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MASTER THESIS

Master Health Sciences

Depression and Emotional Difficulty in Informal Caregivers
by Employment Status: An Analysis based on data of the
National Study of Caregiving (NSOC)

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Abstract

Background: 81% of more than 43 million informal caregivers (CG) in the U.S. are in working age, of whom more than two third are employed. Some studies found that CG are more likely to work fewer hours, leave the labor market, or have higher work productivity losses than non-caregivers. Although the results are quite consistent regarding the association between informal care and depression, the effect of employment status on CGs' mental health is less clear.

Objectives: First, this study aims to examine whether employment status is associated with depression or emotional difficulty in informal CG in working age, and second, to descriptively compare predictors of depression/emotional difficulty in different employment status groups.

Methods: This cross-sectional study analyzed CG aged 18 to 64 from the NSOC III (N=1,292/1,306). Binary logistic regression analyses were performed. The Stress Process Model functioned as the theoretical framework for the modeling process and the selection of independent variables. Interactions were included if they were significant.

Results: Around 40% of CG in working age have emotional difficulty and 12% have depression. Unemployment is associated with depression (OR=2.22, 95% CI [1.51-3.27]) but not with emotional difficulty. In both employment groups, worse physical health, relational deprivation, and overload predict depression. For employed CG, having children under 18 is protective, whereas for unemployed CG, living with a partner is protective, but co-residence is associated with a higher risk of depression. In both employment groups, constriction of social life, financial difficulty, relational deprivation, and overload are associated with emotional difficulty. Black race, being a friend/non-relative, and co-residence is protective against emotional difficulty in employed CG. In unemployed CG, female sex is associated with a higher risk of emotional difficulty.

Conclusion: This study supports the protective effect of employment on mental health but cannot make a sufficient explanatory contribution. Future studies should illuminate causal relationships by analyzing trajectories of the stress process with a special focus on employment status or identifying early indicators of depression to offer support services to relevant target groups.

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Abbreviations

ADL	activities of daily living
AIC	Akaike Information Criterion
CG	informal caregiver(s)
CI	confidence interval
CR	care recipient
CSPM	Caregiver stress process model
DK	don't know
e.g.	for example
IADL	instrumental activities of daily living
lm	last month
lml	last month of life
M	missing
MCA	medical care activities
NCG	non-caregiver(s)
NHATS	National Health and Aging Trends Study
NPV	negative predictive value
OECD	Organization for Economic Co-operation and Development
OR	odds ratio
PHQ	Patient Health Questionnaire
PPV	positive predictive value
r	correlation coefficient
R ²	pseudo R-squared
RF	refused
UK	United Kingdom
U.S.	United States of America
VIF	variance inflation factor
χ^2	chi squared

1. Introduction

Informal Caregivers (CG), defined as people providing unpaid care to a relative or a friend, are an essential pillar in western, aging societies. In 2015, an estimated number of 43.5 million people provided informal care in the United States of America (U.S.), accounting for 18.2 percent of the U.S. adult population of whom 91 percent care for an adult. [1]

Informal caregiving entails different consequences for the CG on different levels, one of them is health. In their review from 2015, Bauer and Souza-Poza [2] summarize that the majority of studies finds an association between caregiving and poor mental health, even though some positive impacts of caregiving on mental health domains were also found. In a more recent review, Bom et al. [3] support these findings.

A common mental health outcome is depression, a serious mental illness that negatively affects the way somebody feels, he or she thinks and acts. Typical symptoms are feelings of sadness and/or a loss of interest in activities once enjoyed. A depression can decrease a person's ability to function in everyday activities due to a variety of emotional and physical problems. [4] Studies from all over the world confirmed the association between informal caregiving and depression [5–9], although country differences are likely to exist. Even within Europe the strength of the association between caregiving and depression varied between countries [7]. Furthermore, a recent worldwide comparison of low-, middle-, and high-income countries showed that the negative effect of caregiving on mental health is especially pronounced in high-income countries [8]. Factors which play a role in the relationship between caregiving and mental health are for example pre-existing physical impairment of the CG, social support or social ties, the timely amount of care, or age [5, 9, 10]. CG who are especially negatively affected seem to be female, spousal CG, and those providing care with a high intensity [2, 3].

In 2015, the largest CG group in the U.S. were people caring for a parent or a parent-in-law (49 %), a group with a high probability of being in working age. Besides this, in general, 81 percent of CG were below the age of 65, of whom 68 percent were employed [1]. Thus, the majority has to reconcile caregiving and job responsibilities. Since two third

are the sole CG and do not get any paid or unpaid help [1], there is reason to believe that it is challenging to reconcile both, caregiving and employment.

A frequently used term in the description of the effects informal caregiving has on the CG is 'caregiver burden'. It is a vague term which is used in previous studies to describe different sets of outcomes. Bastawrous [11] criticizes the lack of consistency and recommends to theoretically base future research on the 'role theory' and the 'stress theory'. Therefore, this thesis deals, guided by the stress process and role theory, with factors associated with CG mental health (emotional difficulty with the caregiving situation and depression) by placing a special focus on different employment status. Since an estimated rate of 35 percent of U.S. employed CG have any form of depression, which is a significantly higher rate than in employed non-caregivers (NCG, 32 %)[12], the topic is of particular relevance.

2. Background/Theory

Previous research studied the consequences of informal care for labor market participation and other job-related outcomes. The challenge there is to rule out endogeneity. The effect of caregiving on labor market outcomes/participation is likely to be over- or underestimated in descriptive or cross-sectional studies [13, 14] since it is impossible to determine the causal association. Many results are biased regarding the possibility that people who are unemployed or a part-time worker may take up informal care responsibilities more frequently. Reasons for previously being unemployed or part-time employed could, for example, be differences in health status or the use of reduced working hours to have more time to raise children. Recent studies tried to address this problem by using longitudinal data and controlling for possible endogenous variables. A systematic review from 2015 by Bauer and Souza-Poza concludes that whether caregiving has an effect on the probability of being employed varies among studies, with the majority finding a small effect of caregiving on the work status [2]. Regarding work hours, research results seem to be less ambiguous: CG are more likely to work fewer hours than NCG [2], but for wage effects, the results cannot be generalized because they differ depending on the specific subgroup and the caregiving situation under study [2]. A recently published longitudinal study from Canada examined the impact of informal care on labor market attachment over a period of 19 years (1997-2015) and reports an increase in all labor market outcomes under study (labor market exit, working part-time, taking time off work for informal care, and the amount of time taken off work) over time [15]. The authors additionally looked at male-female differences and conclude that the impact of informal care on the labor market participation remains gendered with women being more likely to leave the labor market, going part-time or taking time off, and taking more time off to care.

Particularly in the U.S., findings are ambiguous. While in an analysis based on longitudinal data from the Health Retirement Study no such effect could be found [16], a recent longitudinal study of a large representative dataset of U.S. civilians found that for women the probability of CG decreases with increasing work hours, with stronger

association in high-intensity CG [17]. In addition, another representative survey compared CG with NCG regarding work productivity outcomes (presenteeism, absenteeism, overall work impairment) and found that a significantly higher rate of CG than NCG shows work productivity losses in all three outcome measures [12].

In summary, the effects of caregiving on employment differ depending on gender, caregiving characteristics (intensity, primary caregiver, residential status, etc.), or country [2, 18]. However, the findings indicate that an effect of caregiving on employment is not nonexistent, although the effects are not always visible in the form of leaving the labor market. It is a fact that many people combine employment and caregiving responsibilities (68 % of people below age 65) [2]. If caregiving actually reduces labor market participation or working hours, a hypothetical reason could be that people fail to reconcile both responsibilities. However, from a health science perspective, it is interesting to look at possible consequences on the caregiver depending on employment status, even if caregiving has no influence on the probability of being employed itself.

Authors of previous studies examining the effects of employment on the CG often embedded their research in role theory. Different theories that were primarily tested were the (dual) role strain and the role enhancement/expansion theory, basically testing whether combining caregiving and employment has positive or negative effects on the CG's well-being.

Role Strain Theory

In 1960, Goode proposed his theory of role strain [19]. He regards societal structures as a result of individual roles and at the same time, he assumes that social norms form role expectations on the individual. In his theory, he describes the overall role system an individual has to deal with as always overdemanding, which consequently leads to strain. Therefore, the individual has to allocate its scarce resources (this can lead to role conflicts), meaning that each role has its demands which cannot be satisfied completely by the individual. This results in a continuous process of adjustment, decision, and/or bargaining of roles. Individuals develop mechanisms to organize their role system, but

these mechanisms are often limited by social structures the individual is trapped in. Goode furthermore highlights that there are some roles from which one cannot escape; they are held up by internal but also external factors. An example of the latter is role pressure from other individuals. Goode views role strain as omnipresent in individuals who thus constantly strive to reduce the strain and to perform better in their roles. The quality of a specific role performance depends on the individual's willingness to carry out the role or to perform well in it. He furthermore assumes that role strain increases with the number of roles which is due to a limited amount of role resources. Goode's theory is therefore also known as the scarcity hypothesis.

Role Enhancement and Role Expansion Theory

Whereas the role strain theory suggests that an increase in the number of roles necessarily leads to higher strain, the role enhancement perspective assumes that people benefit from occupying multiple roles: "Social integration, in the form of multiple roles, augments an individual's power, prestige, resources, and emotional gratification, including social recognition and a heightened sense of identity" [20, p. 260].

With the role expansion theory, Marks [21] accounts for the few individuals who, against the overall role strain assumption, do not indicate having role conflicts or experiencing overload from their multiple role responsibilities. He kind of extended the scarcity assumption by an 'energy-creation theory of multiple roles'. He adds the term 'energy' to 'time' and assumes that human-beings have mechanisms to allocate their energy and time resources flexibly (they decide where to spend the most of their energy). Energy is not only consumed but also produced by role obligations, especially from engaging in highly committed roles. At the downside, activities to which the individual is less committed are unlikely to create energy and lead into exhaustion. Marks suggests a theory of interplay between energy, time, and commitment to explain role strain (or no perceived role strain). For the concept of time he formulates a modified statement of the scarcity assumption: it is only scarce if social institutions (e.g. work place and home/family) are segregated (isolation of roles). Hence, time scarcity is not naturally given but is created by socio-cultural arrangements and individual role bargain

outcomes. Whether overload or strain evolve is determined by the level of commitment to a role or multiple roles. He distinguishes between three commitment types or systems: (1) a system with equally positive commitments, (2) a system with equally negative commitments, and (3) a system of over- and under-commitments (some roles are valued more important than others). Whereas type one is unlikely to experience role strain, type three is most prone to role strain because people will always feel like they are wasting time on under-committed roles instead of investing time in over-committed roles. Vice versa they will always perceive time scarcity in the under-committed roles because more time is devoted to over-committed roles.

To summarize, one could say "it depends" whether occupying multiple roles is beneficial or detrimental for the individual.

Employment Status, Caregiving and (Mental) Health

Regarding the reconciliation of an informal care role with an employment role, the results either support the one or the other theory, depending on the outcome that was measured. On the one hand, a study based on the U.S. Health and Retirement Study (2009-2012), found an interaction effect between caregiving duration and employment on self-rated health [22], indicating that employed CG (compared to retired CG) have worse self-rated health. Furthermore, full-time-employed CG and those who report difficulties reconciling job and informal care have higher role strain than part-time or unemployed CG in a study from Taiwan [23]. But in other studies, CG mental health [5, 22, 24], well-being [25], role overload, or worry and strain [24] did not differ by employment status. It even seems that the opposite is true: In U.S. longitudinal data, being unemployed was associated with worse psychological health (depression), whereas being employed and married (multiple roles) seems to be protective against depression [26]. Moreover, in Japanese longitudinal data, an association between being a non-working CG and worse mental health could be observed as well, even when comparing employed and unemployed CG with a high caregiving intensity [27]. However, both studies were limited to older adult CG (age 50 plus), and the U.S data focused on child CG only. For the United Kingdom (UK), Doebler et al. [28] examined

the impact of employment on the association between caregiving and mental health in a sample aged 16 and above. She and her colleagues observed that unemployed CG, especially younger female ones, have worse mental health. A study that considered positive outcomes showed that being an employed CG was even associated with higher ratings of happiness compared to people who only provide care [29]. A qualitative study with eleven participants from Sweden furthermore found that employment and caregiving can be perceived as fulfillment: CG experience satisfaction if a balance between both responsibilities can be achieved [30].

Caregiver Stress Process Model

Besides the role theory, Pearlin's Caregiver Stress Process Model (CSPM) [31] will function as the theoretical framework in this study. Pearlin refers to caregiver stress as "a mix of circumstances, experiences, responses, and resources that vary considerably among caregivers and that, consequently, vary in their impact on caregivers' health and behavior" [31, p. 591]. Thus, the stress process model is a conceptual scheme made up of various factors that influence the development of stress, these factors influence each other and can change over time. The framework is organized into four domains: background and context, stressors, mediators of stress, and outcomes of stress (Figure 1).

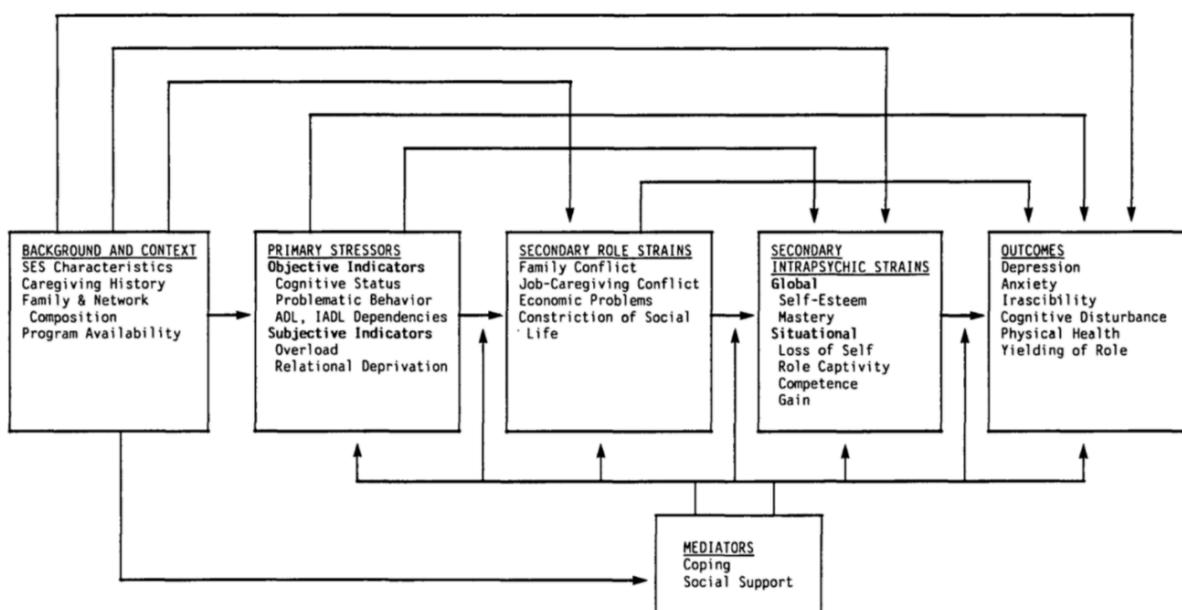


Figure 1 Caregiver stress process model by Pearlin (1990) [31]

Background and contextual factors (e.g. gender, socio-economic status, race, household composition, etc.) largely determine where an individual stands in society, which resources or opportunities someone has. They can be seen as structural components that influence all other components of the stress process.

Stressors are divided by Pearlin into three sub-domains. Primary stressors are those that are directly related to the care recipient's characteristics, behavior, or demands and the caregiving task itself. Secondary role strains refer to consequences of caregiving in other roles or activities of life, for example within the family or the job, whereas secondary intrapsychic strains refer to an individual's appraisal of the caregiving situation. Pearlin refers to role and intrapsychic strains as secondary because they evolve from primary stressors (and are also influenced by contextual factors).

By including *mediating factors* in the framework, Pearlin accounts for the observation that not everyone who seems to experience the same problems as others reports the same amount of burden. Coping as the ability to manage difficult situations, as well as social support, constitute the key mediating factors in the framework.

