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The Impact of Family Structure on Spare Capacity and Health Care Utilization

by Philip Castevens

Occasionally, my business partner (actuary Carlton Harker) and I research the health care claims history of some of our third party administrator (TPA) databases to see if our family tier ratios need adjusting. As I analyzed the data of one mid-sized TPA recently, I noticed some surprising findings: The employee-plus-spouse ratio seemed extremely high and the employee-plus-children ratio seemed extremely low. I wondered what was going on, especially with the adults in these families.

After analyzing the more obvious factors, there was still a significant unexplained effect, so I turned to behavioral economics. I was intrigued by the idea that people's priorities are affected by the amount of time, social support and free attention (what I call "spare capacity") they have on their hands. And I found that Ross, Mirowsky and Goldstein¹¹ had already documented the relationship between family structure and many of these social factors. In this article, I will use my TPA study and references to other studies to explore the relationships between family structure, spare capacity and health care utilization.

Spare Capacity

The Cambridge Business English Dictionary¹⁶ defines spare capacity as:

The ability of a factory, company or industry to produce more of a product than is now being produced.

It has most commonly been used in relation to crude oil production, especially concerning OPEC. Kahneman used this term in a slightly different way. He defines a capacity model for attention (rather than oil) and then defines spare capacity as the difference between total capacity of an individual and the capacity currently supplied to high priority tasks. "Spare capacity decreases as the effort invested in the primary task increases: attention is withdrawn from perceptual monitoring and concentrated on the main task."²¹ In *Thinking, Fast and Slow*, Kahneman says people's response to mental overload is to protect "the most important activity, so it receives the attention it needs; 'spare capacity' is allocated second by second to other tasks."²⁴

For this article, I will use spare capacity in a similar but broader way, adding social support in addition to attention, so that it becomes a more general measure of one's available energy resources.

Wills distinguishes four functions that are part of social support:¹⁵

1. Esteem or emotional support
2. Informational support, which may include problem-solving and learning new skills
3. Instrumental or tangible support, which may include time and money
4. Companionship

For this article, I will refer to spare capacity as the amount of available attention and social support a person has in their day-to-day life.

First, we'll take a look at the TPA study to explore the effects of the family structure on health care costs, and then we will consider the impact of the family structure on the spare capacity available to the adults in the family.

TPA Study

The TPA study I performed consisted of more than 2 million claims (more than \$347 million) from more than 200 self-funded plans for employers mainly in the southeastern United States. Most of these plans covered fewer than 500 employees each. More than 42,000 employees and 32,000 dependents were included in the study.

Here are some per-employee averages from the study.

Age:	43.5 (59% male)
Age of spouse:	45.8 (28% male)
Age of children:	12.7 (51% male)
Family size:	1.77
With spouses:	28%
With children:	25%

See Appendix III: Health Care Claims by Age from the TPA Study for a detailed look at the annual health care expenses per person.



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Below are the unadjusted family tier claim cost ratios from the study. Note that “EE” means employee.

Family Tier	Number of EEs	Ratio to EE-Only
Employee only	26,925	1.00
Employee/child(ren)	2,485	1.25
Employee/spouse	2,504	3.76
Family	10,441	3.09

The raw data from which the ratios above were obtained consisted of healthy and nonhealthy members of self-funded health care plans. The claims used above were not adjusted for age and gender differences. The value that jumps out is the employee/spouse ratio of 3.76 because most would tend to assume the health care costs of two adults would be only about twice that of one adult. Bohn reported a ratio of 2.751 from a similar population.²

Marriage and parenthood. After adjusting for certain obvious confounding factors, such as age and gender, I observed that married people spent an average of 24 percent more on health care than unmarried people (see Appendix I on page 35 for details). I also found that employees with children spent an average of 10 percent less on themselves than employees without children. I will look at marriage in more detail below. Throughout this article, I include details concerning my analysis of marriage’s effect on health care costs. I use similar methods to analyze the effects of parenthood on health care costs, though the analysis details are omitted from this article.

