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**TNO report**

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# Response Conversion for Indicator Harmonisation

# (Interim report)

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# Contents

# 1 Summary

The project aims to disseminate and apply Response Conversion (RC) within the Health Monitoring Program (HMP). Response Conversion is a technique for translating incomparable data into community indicators. The project consists of the following tasks:

1. Evaluation of the suitability of RC for project and data within the HMP;
2. Construction of new conversion keys;
3. Development of an interactive web site for actual conversion to CI indicators;
4. Integration of RC into the IDA-HIEMS system.

**Task 1** includes an assessment of the following studies: Mental health (Lehtinen), Food consumption (Trichopoulo), Morbidity (Kelly), Health expectancies (Robine), Sentinel networks (Schellevis), Regional indicators (Ochoa), Physical activity (Rütten), Nutrients (Brussaard), Monica (Kuulasmaa), HIS/HES (Aromaa), Eur-med (Lagasse), Framework (Kramers), EPIC (Riboli), and the Dublin agency on living and working conditions. Precise evaluation criteria, that reflect the technical conditions that are needed for RC, will be developed. Each of the above projects will be scanned with respect to the question how far these conditions are met. This results in an *applicability score* (with a limited number of categories) for each indicator-study combination.

The list of evaluation criteria is currently being developed. This list draws upon the current insights into the problem of international comparability, as well as technical requirements of the RC technique. Scanning of all mentioned HMP project will be executed in the second half year of 2002.

**Task 2** involves the construction of conversion keys. This is done as joint work with one of the projects within the HMP.

Keys are currently being developed for two topics, personal care and physical activity. The physical activity key builds upon the classification and the data from the EUPASS project, co-ordinated by Prof. Rütten. Appendix I contains a more detailed description of the current status. The key for personal care items uses results from the HIS-HES database. Appendix II provides more details about the progress on this work.

**Task 3**: Development of a web site. The site provides the necessary scientific information about RC, and allows users to convert actual data into community indicators.

A prototype of the online conversion tool has been made. The prototype allows the user first to choose the questionnaire item. The user can then type in the observed frequencies in each response category, and the web page returns the result of the conversion in a graphical form. The architecture is based on a cliënt-server database model. As a consequence, item formulations and conversions keys can be dynamically updated without the need to change the source code. Appendix III contains screen dumps of the current prototype.

**Task 4**: The technique will be integrated with the IDA-HIEMS database system, so that the European Commission can routinely apply it to new data. All conversion keys that are developed under task 2, as well as the keys from the pilot project, will be included. The actual integration will be done in conjunction with Cap Gemini Ernst & Young.

Execution of this task has not yet been started as it is uncertain which form the technical realisation of the database system under Pillar 2 of the HMP will take. If the realisation is being done by the IDA-HIEMS initiative, a SAS program implementing routine response conversion will be made, and its implementation will be discussed with the maintainers of the database software.

# A Conversion key for physical activity

## A.1 Introduction

The objective is to create a conversion key to allow the comparison of physical activity levels between different EC Member States with use of the Response Conversion methodology (Van Buuren et al., 2001). This methodology consists of a number of steps:

1. Choose a specific area of interest
2. Identify the instruments and items that are used in each member state of measuring this area
3. Search the literature for bridge studies and bridge items
4. Construct a linkage diagram that shows if, and how, prevalence items can be linked by means of bridge studies and bridge items
5. Formulate explicit equivalence assumptions about which items can be considered equivalent
6. Obtain microdata from bridge studies
7. Construct a linked data set containing the combined data from the bridge studies
8. Conduct preliminary statistical analysis
9. Check equivalence assumptions
10. Construct the conversion key
11. Express prevalence data on a common scale using the conversion key.

Below, we address the progress of our study referring to these steps in more detail for physical activity.

## A.2 Area of interest: physical activity

Internationally physical activity is regarded as a complex behaviour that generally accounts for 15% to 40% of a person's total energy expenditure. This behaviour encompasses physical activity on the job, self-care, household chores, home and yard maintenance, transportation, and discretionary leisure-time activities including fitness-promoting exercise and sports. This is, generally, roughly divided into occupational activities, leisure-time activities, and household and other chores. Health-related dimensions include not only the contribution of physical activity to total energy expenditure, but also intensity, duration, and frequency. We have taken a rather pragmatic approach with respect to the inclusion of items.