Finally, *outcomes* of the stress process in which causal origination health and social scientists are interested are well-being, mental or physical health.

2.1. Objectives of the Current Study

This study has two aims. Since the results whether caregiving and being employed decreases mental health are inconsistent, the study first aims to examine whether employment status is associated with depression or CG burden in terms of emotional difficulty with the caregiving role. Although previous studies had similar goals, some literature is already outdated or was limited to older adult child CG [26]. By using the third wave of the National Study of Caregiving (NSOC), this study has the advantage of using more recent data of a representative sample of U.S.-American CG. Thus, this part of the study can be seen as replication or confirmatory study. Based on recent findings that identify employment as protective against depression in caregivers, it is hypothesized that unemployed CG have a higher probability of depression or reporting emotional difficulty than employed CG. Furthermore, it is hypothesized that part-time

employment is associated with a lower probability of depression or emotional difficulty than unemployment or full-time employment.

Beyond that, the study aims to identify and to descriptively compare predictors of the outcomes mentioned before in different employment status groups (employed, unemployed) in order to possibly derive different policy implications for these different employment groups.

3. Methods

This chapter describes the methodological approach used to answer the research questions. It gives an overview of the data on which the analyses are based, the operationalization of the dependent and independent variables, and the statistical approach.

3.1. Data

This cross-sectional study is based on data from the third National Study of Caregiving (NSOC III - 2017) which is a supplemental study (telephone survey) of the National Health and Aging Trends Study (NHATS)¹. Since 2011, the NHATS collects data of a representative sample of Medicare beneficiaries in the U.S. aged 65 and older on an annual basis. The longitudinal study design enables to study national trends as well as individual trajectories in health and disablement processes in an aging population [32]. Participants of the NSOC² are periodically (2011, 2015, 2017) identified from NHATS participants who were receiving assistance with self-care, mobility, or household activities. Helpers were eligible if they helped with any of these activities. Up to five helpers per NHATS participant were included. This sampling strategy allows analyses using the information of both, the caregiver and the care recipient, which is to date unique. The NSOC is a nationally representative cross-sectional study of family caregivers (paid or unpaid) and other unpaid caregivers. However, in NSOC III, 1,453 NSOC II participants were re-interviewed (response rate: 74.9%). Moreover, in NSOC III, a sample of last month of life CG to deceased NHATS participants was added. Hence, the initial cross-sectional sample for this study consists of 2,361 CG (1,453 re-interviewed from NSOC II) to living NHATS participants (response rate: 63.1%) and 291 last month of life CG (response rate: 59.2%) to deceased NHATS participants.

¹ The National Health and Aging Trends Study (NHATS) is sponsored by the National Institute on Aging (grant number NIA U01AG032947) through a cooperative agreement with the Johns Hopkins Bloomberg School of Public Health.

² NSOC I (2011) and II (2015) were conducted with funding from the Assistant Secretary of Planning and Evaluation, DHHS. NSOC III (2017) was funded by the National Institute on Aging R01AG054004.

Besides other possible research questions which can be answered using NSOC data, the NSOC is intended to study consequences of caregiving on health and well-being [33]. The outcomes of the current study (depression, emotional difficulty) can be seen as dimensions of well-being and therefore fit in this field.

NHATS data sets are public use files and can be downloaded from the NHATS website [34]. For NSOC data, researchers must first apply and obtain permission to access these sensitive files. Once access was granted, relevant variables from the NHATS data set were merged with the NSOC data set.

3.2. Outcome Variables (Emotional Difficulty and Depression)

Two mental health outcomes were considered in this study: Emotional difficulty and depression. Individuals were classified having emotional difficulty if they answered 'yes' to the question of whether helping the care recipient is or has been emotionally difficult (yes/no) for them. Depression as a common measure of mental health was assessed using the Patient Health Questionnaire-2 (PHQ-2), a validated two-item depression screening [35] (*Over the last month, how often have you [a] ...had little interest or pleasure in doing things [b] ...felt down, depressed, or hopeless*?). Response levels reach from zero (not at all) to three (every day). The two items are summed up, a sum score of three or higher indicates a depression.

The two outcomes were chosen because depression (although established as a common mental health outcome) does not necessarily reflect the mental burden of caregiving. The burden is possibly underestimated. If someone is not depressed in general, this does not mean that caregiving is not emotionally burdensome. Informal caregiving may lead to a deterioration in mental health, apart from being visible as an actual disease such as depression. The correlation analysis further showed that there is only a weak association between emotional difficulty and depression in this study ($r=0.1$, $p<0.001$), so it makes sense to consider both outcomes (independently).

3.3. Independent/Predictor Variables

The theoretical selection of relevant independent variables was made on the basis of the CSPM [31] which served as the theoretical framework in studies using previous waves of the NSOC [36, 37]. The NSOC data collection instrument covers all structural components of the theoretical framework. However, based on bivariate analyses and during the modeling process, few variables that were initially considered relevant were excluded from the model(s) (e.g. caregiving duration in years). The following sections describe the independent variables, which were included in the final models for depression and emotional difficulty.

3.3.1 Background and Context Factors (Socio-demographics)

Since the first aim of this study is to examine whether employment status is associated with depression or emotional difficulty, it is included in the analysis as an independent variable. For the second aim (identification of predictors of depression/emotional difficulty in different employment status groups), employment status is used to stratify the analysis. It was operationalized as follows: Individuals were classified as 'employed' if they indicated that they had worked for pay in the last week, if they indicated that they had not worked last week but answered in the subsequent question that they were just absent from work, or if they indicated owning a business or a farm. Individuals who already retired were classified as 'unemployed'. For an additional analysis regarding the first objective of the study, employment status was divided into three categories 'unemployed', 'part-time employed', and 'full-time employed'. The U.S. Department of Labor does not define when a worker is considered a part-time or full-time worker. However, this study uses the following classification which was used by the Bureau of Labor Statistics for a recent population survey [38]: zero hours of work are considered as unemployed, one to 34 hours as part-time work, and 35 or more hours per week as full-time work.

Other context or demographic factors considered were age and sex (male/female) of the CG, CG education, race/ethnicity, relationship to the CR, whether the CG is co-residing with the CR (yes/no), the number of chronic conditions, marital status, and

whether a child below 18 lives in the CG's household. Education was collapsed from an original nine-level variable into a four-level variable (less than high school/high school graduate/some college, technical school diploma or associate degree/bachelor's degree or higher). Race/ethnicity was categorized as assessed into 'White, non-Hispanic', 'Black, non-Hispanic', 'Hispanic' and 'other, non-Hispanic'. Categories of relationship to the CR were summarized as 'spouse/partner', 'child/step-child', 'daughter-/son-in-law', 'grandchild', 'niece/nephew', 'other relative', and 'friend/other non-relative'. Controlling for the relationship between CG and CR is important because it has been shown that the effect of e.g. mental health are different in different care relationships, with (female) spousal CG being especially prone to adverse mental health outcomes [39, 40]. For the physical health status of the CG was accounted using a sum score of existing (yes/no) chronic conditions (heart-attack, other heart diseases, high blood pressure, arthritis, osteoporosis, diabetes, lung disease, cancer, difficulty seeing, difficulty hearing). Whether CG have one child (or more children) below 18 living in the household (yes/no) is relevant from the role-theoretical perspective since taking care of children can also be time-consuming and thus constitutes an additional responsibility the CG has to reconcile with caregiving to an elderly person and possibly work. In 2015, 28 percent of informal CG in the US had a child (or a grandchild) living in their household [1]. So-called 'sandwiched' CG were the object of research previously and were found to be at potential risk for adverse health outcomes including increased stress [41] and poor subjective general health [42].

3.3.2 Primary Stressors

Pearlin distinguishes primary stressors between objective and subjective indicators. As objective indicators, caregiving intensity as well as CR-specific characteristics like dementia status and the number of chronic conditions were considered. Furthermore, measures of relational deprivation and overload were included as subjective indicators. Caregiving intensity was captured by several measures since different definitions of caregiving intensity show different effects on outcomes under study [43]. Firstly, average hours providing care per month were considered. Secondly, the sum of the number of activities of daily living (ADL) was examined which include personal care (eating,

showering or bathing, dressing or grooming, or using the toilet) and helping the CR getting around inside his/her home or to leave his/her home. Thirdly, the number of instrumental activities of daily living (IADL) was summed up, comprising doing chores (laundry, cleaning, or making hot meals), shopping of grocery or personal items, handling bills/banking, and driving to places (or going on other transportation with the CR). Fourthly, medical care activities (MCA) were considered as the sum of helping ordering medicines, helping with teeth, feet or skin/wound care, talking to medical providers, making medical appointments, changing or adding health insurance, handling other insurance issues, keeping track of CR's medicines, taking shots/injections, managing medical tasks (e.g. testing blood), helping with exercises, or helping with a special diet. Finally, high-intense CG were identified in each intensity domain by using the upper quartile as 'high-intensity caregiving' (coded with 1, values below with 0). The dichotomous variables of average hours of care per month, ADL, IADL, and MCA were summed up into a composite measure of caregiving intensity. This operationalization of caregiving intensity has been used previously for NSOC data [43].

The classification of persons by dementia status was done according to the official technical paper which is accessible via the NHATS website [44]. As the level of care dependency is high, providing care for people with dementia is especially burdensome and dementia CG are a group in which mental health outcomes like depression and anxiety are especially pronounced [45]. The NHATS draws on three sources to classify dementia status. The type of available information varies by the type of respondent. For self-respondents, cognitive tests on memory, orientation, and executive functioning were applied. To proxy respondents, the AD8 Dementia Screening Interview [46, 47] was administered. Proxy respondents were further asked if they thought the sample person was capable of performing the cognitive test module. If they said yes, the sample person additionally undertook cognitive tests. The technical paper classifies persons into 'no dementia', 'possible dementia', and 'probable dementia'. In the current study, a binary variable for dementia status (yes/no) was created with the fulfillment of the classification criteria for 'probable dementia' indicating that a CR has dementia (a reported diagnosis,

met AD8 criteria, scored less or equal to 1.5 standard deviations below the mean in at least two cognitive test domains).

Besides the caregiving intensity measures from the CG's perspective, the number of chronic conditions of the CR was additionally included as a sum of the questions of whether the CR has/had the following chronic conditions: heart attack/myocardial infarction, other heart diseases, high blood pressure, arthritis, osteoporosis, diabetes, lung disease, stroke, or cancer.

Relational deprivation is a composite measure of four items. The participants were asked on a four-level scale (a lot, some, a little, not at all) how much they enjoy being with the care recipient, how much the CR argues with the CG, how much the CR appreciates what the CG does for him/her, and how often the CR is going on the CG's nerves. The levels of enjoyment and appreciation were reverse-coded. Finally, a sum score of relational deprivation was built with higher scores indicating lower relationship quality between the CG and the CR (maximum score: 12).

Overload was generated from the variables 'exhaustion when going to bed at night', 'having more things to do than being able to handle', 'not having time for self', and 'as soon as getting a routine, the CR needs a change'. All four variables were assessed as three-level items (very much, somewhat, not so much). A sum score was calculated from the reverse-coded individual item levels (maximum score: 8).

3.3.3 Secondary Role Strains

For all analyses, constriction of social life and financial difficulty through caregiving were considered as secondary role strains.

Constriction of social life combines four initial variables from the questionnaire where people were asked whether caregiving kept them from visiting friends or family, attending religious services, participating in group activities, or going out for enjoyment. All variables were assessed as binary variables (yes/no) and were summed up (maximum four areas of life negatively affected by caregiving).

Financial difficulty was included as a binary variable generated from the question of whether caregiving is/has been financially difficult (yes/no).

3.3.4 Intrapsychic Strains/Appraisal

Besides different aspects which negatively affect the CG, the questionnaire comprises questions regarding possible positive experiences. Four positive aspects were summarized to a composite measure of gain from caregiving. Participants answered on a three-level scale (very much, somewhat, not so much) how much confidence about their abilities they gained from helping the CR, how much helping has taught them to deal with difficult situations, how much helping has brought them closer to the CR, and how much satisfaction that the CR is well cared for has helping given them. A sum score with a maximum of 12 was derived.

3.3.5 Mediators

Mediators refer to coping strategies or other factors which help to deal with the situation. A factor that is widely established as a buffer for stress is social support [48, 49].

Social support was considered in this study via questions of emotional (*“Do you have friends or family that you talk to about important things in your life?”* – yes/no) and instrumental social support (sum score of *“Do you have friends or family that help you with your daily activities, such as running errands, or helping you with things around the house?”* and *“Do you have friends or family that help you care for the CR?”*). Previous studies found that emotional social support reduces CG distress [50] and moderates the relationship between care-related work interruptions and depressive symptoms [51].

The questionnaire section that captures the support environment also comprises questions regarding the use of support services by the CG. Support services aim to alleviate the burden of caregivers, which is why it is interesting to check whether they actually do so with regard to depression and emotional difficulty. A sum score of the number of services used (support group, service that took care of the CR to take time away from helping, participation in CG training, financial help, and help CR finding paid helper) was built and included as an independent variable.

Table 13 (appendix, page 61 ff.) gives an overview of the variables included and the questionnaire items from which they originate.

3.4. Handling of Missing Data

Due to several missing values, imputation strategies were applied if reasonable. This was done in order to prevent the sample from becoming too small. For CG age, missing values from the categories 'don't know' (DK), 'refused' (RF), and 'missing' (M) were replaced by the rounded mean (was equal to the median), for educational degree, the mode (some college/technical school or associate degree) was used for DK/RF/M. For co-residence, individuals who replied with DK/RF/M to the question regarding how much time they need to get to the CR, were assigned to the group of 'non-co-residents'. Similarly, people who replied DK/RF/M to the question regarding their marital/relationship status or the question whether they have children or not were coded as having 'no partner' or 'no children under 18'. For missing values for the average number of care hours per month, median imputation was performed. The median was considered more appropriate than the mean, as there are outliers with extremely high hours of care per month, resulting in a high mean. For the number of chronic conditions (CG and CR), ADL, IADL, MCA, gain, instrumental social support, and support services use, missing values were minimized using the command 'rowtotal' to build sum scores from the underlying variables. This command treats missing values as zero, except when an individual has missing data in all variables 'in row' (all variables that are included in the sum score). Missing values of employment status were not replaced since it is the main independent variable and should not be changed.

3.5. Development of Sample Size

As the purpose of this study is to examine the influence of employment status on mental health outcomes, participants aged 65 or older were excluded (n=1057). This cut point refers to the OECD definition of working age (15 to 64) [52]. In addition, some sections of the questionnaire were deliberately omitted from certain participants (if they did not care last month/last month of the care recipient's life or if they took care in the last month of life of a CR who already deceased), so that these NSOC III participants were not included in this study. Moreover, some missing variables still exist because there was no reasonable way to impute missing values. The final sample analyzed in this study consists

of 1,292 participants for the outcome depression and 1,306 participants for the outcome emotional difficulty. Figure 2 gives an overview of how the sample size was derived for each outcome.

