Scottish Surveys Core Questions
2014

Supplementary analysis

Police Confidence

Contents

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About this Publication

This publication contains results from the Scottish Surveys Core Questions (SSCQ) 2014 collection period. Drawn from three major populations surveys commissioned by the Scottish government, SSCQ has a large sample size of over 20,000 respondents each year. More information about the SSCQ is available on the Scottish government website[1].

This report stands alongside the Official Statistics from the core published on May 18th, 2016[2]. Statistics reported here are described as being "in development", as they provide analysis based on Latent Class Analyis – a novel technique for these data. As this is the first time that analysis of this kind has been undertaken by the Scottish Government, we are keen to gather opinions and feedback from users on the utility of this technique and the analytical content of this report.

The SSCQ Project Team can be contacted on this subject, or more generally on the usage and planned development of the Core, by email: SSCQ@gov.scot

Patterns in Police Confidence

Legend:
- A: prevent crime
- B: respond to calls
- C: deal with incidents
- D: investigate incidents
- E: solve crimes
- F: catch criminals
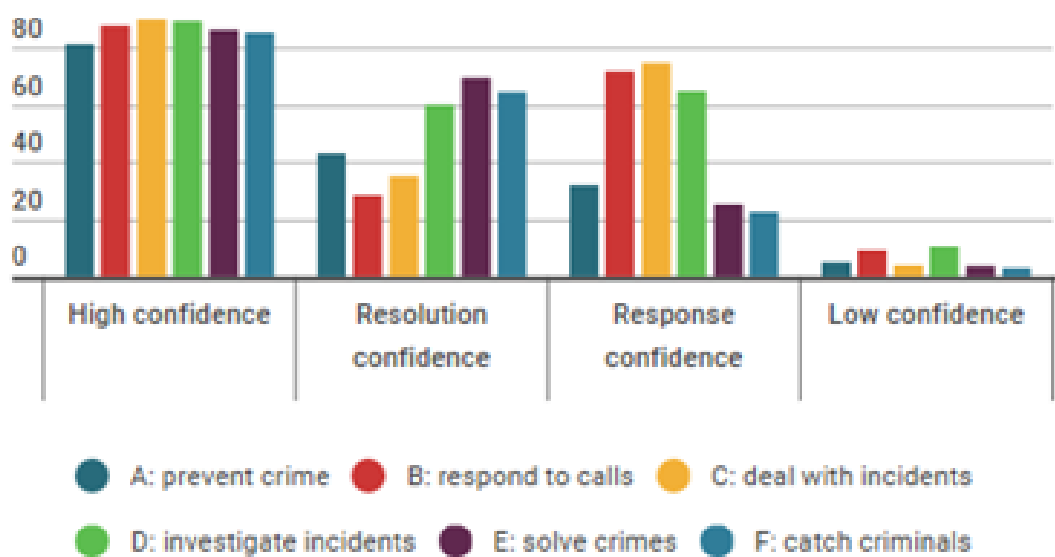
Confidence Classifications

Legend:
- High confidence
- Resolution
- Response
- Low confidence

High confidence	High probability of responding positively across all police confidence questions	58.4%
Resolution confidence	More likely to express confidence in questions D, E and F, but less likely to also respond positively to other questions	12.0%
Response confidence	More likely to express confidence in questions B, C and D, but less likely to also respond positively to other questions	13.6%
Low confidence	Low probability of responding positively to any police confidence question	16.1%

1 Confidence in Policing

Among the questions in the Core, there are six which address people's attitudes to and confidence in police services. These relate to confidence in the ability of the police to:

A. prevent crime
B. respond quickly to appropriate calls and information from the public
C. deal with incidents as they occur
D. investigate incidents after they occur
E. solve crimes, and
F. catch criminals

There is a complex pattern of inter-relationships to the responses given across these six questions. Latent class analysis (LCA) provides a method of uncovering groupings of response patterns. The result is 4 subgroups, or classes, each containing individuals who are similar to each other and different from individuals in the other classes. The four characteristic classes are described in Table 1. The probability of a positive response across the 6 police questions in each of the confidence classes is provided in Table 2.

These groups will be used in the following sections to discuss patterns of response by equality characteristic groups and geographical area.

Statistical tests are applied to the class occupancy levels in subgroups to determine differences from a reference category, or from all other Police Divisions in the case of Subnational Geographies. For details of the test see section 2.3.

