



**University of  
Zurich**<sup>UZH</sup>

**Zurich Open Repository and  
Archive**

University of Zurich  
Main Library  
Strickhofstrasse 39  
CH-8057 Zurich  
[www.zora.uzh.ch](http://www.zora.uzh.ch)

---

Year: 2017

---

**Implications of population aging and resulting multiple social responsibilities  
on health outcomes of the workforce**

Häusler, Nadine Sara

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-152462>

Dissertation

Published Version

Originally published at:

Häusler, Nadine Sara. Implications of population aging and resulting multiple social responsibilities on health outcomes of the workforce. 2017, University of Zurich, Faculty of Science.

## **Chapter III**

Impact of parenthood, informal caregiving and its combination on  
self-rated health – A population based study in Switzerland

Nadine Häusler, Oliver Hämmig, Matthias Bopp

Published in: Journal of Population Ageing. 2017 Oct 23. doi: 10.1007/s12062-017-9208-0

## **ABSTRACT**

**Objectives** In view of the lack of representative longitudinal studies comparing the effect of different caregiving situations on self-rated health, we aim to study the effect of parenting underage children and informal caregiving with or without children on self-rated health at baseline and one year later and whether this effect differs between the sexes.

**Methods** Sex-stratified linear mixed models were performed to assess the effect of different informal caregiving situations on self-rated health at baseline and one year later, using data from the Swiss Labor Force Survey.

**Results** In Switzerland, the percentage of informal caregivers with and without children is low and has been decreasing since 1997. Informal male caregivers with and without children reported significantly worse health at baseline, whereas no significant difference was found for informal female caregivers. Mothers and fathers (defined as living with underage child(ren) in the same household) without informal caregiving responsibilities reported slightly better health compared to non-caregivers. The caregiving situation did not affect the general decline in self-rated health for women, whereas fathers reported significantly worse and informal male caregivers significantly better health one year later compared to the change in self-rated health among non-caregivers.

**Discussion** Being parent, informal caregiving and the combination of both have a substantial impact on self-rated health at baseline and one year later. The effects however differ between men and women as well as between caregiving roles. More population-based studies investigating the effect of informal caregiving on health outcomes among both sexes are needed.

**Keywords:** Informal caregivers, parents, sandwich-generation, sex differences, health status

## **BACKGROUND**

As a large share of the growing elderly population [1] relies either on formal or informal care due to impaired health, the demand for informal care is expected to rise in the future. As informal caregivers are needed to complement the long-term formal care workforce due to the limited human resources in the healthcare sector, it is crucial to assess the effect of informal caregiving on the care provider's health. Low fertility rates, postponed parenthood [2] and longer lasting dependency of children on their parents [3] combined with the increasing labor force participation of women [4] lead to higher opportunity costs for informal caregiving [5], especially for women who have traditionally been care providers. Nevertheless, it is becoming more common for men to provide care [6,7], the most important care providers being family, friends or neighbors [8]. Higher opportunity costs, the increased personal mobility and the trend to smaller families and childless couples compared to the past [9] has led to a decline in the number of potential informal caregivers (IC) [10]. However, some studies report constant shares of primary ICs and the subgroup of informal caregivers with dependent children (ICC) [11] also termed the "sandwich-generation" [12]. Whereas there is a lack of recent information about the proportion of informal caregivers (ICs and ICCs) in the Swiss population, the OECD [13] estimated that about 13% of the Swiss population over 50 provided informal care in 2013. The percentage of ICCs was estimated to be lower at about 6-7% of the female population aged 40-49 in 1999 [14]. The prevalence of ICs and ICCs varies greatly in different studies depending on their operationalization and study population [7,14].

### **Theoretical framework on how caregiving affects health**

Role theory provides three conflicting perspectives or hypotheses as to how caregiving can affect health: role strain, role enhancement and role expansion. Whereas the role strain hypothesis implies adverse health effects due to role overload and/or time scarcity [15], the role enhancement hypothesis suggests favorable health outcomes resulting from status enhancement and security as well as personality enrichment [16]. Instead of a purely additive model, the role expansion hypothesis postulates that personal commitment to a role mitigates its effect on health [17].

Whereas these three hypotheses focus on the current health effects of informal caregiving, two controversial hypotheses have been proposed to explain the long-term effects of informal caregiving on health and well-being: whereas the “wear and tear” hypothesis predicts persisting negative effects due to the erosion of the informal caregivers’ resources, the adaption model suggests that the negative effects of informal caregiving to disappear after an adaption phase [18].

### **Effect of caregiving situations on health**

Self-rated health is a valid and reliable indicator of morbidity [19] and mortality [20] and is influenced by sociodemographic characteristics [21,22]. Most studies assessing the effect of parenthood on self-rated health did so in combination with employment and revealed inconsistent results. Whereas some studies found worse self-rated health for employed women [23,24], other suggest beneficial effects on self-rated health for these women [25–28] as well as for employed men [27,28]. Studies investigating the effect of informal caregiving on self-rated health are mostly cross-sectional and point to adverse health effects for ICs compared to non-ICs [29,30] although contradictory results were also found [31]. Longitudinal studies revealed inconsistent results, as some found only short-term adverse health effects for female ICs [32], whereas population-based studies reported long-term survival benefits for female ICs [33,34] and ICs in general, regardless of their sex [10,35]. Sex differences in self-rated health are pointed out in another study which showed adverse effects on self-rated health for female ICs but not for male ICs, who reported better self-rated health two years later [36]. Most studies of the health of ICCs were cross-sectional and reported worse self-rated health for ICCs compared to non-ICCs [37], whereas no such association was found between ICCs and well-being [38]. Penning [39] reported sex differences, with male ICCs reporting worse emotional health compared to males occupying fewer caregiving roles, while female ICCs reported better emotional health. These ambiguous results may stem from different operationalizations of ICs and ICCs [7], different outcome measures [40], different study populations [7,8] as well as the inclusion of other covariates.

## **Research questions**

Most previous studies investigating the impact of informal caregiving on caregivers' health do not contrast different caregiving situations but focus on either ICs or ICCs and are cross-sectional. With some exceptions [for example 41,127], most studies rely on non-representative convenience samples with different recruitment methods for caregivers versus non-caregivers, possibly leading to biased and confounded results [10]. We aim to fill this gap by evaluating the effect of different caregiving situations on self-rated health at two time points in a representative sample of the Swiss population and hence aim to answer the following questions:

1. What are the effects of parenting, informal caregiving and the combination of both on self-rated health at baseline and are these effects different between the sexes?
2. What are the effects of informal caregiving roles on self-rated health over time and do they differ between the sexes?

