

Statistical Analysis for Business Project I



Abdullah S. Al-Salloum (0801202023)
Abdulrahman Al-Khannah (0801202021)
Ahmed O. Al-Ayyar (0801102015)
Mejbil H. Al-Shammari (0801102061)

ECO580

STATISTICAL ANALYSIS FOR
BUSINESS

DR. NASRELDDEIN SADDOULLI

PROJECT I

12/2/2008



Part I: Al-Shindagha Tunnel Problem:

The Municipality of Dubai is responsible for the city's infrastructure. One of these is the Al-Shindagha tunnel which links the Bur-Dubai to Al-Deera areas. The following map indicates the precise location of the tunnel. The management is concerned with the state of the tunnel. An important criterion to investigate is leaks at expansion joints. These leaks can be a good indicator of structural problems that require maintenance repairs. Towards this end, the management has collected a data set of random observations measuring the leaks in each month for five years. The data is provided in the accompanying Excel sheet.

You have been charged with the task of making sense out of this data. In particular, the management is interested in the basic summary of the data (means, variations,...etc) for each month, as well as for each year and for the total of the data set. They are also interested in the presence of any patterns or trends that may be viewed. For instance, are the leaks getting larger from one month to the next? From year to the next? Are there periods during the year in which these leaks become more significant which could help in the long-term scheduling of maintenance staff? Etc.

The management is also interested in making some inferences regarding these leaks. In particular, they are interested in confidence intervals of the average yearly leak for each year, in addition to the average of the total of the five years. The confidence levels typically used are 90%, 95% and 99%.

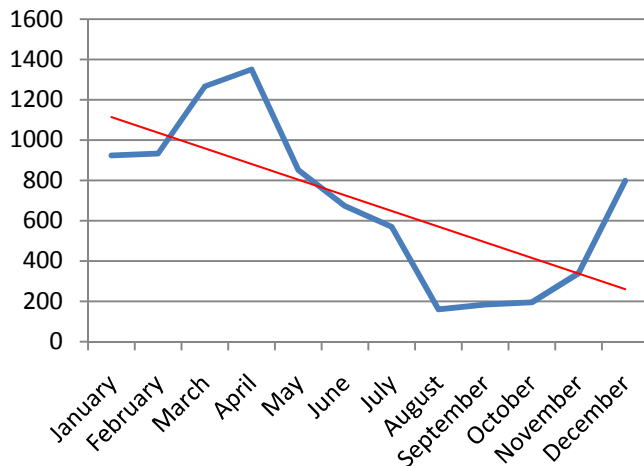
By looking at other tunnels around the World, and considering the construction standards, the management has found that the average yearly leak is 10 liters. If the yearly average of the tunnel exceeds this standard, then the tunnel would require either significant overhaul or maybe even reconstruction. Carry out the appropriate hypotheses tests to help the management make an informed decision. A significance level of 5% and 1% are used since the consequences of making the wrong decision are very costly. Basically, overhauling the tunnel when it does not need overhaul will cost the Municipality significant funds unnecessarily; and if the tunnel is not overhauled when it should be, it could collapse and cause significant loss of life and property.

Finally, the management wants to determine if the yearly average is the same in all five years or not. Carry out the appropriate analysis of variance tests to answer this question. Make sure you interpret your findings from the management point of view.



In order to make sense out of the given observation, we had to start by calculating the descriptive statistics using Excel for each month (included in the Excel sheets provided). We will be starting discussing the visualizing the problem year by year which includes all monthly variances.

Year 1997 Overview:



Month	Mean
January	923.4375
February	933.28125
March	1265.625
April	1350
May	852.34375
June	673.4375
July	570.3125
August	160.78125
September	185
October	196.09375
November	340.625
December	798.4375

Here we started with year 1997, as you can see from the table; the leaks average does not change much from January to February. However, it increases in the next two months, March and April, and that is where it concaves down which is the maximum point of 1997. The average of leaks keeps falling since then down at minimum in August where it concaves up. The average moves back to normal approximately as how it begins at the beginning of the year. We had to get the trend line to visualize how the monthly average is performing. As you may see the red trend line on the graph, our curve, if unadjusted with the errors elimination, is decreasing month by month.

According to the given observations of 1997, and not later ones and since the leaks above 10 Liters need to be maintained, we believe that the tunnel requires the presence of maintenance between February and April since these months are where the leaks are increasingly getting their averages high.

Leaks Average Summary:

- ▲ March, April, September
- ▲ November, October
- ▲ December
- ▼ May, June, July
- ▼ August

Symbol: [Highest or Lowest month], [Less higher or lower month], [the least higher or lower]

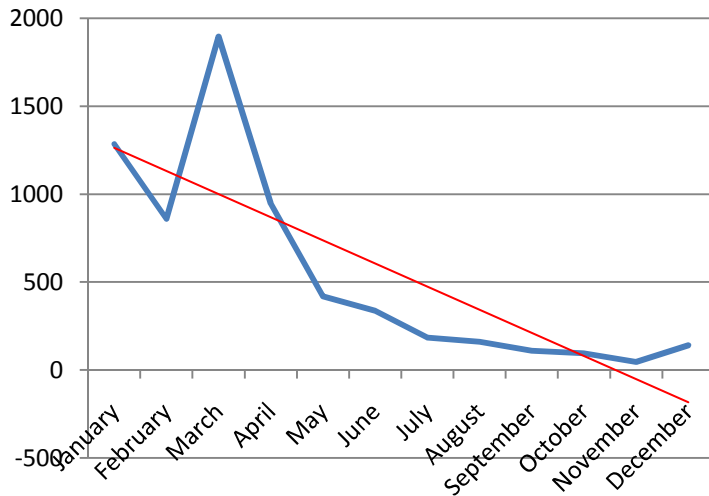
Maintenance in (first view):

March¹, April¹, November¹, and December¹.