Table 1: Police Confidence classes, SSCQ 2014

Group	Adults	Description
A: High confidence	58.4%	High probability of responding positively across all police confidence questions
B: Resolution confidence	12.0%	More likely to express confidence in questions D, E and F, but less likely to also respond positively to other questions
C: Response confidence	13.6%	More likely to express confidence in questions B, C and D, but less likely to also respond positively to other questions
D: Low confidence	16.1%	Low probability of responding positively to any police confidence question

Table 2: Positive response rates across 6 police confidence questions by Police Confidence class, SSCQ 2014

	A: High confidence	B: Resolution confidence	C: Response confidence	D: Low confidence
Prevent Crime	82%	43%	32%	5%
Respond to calls	88%	29%	72%	9%
Deal with incidents	90%	35%	75%	4%
Investigate incidents	90%	60%	65%	11%
Solve crimes	87%	70%	25%	4%
Catch criminals	86%	65%	23%	3%

1.1 Police confidence class occupancy

Table 3: Police confidence class occupancy, SSCQ 2014

	A: High confidence	B: Resolution confidence	C: Response confidence	D: Low confidence	Number of Adults
All	58.4	12.0	13.6	16.1	4,436,300
Respondent Age Group					
16-24	61.5	10.8	14.4	13.3	619,800
25-34	60.7	10.5	13.4	15.3	700,000
35-44[†]	59.2	12.1	13.6	15.1	675,500
45-54	55.4 *	12.5	14.0	18.1 *	802,100
55-64	52.5 *	14.3 *	14.1	19.1 *	670,600
65-74	56.6	12.3	13.1	18.0 *	535,000
75+	66.3 *	10.6	11.3	11.7	433,400
Respondent sex					
Female[†]	61.2	11.3	12.9	14.6	2,305,600
Male	55.4 *	12.7	14.3	17.6 *	2,130,700
Limiting Long-term Physical or Mental Health Condition					
No limiting condition[†]	59.5	11.9	13.7	15.0	3,404,400
Limiting condition	55.0 *	12.3	13.3	19.4 *	1,011,000
Ethnic Group					
White: Scottish[†]	57.1	12.5	13.6	16.8	3,475,000
White: Other British	59.9 *	11.3	14.0	14.9	551,900
White: Polish	63.4 *	8.9	14.5 *	13.2	79,500
White: Other	68.8 *	8.7 *	11.5	11.0 *	169,000
Asian	67.9 *	8.2	13.5	10.4 *	106,800
All other ethnic groups	69.9 *	8.7	9.9	11.5	49,400
Religion					
None[†]	57.4	11.6	14.5	16.4	1,968,800
Church of Scotland	58.0	13.0 *	12.7 *	16.2	1,277,400
Roman Catholic	59.5	11.6	12.9	16.1	681,500
Other Christian	63.3 *	11.5	12.2	13.0 *	335,900
Muslim	68.5 *	7.3	10.8	13.4	66,000
Other	58.3	10.9	16.5	14.3	76,000
Sexual Orientation					
Heterosexual[†]	58.4	12.0	13.6	16.0	4,290,300
LGB & other	59.7	11.8	13.1	15.4	69,100
Country of Birth					
Scotland[†]	56.9	12.5	13.7	16.9	3,559,500
Rest of UK	61.2 *	11.1	13.8	13.9 *	468,900
Rest of EU	67.1 *	8.7 *	12.0	12.2 *	198,000
Rest of World	70.0 *	8.6 *	11.8	9.6 *	204,300
Scottish Index of Multiple Deprivation - Quintiles					
Most deprived 20%	53.2 *	12.1	14.3	20.4 *	938,200
2	56.1 *	12.3	13.6	18.1 *	911,600
3[†]	58.7	12.9	13.6	14.8	828,100
4	60.7	11.1	12.9	15.3	859,800
Least deprived 20%	63.9 *	11.4	13.3	11.4 *	898,600

In Table 3, reference categories for statistical testing are marked with a dagger (†). For more information see section 2.3. An asterisk (*) indicates that a significantly different distribution from the reference category is detected.

Interpreting Results

Higher occupancy of the *High confidence* class indicates that a particular subgroup has better a general impression of policing. A higher occupancy of the *Low confidence* class means respondents are more likely to lack confidence across the board.

Higher *Resolution* and *Response confidence* indicate that while respondents are likely to have confidence in some aspects of policing, others are seen to be lacking. As such, a lower level in these groups is not necessarily a negative indicator where the *High* confidence group is also larger. For example, where both *High* and *Resolution* classes are higher than average, it indicates that respondents are less likely to fall into the other classes, but may also indicate a confidence deficit across *Response* functions.

Based on this information, operations and communications can target areas and groups:

- with higher *Resolution confidence*, focussing on performance in responding to calls and information from the public (B) and dealing with incidents as they occur (C) to move people from this class into the *High confidence* class, reduce the *Response* deficit and move *Low confidence* respondents into the *Response confidence* group.
- with higher *Response confidence*, focussing on performance in solving crime (E) and catching criminals (F) to move people from this group into the *High confidence* group, reduce the *Resolution* deficit, and to encourage people from the *Low confidence* group into having *Resolution confidence*

