimore, MD, USA (M C Fitzpatrick PhD)

Correspondence to: Prof Alison P Galvani, Center for Infectious Disease Modeling and Analysis, Yale School of Public Health, New Haven, CT 06510, USA  
alison.galvani@yale.edu

Although health care expenditure per capita is higher in the USA than in any other country, more than 37 million Americans do not have health insurance, and 41 million more have inadequate access to care. Efforts are ongoing to repeal the Affordable Care Act which would exacerbate health-care inequities. By contrast, a universal system, such as that proposed in the Medicare for All Act, has the potential to transform the availability and efficiency of American health-care services. Taking into account both the costs of coverage expansion and the savings that would be achieved through the Medicare for All Act, we calculate that a single-payer, universal health-care system is likely to lead to a 13% savings in national health-care expenditure, equivalent to more than US\$450 billion annually (based on the value of the US\$ in 2017). The entire system could be funded with less financial outlay than is incurred by employers and households paying for health-care premiums combined with existing government allocations. This shift to single-payer health care would provide the greatest relief to lower-income households. Furthermore, we estimate that ensuring health-care access for all Americans would save more than 68 000 lives and 1·73 million life-years every year compared with the status quo.

### Introduction

More than 78 million Americans do not have adequate health insurance,<sup>1–3</sup> and millions more are at risk of losing coverage. The 24% of Americans who do not have adequate insurance include individuals who are entirely uninsured and those for whom out-of-pocket costs and deductibles are disproportionately high relative to their incomes.<sup>1</sup> Compounding this crisis, more than 70 congressional bills have been introduced that aimed to undermine the improvements in access to health care that have been realised by the Affordable Care Act.

The move to repeal the Affordable Care Act by the Trump administration will further jeopardise the health care of 21 million Americans.<sup>4</sup> Despite higher national health-care expenditure than any other country, constituting 18% of gross domestic product,<sup>5,6</sup> the USA ranks below 30 countries for many public health indicators, including preventable deaths,<sup>7</sup> infant survival,<sup>8</sup> maternal mortality,<sup>9</sup> and overall life expectancy.<sup>10</sup> To address this disconnect, Senator Bernard Sanders introduced the Medicare for All Act, which proposes a single-payer system of universal health care for every American.<sup>11,12</sup> Here we project both the economic and life-saving effects likely to be generated by the Medicare for All Act relative to the current American system. We find that the expected savings from a universal single-payer system would more than compensate for the increased expenditure associated with universal health-care coverage. Moreover, universal health care would save lives while simultaneously improving the quality and productivity of those lives, as detailed here. Specifically, we calculate that the Medicare for All Act would reduce national health-care expenditure by more than US\$458 billion, corresponding to 13·1% of health-care expenditure in 2017. We also project that the Medicare for All Act would save more than 68 500 lives every year, compared with the status quo. If the Affordable Care Act were to be repealed, we would expect an additional annual loss of more than 38 500 lives. Compared with health-care access before the Affordable Care Act, the legislation proposed by Senator Sanders, would save 107 000 lives annually. To inform policy makers' ongoing deliberations, we also introduce an interactive online tool through which users can explore how input assumptions influence spending projections and tailor a plan to finance the predicted expenditure.<sup>13</sup>

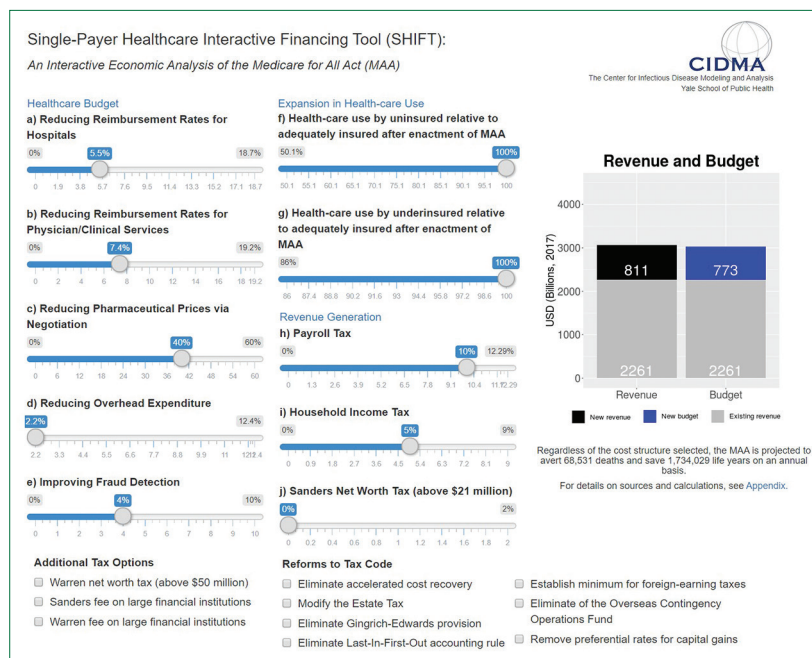


Figure 1: Single-payer Healthcare Interactive Financing Tool (SHIFT) interface

This tool allows users to adjust input parameters and assumptions, including expansion in health-care service use, to determine the health-care budget. Revenue generation options to cover the projected budget can also be selected. Here, we provide a modified static image of the tool, displaying all adjustable parameters set to their default values. Within the online tool, the health-care budget, expansion in health care use, and revenue generation are individual tabs.

### Budgetary projections for single-payer universal health care

Single-payer universal health care has long been perceived as politically and economically impractical in the USA. However, the national health insurance programme

Medicare is a 54-year-old, real-world test for the viability of single-payer, government-funded health care. In 1965 Medicare was established in response to the widespread refusal of private sector companies to provide insurance for older patients ( $\geq 65$  years), it has significantly and cost-effectively improved the health of older people.<sup>14–16</sup> Public opinion is clear: the vast majority of Americans view Medicare as an important programme that works well.<sup>17</sup> If Medicare can succeed in the age cohort that uses health-care services most frequently, it is reasonable to expect that extending coverage to all Americans would only be more feasible and less costly per capita.

Previous estimates of the national cost of health care under the Medicare for All Act range from a 16.9% increase to a 27% decrease.<sup>18–24</sup> In this study, we estimate the national health-care expenditure under the single-payer universal health-care system detailed in the Medicare for All Act. Furthermore, we consider the robustness of our budgetary projections by systematically altering the values of key parameters that underlie health-care system costs in our model. As highlighted by the divergent conclusions of the previous Medicare for All Act evaluations,<sup>18–23</sup> these inputs can vary as a result of differing expert opinions or empirical uncertainties. Accordingly, we develop the Single-payer Healthcare Interactive Financing Tool (SHIFT) in which these parameters can be adjusted (figure 1). SHIFT similarly enables the customisation of a national financing plan in which insurance premiums paid by employers and individuals would be replaced with other options, such as a payroll tax. Projections from SHIFT indicate that the Medicare for All Act would yield net savings for the health-care system across a wide range of assumptions regarding insurance expansion, service improvements, administrative efficiency, and pharmaceutical pricing (figure 2; panel).

