



Significant Changes in the Factors Driving Medical Severity 1996–2001 vs. 2001–2006

An Update to *Measuring the Factors Driving Medical Severity: Price, Utilization, Mix*

Introduction

A previous study published in January 2007¹ examined the significant increase in medical severity over the period 1996/97 to 2001/02. A simple “model” of claim costs was used to identify and quantify the factors that explained that overall increase. The model of claim costs is defined as follows:

$$\text{Cost} = \text{Price} \times \text{Utilization},$$

where utilization consists of both quantity and mix. We examined the impacts of:

- Mix—Differences in diagnosis mix
- Quantity—Differences in the average number of treatments per claim
- Price—Differences in the average price of treatments

Key findings from that study were:

- The primary driver of the increase in medical severity was utilization, as measured by increases in the number of treatments per claim after accounting for the shift to more severe injuries
- This shift toward relatively more severe injuries accounted for a modest portion of the increase in medical severity
- The estimated impact of price was consistent with changes in the medical Consumer Price Index

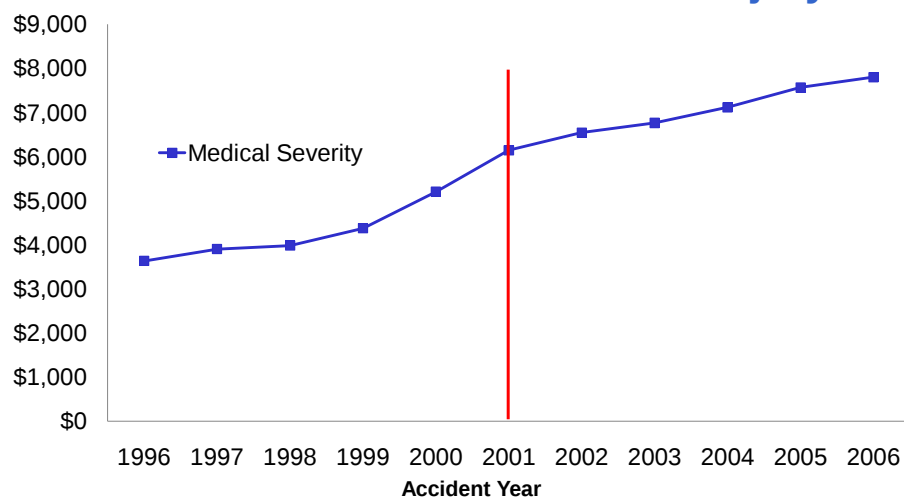
This is an update to that study, using more current data and extending the time frame through 2006.² As before, the calculations are based on lost-time claims closed within 24 months of date of injury for NCCI states. Exhibit 1 contains a graph of paid medical severity from Accident Years 1996 to 2006. Since there seems to be a shift in the increase in medical severity in 2001, this update splits the analysis into two time periods and compares the results for 1996/97 to 2000/01 with the results for 2001/02 to 2005/06.³

¹ See *Measuring the Factors Driving Medical Severity: Price, Utilization, Mix* on ncci.com.

² This study is based on data licensed to NCCI by insurers for purposes of this study for the 11 accident years from 1996–2006.

³ In this report, averages of the start and end periods are used. For example, 1996/97 refers to an average of 1996 and 1997. The accident year period 1996/97 includes data on claims for injuries that occurred from January 1, 1996 to December 31, 1997.

Medical Severity for Lost-Time Claims Closed Within 24 Months of Date of Injury



Lost-Time Claims Closed Within 24 Months of Date of Injury, NCCI States
Source: NCCI

