7 HOW THE DATA ARE HOMOGENIZED

Intro

All data reported in this collection are based on *accepted* measures of happiness. As noted in chapter 4, we selected only studies that used questions on happiness which passed a test for face validity. Though all acceptable, the questions are not all the same. The questions not only measure different happiness-variants, but also do so by means of different methods. Therefore, the data are not simply comparable.

This heterogeneity has some advantages: The dissimilarity in happiness-variants allows a differentiated look at public happiness. For example, possible inconsistencies between hedonic level and contentment may provide clues about the processes that underlie differences in overall evaluation of life. The diversity in measurement methods is useful as well. It prevents dependency on only one method and provides an empirical basis for estimating method-effects.

Clearly, the heterogeneity has also disadvantages. The main goal of this inventory is to compare public happiness between nations and through time. The more heterogeneous the data, the less we can compare.

Below I will first consider the heterogeneity of the measures in more detail (Section 7/1). On that basis I will group the measures in subsets of (almost) identical indicators, within which we deem comparison possible (Section 7/2). Next, will consider the possibilities for comparison across these subsets, by means of conversion procedures. Three possible methods are described and tested (Section

7/3). These methods that are applied in the present collection of Distributional Findings on Happiness in Nations.

Next in section 7/4, I will note some new methods for conversion, that are not yet applied to date (July 2020)

Note: This text is an update of chapter 7 of the 1993 book 'Happiness in Nations', which is the predecessor of this collection of Distributional Findings on Happiness in Nations. In this text, the reader will find references to tables in that book, which are available online at https://personal.eur.nl/veenhoven/Pub1990s/93b-part2.pdf
The numbering of these tables in the 1993 book correspond with the numbering of tables in this present collection of Happiness in Nations

7/1 Heterogeneity in accepted questions on happiness

As we have seen in chapter 4 of this introductory text, happiness has been measured in many ways. That variety was considerably reduced by the drastic selection for face-validity reported in section 4.2. Still we are left with a great amount of subtly differing questions. Scheme 7/1 presents some illustrative cases.

Scheme 7/1.
Some current single questions on happiness

Question	*Our classification of Focus*
Taking all together, how happy would you say you are? Very happy, pretty happy, not too happy	O-HL
Generally speaking, how satisfied are you with the life you lead? Very satisfied, fairly satisfied, not so satisfied, dissatisfied	O- SLL
Here is a picture of a ladder. Suppose that the top represents the best possible life for you, and the bottom the worst possible life. Where on the ladder do you feel you stand at the present time?	O-BW
How do you feel about your life as a whole? Delighted, pleased, mostly satisfying, mixed, mostly dissatisfying, unhappy, terrible?	O-DT
Are you most of the time? In very good spirits, in good spirits, in low spirits, in very low spirits	A-AOL
How would you rate yourself as to how successful you have been in terms of achieving your goals and aims in life? Think of 10 s very successful and 0 as being entirely unsuccessful	C-RA

In the earlier discussion on measurement of happiness (chapter 4, section 3) we have seen that accepted questions can differ in the following respects.

- *Focus*
  The questions address different kinds of happiness.

- *Time reference*
  Questions about happiness refer to different periods

- *Mode of assessment*
  Various questioning techniques have been used, and hedonic level has also been assessed by observation

- *Rating of the response*
  Responses have been recorded on different kinds of rating scale of different length. There are also differences in the wording of verbal labels.

Below we will consider to what extend these variations in measurement jeopardize comparison across nations and trough time.

7/1.1 Heterogeneity in focus

Though all questions in Scheme 7/1 concern happiness, they do not tap quite the same kind. Hence the data they yield are not quite comparable: we cannot say that inhabitants of country A are happier than inhabitants of country B, if we know only that the former score high on an indicator of contentment and the latter low on an indicator of hedonic level. As explained in chapter 4 of this introductory text, these variants do not necessarily coincide: e.g. resignation may involve high contentment together with depressed mood. Therefore, this database does not throw all happiness on one heap but presents the findings by happiness variants.

Main focus variants
Following the conceptualization of happiness described in chapter 2 of this introductory text, we distinguish between *Overall Happiness* and 'components' of happiness; an affective component called *Hedonic level of Affect* and a cognitive component called *Contentment.* This conceptual difference results in four main kinds of measures.

- Overall happiness coded O
- Hedonic level of Affect coded A
- Contentment coded C
- Mixed Measures coded M

Sub focus variants

Within main variants of happiness there are further limitations to comparability. Questions on the same kind are phrased differently and these differences are sometimes too great to allow meaningful comparison. For example: in the same population, the average answer to a question on how 'happy' one is (type O-HL) can be more positive than to a question on how satisfied on is (type O-SL). That means that the former interrogation method gives a more favourable estimate of true happiness in that population than the latter.

Likewise, variations in focus can complicate comparison between scores on indicators of hedonic level. It is for instance not at all sure that hedonic level is higher in a country were a single question on general mood (type A-AOL) is rated 7.5 on a 0-10 scale, than in a country were average Affect Balance (A-BB) is 6.5 on the same scale or, interviewer rated cheerfulness (A-CA) is 5.5.

A full list of focus variants is presented on Scheme 7/1.1

Scheme 7/1.1
Variation in focus in measures of happiness

Code	***Description***	***Used in N nation studies by July 2020***
Focus on Overall appraisal of Life		
Self-estimate in response to question with keyword *happiness*		
O-HL	Overall: Happiness in Life	2794
O-HP	Overall: Happy Person	230
Self-estimate in response to question with keyword *life-satisfaction*		
O-SLu	Overall: Satisfaction with life (unspecified)	1993
O-SLC	Overall: Satisfaction with Life-Course	58
O-SLL	Overall: Satisfaction with Life one Lives	2502
O-SLS	Overall: Satisfaction with Life-Situation	14
O-SLW	Overall: Satisfaction with Life as a Whole	2918
O-SP	Overall: Satisfied Person	4
O-SLP	Overall: Satisfaction with Personal Life	133
Self-estimate in response to question with keywords *quality of life*		
O-QOL	Overall: Quality of Life	42
O-QLS	Overall: Quality of Life Situation	23
O-SQL	Overall: Satisfaction with Quality of Life	21
O-QL?	Overall: Quality of Life, question not reported	2
Self-estimate in response to question with further keywords		
O-DT	Overall: Delighted vs Terrible life	234
O-GBB	Overall: Good-Bad Balance	8
O-LWL	Overall: Life Worth Living	1
Sum Scores		
O-Sum	Overall: Summed overall appraisals of life	145

Focus on Hedonic level of Affect

Self-estimates in response to questions on how well one feels most of the time

A-AOL	Average Overall Level	225
A-TH	Time Happy	20

Computed averages

A-AA	Affect: Average during Activities	2
A-ARE	Affect: Average Repeated Overall Estimate	32
A-ASA	Affect: Average of Specific Affects	21

Computed Affect Balance (positive minus negative affects)

A-AB	Affect: Balance: various	2370
A-BB	Affect: Balance (Bradburn's 10 item index	227
A-BBr	Affect: Balance (Brenner's index)	5
A-BC	Affect: Balance (Cohen's index)	1
A-Bde	Affect: Balance (Derogatis)	2
A-BD1	Affect: Balance (Diener's 8 item index)	4
A-BD2	Affect: Balance (Diener's ABS)	11
A-BD3	Affect: Balance (Diener's 24 item index)	7
A=BF	Affect: Balance (Fredrickson Differential Emotion)	3
B-H	Affect: Balance (Huelsman)	1
A-BL	Affect: Balance (Kamman/Lichter index)	14
A-BMc	Affect: Balance: McGreal 'Depression-Happiness'	16
A-BMr	Affect: Balance (Mrozek)	3
A-BS	Affect: Balance (Schultz's index)	1
A-BW	Affect: Balance (Watson et al PANAS)	77

Ratings of affect level by others

A-CA	Affect: Cheerful Appearance	55
A-CP	Cheerful Person	72

Sum-scores of responses to different questions on how one feels most of the time

A-Sum	Affect: Summed appraisals	7

Focus on Contentment

Self-estimates in response to questions on getting what one want in life

C-BW	Contentment: Best-Worst possible life	3408
C-RA	Contentment: Realization of Aspirations	52
C-RG	Contentment: Realization of Goals	19
C-A	Contentment: Accomplishments in life	5
C-W	Contentment: Getting things Wanted	31

Computed average of responses to questions on wants and achievements

C-ASG	Contentment: Average Success in Goals	3

Mixed focus

Self-estimates in response to ambiguous questions

M-TH	Mixed: Time Happy	110
M-PL	Mixed: Pleasure in Life	17
M-FH	Mixed: Feel Happy	384

Sum-scores of responses to questions on different main focus variants

M-AO	Mixed: Affect + Overall	69
M-AC	Mixed: Affect + Contentment	7
M-CO	Mixed: Contentment + Overall	22
M-ACO	Mixed: Affect + Contentment + Overall	22

7/1.2 Heterogeneity in time reference

One of the most commonly used measures is a single closed question on 'happiness-in- life' (type O-HL). This question has been put in different ways, which differ in time-reference. Scheme 7/1.2 presents some examples.
Though all these questions use the word 'happiness' as the key-term, they differ subtly in time-perspective ('up to now', 'generally', 'now', 'at the moment'). Such minor differences can possibly produce small variations in average scores, which could jeopardize comparisons between nations and through time. A check of that possibility is planned. For the time being it is assumed that variations in time reference do not seriously affect the scores.

Scheme 7/1.2
Variation in time reference in questions on happiness-in-life (type O-HL)

How happy would you say you have been up to now?
Taken all together, how happy would you say you are?
How happy do you feel as you live now?
Generally speaking, are you a happy person?
How happy is your life at this moment?

