

Chapter 4

Statistical Modelling

In chapter 3 we used some basic statistical methods for analysing the data. In this chapter we use factor analysis and linear regression modelling.

4.1 Factor Analysis

Factor Analysis is used to deduce the appropriate number of outcome variables. There were 237 observations corresponding to the 12 questionnaire items in Part 2 and the 15 questionnaire items in Part 3 item. We analysed to fit 4, 5, and 6 factors in Part 2, and fit 4, 5, 6, and 7 factors in Part 3 using the maximum likelihood method and rotation with the varimax method with maximum iterations for convergence 100. Tables 4.1 and 4.2 show the results for the goodness-of-fit tests in each case. (McNeil, 2001:209)

Number of factors	Chi-squared statistic	Degrees of freedom	<i>p</i> -value
4	41.20	24	0.016
5	22.30	16	0.134
6	6.57	9	0.681

Table 4.1: Results for goodness-of-fit tests of factor models in Part 2

Number of factors	Chi-squared statistic	Degrees of freedom	<i>p</i> -value
4	82.78	41	0.000
5	47.977	31	0.026
6	25.934	22	0.255
7	13.283	14	0.504

Table 4.2: Results for goodness-of-fit tests of factor models in Part 3

We can see that the fit is satisfactory result, in the sense that the *p*-values are greater than 0.05, for the models with 5 factors in Part 2 and 6 factors in Part 3.

Table 4.3 shows the loadings from the factor analysis of fitting five factors to the items responses from Part 2. The loadings greater than 0.33 are highlighted.

Questionnaire Item	Factor				
	1	2	3	4	5
1. Been able to concentrate on what you're doing?	0.232	0.308	0.131	0.425	0.171
2. Lost much sleep over worry?	0.000	0.180	0.000	0.516	0.000
3. Felt you were playing a useful part in things?	0.103	0.656	0.139	0.109	0.000
4. Felt capable of making decisions about things?	0.135	0.718	0.000	0.194	0.115
5. Felt constantly under strain?	0.487	0.000	0.151	0.570	0.228
6. Felt you couldn't overcome your difficulties?	0.606	0.172	0.000	0.000	0.215
7. Been able to enjoy your normal day-to-day activities?	0.304	0.168	0.188	0.166	0.831
8. Been able to face up to your problems?	0.317	0.484	0.148	0.115	0.217
9. Been feeling unhappy and depressed?	0.715	0.118	0.227	0.294	0.183
10. Been losing confidence in yourself?	0.659	0.266	0.173	0.258	0.000
11. Been thinking of yourself as a worthless person?	0.466	0.143	0.376	0.101	0.000
12. Been feeling reasonably happy, all things considered?	0.249	0.154	0.929	0.152	0.167

Table 4.3: Varimax-rotated loadings for five factor model in Part 2

Table 4.4 shows the loadings from the factor analysis of fitting five factors to the items responses from Part 2 after sorting the items according to the loadings with the factors. The loadings less than 0.33 are omitted from this table.

The items separated reasonably cleanly into the five factor groups. The exceptions were that factor groups 3 and 5 contained only one item, and items 5 and 11 were each involved in two factors.

Questionnaire Item	Factor				
	1	2	3	4	5
6. Felt you couldn't overcome your difficulties?	0.606				
9. Been feeling unhappy and depressed?	0.715				
10. Been losing confidence in yourself?	0.659				
11. Been thinking of yourself as a worthless person?	0.466		0.376		
3. Felt you were playing a useful part in things?		0.656			
4. Felt capable of making decisions about things?		0.718			
8. Been able to face up to your problems?		0.484			
12. Been feeling reasonably happy, all things considered?			0.929		
1. Been able to concentrate on what you're doing?				0.425	
2. Lost much sleep over worry?				0.516	
5. Felt constantly under strain?	0.437			0.570	
7. Been able to enjoy your normal day-to-day activities?					0.831

Table 4.4: Varimax-rotated loadings greater than 0.33 for five factor model for Part 2

In Part 2, the questionnaire items were thus grouped into five factors as follows:

1. Q6: You feel that you are unable to overcome difficulties?
Q9: You feel that you are not happy & sorrowful?
Q10: You feel that you have lost your self-confidence?
Q11: You feel that you are a useless fellow?
2. Q3: You feel you are helpful to all?
Q4: You feel you are able to make up your mind?
Q8: You are able to resolve all difficulties by your self?
3. Q12: You feel that generally you are happy suitable for station in life?
4. Q1 : Been able to concentrate on what you're doing?
Q2 : Lost much sleep over worry?
Q5 : Felt constantly under strain?
5. Q7: You feel you are happy over doing daily activities as usual?

Tables 4.5 and 4.6 show the corresponding results for the items from Part 3.

In this case the items separated less cleanly into the six factor groups. The exceptions were that factor group 4 contained only one item, and items 2, 4, 5, 7 and 10 were each involved in two or more factors. Item 15 did not have a loading greater than 0.33, so it was excluded.

