

**Trends and Seasonal Variations on
where new Quitline clients obtained the Quitline number
2003-2007**

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July 2008

The national Quitline is the biggest smoking cessation provider in New Zealand. The Quitline free phone number (0800 778 778) is promoted via different paid media and unpaid information sources. One of the most important paid media for the Quitline is television advertising. Media analysis reports^{1 2} have consistently shown a strong relationship between the volume of television advertising (measured by target audience rating points - TARPs) and the number of caller registrations to the Quitline. The objectives of this report are to find out about the trends and seasonal variations of the different information sources (paid and unpaid) where first-time Quitline clients obtained the Quitline number from, for the five-year period between 2003 and 2007.

Method

When first-time clients registered with the Quitline, they were asked by the Quitline Advisor over the phone where they obtained the Quitline number. This information is stored at the Quitline database, and is routinely reported in the monthly client reports. For the purpose of this analysis, this data was extracted from all monthly reports between 2003 and 2007.

Throughout these five years, minor changes were made on how the data was collected and recorded in the Quitline database. From July 2006, the question was re-worded from "Where did you hear about the Quitline(?)" to "Where did you get the Quitline number(?) from". This change was to remove bias from the previous wording that may imply all clients have obtained the Quitline number verbally. In September 2006, two categories were added to the Quitline database to record

¹ The Quit Group (2004). *Effectiveness of generating callers to the Quitline.*

² The Quit Group (2006). *Quitline media campaigns and caller registrations.*

responses, being the Internet and phonebook. In December, another new category, hospital, was added. Before the addition of these three categories, they were recorded under the 'other' category. To enable comparisons across time, these responses were re-coded to 'other' for the purpose of this analysis. Clients who did not answer this question or couldn't remember where they obtained the Quitline number were excluded from this analysis.

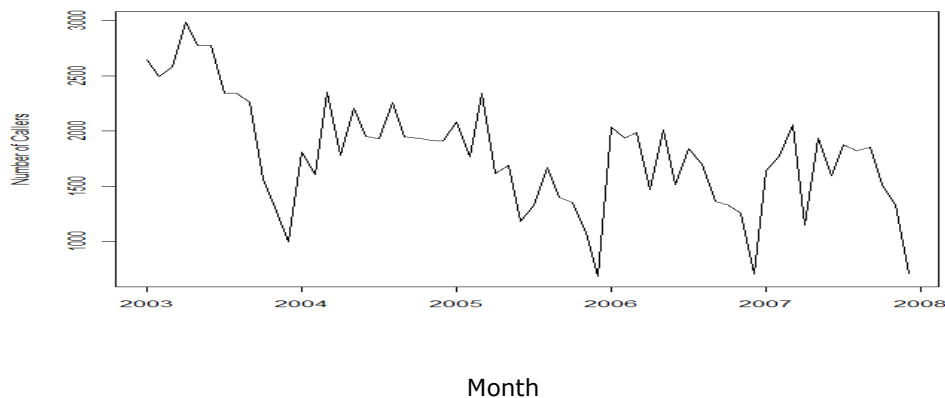
The data were manipulated using a statistical package 'R', and results are presented next.

Results

Overview of New Quitline Clients between 2003 and 2007

As shown from the monthly data, the number of new Quitline clients registered each month fluctuated during the five-year period between 2003 and 2007 (Figure 1). Although the fitted time series model indicated the Quitline was losing five new registered clients each month on average, the decrease was not statistically significant ($p\text{-value} > 0.05$) (Appendix 1).

Figure 1: Monthly number of new registered clients, 2003 and 2007



The fitted model also indicates a seasonal variation in the number of new clients registered (Appendix 1). For ease of comparison, January was selected as the reference month. Every year, the number of new clients registered in February, April, June, July and from September to December were significantly less than the number of registrations in January ($p\text{-value} < 0.05$).

Table 1 shows the seasonal pattern of each month in a slightly different way. A linear trend was fitted to smooth out the seasonal variations. The averaged trend for each month was then compared against the average number of new clients registered each month across the five-year period. The direction of the variation from the trend is signified by the positive or negative sign (i.e. the positive sign means the number of new registrations in that month is above the averaged trend and vice versa) and the number indicates the difference between the actual registration and the averaged trend for that month. The table shows that March was the peak time of each year (on average 431 new registrations above the averaged trend), and December had the lowest number of new registrations (on average 717 below the averaged trend).

