

# The design and methods of the mental health module in the German Health Interview and Examination Survey for Adults (DEGS1-MH)

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## Abstract

DEGS1-MH is part of the first wave of the German Health Interview and Examination Survey (DEGS1) covering all relevant health issues. Aims of DEGS1-MH are to supplement DEGS1 by describing (1) the distribution and frequency, the severity and the impairments of a wide range of mental disorders, (2) risk factors as well as patterns of help-seeking and health care utilization, and (3) associations between mental and somatic disorders, (4) and by comparisons with a similar survey in the late 1990s (GHS-MHS), longitudinal trends and changes in morbidity over time. Out of all eligible DEGS1 respondents (nationally representative sample aged 18–79), N = 5318 subjects (conditional response rate 88%) were examined at their place of residence by clinically trained interviewers with a modified version of the standardized, computer-assisted Composite International Diagnostic Interview (DEGS-CIDI). Innovative additions were: a comprehensive neuropsychological examination, a broader assessment of psychosis-like experiences, disorder-specific disabilities, help-seeking and health care utilization. The mental health module and its combination with the assessment of somatic and other health issues in DEGS1 allow for internationally unique, detailed and comprehensive analyses about mental disorders and the association of mental and somatic health issues in the community, constituting an improved basis for regular future surveys of this sort. Copyright © 2013 John Wiley & Sons, Ltd.

## Introduction

Recently, the Robert Koch Institute (RKI) presented the background, the aims and the design and methods of the German Health Interview and Examination Survey (DEGS, Scheidt-Nave *et al.*, 2012). DEGS is part of the continuous national health monitoring system established in Germany and provides nationally representative data on the health status of the adult general population. Against the background of several health interview and examination surveys for different subsets of the population carried out since 1984 (see Scheidt-Nave *et al.*, 2012), the German Ministry of Health commissioned the RKI to implement a system of health studies for continuous monitoring of the non-institutionalized population. The first wave of DEGS (DEGS1) is the cornerstone of this ambitious program focusing on the adult, non-institutionalized general population aged 18–79. Because of the increasing recognition of the societal burden of mental disorders (Wittchen *et al.*, 2011; Wittchen, 2012), it was decided to deal with mental health issues in a separate supplementary module (DEGS1-MH), to accommodate for the need of differential diagnostic clinical assessments for mental disorders and the time burden associated with such clinically more detailed assessments.

Accordingly two associated surveys were conducted in a coordinated way based on the same nationally representative sample of the German general population. First, the main survey DEGS1, covering the general health status, risk factors, health related behaviours, a wide range of diagnoses of somatic disorders and conditions, along with laboratory tests, assessments of quality of life, a core set of mental health indicators and utilization of health care resources (Scheidt-Nave *et al.*, 2012). Second, contingent on the completion of the DEGS1, subjects participated additionally in the additional mental health module (DEGS1-MH) for the assessment of prevalence, severity, and comorbidity of mental disorders and a range of other relevant mental health domains.

The DEGS1 and the DEGS1-MH are essentially the successor of a previous comprehensive study conducted in the year 1998, namely the “German National Health Interview and Examination Survey 1998” (GNHIES98; Bellach *et al.*, 1998) that was also coupled with a separate mental health module (GHS-MHS; Jacobi *et al.*, 2002; Wittchen *et al.*, 1999). This mental health module was the first nationally representative adult community study of this sort in Germany, providing comprehensive data about the lifetime and 12-month prevalence of mental disorders (Jacobi *et al.*, 2004b; Wittchen *et al.*, 2000; Wittchen & Jacobi, 2001), along with a broad range of associated topics

of relevance such as associations and interactions between mental and somatic health (Goodwin *et al.*, 2003; Härter *et al.*, 2007; Ratcliffe *et al.*, 2009; Sareen *et al.*, 2006) or associated impairments and help-seeking (Wittchen and Jacobi, 2004; Jacobi *et al.*, 2004a). This earlier study revealed that the prevalence of mental disorders had been widely underestimated, that most disorders evidently remain undiagnosed and untreated, and that they are associated with high disability and cost burden for the society (Gustavsson *et al.*, 2011; Wittchen, 2002, 2004; Wittchen and Jacobi, 2005, Wittchen *et al.*, 2011). The GHS-MHS findings also served as input for major pan-European Union (EU) re-analyses on the size and burden of mental disorders in Europe (Wittchen *et al.*, 2011).

When designing the new DEGS1 survey, the availability of the previous GNHIES98 and GHS-MHS prompted the development of a complex sampling scheme with the goal to define a national representative sample of the adult general population, enriched by participants of the previous 1998 survey. This should allow for both, a nationally representative, general population sample to provide an up to date description (e.g., in terms of prevalence and risk factors) as well as cohort and trend analyses, and prospective risk factors examinations. This complex sampling scheme and the respective methodological aspects of the overall DEGS approach have been presented already in detail in a methods publication (Scheidt-Nave *et al.*, 2012).

## Aims

This paper provides information about the aims, design and methods of the mental health component (DEGS1-MH) supplementing the recent overall DEGS1 presentation (Scheidt-Nave *et al.*, 2012). Overall aims of the DEGS1-MH module are to describe:

- (1) the distribution and frequency, the severity and the impairments of a wide range of mental disorders by gender and age groups, including the elderly (65–79 years);
- (2) the comorbidity patterns and the interactions between mental disorders and physical conditions, for example with regard to course and outcome, quality of life, role functioning;
- (3) risk factors as well as patterns of help-seeking and health care utilization;
- (4) further, we provide a more comprehensive assessment and description of mental disorders according to DSM-IV-TR (American Psychiatric Association, 2000), for example by including a neuropsychological module that allows to compare cognitive factors, such as attention, memory and executive functions

over the lifespan and across different morbidity patterns, and a broader assessment of psychosis-like experiences;

- (5) DEGS1-MH will also allow updated descriptions of met and unmet needs in the mental health field in light of recent changes in the health care sector by describing help-seeking patterns and changes in the morbidity spectrum since 1998 (i.e. incidence, remission, predictors of healthy aging, etc.).