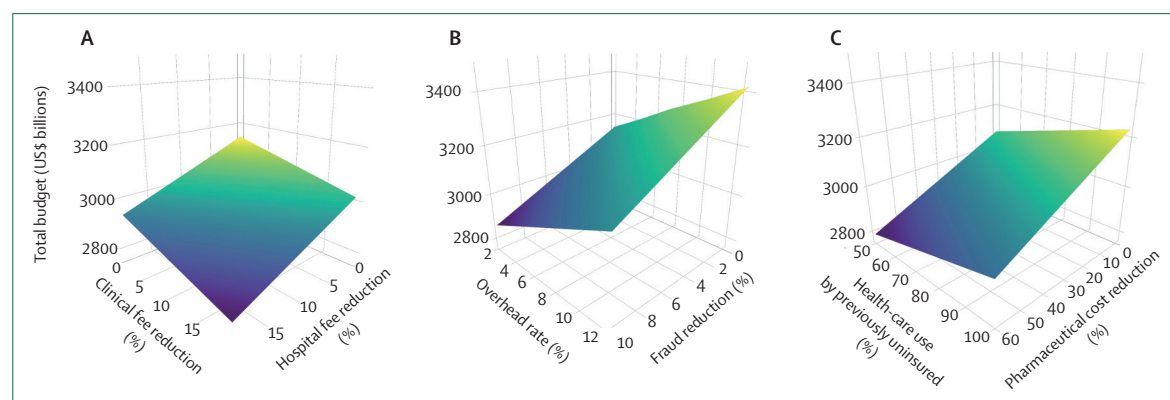
### Reduced fees for hospital and clinical services

The first set of savings could be achieved by applying the existing Medicare fee schedule across all hospital and clinical services. Hospital and clinical services constitute more than a third of health-care expenditure in the USA.<sup>29</sup> Fees charged to private insurers are often inconsistent and incommensurate with the quality of services.<sup>30,31</sup> For example, charges for an uncomplicated vaginal birth can be ten-times more expensive in some areas of California, USA, compared with others, and less than a third of this variation is attributable to location or the patient population.<sup>32</sup> Moreover, hospital fees do not correlate with maternal and neonatal outcomes.<sup>33</sup> The incongruity is even more pronounced when clinical outcomes and costs in the USA are compared with those in other countries. The average cost of giving birth in Spain is \$2333 compared with \$14910 in the USA, yet the prevalence of neonatal mortality in the USA is double that in Spain.<sup>34–36</sup> Similarly, appendectomy fees in the USA vary from \$9332 to \$33 250, with an inverse correlation between cost and clinical outcomes. For instance, California has the highest median cost of appendectomies, but it also has higher rates of associated morbidity and perforation than any other state.<sup>37</sup> By contrast, Medicare reimburses hospitals and physicians for services at fixed rates. Applying the fees negotiated by Medicare across all services for all individuals (appendix pp 2, 3, 13),<sup>38–40</sup> we calculated that hospital fees would be reduced by 5.54% and clinical service fees by 7.38%, amounting to annual savings of \$100 billion.

From the perspective of health-care providers, lower fees per service would be offset by savings from reduced billing and administrative tasks, which represent a \$768 billion cost for health-care providers. Consolidation of billing into a unified system is estimated to have the potential to reduce this expenditure by \$284 billion,<sup>26</sup>

For more on the Single-payer Healthcare Interactive Financing Tool see <http://shift.cidma.us/>

See Online for appendix



**Figure 2: Influence of key parameters on national health-care expenditure**

Total budgetary effect of variation in select parameters. (A) Reducing physician and clinical fees (base case: 7.38%; range: 0–19.23%) and hospital fees (5.54%; 0–18.74%). (B) Reducing fraud (4%; 0–10%) and overheads (2.2%; 2.2–12.4%). (C) Pharmaceutical price reduction (40%; 0–60%) and projected health care use by people who are uninsured upon becoming insured, compared with those who are already adequately insured (50.1%; 50.1–100%). For example, if hospital and clinical fees are each reduced by 5% the total budget becomes US\$3054 billion. Furthermore, the total budget becomes \$3144 billion if an overhead rate of 2.2% and a fraud reduction of 0% are enacted. If pharmaceutical costs are reduced by 40% and health-care service use by people who were previously uninsured is maintained at 50% of those who are adequately insured, then the total budget would be \$2887 billion.

which would be more than double the proposed change in fees. Another benefit of a single-payer billing system to providers is the elimination of unpaid bills, which can

#### Panel: Parameter defaults and bounds for the Single-payer Healthcare Interactive Financing Tool (SHIFT)

The following parameters are adjustable within our user-friendly tool, SHIFT. We provide a rationale for the default values, which correspond to our base case (default) analysis and the lower (minimum parameter value) and upper (maximum parameter value) bounds. Further details on input parameters and assumptions are provided in the appendix pp 1–13.

##### Health-care budget

###### *Reducing reimbursement rates for hospitals*

If all hospital fees were reimbursed at 2017 Medicare amounts, the fees would overall be 5–54% lower (default); however, if reimbursed at Medicaid rates, fees would be reduced by 18–74% (upper bound).

###### *Reducing reimbursement rates for physician and clinical services*

If all physician and clinical services were reimbursed at current Medicare rates, the fees would be 7–38% lower (default), and if reimbursed at Medicaid rates, fees would be reduced by 19–23% (upper bound).

###### *Reducing pharmaceutical prices via negotiation*

The Department of Veterans Affairs has the authority to negotiate prices in accordance with therapeutic value, achieving prices that are 40% lower than those paid by the Medicare scheme (default).<sup>25</sup>

###### *Reducing overhead expenditure*

Within the US health-care system, insurance overheads range from 2–2% for Medicare (lower bound; default) to 12–4% for the private sector (upper bound).<sup>26</sup>

###### *Improving fraud detection*

Given estimates that 4% of health-care expenditure (default) could be eliminated through fraud detection within the first two years of implementing a single-payer system,<sup>27</sup> we allow fraud reduction to range from 0% (lower bound) to 10% (upper bound) upon enactment of the Medicare for All Act.

##### Expansion in service use

Health-care service use by people who are uninsured and underinsured is expected to range from current levels (lower bound) to usage commensurate with those who are fully insured (default, upper bound).

##### Revenue generation

###### *Payroll tax*

The \$536 billion spent by employers on health-care premiums is equivalent to a 12–29% payroll tax (upper bound). Any payroll tax that collects revenue below the 12–29%-level expenditure would represent savings, including our default value of 10%.

###### *Household income tax*

Households currently pay \$738 billion towards premiums and out-of-pocket expenditures. Only \$64 billion of out-of-pocket costs would remain under the Medicare for All Act. If the remaining \$674 billion in spending were replaced by a 5% household income tax (default) on income beyond the standard deduction, the tax would yield \$375 billion annually.<sup>28</sup> The \$674 billion replaced by Medicare for All Act would be equivalent to a tax rate of 9% (upper bound).

###### *The Sanders net worth tax*

A 1% tax on household net worth above \$21 million, applied to 0–1% of all households in the USA, would yield \$109 billion annually.<sup>28</sup> This tax rate can be modified to range from 0% (lower bound, default) to 2% (upper bound).

exceed \$35 billion annually for hospitals alone.<sup>41</sup> Furthermore, overwhelming paperwork is a primary factor in physician burnout.<sup>42,43</sup> As providers reduce their administrative workload, they free time for patient care, which will bolster career satisfaction<sup>42</sup> and increase their revenue. Moreover, the additional provider time will be in demand following the expected increase in service use.

Recognising the benefits to providers and patients, National Nurses United and Physicians for a National Health Program are both advocates of the Medicare for All Act. By contrast, the American Hospital Association is opposed to the act. The American Hospital Association has argued that it relies on private patients to subsidise the care of patients covered by the Medicare and Medicaid schemes. However, the lower Medicaid fees will be replaced by the higher Medicare reimbursements, and the burden of unpaid bills will be eliminated. This adjustment would particularly ameliorate the financial struggles of hospitals serving low-income communities. Likewise, the financial relief from reduced administrative tasks and eliminated unpaid bills might not yet be routinely considered by stakeholders.