Summary Findings

- Across all equality groups and sub-national areas examined, more than half the population were likely to have High confidence in Police functions
- 58.4% of adults are likely to have *High confidence* across all police functions at national level. The remaining are split between three groups: *Response confidence* (to respond to calls, deal with incidents as they occur and investigate incidents, 13.6%); *Resolution confidence* (to solve crimes and catch criminals, 12%) and those who lack confidence across all functions (16.1%)
- People aged 45-74 are less likely to have *High confidence* in Police than younger people and those aged 75 and over. This older group have the highest occupancy of the *High confidence* group, at 66.3%
- Women are more likely than men to have *High confidence* in Police
- People with long-term limiting conditions are less likely to report having *High confidence* in the police than those without (55.0% compared with 59.5%), and more likely to report *Low confidence* (19.4% compared with 15.0%)
- All ethnic groups except White: Scottish, all respondents born outside of Scotland and those identifying as Muslim or "Other Christian" are more likely than the majority reference groups to report *High confidence* in Policing
- Respondents who identified as Church of Scotland are more likely to have *Resolution confidence* and less likely to have *Response confidence* than the majority group
- Confidence in Policing is tied to deprivation, with those in less deprived areas more likely to report *High confidence* and less likely to report *Low confidence,* and vice versa

1.2 Age and Sex

The 35-44 year old group provides responses most similar to the national average; statistical testing is conducted relative to this reference category. Respondents in the younger age groups do not differ significantly from this reference category.

The groups containing 45-74 year-olds are more likely to have *Low confidence* than younger age groups. Almost a fifth of these age groups were likely to lack confidence in any policing function. Conversely, those aged 75+ were more likely to have *High confidence* than the reference group – almost two thirds were likely to express confidence across all six police questions compared with 59.2% in the reference group (and 58.4% of Scotland as whole).

55-64 year olds were more likely to have only *Resolution confidence*. 14.3% fall into class B compared with 12.0% of the reference group.

Women in the surveys were more likely than men to have *High confidence*; 61.2% were in class A, compared with 55.4% of men.

1.3 Disability

Those with a limiting long-term condition are more likely to express *Low confidence* in the police across all six questions: 19.4% compared with 15% of the rest of the population. They are conversely less likely to have *High confidence*. There are no significant differences in the occupancy of other classes.

1.4 Ethnicity

All ethnic subgroups are more likely to have *High confidence* than the White Scottish majority. The highest occupancy of this class is among "All other ethnic groups", were almost 70% are likely to express confidence across all police functions.

Where they do not express confidence across the board, the White: Polish subgroup is more likely to have at least *Response confidence* (class C 14.5% compared with 13.6% in the reference group).

Most ethnic subgroups are just as likely as the majority reference gorup to have *Low confidence* except for White: Other and Asian, who are less likely to express a lack of confidence overall (11.0 and 10.4% respectively compared with 16.8% in the reference group).

1.5 Religion

Muslims are the most likely to have *High confidence* in policing overall, at 68.5%.

The "Other Christian" group are also more likely than the majority reference group to have *High confidence* across all six policing questions; 63.3% are in class *A* compared with 57.4% of those who identify as having no religion.

Members of the Church of Scotland are more likely to have *Resolution confidence* (13.0%), and less likely to have *Response confidence* (12.7%) in the police than the majority reference group (where the rates are 11.6% and 14.5% respectively).

Roman Catholics and Other religious groups do not differ significantly from the majority reference group in their confidence in policing.

1.6 Sexual orientation

There are only slight differences in the class occupancies in Lesbian, Gay, Bisexual (LGB) & Other group compared with those identifying as heterosexual, none of which are statistically significant.

1.7 Country of Birth

Compared with those born in Scotland, all other groups are significantly less likely to express *Low confidence* in policing, and are more likely to have *High confidence* as a result. Those born outside the UK are also less likely to have only *Resolution confidence* (around 8.6%).

All four groups have similar levels of *Response confidence*, at between 11.8% and 13.8%.

1.8 Deprivation

Compared with the middle deprivation quintile group, more deprived areas are significantly more likely to have *Low confidence* in Police and less likely to have *High confidence*. The converse is true in less deprived groups, with higher levels of *High confidence* and lower levels of *Low confidence*.

The 3rd and 4th deprivation quintiles are not significantly different from each other and the distribution in the intermediate classes B and C is not significantly different between deprivation groups.

