BBVA | Research

Got symptoms? High U.S. healthcare spending and its long-term impact on economic growth

Filip Blazheski and Nathaniel Karp

29 March 2018

- **Systemic inefficiencies explain the high level of healthcare spending in the U.S.**
- **The share of overhead costs is significantly higher than in other developed countries**
- **U.S. hospitals employ almost twice as many people per bed than the OECD average, amid a high share of employees not providing direct health care**
- **While physician and nurse incomes are significantly higher than in other countries, they are in line with income differentials for high earning professions and represent a small share of total healthcare expenditures**
- **Prescription drug spending per capita is elevated due to more intensive use of latest medicines and higher prices than in other nations**
- **Reducing deadweight losses and redirecting resources to more productive uses could boost output by $8 trillion over 30 years**

Total healthcare expenditures in the United States stood at $3.3tn in 2016[1]. This accounted for almost 18% of GDP, significantly higher than any other OECD country. In fact, the weighted average for the OECD ex-U.S. stands at 9.3%[2]. In other words, the amount of healthcare spending in the U.S. could cover all other 34 OECD countries combined, which have a population three times as large as in the U.S.

Statistically speaking, the U.S. is an extreme outlier[3] in terms of healthcare spending among OECD countries, and it has been the case for some time (Figure 1). According to Anderson and Poullier (1999), as early as 1960, the U.S. was spending almost 50% more per capita on healthcare than any other OECD country, which suggests that the disparity between the U.S. and the rest of the OECD countries is not just a reflection of higher incomes but also of structural differences. Personal healthcare expenditures, at almost $2.3tn, are the second largest category of personal consumption spending after housing. This is especially concerning since healthcare spending is increasing faster than GDP (Figure 2). If these trends continue at the same rate as in 2000-2016, by 2030 healthcare spending would represent 23% of GDP and would surpass spending on housing and utilities.

Despite the U.S. spending significantly more compared to other OECD countries, the health status of the population remains below the average (Figures 3 and 4[4]). In general, the U.S. has good outcomes when it comes to acute care, but ranks below or near average on some basic metrics such as life expectancy, low birth weight of infants, infant mortality and obesity rates.

These trends highlight a mammoth opportunity cost for the economy. Health care outcomes and coverage could be improved while reducing overall spending, and the savings could be redirected to other more productive uses. This is

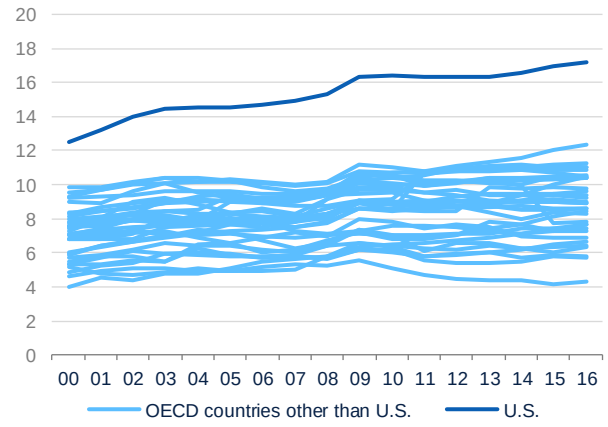
1: Centers for Medicare and Medicaid Services data (somewhat higher than the OECD estimates for 2016)
2: Weighted by GDP purchasing power parity
3: Extreme outliers lie more than three times the interquartile range below the first or above the third quartile
4: The life expectancy and infant mortality figures could be painting a bleaker picture of the U.S. healthcare system than warranted due to higher deaths due to violence in the U.S. and differences in reporting of infant mortality statistics. See Conover (2012)

especially the case in parts of the healthcare sector where productivity growth is low or even negative. Thus, reducing spending and increasing efficiency would boost productivity growth and the well-being of the population.

According to Conover (2011), in 2007, the output of real health services in hospitals and nursing homes was approximately 100% higher compared to 20 years earlier. However, combined inputs increased by 140% during the same period implying a decline in productivity. The same results occurred with ambulatory services. Considering that health facilities and ambulatory services account for over one-half of total healthcare expenditures, the potential efficiency gains are colossal.

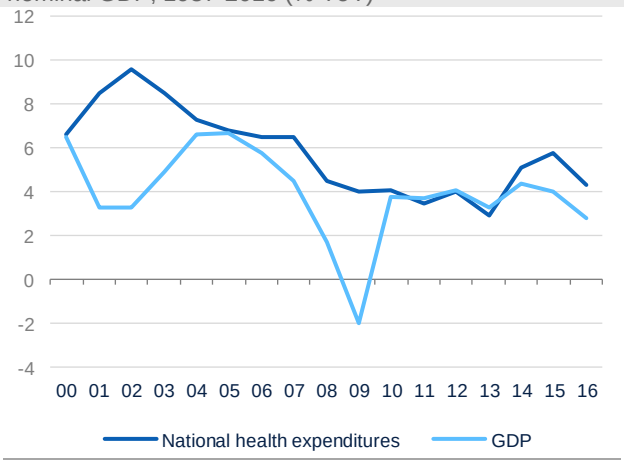
In light of these facts, this brief focuses on two main questions – why does healthcare in the U.S. cost more than in other OECD countries and what are the potential gains to economic output from reducing large inefficiencies.

Figure 1. Healthcare expenditures, (% of GDP, '16 estimate)



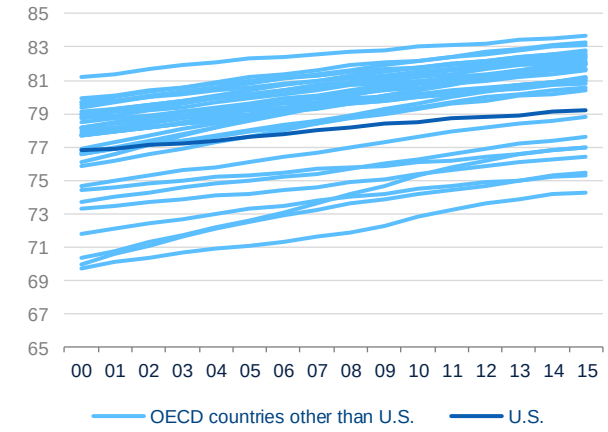
Source: BBVA Research and OECD

Figure 2. Growth in national health expenditures and nominal GDP, 1987-2016 (% YoY)



