The relationship between subjective and objective indicators of individual well-being - a linear modelling approach

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The data used for analysis in this paper came from three surveys. Two were the national surveys of Quality of life conducted in Oct-Dec. 1973 (QL3) and March-May 1975 (QL4) in urban areas of Great Britain. Both surveys were conducted in the same primary sampling units, but with a different sample of individuals. Some questions were replicated in both surveys. The third survey was a study of Sunderland, using the same questionnaire and conducted at the same time, as the national 1973 survey. This latter is interesting because we were able to relate subjective data from individual respondents to census and similar official data on the wards in which respondents lived.

Some of the subjective measures used have been shown to be highly sensitive to differences in individual circumstances. This is true especially of housing and health. What is not always easy to demonstrate is any strong direct relationship of global subjective measures of well-being to differences in objective circumstances. Such sensitivity as can be shown is in many cases slight, and may even, perversely, be the opposite of what might be expected. It is by no means unusual to find people in quite disadvantaged circumstances reporting higher than average levels of satisfaction and happiness. If subjective indicators are to be used in policy formulation or evaluation, there is surely a dilemma here for the interventionism of welfare economics.

In his review of Campbell and Converse (1970) McKennell (1971) hypothesized three sample models to explain life-satisfaction, assuming that it was possible to obtain a valid and reliable measure of such a notion. The simplest (Model (a)) states that overall life- satisfaction is a weighted sum of satisfactions with different aspects of life, which we term "domains, and that, in turn, these domain-satisfactions are weighted sums of specific satisfiers and dis-satisfiers. The second model introduces the concepts of negative and positive affect as identified by Bradburn, stating that some domains will contribute to life-satisfaction more through positive than through negative affect, or vice versa. The same will apply to the contribution to domain satisfactions of their component sup-domains. The third model (Model (c)) allows for the possibility that all self-reported satisfactions, whether at global, domain or sub-domain level, are determined by some underlying social psychological syndrome-or short term mood state. All three models should be seen in the context of background

or stratification variables. More complex models would introduce Maslovian hierarchies of both subjective and objective measures.

Fig. 1 here

Since the 1973 study was concerned primarily with social policy domains we did not include specific measures of affect or of personality, and so our measures of these were, to say the least, indirect. However, the 1975 study replicated Bradburn's measures of affect and Campbell's measures of personal competence and trust in others. It is therefore possible to test all three simple models and also some of their more complex variations. At the global life level, the dependent variable is the single overall rating of satisfaction with "your life as a whole these days". At the domain level, two models are tested: one for housing using the single satisfaction rating with "your (house/flat)" and one for district using satisfaction with "this local district as a place to live in".

All models are tested on data from the whole relevant sample, using both hard and soft measures as predictors. The district model uses data from Sunderland to which census data from wards has been added. Most of the analysis about to be described was done interactively using a path analysis program written by James Ring of the Survey Unit. The district models for Sunderland were tested using a special program also written by James Ring.

Marans and Rodgers (1972) report analysis of USA data in which they tested MCA on three types of predictor of neighbourhood satisfaction. They show that it is the subjective assessments of neighbourhood which are the best predictors and that person variables and locality variables do not have much effect when they are included. We therefore set out to repeat their analysis on our data from Sunderland using the Census data from the local wards and with the advantage that all the data was from a single city. We first reduced an initial list of over 30 predictors by preliminary analysis to select the best ones using MCA and regression. Since some of the predictors are ordinal and since MCA assumes nominal categories, James Ring wrote an extended version (EMCA) to take account of ordered predictors and this was used to select the district items for the model. There is little difference in the beta-weights or in the proportion of explained variance between the multiple regression and the extended MCA and the addition of two house items (privacy and view) does not make any difference to the regression.

Table 1 here

MCA was used on a selection of person variables and those with beta-weight* of .10 or greater were included in the MCA model of the full set of predictors. Census variables were chosen on the basis of prima-facie relation to district

satisfaction. The full model included eight satisfaction ratings, seven Census variables and five person variables, with district satisfaction as the dependent variable. The MCA model was run seven times in all so that the three sets of predictors could be used separately and in all three pairings and finally all three together.