Questionnaire Item	Factor					
	1	2	3	4	5	6
1. I thought about it when I didn't mean to.	0.182	0.000	0.661	0.000	0.000	0.150
2. I avoided letting myself get upset when I thought about it or was reminded of it.	0.224	0.179	0.600	0.179	0.387	0.122
3. I tried to remove it from memory	0.113	0.266	0.238	0.000	0.772	0.124
4. I had trouble falling asleep or staying asleep, because of pictures or thought about it that came into my mind	0.210	0.164	0.368	0.112	0.445	0.483
5. I had waves of strong feelings about it.	0.202	0.148	0.397	0.301	0.246	0.380
6. I had dreams about it.	0.247	0.231	0.196	0.231	0.000	0.476
7. I stayed away from reminders of it.	0.279	0.527	0.212	0.000	0.140	0.347
8. I felt as if it hadn't happened or it wasn't real.	0.000	0.505	0.000	0.152	0.259	0.199
9. I tried not to talk about it.	0.224	0.749	0.255	0.167	0.105	0.000
10. Pictures about it popped into my mind.	0.528	0.256	0.282	0.114	0.111	0.355
11. Other things kept making me think about it.	0.574	0.203	0.258	0.150	0.101	0.216
12. I was aware that I still had a lot of feelings about it, but I didn't deal with them.	0.215	0.275	0.157	0.890	0.120	0.213
14. Any reminder brought back feelings about it.	0.512	0.340	0.320	0.315	0.235	0.000
15. My feelings about it were kind of numb.	0.270	0.271	0.000	0.164	0.164	0.199

Table 4.5: Varimax-rotated loadings for six factor model in Part 3

Questionnaire Item	Factor					
	1	2	3	4	5	6
11. Other things kept making me think about it.	0.574					
10. Pictures about it popped into my mind.	0.528					0.355
14. Any reminder brought back feelings about it.	0.512	0.340				
9. I tried not to talk about it.		0.749				
7. I stayed away from reminders of it.		0.527				0.347
8. I felt as if it hadn't happened or it wasn't real.		0.505				
1. I thought about it when I didn't mean to.			0.661			
2. I avoided letting myself get upset when I thought about it or was reminded of it.			0.600		0.387	
5. I had waves of strong feelings about it.			0.397			0.380
12. I was aware that I still had a lot of feeling about it, but I didn't deal with them.				0.890		
3. I tried to remove it from memory					0.732	
4. I had trouble falling asleep or staying asleep, because of pictures or thought about it that came into my mind			0.368		0.445	0.483
6. I had dreams about it.						0.476

Table 4.6: Varimax-rotated loadings greater than 0.33 for six factor model for Part 3

In Part 3 the questionnaire items were thus grouped into six factors as follows :

6. Q10. Pictures about it popped into my mind.
Q11. Other things kept making me think about it.
Q14. Any reminder brought back feelings about it.
7. Q7. I stayed away from reminders of it.
Q8. I felt as if it hadn't happened or it wasn't real.
Q9. I tried not to talk about it.
8. Q1. I thought about it when I didn't mean to.
Q2. I avoided letting myself get upset when I thought about it or was reminded of it.
Q5. I had waves of strong feelings about it.
9. Q12. I was aware that I still had a lot of feeling

10. Q3. I tried to remove it from memory

11 Q4. I had trouble falling asleep or staying asleep, because of pictures or thoughts about it that came into my mind.

Q6. I had dreams about it.

In factor 1 the components were item 6 (Felt you couldn't overcome your difficulties?) item 9 (Been feeling unhappy and depressed?) item 10 (Been losing confidence in yourself?) and item 11 (Been thinking of yourself as a worthless person?). So we name for factor 1 "*low self esteem*".

All the questions in factor 2 were related to the police officer being able to make a decision against his wishes. Therefore we named this factor2 "*can't cope*".

In factor 3 the components were item 12 (Been feeling reasonably happy, all things considered?). Thus we named factor 3, which contains a single item, "*unhappy*".

All questions in factor 4 indicated that the police officer was apprehensive. Therefore we named this factor4 "*worried*".

A positive response to the item in factor 5 indicated that the police officer did not enjoy this routine activity. Therefore we named this factor5 "*dislike job*".

In factor 6 the components were item 10 (pictures about it popped into my mind) item 11 (other things kept making me think about it) item 14 (any reminder brought back feelings about it), item 15 (my feelings about it were kind of numb). Therefore we named factor 6 "*haunted*".

All the questions in factor 7 were related to police officer trying not to talk and staying away from reminders. Therefore we named this factor7 "*escaping*".

In factor 8 the components were item 1 (I thought about it when I didn't mean to), item 2 (I avoided letting myself get upset when I thought about it or was reminded of it) and item 5 (I had waves of strong feelings about it). Therefore we named this factor8 "*avoiding*".

In factor 9 the components were item 12 (I was aware that I still had a lot of feeling about it, but I didn't deal with them.). Therefore we named factor 9 “*ignoring*”.

In factor 10 the components were item 3 (I tried to remove it from memory) Therefore we named factor 10 “*erasing*” or “*repression*”.

In factor 11 the components were item 4 (I had trouble falling asleep or staying asleep, because of pictures or thought about it that came into my mind) and item 6 (I had dreams about it.) Therefore we named factor 11 “*nightmares*”.

Table 4.7 presents numerical summaries of the eleven outcome factors. The means range from a minimum of 0.60 (the *low self esteem* factor) to a maximum of 1.39 (the avoiding factor), and the standard deviations range from 0.44 (the *can't cope* factor) to 1.12 (the *erasing* factor). The distributions of five of the factors (*low self esteem*, *unhappy*, *worried*, *dislike job* and *nightmares*) are skewed to the right, and the distributions of one of the factors (*unhappy*) has a substantially high kurtosis coefficient.