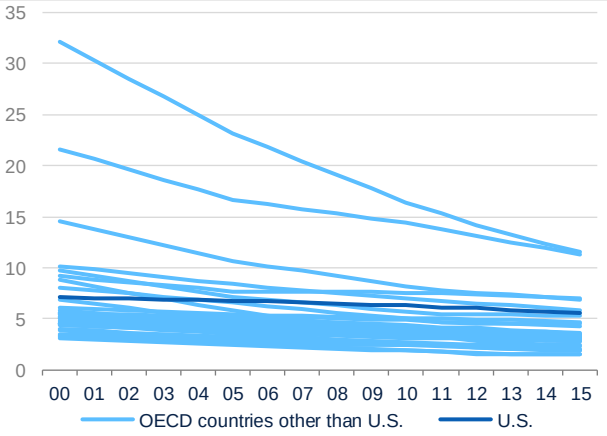
Source: BBVA Research, Centers for Medicate and Medicaid Services and BEA

Figure 3. Life expectancy at birth (years)



Source: BBVA Research and OECD

Figure 4. Infant mortality (per 1000 live births)



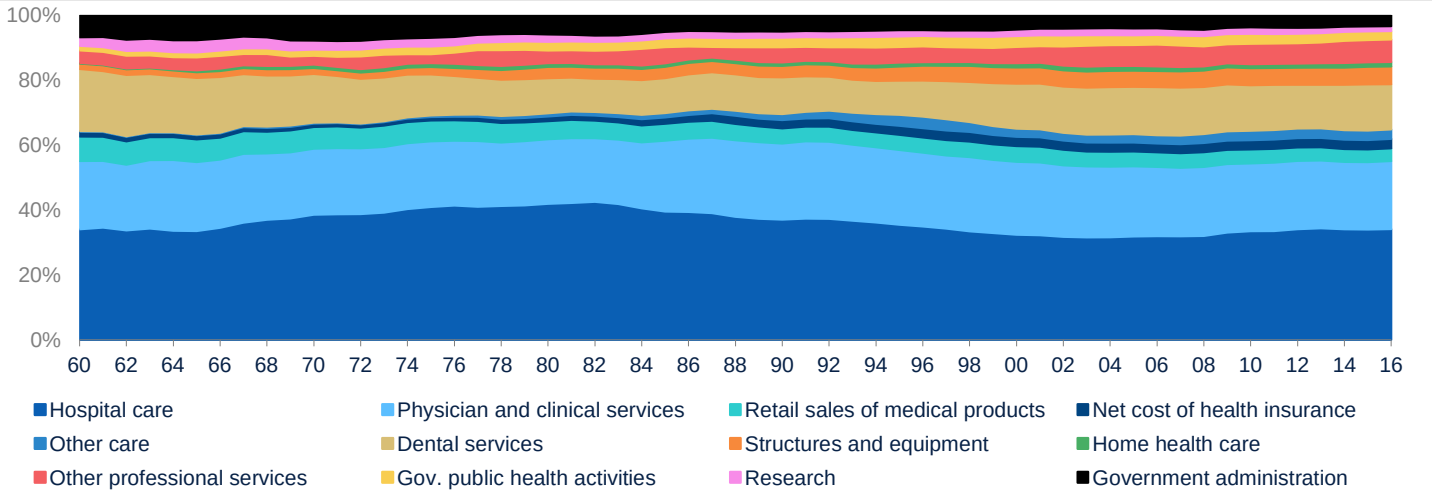
Source: BBVA Research and OECD

Breakdown of expenditure

The composition of U.S. national health expenditures does not seem to have changed dramatically over the last 57 years (Figure 5). Also, the composition of expenditures does not differ greatly from other OECD countries (Figure 6), except in the case of governance, finance and administrative costs, i.e. overhead expenditure, and to some extent in the case of curative, rehabilitative and ancillary care.

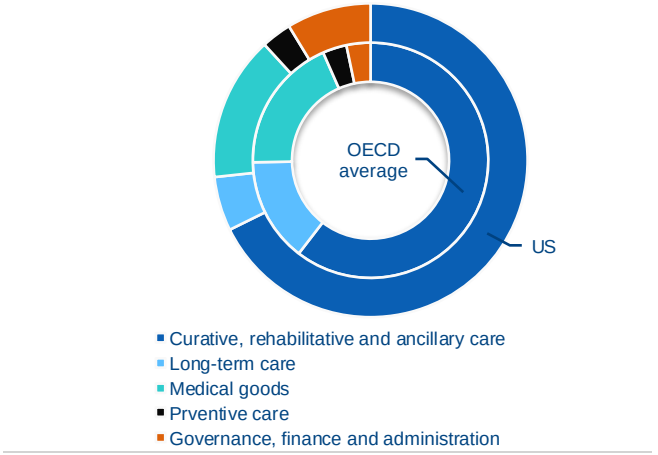
In 2015, overhead costs in the U.S. (corresponding to government administration and net cost of insurance) accounted for 8.2% of total costs, compared to 3.4% on average for all OECD countries. The share of this type of expenditure in the U.S. increased relative to inflation over the last two decades. Its ratio to GDP went from 0.8% to 1.4% during 2000-2015. This increase amounts to a compound annual growth rate of 7.9%. The increase has been more or less steady, with the highest increases occurring in 2001-2003 and 2014 (Figure 7).

Figure 5. Composition of national health expenditures (%)



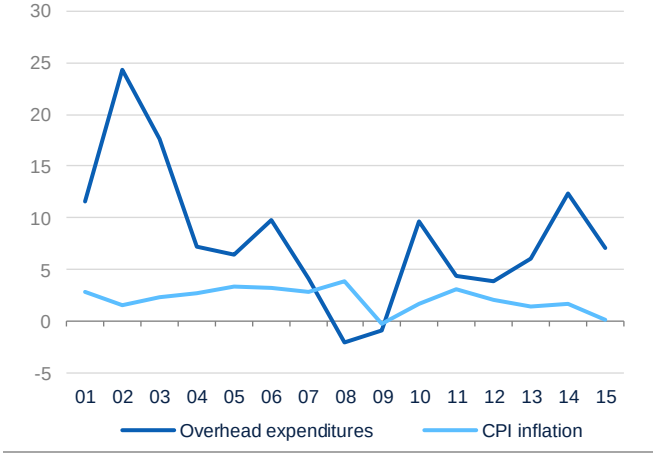
Source: BBVA Research and Centers for Medicare and Medicaid Services

