

Supplementary Information for

Universal healthcare as pandemic preparedness: the lives and costs that could have been saved during the COVID-19 pandemic

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We estimated the overall national health expenditure for 2019 if the Medicare for All Act (MAA) had been fully implemented, as detailed below. These calculations closely follow our previously published estimation, with updated data on status quo expenditures and funding sources from the Centers for Medicare and Medicaid Services (CMS).

Expenditure

Our projections of the national health expenditure following enactment of the MAA take into account expansion of coverage to the 40.96 million Americans who are currently uninsured,(1, 2) as well as increased healthcare utilization for an additional 45.28 million who are underinsured.(3, 4) We also incorporate anticipated savings, including those related to overhead, provider fees and pharmaceutical costs.

The 2019 federal report of national healthcare spending conducted by the Centers for Medicare and Medicaid Services (CMS) estimated that the country spends \$3.795 trillion on healthcare (Σ_{t0}) (Table S1).(5)

$$\Sigma_{t0} = \$3795 \text{ billion}$$

We calculated the impact of the MAA on each expenditure category as defined by the CMS: service provision, overhead, pharmaceuticals, durable medical equipment, non-durable medical products, public health, and investment. Each step of our calculations is detailed below, with numerical headings corresponding to the columns of Table S2 and to numerical subscripts throughout.

(1) Consolidating pharmaceutical spending

Given that the MAA would be implemented independently of the Department of Veterans Affairs (VA) and the Indian Health Service (IHS), we separated out the expenditures for these entities from their respective CMS categories. We also consolidated pharmaceutical spending into a single category, including the \$171 billion in pharmaceuticals that are administered as a component of service provision.(6)

(2) Eliminating uncompensated hospitalization fees

An annual \$41.61 billion in hospitalization fees are uncollected, equivalent to 3.5% of the national expenditure for hospital care.(7) Given that the MAA would reimburse all legitimate healthcare, the national expenditure for hospital services would increase commensurately, and the budget subtotal becomes:

$$\Sigma_{h2} = \Sigma_{h1} + \$41.61 \text{ billion}$$

$$\Sigma_{t2} = \$3837 \text{ billion}$$

Savings

(3) Eliminating avoidable emergency room visits and hospitalizations

Avoidable emergency room visits and hospitalizations can be averted through improved access to primary care. It has been estimated that by providing primary care to people who are currently uninsured, \$8.15 billion for emergency room expenses(8) and \$73.43 billion for

inpatient hospitalization costs,(9) together totalling \$81.58 billion, could be saved.

$$\Sigma_{h3} = \Sigma_{h2} - \$81.58 \text{ billion}$$

$$\Sigma_{t3} = \$3755 \text{ billion}$$

(4) Reducing reimbursement rates for hospitals, physician/clinical services

4.1 Reimbursement of hospital fees

The MAA is expected to establish reimbursement rates for hospital fees comparable to those currently paid by Medicare, which are 22%(10) lower than private insurance but 30% higher than Medicaid. (10–12) We applied Medicare rates to all hospital reimbursements, lowering spending from private insurance and raising spending from Medicaid, which on balance reduces overall hospital expenditures by 2.76% (Table S3).

4.2 Reimbursement of physician/clinical fees

Similarly, Medicare reimbursements for physician and clinical services are 22% lower than those for private insurance,(10) but 20% higher than those for Medicaid.(11, 12) If all physician and clinical services were reimbursed at Medicare rates, the fees would overall be 6.41% lower than the current average (Table S3).

4.3 Implementation

Our application of Medicare rates to all fees for hospital and for physician and clinical services yields a budget subtotal of:

$$I_h = 0.0276$$

$$I_c = 0.0641$$

$$\Sigma_{h4} = \Sigma_{h3} (1 - I_h)$$

$$\Sigma_{c4} = \Sigma_{c3} (1 - I_c)$$

$$\Sigma_{t4} = \$3684 \text{ billion}$$

(5) Reducing pharmaceutical prices via negotiation

The US spends \$531 billion on pharmaceuticals (Σ_{p1}), equivalent to 14.0% of its national healthcare expenditure.(5) Legislative prohibitions on pharmaceutical price negotiations have led to prices in the US that are higher than in any other country.(13) As an exception, the VA has the authority to negotiate prices in accordance with therapeutic value, achieving prices that are 40% lower than those paid by Medicare.(14) The VA approach could reasonably realize comparable reductions nationwide given that price negotiations would be permitted by the MAA. Therefore, we apply a 40% reduction for our base case, similar to Senator Elizabeth Warren,(15) Pollin *et al*(12) and Friedman.(16) Other studies have included smaller reductions.(16–20). If negotiations could lower prices to those paid by the VA, and thereby achieve a 40% reduction, the budget subtotal becomes:

