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Detecting and measuring deprivation in primary care: development, reliability and validity of a self-reported questionnaire: the DiPCare-Q

Paul Vaucher,[1] Thomas Bischoff,[2] Esther-Amélie Diserens,[1] Lilli Herzig,[2] Giovanna Meystre-Agustoni,[3] Francesco Panese,[4] Bernard Favrat,[1] Catherine Sass,[5] Patrick Bodenmann[1]

To cite: Vaucher P, Bischoff T, Diserens EA, *et al*. Detecting and measuring deprivation in primary care: development, reliability and validity of a self-reported questionnaire: the DiPCare-Q. *BMJ Open* 2012;**2**:e000692. doi:10.1136/bmjopen-2011-000692

► Prepublication history and additional appendix for this paper are available online. To view these files please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2011-000692).

Received 30 November 2011
Accepted 9 January 2012

For numbered affiliations see end of article.

Correspondence to
Paul Vaucher;
paul.vaucher@gmail.com

ABSTRACT

Objectives: Advances in biopsychosocial science have underlined the importance of taking social history and life course perspective into consideration in primary care. For both clinical and research purposes, this study aims to develop and validate a standardised instrument measuring both material and social deprivation at an individual level.

Methods: We identified relevant potential questions regarding deprivation using a systematic review, structured interviews, focus group interviews and a think-aloud approach. Item response theory analysis was then used to reduce the length of the 38-item questionnaire and derive the deprivation in primary care questionnaire (DiPCare-Q) index using data obtained from a random sample of 200 patients during their planned visits to an ambulatory general internal medicine clinic. Patients completed the questionnaire a second time over the phone 3 days later to enable us to assess reliability. Content validity of the DiPCare-Q was then assessed by 17 general practitioners. Psychometric properties and validity of the final instrument were investigated in a second set of patients. The DiPCare-Q was administered to a random sample of 1898 patients attending one of 47 different private primary care practices in western Switzerland along with questions on subjective social status, education, source of income, welfare status and subjective poverty.

Results: Deprivation was defined in three distinct dimensions: material (eight items), social (five items) and health deprivation (three items). Item consistency was high in both the derivation (Kuder-Richardson Formula 20 (KR20) =0.827) and the validation set (KR20 =0.778). The DiPCare-Q index was reliable (interclass correlation coefficients=0.847) and was correlated to subjective social status (r_s=−0.539).

Conclusion: The DiPCare-Q is a rapid, reliable and validated instrument that may prove useful for measuring both material and social deprivation in primary care.

ARTICLE SUMMARY

Article focus

- This study aims to identify and test the relevance of existing indicators of deprivation to help clinicians investigate social status.
- We constructed and validated an individual-level measurement of deprivation for patients attending their general practitioner: the deprivation in primary care questionnaire (DiPCare-Q).

Key messages

- The DiPCare-Q proposes a reliable, validated instrument for screening and measuring deprivation among patients in developed countries.
- Compared with usual indicators of socioeconomical status, the DipCare-Q index gives important additional information on subjective social status and state of deprivation.
- Social deprivation is an important aspect of deprivation in general and needs to be distinguished from material deprivation.

Strengths and limitations of this study

- Compared with socioeconomical status, self-reported perceived signs of deprivation are more relevant in identifying potential underlying social distress. However, the DiPCare-Q only identifies signs of deprivation without highlighting their reasons.
- To improve public health and limit effects of health disparities, detecting deprivation also requires physicians to know how this is to affect their relation with their patient's in a beneficial way.

BACKGROUND

Social determinants have been identified as risk factors for many diseases or behaviours that have an important global impact on health.[1–4] This fact affects not only the most disadvantaged but can be observed throughout the social gradient[5 6] and is not explained by health behaviour differences

alone.[7] Stress engendered by an individual's social environment is suggested to be an alternative biological explanation.[8–10] In the early 1990s, Townsend[11] identified material or social inequities that could engender such stress. These conditions of deprivation are reversible. Therefore focusing on these social conditions and their impact on health is a promising field for diminishing the total health burden.[12 13] This has been promoted at the community level,[14 15] but little is known about handling deprivation on an individual level which nevertheless seems to be part of a general practitioner's (GP's) daily work.[16] GPs undeniably also play a central role in healthcare by adapting treatments and prevention to their patients' state of deprivation.[17 18] Detecting and questioning patients on their state of deprivation, objective and subjective, is therefore the first step towards developing future social interventions.[19] A validated individual deprivation index is becoming an essential consideration for clinicians, epidemiologists and public health workers in order to relate social aspects to overall health.

Using Townsend's[11 20] concepts of deprivation and selecting factors compatible with Marmot's health determinants,[21] this project aims to develop and evaluate a psychometric individual-level measurement of deprivation for patients attending their GP: the deprivation in primary care questionnaire (DiPCare-Q) index.

METHODS

The development of the DiPCare-Q was planned in six stages running from March 2008 to April 2011. These were item generation, questionnaire construction and face validity, derivation and reliability study (reduction, consistency, test–retest reliability), content validity, translation and a validation study of the final instrument (consistency, concurrent validity). All patients gave their informed consent to participate. Ethical approval was obtained from the official state Biomedical Ethical Committee under reference number 157/09 for the derivation study and reference number 155/10 for the validation study.

Stage 1: item generation

We identified potential items related to the concept of deprivation through a systematic review and extracted existing questions investigating deprivation at an individual level. Medline, Cochrane, Scopus, ISI web, PsycINFO and Francis were searched. Our methodology identified 12 articles that studied individual-level indicators of deprivation. Two authors extracted data independently and identified a total of 199 different questions related to deprivation.

Stage 2: questionnaire construction and face validity

Items extracted from each study were categorised and organised to respect Townsend's definition of deprivation.[11 20] Labels for subcategories were chosen in respect to factors identified as health related by Marmot's[21] structure of social determinants (table 1). Using judgemental item quality, four authors discussed, modified and selected items to be retained. They discarded questions, basing their judgement on clarity of expression, the question's relevance to patients attending a GP, the fact that people with low literacy levels must be able to answer, appropriateness at an individual level, simplicity of answers, gender specificity, the potential invasiveness of an item and the risk of response bias if the question would be asked by a GP.

Face validity of the 38 retained questions was first assessed by three separate groups: 20 GPs working in private practices, five experienced researchers in the field of general practice and 10 individual patients from different socioeconomic backgrounds. Based on their comments, questions were rephrased and validated by six authors. This final version was tested by eight hospital cleaning employees using a thinking aloud approach.[22] The final version of the deprivation questionnaire was validated by all authors.