## **METHODS**

### **Data source**

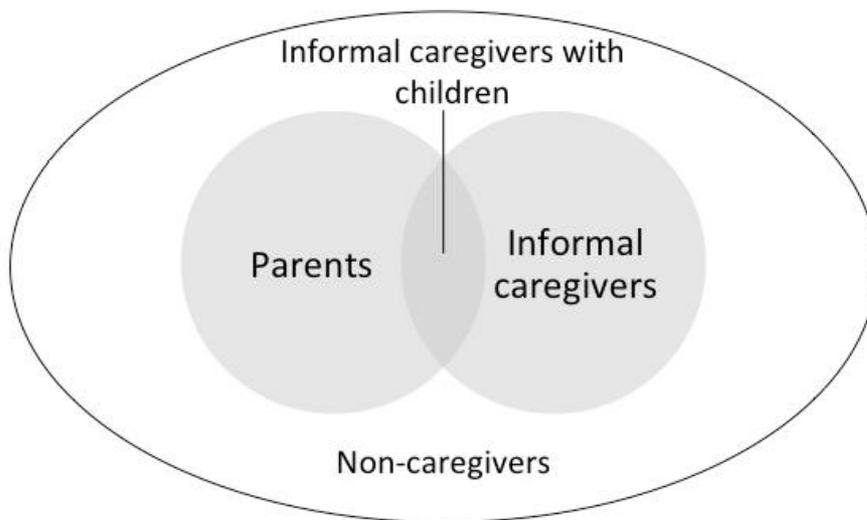
The Swiss Labor Force Survey is conducted by the Swiss Federal Statistical Office and is based on a nationally representative probability sample of the population permanently resident in Switzerland aged over 15 years. The data is assessed at individual and household level via telephone interviews. In the years 1997, 2000, 2004, 2007, 2010 and 2013, a national module on unpaid work provided data on domestic, childcare and voluntary work [42]. Before 2010, the Swiss Labor Force Survey was conducted in the second quarter of the year and the participants were re-interviewed in the following three years. Since 2010, this survey is conducted quarterly, includes a question on self-rated health and interviews participants four times within 18 months. Questions belonging to the national module were asked only at the first interview and participants were asked about their health status at the first interview (baseline) and at the third interview (one year later). As this is an observational study with

survey data collected on a voluntary and anonymous basis, no approval by an ethics committee was required.

We restricted the study population to participants who had not yet reached the statutory retirement age (i.e. 65 for men and 64 for women) responding to the national module on unpaid work, since only these can be evaluated as regards the prevalence of diverse caregiving situations. For the core study – examining the effect of informal caregiving on self-rated health – we had to restrict ourselves to participants from the 2010 and 2013 Swiss Labor Force Surveys with follow-up information one year after the initial survey. Finally, all participants with missing values on variables of interest were excluded, resulting in a study population of 12,863 men and 14,152 women.

## **Measures**

The dependent variable of self-rated health was measured on a 5-point Lickert scale ranging from 1 (very good) to 5 (very bad). We categorized the study population into *caregiving groups* according to their additional caregiving roles or a combination of these (Fig 1). The reference group of *non-caregivers* has no additional caregiving roles for either dependent children or dependent adults, whereas individuals identifying at least one underage person in the same household as their or their partner's child were classified as *parents*. Adult children were not taken into account for this categorization since time transfers to adult children are of a different intensity and quality than those to underage children [43,44]. Study participants living in the same household with an adult person in need of care ('Does someone living in your household rely on care?') and/or providing informal care to a related adult or another adult living outside of the household ('Did you carry out unpaid work in the last four weeks? If yes, did you provide care for a related adult or another adult living outside of the household?') are categorized as *ICs*. Study participants performing both these caregiving roles i.e. living in the same household with at least one child under 18 years and providing informal elderly care are classified as *ICCs*. As no information about caregiver status is available one year later, we had to assume the same caregiving category for both assessments of self-rated health.



**Fig 1.** Caregiving groups

As control variables, we used age, marital status (classified into married, single or divorced) and educational level. The latter is based on the highest ISCED-level achieved and was categorized into three levels, namely primary (0-2), secondary (3-4) and tertiary education (5-6) in accordance with Eurostat's educational attainment classification. Further we adjusted for level of employment with the following categories: less than 10% or unemployed, 10-49%, 50-89%, 90-100%.

### **Statistical analysis**

We calculated the proportion of ICs and ICCs for the years 1997, 2000, 2004, 2007, 2010 and 2013 separately. The repeated measurement of self-rated health in 2010/11 and 2013/14 allowed us to use linear mixed models to investigate whether the caregiving groups differed with regard to self-rated health at baseline and one year later, and whether they differed with regard to a change in self-rated health over one year. Hence we included fixed effects for caregiving groups, changes in self-rated health over one year and interaction terms for caregiving groups with changes in self-rated health over one year as well as random effects for the subjects to account for within-subject correlations. As we assume differences between the sexes, we stratified the analyses by sex and adjusted for sociodemographic characteristics such as age, marital status and education as well as year of survey.

Further, we controlled for the level of employment, as this is a protective factor with respect to health and may affect the time burden of caregivers. Hence, for each individual  $i = 1, \dots, n$ , there are two measurements at time points  $j = 0, 1$ . The linear mixed regression model has the following form:

$$SRH_{ij} = \beta_0 + \beta_1 * age_i + \beta_2 * marital\ status_i + \beta_3 * education_i + \beta_4 * work\ volume_i + \beta_5 * caregiving\ groups_i + \beta_6 * timepoint_{ij} + \beta_7 * caregiving\ groups_i \# timepoint_{ij} + \beta_8 * survey\ period_i + u_{0i} + \varepsilon_{ij},$$

With  $\beta_0$  being the intercept,  $u_{0i}$  being the individual random intercept and  $\varepsilon_{ij}$  being the residuals [45]. All variables in the model are kept constant over time, only the time point variable changes (baseline and one year later).

In further sensitivity analyses designed to check the robustness of the results, we additionally adjusted for restrictions in daily activities, chronic health problems and the care needs of the caregivers themselves. We also refined the four caregiving groups according to their active participation in the workforce and re-ran the model. We performed all analyses using STATA 14.0.