Table 2 here

Again, as with the Marans and Rodgers findings, the subjective assessments of district account for vastly more variation in district satisfaction than do Census or person variables. The multiple R for the set of district satisfaction items is 0.60 on their own, rising insignificantly to 0.61 with the addition of either set of Census or person items, and to 0.62 with all three sets together. Sets of Census and person items separately have 0.12 and together they have 0.20. The highest beta-weights are for "sort of people" and for "general appearance" (0.38 and 0.30) followed by "view from your windows" (0.18) percentage of households with access to a car (0.16) and "freedom from crime" (0.15). We appreciate that the more generally worded phrases are the best predictors, but it does look as though policy makers will have to take account of subjective assessments of environment as perceived by those who live in it, since it is likely that even the "best" environments they devise may not meet with the approval of the people, especially if they perceive the other inhabitants as unsatisfactory.

A similar model was tested on variables relevant to housing, using satisfaction with house as the dependent variable, and a mixture of hard and soft predictor variables. Four types of variables were included: background variables related to the respondent (sex, age, class, income) situational measures related to the dwelling itself (year of construction, nature of immediate environment, an index of basic amenities, and type of structure) variables indicating the relationship of the respondent to the house (density of occupation, cost of maintenance, dampness as a problem, type of tenure, number of problems reported) and finally the full set of thirteen satisfaction ratings with specific aspects of the house. The four types of variables were used separately and in all combinations to yield fifteen regression models. These models were run interactively using James Ring's program. Since the program can currently handle a maximum of 25 variables simultaneously, the fifteenth model was run without the full set of predictors.

Table 3 here

Very small amounts of variance in housing satisfaction are explained either by person variables or house variables on their own (R^2 = 0.07 and 0.08) but the two sets appear to be additive (R^2 = 0.14) However the set of relational variables explains twice as much just on its own (R^2 = 0.29) and there is no noticeable increase in explanatory power when the other two sets are added in, either separately or together (R^2 = 0.30, 0.30, 0.31). Bringing in the subjective predictors immediately doubles the variance explained (R^2 = 0.63) and whichever combination of the previous sets of predictors is added in there is no noticeable increase in explanation (R^2 variously = 0.64, 0.65). Inspection of the beta-coefficients in table 3 would indicate that the objective indicators only affect house satisfaction through the relational variables and these in turn only affect satisfaction through the specific sub-domain satisfactions. Using Ring's program to build path models with variables constrained at logically separate levels and deleting all paths with coefficients of less than 0.1 yields a best path model using "objective" predictors as shown in Fig. 2. The number of predictors has been reduced from thirteen to eight, and the proportion of variance explained is the same (R^2 = 0.32).

Fig. 2 here

Finally, a selection of variables was used in regression and path models of satisfaction with life as a whole. Again the variables were divided into four basic types or levels. At the lowest logical level there are sex, age, class and income; at the second logical level are what might be termed "situational" variables which include the number of health symptoms admitted, the number of consumer durables possessed and the number of housing problems experienced; at the third level the domain satisfactions are included and at the fourth the measures of positive and negative affect. The dependent variable is the single rating on the 0 - 10 scale of satisfaction with "your life as a whole".
As with housing, fifteen different regression models were tested and the same kinds of results obtained. The lower the logical level of the predictor set the lower the variance explained. However the variance explained by the affect measures is lower than that explained by the satisfaction measures, and it may be that levels three and four should be reversed. As with housing the introduction of higher order predictors masks the variance explained by the lower order predictors. The best fit with the regression models explains half the variance in life satisfaction (R^2 = 0.51), but if the satisfaction and affect measures are left out this falls drastically (R^2 = 0.10).