Stage 3: derivation and reliability study

The aim of this stage was to reduce the number of questions required to assess deprivation and to measure the consistency and the reliability of the derived instrument. This monocentric test–retest study recruited 200 randomly selected patients attending their GP during their planned visits to a general internal medicine clinic at an academic medical institution in Switzerland during 2 months. The study was expressly designed not to exclude patients with psychiatric comorbidities, cognitive disorders or reading difficulties. Once the questionnaire was completed, a second appointment was scheduled within the following 3 days, so that the 38 questions related to deprivation could be asked again over the phone by an independent researcher blinded to the first set of answers. All data were manually entered into the database. Double entry prevented transcription errors.

Stage 4: content validity

Content validity was assured by asking by mail a convenient sample of 50 GPs professionally active in the French speaking part of Switzerland to subjectively rate the 'quality' of each item on a 8-point Likert scale.

Stage 5: translation of the instrument

Professional interpreters translated the DiPCare-Q into English, German and Italian (available online as supplementary material). Each translated version was then reverse translated into French again by another interpreter blinded to the original text. When reverse translation was discordant with original text, translators discussed the discrepancy until the issue was solved.

Stage 6: validation study

Forty-seven GPs working independently in primary care practices in Switzerland (cantons of Geneva, Vaud, Fribourg, Valais and Neuchâtel) were recruited to serve as investigators. A random sample of 1898 patients was

Table 1 Conceptual construction of components defining deprivation in primary care

Dimensions of deprivation	Categories	Number of items		
		Retrieved from systematic review	DiPCare-Q38	DiPCare-Q16
Material deprivation	Dietary	9	1	1
	Clothing	5	1	1
	Housing	53	4	2
	Transport	6	1	
	Environmental	13	1	
	Financial burden	10	3	3
Societal security	Healthcare	3	1	1*
	Work	5	2	
	Access to social welfare	3	1	
	Criminality	3	–	
	Education	4	1	
Social relationship	Social isolation	17	4	2†
	Discrimination	3	1	
	Family/friends	21	5	1
	Work	13	2	
	Leisure/recreational	6	3	2
Health deprivation	Physical	3	1	1
	Psychiatry	6	2	2
	Time perspective	9	1	
	Self-esteem/autonomy	7	–	
	Health literacy	–	3	
Total		199	38	16

*Was retained as an indicator of material deprivation.
†Not having access to the internet revealed itself to be a good indicator of social deprivation but was initially falsely presumed to be related to material deprivation (housing).
DiPCare-Q, deprivation in primary care questionnaire.

questioned between September 2010 and February 2011. To be included, patients had to be over 16 years of age and have a prescheduled day visit to the GP's office. Patients also had to understand French, German, Italian or English. They were invited to fill out the self-administered questionnaire in the waiting room. Physicians were blinded to the responses that were returned in a sealed envelope. Data management staff checked returned material and obtained missing data by phone, including for material sent back by patients who could not read or write. All questionnaires were scanned for data entry.

Data analysis

For the derivation study, we first discarded questions with Cohen's κ coefficients <0.4 or those with an item-rest correlation (IRC) of ≥0.2. Assuming that indicators of material, social and health deprivation can be ordered in degree of difficulties (hierarchical property), we used Mokken Scale Procedure (MSP) to select items for each subscale. Items with a Loevinger Hi coefficient <0.3 were ruled out. Internal consistency and reliability of retained items for the overall index were measured using Kuder-Richardson Formula 20 (KR20). Coefficients for each item were calculated to best-fit patients' subjective social status using regression analysis. Test–retest reliability of the DiPCare-Q was measured using one-way random effect interclass correlation coefficients ($ICC_{2,1}$). Content validity was estimated by averaging 17 physicians' appreciations of representativeness for each item on an 8-point Likert scale ranging from 1 (not at all representative) to 8 (extremely representative). For concurrent validity, we used the international definition of relative poverty adapted to family income using the modified equivalence scale from the Organisation for Economic Co-operation and Development (OECD)[23] and using the yearly income of Swiss Francs CHF 28 700—as a cut-off point for relative poverty.

Sample size for the derivation study was calculated[24] to assure that the κ coefficient would be different from 0.6 with power set at 0.8 and significance level at 0.05, expecting a κ of 0.9 for traits present in at least 10% of patients. The number of patients calculated to be included in the analysis would be 149. Expecting 8% missing data and 25% of patients lost in follow-up, the number of patients to be recruited was set at 200. The validation study was nested in a transversal survey that required 2000 participants in order to detect differences in the prevalence of deprivation between physicians.

RESULTS

Derivation and reliability study

Data were available from 178 patients. Reasons for refusal and/or dropout are given in figure 1A. Patients were aged between 17 and 89 years with a mean and median of 47 years of age. Both genders were equally

