

Medical Spending Differences in the United States and Canada: The Role of Prices, Procedures, and Administrative Expenses

The United States far outspends Canada on health care, but the sources of additional spending are unclear. We evaluated the importance of incomes, administration, and medical interventions in this difference. Pooling various sources, we calculated medical personnel incomes, administrative expenses, and procedure volume and intensity for the United States and Canada. We found that Canada spent \$1,589 per capita less on physicians and hospitals in 2002. Administration accounted for the largest share of this difference (39%), followed by incomes (31%), and more intensive provision of medical services (14%). Whether this additional spending is wasteful or warranted is unknown.

The United States spends nearly twice as much per capita on health care as Canada: \$7,290 per person in the United States in 2007 compared with \$3,895 per person in Canada (Organisation for Economic Co-operation and Development [OECD] 2009a). This difference constitutes 19% of median household income for a household of four, \$72,695 (American Community Survey 2007). Sixty-six percent of this difference in spending is for hospitals and physicians. The rest is accounted for by government activities (10%); other professional services (9%); other institutions such as nursing homes (7%); prescription drugs (5%); and capital investment and other spending (4%) (Centers for Medicare and Medicaid Services [CMS] 2009; Canadian Institute for Health Information [CIHI] 2008). Despite this higher spending, however, U.S. health indicators continue to lag behind

those of Canada. In 2006, infant mortality was 6.7 per 1,000 live births in the United States, compared to 5.0 per 1,000 in Canada. In the same year, life expectancy at birth was 78.1 years in the United States and 80.7 years in Canada (OECD 2009a).

Some of U.S. health care spending is valuable. The United States has received a high return on investment in care for depression, heart attacks, and low birth-weight infants (Cutler 2004). At the same time, there also is evidence of wasteful spending. For example, a cross-national survey of health systems found that 14% of Americans reported that a physician had ordered a test that had already been done, compared to 5% in Canada (Schoen et al. 2007).

While we can see from national health accounts which sectors of the U.S. health care system exhibit higher spending than in

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Canada, it is unclear where this additional spending is coming from. Determining the sources of additional spending is the first step in ascertaining whether such spending is wasteful. Previous studies have examined various reasons for greater U.S. health care spending. Some studies stress administrative expenses; estimates suggest that U.S. administrative costs are 46% to 71% higher than Canada's (Aaron 2003; Woolhandler, Campbell, and Himmelstein 2003). Other studies propose that higher prices paid for services are the primary driver of greater spending (Anderson et al. 2003). Pharmaceutical costs are higher for branded drugs (Danzon 1992; Graham and Robson 2000), and physicians earn more in the United States as well (Newhouse 1992). Still other studies have examined the volume and intensity of health care services received. These studies usually focus on one condition or procedure, such as myocardial infarction (Mark et al. 1994; Rouleau et al. 1993; Tu et al. 1997), coronary artery bypass graft surgery (Eisenberg et al. 2005; Anderson et al. 1993), or hip replacement surgery (Antoniou et al. 2004). In virtually all of these settings, the United States has been found to treat patients more aggressively than Canada.

While all of these hypotheses have support in the data, analyses have focused on only one explanation at a time. Thus, the relative importance of each factor in accounting for the large difference in health care spending between the United States and Canada is not known. In this study, we considered three of the most salient arguments for why the United States spends more on health care—higher administrative costs, greater incomes for health care workers, and larger volume and intensity of medical interventions. We determined how much each explanation contributed to differences in spending between the United States and Canada. Because hospital and physician services constitute the bulk of spending differences, we focused on these two areas.

Methods

General Approach

We explored three facets of spending: medical personnel incomes, administrative costs relat-

ed to both staff and non-staff, and medical interventions. We aimed to examine a counterfactual: what the United States could be saving if it spent health care dollars like Canada. To construct this counterfactual, we multiplied U.S. spending on each item by the percentage difference in spending between the United States and Canada, which gave us dollar amounts for potential savings in each area.