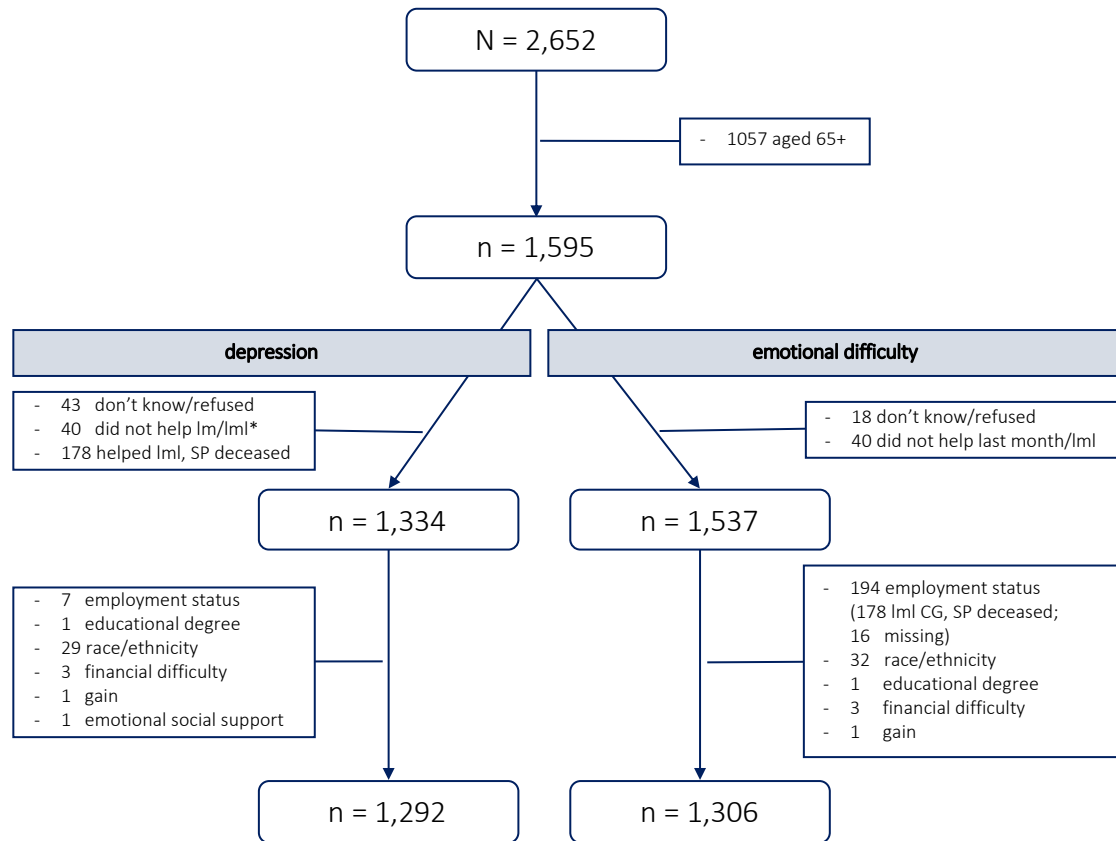


Figure 2 Flow chart – development of sample size for each outcome

3.6. Statistical Analyses

The analyses were performed separately for each outcome. First, descriptive statistics were performed to get an overview of the frequency distributions in the variables of interest. The process to be followed in the model development is shown in Figure 3. As a first step of the modeling, bivariate analyses were carried out, between the independent variables and the outcome and between all independent variables. Either Pearson product-moment correlation or chi-squared tests with Cramer's V were applied to determine the strength of the associations. Potential predictor variables were included in the initial model if there was a significant bivariate association with the

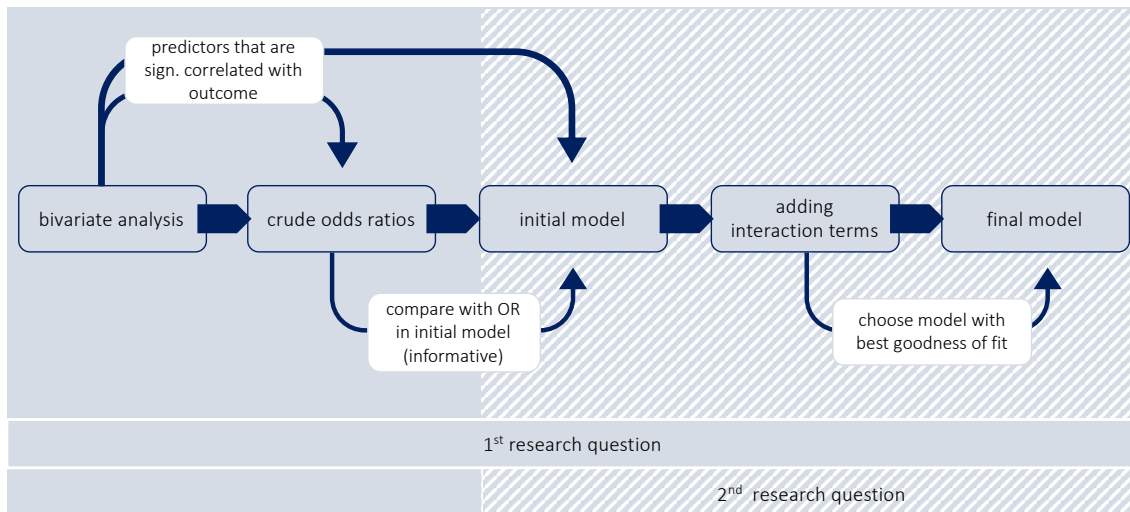


Figure 3 Graphic representation of the modeling process

outcome or if there was a significant correlation of r (or Cramer's V) ≥ 0.2 between the variable of interest and other predictor variables which are significantly associated with the outcome. The significance level was set at 5 percent ($p < 0.05$) for all analyses in this study. Since both outcomes are treated as dichotomous variables, binary logistic regression analyses were performed. First, crude odds ratios (OR) for each predictor on the outcome were calculated and subsequently compared with OR in the initial model which contains all predictors which were chosen based on the bivariate analyses. Subsequently, a theoretical approach (stress process model) was used to identify possible interactions between predictors. Interaction terms were added stepwise to the initial model: context factor#context factor, primary stressor#primary stressor, context#primary, secondary role strain#secondary role strain, context#secondary, primary#secondary, context#appraisal, primary#appraisal, secondary#appraisal, mediator#mediator, primary#mediator, secondary#mediator. An interaction was kept in the model if it was significant. If a previously added significant interaction became nonsignificant by adding another interaction (which is significant if the previous interaction is excluded again), the model with better goodness of fit parameters (percentage of correctly classified cases, Nagelkerke's R^2 , Akaike information criterion [AIC], Hosmer-Lemeshow test) was chosen. For the stratified analyses, the respective initial model from the non-stratified analyses was used. However, the strategy to identify interactions was repeated for each stratified model separately.

For an additional analysis, the independent variable employment status was included as an indicator variable in the final non-stratified logistic regression model. The effects of part-time and full-time employment were compared to unemployment (base category).

4. Results

In this chapter, all results of the non-stratified and stratified analyses for each outcome are presented. Since the analytical samples for the outcomes depression and emotional difficulty differ only marginally and the descriptive statistics show only minimal differences in the distribution of frequencies (Table 1 and 2), the sub-chapter 'sample description' refers to both outcomes.

4.1. Sample Description

Table 1 and 2 give an overview of the distribution of the outcomes, context/background factors, primary stressors, secondary role strains, appraisal, and mediators for the overall sample as well as for employed and unemployed CG separately.

Overall, around 63 percent of the participants are employed (which is similar to the estimated 68 percent from the National Alliance of Caregiving [1]), and emotional difficulty is more prevalent than depression (39.8 versus 12.3 %). For depression, the prevalence is nearly doubled in unemployed compared to employed CG (19.5 versus 8.1 %), whereas the proportion of people experiencing emotional difficulty varies only marginally between employment status groups. The mean age of the sample is 52.6 (± 10.6) years, with unemployed CG being on average significantly older than employed CG. The majority is female (69.4 %) and higher educated (68.0/67.8 %), with employed CG being more frequently higher educated than unemployed CG (72.8/72.7 versus 59.7/59.5 %). The biggest race or ethnic group are white CG (55.8 %) followed by black (33.4 %). The proportion of white people is significantly higher in the group of employed than in unemployed, whereas the proportion of black people is higher in the group of unemployed versus employed. Two thirds of the sample are child or step-child caregivers, one third shares the same household with the CR, and one third provides care to a CR with probable dementia. Around half of the sample (53.8/53.4 %) lives in a partnership, and around 20 percent have one or more child/children below the age of 18 living in the household. The mean of the composite measure of care intensity shows that the sample provides on average high intense care in 1.2 ($\pm 1.3/1.7$) intensity domains

(hours of care per month, ADL, IADL, MCA). Furthermore, unemployed CG care on average with significantly higher intensity and have a higher mean number of chronic conditions (1.8 ± 1.5 versus 1.0 ± 1.1). Although unemployed CG report on average higher relational deprivation, the overall sample scores rather low on relational deprivation (2.2 ± 2.2) and overload (2.1 ± 2.2).

Table 1 Descriptive statistics – NSOC III, people aged 17- 64 with valid information on depression status

	overall sample (N= 1,292)	employed (n=816)	unemployed (n=476)
% depression	12.31	8.09 *	19.54 *
Context/background factors			
% employed	63.16	-	-
mean (SD) age	52.64 (10.56)	51.64 (10.57) *	54.35 (10.34) *
% female	69.43	68.75	70.59
% white	55.80	58.09 *	51.89 *
% black	33.44	30.64 *	38.24 *
% Hispanic	7.97	8.58	6.93
% other	2.79	2.70	2.94
% some college/technical school or higher	67.96	72.79 *	59.67 *
% spouse/partner	3.41	2.45	5.04
% child/step-child	67.26	67.77	66.39
% daughter-/son-in-law	5.42	6.00	4.41
% grandchild	11.92	13.11	9.87
% niece/nephew	3.95	4.17	3.57
% friend/other non-relative	4.33	3.80	5.25
% other relative	3.72	2.70	5.46
% co-residing	34.21	29.53	42.23
mean (SD) No. chronic conditions (max: 9)	1.29 (1.32)	1.01 (1.08) *	1.76 (1.53) *
% living with a partner	53.79	57.84	46.85
% having a child < 18 in household	19.50	22.79 *	13.87 *
Primary stressors			
mean (SD) CG intensity ¹ (max: 4)	1.18 (1.31)	1.07 (1.26) *	1.36 (1.39) *
mean (SD) CG duration in years	7.36 (7.50)	7.40 (7.54)	7.29 (7.45)
% CR with dementia	33.51	32.35	35.50
mean (SD) relational deprivation (max: 12)	2.20 (2.20)	2.12 (2.17) *	2.34 (2.24) *
mean (SD) overload (max: 8)	2.09 (2.19)	2.12 (2.20)	2.03 (2.18)
Secondary role strain			
% having any constriction of social life	23.45	21.94	26.05
% financial difficulty	15.40	13.60 *	18.49 *
Appraisal			
mean (SD) Gain (max: 8)	6.34 (1.84)	6.30 (1.86)	6.41 (1.82)
Mediators			
% having emotional social support	89.09	89.95	87.61
% receiving any instrumental social support ²	86.38	89.09 *	81.72 *
% using any support service	38.70	40.44	35.71

* significant difference in means or frequencies between employed and unemployed CG

¹ composite measure of ADL, IADL, average hours of care per month, and MCA

² either receiving help from family/friends with daily activities or with care for the CR, or both

On average, CG have high scores of gain from caregiving ($6.3 \pm 1.8/1.9$), have emotional social (89.1 %) and informal social support (86.4 %). In 23.5/23.4 percent, at least one area of social life is constricted, further do unemployed CG indicate significantly more often having financial difficulties (18.5/18.6 versus 13.6/14.0 %).

Table 2 Descriptive statistics – NSOC III, people aged 17- 64 with valid information on emotional difficulty

	overall sample (N=1,306)	employed (n=827)	unemployed (n=479)
% emotional difficulty	39.82	40.87	38.00
Context/background factors			
% employed	63.32	-	-
mean (SD) age	52.64 (10.58)	51.68 (10.56) *	54.30 (10.41) *
% female	69.45	68.56	70.98
% white	55.74	58.16 *	51.57 *
% black	33.46	30.47 *	38.62 *
% Hispanic	8.12	2.66	7.10
% other	2.68	8.71	2.71
% some college/technical school or higher	67.85	72.67 *	59.50 *
% spouse/partner	3.45	2.54	5.01
% child/step-child	67.15	67.71	66.18
% daughter-/son-in-law	5.36	5.93	4.38
% grandchild	12.02	13.18	10.02
% niece/nephew	3.91	4.23	3.34
% friend/other non-relative	4.29	3.75	5.22
% other relative	3.83	2.66	5.85
% co-residing	34.07	29.5	41.96
mean (SD) No. Chronic conditions (max: 9)	1.28 (1.31)	1.00 (1.08) *	1.76 (1.52) *
% living with a partner	53.37	57.19	46.76
% having a child < 18 in household	19.60	22.97 *	13.78 *
Primary stressors			
mean (SD) CG intensity ¹ (max: 4)	1.17 (1.71)	1.07 (1.25) *	1.35 (1.38) *
mean (SD) CG duration in years	7.34 (7.48)	7.42 (7.54)	7.21 (7.38)
% CR with dementia	33.54	32.53	35.28
mean (SD) relational deprivation (max: 12)	2.20 (2.20)	2.12 (2.17) *	2.33 (2.24) *
mean (SD) overload (max:8)	2.10 (2.19)	2.13 (2.20)	2.03 (2.18)
Secondary role strain			
% having any constriction of social life	23.43	22.01	25.89
% financial difficulty	15.70	14.03 *	18.58 *
Appraisal			
mean (SD) Gain (max: 8)	6.33 (1.85)	6.29 (1.87)	6.40 (1.82)
Mediators			
% having emotional social support	89.05	89.72	87.89
% receiving any type of instrumental social support ²	86.37	89.12 *	81.63 *
% using any support service	38.74	40.63	35.49

* significant difference in means or frequencies between employed and unemployed CG

¹ composite measure of ADL, IADL, average hours of care per month, and MCA

² either receiving help from family/friends with daily activities or with care for the CR, or both

4.2. Depression

4.2.1 Bivariate associations

In the bivariate analysis, employment status, education, co-residence with the CR, the number of chronic conditions (CG), living with a partner, having a child under 18 in the household, caregiving intensity, relational deprivation, overload, constriction of social life, financial difficulty, and emotional social support are significantly correlated with depression (Table 3) and hence are included in the following logistic regression model. Although significant, the bivariate associations between the predictors and the outcome depression are weak ($r \geq 0.1$ to $r < 0.3$) to very weak ($r < 0.1$), according to Cohen [53]. Furthermore, there are significant bivariate

Table 3 Bivariate correlation coefficients between depression and predictors

	Depression	
employment status	0.1660	*
age	0.0321	
sex	0.0044	
race/ethnicity	0.0764 ¹	
education	0.1088 ¹	*
co-residence	0.0992	*
Relationship to the CR	0.0584 ¹	
CG chronic conditions	0.1945	*
living with a partner	-0.0921	*
child u18 in household	-0.0805	*
caregiving intensity	0.0809	*
caregiving duration	0.0413	
dementia	-0.0174	
CR chronic conditions	0.0308	
relational deprivation	0.1624	*
overload	0.2005	*
constriction of social life	0.1461	*
financial difficulty	0.1339	*
gain	0.0224	
emotional social support	-0.0944	*
instrumental social support	-0.0326	
support services use	0.0098	

¹ Cramer's V

correlations (weak to medium strong effects) between instrumental social support and emotional social support ($r = 0.31$, $p < 0.05$), race/ethnicity and caregiving intensity ($r = 0.19$, $p < 0.05$), gain and caregiving intensity ($r = 0.27$, $p < 0.05$), and gain and relational deprivation ($r = -0.2934$, $p < 0.05$). Therefore, instrumental social support, race/ethnicity, and gain are included in the model as well.