**Methods**

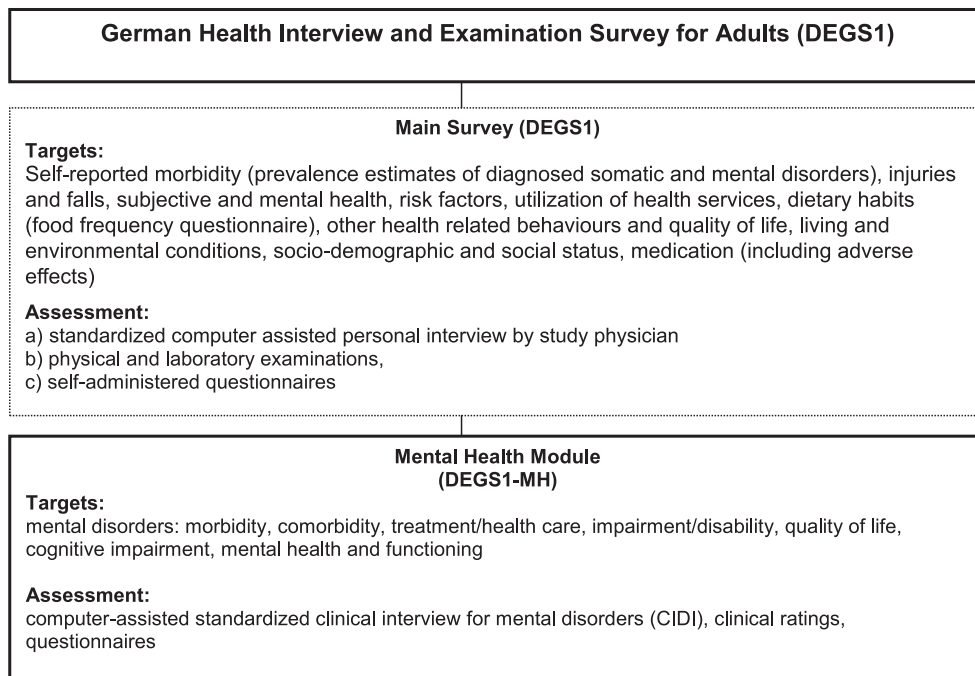
**Study components**

The overall DEGS study design with its main survey and the mental health module is presented in Figure 1. The DEGS1-MH was designed as an independent assessment wave, administered by an independent research group of clinical experts (see authors and acknowledgments), subsequent to completion of the main survey. The study proposal, field procedures, and information for respondents of DEGS1 were approved by the Medical Ethics Review Committees responsible for the RKI main survey (Charité, Berlin) and for DEGS1-MH by the Ethics Board of the Technische Universität Dresden, respectively.

**Sample**

**Sampling of DEGS1 participants**

In order to perform both cross-sectional and longitudinal analyses, DEGS adopted a mixed study design (see details in Scheidt-Nave *et al.*, 2012; Kamtsiuris *et al.*, in press) that is only briefly summarized here. A nationally representative sample of persons aged 18-79 was randomly chosen from local population registries and then supplemented by former participants of the predecessor GNHIES98 study. The random sample was drawn by the RKI in two steps (two-layered cluster sample). First, among all German political communities, 180 study sample points were determined. In doing so, the 120 former sample points from GNHIES98 were retained and supplemented by 60 newly chosen sample points. Second, subjects were randomly selected from local population registries covering the 180 sample points. Again invited were those GNHIES98 participants who had neither died nor moved abroad and agreed to renewed contact. These people were now 28 to 91 years old. The total number of DEGS1 participants was  $N = 8152$ , of which  $N = 164$  subjects were older than 79 and  $N = 872$  were only interviewed, but not assessed by clinical and laboratory examinations. A total of  $N = 7116$  DEGS1 participants aged 18-79 years had complete assessments with interview and examination



**Figure 1.** The German Health Interview and Examination Survey (DEGS1).

(Scheidt-Nave *et al.*, 2012). The response rate among previous GNHIES98 participants was consistently higher (64%) than the one for the newly sampled (42%).

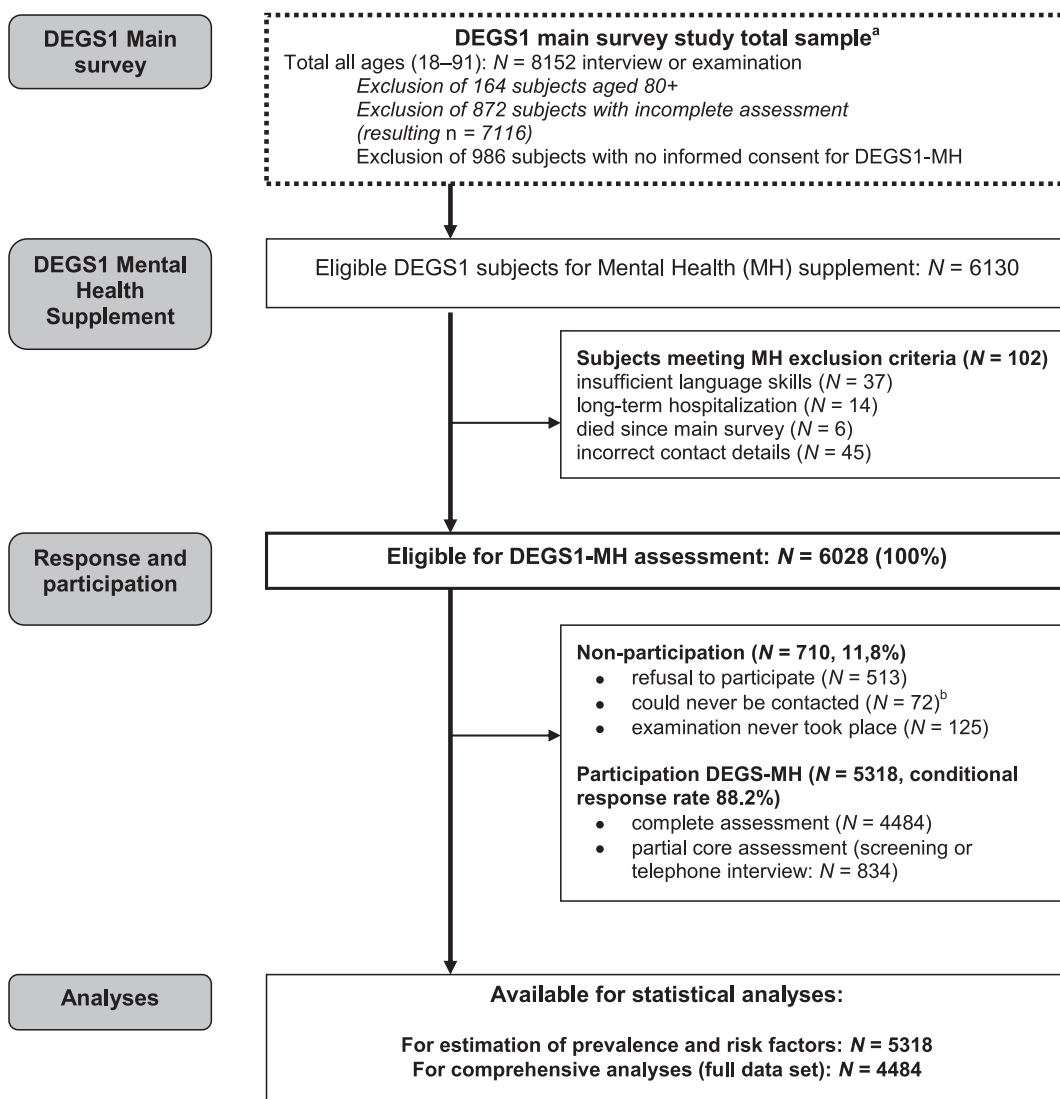
**Eligibility for the DEGS1-MH assessment**

For the DEGS1-MH, only DEGS1 participants were eligible who met the following criteria: (a) age 18–79, (b) complete DEGS1 assessment consisting of the medical interview and examination, laboratory tests and self-report scales, (c) informed consent to be re-contacted by the independent DEGS1-MH team for the mental health supplement and

(d) meeting general inclusion criteria; that is subjects had to have sufficient language skills to complete the mental health assessment and had to be available during the assessment period (see later and Figure 2). Based on these criteria a total of  $N = 6028$  (100%) of the DEGS1 participants were defined as being eligible for the mental health supplement.