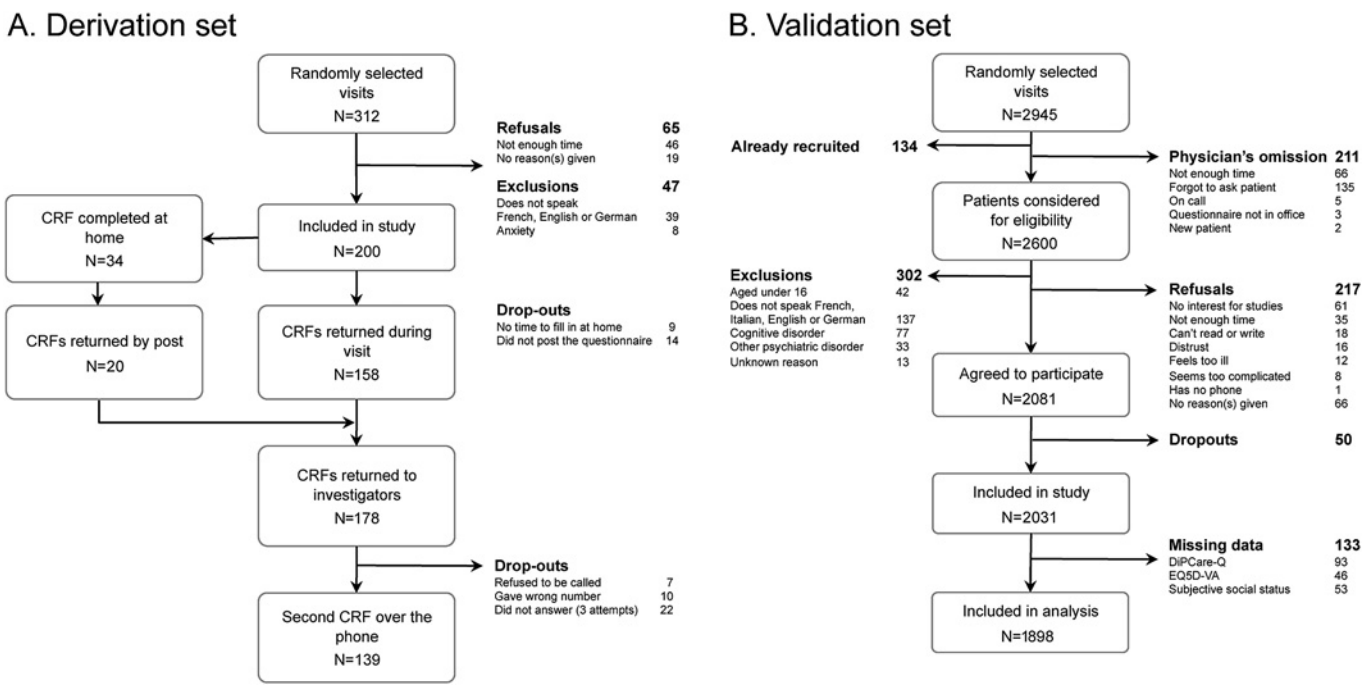

Figure 1 Flow chart giving reasons for refusals and dropouts. (A) Derivation study, (B) validation study. N, number of patients; CRF, case report form.

represented (45.7% female). Twenty-three per cent (41 of 178) of the patients required assistance to answer the questionnaire due to poor literacy or psychiatric comorbidities. A slight majority of patients (50.9%) did not have Swiss nationality. Sixty-two patients (34.8%) were receiving social benefits.

Deriving the DiPCare-Q index

The first step was item number reduction. Three items showed poor test–retest reliability and were therefore set aside: understanding the physician (κ=0.175), being a single parent (κ=0.191) and living in overcrowded conditions (κ=0.266). Eleven items had an IRC <0.2 and were set aside stepwise: being an elderly person living alone (IRC=−0.09), experiencing difficulty at work (IRC=−0.02), not knowing where to obtain social aid (IRC=0.06), having no associative activity (IRC=0.07), lack of transport (IRC=0.12), having more than two children (IRC=0.13), not having completed compulsory education (IRC=0.13), having difficulties in reading (IRC=0.14), moving home frequently (IRC=0.15), having an elderly or handicapped person at home (IRC=0.17) and having difficulties with numbers (IRC=0.17).

Non-parametrical Mokken scaling identified societal security deprivation not to be a relevant dimension for the studied population as items from this dimension were not related to each other. Items from this dimension were therefore tested as indicators of other dimensions of deprivation. MSP identified eight items which were not related to material, social or health deprivation: inappropriate housing, conflict with a partner, having lost his/her job, having a sick family member, suffering from discrimination, suffering from post-traumatic syndrome, benefiting from paid annual leave and being appropriately insured for his/her retirement. Our analysis revealed that financial barriers to accessing healthcare were more related to material deprivation than to societal security deprivation, and not having access to the internet was consistent with social and not material deprivation. Sixteen items were therefore retained to constitute the DiPCare-Q: eight for material deprivation, five for social deprivation and three for health deprivation. The overall internal consistency of the DiPCare-Q was KR20=0.827 (equivalent to Cronbach's α for binomial variables). Table 2 provides frequency of positive answers, item variance, IRC, Loevinger H coefficients, item test–retest reliability and items weight for each subindex (material, social and health deprivation). Subindexes for material, social and health deprivation were calculated adding one point for each positive answer. Social deprivation and health indexes could be assumed to be linearly correlated to subjective social status, whereas material deprivation could not. Using linear regression, the DiPCare-Q index was constructed and simplified for clinical use (figure 2). This final model was linearly correlated to subjective social status (r_P=0.613).

Reliability of the DiPCare-Q

Data for reliability analysis were available for 139 patients. Overall, the DiPCare-Q index showed a good test–retest reliability with an ICC=0.847 (95% CI 0.79 to 0.89). Reliability was better for material (ICC=0.852) and social (ICC=0.865) deprivation indexes than for the health deprivation index (ICC=0.606), which was measured before and after the visit to the GP.

Table 2 Retained items included in the DiPCare-Q with psychometric values

Dimensions	Items (question number)	Item frequency (prevalence)		Loevinger H coefficients		Item-rest correlation		Reliability Cohen's κ	Content validity* Mean (SD)	Subindex coefficients
		Derivation set (%)	Validation set (%)	Derivation set	Validation set	Derivation set	Validation set			
Material	Difficulties paying bills (D1)	55.6	25.7	0.614	0.651	0.480	0.546	0.570	7.2 (1.0)	1
	Need to borrow money for daily expense (D2)	38.8	13.6	0.506	0.469	0.496	0.412	0.755	7.4 (0.8)	1
	Limited access to healthcare (D3)	19.1	10.7	0.448	0.422	0.422	0.375	0.597	7.4 (0.8)	1
	Scared of losing housing (D4)	23.0	4.5	0.448	0.458	0.419	0.328	0.727	7 (1.6)	1
	Can't afford clothes (D5)	40.5	17.3	0.553	0.529	0.564	0.561	0.675	6.9 (1.2)	1
	Can't afford furniture (D6)	38.8	19.1	0.530	0.501	0.564	0.475	0.550	6.2 (1.3)	1
	Not enough to eat at home (D10)	17.4	5.6	0.638	0.434	0.579	0.326	0.571	7.9 (0.8)	1
	Difficulties reimbursing loan(s) (D13)	29.2	13.8	0.492	0.503	0.471	0.504	0.573	5.9 (1.6)	1
Social	No holidays (D7)	60.1	39.1	0.365	0.372	0.324	0.430	0.801	5.2 (2.3)	1
	No evening(s) spent with family or friends (D8)	29.2	16.1	0.493	0.502	0.562	0.428	0.719	5.5 (2.3)	1
	No cultural activities (D9)	61.2	49.4	0.444	0.468	0.398	0.427	0.804	5.2 (2.3)	1
	No access to the internet (D11)	42.1	25.5	0.369	0.360	0.303	0.192	0.791	3.4 (2.1)	1
	No one to turn to for material support (D12)	43.3	31.8	0.344	0.309	0.283	0.284	0.545	6.1 (2.1)	1
Health	Physical handicap (D14)	29.2	21.5	0.339	0.308	0.339	0.266	0.515	6.6 (1.2)	1
	Psychic handicap (D15)	33.2	17.0	0.398	0.355	0.398	0.343	0.565	7 (1.1)	1
	Addiction (D16)	16.9	5.5	0.370	0.222	0.370	0.154	0.593	7.2 (1.0)	1

*Content validity was measured on an 8-point Likert scale ranging from 1 to 8. Consistency was measured for 178 patients for the derivation set and for 1898 patients for the validation set, reliability for 139 and content validity by 17 physicians.