1.9 Subnational Geographies

Table 4: Police confidence class occupancy by Police Scotland Division (Row %), SSCQ 2014

	A: High confidence	B: Resolution confidence	C: Response confidence	D: Low confidence	Sample
Scotland	58.4%	12.0%	13.6%	16.1%	18,499
Police Scotland Division					
Aberdeen City	53.5%	14.5% *	15.3% *	16.7%	840
Aberdeenshire & Moray	54.8% *	13.4%	10.2% *	21.6% *	1,278
Argyll & West Dunbartonshire	58.8%	12.8%	11.4%	16.9%	971
Ayrshire	58.7%	10.8% *	11.4% *	19.1%	1,469
Dumfries & Galloway	59.4%	12.4%	10.3% *	17.9%	633
Edinburgh	62.1% *	9.9%	14.8% *	13.1%	1,369
Fife	64.4% *	11.1%	11.2% *	13.4% *	1,136
Forth Valley	61.1% *	11.6%	15.9% *	11.5% *	1,211
Greater Glasgow	60.8% *	10.1% *	13.7%	15.4%	2,500
Highland & Islands	66.4% *	8.9% *	10.5% *	14.2% *	1,852
Lanarkshire	54.6% *	13.0%	14.6%	17.8%	1,618
Lothians & Scottish Borders	52.6% *	13.7% *	16.2% *	17.5% *	1,429
Renfrewshire & Inverclyde	55.8%	12.7%	15.8% *	15.7%	930
Tayside	55.6%	15.1% *	14.3%	15.0%	1,263

An asterisk - * - indicates a statistically significant difference from the sum of all other Police Division areas.

Across all Police Scotland Divisions, more than half of adults are likely to have *High confidence* across all Police functions (see Table 1. The highest levels of *High confidence were* found in the Highlands & Islands, Fife and Edinburgh Division areas.

Adults in Aberdeenshire & Moray and Lothians & Scottish Borders are more likely to have *Low confidence* than the national average. This is highest overall in Aberdeenshire & Moray at 21.6%. This area also has lower levels of *Response confidence* than national levels, at 10.2%.

In Lothians & Scottish Borders, respondents are less likely than the national average to have *High confidence*, at 52.6%. All other classes have significantly higher occupancy levels than the national average. Adults in the area are more likely to have *Response confidence* than *Resolution confidence* in general, at 16.2% and 13.7% respectively.

Only Edinburgh and Forth Valley respondents are likely to have higher than national levels of *Response confidence*, as well as a higher proportion reporting *High confidence* overall. Forth Valley also has the lowest proportion likely to report *Low confidence* in policing (11.5%).

Table 5 is intended to provide a digest of the differences in percentage point terms. Significant differences are represented by solid bars, while striped bars represent those differences that are not statistically significant.

Table 5

	A: High confidence		B: Resolution confidence		C: Response confidence		D: Low confidence	
		difference from National Level		difference from National Level		difference from National Level		difference from National Level
Scotland	58.4%		12.0%		13.6%		16.1%	
Police Scotland Division								
Aberdeen City	53.5%		14.5%	+2.5	15.3%	+1.8	16.7%	
Aberdeenshire & Moray	54.8%	-3.6	13.4%		10.2%	-3.4	21.6%	+5.6
Argyll & West Dunbartonshire	58.8%		12.8%		11.4%		16.9%	
Ayrshire	58.7%		10.8%	-1.1	11.4%	-2.2	19.1%	
Dumfries & Galloway	59.4%		12.4%		10.3%	-3.3	17.9%	
Edinburgh	62.1%	+3.7	9.9%		14.8%	+1.3	13.1%	
Fife	64.4%	+5.9	11.1%		11.2%	-2.3	13.4%	-2.7
Forth Valley	61.1%	+2.7	11.6%		15.9%	+2.3	11.5%	-4.6
Greater Glasgow	60.8%	+2.4	10.1%	-1.8	13.7%		15.4%	
Highland & Islands	66.4%	+7.9	8.9%	-3.0	10.5%	-3.1	14.2%	-1.8
Lanarkshire	54.6%	-3.8	13.0%		14.6%		17.8%	
Lothians & Scottish Borders	52.6%	-5.8	13.7%	+1.8	16.2%	+2.6	17.5%	+1.4
Renfrewshire & Inverclyde	55.8%		12.7%		15.8%	+2.2	15.7%	
Tayside	55.6%		15.1%	+3.2	14.3%		15.0%	

2 Technical Notes

2.1 Latent Class Modelling

Latent Class Analysis reveals underlying patterns of response across a range of variables – in this case, the six police confidence questions. Each class has a characteristic patterns of response across the six questions.

The data used to develop the model consists of all three years of SSCQ data on police confidence (2012-14). This allows us to examine patterns of response not only between subgroups, but also over time.

2.1.1 Assigning Class Membership

In LCA, respondents are not assigned to a class with certainty, but are given a probability of class membership.

Police Confidence questions are answered on a common scale (very/fairly confident; not very/not at all confident). The common indicator for these questions is a positive response (very/fairly confident). The counter-indicator is not very/not at all confident. All six questions are therefore recoded as binomial variables.

Where a respondent declines to answer one or more questions, the response is recorded as "missing". LCA deals with these missing data by assigning cases to classes based on the available data. A greater number of missing answers results in lower certainty in class assignment. Where a respondent declines to answer all questions, they are assigned class membership based on the population distribution as a whole.

