



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

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2011-000692
Article Type:	Research
Date Submitted by the Author:	30-Nov-2011
Complete List of Authors:	Vaucher, Paul; University of Lausanne, Departement of Ambulatory Care and Community Medicine; University of Geneva, Department of Community, Primary care, and Emergency Medicine Bischoff, Thomas; University of Lausanne, Institute of General Medicine Diserens, Esther-Amélie; University of Lausanne, Departement of Ambulatory Care and Community Medicine Herzig, Lilli; University of Lausanne, Institute of General Medicine Meystre-Agustoni, Giovanna; University of Lausanne, Institute of Social and Preventive Medicine Panese, Francesco; University of Lausanne, Institute of History of Medicine Favrat, Bernard; University of Lausanne, Departement of Ambulatory Care and Community Medicine; University of Geneva, Department of Community, Primary care, and Emergency Medicine Sass, Catherine; Centre Technique d'Appui et de Formation des Centres d'Examens de Santé, Bodenmann, Patrick; University of Lausanne, Departement of Ambulatory Care and Community Medicine
Primary Subject Heading:	General practice / Family practice
Secondary Subject Heading:	Epidemiology, Patient-centred medicine
Keywords:	PRIMARY CARE, EPIDEMIOLOGY, PUBLIC HEALTH, SOCIAL MEDICINE

SCHOLARONE™
Manuscripts

DETECTING AND MEASURING DEPRIVATION IN PRIMARY CARE: DEVELOPMENT, RELIABILITY AND VALIDITY OF A SELF-REPORTED QUESTIONNAIRE - THE DIPCARE-Q

Paul Vaucher^{1*}, Thomas Bischoff², Esther-Amélie Diserens¹, Lilli Herzig², Giovanna Meystre-Agustoni³, Francesco Panese⁴, Bernard Favrat¹, Catherine Sass⁵, Patrick Bodenmann¹

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

* Corresponding author

Corresponding author:

Paul Vaucher, MSc CT (DLSHTM), Department of ambulatory care and community medicine, Bugnon 44, 1011 LAUSANNE, Switzerland, tel +41 21 314 47 20, fax. +41 21 314 48 88
paul.vaucher@gmail.com

Keywords: primary care, self-administration, questionnaires, poverty, psychosocial deprivation

Total word count: 2,942

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 GP: the DiPCare-Q

Key Messages -

The DiPCare-Q proposes a reliable, validated instrument for screening and measuring deprivation among patients in developed countries.

Compared to usual indicators of socio-economical 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 –

Compared to socio-economical 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.

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 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 three 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 1,898 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 (KR20=0.827) and the validation set (KR20=0.778). The DiPCare-Q index was reliable (ICC=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.

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 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 which 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 judgmental item quality, four authors discussed, modified, and selected items to be retained. They discarded questions, basing their judgment 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: twenty GPs working in private practices, five experienced researchers in the field of general practice, and ten individual patients from different socio-economic 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 mono-centric test-retest study recruited 200 randomly selected patients attending their general practitioner during their planned visits to a general internal-medicine clinic at an academic medical institution in Switzerland

Tables

Dimensions of deprivation	Categories	Number of items		
		Retrieved from systematic review	DiPCare-Q ₃₈	DiPCare-Q ₁₆
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 ^a
	• Work	5	2	
	• Access to social welfare	3	1	
	• Criminality	3	-	
	• Education	4	1	
Social relationship	• Social isolation	17	4	2 ^b
	• 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

^a Was retained as an indicator of material deprivation. ^b 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.

Table 1: Conceptual construction of components defining deprivation in primary care

during two 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 three 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. 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 1,898 patients was questioned between September 2010 and February 2011. To be included, patients had to be over 16 years of age and have a pre-scheduled 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 which 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 kappa coefficients lower than 0.4, or those with an item-rest correlation of 0.2 or more. 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 sub-scale. Items with a Loevinger Hi coefficient lower than 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 eight 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 28,700.- as a cut-off point for relative poverty.

Sample size for the derivation study was calculated [24] to assure the kappa coefficient would be different from 0.6 with power set at 0.8 and significance level at 0.05, expecting a Kappa 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 2,000 participants in order to detect differences in prevalence of deprivation between physicians.

RESULTS

Derivation and reliability study

Data was available from 178 patients. Reasons for refusal and/or drop-out are given in Figure 1A. Patients were aged between 17 and 89 with a mean and median of 47 years of age. Both genders were equally represented (45.7% female). Twenty-three percent (41 out 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 ($k=0.175$), being a single parent ($k=0.191$), and living in overcrowded conditions ($k=0.266$). Eleven items had an item-rest correlation (IRC) lower than 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, benefitting 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 alpha for binomial variables). Table 2 provides frequency of positive answers, item variance, item-rest correlation, Loevinger H coefficients, item test-retest reliability, and items weight for each sub-index (material, social and health deprivation). Sub-indexes 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 was available for 139 patients. Overall the DiPCare-Q index showed a good test-retest reliability with an $ICC=0.847$ ($CI95\%$ 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.

Content validity

Eighteen physicians agreed to participate. Seventeen sent back their appreciation of the appropriateness of every item on an eight point Likert scale (Table 2). Overall, items from material deprivation (mean = 7.0; $CI95\%$ 6.7 to 7.3) and health deprivation (mean = 7.0; $CI95\%$ 6.5 to 7.4) were considered more appropriate than those from social deprivation (mean = 5.1; $CI95\%$ 4.2 to 5.9).

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49

Dimensions	Items (question number)	Item frequency (prevalence)		Loevinger H coefficients		Item-rest correlation		Reliability	Content validity ^a	Sub-index coefficients
		Derivation set	Validation set	Derivation set	Validation set	Derivation set	Validation set	Cohen's kappa	mean (SD)	
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 health care (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

^aContent validity was measured on an eight point Likert scale ranging from 1 to 8. Consistency was measured for 178 patients for the derivation set and for 1,898 patients for the validation set, reliability for 139, and content validity by 17 physicians.

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

Validation study

The total number of patients included in the study was 2,031. Full data was, however, only available for 1,898 patients. Details on exclusions, refusals, and dropouts are given in Figure 1B.

In the validation study, the overall internal consistency of the DiPCare-Q was $KR20=0.778$. Item frequency, item-rest correlation, 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 of 0.310 respectively, supporting the hierarchical properties of each sub-index.

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 (Appendix 1). 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 (FWID), 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

	NZiDep [25]	FWID [28]	EPICES [30]	DiPCare-Q
Material deprivation	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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 (i.e. first or second hand) of furniture and appliances	<ul style="list-style-type: none">• Owner of own house• Having financial difficulties (food, rent, basic needs, ...)	<ul style="list-style-type: none">• 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		<ul style="list-style-type: none">• Number of children in compulsory or higher education• Quality of education being received by the children	<ul style="list-style-type: none">• 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 six months• Not having someone to rely on for accommodation• Not having someone to rely on for material support	<ul style="list-style-type: none">• 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
Societal security / working conditions	<ul style="list-style-type: none">• Unemployed	<ul style="list-style-type: none">• Household occupational risk grade• Household social security ratio• Household income to work hour ratio• Pension prospects• Work-related assets, equipment and supplies		
Health deprivation		<ul style="list-style-type: none">• Environmental hygiene and safety• Quality of medical service being received by all family members	<ul style="list-style-type: none">• Complementary health insurance	<ul style="list-style-type: none">• Physical disability• Mental health issue• Addiction

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

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.[26] Including social aspects of deprivation is particularly important to healthcare, as psychosocial context has been shown to affect health.[27] The same criticism can be made of the FWID [28] which only investigated monetary, consumption and work-related deprivation. Eroglu's field work 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 individuals in French Health Examination Centres.[29] It was constructed on the same conceptual basis as the DiPCare-Q. Compared to the DiPCare-Q, the EPICES score included more items on social deprivation. It also showed lower internal consistency (Cronbach's alpha = 0.410) compared to other instruments. The EPICES score was nevertheless much more relevant in predicting unhealthy behaviours than either the administrative legal definition of deprivation or socio-economic characteristics.[30]

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 to 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. Switzerland's population is representative of many different cultural backgrounds and this leads us to believe that the DiPCare-Q could show similar psychometric properties in 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 characterized 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]

Our study has several limitations. Firstly, 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. Secondly, 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. Thirdly, 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 for improve clinical investigations by measuring potential underlying social problems which could affect health.[36, 37] 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.