4.2.2 Effect of Employment Status and other Predictors on Depression

One analytical step was the comparison of crude and adjusted effects of the predictors on depression (Table 4, column 1 and 2). For most of the predictors, the effect on depression becomes weaker ('unemployed'; 'high school graduate'; 'CG number of chronic conditions'; 'living with a partner'; 'relational deprivation'; 'overload'; 'emotional social support') and partially becomes nonsignificant ('children under 18'; 'some college/technical school certificate/associate degree'; '<high school'; 'black'; 'co-residence'; 'caregiving intensity'; 'constriction of social life'; 'financial difficulty'),

Table 4 Odds ratios for the predictors of depression - crude, adjusted, and stratified by employment status

Outcome: Depression	crude OR (n=1,292)	adjusted OR/ initial model (n=1,292)	final non- stratified model (n=1,292)	employed (n=789)	unemployed (n=476)
unemployed	2.76*** (1.97 - 3.87)	2.09*** (1.43 - 3.07)	2.22*** (1.51 - 3.27)		
children <18	0.49** (0.29-0.82)	0.61 (0.35 - 1.07)	0.59 (0.34 - 1.04)	0.39* (0.16 - 0.95)	1.00 (0.45 - 2.20)
highest educational degree					
≥ college degree	ref.	ref.	ref.	ref.	ref.
some college/technical school	1.87** (1.17 - 2.99)	1.35 (0.81 - 2.26)	1.39 (0.83 - 2.34)	1.04 (0.50 - 2.15)	1.80 (0.81 - 4.02)
certificate/associate degree	2.56*** (1.58 - 4.14)	2.08** (1.22 - 3.54)	2.06** (1.20 - 3.52)	1.98 (0.95 - 4.14)	2.16 (0.94 - 4.94)
high school graduate	2.66** (1.31 - 5.41)	1.24 (0.55 - 2.80)	1.23 (0.54 - 2.81)	(omitted)	1.68 (0.60 - 4.69)
< high school					
race & Hispanic ethnicity					
white	ref.	ref.	ref.	ref.	ref.
black	1.56* (1.10 - 2.22)	1.33 (0.87 - 2.04)	1.30 (0.85 - 2.00)	1.37 (0.68 - 2.73)	1.33 (0.75 - 2.34)
other	1.05 (0.36 - 3.04)	0.93 (0.29 - 3.06)	0.99 (0.30 - 3.21)	2.12 (0.47 - 9.50)	0.39 (0.046 - 3.36)
Hispanic	0.90 (0.45 - 1.80)	0.74 (0.34 - 1.62)	0.72 (0.32 - 1.59)	0.48 (0.11 - 2.01)	1.00 (0.35 - 2.82)
CG number of chronic conditions	1.45*** (1.30 - 1.62)	1.26*** (1.11 - 1.43)	1.25*** (1.10 - 1.42)	1.43** (1.14 - 1.80)	1.18* (1.01 - 1.39)
living in a partnership	0.54*** (0.38 - 0.75)	0.65* (0.44 - 0.96)	0.66* (0.44 - 0.98)	0.75 (0.41 - 1.39)	0.56* (0.32 - 0.96)
co-residence (yes)	1.71** (1.22 - 2.39)	1.19 (0.80 - 1.77)	1.99* (1.14 - 3.46)	0.88 (0.47 - 1.66)	2.90** (1.35 - 6.23)
caregiving intensity	1.18** (1.05-1.33)	0.88 (0.75 - 1.03)	1.03 (0.84 - 1.26)	0.89 (0.68 - 1.16)	1.06 (0.79 - 1.41)
relational deprivation	1.22*** (1.14 - 1.30)	1.14** (1.05 - 1.25)	1.15** (1.05 - 1.26)	0.79 (0.61 - 1.03)	1.24** (1.09 - 1.41)
overload	1.28*** (1.19 - 1.37)	1.20*** (1.10 - 1.32)	1.22*** (1.11 - 1.34)	1.04 (0.85 - 1.26)	1.22** (1.06 - 1.39)
constriction of social life	1.44*** (1.25 - 1.65)	1.11 (0.92 - 1.33)	1.45* (1.08 - 1.95)	1.31 (0.96 - 1.77)	0.95 (0.73 - 1.23)
financial difficulty	2.61*** (1.78 - 3.82)	1.22 (0.77 - 1.93)	1.19 (0.75 - 1.90)	1.30 (0.60 - 2.79)	1.06 (0.57 - 1.98)
gain	1.04 (0.95 - 1.14)	1.08 (0.96 - 1.22)	1.09 (0.97 - 1.23)	1.18 (0.98 - 1.43)	1.04 (0.88 - 1.23)
emotional social support	0.44*** (0.29 - 0.69)	0.54* (0.32 - 0.91)	0.57* (0.33 - 0.97)	0.61 (0.27 - 1.38)	0.63 (0.30 - 1.34)
instrumental social support	0.89 (0.71 - 1.11)	1.22 (0.94 - 1.57)	1.45* (1.06 - 1.98)	1.36 (0.89 - 2.08)	1.14 (0.81 - 1.60)
co-residence (yes) # caregiving intensity			0.70* (0.53 - 0.92)		0.67* (0.46 - 0.99)
overload # relational deprivation				1.07** (1.02 - 1.12)	
constriction of social life # instrumental social support			0.80* (0.67 - 0.97)		
constant		0.021*** (0.007 - 0.060)	0.025*** (0.008 - 0.082)	0.016*** (0.003 - 0.099)	0.031*** (0.006 - 0.150)

*** p<0.001, ** p<0.01, * p<0.05

indicating that these variables do not have a significant independent influence, or that the independent effect of the respective predictor is less strong when controlling for several other factors. For 'gain' and 'instrumental social support', the odds ratios (OR) of depression in the initial adjusted model are higher than the crude OR, however, in both analyses, the OR are nonsignificant and therefore, 'gain' and 'instrumental social support' do not have an independent effect on depression.

Model Description/Goodness of Fit

The omnibus test for the final binary logistic regression model with interactions is significant, $\chi^2(21)=159.5$, $p<0.001$, indicating that the log-likelihoods of the full and the baseline model significantly differ (Table 5). With a positive predictive value (PPV) of

Table 5 Goodness of fit parameters - Depression, final non-stratified model

Goodness of fit parameter	
Omnibus test	$\chi^2(21)=159.50$ $p < 0.001$
Log-likelihood model	-402.15
intercept-only	-481.90
correctly classified	88.08 %
positive predictive value	58.62 %
negative predictive value	88.76 %
Nagelkerke's R^2	0.22
Hosmer-Lemeshow	$\chi^2(8)=9.99$ $p=0.27$

58.62 percent, a negative predictive value (NPV) of 88.76 percent, and 22 percent explained variance (pseudo $R^2=0.22$), the model fit is sufficient. In general, the Hosmer-Lemeshow test also indicates sufficient goodness of fit ($\chi^2(8)=9.99$, $p>0.05$), meaning that there is no significant difference between expected and observed cases. However, on group level, differences in the expected and observed cases in both outcome categories can be observed. Moreover, the data violates the requirement of a chi-squared test to have at least five cases in each cell, which is not the case for the first and second decile for the expected and observed cases of depression. There is no multicollinearity between the independent variables (variance inflation factor [VIF] <2 for all independent variables).

The Effects of Independent Predictors

In the final adjusted logistic regression model (Table 4, column 3), unemployed CG have 2.22 times higher odds of depression than employed CG (95% CI [1.51-3.27]). When different intensities of employment are considered in the model, part-time (OR=0.33,

95% CI [0.17-0.65]) as well as full-time employed CG (OR=0.44, 95% CI [0.28-0.68]) have significantly lower odds of depression than unemployed CG (reference category). However, the confidence intervals for part-time and full-time employment are overlapping, indicating no significant difference in the odds of depression between these two employment levels (compared to unemployed CG).

Other context/background factors that are significant predictors of depression are the educational degree, the caregiver's number of chronic conditions, and marital status (living with a partner). Compared to CG in the highest educational level (college degree or higher), high school graduates have higher odds of depression (OR=2.06, 95% CI [1.20-3.52]). The second highest, as well as the lowest educational level, have non-significantly higher odds of depression than the reference group (OR=1.39, 95% CI [0.83-2.34]; OR=1.23, 95% CI [0.54-2.81]). The number of chronic conditions increases the odds of depression. For each additional chronic condition, the chance of the probability of depression increases by 25 percent (95% CI [1.10-1.42]). CG living in a partnership have lower odds of depression than people living without a partner (OR=0.66, 95% CI [0.44-0.98]).

Primary stressors which predict depression significantly are relational deprivation and overload. With each unit increase in relational deprivation or overload, the chance of the probability of depression increases by 15 (95 % CI [1.05-1.26]) and 22 percent (95% CI [1.11-1.34]). With an odds ratio of 0.57 (95% CI [0.33-0.97]), people receiving emotional social support have lower odds of depression than those receiving no emotional social support.

Other independent variables are either significant as an interaction effect, as the main effect of an interaction (see next chapter), or they are only randomly associated with depression.

Interactions/Moderators

Significant interactions between co-residence and caregiving intensity as well as between constriction of social life and instrumental social support were identified. Thus, post hoc simple slope analyses were conducted (Figure 4 and 5).

There is a significant main effect of co-residence with the CR. If caregiving intensity is zero (no high intensity care in any intensity domain), co-residing CG have nearly two times higher odds of depression than people not living in the same household with the CR (OR=1.99, 95% CI

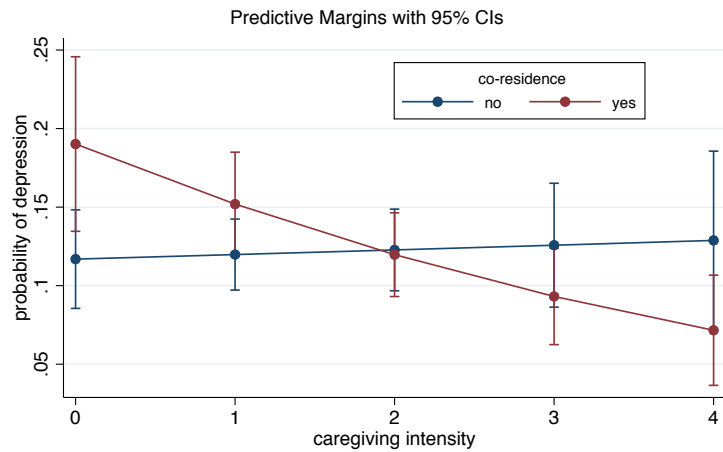


Figure 4 Interaction plot - caregiving intensity#co-residence on depression (non-stratified model)

[1.14-3.46]). For caregiving intensity, the main effect is not significant. However, caregiving intensity moderates the effect of co-residence with the CR: For co-residing CG, the margins of depression decrease with increasing caregiving intensity, whereas the margins of depression remain nearly unchanged with increasing caregiving intensity for non-co-residing CG (Figure 4).

If instrumental social support is held at zero (neither help with daily activities, nor with CR), the odds of depression increase by 1.45 (95% CI [1.08-1.95]) for each unit increase in constriction of social life. Conversely, with each unit increase in instrumental social support, the odds of depression increase by 1.45 (95% CI [1.06-1.98]) if constriction of social life is zero. However, the antagonistic interaction (Figure 5) shows that the probability of depression only increases with higher constriction of social life if instrumental social support is low. At high constriction of social life, the group with no instrumental social support is the group with the highest probability of depression, whereas at low levels of constriction of

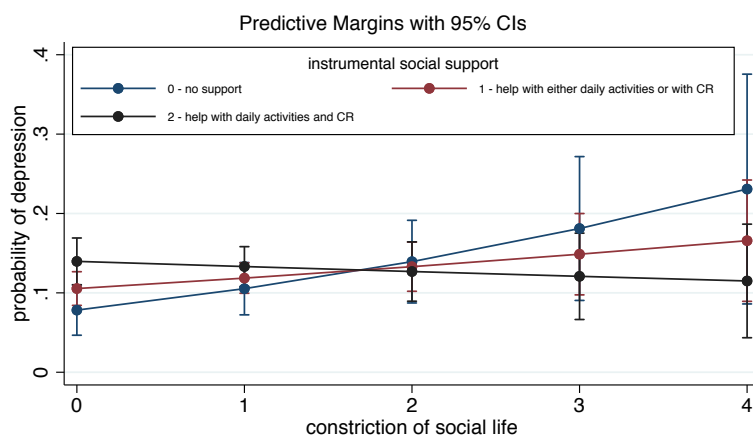


Figure 5 Interaction plot - constriction of social life#instrumental social support on depression (non-stratified model)

social life, it is the lowest. However, at no point on the x-axis (constriction of social life), the difference between instrumental support groups is significant. When people report constrictions in two areas of social life (constriction of social life=2), the probability of depression does not differ depending on instrumental social support.

4.2.3 Predictors of Depression in Employed Caregivers

Model Description/Goodness of fit

The full logistic regression model for employed CG predicts depression significantly better than the intercept-only model ($\chi^2(18)=78.45$, $p<0.001$). The classification table shows a good PPV (62.50 %) and NPV (92.76 %).

Table 6 Goodness of fit parameters - Depression, employed CG

Goodness of fit parameter	
Omnibus test	$\chi^2(18)=78.45$ $p<0.001$
Log-likelihood model	-187.69
intercept-only	-226.91
correctly classified	92.14 %
positive predictive value	62.50 %
negative predictive value	92.76 %
Nagelkerke's R ²	0.22
Hosmer-Lemeshow	$\chi^2(8)=11.84$ $p=0.16$

With a pseudo R-squared of 0.22, the explained variance of the model is equal to the non-stratified model (Table 6). Although indicating good model fit ($\chi^2(8)=11.84$, $p=0.16$), the Hosmer-Lemeshow test of expected and observed cases in ten subgroups of employed caregivers violates the 'five cases per cell' requirement of a chi-squared test in the outcome category depression.

The Effect of Independent Predictors

Only a few predictors have a significant independent effect on depression in the final adjusted model. With an odds ratio of 0.39 (95% CI [0.16-0.95]), having a child/children under 18 living in the household is negatively associated with depression. Furthermore, a significant positive association between the number of chronic conditions and depression can be found. Although not significant, the odds ratios of other predictors point in the same direction as in the non-stratified model. For example, the odds for high school graduates are 1.98 times higher than the odds for people holding a college degree or higher (95% CI [0.95-4.14]), people receiving emotional social support have lower odds of depression than people who do not receive social support (OR=0.61, 95%

CI [0.27-1.38]), and people living in a partnership have lower odds of depression than those living without a partner (OR=0.75, 95% CI [0.41-1.39]).

Interactions/Moderators

A significant interaction between overload and relational deprivation was identified and included in the final model (OR=1.07, 95% CI [1.02-1.12]). Post hoc slope analysis (Figure 6) shows that the simultaneous increase of

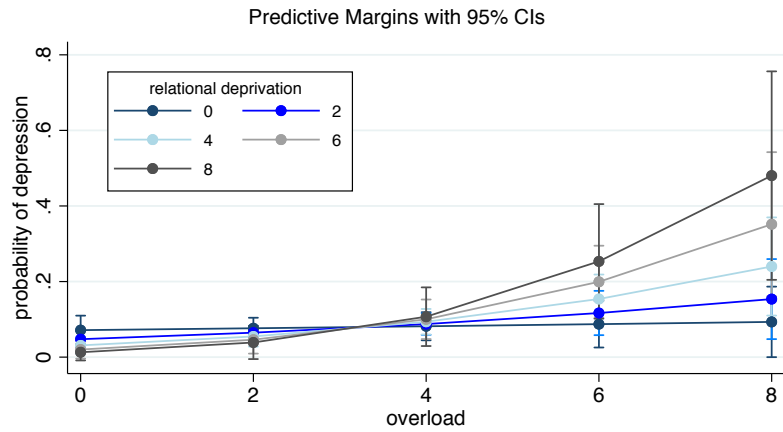


Figure 6 Interaction plot - overload#relational deprivation on depression (employed CG)

overload and relational deprivation leads to higher probabilities of depression. But until overload exceeds the value of four, the probability of depression for all levels of relational deprivation is low, with only marginal differences. If overload is higher than four, the slope for the upper three levels of relational deprivation becomes steeper, while if the relational deprivation is low, the probabilities of depression differ only slightly between the different levels of overload. But even at high levels of overload, the probabilities of depression do not significantly differ between different levels of relational deprivation. Neither for relational deprivation nor for overload are the main effects significant.

4.2.4 Predictors of Depression in Unemployed Caregivers

Model Description/Goodness of fit

The adjusted model is an improvement over the model, which contains only the constant, the log-likelihood value is significantly lower than in the intercept-only model ($\chi^2(19)=68.05, p<0.001$). 21 percent of variance in the probability of the

Table 7 Goodness of fit parameters - Depression, unemployed CG

Goodness of fit parameter		
Omnibus test	$\chi^2(19)=68.05$	$p < 0.001$
Log-likelihood model	-201.08	
intercept-only	-235.11	
correctly classified	81.72	%
positive predictive value	61.54	%
negative predictive value	82.89	%
Nagelkerke's R ²	0.21	the
Hosmer-Lemeshow	$\chi^2(8)=7.41$	$p=0.49$

outcome is explained by the model (pseudo R²=0.21). The PPV of 61.54 percent, the NPV of 82.89 percent, as well as the Hosmer-Lemeshow chi-square test of expected and observed cases in deciles ($\chi^2(8)=7.41, p=0.49$) indicate a good model fit (Table 7). Nonetheless, some groups (cells) of expected or observed cases contain less than five cases which is a violation of the requirements of a chi-square test.