**Recruitment procedure, response and non-response in DEGS1-MH**

During the physical examination, DEGS1 participants were asked to provide informed consent to be re-contacted



**Figure 2.** Response and non-response in DEGS1-MH.

<sup>a</sup>See Scheidt-Nave *et al.* (2012) and Kamtsiuris *et al.*, in press. <sup>b</sup>After a minimum of 10 contact attempts by telephone or letter (different days and times).

for a home visit appointment for additional mental health examinations. However,  $N=986$  subjects did not wish to be re-contacted, thus the RKI only transmitted the contact data of  $N=6130$  subjects who were aged 18–79, had a complete DEGS1 assessment and who agreed to be re-contacted by the mental health team. A further  $N=102$  (1.7%) did not meet inclusion criteria because of wrong contact data ( $N=45$ ), insufficient language skills ( $N=37$ ), long-term hospitalization ( $N=14$ ), or because they were deceased in the time interval between DEGS1 and DEGS1-MH contact ( $N=6$ ). Thus  $N=6028$  remained for the DEGS1-MH assessment and were re-contacted for participation for the additional examinations (Figure 2).

Of the contacted subjects, 513/6028 (8.5%) refused participation, 125/6028 (2.1%) were willing to participate, but the interview never took place, and 72/6028 (1.2%) could never be contacted. The remaining, namely  $N=5318/6028$ , form the final DEGS1-MH sample (conditional response rate of 88.2%). Of the 5318 DEGS1-MH participants,  $N=2245$  subjects (42%) already participated the 1998 predecessor study (GNHIES98), among them  $N=1611$  subjects (30%) also examined in the GNHIES98 mental health supplement (GHS-MHS).

Thus,  $N=4484/5318$  completed the full DEGS1-MH assessment, while  $N=834$  completed only the core part of the assessment package, by only completing a screening interview, based on the Composite International Diagnostic Interview (CIDI) stem questions (CID-S; Wittchen *et al.*, 1999). Reasons for administering the screening interview were: time constraints ( $N=450$ ), health problems ( $N=49$ ), and other reasons ( $N=335$ , not further explored). Thus, for the statistical analyses, in particular for estimations of prevalence and risk factors  $N=5318$  subjects were available, while more comprehensive data analyses are restricted to  $N=4484$  subjects who completed the full assessment. It should be noted, that screening interviews and missing diagnostic information in parts of the interview were imputed to derive probabilities for diagnosis (see later).

### Weighting

The complex sampling strategy of DEGS required multiple weighting steps. Adopting the DEGS1 design, sample and attrition weights of the RKI for the  $N=7116$  DEGS1 respondents aged 18–79 with complete data (Scheidt-Nave *et al.*, 2012), post stratification weights were calculated for DEGS1-MH respondents (separate weights for both  $N=5318$  and  $N=4484$ ). First, marginal (and partially multivariate) distributions of age, sex,

federal state of residence, community size, education and German citizenship according to the official records of the local population registries were iteratively adjusted to the German population in the age of 18–79 (Kamtsiuris *et al.*, in press). Then logistic regression, using the weights provided by the RKI, were applied to predict participation in the mental health module. Eleven demographical, socio-economical and geographical covariates were considered in the model. In the multiple model which determined the final weight, four variables remained statistically significant (in  $N=4484$ : linear and squared terms of age, German citizenship and total socio-economical level (dimensional; Lampert *et al.*, in press), in  $N=5318$  the cubic term of age was included as well). The RKI weight was multiplied with the inverse model-based predicted probability to be a participant in the mental health module. Finally, the weight was rescaled in both samples so that the average weight equaled one. Weights for longitudinal analysis are yet to be developed.

Age varied between 18 and 79 years (at the time of the physical examination in the main survey). In exceptional cases, however, the time-lag between core survey and mental health examination was more than one year resulting in the fact that in 15 cases, participants were older than 79 years at the time of the mental health examination. Tables 1 and 2 show the distribution of selected socio-demographic variables in the DEGS1 main survey and DEGS1-MH.

### Fieldwork DEGS1-MH

The fieldwork and assessment domains of the main DEGS1 survey have been presented elsewhere (Scheidt-Nave *et al.*, 2012). The DEGS1-MH computer assisted personal interviews (CAPI) were performed from September 2009 to March 2012 at the respondent's place of residence either at home ( $N=1020$ ), at local study centers that had been already used in the main survey assessment ( $N=2715$ ), or at another place of the participant's choice if neither home or study center were suitable (e.g. café, workplace;  $N=187$ ). However,  $N=562$  (12.5%) interviews were conducted via telephone (CATI). Interviews were usually performed 2–8 weeks after the main survey examination (time lag: median=6 weeks; 55% < 6 weeks, 12% 6–12 weeks, 33% > 12 weeks). The relatively long field period optimized the opportunity to re-contact respondents when no interview was possible at the first regular tour of the interviewer team to their residence. Appointments were made six to eight weeks before examination.



**Table 1.** Demographic distribution of the German population, the respondents of the main survey (DEGS1) and the respondents of the mental health supplement (DEGS1-MH) unweighted (*N*, %) and weighted (%*w*)