$$I_n = 0.4$$

$$\Sigma_{p5} = \Sigma_{p4} (1 - I_n)$$

$$\Sigma_{t5} = \$3471 \text{ billion}$$

(6) Reducing overhead expenditure

Insurance overhead currently ranges from 2.2% under Medicare to 12.4% within the private sector,(21) and overall represents 7.6% of national healthcare spending. If the MAA achieves the current Medicare overhead rate of 2.2% on all categories excluding non-durable medical products, investment, public health, and VA/IHS, the budget subtotal becomes:

$$I_o = 0.022$$

$$\Sigma_{o6} = I_o(\Sigma_{t5} - \Sigma_{o5} - \Sigma_{n5} - \Sigma_{m5} - \Sigma_{p5} - \Sigma_{v5})$$

$$\Sigma_{t6} = \$3244 \text{ billion}$$

(7) Improving fraud detection

In addition to reducing overhead, the unified billing system generated for a single-payer system would facilitate fraud detection. It has been estimated that 5% of healthcare expenditure could be eliminated through fraud detection within the first two years of implementing a single-payer system.(22) In Taiwan, consolidation of provider claims via a single-payer system, which made fraud and abuse detection possible, resulted in an 8% reduction in national healthcare spending.(23) We conservatively assume half of the reduction in national health expenditure realized in Taiwan as a result of improved fraud detection: 4%. With 4% savings applied to all categories excluding non-durable medical products, investment, public health, and VA/IHS, the budget subtotal becomes:

$$I_f = 0.04$$

$$\Sigma_{t7} = (1 - I_f)(\Sigma_{t6} - \Sigma_{n6} - \Sigma_{m6} - \Sigma_{p6} - \Sigma_{v6})$$

$$\Sigma_{t7} = \$3133 \text{ billion}$$

Consumption

(8) Insurance expansion

In 2019, an estimated 40.96 million Americans (12.5% of the country, P_w)(24) were uninsured. An additional 45.28 million adults were underinsured (13.8%, P_u).(25) Healthcare spending among uninsured people is 50.1% of that among their insured counterparts (S_w),(26) while spending among underinsured people is approximately 86.0% of that spent by those who are adequately insured (S_u).(27) With the expected increase in healthcare use for the uninsured or underinsured (I_w and I_u , respectively), compared to current health-care use for the adequately insured, the factor by which overall health-care use increases (F) is calculated to be 1.088. The RAND study projected an 8% increase, aligning with our estimation despite different underlying calculations.(19) F is applied to all expenditure categories excluding dental, non-durable medical products, investment, public health, and VA/IHS:

$$S_w = 0.501$$

$$S_u = 0.860$$

$$I_w = 1$$

$$I_u = 1$$

$$P_w = 0.125$$

$$P_u = 0.138$$

$$F = \frac{(1-P_w - P_u) + P_w I_w + P_u I_u}{(1-P_w - P_u) + P_w S_w + P_u S_u} = 1.088$$

$$\Sigma_{h8} = F (\Sigma_{h7})$$

$$\Sigma_{c8} = F (\Sigma_{c7})$$

$$\Sigma_{j8} = F (\Sigma_{j7})$$

$$\Sigma_{a8} = F (\Sigma_{a7})$$

$$\Sigma_{k8} = F (\Sigma_{k7})$$

$$\Sigma_{r8} = F (\Sigma_{r7})$$

$$\Sigma_{o8} = F (\Sigma_{o7})$$

$$\Sigma_{p8} = F (\Sigma_{p7})$$

$$\Sigma_{e8} = F (\Sigma_{e7})$$

Altogether, the total projected expenditure is:

$$\Sigma_{t8} = \$3357 \text{ billion}$$

Thus, the implementation of the MAA would have resulted in cost savings of \$438 billion in 2019, corresponding to an 11.5% reduction in national health expenditure.