<i>Variable</i>	<i>Size</i>	<i>Mean</i>	<i>St Dev</i>	<i>Skewness</i>	<i>Kurtosis</i>	<i>St Error</i>
Low self esteem	237	0.602	0.589	0.850	0.100	0.038
Can't cope	237	0.914	0.442	0.241	0.858	0.029
Unhappy	237	1.080	0.485	1.107	4.306	0.031
Worried	237	1.122	0.528	0.796	0.124	0.034
Dislike job	237	1.232	0.568	0.953	1.529	0.037
Haunted	237	1.303	0.801	-0.110	-0.778	0.052
Escaping	237	1.145	0.834	0.285	-0.815	0.054
Avoiding	237	1.387	0.753	-0.121	-0.472	0.049
Ignoring	237	1.304	1.058	-0.048	-1.380	0.069
Erasing	237	1.316	1.119	0.065	-1.427	0.073
Nightmares	237	0.852	0.797	0.759	0.020	0.052

Table 4.7: Numerical summaries of the eleven outcome factors

Figure 4.1 shows the correlations between the factors in Part 2. The correlation coefficients were all positive, ranging from 0.335 to 0.574.

Figure 4.2 shows the correlations between the factors in Part 3. The correlation coefficients were again all positive, ranging from 0.334 to 0.631.

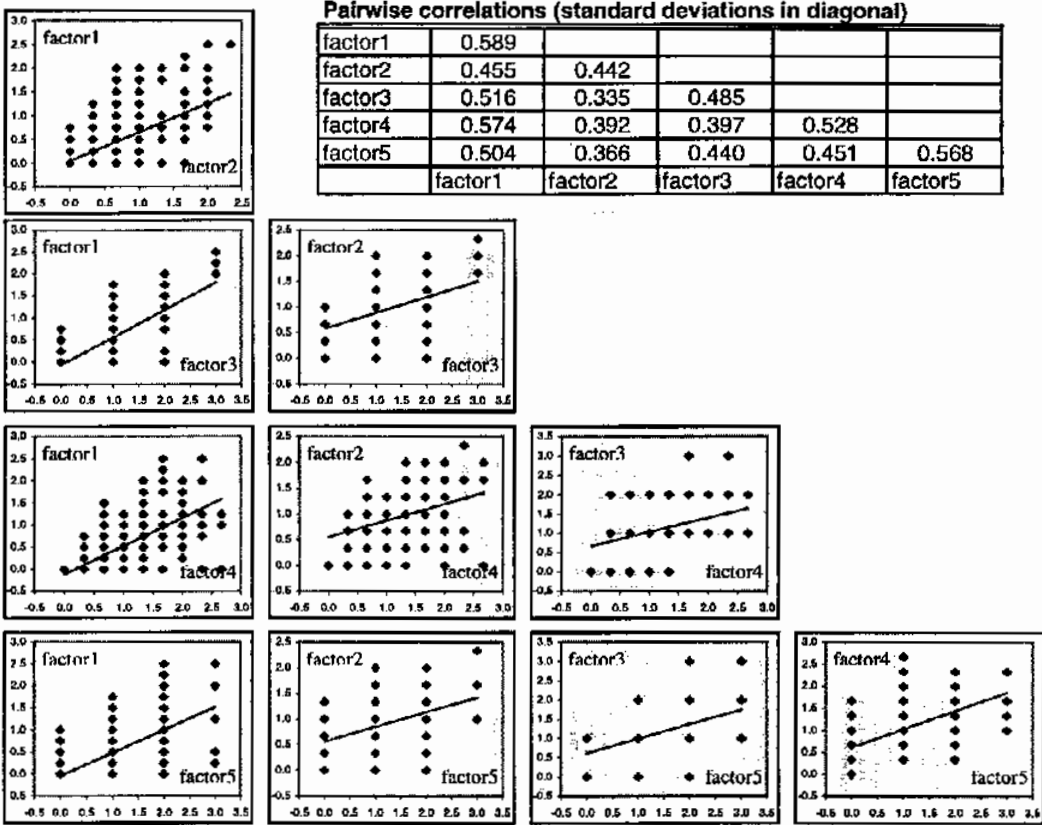


Figure 4.1: Scatterplot matrix of relations between each pair of factor indexes in Part 2