Table 4 here

By a little judicious juggling it is possible to increase the variance explained in regression models for the whole sample (R^2 =0.55)> but this means reducing the domain satisfactions to five, omitting all the variables at levels one and two, replacing negative and positive affect by affect balance, and introducing two new predictors: amount of perceived control over life and the score on the semantic differential scale assessing "my present life". Attempts to weight predictor satisfaction ratings by their perceived importance rankings increases some beta-weights slightly but the net effect is to reduce the variance explained (For QL3 this meant that R^2 went down from 0.44 to 0.39). Retaining the logical levels as in para 12 number of systematic searches were made for path models. Since the net result of this resembles something like grandmother's knitting after a bad attack by kittens, it is simpler to display the models in sections, or in tabular form. It is important to notice that there are no significant direct paths from any variables at levels one or two to variables at level four or to life- satisfaction. Approximately half of the variance in life-satisfaction is explained by six domains (family life, standard of living, health, financial situation, job and leisure) and by the two affect measures (R^2 = 0.50), but the domains by themselves explain practically all of this (R^2 = 0.48).

Fig. 3 here

At the lower levels of the model there are some effects, direct or indirect, of objective predictors on domain satisfactions. Since the paths tend to criss-cross it is simpler to display the beta coefficients in tabular form. There are direct paths to family life, health and leisure from age and symptoms, to standard of living from sex, age, consumption and symptoms, to financial satisfaction from sex, age, income and symptoms, and to job from all variables at lower levels. Variables at level two with significant direct paths from variables at level one are: number of housing problems from age and income, number of consumer durables from class and income, and number of health symptoms from sex and income.

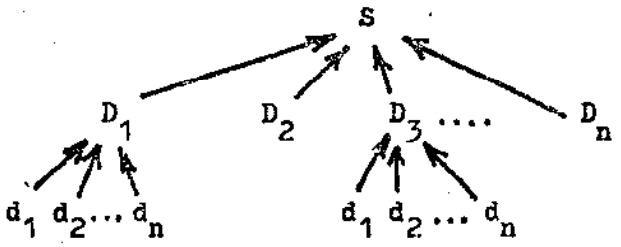
Table 5 here

Even though there are no significant direct paths from levels one or two to life-satisfaction, there are some very strong paths from some 'objective' measures to the related satisfaction measure. We ourselves have not yet experimented with the model replacing those satisfaction measures with their

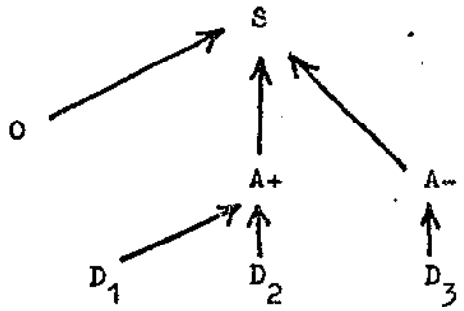
related 'objective' measure, but it is suspected that a fair proportion of variance would still be explained. Certainly replacing health satisfaction by health symptoms only reduces R^2 by 0.01. It is perhaps worth noting in passing that the ISR measure of trust in others does not appear to be related in any way to any other variables in the model, but that the measure of competence is related to negative affect and to housing problems and health symptoms. There are some implications in these findings for policy-makers. On the assumption that the indicators described are reliable, valid and robust, that the models are underpinned by adequate theory and understanding of social processes, that there is no impediment to the translation of research into action, and that action or intervention are feasible and desirable, then there appear to be several uses for subjective indicators and for model building approaches. First, subjective measures, or measures of subjective states could be used to highlight circumstances occasioning acute personal distress.

Second they could be used to attach a "satisfaction quotient" or "distress quotient" to different conditions as a means of weighting for priorities when decisions have to be made. Finally, the use of models, both linear and non-linear, may help to decide the most effective method or point of intervention. In Britain's current economic situation, any aid of this kind will help to maximise the benefit to be obtained from the allocation of scarce resources.