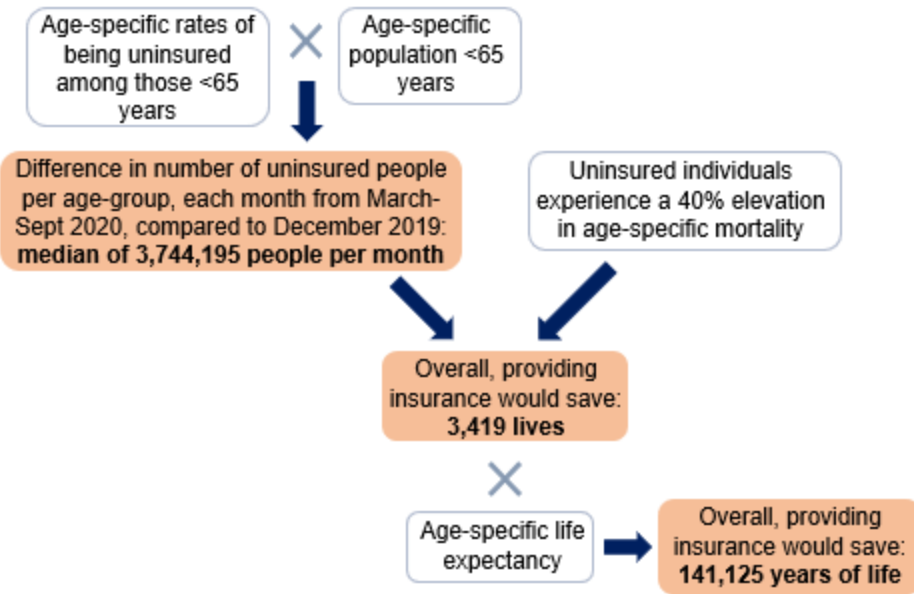


Fig. S1: Life-saving potential of Medicare for All insurance expansion given loss of employment due to COVID-19 pandemic driven insurance enrollment changes for those <65 years of age from March to September 2020.

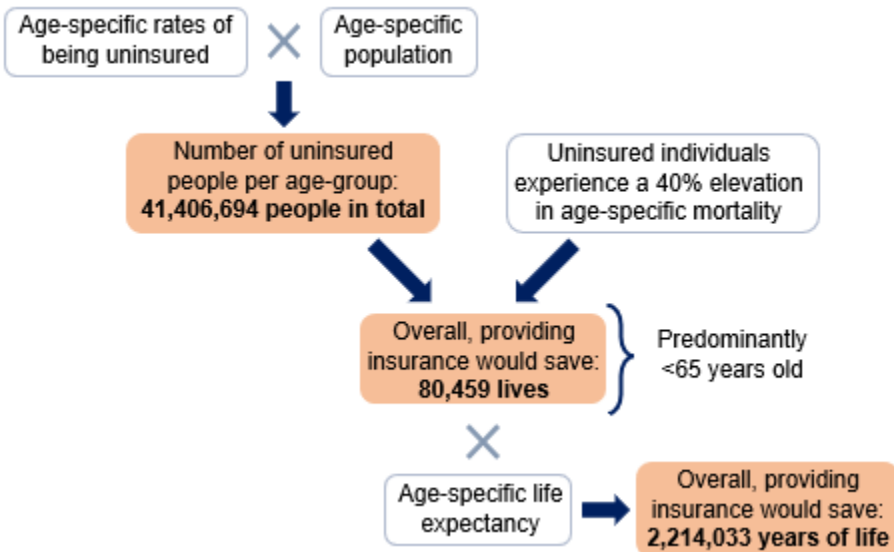


Fig. S2: The annual life-saving potential of the Medicare for All Act in 2020 compared to the present system

Estimation of cumulative COVID-19 hospitalizations

The Center for Disease Control (CDC) reports total hospital admissions since August 1 2020 (28). In addition, a CDC population-based surveillance system (COVID-NET) provides cumulative rates of hospitalizations based on data from over 250 acute-care hospitals in 14 states in the United States since the beginning of the pandemic (29). We used the age-distributed cumulative rates of hospitalizations from COVID-NET to obtain the most recent estimate for total COVID-19 hospitalizations in the US. The CDC acknowledges that COVID-19 hospitalizations have been underreported due to test availability and provider or facility practices (28). Specifically, the CDC estimates that 1 in 1.9 (95% Uncertainty Interval 1.7 – 2.1) COVID-19 hospitalizations were reported (30). We applied these CDC estimates to account for under reporting in our estimate and obtain a 95% uncertainty interval.