7/1.3 Heterogeneity in assessment modes

Next to this substantive variation, there are difference in methodology. One of these differences is in the mode of assessment. The most common technique is interrogation, but hedonic level has also been assessed by cheerful appearance (A-CA). These techniques are too different to allow meaningful comparison. A self-estimate of 6 on a 10-step scale could correspond with an external rating of 4. The relation between these appraisal methods is not sufficiently investigated as yet.

Interrogation is typically done by means of standard questions, with pre-coded response options. Mostly these are single questions (code sq.), sometimes asked twice in the interview and the ratings are added (coded sqt). Such single questions are deemed comparable, provided that lead text and response options are equivalent.

Next to single questions, there are also multiple item questionnaires, often referred to as a 'happiness scale'. Average scores on such inventories cannot be meaningfully compared with average responses on a single question, even when both are expressed on a same numerical range. For instance, when in a country the average score on a ten-step single question on general mood (A-AOL) is 6, the mean score on the 10 item Bradbum's Affect Balance Scale (A-BB) could be 7.

7/1.4 Heterogeneity in rating of responses

All measures rate the degree of happiness on some rating scale[1]. These rating scales differ also in some respects; in the rating device, in the number of response categories and in the precise labelling of response options.

7/1.4.1 Kind of rating scale

Most questions use verbal rating scales, such as 'very happy', 'fairly happy', 'not very happy' and 'unhappy'. Average scores are computed by attributing numerical values to these options, e.g. by giving 'very happy' responses the value '4' and 'unhappy' value '1'. Another technique is to have the respondents themselves express their happiness in a number, mostly between 1 and 10. Clearly, such values are not comparable, not even when expressed on the same range.

7/1.4.2 Number of response categories

Questions type O-HL are commonly presented with three answer categories. However, there are also variants with four or five answer categories. Scheme 7/1.4.2 presents some examples of rating-scales of varying length. Clearly such differences hamper comparison as well. One cannot say that public happiness is higher in a country with score 2 on a 3- step scale, than in a country with score 3 on a 5-step scale.

7/1.4.3 Labelling of verbal response categories

The common lead question 'In general, how happy would you say you are' is typically presented with three answer categories. However, these answer categories are not always identically labelled. Scheme 7/1.4.3 presents some examples.
The difference is in this case largely in the last answer category: ‘not at all happy’, ‘unhappy’, ‘not very happy’ and ‘not too happy’. If all these response options are given an equal weight (i.e. 1 on a 1-3 scale), questions that provide a response option of the former kind will probably yield a more favourable estimate of true happiness in a population than the latter. The more pertinent the unhappy category, the less respondents will choose it, and the more will characterize themselves as ‘fairly’ happy. Similar variation in response categories exists with other question types, in particular with questions on life-satisfaction (type O-SL). Obviously, such variations also limit the comparability of the data, especially if questions also diverge in the number of response categories offered.

[1] Note that the term ‘scale’ denotes in this case a range on which a value is reported and not a series of questions as in the above-mentioned case of multiple item questionnaires

Scheme 7/1.4.2
Variation in number of response categories with a simple closed question on happiness

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Taken all together, how happy would you say you are?

very happy	very happy	very happy
fairly happy	quite happy	rather happy
not too happy	not very happy	neither happy nor unhappy
	not at all happy	fairly unhappy
		very unhappy

Scheme 7/1.4.3

Variation in labelling of response categories

with a 3-step question on happiness-in-life (code O-HL/g/v/3)

In general, how happy would you say you are?

very happy	fairly happy	not at all happy
very happy	fairly happy	not happy
very happy	pretty happy	not too happy

7/2 Grouping comparable findings

The main goal of this Collection of Happiness in Nations to compare public happiness across nations and through time. Therefore, its data are organized in comparable sets. These sets are the tables in this collection. The construction of these comparable sets involved the following steps:

7/2.1 Grouping by focus of question

As we have seen in Section 7/1.1, there are differences in focus at two levels: firstly, between the happiness variant addressed and secondly in the phrasing of lead questions. Since these differences impede comparison, the findings yielded with such questions are presented separately.

7/2.1.1 Main variant of happiness

Questions that address different variants of happiness do not produce comparable results. In the same country at a particular time, overall happiness may rate point 7.5 on a 0-10 scale, hedonic level 6.0 and contentment 8.2. For that reason, this collection of research findings presents the data of different happiness variants separately.

It has four main sections: section 1 presents the findings on 'overall happiness', section 2 findings on 'hedonic level' and section 3 findings on 'contentment'. Because classification is dubious in some cases, section 4 presents findings yielded with 'mixed indicators' separately.

This grouping breaks the collection into four pieces: one big piece (overall happiness, code O), one smaller piece (affect level, code A) and two minor pieces (contentment (C) and mixed questions (M).

7/2.1.2 Minor variation in key words

In Section 7/1.1 we have also seen that questions on the same happiness variant can differ slightly. In the case of overall happiness, the difference is in the key terms such

as 'happiness', 'life-satisfaction', or 'delighted-terrible'. Comparison between scores on such different items is not possible either. Therefore, the data are split up further by focus variant. This breaks the collection into nine pieces: four variants of overall happiness (O-HL, O-SL, O-DT), three variants of hedonic level (A-AOE, A-BB and A-CA), two variants of contentment (C-BW, C-RA) and one mixed indicator (M-AO). Within each focus category, there is also a table of miscellaneous items, which brings the total on twelve tables.

7/2.2 Grouping of near-identical questions[2]

Still there are differences between questions that focus on the same subject matter, among single questions about overall happiness. The difference is now in the response scales.

Happiness-in-life

Single questions on happiness-in-life (O-HL) were further differentiated in three more homogenous classes and a rest category. The three-class distinction is mainly based on the number of response categories, but we also considered similarity of lead phrase and category labels. Divergent items were moved to the rest category. This resulted in four tables in this book: Table 1.1.1a: '3-step happiness', table 1.1.1b: '4-step happiness', table 1.1.1c: '5-step happiness' and table 1.1.2: 'further single questions on happiness'; the rest category.

Though almost identical, the items in the first three homogenous categories still differ slightly in lead question and labelling of answer categories. To allow further differentiation, the tables contain references as to the precise wording of the questions. For instance, table 1.1.1a enumerates twelve variations on the question 'In general, how happy would you say you are?' These variations are marked by a code: HL1 to HL12. In the notes to the table, all questions are presented in English translation.

Satisfaction-with-life

In the case of single questions on satisfaction-with-life (O-SL) there are two main question types: Firstly, questions that focus on 'satisfaction with the life one leads' and that use short verbally labelled answer categories (code O-SLL). Secondly, questions about 'satisfaction with life-as-a-whole' that are represented on a longer graphic rating scale of which only the extremes are defined verbally (O-SLW). Within these two variants there are further differences in length of rating-scales.

Again, identical subsets were created based on similarity in lead question and rating-scale. This resulted in five separate tables. First, three tables on the question on 'satisfaction with the life one leads'; table 1.2.1a: 3-step way-of-life-satisfaction, table 1.2.1b: 4-step way-of-life satisfaction and table 1.2.1c: 5-step way-of-life satisfaction. Next, two tables on 'satisfaction with life-as-a-whole': table 1.2.2a: 10-

[2] The tables mentioned in this section are part of the 1993 book Happiness in Nations and are available on-line at https://personal.eur.nl/veenhoven/Pub1990s/93b-part2.pdf

step life- satisfaction and table 1.2.2b: 11-step life-satisfaction. Items that do not fit any of these subsets are again separately presented in a rest category (table 1.2.3 various life- satisfaction items).

The resulting classification of the data is presented in Scheme 7/2.3. That Scheme also mentions the tables in this database where the scores on these questions are reported. The table titles in the Scheme are printed in italics: ***bold italics*** refer to similar items; here comparison is possible between nations and through time. *Non-bold italics* denote heterogeneous rest-categories, that do not allow comparison. Scheme 7/2.3 does not enumerate the questions that have been used in cross-national studies on specific groups, such as university students.

7/2.3 Equivalent questions[3]

In the foregoing section we have grouped these items in near-identical classes. Accordingly, the scores on these indicators are presented in separate table and hence marked as incomparable. In some cases that is too strict, however. There are clusters of items that involve essentially the same question and differ only slightly in number and labelling of response categories. Though the numerical scores on these questions are not comparable, their content is equivalent. Therefore, they are suitable for conversion to a same standard. We call these equivalent items. Conversion procedures will be discussed in Section 7/3.