Authors' contributions

PV designed the systematic review; PV, EAD, PB selected articles; PV and EAD extracted data from articles; PV, EAD, PB, and TB validated the categorisation of items and formulated the initial questionnaire. EAD interviewed patients and hospital cleaning personnel to validate and improve questionnaire. PV, TB, and PB planned and collected data for face validity with GPs. For the derivation study, PV, EAD, PB, TB, CS, GMA, and BF participated to the design of the study, PV wrote the protocol; PV and EAD recruited patients and collected data, Adelaide Rosset contacted patients over the phone three days after enrollement. 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, 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.

Conflicts of interest

Authors declare they have no competing interests.

Fundings

This work was supported by the Swiss Academy of Medical Science; by the Department of Social Action and Health of the Canton of Vaud (Grant number 359516); and by the Faculty of Biology and Medicine from the University of Lausanne.

Acknowledgments

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, co-investigators for the validation study, who recruited patients and offered us their precious time without receiving any financial return.

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 bmj.com. Instructions and STATA commands to calculate the DiPCare-Q index are also provided.

List of abbreviations used

GP = General Practitioner, FWID = Weighted Index of Deprivation, ICC = Interclass Correlation Coefficient, k = Cohen's kappa coefficient, KR20 = Kuder-Richardson Formula 20, MSP = Mokken Scale Procedure, OECD = Organisation for Economic Co-operation and Development, r_s = Spearman's rank coefficient of correlation, r_p = Pearson's linear correlation coefficient.

References

- 1 Marmot M, Friel S, Bell R, *et al.* Closing the gap in a generation: health equity through action on the social determinants of health. *Lancet* 2008;**372**:1661-9.
- 2 Ansari Z, Carson NJ, Ackland MJ, *et al.* A public health model of the social determinants of health. *Soz Präventivmed* 2003;**48**:242-51.
- 3 Feinstein JS. The Relationship between Socioeconomic Status and Health: A Review of the Literature. *The Milbank Quarterly* 1993;**71**:279-322.
- 4 Egan M, Tannahill C, Petticrew M, *et al.* Psychosocial risk factors in home and community settings and their associations with population health and health inequalities: a systematic meta-review. *BMC Public Health* 2008;**8**:239.
- 5 Singh-Manoux A, Adler NE, Marmot MG. Subjective social status: its determinants and its association with measures of ill-health in the Whitehall II study. *Soc Sci Med* 2003;**56**:1321-33.
- 6 Goldberg M, Melchior M, Leclerc A, *et al.* Epidemiologie et determinants sociaux des inegalites de sante. *Rev Epidemiol Sante Publique* 2003;**51**:381-401.
- 7 Stringhini S, Dugravot A, Shipley M, *et al.* Health Behaviours, Socioeconomic Status, and Mortality: Further Analyses of the British Whitehall II and the French GAZEL Prospective Cohorts. *PLoS Med* 2011;**8**:e1000419.
- 8 Kaufman JS, Cooper RS. Seeking causal explanations in social epidemiology. *Am J Epidemiol* 1999;**150**:113-20.
- 9 Krieger N. Theories for social epidemiology in the 21st century: an ecosocial perspective. *Int J Epidemiol* 2001;**30**:668-77.
- 10 Lorant V, Croux C, Weich S, *et al.* Depression and socio-economic risk factors: 7-year longitudinal population study. *The British journal of psychiatry : the journal of mental science* 2007;**190**:293-8.
- 11 Townsend P. Deprivation and ill health. *Nursing (Lond)* 1991;**4**:11-5.
- 12 Krieger N. Why epidemiologists cannot afford to ignore poverty. *Epidemiology* 2007;**18**:658-63.
- 13 Barten F, Mitlin D, Mulholland C, *et al.* Integrated approaches to address the social determinants of health for reducing health inequity. *J Urban Health* 2007;**84**:i164-73.
- 14 Whitehead M. The concepts and principles of equity and health. *Health Promot Int* 1991;**6**:217-28.
- 15 Salmela R. Health policies and health for all strategies in the Nordic countries. *Health Policy* 1991;**18**:207-18.
- 16 McCally M, Haines A, Fein O, *et al.* Poverty and ill health: Physicians can, and should, make a difference. *Annals of Internal Medicine* 1998;**129**:726-33.
- 17 Flores P, Falcoff H. Social inequalities in health: what could be done in general practice? *Rev Prat* 2004;**54**:2263-70.
- 18 Fritzsche K, Armbruster U, Hartmann A, *et al.* Psychosocial primary care - what patients expect from their General Practitioners A cross-sectional trial. *BMC Psychiatry* 2002;**2**:5.
- 19 Bodenmann P, Jackson Y, Bischoff T, *et al.* Precarite et determinants sociaux de la sante: quel(s) role(s) pour le medecin de premier recours? *Rev Med Suisse* 2009;**5**:845-9.
- 20 Lee P, Townsend P. *Trends in deprivation in the London labour market: A study of low incomes and unemployment in London*. Geneva: International Labour Organization 1993.
- 21 Marmot M. Social determinants of health inequalities. *Lancet* 2005;**365**:1099-104.

22 Dillman DA. *Mail and Telephone Surveys*. New York: John Wiley and Sons 2000.

23 Anyaegbu G. Using the OECD equivalence scale in taxes and benefits analysis. *Economic & Labour Market Review* 2010;**4**:49-54.

24 Shoukri MM, Asyali MH, Donner A. Sample size requirements for the design of reliability study: review and new results. *Statistical Methods in Medical Research* 2004;**13**:251-71.

25 Salmond C, Crampton P, King P, *et al*. NZiDep: A New Zealand index of socioeconomic deprivation for individuals. *Social Science & Medicine* 2006;**62**:1474-85.

26 Willems SJ, Swinnen W, De Maeseneer JM. The GP's perception of poverty: a qualitative study. *Fam Pract* 2005;**22**:177-83.

27 Bortolotti B, Menchetti M, Bellini F, *et al*. Psychological interventions for major depression in primary care: a meta-analytic review of randomized controlled trials. *General Hospital Psychiatry* 2008;**30**:293-302.

28 Eroglu S. Developing an index of deprivation which integrates objective and subjective dimensions: Extending the work of townsend, mack and lansley, and halleröd. *Social Indicators Research* 2007;**80**:493-510.