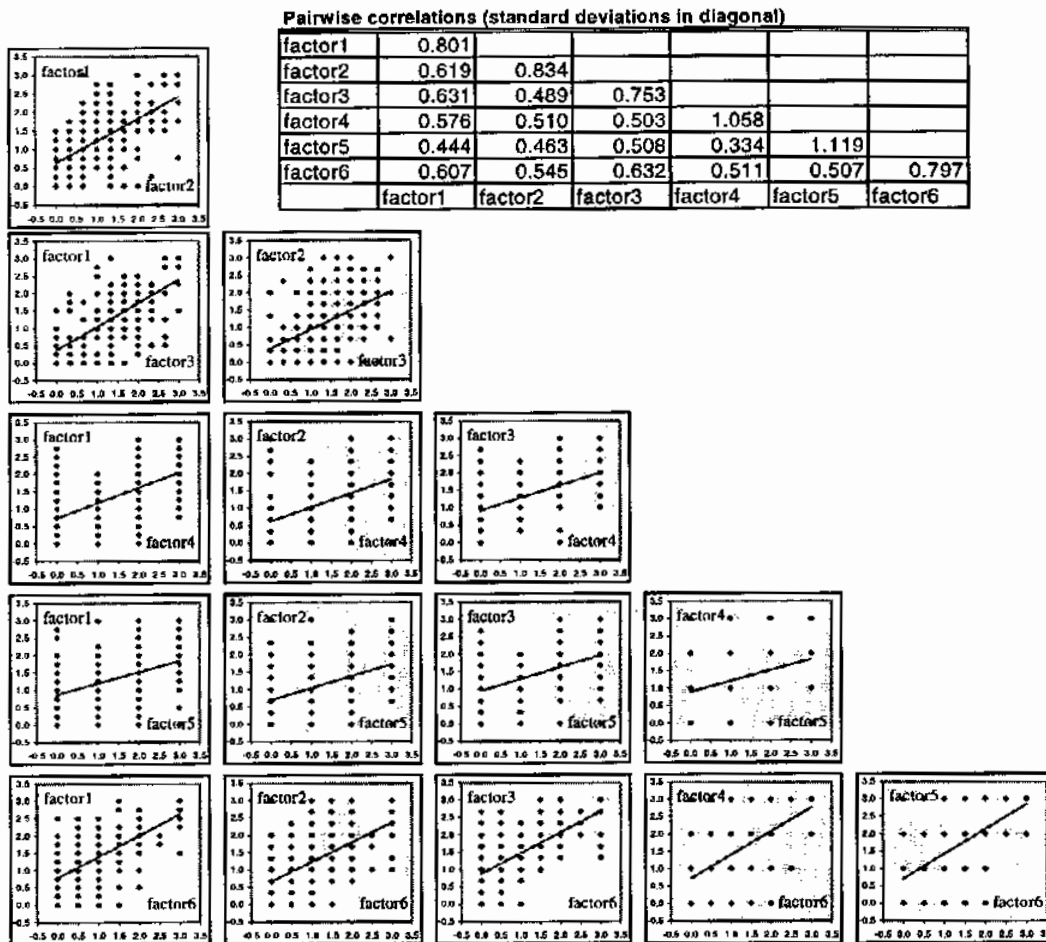


Figure 4.2: Scatterplot matrix of relations between each pair of factor indexes in Part 3

4.2 Comparison Between Each Factor and Each Determinant

Next we report on the comparison between each factor and each determinant. There were 13 determinants, of which three of them (age, length of service and length of duty) were continuous, two (religion and education) were binary, and the remaining seven were categorical with three or more categories.

Since the outcomes were all treated as continuous variables, we used simple linear regression to assess the relations between the outcomes and the continuous determinants, we used two-sample t-tests to compare the means of the outcomes applied to the binary

determinants, and we used oneway analysis of variance to compare the mean outcomes with respect to the categorical determinants.

The p -values for these associations are shown in Table 4.8 for the GHQ-12 questionnaire, and the corresponding p -values are shown in Table 4.9 for the IES-15 questionnaire.

<i>Determinant</i>	<i>Low self esteem</i>	<i>Can't cope</i>	<i>Unhappy</i>	<i>Worried</i>	<i>Dislike job</i>
Police Station	0.060	0.000	0.104	0.749	0.140
Age	0.590	0.127	0.881	0.169	0.050
Length of service	0.907	0.178	0.901	0.122	0.026
Rank	0.983	0.720	0.435	0.159	0.077
Salary	0.866	0.665	0.609	0.762	0.606
Adequacy of salary	0.229	0.149	0.149	0.146	0.010
Education	0.437	0.754	0.299	0.863	0.111
Home province	0.204	0.316	0.465	0.013	0.013
Religion	0.050	0.917	0.767	0.306	0.611
Spoken language	0.015	0.214	0.453	0.068	0.301
Marital Status	0.414	0.921	0.450	0.545	0.973
Duty	0.065	0.192	0.339	0.158	0.002
Length of duty	0.974	0.476	0.523	0.632	0.132

Table 4.8: P-values relating each determinant and each factor variable in Part 2

<i>Determinant</i>	<i>Haunted</i>	<i>Escap- ing</i>	<i>Avoid- ing</i>	<i>Ignoring</i>	<i>Erasing</i>	<i>Night- mares</i>
Police Station	0.152	0.333	0.862	0.480	0.441	0.434
Age	0.033	0.074	0.120	0.035	0.799	0.055
Length of service	0.050	0.099	0.043	0.047	0.799	0.055
Rank	0.112	0.101	0.357	0.321	0.127	0.257
Salary	0.054	0.301	0.165	0.108	0.743	0.125
Adequacy of salary	0.378	0.754	0.708	0.287	0.349	0.236
Education	0.071	0.301	0.165	0.108	0.743	0.125
Home province	0.016	0.157	0.287	0.217	0.899	0.218
Religion	0.666	0.697	0.990	0.413	0.658	0.625
Spoken language	0.345	0.514	0.925	0.184	0.268	0.254
Marital Status	0.160	0.417	0.718	0.146	0.528	0.439
Duty	0.277	0.018	0.066	0.247	0.180	0.323
Length of duty	0.076	0.108	0.282	0.065	0.914	0.019

Table 4.9: P-values relating each determinant and each factor variable in Part 3

With 143 p -values, 5% were expected to be below 0.05 by chance when all null hypotheses are true. To adjust for this multiplicity effect, we discarded the seven comparisons corresponding to the largest p -values below 0.05. That left ten statistically valid associations.