The Effects of Independent Predictors

As in the non-stratified model, the number of chronic conditions and marital status are significantly associated with depression. Each additional chronic condition increases the odds of depression by 1.18 (95% CI [1.01-1.39]) and CG living in a partnership have significantly lower odds of depression than CG without a partner. Furthermore, significant relationships between depression and relational deprivation or overload can be observed. Per unit increase in relational deprivation or overload, the odds of depression increase by 24 (95% CI [1.09-1.41]) and 22 percent (95% CI [1.06-1.39]), respectively. As in the non-stratified model, high school graduates have higher odds of depression than the reference group of college graduates or higher educational levels (OR=2.16, 95% CI [0.94-4.94]). Moreover, experiencing emotional social support is associated with lower odds of depression (OR=0.63, 95% CI [0.30-1.34]). The other independent variables in the model do either influence the probability of depression at random or in interaction with other independent variables (see next chapter).

Interactions/mediators

The interaction between co-residence and caregiving intensity from the non-stratified model is also significant in the model of unemployed CG (OR=0.67, 95% CI [0.46-0.99]). If people care with low intensity (caregiving intensity = 0), those living

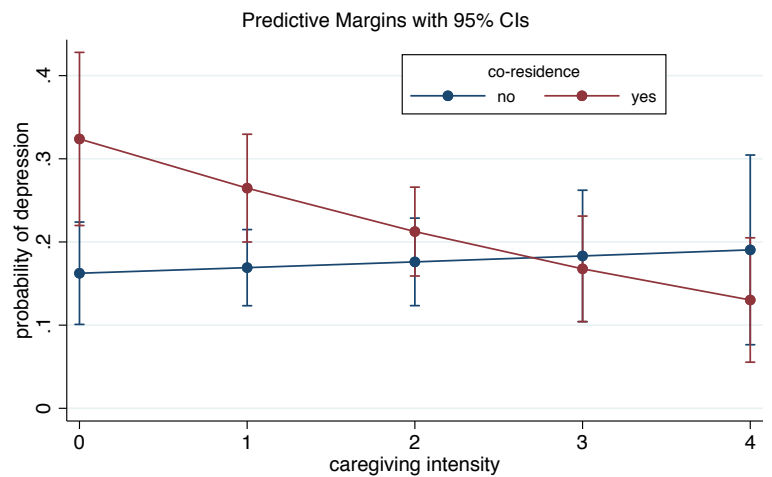


Figure 7 Interaction plot - caregiving intensity#co-residence on depression (unemployed CG)

in the same household as the CR have a higher probability of depression. This main effect of co-residence is significant (OR=2.90, 95% CI [1.35-6.23]). With increasing caregiving intensity, the probability of depression decreases in the group of co-residents; at the two highest levels of caregiving intensity, the probability of depression is lower than in non-co-residents (Figure 7). However, the difference between co-residents and non-co-residents is at no level of caregiving intensity significant. Within co-residents, the predictive margins for depression are significantly lower in the highest compared to the lowest caregiving intensity group (Pr(depression)=0.32, 95% CI [0.22-0.43] versus Pr(depression)=0.13, 95% CI [0.06-0.21]).

4.3. Emotional Difficulty

4.3.1 Bivariate associations

Significant correlations with depression were found in the bivariate analysis (Table 8) for age, sex, race/ethnicity, education of the caregiver, as well as for the relationship to the CR, marital status, having a child/children under 18, caregiving intensity, dementia, the CR's number of chronic conditions, relational deprivation, overload, constriction of social life, financial difficulty, gain from caregiving, and support services use. Except for relational deprivation, overload, constriction of social life, and financial difficulty, which have a medium strong association with emotional difficulty ($r \geq 0.3$ to $r < 0.5$), the significant associations are very weak ($r < 0.1$) to weak ($r \geq 0.1$ to $r < 0.3$). Even though employment

Table 8 Bivariate correlation coefficients between emotional difficulty and predictors

	emotional difficulty
employment status	-0.0279
age	0.0694*
sex	0.0840*
race/ethnicity ¹	0.1820*
education ¹	0.0833*
co-residence	-0.0008
relationship to the CR ¹	0.1809*
CG chronic conditions	0.1076*
living with a partner	0.0936*
child u18 in household	-0.0161
caregiving intensity	0.1195*
caregiving duration	0.0149
dementia	0.1252*
CR chronic conditions	0.0800*
relational deprivation	0.4059*
overload	0.3947*
constriction of social life	0.3082*
financial difficulty	0.3028*
gain	-0.0911*
emotional social support	-0.0288
instrumental social support	-0.0375
support services use	0.1683*

¹ Cramer's V

status is not associated with emotional difficulty, it was included in the model, since it is the main outcome variable of interest to answer the first research question. Moreover, the variable which indicates whether CG live in the same household as the CR was included because it is correlated ($r \geq 0.2$) with caregiving intensity ($r=0.2796$, $p < 0.05$) and therefore might have an influence on the outcome as well.

4.3.2 Effect of Employment Status and other Predictors on Emotional difficulty

When comparing the crude and the adjusted effect (initial model) of employment status on emotional difficulty, the effect remains non-significant. For female sex, black race (compared to white), and co-residence with the CR, the adjusted effect is stronger than the crude effect, the effect of co-residence even becomes significant in the adjusted model although it was not significant in the crude model (Table 9, column 1 and 2). For friends/other non-relatives (compared to spouses), dementia, relational deprivation, overload, constriction of social life, and financial difficulty, the crude OR of emotional

difficulty are higher than the adjusted ones in the initial model, indicating, that the adjusted effects of these predictors are not as strong as the crude effects. Furthermore, the crude effects on emotional difficulty become nonsignificant in the adjusted model for CG age, other race compared to white, grandchild, niece/nephew, and other relative compared to spouse/partner, CG number of chronic conditions, living in a partnership, CR chronic conditions, caregiving intensity, gain, and support services use. Hence, these predictors do not have an independent influence on the outcome.

Table 9 Odds ratios for the predictors of emotional difficulty - crude, adjusted, and stratified by employment status

Outcome: Emotional difficulty	crude OR (n=1,306)	adjusted initial model (n=1,306)	final non- stratified model (n=1,306)	employed (n=827)	unemployed (n=479)
employed	0.87 (0.70 - 1.12)	0.80 (0.59 - 1.09)	0.82 (0.60 - 1.13)		
CG age	1.01** (1.003-1.03)	1.00 (0.98 - 1.01)	1.00 (0.98 - 1.01)	1.00 (0.98 - 1.03)	0.98 (0.95 - 1.01)
female sex	1.49** (1.16 - 1.90)	1.51** (1.11 - 2.06)	1.18 (0.80 - 1.74)	1.38 (0.94 - 2.02)	1.94* (1.07 - 3.52)
CG race & Hispanic ethnicity					
white	ref.	ref.	ref.	ref.	ref.
black	0.55*** (0.43 - 0.71)	0.52*** (0.37 - 0.73)	0.24*** (0.13 - 0.46)	0.40*** (0.25 - 0.63)	0.71 (0.38 - 1.31)
other	0.41* (0.19 - 0.89)	0.53 (0.21 - 1.36)	0.92 (0.10 - 8.17)	0.28 (0.072 - 1.05)	0.98 (0.21 - 4.61)
Hispanic	0.75 (0.50 - 1.14)	0.68 (0.40 - 1.17)	0.48 (0.18 - 1.28)	0.66 (0.35 - 1.26)	0.70 (0.24 - 2.07)
highest educational degree					
≥ college degree	ref.	ref.	ref.	ref.	ref.
some college/technical school	0.88 (0.67 - 1.15)	0.90 (0.63 - 1.28)	0.93 (0.65 - 1.33)	0.83 (0.54 - 1.26)	1.10 (0.55 - 2.21)
certificate/associate degree					
high school graduate	0.88 (0.65 - 1.18)	1.16 (0.80 - 1.68)	1.16 (0.79 - 1.70)	1.09 (0.69 - 1.72)	1.26 (0.61 - 2.61)
< high school	0.68 (0.41 - 1.14)	0.57 (0.29 - 1.09)	0.56 (0.29 - 1.08)	0.72 (0.28 - 1.83)	0.47 (0.16 - 1.35)
relationship to CR					
spouse/partner	ref.	ref.	ref.	ref.	ref.
child/step-child	0.84 (0.46 - 1.53)	0.85 (0.38 - 1.90)	0.85 (0.38 - 1.92)	0.76 (0.25 - 2.32)	1.33 (0.37 - 4.76)
daughter-/son-in-law	0.78 (0.37 - 1.66)	1.00 (0.39 - 2.59)	1.06 (0.40 - 2.77)	0.85 (0.24 - 3.02)	1.77 (0.34 - 9.27)
grandchild	0.39** (0.20 - 0.78)	0.56 (0.20 - 1.52)	0.57 (0.20 - 1.56)	0.62 (0.16 - 2.35)	0.47 (0.085 - 2.55)
niece/nephew	0.36* (0.15 - 0.84)	0.58 (0.19 - 1.72)	0.56 (0.18 - 1.70)	0.31 (0.069 - 1.36)	2.45 (0.39 - 15.5)
friend/other non-relative	0.17*** (0.07 - 0.45)	0.26* (0.078 - 0.83)	0.28* (0.085 - 0.92)	0.16* (0.030 - 0.84)	0.89 (0.14 - 5.59)
other relative	0.37* (0.16 - 0.87)	0.57 (0.20 - 1.66)	0.55 (0.18 - 1.63)	0.50 (0.11 - 2.32)	0.82 (0.15 - 4.40)
CG number of chronic conditions	1.19*** (1.09-1.29)	1.08 (0.96 - 1.21)	1.07 (0.95 - 1.20)	1.10 (0.93 - 1.30)	1.02 (0.86 - 1.22)
living in a partnership	1.34* (1.07 - 1.67)	1.01 (0.74 - 1.39)	1.04 (0.75 - 1.43)	0.84 (0.57 - 1.24)	1.46 (0.80 - 2.66)
co-residence with care recipient	0.94 (0.75 - 1.19)	0.65* (0.47 - 0.92)	0.67* (0.48 - 0.95)	0.64* (0.42 - 0.98)	0.80 (0.43 - 1.47)

Table 9 continued

CR dementia	1.63*** (1.29 - 2.06)	1.44* (1.06 - 1.96)	1.42* (1.04 - 1.93)	1.41 (0.97 - 2.06)	1.32 (0.74 - 2.36)
CR number of chronic conditions	1.11** (1.03 - 1.20)	1.02 (0.93 - 1.12)	1.01 (0.92 - 1.11)	0.99 (0.88 - 1.11)	1.04 (0.87 - 1.24)
caregiving intensity	1.15** (1.06 - 1.26)	0.94 (0.83 - 1.07)	1.04 (0.90 - 1.21)	1.12 (0.93 - 1.34)	0.96 (0.75 - 1.22)
relational deprivation	1.55*** (1.45 - 1.65)	1.41*** (1.31 - 1.52)	1.48*** (1.36 - 1.61)	1.42*** (1.28 - 1.57)	1.64*** (1.42 - 1.90)
overload	1.50*** (1.41 - 1.59)	1.24*** (1.15 - 1.33)	1.29*** (1.18 - 1.40)	1.26*** (1.15 - 1.38)	1.23** (1.06 - 1.42)
constriction of social life	2.01*** (1.75 - 2.31)	1.34*** (1.13 - 1.59)	1.67*** (1.24 - 2.26)	1.80** (1.22 - 2.66)	1.64*** (1.23 - 2.20)
financial difficulty	4.81*** (3.47 - 6.67)	3.35*** (2.21 - 5.06)	17.3*** (7.31 - 40.9)	6.57*** (3.12 - 13.8)	9.19*** (2.96 - 28.6)
gain	0.87*** (0.82 - 0.93)	1.01 (0.93 - 1.10)	1.03 (0.94 - 1.12)	1.04 (0.94 - 1.15)	1.01 (0.86 - 1.19)
support services use	1.31*** (1.15 - 1.49)	1.13 (0.95 - 1.33)	1.14 (0.96 - 1.35)	1.17 (0.96 - 1.43)	1.13 (0.82 - 1.57)
female # black			2.69** (1.33 - 5.46)		
female # other			0.49 (0.043 - 5.60)		
female # Hispanic			1.47 (0.47 - 4.61)		
caregiving intensity # constriction of social life			0.90 (0.81 - 1.01)	0.81** (0.70 - 0.94)	
financial difficulty # caregiving intensity			0.73* (0.55 - 0.96)		0.60* (0.36 - 0.99)
financial difficulty # relational deprivation			0.80* (0.67 - 0.97)	0.72** (0.59 - 0.89)	
financial difficulty # overload			0.84* (0.71 - 0.99)		
constant		0.19* (0.039 - 0.91)	0.13* (0.025 - 0.69)	0.14 (0.019 - 1.08)	0.091 (0.005 - 1.56)

*** p<0.001, ** p<0.01, * p<0.05

Goodness of fit/fit of the model

The omnibus test is significant (Table 10), indicating that the final adjusted model has a significantly lower log-likelihood than the intercept-only model ($\chi^2(34)=487.88$, $p<0.001$). The model has good classification accuracy (PPV=74.94%, NPV= 78.22%) and

Table 10 Goodness of fit parameters - emotional difficulty, non-stratified model

Goodness of fit parameter	
Omnibus test	$\chi^2(34)=487.88$ $p < 0.001$
Log-likelihood model	-634.03
intercept-only	-877.97
correctly classified	77.11 %
positive predictive value	74.94 %
negative predictive value	78.22 %
Nagelkerke's R ²	0.42
Hosmer-Lemeshow	$\chi^2(8)=7.39$ $p=0.50$

according to the Hosmer-Lemeshow test, it is sufficiently calibrated ($\chi^2(8)=7.39$, $p=0.50$).

Overall, the model explains 42 percent of variance in the probability of the outcome (pseudo $R^2=0.42$). Multicollinearity is unlikely since the VIF is below two for all independent variables.

Effects of Independent Predictors

Employment status as the main independent variable of interest is not significantly associated with emotional difficulty (OR=0.82, 95% CI [0.60-1.13]), neither in the crude nor in the adjusted models (Table 9). Based on the results, unemployed CG have non-significantly lower odds of emotional difficulty than their employed counterparts (Table 9, column 3). In the model which further differentiates between part- and full-time employment, neither for part-time (OR=0.91, 95% CI [0.57-1.44]) nor for full-time employed CG (OR=1.39, 95% CI [0.99-1.95]) the odds of emotional difficulty are significantly different from those for unemployed CG (not displayed in the table).

Regarding the relationship to the CR, friends or other non-relatives who provide care have significantly lower odds of emotional difficulty compared to spousal CG (OR=0.28, 95% CI [0.085-0.92]). Moreover, CG living together with the CR have significantly lower odds of emotional difficulty than those living in separate households (0.28, 95% CI [0.48-0.95]), and providing care to a CR with dementia is associated with 1.42 times higher odds of emotional difficulty than providing care to a person without dementia (95% CI [1.04-1.93]). The remaining independent variables in the model (table 9, column 3) have only random effects on the outcome or are significant as main or interaction effects (see chapter below).