Mean (of months' means)	687.4479167
Standard Error	117.8841938
Median	735.9375
Standard Deviation	408.362826
Sample Variance	166760.1977
Skewness	0.13310081
Range	1189.21875
Minimum	160.78125
Maximum	1350
Sum	8249.375
Count	12



Year 1998 Overview:



Month	Mean
January	1284.375
February	859.375
March	1895.3125
April	946.875
May	420.3125
June	338.28125
July	184.375
August	161.71875
September	110.9375
October	95.3125
November	46.875
December	140.625

Now we start with year 1998, as you can see from the table; the leaks average decreases from January to February (concaves up, but not minimum) and then highly increases in March where it here concaves down as the maximum point. According to what we have covered yet, we see that in both years, 1997 and 1998, leaks average increases in an extreme manner in which it witnesses that the tunnel requires the presence of maintenance during this month. In March, the weather becomes humid and wet where it may influence on the tunnel's average of leaks. This average decreases in April to November which is extremely fair and does not require the maintenance. However, in December, the curve concaves up as minimum and increases with the triple of the recently recorded mean of November which is, still, low.

However, the issue here is that the tunnel started its year with a high average of leaks. It was decreasing during January but why was it increased up to that point during December of the previous year?

SUMMARY OF THIS YEAR

Leaks Average Summary:

- ▲ March,
- ▲ December
- ▼ Feb, April, May, June
- ▼ July, Aug, Sept, Oct, Nov

Symbol: [Highest or Lowest month], [Less higher or lower month], [the least higher or lower]

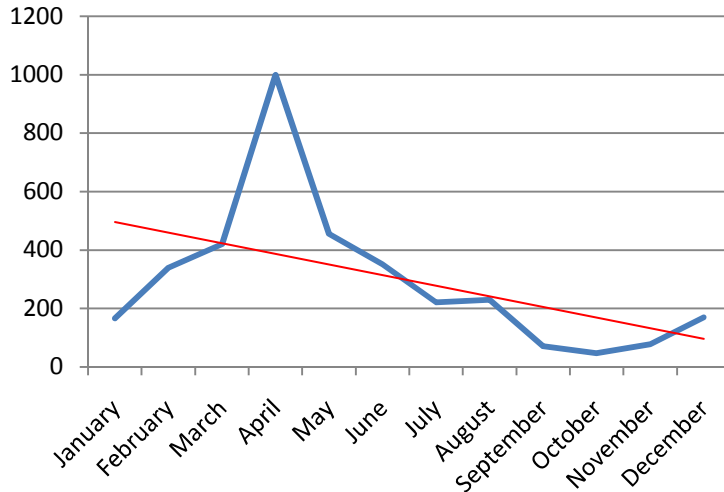
Maintenance in (first view):

March₂, December₂.

Mean (of months' means)	540.3645833
Standard Error	168.9452087
Median	261.328125
Standard Deviation	585.2433704
Sample Variance	342509.8026
Skewness	1.381372476
Range	1848.4375
Minimum	46.875
Maximum	1895.3125
Sum	6484.375
Count	12



Year 1999 Overview:



Month	Mean
January	166.25
February	339.0625
March	420.46875
April	998.75
May	454.6875
June	351.5625
July	220.3125
August	229.6875
September	71.09375
October	46.875
November	77.34375
December	169.53125

In this year, we can see that the maximum average of leaks has not reached much. The maximum leaks average of 998.75 was reported during April. It is April's second time, once in 1997, and one is now. Also March was increasing too, so it is the third of March, once 1997, 1998 and once is now. The average keeps falling, and then increasing in November, and December. So, it is November's second time (1997 and now), and December's third time (1997, 1998, and now).

The high increase in average of leaks during April might be caused due to the rain since it is Dubai's raining month. And what we can notice too is that the tunnel's leaks average is not affected by humidity in this year as you can see the average is decreasingly getting low from May to October which is the summer season in Dubai. We cannot assure these until we go through the history of the next years.