29 Sass C, Moulin J-J, Guéguen R, *et al*. Le score Epices : un score individuel de précarité. Construction du score et mesure des relations avec des données de santé, dans une population de 197 389 personnes. *Bull Épidemiol Heb* 2006;**14**:93-6.

30 Sass C, Gueguen R, Moulin JJ, *et al*. Comparaison du score individuel de précarité des Centres d'examens de santé, EPICES, à la définition socio- administrative de la précarité. [Comparaison of the individual deprivation index of the French Health Examination Centres and the administrative definition of deprivation]. *Santé Publique* 2006;**18**:513-22.

31 Townsend P. *Poverty in the United Kingdom*. Harmondsworth: Allen Lane and Penguin Books 1979.

32 Abbott S, Freeth D. Social capital and health: starting to make sense of the role of generalized trust and reciprocity. *J Health Psychol* 2008;**13**:874-83.

33 Gellis Z, Kenaley B. Problem-solving therapy for depression in adults: a systematic review. *Research on Social Work Practice* 2008;**18**:117.

34 Mynors-Wallis LM, Gath DH, Day A, *et al*. Randomised controlled trial of problem solving treatment, antidepressant medication, and combined treatment for major depression in primary care. *BMJ* 2000;**320**:26-30.

35 Jackson L, Langille L, Lyons R, *et al*. Does moving from a high-poverty to lower-poverty neighborhood improve mental health? A realist review of 'Moving to Opportunity'. *Health Place* 2009;**15**:961-70.

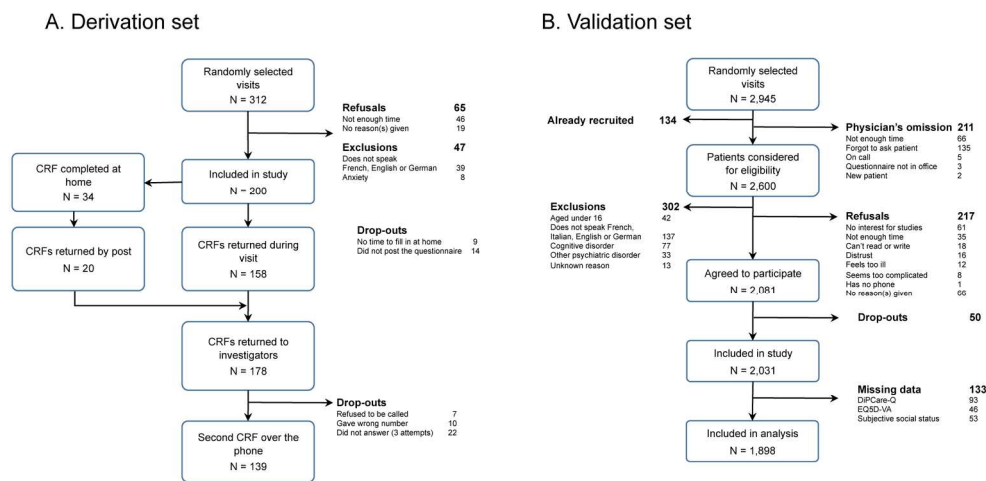
36 Ben-Shlomo Y, White I, McKeigue PM. Prediction of general practice workload from census based social deprivation scores. *J Epidemiol Community Health* 1992;**46**:532-6.

37 Balarajan R, Yuen P, Machin D. Deprivation and general practitioner workload. *BMJ* 1992;**304**:529-34.

Figure captions

Figure 1: Flow chart giving reasons for refusals and drop-outs. **A** Derivation study, **B** Validation study N = number of patients, CRF = case report form.

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



Flow chart giving reasons for refusals and drop-outs. A Derivation study, B Validation study N = number of patients, CRF = case report form.
178x89mm (300 x 300 DPI)

		Health deprivation index [0] 0 to 1 point						Health deprivation index [1] 2 to 3 points			
Social index	0 point [0]	0	1	2	2	Social index	0 point [0]	1	2	2	3
	1 point [1]	0	1	2	3		1 point [1]	1	2	3	4
	2 points [2]	1	2	3	3		2 points [2]	2	2	3	4
	3 points [2]	1	2	3	4		3 points [2]	2	3	4	5
	4 points [2]	2	3	3	4		4 points [2]	3	3	4	5
	5 points [3]	2	3	4	5		5 points [3]	3	4	5	5
		0 points [0]	1 to 2 points [1]	3 to 6 points [2]	7 to 8 points [3]			0 points [0]	1 to 2 points [1]	3 to 6 points [2]	7 to 8 points [3]
		Material index						Material index			
Overall index = [material deprivation] x 0.810 + [social deprivation] x 0.455 + [health deprivation] x 0.711											

Calculation table for the DiPCare-Q index ranging from 0 to 5 using sub-indexes corresponding to material-, social- and health deprivation.
90x51mm (300 x 300 DPI)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

DiPCare-Q in English, French, German, and Italian

For peer review only

Instructions for calculating DiPCare-Q indexes

- Code all 16 questions (D1 to D16) "1" for "Yes" and "0" for "No".
- Recode questions D7, D8, D9, D11, and D12 "1" to "0" and "0" to "1" for all positive items to be related to deprivation.
- 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: $D14+D15+D16$
- Calculating overall deprivation index: DiPCare-Q index
 - 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
 - Using these variables, compute the overall deprivation index using the following equation for each participant:

$$\text{index} = 0.810 \times \text{mat_cat} + 0.455 \times \text{soc_cat} + 0.711 \times \text{health_cat}$$

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

STATA commands

```

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

gen mat_dep=d1+d2+d3+d4+d5+d6+2*d10+d13
gen soc_dep= d7+d8+d9+d11+d12
gen health_dep= d14+d15+d16

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 1.5000001/2.5=2 2.5000001/3.5=3 3.5000001/4.5=4 4.5000001/5.5=5
5.500001/6.5=6

```

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 aux questions suivantes qui vous interrogent sur votre situation matérielle, sociale, et votre état de santé. Mettez une croix (X) dans la case qui correspond le mieux à votre situation en répondant à oui ou non à toutes les questions suivantes.

- | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|
| 1. Durant les <u>12 derniers mois</u> , avez-vous eu de la peine à payer les factures de votre <u>ménage</u> (impôts, assurances, téléphone, électricité, cartes de crédit, etc.) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 2. Durant les <u>12 derniers mois</u> , avez-vous eu besoin de demander de l'argent à des proches pour des besoins quotidiens ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 3. Durant les <u>12 derniers mois</u> , quelqu'un <u>dans votre ménage</u> a-t-il dû renoncer à se faire soigner parce que vous n'aviez pas assez d'argent (dentiste, médecin, achat de médicaments) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 4. Durant les <u>12 derniers mois</u> , avez-vous eu peur d'être expulsé(e) de votre logement ou de perdre votre habitation ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 5. Durant les <u>12 derniers mois</u> , avez-vous dû renoncer à acheter des habits alors que vous-même ou un membre <u>de votre ménage</u> en avait pourtant besoin ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 6. Durant les <u>12 derniers mois</u> , avez-vous dû renoncer à acheter des meubles ou des appareils alors que vous ou un membre <u>de votre ménage</u> en aviez pourtant besoin ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 7. Durant les <u>12 derniers mois</u> , êtes-vous partis en vacances ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 8. Durant les <u>3 derniers mois</u> , avez-vous partagé une soirée avec des proches ou des amis ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 9. Durant les <u>3 derniers mois</u> , avez-vous été au cinéma, au théâtre, à un concert ou à un événement sportif ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 10. Durant <u>le dernier mois</u> , est-il arrivé qu'il n'y ait pas assez à manger dans votre <u>ménage</u> ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 11. Durant <u>le dernier mois</u> , avez-vous eu la possibilité d'accéder à Internet (maison, travail, bibliothèque, Internet café, etc.) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 12. En cas de difficulté, pourriez-vous faire appel à des personnes <u>extérieures à votre ménage</u> pour vous apporter une aide matérielle (argent, nourriture, logement) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 13. <u>Actuellement</u> , le remboursement d'argent (banque, famille, proche, etc.) vous pose-t-il un problème important ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 14. <u>Actuellement</u> , souffrez-vous d'un handicap physique qui a des conséquences importantes sur votre vie quotidienne ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 15. <u>Actuellement</u> , souffrez-vous de difficultés ou problèmes psychiques qui ont des conséquences importantes sur votre vie quotidienne ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 16. <u>Actuellement</u> , avez-vous des difficultés liées à une consommation d'alcool, de drogue, de jeu, ou autres ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | 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 <u>letzten 12 Monaten</u> Schwierigkeiten, die Rechnungen <u>Ihres Haushalts</u> zu bezahlen (Steuern, Versicherungen, Telefon, Strom, Kreditkarten usw.)? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 2. Mussten Sie in den <u>letzten 12 Monaten</u> bei Angehörigen Geld für den täglichen Bedarf ausleihen? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 3. Musste in den <u>letzten 12 Monaten</u> jemand in <u>Ihrem Haushalt</u> auf medizinische Versorgung verzichten, weil Sie nicht genügend Geld hatten (Zahnarzt, Arzt, Kauf von Medikamenten)? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 4. Hatten Sie in den <u>letzten 12 Monaten</u> Angst, aus Ihrer Wohnung hinausgeworfen zu werden oder Ihre Bleibe zu verlieren? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 5. Mussten Sie in den <u>letzten 12 Monaten</u> auf den Kauf von Kleidung verzichten, obwohl Sie selber oder ein Mitglied <u>Ihres Haushalts</u> diese benötigten? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 6. Mussten Sie in den <u>letzten 12 Monaten</u> auf den Kauf von Möbeln oder Geräten verzichten, obwohl Sie selber oder ein Mitglied <u>Ihres Haushalts</u> diese benötigten? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 7. Sind Sie in den <u>letzten 12 Monaten</u> in die Ferien gefahren? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 8. Haben Sie in den <u>letzten 3 Monaten</u> einen Abend mit Angehörigen oder Freunden verbracht? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 9. Waren Sie in den <u>letzten 3 Monaten</u> im Kino, Theater, an einem Konzert oder einer Sportveranstaltung? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 10. Ist es <u>im letzten Monat</u> vorgekommen, dass es in <u>Ihrem Haushalt</u> nicht genug zu essen gab? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 11. Hatten Sie <u>im letzten Monat</u> die Möglichkeit, ins Internet zu gelangen (zu Hause, Arbeit, Bibliothek, Internet-Café usw.)? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 12. Können Sie bei Schwierigkeiten Personen, die <u>nicht Ihrem Haushalt angehören</u> , um materielle Hilfe bitten (Geld, Nahrungsmittel, Unterkunft)? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 13. Haben Sie <u>gegenwärtig</u> grosse Schwierigkeiten, Geld zurückzuzahlen (Bank, Familie, Angehörige usw.)? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 14. Leiden Sie <u>derzeit</u> an einer körperlichen Behinderung, die weit reichende Auswirkungen auf Ihren Alltag hat? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 15. Leiden Sie <u>derzeit</u> an psychischen Schwierigkeiten oder Problemen, die weit reichende Auswirkungen auf Ihren Alltag haben? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 16. Haben Sie <u>gegenwärtig</u> Probleme im Zusammenhang mit dem Konsum von Alkohol, Drogen, Spielen oder anderem? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
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 <u>scorsi 12 mesi</u> ha fatto fatica a pagare le fatture del suo <u>nucleo familiare</u> (imposte, assicurazioni, telefono, elettricità, carte di credito, ecc.) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 2. Negli <u>scorsi 12 mesi</u> ha avuto bisogno di chiedere denaro a persone a lei vicine per dei bisogni quotidiani ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 3. Negli <u>scorsi 12 mesi</u> qualcuno nel suo <u>nucleo familiare</u> ha dovuto rinunciare a delle cure perché non aveva denaro a sufficienza (dentista, medico, acquisto di farmaci) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 4. Negli <u>scorsi 12 mesi</u> ha avuto paura di essere sfrattato/a dalla sua abitazione o di perderla ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 5. Negli <u>scorsi 12 mesi</u> ha dovuto rinunciare ad acquistare dei vestiti anche se lei stesso/a o un membro del suo <u>nucleo familiare</u> ne aveva bisogno ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 6. Negli <u>scorsi 12 mesi</u> ha dovuto rinunciare ad acquistare dei mobili o degli apparecchi anche se lei stesso/a o un membro del suo <u>nucleo familiare</u> ne aveva bisogno? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 7. Negli <u>scorsi 12 mesi</u> è andato/a in vacanza? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 8. Negli <u>scorsi 3 mesi</u> ha passato una serata con persone a lei vicine o con amici ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 9. Negli <u>scorsi 3 mesi</u> è andato/a al cinema, a teatro, a un concerto o a una manifestazione sportiva ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 10. Nello <u>scorso mese</u> è successo che non ci fosse cibo a sufficienza nel suo <u>nucleo familiare</u> ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 11. Nello <u>scorso mese</u> ha avuto la possibilità di accedere a Internet (casa, lavoro, biblioteca, Internet café, ecc.) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 12. In caso di difficoltà potrebbe fare affidamento su delle persone <u>all'esterno del suo nucleo familiare</u> per chiedere un aiuto materiale (denaro, cibo, abitazione) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 13. <u>Attualmente</u> la restituzione di denaro (banca, famiglia, persone a lei vicine ecc.) rappresenta un problema importante per lei ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 14. <u>Attualmente</u> soffre di un handicap fisico che ha conseguenze importanti sulla sua vita quotidiana ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 15. <u>Attualmente</u> soffre di difficoltà o problemi psichici che hanno conseguenze importanti sulla sua vita quotidiana ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 16. <u>Attualmente</u> ha difficoltà legate al consumo di alcool o droga, al gioco o altro ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |



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

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2011-000692.R1
Article Type:	Research
Date Submitted by the Author:	05-Jan-2012
Complete List of Authors:	Vaucher, Paul; University of Lausanne, Departement of Ambulatory Care and Community Medicine; University of Geneva, Department of Community, Primary care, and Emergency Medicine Bischoff, Thomas; University of Lausanne, Institute of General Medicine Diserens, Esther-Amélie; University of Lausanne, Departement of Ambulatory Care and Community Medicine Herzig, Lilli; University of Lausanne, Institute of General Medicine Meystre-Agustoni, Giovanna; University of Lausanne, Institute of Social and Preventive Medicine Panese, Francesco; University of Lausanne, Institute of History of Medicine Favrat, Bernard; University of Lausanne, Departement of Ambulatory Care and Community Medicine; University of Geneva, Department of Community, Primary care, and Emergency Medicine Sass, Catherine; Centre Technique d'Appui et de Formation des Centres d'Examens de Santé, Bodenmann, Patrick; University of Lausanne, Departement of Ambulatory Care and Community Medicine
Primary Subject Heading:	General practice / Family practice
Secondary Subject Heading:	Epidemiology, Patient-centred medicine, Research methods, Public health
Keywords:	PRIMARY CARE, EPIDEMIOLOGY, PUBLIC HEALTH, SOCIAL MEDICINE