## RESULTS

In 2013, the proportion of the Swiss population who had not yet reached the statutory retirement age and were providing informal care (regardless of parenthood) was 3.67% and 1.36% for ICCs (Table 1). The proportion of people in Switzerland providing informal care regardless of parenthood, i.e. ICs and ICCs, has been decreasing since 1997. This decrease was more pronounced in ICs (i.e., those not living with underage children in the same household) than in ICCs, for which the trend is less clear.

**Table 1** Proportion of Swiss residents providing informal care from 1997 to 2013, Swiss Labor Force Survey

	1997 (n=11,054)	2000 (n=12,036)	2004 (n=36,766)	2007 (n=32,151)	2010 (n=16,391)	2013 (n=16,382)
Informal care providers	5.50	4.87	4.72	4.38	3.81	3.67
<i>ICs</i>	3.68	2.98	3.04	2.69	2.49	2.31
<i>ICCs</i>	1.82	1.89	1.68	1.69	1.32	1.36

Although average self-rated health across all caregiving groups was between good (2) and very good (1)– with the exception of male ICs (2.05) – differences were found between caregiving groups as well as between the sexes (Table 2). Parents reported the best self-rated health for both sexes and time points. ICs revealed significantly worse self-rated health at baseline for both sexes. Whereas fathers and male non-caregivers generally reported significantly better health than their female counterparts, no significant differences in SRH between the sexes for ICs and ICCs emerged.

**Table 2** Average self-rated health at baseline (Swiss Labor Force Survey 2010 and 2013) and one year later (Swiss Labor Force Survey 2011 and 2014) for caregiving groups, unadjusted

	Women <sup>1</sup>			Men <sup>1</sup>		
	N	Self-rated health at baseline	Self-rated health one year later	N	Self-rated health at baseline	Self-rated health one year later
Non-caregivers	8266	1.77 (1.75-1.79)	1.81 (1.79-1.83)	7892	1.72 (1.70-1.75)	1.74 (1.72-1.76)
Parents	5158	1.66 (1.63-1.69)	1.68 (1.66-1.71)	4568	1.59 (1.57-1.62)	1.64 (1.61-1.66)
ICs	436	1.93 (1.83-2.02)	1.92 (1.83-2.01)	192	2.05 (1.91-2.18)	1.88 (1.73-2.05)
ICCs	227	1.72 (1.59-1.85)	1.78 (1.65-1.91)	138	1.92 (1.72-2.11)	1.93 (1.75-2.11)

<sup>1</sup> Sample size: Women; 14,152 Men; 12,863

### Effect of caregiving roles in women

The effect of the caregiving situation on self-rated health for women is shown in Table 3. Whereas at baseline only ICs reported worse, and mothers as well as ICCs reported better self-rated health than non-caregivers, the difference was only significant for mothers (-0.085). Self-rated health worsened significantly over one year for women in general (0.04). However the change in self-rated health over one year for all caregiving groups did not differ significantly from the change in self-rated health in female non-caregivers.

**Table 3** Effects of caregiving situations on self-rated health - Swiss Labor Force Survey 2010/11 & 2013/14

	Women <sup>1</sup>			Men <sup>1</sup>		
	Coef.	CI (95%)		Coef.	CI (95%)	
Age	<b>0.009</b>	0.008	- 0.011	<b>0.012</b>	0.010	- 0.013
Marital status						
<i>Married (ref.)</i>	0			0		
<i>Single</i>	<b>0.127</b>	0.093	- 0.161	<b>0.034</b>	0.001	- 0.067
<i>Divorced</i>	<b>0.168</b>	0.133	- 0.204	<b>0.055</b>	0.012	- 0.098
Education						
<i>Primary (ref.)</i>	0			0		
<i>Secondary</i>	<b>-0.460</b>	-0.502	- -0.418	<b>-0.320</b>	-0.367	- -0.273
<i>Tertiary</i>	<b>-0.575</b>	-0.618	- -0.531	<b>-0.501</b>	-0.547	- -0.455
Level of employment						
<i>90%+ (ref.)</i>	0			0		
<i>50-89%</i>	<b>0.065</b>	0.036	- 0.093	<b>0.112</b>	0.067	- 0.158
<i>10-49%</i>	<b>0.135</b>	0.099	- 0.172	<b>0.378</b>	0.266	- 0.490
<i>Less than 10% or unemployed</i>	<b>0.403</b>	0.364	- 0.442	<b>0.598</b>	0.539	- 0.656
Caregiving groups						
<i>Non-caregivers (ref.)</i>	0			0		
<i>Parents</i>	<b>-0.085</b>	-0.119	- -0.052	<b>-0.033</b>	-0.064	- -0.001
<i>ICs</i>	0.025	-0.055	- 0.106	<b>0.224</b>	0.098	- 0.350
<i>ICCs</i>	-0.050	-0.162	- 0.062	<b>0.211</b>	0.067	- 0.345
Change in self-rated health over one year	<b>0.040</b>	0.021	- 0.059	0.011	-0.007	- 0.029
Caregiving groups * change in self-rated health over one year						
<i>Non-caregivers*one year later (ref.)</i>	0			0		
<i>Parents*one year later</i>	-0.015	-0.044	- 0.014	<b>0.036</b>	0.008	- 0.065
<i>ICs*one year later</i>	-0.045	-0.119	- 0.028	<b>-0.168</b>	-0.281	- -0.055
<i>ICCs*one year later</i>	0.019	-0.091	- 0.129	-0.004	-0.147	- 0.155

<sup>1</sup> Sample size: Women; 14,152 Men; 12,863

Adjustments for restrictions of daily activities, chronic health problems and the need to rely on care by the caregivers themselves decreased the coefficients for the caregiving groups slightly, although the significant effect for mothers remained (Table 4). When differentiating between the four caregiving groups according to their active participation in the workforce, which results in eight caregiving groups, all unemployed caregiving groups as well as employed ICs reported significant worse self-rated health compared to employees with no caregiving responsibilities, with a stronger adverse effect on self-rated health for all unemployed caregiving groups (Table 5).