Most of the questions on happiness-in-life (O-HL) are considered equivalent. Among the questions about satisfaction-with-life two groups of equivalent items are discerned: Firstly, questions about satisfactions with one's way of life (O-SLL), which are typically scored on short rating scales. Secondly, questions about satisfaction with life-as-a-whole that are rated on longer graphic scales (O-SLW). See again Scheme 7/2.3

[3] [3] The tables mentioned in this section are part of the 1993 book Happiness in Nations and are available on-line at https://personal.eur.nl/veenhoven/Pub1990s/93b-part2.pdf

Scheme 7/2.3

Measures of happiness in nation by focus and comparability

Table on website	**Measure type**	**Equivalence** indicated by shared block + conversion method
OVERALL HAPPINESS		
Key word happiness		
111A	2-step verbal happiness	
111B	3-step verbal Happiness	Conversion of means and SD to common 0-10 numerical scale using expert rating of response options
111BA	3-step verbal Happiness B	
111C	4-step verbal Happiness	
111D	5-step verbal Happiness	
111F	7-step verbal Happiness	
111G	11-step verbal happiness	
112A	5 step numeral happiness	
112B	6-step numeral happiness	
112C	7-step numeral Happiness	Conversion of means and SD to common 0-10 numerical scale using linear transformation
112D	8-step numeral happiness	
112E	9-step numeral happiness	
112F	10-step numeral Happiness	
112G	11-step numeral Happiness	
113	3-step verbal Happy Right-Wrong	
Key word life satisfaction		
121A	2-step verbal Life-satisfaction	
121B	3-step verbal Life-Satisfaction	Conversion of means and SD to common 0-10 numerical scale using expert rating of response options
121C	4-step verbal Life-Satisfaction	
121D	5-step verbal Life-Satisfaction	
121E	6-step verbal Life-satisfaction	
121F	7-step verbal Life-Satisfaction	
122A	5-step numeral Life-Satisfaction	Conversion of means and SD to common 0-10 numerical scale using linear transformation
122B	6-step numeral Life-Satisfaction	
122C	7-step numeral Life-Satisfaction	
122D	8-step numeral Life-Satisfaction	
122E	9-step numeral Life-Satisfaction	
122F	10-step numeral Life-Satisfaction	
122G	11-step numeral Life-Satisfaction	
122H	101-step numeral Life-Satisfaction	
Key word Delighted-Terrible		
13A	7-step verbal Delighted-Terrible life	Conversion of means and SD to common 0-10 numerical scale using linear transformation
13B	8-step verbal Delighted-Terrible life	
Key word quality of life		
152	10 step Quality-of-life	
153	4-step satisfaction with QOL	

154	5 step quality of life	
Further questions		
155	Diener's SWLS, shortened version	
156	7-step good-bad things in life	
157	3-item overall happiness	
158	2 item life satisfaction	
160	happiness + life-satisfaction in one question	
HEDONIC LEVEL		
21A	2-step verbal Average Affect	
21C	4-step verbal Average Affect	Conversion of means and SD to common 0-10 numerical scale using expert rating of response options
231	5-step verbal Current Affect	
21F	6-step verbal Average Affect	
21G	7-step Pictorial Average Affect	
21J	11-step numeral Average Affect	
21K	11-step average verbal affect	
Affect Balance scales		
221	8-item Affect Balance Scale (Diener)	Conversion of means and SD to common 0-10 numerical scale using linear transformation[4]
222	10-item Affect Balance Scale (Bradburn)	
223	20 item Affect Balance Scale (Watson): PANAS	
224	Further Affect Balance Scales	
24B	6-item yesterday Affect Balance	Mean expressed in % more positive than negative affect
24C	14-item Yesterday's Affect Balance	
24D	11 item Yesterday's Affect Balance	
24E	10 item Yesterday Affect Balance	
Further measures of hedonic level		
24A	More days like yesterday	
24G	Yesterday's overall affect	
25C	Automatic face analysis	
CONTENTMENT		
Key term Best-Worst possible life (Cantril ladder question)		
31A	7-step numeral Best-Worst possible life	Conversion of means and SD to common 0-10 numerical scale using linear transformation
31B	9-step numeral Best-Worst possible life	
31C	10-step Best-Worst possible life	
31D	11-step numeral Best-Worst possible Life	
Key term Realization of goals/wants		
321	4-step verbal Realization of Goals	
322	7-step verbal Realization of Goals	Conversion of means and SD to common 0-10 numerical scale using linear transformation
323	11 step numeral Success in Goals	
33A	2-step verbal Life fits Wants	
33B	3-step verbal Life fits Wants	Conversion of means and SD to common 0-10
33D	5-step verbal Life fits Wants	

[4] Not yet implemented by July 2020

		numerical scale using expert rating of response options[5]
33E	10- step numerical Life fits Wants	Conversion of means and SD to common 0-10 numerical scale using linear transformation
33F	11-step numerical Life fits Wants	
MIXED MEASURES		
Key term Feel Happy		
411A	2-step Feel happy	
411B	3-step Feel Happy	Conversion of means and SD to common 0-10 numerical scale using expert rating of response options[6]
411C	4-step Feel Happy	
411D	5-step Feel Happy	
411E	6-step Feel Happy	
411F	7-step Feel Happy	
411G	7-step Feel Happy	
411H	10/11-step Feel Happy	
Key term Time Happy		
412A	4-step Time Happy	Conversion of means and SD to common 0-10 numerical scale using expert rating of response options[7]
412B	5-step Time Happy	
412C	6-step Time Happy	
Key term Pleasant life		
413A	4-step Pleasant Life	Conversion of means and SD to common 0-10 numerical scale using expert rating of response options[8]
413B	5-step Pleasant Life	
Further mixed measures		
414	Happy days	
421	Yesterday affect + best-worst possible life	
432	4 item Satisfaction with Life Scale	

[5] Not yet implemented by July 2020

[6] Not yet implemented by July 2020

[7] Not yet implemented by July 2020

[8] Not yet implemented by July 2020

7/3 CONVERTING SCORES ON NON-IDENTICAL ITEMS

This partition of the data into sets of (near) identical questions breaks this data collection into splinters. The number of cases for comparisons is thereby reduced considerably. Though comparison is better possible within the purged categories (tables), there is less to compare: less countries in each subset and less years in time-series. Therefore, we considered the possibilities for converting scores on different indicators to a common standard. We focussed on transforming averages. Conversion of measures of dispersion was not attempted.

Converting average scores on different questions on happiness is in fact estimating how respondents would have answered on a question that was not presented to them. That estimate is made based on their responses to one or more other questions they did answer.

The simplest estimate of that kind is inferring the average response on an (unasked) question A in the light of a response on question B. For instance: we can assume that people in a country which scores 5 on a 10-step life-satisfaction question (B) would have scored 2.5 on a 5-step happiness (A) item. Such estimates can help to reduce the number of ‘missing values' in nation-sets or time-series. If we have too few observation based on question A, we can supplement these with transformed scores on question B.

More far-reaching is transforming all scores for all questions to one standard;

i.e. to an imaginary 100 step happiness scale. That would of course create the greatest possible dataset.

Such estimates are no more than guesses. One can never be sure how people in a country would have answered a question that was not posed to them. Still, one can make educated guesses. Let's us look at the possibilities for transformation and see how this works out in this dataset.

7/3.1 Converting average scores on measures of different happiness variants

As noted above, the indicators of overall happiness, hedonic level and contentment measure essentially different things. Hence scores on these indicators can*not* be transformed to one common standard. At best such scores can be combined in an overall index. However, that is hardly helpful conceptually. Indicators of overall happiness are already supposed to cover the whole. Moreover, such a procedure would not create more comparable data.

7/3.2 Converting average scores on different measures of a same happiness variant[9]

The four blocks in Scheme 7/2.3 present different methods for measuring the same happiness variants. All indicators type O in the first block are supposed to measure 'overall happiness', all indicators type A in second block 'hedonic level' and all indicators type C in the third block 'contentment'. In principle different measures of the same phenomenon are comparable. However, in practice they are not. As we have seen in Section 7/1.2, method-effects may veil the differences in true happiness.

Still, it is possible that there is constancy in these method effects which may allow estimates of missing values. Suppose that we have average scores on two questions in a sizable number of nations; i.e. on the question on 'happiness-in-life' (X) and on the question about 'satisfaction with life' (Y). Suppose further that the average scores on the former question are typically more positive than on the latter, and that the relation can fairly well be described by an equation; for instance, the formula X = 1,25 + 0,5 Y, where X is 5-step happiness (independent variable) and Y is 11-steplife-satisfactiont (dependent variable). We can then estimate average life-satisfaction rating in a country of which we have only information about average happiness-in-life. The parameters for such a formula can be found by means of regression analysis. In that way we can derive estimates for missing happiness values in nation-sets and time-series.

Such conversions of one measure to another are risky, because one is never sure that the equation derived from a set of countries for which scores on both

[9] [9] The tables mentioned in this section are part of the 1993 book Happiness in Nations and are available on-line at https://personal.eur.nl/veenhoven/Pub1990s/93b-part2.pdf

measures are available, also applies to the country with a missing X-score. Yet, the risk that the equation does not apply is clearly smaller if it is based on many cases (countries, years) and if the variability (deviance from the regression line) is low.

We explored this possibility in an analysis of cross-national studies that involved several items on overall happiness. We inspected the relation of responses in four pairs of questions: 1) happiness-in-life vs. satisfaction-with-life, 2) happiness-in-life vs. best- worst-possible-life[10], 3) satisfaction-with-life vs. best-worst-possible-life and 4) happiness- in-life vs. delighted-terrible-life.

The scores on these pairs of items were analysed by means of bi-variate regression. If there is a clear linear relation, the average scores must neatly fit the regression line. In that case the equation of that line provides a formula for converting one score to another. If, however the scores appear to be scattered, there is apparently no consistency in the ratio of responses to these questions across countries.

This analysis requires two choices: a choice for the most appropriate regression line and a choice of the acceptable divergence from that line. The first-choice concerns three possible regression lines: 1) the regression line with happiness-Y as the dependant variable, 2) the regression line with happiness-X as the dependant variable and 3) the intermediate line based on the z-scores of Y and X. If we want to predict a missing score on happiness-Y in a particular country on the basis of happiness-X in that country, regression line 1 is clearly more appropriate than regression line 2; because Y is the dependent variable in this case and not X. Regression line 1 is also preferable to z-score line 3.

The acceptable dispersion around the regression line is usually indicated by 5% confidence intervals at each side. These confidence intervals are typically narrower around the average than at the extremes of the distribution. Due to the limited number of observations at hand here, it is not well possible to estimate such confidence intervals. Therefore, we reverted to a simpler criterion and fixed the acceptable dispersion at 10% of the possible scale range; 5% above and 5% under the line. This may seem a rather narrow tolerance area, but the actual range of variation in the data at hand here is in fact only 50% of the possible range.