SCHOLARONE™
Manuscripts

DETECTING AND MEASURING DEPRIVATION IN PRIMARY CARE: DEVELOPMENT, RELIABILITY AND VALIDITY OF A SELF-REPORTED QUESTIONNAIRE - THE DIPCARE-Q

Paul Vaucher^{1*}, Thomas Bischoff², Esther-Amélie Diserens¹, Lilli Herzig², Giovanna Meystre-Agustoni³, Francesco Panese⁴, Bernard Favrat¹, Catherine Sass⁵, Patrick Bodenmann¹

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

* Corresponding author

Corresponding author:

Paul Vaucher, MSc CT (DLSHTM), Department of ambulatory care and community medicine, Bugnon 44, 1011 LAUSANNE, Switzerland, tel +41 21 314 47 20, fax. +41 21 314 48 88
paul.vaucher@gmail.com

Keywords: primary care, self-administration, questionnaires, poverty, psychosocial deprivation

Total word count: 3,161

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 GP: the DiPCare-Q

Key Messages -

The DiPCare-Q proposes a reliable, validated instrument for screening and measuring deprivation among patients in developed countries.

Compared to usual indicators of socio-economical 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 –

Compared to socio-economical 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.

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 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 three 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 1,898 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 (KR20=0.827) and the validation set (KR20=0.778). The DiPCare-Q index was reliable (ICC=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.

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 gradient⁵⁻⁶ 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, Townsend¹¹ 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's¹¹⁻²⁰ 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 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 which 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's²¹ structure of social determinants (Table 1). Using judgmental item quality, four authors discussed, modified, and selected items to be retained. They discarded questions, basing their judgment 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: twenty GPs working in private practices, five experienced researchers in the field of general practice, and ten individual patients from different socio-economic 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 mono-centric test-retest study recruited 200 randomly selected patients attending their general practitioner during their planned visits to a general internal-medicine clinic at an academic medical institution in Switzerland

Tables

Dimensions of deprivation	Categories	Number of items		
		Retrieved from systematic review	DiPCare-Q ₃₈	DiPCare-Q ₁₆
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 ^a
	• Work	5	2	
	• Access to social welfare	3	1	
	• Criminality	3	-	
	• Education	4	1	
Social relationship	• Social isolation	17	4	2 ^b
	• 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

^a Was retained as an indicator of material deprivation. ^b 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.

Table 1: Conceptual construction of components defining deprivation in primary care

during two 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 three 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. 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 1,898 patients was questioned between September 2010 and February 2011. To be included, patients had to be over 16 years of age and have a pre-scheduled 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 which 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 kappa coefficients lower than 0.4, or those with an item-rest correlation of 0.2 or more. 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 sub-scale. Items with a Loevinger Hi coefficient lower than 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 eight 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 28,700.- as a cut-off point for relative poverty.

Sample size for the derivation study was calculated²⁴ to assure the kappa coefficient would be different from 0.6 with power set at 0.8 and significance level at 0.05, expecting a Kappa 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 2,000 participants in order to detect differences in prevalence of deprivation between physicians.

RESULTS

Derivation and reliability study

Data was available from 178 patients. Reasons for refusal and/or drop-out are given in Figure 1A. Patients were aged between 17 and 89 with a mean and median of 47 years of age. Both genders were equally represented (45.7% female). Twenty-three percent (41 out 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 ($k=0.175$), being a single parent ($k=0.191$), and living in overcrowded conditions ($k=0.266$). Eleven items had an item-rest correlation (IRC) lower than 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, benefitting 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 alpha for binomial variables). Table 2 provides frequency of positive answers, item variance, item-rest correlation, Loevinger H coefficients, item test-retest reliability, and items weight for each sub-index (material, social and health deprivation). Sub-indexes 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 was available for 139 patients. Overall the DiPCare-Q index showed a good test-retest reliability with an $ICC=0.847$ ($CI95\%$ 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.

Content validity

Eighteen physicians agreed to participate. Seventeen sent back their appreciation of the appropriateness of every item on an eight point Likert scale (Table 2). Overall, items from material deprivation (mean = 7.0; $CI95\%$ 6.7 to 7.3) and health deprivation (mean = 7.0; $CI95\%$ 6.5 to 7.4) were considered more appropriate than those from social deprivation (mean = 5.1; $CI95\%$ 4.2 to 5.9).

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49

Dimensions	Items (question number)	Item frequency (prevalence)		Loevinger H coefficients		Item-rest correlation		Reliability	Content validity ^a	Sub-index coefficients
		Derivation set	Validation set	Derivation set	Validation set	Derivation set	Validation set	Cohen's kappa	mean (SD)	
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 health care (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

^aContent validity was measured on an eight point Likert scale ranging from 1 to 8. Consistency was measured for 178 patients for the derivation set and for 1,898 patients for the validation set, reliability for 139, and content validity by 17 physicians.

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

Validation study

The total number of patients included in the study was 2,031. Full data was, however, only available for 1,898 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, item-rest correlation, 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 of 0.310 respectively, supporting the hierarchical properties of each sub-index.

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 (Appendix 1). 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 (FWID), 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 NZiDep²⁵ 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 Townsend²⁰ and perceived by GPs.²⁶ Including social aspects of deprivation is particularly important to healthcare, as psychosocial context has been shown to affect health.²⁷ The same criticism can be made of the FWID²⁸ which only investigated monetary, consumption and work-related deprivation. Eroglu’s field work 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 individuals in French Health Examination Centres.²⁹ It was constructed on the same conceptual basis as the DiPCare-Q. Compared to the DiPCare-Q, the EPICES score included more items on social deprivation. It also showed lower internal consistency (Cronbach’s alpha = 0.410) compared to other instruments. The EPICES score was nevertheless much more relevant in predicting unhealthy behaviours than either the administrative legal definition of deprivation or socio-economic characteristics.³⁰

	NZiDep ²⁵	FWID ²⁸	EPICES ³⁰	DiPCare-Q
Material deprivation	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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 (i.e. first or second hand) of furniture and appliances 	<ul style="list-style-type: none"> • Owner of own house • Having financial difficulties (food, rent, basic needs, ...) 	<ul style="list-style-type: none"> • 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		<ul style="list-style-type: none"> • Number of children in compulsory or higher education • Quality of education being received by the children 	<ul style="list-style-type: none"> • 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 six months • Not having someone to rely on for accommodation • Not having someone to rely on for material support 	<ul style="list-style-type: none"> • 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
Societal security / working conditions	<ul style="list-style-type: none"> • Unemployed 	<ul style="list-style-type: none"> • Household occupational risk grade • Household social security ratio • Household income to work hour ratio • Pension prospects • Work-related assets, equipment and supplies 		
Health deprivation		<ul style="list-style-type: none"> • Environmental hygiene and safety • Quality of medical service being received by all family members 	<ul style="list-style-type: none"> • Complementary health insurance 	<ul style="list-style-type: none"> • Physical disability • Mental health issue • Addiction

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

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 status⁵ compared to 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 for 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 deprivation³¹ and its importance in defining deprivation seems, for patients from developed countries but also characterized 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 family³² 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 this will change the way physicians relate to their patient. In a public health care 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. Firstly, 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. Secondly, 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. Thirdly, 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 for 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.