	German population 31 December 2010 (in thousand)		DEGS1 <i>N</i> =7116 <sup>1</sup>			DEGS1-MH <i>N</i> =5318				
	<i>N</i>	%	<i>N</i>	%	% <i>w</i> <sup>RKI</sup>	<i>N</i>	%	% <i>w</i> <sup>RKI</sup>	% <i>w</i> <sup>TUD</sup>	
<i>Men</i>										
18–24	3 444.2	10.8	318	9.3	10.8	213	8.4	10.0	10.8	
25–34	4965.4	15.6	399	11.7	15.6	283	11.1	14.6	15.2	
35–44	5901.3	18.5	485	14.2	18.6	378	14.9	19.6	19.2	
45–54	6766.5	21.2	673	19.7	21.3	501	19.7	21.5	21.1	
55–64	4990.1	15.7	612	17.9	15.6	456	18.0	15.7	15.2	
65–69	2106.1	6.6	370	10.8	6.6	290	11.4	7.2	7.1	
70–79	3 676.1	11.5	554	16.2	11.6	419	16.5	11.4	11.4	
	31 849.7									
<i>Women</i>										
18–24	3 292.5	10.2	312	8.4	10.2	213	7.7	9.4	10.4	
25–34	4827.8	15.0	428	11.6	15.0	309	11.1	14.4	14.6	
35–44	5693.1	17.7	562	15.2	17.7	423	15.2	18.1	17.9	
45–54	6562.2	20.3	794	21.4	20.3	625	22.5	21.1	20.3	
55–64	5123.4	15.9	680	18.4	15.9	513	18.5	16.0	15.5	
65–69	2275.8	7.1	373	10.1	7.1	299	10.8	7.6	7.6	
70–79	4 479.6	13.9	556	15.0	13.9	396	14.3	13.4	13.7	
	32 254.4									
<i>Total</i>										
18–24	6 736.7	10.5	630	8.9	10.5	426	8.0	9.7	10.6	
25–34	9793.2	15.3	827	11.6	15.3	592	11.1	14.5	14.9	
35–44	11594.4	18.1	1047	14.7	18.1	801	15.1	18.8	18.5	
45–54	13328.7	20.8	1467	20.6	20.8	1126	21.2	21.3	20.7	
55–64	10113.5	15.8	1292	18.2	15.7	969	18.2	15.8	15.4	
65–69	4381.9	6.8	743	10.4	6.8	589	11.1	7.4	7.3	
70–79	8 155.7	12.7	1110	15.6	12.7	815	15.3	12.4	12.5	
	64 104.1									

<sup>1</sup>DEGS1 respondents aged 18-79 years with both interview and examination data

Note: %*w*<sup>RKI</sup>, sample weight provided by RKI, accounting for selection probabilities of sampling points and age groups, regional distribution, German citizenship, education and re-participation probability of former GNHIES98 participants; %*w*<sup>TUD</sup>, post-stratification weight provided by TUD to additionally account for non-participation in DEGS1-MH

Interview duration [mean = 66.3 minutes; standard deviation (SD) = 27.7] varied depending on age and diagnostic status and could go up to several hours. Interviews were conducted strictly confidential face-to-face interviews involving only interviewer and participant. In 9% of the interviews, however, at least one more person (usually family member or partner) was present at least for some time in the examination room; but *post hoc* comparisons of these subjects revealed no differences in the reporting behavior of these subjects, thus it is unlikely that this protocol deviation has a significant effect on findings.

## Interviewers

The fieldwork was conducted by a total of 49 clinically trained and experienced interviewers (94% clinical psychologists or advanced clinical psychology students, 6% other occupational background, e.g. medical students). Most of the interviewers were highly experienced due to their inclusion in previous studies with the instrument. All interviewers had to complete at least one mandatory DEGS-CIDI training (two days plus supervision of at least two training interviews). Additionally training

**Table 2.** Socio-demographic characteristics of DEGS1 and DEGS1-MH sample (unweighted and weighted)

	DEGS1 (N= 7116)					DEGS1-MH (N= 5318)				
	N <sup>1</sup>	M	SD	Mw	SDw	N <sup>1</sup>	M	SD	Mw	SDw
Age	7116	50.6	16.7	47.4	16.7	5318	51.0	16.4	47.4	16.7
		N	%	%w			N	%	%w	
18–19		217	3.0	3.9			146	2.7	4.0	
20–29		854	12.0	14.9			602	11.3	15.0	
30–39		842	11.8	14.7			609	11.5	14.3	
40–49		1296	18.2	21.4			991	18.6	21.3	
50–59		1399	19.7	18.2			1064	20.0	18.0	
60–69		1398	19.6	14.1			1091	20.5	14.8	
70–79		1110	15.6	12.7			815	15.3	12.5	
Sex										
male	7116	3411	47.9	49.7		5318	2540	47.8	49.6	
female		3705	52.1	50.3			2778	52.2	50.4	
		M	SD	Mw	SDw		M	SD	Mw	SDw
SES <sup>2</sup> – job position (range 1–7)	6941	3.4	1.3	3.3	1.2	5242	3.5	1.3	3.3	1.2
SES – education (range 1–7)	7048	4.0	1.5	3.7	1.5	5280	4.0	1.5	3.7	1.4
SES – income (range 1–7)	7116	4.1	1.8	4.0	1.9	5318	4.2	1.8	4.0	1.8
SES – aggregated (range 1–21)	7048	11.5	3.6	11.0	3.6	5280	11.7	3.6	11.1	3.5
SES – distribution total		N	%	%w			N	%	%w	
low SES	7048	1160	16.5	19.8		5280	766	14.5	19.3	
medium SES		4209	59.7	60.1			3168	60.0	60.7	
high SES		1679	23.8	20.1			1346	25.5	20.0	
German citizenship										
yes	7116	6802	95.6	90.5		5318	5146	96.8	90.9	
no		314	4.4	9.5			172	3.2	9.1	
Municipality: Number of inhabitants										
<2000	7116	612	8.6	7.1		5318	482	9.1	7.4	
2000–< 5000		691	9.7	8.1			503	9.5	8.0	
5000–< 20000		1714	24.1	23.9			1277	24.0	24.2	
20000–< 50000		1479	20.8	19.6			1106	20.8	19.5	
50000–< 100000		601	8.4	9.8			452	8.5	10.1	
100000–< 500000		1023	14.4	15.9			749	14.1	15.1	
>= 500000		996	14.0	15.5			749	14.1	15.7	
Marital status										
married (living together)	7042	4477	63.6	61.0		5278	3424	64.9	61.7	
married (separated)		121	1.7	1.8			97	1.8	1.9	
never married		1587	22.5	26.1			1118	21.2	25.5	
divorced		453	6.4	6.0			347	6.6	5.9	
widowed		404	5.7	5.1			292	5.5	5.0	

<sup>1</sup>Available N; differences to total N due to missing data.

Note: SES, measures of socio-economic status Lampert *et al.*, in press

components dealt with ethically sensitive issues and issues concerning data protection, and skills in the management of potentially difficult interview situations. For the neuropsychological assessment, additional specialized trainings of one day were conducted.

The average interviewer worked in 21.3 sample points (SD = 13.0; range = 1–45) and conducted 193.4 (SD = 128.6; range = 6–415) interviews. Payment for interviewers varied according to interviewer status (student/postgraduate, service contract/employed) and effort related to length of interview trip.

### Monitoring and quality assurance

Fieldwork was monitored closely over the entire data collection period using a monitor protocol. Interviewers were monitored by four supervisors (one regularly present in every interviewer team) according to three standard protocols: (a) the overall DEGS1 fieldwork protocol (see Scheidt-Nave *et al.*, 2012) defined contact behavior, informed consent and the general procedures during fieldwork (appearance, clothing, etc.); (b) the standard CIDI protocol defined all rules and guidelines to be followed while administration the standardized assessment with the CAPI platform the CIDI; (c) the third protocol defined handling of data after assessment, transmission of data to the study center and data quality control and assurance as well as plausibility checks as defined by the CIDI platform (see Wittchen and Pfister, 1997).