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Exhibit 1

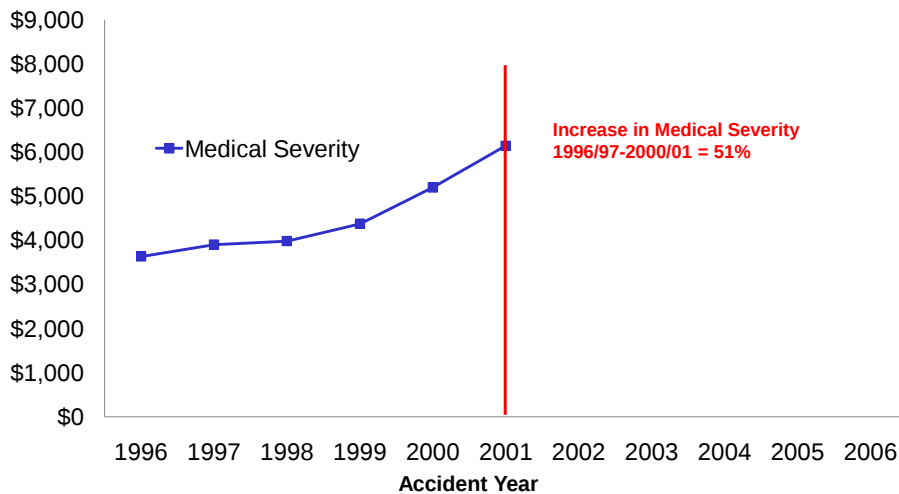
Key Findings

- The increase in medical severity was significantly less in the most recent period (21% vs. 51%).
- There are significant differences in the drivers of medical severity between the two time periods.
- Changes in “quantity,” as measured by treatments per claim after accounting for the shift to more severe injuries, were the primary driver of the increase in severity in the first period. However, the impact of this component of utilization diminished significantly in the second period as the number of treatments per claim remained steady. In fact, the leveling off in utilization accounts for nearly the entire observed decline in medical severity growth between the two periods.
- Changes in price after controlling for the change in the mix of injuries are the primary driver in the second period.
- Changes in diagnosis mix account for a small share of the increase in both periods due to the continued relative shift from less severe to more severe injuries.

Examining the Factors Driving Medical Severity 1996/97–2000/01

Exhibit 2 shows that from 1996/97 to 2000/01, paid medical severity for lost-time claims closed within 24 months of date of injury increased by 51%.⁴ As in the previous study, that 51% increase will be broken down into its components using the simple model of claim costs described above.

Medical Severity for Lost-Time Claims Closed Within 24 Months of Date of Injury



Lost-Time Claims Closed Within 24 Months of Date of Injury, NCCI States
Source: NCCI

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Exhibit 2

⁴ The 51% increase is calculated from the average severity for 1996 and 1997 to the average severity for 2000 and 2001. Severity was \$3,633 in 1996 and \$3,899 in 1997 for an average of \$3,766 for 1996/97. In 2000, severity was \$5,202, and in 2001 it was \$6,143 for an average of \$5,672 ($\$5,672 / \$3,766 = 51\%$ increase).

The first step is to control for the change in the mix of injuries. Exhibit 3 shows that, of the 51% increase in paid medical severity, 9%—or almost a fifth (a 19% share)—can be attributed to the shift to more severe injuries from 1996/97 to 2000/01.⁵

Share of Medical Severity Increase Due to Mix, Quantity, and Price

**Paid Medical Severities on Lost-Time Claims Closed
Within 24 Months of Date of Injury**

	1996/97-2000/01		2001/02-2005/06	
Total	51%	100%		
Share Due to Diagnosis Mix	9%	19%		
Share Due to Number of Treatments				
Share Due to Price and Other Factors				

Source: NCCI
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Exhibit 3

⁵ The contribution of the change in injury mix is estimated by calculating what severity would have been in 2000/01 if the mix of injuries was the same as in 1996/97 and what severity would have been in 1996/97 if the mix of injuries was the same as in 2000/01. When holding mix constant, severity increased by 41%. Therefore, the 9% due to changes in diagnosis mix is calculated by subtracting the 41% increase in severity, after controlling for changes in mix, from the 51% increase, without controlling for change in mix. The result is 9% instead of 10% due to rounding.

Exhibit 4 illustrates this shift to more severe injuries. It contains the top 10 diagnoses in terms of the number of claims. The left column contains the top 10 injury diagnoses in 1996/97 while the right column contains the top 10 injury diagnoses in 2000/01. Eight of the top 10 remained the same between the two time periods, but two changed (highlighted in red). Sprain of lumbosacral and sprain of neck were in the top 10 in 1996/97, but were replaced by tear of medial cartilage/meniscus of knee and sprain of rotator cuff in 2000/01. As shown by the severity index,⁶ the two that dropped out of the top 10 were diagnoses with below-average severity (severity indexes of 0.36 and 0.57, respectively) and they were replaced with two injuries with above-average severity (1.73 and 2.20, respectively).⁷ This shift to a more severe mix of injuries contributed to about a fifth of the increase in medical severity from 1996/97 to 2000/01.