Authors’ contributions

PV designed the systematic review; PV, EAD, PB selected articles; PV and EAD extracted data from articles; PV, EAD, PB, and TB validated the categorisation of items and formulated the initial questionnaire. EAD interviewed patients and hospital cleaning personnel to validate and improve questionnaire. PV, TB, and PB planned and collected data for face validity with GPs. For the derivation study, PV, EAD, PB, TB, CS, GMA, and BF participated to the design of the study, PV wrote the protocol; PV and EAD recruited patients and collected data, Adelaide Rosset contacted patients over the phone three days after enrollement. 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, 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.

Conflicts of interest

Authors declare they have no competing interests.

Fundings

This work was supported by the Swiss Academy of Medical Science; by the Department of Social Action and Health of the Canton of Vaud (Grant number 359516); and by the Faculty of Biology and Medicine from the University of Lausanne.

Acknowledgments

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, co-investigators for the validation study, who recruited patients and offered us their precious time without receiving any financial return.

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 bmj.com. Instructions and STATA commands to calculate the DiPCare-Q index are also provided.

List of abbreviations used

GP = General Practitioner, FWID = Weighted Index of Deprivation, ICC = Interclass Correlation Coefficient, k = Cohen's kappa coefficient, KR20 = Kuder-Richardson Formula 20, MSP = Mokken Scale Procedure, OECD = Organisation for Economic Co-operation and Development, r_s = Spearman's rank coefficient of correlation, r_p = Pearson's linear correlation coefficient.

References

1. Marmot M, Friel S, Bell R, Houweling TAJ, Taylor S. Closing the gap in a generation: health equity through action on the social determinants of health. *Lancet* 2008;372(9650):1661-69.

2. Ansari Z, Carson NJ, Ackland MJ, Vaughan L, Serraglio A. A public health model of the social determinants of health. *Soz Präventivmed* 2003;48(4):242-51.

3. Feinstein JS. The Relationship between Socioeconomic Status and Health: A Review of the Literature. *The Milbank Quarterly* 1993;71(2):279-322.

4. Egan M, Tannahill C, Petticrew M, Thomas S. Psychosocial risk factors in home and community settings and their associations with population health and health inequalities: a systematic meta-review. *BMC Public Health* 2008;8:239.

5. Singh-Manoux A, Adler NE, Marmot MG. Subjective social status: its determinants and its association with measures of ill-health in the Whitehall II study. *Soc Sci Med* 2003;56(6):1321-33.

6. Goldberg M, Melchior M, Leclerc A, Lert F. Epidemiologie et determinants sociaux des inegalites de sante. *Rev Epidemiol Sante Publique* 2003;51(4):381-401.

7. Stringhini S, Dugravot A, Shipley M, Goldberg M, Zins M, Kivimaki M, et al. Health Behaviours, Socioeconomic Status, and Mortality: Further Analyses of the British Whitehall II and the French GAZEL Prospective Cohorts. *PLoS Med* 2011;8(2):e1000419.

8. Kaufman JS, Cooper RS. Seeking causal explanations in social epidemiology. *Am J Epidemiol* 1999;150(2):113-20.

9. Krieger N. Theories for social epidemiology in the 21st century: an ecosocial perspective. *Int J Epidemiol* 2001;30(4):668-77.

10. Lorant V, Croux C, Weich S, Deliege D, Mackenbach J, Anseu M. Depression and socio-economic risk factors: 7-year longitudinal population study. *The British journal of psychiatry : the journal of mental science* 2007;190:293-8.

11. Townsend P. Deprivation and ill health. *Nursing (Lond)* 1991;4(43):11-5.

12. Krieger N. Why epidemiologists cannot afford to ignore poverty. *Epidemiology* 2007;18(6):658-63.

13. Barten F, Mitlin D, Mulholland C, Hardoy A, Stern R. Integrated approaches to address the social determinants of health for reducing health inequity. *J Urban Health* 2007;84(3 Suppl):i164-73.

14. Whitehead M. The concepts and principles of equity and health. *Health Promot. Int.* 1991;6(3):217-28.

15. Salmela R. Health policies and health for all strategies in the Nordic countries. *Health Policy* 1991;18(3):207-18.

16. McCally M, Haines A, Fein O, Addington W, Lawrence RS, Cassel CK. Poverty and ill health: Physicians can, and should, make a difference. *Annals of Internal Medicine* 1998;129(9):726-33.

17. Flores P, Falcoff H. Social inequalities in health: what could be done in general practice? *Rev. Prat.* 2004;54(20):2263-70.

18. Fritzsche K, Armbruster U, Hartmann A, Wirsching M. Psychosocial primary care - what patients expect from their General Practitioners A cross-sectional trial. *BMC Psychiatry* 2002;2:5.

19. Bodenmann P, Jackson Y, Bischoff T, Vaucher P, Diserens EA, Madrid C, et al. Precarite et determinants sociaux de la sante: quel(s) role(s) pour le medecin de premier recours? *Rev Med Suisse* 2009;5(199):845-9.

20. Lee P, Townsend P. *Trends in deprivation in the London labour market: A study of low incomes and unemployment in London*. Geneva: International Labour Organization, 1993.
21. Marmot M. Social determinants of health inequalities. *Lancet* 2005;365(9464):1099-104.
22. Dillman DA. *Mail and Telephone Surveys*. New York: John Wiley and Sons, 2000.
23. Anyaegbu G. Using the OECD equivalence scale in taxes and benefits analysis. *Economic & Labour Market Review* 2010;4(1):49-54.
24. Shoukri MM, Asyali MH, Donner A. Sample size requirements for the design of reliability study: review and new results. *Statistical Methods in Medical Research* 2004;13(4):251-71.
25. Salmond C, Crampton P, King P, Waldegrave C. NZiDep: A New Zealand index of socioeconomic deprivation for individuals. *Social Science & Medicine* 2006;62(6):1474-85.
26. Willems SJ, Swinnen W, De Maeseneer JM. The GP's perception of poverty: a qualitative study. *Fam. Pract.* 2005;22(2):177-83.
27. Bortolotti B, Menchetti M, Bellini F, Montaguti MB, Berardi D. Psychological interventions for major depression in primary care: a meta-analytic review of randomized controlled trials. *General Hospital Psychiatry* 2008;30(4):293-302.
28. Eroglu S. Developing an index of deprivation which integrates objective and subjective dimensions: Extending the work of townsend, mack and lansley, and halleröd. *Social Indicators Research* 2007;80(3):493-510.
29. Sass C, Moulin J-J, Guéguen R, Abric L, Dauphinot V, Dupré C, et al. Le score Epices : un score individuel de précarité. Construction du score et mesure des relations avec des données de santé, dans une population de 197 389 personnes. *Bull Épidemiol Heb* 2006;14:93-96.
30. Sass C, Gueguen R, Moulin JJ, Abric L, Dauphinot V, Dupre C, et al. Comparaison du score individuel de précarité des Centres d'examens de santé, EPICES, à la définition socio-administrative de la précarité. [Comparaison of the individual deprivation index of the French Health Examination Centres and the administrative definition of deprivation]. *Santé Publique* 2006;18(4):513-22.
31. Townsend P. *Poverty in the United Kingdom*. Harmondsworth: Allen Lane and Penguin Books, 1979.
32. Abbott S, Freeth D. Social capital and health: starting to make sense of the role of generalized trust and reciprocity. *J Health Psychol* 2008;13(7):874-83.
33. Gellis Z, Kenaley B. Problem-solving therapy for depression in adults: a systematic review. *Research on Social Work Practice* 2008;18(2):117.
34. Mynors-Wallis LM, Gath DH, Day A, Baker F. Randomised controlled trial of problem solving treatment, antidepressant medication, and combined treatment for major depression in primary care. *BMJ* 2000;320(7226):26-30.
35. Jackson L, Langille L, Lyons R, Hughes J, Martin D, Winstanley V. Does moving from a high-poverty to lower-poverty neighborhood improve mental health? A realist review of 'Moving to Opportunity'. *Health Place* 2009;15(4):961-70.
36. Alexander GC, Casalino LP, Meltzer DO. Patient-physician communication about out-of-pocket costs. *JAMA* 2003;290(7):953-8.
37. Franks P, Fiscella K. Reducing disparities downstream: prospects and challenges. *J Gen Intern Med* 2008;23(5):672-7.
38. Bloch G, Rozmovits L, Giambrone B. Barriers to primary care responsiveness to poverty as a risk factor for health. *BMC Fam Pract* 2011;12:62.
39. Alexander GC, Casalino LP, Tseng CW, McFadden D, Meltzer DO. Barriers to patient-physician communication about out-of-pocket costs. *J Gen Intern Med* 2004;19(8):856-60.
40. Hardee JT, Platt FW, Kasper IK. Discussing health care costs with patients: an opportunity for empathic communication. *J Gen Intern Med* 2005;20(7):666-9.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