SUMMARY OF THIS YEAR

Leaks Average Summary:

- ▲ Feb, March
- ▲ April, August, November
- ▲ December
- ▼ Jan
- ▼ May, June, July
- ▼ Sept, October

Symbol: [Highest or Lowest month], [Less higher or lower month], [the least higher or lower]

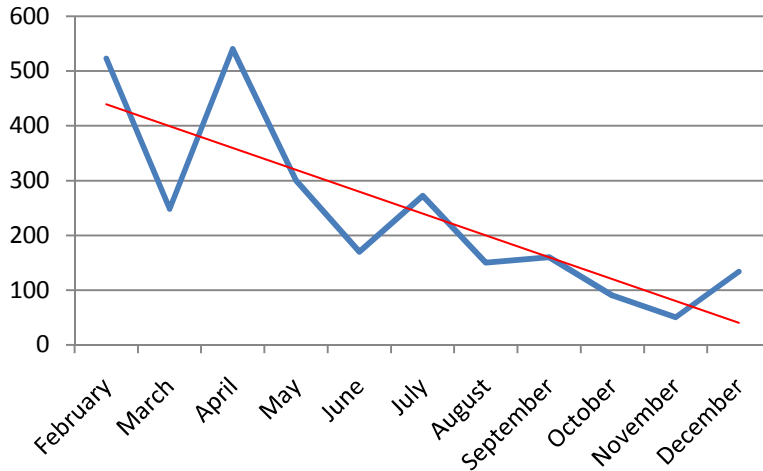
Maintenance in (first view):

February¹, March³, April², December³.

Mean(of months' means)	295.46875
Standard Error	75.0192871
Median	225
Standard Deviation	259.8744336
Sample Variance	67534.72124
Skewness	1.940538159
Range	951.875
Minimum	46.875
Maximum	998.75
Sum	3545.625
Count	12



Year 2000 and 2001 Overview:



Month	Mean
January	No Observations
February	522.222222
March	247.777778
April	540
May	300
June	170
July	272.222222
August	150
September	160
October	90
November	50
December	133.333333

Since the observations of 2000 and 2001 are similar, we'll cover their monthly statistics in this page. The observations collected are weak and we are not confident about the decisions of these two years all due to the number of observations. Approximately, the given number of observations of these two years is about half of the observations of each of the previous years. The average starts 522 during February (January is skipped since we have observations for it). Our curve goes down in March and increases in April where it is April's third (2000) and fourth (2001). The average falls down until it reaches July where it doubles up to 272.22, that is another concaving-up-curve but it isn't that much and still safe. Our curve goes down and then increases in November and December where it is November's third and December's fourth time.

It is the same here for April, leaks, as I believe, are a consequence of rains. This assures our figure of the last year. Humidity did not affect the tunnel leaks as leaks average decreases from May to November. This assures, too, that humidity has no effect on the tunnel's average of leaks.

SUMMARY OF THIS YEAR

Leaks Average Summary:

- ▲ February, July
- ▲ April, Sept
- ▲ December
- ▼ March, May, June
- ▼ August, October, November

Symbol: [Highest or Lowest month], [Less higher or lower month], [the least higher or lower]

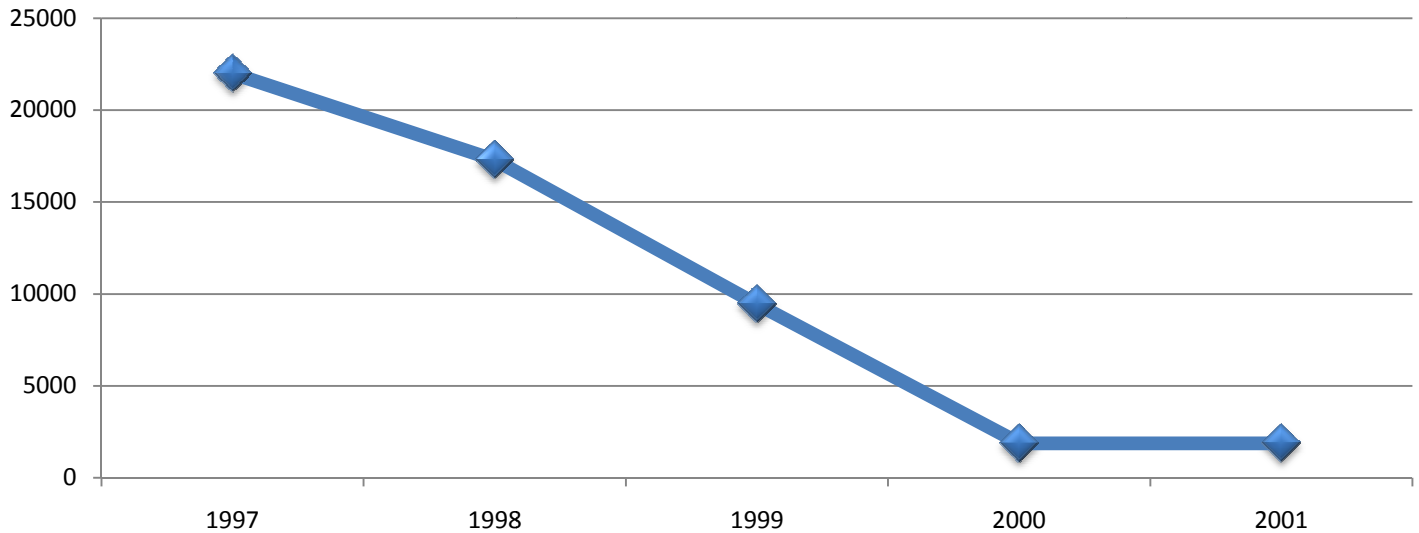
Maintenance in (first view – two digits added since for 2000 & 2001):

February³, July², April⁴, December⁵.