2.1.2 Finding the Best Model

The LCA procedure does not estimate the best number of classes. We have therefore run a series of models with 1-7 latent classes to check for the best fit. To choose the best solution, we seek the solution that:

- is interpretable and helps to explain the data
- maximises the likelihood estimate (and therefore minimises the Adjusted Bayes Information Criterion (ABIC))
- is parsimonious

More classes generally provide greater certainty in assigning group membership but may suffer from over-fitting and require greater explanation in communicating results.
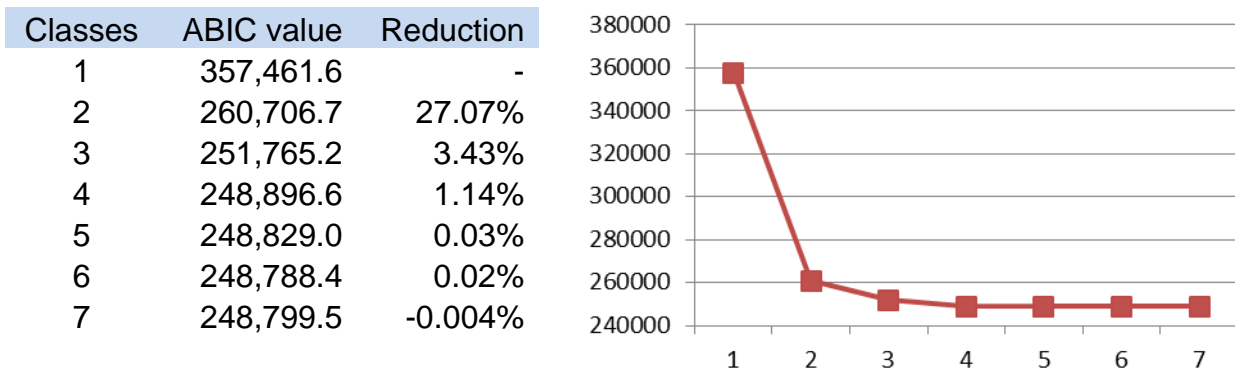
The LCA is performed using the R package poLCA[3]. In calculating the attribute of each class, poLCA picks a random starting point in the data space. Multiple runs are therefore required to ensure that a local maximum likelihood value is not taken in place of a "global" maximum likelihood. Given sufficient iterations, poLCA will converge upon a single solution that assigns each respondent a probability of membership in a given number of groups.

The model was run 7 time for an incrementally increasing number of latent classes (1-7). The likelihood estimates for each step are provided in Table 6.
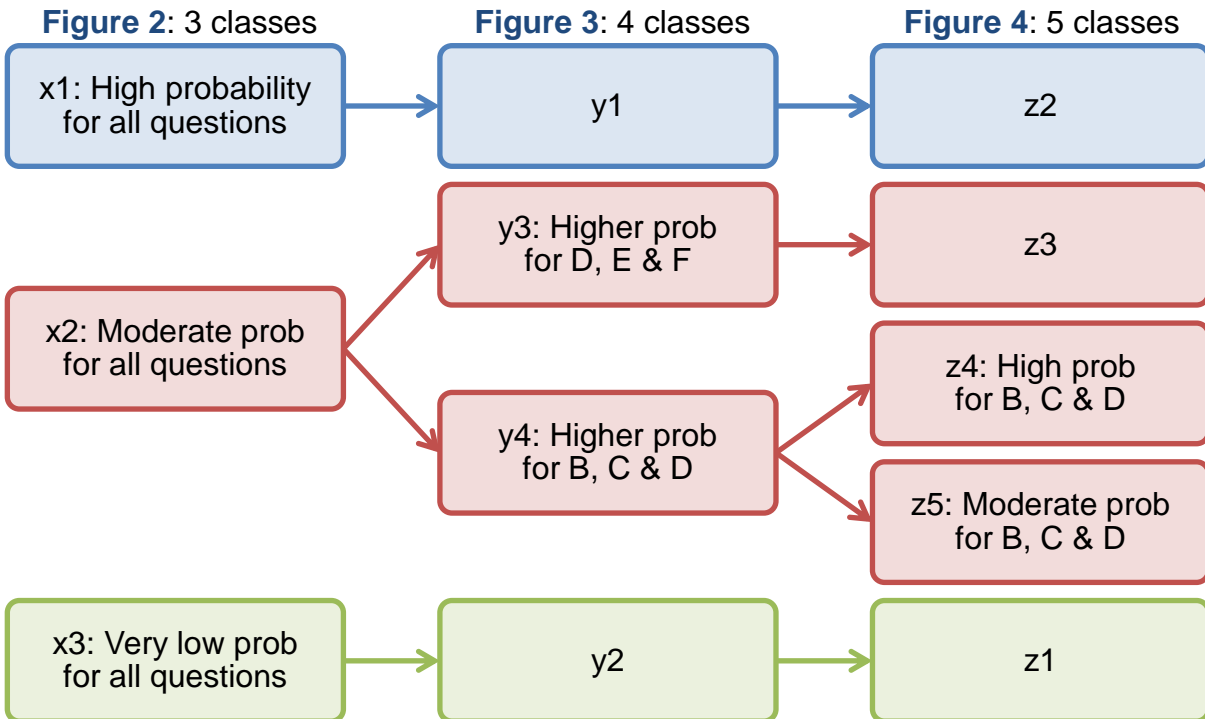
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[3] https://cran.r-project.org/web/packages/poLCA/poLCA.pdf , poLCA v1.4.1