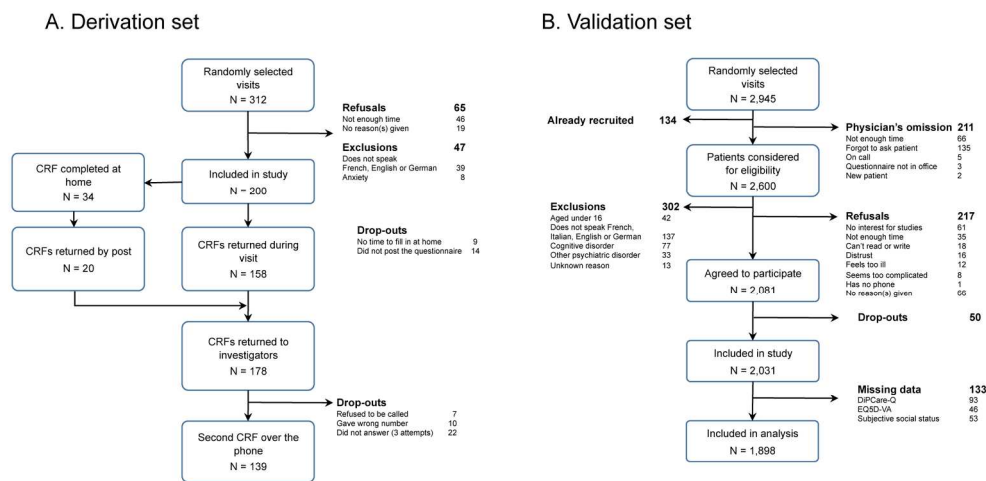
41. Ben-Shlomo Y, White I, McKeigue PM. Prediction of general practice workload from census based social deprivation scores. *J Epidemiol Community Health* 1992;46(5):532-6.
42. Balarajan R, Yuen P, Machin D. Deprivation and general practitioner workload. *BMJ* 1992;304(6826):529-34.

For peer review only

Figure captions

Figure 1: Flow chart giving reasons for refusals and drop-outs. **A** Derivation study, **B** Validation study N = number of patients, CRF = case report form.

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



Flow chart giving reasons for refusals and drop-outs. A Derivation study, B Validation study N = number of patients, CRF = case report form.
178x89mm (300 x 300 DPI)

		Health deprivation index [0] 0 to 1 point						Health deprivation index [1] 2 to 3 points			
Social index	0 point [0]	0	1	2	2	Social index	0 point [0]	1	2	2	3
	1 point [1]	0	1	2	3		1 point [1]	1	2	3	4
	2 points [2]	1	2	3	3		2 points [2]	2	2	3	4
	3 points [2]	1	2	3	4		3 points [2]	2	3	4	5
	4 points [2]	2	3	3	4		4 points [2]	3	3	4	5
	5 points [3]	2	3	4	5		5 points [3]	3	4	5	5
		0 points [0]	1 to 2 points [1]	3 to 6 points [2]	7 to 8 points [3]			0 points [0]	1 to 2 points [1]	3 to 6 points [2]	7 to 8 points [3]
		Material index						Material index			
Overall index = [material deprivation] x 0.810 + [social deprivation] x 0.455 + [health deprivation] x 0.711											

Calculation table for the DiPCare-Q index ranging from 0 to 5 using sub-indexes corresponding to material-, social- and health deprivation.
90x51mm (300 x 300 DPI)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

DiPCare-Q in English, French, German, and Italian

For peer review only

Instructions for calculating DiPCare-Q indexes

- Code all 16 questions (D1 to D16) "1" for "Yes" and "0" for "No".
- Recode questions D7, D8, D9, D11, and D12 "1" to "0" and "0" to "1" for all positive items to be related to deprivation.
- 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: $D14+D15+D16$
- Calculating overall deprivation index: DiPCare-Q index
 - 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
 - Using these variables, compute the overall deprivation index using the following equation for each participant:

$$\text{index} = 0.810 \times \text{mat_cat} + 0.455 \times \text{soc_cat} + 0.711 \times \text{health_cat}$$

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

STATA commands

```

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

gen mat_dep=d1+d2+d3+d4+d5+d6+2*d10+d13
gen soc_dep= d7+d8+d9+d11+d12
gen health_dep= d14+d15+d16

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 1.5000001/2.5=2 2.5000001/3.5=3 3.5000001/4.5=4 4.5000001/5.5=5
5.500001/6.5=6

```

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 (X) the answer that best applies to your own situation.