Refreshment training of half-day duration took place every six months for all current interviewers. Regular external random quality control by RKI group leaders did not reveal any significant violations of the study protocols. Data entry of each participant (including questionnaire data) was independently double checked by two editors.

During fieldwork, “critical events” (e.g. aggression, alcohol or drug intoxication of a participant, acute suicidality) were extremely rare ( $N < 20$ ) and were immediately reported to supervisors who supported the interviewers and contacted the participants by telephone if needed. In no case a negative or harmful outcome related to the examination could be identified.

In order to check acceptance and satisfaction with the examination procedures, 20% of the participants with complete interviews ( $N = 849$ ) were asked to rate the following items on a four-point rating scale (see Table 3): initial contact before interview, material and study information, competence of interviewer, atmosphere during interview, effort to participate in study, meaningfulness/relevance of examined topics, computer-assisted interview tool, and detail of examination. Further they were asked if they would participate again in such a study in the future. Items correlated highly amongst each other and loaded only on one factor (eigenvalue 2.01, all other factors 0.21) that can be interpreted as overall satisfaction with examination. On average participants were highly satisfied (mean = 1.15, SD = 0.23) on the scale ranging from one (very satisfied) to four (not satisfied at all), and 98% stated that they would participate again. There were some indications of a higher satisfaction in older and females respondents. No associations were found with regard to psychopathology (as measured with the number of positive stem questions of the CIDI and the PHQ9, see later).

### Diagnostic instruments and domains

Table 4 provides an overview on the diagnostic and non-diagnostic assessment domains. All components were assessed within one computer-assisted standardized procedure implying interview questions and ratings by the respondents

**Table 3.** Participant satisfaction (%) with DEGS1-MH assessment procedure ( $N = 849$ )

Satisfaction with ... <sup>1</sup>	1	2	3	4
Initial contact before interview	95.6	3.7	0.7	0.0
Material and study information	88.0	10.4	1.3	0.3
Competence of interviewer	97.3	2.7	0.0	0.0
Atmosphere during interview	95.3	4.3	0.4	0.1
Effort to participate in study	86.3	12.2	1.3	0.2
Meaningfulness/relevance of examined topics	77.7	20.7	1.3	0.4
Computer-assisted interview tool	78.8	11.4	1.9	7.9
Detail of examination	83.8	15.0	0.8	0.4
Willingness to participate again	98%			

<sup>1</sup>Items were rated on a four-point rating scale (1 = very satisfied, 4 = not satisfied at all).



**Table 4.** DSM-IV-TR diagnoses (A), and other diagnostic and non-diagnostic (B) domains covered in DEGS1-MH

(A) DSM-IV-TR Diagnoses (F-Codes according to ICD-10)	(B) Other diagnostic and non-diagnostic domains
<p><b>1. Mental disorders due to general medical condition</b> General medical condition (GMC; F06.x) Substance-induced diagnoses (F1x.x)</p> <p><b>2. Substance-related disorders</b> Nicotine dependence (F17.2x) Alcohol abuse (F10.1x) Alcohol dependence (F10.2x) Any alcohol-related disorder (F10.1/2) Medication abuse (F11/F13/F15.1x) Medication dependence (F11/F13/F15.2x) Any medication-related disorder (F11/F13/F15.1/2)</p> <p><b>3. Schizophrenia and other psychotic disorders (F2x.x)</b></p> <p><b>4. Anxiety disorders</b> Panic-disorder with and without agoraphobia (F40.01) Agoraphobia without history of panic disorder (F40.00) Generalized anxiety disorder (F41.1) Social phobia (40.1) Specific-phobia (F40.2) - Animal-type (F40.21) - Blood-injection-injury-type (F40.23) - Natural-environmental-type (F40.22) - Situational-type (F40.24) - Other type (F40.25)</p> <p><b>5. Obsessive-compulsive disorder (F42.x)</b></p> <p><b>6. Post-traumatic stress disorder (F43.1)</b></p> <p><b>7. Affective (Mood) disorders</b> Major depression Single episode (F32.x) Recurrent episode (F33.x) Non-remitted recurrent (F32/33.1/2/3) Specifier for MDD (mild, F32/33.0; moderate, F32/33.1; severe, F32/33.2/3) - mild (F32.0) - moderate (F32.1) - severe (F32.2/3) - with melancholic features (F3x.x1) - with postpartum onset Dysthymic disorder (with hierarchy) (34.1) Bipolar I affective disorder (F30.1/2, F31.1-9) Bipolar II affective disorder (F30/31.0)</p>	<p><b>1. Neuropsychological section</b> Subjective memory impairment (Jessen, 2007) Prospective memory (Kliegel <i>et al.</i>, 2007) Episodic memory (Morris <i>et al.</i>, 1989; Luck <i>et al.</i>, 2009) Verbal working memory (von Aster <i>et al.</i>, 2006) Visual search, attention, task-switching (Reitan and Wolfson, 1993) Mental speed (Jolles <i>et al.</i>, 1995; van der Elst <i>et al.</i>, 2006) Verbal fluency (Morris <i>et al.</i>, 1989; Jolles <i>et al.</i>, 1995; Luck <i>et al.</i>, 2009) Verbal intelligence (Lehrl, 2005)</p> <p><b>2. Impairments and disabilities</b> Impairment days (within past four weeks) due to psychological/psychosomatic and somatic problems, alcohol/drug intake or medication</p> <p><b>3. Help-seeking behavior due to psychological problems</b> - Inpatient: seven types of institutions - Outpatient: psychiatrist, psychotherapist (four types), general practitioner, counselor (eight types), other institutions (seven types) - Kind of treatment (medication, behavior therapy, other psychotherapy, none of these) - Barriers of utilization of health services - Discontinuation of therapy (remitted, partly remitted, dissatisfaction with therapy/therapist, problems with health insurance, stigmatization, change of residence, etc.)</p> <p><b>4. Subjective generic quality of life (EQ-5D)</b> (Hinz <i>et al.</i>, 2006; Greiner <i>et al.</i>, 2003)</p> <p><b>5. (short) BIG Five Inventory (BFI-10)</b>(Rammstedt, 2007)</p> <p><b>6. Life Orientation Test (LOT)</b> (Scheier <i>et al.</i>, 1994)</p> <p><b>7. Cross-sectional depressive symptoms (PHQ-9)</b> (Kroenke <i>et al.</i>, 2001)</p> <p><b>8. Suicidal tendency</b> (five items) (Wittchen and Pfister, 1997)</p> <p><b>9. Fatigue scale for motor and cognitive functions (FSMC)</b> (Penner <i>et al.</i>, 2009)</p> <p><b>10. Psychotic experiences:</b> Launay–Slade Hallucinations Scale (LSHS) (Launay and Slade, 1981; Laroi <i>et al.</i>, 2004) Peters <i>et al.</i> Delusions Inventory (PDI) (Peters, 2004)</p> <p><b>11. Effort-Reward-Imbalance (ERI) for working and non-working subjects</b> (Siegrist <i>et al.</i>, 2004; Siegrist and Jacobi, 2009)</p>