Changes in the Mix of Diagnoses

Top 10 Claim Diagnoses by Accident Year for Lost-Time Claims That Closed Within 24 Months of Date of Injury

Accident Years 1996/1997			Accident Years 2000/2001		
Diagnosis and Severity Index			Diagnosis and Severity Index		
1	Sprain Lumbar Region	0.45	Sprain Lumbar Region	0.42	
2	Carpal Tunnel Syndrome	1.41	Carpal Tunnel Syndrome	1.25	
3	Lower Leg Injury, not otherwise specified	0.91	Lower Leg Injury, not otherwise specified	0.79	
4	Unilateral Inguinal Hernia	1.16	Unilateral Inguinal Hernia	0.90	
5	Sprain Lumbosacral	0.36	Tear Medial Cartilage/Meniscus of Knee	1.73	
6	Lumbar Disc Displacement	1.98	Cervicalgia	1.25	
7	Cervicalgia	1.33	Lumbar Disc Displacement	2.01	
8	Sprain of Ankle, not otherwise specified	0.24	Sprain Rotator Cuff	2.20	
9	Sprain of Neck	0.57	Lumbago	0.63	
10	Lumbago	0.60	Sprain of Ankle, not otherwise specified	0.26	

The severity index is the ratio of paid medical severity for that diagnosis to overall average paid medical severity. Source: NCCI
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Exhibit 4

⁶ The severity index is the ratio of paid medical severity for that diagnosis to average paid medical severity for all claims.

⁷ This shift could well reflect the aging of the workforce since higher cost claims involving rotator cuff sprains and tears of knee cartilage tend to be more common with older workers. See *Thinking About an Aging Workforce—Potential Impact on Workers Compensation*, published in May 2005, and *Age as a Driver of Frequency and Severity*, published in December 2006 on ncci.com.

The next piece is the portion due to changes in the average number of treatments per claim, the quantity portion of utilization. Exhibit 5 shows that after accounting for the shift to more severe injuries, 32%, or a 62% share of the 51% increase in medical severity from 1996/97 to 2000/01, can be attributed to an increase in the number of treatments per claim.⁸ Exhibit 6 illustrates the increase from an average of 37 treatments per claim in 1996 to an average of 56 treatments per claim in 2001.⁹ During the 1996/97 to 2000/01 period, this increase in utilization is the key driver of the increase in medical severity.

Share of Medical Severity Increase Due to Mix, Quantity, and Price

**Paid Medical Severities on Lost-Time Claims Closed
Within 24 Months of Date of Injury**

	1996/97-2000/01		2001/02-2005/06	
Total	51%	100%		
Share Due to Diagnosis Mix	9%	19%		
Share Due to Number of Treatments	32%	62%		
Share Due to Price and Other Factors				

Source: NCCI
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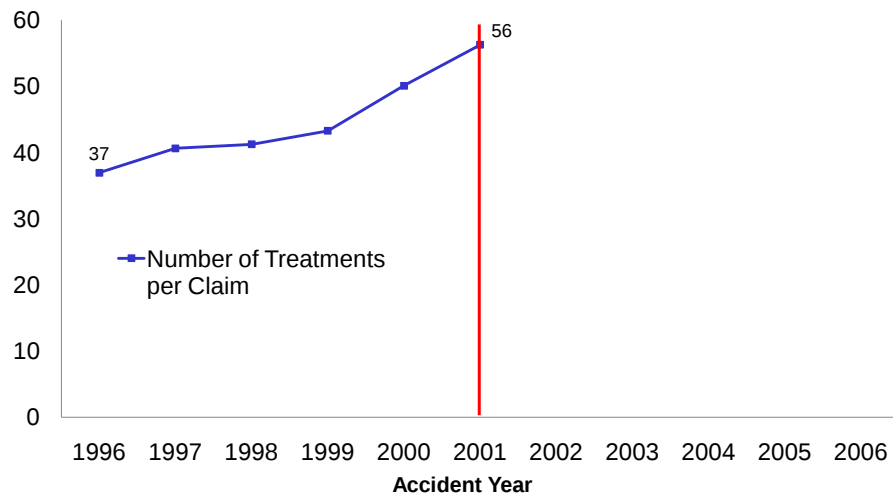