Mean (of months' means)	239.5959596
Standard Error	48.96419194
Median	170
Standard Deviation	162.3958528
Sample Variance	26372.41302
Skewness	1.056389582
Range	490
Minimum	50
Maximum	540
Sum	2635.555556
Count	11



Yearly Overview:



When we look at the average of leaks yearly, we see that leaks are obviously reducing. We may assure it is decreasing for year 1997, 1998, and 1999 but not for 2000 and 2001 as they do not have enough observations to get the accurate results.

Year	Average
1997	21998.33333
1998	17291.66667
1999	9455
2000	1877.5
2001	1877.5

Mean	10500
Standard Error	4050.465671
Median	9455
Mode	1877.5
Standard Deviation	9057.116581
Sample Variance	82031360.76
Kurtosis	-2.303900962
Skewness	0.308575228
Range	20120.83333
Minimum	1877.5
Maximum	21998.33333
Sum	52500
Count	5

Confidence Intervals:

Below and at the center of this page we have the confidence intervals at 99%, 95% and 90% confidence levels for the whole data of five years and for each year too.

Year	Con. Level	Lower	Upper
Five years	99%	1082.6	19917.3
	95%	3836.9	17163.01
	90%	5315.4	15684.5

Confidence Intervals for Each Year:

Year	Con. Level	Lower	Upper
1997	99%	13227.749	30768.917
	95%	15792.909	28203.757
	90%	17169.797	26826.87
1998	99%	4722.1431	29861.19
	95%	8398.3909	26184.942
	90%	10371.671	24211.662
1999	99%	3873.565	15036.435
	95%	5505.9847	13404.015
	90%	6382.21	12527.79
00-01	99%	957.39815	2797.6019
	95%	1226.5032	2528.4968
	90%	1370.9493	2384.0507



Hypotheses Testing for Tunnel Constructions:

Quoted [By looking at other tunnels around the World, and considering the construction standards, the management has found that the average yearly leak is 10 liters. If the yearly average of the tunnel exceeds this standard, then the tunnel would require either significant overhaul or maybe even reconstruction.]

✓ Formulating the hypotheses test: $\begin{cases} H_0: \mu \leq 10K \\ H_1: \mu > 10K \end{cases}$: One Tail;

Year 1997:

($\mu_0=10K$, $n=12$, Standard Deviation= 13067.61043, Mean= 21998)

T-Test: $z = 3.18$

When Alpha: 0.01:

Area = $0.5 - 0.01 = 0.49$

$Z = 2.325$

$3.18 \leq 2.325$? No! → Reject H_0

When Alpha: 0.5:

Area = $0.5 - 0.05 = 0.450$

$Z = 1.645$

$3.18 \leq 1.645$? No! → Reject H_0

Conclusion:

There is evidence that the yearly average of the tunnel leaks exceeds the standard of 10 liters where it would require either significant overhaul or maybe even reconstruction.

Year 1999:

($\mu_0=10K$, $n=12$, Standard Deviation= 8315.982, Mean= 9455)

T-Test: $z = -0.227$

When Alpha: 0.01:

Area = $0.5 - 0.01 = 0.49$

$Z = 2.325$

$-0.227 \leq 2.325$? Yes! → Do Not Reject H_0

When Alpha: 0.5:

Area = $0.5 - 0.05 = 0.450$

$Z = 1.645$

$-0.227 \leq 1.645$? Yes! → Do Not Reject H_0

Conclusion:

There is no evidence that the yearly average of the tunnel leaks exceeds the standard of 10 liters where it would require either significant overhaul or maybe even reconstruction.

Year 1998:

($\mu_0=10K$, $n=12$, Standard Deviation= 18727.79, Mean= 17291)

T-Test: $z = 1.348$

When Alpha: 0.01:

Area = $0.5 - 0.01 = 0.49$

$Z = 2.325$

$1.348 \leq 2.325$? Yes! → Do Not Reject H_0

When Alpha: 0.5:

Area = $0.5 - 0.05 = 0.450$

$Z = 1.645$

$1.348 \leq 1.645$? Yes! → Do Not Reject H_0

Conclusion:

There is no evidence that the yearly average of the tunnel leaks exceeds the standard of 10 liters where it would require either significant overhaul or maybe even reconstruction.

Year 2000, 2001:

($\mu_0=10K$, $n=12$, Standard Deviation= 1370.893, Mean= 1877)

T-Test: $z = -20.525$

When Alpha: 0.01:

Area = $0.5 - 0.01 = 0.49$

$Z = 2.325$

$-20.525 \leq 2.325$? Yes! → Do Not Reject H_0

When Alpha: 0.5:

Area = $0.5 - 0.05 = 0.450$

$Z = 1.645$

$-20.525 \leq 1.645$? Yes! → Do Not Reject H_0

Conclusion:

There is no evidence that the yearly average of the tunnel leaks exceeds the standard of 10 liters where it would require either significant overhaul or maybe even reconstruction.