Interactions/Moderators

Interactions were identified and added to the model between race/ethnicity and sex, caregiving intensity and constriction of social life, financial difficulty and caregiving intensity, financial difficulty and relational deprivation, and financial difficulty and overload. More specifically, the interaction between black (compared to white) and sex is significant. Consequently, within white CG, the probability of emotional difficulty does not differ depending on sex (Figure 8). White males have a probability of 0.42 (95% CI [0.37-0.48]), and females have a probability of 0.45 (95% CI [0.41-0.49]). Conversely, black

males have a significantly lower probability of emotional difficulty (0.22, 95% CI [0.16-0.28]) than black females (0.38, 95% CI [0.33-0.43]). However, within females, there is no significant difference in the probability of emotional difficulty between black and white CG, whereas within

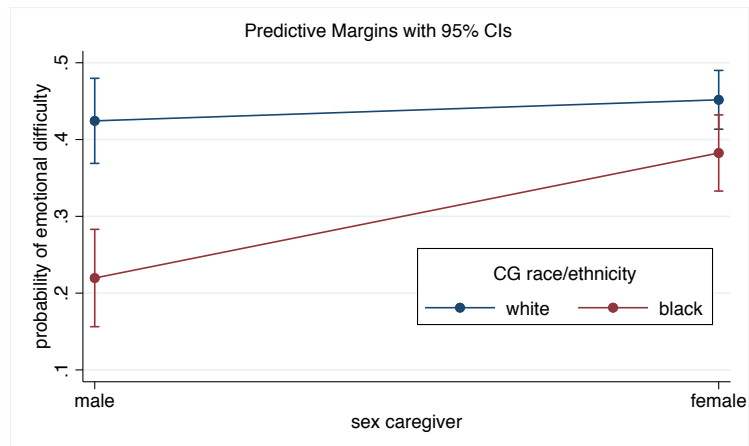


Figure 8 Interaction plot - sex#race/ethnicity on emotional difficulty (non-stratified model)

males, white CG have a significantly higher probability of emotional difficulty (0.42, 95% CI [0.37-0.48]) than black CG (0.22, 95% CI [0.16-0.28]), which is depicted in the significant main effect of 'black' in the model with an odds ratio of 0.24 (96% CI [0.13-0.46]).

The interaction term between caregiving intensity and constriction of social life was included although it was not significant in the final model after including other interactions. Although not significant, it increased the fit of the model and was therefore left in the model. The slope

analysis shows that the probability of emotional difficulty at high levels of caregiving intensity is nearly equally low for all strengths of constriction of social life (Figure 9). However, at low

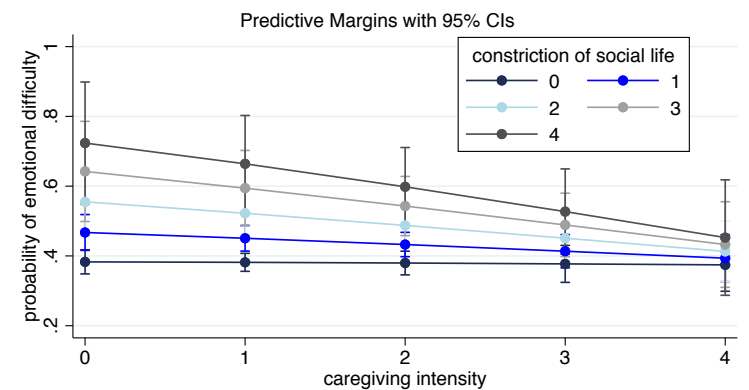


Figure 9 Interaction plot - caregiving intensity#constriction of social life on emotional difficulty (non-stratified model)

higher constriction of social life is associated with a higher probability of emotional difficulty. At low caregiving intensity (caregiving intensity=0), the main effect of constriction of social life is significant (OR=1.67, 95% CI [1.24-2.26]), indicating that the odds of emotional difficulty increase by 67 percent for each additional area of social life which is constricted. The main effect of caregiving intensity is not significant which means

that at zero constriction of social life, the probability of emotional difficulty does not vary depending on caregiving intensity.

The slope analysis of the interaction between caregiving intensity and financial difficulty (Figure 10) shows that, at each level of caregiving intensity, the probability of emotional difficulty is higher for CG who indicate having financial

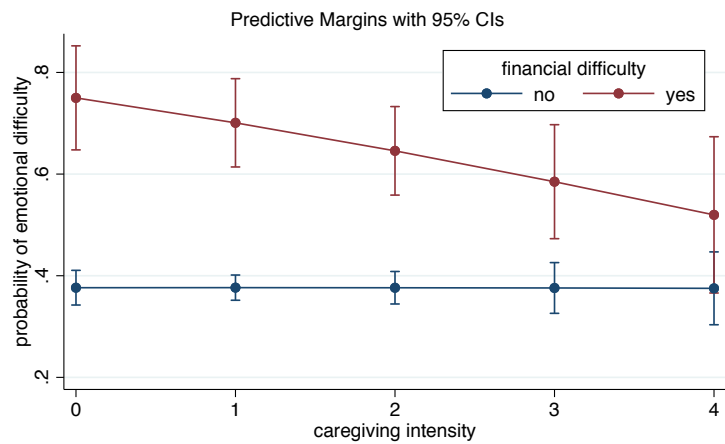


Figure 10 Interaction plot - caregiving intensity#financial difficulty on emotional difficulty (non-stratified model)

difficulties. Although this difference is significant (with the exception of the highest intensity), the probability of emotional difficulty for CG with financial difficulties decreases with increasing caregiving intensity from 0.75 (95% CI [0.65-0.85]) to 0.52 (95% CI [0.37-0.67]). In CG who do not report having financial difficulty, the probability of emotional difficulty remains unchanged at 0.38 (95% CI varies) in different caregiving intensities.

The significant interaction between financial difficulty and relational deprivation is plotted in figure 11. The main effect of relational deprivation is significant (95% CI [1.36-1.61]), indicating that if people report no financial

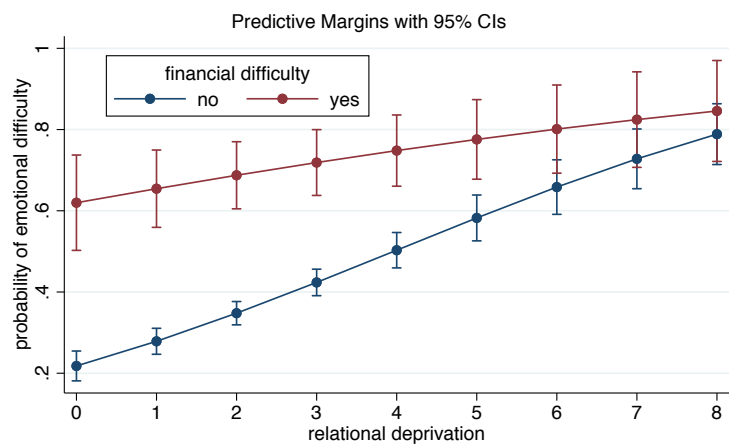


Figure 11 Interaction plot - relational deprivation#financial difficulty on emotional difficulty (non-stratified model)

difficulties, they have 1.48 times greater odds of emotional difficulty per unit increase in relational deprivation. In probabilities, the chance of emotional difficulty increases from 0.22 (95 % CI [0.18-0.25])

to 0.79 (95% CI [0.71-0.86])³. For CG with financial difficulty, the probability of emotional difficulty also increases with increasing relational deprivation, but the increase is neither as steep as for CG without financial difficulty, nor is the increase significant. However, until relational deprivation reaches a value of five, CG with financial difficulty have a significantly higher probability of emotional difficulty than CG without financial difficulty. The interaction between financial difficulty and overload is similar to the interaction between financial difficulty and relational deprivation (Figure 12). CG with financial difficulties have generally a higher probability of emotional difficulty than those without. With increasing overload, this difference diminishes until it is not significant anymore in the upper two values of overload. Whereas the probability of emotional difficulty significantly increases with higher overload in the group without financial difficulties (significant main effect of overload: OR=1.29, 95% CI [1.18-1.40]), only a small and nonsignificant increase can be observed in the group with financial difficulties. The main effect of financial difficulty is extremely high (OR=17.3, 95% CI [7.31-40.9]) since the final non-stratified model involves three interactions with financial difficulty and the main effect relates to the case where caregiving intensity, relational deprivation, and overload are zero.

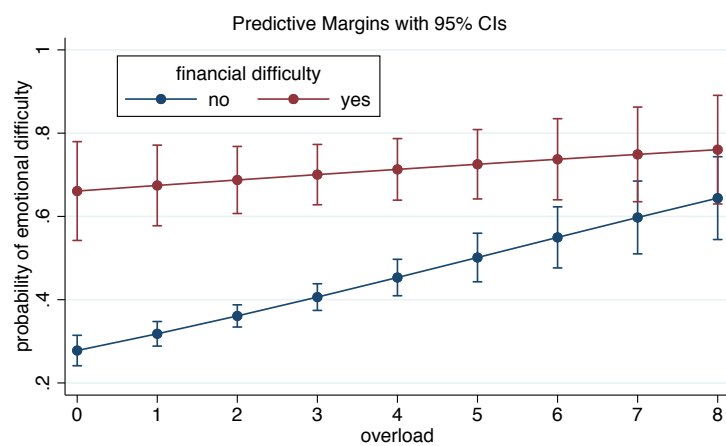


Figure 12 Interaction plot - overload#financial difficulty on emotional difficulty (non-stratified model)

³ due to very small case numbers in higher categories of relational deprivation, relational deprivation is only displayed until the value of 8

4.3.3 Predictors of Emotional Difficulty in Employed Caregivers

Goodness of fit/fit of the model

Table 11 Goodness of fit parameters - emotional difficulty, employed CG

The adjusted model predicts emotional difficulty significantly better than the intercept-only model ($\chi^2(28)=275.27$, $p<0.001$). With a PPV of 73.08 percent and a negative predictive value of 76.16 percent, the model's predictive

Goodness of fit parameter	
Omnibus test	$\chi^2(28)=275.27$ $p<0.001$
Log-likelihood model	-421.74
intercept-only	-559.37
correctly classified	75.09 %
positive predictive value	73.08 %
negative predictive value	76.16 %
Nagelkerke's R ²	0.38
Hosmer-Lemeshow	$\chi^2(8)=13.58$ $p=0.09$

power is sufficient. The Hosmer-Lemeshow test shows no significant difference in expected and observed cases ($\chi^2(8)=13.58$, $p=0.09$), which further indicates a good model fit. Overall, the model explains 38 percent of the variance in the probability of emotional difficulty (pseudo R²=0.38).

Effect of Independent Predictors

Significant associations can be found for black CG, being a friend or another non-relative, co-residence with the care recipient, and overload (Table 9, column 4). Black CG have significantly lower odds of emotional difficulty than white CG (OR=0.40, 95% CI [0.25-0.63]), friends/other non-relative CG have significantly lower odds compared to spousal CG (OR=0.16, 95% CI [0.03-0.84]), and co-residents have significantly lower odds than non-co-residents (OR=0.64, 95% CI [0.42-0.98]). Furthermore, overload is associated with higher odds of emotional difficulty. For each unit increase in overload, the odds of emotional difficulty increase by 26 percent (95% CI [1.15-1.38]). Although not significant in this model, providing care to a CR with dementia is associated higher odds of emotional difficulty (OR=1.41, 95% CI [0.97-2.06]) which is a similarity to the non-stratified model (where the CI is only marginally smaller).

Independent variables which were nonsignificant in the non-stratified model remained nonsignificant in this model.

Interactions/Moderators

Two significant interactions were included in the model, between caregiving intensity and constriction of social life, and between relational deprivation and financial difficulty.

The main effect of constriction of social life is significant (OR=1.80, 95% CI [1.22-2.66]), indicating that higher constriction of social life (in terms of more areas of social life being constricted) is associated with a higher probability of

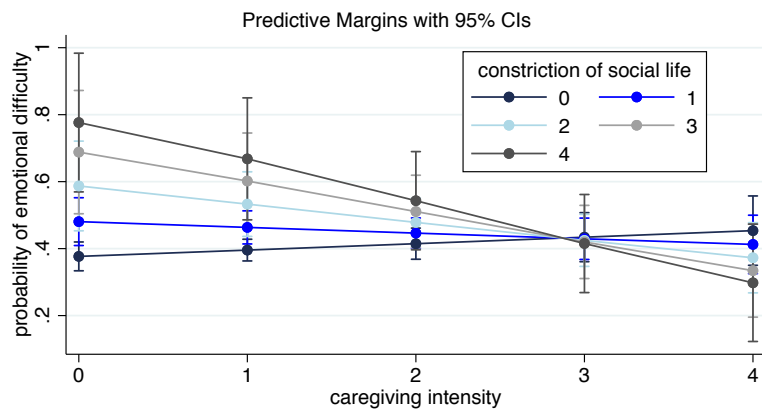


Figure 13 Interaction plot - caregiving intensity#constriction of social life on emotional difficulty (employed CG)

emotional difficulty. Conversely, the main effect of caregiving intensity is not significant, which can be seen in the graphic representation (Figure 13) as an only weak and nonsignificant increase of emotional difficulty for the graph 'constriction of social life = 0'. The interaction effect is made up of the observations that the simultaneous increase in constriction of social life and caregiving intensity leads to a decrease in the probability of emotional difficulty. Even though medium to high constriction of social life is associated with higher probability of emotional difficulty at low levels of caregiving intensity, the probability of emotional difficulty at higher levels of constriction of social life drops below the probability at lower constriction levels. Hence, the moderating effect of caregiving intensity only occurs when several areas of social life are constricted. The interaction between financial difficulty and relational deprivation is depicted in Figure 14. The significant main effect of financial difficulty implies that for CG with no relational deprivation (=0) the odds of emotional difficulty are 6.57 times higher for those with versus without financial difficulty. The difference in the probability of emotional difficulties between CG with and without financial difficulties remains significant up to a level of 3 in relational deprivation.

While the probability of emotional difficulties with higher relational deprivation increases significantly in the group without financial difficulties (significant main effect of relational deprivation: OR=1.42, 95% CI [1,28-1,57]), it remains stable with probabilities

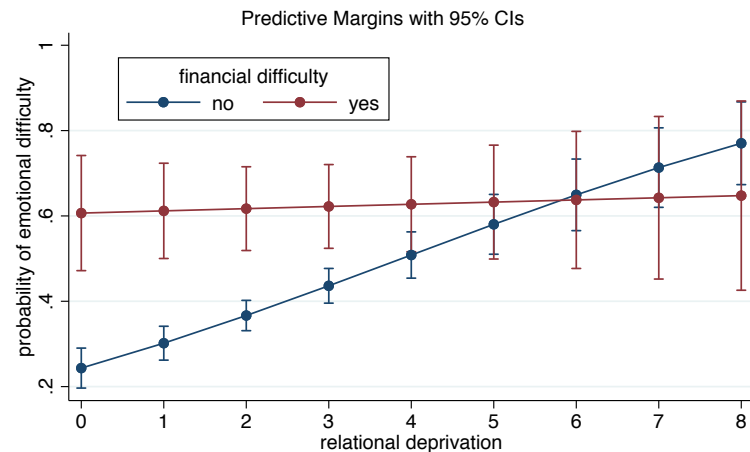


Figure 14 Interaction plot - relational deprivation#financial difficulty on emotional difficulty (employed CG)

between 0.60 and 0.66 in the group with financial difficulties.

4.3.4 Predictors of Emotional Difficulty in Unemployed Caregivers

Goodness of fit/fit of the model

The log-likelihoods of the final adjusted model for emotional difficulty in unemployed CG are significantly lower than in the intercept-only model ($\chi^2(27)=229.71, p<0.001$), indicating that the final adjusted model predicts

Table 12 Goodness of fit parameters - emotional difficulty, unemployed CG

Goodness of fit parameter	
Omnibus test	$\chi^2(27)=229.71$ $p<0.001$
Log-likelihood model	-203.221
intercept-only	-318.077
correctly classified	82.25 %
positive predictive value	81.29 %
negative predictive value	82.72 %
Nagelkerke's R ²	0.52
Hosmer-Lemeshow	$\chi^2(8)=3.96$ $p=0.86$

emotional difficulty significantly better (Table 12). With a PPV and an NPV of more than 80 percent, the classification accuracy is sufficiently high. Furthermore, 52 percent of the variance in the probability of emotional difficulty is explained (pseudo R² = 0.52) which can be rated as good. According to the Hosmer-Lemeshow test, the number of expected and observed cases does not significantly differ ($\chi^2(8)=3.96, p=0.86$), which further supports the good model fit.

Effect of Predictors

In unemployed CG, only sex, constriction of social life, relational deprivation, and overload are independently associated with emotional difficulty (Table 9, column 5).

Different from the non-stratified and the model of employed CG, female sex is significantly associated with emotional difficulty (OR=1.94, 95% CI [1.07-3.52]). For each additional constricted area of social life, the odds of emotional difficulty increase by 1.64 (95% CI [1.23-2.20]). Per unit increase in relational deprivation or overload, the odds of emotional difficulty increase by 64 (95% CI [1.42-1.90]) and 23 percent (95% CI [1.06-1.42]).