Spending levels are from 2002, since that was the year that most of our data had in common. Overall spending on hospitals and physicians' offices was obtained from CMS (2009) and CIHI (2008). When per capita estimates of spending were not available, they were calculated using census population projections (Census Bureau 2000; Statistics Canada 2001a). All Canadian dollars were converted to U.S. dollars using the 2002 Purchasing Power Parity (OECD 2009b).

Incomes: Physicians and Staff

Incomes were calculated for physicians, non-physician clinical staff, and non-clinical staff in hospitals and physicians' offices. The percentage difference in income between the United States and Canada was multiplied by U.S. spending per capita on each type of health care worker to determine the savings that the United States could realize through lowering worker incomes to the level of Canada. Spending per capita was defined as the number of personnel multiplied by average income, divided by the population. In the case of physicians, it was the percentage difference in the price of generalists that was multiplied by total physician spending because we hypothesized that higher U.S. specialist prices more closely reflected the greater intensity of care rather than price.¹ For example, U.S. cardiologists have been shown to treat patients more aggressively than their Canadian counterparts (Rouleau et al. 1993). To the extent that the greater number of specialist physicians in the United States also reflects greater intensity of care, our estimates for U.S. savings will be overstated.

Because we had data on total physician employment in 2002, but not a breakdown of generalists and specialists, we used 2000 data from an American Medical Association

workforce survey on U.S. physician employment by specialty (Pasko and Seidman 2002) to calculate the ratio of generalists to specialists. To estimate the number of generalists and specialists in 2002, we multiplied these ratios by the number of physicians employed in 2002 (Bureau of Labor Statistics [BLS] and Census Bureau 2003). Data on physician income by specialty were obtained from an annual survey in *Medical Economics* (Guglielmo 2003) and were combined with employment data to obtain weighted estimates of income for generalists and specialists.

We used the Canadian Labour Force Survey (LFS) for employment data on Canadian physicians (Statistics Canada 2002). Because the LFS had substantial missing income data, we used 2000 estimates of income (Statistics Canada 2001b), which we inflated by estimated wage growth from 2000 to 2002.²

We obtained spending on non-physician staff using the Current Population Survey (CPS) (BLS and Census Bureau 2003), and the LFS, separating clinical from non-clinical staff.³ We added fringe benefits to reported income by calculating the ratio of benefits to income for various specialties in the United States, obtained from a *Medical Economics* survey on physician practice expenses (Weiss 2003). For lack of more detailed data, we assumed that this level was the same in Canada. If fringe benefits are lower in Canada, then our estimate of dollars saved on administration is understated.

Administration: Non-clinical Staff, Physician Administration, and Non-staff Spending

We defined administration as consisting of three components: the number of non-clinical staff (rather than their incomes), physician time devoted to administration, and non-staff expenditures. The percentage difference in employment or spending was multiplied by U.S. per capita spending on them to calculate the savings that the United States could realize by reducing its spending on administration to the level of Canada. Per capita spending was defined, as in the previous section, as the number of employees multi-

plied by average income, divided by population.

For non-clinical staff, we used the data from the incomes section, but instead took the percentage difference in *employment* per 1,000 population and multiplied it by U.S. spending on non-clinical staff.

We used a study by Remler, Gray, and Newhouse (2000) to determine the share of physician time devoted to administrative and insurance tasks in the United States. The survey was designed to examine whether physicians with greater exposure to managed care spent more time on administrative tasks. The data are from 1995 but were the most recent available. Since then, administrative tasks may have intensified because of the increased complexity of medical care, or decreased because of the reduced penetration of health maintenance organizations (HMOs). For Canada, we used the 2003 Physician Resource Questionnaire to determine the proportion of hours spent on similar tasks: administration and practice management (Canadian Medical Association [CMA] 2003). We multiplied U.S. physicians' administrative share by U.S. spending on physicians (computed in the incomes section) to calculate the opportunity cost of administrative tasks in the United States. We then multiplied the percentage difference in administrative shares between the United States and Canada by this opportunity cost to determine how much the United States would save if it lowered the burden of physician administration to the level of Canada.