Employment. I also observed a strong negative employment effect; that is, workers tend to have lower health care costs than their unemployed spouses. However, I discovered that most of this difference is likely due to ill health, as opposed to spare capacity. Employment does seem to increase certain aspects of spare capacity, such as tangible support, but decreases others such as time and attention for body awareness and trips to the doctor. Thus, there may be a small positive or negative net employment effect due to spare capacity but if there is one, it

is less obvious than with marriage and parenting. More data and much work would have to be done to measure how much (if any) difference employment has on health care utilization.

Impact of Marriage and Parenthood on Health Care Utilization

Marriage. In addition to the TPA study, there are consistent and significant results from the U.S. Department of Labor’s Consumer Expenditure (CE) Survey indicating higher health care expenses for married people than for singles, after adjusting for age, gender and size of consumer unit. For example, the 2012 CE Survey¹² indicates higher (13 percent) health care expenses for married people (see Appendix II on page 37 for more details). In fact, almost all of the research I could find supports the hypothesis that married people spend more on health care than nonmarried people. Here is a sampling of the conclusions from such studies.

- Single people in their 20s tend to spend less on health care than do married people of the same age.⁸
- “Married persons were more likely than unmarried persons to report ever having undergone a colorectal endoscopy exam,” according to a 2012 study on people over the age of 50.⁹
- The Commonwealth Fund reported that single men between the ages of 18 and 64 had 33 percent less utilization of the health care system than married men.¹⁰ For further support of this conclusion, see Figure 4 at the end of Appendix I for a table by age and gender.
- Married people are more likely to seek checkups, screening and other early detection services than nonmarried people with the same symptoms, functioning and general level of health.¹¹

In fact, I could not find any study against the claim that married people spend more on health care.

Parenthood. Similar to the marriage effect, there are consistent and significant results from the CE Survey indicating lower health care expenses for



parents than for nonparents, after adjusting for age, gender and the size of the consumer unit. For example, the CE Survey¹² indicates much lower (20 percent) health care expenses for parents than for nonparents. This is an even stronger effect than I found in my study (10 percent). I could not find much research that studied the impact of parenting on health care utilization. What I have found indicates parents spend less on their own health care than nonparents, all other things being equal.

Impact of Marriage and Parenthood on Spare Capacity

There is strong evidence that marriage and parenthood affect the amount of spare capacity. Ross, Mirowsky and Goldsteen address this in their article,¹¹ and although they do not use the term spare capacity, their extensive analysis focuses on how marriage and parenthood affect social support and economic well-being, both important aspects of spare capacity.

Marriage. It makes sense that married people will generally have more time and money to go to the doctor and take care of their health problems, since the responsibilities of working and household chores are shared with another person. Division of labor reduces the “basic tasks” for each partner. Further, married people tend to have more informational and emotional support because their

partner can often spot trouble better than they can themselves.⁷ These factors tend to increase the total capacity of married people.

The hypothesis that marriage increases spare capacity is also supported by research. According to Ross, Mirowsky and Goldsteen,¹¹ marriage increases the health of the partners by increasing social support:

Social support is the commitment, caring, advice, and aid provided in personal relationships. It has several dimensions, including emotional and instrumental support. Marriage typically provides social support of all forms—particularly the emotional element.

and economic well-being:

Married people have higher household incomes than the nonmarried.

Parenthood. Kristi Bohn’s recent study on this topic had a much larger sample and showed how “the adults on the employee-only and employee-plus-spouse contracts were much more expensive than the adults on the contracts with children.” She hypothesized that “parents of multiple children have less time and money to take themselves and their children to the doctor.”²² In other words, it makes sense that parenthood reduces spare capacity, all other things being equal. According to Ross, Mirowsky and Goldsteen,¹¹ parenthood tends to

There seems to be a strong correlation between health care utilization and spare capacity. If spare capacity goes up or down, then health care utilization goes up or down respectively.

decrease social support and physical, psychological and economic well-being:

Children do not generally improve the psychological well-being of parents. ... People with children at home do not have higher levels of well-being than nonparents.

Two explanations stand out: children increase economic hardships on families, and children decrease the amount of emotional support that spouses receive from each other. Economic well-being and social support reduce the detrimental impact of children on the health and well-being of parents, but children deplete those very resources (providing an example of structural amplification).

It is informative to look at the effect the number of children has on the average claims cost of employees. The data below is from my study, and is adjusted for age, gender and health status. The parenting effect is relative to those employees on single contracts.