Figure 4.3 shows the comparison of the means of “*can't cope*” mental health outcome of the police officers with respect to police station. It shows that the police officers in the *Su-ngi-padee*, *Ja-nae* and *Yaha* police stations had higher scores on “*can't cope*” mental health factor, whereas the police officers stationed at *MaungYala* had lower scores.

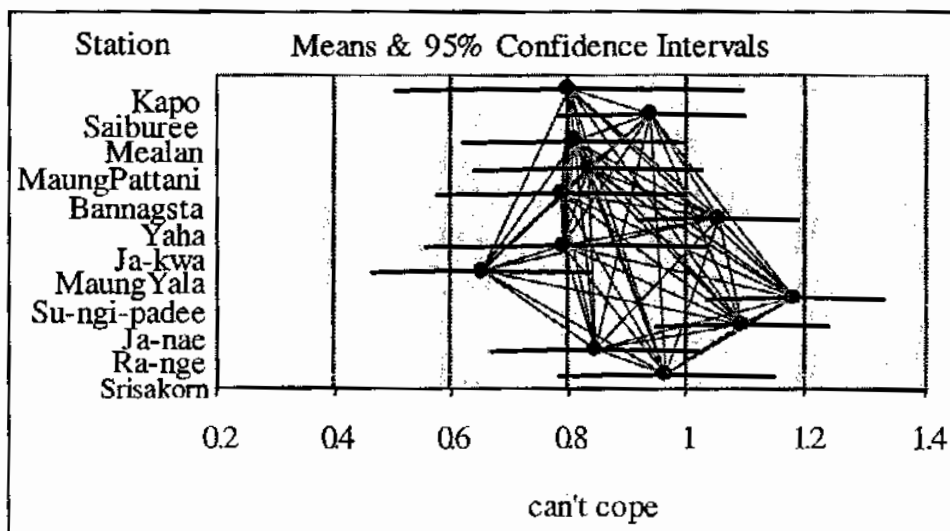


Figure 4.3: Comparison of mean *can't cope* outcome scores by police station

Figure 4.4 shows the comparison of the means of “*dislike job*” mental health outcome of the police officers with respect to their duties. It shows that the police officers whose duties were patrolling on foot and those who were involved in community relations had higher scores, whereas those involved in security and in traffic control had lower scores. However, it should be noted that there were only five police officers in the sample whose duty was traffic control.

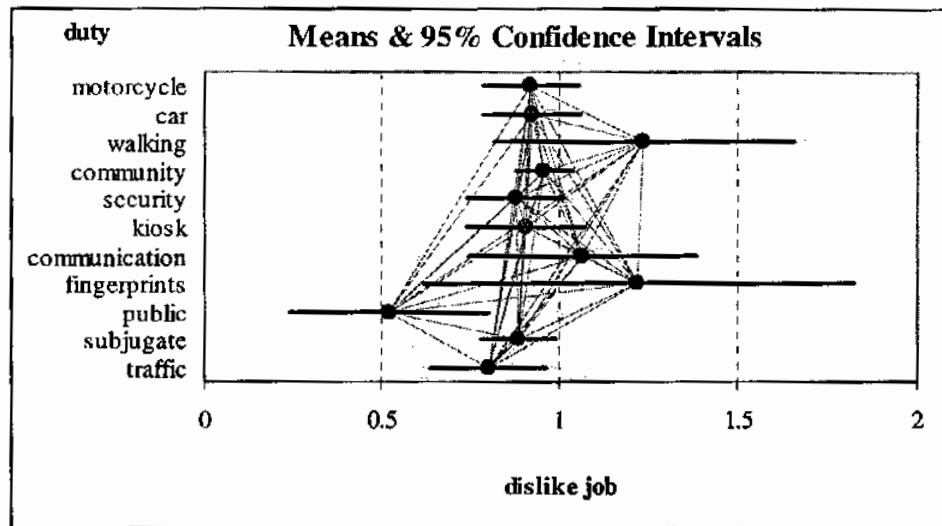


Figure 4.4: Comparison of means of *dislike job* factor by duty

Figure 4.5 shows the comparison of the means of "*dislike job*" mental health outcome of the police officers with adequacy of salary. It shows that the police officers who considered their salary insufficient had higher scores than those who felt that their salaries were adequate.

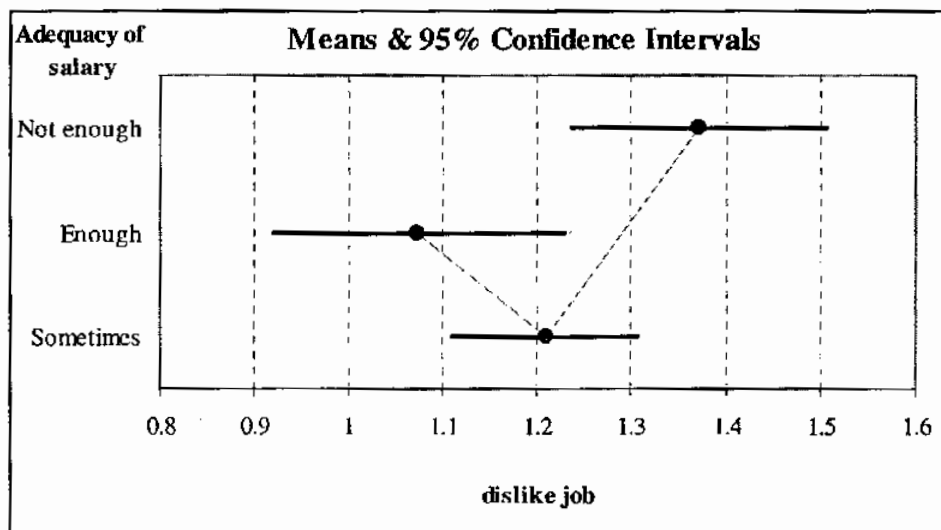


Figure 4.5: Comparison of means of *dislike job* factor by adequacy of salary

Figure 4.6 shows the comparison of the means of “*worried*” mental health outcome of the police officers with respect to their duties. It shows that the police officers whose home provinces were Narathiwat and Nakorn-sri-thammarat had higher scores on this outcome.