To determine non-staff expenditures in U.S. physicians' offices, we used the *Medical Economics* survey of practice expenses, which had a breakdown of expenses by type (Weiss 2003). The number of office-based physicians was calculated using the CPS (BLS and Census Bureau 2003) and multiplied by non-staff expenditures to obtain non-staff spending in U.S. physician's offices. To calculate non-staff spending in Canadian physicians' offices, we multiplied average percentage overhead (CMA 2002) by spending in Canadian physicians' offices according to the national health accounts (CIHI 2008).

For U.S. hospitals, we calculated non-staff expenditures using the Medicare Cost Report

(CMS 2003). We defined these expenses as total non-income costs less contract labor, but could not disaggregate these costs further. For Canadian hospitals, we calculated these expenses using data broken down by expenditure type (CIHI 2005). We included drugs, medical supplies, other supplies, and sundries to most closely match the categories in U.S. hospitals.

Higher non-staff spending in U.S. hospitals may reflect greater care intensity since we include drugs and medical supplies, so potential administrative savings may be overstated. However, we hypothesized that the impact on spending of medical equipment and drugs would be higher in hospitals than in physicians' offices. Thus, to separate increased spending due to more intensive care from spending due to increased administrative costs, non-staff spending in U.S. hospitals was multiplied by the percentage difference in non-staff expenditures in physicians' offices.

Medical Interventions

We used the National Hospital Discharge Survey (NHDS) (Centers for Disease Control and Prevention [CDC] 2002) and the National Hospital Ambulatory Medical Care Survey (NHAMCS) (CDC 2003) to calculate the number of different types of procedures by diagnosis in hospitals. The diagnosis-related group (DRG) weight for each patient was included in these data sets, and was used to calculate the weighted average of DRG weight per diagnosis/procedure pair. For Canada, we obtained the number of different types of procedures by diagnosis using the Discharge Abstract Database (DAD) (CIHI 2002–03), which contains data from all provinces except Quebec. Using a crosswalk provided by CIHI, we converted the NHDS and NHAMCS' *International Classification of Diseases, ninth revision*, (ICD-9-CM) codes to the DAD's ICD-10 codes. Because Canada does not use the DRG system, we assumed the DRG weight for each diagnosis/procedure pair would be the same in Canada.

With these calculations on the average DRG weight per diagnosis/procedure pair, we were able to compute the average DRG weight per capita (weighted by the number of

diagnoses). We multiplied the percentage difference in DRG weight per capita by total spending in hospitals and total spending in specialist physicians' offices (again, assuming that spending on specialists reflects care intensity more than price). We determined what share of greater intensity was due to higher volume by holding constant the number of diagnoses in the United States but reducing DRG weight per diagnosis to the level of Canada; similarly, we determined what share of greater intensity was due to greater severity by holding constant U.S. DRG weight per diagnosis and reducing the number of diagnoses to the level of Canada.

Results

In 2002, the United States spent \$1,697 per capita on hospital care and \$1,173 per capita on physician services, while Canada spent \$891 per capita on hospital care and \$390 per capita on physician services. Therefore, the difference in spending between the United States and Canada was \$1,589 for hospital and physician services combined.

Incomes

Results of income differences are reported in Table 1. Generalist physicians earned \$154,573 on average in the United States and \$97,396 in Canada, a 37% difference. Specialists earned \$265,257 in the United States compared to \$124,194 in Canada. With 1.17 generalists and 1.28 specialists per 1,000 population in the United States and 1.17 generalists and .83 specialists in Canada, the weighted average income was \$212,379 for U.S. physicians and \$107,041 for Canadian physicians. Therefore, physician incomes cost \$521 per capita in the United States and \$214 per capita in Canada. The United States would save \$193 ($37\% \times \521) per capita—12% of the total difference in spending— if it lowered physician salaries to the level of Canada.