## A.3 Questionnaire items physical activity in the EC

We studied a number of interim and final reports of projects conducted within the EU Health Monitoring Program to identify physical activity questionnaire items that were being collected throughout the EU. Two studies were very useful for this purpose, entitled 'Health surveys in the EU: HIS and HIS/HES evaluations and models' (Hupkens&Swinkels, 2001) and 'European Physical Activity Surveillance System (EUPASS)' (Rütten, 2001).

Within the first project a health survey database was developed, which includes an overview of the methods and contents of existing and planned HIS and HES in the EU/EFTA Member States (MS). Within the second, the EUPASS project an inventory

was done on physical activity data sets and indicators used in the different member states for physical activity surveillance and surveys on existing and new indicators of physical activity were prepared and conducted in the MS actively involved in this project.

It will be clear that the comparison of physical activity across different MS will be hampered by the heterogeneity of the items. Items on physical activity can ask on type, frequency, intensity, duration and combinations of those. Within the EUPASS project it was already concluded that comparability of items between different MS is difficult, and therefore new indicators for measuring physical activity were developed.

## A.4 Bridge studies and items

Bridge studies and bridge items are needed in order to be able to link different items to a common scale. Because the EUPASS study contains data on existing and new indicators of physical activity of 6 of the 8 participating MS, namely Belgium (B), Finland (FIN), Germany (D), Italy (I), the Netherlands (NL) and United Kingdom (UK). Thus, the EUPASS study is very suitable to function as bridge study and provide bridge items, which were collected with use of a computer-aided telephone interview of approximately 600 persons per MS. Table I.1 lists the EC Member States surveys and bridging studies that contain physical activity items.

Table I.1 EC Member States surveys and bridging studies containing physical activity items

| Code | Study | Country |
|---|---|---|
| B01 | Belgian Health Interview Survey | Belgium |
| FIN01 | Health Behaviour among Finnish Adult Population | Finland |
| F06 | Health Barometer | France |
| D05 | Federal Health Survey | Germany |
| NLPAH | Monitor physical activity and health | Netherlands |
| POLS | Continuous Quality of Life Survey | Netherlands |
| UK12 | Health Survey for England | United Kingdom |
| UK11 | General Household Survey | United Kingdom |

## A.5 The linkage diagram

A next step consists of the construction of the so-called linkage diagram. Table I.2 contains the linkage diagram based on the bridge items of EUPASS study. The 'Y' symbol in a cell indicates that the specific study-item combination occurs. In principle, all items are linked.

Table I.2
Linkage diagram of items measuring physical activity

| Name | B01 | FIN01 | D02 | I03 | NL01 | UK |
|---|---|---|---|---|---|---|
| A01_I | | | | Y | | |
| A02_NL | | | | | Y | |
| A03_NL | | | | | Y | |
| A04_NL | | | | | Y | |
| A05_NL | | | | | Y | |
| A06_UK | | | | | | Y |