*(Continues)*

**Table 4.** (Continued)

(A) DSM-IV-TR Diagnoses (F-Codes according to ICD-10)	(B) Other diagnostic and non-diagnostic domains
<b>8. Eating disorders</b>	
Anorexia nervosa (F50.0)	
Bulimia nervosa (F50.2)	
Binge eating (F50.9)	
<b>9. Somatoform disorders</b>	
SSI4/6 (F45.0)	
Pain disorder (F45.4)	
<b>10. Clinical and other interviewer observations</b>	
- Brief psychiatric rating scale (BPRS)	
- Interview setting, participant's behavior and features	

or the interviewer, the instruction and administration of tests and self-report scales, and the coding rules. Within this assessment platform, the DEGS-CIDI (DIA-X/M-CIDI) was the main component.

The DEGS-CIDI is a modified version of the World Health Organization CIDI (Kessler and Üstün, 2004), available in more than 16 languages, also used in the World Mental Health series and internationally in hundreds of comparable surveys (ESEMED/MHEDEA 2000 Investigators, 2004; Haro *et al.*, 2006; Kessler and Üstün, 2008; Kessler *et al.*, 2004). The fully structured algorithm- and computer-based DIA-X/M-CIDI (Lachner *et al.*, 1998; Reed *et al.*, 1998; Wittchen *et al.*, 1991; Wittchen, 1994; Wittchen and Pfister, 1997) allows for reliable assessments of symptoms and syndromes according to the criteria of DSM-IV-TR [with its compatible International Classification of Disease, 10th Revision (ICD-10; WHO, 1993) codes] for different time frames (four-week, 12-month, and lifetime), along with information about onset, duration, and severity of threshold and subthreshold conditions. Moreover, in this study, for all “key syndromes”, the medical and non-medical help-seeking behavior as well as medication use were assessed and coded.

Additional standard CIDI probe questions allow the description of physical factors and diseases as well as substances that might be causally associated with the symptoms described by the subjects. Diagnoses are derived in a highly objective manner by using exclusively the standardized CIDI diagnostic program to ensure that the diagnostic criteria are strictly applied on the basis of the symptom information without the interviewer playing any role in making diagnostic statements.

The DEGS-CIDI maintained the overall structure and rules and protected the integrity of the diagnostic program. However, to allow addressing the research questions in an optimal and efficient way, several adaptations were made:

- The initial psychosocial CIDI section (i.e. section A: socio-demographics) was shortened to avoid overlap with main DEGS1 survey, where this information was already assessed in greater detail.
- The CIDI section L was limited to medication use and abuse. Illegal drug use disorders were not assessed because of the associated time burden and previous evidence of low base rates, insufficient for detailed analyses. Further, several regular and specialized drug use surveys already exist in Germany (Kraus *et al.*, 2010).
- Standard CIDI questions on impairment and disability were supplemented by a more detailed assessment of disorder-specific functional impairments.
- The use of CIDI skip-rules in almost all diagnostic sections were minimized, to allow for the assessment of subthreshold conditions (conditions falling short of mandatory DSM-IV-TR diagnostic criteria), to improve the dimensional description within the diagnostic status description.
- Section Q on help-seeking, service use and treatment was extended by CIDI questions regarding (a) diagnosis-specific help-seeking behavior of general health care providers, specialized psychiatric and psychological institutions, and complementary, informal providers, (b) frequency and type of received treatment/intervention, (c) person- and system-based barriers, e.g. stigmatization, attitude, knowledge about illness and symptoms.

The DEGS-CIDI covers the following groups of mental disorders: mood disorders (major depression, dysthymia, bipolar disorder I and II, lifetime and past 12 months), anxiety disorders (panic disorder, agoraphobia, generalized anxiety disorder, social phobia, specific phobias in the past 12 months, except for panic (lifetime and 12-month), obsessive-compulsive disorder (past 12 month), post-traumatic stress disorder (lifetime and past 12 month), substance use disorders (nicotine dependence, alcohol and medication abuse and dependence; lifetime and 12-month), somatoform disorders (pain disorder and undifferentiated somatoform disorder as measured by the Somatic Symptom Index, SSI4,6; lifetime and past 12 month), eating disorders (anorexia nervosa, bulimia nervosa, binge eating disorder; lifetime and past 12 month), psychotic disorders (lifetime) and cognitive impairment (see later).

Due to the diagnostic criteria and the conventions for reporting, only the 12-month frame should be considered as an appropriate diagnostic reporting standard for all diagnoses, except for two groups of disorders, namely mood disorders that could be interpreted for lifetime and 12-month, and psychotic disorders for which only lifetime estimates are meaningful. For the disorders only assessed for the past 12 months, additional “prior 12 months” information is only available when symptoms were present within last year.

### Neuropsychological section

The DEGS1-MH includes a cognitive and neuropsychological assessment module for all respondents to map cognitive function over the whole adult life span. The test battery can be used to examine cognitive function scores in relation to a range of other aspects of mental and somatic health, health behaviors and psychosocial characteristics. It can also serve to identify persons with reduced levels of cognitive functioning by applying normative data for individual tests, e.g. from the Consortium to Establish a Registry for Alzheimer’s Disease (CERAD) test battery (Luck *et al.*, 2009). The neuropsychology section included the following measures: subjective memory impairment (SMI) and related concerns were assessed by the questions: “Do you feel like your memory is becoming worse?” and if the answer was yes, “Does that worry you?” and “Does that worry you a lot?” (Jessen, 2007) and for a subsample ( $N=1427$ ) further questions on memory impairment (comparison with peers, impairment rating, health care utilization due to memory problems). Then the following test battery was administered (Table 4). It consisted of 10 cognitive performance tests (administration time: mean = 21.4, SD = 4.3 minutes) and was developed to

assess six domains of cognitive functioning with reasonable efficiency: memory: episodic memory (immediate and delayed recall of word lists from CERAD; Morris *et al.*, 1989; Luck *et al.*, 2009), prospective memory (two tasks that could be administered by telephone, analogous to CogTel; Kliegel *et al.*, 2007), and verbal working memory (digit span backwards analogous to Wechsler Intelligence Scale for Adults; Von Aster *et al.*, 2006); executive function and mental speed (verbal fluency task analogous to CERAD; Morris *et al.*, 1989; Luck *et al.*, 2009; letter digit substitution test (LDST); Jolles *et al.*, 1995; van der Elst *et al.*, 2006; Trail making tests (TMT) A and B analogous to CERAD; Morris *et al.*, 1989); and verbal IQ (multiple choice vocabulary test, MWT-B; Lehl, 2005).