Table 1: Seasonal component of callers between January and December

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
+161.52	+57.79	+431.66	-14.76	+326.01	+18.41	+89.21	+192.73	+8.04	-202.98	-350.41	-717.22

Data from Table 1 clearly indicates that there was a seasonal dip towards the end of the year (October to December). It was the time when the volume of television advertising tended to be lower and that it was generally not considered as a good time for quitting smoking by many people. When referring back to the actual number of monthly new clients registrations (Figure 1), this seasonal dip was consistent but

was not seen in 2004. It was the time when the Smokefree Environment Amendment Act was put in force on the 19 December 2004 making all indoor working places including bars and restaurants smokefree. There was a lot of publicity about smoking and smoking cessation, prompting smokers to register with the Quitline for cessation support.

The above suggested that the number of new clients registrations to the Quitline was affected by both the volume of promotion on the Quitline and the activities of the tobacco control sector such as the introduction of a legislation.

Trend of Different Information Sources

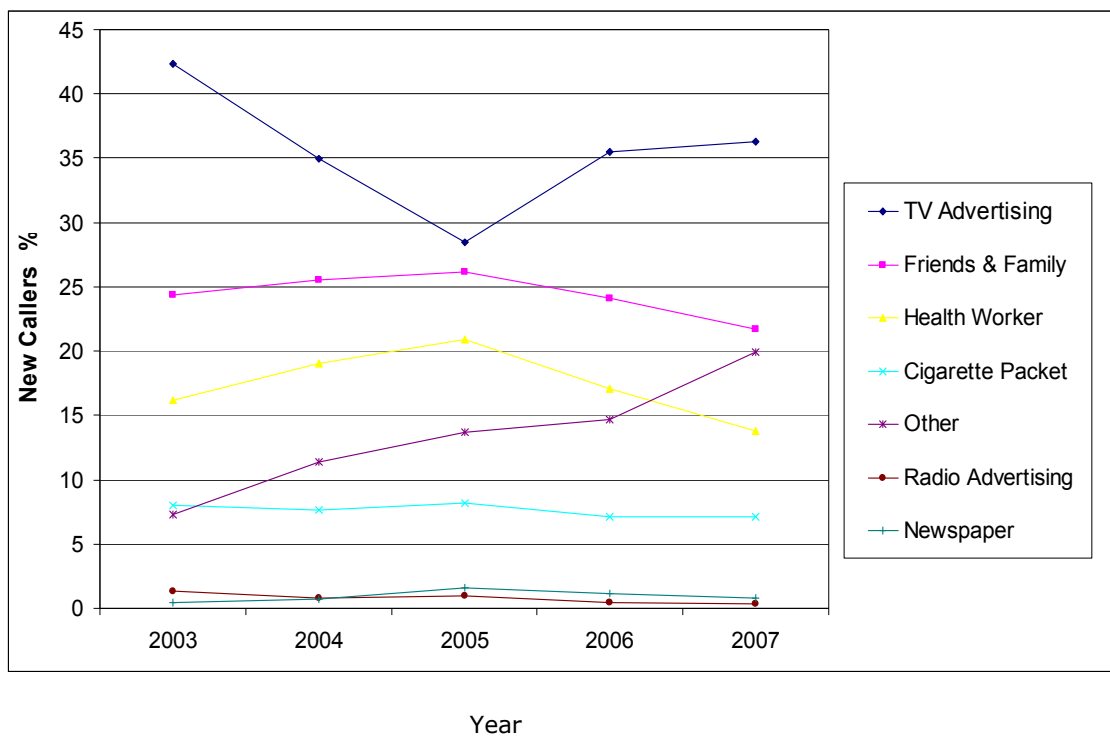
This part of the analysis focuses on the trends in proportions of different information sources where new clients had obtained the Quitline number. Firstly, monthly data were aggregated to form the annual total for each category. Television advertising (36%) was the most commonly mentioned, followed by friends and family (24%) and health worker (17%) (Table 2).