#### Unified system for billing and administration

Administrative overhead costs associated with providing health insurance comprise 12–4% of spending for insurance companies compared with 2–2% for the Medicare scheme.<sup>26</sup> Although an inherent risk exists that such overhead efficiency would not remain after the scheme had been scaled up, expanding Medicare to a larger population could facilitate improved efficiency. Therefore, applying the current overhead rate, we calculate that a further \$219 billion could be saved annually by consolidating all insurance schemes into the Medicare framework. Components of this reduction in overheads include the elimination of redundant corporate functions and the truncation of the top-heavy salary architecture of health insurance corporations. The salary for the head of the proposed single-payer system would be capped at \$210 700—the salary of the Secretary of Health and Human Services.<sup>44</sup> This cap would eliminate the excessive compensation of health insurance company executives, some of whom earn more than \$20 million annually.<sup>45</sup> In addition to savings on overheads, a comprehensive database of health-care charges would facilitate detection of fraud, which extracts \$85·7 billion every year.<sup>46</sup> Following the transition to a single-payer system in Taiwan, an 8% reduction in overall national expenditure was attributed to the reduction in fraud.<sup>27,47</sup> By moving from a fragmented health-care payment system to a unified system, irregularities in provider claims can be more easily detected.<sup>27</sup> For example, under the fragmented system excessive claims for physician time can be spread across patients with several different insurance providers. However, acknowledging that improvements have been made in fraud detection since Taiwan's transition, we conservatively assume that the improved fraud detection

would garner savings amounting to half that observed in Taiwan, corresponding to 4% of total health-care expenditure.<sup>27,47</sup> Furthermore, sensitivity analysis examining the contribution of variation in this parameter showed that a transition to the system proposed by the Medicare for All Act would remain cost-saving even without savings from improved fraud detection (figure 2B).

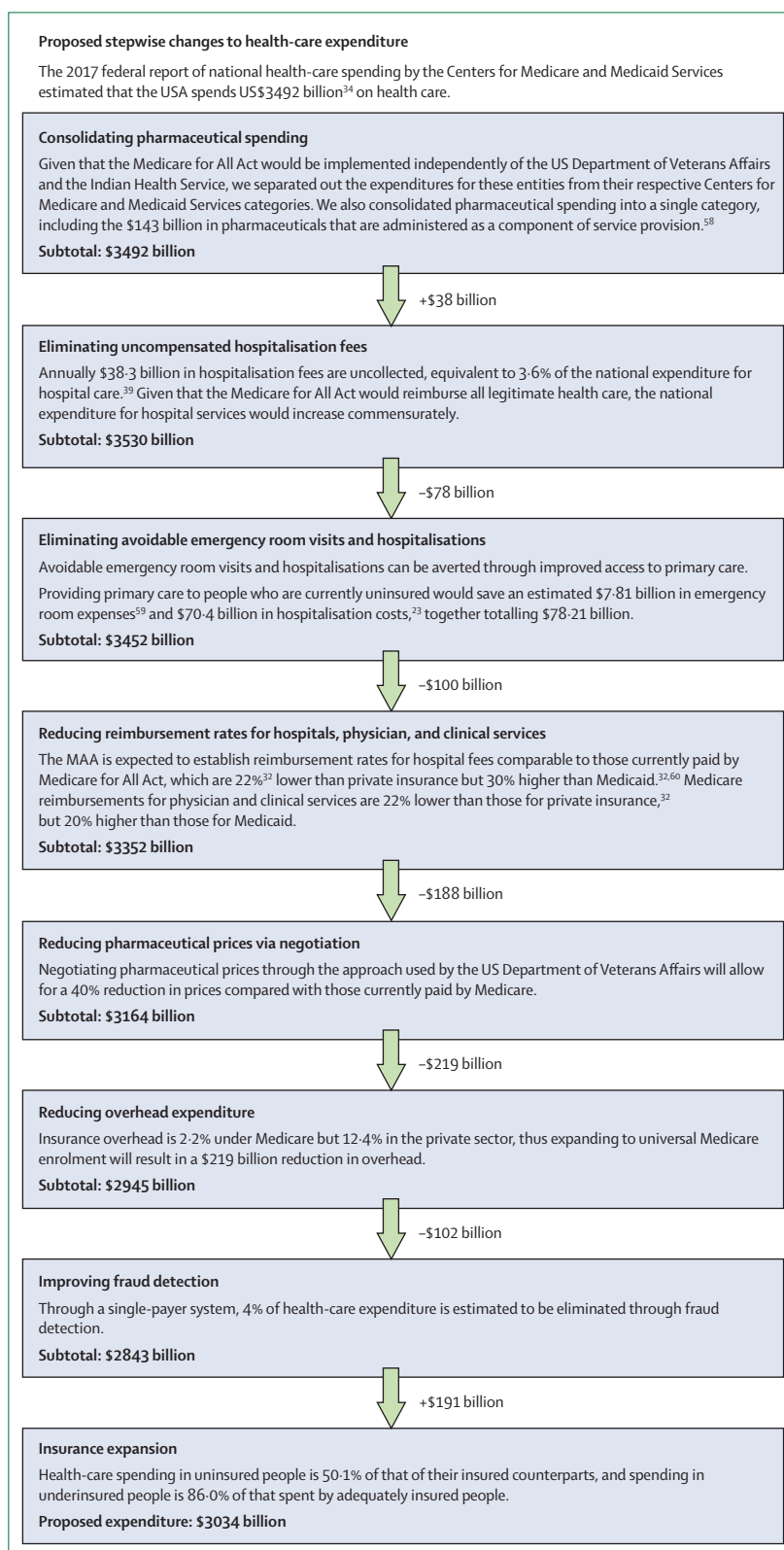
### Pharmaceutical price negotiation

In 2017, \$469 billion was spent on pharmaceuticals in the USA,<sup>40</sup> fuelled by prices that are higher than in any other country and which continue to increase more steeply than inflation.<sup>34,48</sup> For example, a vial of insulin costs approximately \$300 in the USA<sup>49</sup> compared with \$30 in Canada.<sup>50</sup> Legislation prohibiting price negotiations for pharmaceuticals, supplies, or equipment has left the Medicare system unable to regulate prices. The imperative for price control is rivalled by the political power of pharmaceutical corporations, emboldened by the Citizens United Supreme Court decision that lifted restrictions on corporate political expenditures. By contrast, the negotiating authority (which can control medication and medical equipment prices) is a fundamental component of the Medicare for All Act. Through representation of the entire US market, the US Department of Health and Human Services would have considerable negotiating power. The US Department of Veterans Affairs (VA) has the capacity to negotiate prices that align with the therapeutic value of pharmaceutical drugs and could be a potential model for the federal single-payer health-care system. This bargaining power results in pharmaceutical prices that are 40% lower in the VA system than those under Medicare.<sup>25</sup> Permitting negotiations for pharmaceutical prices with a formula similar to that used by the VA would increase savings by more than \$180 billion. These annual savings are similar to those proposed through alternative mechanisms for pharmaceutical price reductions by Senator Elizabeth Warren.<sup>24</sup>

Concerns have been expressed that reduced profits for pharmaceutical corporations would dampen biomedical innovation.<sup>51</sup> However, the observed decline in scientific investment,<sup>52</sup> which has accompanied consistently sizable profit margins for the pharmaceutical industry,<sup>53</sup> suggests that the market assumptions underlying these concerns might not be correct. Nonetheless, given that optimal or achievable prices might be different from those negotiated by the VA, the interactive SHIFT tool

**Figure 3: Overview of Single-payer Healthcare Interactive Financing Tool (SHIFT) calculations**

Arrows indicate changes in total national health-care expenditure upon implementation of each step. Subtotals and changes in national health-care expenditure have been rounded to the nearest billion. Additional details on steps in the enactment of the Medicare for All Act and relevant calculations are provided in the appendix (pp 1–13).





allows price reduction to vary from 0 to 60%. Even if pharmaceutical prices remained unaffected, the Medicare for All Act would still reduce overall health-care system costs (figure 2C).