The 10% tolerance area is depicted graphically in the Schemes below. If a sizable amount of the cases is outside that area, the dispersion is clearly too great and consequently transformation not justified. If there are only a few cases slightly outside the area, it is worth considering the probability that these are incidental outliers.

Regression of responses to items on 'happiness-in-life' and 'satisfaction-with-life'

[10] In a later phase of this study I changed the classification of the Cantril ladder from O-BW to C-BW and thus to another happiness variant. Following Section 7/3.1 this implies that conversion using regression is not allowed anymore.

Two cross-national studies involved questions on both 'happiness-in-life' and 'satisfaction-with-life'. The 11 nations Gallup/Kettering World Survey and the 22 nations World Value Study I.

The Gallup/Kettering World Survey involves a 3-step happiness (table 1.1.1a, question O-HL8) and an 11-step life-satisfaction (table 1.2.2b, question O-SLW17). The average scores on these items in the eleven countries were crossed. See the scatter gram in Scheme 7.3.2a.. Six of the eleven scores are very close to the regression line. Four cases are outside the interval, however. The regression line is heavily influenced by the extreme case of India. However, there are no reasons to consider that case as invalid. Moreover, omitting India does not provide a better fit.

The World Values Survey I involves a 4-step item (table 1.1.1.b, question O-HL13) and 10-step life-satisfaction (table 1.2.2a, question O-SLW10). The average scores on these items are crossed. See Schemes 7/3.2b. Again, there are quite a few cases outside the acceptable range of variation.

All in all, these data do *not* provide a solid basis for estimating life-satisfaction in countries based on responses to questions about happiness-in-life, or vice versa. This is a pity, because the present dataset involves many missing values that might have been estimated in this way.

Regression of responses to questions on 'happiness' and the 'best-worst possible life'

The 11 nation Gallup/Kettering World Survey also involved a question on 'Best-Worst' possible life (table 1.3, question C-BW 2, currently known as the 'Cantril Ladder-rating of present life'). The average scores on this item were also crossed with happiness (table 1.1.1a, question O-HL8). See Schemes 7/3.2c. In this case several cases are outside the interval, though not very far. Again, Mexico and West Germany are most deviant. Estimating BW scores based on responses to questions about happiness-in-life is this very risky.

Regression of scores on questions about 'satisfaction-with-life' and 'best-worst possible life'

The above-mentioned questions on 'satisfaction-with-life' and 'best-worst possible life' in the Gallup/Kettering World Survey are also crossed. This pair is especially interesting because both questions use the same rating scale: Cantril's 0-10 step ladder-picture. The data are presented in Scheme 7/3.2d. In this case all the scores are neatly within the 10% interval. Unlike the previous scatter gram, India and West Germany do not appear as deviant. This suggests that we can obtain reasonably good estimates of missing Best/Worst scores based on observed Life-Satisfaction scores. The appropriate transformation formulae are mentioned at the bottom of the Scheme.

In the present dataset there are many missing values which can be substituted in this way. For a lot of countries, we know the score on 11-step satisfaction-with-life around 1975, but not the score on 11-step best-worst possible life: e.g. Austria, Belgium, Finland and the Netherlands. In the latter case conversion yields an estimated Best-Worst score for the Netherlands of 6.8, which is close to the score 7.1

observed in a small sample at that time. There are also quite some countries of which we know the best-worst score at a time, but not average satisfaction-with-life. Such cases are Israel, Poland and Yugoslavia. Compare table 1.2.2b with table 1.3.

Regression of responses to question on 'Happiness-in-life' and 'Delighted-Terrible-life'
Michalos' 'Global Student Well-Being Survey' involves both a question on 'Happiness-in- life' and a question on feelings about life in terms of 'Delighted-Terrible'. This data set is particularly suited for the purpose of identifying a possible stable ratio in the responses to these items. Firstly, both questions are rated on a 7-step scale. Secondly, the number of nations is largest (38). Thirdly, the respondents are university students and probably understand differences in wording better than respondents drawn from the general population.

The data are presented in Scheme 7/3.2e. Again, we see a clear pattern of the scores around a linear regression line, but once more there are outliers. Of the 38 countries, 6 are outside the tolerance interval; two countries are beyond the line in both analyses (Thailand and Bangladesh). Though not dramatic, this deviance marks that transformation of one score to another is risky.

In the present dataset there is only one case of a missing value, which could be estimated in this way. That is the case of Russian university students, of which we have a D/T score (4.15 on a 1-7 scale, but not a happiness rating. The estimated happiness score would be 4.32.

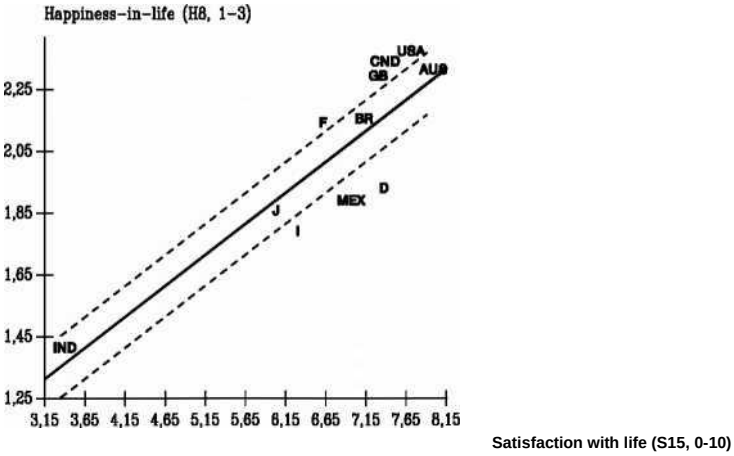
Regression of responses to 4-step 'satisfaction with way-of-life' and 10-step 'satisfaction with life-as-a-whole'
Finally, we considered two items on 'satisfaction-with-life'. Though there is no study that asked both questions in the same interview, there are highly comparable data from surveys in West-European countries in 1981. The Eurobarometer survey involves a 4- step question on satisfaction with the life one leads (Question O-SLL4, table 1.2.1b). World Value Study I contains a 10-step question on satisfaction with life-as-a-whole (QuestionO-SLW12, table 1.2.2a). Eight countries were involved in both studies.

The scores on these items in the eight countries are presented in Schemes 7/3.2f. The correlation is high (r=+.94) and the scores are all within the 10% interval. Hence transformation seems justified in this case. Missing values on 4-step satisfaction with way of life can be estimated based on scores on 10-step satisfaction with life-as-a- whole. Reversibly, missing values on 10-step satisfaction with life-as-a-whole can be estimated reliably based on observing responses to 4-step satisfaction with way-of- life. The conversion formulae are again presented at the bottom of the Schemes.

Several missing values can be substituted in this way. Of Greece and Luxembourg we have scores on 4-step satisfaction in 1981 (table 1.2.1b) but not scores on 10- step satisfaction (table 1.2.2a). Conversion of 4-step satisfaction yields the following estimates of 10-step satisfaction: Greece 6.44 and Luxembourg 7.84. Likewise, we can now estimate 4-step satisfaction of many countries of which we

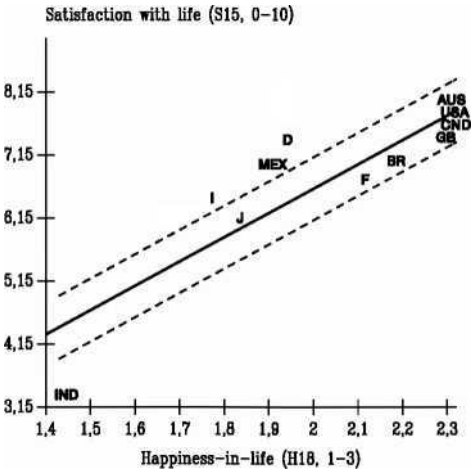
have only 10-step satisfaction scores, such as Australia, Hungary, Iceland, Mexico and White Russia.

Scheme 7/3.2a
Average scores on items about 'happiness-in-life'
in 11 nations in 1975



Happiness = 0.68 + 0.20 Satisfaction.

'satisfaction-with-life' in 11 countries

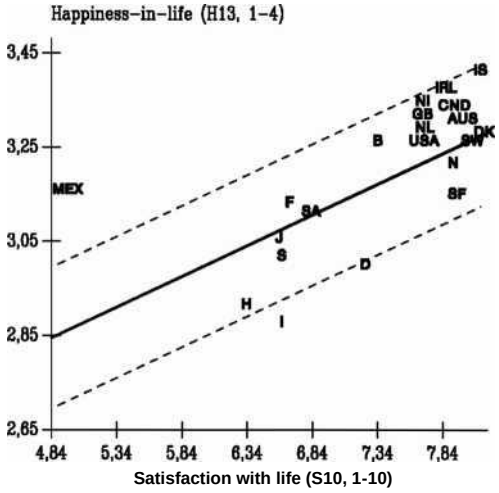


Satisfaction = -1.10 + 3.86 Happiness.