Exhibit 5

⁸ The portion due to the change in the number of treatments and the change in price is calculated using the average number of treatments per claim and the average cost per treatment after controlling for the change in diagnosis mix. The increase in severity after controlling for diagnosis mix is allocated using the formula: (change in price times quantity) plus (change in quantity times price) plus (change in price times change in quantity) where price is the average cost per treatment and quantity is the number of treatments per claim. The portion due to the change in price times the change in quantity is then allocated to the individual pieces (price and quantity) based on the shares of each. The calculation is done two ways (ending period minus beginning period and beginning period minus ending period) and the final result is the geometric average of the two.

⁹ Exhibit 6 is meant to illustrate the trend in the number of treatments per claim, but does not control for the change in diagnosis mix. The 32% increase in severity due to the change in the number of treatments per claim in Exhibit 5 is after controlling for the change in diagnosis mix. See the previous footnote for more details on that calculation.

Utilization—Treatments per Claim



Lost-Time Claims Closed Within 24 Months of Date of Injury, NCCI States
Source: NCCI

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Exhibit 6

Finally, Exhibit 7 shows that 10%, or about a fifth of the increase, can be attributed to changes in the average cost per treatment. Technically, this reflects not only actual changes in prices charged but also factors such as the change in the mix of treatments, which arguably could also be termed changes in “utilization.” Quantifying these separate components is beyond the scope of this project.¹⁰ The 10% increase compares with changes in the medical consumer price index, which increased by 15% over this period.

Share of Medical Severity Increase Due to Mix, Quantity, and Price

**Paid Medical Severities on Lost-Time Claims Closed
Within 24 Months of Date of Injury**

	1996/97-2000/01		2001/02-2005/06	
Total	51%	100%		
Share Due to Diagnosis Mix	9%	19%		
Share Due to Number of Treatments	32%	62%		
Share Due to Price and Other Factors	10%	19%		

Source: NCCI
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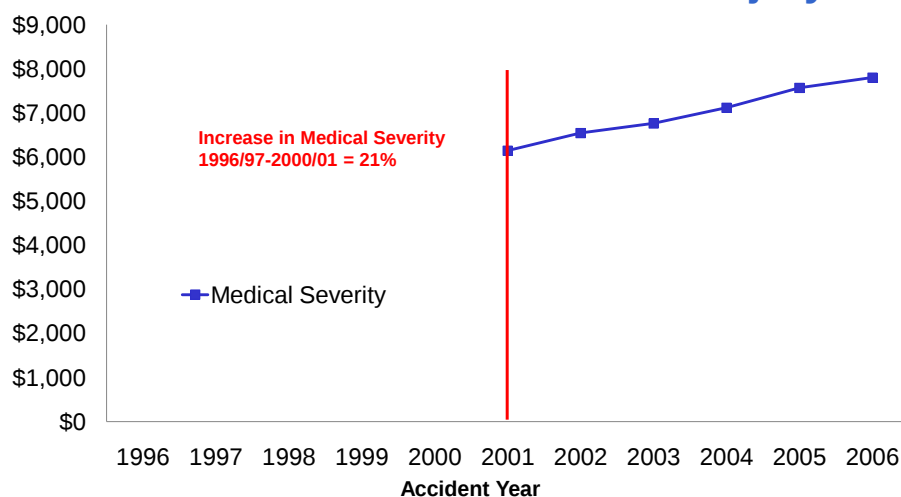
Exhibit 7

¹⁰ Computing stand-alone price indexes is a highly technical exercise that must deal not only with the changes in prices for individual items but also with differences in the mix of items in the market basket between points in time or between, for example, two states at the same point in time. Changes in quality also are a complicating factor; for example, it has been reported that there was a marked improvement in surgical techniques for shoulder injuries between the mid-1990s and the early 2000s. As a result, the data indicates that there was a material increase over this period in the share of shoulder injuries receiving complex surgery. This was associated with more and higher cost treatments for claims with a shoulder injury. This suggests that the average cost per treatment for shoulder injuries increased but the patient likely received better treatment.