### Expansion of coverage and services

The provision of universal health care would entail expanded use of health services by those who are currently uninsured and those who are insured but for whom cost, such as copays, imposes a barrier to health care. Empirically, the 38 million Americans who are uninsured tend to forego necessary treatments and prophylactic measures.<sup>2</sup> Specifically, uninsured individuals use health-care services at 50·1% of the rate of those with adequate insurance.<sup>39</sup> There are also 41 million underinsured Americans who have insurance plans with prohibitively high deductibles and copays.<sup>1</sup> Underinsured individuals use health-care services at 86% of the rate of adequately insured individuals.<sup>54</sup> In our base case, we assumed that health-care use by both people who are uninsured and underinsured would increase to the usage of people with adequate insurance for whom cost does not discourage health-care service use. A previous analysis assumed that uninsured individuals have opted not to pay for health insurance because they are in less need of it,<sup>23</sup> which is empirically supported by the disproportionately high number of younger people who are uninsured.<sup>55</sup> However, other studies have indicated that uninsured people might be more likely to have undiagnosed comorbidities and conditions<sup>56,57</sup> that might require increased health-care resources compared with insured people.

### The bottom line of Medicare for All

Through the mechanisms detailed previously, we predict that a single-payer health-care system would require \$3·034 trillion annually (figure 3; appendix p 5), \$458 billion less than national health-care expenditure in 2017.<sup>40</sup> Even after accounting for the increased costs of coverage expansion, our data-driven base case includes \$59 billion savings on hospital care, \$23 billion on physician and clinical services, \$217 billion on overheads, and \$177 billion on prescription drugs (figure 3;

appendix p 11). Consequently, annual expenditure per capita would decrease from \$10739<sup>6</sup> to \$9330, equivalent to a 13·1% reduction. The expectation of savings is robust and remains following variation in the input parameters. For example, if overhead costs only dropped to 6% of total health expenditure—rather than Medicare's current 2·2%—the Medicare for All Act would still reduce costs by 10·3%. Conversely, savings would increase beyond our base case if our model overestimates the unfulfilled demand in people who do not have insurance or are underinsured. Given that \$2261 billion is already allocated to health care by existing governmental and philanthropic sources (appendix p 5), a further \$773 billion must be collected by the government to fully fund the Medicare for All Act.

### Restructuring health-care expenditure by employers, individuals, and as a country

The removal of federal subsidies for low-income households and the ensuing decline of enrolment in the Affordable Care Act have driven a rise of insurance premiums for everyone, including those with employer-sponsored plans. This financial strain could be eased by the savings that arise from a single-payer health-care system. One proposed financing option would involve a replacement of employer insurance premiums with a payroll tax and household insurance premiums with an income tax.<sup>28</sup> Taxation could be set such that savings accrue in both cases (table; appendix p 6). The redirection of premiums to taxes would also be tantamount to a transfer of capital from private companies to the public sector, with redistributive economic effects.

Employer contributions to health insurance currently average \$10446 per employee and cover 71% of a household's premium.<sup>58,61</sup> These employer premiums are equivalent to a 12·29% tax on payroll exceeding the first \$2 million (table; appendix p 6), extrapolated from Sanders and colleagues.<sup>28</sup> Therefore, any payroll tax less than 12·29%, our upper bound in the SHIFT interface, would result in savings for employers. A 10% payroll tax would generate \$436 billion annually, saving employers \$100 billion. Additionally, the substantial cost of managing employee health-care benefits will be relieved, a factor which we conservatively do not include in our calculations. Although taxes are usually associated with deadweight loss, as higher prices can dampen transactions within a market, the replacement of the legal obligation to provide health care with a tax that does so at a reduced cost is likely to act as an economic stimulus for employers.<sup>59</sup>

The remaining \$337 billion that would be required could be generated by a 5% tax on household income exceeding the standard deduction, which would yield \$375 billion (appendix p 6).<sup>28</sup> The \$38 billion surplus could provide a contribution towards transition costs or a fund to pay for unanticipated events. Extrapolating again from Sanders and colleagues,<sup>28</sup> replacement of the

	Employers		Households	
	Employer premiums	Proposed payroll tax	Average household premiums and out-of-pocket spending	Proposed household tax and out-of-pocket spending
Annual expenditure	\$536 billion	\$436 billion	\$5847	\$3478
Equivalent tax rate	12·29%	10%	9%	5%

Employer and household expenditures on health-care premiums compared with the proposed payroll and household taxes, respectively. These expenditures and tax rates are derived from Sanders and colleagues<sup>28,40</sup> and the Centers for Medicare and Medicaid Services, and are detailed in the appendix p 6. For households, the tax rate is applied to income more than \$29 000, as stipulated by Sanders and colleagues,<sup>28,40</sup> and added to a projected out-of-pocket spending average of \$507.

**Table: The effect of a universal health-care system for employers and households**

premiums currently paid with a 5% tax would save households an average of \$2369 (appendix p 6). This tax structure redistributes the burden of health-care costs to provide lower-income households with the greatest relief.<sup>23</sup> For instance, current Medicaid enrollees will continue to pay few or no income taxes toward their health care because their household income often falls below the standard tax deduction. In addition, the Medicare for All Act eliminates deductibles and copayments that are particularly burdensome for low-income households. Pollin and colleagues<sup>23</sup> provide a comprehensive analysis of the redistributive effects for households and businesses.<sup>23</sup>

Improvements in system efficiency, such as reductions in billing tasks, will involve a contraction of the workforce. Although the country will benefit from lower costs, 936 000 administrative positions and 746 600 positions in the health-care insurance industry are estimated to become redundant.<sup>23</sup> However, detailed transition plans have suggested either funding for early retirement options, extensive severance, retraining programmes, and relocation expenses for all workers in these sectors.<sup>23</sup> Implementation of such a plan is estimated to cost \$61·5 billion annually over 2 years,<sup>23</sup> a sum which would be recouped within the first year by the health-care savings estimated here. Although multiple avenues for financing the transition are possible, a simple solution could involve setting the household income tax to 6% for the first two years followed by a stabilisation at 5%.

### The life-saving potential of Medicare for All

Beyond economic considerations, the paramount objective of a health-care system is to save lives. We projected the life-saving effect that the Medicare for All Act would achieve through the provision of health insurance for the currently uninsured (figure 4). From the prevalence of people without insurance in each age group (0–18, 19–24, 25–34, 35–64, and ≥65 years)<sup>55,60</sup> and the age-specific population within,<sup>2</sup> we calculated the number of uninsured people, collectively totaling more than 37 977 297 Americans. Given that uninsured people experience a 40% elevation in age-specific mortality risk,<sup>62</sup> we calculated the expected number of deaths in each age cohort if all Americans became insured. We estimated that on an annual basis, universal coverage would save 68 531 lives in the USA. These are predominantly the lives of young people, given that most individuals older than 64 years are already covered under Medicare. Adults aged 25–35 years are disproportionately represented, accounting for more than 9 million of the uninsured. Based on the age distribution of these premature deaths that would be averted and their corresponding age-specific life expectancies, we calculated that universal coverage would save 1·73 million life-years annually. If the Affordable Care Act is repealed, 21 million Americans are predicted to lose health insurance coverage.<sup>4</sup> Assuming this population is distributed by age proportional to those who are currently uninsured,