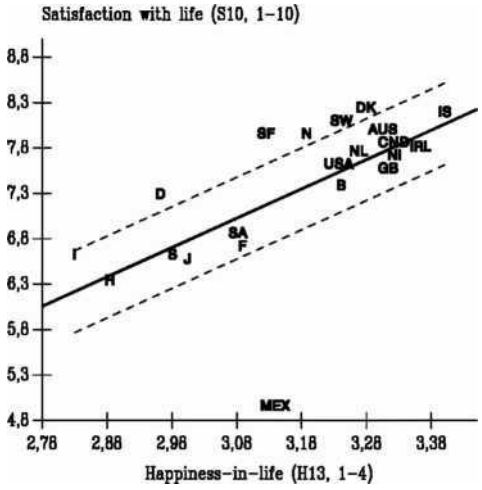
Data: Gallup/Kettering World Survey 1975. See tables 1.1.1a and 1.2.2b.
Nation codes : see p 283.

r = +.88

Scheme 7/3.2b
Average scores on items about 'happiness-in-life' and 'satisfaction-with-life'
In 22 nations in 1980



Happiness = 2.21 + 0.13 Satisfaction

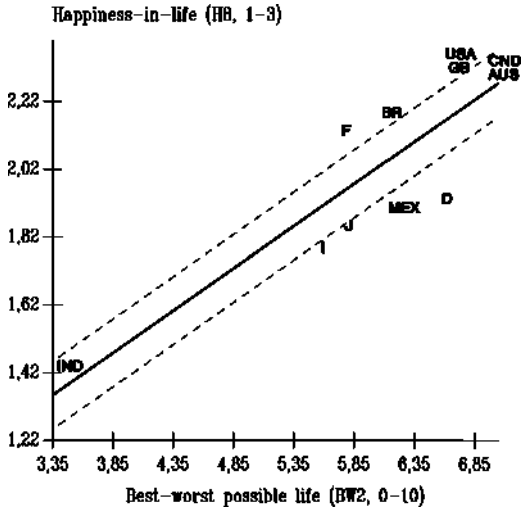


Satisfaction = -2.92 + 3.23 Happiness

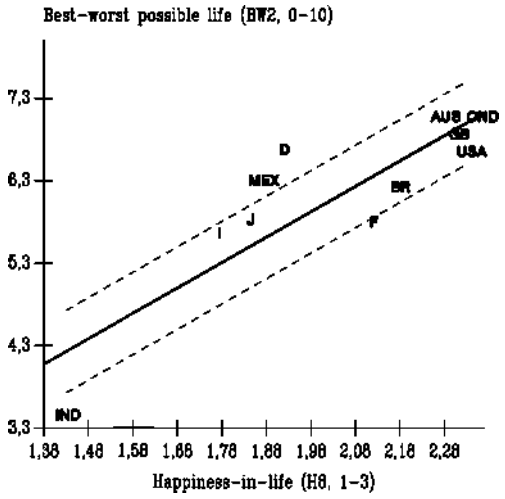
Data: World Value Study I 1980. See table 1.1.1b and 1.2.2a.
Nation codes: See p 283.

r = +.65

Scheme 73.2c
Average scores on items about 'happiness-in-life' and 'best-worst possible life'
in '11 nations in 1975



Happiness = 0.52 + 0.25 Best/Worst



.

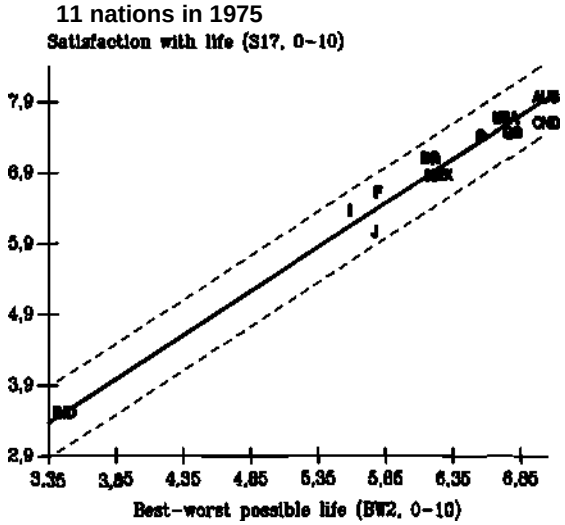
Best/Worst = 0.18 + 3.08 Happiness.

Data: Gallup/Kettering World Survey 1975. See table 1.1.1a and 1.3.
Nation codes: See p 283.

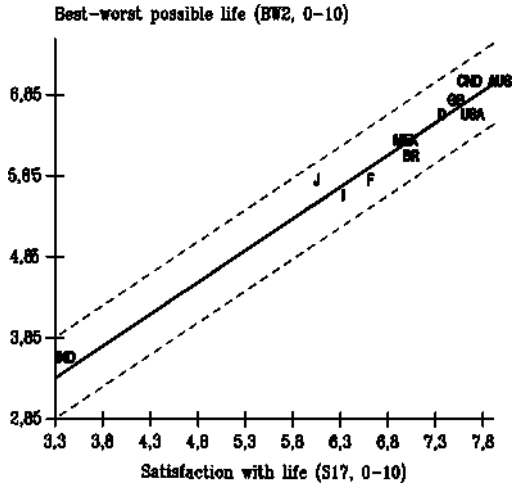
r = +.88

Scheme 7/3.2d

Average scores on questions about 'Satisfaction-with-life' and 'Best-Worst possible life' (both questions rated on same graphic scale)



Satisfaction = -0.79 + 1.24 Best/Worst.

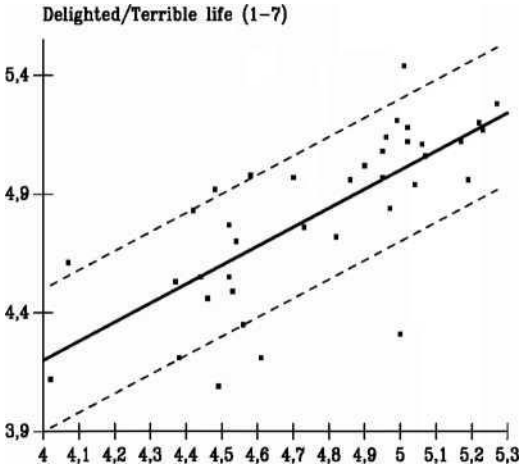


Best/Worst = 0.75 + 0.79 Satisfaction.

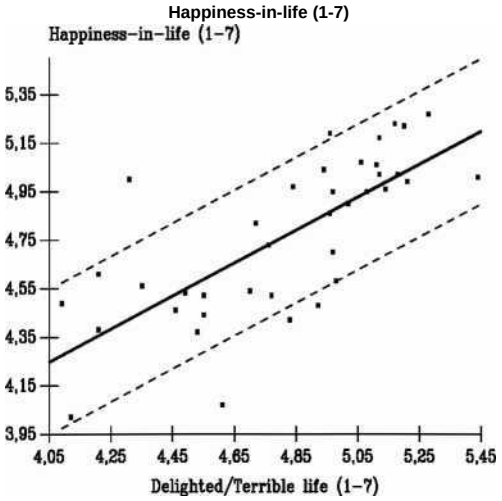
Data: Gallup/Kettering World Survey 1975. See table 1.2.2b and 1.3.
Nation codes: See p 283.

r = +.99

Scheme 7/3.2e
Average scores on 'happiness-in-life' and 'delighted-terrible life'
(Both questions rated on 1-7 scales)
University students in 38 countries 1985



D/T = 1.00+ 0.80 Happiness.

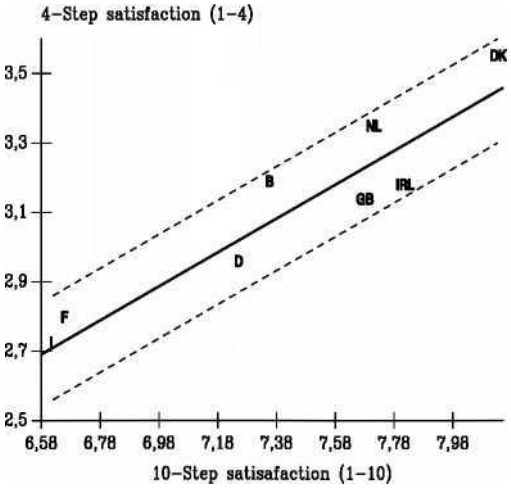


Happiness = 1.50 + 0.68 D/T

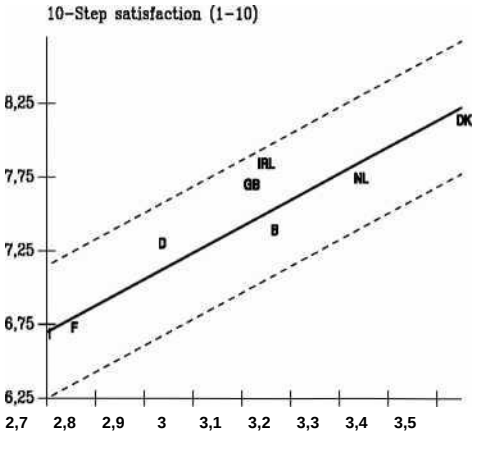
Data: Michalos (1986). Student Well-being Survey

r = +.74

Scheme 7/3.2f
Average scores on 4-step 'satisfaction with way-of-life' and 10-step 'satisfaction with life-as-a-whole'
8 nations in 1980/81



4-step satisfaction = -0,53 + 0,49 10-step



10-step satisfaction = 1,85 + 1,8 4-step

Data: Eurobarometer 1981. See table 1.2.1b. World Value Study I. See table 1.2.2a.
Nation codes see p 283.

r = +.94

In summary

In two cases (pairs of items) the consistency of responses is sufficiently great. These pairs are: 1) 11-step 'satisfaction-with-life-as-a-whole' and 11-step 'best-worst-possible- life', and 2) 4-step 'satisfaction with way-of-life' and 10-step 'satisfaction with life-as-a- whole'. In these cases, transformation to and from seems justified, at least when the transformed values are between the highest and lowest observed score of untransformed happiness (interpolation). Going beyond the observed range (extrapolation) is not advised.

In three cases the consistency is not enough, however. The cases concerned are all pairs with 'happiness-in-life': a) with 'satisfaction with life-as-a-whole', b) with 'Best- Worst possible life' and c) 'with Delighted-Terrible life'. Transformation is therefore not recommendable in these cases.