**Table 4** Effects of caregiving situations on self-rated health adjusted for unemployment - Swiss Labor Force Survey 2010/11 & 2013/14

	Women <sup>1</sup>			Men <sup>1</sup>		
	Coef.	CI (95%)		Coef.	CI (95%)	
Age	<b>0.009</b>	0.007	- 0.010	<b>0.012</b>	0.010	- 0.013
Marital status						
<i>Married (ref.)</i>	<b>0</b>			<b>0</b>		
<i>Single</i>	<b>0.125</b>	0.091	- 0.158	<b>0.035</b>	0.002	- 0.067
<i>Divorced</i>	<b>0.166</b>	0.131	- 0.202	<b>0.055</b>	0.012	- 0.098
Education						
<i>Primary (ref.)</i>	<b>0</b>			<b>0</b>		
<i>Secondary</i>	<b>-0.458</b>	-0.500	- -0.416	<b>-0.319</b>	-0.366	- -0.272
<i>Tertiary</i>	<b>-0.572</b>	-0.616	- -0.529	<b>-0.500</b>	-0.546	- -0.454
Level of employment						
<i>90%+ (ref.)</i>	<b>0</b>			<b>0</b>		
<i>50-89%</i>	<b>0.054</b>	0.025	- 0.082	<b>0.112</b>	0.067	- 0.158
<i>10-49%</i>	<b>0.114</b>	0.077	- 0.150	<b>0.376</b>	0.264	- 0.489
Caregiving groups						
<i>Employed non-caregivers (ref.)</i>	<b>0</b>			<b>0</b>		
<i>Employed parents</i>	<b>-0.033</b>	-0.068	- 0.001	<b>-0.035</b>	-0.066	- -0.004
<i>Employed IC</i>	<b>0.086</b>	0.003	- 0.168	<b>0.168</b>	0.049	- 0.288
<i>Employed ICC</i>	<b>0.012</b>	-0.118	- 0.141	<b>0.104</b>	-0.024	- 0.232
<i>Unemployed non-caregivers</i>	<b>0.502</b>	0.443	- 0.561	<b>0.581</b>	0.512	- 0.651
<i>Unemployed parents</i>	<b>0.239</b>	0.182	- 0.295	<b>0.578</b>	0.410	- 0.746
<i>Unemployed IC</i>	<b>0.369</b>	0.188	- 0.551	<b>0.995</b>	0.625	- 1.365
<i>Unemployed ICC</i>	<b>0.310</b>	0.107	- 0.512	<b>1.859</b>	1.178	- 2.539
Change in self-rated health over one year	<b>0.039</b>	0.018	- 0.059	0.013	-0.005	- 0.032
Caregiving groups*change in self-rated health over one year						
<i>Employed non-caregivers*one year later (ref.)</i>	<b>0</b>			<b>0</b>		
<i>Employed parents*one year later</i>	<b>-0.009</b>	-0.041	- 0.022	<b>0.034</b>	0.005	- 0.063
<i>Employed IC*one year later</i>	<b>-0.062</b>	-0.146	- 0.022	<b>-0.182</b>	-0.314	- -0.051
<i>Employed ICC*one year later</i>	<b>0.053</b>	-0.069	- 0.176	<b>0.032</b>	-0.119	- 0.184
<i>Unemployed non-caregivers*one year later</i>	<b>0.005</b>	-0.049	- 0.059	<b>-0.017</b>	-0.072	- 0.038
<i>Unemployed parents*one year later</i>	<b>-0.027</b>	-0.077	- 0.023	<b>0.040</b>	-0.105	- 0.185
<i>Unemployed IC*one year later</i>	<b>-0.001</b>	-0.143	- 0.140	<b>-0.116</b>	-0.285	- 0.054
<i>Unemployed ICC*one year later</i>	<b>-0.042</b>	-0.256	- 0.172	<b>-0.235</b>	-0.810	- 0.339

<sup>1</sup> Sample size: Women; 14,152 Men; 12,863

**Table 5** Effects of caregiving situations on self-rated health with adjustment for health problems - Swiss Labor Force Survey 2010/11 & 2013/14