| | | | | | | |
|---|---|---|---|---|---|---|
| B01_FIN | | Y | | | | |
| B02_D | | | Y | | | |
| B03_I | | | | Y | | |
| B04_I | | | | Y | | |
| B05_I | | | | Y | | |
| B06_I | | | | Y | | |
| B07_I | | | | Y | | |
| B08_NL | | | | | Y | |
| B09_NL | | | | | Y | |
| B10_UK | | | | | | Y |
| C01_FIN | | Y | | | | |
| C02_NL | | | | | Y | |
| D01_B | Y | | | | | |
| D02_FIN | | Y | | | | |
| D03_D | | | Y | | | |
| D04_UK | | | | | | Y |
| EUPASS01 | Y | Y | Y | Y | Y | Y |
| EUPASS02 | Y | Y | Y | Y | Y | Y |
| EUPASS03 | Y | Y | Y | Y | Y | Y |
| EUPASS04 | Y | Y | Y | Y | Y | Y |
| EUPASS05 | Y | Y | Y | Y | Y | Y |
| E01_FIN | | Y | | | | |
| E02_D | | | Y | | | |
| E03_D | | | Y | | | |
| E04_D | | | Y | | | |
| E05_D | | | Y | | | |
| E06_D | | | Y | | | |
| E07_D | | | Y | | | |
| E08_D | | | Y | | | |
| E09_D | | | Y | | | |
| E10_D | | | Y | | | |
| E11_D | | | Y | | | |
| E12_D | | | Y | | | |
| EUPASS06 | Y | Y | Y | Y | Y | Y |
| EUPASS07 | Y | Y | Y | Y | Y | Y |
| F01_B | Y | | | | | |
| F02_D | | | Y | | | |
| F03_NL | | | | | Y | |
| F04_NL | | | | | Y | |
| F05_NL | | | | | Y | |
| EUPASS08 | Y | Y | Y | Y | Y | Y |
| EUPASS09 | Y | Y | Y | Y | Y | Y |
| G01_UK | | | | | | Y |
| EUPASS10 | Y | Y | Y | Y | Y | Y |
| EUPASS11 | Y | Y | Y | Y | Y | Y |
| EUPASS12 | Y | Y | Y | Y | Y | Y |
| EUPASS13 | Y | Y | Y | Y | Y | Y |
| EUPASS14 | Y | Y | Y | Y | Y | Y |

| | | | | | | |
|---|---|---|---|---|---|---|
| EUPASS15 | Y | Y | Y | Y | Y | Y |
| EUPASS16 | Y | Y | Y | Y | Y | Y |
| EUPASS17 | Y | Y | Y | Y | Y | Y |
| EUPASS18 | Y | Y | Y | Y | Y | Y |
| L01_I | | | | Y | | |
| L02_I | | | | Y | | |
| L03_I | | | | Y | | |
| L04_I | | | | Y | | |
| L05_NL | | | | | Y | |
| L05_NL | | | | | Y | |
| L06_NL | | | | | Y | |
| L07_NL | | | | | Y | |
| L08_NL | | | | | Y | |
| L09_NL | | | | | Y | |
| L10_NL | | | | | Y | |
| L11_NL | | | | | Y | |
| L12_NL | | | | | Y | |
| L13_NL | | | | | Y | |
| L14_NL | | | | | Y | |
| L15_NL | | | | | Y | |
| L16_NL | | | | | Y | |
| L17_NL | | | | | Y | |
| L18_NL | | | | | Y | |
| L19_NL | | | | | Y | |

## A.6 Further actions

In conclusion, steps 1 to 4 of the research methodology were completed. We continue to complete step 5 to 11. Data of the EUPASS-project will be used as basis for constructing a conversion key. Micro data and a linked data set have already made available by Prof. dr. A. Rütten, and therefore step 6 and 7 of the methodology is also completed.

# B Conversion key for Personal Care Disability

The goal of the subproject is to create a conversion key to allow the comparison of levels of Personal Care disability in different EC member states. This methodology for this is set out in detail in the Pilot study "Response conversion: a new technology for comparing existing health information" (van Buuren, Eyres, Tennant, Hopman-Rock, 2001).

## B.1 Definition of Person Care

To define Personal Care (PC) for the purposes of this project, we examined the ICIDH-2 description of Self Care Activities as a guideline for item selection. Of the eight sub categories set out, six were chosen for the definition, these were; Activities of washing and drying oneself, Activities of caring for body parts, Activities related to toileting, Dressing activities, Activities of eating and Activities of drinking (the sub-categories of 'Activities of looking after one's health' and 'Activities related to menstruation' were excluded).

## B.2 Questionnaire items for personal care in the EC

The main source of information on PC items being collected in the EC was the HIS_HES database. As well as consulting previous work done in this area, a comprehensive search made of this database and items selected according to the above criteria. Table 1 gives a list of the member states collecting PC.