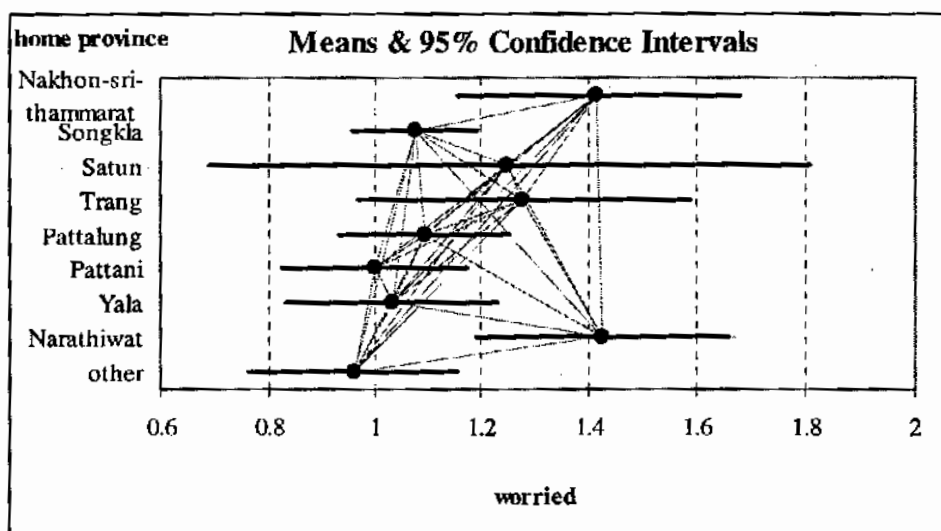


Figure 4.6: Comparison of mean *worried* outcome scores by home province

Figure 4.7 shows the comparison of the means of “*low self esteem*” mental health outcome of the police officers with spoken language.

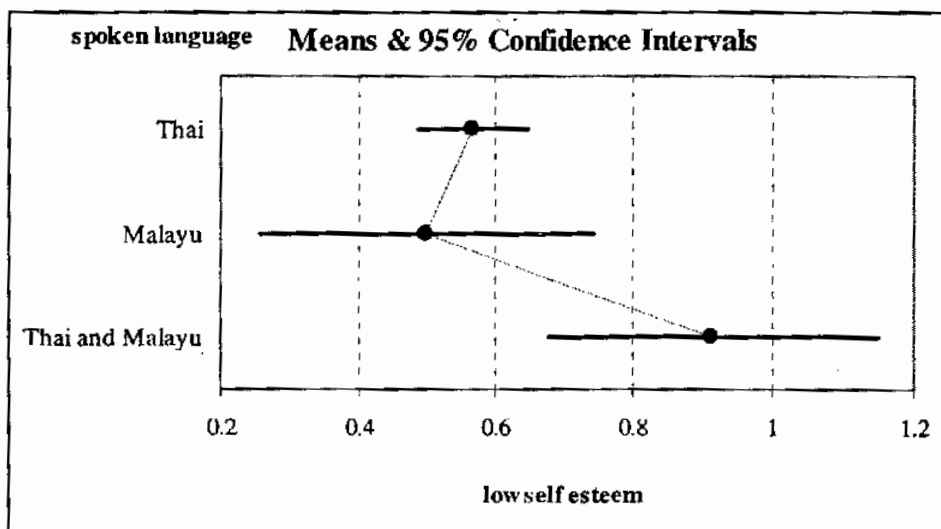


Figure 4.7: Comparison of mean *low self esteem* outcome scores by spoken language

It shows that the police officers who considered their spoken language Thai and Malayu had higher scores than the others.

Figure 4.8 shows the comparison of the means of the *dislike job* mental health outcome of the police officers with respect to their home province. It shows that the police officers whose home province was Narathiwat had higher scores than others.