Table S1: Number of Uninsured Individuals by Year

	Number of uninsured individuals			
Age Group	2017	2018	2019	2020
<18	3,909,933	3,885,915	3,871,075	3,956,980
18-34	16,369,149	16,412,455	16,976,872	16,960,482
35-64	17,106,326	17,127,114	17,670,538	18,033,529
65+	1,877,876	1,937,666	2,444,635	2,455,702
Total	39,263,284	39,425,483	40,963,120	41,406,694

Table S2. Model parameters.

Parameter	Symbol	Value	Source
<i>National Health Expenditure Budget Category (\$US 2019, billions)</i>			(5)[Table 19]
Services	Σ_{s0}	$\Sigma_{h0} + \Sigma_{c0} + \Sigma_{j0} + \Sigma_{d0} + \Sigma_{a0} + \Sigma_{k0} + \Sigma_{r0}$	
Hospital Care	Σ_{h0}	1191.98	
Physician and Clinical Services	Σ_{c0}	772.12	
Other Professional Services	Σ_{j0}	110.63	
Dental Services	Σ_{d0}	143.19	
Other Health, Residential, and Personal Care Services	Σ_{a0}	193.63	
Home Health Care	Σ_{k0}	113.51	
Nursing Care Facilities and Continuing Care Retirement Communities	Σ_{r0}	172.66	
Overhead	Σ_{o0}	288.89	
Prescription Drugs	Σ_{p0}	369.69	
Durable Medical Equipment	Σ_{e0}	57.57	
Other Non-durable Medical Products	Σ_{n0}	82.06	
Investment	Σ_{m0}	201.66	
Public Health	Σ_{u0}	97.81	
Veterans Affairs and Indian Health Services	Σ_{v0}	0	
Total National Health Expenditure (\$, billions)	Σ_{t0}	3795.38	(5)[Table 19]
Uncompensated hospitalization fees (\$, billions)	H	41.61	(7)
<i>Cost reduction due to:</i>			
Reduced reimbursement for hospital services	I_h	0.0276	See Table S3
Reduced reimbursement for physician and clinic services	I_c	0.0641	See Table S3
Pharmaceutical price negotiation	I_n	0.40	(14)
Reduced overhead	I_o	0.022	(21)
Improved fraud detection	I_f	0.04	(22, 23)
<i>Proportion of population:</i>			
Uninsured	P_w	0.125	(24, 31, 32)
Underinsured	P_u	0.138	(24, 25)
<i>Healthcare spending as a proportion of those insured or adequately insured, by:</i>			
Uninsured	S_w	0.501	(26)
Underinsured	S_u	0.86	(27)
Factor increase in healthcare spending for the total population	F	$\frac{(1-P_w - P_u + P_w(I_w) + P_u(I_u))}{1 - P_w(1-F_w) - P_u(1-F_u)} =$ 1.088	Calculated

Table S3. National Health Expenditure Budget by Category (\$US 2019, billions) upon adoption of the Medicare for All Act (MAA). The budget is shown for each category as aspects of the MAA are implemented, step-by-step, as outlined above. Budget subtotals due to the savings accrued by adopting the MAA are denoted by Σ_{t1} through Σ_{t8} , with the final budget denoted Σ_{t8} .