There were 16.17 clinical workers per 1,000 population in the United States compared to 12.33 in Canada. Their average income was \$52,101 in the United States and \$45,429 in Canada, a 13% difference. Spending on clinical workers was therefore \$842 per capita in the United States and \$560 per capita in

Table 1. Comparison of earnings in the United States and Canada

	U.S.	Canada ^a	Difference	%
Physician incomes				
Generalist	\$154,573	\$97,396	\$57,177	37
Specialist	\$265,257	\$124,194	\$141,063	53
All physicians	\$212,379	\$107,041	\$105,338	50
Physicians/1,000 population	2.46	2.00	.46	19
Spending per capita ^b	\$521	\$214	\$307	59
Per capita savings from lower incomes	\$193			
Clinical staff				
Average annual income	\$52,101	\$45,429	\$6,672	13
Staff/1,000 population	16.17	12.33	3.84	24
Spending per capita ^b	\$842	\$560	\$282	34
Per capita savings from lower incomes	\$109			
Non-clinical staff				
Average annual income	\$48,853	\$35,524	\$13,329	27
Staff/1,000 population	14.24	7.98	6.26	44
Spending per capita ^b	\$696	\$283	\$412	59
Per capita savings from lower incomes	\$188			
Effect of income differences^c	\$490			

^a Adjusted to U.S. dollars using the 2002 Purchasing Power Parity.

^b Income multiplied by staff/1,000 divided by 1,000.

^c Combined savings from physicians and staff.

Canada. Savings from clinical staff would constitute \$109 per capita (13% * \$842), or 7% of the total difference in spending.

In the United States, there were 14.24 non-clinical workers per 1,000 population with an average income of \$48,853, compared to 7.98 non-clinical workers per 1,000 in Canada with an average income of \$35,524—27% lower than in the United States. Spending on non-clinical workers was \$696 per capita in the United States and \$283 per capita in Canada. Savings from the price (as opposed to the volume) of non-clinical staff would be \$188 per capita (27% * \$696), or 12% of the total difference in spending.

All together, incomes accounted for 31% of the difference in spending, or \$490 per capita.

Administration

Results of administrative costs are presented in Table 2. Calculations for non-clinical staff were discussed earlier. There were 44% fewer non-clinical workers per 1,000 population in Canada than in the United States. Therefore, the United States would realize \$306 per capita (44% * \$696) in savings—or 19% of the total difference in spending—if it were to

reduce the volume of non-clinical staff to the level of Canada.

In the United States, physicians spent about 13% of their time on administrative tasks, while Canadian physicians spent 8% of their time on such tasks—41% less. As discussed in the previous section, spending on physicians was \$521 per capita in the United States, so the opportunity cost of administration for physicians was \$70.25 (13% * \$521); therefore savings from reduced physician administration accounted for \$29 per capita (41% * \$70.25), 2% of the difference in spending.

Non-staff spending was \$158 per capita in U.S. physicians' offices and \$966 per capita in U.S. hospitals (with the total equal to \$158 + \$966 = \$1,124 per capita). In Canada, non-staff spending was \$119 per capita in medical offices (25% less) and \$229 per capita in hospitals. Therefore the savings from non-staff expenditures constituted \$281 per capita (25% * \$1,124), or 18% of the total spending difference.

Together, hospital and medical office administration accounted for \$616 per capita, or 39% of the total spending difference.