The percent of new clients who obtained the Quitline number from 'other' increased over time, from 7% in 2003 to 20% in 2007 (Figure 2). As mentioned earlier in the report, there are sufficient details from the Quitline database to break down this category further for 2007; phone book (7.6% of all new registered clients), Internet (4.9%), hospital (2.4%) and other unspecified (4.3%).

Table 2: Source of Quitline number cited by new clients, 2003-2007

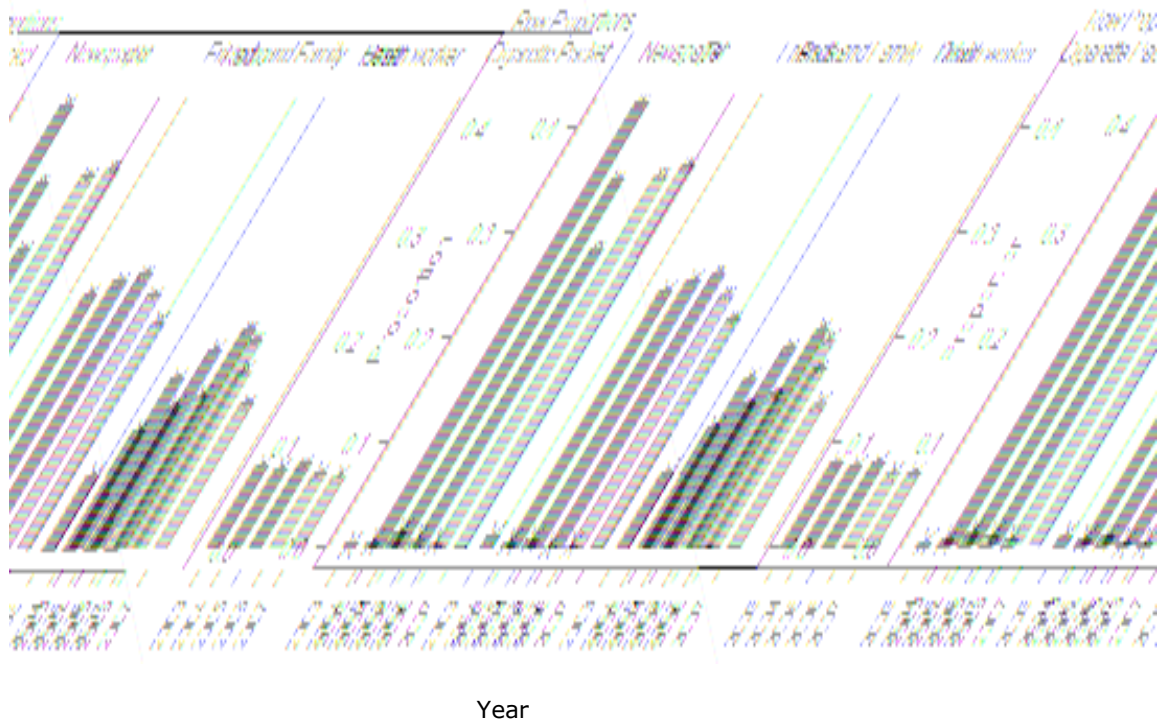
Source	2003 %	2004 %	2005 %	2006 %	2007 %	Total %
Television Advertising	42.3	35.0	28.5	35.5	36.3	36.2
Friends & Family	24.4	25.5	26.1	24.1	21.7	24.4
Health Worker	16.2	19.0	20.9	17.1	13.8	17.3
Cigarette Packet	8.0	7.7	8.2	7.1	7.1	7.7
Newspaper	0.5	0.7	1.6	1.1	0.8	0.9
Radio Advertising	1.3	0.8	1.0	0.4	0.4	0.8
Other	7.3	11.4	13.7	14.7	19.9	12.8

Figure 2. The different information sources where new callers obtained the Quitline number (%), 2003-2007



Across this five-year period, there were changes in the proportion in where new clients obtained the Quitline number ($p\text{-value} < 0.001$) (Appendix 2). Figure 3 shows the changes in proportion in each information source at the 95% confidence interval.