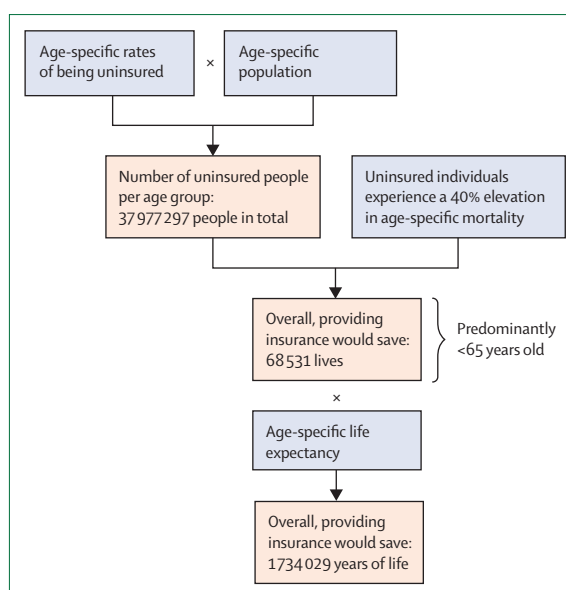


Figure 4: The annual life-saving potential of the Medicare for All Act compared to the present system

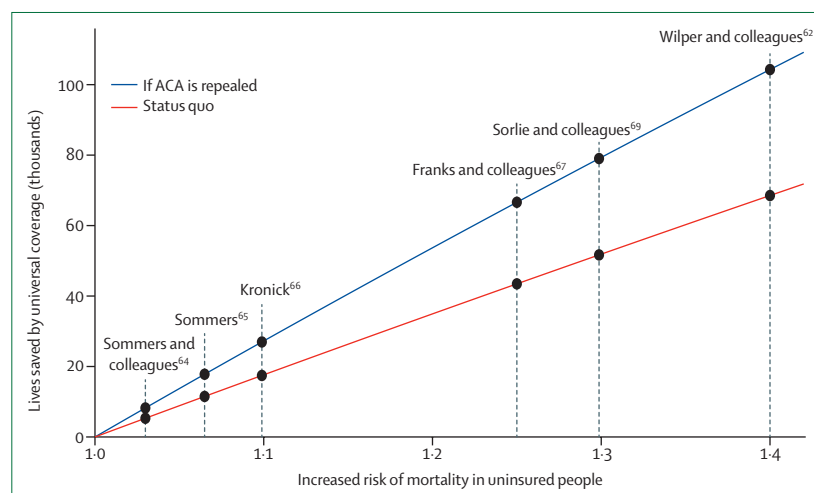


Figure 5: The number of lives saved by the Medicare for All Act

The number of lives saved by the Medicare for All Act as a function of increased mortality in people who are uninsured. The number of people without insurance would be higher if the Affordable Care Act is repealed (blue line), compared to the status quo (red line), which translates to a greater difference in the absolute number of lives saved by moving to universal healthcare. Vertical lines indicate studies which found a statistically significant relationship between insurance status and mortality, among those identified in a recent review.<sup>69</sup>

elimination of the Affordable Care Act would result in the loss of 38 557 lives and 980 103 life-years, annually.

Studies evaluating the relationship between insurance status and mortality have been limited by the difficulties of reaching sufficient statistical power and of achieving true prospective randomisation.<sup>63</sup> Therefore, we also present the estimated number of lives saved by universal health care as a function of the increased mortality risk for uninsured people (figure 5). Our calculation of the life-saving potential of the Medicare for All Act is highly conservative in a number of aspects. Additional lives

would likely be saved through the improvements in continuity of care facilitated by a single-payer system. Moreover, this calculation does not incorporate the improvements in survival from fully insuring the 41 million people who are underinsured, and therefore currently forego necessary care.<sup>1</sup>

### Synergies between health and prosperity

In addition to averting mortality, substantial morbidity would be alleviated through both the mechanisms of universal health-care coverage and single-payer financing. Universal coverage removes barriers to accessing existing primary and preventive care, and a single-payer system incentivises the expansion of preventive programmes. Preventive care reduces the incidence of myriad diseases, including type 2 diabetes,<sup>70</sup> heart disease,<sup>71</sup> and osteoporosis,<sup>72</sup> all of which decrease quality of life—even in cases that do not result in death. For example, prompt diagnosis of prediabetes combined with health-care provider recommendations about diet and exercise can reduce the risk of progressing to type 2 diabetes.<sup>70</sup> Given that a single-payer system would be financially responsible for health care throughout the lifespan of all Americans, it becomes efficient to incur a small cost in the present with the purpose of avoiding more serious and costly health conditions in the future. By contrast, private insurance companies, within which patients are most often transiently enrolled, maximise profit by minimising short-term costs. This practice reflects the fiduciary responsibility of health insurance corporations to their shareholders; it also inherently disincentivises the prioritisation of long-term health. Shortsighted cost-cutting can catalyse a cascade of longer-term health and financial repercussions over the lifespan of a patient. The single payer health-care system in Canada spends more per capita on prevention (6·2%), allocating more than double the funding to prevention as a share of total national health expenditure than the USA (2·8%).<sup>73</sup> This is especially startling in light of the elevated prevalence of chronic diseases in the USA (eg, men in the USA have a 28% higher mortality rate from cardiovascular disease compared with Canadian men).<sup>74</sup>

The repercussions of cost-cutting in the USA extend beyond chronic diseases. For example, despite the unprecedented epidemic of opioid dependence in the USA, many insurance companies continue to refuse reimbursement for less addictive, but more expensive medications, and for physical therapy alternatives.<sup>75</sup> Over a patient's lifetime, the higher prices of alternative medications for chronic pain are likely to be dwarfed by the benefits to health and quality of life that stem from averting addiction and the downstream costs of substance abuse treatment. Additionally, employer-based health-care insurance favours the use of addictive pharmaceuticals for the treatment of pain in lieu of more expensive options, including physical therapy.<sup>76</sup> Exacerbating the crisis, opioid manufacturers have run aggressive marketing campaigns over the past

three decades following the lifting of regulations by the US Food and Drug Administration on direct consumer advertising of pharmaceuticals, including narcotics. Additionally, opioid manufacturers targeted physicians-in-training to promote the prescription of opioids and funded advocacy programmes, which argued that excessively judicious prescription of narcotics had led to unnecessary suffering of patients.<sup>77</sup> Consequently, the epidemic of opioid dependence boomed in the USA and now exceeds that in any other country. For example, in Canada mortality attributable to opioid overdoses is 32% lower than that in the USA.<sup>78</sup> To tackle the opioid epidemic in the USA the Medicare for All Act includes the treatment of drug use disorders, including medication-assisted treatment, behavioural therapies, and in-patient care.

Universal health insurance would also lead to positive economic externalities by enhancing workforce productivity. For example, prostate cancer causes \$5·4 billion in lost productivity, a figure further compounded by the \$3·0 billion in lost productivity for the spouses of these patients.<sup>79</sup> The productivity loss attributable to diabetes is even greater, with the absenteeism, disability, and premature mortality resulting from this condition annually responsible for \$73·7 billion in losses across the USA.<sup>80</sup> By extending access to screening and preventive care, the Medicare for All Act would help avert these diseases and thereby boost American prosperity.

### Improving the continuity of health care

Contrary to the popular misconception that a federal health-care system would restrict provider selection by patients, a single-payer system integrates all providers under a unified financial framework. This restructuring erases in-network and out-of-network distinctions and the issue of health-care providers declining to accept individuals based on their insurance status. Patient choice will be dramatically expanded if a universal health-care system is adopted. With the uncoupling of employment status from insurance plans, a single-payer system would also resolve system fragmentation that arises during employment transition (eg, a patient's former doctor is considered out-of-network under a new employer's insurance plan). This fragmentation decreases the efficacy of chronic disease management and delays care for acute conditions. Universal single-payer coverage eliminates the danger of losing health care when it is needed most. For many Americans, a serious illness precipitates the simultaneous losses of income and employment-based health insurance. The Americans with Disabilities Act does not protect employees whose medical needs impose an "undue hardship"<sup>81</sup> to their employer. For example, 19% of women diagnosed with breast cancer become unemployed within 4 months after treatment.<sup>82</sup> Such confluence of unemployment and loss of health insurance gravely affects health outcomes. Uninsured people with cancer have a 17% increased risk of metastasis and 30% increased risk of death compared with insured patients.<sup>83</sup>

Fragmentation is particularly problematic in the treatment of chronic diseases, such as mental illness. 57% of the 50 million Americans who experience mental illness are not receiving treatment,<sup>84,85</sup> the most common reason for which is prohibitive cost.<sup>86,87</sup> Even plans that ostensibly cover mental illness and substance use disorders often deny treatment and authorise an insufficient number of practitioners.<sup>87</sup> Precariously, abandoning protection for individuals with pre-existing conditions will lead to mounting premiums for people with a history of mental illness or a substance use disorder. By removing cost barriers for patients and by consolidating mental health practitioners into a single network, the Medicare for All Act would help close the perpetually widening gap between mental health needs and access to services.