Table 6: ABICs used to determine the best number of latent classes

Classes	ABIC value	Reduction
1	357,461.6	-
2	260,706.7	27.07%
3	251,765.2	3.43%
4	248,896.6	1.14%
5	248,829.0	0.03%
6	248,788.4	0.02%
7	248,799.5	-0.004%

The minimum ABIC value achieved was for 6 latent classes. However the fractional difference in ABIC between 4 and 5 and between 5 and 6 is very small.

Figure 1 summarises the way populations move between subgroups as the models with 3, 4 and 5 latent classes are considered.

Figure 1: Summary of effects of increasing number of latent classes from 3 to 5

Figure 2: 3 classes **Figure 3**: 4 classes **Figure 4**: 5 classes

x1: High probability for all questions → y1 → z2

x2: Moderate prob for all questions → y3: Higher prob for D, E & F → z3

x2: Moderate prob for all questions → y4: Higher prob for B, C & D → z4: High prob for B, C & D

y4: Higher prob for B, C & D → z5: Moderate prob for B, C & D

x3: Very low prob for all questions → y2 → z1

The changes in ABIC between the three options (Table 6) indicate that there is only a small amount of information loss in choosing a 4-class model compared with the 5 and 6-class models and the three-class model does not differentiate sufficiently. For that reason, and considering how these classes can be explained and communicated, the 4-class model was chosen.

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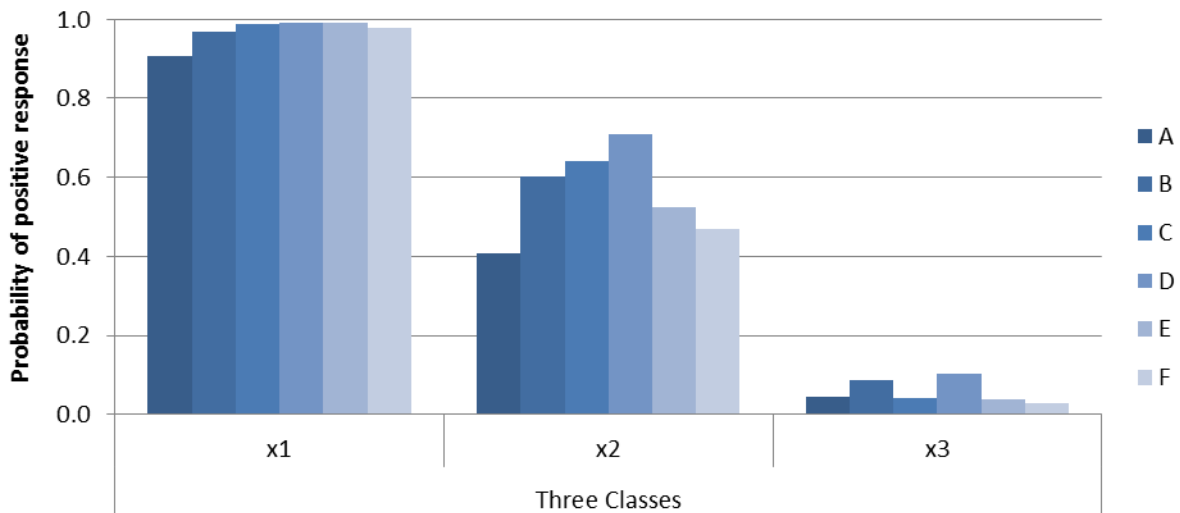## Figure 2: 3-class model with police confidence responses