Interactions/Moderators

The interaction plot shows that for CG without financial difficulty, the probability of emotional difficulty does not change depending on caregiving intensity (Figure 15). Thus, the main effect of caregiving intensity is not significant. However, the main effect of financial difficulty is significant, indicating that CG who have financial difficulties have 9.19 times higher odds of emotional difficulty than CG without financial difficulty when caregiving intensity is equal to zero (95% CI [2.96-28.59]). With increasing caregiving intensity, the probability of emotional difficulty decreases in the group with financial difficulties until the probability does not differ anymore in depending on financial difficulty at high levels of caregiving intensity. Only considering the group with financial difficulties, the probability of emotional difficulty is significantly lower for the highest (Pr(emotional difficulty)=0.71, 95% CI [0.54-0.87]) compared to the lowest caregiving intensity level (Pr(emotional difficulty)=0.35, 95% CI [0.18-0.52]).

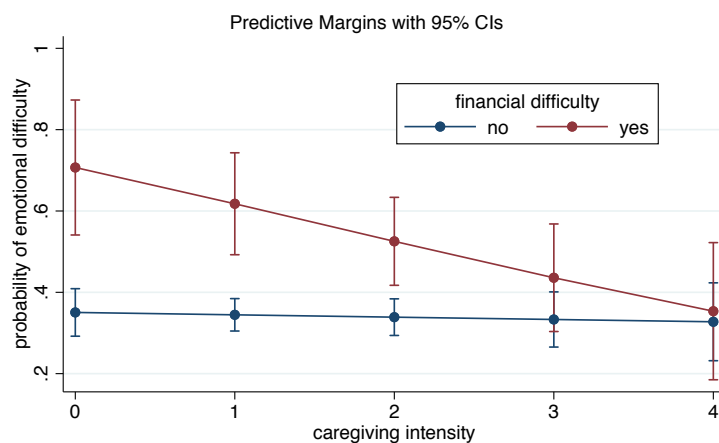


Figure 15 Interaction plot caregiving intensity#financial difficulty (unemployed CG)

5. Discussion

5.1. Summary of Results and Interpretation

Regarding the first aim of the study, unemployed CG have 2.22 times higher odds of depression than employed CG, but employment status has no significant influence on emotional difficulty. Hence, the results support the hypothesis for depression, but not for emotional difficulty. The protective effect of employment for depression is in line with previous findings [26]. Applying these results to role theory, one could assume that caregiving and employment are roles one cannot escape (at least not that easily) due to internal (self-imposed obligation) and external factors or reasons (expectation of the society to care for a relative) as well as due to objective factors like the necessity of work for financial and personal reasons. But different from Goode's scarcity hypothesis [19], it does not seem to strain people to carry out both roles. At least for depression, the results rather promote the role enhancement perspective [20]. This perspective is supported by qualitative findings as well. Eldh and Carlsson [30] for example summarized from a Swedish sample that combining informal care with employment can be perceived fulfilling, and in a study from Italy [54], older working CG describe employment as a buffer against caregiving strain. Regarding the role expansion theory, this study's sample reports on average having relatively low levels of overload and seem in general highly committed to their CG role (report on average high levels of gain from caregiving). This observation may explain the lower prevalence of depression in this study (12.31 % overall, 8.09 % in employed CG) compared to other estimates for U.S. CG (53 % of employed CG) [12]. However, these differences may also be partly existent, because Hopps et al. [12] used a more detailed version of the PHQ (PHQ-9) which allows differentiating between four different severity groups of depression. The PHQ-2 used in this study may does not capture mild depressions.

5.1.1 Predictors of Depression

Independent of the employment status, lower educational status, negative physical health (higher number of chronic conditions), relational deprivation, and overload

predict depression positively, whereas living in a partnership and emotional social support is protective. The results regarding the association between physical impairment and depression, as well as the protective effects of emotional social support and living with a partner, are in line with previous findings [10, 51]. Moreover, caregiving intensity moderates the relationship between co-residence and depression: Whereas at low levels of intensity, co-residents have significantly higher odds of depression than non-co-residents, the probability of depression decreases with increasing intensity for co-residents, but not for non-co-residents. No independent effect of caregiving intensity could be found. Kumagai [27] recently showed that co-residential care is a determinant of high-intensity care. This can also be observed in this sample, since 14 percent of non-co-residents versus 30 percent of co-residents provide care in the upper two care intensity levels.

Both, constriction of social life and instrumental social support, increase the chance of depression. However, instrumental social support buffers the effect of constriction of social life (increase in the probability of depression over constriction of social life only if CG receive no instrumental social support). That constriction of social life is associated with a higher risk of depression is plausible in the sense that social activities can be considered as balance from the caregiving responsibility. Hence, especially if people do not receive instrumental social support, constrictions in social life can be burdensome. Regarding the increasing risk for depression with increasing instrumental social support, it can be assumed that higher instrumental social support reflects the demand for it and therefore indicates a higher burden with care in general. However, the majority of CG in this sample receives instrumental social support and has low levels of constriction of social life, the analysis/the interaction is therefore possibly underpowered. Different to previous findings [2, 3, 5], neither sex of the caregiver, nor the relationship to the CR or caregiving intensity (as independent effect) play a significant role for depression in CG. When comparing determinants of depression in employed and unemployed CG, it can be observed that negative physical health increases the risk of depression in both groups. However, having a child or children under 18 in the household is protective in employed CG but does not predict depression in unemployed CG (where a generally

lower percentage has children). This observation further supports the role enhancement theory: not only being employed is protective, but within employed CG, additionally having children, which indicates having at least three different role obligations (caregiver, employee, parent), is also protective against depression. Moreover, living in a partnership is protective in unemployed CG but has no influence in employed CG, and co-residing with the CR increases the risk of depression in unemployed CG (buffered by caregiving intensity) but has no influence in employed CG. This difference may exist due to the circumstance that unemployed CG who co-reside with the CR are around the CR more frequently, whereas employed co-residents can escape from or have more distance to the caregiving situation when being at work regularly. Relational deprivation and overload are independent predictors in unemployed CG, but they are only detrimental in employed CG if both, overload and relational deprivation, are high.

5.1.2 Predictors of Emotional Difficulty

Controlling for employment status in the overall sample, co-residing with the CR as well as being a friend or another non-relative of the CR (compared to spouses/partners of the CR) is protective against emotional difficulty. This may be explained by the higher emotional distance a friend or a non-relative probably has compared to people who provide care to a spouse or a partner. On the contrary, providing care to a CR with dementia is positively associated with emotional difficulty. That dementia CG are especially burdened has frequently been reported in the literature [45] and is explained by, for example, the high care dependence or behavioral psychological changes and symptoms. Sex differences can only be found in black CG: black males have a lower probability of emotional difficulty than black females, whereas, for White's, the probability of emotional difficulty is equally high as in black females, independent of sex. In non-high-intense CG, constriction of social life is associated with a higher chance of emotional difficulty. Caregiving intensity furthermore buffers the effect of financial difficulty. With increasing relational deprivation or overload, the probability of emotional difficulty increases in the group without financial difficulties but remains nearly unchanged high for those with financial difficulties. However, this cross-sectional data does not allow a statement regarding the causal explanation of this observation.

Therefore, it remains unclear whether CG with financial difficulty have a generally high probability of emotional difficulty, independent of having high levels of overload or relational deprivation, or whether it is the other way around, meaning that the effect of relational deprivation or overload on emotional difficulty is stronger and outweighs the effect of financial difficulty. Moreover, using a dichotomous outcome of emotional difficulty is may not sufficient to capture the severity of emotional difficulty or the additional influence of relational deprivation or overload, which is a limitation in general. The comparison between employed and unemployed CG regarding the determinants of emotional difficulty indicates that female unemployed CG have a significantly higher risk of emotional difficulty than males. This sex difference is not present in employed CG. For race it is the other way around: employed black people have a significantly lower risk of emotional difficulty compared to white people, whereas no differences in race regarding emotional difficulty can be found in unemployed CG. Future studies should examine the interrelation of sex/gender roles, race/ethnicity, and employment/socio-economic status to shed light on the causal explanation of these findings. Furthermore, co-residence with the CR as well as being a friend or another non-relative (compared to spousal CG) is protective against emotional difficulty in employed CG but does not predict emotional difficulty in unemployed CG. However, the large confidence interval for the odds of co-residence in unemployed CG indicates that the analysis may be underpowered to detect a significant (probably similar) effect for being a friend/non-relative in unemployed CG. In both groups, financial difficulty, constriction of social life, relational deprivation, and overload are positively associated with emotional difficulty. However, different interactions can be observed. In employed CG, caregiving intensity buffers the effect of constriction of social life, meaning that at high caregiving intensity, CG with different levels of constriction of social life have a similar low probability of emotional difficulty. Further observations in employed CG are that relational deprivation only increases the probability of emotional difficulty in the group without financial difficulties whereas it does not change the probability for CG with financial difficulties (whose probability of emotional difficulty is initially higher). In unemployed CG, the

negative effect of financial difficulty is only moderated by caregiving intensity, which buffers the effect.

5.2. General Discussion of the Results

Against initial assumptions based on previous studies [2, 3], caregiving intensity as primary stressor does neither predict depression, nor emotional difficulty independently, but it buffers the effect of some other factors like constriction of social life, financial difficulty, and co-residence with the CR. A possible explanation for this could be that only a minority of CG in this sample provides high-intense care and if they do care in a high intensity, they want to do this, meaning that they might be very committed to this role. This may also mean that they are very resilient against negative effects from financial difficulty or are ok with foregoing, for example, other social activities. Thus, people may select themselves into a high-intense caregiving role and otherwise find, for example, external support. A study from Japan [27] furthermore found that non-working or irregular working CG who experienced high-intensity caregiving (20 to 40 hours per week) are likely to continue high-intensity caregiving. The author furthermore found, that high-intensity caregiving is associated with worse mental health in non-working CG, but not in those with irregular work. In the current study, on the other hand, no association between caregiving intensity and depression could be found, even for unemployed CG. Different than expected based on previous results [45], there is no association between dementia status of the CR and depression of the CG, but between dementia status and emotional difficulty in the non-stratified sample.

In summary, depression and emotional difficulty are determined to some extent by different factors. In some cases, even the direction of the influence is different (for example, co-residence with the CR is positively associated with depression but is protective for emotional difficulty). Furthermore, between employment groups, different interactions can be observed. Nevertheless, the results are quite consistent for the detrimental effects of overload and relational deprivation as primary stressors on the CG's mental health (although the majority is distributed among lower levels of relational deprivation or overload). However, in case financial difficulties are also occurring, these

factors do not have an additional detrimental effect. On the contrary, financial difficulties do not have an effect on depression, which may be explained as follows: Financial difficulty is maybe enough to make care emotionally challenging but does not have the potential to develop into a serious health state like depression. Thus, the key is possibly how to cope with emotional difficulty, which leads to the assumption that even though a similar proportion of employed and unemployed CG have emotional difficulty (40.9% versus 38%) - maybe just because it is normal to be emotionally attached when caring for a beloved one - , employed CG have better resources to deal with it (since their risk of depression is lower). This hypothesis is supported by an integrative review of quantitative and qualitative studies from Yu and colleagues [55] who unraveled positive effects of caregiving which arise from effective coping with care-related challenges (personal accomplishment and gratification, feelings of mutuality in a dyadic relationship, increased family cohesion and functionality, and sense of personal growth and purpose in life). They furthermore emphasize a paradigm shift from "stress-reduction" to "optimization of positive experiences". However, it is also possible that emotional difficulty is completely independent of depression (in this sample the association is very weak: $r=0.10$, $p<0.05$) and the assumption that emotional difficulty is a preliminary state of depression cannot be accepted. Consequently, different predictors play a role. Moreover, whereas the item in the questionnaire regarding emotional difficulty was directly related to the caregiving process, depression was assessed using a general measurement and hence must not necessarily be a result of caregiving.

5.3. Thoughts regarding caregiving and employment/labor market

It remains unclear for which reasons people in this study are unemployed, it cannot be excluded that they retired or reduced working hours in order to provide more or more intense care. In this sample, unemployed CG in working age provide on average care with a higher intensity. They furthermore have a higher mean number of chronic conditions; hence, it is possible that they initially became unemployed or retired earlier for physical health reasons and thus were predisposed to take up the care responsibility.

Several studies examined job-related outcomes or job-caregiving conflicts, which are also considered by Pearlin in the SPM [31]. Hopps et al. [12] showed in their comparison of employed CG and NCG that CG have significantly higher work productivity impairments (absenteeism, presenteeism, and work activity impairment). Ang and Malhotra [51] recently showed that care-related work interruptions are associated with more depressive symptoms in CG, and Trukeschitz et al. [56] found that combining work and caregiving is problematic if time demands and burden are high. Thus, job-caregiving conflicts were initially hypothesized to be important. However, job-caregiving conflicts were not considered in this study due to several reasons: Firstly, only a small percentage indicates having job-caregiving conflicts (lower than in other studies which examined the influence of work inferences on CG burden [57]). Secondly, the majority of this sample provides care in a rather low intensity. Thirdly, only weak bivariate associations were found between the outcomes of interest and the available variables “Did providing care keep you from working for pay?” and “Did helping the CR made it harder for you to get your work done?”⁴. This does not mean that these factors are unimportant for the analysis of the effects of caregiving on work/labor market participation in general, but this was beyond the aim of this study.

5.4. Limitations

This study analyzed the difference between employed and unemployed caregivers regarding depression and emotional difficulty in informal caregivers of a national representative sample of care-dependent people aged 65. The analyses are based on a theoretical framework of stress process and confirm previous findings regarding the association between employment and depression [26] in a sample which does not exclusively focus on adult-child CG aged 50 plus. However, several limitations have to be highlighted.

⁴ Even though bivariate associations with a significant correlation coefficient of ≥ 2 were found between job-caregiving conflicts and emotional difficulty, these associations diminished in the adjusted model. Moreover, including these factors would reduce the sample size since the question whether caregiving affects work was only answered by participants who indicated that they worked for pay the last week. Thus, several participants who were just absent from work the previous week or own a business/farm were neglected.

Firstly, and since the sample was derived from care-dependent participants of the NHATS which comprises Medicare beneficiaries aged 65 and older, the results of the current study cannot be applied to CG of younger CR, for example to disabled children or people below the age 65 with a chronic disease.

Secondly, the results are not generalizable to CG aged 65 or older as the analyses were limited to CG below the age of 65. This cut-off value was chosen to compare employed and unemployed CG in working age. However, there are many older people in the original sample of the NSOC who work beyond the age of 65, at least for a few hours per week. Inversely, some people already retired earlier and hence were categorized in this study as 'unemployed'. According to the *Report on the Economic Wellbeing of U.S. Households in 2017*, "half of the retirees in 2017 retired before age 62, and an additional one-fourth retired between the ages of 62 and 64" [58, p. 50]. Thus, it can be questioned whether the age span is appropriate for the comparison between employed and unemployed CG, or whether it makes sense to compare employed CG with those who partly already retired. Moreover, the study says nothing about the duration of unemployment, nor anything about the individual reasons for it.

Thirdly, the results lack robustness as the stratified analyses may be underpowered. The odds ratios often point in a similar direction like in the non-stratified analysis but are non-significant with larger confidence intervals.

Fourthly, a heterogeneous group of CG is analyzed in this study without specification on the CG type (spouse, child, friend, etc.). However, the relationship to the care recipient was taken into account in the model, and the analysis showed that the relationship to the CR is nearly irrelevant. Only for emotional difficulty, spouses have a higher probability to report emotional difficulties than friends or non-relatives.