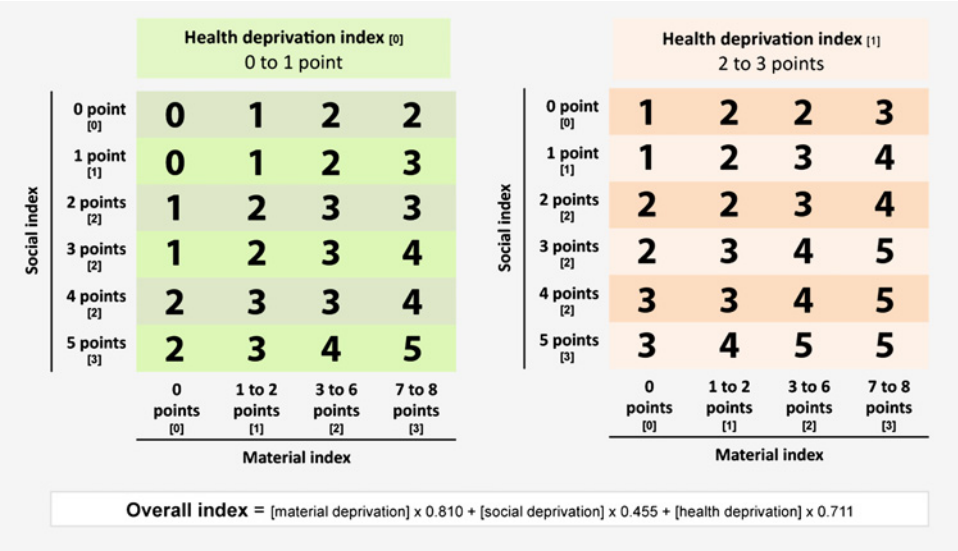

Figure 2 Calculation table for the DiPCare-Q index ranging from 0 to 5 using subindexes corresponding to material, social and health deprivation.

Content validity

Eighteen physicians agreed to participate. Seventeen sent back their appreciation of the appropriateness of every item on an 8-point Likert scale (table 2). Overall, items from material deprivation (mean=7.0; 95% CI 6.7 to 7.3) and health deprivation (mean=7.0; 95% CI 6.5 to 7.4) were considered more appropriate than those from social deprivation (mean=5.1; 95% CI 4.2 to 5.9).

Validation study

The total number of patients included in the study was 2031. Full data were, however, only available for 1898 patients. Details on exclusions, refusals and dropouts are given in figure 1B. Patients' age ranged from 16 to 94 years (median 57 years), 58.4% were women, 18.9% did not have the Swiss nationality but only 1.7% of questionnaires (n=32) were answered in another language than French. 73.4% of patients completed their education after compulsory school including apprentices and 61.1% lived with a partner. Using the definition OECD definition of poverty, 7.3% of patients (n=118) lived in a household that was considered as poor.

In the validation study, the overall internal consistency of the DiPCare-Q was KR20=0.778. Item frequency, IRC and Loevinger H coefficients are reported in table 2. Material, social and health deprivation indexes had a total Loevinger H coefficients of 0.505, 0.394 and 0.310, respectively, supporting the hierarchical properties of each subindex.

Material (r_s=−0.486), social (r_s=−0.432) and health (r_s=−0.263) deprivation were all correlated to subjective social status to a greater extent than to family income or education level. The DiPCare-Q index showed higher correlations to subjective social status (r_s=−0.539) than to family income (r_s=−0.480), OECD's definition of relative poverty (r_s=0.202), receiving welfare benefits (r_s=0.288) or education level (r_s=−0.328). Finally, when modelling subjective social status, adding the DiPCare-Q index to age, education, gender, family income, poverty and receiving welfare assistance increased the proportion of explained variance from 27.0% to 38.4% (p<0.0001).

Translated versions of the questionnaire

The French version—and professionally translated versions in English, German and Italian—of the final 16-item DiPCare-Q are available online (supplementary material). They can be used free of charge, without the express authorisation of the authors, if the present article is referred to.

DISCUSSION

Before proposing a new measuring instrument, we critically investigated the true need for a new deprivation index adapted to primary care. Three existing instruments were identified through our systematic review: the NZiDep, the Factor Weighted Index of Deprivation and the EPICES score (table 3). These instruments were found to be poorly adapted to our Swiss primary care setting; they included items that were specific to other social or cultural habits and were therefore inapplicable to our multicultural population.

Using Townsend's concept of deprivation, the NZiDep[25] constructed an eight-item score adapted to populations from different cultural backgrounds in New Zealand. This instrument, however, exclusively investigates material deprivation and does not therefore correspond to the broader definition of deprivation developed by Lee and Townsend[20] and perceived by GPs.[28] Including social aspects of deprivation is particularly important to healthcare, as psychosocial context has been shown to affect health.[29] The same criticism can be made of the Factor Weighted Index of Deprivation,[26] which only investigated monetary, consumption and work-related deprivation. Eroglu's fieldwork however supports our observations regarding the importance of including subjective questions and household-level questions when measuring deprivation. The EPICES score was designed to identify deprived

Table 3 Items included in different deprivation measuring instruments (classified by the authors of this article)

	NZiDep[25]	FWID[26]	EPICES[27]	DiPCare-Q
Material deprivation	► Been on means-tested benefit ► Getting community help ► Helped to get food ► Wearing worn out shoes ► Buying cheap food ► Doing without fresh fruit and vegetables ► Feeling cold	► Real disposable monthly household income ► Real total household savings ► Real total household debts ► Housing security ► Urban property ownership ► Second urban house ownership ► Rural land ownership ► Car ownership ► Monthly meat consumption ► Winter food stock ► Number of household members with access to free/discounted medicine ► Optimum housing size ► Private room availability ► Fuel type and quantity ► Hot water use ► Insulation of rooms which are heated ► Individual subscription to utilities ► Number of furniture items ► Number of electrical appliances ► Age and purchase type (ie, first or second hand) of furniture and appliances	► Owner of own house ► Having financial difficulties (food, rent, basic needs, …)	► Difficulties paying household bills ► Having to ask for money for basic needs ► Not sought medical treatment because of cost ► Fears being evicted from home ► Did not buy clothes ► Did not buy furniture ► Did not have enough to eat ► Difficulties reimbursing loan(s)
Social deprivation		► Number of children in compulsory or higher education ► Quality of education being received by the children	► Meets a social worker sometimes ► Not living with a partner ► Not taken part in any sporting activity in the last 12 months ► Not gone to any shows (movies, theatre, …) over the past 12 months ► Not gone on holiday over the past 12 months ► No contact with family other than parents or children over the last 6 months ► Not having someone to rely on for accommodation ► Not having someone to rely on for material support	► Not gone on holiday ► Not spending an evening with family or friends ► Not been to cinema, theatre or sporting event(s) ► Not having access to the internet ► Not having someone to turn to for material help