Conclusion:

Yearly Average & Long-Term maintenance Scheduling

The yearly average of tunnel leaks is decreasing until it remains unchanged in years 2000 and 2001 in stable status that does not require maintenance. However, historically, we believe that the tunnel requires maintenance in February, March, April, July, and December because, according to our monthly overview, we found that these months are where the leaks are increasing. When applying maintenance during these months each year in long-term the tunnel leaks will be perfectly handled and the average of leaks will not get higher than the standard of 10 liters yearly.

March & April Weather

For maintenance management team, we believe that rain has an obvious impact on the tunnel's average of leaks which is increasingly getting higher when it rains during March and April. It is important that maintenance present while raining to reduce the tunnel's average leaks average. However, in May, the average of leaks falls during this month.

Humidity is Fine!

The observations led to extracted information which believes that humidity does not increase the tunnel's average of leaks. Humidity begins at the beginning of summer, from July to October where, during this period, the tunnel's average of leaks is always decreasing.

We got a type II error!

In year 1998 in our hypothesis test, I believe we have a type II error where we did not reject H_0 and it should be rejected since the total average is already greater than 17 liters > 10 liters. In this test we concluded with "There is no evidence that the yearly average of the tunnel leaks exceeds the standard of 10 liters where it would require either significant overhaul or maybe even reconstruction." Overhauling the tunnel when it does not need overhaul will cost the Municipality significant funds unnecessarily of course; and if the tunnel is not overhauled when it should be, it could collapse and cause significant loss of life and property. Therefore, since we got no evidence but we found out that the average is more than the standard, then overhauling must present.





Part II: The MGRP of Kuwait Problem (Categorical Data):

The Manpower Growth and Restructuring Program (MGRP) of Kuwait is a government agency that was founded in July of 2002 to aid in the placement of Kuwaiti job seekers in the private sector. After 6 years of operation, the MGRP management is not quite clear on whether they have been accomplishing their objectives.

A study was carried out to investigate the target population's perceptions of the MGRP. This would be instrumental to the MGRP management not only in determining the extent to which they have accomplished their objectives, but will also give future directions for improvement.

A sample of 90 (assume this is a large enough sample) students were surveyed to answer to some of these questions. The raw data set is provided in the accompanying Excel sheet.

You are charged with, again, making sense of the data. First of all, you need to start by summarizing the data in a suitable form (possibly frequency tables). Secondly, using the descriptive statistics (primarily the proportions and the various charts), interpret your initial findings.

The management is interested in determining some confidence levels on the various proportions of concern at 95% and 90% confidence levels.

Another concern of management is determining whether their message is getting through to males and females equally. This will help in formulating better awareness messages and programs in the future.



The Manpower Growth and Restructuring Program (MGRP) of Kuwait is a government agency that was founded in July of 2002 to improve the management of the state labor markets and human resources; and to expand the opportunities and options for job seekers in the private sector. It also contributes to the development of the values of productive work and initiative culture in the community, by using the legislative and Institutional tool, policy, and appropriate scientific methods.

The objective of the program

- The restructuring of the program institutional relations with concerned parties within and outside the State.
- Strengthening the role of the program in the planning and managing of state labor markets.
- Improve the quality and skills of national labors according to the changing needs of labor markets outside the government sector.
- To provide more jobs opportunities at the private sector.
- Create a supportive environment that helps to develop the business and the small and medium-sized projects.
- To spread the initiative culture in the community

Evaluating the work of (MGRP)

After 6 years of operation it has become an important matter to decide how efficient the program has been, whether it achieved its desired goals or not and how well the population knows about it and about the services it provides. To answer the previous questions a survey has been made and was distributed to a sample of 90 students. This survey will not only answer these questions it will also give them a guideline on how to improve their work in the future to achieve more desirable results.

Following is a sample of the questions that were asked in the survey:

- How much do you know about the MGRP?
- How did you come to know about the MGRP?
- Did the MGRP offerings meet your expectations?
- Were you satisfied with the results of using the MGRP services?
- Would you consider using their services?
- Would you consider working for the private sector?
- Do you intend to start your own business one day?

Survey Results Overview:

A sample of 90 (assume this is a large enough sample) students were surveyed to answer to some of these questions and based on those questions and the results from those questions we are going to analyze the results and make the proper hypotheses test to ensure the management determination to see whether the program has reached their objectives and from those hypotheses they want to conclude the best way to improve the program by letting people know more about what MGRP provides to people.



Are you familiar with the Manpower Growth and Restructuring Program (MGRP) of Kuwait? Are you familiar with the Manpower Growth and Restructuring Program (MGRP) of Kuwait?

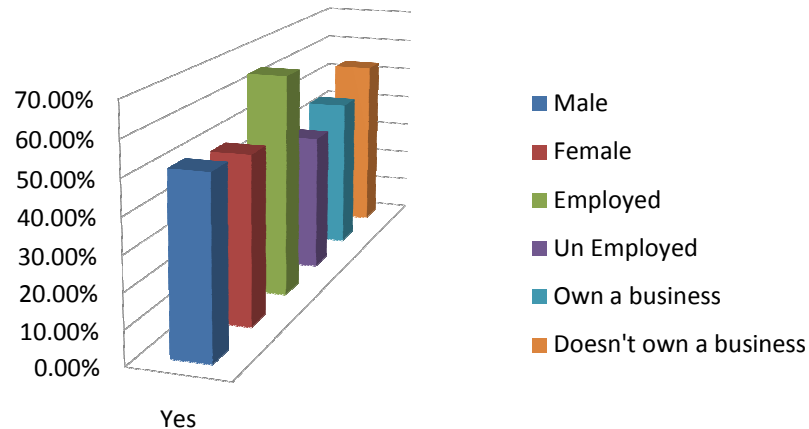


Figure 1

We have displayed the result of category that is familiar of MGRP and Figure 1 shows us that between each category and the proportion of each category:

- Male Vs Female : it shows that there is no recognizable difference between both proportion in term of familiarity with MGRP
- Employed Vs Unemployed : it shows us that there is a slightly difference between both proportion where the employees knows more about MGRP and this result make sense because employees have desire to know more about their services.
- Own a business Vs doesn't own a business: it shows us a very small difference between the two proportions.

In the hypotheses testing stage we will be testing each conclusion was made based on the survey test.

One of the important question was in the survey is the question from where you knew about MGRP and this question we took it from all category due to our determination to deliver the message and the information about MGRP to all categories.

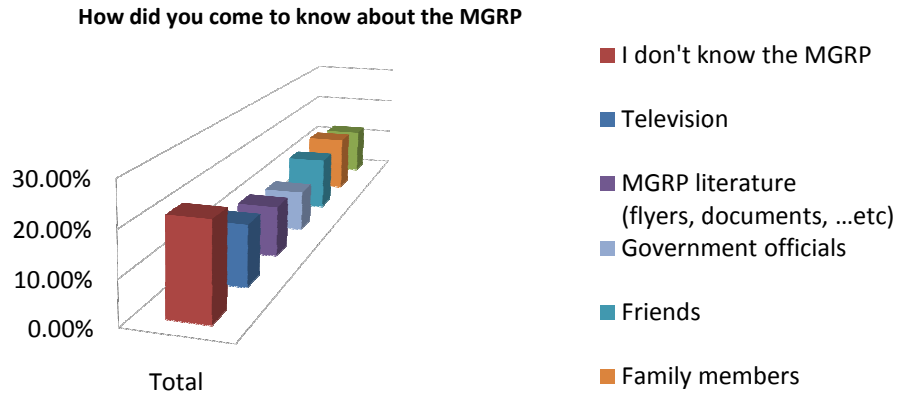


Figure 2

And in this analysis we want to determine the more influential way for all category of people to know more and in Figure 2 we can summarize it that television and family members and more influential to people rather than any other source while the government official has the least influential part for the people.

Based on that summary we will be testing a hypotheses about a certain percentage of influence that the television on people and to have a better result we will try to make the advertisement in a way that people can talk about it and deliver the message to other family members and friends.

After categorizing people the program management has a determination about the result of the survey between important categories which are Male & Female we choose two important criteria other than familiarity which has been done before with all categories to differentiate between them.

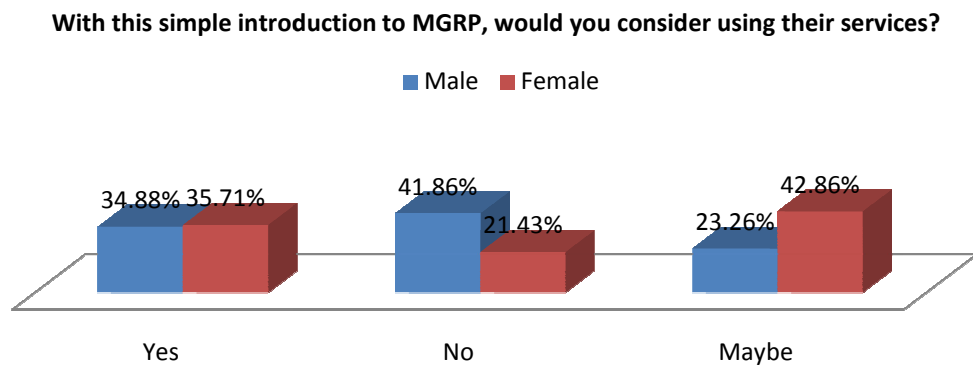


Figure 3



The result shows no difference between Males and Females in term on surely considering using MGRP services while the females may have more intention to use the services (ref Maybe columns).

Would you consider working for the private sector?

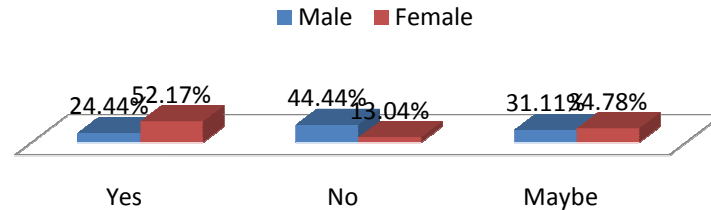


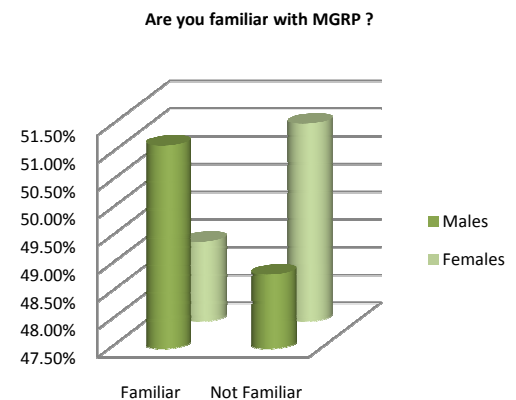
Figure 4

The result shows no difference between Males and Females in term on surely considering working in the privet sector it shows that females have more intention to in the privet sector