### Time to act

As public support for health-care reform mounts in the USA, legislators are poised to transform the health-care system and save thousands of lives every year. Single-payer universal health care has the potential to improve the quality, cost-effectiveness, and accessibility of medical services. Our projections indicate that implementing the Medicare for All Act specifically would generate net savings across a wide range of possible expenditure and financing options. Objections to the Medicare for All Act based on the expectation of rising costs are mistaken. Some Americans express concern about the federal government controlling this large sector of the economy, or about violating capitalist principles. However, the health-care sector is already highly regulated in many aspects, and deviates from capitalist ideals through opaque and often monopolistic pricing. Strong opposition should be expected from powerful vested interests, including the health insurance and pharmaceutical industries. Counterbalancing these concerns is the moral imperative to provide health care as a human right, not dependent on employment or affluence. The medical community should seize this opportunity to promote wellbeing, enhance prosperity, and establish a more equitable health-care system for all Americans.

### Contributors

APG conceived of the study. APG, MCF, ASP, and BHS contributed to the writing. ASP and MCF searched the literature. MCF, APG, and ASP did the calculations. EMF, ASP, and MCF programmed the interface, with input from APG.

### Declaration of interests

APG was an informal unpaid adviser to the Office of Senator Sanders regarding the Medicare for All Act, 2019. All other authors declare no competing interest.

### Acknowledgments

APG was supported by the Burnett and Stender Families' Endowment. ASP was supported by the Yale Climate Change and Health Initiative through a grant from the Overlook International Foundation. MCF was supported by the National Institutes of Health grant K01 AI141576 and the Notsew Orm Sands Foundation. EMF was funded by the Notsew Orm Sands Foundation.

### References

- Collins SR, Gunja MZ, Doty MM. How well does health coverage protect consumers from costs? Findings from the Commonwealth Fund Biennial Health Insurance Survey, 2016. Oct 11, 2017 [http://www.commonwealthfund.org/~media/files/publications/issue-brief/2017/oct/collins\\_underinsured\\_biennial\\_ib.pdf](http://www.commonwealthfund.org/~media/files/publications/issue-brief/2017/oct/collins_underinsured_biennial_ib.pdf) (accessed March 27, 2019).
- United States Census Bureau. Annual estimates of the resident population for selected age groups by sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2017 2017 population estimates. Feb 18, 2018. <https://factfinder.census.gov/bkmk/table/1-0/en/PEP/2017/PEPAGESEX> (accessed July 3, 2018).
- Auter Z. U.S. uninsured rate steady at 12.2% in fourth quarter of 2017. Jan 16, 2018. <https://news.gallup.com/poll/225383/uninsured-rate-steady-fourth-quarter-2017.aspx> (accessed July 3, 2018).
- Fiedler M, Adler L. How will the Graham-Cassidy proposal affect the number of people with health insurance coverage? Sept 22, 2017. <https://www.brookings.edu/research/how-will-the-graham-cassidy-proposal-affect-the-number-of-people-with-health-insurance-coverage/> (accessed March 27, 2019).
- Organisation for Economic Co-operation Development. OECD Health Statistics 2015. 2015. [https://www.oecd-ilibrary.org/social-issues-migration-health/data/oecd-health-statistics\\_health-data-en](https://www.oecd-ilibrary.org/social-issues-migration-health/data/oecd-health-statistics_health-data-en) (accessed March 27, 2019).
- Centers for Medicare and Medicaid Services. NHE Fact Sheet. April 17, 2018. <https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/nationalhealthexpenddata/nhe-fact-sheet.html> (accessed June 8, 2018).
- GBD 2015 Healthcare Access and Quality Collaborators. Healthcare Access and Quality Index based on mortality from causes amenable to personal health care in 195 countries and territories, 1990–2015: a novel analysis from the Global Burden of Disease Study 2015. *Lancet* 2017; **390**: 231–66.
- Central Intelligence Agency. The World Factbook. May 16, 2007. <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2091rank.html> (accessed June 7, 2018).
- GBD 2015 Maternal Mortality Collaborators. Global, regional, and national levels of maternal mortality, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016; **388**: 1775–812.
- World Health Organization. World Health Statistics 2017: Monitoring Health for the SDGs, Sustainable Development Goals. WHO, 2017. [https://www.who.int/gho/publications/world\\_health\\_statistics/2017/en/](https://www.who.int/gho/publications/world_health_statistics/2017/en/) (accessed March 27, 2019).
- Congressional Budget Office. Preliminary analysis of legislation that would replace subsidies for health care with block grants. Sept, 2017. <https://www.cbo.gov/system/files/115th-congress-2017-2018/costestimate/53126-health.pdf> (accessed March 27, 2019).
- Sanders B. To establish a Medicare-for-all national health insurance program. May 23, 2017. <https://www.sanders.senate.gov/download/medicare-for-all-act?id=6CA2351C-6EAE-4A11-BBE4-CE07984813C8&download=1&inline=file> (accessed March 27, 2019).
- The Center for Infectious Disease Modeling and Analysis Yale School of Public Health. Single-payer healthcare interactive financing tool. Feb 26, 2017. <http://shift.cidma.us> (accessed Feb 21, 2019).
- McWilliams JM, Meara E, Zaslavsky AM, Ayanian JZ. Health of previously uninsured adults after acquiring Medicare coverage. *JAMA* 2007; **298**: 2886–94.
- Colla CH, Morden NE, Sequist TD, Mainor AJ, Li Z, Rosenthal MB. Payer type and low-value care: comparing choosing wisely services across commercial and medicare populations. *Health Serv Res* 2018; **53**: 730–46.
- Barnett ML, Linder JA, Clark CR, Sommers BD. Low-value medical services in the safety-net population. *JAMA Intern Med* 2017; **177**: 829–37.
- Kaiser Family Foundation. Medicare and medicaid at 50. July 17, 2015. <https://www.kff.org/medicaid/poll-finding/medicare-and-medicaid-at-50/> (accessed Jan 8, 2019).
- Blahous C. The costs of a national single-payer healthcare system. *Mercatus Research Paper* 2018; published online July 30. DOI:10.2139/ssrn.3232864.