Continued

Table 3 Continued

	NZiDep[25]	FWID[26]	EPICES[27]	DiPCare-Q
Societal security/ working conditions	▲ Unemployed	▲ Household occupational risk grade ▲ Household social security ratio ▲ Household income to work hour ratio ▲ Pension prospects ▲ Work-related assets, equipment and supplies		
Health deprivation		▲ Environmental hygiene and safety ▲ Quality of medical service being received by all family members	▲ Complementary health insurance	▲ Physical disability ▲ Mental health issue ▲ Addiction

DiPCare-Q, deprivation in primary care questionnaire; FWID, factor weighted index of deprivation.

individuals in French Health Examination Centres.[30] It was constructed on the same conceptual basis as the DiPCare-Q. Compared with the DiPCare-Q, the EPICES score included more items on social deprivation. It also showed lower internal consistency (Cronbach's α=0.410) compared with other instruments. The EPICES score was nevertheless much more relevant in predicting unhealthy behaviours than either the administrative legal definition of deprivation or socioeconomic characteristics.[27]

Using pre-existing questions on deprivation issued from this systematic review, we therefore conceptualised, identified and constructed a 38-item questionnaire to be reduced in size following data collection from patients attending a general internal medicine clinic at an academic medical institution. MSP then made it possible to retain 16 questions and to organise the DiPCare-Q in three dimensions: material deprivation, social deprivation and health deprivation. Our instrument showed acceptable psychometric properties. Items were consistent with one another (KR20=0.778) and all of them reached moderate levels of agreement; the DiPCare-Q seems highly reliable (ICC=0.847), and concurrent validity showed the DiPCare-Q to be an important indicator of patients' subjective social status[5] compared with other social status indicators. Like subjective social status, deprivation is a culturally based subjective state as its definition depends greatly upon what we expect to have under normal circumstances. This allows us to believe the DiPCare-Q to be a better surrogate of 'deprivation' than measures of income when used on populations requiring healthcare. Finally, the high heterogeneity of the profiles of patients within the study improves the DiPCare-Q's external validity. Apart from asylum seekers and undocumented migrants (who were included in the derivation study), all Swiss residents have access to private practices whose costs are covered by their compulsory health insurance. The studied population is therefore representative of many different cultural backgrounds and this leads us to believe that the DiPCare-Q could show similar psychometric properties in clinical settings for most Western European countries.

Townsend's conceptual separation of material and social deprivation[31] and its importance in defining deprivation seems, for patients from developed countries but also characterised by social inequalities, to be confirmed by our study. Social deprivation could even be, in countries with very high standards of living such as Switzerland, more important than material deprivation as lack of social support from the community and family[32] is more frequent in places where living standards are higher. This aspect underlines the effects on individual health of the personal state of isolation and anxiety resulting from a lack of social integration (anomy). Furthermore, helping patients handle psychosocial stress has been shown to be effective in improving their health,[33 34] whereas improving their financial situation has revealed itself to be much more complicated.[35]

In clinical practice, relying on a standardised questionnaire for detecting deprivation could have its downfalls. Improving the detection of social difficulties assumes that this will change the way physicians relate to their patient. In a public healthcare perspective, this could be positive if physicians favour behaviours against existing disparities.[36 37] On the other hand, it could increase health disparities if physicians tend to disfavour the most deprived. Inappropriate response to poverty has been recognised as a major barrier in preventing its negative effects on health.[38] This underlines physicians' responsibility of correctly handling such information. Therefore, detecting deprivation also requires physicians to express empathy and adapt their behaviour for their patient's benefit.[39 40]

Our study has several limitations. First, we cannot exclude other phenomenon from being implicated in deprivation such as work conditions. Contrarily to the Whitehall and the GAZEL studies,[7] our study also included the retired, housewives, the self-employed and students who often do not feel deprived even if they do not benefit from favourable working conditions. This might have confounded the true relationship between working conditions and workers' feeling of deprivation. Our observations should therefore not prevent clinicians from investigating working conditions for those who are employed or those who experience unemployment. Second, our conceptual framework was designed for patients in primary care in developed countries. Given the multiplicity of deprivation factors, the psychometric properties of the deprivation index questionnaire could however be applicable to other populations characterised by objective and subjective deprivation. Third, relevant items might have been falsely discarded due to the lack of power of the derivation study. The sample size (n=178) is below the recommended number of 200 for using MSP. However, the studied sample being highly deprived, we believe that this small difference does not affect the internal validity of our results. Finally, we cannot exclude social desirability bias from having influenced responses on health deprivation status before and after the visit to the physician.

CONCLUSIONS

The promising psychometric properties of the DiPCare-Q allow us to believe that it could be used as an indicator of the patient's material and social state of deprivation. This deprivation index is a promising screening instrument to improve clinical investigations by measuring potential underlying social problems which could affect health.[41 42] Furthermore, this instrument could improve more broadly the understanding of social and material deprivation by serving as a reliable individual measure in future observational and experimental studies.

Author affiliations
[1]Department of Ambulatory Care and Community Medicine, University of Lausanne, Lausanne, Switzerland
[2]Institute of General Medicine, University of Lausanne, Lausanne, Switzerland
[3]Institute of Social and Preventive Medicine, University of Lausanne, Epalinges, Switzerland
[4]Institute of History of Medicine, University of Lausanne, Lausanne, Switzerland
[5]Centre Technique d'Appui et de Formation des Centres d'Examens de Santé, St-Etienne, France

Acknowledgements We thank Adelaïde Rosset who contacted patients over the phone for the derivation study and Catherine Delafontaine who managed and completed data for the validation study. We also thank David Brook who revised and corrected our English through his English Language Coaching service (ELCS). We especially thank the 47 GPs, coinvestigators for the validation study, who recruited patients and offered us their precious time without receiving any financial return: Gilbert Abetel, Jacques Aubert, Elisabeth Becciolini-Lebas, Corinne Bonard, Robert Bourgeois, Jacques Carrel, Georges Conne, Christian Cuendet, Michel Dafflon, Gabrielle de Torrente, Pierre De Vevey, Maryse De Vevey, Hedy Decrey, Charles Dvorak, Frédéric Fellrath, Elisabeth Flammer, Francine Glassey-Perrenoud, Nils Gueissaz, Jean-Luc Held, Lilli Herzig, Blaise Ingold, Nicole Jaunin, Sébastien Jotterand, Michel Junod, Philippe Krayenbuhl, Maxime Mancini, Jacques Meizoz, Alain Michaud, Marie Neeser, Marie-Amélie Pernet, Antonio Petrillo, François Pilet, Michel Ravessoud, Laurent Rey, Joël Rilliot, Xavier Risse, Pierre-Yves Rodondi, Olivier Rubli, Laurent Schaller, Pierre-Alain Schmied, Alain Schwob, Paul Sébo, Johanna Sommer, Anne-Lise Tesarik-Vouga, Rodrigo Vasquez, François Verdon, Daniel Widmer.