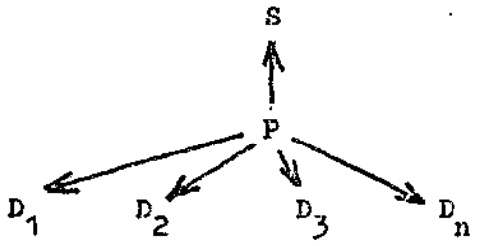
Fig. 1 Models of life satisfaction. McKennell (1971)



Model (a)



Model (b)



Model (c)

S = Life-satisfaction/Well-Being

D = Domain satisfaction

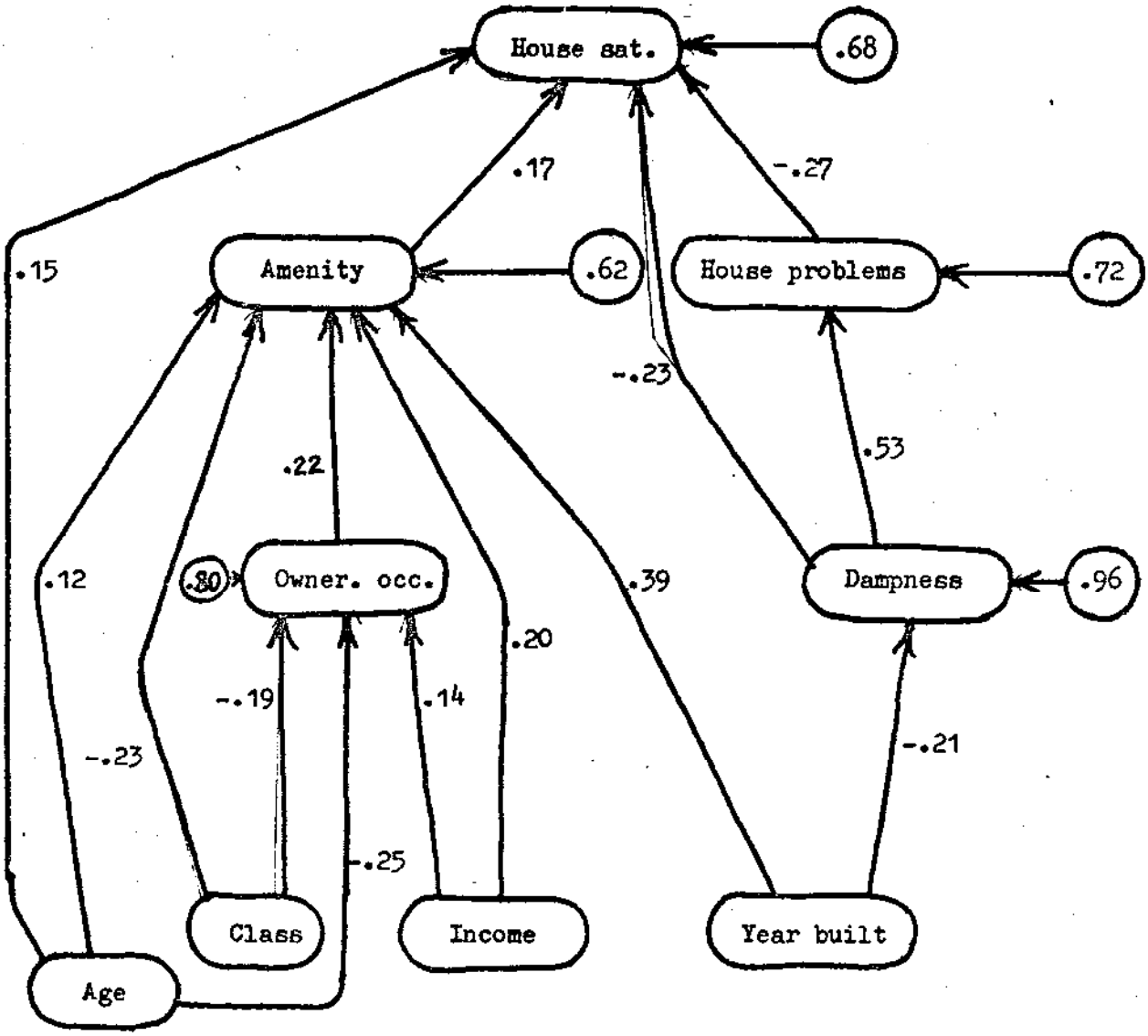
d = Sub-domain satisfaction

A = Affect

P = Personality

O = Other components of S

Fig. 2



Path model of house satisfaction predicted by objective measures only. Circled figures are proportion of variance unexplained ($1 - R^2$). This model has the lowest unexplained variance we have found to date using objective predictors.