- 19 Friedman G. Yes, we can have improved medicare for all. March, 2019. [https://f411bec1-69cf-4acb-bb86-370f4ddb5c3a.filesusr.com/ugd/698411\\_9144a6d2d0374ec1a183b30e8369738b.pdf](https://f411bec1-69cf-4acb-bb86-370f4ddb5c3a.filesusr.com/ugd/698411_9144a6d2d0374ec1a183b30e8369738b.pdf) (accessed Dec 1, 2019).
- 20 Thorpe KE. An analysis of senator sanders single payer plan. Jan 27, 2016. <https://www.healthcare-now.org/296831690-Kenneth-Thorpe-s-analysis-of-Bernie-Sanders-s-single-payer-proposal.pdf> (accessed Dec 1, 2019).
- 21 Holahan J, Clemans-Cope L, Buettgens M, Favreault M, Blumberg LJ, Ndawandwe S. The Sanders single-payer health care plan. Urban Institute. May, 2016. <https://www.urban.org/sites/default/files/alfresco/publication-pdfs/2000785-The-Sanders-Single-Payer-Health-Care-Plan.pdf> (accessed Dec 1, 2019).
- 22 Liu JL, Eibner C. National health spending estimates under medicare for all. Aug 1, 2018. [https://www.rand.org/pubs/research\\_reports/RR3106.html](https://www.rand.org/pubs/research_reports/RR3106.html). (accessed Dec 1, 2019).
- 23 Pollin R, Heintz J, Arno P, Wicks-Lim J, Ash M. Economic analysis of medicare for all. Nov 30, 2018. <https://www.peri.umass.edu/publication/item/1127-economic-analysis-of-medicare-for-all> (accessed Dec 5, 2019).
- 24 Berwick DM, Johnson S. Medicare for all cost letter. Senator Elizabeth Warren. Oct 31, 2019. [https://assets.ctfassets.net/4ubxbg9463z/2Tg9oB551Cu2vtYBaKKcVr/d124e0eeb128ad3a8d8ab8a6ccea44c0/20191031\\_Medicare\\_for\\_All\\_Cost\\_Letter\\_Appendices\\_FINAL.pdf#page=2](https://assets.ctfassets.net/4ubxbg9463z/2Tg9oB551Cu2vtYBaKKcVr/d124e0eeb128ad3a8d8ab8a6ccea44c0/20191031_Medicare_for_All_Cost_Letter_Appendices_FINAL.pdf#page=2) (accessed Nov 15, 2019).
- 25 Frakt AB, Pizer SD, Feldman R. Should medicare adopt the Veterans Health Administration formulary? *Health Econ* 2012; 21: 485–95.
- 26 Woolhandler S, Himmelstein DU. Single-payer reform: the only way to fulfill the President's pledge of more coverage, better benefits, and lower costs. *Ann Intern Med* 2017; 166: 587–88.
- 27 Hsiao WC, Knight AG, Kappel S, Done N. What other states can learn from vermont's bold experiment: embracing a single-payer health care financing system. *Health Aff* 2011; 30: 1232–41.
- 28 Sanders B. Options to finance medicare for all. Sept 13, 2017. <https://www.sanders.senate.gov/download/options-to-finance-medicare-for-all?inline=file>. (accessed March 27, 2019).
- 29 Cuckler GA, Sisko AM, Poisal JA, et al. National health expenditure projections, 2017–26: despite uncertainty, fundamentals primarily drive spending growth. *Health Aff* 2018; 37: 482–92.
- 30 Hussey PS, Wertheimer S, Mehrotra A. The association between health care quality and cost: a systematic review. *Ann Intern Med* 2013; 158: 27–34.
- 31 Tsugawa Y, Jha AK, Newhouse JP, Zaslavsky AM, Jena AB. Variation in physician spending and association with patient outcomes. *JAMA Intern Med* 2017; 177: 675–82.
- 32 Hsia RY, Akosa Antwi Y, Weber E. Analysis of variation in charges and prices paid for vaginal and caesarean section births: a cross-sectional study. *BMJ Open* 2014; 4: e004017.
- 33 Xu X, Lee HC, Lin H, et al. Hospital variation in cost of childbirth and contributing factors: a cross-sectional study. *BJOG* 2018; 125: 829–39.
- 34 International Federation of Health Plans. 2015 Comparative Price Report: Variation in Medical and Hospital Prices by Country. iFHP, 2016. <https://docplayer.net/48892596-2015-comparative-price-report-variation-in-medical-and-hospital-prices-by-country.html> (accessed Jan 2, 2020).
- 35 OECD. Health at a Glance 2017. Caesarean sections. Paris: OECD, 2017.
- 36 The World Bank. Mortality rate, neonatal (per 1,000 live births). Sept 24, 2011. <https://data.worldbank.org/indicator/SH.DYN.NMRT> (accessed July 18, 2019).
- 37 Won RP, Friedlander S, Lee SL. Regional variations in outcomes and cost of appendectomy in the United States. *J Surg Res* 2017; 219: 319–24.
- 38 Medicare Payment Advisory Commission. Report to the Congress: Medicare Payment Policy. March 15, 2017. [http://medpac.gov/docs/default-source/reports/mar17\\_entirereport.pdf](http://medpac.gov/docs/default-source/reports/mar17_entirereport.pdf) (accessed March 27, 2019).
- 39 Coughlin TA. Uncompensated care for the uninsured in 2013: a detailed examination. May 30, 2014. <https://www.kff.org/uninsured/report/uncompensated-care-for-the-uninsured-in-2013-a-detailed-examination/> (accessed March 27, 2019).
- 40 Centers for Medicare and Medicaid Services. Historical National Expenditure Accounts. Jan 8, 2018. <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical.html> (accessed Aug 13, 2018).
- 41 American Hospital Association. Uncompensated Hospital Care Cost Fact Sheet. December 2017 <https://www.aha.org/system/files/2018-01/2017-uncompensated-care-factsheet.pdf> (accessed March 27, 2019).
- 42 Sorum P. Why internists might want single-payer health care. *Ann Intern Med* 2018; 168: 438–39.
- 43 Gundersen L. Physician burnout. *Ann Intern Med* 2001; 135: 145–48.
- 44 Sarah Janssen. The World Almanac and Book of Facts 2019. New York, NY: Simon and Schuster, 2018.
- 45 Herman B. The sky-high pay of health care CEOs. Axios. July 24, 2017. <https://www.axios.com/the-sky-high-pay-of-health-care-ceos-1513303956-d5b874a8-b4a0-4e74-9087-353a2ef1ba83.html> (accessed June 26, 2018).
- 46 Institute of Medicine. The healthcare imperative: lowering costs and improving outcomes: workshop series summary. Washington, DC: The National Academies Press, 2010.
- 47 Lu J-FR, Hsiao WC. Does universal health insurance make health care unaffordable? Lessons from Taiwan. *Health Aff* 2003; 22: 77–88.
- 48 Reuters. J&J raises U.S. prices on around two dozen drugs. The New York Times. Jan 11 2019. <https://www.reuters.com/article/us-johnson-johnson-drugpricing/jj-raises-u-s-prices-on-around-two-dozen-drugs-idUSKCN1P42VY> (accessed Jan 11, 2019).
- 49 Kuchler H. Sanofi and Novo Nordisk press ahead with US insulin prices rises. Financial Times. Jan 10, 2019. <https://www.ft.com/content/b102475a-1460-11e9-a581-4ff78404524e> (accessed July 29, 2019).
- 50 Abedi M. 'This is a solvable issue': pricey insulin has Americans trekking to Canada in 'caravans'. Global News. May 9, 2019. <https://globalnews.ca/news/5249662/americans-driving-canada-insulin-prices/> (accessed July 29, 2019).
- 51 Lakdawalla D, Sood N. Innovation and the welfare effects of public drug insurance. *J Public Econ* 2009; 93: 541–48.
- 52 Arora A, Belenzon S, Pataconi A. Killing the golden goose? The decline of science in corporate R&D. January 2015. <https://www.nber.org/papers/w20902> (accessed March 27, 2019).
- 53 United States Government Accountability Office. Drug industry: profits, research and development spending, and merger and acquisition deals. Nov 17, 2017. <https://www.gao.gov/assets/690/688472.pdf> (accessed March 27, 2019).
- 54 Brot-Goldberg ZC, Chandra A, Handel BR, Kolstad JT. What does a deductible do? The impact of cost-sharing on health care prices, quantities, and spending dynamics. *Q J Econ* 2017; 132: 1261–318.
- 55 Berchick ER, Hood E, Barnett JC. Health insurance coverage in the United States: 2017. Sept 12, 2018. <https://www.census.gov/library/publications/2018/demo/p60-264.html> (accessed Jan 14, 2020).
- 56 Duron VP, Monaghan SF, Connolly MD, et al. Undiagnosed medical comorbidities in the uninsured: a significant predictor of mortality following trauma. *J Trauma Acute Care Surg* 2012; 73: 1093–98.
- 57 Lopez-Gonzalez L, Pickens GT, Washington R, Weiss AJ. Characteristics of medicaid and uninsured hospitalizations, 2012. Oct 1, 2014 <https://www.hcup-us.ahrq.gov/reports/statbriefs/sb182-Medicaid-Uninsured-Hospitalizations-2012.jsp> (accessed March 27, 2019).
- 58 The Kaiser Family Foundation and Health Research & Educational Trust. Employer health benefits 2017 summary of findings. Jun 15, 2017 <http://files.kff.org/attachment/Summary-of-Findings-Employer-Health-Benefits-2017> (accessed March 27, 2019).
- 59 US Census Bureau. America's families and living arrangements: 2017, Average number of people (AVG table series). United States Census Bureau. <https://www.census.gov/data/tables/2017/demo/families/cps-2017.html> (accessed July 18, 2018).
- 60 Galvani AP, Durham DP, Vermund SH, Fitzpatrick MC. California Universal Health Care Bill: an economic stimulus and life-saving proposal. *Lancet* 2017; 390: 2012–14.
- 61 Witters D. U.S. uninsured rate rises to four-year high. Gallup national health and well-being index. Jan 23, 2019. <https://news.gallup.com/poll/246134/uninsured-rate-rises-four-year-high.aspx> (accessed Jan 23, 2019).