Figure 6. Healthcare expenditure breakdown, 2015



Source: BBVA Research calculations based on OECD data

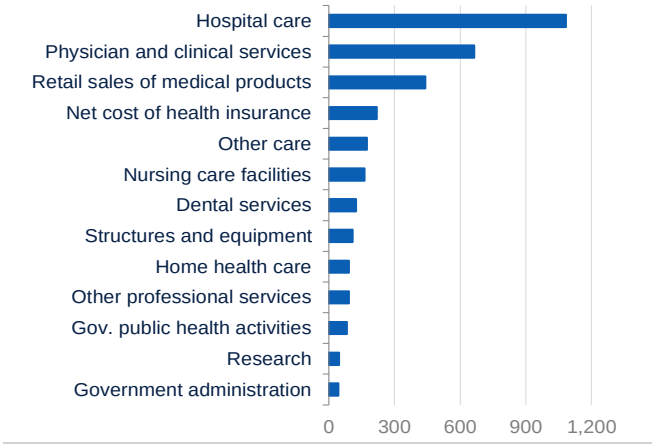
Figure 7. Overhead expenditures and CPI inflation (% YoY)



Source: BBVA Research, BLS and calculations based on OECD data

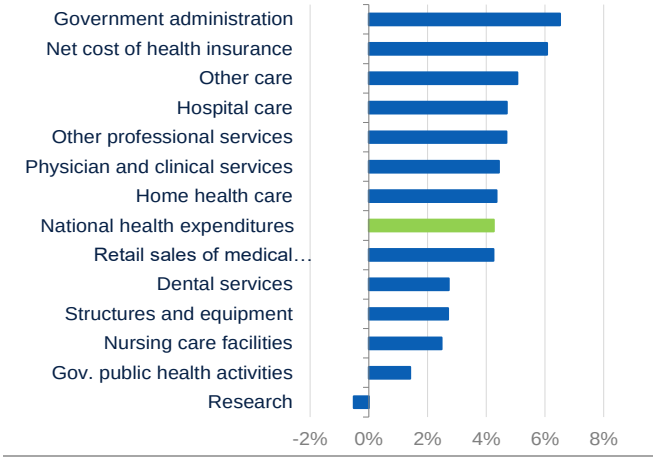
Looking at curative, rehabilitative and ancillary care, we find that the two largest components are hospital care and, physician and clinical services (Figure 8). In 2016, they accounted for 32% and 20% of total U.S. expenditures, respectively. These shares are similar to other developed countries. For example, data for the European Union provided by Eurostat (2018) shows that in 2014, hospitals generally accounted for the highest proportion of current healthcare expenditure, ranging from 29.5% in Germany to 47.9% in Estonia. Moreover, ambulatory health care expenditure generally came in second, ranging from 11.4% in Romania to more than 30.0% in Denmark and Germany. In the U.S., hospital care costs increased on average by 4.7% per year during 2010-2016, while physician and clinical services increased by an annual average of 4.4% in the same period (Figure 9).

Figure 8. Breakdown of U.S. national health expenditures in 2016 by purpose ($bn)



Source: BBVA Research and Centers for Medicare and Medicaid Services

Figure 9. Compounded annual growth rate of national health expenditures, 2010-2016 (%)



Source: BBVA Research, and Centers for Medicare and Medicaid Services

Hospital care

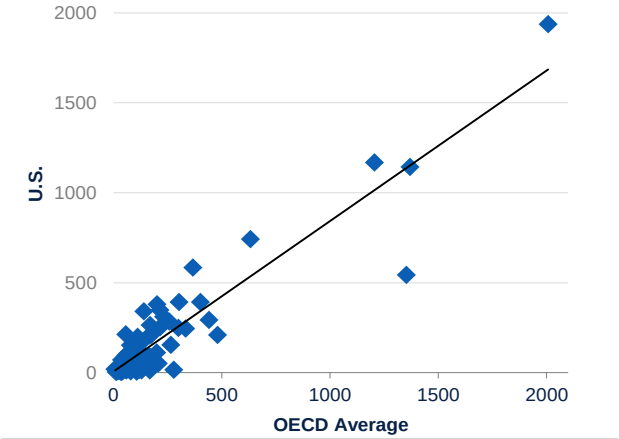
In 2015, the U.S. spent over $1tn or 5.4% of GDP on hospital care. The only OECD country that came close to this share was Denmark with 4.7% while the simple average for all OECD stood at 3.7%. This discrepancy is even larger if one takes into account that U.S. hospitals tend to employ a lower number of physicians, relying on independent physicians with hospital privileges. For illustration purposes, had the U.S. spent the same share of GDP on hospital care as Denmark, it would have saved $194bn in 2017, and had it been spending the same share as the OECD average, it would have saved $397bn or $1.2K per person. This would be equivalent to a reduction of around 30% for the average annual premium for individual coverage.

The cause of higher spending on hospital care is not higher admission/discharge rates or longer stay per hospitalization. In fact, the U.S. has slightly lower admission/discharge rates than OECD countries (Figure 10), while the length of stay per hospitalization is almost 30% shorter compared to the OECD average (Figure 11).

Therefore, the cause of higher hospital spending in the U.S. seems to lie in the lower level of efficiency and lack of competitive markets. U.S. hospitals have lower occupancy rates (Figure 11) and more hospital employees per 1,000 population, despite having less hospital beds (Figure 12). In fact, the employment-to-bed ratio in the U.S. at 5.6 is almost twice as high as the OECD average of 2.9. Moreover, the composition of hospital employment in the U.S. tilts toward staff

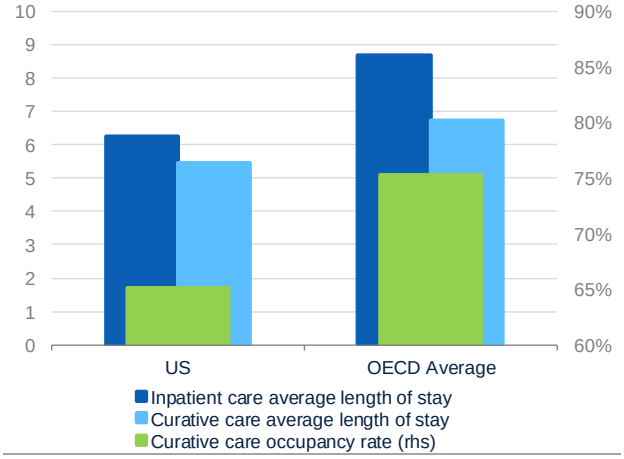
that does not provide direct healthcare. While the hospital sector in the U.S. has about the same number of healthcare providing staff per 1000 population compared to OECD countries, after adjusting for the fact that physicians are more likely to be independent providers, it has more than twice as many non-healthcare providing personnel (Figure 13). This indicates that a large component of hospital care expenses are related to costs not involving direct healthcare provision[5]. In addition, some hospitals use their market power to increase prices. Cooper et al. (2015) found that hospital prices in monopoly markets are 15.3% higher than in markets with four or more hospitals.