Examining the Factors Driving Medical Severity 2001/02–2005/06

Exhibit 8 shows that from 2001/02 to 2005/06, paid medical severity for lost-time claims closed within 24 months of date of injury increased by 21%. As noted earlier, this is a much smaller increase compared to the 51% increase of the prior period. Exhibit 9 shows the portions of the 21% increase due to diagnosis mix, changes in treatments per claim, and price and other factors.

Medical Severity for Lost-Time Claims Closed Within 24 Months of Date of Injury



Lost-Time Claims Closed Within 24 Months of Date of Injury, NCCI States
Source: NCCI

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Exhibit 8

Share of Medical Severity Increase Due to Mix, Quantity, and Price

Paid Medical Severities on Lost-Time Claims Closed Within 24 Months of Date of Injury

	1996/97-2000/01		2001/02-2005/06	
	51%	100%	21%	100%
Total	51%	100%	21%	100%
Share Due to Diagnosis Mix	9%	19%	3%	13%
Share Due to Number of Treatments	32%	62%	-2%	-11%
Share Due to Price and Other Factors	10%	19%	21%	98%

Source: NCCI
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Exhibit 9

The shift to more severe injuries continues to account for a portion of the increase in medical severity from 2001/02–2005/06, contributing 3%, or 13% of the increase. This compares to a 19% share due to changes in the mix of injuries in the earlier period. Exhibit 10 is similar to Exhibit 4, but shows the top 10 diagnosis codes in terms of the number of claims for 2001/02 on the left side and 2005/06 on the right. Over this period, nine of the top 10 remained the same, but the relative shift to more severe injuries continued. For example, sprain of ankle, a below-average severity injury with a severity index of 0.25, dropped out of the top 10 and was replaced by rotator cuff syndrome, an above-average severity injury with a severity index of 1.81.

Changes in the Mix of Diagnoses

Top 10 Claim Diagnoses by Accident Year for Lost-Time Claims That Closed Within 24 Months of Date of Injury

Accident Years 2001/2002			Accident Years 2005/2006		
Diagnosis and Severity Index			Diagnosis and Severity Index		
1	Sprain Lumbar Region	0.41	Sprain Lumbar Region		0.33
2	Carpal Tunnel Syndrome	1.19	Carpal Tunnel Syndrome		1.12
3	Unilateral Inguinal Hernia	0.86	Tear Medial Cartilage/Meniscus of Knee		1.48
4	Lower Leg Injury, not otherwise specified	0.77	Unilateral Inguinal Hernia		0.85
5	Tear Medial Cartilage/Meniscus of Knee	1.66	Lower Leg Injury, not otherwise specified		0.81
6	Cervicalgia	1.20	Cervicalgia		1.15
7	Lumbar Disc Displacement	1.95	Sprain Rotator Cuff		2.15
8	Sprain Rotator Cuff	2.18	Lumbar Disc Displacement		1.70
9	Lumbago	0.59	Rotator Cuff Syndrome, not otherwise specified		1.81
10	Sprain of Ankle, not otherwise specified	0.25	Lumbago		0.59

The severity index is the ratio of paid medical severity for that diagnosis to overall average paid medical severity. Source: NCCI

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Exhibit 10

A significant difference in the drivers of the increase in medical severity between the earlier and later periods is the impact of the change in the number of treatments per claim. This was the key driver of the increase in medical severity from 1996/97 to 2000/01, but from 2001/02 to 2005/06 the change in the number of treatments per claim after accounting for the shift to more severe injuries is actually putting downward pressure on the increase in severity, as seen in Exhibit 9.