Table 2. Comparison of administrative costs in the United States and Canada

	U.S.	Canada ^a	Difference	%
Non-clinical staff				
Average annual income	\$48,853	\$35,524	\$13,329	27
Staff/1,000 population	14.24	7.98	6.26	44
Spending per capita ^b	\$696	\$283	\$412	59
Per capita savings from fewer staff	\$306			
Physician administration				
Share of physician time devoted to administration	.13	.08	.06	41
Spending per capita on physicians ^b	\$521	\$214	\$307	59
Opportunity cost of administrative share ^c	\$70.25	\$17	\$53.25	76
Per capita savings from lower administrative share	\$29			
Non-staff expenditures				
Non-staff spending in physicians' offices per capita	\$158	\$119	\$39	25
Non-staff spending in hospitals per capita	\$966	\$229	\$737	76
Total non-staff spending per capita	\$1,124	\$348	\$776	69
Per capita savings from lower non-staff expenditures	\$281			
Total administrative savings	\$616			

^a Adjusted to U.S. dollars using the 2002 Purchasing Power Parity.

^b Income multiplied by staff/1,000 divided by 1,000.

^c Administrative share multiplied by spending per capita.

Medical Interventions: Volume and Intensity

The average DRG weight per capita was .1612 in the United States and .1429 in Canada, a difference of 11% (Table 3). As presented in the beginning of the section, \$1,697 was spent on U.S. hospitals, so the United States would save \$187 (11% * \$1,697), or 12% of the total spending difference, if it reduced the intensity and volume of hospital procedures to the level of Canada. We found that two percentage points of the 11% difference in DRG weight per capita were due to a higher volume of

patients, while nine percentage points were due to greater DRG weights per diagnosis.

Because we assumed that spending on specialist physicians more greatly reflected procedures than prices, we also multiplied the 11% difference in DRG weight per capita by spending on specialist physicians, \$340, to obtain savings of \$37 per capita, or 2% of the overall spending difference.

Together, the savings from care received would be \$224 per capita, or 14% of the difference in spending. Incomes, administration, and medical interventions therefore accounted for 84% (31% + 39% + 14%) of the difference in

Table 3. Impact of procedure use on spending differentials

	U.S.	Canada ^a	Difference	%
Total hospital spending per capita	\$1,697	\$891	\$806	47
Total specialist spending per capita	\$340	\$103	\$236	70
Average DRG weight per capita	.16	.14	.02	11
Diagnoses per capita	.141	.138	.003	2
Average DRG weight per diagnosis	1.142	1.032	.11	10
Savings from lower DRG weight per capita	\$224			

^a Adjusted to U.S. dollars using the 2002 Purchasing Power Parity.

Table 4. Summary of results in spending differences between the United States and Canada

	Dollars saved per capita	Percent of total difference
Total difference	1,589	100
Incomes		
Physicians	193	12
Clinical staff	109	7
Non-clinical staff	188	12
Total savings on prices	490	31
Administration		
Non-clinical staff	306	19
Physician time	29	2
Other expenses	281	18
Total savings on administration	616	39
Care received		
Inpatient and outpatient hospital care	187	12
Specialist physician spending	37	2
Total savings on care received	224	14
Total dollars saved	1,330	84

spending between the United States and Canada, or \$1,330 per capita. A summary of these results is presented in Table 4.

Discussion

The United States is often criticized for its large expenditures on health care, but the source of this greater spending has not been fully identified. There are three conflicting explanations in the literature. The first is administrative inefficiency: the United States spends more because of its fragmented insurance and delivery system (Woolhandler, Campbell, and Himmelstein 2003). The second explanation is that people earn more for providing the same services in the United States, as emphasized in the memorable title of one article, “It’s the Prices, Stupid” (Anderson et al. 2003). Finally, some studies stress the additional care received in the United States (Mark et al. 1994). Clearly,

only one of these explanations can constitute the largest source of spending. Our analysis considered the relative magnitude of each. We found that the difference in spending in U.S. and Canadian hospitals and physicians’ offices was most greatly attributable to administrative costs (39%), followed by staff prices (31%), and greater volume and intensity of care received (14%). Together, these explanations accounted for 84% of the \$1,589 cost differential. While it was beyond the scope of this study to determine whether the additional spending in the United States was warranted, we took the first step in answering this question by determining the major contributors to higher spending and disentangling them from one another. Future research can look to each source to further differentiate wasteful from useful spending.