Budget Category ^b	Step in calculation of National Health Expenditure Budget by category upon adoption of the MAA (\$US 2019, billions) ^a							
	1	2	3	4	5	6	7	8
Hospital (Σ_{hi})	1092.3	1133.9	1052.4	1023.3	1023.3	1023.3	982.4	1069.7
Clinical (Σ_{ci})	659.1	659.1	659.1	616.8	616.8	616.8	592.1	644.7
Other Prof. (Σ_{ji})	110.6	110.6	110.6	110.6	110.6	110.6	106.2	115.6
Dental (Σ_{di})	142.6	142.6	142.6	142.6	142.6	142.6	136.9	136.9
Other Serv. (Σ_{ai})	192.0	192.0	192.0	192.0	192.0	192.0	184.4	200.7
Home Care (Σ_{ki})	107.6	107.6	107.6	107.6	107.6	107.6	103.3	112.5
Nursing Care (Σ_{ri})	146.2	146.2	146.2	146.2	146.2	146.2	140.3	152.8
Overhead (Σ_{oi})	287.6	287.6	287.6	287.6	287.6	59.7	57.4	62.4
Prescriptions (Σ_{pi})	531.7	531.7	531.7	531.7	319.0	319.0	306.2	333.4
Durable Med. (Σ_{ei})	57.6	57.6	57.6	57.6	57.6	57.6	55.3	60.2
Non-Durable (Σ_{ni})	82.1	82.1	82.1	82.1	82.1	82.1	82.1	82.1
Investment (Σ_{mi})	201.7	201.7	201.7	201.7	201.7	201.7	201.7	201.7
Public Health (Σ_{ui})	97.8	97.8	97.8	97.8	97.8	97.8	97.8	97.8
VA & IHS (Σ_{vi})	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6
Total (Σ_{ti})	3795.4	3837.0	3755.4	3684.1	3471.5	3243.6	3132.6	3357.1

^a In order, the steps in the calculation of National Health Expenditure Budget by category are: (1) Consolidating pharmaceutical spending, (2) Eliminating uncompensated hospitalization fees, (3) Eliminating avoidable emergency room visits and hospitalizations, (4) Reducing reimbursement rates for hospitals, physician, and clinical services, (5) Reducing pharmaceutical prices, (6) Reducing overhead expenditure, (7) Improving fraud detection, and (8) Insurance expansion

^b In order, the budget categories are: Hospital Care, Physician and Clinical Services, Other Professional Services, Dental Services, Other Health, Residential, and Personal Care Services, Home Health Care, Nursing Care Facilities and Continuing Care Retirement Communities, Overhead, Prescription Drugs, Durable Medical Equipment, Other Non-durable Medical Products, Investment, Public Health, Veterans Affairs and Indian Health Services, and the Total National Health Expenditure.

Table S4. Calculation for percent reduction in spending by funding source upon application of Medicare rates under the Medicare for All Act for both Hospitals and Physician & Clinical services.

	Current Spending (\$, billions)(5)	Spending after applying Medicare rates (\$, billions)(5, 10, 26)	Percent Reduction (%)
Physician and Clinical Services			
<i>Private insurance</i>	305.00	237.90	
<i>Medicare</i>	192.97	192.97	
<i>Medicaid and CHIP</i>	87.92	105.50	
<i>Other Payment</i>	186.23	186.23	
	772.12	722.60	6.41%
Hospitals			
<i>Private insurance</i>	438.12	341.74	
<i>Medicare</i>	315.84	315.84	
<i>Medicaid and CHIP</i>	211.71	275.22	
<i>Other Payment</i>	226.31	226.31	
	1191.98	1159.10	2.76%

Table S5: COVID-19 Hospitalizations by insurance type and age.

A. Insurance coverage stratified by age and insurance type				
Age-groups	Insurance Type			
	Medicaid	Medicare	Private	Uninsured
0–17	57,590,334	917,550	81,424,118	6,940,800
18–29	18,810,832	1,044,312	71,504,854	16,035,070
30–39	12,882,016	1,474,286	58,463,546	13,209,856
40–49	9,696,366	2,435,716	58,783,088	10,432,440
50–64	13,546,510	10,463,528	90,476,036	11,181,758
65+	0	97,502,314	3,223,434	827,956
B. Total Number of hospitalizations by age-groups				
	Age groups			
	0–17	18–49	50–64	65+
Hospitalizations not requiring ventilation	286,886 (256,688–317,085)	2,877,094 (2,574,242–3,179,946)	2,814,747 (2,518,458–3,111,036)	4,357,964 (3,899,231–4,816,698)
Hospitalizations requiring ventilation	18,963 (16,967–20,959)	284,548 (254,595–314,500)	446,837 (399,801–493,872)	745,038 (666,613–823,464)
C. Unit hospitalization cost by insurance type (in US dollars)				
	Insurance Type			
	Medicaid	Medicare	Private	Uninsured
Hospitalizations not requiring ventilation	13,780	16,812	34,890	16,812
Hospitalizations requiring ventilation	47,396	57,822	114,842	57,822

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