Contributors PV designed the systematic review; PV, E-AD and PB selected articles; PV and E-AD extracted data from articles; PV, E-AD, PB and TB validated the categorisation of items and formulated the initial questionnaire. E-AD interviewed patients and hospital cleaning personnel to validate and improve questionnaire. PV, TB and PB planned and collected data for face validity with general practitioners. For the derivation study, PV, E-AD, PB, TB, CS, GM-A and BF participated to the design of the study; PV wrote the protocol; PV and E-AD recruited patients and collected data, Adelaide Rosset contacted patients over the phone 3 days after enrolment. For the validation study, PV, PB, TB, FP, LH and BF participated to the design of the study; PV wrote grant applications and the protocol; LH recruited physicians; Catherine Delafontaine trained physicians and managed data entry and quality control; Isabelle Cardoso entered data and Estelle Martin managed the forms for scanned entry. PV analysed the data; all authors discussed the results and participated to the draft outline. PV wrote the manuscript under the supervision of PB. All authors read and approved the final manuscript. The final manuscript was corrected by David Brooks's English Language Coaching service (ELCS). PV serves as guarantors of the paper and accepts full responsibility for the work and the conduct of the study.

Funding Swiss Academy of Medical Science, by the Department of Social Action and Health of the Canton of Vaud and by the Faculty of Biology and Medicine from the University of Lausanne.

Competing interests None.

Patient consent Signed consent was obtained during the derivation study. For the validation study, oral and written information were given to participants. The physician obtained oral consent before handing out the questionnaire. Patients were clearly informed that returning the questionnaire meant they approved participating.

Ethics approval Ethical approval was obtained from the official state Biomedical Ethical Committee under reference number 157/09 for the derivation study and reference number 155/10 for the validation study.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement The DiPCare-Q in English, French, German and Italian is made openly accessible to all on the web with a link on http://bmj.com. Instructions and STATA commands to calculate the DiPCare-Q index are also provided.

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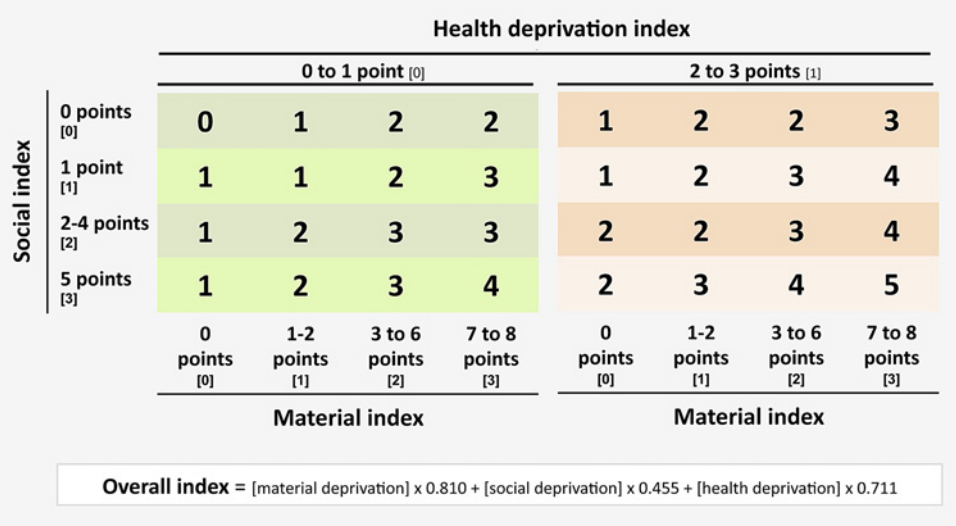
Correction

Vaucher P, Bischoff T, Diserens EA, *et al*. Detecting and measuring deprivation in primary care: development, reliability and validity of a self-reported questionnaire: the DiPCare-Q. *BMJ Open* 2012;**2**:e000692. Figure 2 reports the DiPCare-Q index combining weights from each of the three sub-indexes. The function below the figure corresponds to the regression function associating subjective social status to the DiPCare-Q sub-indexes from the derivation set. The entered numbers in the table do not fit to the function. The numbers written in the table itself are issued from a first version that had not transformed sub-indexes before computing the final index. They are therefore erroneous. Please refer to the corrected figure below.



BMJ Open 2012;**2**:e000692corr1. doi:10.1136/bmjopen-2011-000692corr1

DIPCARE-Q IN ENGLISH, FRENCH, GERMAN, AND ITALIAN

INSTRUCTIONS 29/02/2012

Citation: *Vaucher P, Bischoff T, Diserens EA, Herzig L, Meystre-Agustoni G, Panese F,Favrat B, Sass C, Bodenmann P*. Detecting and measuring deprivation in primary care: development, reliability and validity of a self-reported questionnaire: the DiPCare-Q. BMJ Open. 2012 Feb 3;2(1):e000692.

URL: http://bmjopen.bmj.com/content/2/1/e000692.full

IMPORTANT: Text highlighted in red in STATA command was amended on 29/02/2012 due to a typographical error.

Instructions for calculating DiPCare-Q indexes

a) Code all 16 questions (D1 to D16) “1” for “Yes” and “0” for “No”.
b) Recode questions D7, D8, D9, D11, and D12 “1” to “0” and “0” to “1” for all positive items to be related to deprivation.
c) Generate the following indexes:
   - Material deprivation index: D1+D2+D3+D4+D5+D6+D10+D13
   - Social deprivation index: D7+D8+D9+D11+D12
   - Health deprivation index: D14+D15+D16
d) Calculating overall deprivation index: DiPCare-Q index
   1. Generate categories of deprivation from the corresponding index:
      Material deprivation categories: generate the following categories from the material deprivation index: 1 to 2 = 1, 3 to 6 = 2, 7 to 8 =.3
      Social deprivation categories = social deprivation index
      Health deprivation categories: generate the following categories from the health deprivation index 0 to 1 = 0, 2 to 3 = 1