Our analysis yielded similar results to previous literature. For example, a study by Woolhandler, Campbell, and Himmelstein (2003) found that Canada spent 67% less on hospital and practitioner administration in 1999, while this paper found that Canada spent 66% less in 2002 $[(\$412+\$53.25+\$776)/(\$696+\$70.25+\$1,124)]$. These similar results hold even though the methods used to achieve them were slightly different. For example, Woolhandler, Campbell, and Himmelstein included in their calculations the opportunity cost of non-physician clinical staff time spent on administration, while we only accounted for physician time; they also excluded some categories of non-staff expenditures that we used in this paper.

The main limitation of this study is its inability to perfectly differentiate prices, administrative costs, and medical interventions. For example, if generalist physicians in the United States earn more because they perform more procedures for which they are reimbursed, and not because their fees are higher, then we may have overestimated the impact of prices on spending. Another unknown is how much non-staff spending is associated with administration, and how much reflects greater intensity of care. We assumed that such spending in physicians’ offices was entirely the result of greater administrative expense. Given the increasing number of procedures performed on an

outpatient basis, however, this assumption may be an overstatement. We cannot quantify either of these possibilities because we do not have data on the volume and intensity of procedures performed in physicians' offices.

On the other hand, our inability to perfectly differentiate sources of spending may have understated some costs. For example, because we multiplied the percentage difference in generalist prices by total spending on physicians, we may also have understated price differences in specialists that were not attributable to care intensity alone. The same argument applies to our treatment of non-staff costs, where the percentage difference in physicians' offices was multiplied by administrative spending, which may have understated non-staff costs in hospitals that were not due to care intensity. These understated costs may help account for the 16% of spending that we do not explain. The missing costs also may come from expenses such as contract labor in hospitals, which we could not capture in our analysis.

We look only at hospitals and physicians' offices and ignore other areas where prices, administrative costs, or clinical intensity may have a substantial impact, such as prescription drugs (prices) and the health insurance industry (administrative costs). In the paper by Woolhandler, Campbell, and Himmelstein (2003), the authors conducted a separate analysis of health insurance overhead and found that Canada spent 82% less on this area of administration.

Using purchasing power parity as a price adjuster could be problematic. In the United States, a bundle of consumer goods includes much more medical care, whereas medical care in Canada is financed by taxes. In this case, U.S. prices could be inflated. This problem was partially offset by our equal treatment of fringe benefits across countries.

An additional concern is that the intensity of medical care is not accounted for in the same way in the United States as in Canada. Since Canada does not use DRG weights to pay hospitals, we had to assume that the DRG weight for each diagnosis/procedure pair was the same in the United States as in Canada. However, because Canadians have

been found to have lower levels of disability (Pozen and Cutler 2009), their DRG weights may be overstated, so the U.S.-Canada difference may be understated.

That cost savings can be realized does not necessarily mean that these savings are desirable. Paying more for the same service seems wasteful. However, in both the United States and Canada, physicians are rivaled in pay only by senior managers and chief executive officers (Statistics Canada 2001b; BLS 2000). If the supply of physicians depends on the comparability of their incomes to the incomes of other highly trained people, physician incomes in the United States may not be so excessive compared to Canada.

Further, defining administration is crucial to separating wasteful spending from non-wasteful spending. Canadian spending on administration may be lower because it has more streamlined payments to providers through its single-payer system, or it may be because rent is lower and equipment is cheaper than in the United States. While complex payments may be considered wasteful, higher office overhead may not. A close analysis of non-staff expenditures must be performed to answer this question. Data from the United States showed that malpractice insurance, office space, and utilities were the largest components of administrative spending. Equipment rental and maintenance were somewhat less important, and automobiles, continuing medical education, and laboratory expenses were relatively low (Weiss 2003). However, non-staff expenditures in Canada were not broken out the same way that they were in the United States, so these expenditures could not be compared.