Hypotheses testing:

1. We want to determine whether the average proportion of male Vs Females are equal.

Males		Females	
Familiar	22 51.16%	23 48.94%	
Not Familiar	21 48.84%	24 51.06%	
H ₀ : p ₁ - p ₂ = 0			
H ₁ : p ₁ - p ₂ ≠ 0		α	10% Or 5%
≠ ₀₁			
p1	0.51	p2	0.49
n1	22	n2	23
pooled proportion =		0.500247	
Z	=	0.149329	
p-value	=	0.8808	> α Do not reject H ₀



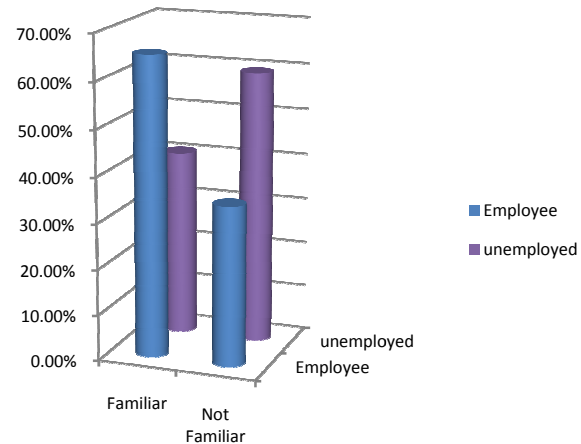


Conclusion:

There is no evidence that the message is getting differently between Males & Females, and in this case we will maintain the same level message because the program objective is to deliver the message to the who population

2. We want to determine that the message is getting through the employees and the unemployed equally.

Employee		unemployed	
Familiar	15 65.22%	13 40.63%	
Not Familiar	8 34.78%	19 59.38%	
$H_0 : p1 - p2 = 0$			
$H_1 : p1 - p2 \neq 0$			
α 10% or 5%			
$\neq 0.1$			
p1	0.65	p2	0.41
n1	23	n2	32
pooled proportion = 0.509091			
Z	= 1.799534		
p-value	= 0.0718	>	$\alpha = 0.05$ Do not reject H_0
p-value	= 0.0718	<	$\alpha = .1$ Reject H_0



Conclusion:

- $\alpha = 0.05$

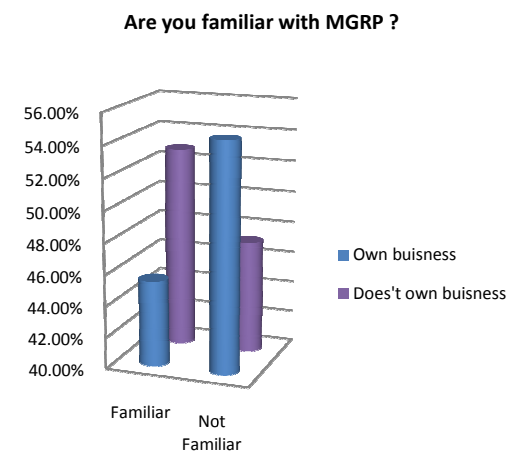
There is no evidence that the message is getting differently between Employees & Unemployed, and in this case we will maintain the same level message because the program objective is to deliver the message to the who population

- $\alpha = 0.1$

There is evidence that the message is getting differently between Employees & Unemployed, and in this case the management has to take action and our recommendation is to increase the advertisement in the universities and any other places where you find the proportion of the unemployed are more.

3. We want to determine that the message is getting through the employees and the unemployed equally.

Own business		Doesn't own business	
Familiar	15 45.45%	28 52.83%	
Not Familiar	18 54.55%	25 47.17%	
$H_0 : p1 - p2 = 0$			
$H_1 : p1 - p2 \neq 0$			
α 10% or 5%			
$\neq 0.1$			
p1	0.45	p2	0.53
n1	33	n2	53
pooled proportion = 0.5			
z	= -0.66524		
p-value	= 0.5028	>	α Do not reject H_0





Conclusion:

There is no evidence that the message is getting differently between people who have any member of the family own business & those who are haven't , and in this case we will maintain the same level message because the program objective is to deliver the message to the who population

4. We want to determine whether the television have at least 15% of the influence to all category of people to know about MGRP.