   2. Using these variables, compute the overall deprivation index using the following equation for each participant:

      index= 0.810*mat_cat + 0.455*soc_cat + 0.711*health_cat

   3. Round result to the closest unit ending with an index of 5 levels of deprivation.

STATA commands

1. Create a variable for each question from the DiPCare-Q naming them d1 to d16.
2. Code issues “0” for “No” and “1” for “Yes”.
3. Use the following commands to generate the scores:

```
* RECODE VARIABLES FOR ALL POSITIVE ITEMS TO BE RELATED TO DEPRIVATION
recode d7 0=1 1=0
recode d8 0=1 1=0
recode d9 0=1 1=0
recode d11 0=1 1=0
recode d12 0=1 1=0

* GENERATE SUB-INDEXES
gen mat_dep=d1+d2+d3+d4+d5+d6+d10+d13
gen soc_dep= d7+d8+d9+d11+d12
gen health_dep= d14+d15+d16

* CALCULATE OVERALL DEPRIVATION INDEX
gen mat_cat=mat_dep
recode mat_cat 2=1 3/6=2 7/8=3
gen health_cat=health_dep
recode health_cat 1=0 2/3=1
gen index= 0.810*mat_cat + 0.455*soc_dep + 0.711*health_cat
recode index 0/0.5=0 0.5000001/1.5=1 1.50000001/2.5=2 2.50000001/3.5=3
3.50000001/4.5=4 4.50000001/5.5=5 5.500001/6.5=6

* LABEL VARIABLES
label variable index "overall deprivation index"
label variable mat_dep "material deprivation index"
label variable soc_dep "social deprivation index"
label variable health_dep "health deprivation index"
```

ENGLISH

We would like you to answer the following questions dealing with your personal finances, social environment and general health. Please mark with an X (☒) the answer that best applies to your own situation.

1.	During the last 12 months, have you had trouble paying your household bills (taxes, insurance, telephone, electricity, credit cards, etc.)?	☐ Yes ☐ No
2.	During the last 12 months, have you had to ask your immediate family for money to cover your basic day-to-day needs?	☐ Yes ☐ No
3.	During the last 12 months, has a member of your household not sought treatment (dentist, doctor, buying medication) because you didn't have enough money?	☐ Yes ☐ No
4.	During the last 12 months, have you feared being evicted from or losing your home?	☐ Yes ☐ No
5.	During the last 12 months, have you not bought clothes even though you or a member of your household needed them?	☐ Yes ☐ No
6.	During the last 12 months, have you not bought furniture or household goods even though you or a member of your household needed them?	☐ Yes ☐ No
7.	During the last 12 months, have you gone on holiday?	☐ Yes ☐ No
8.	During the last 3 months, have you spent an evening in the company of close family members or friends?	☐ Yes ☐ No
9.	During the last 3 months, have you been to the cinema, the theatre, a concert or a sports event?	☐ Yes ☐ No
10.	During the last month, has there been an occasion when your household did not have enough to eat?	☐ Yes ☐ No
11.	During the last month, have you been able to access the internet (at home, at work, at a library, at an internet café, etc.)?	☐ Yes ☐ No
12.	If you're in difficulty, is there someone outside your household to whom you can turn for material help (money, food, accommodation)?	☐ Yes ☐ No
13.	Are you currently finding it very difficult to pay back money (to the bank, family, friend etc.)?	☐ Yes ☐ No
14.	Do you currently suffer from a physical disability that has a major impact on your day-to-day life?	☐ Yes ☐ No
15.	Do you currently suffer from mental health issues or problems that have a major impact on your day-to-day life?	☐ Yes ☐ No
16.	Do you currently have problems linked to alcohol consumption, drug-taking, gambling etc.?	☐ Yes ☐ No

FRENCH

Vous êtes invité(e) à répondre au questions suivantes qui vous interrogent sur votre situation matérielle, sociale, et votre état de santé. Mettez une croix (☒) dans la case qui correspond le mieux à votre situation en répondant à oui ou non à toutes les questions suivantes.

1. Durant les 12 derniers mois, avez-vous eu de la peine à payer les factures de votre ménage (impôts, assurances, téléphone, électricité, cartes de crédit, etc.) ?	☐ **Oui**	☐ **Non**
2. Durant les 12 derniers mois, avez-vous eu besoin de demander de l'argent à des proches pour des besoins quotidiens ?	☐ **Oui**	☐ **Non**
3. Durant les 12 derniers mois, quelqu'un dans votre ménage a-t-il dû renoncer à se faire soigner parce que vous n'aviez pas assez d'argent (dentiste, médecin, achat de médicaments) ?	☐ **Oui**	☐ **Non**
4. Durant les 12 derniers mois, avez-vous eu peur d'être expulsé(e) de votre logement ou de perdre votre habitation ?	☐ **Oui**	☐ **Non**
5. Durant les 12 derniers mois, avez-vous dû renoncer à acheter des habits alors que vous-même ou un membre de votre ménage en avait pourtant besoin ?	☐ **Oui**	☐ **Non**
6. Durant les 12 derniers mois, avez-vous dû renoncer à acheter des meubles ou des appareils alors que vous ou un membre de votre ménage en aviez pourtant besoin ?	☐ **Oui**	☐ **Non**
7. Durant les 12 derniers mois, êtes-vous partis en vacances ?	☐ **Oui**	☐ **Non**
8. Durant les 3 derniers mois, avez-vous partagé une soirée avec des proches ou des amis ?	☐ **Oui**	☐ **Non**
9. Durant les 3 derniers mois, avez-vous été au cinéma, au théâtre, à un concert ou à un événement sportif ?	☐ **Oui**	☐ **Non**
10. Durant le dernier mois, est-il arrivé qu'il n'y ait pas assez à manger dans votre ménage ?	☐ **Oui**	☐ **Non**
11. Durant le dernier mois, avez-vous eu la possibilité d'accéder à Internet (maison, travail, bibliothèque, Internet café, etc.) ?	☐ **Oui**	☐ **Non**
12. En cas de difficulté, pourriez-vous faire appel à des personnes extérieures à votre ménage pour vous apporter une aide matérielle (argent, nourriture, logement) ?	☐ **Oui**	☐ **Non**
13. Actuellement, le remboursement d'argent (banque, famille, proche, etc.) vous pose-t-il un problème important ?	☐ **Oui**	☐ **Non**
14. Actuellement, souffrez-vous d'un handicap physique qui a des conséquences importantes sur votre vie quotidienne ?	☐ **Oui**	☐ **Non**
15. Actuellement, souffrez-vous de difficultés ou problèmes psychiques qui ont des conséquences importantes sur votre vie quotidienne ?	☐ **Oui**	☐ **Non**
16. Actuellement, avez-vous des difficultés liées à une consommation d'alcool, de drogue, de jeu, ou autres ?	☐ **Oui**	☐ **Non**

GERMAN

Beantworten Sie bitte die die folgenden Fragen zu Ihrer materiellen und sozialen Situation sowie zu Ihrem Gesundheitszustand. Kreuzen Sie das Feld an (☒), das Ihrer Situation am besten entspricht und beantworten Sie sämtliche der folgenden Fragen mit Ja oder Nein.