Family Tier	Parenting Effect
Employee/1 child	-7%
Employee/2 children	-11%
Employee/3 children	-14%
Employee/4+ children	-23%

The more children in the family, the less claims the parent had. This supports the compelling behavioral argument that the more parenting responsibilities the adult has, the less spare capacity and health care utilization they have.

Confounding Factors

There seems to be a strong correlation between health care utilization and spare capacity. If spare capacity goes up or down, then health care utilization goes up or down respectively. However, it is possible there are other selective characteristics of married people and parents that cause the correlation with health care utilization. For example, it may be that married people tend to have a more extensive social network even before they marry

and this extensive social network correlates to increased health care utilization. However, Ross, Mirowsky and Goldstein, in studying the effects of marriage, found that although there may be some selection before marriage, it is the effects of marriage itself, mainly through social support and economic well-being, that accounts for more of the association.¹¹ In this sense, marriage itself seems to bring more spare capacity to couples' lives.

Impact of Spare Capacity on Health Care Utilization

It is difficult to argue against the notion that, all things being equal, having more spare capacity will result in higher health care utilization. If people have less time and money, then they will tend to go to the doctor less. There is a general sense that spare capacity has a direct effect on health care utilization. For example, it is generally accepted that factors such as "income, insurance, time and inclination" influence the frequency of doctor visits.¹¹

It is not so much a question of whether spare capacity influences health care utilization, but rather by how much. If we take into account the possibility of confounding factors, we can say that spare capacity may have an effect of as much as 24 percent on health care spending in the case of marriage. For parenthood, spare capacity may account for as much as 10 percent of the decrease in health care expenditures. Additional work would need to be done to fix more exact numbers with confidence. Also, note that Kahneman says that (mental) spare capacity is allocated second by second.⁴ With health insurance, it is year by year.

Implications to Setting Tier Ratios

There are possible implications of these findings to plan design, marketing, risk adjustment and compliance. In this article, I only consider some implications relevant to family tiering structure alternatives. In the TPA study, I was able to calculate some averages based on common family tiering structure alternatives.

Family Tier	Average Family Size	Tier Ratio
Employee only	1.00	1.00
Employee/child(ren)	2.74	1.47
Employee/spouse	2.00	2.44
Family	3.46	2.76
Employee/1 child	2.00	1.22
Employee/2 children	3.00	1.45
Employee/3 children	4.00	1.67
Employee/4+ children	5.25	1.73

The data from which the tier ratios above were estimated reflects adjustments for age and gender differences, with some minor smoothing performed. As demonstrated above, spare capacity significantly impacts the tier ratios. Experiential data does not always reflect the intuitive building block approach used to create claims cost expectations. However, some of these ratios are surprisingly close to the ratios used in premium rating (the family tier, for example). Overall, there are practical limits that come into play when setting rates. In particular, it is unlikely the employee/spouse premium will ever be set at 244 percent of the employee-only premium; a more practical ratio for the employee/spouse tier is 2.00. Employers tend to partially make up for the additional cost of spouses through their premium subsidization policy, rather than through their calibration of family tiers.

Conclusion

Marriage has been observed to increase health care utilization by 24 percent, while parenthood has been observed to decrease health care utilization by 10 percent. Marriage and parenthood have been reported to increase and decrease spare capacity, respectively. There is a positive correlation between

spare capacity and health care utilization. These relationships may be a common and understandable response to the simple situational demands on the population, including limited time, money, attention and support available for doctor visits and other medical services. Family structures' impact on health care utilization may be an important next step for inclusion in risk adjustment methodologies, since it seems to play an important additional predictor of health care cost.

Appendix I. Marriage and my TPA Study (Details of Analysis)

What effect does marriage have on health care costs? The most straightforward comparison I could make from the results of the TPA study for this question was between employees with the following tier coverages:

employee-plus-spouse vs. employee-only

By comparing these two kinds of employees without covered children, I tried to avoid any biases due to parenting or employment.

From the TPA study, I found that the total average annual claims amount per employee with employee-plus-spouse coverage was \$5,736 (67 percent male, average age 52, 100 percent married), while the average claims for employee-only coverage was \$3,632 (52 percent male, average age 43, 91.5 percent single).