	Women <sup>1</sup>						Men <sup>1</sup>									
	Coef.	CI (95%)	Coef.	CI (95%)	Coef.	CI (95%)	Coef.	CI (95%)	Coef.	CI (95%)	Coef.	CI (95%)	Coef.	CI (95%)		
Age	<b>0.01</b>	0.00–0.01	<b>0.01</b>	0.01–0.01	<b>0.01</b>	0.01–0.01	<b>0.01</b>	0.01–0.01	<b>0.01</b>	0.01–0.01	<b>0.01</b>	0.01–0.01	<b>0.01</b>	0.01–0.01		
Marital status																
<i>Married (ref.)</i>	0		0		0		0		0		0		0			
<i>Single</i>	<b>0.05</b>	0.02–0.08	<b>0.05</b>	0.02–0.08	<b>0.08</b>	0.05–0.11	<b>0.12</b>	0.09–0.16	<b>0.03</b>	0.00–0.06	<b>0.03</b>	0.00–0.06	0.03	-0.00–0.06	<b>0.04</b>	0.01–0.07
<i>Divorced</i>	<b>0.09</b>	0.06–0.11	<b>0.09</b>	0.06–0.12	<b>0.12</b>	0.09–0.15	<b>0.17</b>	0.13–0.20	0.03	-0.00–0.07	<b>0.04</b>	0.00–0.07	0.03	-0.00–0.07	<b>0.06</b>	0.03–0.11
Education																
<i>Primary (ref.)</i>	0		0		0		0		0		0		0		0	
<i>Secondary</i>	<b>-0.35</b>	-0.39–0.32	<b>-0.36</b>	-0.39–0.32	<b>-0.41</b>	-0.44–0.37	<b>-0.45</b>	-0.49–0.41	<b>-0.25</b>	-0.29–0.22	<b>-0.24</b>	-0.28–0.20	<b>-0.31</b>	-0.35–0.27	<b>-0.30</b>	-0.35–0.26
<i>Tertiary</i>	<b>-0.42</b>	-0.46–0.39	<b>-0.44</b>	-0.47–0.40	<b>-0.49</b>	-0.53–0.45	<b>-0.56</b>	-0.60–0.51	<b>-0.37</b>	-0.41–0.34	<b>-0.37</b>	-0.41–0.33	<b>-0.46</b>	-0.50–0.42	<b>-0.48</b>	-0.52–0.43
Level of employment																
<i>90%+ (ref.)</i>	0		0		0		0		0		0		0		0	
<i>50-89%</i>	0.01	-0.01–0.04	0.02	-0.01–0.04	0.03	-0.00–0.05	<b>0.06</b>	0.03–0.09	-0.00	-0.04–0.04	0.02	-0.02–0.06	<b>0.04</b>	0.00–0.08	<b>0.10</b>	0.05–0.14
<i>10-49%</i>	<b>0.04</b>	0.01–0.07	<b>0.05</b>	0.01–0.08	<b>0.07</b>	0.04–0.10	<b>0.13</b>	0.09–0.17	<b>0.09</b>	0.02–0.17	<b>0.12</b>	0.04–0.21	<b>0.24</b>	0.15–0.34	<b>0.34</b>	0.23–0.45
<i>Less than 10% or unemployed</i>	<b>0.15</b>	0.12–0.18	<b>0.18</b>	0.15–0.21	<b>0.26</b>	0.22–0.29	<b>0.38</b>	0.34–0.41	<b>0.19</b>	0.15–0.23	<b>0.22</b>	0.18–0.26	<b>0.42</b>	0.37–0.46	<b>0.55</b>	0.49–0.61
Caregiving groups																
<i>Non-caregivers (ref.)</i>	0		0		0		0		0		0		0		0	
<i>Parents</i>	-0.02	-0.05–0.01	<b>-0.04</b>	-0.07–0.01	<b>-0.04</b>	-0.07–0.01	<b>-0.08</b>	-0.11–0.05	-0.02	-0.05–0.01	-0.02	-0.05–0.00	-0.021	-0.05–0.01	-0.03	-0.06–0.00
<i>IC</i>	0.04	-0.03–0.10	0.04	-0.03–0.11	0.03	-0.05–0.10	0.02	-0.06–0.10	<b>0.12</b>	0.02–0.23	<b>0.15</b>	0.04–0.25	<b>0.169</b>	0.06–0.28	<b>0.18</b>	0.06–0.31
<i>MGC</i>	0.01	-0.09–0.10	0.00	-0.09–0.10	-0.02	-0.12–0.08	-0.04	-0.15–0.07	0.12	-0.01–0.25	0.11	-0.01–0.24	<b>0.188</b>	0.05–0.32	<b>0.20</b>	0.05–0.34
Change in self-rated health over one year	<b>0.04</b>	0.02–0.06	<b>0.04</b>	0.02–0.06	<b>0.04</b>	0.02–0.06	<b>0.04</b>	0.02–0.06	0.01	-0.01–0.03	0.01	-0.01–0.03	0.01	-0.01–0.03	0.01	-0.01–0.03
Caregiving groups * change in self-rated health over one year																
<i>Non-caregivers*one year later (ref.)</i>	0		0		0		0		0		0		0		0	
<i>Parents*one year later</i>	-0.02	-0.04–0.01	-0.15	-0.04–0.01	-0.15	-0.04–0.01	-0.15	-0.04–0.01	<b>0.04</b>	0.01–0.06	<b>0.04</b>	0.01–0.07	<b>0.04</b>	0.01–0.07	<b>0.04</b>	0.01–0.06
<i>IC*one year later</i>	-0.05	-0.12–0.03	-0.045	-0.12–0.03	-0.045	-0.12–0.03	-0.045	-0.12–0.03	<b>-0.17</b>	-0.29–0.06	<b>-0.17</b>	-0.28–0.06	<b>-0.17</b>	-0.28–0.06	<b>-0.17</b>	-0.28–0.06
<i>MGC*one year later</i>	0.02	-0.09–0.13	0.019	-0.09–0.13	0.019	-0.09–0.13	0.019	-0.09–0.13	-0.00	-0.15–0.15	-0.00	-0.15–0.15	-0.00	-0.15–0.15	-0.00	-0.15–0.15
Number of health problems <sup>1</sup>																
<i>0 (ref.)</i>	0								0							
<i>1</i>	<b>0.42</b>	0.39–0.45							<b>0.39</b>	0.36–0.42						
<i>2</i>	<b>0.89</b>	0.86–0.93							<b>0.85</b>	0.81–0.90						
<i>3</i>	<b>1.69</b>	1.62–1.76							<b>1.75</b>	1.66–1.84						
<i>4</i>	<b>2.15</b>	1.95–2.36							<b>1.86</b>	1.64–2.07						
Restriction of daily activities																
<i>Not at all (ref.)</i>			0								0					
<i>Yes, a little</i>			<b>0.77</b>	0.74–0.81							<b>0.74</b>	0.70–0.78				
<i>Yes, a lot</i>			<b>1.60</b>	1.53–1.67							<b>1.63</b>	1.54–1.72				
Chronic health problems																
<i>No (ref.)</i>					0								0			
<i>Yes</i>					<b>0.80</b>	0.78–0.83							<b>0.73</b>	0.70–0.77		
Relying on care from someone else																
<i>No (ref.)</i>									0						0	
<i>Yes</i>									<b>1.46</b>	1.26–1.66					<b>1.09</b>	0.92–1.26

<sup>1</sup> Sample size: Women; 14,152 Men; 12,863

### **Effect of caregiving roles in men**

The effect of the caregiving situation on self-rated health in the male study population is shown in Table 3. The self-rated health of all caregiving groups differed significantly at baseline. Whereas male ICs rated their health as 0.224 worse than male non-caregivers, and male ICCs as 0.210 worse, fathers reported better self-rated health (-0.033) compared to male non-caregivers at baseline. The general decrease in self-rated health over one year (0.011) was not significant. However the decline in self-rated health for fathers over one year (0.036) differed significantly from the decline among male non-caregivers. For male ICs an improvement in self-rated health over one year was observed (-0.168), which differed significantly from the decline in male non-caregivers.

Whereas the effect on the self-rated health of fathers disappeared with additional adjustment for restrictions of daily activities, chronic health problems and the need of caregivers for care themselves, the significant effect on self-rated health remained for male ICs (Table 4). The effect on the self-rated health of ICCs disappeared only with the adjustment for restrictions of daily activities. As for the female population, we found that when differentiating between caregiving groups according to their active participation in the workforce, which results in eight caregiving groups, all unemployed caregiving groups reported significant worse self-rated health than employees with no caregiving responsibilities (Table 5). Whereas employed fathers still rated their health significantly better and employed ICs worse than non-caregivers, the effects for ICCs disappeared.

### **DISCUSSION**

Men providing informal care reported significantly worse self-rated health at baseline compared to those with no caregiving responsibilities. This adverse effect of informal caregiving was not observed among women. The general deterioration in self-rated health over one year did not differ between female caregiving groups and was absent in the male population, as only fathers reported worse self-rated health and male ICs rated their health better after one year.