1. Hatten Sie in den letzten 12 Monaten Schwierigkeiten, die Rechnungen Ihres Haushalts zu bezahlen (Steuern, Versicherungen, Telefon, Strom, Kreditkarten usw.)?	☐ **Ja**	☐ **Nein**
2. Mussten Sie in den letzten 12 Monaten bei Angehörigen Geld für den täglichen Bedarf ausleihen?	☐ **Ja**	☐ **Nein**
3. Musste in den letzten 12 Monaten jemand in Ihrem Haushalt auf medizinische Versorgung verzichten, weil Sie nicht genügend Geld hatten (Zahnarzt, Arzt, Kauf von Medikamenten)?	☐ **Ja**	☐ **Nein**
4. Hatten Sie in den letzten 12 Monaten Angst, aus Ihrer Wohnung hinausgeworfen zu werden oder Ihre Bleibe zu verlieren?	☐ **Ja**	☐ **Nein**
5. Mussten Sie in den letzten 12 Monaten auf den Kauf von Kleidung verzichten, obwohl Sie selber oder ein Mitglied Ihres Haushalts diese benötigten?	☐ **Ja**	☐ **Nein**
6. Mussten Sie in den letzten 12 Monaten auf den Kauf von Möbeln oder Geräten verzichten, obwohl Sie selber oder ein Mitglied Ihres Haushalts diese benötigten?	☐ **Ja**	☐ **Nein**
7. Sind Sie in den letzten 12 Monaten in die Ferien gefahren?	☐ **Ja**	☐ **Nein**
8. Haben Sie in den letzten 3 Monaten einen Abend mit Angehörigen oder Freunden verbracht?	☐ **Ja**	☐ **Nein**
9. Waren Sie in den letzten 3 Monaten im Kino, Theater, an einem Konzert oder einer Sportveranstaltung?	☐ **Ja**	☐ **Nein**
10. Ist es im letzten Monat vorgekommen, dass es in Ihrem Haushalt nicht genug zu essen gab?	☐ **Ja**	☐ **Nein**
11. Hatten Sie im letzten Monat die Möglichkeit, ins Internet zu gelangen (zuhause, Arbeit, Bibliothek, Internet-Café usw.)?	☐ **Ja**	☐ **Nein**
12. Können Sie bei Schwierigkeiten Personen, die nicht Ihrem Haushalt angehören, um materielle Hilfe bitten (Geld, Nahrungsmittel, Unterkunft)?	☐ **Ja**	☐ **Nein**
13. Haben Sie gegenwärtig grosse Schwierigkeiten, Geld zurückzuzahlen (Bank, Familie, Angehörige usw.)?	☐ **Ja**	☐ **Nein**
14. Leiden Sie derzeit an einer körperlichen Behinderung, die weit reichende Auswirkungen auf Ihren Alltag hat?	☐ **Ja**	☐ **Nein**
15. Leiden Sie derzeit an psychischen Schwierigkeiten oder Problemen, die weit reichende Auswirkungen auf Ihren Alltag haben?	☐ **Ja**	☐ **Nein**
16. Haben Sie gegenwärtig Probleme im Zusammenhang mit dem Konsum von Alkohol, Drogen, Spielen oder anderem?	☐ **Ja**	☐ **Nein**

ITALIAN

La invitiamo a rispondere a tutte le domande seguenti sulla sua situazione materiale e sociale e sul suo stato di salute. Metta una crocetta (☒) nella casella che meglio corrisponde alla sua situazione, rispondendo sì o no a tutte le domande seguenti.

1. Negli scorsi 12 mesi ha fatto fatica a pagare le fatture del suo nucleo familiare (imposte, assicurazioni, telefono, elettricità, carte di credito, ecc.) ?	☐ **Sì**	☐ **No**
2. Negli scorsi 12 mesi ha avuto bisogno di chiedere denaro a persone a lei vicine per dei bisogni quotidiani ?	☐ **Sì**	☐ **No**
3. Negli scorsi 12 mesi qualcuno nel suo nucleo familiare ha dovuto rinunciare a delle cure perché non aveva denaro a sufficienza (dentista, medico, acquisto di farmaci) ?	☐ **Sì**	☐ **No**
4. Negli scorsi 12 mesi ha avuto paura di essere sfrattato/a dalla sua abitazione o di perderla ?	☐ **Sì**	☐ **No**
5. Negli scorsi 12 mesi ha dovuto rinunciare ad acquistare dei vestiti anche se lei stesso/a o un membro del suo nucleo familiare ne aveva bisogno ?	☐ **Sì**	☐ **No**
6. Negli scorsi 12 mesi ha dovuto rinunciare ad acquistare dei mobili o degli apparecchi anche se lei stesso/a o un membro del suo nucleo familiare ne aveva bisogno?	☐ **Sì**	☐ **No**
7. Negli scorsi 12 mesi è andato/a in vacanza?	☐ **Sì**	☐ **No**
8. Negli scorsi 3 mesi ha passato una serata con persone a lei vicine o con amici ?	☐ **Sì**	☐ **No**
9. Negli scorsi 3 mesi è andato/a al cinema, a teatro, a un concerto o a una manifestazione sportiva ?	☐ **Sì**	☐ **No**
10. Nello scorso mese è successo che non ci fosse cibo a sufficienza nel suo nucleo familiare ?	☐ **Sì**	☐ **No**
11. Nello scorso mese ha avuto la possibilità di accedere a Internet (casa, lavoro, biblioteca, Internet café, ecc.) ?	☐ **Sì**	☐ **No**
12. In caso di difficoltà potrebbe fare affidamento su delle persone all'esterno del suo nucleo familiare per chiedere un aiuto materiale (denaro, cibo, abitazione) ?	☐ **Sì**	☐ **No**
13. Attualmente la restituzione di denaro (banca, famiglia, persone a lei vicine ecc.) rappresenta un problema importante per lei ?	☐ **Sì**	☐ **No**
14. Attualmente soffre di un handicap fisico che ha conseguenze importanti sulla sua vita quotidiana ?	☐ **Sì**	☐ **No**
15. Attualmente soffre di difficoltà o problemi psichici che hanno conseguenze importanti sulla sua vita quotidiana ?	☐ **Sì**	☐ **No**
16. Attualmente ha difficoltà legate al consumo di alcool o droga, al gioco o altro ?	☐ **Sì**	☐ **No**

List of modifications

29/02/2012 : Amendements to online version published on 03/02/2012 due to a typographical error.

1. DiPCare logo was added
2. Name of version was added
3. Reference for citation was added
4. URL link to article was added
5. Step by step instructions to code variables on STATA was added
6. Prior error to calculate material deprivation using STATA was corrected.
   "*gen mat_dep=d1+d2+d3+d4+d5+d6+2*d10+d13*"
   was changed to
   "*gen mat_dep=d1+d2+d3+d4+d5+d6+d10+d13"*
7. Commands to create variable labels were added.