Substitution of missing cases by means of transformation results in identical datasets for different happiness items. In other words: the concerned tables in part II of this book will contain the same cases (nations-years). This leaves the user a choice: he can use either one table or the other. This option may tempt to go for the one that produces the most desirable results. That is likely to create confusion. We therefore advise to choose the dataset (table) with the least transformed cases. Original scores are always preferable to estimated ones. If both sets might include about equally much of such cases, we advise to consider them both, in order to check possible differences.

7/3.3 Conversion of average scores on equivalent items[11]

A more modest approach is to focus on measures of the same kind: that is on similar questions about the same happiness variant. In section 7/2.4 we have already identified items that are 'equivalent' in content but differ in rating scales and are therefore not comparable. For example: there is no substantial difference in the 3-step and the 4-step variant of the question 'Taking all together, how happy would you say you are' (0-HL7: very/fairly/not-too, 0-HL13 very/quite/not-very/not-at-all). Still the numerical scores are not comparable: we cannot say that 2.5 on the former item marks higher happiness than 3.0 on the latter. Conversion is easier in this case. We need not go into comparison of qualities (characterization of life) but can restrict to estimates of quantity (ratings of the same).
As in the previous case, we could try to transform scores by means of regression equations. However, that approach requires that we estimate a linear relationship and establish whether the observations are sufficiently close to the regression line. Unfortunately, we have insufficient data for that purpose (7/3.3.1). Yet, there are more possibilities in this case. As we deal with differences in measures of quantity only, we can try to transform these to a common scale; that is, 'standardize' the average scores. Two methods can be used for that purpose: weighting of response categories by experts and simple linear transformation. Expert-weighting

[11] [11] The tables mentioned in this section are part of the 1993 book Happiness in Nations and are available on-line at https://personal.eur.nl/veenhoven/Pub1990s/93b-part2.pdf

is most appropriate where we want to standardize scores on rating-scales that differ in verbal labels of response categories. This method will be described in section 7/3.3.2. Linear transformation is more appropriate

where the difference is only in the length of graphic rating-scales. That method will be considered in section 7/3.3.3. Next the sections 7/3.3.4 and 7/3.3.5 will check the validity of these transformations.

7/3.3.1 Regression of average scores on equivalent items

In principle we can follow the same method as used for transforming scores from different methods, now hoping for a greater consistency. That procedure requires studies that involve several such subtly differing questions; preferably many of that kind in different nations.

Such studies are hardly available, however. The surveys that involve different questions on happiness typically pose questions of different kinds and not variations on the same. Only studies that focus on measurement issues sometimes consider different variations of equivalent questions. Unfortunately, these studies do not cover all the variants at hand here. Even the detailed study on happiness questions by Andrews and Withey (1976) involved only a fraction.

7/3.3.2 Standardization by expert weighting

Quite another approach is to read equivalent items carefully and estimate off hand the level of happiness indicated by the various answer-categories on some common scale. For instance, one could consider the common three step happiness item 'Taking all together, how happy would you say you are: very happy, pretty happy or not too happy'. One can then estimate the weight of these three responses on a 0 to 10 step scale. For example: a weight of 9 for the 'very happy' response, 7 for 'pretty happy' and 4 for 'not too happy'.

The weights awarded depend of course on personal interpretation of the questions and on response tendencies. This bias can be reduced by using more than one judge. The more judges, the greater the chance that personal interpretation-differences neutralize each other. The use of more than one judge also makes variation in interpretation visible. Inter judge-reliabilities can be computed and if these are not satisfactory, the attempt can be stopped.

Judges can be 'typical respondents' or 'experts'. The use of respondents has the advantage that one gets a better view on the interpretation of the item in practice. However, that advantage applies only when there is a typical respondent, which is not the case in this comparative endeavour. Ratings can also be made by people who are well acquainted with the matter; for instance, students, experienced interviewers or colleague investigators. That latter method is described by Torgerson (1958:67). We followed his directions.

This weighting method is obviously a rather uncertain one. There is no check whether one assigns the right weights or not.

Nine subtly different questions on happiness-in-life (type O-HL) were considered. The introductory sentence of these questions is almost identical. The difference is in the length and labelling of the rating scales. These items were rated by ten investigators working on the World Database of Happiness, who were all well acquainted with the subject. These experts graded the degree of happiness indicated by each response category on a 0-10 scale. The results are presented in Scheme 7/3.3.1

These ratings appear consistent. Standard deviations are typically below one interval on this ten-step scale. Only in the weighting of unhappy categories do the judges diverge. Not surprisingly this occurs on the item that provides only one possibility for expressing unhappiness.

The overall means were used to compute standardized 0-10 scores for all items on happiness-in-life reported in the tables 1.1.1a, 1.1.1b and 1.1.1c. These converted means are reported in a column in the tables next to the original means.

Weighting responses to equivalent questions about satisfaction-with-life

In the same vein response categories of questions on satisfaction-with-life (type O-SL) were weighted. The results are presented in the Schemes 7/3.3.2 and 7/3.3.3 In only two cases can we see how a same answer category is answered in the context of a slightly different configuration of further response options. The difference is negligible in these cases. Hence, we decided again to use the overall

Scheme 7/3.3.1
Ratings on a 0-10 scale of response-categories to equivalent questions on happiness-in-life.

Question	*Mean rating*	*Standard deviation*	*table*	*question type*
In general, how happy would you say you are?				
- very happy	9.2	0.75	1.1.1a	H1/2
- fairly happy	6.4	0.49		
- not very happy	3.5	1.28		
In general, how happy would you say you are?				
- very happy	9.2	0.98	1.1.1a	H3
- fairly happy	6.3	0.64		
- not at all happy	1.1	0.94		
In general, how happy would you say you are?				
- very happy	9.3	0.64	1.1.1a	H4/5
- fairly happy	6.5	0.50		
- not very happy/not at all happy*	2.5	1.53		
In general, how happy would you say you are?				
- very happy	9.2	0.98	1.1.1a	H6
- fairly happy	6.3	0.64		
- not happy	2.7	1.27		
In general, how happy would you say you are?				
- very happy	9.0	0.63	1.1.1a	H7/8/9
- fairly happy	6.8	0.60		
- not too happy	4.2	0.75		
Taking all things together, how would you say things are these days				
- very happy	9.3	0.64	1.1.1a	H10/11/12
- pretty happy	6.7	0.78		
- not too happy	4.0	1.18		
Taken all together, would you say you are?				
- very happy	9.3	0.90	1.1.1b	H13
- quite happy	7.2	0.40		
- not very happy	3.9	0.70		
- not at all happy	1.0	0.89		
Is your life at the moment?				
- very happy	9.3	0.90	1.1.1b	H14
- quite happy	7.2	0.40		
- quite unhappy	3.9	0.70		
- very unhappy	1.0	0.89		
How happy do you feel as you live now? Please choose one item from this card, that comes closest to your feeling				
- very happy	9.4	0.66	1.1.1c	H15
- fairly happy	6.9	0.54		
- neither happy or unhappy	5.1	0.30		
- fairly unhappy	3.4	0.49		
- very unhappy	0.6	0.80		

* Combined categories. Scores on separate categories not available in some cases

Scheme 7/3.3.2
Expert ratings on a 0 - 10 scale of responses to equivalent questions on happiness-in-life
Mean ratings by response category. N = 10

Response category	*Mean rating in the context of question type*									*Overall mean*
	H1 H2	*H3*	*H4 H5*	*H6*	*H7 H8 H9*	*H10 H11 H12*	*H13*	*H14 H15 H16 H17*	*H18*	
Very happy	9,2	9,2	9,3	9,2	9,0	9,3	9,3	9,4		**9,3**
Quite happy							7,2			**7,2**
Happy*							7,0			**7,0**
Pretty happy						6,7				**6,7**
Fairly happy	6,4	6,3	6,5	6,8				6,9		**6,5**
Rather happy*									6,0	**6,0**
Neither happy nor unhappy								5,1		**5,1**
Rather unhappy*								4,0		**4,0**
Not too happy					4,2	4,0				**4,1**
Not very happy	3,5		3,5					3,9		**3,7**
Fairly unhappy								3,4		**3,4**
Not happy				2,7						**2,7**
Not very- not at all*										**2,5**
Not at all happy		1,1					1,0			**1,0**
Very unhappy								0,6		**0,6**

- This item did not figure in the original weighting procedure and was estimated later

Value assigned to combined categories where scores on separate categories were not available

Scheme 7/3.3.3
Expert ratings of responses on a 0 - 10 scale of response categories to equivalent questions about 'satisfaction with way-of-life' Results by question. N = 10

Question	*Mean rating*	*Standard deviation*	*Location in part II table*	*question*
How satisfied are you with the way you are getting on now?				
- very satisfied	9.4	0.49	1.2.1a	SI+2+3
- all right	7.0	0.63		
- dissatisfied	2.9	1.04		
On the whole, how satisfied are you with the life you lead?				
- very satisfied	9.3	0.64	1.2.1b	S4+7
- fairly satisfied	6.5	0.50		
- not very satisfied	3.7	0.78		
- not at all satisfied	1.3	1.10		
On the whole, how satisfied are you with the life you lead?				
- fully satisfied	9.7	0.48	1.2.1b	S5
- not fully but to an extent satisfied	6.9	0.57		
- as yet unsatisfied	4.0	0.67		
- very unsatisfied	1.7	0.95		
On the whole, how satisfied are with the life you lead?				
- satisfied	8.5	0.71	1.2.1b	S6
- rather satisfied	6.8	0.42		
- as yet unsatisfied	4.0	0.67		
- unbearably dissatisfied	1.2	0.63		

7/3.3.3 *Standardization by linear stretch*

The above method of expert weighting of verbally labelled response categories is less appropriate if the difference between response scales is only the length. For instance, in the case of the same question on life-satisfaction that is either scored on a 0-10 scale or on a 1-10 scale. In such cases simple linear transformation will do.