Table II.1 EC member state surveys and bridging studies that contain PC items

| Code | Study | Country |
|---|---|---|
| A02 | Disabled Persons | Austria |
| B01 | Health Interview Survey 1997 | Belgium |
| CH01 | Swiss Health Survey | Switzerland |
| D02 | Survey on living conditions, health and environment | Germany |
| D05 | German National Health Examination and Interview Survey | Germany |
| DK01 | Danish Health and Morbidity Survey | Denmark |
| E04 | Impairments, Disabilities and Health Status Survey | Spain |
| F01 | Health and Care Interview Survey | France |
| F02 | Handicaps, Disabilities and Dependency Survey | France |
| FIN03 | Health 2000 | Finland |
| I01 | Health Conditions and the Use of Health Services | Italy |
| INT01 | Recommendations WHO-EURO | WHO |
| IRL01 | Survey of Lifestyle, Attitudes and Nutrition (SLÁN) | Ireland |
| N01 | Survey on Living Conditions | Norway |
| NL01 | Continuous Quality of Life Survey | The Netherlands |
| P01 | National Health Survey | Poland |
| POLS | POLS Health and Labour | The Netherlands |
| UK04 | Disability Survey | UK |

The types of PC questions asked in these surveys can be summarised into six sub-categories of questions that reflect the ICIDH-2 Self Care definition; dressing, eating, toileting, washing, cutting toenails, general/combined. Within each of these categories two main types of questions emerged, these were; question regarding difficulty in performing activity and questions about help needed with the activity.