Television		Newspapers		MGRP literature (flyers, documents, ...etc)	
26	18.71%	22	15.83%	23	16.55%
Friends		Family Member		Government official	
24	17.27%	26	18.71%	18	12.95%
H ₀ :					
p ≥		15%			
H ₁ :		p < 15% α		10% or 5%	
n =		45			
p =		18.71%			
z =		0.696055			
p-value =		0.242 > α		Do not Reject H ₀	

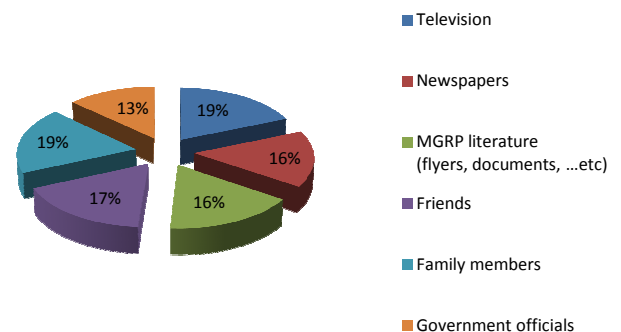
Conclusion:

There is no evidence that the amount of people who knew about MGRP from television is less than 15% from the whole population who knew are familiar with MGRP.

There for and in this case we highly recommend to the management of the program to concentrate on the television to reach their objective by increasing the number of people who are familiar with MGRP.

Another conclusion since friends & family member are also a good influence to reach the objective of the program we highly recommend to have a very creative advertisement will also mentioned during the sittings of people.

From where you did know MGRP ?

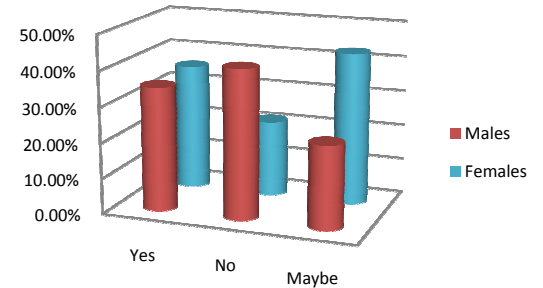




5. We want to determine whether there is difference between males & females in terms of intention to use the service of MGRP

Males		Females	
Yes	15 34.88%	15 35.71%	
No	18 41.86%	9 21.43%	
Maybe	10 23.26%	18 42.86%	
$H_0 : p_1 - p_2 = 0$			
$H_1 : p_1 - p_2 \neq 0$			
α			
$\neq 0.1$			
p1	0.42	p2	0.36
n1	43	n2	42
pooled proportion =	0.388235		
z	= 0.58132		
p-value	= 0.562 > α Do not reject H_0		

Do you want to use MGRP services ?



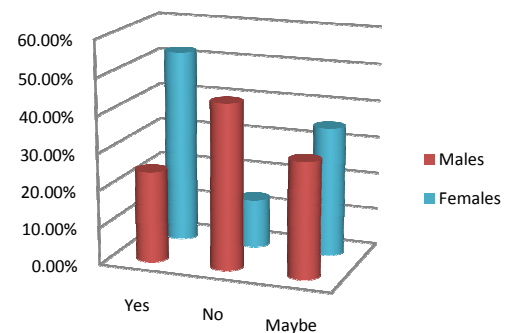
Conclusion:

There is no evidence that there is a difference between Males & Females in terms of the intention of using MGRP. Therefore the management has successfully managed to deliver the message for females and males equally.

6. We want to determine whether there is a difference between males & females in terms of their desire to work in the private sector.

Males		Females	
Yes	11 24.44%	24 52.17%	
No	20 44.44%	6 13.04%	
Maybe	14 31.11%	16 34.78%	
$H_0 : p_1 - p_2 = 0$			
$H_1 : p_1 - p_2 \neq 0$			
α			
$\neq 0.1$			
p1	0.24	p2	0.52
n1	45	n2	46
pooled proportion =	0.384615		
z	= -2.71844		
p-value	= 0.0066 > $\alpha = 0.05$ Do not reject H_0		
p-value	= 0.0066 < $\alpha = .1$ Reject H_0		

Do you have intention to work in private sector ?





Conclusion:

- $\alpha = 0.05$

There is no evidence that the desire to work in the private sector is different between males & females. In this case the program has reached the balance in terms of attractiveness of working in the private sector between males & females.

- $\alpha = 0.01$

There is evidence that the desire to work in the private sector is different between males & females. Actually females are requesting to work in the private sector more than males.

We have 2 analyses for this situation

- The program has delivered the message to females more than males and in this situation it is not applicable since we have tested this before and there was no evidence for this.
- The program has to increase the attractiveness for males to work more in the private sector since this is the main objective for the program.





How this project benefited us!

Abdullah S. Al-Salloum

“Working on such cases gave me the needed confidence to work on such large sized data observations in the future career where I could get the needed information from semi-dummy numbers and visualize them using Excel. This project gave me the power to understand how Excel is one of the applications that leads to a successful work. Group-wise, I found it interesting and achievable although we faced many conflicts in opinions.”

Abdulrahman M. Al-Khannah

“The main benefit of the project that I gained is the proper way to extract the needed information from the survey – observations to summarize and, then, analyze them where we finally get the appropriate conclusion. Regarding the group, I did not face any issue; however, the benefits were the group discussion and dividing the work effort to increase the output efficiency.”

Ahmed O. Al-Ayyar

“I gained much information on how it works while getting observations and define the needed analysis. Working as a group member helped me a lot while distributing the work between us. It is a good experience.”

Mejbil H. Al-Shammari

“The benefit that I got from this experiment is how to take serious decisions based on analysis which would assist me in my future career. However, regarding the group work we have experienced, I liked the work cooperation between all group members.”