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

FRENCH

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

- | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|
| 1. Durant les <u>12 derniers mois</u> , avez-vous eu de la peine à payer les factures de votre <u>ménage</u> (impôts, assurances, téléphone, électricité, cartes de crédit, etc.) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 2. Durant les <u>12 derniers mois</u> , avez-vous eu besoin de demander de l'argent à des proches pour des besoins quotidiens ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 3. Durant les <u>12 derniers mois</u> , quelqu'un <u>dans votre ménage</u> a-t-il dû renoncer à se faire soigner parce que vous n'aviez pas assez d'argent (dentiste, médecin, achat de médicaments) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 4. Durant les <u>12 derniers mois</u> , avez-vous eu peur d'être expulsé(e) de votre logement ou de perdre votre habitation ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 5. Durant les <u>12 derniers mois</u> , avez-vous dû renoncer à acheter des habits alors que vous-même ou un membre <u>de votre ménage</u> en avait pourtant besoin ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 6. Durant les <u>12 derniers mois</u> , avez-vous dû renoncer à acheter des meubles ou des appareils alors que vous ou un membre <u>de votre ménage</u> en aviez pourtant besoin ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 7. Durant les <u>12 derniers mois</u> , êtes-vous partis en vacances ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 8. Durant les <u>3 derniers mois</u> , avez-vous partagé une soirée avec des proches ou des amis ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 9. Durant les <u>3 derniers mois</u> , avez-vous été au cinéma, au théâtre, à un concert ou à un événement sportif ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 10. Durant <u>le dernier mois</u> , est-il arrivé qu'il n'y ait pas assez à manger dans votre <u>ménage</u> ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 11. Durant <u>le dernier mois</u> , avez-vous eu la possibilité d'accéder à Internet (maison, travail, bibliothèque, Internet café, etc.) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 12. En cas de difficulté, pourriez-vous faire appel à des personnes <u>extérieures à votre ménage</u> pour vous apporter une aide matérielle (argent, nourriture, logement) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 13. <u>Actuellement</u> , le remboursement d'argent (banque, famille, proche, etc.) vous pose-t-il un problème important ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 14. <u>Actuellement</u> , souffrez-vous d'un handicap physique qui a des conséquences importantes sur votre vie quotidienne ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 15. <u>Actuellement</u> , souffrez-vous de difficultés ou problèmes psychiques qui ont des conséquences importantes sur votre vie quotidienne ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Oui | Non |
| 16. <u>Actuellement</u> , avez-vous des difficultés liées à une consommation d'alcool, de drogue, de jeu, ou autres ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | 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 <u>letzten 12 Monaten</u> Schwierigkeiten, die Rechnungen <u>Ihres Haushalts</u> zu bezahlen (Steuern, Versicherungen, Telefon, Strom, Kreditkarten usw.)? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 2. Mussten Sie in den <u>letzten 12 Monaten</u> bei Angehörigen Geld für den täglichen Bedarf ausleihen? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 3. Musste in den <u>letzten 12 Monaten</u> jemand in <u>Ihrem Haushalt</u> auf medizinische Versorgung verzichten, weil Sie nicht genügend Geld hatten (Zahnarzt, Arzt, Kauf von Medikamenten)? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 4. Hatten Sie in den <u>letzten 12 Monaten</u> Angst, aus Ihrer Wohnung hinausgeworfen zu werden oder Ihre Bleibe zu verlieren? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 5. Mussten Sie in den <u>letzten 12 Monaten</u> auf den Kauf von Kleidung verzichten, obwohl Sie selber oder ein Mitglied <u>Ihres Haushalts</u> diese benötigten? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 6. Mussten Sie in den <u>letzten 12 Monaten</u> auf den Kauf von Möbeln oder Geräten verzichten, obwohl Sie selber oder ein Mitglied <u>Ihres Haushalts</u> diese benötigten? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 7. Sind Sie in den <u>letzten 12 Monaten</u> in die Ferien gefahren? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 8. Haben Sie in den <u>letzten 3 Monaten</u> einen Abend mit Angehörigen oder Freunden verbracht? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 9. Waren Sie in den <u>letzten 3 Monaten</u> im Kino, Theater, an einem Konzert oder einer Sportveranstaltung? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 10. Ist es <u>im letzten Monat</u> vorgekommen, dass es in <u>Ihrem Haushalt</u> nicht genug zu essen gab? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 11. Hatten Sie <u>im letzten Monat</u> die Möglichkeit, ins Internet zu gelangen (zu Hause, Arbeit, Bibliothek, Internet-Café usw.)? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 12. Können Sie bei Schwierigkeiten Personen, die <u>nicht Ihrem Haushalt angehören</u> , um materielle Hilfe bitten (Geld, Nahrungsmittel, Unterkunft)? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 13. Haben Sie <u>gegenwärtig</u> grosse Schwierigkeiten, Geld zurückzuzahlen (Bank, Familie, Angehörige usw.)? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 14. Leiden Sie <u>derzeit</u> an einer körperlichen Behinderung, die weit reichende Auswirkungen auf Ihren Alltag hat? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 15. Leiden Sie <u>derzeit</u> an psychischen Schwierigkeiten oder Problemen, die weit reichende Auswirkungen auf Ihren Alltag haben? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
Nein |
| 16. Haben Sie <u>gegenwärtig</u> Probleme im Zusammenhang mit dem Konsum von Alkohol, Drogen, Spielen oder anderem? | <input type="checkbox"/>
Ja | <input type="checkbox"/>
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 <u>scorsi 12 mesi</u> ha fatto fatica a pagare le fatture del suo <u>nucleo familiare</u> (imposte, assicurazioni, telefono, elettricità, carte di credito, ecc.) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 2. Negli <u>scorsi 12 mesi</u> ha avuto bisogno di chiedere denaro a persone a lei vicine per dei bisogni quotidiani ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 3. Negli <u>scorsi 12 mesi</u> qualcuno nel suo <u>nucleo familiare</u> ha dovuto rinunciare a delle cure perché non aveva denaro a sufficienza (dentista, medico, acquisto di farmaci) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 4. Negli <u>scorsi 12 mesi</u> ha avuto paura di essere sfrattato/a dalla sua abitazione o di perderla ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 5. Negli <u>scorsi 12 mesi</u> ha dovuto rinunciare ad acquistare dei vestiti anche se lei stesso/a o un membro del suo <u>nucleo familiare</u> ne aveva bisogno ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 6. Negli <u>scorsi 12 mesi</u> ha dovuto rinunciare ad acquistare dei mobili o degli apparecchi anche se lei stesso/a o un membro del suo <u>nucleo familiare</u> ne aveva bisogno? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 7. Negli <u>scorsi 12 mesi</u> è andato/a in vacanza? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 8. Negli <u>scorsi 3 mesi</u> ha passato una serata con persone a lei vicine o con amici ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 9. Negli <u>scorsi 3 mesi</u> è andato/a al cinema, a teatro, a un concerto o a una manifestazione sportiva ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 10. Nello <u>scorso mese</u> è successo che non ci fosse cibo a sufficienza nel suo <u>nucleo familiare</u> ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 11. Nello <u>scorso mese</u> ha avuto la possibilità di accedere a Internet (casa, lavoro, biblioteca, Internet café, ecc.) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 12. In caso di difficoltà potrebbe fare affidamento su delle persone <u>all'esterno del suo nucleo familiare</u> per chiedere un aiuto materiale (denaro, cibo, abitazione) ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 13. <u>Attualmente</u> la restituzione di denaro (banca, famiglia, persone a lei vicine ecc.) rappresenta un problema importante per lei ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 14. <u>Attualmente</u> soffre di un handicap fisico che ha conseguenze importanti sulla sua vita quotidiana ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 15. <u>Attualmente</u> soffre di difficoltà o problemi psichici che hanno conseguenze importanti sulla sua vita quotidiana ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |
| 16. <u>Attualmente</u> ha difficoltà legate al consumo di alcool o droga, al gioco o altro ? | <input type="checkbox"/> | <input type="checkbox"/> |
| | Sì | No |

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.

Health deprivation index									
		0 to 1 point [0]				2 to 3 points [1]			
		0	1	2	2	1	2	2	3
Social index	0 points [0]	0	1	2	2	1	2	2	3
	1 point [1]	1	1	2	3	1	2	3	4
	2-4 points [2]	1	2	3	3	2	2	3	4
	5 points [3]	1	2	3	4	2	3	4	5
		0 points [0]	1-2 points [1]	3 to 6 points [2]	7 to 8 points [3]	0 points [0]	1-2 points [1]	3 to 6 points [2]	7 to 8 points [3]
Material index					Material index				
Overall index = [material deprivation] x 0.810 + [social deprivation] x 0.455 + [health deprivation] x 0.711									

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