- 62 Wilper AP, Woolhandler S, Lasser KE, McCormick D, Bor DH, Himmelstein DU. Health insurance and mortality in US adults. *Am J Public Health* 2009; **99**: 2289–95.
- 63 Black B, Hollingsworth A, Nunes L, Simon K. The effect of health insurance on mortality: power analysis and what we can learn from the affordable care act coverage expansions. *NBER Work Pap Ser* 2019; published online Feb. DOI:10.3386/w25568.
- 64 Sommers BD, Long SK, Baicker K. Changes in mortality after Massachusetts health care reform: a quasi-experimental study. *Ann Intern Med* 2014; **160**: 585–93.
- 65 Sommers BD. State medicaid expansions and mortality, revisited: a cost-benefit analysis. *Am J Health Econ* 2017; **3**: 392–421.
- 66 Kronick R. Health insurance coverage and mortality revisited. *Health Serv Res* 2009; **44**: 1211–31.
- 67 Franks P. Health insurance and mortality. Evidence from a national cohort. *JAMA* 1993; **270**: 737–41.
- 68 Sorlie PD, Johnson NJ, Backlund E, Bradham DD. Mortality in the uninsured compared with that in persons with public and private health insurance. *Arch Intern Med* 1994; **154**: 2409–16.
- 69 Woolhandler S, Himmelstein DU. The relationship of health insurance and mortality: is lack of insurance deadly? *Ann Intern Med* 2017; **167**: 424–31.
- 70 Hemmingsen B, Gimenez-Perez G, Mauricio D, Roqué i Figuls M, Metzendorf M-I, Richter B. Diet, physical activity or both for prevention or delay of type 2 diabetes mellitus and its associated complications in people at increased risk of developing type 2 diabetes mellitus. *Cochrane Database Syst Rev* 2017; **12**: CD003054.
- 71 Perk J, De Backer G, Gohlke H, et al. European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). The fifth joint task force of the European Society of Cardiology and other societies on cardiovascular disease prevention in clinical practice (constituted by representatives of nine societies and by invited experts). *Eur Heart J* 2012; **33**: 1635–701.
- 72 Nayak S, Roberts MS, Greenspan SL. Cost-effectiveness of different screening strategies for osteoporosis in postmenopausal women. *Ann Intern Med* 2011; **155**: 751–61.
- 73 Gmeinder M, Morgan D, Mueller M. How much do OECD countries spend on prevention? *OECD Health Working Papers* 2017; published online Dec 15. DOI:10.1787/f19e803c-en.
- 74 Cardiovascular Disease and Diabetes: Policies for Better Health and Quality of Care | READ online. OECD iLibrary. June 17, 2015. [https://read.oecd-ilibrary.org/social-issues-migration-health/cardiocvascular-disease-and-diabetes-policies-for-better-health-and-quality-of-care\\_9789264233010-en](https://read.oecd-ilibrary.org/social-issues-migration-health/cardiocvascular-disease-and-diabetes-policies-for-better-health-and-quality-of-care_9789264233010-en) (accessed July 2, 2019).
- 75 Thomas K, Ornstein C. Amid opioid crisis, insurers restrict price, less addictive painkillers. Sept 17, 2017. <https://www.nytimes.com/2017/09/17/health/opioid-painkillers-insurance-companies.html> (accessed Dec 1, 2019).
- 76 Amos O. Why opioids are such an American problem. BBC. Oct 25, 2017. <https://www.bbc.com/news/world-us-canada-41701718> (accessed July 19, 2019).
- 77 Kolodny A, Courtwright DT, Hwang CS, et al. The prescription opioid and heroin crisis: a public health approach to an epidemic of addiction. *Annu Rev Public Health* 2015; **36**: 559–74.
- 78 Priest KC, Gorfinkel L, Klimas J, Jones AA, Fairbairn N, McCarty D. Comparing Canadian and United States opioid agonist therapy policies. *Int J Drug Policy* 2019; published online Feb 11. DOI:10.1016/j.drugpo.2019.01.020.
- 79 Rizzo JA, Zyczynski TM, Chen J, Mallow PJ, Trudel GC, Penrod JR. Lost labor productivity costs of prostate cancer to patients and their spouses: evidence from US national survey data. *J Occup Environ Med* 2016; **58**: 351–58.
- 80 American Diabetes Association. Economic costs of diabetes in the U.S. in 2012. *Diabetes Care* 2013; **36**: 1033–46.
- 81 Enforcement guidance: reasonable accommodation and undue hardship under the Americans with Disabilities Act. 2002. <https://www.eeoc.gov/policy/docs/accommodation.html#leave> (accessed Jan 6, 2020)
- 82 Blinder V, Eberle C, Patil S, Gany FM, Bradley CJ. Women with breast cancer who work for accommodating employers more likely to retain jobs after treatment. *Health Aff* 2017; **36**: 274–81.
- 83 Aizer AA, Falit B, Mendu ML, et al. Cancer-specific outcomes among young adults without health insurance. *J Clin Oncol* 2014; **32**: 2025–30.
- 84 Substance Abuse and Mental Health Services Administration. Behavioral health trends in the United States: results from the 2014 national survey on drug use and health. Sept 10, 2015. <https://www.samhsa.gov/data/sites/default/files/NSDUH-FRR1-2014/NSDUH-FRR1-2014.pdf> (accessed March 27, 2019).
- 85 National Institute of Mental Health. Mental Illness. Nov, 2017. <https://www.nimh.nih.gov/health/statistics/mental-illness.shtml> (accessed June 8, 2018).
- 86 Firth J, Kirzinger A, Brodie M. Kaiser Health Tracking Poll: April 2016. April 28, 2016. <https://www.kff.org/report-section/kaiser-health-tracking-poll-april-2016-substance-abuse-and-mental-health/> (accessed March 27, 2019).
- 87 National Alliance on Mental Illness (NAMI). A Long Road Ahead: Achieving True Parity in Mental Health and Substance Use Care. NAMI, 2015. <https://www.nami.org/about-nami/publications-reports/public-policy-reports/a-long-road-ahead/2015-alongroadahead.pdf> (accessed Jan 6, 2020).

© 2020 Elsevier Ltd. All rights reserved.