In addition to analyzing individual test scores, a composite measure of global cognitive function will be created by converting each cognitive performance test into a *z*-score and averaging *z*-scores of all tests (stratified by age, education, verbal intelligence where appropriate). Composite measures of specific cognitive domains can similarly be created (e.g. memory, mental speed, and executive function).

### Additional instruments

The following non-diagnostic modules were added to the diagnostic interview.

*Personality:* Inclusion of resource-oriented variables and personality dimensions as moderators of health-related behavior (Big Five Inventory short form, BFI-10; Rammstedt, 2007; Life Orientation Test, LOT-R, depicting optimism, Scheier *et al.*, 1994).

*Subjective generic quality of life:* the short questionnaire EQ-5D was used (Greiner *et al.*, 2003), since the main survey covers further comprehensive assessments.

*Suicidal tendency:* assessment of suicidal thoughts, plans, attempts, self-destructive behavior, also in subjects who were not interviewed in the CIDI depression section (this was a limitation of previous studies).

*Cross-sectional depressive symptoms and fatigue* were assessed with the PHQ-9 (Kroenke *et al.*, 2001) and the Fatigue Scale for Motor and Cognitive Functions (FSMC; Penner *et al.*, 2009) for cognitive and physical fatigue.

*Effort-Reward Imbalance:* This psychological construct refers to “gratification crisis models”. In collaboration with the author of the original instrument (ERI; Siegrist *et al.*, 2004), a variant for non-working participants was developed, since a relevant proportion of the sample ( $N=2489$ ; 55.5%) was not, not yet, or no longer employed.

*Psychotic experiences:* We modified and supplemented the CIDI psychosis section by using psychosis-screenings regarding delusional events along with their frequency, subjective disturbance and conviction of thoughts (PDI; Peters, 2004) and hallucinations in all sensory modalities (LSHS; Launay and Slade, 1981; Bentall and Slade, 1985). Both are validated for surveys in the general population.

#### Imputation of missing data and screening interviews

In exceptional cases only parts of the interview and the CIDI stem questions were administered. The questionnaire instruments, usually embedded in the interview, were given to complete and send back later. In  $N=834$  cases, when it was not possible to arrange an interview appointment the screening interview (CIDI stem questions) was conducted. Given that the sensitivity and specificity of the CIDI stem questions for diagnostic status is well established (CID-S; Wittchen *et al.*, 1999), we calculated for these incomplete data rows, model based estimates of the probability of every diagnosis, to enhance the power of prevalence estimates. Covariates for predicting these probabilities were age, gender and the 11 stem questions. We forced the number of items endorsed (represented by five dummy variables) in the logistic regression models as well as the main effects of age and sex and their interaction. On top of that, specific items as well as the quadratic and cubic terms of age were selected with combined backward and forward selection (exclusion probability=0.05, inclusion probability=0.01; when the cubic term of age was in the model, the quadratic term was left in, too). In case of rare diagnoses where numerical problems in prediction occurred, model selection was simplified: Only age and the dimensional count of endorsed stem questions were forced into the model, stem questions with empty cells in combination with a diagnosis were disregarded. All regressions were weighted. This imputation method was also conducted for cases, which did not complete the respective CIDI section for a specific diagnosis. In the final DEGS1-MH dataset, prevalence estimation will always be reported separately for the  $N=4484$  respondents with a complete diagnostic data set and the total sample examined of  $N=5318$  using the model-based probabilities for the 834 with partial assessment.

#### Discussion and conclusion

In this paper we presented essential information on design, sampling (response rate, weighting), socio-demographic

sample characteristics, fieldwork and assessment methods of the DEGS1-MH. The overall aim of DEGS1 is to describe the health status and the morbidity patterns of the adult German population covering both, somatic health and crude indicators of mental health within the DEGS1 main survey and mental disorders and more detailed measures of mental health in the separate mental health module (DEGS1-MH).

In comparison to previous mental health studies, DEGS1-MH is expected to provide more detailed and more comprehensive information about the mental health status, mental disorder as well as the health care utilization and the functional limitations in the German general population, aged 18–79. In terms of power considerations for diagnostic issues, the study could be regarded as well powered for all disorders with a prevalence of 1.5% or above, given a total of 5318 respondents. With regard to longitudinal analyses (possible for  $N=1611$  participants), certain power restrictions will apply, requiring to collapse single diagnoses for some specific diagnoses into larger diagnostic groups. The more comprehensive coverage of diagnostically relevant mental health issues in DEGS1 and DEGS1-MH will allow for addressing a large range of research questions.

The high acceptance and satisfaction with the study procedures corresponds to other studies using similar demanding interviews for mental disorders (Hoyer *et al.*, 2006). Together with the results of internal and external quality control, this suggests that the fieldwork was designed and conducted properly. Further strengths are the greater emphasis on dimensional measures, improved information about severity, course and disability, the neuropsychological assessment and the opportunity to link data from the somatic and general health component (DEGS1) with the more detailed assessment of mental disorders (DEGS1-MH) cross-sectionally and longitudinally.

#### Limitations of the design

An important limitation in DEGS1 might be the fact that certain high risk groups might not be appropriately covered, such as residents that are long-term or permanently institutionalized, immigrants not speaking fluent German, and the homeless. Another potential limitation might be that both surveys, DEGS1 and DEGS1-MH, were in some cases significantly apart in time (out of the target range 2–6 weeks). Thus, some cross-sectional analyses linking the two survey waves might need caution. However this potential limitation might not be critical, because more than 90% of participants reported during the

DEGS1-MH interview to have the same overall health state as during the preceding DEGS1 examination.

Undoubtedly the sampling design of this ambitious program is quite complex, raising the question of how representative findings will be for the German adult population overall. This question is critical, given that the design tries to accommodate for various goals at a time. First, sample selection was based on an established (Bellach *et al.*, 1998; Kurth *et al.*, 2008) complex two-stage stratified cluster random sampling, using communities as the primary sample points and population registry data for the non-institutionalized adult population aged 18–79 with permanent residence in Germany. This ensured, within acceptable limits, the representativeness of the target population (Scheidt-Nave *et al.*, 2012; Kamsturius *et al.*, in press). Additionally however the study should be powered for longitudinally analyses by enriching the sample with respondents from the previous 1998 national survey. This additional goal required complex additional strategies and considerations (i.e. replacement, power) to add appropriately the past respondents into the overall sample of the newly sampled. And finally the additional incorporation of the separate mental health module, associated with loss due to lacking informed consent and other reasons for attrition needs to be accommodated for. Thus, due to the complex nature of the overall sampling and design, there was the need of substantial design and post-stratification weighting to adjust for potential deviations in representativeness, particularly so because of substantial differences in response rates among newly sampled (42%) and past participants (64%, see Scheidt-Nave *et al.*, 2012, for details). Additionally, the clustering of participants within sample points has to be accounted for in statistical analyses by using procedures designed to analyze data derived from a complex sample survey (Siller, Tompkins, 2006).