I will first adjust for the gender and age differences and then make an adjustment for the fact that the employee-only people are "only" 91.5 percent single.

GENDER ADJUSTMENT

It has been observed that per capita health care spending for females is about 30 percent higher than for males⁵ and that "per capita differences were most pronounced among the working-age population, largely because of spending for maternity care."⁶ So, to remove this gender bias, I normalized the

employee-plus-spouse amount, which comes from a sample with 67 percent males, to a “gender neutral” (50/50) value, as follows:

$$\frac{(.50)(1) + (.50)(1.3)}{(.67)(1) + (.33)(1.3)} \times (5,736) = \$6,002$$

In a similar manner, I also normalized the \$3,632 (which comes from a sample with 52 percent males) to its gender-neutral equivalent: \$3,664.

AGE ADJUSTMENT

Then I adjusted for the significant difference in age—the employee-only employees have an average age of 43, while the employee-plus-spouse employees have an average age of 52. As Bohn noted in her article, adults with no children covered may be older, because it is likely their children have grown up and are no longer covered under their parents’ plan (although this is changing somewhat with the age-26 student status provision of the Affordable Care Act).

To adjust for age, I used the ratio:

$$\frac{C_{52}}{C_{43}} = \frac{4,832}{3,591} = 1.35$$

where C_{43} and C_{52} are the average annual expenses for ages 43 and 52, taken from the TPA study (the same population we are studying). If I now adjust the employee-only value for age, then it becomes $\$3,664 \times 1.35 = \$4,946$.

ADJUSTMENT FOR THE EFFECT OF THE MARRIED WITH EMPLOYEE-ONLY COVERAGE

The database of the TPA study contains the marital status and I used it to calculate 91.5 percent as the percentage of single employee-only. Therefore, if I let $CR = \text{Claims Ratio of married/single}$, then when I solve for CR in the formula below,

$$4,946 = (.915) (6,002/CR) + (.085)(6,002),$$

I see that $CR = 1.24$. In other words, for the TPA study, married people spent 24 percent more than unmarried people of the same age and gender, on average.

CONFIDENCE INTERVAL (CI) AND STATISTICAL SIGNIFICANCE

First, I needed to adjust the employee-plus-spouse value to its 100 percent unmarried equivalent: $\$6,002/1.24 = \$4,840$. Then I performed 100,000 Monte Carlo simulation trials using the single and married mean claim amounts, \$4,840 and \$6,002, and their respective sample sizes, $N = 27,000$ and $N = 2,500$. I used the lognormal probability distribution for annual claims per person, and a standard deviation of 4.5 times the mean, which was observed in the population.

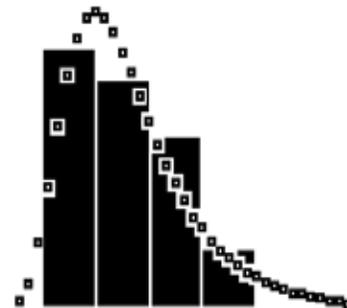


Figure 3. Lognormal distribution. I have found that, among several distributions tested, the lognormal distribution is the best fit for the claims data based on the chi-square and Kolmogorov–Smirnov tests.

I found that in 95 percent of the trials, the claims ratio was between 1.00 and 1.45. Thus there is a high level of confidence in the hypothesis that there is a positive marriage effect.

**Observed Marriage Effect:
24% and $1.00 < CR < 1.45$ (95% CI)**

I also tested the “null hypothesis” that this 24 percent difference happened by chance and found this chance is less than 1 percent; that is, the “observed significance level” (P-value) is $P < 1$ percent. Therefore, it is not only statistically significant, it is “highly significant.”

THE MARRIAGE EFFECT BY AGE AND GENDER

The marriage effect in the TPA study is much stronger for men than for women and for young adults than for older adults, as shown in the following subgroup results.