Fig. 3 Upper section of path model for life-satisfaction (QL4:1975)

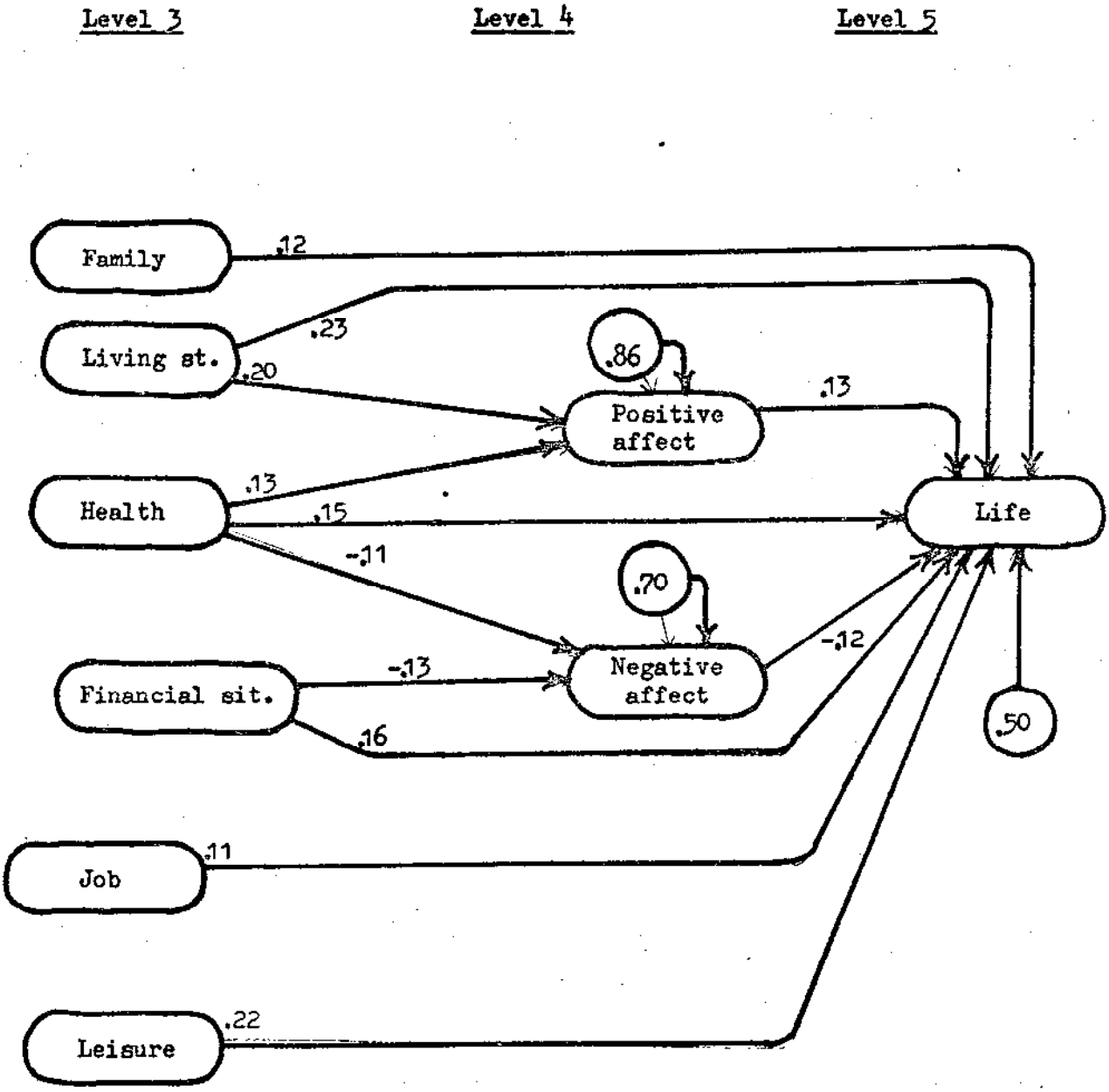


Table 1 Selection of variables for MCA model of district satisfaction

SUNDERLAND

DISTRICT with district list

Model	Ordered MCA	Multiple R	Multiple R
Number of cases	701	701	701
State of roads	-02	01	01
Bus & Train services	--	-03	-03
Shops	05	05	05
Freedom from noise*	10	10	07
Entertainments	06	05	04
Freedom from crime*	10	09	09
Schools	02	-03	-03
Parks & open spaces	06	06	04
Traffic in strects	03	-01	01
General appearance*	24	27	27
Safety at night	04	02	--
Being near family*	08	06	05
Being near friends*	08	08	08
Clean air	09	06	04
Sort of people*	35	34	33
(View from windows)*			09
(Privacy from neighb.)*			06
% variance explained	62	58	59

DISTRICT with person variables using MCA model (N = 692)

Predictor	Beta-weight
Sex	08
Age group*	26
Working status*	15
Terminal education age	02
Tenure of dwelling*	17
Type of dwelling*	11
Marital status	08
Residence as % of age*	10
Social class of HH	05
Adjusted multiple R^2	11
% variance explained	15

The best predictors from each set (those marked *) were included in the final model together with census variables selected as having prima-facie relation to district satisfaction (see table 4.4)

Table 2 Satisfaction with district using all permutations of predictor sets with MCA (Sunderland)

Predictor:	No. of categories	Est. simple r	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Environment: No. of cases			733	748	704	733	689	704	689
View from windows	10	43	14			15	17		18
Privacy from neighbours	10	43	09			09	07		07
Freedom from noise	10	47	12			11	10		10
Freedom from crime	10	45	14			13	15		15
General appearance	10	61	29			30	29		30
Being near family	10	31	11			12	13		14
Being near friends	10	38	12			12	11		12
Sort of people	10	42	37			35	40		38
Census:									
% aged 0-14	3	24		38		14		33	11