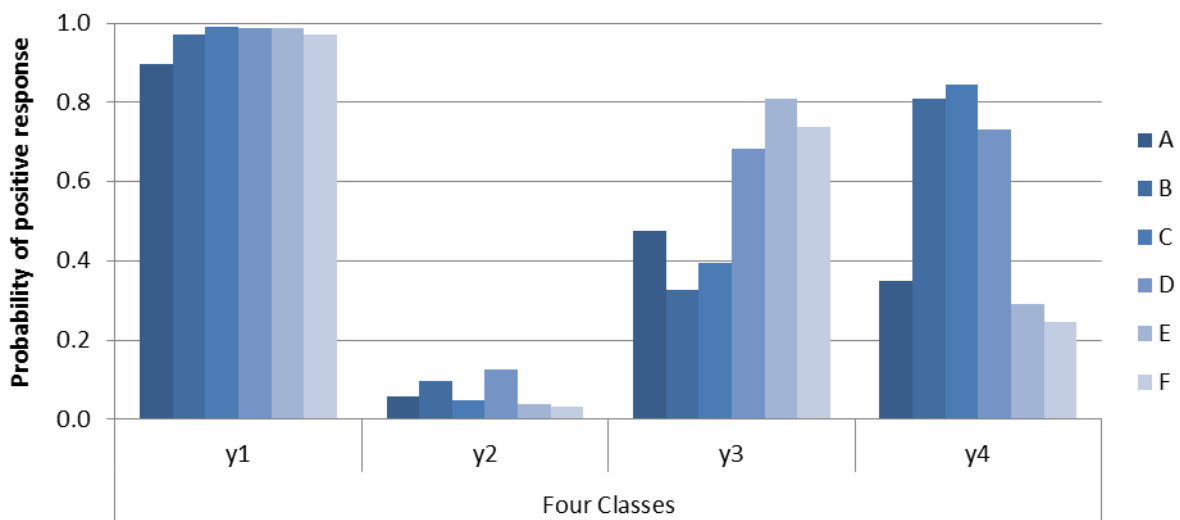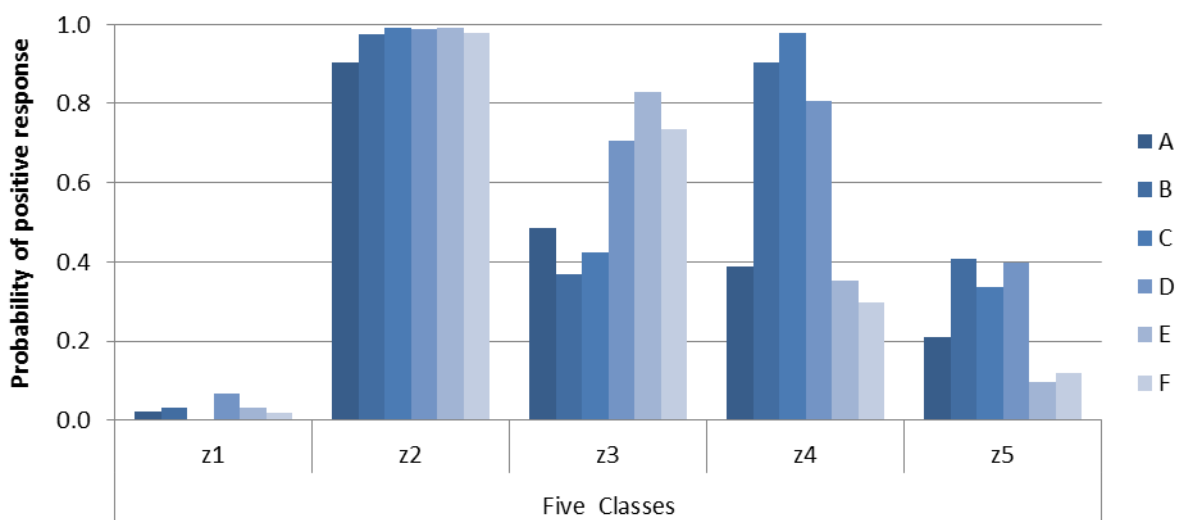## Figure 3: 4-class model with police confidence responses

Figure 4: 5-class model with police confidence responses

2.1.3 Final Model Description

The simplest model that describes the range of responses is therefore the model with four latent classes, shown in Figure 5. This model identifies the following four groups based on their responses to the six Police confidence questions:

- Y1: In the first class, representing around 58.4% of adults, respondents are very likely to report having confidence across all six questions. It is therefore labelled the *High confidence* class.
- Y2: In the second class, 16.1% of adults, are very likely tp report not having confidence across any of the six questions (A-F, <=11%). We have named this class *Low confidence*.
- Y3: Around 12% of adults fall into the third class, and are likely to have confidence in the police to solve crimes (E, 70% confident) and catch criminals (F, 65%), and are more likely than not to be confident in the ability of police to investigate incidents (D, 60%).
  This group tends to lack confidence in their ability to respond quickly to appropriate calls and information from public (B, 29%) and deal with incidents as they occur (C, 35%)
 We have termed this the *Resolution confidence* group, as these relate to police performing investigations, completing cases and arresting perpetrators.
- Y4: 13.6% of adults fall into the fourth class, who are likely to have confidence in police to respond quickly to appropriate calls and information from public (B,72%), deal with incidents as they occur (C,75%) and investigate incidents after they occur (D,65%).
  This group tend to lack confidence in the police to prevent crime (A,35%), solve crimes (E,25%), and catch criminals (F, 23%).
  We have termed this the *Response confidence* group, as these factors deal with the immediate responses of police to calls, information and unfolding incidents.