Figure 3. Proportions of places where new callers obtained the Quitline number from, 2003-2007



Note: at the 95% confidence intervals

Television Advertising

Figure 3 shows that the proportions of new clients obtained the Quitline number from television advertising decreased significantly from 42% in 2003 to 29% in 2005, followed by a significant rebound to 36% in 2006 and sustained in 2007 (Figure 3 and Appendix 2).

Friends and Family

Friends and family were another important information source where new clients obtained the Quitline number from. The proportion changed significantly throughout the five-year period, between 22% and 26 (Table 2 and Appendix 2).

Health worker

Health workers were the third most important information source. Although the proportions increased significantly from 16% in 2003 to 21% in 2005, it dropped rapidly to 14% in 2007. The difference was significant (Table 2 and Appendix 2).

Cigarette Packet

The percent of new callers obtained the Quitline number from cigarette packet was stable at around 7% and 8% between 2003 and 2007. There was no significant change in this five-year period (Table 2 and Appendix 2).

Radio and Newspaper Advertising

Radio and newspaper advertising were the sources mentioned the least by new clients, at 0.8% and 0.9% respectively. The proportion of radio advertising decreased continuously from 1.3% in 2003 to 0.4% in 2006. Although the proportions of newspaper advertising increased significantly from 2003 to 2005, it dropped from 1.6% in 2006 to 0.8% in 2007 (Table 2 and Appendix 2).

Other sources

The proportion of new clients who obtained the Quitline number from "other" increased significantly, almost tripled from 7% in 2003 to 20% in 2007. The rate of increase was relatively slow between 2003 and 2005 than between 2006 and 2007 (Table 2 and Appendix 2). Hence, three new categories "phonebook" "Internet", and "hospital" were introduced into the Quitline database at the end of 2006 to reflect the new information sources that were used to promote the Quitline.

Seasonal Variation of Information Sources

As the fitted time series model also showed seasonal variations in the information sources mentioned by new clients (Appendix 1), this part of the analysis focuses on the seasonal variations for the three most commonly mentioned information sources between 2003 and 2007. Similar to the seasonal variation analysis undertaken for the monthly new clients registrations in the earlier of the report, two slightly different methods are used to fit the dataset.

Television Advertising

The average number of registered new clients mentioned television advertising each month, was compared against the overall 2003-07 trend for this information source. It showed that the month with the highest percent was July, an average of 7% above the trend (Table 3). The percent was below the overall trend in the five-month period between September to January, especially in December (11% below the trend). This is because Quit television campaigns are not typically aired towards the end of year due to television air time being expensive that time of the year and that it is also not a popular time for quitting smoking.

Table 3: Seasonal component of television advertising (%)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
%	-2.03	4.29	5.86	0.68	3.10	2.41	6.90	1.87	-1.31	-1.79	-8.83	-11.15

In the second model, January was once again selected as the reference month in the fitted models for comparison. The only significant difference found was between November to December and the reference month (i.e. January), that the percent of new clients mentioned television advertising was 10% lower than January on average (*p-value* < 0.05) (Appendix 3).

Friends and Family

The fitted model showed that the percent of new registered callers who obtained the Quitline number from friends and family had a relatively weak seasonal variation. In other words, there wasn't much fluctuation between each month. In contrast to the seasonal dip towards the end of year found in television advertising, the percent of those mentioned friends and family towards the end of the year (from September to December) was between one and two percents above the overall trend (Table 4). This suggested that friends and family became an important supplement to encourage smokers to register with the Quitline when the volume of television advertising was lower (Appendix 3).

Table 4: Seasonal component of friends and family (%)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
%	1.46	-0.28	-2.27	0.00	-1.38	-1.14	-1.22	0.59	0.74	1.07	1.57	0.86

Health worker

The seasonal variation was also weak for this information source. By saying that, the percent of new registered clients obtained the Quitline number from health worker in the months between September and December was between one to three percents above the overall trend. Therefore, health workers were also an important supplement information source to encourage smokers to register when the volume of television advertising subsided (Appendix 3).