Figure 10. Hospital discharges by diagnostic category per 100,000 population, average 2005-2010 (number)



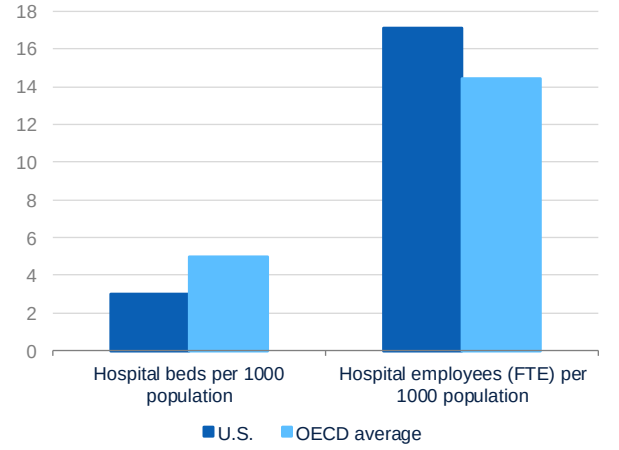
Source: BBVA Research calculations based on OECD data

Figure 11. Length of stay per hospitalization and hospital occupancy rate 2005-2014 (days and %)



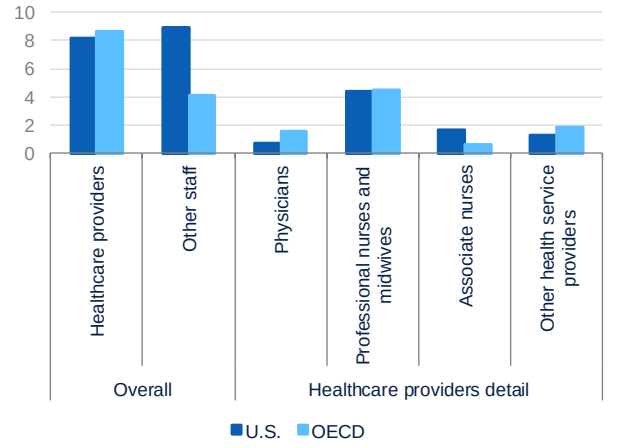
Source: BBVA Research and OECD

Figure 12. Hospital beds and employees in the U.S and OECD average per 1000 population, average 2005-2014 (number)



Source: BBVA Research and OECD

Figure 13. Hospital employees per 1000 population (FTE), average 2005-2014 (number)



Source: BBVA Research and OECD

5: According to BLS data, the wage bill for registered nurses, the most numerous healthcare providers in hospital employment, represented 11.3% of hospital care expenditures or 3.7% of total national expenditures

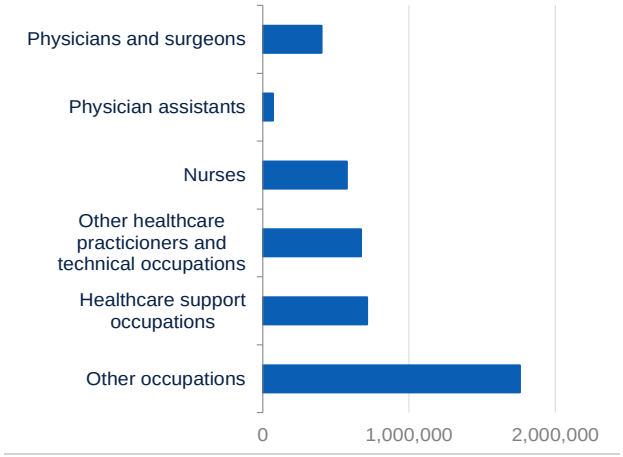
Physician and clinical services

In 2016, the U.S. spent $665bn on physician and clinical services equivalent to 3.6% of GDP. Spending on physician and clinical services has remained at around 20% of total healthcare expenditures since 1960. This segment of the healthcare system falls within the ambulatory health care services industry, as defined by the North American Industry Classification System (NAICS) and generally corresponds to three subindustries: offices of physicians, offices of other health practitioners, and outpatient care centers. These three segments employed 4.2 million people, including 401 thousand physicians, 69 thousand physician assistants, and 625 thousand nurses (Figure 14). The breakdown by type of occupation is similar across the three segments, with non-healthcare providing occupations accounting for 40-50% of total.

Using Bureau of Labor Statistics data, the calculated wage bill for this segment in 2016 stood at $290bn, implying that labor costs accounted for 44% of overall expenses. Out of this, physician pay amounted to $92bn or 13.8% of costs. This also implies that labor costs for physicians in private practice represent less than 3% of total national health expenditure. Together with the salaries of physicians employed by hospitals, which amount to 29bn, the share of physician salaries in total healthcare expenditure remains relatively low at less than 4%. Thus, despite popular belief that high physician pay drives healthcare costs, physician remuneration represents only a small fraction of total healthcare spending. This is despite the fact that physicians provide one of the key value added services to customers in the whole healthcare system.

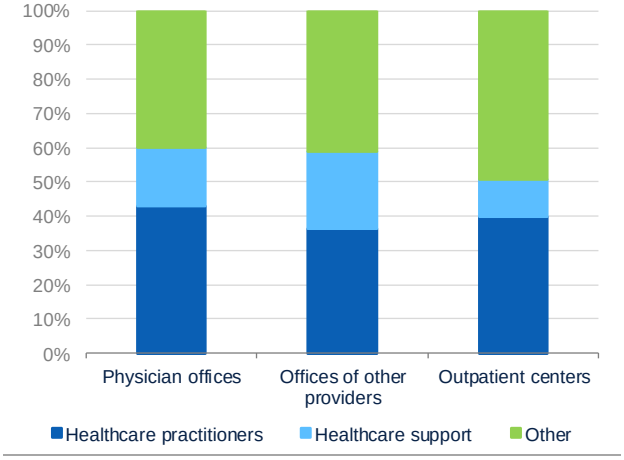
That said physician pay in the U.S. is higher than in other OECD countries. According to Papanicolas et al. (2017), after adjusting for purchasing power parity, the mean remuneration for generalists in the U.S. was $218,173, compared to between $86,607 and $154,126 in eleven OECD countries. For specialists it was $316,000, compared to between $98,425 and $202,291. There are multiple reasons for these pay differentials; the most important being the relative value-added of highly specialized and high earning professions in each country, the differences and costs of medical training, and the relative scarcity of physicians.