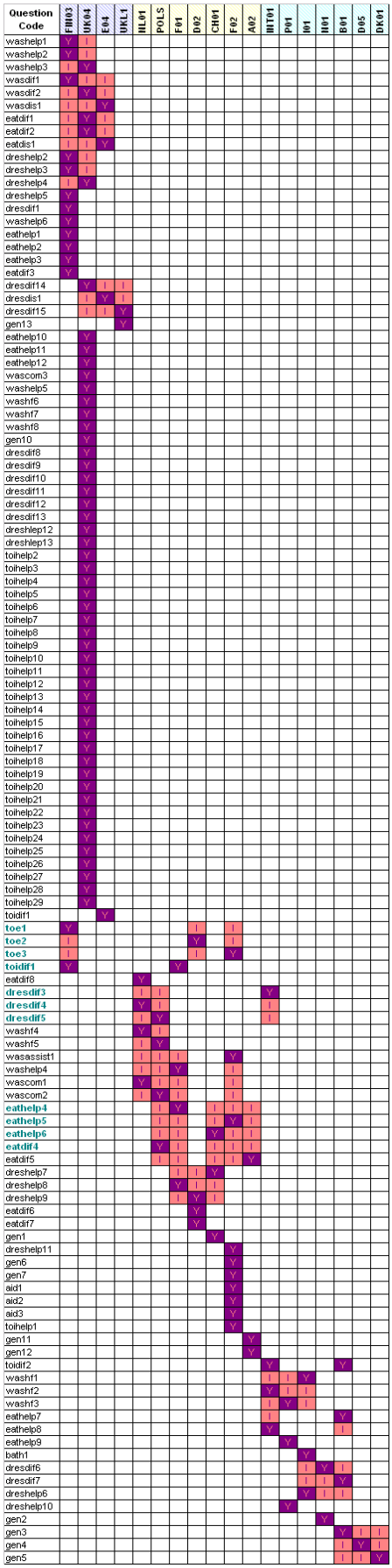



Figure II.1 Linkage Diagram of PC item

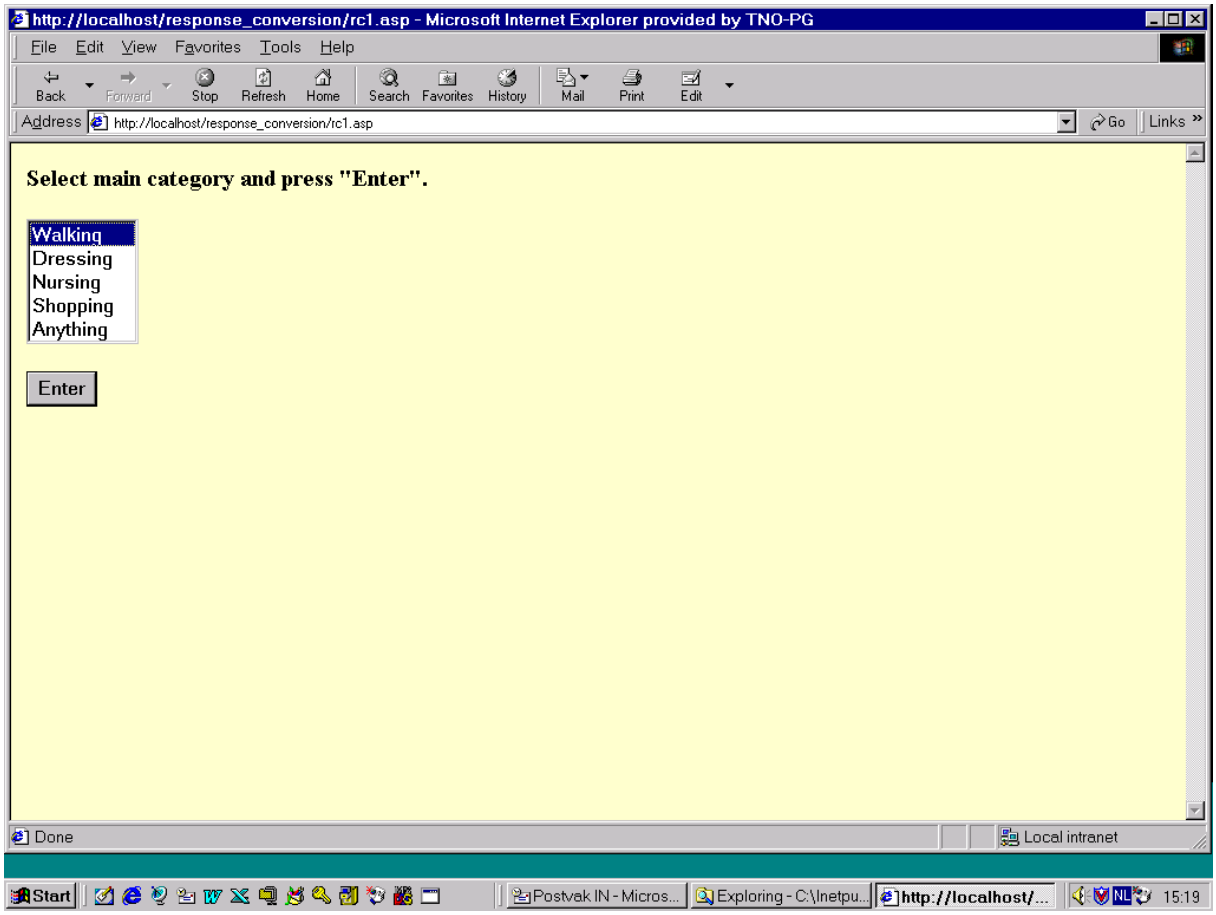
## B.3 Linkage structure

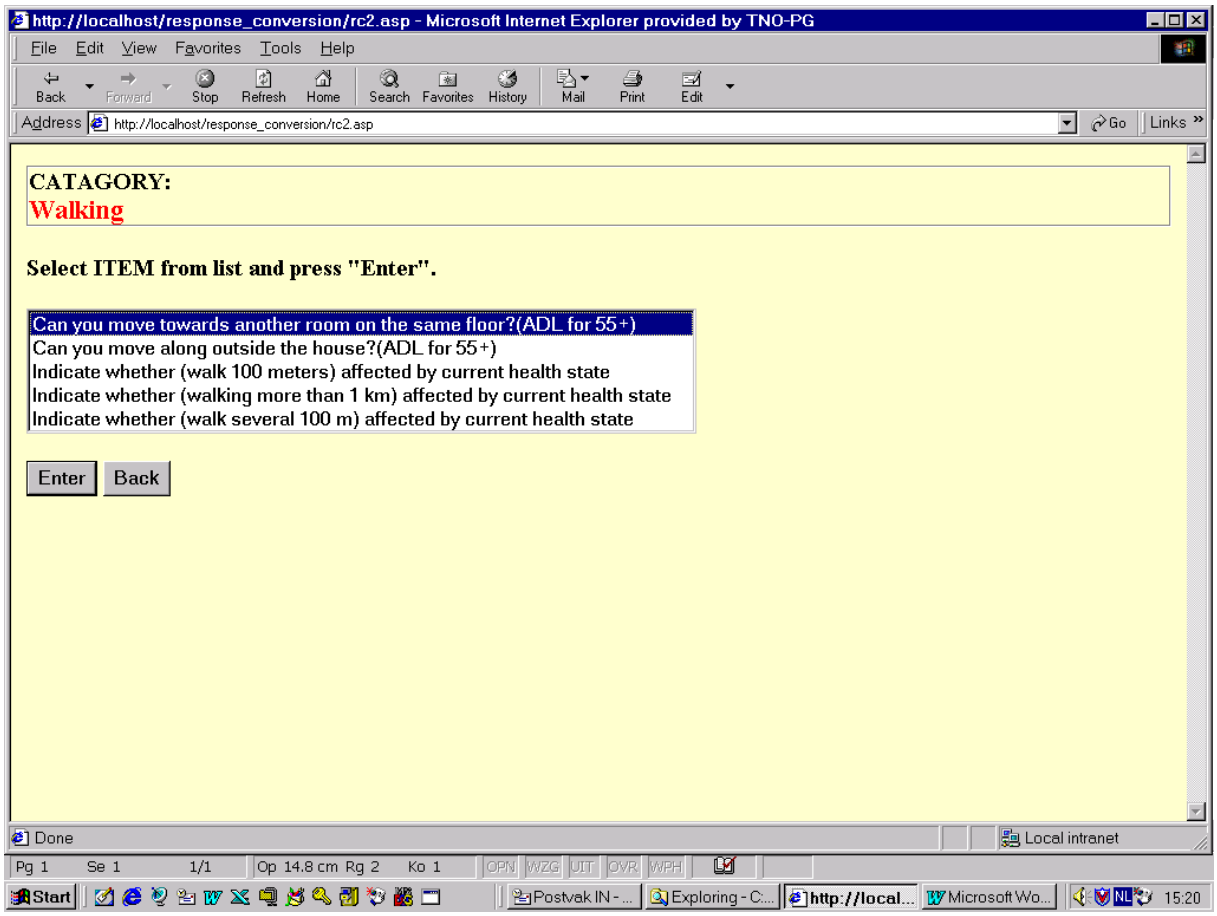
Next the linkage diagram was constructed (Figure II.1). The label 'Y' indicates a specific study-item combination and an 'I' indicates that the questions from different studies are similar enough to be equated. The diagram can be divided into three groups of surveys that form the main blocks of linked items. Linking the main blocks of surveys are three blocks of questions (highlighted in blue).
However, the linking of the three blocks of studies using equated items leaves the structure vulnerable. The equivalence assumptions used to equate the items will be tested using DIF analysis, therefore if a problem is found it may mean that the link between all of the studies is broken.