Table 5: Seasonal component of health worker (%)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
%	-1.86	-1.26	-1.90	-0.92	-1.25	-0.24	-0.19	-0.63	1.44	1.13	2.96	2.73

Conclusion

The purpose of this report is to find out about the trends and seasonal variations of the different paid or unpaid information sources where new registered clients have obtained the Quitline number, between 2003 and 2007. During these five years, although television advertising, friend and family and health workers were the three most commonly mentioned channels, the percent of these three information sources dropped with a fluctuation in 2005. In contrast, the percent of 'other' channels increased continuously and rapidly. The percent of new clients who got the Quitline number from cigarette packet had no significant fluctuation. Radio and newspaper advertising were the least mentioned information sources. This is expected as the volume of paid activities in these media was very low.

As known from previous media analysis reports^{3 4}, there is always a strong relationship between the number of caller registrations and the volume of television advertising. Each year, the volume of television advertising subsided towards the end of the year; this is mirrored by the reduced number of registered callers and the percent of new clients who obtained the number from this information source.

The importance of television advertising in promoting the Quitline number is not matched by any other sources. At times when television advertising is not a possible source to promote the number (i.e. cost of television advertising towards Christmas), friends and family and health workers become good supporting information sources to maintain awareness of the Quitline services.

³ The Quit Group (2004). *Effectiveness of generating callers to the Quitline.*

⁴ The Quit Group (2006). *Quitline media campaigns and caller registrations.*

In future, another analysis will be undertaken focusing on the extent how cigarette and tobacco packets promote the Quitline number. The Ministry of Health has progressively introduced pictorial health warnings on tobacco packaging from the beginning of 2008. Under the new labelling regulation, the graphic warnings cover 30% and 90% of the front and back of the packaging. The Quitline logo and freephone number are printed on the back of the packaging, alongside a positive message on quitting smoking. An increase on the number of Quitline clients who obtained the number from cigarette and tobacco packets are expected, and will be evaluated after more data become available.

Appendix

Appendix 1: The number of new registrations between 2003 and 2007

```
> summary(seas.fact.fit2)

Call:
lm(formula = caller.ts[-1] ~ time[-1] + month[-1] + caller.ts[-60])

Residuals:
    Min     1Q   Median     3Q     Max
-404.80 -174.43  -19.14  143.57  878.01

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   1433.6286   236.9824   6.050 2.64e-07 ***
time[-1]       -5.3329     2.7266  -1.956 0.056706 .
month[-1]2     -565.1653    214.4127  -2.636 0.011473 *
month[-1]3     -135.9012    207.8036  -0.654 0.516448
month[-1]4     -797.2722    230.7609  -3.455 0.001211 **
month[-1]5     -199.5090    203.2179  -0.982 0.331473
month[-1]6     -701.1664    222.9147  -3.145 0.002937 **
month[-1]7     -451.5634    204.7883  -2.205 0.032605 *
month[-1]8     -385.4539    208.6933  -1.847 0.071331 .
month[-1]9     -628.4264    215.0706  -2.922 0.005423 **
month[-1]10    -735.4266    205.0413  -3.587 0.000821 ***
month[-1]11    -760.7290    195.6434  -3.888 0.000330 ***
month[-1]12   -1041.3230    190.8420  -5.456 1.99e-06 ***
caller.ts[-60]  0.5801     0.1198   4.841 1.56e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 276 on 45 degrees of freedom
Multiple R-squared:  0.7628,    Adjusted R-squared:  0.6942
F-statistic: 11.13 on 13 and 45 DF, p-value: 4.192e-10
```

The F -test provides extremely strong evidence that there is at least one variable relates to the number of new Quitline registrations (P -value ≈ 0) between 2003 and 2007. The Multiple R^2 is 0.7628 indicating that 76 % of the variation in the number of new registrations can be explained by the fitted model.