Figure 14. Employment in physician and clinical services, 2016 (number)



Source: BBVA Research and BLS

Figure 15. Structure of employment in physician and clinical services, 2016 (%)



Source: BBVA Research and BLS

Physician pay has to be observed through the lens of average pay of other highly-specialized and high earning professionals in each country, especially since physicians can be seen as delivering high value-added services that are

not tradeable across borders. If other comparably complex and demanding professions carry lower remuneration than medical doctors, then physicians could indeed be seen as overpaid. However, according to findings by Cutler and Ly (2011), this does not seem to be the case in the U.S. as they find that relative to other high-earners (those in the 95th to 99th percentile of earnings distribution), physicians in the U.S. tend to be paid comparably the same as in other developed countries. Specialists in the U.S. earn 37% more than average high-earners, whereas general practitioners earn 8% less. The average for 12 other developed countries[6] was 45% more for specialists and 6% less in the case of general practitioners. In the case of nurses, the findings resulted in the same conclusion.

Out of all comparable OECD countries, Germany tends to have more highly paid healthcare practitioners. For example, specialist physicians and general practitioners earn 45% and 6% more than average high-earners, respectively. Zavlin et al. (2017), analyze medical training in the U.S. and Germany that can help further explain nominal earning differentials. First, medical education in the U.S. is generally paid for by students themselves, so large tuition loans are not uncommon, while medical education in Germany tends to be tax-funded and tuition-free[7]. Second, the earliest a typical medical student in the U.S. graduates is age 26, whereas in Germany is 24. This means that physicians in the U.S. realize their full earning potential at a later point in their life. Also, during residence, physicians in the U.S. tend to earn a small fraction of the pay of a fully licensed physician, unlike in some other countries, which could also contribute to the pay differential of fully licensed physicians. Similar differences also exist in the case of nurses.

That said lower supply of physicians in the U.S. can also be contributing to pay differentials between the U.S. and other developed countries. With 2.5 practicing physicians per 1,000 population, the U.S. ranks toward the bottom of OECD countries (Figure 16). Some researchers[8] have argued that the cause for this scarcity is the limited number of residency positions.

Last but not least, a source of inefficiency in physician and clinical services could be the high share of non-healthcare providing staff. At 42%, the share of this type of employment is lower than in hospitals, where it stands at 51%. However, it is still high, and is likely caused by the needs to meet inefficient billing, record keeping, scheduling and other requirements not directly related to healthcare provision. According to a survey by the Physicians Foundation (2016), physicians across the U.S. spend 21% of their time (11.3 hours per week) on non-clinical paperwork, 72% indicate that external factors such as third party authorizations significantly detracts them from providing quality care, and only 43% say that their compensation is tied to quality or value they provide.

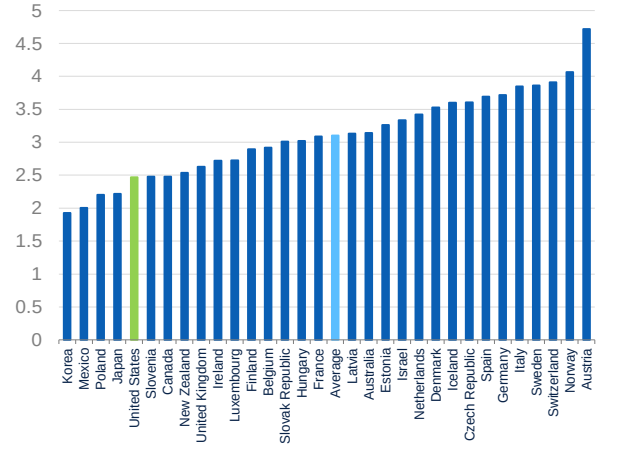
Retail sales of medical products

The expenditure on retail sales of medical products in 2016 stood at $441.7bn, or almost 2.4% of GDP. Out of that, prescription drugs accounted for $328.6bn or 75% of total. Although the shares of retail sales of medical products and prescription drugs in total national health expenditures has been more or less stable over the last 15 years (Figure 17), the U.S. spends significantly more than other countries on prescription medications, even when adjusting for purchasing power differences (Figure 18). Following the analysis of Sarnak et al. (2017), this could theoretically be due to higher

6: Australia, Canada, France, Germany, Italy, Netherlands, New Zealand, Norway, Portugal, Sweden, Switzerland and U.K.
7: Average total tuition in the U.S. is $25,550-$39,950 for undergraduate degree, plus $180,610 for public medical school or $203,201 for private medical school, versus $0 for public medical school in Germany
8: See Baker (2017)

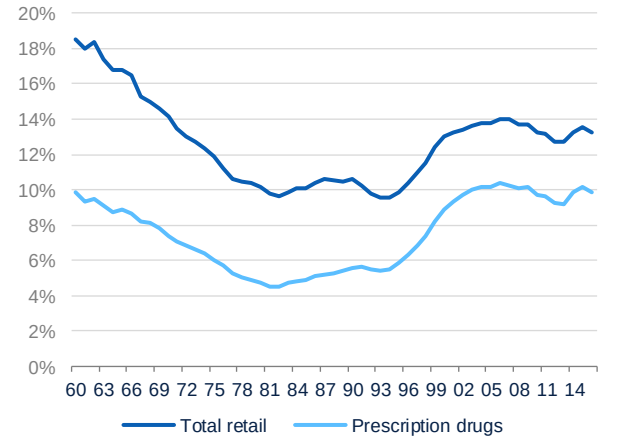
usage of drugs, a different mix of medicines and higher prices. In terms of volume of medicines consumed, the U.S. is in the upper range of consumption of medicines per capita (Figure 19). Still, it is not an outlier as two other countries, France and Spain, consume more. In terms of the mix of medicines, the U.S. has a high rate of generic medicine utilization, which indicates that the cost savings available through the use of generics are being realized (Figure 20), assuming that the prices of generic drugs are competitive. However, on the non-generic side, there seems to be a greater usage of newest medications, which are generally more expensive. Danzon and Furukawa (2005) state that: "U.S. per capita use is higher than in all other countries for molecules within ten years of global launch, particularly for the newest molecules within five years of global launch. Greater U.S. use of new compounds reflects earlier launch and relatively rapid diffusion, conditional on launch."