In our population-based study we identified a much smaller proportion of people providing informal care as well as ICCs compared to previous studies [13,14]. This large difference may be due to the different age range in the study populations, as it is more common to provide informal care at a later stage in life [46], although ICs are found in all age groups [47]. Nevertheless, this points to the problem of different ways of operationalizing informal caregiving situations with or without dependent children. This issue calls for a commonly agreed operationalization of ICs and ICCs in order to increase comparability between studies and facilitate the decision-making process for policymakers. The descriptive results revealed that the share of the population providing informal care, including ICCs, was declining, which has already been suggested in the study by Roth et al. [10] but does not reflect the results of other studies in various countries [11,12]. Institutional differences between countries, in the form of public support and alternatives to informal caregiving, can explain the variation in the proportion of ICs/ICCs between countries to some extent [40]. Although disability-free life expectancy has been increasing [13], the elderly will continue to rely on informal care. We assumed the decline in the proportion of ICs/ICCs to be due to the decreasing number of available informal caregivers rather than to a lack of demand for informal care, which in turn is presumably increasing [40]. Moreover, the decline in proportion does not necessarily imply a reduction in the amount of informal care provided, as it may be that fewer caregivers provide the same amount of informal care, leading to an increased individual share, as Bauer and Souza-Poza [40] pointed out. This potential intensification of informal caregiving could increase the burden on care providers due to a greater time commitment. Although Switzerland is considered to be a country that relies mainly on formal care [32], this is widely complemented by informal care [40].

The results obtained to our first research question show that the effect of caregiving roles on self-rated health differed between the sexes. First we looked at the effect on SRH for parents. Being parent had a small but beneficial effect on self-rated health for both sexes, whereas the effect was stronger for women than men. Although previous studies reported the same beneficial effect on self-rated health [25–28], the results were more inconclusive for employed women [23,24] than for employed men [27,28]. We assumed the positive effect of being parent to be due to the high commitment to this role as suggested by Marks [17]. Hence the stronger effect for women could be due to their higher time

commitment to childcare [48]. Second, we focus on the effect of informal caregiving on SRH. In contrast to being parent only, we found that informal caregiving irrespective of parenthood had no health effect for women, but had adverse health effects for men. This finding contrasts with the literature, which mostly suggested stronger adverse health effects on female ICs [49,50] due to greater time commitment and less support [49]. A meta-analysis suggested that these sex differences regarding the effect of informal caregiving on health were smaller than expected, as women in general report worse health than men, both physical health and depression [51] as well as self-rated health [22]. However, as our analyses were stratified by sex and adjusted for age and level of employment, the results for the caregiving groups hold true within the same sex. Third, we discuss the health implications for ICCs. Whereas the combination of parenting and informal caregiving was a burden for the self-rated health of men, the additional parenting role did not result in a stronger effect on self-rated health for male ICCs compared to male ICs. We assumed there was no double burden for male ICCs, as being father only was not associated with worse self-rated health. The combination of the two caregiving roles did not affect women's self-rated health, as has been reported in previous studies [37] but is in contrast to Penning [39] who found the same sex difference for ICCs regarding emotional well-being. Focusing on the results of the sensitivity analyses, we observed that the adverse effect for the unemployed caregiving groups on health was stronger among men than women. This suggests that the most deprived male caregivers did not participate actively in the workforce. The observation that the strongest adverse health effects were found for the unemployed supports literature about provision of informal care being positively associated with a reduction in working hours and a higher probability to leave the workforce [8]. This highlights the importance of flexible working time policies when people struggle with multiple social roles [8,52]. Robustness checks revealed that the effect of caregiving on self-rated health cannot be attributed to differences in physical health. Hence our results favor the role expansion hypothesis, which differentiates roles with respect to the extent to which they are self-induced, i.e., assuming a greater commitment to parenting than to informal caregiving.

As regards our second research question about the effect of informal caregiving on self-rated health over time, the results also pointed to different effects for the sexes. There was a small but significant general decline in SRH over one year for women but not for men. When looking at the effect of

informal caregiving on SRH of women, we noticed that the caregiving status did not affect the change in self-rated health over time, as none of the caregiving groups differed significantly from the control group. The observation that additional caregiving roles did not aggravate the decline of self-rated health of women over time is documented in other studies on the well-being of female ICs [18]. Among men, we found that male ICs rate their health significantly better after one year, which has been reported in a previous study [53]. There are several possible explanations for this improvement in self-rated health: ICs may become non-caregivers after one year and hence no longer bear this burden, or they adapt their perception of health by comparing their own general health status with that of the care recipients and rating it accordingly. This “family effect” has been pointed out in previous studies [54,55]. Another explanation for the improvement in self-rated health over time is that ICs experience fulfillment through their role, which points towards the role enhancement hypothesis over time. Moreover, the initial negative health effects of informal caregiving may disappear after an adaption phase as proposed by Lawton et al. [18]. As regards the initial worse self-rated health of male ICs and their improvement in self-rated health over time, our results favor the adaption model for the effects of informal caregiving for men over time, as other studies have documented the same effect [36,53].

### **Strengths and Limitations**

This study is a valuable contribution to the caregiving literature, as we used a population-based representative sample unlike the majority of studies in this field. As our data was drawn only from Switzerland, we can exclude the effects of differences in the healthcare system that may interact with the effects of caregiving on health, as pointed out in a previous study [32]. Moreover, we included men in our sample, as it becomes more common for men to provide informal care as well [6,7]. In contrast to most others, we did not limit our study to a specific illness of the care recipient. By investigating the effect of informal caregiving on self-rated health, this study contributes to the literature, as it is usual to study mental health factors in combination with caregiving. Extending the focus to parenting and informal caregiving roles enabled us to study the effects of single and combined caregiving roles on the caregiver’s health. As the repeated measurement of self-rated health

allowed us to use linear mixed models, we could account for within and between subject variance, and thus reduce the standard errors of the estimates.

This study has several limitations. Although we considered the caregiving situation to be a predictor of self-rated health, the cross-sectional nature of our data does not allow us to draw causal conclusions. Since the Labor Force Survey did not explicitly ask for parenthood but only assessed the age of all household members, we had to define caregiving to children as living in the same household with at least one underage own or partner's child. For the sake of comprehensibility and readability, we termed this caregiving group “parents”, despite acknowledging that parenthood is not restricted by child’s age or cohabitation status. Moreover, our categorization of the caregiving situation was based on the self-selection of participants as informal caregivers. As we limited our data to the national module, which is conducted only every third year, we lacked information as to whether caregivers were still in the same caregiving situation one year after baseline. Also, in view of the low number of ICs/ICCs, we had to merge those caregivers who are taking care of relatives (m: n=293; f: n=552) with those caring for non-relatives (m: n=37; f: n=133) and those doing both (m: n=0; f: n=22). For the same reason, we merged ICs/ICCs cohabiting with the person in need of care (m: n= 223; f: n=266) with those who were not cohabiting (m: n= 107; f: n=410) or those in both situations (m: n=0; f: n=13), even though it has been shown that cohabitation with the person in need of care is more intense [40] and has more serious implications for employment [56].