Appendix 2: The trend of channels between 2003 and 2007

	2003	2004	2005	2006	2007	Total
Television Advertising	11177	7792	4556	6187	6681	36393
Friends & Family	6448	5682	4179	4199	3998	24506
Health Worker	4280	4235	3339	2970	2538	17362
Cigarette Packet	2122	1713	1307	1243	1311	7696
Newspaper	128	159	260	198	143	888
Radio Advertising	341	170	157	70	73	811
Other	1919	2535	2196	2553	3665	12868
Total	28418	24290	17999	19426	20416	100524

Chi-square Test

H_0 : The distributions of channels are all the same every year

```
> chisq.test(tab)

Pearson's Chi-squared test

data: tab
X-squared = 4299.099, df = 28, p-value < 2.2e-16
```

Television Advertising

95% confidence interval for differences between proportions (row-column)

	2004	2005	2006	2007
2003	(0.061,0.086)* ⁵	(0.125,0.151)*	(0.055,0.081)*	(0.047,0.073)*
2004		(0.051,0.078)*	(-0.019,0.008)	(-0.027,0.000)*
2005			(-0.085,-0.056)*	(-0.092,-0.064)*
2006				(-0.022,0.006)

Friends and Family

95% confidence interval for differences between proportions (row-column)

	2004	2005	2006	2007
2003	(-0.022,0)*	(-0.029,-0.005)*	(-0.009,0.015)	(0.016,0.038)*
2004		(-0.019,0.006)	(0.002,0.026)*	(0.026,0.05)*
2005			(0.007,0.034)*	(0.031,0.057)*
2006				(0.011,0.036)*

⁵ * means the p-value less than 0.05 so there are significant differences between row and column.

Health Worker

95% confidence interval for differences between proportions (row-column)

	2004	2005	2006	2007
2003	(-0.038,-0.018)*	(-0.058,-0.036)*	(-0.019,0.002)	(0.015,0.034)*
2004		(-0.03,-0.007)*	(0.009,0.03)*	(0.042,0.062)*
2005			(0.026,0.05)*	(0.059,0.082)*
2006				(0.022,0.043)*

Cigarette Packet

95% confidence interval for differences between proportions (row-column)

	2004	2005	2006	2007
2003	(-0.003,0.01)	(-0.009,0.006)	(0.002,0.016)*	(0.002,0.016)*
2004		(-0.013,0.003)	(-0.002,0.013)	(-0.002,0.013)
2005			(0.002,0.019)*	(0.002,0.019)*
2006				(-0.007,0.008)

Newspaper Advertising

95% confidence interval for differences between proportions (row-column)

	2004	2005	2006	2007
2003	(-0.004,0)*	(-0.014,-0.008)*	(-0.009,-0.004)*	(-0.005,-0.001)*
2004		(-0.012,-0.006)*	(-0.007,-0.001)*	(-0.003,0.002)
2005			(0.001,0.008)*	(0.005,0.012)*
2006				(0.001,0.006)*

Radio Advertising

95% confidence interval for differences between proportions (row-column)

	2004	2005	2006	2007
2003	(0.003,0.008)*	(0.000,0.006)*	(0.007,0.011)*	(0.007,0.011)*
2004		(-0.005,0.001)	(0.001,0.006)*	(0.002,0.006)*
2005			(0.003,0.008)*	(0.003,0.008)*
2006				(-0.002,0.002)

Other

95% confidence interval for differences between proportions (row-column)

	2004	2005	2006	2007
2003	(-0.049,-0.034)*	(-0.074,-0.056)*	(-0.083,-0.065)*	(-0.136,-0.117)*
2004		(-0.033,-0.014)*	(-0.042,-0.023)*	(-0.096,-0.075)*
2005			(-0.02,0.001)	(-0.073,-0.051)*
2006				(-0.064,-0.041)*