Figure 16. Practicing physicians per 1000 population, average 2005-2014 (number)



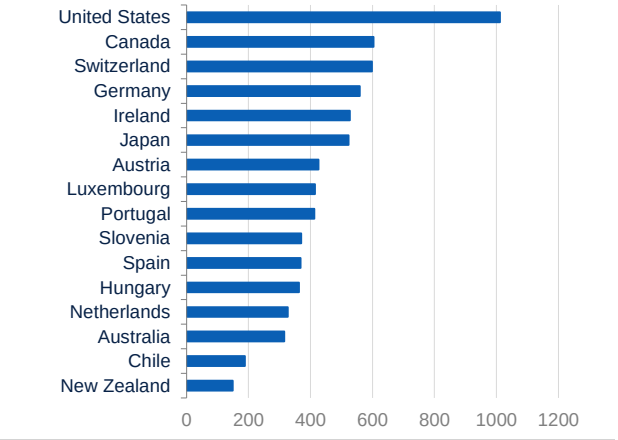
Source: BBVA Research and OECD

Figure 17. Share of retail sales of medical products of total national health expenditures (%)



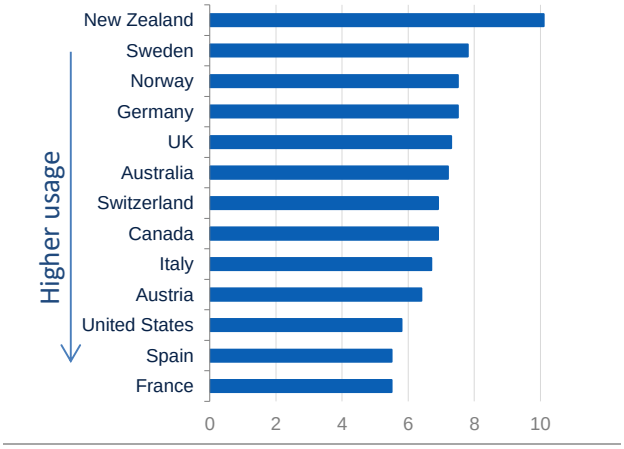
Source: BBVA Research and Centers for Medicare and Medicaid Services

Figure 18. Per capita retail pharmaceutical sales in comparable OECD countries in 2015 ($ PPP)[9]



Source: BBVA Research, OECD, and calculations based on data from the Centers for Medicare and Medicaid Services and the Census Bureau

Figure 19. Mean ranking by population adjusted usage of medicines (highest usage=1, lowest = 13)

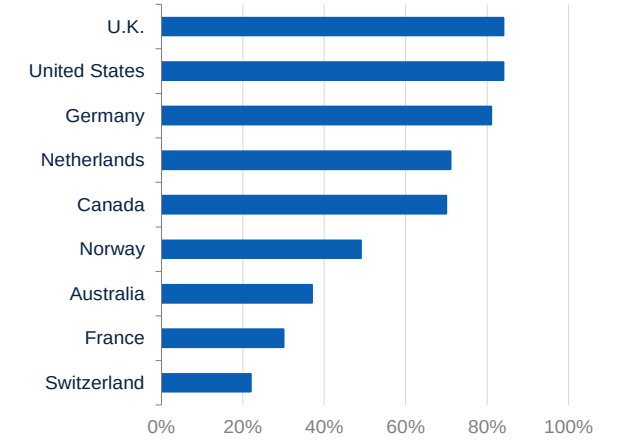


Source: BBVA Research and O'Neil and Sussex

9: For some of the countries spending includes VAT

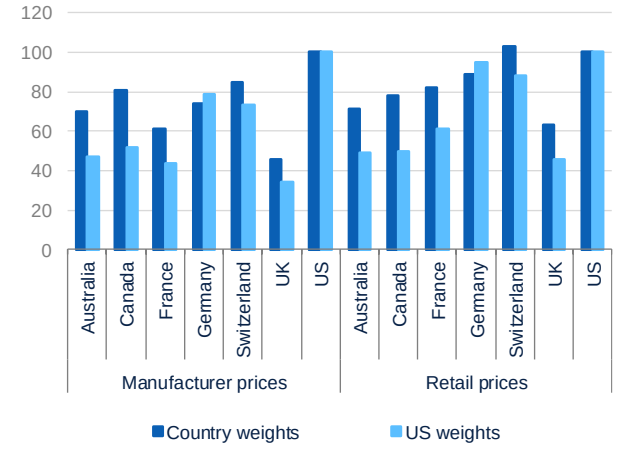
The more intensive use of newer medicines is only part of the story, though. Prices of brand-name medicines in the U.S. also tend to be higher, as calculated by Kanavos et al. (2013) using a sample of fifty one brand name drugs in use in a selection of developed countries in 2010. Direct comparisons across countries should be appropriate if conducted properly, since unlike physician services, medicines could be considered tradeable goods. When U.S. weights (volume market shares) are used, the price index for the U.S. is higher than in all other countries, regardless of whether one is looking at manufacturer or retail prices (Figure 21). In the same study, the authors find that "depending on how prices were weighted for volume across the countries, brand-name prescription drug prices were 5% to 198% higher in the United States than in the other countries" in the three study years – 2005, 2007 and 2010. A Bloomberg News analysis from 2015 looked at the monthly prices after discounts for eight top-selling drugs: Crestor, Lantus, Advair, Januvia, Sovaldi, Humira, Herceptin, and Gleevec[10]. The analysis concludes that in all cases their cost is significantly higher in the U.S. than in all other 13 countries.[11]

Figure 20. Share of generics in pharmaceutical markets (%)



Source: BBVA Research and Sarnak et al.