## **CONCLUSION**

As most studies of informal caregiving focus on mental health outcomes such as stress or the impact on employment, further research should focus on whether the resulting stress translates into specific health outcomes [10,33,39], what role personal resources play in the relationship between informal caregiving and health [57] and how this relationship is affected by the caregiver’s financial and employment situation [40,56]. While active participation in the workforce is a protective factor for self-rated health, it has been found to have a negative impact on willingness to provide informal care [56]. Evidence-based policies which facilitate a combination of work and informal caregiving are

consequently favorable. Such interventions may simultaneously reduce the opportunity costs for becoming an IC/ICC.

## REFERENCES

1. Federal Statistical Office. Medienmitteilungen - Szenarien zur Bevölkerungsentwicklung der Schweiz 2015-2045 [Internet]. 2015 [cited 2016 Jul 26]. Available from: <http://www.bfs.admin.ch/bfs/portal/de/index/news/medienmitteilungen.html?pressID=10233>
2. Federal Statistical Office. Geburten und Fruchtbarkeit [Internet]. 2016 [cited 2016 Jul 26]. Available from: <http://www.bfs.admin.ch/bfs/portal/de/index/themen/01/06/blank/key/02.html>
3. Harrison E. Reviewed Work: Seven Years in the Lives of British Families: Evidence on the Dynamics of Social Change from the British Household Panel. *Eur Sociol Rev.* 2003;19(2):233–5.
4. Federal Statistical Office. GDP and beyond - Indicators [Internet]. 2013 [cited 2016 Jul 26]. Available from: <http://www.bfs.admin.ch/bfs/portal/en/index/themen/00/09/blank/ind42.indicator.420007.420002.html>
5. Thome H, Birkel C. Basisindikatoren der ökonomischen Entwicklung in Deutschland , Großbritannien, Schweden, USA - 1905 bis 2000. *Der Hallesche Graureiher* 2005-4. 2005.
6. Friedman EM, Park SS, Wiemers EE. New Estimates of the “ Sandwich Generation ” in the 2013 Panel Study of Income Dynamics. *Gerontologist.* 2015;1–6.
7. Hammer LB, Neal MB. Working sandwiched-generation caregivers: Prevalence, characteristics, and outcomes. *Psychol J.* 2008;11(1):93–112.
8. Bettio F, Verashchagnia A. Long-Term Care for the elderly. Provision and providers in 33 European countries. EU Expert Group on Gender and Employment (EGGE). Luxembourg; 2010.
9. Federal Statistical Office. Demografisches Verhalten der Familien in der Schweiz. 1970 bis 2008 [Internet]. 2009. Available from: <https://www.bfs.admin.ch/bfs/de/home/statistiken/bevoelkerung/familien.assetdetail.347249.html>
10. Roth DL, Fredman L, Haley WE. Informal Caregiving and Its Impact on Health: A Reappraisal From Population-Based Studies. *Gerontologist.* 2015;0(0):309–19.
11. Spillman BC, Pezzin LE. Potential and Active Family Caregivers: Changing Networks and the “Sandwich Generation.” *Milbank Q.* 2000;78(3):347–74.

12. Keene JR, Prokos AH. The Sandwiched Generation: Multiple Caregiving Responsibilities and the Mismatch Between Actual and Preferred Work Hours. *Sociol Spectr*. 2007;27(4):365–87.
13. OECD. *Health at a Glance 2015: OECD INDICATORS*. Paris: OECD Publishing; 2015.
14. Höpflinger F, Baumgartner D. “Sandwich-Generation”: Metapher oder soziale Realität. *Zeitschrift für Fam*. 1999;3:102–11.
15. Goode WJ. A Theory of Role Strain Author. *Am Sociol Rev*. 1960;25(4):483–96.
16. Sieber SD. Toward a Theory of Role Accumulation. *Am Sociol Rev*. 1974;39(4):567–78.
17. Marks SR. Multiple Roles and Role Strain: Some Notes on Human Energy, Time and Commitment Author. *Am Sociol Rev*. 1977;42(6):921–36.
18. Lawton MP, Moss M, Hoffman C, Perkinson M. Two transitions in daughters’ caregiving careers. *Gerontologist*. 2000;40(4):437–48.
19. Martikainen P, Aromaa A, Heliövaara M, Klaukka T, Knekt P, Maatela J, et al. Reliability of perceived health by sex and age. *Soc Sci Med*. 1999;48(8):1117–22.
20. Mossey JM, Shapiro E. Self-Rated Health: A Predictor of Mortality Among the Elderly. *Am J Public Health*. 1982;72(8):800–8.
21. Etilé F, Milcent C. Income-related reporting heterogeneity in self-assessed health: evidence from France. *Health Econ*. 2006;15(9):965–81.
22. Lindeboom M, Van Doorslaer E. Cut-point shift and index shift in self-reported health. *J Health Econ*. 2004;23(6):1083–99.
23. Floderus B, Hagman M, Aronsson G, Marklund S, Wikman A. Work status, work hours and health in women with and without children. *Occup Environ Med*. 2009;66(10):704–10.
24. Nyman CS, Spak L, Hensing G. Are there any associations between single and / or multiple social roles and self-rated physical health, psychiatric disorder and long-term sickness absence in women? *Ital J Public Health*. 2012;9(1).
25. Buehler M, O’Brien C. Mothers’ Part-time Employment: Associations with Mother and Family Well-being. *J Fam Psychol*. 2011;25(6):895–906.
26. Fokkema T. Combining a job and children: Contrasting the health of married and divorced women in the Netherlands? *Soc Sci Med*. 2002;54(5):741–52.