% aged 60 or over	3	19		05		06		12	07
% h'holds with 6 or more persons	2	23		05		09		03	07
% H'holds in owner-occupation	3	17		08		11		05	13
% with excl. use all amenities	3	16		15		06		12	07
% at more than 1 person per room	3	26		14		09		09	08
% h'holds with access to a car	3	26		22		13		20	16
Person:									
Age group	4	24			28		10	25	11
Working status	4	11			09		09	08	11
Tenure of dwelling	4	18			17		05	08	05
Type of dwelling	4	21			19		03	16	04
Residence as % of age	11	08			10		08	09	08
Adjusted multiple R^2			60	12	12	61	61	20	62
% variance explained			64	14	14	66	67	24	68

Dependent variable = house satisfaction. Table 3 Beta-weights from regression models (QL4:1975)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SEX	02		01		01		01		-00			-00	00		X
AGE	25		23		12		11		-05			-05	-06		-05
CLASSH	-14		-06		-07		-04		-04			-02	-04		-02
INCOMEH	09		-00		01		-03		-00			-01	-02		X
BUILT		01	01			-01	-01			-03		-03		-03	X
ENVIRON		-02	-01			-00	-00			02		01		02	02
AMENITY		24	24			14	14			05		03		04	01
DWELLING		-08	-09			-03	-03			-03		-03		-03	-02
DENSITY				-16	-12	-15	-10				01		-00	02	-00
COST				01	02	-02	-00				05		04	04	04
DAMP				-27	-25	-24	-23				-10		-10	-10	-10
TENURE				00	02	-04	-01				-01		-03	-02	-04
HOUSPROB				-27	-27	-26	-26				-07		-07	-07	-07
Kitchen								10	11	10	10	12	11	10	11
No. of.rooms								14	14	14	14	14	14	14	14
Shape & size								14	15	14	14	15	15	14	15
Keep warm								09	09	07	08	08	08	07	08
Keep clean								00	00	01	-00	01	00	01	00
Baths								14	13	12	12	12	12	12	12
Noise free								04	03	04	02	03	02	02	02
Damp free								07	07	07	02	07	-03	-02	-03
View								08	08	08	08	09	08	08	08
Privacy								03	04	03	04	04	04	04	04
Cost								05	05	06	06	05	06	06	06
Repair								18	18	18	18	18	18	18	17
Appearance								18	18	17	17	17	18	17	17
R^2	07	08	14	29	30	31	30	63	64	64	65	64	65	65	65