Figure 21. Manufacturer and retail price indexes for sample drugs In seven countries (index, U.S. = 100)



Source: BBVA Research, Kanavos et al. (2013)

Population ageing as a factor of healthcare costs

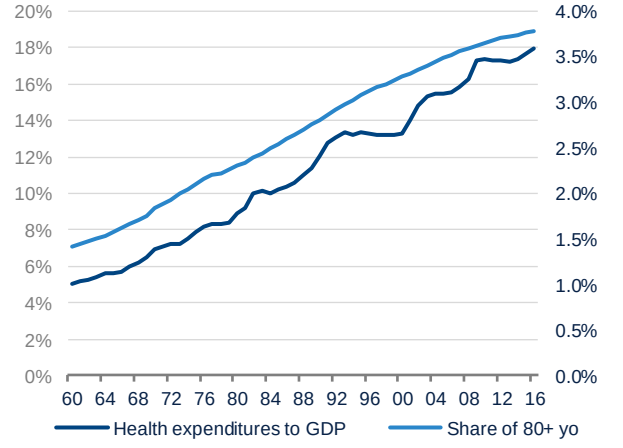
One factor contributing for the across-the-board increase in healthcare expenditure relative to GDP is the increasing share of older population (Figure 22). According to data from Dielman et al. (2016), close to 40% of personal health care spending is related to individuals aged 65 years or older, even though they only represent around 15% of total resident population. With the share of older residents projected to continue increasing, we can expect the share of healthcare expenditures to maintain an upward trend, even if deadweight losses are reduced or eliminated. Nonetheless, while ageing contributes to the increase in healthcare spending, it is not the primary factor. According to Dielman et al. (2017), service price and intensity alone account for more than 50% of the health care spending increase of $933.5bn from 1996 to 2013. This is in line with our analysis of the multiple areas where savings could be realized.

10: The discounts for Gleevec were not estimated
11: Germany, Canada, China, Japan, UK, Brazil, Saudi Arabia, Norway, France, South Africa, Morocco, Australia and India

Impact on economic growth

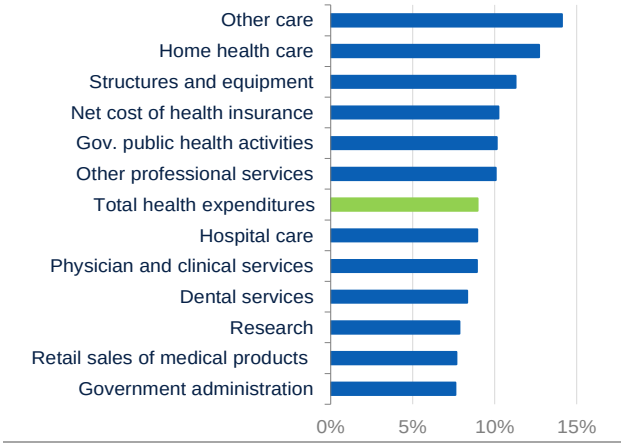
When markets fail to reach an efficient equilibrium due to monopoly pricing, artificial scarcity, ineffective or counterproductive government intervention, excess demand or any other market failure, the economy experiences an economic cost also known as deadweight loss. According to our estimates, if healthcare expenditures as a share of GDP in the U.S. were similar to Switzerland – the second highest within the OECD – the economy would save around $900bn[12]. If expenditures were similar to the OECD average, the savings would reach almost $1.5tn. A more conservative estimate, assuming that efficiency gains take time to materialize and considering differences across structural factors and market conditions, suggests that the U.S. could save around $700bn from excessive healthcare spending.

Figure 22. Health expenditures and share of 80+ year old in total resident population (%)



Source: BBVA Research, BEA, Census and Centers for Medicare and Medicaid Services

Figure 23. Compounded annual growth rate of national health expenditures, 1960-2016 (%)



Source: BBVA Research and Centers for Medicare and Medicaid Services

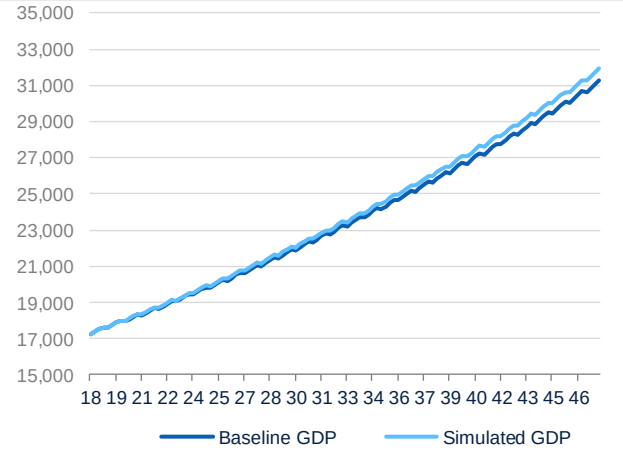
To estimate the economic impact of these potential savings, we assume that the reduction in deadweight losses is reallocated to more productive uses. The primary mechanism of how this would work is by lowering healthcare expenditures by the private sector, which allows for higher investment in productive activities. In addition, a more competitive landscape and a better regulatory framework would induce productivity-enhancing investment and new technologies across the healthcare value chain. In addition, the reallocation of human capital and improved health outcomes from a more efficient system would increase labor productivity, while higher fiscal revenues from increased output would help reduce the budget deficit or increase government investment. We estimate that the savings from lower healthcare spending could be allocated to uses that increase their contribution to growth by 70%. This is a reasonable assumption considering that significant segments of the healthcare system have negative total factor productivity. The results from our simulation suggest that potential GDP growth could increase by almost 0.1 p.p. per year. In 30 years, GDP would be 2% higher (Figure 24) and over this period the U.S. would realize a cumulated increase in total output of close to $8tn in real terms (Figure 25). These estimates have a high degree of uncertainty and thus, while the gains could be smaller, they could also be significantly higher.

12: The age structure in the two countries could contribute to the estimate of $930B also being conservative, since at 18%, the share of 65+ year old population in Switzerland's total population is higher than in the U.S (Swiss Federal Statistical Office). The ratio for the U.S. stood at 16.5% in 2016

System complexity and opacity as an opportunity for disruption

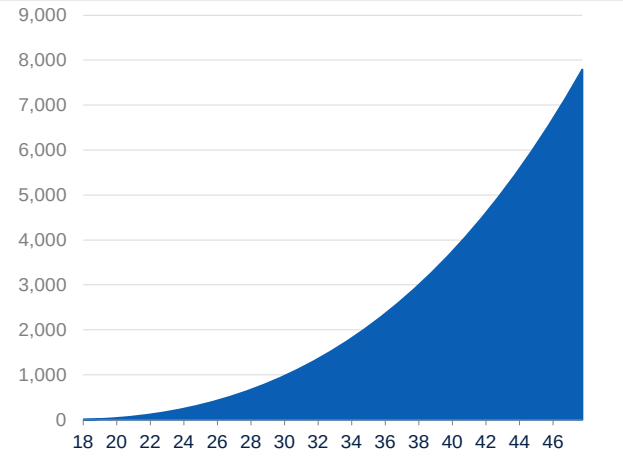
Our analysis of the different types of national healthcare expenditures identifies multiple areas where excess spending occurs. Most often the excesses are enabled by a high degree of complexity and opacity of the system, inefficient regulation and lack of competition. This makes the industry a prime candidate for disruption, assuming that regulation and government intervention is not used to keep new entrants and new business models out of the healthcare market. The increase in competition and innovation in the delivery of healthcare, especially through the use of new technologies, could help contain cost increases and eliminate part of the excess spending. If disruption occurs, the impact on the incumbents can be similar to the impact that e-commerce has had on traditional brick and mortar retailers.