Figure 5: Weighted police confidence responses by class, SSCQ 2014
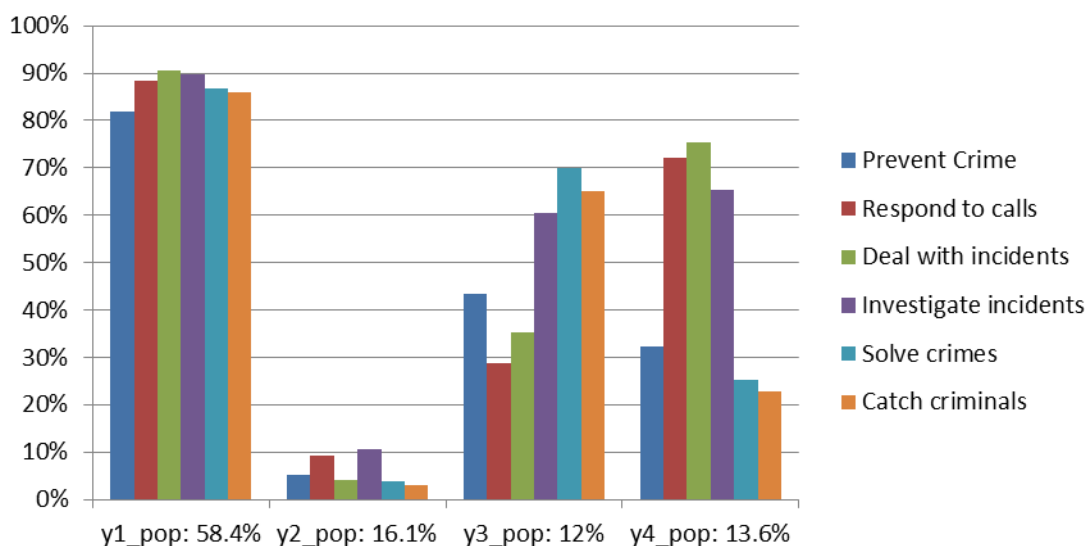
The classes are therefore relabelled as described in Table 7. The shares of the adult population in Figure 5 and Table 7 are based on weighted data.

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Table 7: Final class designations

Group	Class	Adults (%)
1	A: High confidence	58.4%
3	B: Resolution confidence	12.0%
4	C: Response confidence	13.6%
2	D: Low confidence	16.1%

2.2 Determining Characteristics of Latent Classes

LCA provides, for each survey case, a probability that it belongs in each of the latent classes modelled. This allows for a degree of uncertainty in the classification of each survey case.

Two imaginary survey cases have the following characteristics:

Case	weight	characteristic	Probabilities of latent class membership			
		(e.g. sex)	class1	class2	class3	class4
1	100	Male	.80	.10	.05	.05
2	100	Female	.05	.10	.15	.70

The weight of 100 indicates that, when grossed-up to national level, these two records represent a population of 200 people: 100 men and 100 women. The process for calculating this weight is described in the SSCQ main report[4].

To produce statistics on the characteristics of the latent classes, the weight for each case is apportioned between the classes using the probabilities of group membership. The first record would therefore count as:

- 80 individuals in class1 (0.8 x 100)
- 10 individuals in class2
- 5 in class3
- 5 in class4

A similar calculation is performed for the second record. In total these two records represent:

- 85 individuals in class1 (0.8 x 100 men + 0.05 x 100 women)
- 20 individuals in class2
- 20 in class3
- 75 in class4

---

[4]

Since there are 200 people represented by these two records, we can also say that 85/200 = 42.5% are in class1, 10% are in class2 and in class3 and 37.5% in class 4.

With sufficient records representing male and female respondents we can draw conclusions about the differing characteristics of sex groups. Determining whether such differences are a result of statisical uncertainty is the subject of section 2.3.

2.3 Correlation with Individual Characteristics and Geographical Attributes

It is necessary to determine whether the apparent differences in latent class membership found between characteristics are statistically significant. To do so, the logit of the probability of each class occupancy is modelled against each of the individual and geographic characteristic factors. Logit is the link function for the Bernoulli distribution.

Differences are determined relative to a reference category. In most cases the most populated level was chosen as the reference category. However for some multi-level factors, this was not always the best option. The covariates and their reference categories are listed in Table 8.

Table 8: Covariate Subgroups, reference categories used and the reasoning behind that choice

Covariate	Reference category	Reason
Age band	35-44	Smallest deviation from national average, allowing comparison to an approximation of average occupancy
Sex	Female	Most populated
Long-term limiting health condition	No limiting condition	Most populated
Ethnicity	White: Scottish	Most populated
Religion	None	Most populated
Sexual Orientation	Heterosexual	Most populated
Deprivation	3rd quintile	Middle deprivation group; Smallest deviation from national average in class membership
Police Scotland Division	NA	When comparing geographies, contrasts are constructed to compare each area against the rest of the Scotland taken as a whole.

Statistics in Development

These statistics are published as "statistics in development". We welcome feedback from readers on the content and analysis in this report.

Correspondence and suggestions

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