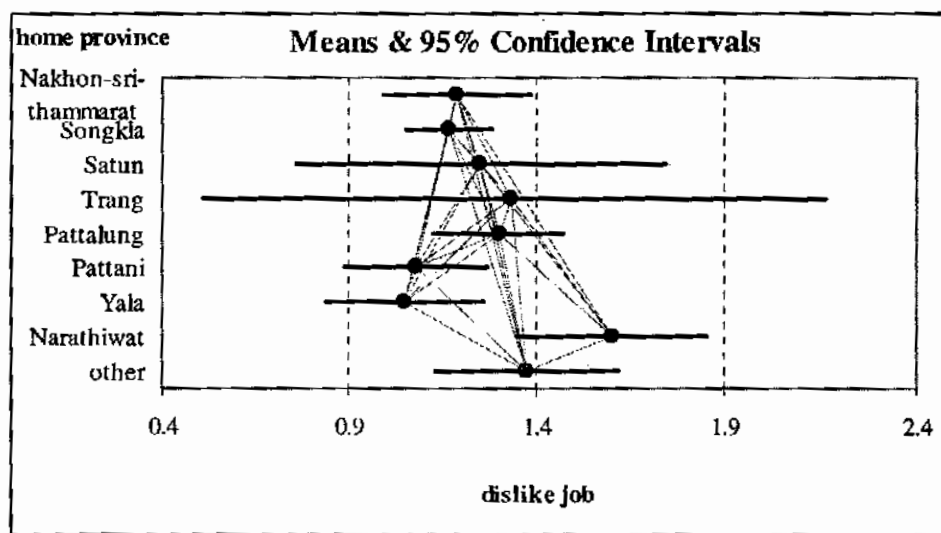


Figure 4.8: Comparison of mean *dislike job* outcome scores by home province

Figure 4.9 shows the comparison of the means of “*haunted*” mental health outcome of the police officers with respect to their home province. It shows that the police officers whose home province was Satun or Narathiwat had higher scores than others. However, it should be noted that there were only four police officers in the sample whose home province was Satun.

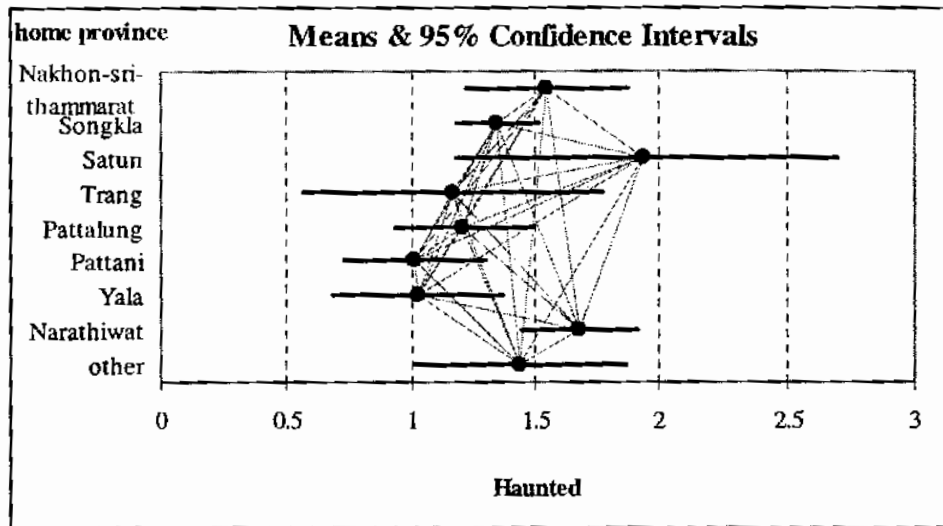


Figure 4.9: Comparison of mean *haunted* outcome scores by home province

Figure 4.10 shows the comparison of the means of “*escaping*” mental health outcome of the police officers with respect to their duties. It shows that the police officers whose duties were to take fingerprints scored higher than others on this factor.

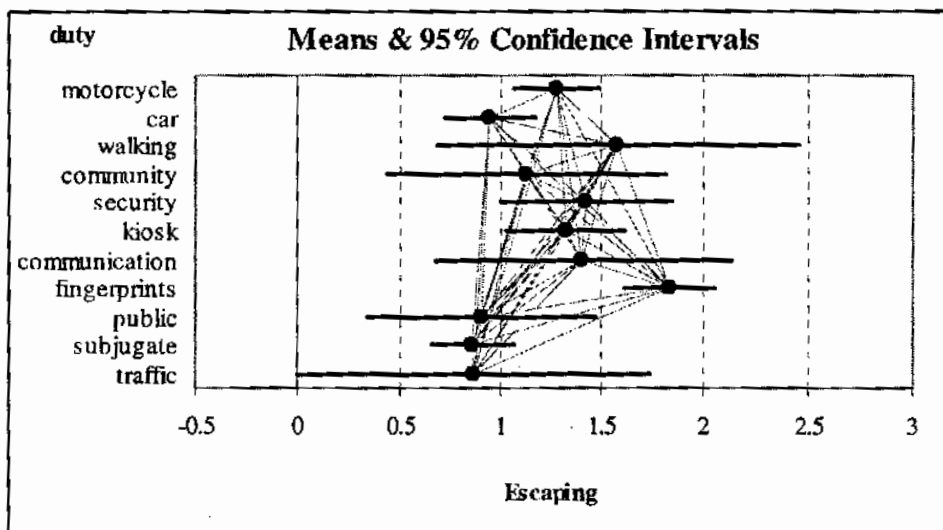


Figure 4.10: Comparison of mean *escaping* outcome scores by duty

4.3 Linear Regression Analysis

Linear regression analysis is used to fit a model predicting the mean of each outcome, given the determinants. There were 13 determinants in this study namely: police station, age, length of service, rank, salary, adequacy of salary, education, home province, religion, spoken language, marital status, duty, and length of study.

Following the strategy described in Chapter 2, we fitted models containing all 13 determinants to each factor in turn as the outcome variable, and if the fitted regression model was statistically significant, we proceeded to find a reduced model containing only the statistically significant determinants, using backward elimination. The results are shown in Table 4.10.