Figure 24. Baseline and simulated GDP scenarios. Simulation assumes more productive allocation of resources (2009 $tn)



Source: BBVA Research

Figure 25. Cumulative increase in output over a 30-year period (2009 $bn)



Source: BBVA Research

Bottom line

The U.S. economy suffers from an overly expensive healthcare system that exhibits a high degree of complexity, opacity and regulatory barriers, resulting in elevated inefficiencies across the value chain. The result of excessive consumption, uncompetitive prices and inefficient resource allocation is a gigantic deadweight loss that makes this sector a prime candidate for disruption. The increase in competition and innovation in the delivery of healthcare, especially through the use of new technologies, could help contain cost increases. A profound structural reform of the healthcare system would increase productivity growth, potential output and the well-being of the population.

References

Anderson G. and Poullier, J. (1999). Health Spending. Access and Outcomes: Trends in Industrialized Countries. *Health Affairs*. Volume 18, Number 3.

Baker, D. (2017). The Problem of Doctors' Salaries. *CEPR*. http://cepr.net/publications/op-eds-columns/the-problem-of-doctors-salaries. Accessed March 20, 2018

Reddy, N. (2018). Surviving the Retail Apocalypse. *CB Insights.* Briefing available on demand from CB Insights. Accessed March 28, 2018

Centers for Medicare & Medicaid Services. *National health expenditure data: historical.* https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/nationalhealthexpenddata/nationalhealthaccountshistorical.html. Accessed March 2, 2018.

Conover, C (2011). *American Health Economy Illustrated.* AEI Press. http://www.aei.org/wp-content/uploads/2014/06/-american-health-economy-illustrated_145021349951.pdf. Accessed March 19, 2018.

Conover, C. (2012). Healthcare Wasn't Broken. Los Angeles Times, March 15, 2015. *LA Times*. http://articles.latimes.com/2012/mar/15/opinion/la-oe-conover-health-myths-20120315. Accessed March 19, 2018.

Cooper Z. et al. (2015). The Price Ain't Right? Hospital Prices and Health Spending on the Privately Insured. *NBER Working Paper*. https://isps.yale.edu/sites/default/files/publication/2015/12/cooper_2015_pricing_variation_manuscript_0.pdf. Accessed March 22, 2018

Cutler, D. and Ly, D. (2011). The (Paper) Work of Medicine: Understanding International Medical Costs. *Journal of Economic Perspectives* 30 (6): 1174-1187.

Danzon, P. and Furukawa M. (2003). International Prices and Availability of Pharmaceuticals In 2005. *Health Affairs.* Vol. 27, No. 1, pp. 221-233. https://www.healthaffairs.org/doi/pdf/10.1377/hlthaff.27.1.221. Accessed March 22, 2018.

Dielman et al (2016). U.S. Spending on Personal Health Care and Public Health, 1996-2013. *Journal of the American Medical Association*. 2016; 316(24):2627–2646. doi:10.1001/jama.2016.16885

Dielman et al (2017). Factors Associated With Increases in US Health Care Spending, 1996-2013. *Journal of the American Medical Association*. 2017; 318(17):1668–1678. doi:10.1001/jama.2017.15927

Eurostat (2018). Healthcare expenditure statistics. https://goo.gl/nqj3rg (accessed February 28, 2018)

Kanavos P. et al. (2013). Higher U.S. Branded Drug Prices and Spending Compared to Other Countries May Stem Partly from Quick Uptake of New Drugs. *Health Affairs*. April 2013 32(4):753–61. https://www.healthaffairs.org/doi/pdf/10.1377/hlthaff.2012.0920. Accessed March 22, 2018.

Langreth, R. et al. (December 15, 2015). The U.S. Pays a Lot More for Top Drugs Than Other Countries. *Bloomberg News*. https://www.bloomberg.com/graphics/2015-drug-prices/. Accessed on March 22, 2018

Mowery, Y. M. (2015). A primer on medical education in the United States through the lens of a current resident physician. *Annals of Translational Medicine*, *3*(18), 270. http://doi.org/10.3978/j.issn.2305-5839.2015.10.19

OECD. OECD.Stat. http://stats.oecd.org/index.aspx. Accessed March 22, 2018

O'Neill, P. and Sussex J. (2014). . International Comparison of Medicines Usage: Quantitative Analysis. Association of the British Pharmaceutical Industry. www.abpi.org.uk/our-work/library/industry/Documents/meds_usage.pdf. Accessed March 21, 2018.

Papanicolas I, Woskie L. and Jha A. (2017). Health Care Spending in the United States and Other High-Income Countries. *Journal of the American Medical Association*. 2018;319(10):1024–1039. doi:10.1001/jama.2018.1150

Physicians Foundation. (2016). *2016 Survey of America's Physicians. Practice Patterns & Perspectives.* https://physiciansfoundation.org/wp-content/uploads/2018/01/Biennial_Physician_Survey_2016.pdf. Accessed March 29, 2019

Sarnak, D. O. et al. (2017). *Paying for Prescription Drugs Around the World: Why Is the U.S. an Outlier?* The Commonwealth Fund. http://www.commonwealthfund.org/publications/issue-briefs/2017/oct/prescription-drug-costs-us-outlier. Accessed March 22, 2018

Swiss Conferedation, Federal Statistical Office. (2015). Szenarien zur Bevölkerungsentwicklung der Schweiz 2015 –2045. https://www.bfs.admin.ch/bfs/de/home/statistiken/bevoelkerung.assetdetail.350324.html. Accessed March 26, 2018

The Law Library of Congress. Medical Malpractice Liability: Germany. https://www.loc.gov/law/help/medical-malpractice-liability/germany.php. Accessed March 19, 2018.

Zavlin, D., Jubbal, K. T., Noé, J. G., & Gansbacher, B. (2017). A comparison of medical education in Germany and the United States: from applying to medical school to the beginnings of residency. *GMS German Medical Science*, 15, Doc15. http://doi.org/10.3205/000256