Appendix 3: Time series fitting models

Television Advertising

```
> summary(seas.fact.fit3)

Call:
lm(formula = tv.ts[-1] ~ time[-1] + I(time[-1]^2) + month[-1] +
    tv.ts[-60])

Residuals:
    Min       1Q   Median       3Q      Max
-10.6081  -2.8281  -0.5779   2.6501   9.5790

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  31.025050   6.154743   5.041 8.42e-06 ***
time[-1]     -0.703429   0.229526  -3.065 0.00371 **
I(time[-1]^2) 0.010542   0.003464   3.043 0.00394 **
month[-1]2    2.823343   3.571196   0.791 0.43343
month[-1]3    2.099681   3.950787   0.531 0.59777
month[-1]4   -3.552723   4.066603  -0.874 0.38706
month[-1]5    0.772852   3.709347   0.208 0.83592
month[-1]6   -0.743533   3.868211  -0.192 0.84846
month[-1]7    4.004411   3.824588   1.047 0.30081
month[-1]8   -2.604924   4.165531  -0.625 0.53497
month[-1]9   -3.974614   3.794183  -1.048 0.30056
month[-1]10  -3.356938   3.611091  -0.930 0.35764
month[-1]11 -10.272269   3.587299  -2.864 0.00640 **
month[-1]12 -10.110633   3.382452  -2.989 0.00457 **
tv.ts[-60]   0.360510   0.141090   2.555 0.01415 *
---
Significant levels: 0 `***' 0.001 `**' 0.01 `*' 0.05 `.' 0.1 ` ' 1

Residual standard error: 4.998 on 44 degrees of freedom
Multiple R-squared: 0.7421, Adjusted R-squared: 0.66
F-statistic: 9.042 on 14 and 44 DF, p-value: 7.8e-09
```

Friends and Family

```
> summary(seas.fact.fit2)

Call:
lm(formula = friend.ts[-1] ~ time[-1] + month[-1] + friend.ts[-60])

Residuals:
    Min       1Q   Median       3Q      Max
-5.7056 -1.2045 -0.4679  1.2829  5.1155

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  14.87053    3.85465   3.858 0.000362 ***
time[-1]     -0.05401    0.02076  -2.602 0.012507 *
month[-1]2   -2.20526    1.56005  -1.414 0.164365
month[-1]3   -3.30678    1.58591  -2.085 0.042763 *
month[-1]4   -0.10724    1.65193  -0.065 0.948525
month[-1]5   -2.53547    1.57552  -1.609 0.114546
month[-1]6   -1.64306    1.61374  -1.018 0.314041
month[-1]7   -1.81169    1.60552  -1.128 0.265127
month[-1]8    0.04894    1.60796   0.030 0.975853
month[-1]9   -0.63594    1.56455  -0.406 0.686324
month[-1]10  -0.36520    1.56295  -0.234 0.816310
month[-1]11  -0.01422    1.56019  -0.009 0.992768
month[-1]12  -1.02354    1.55828  -0.657 0.514628
friend.ts[-60] 0.47304    0.13323   3.551 0.000914 ***
---
Significant levels: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.318 on 45 degrees of freedom
Multiple R-squared: 0.5336, Adjusted R-squared: 0.3989
F-statistic: 3.96 on 13 and 45 DF, p-value: 0.0002730
```

Health Worker

```
> summary(seas.fact.fit3)

Call:
lm(formula = health.ts[-1] ~ time[-1] + I(time[-1]^2) + month[-1] +
    health.ts[-60])

Residuals:
    Min       1Q   Median       3Q      Max
-6.0883 -1.2687  0.3917  1.2343  2.9862

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)   6.943620   2.809361   2.472 0.017392 *
time[-1]      0.166210   0.078166   2.126 0.039119 *
I(time[-1]^2) -0.003476   0.001317  -2.640 0.011442 *
month[-1]2    2.206352   1.518991   1.453 0.153454
month[-1]3    1.355127   1.486149   0.912 0.366823
month[-1]4    2.558704   1.518921   1.685 0.099156 .
month[-1]5    1.888627   1.467933   1.287 0.204966
month[-1]6    3.020878   1.482417   2.038 0.047610 *
month[-1]7    2.723245   1.438016   1.894 0.064844 .
month[-1]8    2.245756   1.435434   1.565 0.124862
month[-1]9    4.476603   1.453329   3.080 0.003559 **
month[-1]10   3.401021   1.396109   2.436 0.018965 *
month[-1]11   5.346815   1.402557   3.812 0.000425 ***
month[-1]12   4.435527   1.394456   3.181 0.002691 **
health.ts[-60] 0.363311   0.141020   2.576 0.013420 *
---
Significant levels:  0 `***' 0.001 `**' 0.01 `*' 0.05 `.' 0.1 ` ' 1

Residual standard error: 2.062 on 44 degrees of freedom
Multiple R-squared: 0.6481,    Adjusted R-squared: 0.5362
F-statistic: 5.789 on 14 and 44 DF, p-value: 3.391e-06
```