For happiness ratings, different scales are in use. Happiness is typically measured by self- report and cross-national studies on happiness mostly used single questions. An example of a commonly used item is presented below:

"Taking all together, how satisfied or dissatisfied are you currently with your life as a whole?"

1	2	3	4	5	6	7	8	9	10
Dissatisfied								Satisfied	

In this case, happiness is rated on a 10-step numerical scale. Other items use verbal rating scales, e.g., the 4-step rating scale

'very happy', 'fairly happy', 'not too happy' and 'unhappy'.

Happiness may be also rated on pictorial scales using smiley and other graphical scales. Whatever the scale used, the respondent has to select one out of a limited number of discrete ratings, which is recorded eventually as a number, in the above scales one of the numbers from the sets {1(1)10} and {1(1)4} or e.g. {0(1)3} respectively.

For comparing results obtained by using different scales, the results of the primary numerical scale are subjected usually to a linear transformation onto a common 'secondary' scale. Below, we shall give the formulae to be used for this transformation.

Let r_1 = the rating on the primary scale,
h_1 = the rating on the primary scale for the most happy/satisfactory situation, and
u_t = ditto for the most unhappy/unsatisfactory situation.
In the above first example $u_t = 1$ and $h_t = 10$.

The ratings after transformation will be denoted r_2, h_2 and u_2 respectively.
In most studies $h >$ u is chosen, so $u \leq r \leq h$. Some researchers, however, prefer $u>h$ and in the latter case $h \leq r \leq u$.

The three underlying assumptions for the linear transformation of happiness ratings are:

(a) the possible ratings of the primary scale can be considered as 'equidistant',

so it is admissible to process the ratings as observations at the 'metric' level of measurement,

(b) u_1 —> u_2, and

(c) h_1 ---> h_2.

The last two assumptions mean that the extreme possible ratings of the primary and the secondary scale are supposed to correspond perfectly to the same verbal or pictorial description label.

The situation in which $u_1 > h_1$ and $h_2 > u_2$ can be represented as follows:

U_1 r_1 h_1
| ---------- | ----------|
U_2 r_2 h_2

From the proportionality

$$(r_1-u_1)/(r_2-u_2) = (h_1-u_1)/(h_2-u_2), \quad (1)$$

it follows for the linear transformation, that

$$r_1 \text{ --> } r_2 = u_2 + (r_1 - u_1)(h_2-u_2)/(h_1-u_1). \quad (2)$$

As the reader can verify easily, this formula also holds in case $h_1 <$ and/or $h_2 < u_2$.

The formula (2) can also be applied to the linear transformation of **mean values** *m:*

$$m_1 \text{ ---> } m_2 = u_2+(m_1-u_1)(h_2-u_2)/(h_1-u_1). \quad (3)$$

For the corresponding **standard deviation** s, the transformation formula is

$$s_1 \text{ ---> } s_2 = s_1.|(h_2-u_2)/(h_1-u_1)|. \quad (4)$$

This is based on the fact that, when visa random variable and a and *c* are constants, then

$$\text{var } (ax+c) = a^2 \text{ var } (x), \quad (5)$$

so

$$s(ax+c) = a\text{- } s(x). \quad (6)$$

Example.
As an example, we consider the transformation of m_1 =2.15 and s_1 = 0.64 as the results of measurements obtained using the above 4-step rating scale

1 2 3 4
'very happy', 'fairly happy', 'not too happy', 'unhappy'.

We want to transform those statistics onto an 11-step scale with u_2 = 0 and h_2 =10. This is the usual secondary scale in studies of happiness in nations. In that case the corresponding transformation formulae are;

$$m_1 \longrightarrow m_2 = 10.(m_1-u_1)/(h_1-u_1) \quad (7)$$

and

$$s_1 \longrightarrow s_2 = 10.s_1/|h_1-u_1|. \quad (8)$$

Inserting h_1 =1, u_1= 4, m_1 =2.15 and s_1= 0.64 respectively results into the values m_2 = 6.17 and s_2 = 2.13 for the corresponding statistics on the [0;10] scale.

In this way we transformed average scores on 10 step-satisfaction in table 1.2.2a to an 11- step 0-10 score, which is presented next to the original means in table 1.2.2b.

Also, some incidental scores were transformed linearly. In table 1.3 1-9 range scores from Israeli studies were upgraded to 0-10. In table 1.4 an Australian 1-9 rating is cut down to the common range 1-7.

7/3.3.4 *Expert-rating and linear-stretch compared*

One can of course wonder whether the latter method of linear transformation is preferable to the former method of expert ratings. Isn't that objective arithmetic rule preferable to subjective estimates by judges, and isn't the transformation by expert-ratings, essentially, also a correction for length of the rating-scales?

An evident objection is that linear transformation works only if the extremes of rating-scales represent the same 'true' happiness level and if the distances between successive steps are equal. These requirements are met only when rating-scales are graphical or numerically divided in equal steps, and when only the extremes are labelled verbally with identical words. These requirements are not quite met in most of the cases at hand here. Still, one could argue that the size of the difference between these methods is too small to take the trouble of making expert-ratings.

Therefore, we inspected whether the results of linear transformation differ substantially from the above discussed method of expert weighting. Both methods were applied to scores on questions on happiness-in-life (type O-HL) in six industrialized nations around 1980. The results are presented in Scheme 7/3.3.4.

The results differ considerably indeed. As we can see linear transformation produces higher scores on items with longer scales, whereas expert rating does not.

7/3.3.5 Validity of expert-rating

It is of course possible that the expert transformation involves a considerable distortion. The experts may have attributed weights to response categories that differ from the meanings respondents had in mind when answering the same questions. Therefore, the transformed scores may not provide a good estimate of true happiness in nations, in particular not of differences with that respect. The validity of our transformed scores can again be tested in two ways: by test for congruent validity and by test for concurrent validity.

An evident test for congruent validity is assessing the correlation between transformed and untransformed scores. If we assume that the original scores provide a valid estimate of happiness in nations, a perfect correlation means that the transformed scores do equally well. If the correlation is not perfect, there are three possible explanations. The first possibility is then that the transformed scores estimate true happiness less well than the original scores (the above-mentioned possibility). Reversibly, the second possibility is that the averages based on expert weighting are in fact closer to true happiness than the untransformed scores. This could be so, because the latter assume equal distances between rating options, whereas the expert ratings do not. Thirdly, it is of course possible that both are flawed in different ways. If transformed and untransformed scores are imperfectly correlated, further tests for external current validity must decide which is the best; for example, by inspecting which variant explains most of the variance in quality of living conditions in nations, in an analysis as shown in chapter 5 of this introductory text, section 5/1.2. If, however, transformed and untransformed scores appear to be perfectly correlated, it is highly probable that both measure true happiness adequately. Further testing for concurrent validity is not useful in that latter case.

We checked congruent validity of our expert rating on two datasets: once more the procedure and the 10% interval around the regression line. Scheme 7/3.3.5 presents the scatter grams of transformed and original scores on the 3-step question on happiness-in-life (H8) in the Gallup/Kettering survey. The correlation is perfect (r=+.99). The scores are neatly on the regression line. Apparently, the transformation procedure involved no distortion.

We also considered the transformed and original scores on the 4-step happiness question in World Value Study I. Here again we see an almost perfect correlation (r=+.98) and all deviations are within the 10% interval.

We can conclude that our expert ratings successfully passed this validity test.

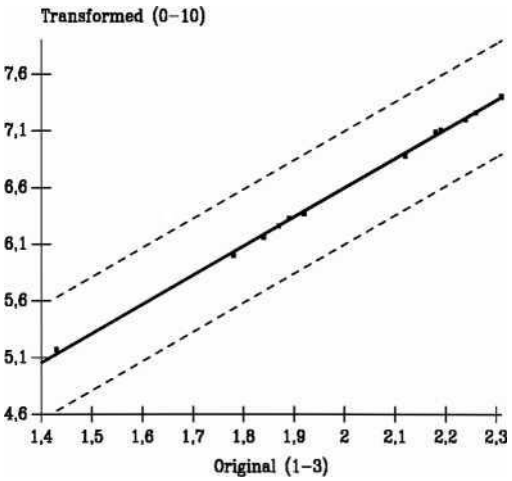
Scheme 7/3.3.4
Two methods of transformation compared: Expert weighting and linear transformation

country	*method*	*happiness question*		
		3-step (table 1.1. la)	*4-step (table 1.1. lb)*	*5-st.ep (table 1.1.1c)*
Australia	expert	7.4	7.8	7.6
	linear	6.5	7.4	8.3
Germany (W)	expert	6.6	6.9	6.2
	linear	5.1	6.5	6.8
France	expert	6.6	7.2	6.4
	linear	5.1	7.0	7.0
Italy	expert	5.8	6.5	6.1
	linear	3.7	6.1	6.6
Japan	expert	6.2	6.9	6.2
	linear	4.2	6.6	6.7
USA	expert	7.2	7.6	7.4
	linear	6.0	7.4	8.2

Gallup/Kettering World Survey and on World Value Study I. Again, we used the regression

Scheme 7/3.3.5
Transformed and original scores compared: 3-step and 4-step happiness

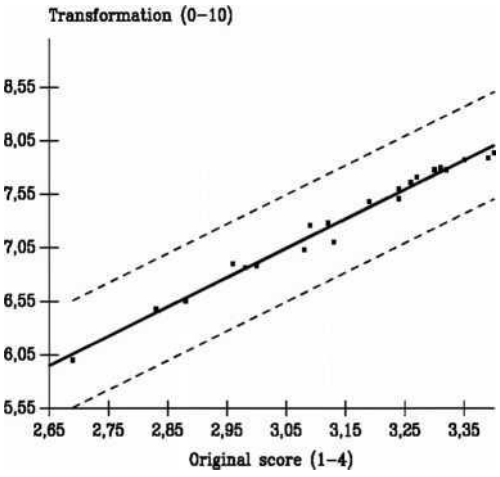
3 step happiness



r = +.99

Data: Gallup/Kettering World Survey. See table 1.1.1

4 step happiness



r = +.99

i. World Value Study I. See table 1.1. lb.