<i>Outcome factor</i>	<i>p-value</i>	<i>r-squared</i>
1. Low self esteem	0.085	0.255
2. Can't cope	0.043	0.270
3. Unhappy	0.028	0.278
4. Worried	0.090	0.254
5. Dislike job	0.006	0.303
6. Haunted	0.051	0.266
7. Escaping	0.167	0.239
8. Avoiding	0.428	0.208
9. Ignoring	0.546	0.197
10. Erasing	0.412	0.210
11. Nightmares	0.480	0.203

Table 4.10: Results for fitted multiple regression models containing all 13 determinants

Figure 4.11 shows the result for fitting the reduced multiple linear regression model for the *can't cope* factor, which contained only one determinant (station). This result was consistent with that obtained from the univariate analysis, as shown in Figure 4.3. The r-squared for the final model was 12.9%.

When the same procedure was applied to the *unhappy* factor, the final model did not contain any statistically significant determinants. This result was again consistent with the univariate analysis.

linear regression analysis: response = Can't cope

predictor	coeff	St.Error	p-value
constant	0.8	0.13375	8.6337e-009
Station	(0)		0.00085484
Kapo	0.14071	0.15582	0.36746
Saiburee	0.0092857	0.17512	0.95776
Mealan	0.034091	0.16131	0.83282
MaungPattani	-0.01	0.16524	0.9518
Bannangsta	0.2532	0.15826	0.11102
Yaha	-0.0053846	0.17791	0.97588
Ja-kwa	-0.14783	0.16021	0.35716
MeaungYala	0.38212	0.15268	0.013034
Su-ngi-padee	0.29571	0.17512	0.092683
Ja-nae	0.046538	0.15739	0.76774
Ra-nge	0.166	0.18916	0.38111
Srisakorn			

r-sq: 0.12902 rss: 40.2526 df: 225 sd: 0.42297 p-value: 0.00085484

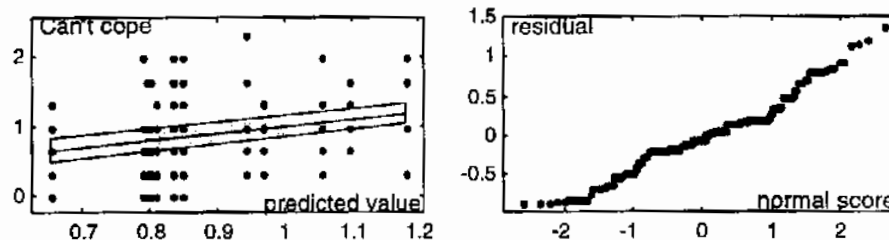


Figure 4.11: Reduced regression model for *can't cope* factor

Figure 4.12 shows the result for fitting the reduced multiple linear regression model for the *dislike job* factor, which contained three determinants (adequacy of salary, home province, and duty). This result was also consistent with that obtained from the univariate analysis, as shown in Table 4.7.

linear regression analysis: response = Dislikejob

predictor	coeff	St.Error	p-value
constant	1.3185	0.16083	2.1538e-014
Adequacy of salary	(0)		0.014852
Not enough	-0.2823	0.096608	0.0038463
Enough	-0.13352	0.082259	0.106
Home province	(0)		0.0038863
Nakhon-sri-thammarat	-0.0068761	0.15018	0.96352
Songkla	-0.14296	0.30074	0.63501
Satun	0.32526	0.25763	0.20814
Trang	0.11158	0.16024	0.48699
Pattalung	-0.15361	0.16181	0.34351
Pattani	-0.20266	0.18028	0.26219
Yala	0.42381	0.17548	0.016558
Narathiwat	0.13489	0.19286	0.48506
Duty	(0)		0.0045925
motorcycle	-0.10278	0.11262	0.36247
car	0.54775	0.21615	0.011982
walking	0.46263	0.20162	0.022723
community	-0.38284	0.143	0.007992
security	0.073737	0.11958	0.53812
kiosk	-0.015047	0.24873	0.95182
communication	0.19398	0.23093	0.40184
fingerprints	-0.090841	0.2145	0.67236
public	0.046082	0.10769	0.66914
subjugate	-0.1975	0.24788	0.42647
traffic			

r-sq: 0.21943 rrs: 59.5077 df: 216 sd: 0.52488 p-value: 3.2526e-005

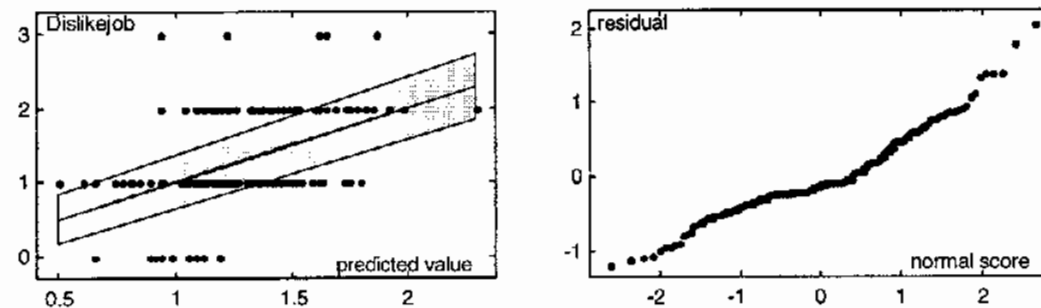


Figure 4.12: Reduced regression model for *dislike job* factor