We found that DRG weight per capita was higher in the United States predominantly because of more intensive interventions. A central question is whether this greater intensity is justified clinically. This question has not yet been resolved. For example, studies in cardiac care have shown that although the United States treats patients more aggressively than Canada, outcomes are sometimes better in the United States (Kaul et al. 2004) and other times better in Canada (O'Hara et al. 2005).

In sum, we found that administrative costs accounted for the greatest proportion of spending differences between the United States and Canada, followed by

prices and medical care provision. Further research must be done to determine whether the additional U.S. expenditures are wasteful.

Notes

The authors are grateful to Adam Block and Jean Roth for assistance with the data.

- 1 Generalists were defined as family practitioners, general practitioners, internists, obstetricians/gynecologists (OBGYNs), pediatricians, family practice subspecialties, and internal medicine subspecialties. Specialists were defined as being in these fields: invasive and noninvasive cardiology, gastroenterology, general surgery, orthopedic surgery, allergy and immunology, dermatology, epidemiology, pediatric allergy, pediatric cardiology, other pediatric subspecialties, pulmonary diseases, colon/rectal surgery, neurological surgery, ophthalmology, otolaryngology, plastic surgery, thoracic surgery, urology, aerospace medicine, anesthesiology, child psychiatry, diagnostic radiology, general preventive medicine, medical genetics, neurology, nuclear medicine, occupational medicine, pathology and forensic pathology, physical medicine and rehabilitation, psychiatry, public health, radiology, and radiation oncology.
- 2 Because of limited data, we obtained the wage growth from 2000 to 2002 in a roundabout way. We had information on specialist and generalist physicians' wage growth from 2000 to 2005 from Statistics Canada. We then estimated what proportion of this growth was accounted for by growth between 2000 and 2002 by looking at national health care spending. The growth rate of annual spending was 17% from 2000 to 2002 and 23% from 2002 to 2005. Therefore 43% of the growth rate from 2000 to 2005 could be attributed to growth from 2000 to 2002. We multiplied this percentage by the growth rate in income for Canadian physicians between 2000 and 2005 to obtain an estimated 2000 to 2002 growth rate, which was 8% for specialists and 3% for generalists. We then increased 2000 salaries by this amount, as well as by the inflation rate from 2000 to 2002 (4.99%).

- 3 We defined clinical workers in the United States as: dietitians and nutritionists, pharmacists, physician assistants, registered nurses, audiologists, occupational therapists, physical therapists, radiation therapists, recreational therapists, respiratory therapists, speech-language pathologists, therapists (all other), health diagnosing and treating practitioners (all other), clinical laboratory technologists and technicians, diagnostic-related technologists and technicians, emergency medical technicians and paramedics, health diagnosing and treating practitioner support technicians, licensed practical and licensed vocational nurses, medical records and health information technicians, dispensing opticians, miscellaneous health technologists and technicians, other health care practitioners and technical occupations, nursing, psychiatric, and home health aides, occupational therapist assistants and aides, physical therapist assistants and aides, massage therapists, and medical assistants and other health care support occupations. Non-clinical workers were defined as all others.

We defined clinical workers in Canada as: pharmacists, dietitians, nutritionists, therapy and assessment professionals, nurse supervisors, registered nurses, medical technologists and technicians, registered nursing assistants, ambulance attendants and other paramedical occupations, other technical occupations in therapy and assessment, and assisting occupations in support of health services. Non-clinical staff included management occupations, business, finance, and administration occupations, natural and applied sciences and related occupations, social science, education, government service, and religion, sales and service occupations, trades, transport and equipment operators and related occupations, and occupations unique to processing manufacturing, and utilities.

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