Table 4 Satisfaction with life as a whole - beta-weights from regression models (QL4:1975)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Background:															
Sex	06				08	$\overline{02}$	09				$\overline{02}$	10	$\overline{01}$		$\overline{01}$
Age	17				15	$\overline{05}$	14				$\overline{05}$	14	$\overline{04}$		$\overline{04}$
Class	$\overline{05}$				$\overline{00}$	$\overline{02}$	$\overline{00}$				$\overline{03}$	02	$\overline{00}$		$\overline{02}$
Income	17				08	$\overline{00}$	07				01	04	$\overline{02}$		00
Behaviour:															
Consumer		07			07			00	01		$\overline{04}$	03		$\overline{03}$	$\overline{05}$
Symptoms		$\overline{24}$			$\overline{26}$			$\overline{01}$	$\overline{08}$		$\overline{01}$	$\overline{11}$		03	03
House problems		$\overline{13}$			$\overline{11}$			02	$\overline{10}$		02	$\overline{08}$		02	02
Satisfaction:															
House			08			08		08		06	09		07	07	08
Family			11			12		11		12	11		12	11	11
Living st.			20			20		20		17	20		17	17	18
Financial sit.			16			16		15		14	15		15	15	15
Health			15			13		14		10	13		09	12	11
Town			05			06		05		06	05		06	06	06
Britain			03			03		03		03	03		03	03	03
Job			11			12		11		11	13		12	11	12
Leisure			19			20		19		17	20		18	17	17
Affect:															
Affpos				25			28		24	14		26	14	15	14
Affneg				$\overline{37}$			$\overline{35}$		$\overline{31}$	$\overline{11}$		$\overline{29}$	$\overline{11}$	$\overline{12}$	$\overline{12}$
R^2	04	10	48	20	12	48	22	48	22	50	48	24	51	51	51

Table 5 Lower levels of path model for life-satisfaction

Dependent variable	Predictor	Beta-weight	R^2
Level 3 (satisfactions)			
FAMILY LIFE	- AGE	0.17	
	- SYMPTOMS	-0.14	0.04
STANDARD OF LIVING	- SEX	0.11	0.15
	- AGE	0.24	
	- CONSUMER	0.28	
	- SYMPTOMS	-0.20	
FINANCIAL SITUATION	- SEX	0.13	0.15
	- AGE	0.29	
	- INCOME	0.19	
	- SYMPTOMS	-0.22	
HEALTH	- AGE	-0.10	0.47
	- SYMPTOMS	-0.67	
JOB	- SEX	0.20	
	- AGE	0.28	
	- CONSUMER	0.19	
	- CLASS	0.19	
	- INCOME	0.18	
	- SYMPTOMS	-0.12	
	- HOUSPROB	-0.10	0.15
LEISURE	- SYMPTOMS	-0.31	0.13
	- AGE	0.24	
Level 2 (behavioural)			
HOUSPROB	- AGE	-0.19	0.04
	- INCOME	-0.20	
CONSUMER	- CLASS	-0.32	0.44
	- INCOME	0.44	
SYMPTOMS	- SEX	0.11	0.08
	- INCOME	-0.24	

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