Exhibit 11¹¹ illustrates that after increasing significantly from 1996 to 2001, the number of treatments per claim remained fairly stable to down slightly over the 2001 to 2006 period.¹²

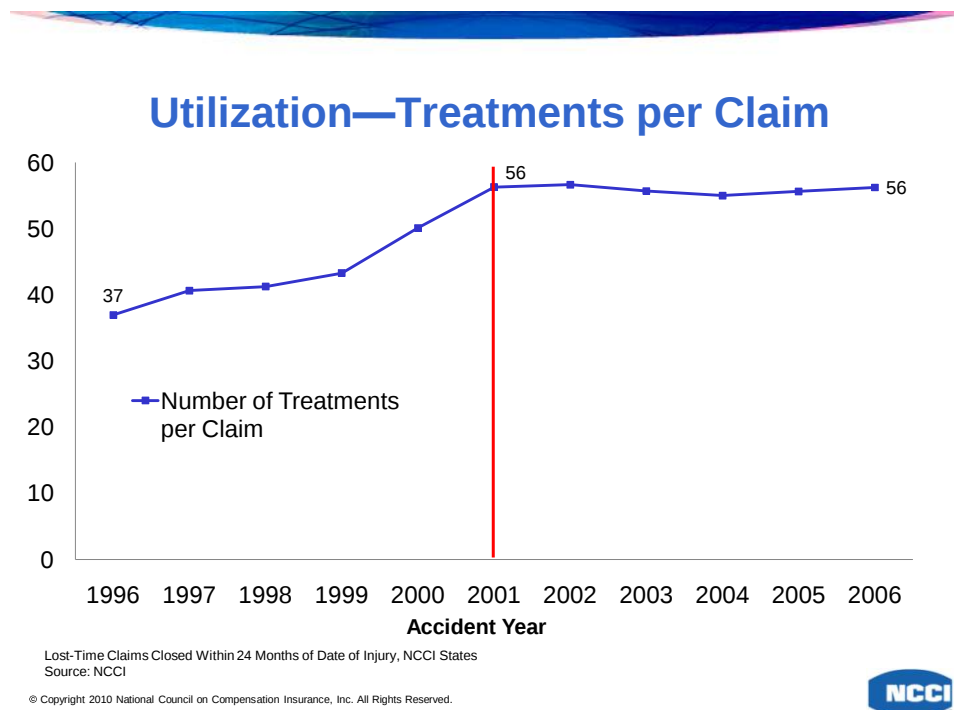


Exhibit 11

Finally, over the 2001/02 to 2005/06 period, the primary driver of the change in paid medical severity is the change in the average cost per treatment, reflecting the change due to price and other more specialized utilization factors. As seen in Exhibit 9, this accounts for virtually all of the 21% increase, since the upward pressure due to the shift to more severe injuries is basically offset by the downward pressure due to the number of treatments per claim. This 21% increase due to price and other factors is similar to what would be expected due to changes in the medical Consumer Price Index, which increased 18% over this time period.

Conclusions

This study provides some understanding about changes in medical claim costs that are part of rate filings. The good news is that the increase in medical severity lessened significantly between the two time periods examined (1996/97 to 2000/01 and 2001/02 to 2005/06). However, there were significant differences in the drivers of medical severity. Whereas changes in utilization, as measured by treatments per claim after controlling for the shift to more severe injuries, were the primary driver of the increase in severity in the first period, the impact of this quantity component of utilization diminished significantly in the second period as the number of treatments per claim remained steady. Changes in average cost per treatment are the primary driver in the second period, while the shift to more severe injuries accounts for a small share of the increase in both time periods.

The fact that changes in medical treatment patterns have been the key drivers of changes in medical severity suggests that more research is needed to enhance the industry's understanding of how best to manage this cost driver. Likely explanatory factors include the introduction of enhanced medical technology, provider responses to tightening medical fee schedules, and the effectiveness of utilization review.

¹¹ As with Exhibit 6, Exhibit 11 is meant to illustrate the trend in the number of treatments per claim, but does not control for the change in diagnosis mix. The portion of the medical severity increase due to the change in the number of treatments per claim in Exhibit 9 is after controlling for the change in diagnosis mix. See footnote 8 for more details on that calculation.

¹² NCCI plans to extend this research to determine the factors that might explain the marked changes in the pattern of utilization over these two time periods.

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