7/4 New methods for homogenization of equivalent questions on happiness

The above-mentioned methods were developed in the early 1990s and are still applied in this collection of distributional findings on happiness in nations. Meanwhile three new techniques have been developed in the context of this World Database of Happiness. Much of this work was done by Wim Kalmijn and Tineke de Jonge.

7/4.1 International Happiness Scale Interval Study (IHSIS)

This study is about survey questions on happiness using verbal response options, such as 'very happy' and 'fairly happy'. The aim is to estimate what degrees of happiness are denoted by such terms in different questions and languages. These degrees are expressed in numerical values on a 0 to 10 scale, which are then used to compute 'transformed' means and standard deviations.

Native speakers read survey questions on happiness that have been used in their country. For each question separately, they rate the relative value of each of the response options in their language.

To date (July 2020) this study has produced values for response options in questions on happiness used in general population samples in the following languages:
- Dutch
- English
- French
- German
- Japanese
- Spanish

The values obtained in this project will be applied to the collection of Happiness in Nations once all languages are covered. Application will only be possible for cases where the full distribution of responses is available.

For the current state of the project go to:
https://worlddatabaseofhappiness.eur.nl/related-sources/international-happiness-scale-interval-study/

7/4.2 Continuous distribution adjustment

The above scale interval study produces 'discrete' values for a particular response option, e.g. 7.3 for 'happy' in English language in the context of a 4-step response scale with the options very happy, happy, not too happy, unhappy. However, in reality happiness is continuously distributed and estimation of a beta-distribution allows a

more precise view on the distribution, from which a mean and standard deviation can be computed. This method is explained in detail in DeJonge et al 2017

This technique requires that the full distribution of responses is available

7/4.3 Reference distribution method

The continuous distribution approach allows comparison with the distribution of responses on a numerical scale of equivalent questions on happiness, used in the same population, that is in the same country and year. This method is explained in another chapter in DeJonge et al 2017.

This method requires availability of the full distribution of responses on two equivalent questions on happiness, in the same nation and year

7/5 Summary

This collection presents the results of investigations that used acceptable measures of happiness. These acceptable measures are not quite identical, however. In this chapter I explain how the divergent data were classified into equivalent categories. I further present three techniques used for transforming responses to dissimilar questions into comparable scores.

Grouping by focus
This collection presents the data by kind of happiness measured. This breaks the data collection into four main parts: one big part on 'overall happiness' (code O), a smaller one on 'hedonic level' (code A) and two minor ones referring to 'contentment' (code C) and 'mixed indicators' (code M). Within these focus categories, groups of questions some can be discerned which ask essentially the same thing, but that differ only in the rating of response. Though not 'identical', the items in these clusters are *'equivalent*'. As such they qualify for conversion to a common scale. The possibilities for converting average scores on divergent indicators of happiness are however limited.

Transformation of scores on non-identical questions
Scores on indicators of different happiness variants cann*ot* be converted to the same standard. They measure essentially different things that do not necessarily coincide.

Non-equivalent questions: Scores on different questions on the same happiness variant can be converted in principle. However, in practice it is quite difficult to estimate the method effects involved. If enough data are available, we can inspect whether there is a linear relationship between responses yielded by different indicators in the same populations. Such data are only available for some single questions on overall happiness.

We found a reliable relation in the nation scores on the two pairs of items: 1) 10-step life-satisfaction by 4-step satisfaction with way-of-life, and 2) 11-step life-satisfaction by 11-step best- worst possible life. In these cases, missing values on one variable can be reliably estimated by linear regression based on observed scores on the other; interpolation is less risky than extrapolation. In three pairs we found no reliable relation however: 1) happiness-in-life by satisfaction-with-life, 2) happiness-in-life by best-worst possible life, and 3) happiness-in-life by delighted-terrible life. In these latter cases we deem transformation inadvisable.

Equivalent questions Conversion is better possible when indicators (questions) are substantially equivalent and differ only in number and labelling of response categories. In that case standardization by expert-weighting is justified for question using a verbal response scale. The expert-transformation applied here successfully passed a test for congruent validity.

If differences between equivalent items concern only the length of a graphic or numerical rating scale, linear transformation is most appropriate.

Only the latter two standardization methods (expert-weighting and linear transformation) are applied in this data collection. See scheme 7/2.3. In the tables on this website, transformed scores are mentioned for equivalent items. Transformed means are presented next to the original means.

To date (July 2020) new techniques for the homogenization of findings obtained with equivalent questions on happiness have been developed, but are not yet applied to this collection of distributional findings on happiness in nations

Scheme 7/3.3d
Expert ratings on a 0 - 10 scale of responses to equivalent questions type O-SL
Mean ratings by response category N = 10

Response category	*Mean rating in the context of question type:*					*Overall*	
	S1 S2 S3	*S4 S7*	*S5*	*S6*	*S8*	*S9 S10 S11*	***mean***
fully satisfied			**9.7**				9.7
extra ordinary satisfied*					9.5		**9.5**
very satisfied	9.4	9.3			9.2		**9.3**
satisfied				8.5	8.5		**8.5**
all right	7,0						**7.0**
not fully but to some extent satisfied			6.9				**6.9**
rather satisfied*				6.8			**6.8**
pretty satisfied*	6.7						**6.7**
fairly satisfied		6.5			6.5		**6.5**
neither satisfied nor dissatisfied *				5.1			**5.0**
as yet unsatisfied			4.0	4.0	4.0		**4.0**
rather dissatisfied*							**4.0**
still dissatisfied*	4.0						**4.0**
not very satisfied		3.7				3.7	**3.7**
fairly dissatisfied*					3.4		**3.3**
dissatisfied	2.9				2.9		**2.9**
very unsatisfied			1.7				**1.7**
very dissatisfied					1.7		**1.7**
not at all satisfied	1.3						**1.3**
extremely dissatisfied*		1.2					**1.2**
unbearably dissatisfied				1.2			**1.2**

*These items did not figure in the original weighting procedure and were later estimated

REFERENCES

Andrews, F.M. & Withey, S.B (1976)
Social indicators of well-being,
New York, U.S.A., Plenum Press.

Gallup, G.H. (1976)
Human Needs and Satisfactions: A Global Survey
Public Opinion Quarterly, Vol.40, 1976, 459-467.

Gallup/Kettering (1976)
Human needs and satisfactions: A Global Survey. (Table books)
Charles F. Kettering Foundations and Gallup International Research Institute, USA

Michalos, A. (1991)
Global Report on Students Well-being, Volume I: Life Satisfaction and Happiness New York, U.S.A., Springer-Verlag.

Torgerson, *(1958)*
Theory and methods of scaling
New York, U.S.A., Wiley.

World Value Surveys 1980-1993,
Cumulative file, 1994
ICPSR, Ann Arbor USA, File Nr. 6160

This text is a revised version of chapter 7 in the book 'Happiness in Nations' by Ruut Veenhoven, RISBO, Erasmus University Rotterdam, 1993, Rotterdam Netherlands, ISBN 90-72597-46-X, pp.86-119
References to the parts II, III and IV of that 1993 book do not apply to the present database.

Later publications by Ruut Veenhoven and co-workers on this subject:

DeJonge, T., Kalmijn, W.M. & Veenhoven, R. (2017)
Diversity in survey questions on the same topic: Techniques for improving comparability
Social Indicators Research Book Series. Volume 68, ISBN: 978-3-319-53260-8 (Print) 978-3-319-53261-5 (Online)

DeJonge, T., Kalmijn, W. Arends, L., Moonen, L., VanBeuningen, J. & Veenhoven, R. (2016)
Pooling time series based on slightly different questions about the same topic: Forty years of survey research on happiness and life-satisfaction in the Netherlands
Social Indicators Research, 126 (2) 863-891, Open Access

DeJonge, T., Kalmijn, W., Arends, L. & Veenhoven, R. (2016)
Conversion of verbal response scales: Robustness across demographic categories
Social Indicators Research, 126(1), 331-358, DOI: 10.1007/s11205-015-0879-6 Open Access

DeJonge, T., Arends, L., Kalmijn, W. & Veenhoven, R. (2015)
Stability of boundaries between response options of response scales: Does 'very happy' remain equally happy over the years?
Social Indicators Research, 123 (1) 241-266,

DeJonge, T., Arends, L., Kalmijn, W. & Veenhoven, R. (2015)
'Very happy' is not always equally happy: On the meaning of verbal response options in survey questions
Journal of Happiness Studies, 16 (1) 77-101

DeJonge, T., Arends, L. Kalmijn, W. & Veenhoven, R. (2014)
Homogenizing responses to different survey questions on the same topic: Proposal of a scale homogenization method using a reference distribution
Social Indicators Research, 117: 275-300

Kalmijn, W., Arends, L. & Veenhoven, R. (2011)
Happiness scale interval study: methodological considerations
Social Indicators Research, 102: 497-515

Veenhoven, R. (2009)
International scale interval study: Improving the comparability of responses to survey questions about happiness
in: Valerie Moller & Dennis Huschka (Eds.) 'Quality of life and the millennium challenge: Advances in quality-of-life studies, theory and research', Social Indicators Research Series vol. 35, Springer, e-ISBN 978-1-4020-8569-7, pp. 45-58