Ages	Males	Females
21–42	+61%	+18%
43–64	+26%	+9%

Figure 4. The marriage effect by age and gender

Appendix II. Marriage and the Consumer Expenditure Survey (Details of Analysis)

From the 2012 CE Survey,¹² I compared the “Husband and wife only” column with the “Single person and other consumer units” column. Like with my TPA study, by comparing these two kinds of consumer units without children, I tried to avoid any biases due to parenting. Even so, I was unable to eliminate as many possibly confounding factors. “Other consumer units” include dependents and “husband and wife” units include the reference person (the one who owns the house or pays the rent) and the spouses, who appear to be mostly unemployed—since there are 1.2 earners (out of 2) in this consumer unit, this makes me think that 80 percent of these spouses are unemployed.

TOTAL ANNUAL HEALTH CARE EXPENDITURES PER PERSON

The husband-and-wife “Average number in consumer unit” is 2.0, so the average annual health care expenditures per person in the “Husband and wife” class was $\$5,407/2 = \$2,704$ (55 percent male, average age 58, 100 percent married). Note that this \$5,407 also includes the average health care expenses of the spouse. The single-person “Average number in consumer unit” is 1.7. We want the expenses of just the single person, not the other .7 people in the consumer unit. Most of this .7 is made up of children under 18 (.2) and people 65 and

older (.3). Because of the lower costs associated with children and the fact that people 65 and older are covered under Medicare, I am going to assume their costs are less than 100 percent of the adult single person. So the average annual health care expenditures per person in the “Single person” class was between the full \$2,430 and $\$2,430/1.7 = \$1,429$ (44 percent male, average age 51, 100 percent single). For simplicity, I will use the midpoint of this range: \$1,930. I will now adjust for the gender and age differences.

GENDER ADJUSTMENT

As above, to remove the gender bias, I normalized the single-person amounts to “gender neutral” (50/50) values.

$$\frac{(.50)(1) + (.50)(1.3)}{(.44)(1) + (.56)(1.3)} \times (1,930) = \$1,897$$

Note the husband-and-wife value is already gender neutral because it includes the averaged health care expenditures for exactly one adult male and one adult female.

AGE ADJUSTMENT

Then I adjusted for the difference in age—the single-person people have an average age of 51, while the husband-and-wife people have an average age of 58.

To adjust for age, I used the ratio:

$$\frac{C_{58}}{C_{51}} = \frac{5,805}{4,609} = 1.26$$

where C_{58} and C_{51} are the average annual expenses for ages 58 and 51, taken from the TPA study (see Appendix III). If I now adjust the single-person value for age, then it becomes $\$1,897 \times 1.26 = \$2,390$. Note that 58 is the average age of the reference person and we assume the spouses are the same average age.

CLAIMS RATIO

If I let CR = Claims Ratio of married/single, then:

$$CR = \frac{2,704}{2,390} = 1.13$$

In other words, for the 2012 CE Survey, this group of married people spent 13 percent more than unmarried people of the same age and gender, on the average.

Appendix III. Health Care Claims by Age from the TPA Study

Age	AAE	Age	AAE	Age	AAE	Age	AAE
1	\$3,744	17	\$1,809	33	\$2,855	49	\$4,239
2	\$3,516	18	\$1,831	34	\$2,902	50	\$4,405
3	\$3,140	19	\$1,848	35	\$2,964	51	\$4,609
4	\$2,721	20	\$1,865	36	\$3,039	52	\$4,832
5	\$2,341	21	\$1,891	37	\$3,121	53	\$5,049
6	\$2,041	22	\$1,936	38	\$3,201	54	\$5,240
7	\$1,830	23	\$2,001	39	\$3,274	55	\$5,396
8	\$1,701	24	\$2,084	40	\$3,345	56	\$5,528
9	\$1,638	25	\$2,182	41	\$3,420	57	\$5,658
10	\$1,618	26	\$2,291	42	\$3,501	58	\$5,805
11	\$1,626	27	\$2,404	43	\$3,591	59	\$5,962
12	\$1,651	28	\$2,513	44	\$3,691	60	\$6,113
13	\$1,683	29	\$2,615	45	\$3,800	61	\$6,263
14	\$1,718	30	\$2,704	46	\$3,905	62	\$6,428
15	\$1,751	31	\$2,770	47	\$4,006	63	\$6,605
16	\$1,781	32	\$2,816	48	\$4,111	64	\$6,776

Figure 5. The annual average expenses (AAE) per person from the TPA study

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