Comparisons of the sampled distribution of DEGS1-MH participants with the true distribution in the population regarding a series of variables (like age, gender, education level) suggest that our findings in the mental health supplement reflect well the true distribution and could be regarded as representative for the German adult population in the age range 18–79. The highly satisfying conditional response rate of 88% at least for the DEGS1-MH and the fact that the weighting procedures do not change the distribution substantially add further confirmation.

It is also noteworthy that declining response rates in population based health surveys have internationally and consistently been reported over the past decade (Galea and Tracy, 2007; Tolonen *et al.*, 2006). Selection bias resulting from selective participation of healthier persons

is a concern in any population-based survey (Criqui *et al.*, 1978). Survey results may therefore underestimate the overall prevalence of chronic diseases and disability. But, as Galea and Tracy (2007) point out, most studies have found little evidence for substantial bias as a result of non-participation, and that extreme efforts to increase participation rates may introduce even more bias into the study if the added respondents are not representative for all non-respondents, or if they are less conscientious in the survey participation.

### Coverage of cognitive abilities

Given the current scientific interest in a better characterization of cognitive factors associated with disorders of the brain, the availability of our neuropsychological data, is a particularly exciting strength of our study. This is to our knowledge the first general population study ever that provides such data, focusing on a broad spectrum of cognitive domains over the whole life span. This will allow to determine the distribution of cognitive impairments and to analyze cognitive function in relation to many other aspects of health. However, no information about functional impairment was obtained from informants (e.g. from relatives), and no information on changes to cognitive function over time is available and other clinical causes of reduced cognitive function cannot be reliably excluded. Thus, it will not be possible to identify clinical diagnoses such as a mild cognitive impairment (MCI) and dementia. In general, the study design of DEGS1 was not suitable to estimate prevalences of dementia since it included a random sample of people from the general population who were able to come to the study center, give informed consent and be interviewed and examined for on average two hours without significant language problems. People living in institutions or having functional or cognitive impairments are therefore most likely to be underrepresented in the study (Scheidt-Nave *et al.*, 2012). Despite this limitation, the data on cognitive function collected in DEGS1-MH is a valuable resource for psychiatric epidemiology and research on public mental health. It can be used to examine cognitive function in relation to a range of other aspects of mental and somatic health, to health behaviors and to psychosocial characteristics both in cross-sectional and longitudinal analysis. The results of such analyses can contribute importantly to the development of strategies for the prevention of dementia and cognitive decline in Germany and of actions at the population level to enable people to preserve their cognitive function as a key component of healthy aging. In future study waves, for which the current wave can serve as a baseline assessment, it may be



possible to identify persons with cognitive decline or new dementia or MCI in later longitudinal analyses. One particular advantage of DEGS1-MH is that cognitive function has been assessed in participants of all age groups. Thus, it will be possible to examine the long-term effects of predictors of cognitive decline starting in early or middle adult age.

### Coverage of psychosis-like experiences

Another innovative component is the section dealing with psychosis-like experiences. The main rationale to include the assessment of psychotic and psychosis-like experiences is that previous studies (Cougnard *et al.*, 2007; Dominguez *et al.*, 2010; Dominguez *et al.*, 2011; Kaymaz *et al.*, 2012; Wigmann *et al.*, 2012) showed highly variable prevalences of such experiences in unselected samples of the general population, and that the prospective significance of such experiences for the presence or the future development of mental disorders is still unclear. Psychosis-like experiences were reported in up to 30% of the general population (reviewed by Nuevo *et al.*, 2012). However, in most cases, such experiences are not “psychotic” (i.e. in a strict sense of the term referring to delusions or hallucinations), but comprise near-normal experiences like magical thinking (reviewed by Nelson *et al.*, 2012). Assessing the symptoms with psychometric scales usually results in much higher prevalence rates compared to using the CIDI psychosis scale (around 10%) or operationalized diagnostic assessments for ICD-10/DSM-IV diagnoses (around 1%) (Nuevo *et al.*, 2012). Also, such symptoms and experiences are usually of a fluctuating or transient nature. Obviously, the point prevalence of such experiences is much higher than the point prevalence of psychotic disorders (around 1%), which indicates that there are different patterns or that additional factors must play a role in determining the progression from transient experiences to a psychotic disorder. Factors like the type of symptom experiences (for example, truly paranoid ideas like persecution versus “near-normal” experiences like magical thinking), environmental, neurocognitive and genetic factors may play a role (Nelson *et al.*, 2012). There is a need to explore the interplay between these experiences and such associated factors with a view to establish risk factors for the development of mental disorders following the occurrence of psychosis-like experiences in otherwise healthy persons. Such knowledge would be essential for assessing the individual risk of progression from psychosis-like experiences to frank mental disorders. This could lead to effective prevention and early detection due to intensified medical follow-up of those persons with high risks of progression. In addition to

the prognostic significance of psychosis-like experiences, Nuevo *et al.* (2012) showed that the occurrence of any such symptom is associated with distress and functional impairments irrespective of the development of a mental disorder. This indicates that the health-outcome of persons with such symptoms needs to be monitored and long-term studies are needed. DEGS1-MH provides a unique opportunity to assess the mental health outcome of persons with such findings.

### Conclusion and further perspectives

To conclude, the DEGS1-MH provides up-to-date and internationally uniquely detailed and comprehensive data on the distribution of mental and somatic health symptoms and diagnoses. The standardized methodology used in this study program allows cross-national comparisons with similar surveys such as the National Comorbidity Survey Replication in the United States (NCS-R; Kessler *et al.*, 2004, 2005) or the Netherlands Mental Health Survey and Incidence Study (NEMESIS-2; de Graaf *et al.*, 2010, 2012). In line with the study of Kessler *et al.* (2012), such more coherent prevalence and morbid risk estimates resulting from our study will inform policy-makers and the public and will also provide science and research with more solid evidence about determinants, severity, course, and associated psychological and social disabilities of mental disorders, as well as their association with somatic disorders.

DEGS1-MH provides a sustainable basis for future research. Currently several research projects are underway using DEGS1-MH data for in depth analysis, among them: (1) methodological and statistical support of the DEGS1-MH research consortium; (2) affective disorders and their correlates; (3) associations of mental disorders with chronic stress and the so called “burnout syndrome”, (4) estimation of changes of mental disorders in the general population during the last ten years; (5) cognitive performance and its association with mental and somatic disorders; (6) processes and circumstances of remissions and chronic courses of mental disorders; (7) help seeking behavior and the use of the health care system; (8) investigation of the comorbidity of somatic and mental disorders, and (9) development of short research instruments for the monitoring of mental disorders in the general population.

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### Declaration of interest statement

The authors have no competing interest to declare.

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