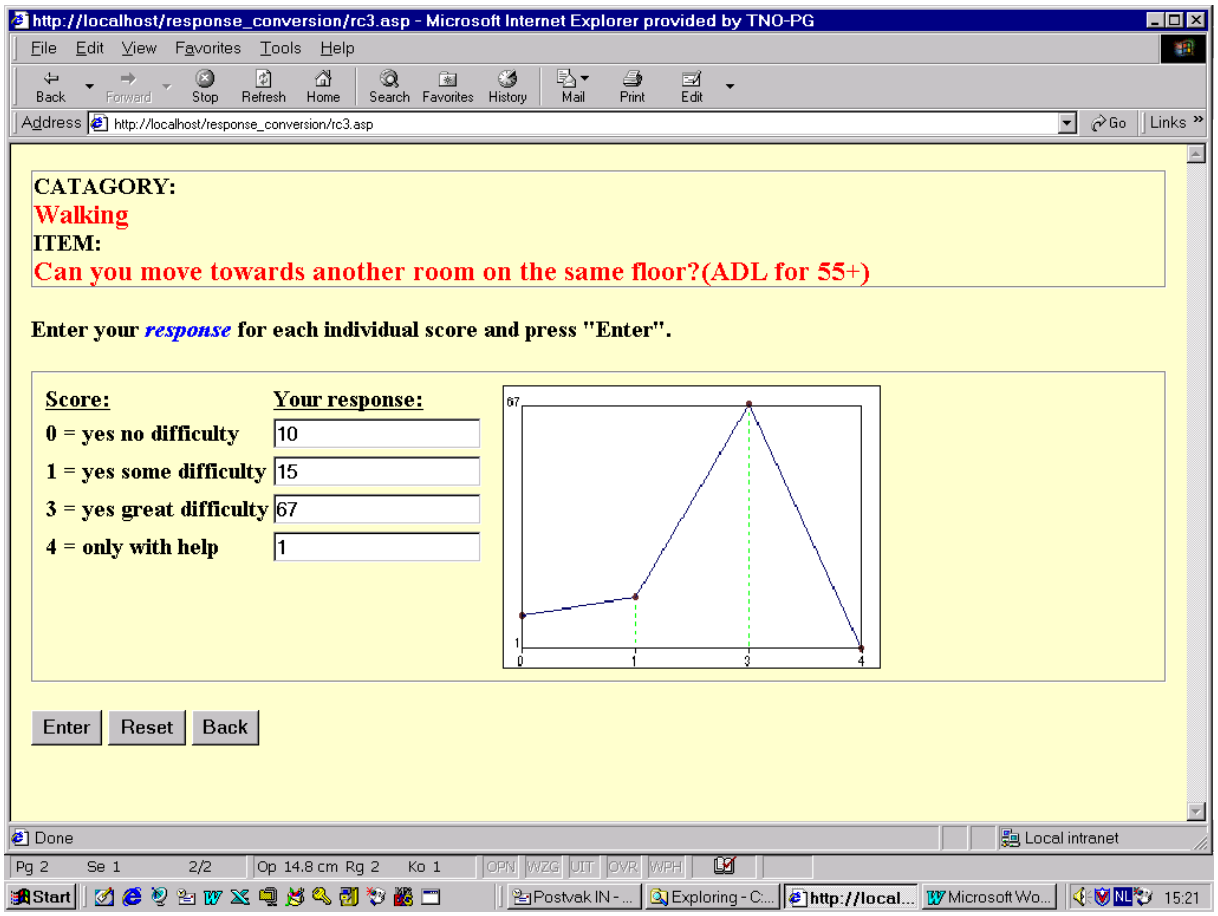
## B.4 Next Stage

The next step will be to obtain the data from the Statistical Offices of the member states in each country. Data can be obtained in one of two forms, ideally micro-data, but if this is not possible a table of response frequencies for the items split by age and gender.
Once the data has been obtained a linked data set will be constructed with all response categories recoded so that zero indicates no disability. Where items are assumed to be equivalent, the responses will be combined into one variable with a second coding variable to identify the original survey from which the item came. Rasch analysis will be performed using RUMM2010, and equivalence assumptions tested within the programme using DIF analysis. The final aim of this study is to construct a conversion key using item difficulty estimates from the Rasch analysis to compare levels of Personal Care disability across the different countries.

# C Screen dumps of prototype web site




http://localhost/response_conversion/rc2.asp - Microsoft Internet Explorer provided by TNO-PG
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit
Address http://localhost/response_conversion/rc2.asp
Go Links
CATAGORY:
Walking
Select ITEM from list and press "Enter".
Can you move towards another room on the same floor?(ADL for 55+)
Can you move along outside the house?(ADL for 55+)
Indicate whether (walk 100 meters) affected by current health state
Indicate whether (walking more than 1 km) affected by current health state
Indicate whether (walk several 100 m) affected by current health state
Enter
Back
Done
Local intranet
Pg 1 Se 1 1/1 Op 14.8 cm Rg 2 Ko 1
Start
Postvak IN - ...
Exploring - C:...
http://local...
Microsoft Wo...
15:20


http://localhost/response_conversion/rc3.asp - Microsoft Internet Explorer provided by TNO-PG
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit
Address http://localhost/response_conversion/rc3.asp
Go Links
CATAGORY:
Walking
ITEM:
Can you move towards another room on the same floor?(ADL for 55+)
Enter your response for each individual score and press "Enter".
Score:
Your response:
0 = yes no difficulty
10
1 = yes some difficulty
15
3 = yes great difficulty
67
4 = only with help
1
67
1
0
1
3
4
Enter
Reset
Back
Done
Local intranet
Pg 2 Se 1 2/2 Op 14.8 cm Rg 2 Ko 1
Start
Postvak IN - ...
Exploring - C:...
http://local...
Microsoft Wo...
15:21