27. von der Lippe E. Parenthood, marital status, employment and self-rated health among German men and women. Results from the 2009/10 GEDA-study. In: European Population Conference 2014 [Internet]. Budapest, Hungary; 2014. Available from: <http://epc2014.princeton.edu/abstracts/140922>
28. von der Lippe E, Rattay P. Association of partner, parental, and employment statuses with self-rated health among German women and men. *SSM - Popul Heal*. 2016;2:390–8.
29. Pinquart M, Sörensen S. Differences between caregivers and noncaregivers in psychological health and physical health: a meta-analysis. *Psychol Aging*. 2003;18(2):250–67.
30. Legg L, Weir CJ, Langhorne P, Smith LN, Stott DJ. Is informal caregiving independently associated with poor health? A population-based study. *J Epidemiol Community Health*. 2013;67(1):95–7.
31. Rozario PA, Morrow-Howell N, Hinterlong JE. Role Enhancement or Role Strain: Assessing the Impact of Multiple Productive Roles on Older Caregiver Well-Being. *Res Aging*. 2004;26(4):413–28.
32. Heger D. Work and Well-Being of Informal Caregivers in Europe. Netspar Discussion Paper No 10/2014-092 [Internet]. 2014;1–57. Available from: <http://dx.doi.org/10.2139/ssrn.2643340>
33. Fredman L, Cauley JA, Hochberg M, Ensrud KE, Doros G. Mortality associated with caregiving, General Stress, and Caregiving-Related Stress in Elderly Women: Results of Caregiver-Study of Osteoporotic Fractures (SOF). *J Am Geriatr Soc*. 2010;58(5):937–43.
34. Fredman L, Lyons JG, Cauley JA, Hochberg M, Applebaum KM. The Relationship Between Caregiving and Mortality After Accounting for Time-Varying Caregiver Status and Addressing the Healthy Caregiver Hypothesis. 2015;70(9):1163–8.
35. Roth DL, Haley WE, Hovater M, Perkins M, Wadley VG, Judd S. Family caregiving and all-cause mortality: Findings from a population-based propensity-matched analysis. *Am J Epidemiol*. 2013;178(10):1571–8.
36. Coe NB, van Houtven CH. Caring for mom and neglecting yourself? The health effects of caring for an elderly parent. *Health Econ*. 2010;19(11):1300–17.
37. Do EK, Cohen S a, Brown MJ. Socioeconomic and demographic factors modify the association between informal caregiving and health in the Sandwich Generation. *BMC Public Health*. 2014;14:362–77.

38. Spencer Loomis L, Booth A. Multigenerational Caregiving an Well-Being: The Myth of the Beleaguered Sandwich Generation. *J Fam Issues*. 1995;16(2):131–48.
39. Penning MJ. In the middle: parental caregiving in the context of other roles. *Journals Gerontol Ser B Psychol Sci Soc Sci*. 1998;53(4):S188-97.
40. Bauer JM, Sousa-Poza A. Impacts of informal caregiving on caregiver employment, health, and family. *J Popul Ageing*. 2015;8(3):113–45.
41. Schulz R, Beach SR. Caregiving as a Risk Factor for Mortality. *J Am Med Assoc*. 1999;282(23):2215–9.
42. Federal Statistical Office. Erhebungen, Quellen - Unbezahlte Arbeit (Modul der Schweizerischen Arbeitskräfteerhebung SAKE) [Internet]. 2013 [cited 2016 Aug 2]. Available from:  
[http://www.bfs.admin.ch/bfs/portal/de/index/infothek/erhebungen\\_\\_quellen/blank/blank/ua\\_sake/01.html](http://www.bfs.admin.ch/bfs/portal/de/index/infothek/erhebungen__quellen/blank/blank/ua_sake/01.html)
43. Federal Statistical Office. Familien in der Schweiz - Statistischer Bericht 2008 [Internet]. Neuchâtel: Bundesamt für Statistik; 2008. Available from:  
<http://www.bfs.admin.ch/bfs/portal/de/index/themen/01/04/blank/01/01.html>
44. Bengtson V, Lowenstein A. *Global aging and the challenge to families*. New York: Aldine de Gruyter; 2003.
45. Diggle PJ, Heagerty P, Liang K-Y, Zeger SL. *Analysis of Longitudinal Data*. second. Oxford: Oxford University Press; 2002. 83 p.
46. Robison J, Moen P, Dempster-McClain D. Women's Caregiving: Changing Profiles and Pathways. *J Gerontol Soc Sci*. 1995;50B(6):362–73.
47. Robison J, Fortinsky R, Kleppinger A, Shugrue N, Porter M. A Broader View of Family Caregiving: Effects of Caregiving and Caregiver Conditions on Depressive Symptoms, Health, Work, and Social Isolation. *J Gerontol Soc Sci*. 2009;64B(6):788–98.
48. Federal Statistical Office. Domestic and family work [Internet]. 2016. Available from:  
<https://www.bfs.admin.ch/bfs/en/home/statistics/work-income/unpaid-work/domestic-family-work.html>
49. Yee JL, Schulz R. Gender differences in psychiatric morbidity among family caregivers: a review and analysis. *Gerontologist*. 2000;40(6):643–4.

50. Vitaliano PP, Zhang J, Scanlan JM. Is caregiving hazardous to one's physical health? A meta-analysis. *Psychol Bull.* 2003;129(6):946–72.
51. Pinquart M, Sörensen S. Gender differences in caregiver stressors, social resources, and health: an updated meta-analysis. *Journals Gerontol Psychol Sci.* 2006;61B(1):P33–45.
52. DePasquale N, Polenick C a., Davis KD, Moen P, Hammer LB, Almeida DM. The Psychosocial Implications of Managing Work and Family Caregiving Roles: Gender Differences Among Information Technology Professionals. *J Fam Issues.* 2015;1–25.
53. Bookwala J. The impact of parent care on marital quality and well-being in adult daughters and sons. *Journals Gerontol - Ser B Psychol Sci Soc Sci.* 2009;64(3):339–47.
54. Hiel L, Beenackers MA, Renders CM, Robroek SJW, Burdorf A, Croezen S. Providing personal informal care to older European adults: Should we care about the caregivers' health? *Prev Med (Baltim).* 2015;70:64–8.
55. Bobinac A, van Exel NJA, Rutten FFH, Brouwer WBF. Caring for and caring about: Disentangling the caregiver effect and the family effect. *J Health Econ.* 2010;29(4):549–56.
56. Carmichael F, Charles S, Hulme C. Who will care? Employment participation and willingness to supply informal care. *J Health Econ.* 2010;29(1):182–90.
57. Kim S, Knight BG. Caregiving Subgroups Differences in the Associations Between the Resilience Resources and Life Satisfaction. *J Appl Gerontol.* 2016;

## **FUNDING**

This work is part of the "Aging, Work & Health" project which is funded by the Pfizer Foundation for Geriatrics and Gerontology. The funding source played no role in the design and conduct of the study, the analysis and interpretation of the data, or the preparation, review or approval of the manuscript.

## **ACKNOWLEDGEMENTS**

We thank the Swiss Federal Statistical Office for providing access to the individual data of the Swiss Labor Force Survey (Schweizerische Arbeitskräfteerhebung) 1997-2014, Julia Braun for the statistical counseling and Milo Puhan for his expertise and comments on this article.