Fifthly, operationalization of multiple variables into composite measures (caregiving intensity, overload, relational deprivation, gain, constriction of social life, and social support) led to a loss of information and is may not appropriate since the combination of the respective variables in a sum score has not been validated. For reasons of unnecessary model complexity (Occam's razor) in relation to the sample size, the before

mentioned variables were nevertheless included as described in the methods chapter. For some variables which were derived from original ordinal variables (for example 'very much', 'somewhat', 'not so much'), it would have been conceivable using means instead of sum scores. Nevertheless, the decision was made in favor of sum scores because they give information on a broader range. In addition, the mean would result in biased or misleading values if a participant on one sub-variable obtained high values and very low values on another, while the use of sum scores means that high values are still considered high and added to, for example, a low expression in another variable. Regarding the operationalization of caregiving intensity as a composite measure of high-intense caregiving in the sub-categories ADL, IADL, MCA, and hours of care per month, there might be issues with comparability with other studies which, for example, only measured the hours of care as care intensity [27]. For the same reasons as above, the composite measure was nevertheless used. However, even within low caregiving intensity groups, the intensity can differ substantially. The composite measure is hence not sensitive enough to examine smaller differences in caregiving intensity.

Finally, this study's biggest weakness is its cross-sectional design which does not allow any causal conclusions. The design did further not allow to take into account the change in stress process components over time, as proposed by Pearlin. There are also several endogeneity issues, for example regarding what was first, depression or unemployment, or unemployment or caregiving.

6. Conclusion and Outlook

Although the relationship is not necessarily causal, unemployment is associated with a higher likelihood of depression, but not of emotional difficulty with caregiving, among CG in working age. Thus, the results support the role enhancement perspective. Other independent predictors of depression in both employment groups are worse physical health, relational deprivation, and overload. Employed CG further benefit from having children under 18. Given that the prevalence of depression in unemployed CG is twice as high, it is unlikely that the differences in determinants provide a full explanation of the differences in risk. Independent of employment status, constriction of social life, financial difficulty, relational deprivation, and overload are associated with a higher risk of emotional difficulty.

Around 40 percent of CG in working age have emotional difficulty, but only 12 percent develop a depression. Future studies should test whether people who report emotional difficulty are more likely to develop depression. Further, they should investigate whether and how employment status mediates this association. To do justice to the temporal aspect of the stress process, which was not taken into account in this study due to its cross-sectional design, future studies should analyze trajectories of the stress process pre-, during-, and post-caregiving with a special focus on employment status and (mental) health. Further research possibilities would be to investigate mental health more comprehensively instead of focusing only on depression as an outcome. This (often binary) outcome does not capture the whole influence of caregiving on mental health. Of practical relevance would further be the identification of early indicators of depression (in a longitudinal design) or care-related mental problems to offer support services to the relevant target groups. Crucial for support services is to ensure the availability, the appropriateness, but also the knowledge that such services exist. In this sample, only a few people used support services, hence support services use had no effect on mental health. Thus, CG may not know about such services, or the available services do not match their needs. Consequently, interventions or support services which target the (mental) health of the CG should be developed based on needs assessments.

These needs assessments may show different needs or demands depending on employment status.

Some intervention studies which target depression or mental distress focus on respite care and found that respite care generally meets the needs and desires of CG and is perceived effective in reducing the burden of care. But a lack of knowledge that these services exist, often prevents the caregivers who need them most from using them [59]. A recent meta-analysis, which examined the efficacy of web-based interventions to reduce depression, concluded that predominately efficacious interventions focus on information and education [60]. In addition, peer and psychological support interventions were found to be partly efficacious [60]. Another study furthermore found that respite care alleviates mental distress, especially in non-working CG [27]. However, the health systems on which these studies are based (Japan and the Netherlands) differ substantially from the U.S. system where respite care is usually not covered by insurances and has to be paid for privately. Given the results of the current study that the risk of emotional difficulty is increased when caring for the CR is financially difficult for the CG, it is important to ensure that CG receive sufficient financial support if they are in need, in order to prevent CG from losing their assets.

Since the results of the current study, as well as previous results show that employment is protective against mental health outcomes, it is important to ensure that it is possible to combine both. Results from quantitative and qualitative studies emphasize the importance of flexible work hours to successfully combine care and work [54, 61, 62]. If workplace arrangements like flexible hours, unpaid family leave, and paid vacation days exist, CG are furthermore more likely to remain employed [63]. This is of particular relevance from an economic or labor market perspective since some studies found that caregiving is associated with earlier retirement/labor market exit or a reduction of working hours [2, 15]. However, a study from the Netherlands which studied the perceived balance between work and care concluded, that even though working CG need leave arrangements to reconcile work with care, this is not sufficient to restore their work-care balance [64].

In conclusion, the associations between informal care, employment or labor market participation, and (mental) health are complex. This study supports the protective effect of employment on mental health in terms of depression but cannot give a sufficient explanatory contribution to this relationship. Thus, more research is needed to illuminate causal relationships.

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Statutory Declaration

I hereby declare that I wrote this thesis without any assistance and used only the aids listed. Any material taken from other works, either as a quote or idea have been indicated under 'References'.

Hamburg, July 15, 2019



Place, Date

Signature

Appendix

Table 13 Overview of variables, scale levels and original questionnaire items

variable	scale level	original questionnaire item(s)
Employment status	dichotomous (employed/ unemployed)	<p>"Did you do any work for pay in the last week?"</p> <p>"Do you {or your {spouse/partner}} own a business or farm?"</p> <p>"Do you have {a/another} job from which you were absent last week because of illness, vacation, or some other reason?"</p>
sex (CG)	dichotomous	"We have you listed as {male/female}. Is that correct?"
age	continuous	(pre-loaded)
race/ethnicity	categorical	<p>"What race do you consider yourself to be: White, Black or African American, American Indian, Alaska Native, Asian, Native Hawaiian or Pacific Islander?"</p> <p>"Do you consider yourself Hispanic or Latino?"</p>
highest educational degree	categorical	"What is the highest degree or level of school you completed?"
having a child <18 in household	dichotomous	<p>"How many children do you {and your {spouse/partner}} have?"</p> <p>"How many are under the age of 18?"</p>
Number of chronic conditions	continuous (sum score)	"I will read a list of some diseases that a doctor may have said you have. Please tell me if a doctor ever told you that you had..."
marital/partnership status	dichotomous	"Are you currently married, living with a partner, separated, divorced, widowed, or never married?"
co-residence	dichotomous	"How long {does/did} it normally take you to get to {SP}'s home from where you {live/lived}?"
caregiving intensity	continuous (sum score)	[see chapter 3.3.2]
CR dementia status	dichotomous	[see chapter 3.3.2]
CR chronic conditions	continuous (sum score)	"Since the time of the last interview in {XY}, has a doctor told {you/him/her} that {you/he/she} had...?"
relational deprivation	continuous (sum score)	<p>"How much do you enjoy being with {SP}?"</p> <p>Would you say a lot, some, a little, or not at all?"</p>

		<p>"How much does {SP} argue with you? Would you say a lot, some, a little, or not at all?"</p> <p>"How much does {SP} appreciate what you do for {him/her}?"</p> <p>"How often does {he/she} get on your nerves?"</p>
overload	continuous (sum score)	<p>"Please listen to a few more statements and answer whether this describes your situation very much, somewhat, or not so much.</p> <p>a. You are exhausted when you go to bed at night.</p> <p>b. You have more things to do than you can handle.</p> <p>c. You don't have time for yourself.</p> <p>d. As soon as you get a routine going, {SP}'s needs change."</p>
financial difficulty	dichotomous	<p>"{Helping a spouse or partner who has health problems can be difficult./Helping older relatives can be difficult.} {Is helping {SP}/Has helping {SP} been} financially difficult for you?"</p>
constriction of social life	continuous (sum score)	<p>"In the last month, did helping {SP} ever keep you from doing this (visiting in person with friends or family not living with you)?"</p> <p>"In the last month, did helping {SP} ever keep you from doing this (attending religious services)?"</p> <p>"In the last month, did helping {SP} ever keep you from doing this (participating in club meetings or group activities {other than religious services})?"</p> <p>"In the last month, did helping {SP} ever keep you from doing this (going out for enjoyment)?"</p>
gain	continuous (sum score)	<p>"Next we have a few questions about your experience helping {SP}. For each statement I read, please tell me whether this describes your situation very much, somewhat, or not so much.</p> <p>a. Helping {SP} has made you more confident about your abilities.</p> <p>b. Helping {him/her} has taught you to deal with difficult situations.</p> <p>c. Helping {SP} has brought you closer to {him/her}.</p>

		d. Helping {SP} has given you satisfaction that {he/she} {is/was} well cared for."
emotional social support	dichotomous	"Do you have friends or family that you talk to about important things in your life?"
instrumental social support	continuous (sum score)	"Do you have friends or family that help you with your daily activities, such as running errands, or helping you with things around the house?" "Do you have friends or family that help you care for {SP}?"
support services use	continuous (sum score)	"In the last year {of {SP}'s life}, {have you gone/did you go} to a support group for people who give care?" "In the last year {of {SP}'s life}, {have you used/did you use} any service that took care of {SP} so that you could take some time away from helping?" "In the last year {of {SP}'s life}, {have you received/did you receive} any training to help you take care of {SP}?" "In the last year {of {SP}'s life}, {have you found/did you find} financial help for {SP}, including helping {him/her} apply for Medicaid?" "In the last year {of {SP}'s life}, {have you helped/did you help} {SP} find a paid helper to do household chores or personal care?"

Syntax (Do file)

```
Stata version 15.1
set more off
capture log close
log using SG_MasterThesis, text replace
log off
```

///DEPENDENT VARIABLES///

*CG burden (emotional difficulty)

```
recode cac7diffemo (1=1) (2=0) (-8 =.) (-7=.) (-4=.), gen(diffemo)
label variable diffemo "emotional difficulty"
label define burden 0 "no" 1 "yes"
label values diffemo burden
```

*depression

```
recode che7flttlin (1=0) (2=1) (3=2) (4=3) (-1 -7 -3 -4 -8 =.),gen(CGdepres1)
recode che7fltdown (1=0) (2=1) (3=2) (4=3) (-1 -7 -3 -4 -8 =.),gen(CGdepres2)
gen CGdepres_sum = CGdepres1 + CGdepres2
recode CGdepres_sum (0/2 = 0) (3/6 = 1),gen(CGdepres)
label define CGdepres 1 "depression" 0 "no depression"
label values CGdepres CGdepres
label variable CGdepres "depression CG"
```

///INDEPENDENT VARIABLES///

Background/Context

*employed/unemployed

```
gen employ_dicho=999
replace employ_dicho=1 if cec7wrk4pay == 2 & cec7misswork ==2 |cec7wrk4pay == 2 & cec7misswork ==3
| cec7wrk4pay == 3
replace employ_dicho=0 if cec7wrk4pay ==1 | cec7wrk4pay==2 & cec7ownbusns ==1 | cec7wrk4pay ==2 &
cec7misswork ==1 | cec7ownbusns ==1 & cec7misswork ==1
replace employ_dicho=. if employ_dicho ==999
label define employ_dicho 1 "unemployed/retired" 0 "employed/owning business"
label values employ_dicho employ_dicho
label variable employ_dicho "employment status dichotomous"
```

*unemployed - part-time - full-time

```
gen employ1=999
replace employ1=0 if employ_dicho==1
replace employ1=1 if employ_dicho==0 & cec7wrkmulti == 2 & inrange(cec7hrsweek,1,34) |
employ_dicho==0 & cec7wrkmulti==1 & inrange(cec7hrswork,1,34)
replace employ1=2 if employ_dicho==0 & cec7wrkmulti == 2 & inrange(cec7hrsweek,35,90) |
employ_dicho==0 & cec7wrkmulti==1 & inrange(cec7hrswork,35,100)
replace employ1=. if employ1==999
label define employ1 0 "unemployed/retired" 1 "<35 hrs" 2 "35+ hrs"
label values employ1 employ1
label variable employ1 "Employment status 3 cat"
```

*CR age

```
recode r7d2intvrage (1=0) (2=1) (3=2) (4=3) (5=4) (6=5) (-1=.),gen(CRage_cat)
```

```
label define CRage_cat 0 "65-69" 1 "70-74" 2 "75-79" 3 "80-84" 4 "85-90" 5 "90+"
label values CRage_cat CRage_cat
label variable CRage_cat "CR age"
```

*CG age

```
recode chd7dage (-4 -7 -8 -9 =.),gen(CGage_cont)
sum CGage_cont,detail //mean: 61.6; median: 62
replace CGage_cont = 62 if chd7dage == -7 | chd7dage == -8 | chd7dage == -9
label variable CGage_cont "CG age continuous"
```

```
recode CGage_cont (18/64=0) (65/98=1) (17=.),gen(CG65)
label define CG65 0 "<65" 1 "65+"
label values CG65 CG65
```

```
drop if CG65 == 1
```

*CG sex

```
recode c7dgender (1=0) (2=1),gen(CGsex)
label variable CGsex "Sex Caregiver"
label define sex 0 "male" 1 "female"
label values CGsex sex
```

*CR sex

```
recode r5dgender (1=0) (2=1),gen(CRsex)
label variable CRsex "Sex Care Recipient"
label values CRsex sex
```

*CG education

```
recode chd7deduc (-9 -8 -7 -4 -1 = .) (1 2 3 = 3) (4=2) (5 6 7 =1) (8 9 = 0),gen(CGedu)
label variable CGedu "caregiver highest educational degree"
label define CGedu 3 "< high school" 2 "high school graduate" 1 "some college/technical school
certificate/associate's degree" 0 "≥ college degree"
label values CGedu CGedu
sum CGedu, detail // mode:1
replace CGedu = 1 if chd7deduc == -7 | chd7deduc == -8 | chd7deduc == -9
```

*CG race and hispanic ethnicity

```
recode crl7dcgracehisp (1=0) (2=1) (3=2) (4=3) (5 6 =.),gen(CGrace)
label variable CGrace "CG race & hispanic ethnicity"
label define race 0 "white" 1 "black" 2 "other" 3 "hispanic"
label values CGrace race
```

*race (dicho)

```
recode CGrace (0=1) (1 2 3=0),gen(white_dicho)
recode CGrace (1=1) (0 2 3=0),gen(black_dicho)
```

*relationship to CR

```
recode c7relatshp (2 33 =0) (3 4 7 8=1) (5 6 = 2) (19 20 = 3) (21 22 =4) (36 35 30 92= 5) (9 10 91 26 28 29 25
11 18=6), gen(Relat)
label variable Relat "CG Relationship to CR"
label define Relat 0 "Spouse/Partner" 1 "child/step-child" 2 "daughter-/son-in-law" 3 "grandchild" 4
"niece/nephew" 5 "friend/other non-relative" 6 "other relative"
label values Relat Relat
```

*co-residence/non-co-residence

```

recode cdi7tm2spunt (-4 = .) (1 2 -8 -9 = 0) (-1 = 1), gen(coresid)
label variable coresid "Co-residence with care recipient yes/no"
label define coresid 0 "no" 1 "yes"
label values coresid coresid

```

number of chronic conditions (CG)

```

foreach X of varlist che7hrtattck che7othheart che7highbld che7arthrits che7osteoprs che7diabetes
che7lungdis che7cancer che7seeing che7hearing {
recode `X' (1=1) (2=0) (-3 -4 -8 -7=.),gen(`X'_dicho)
}
egen CGchroncond = rowtotal(che7hrtattck_dicho che7othheart_dicho che7highbld_dicho
che7arthrits_dicho che7osteoprs_dicho che7diabetes_dicho che7lungdis_dicho che7cancer_dicho
che7seeing_dicho che7hearing_dicho), missing
label variable CGchroncond "CG No. of chronic conditions"

```

*marital/partnership status

```

recode chd7dmarstat (1 2= 1) (3/6 -7 -8 -9 =0) (-4 =.),gen(partner)
label variable partner "marital/partnership status"
label define partner 0 "no partner" 1 "partner"
label values partner partner

```

*children/no children u18 in household

```

recode chd7dnumchu18 (1/9 = 1) (0 -1 -7 -9 = 0) (-4 = .),gen(child_u18)
label variable child_u18 "children <18"
label define child_u18 0 "no children <18" 1 "children <18"
label values child_u18 child_u18

```

Primary Stressors

*ADL (Einteilung wie Pristavec, 2018)

```

recode cca7hwoftpc (1 2 3 = 1) (4 5 = 0) (-8 =.), gen(personalcare)
recode cca7hwofthom (1 2 3 = 1) (4 5 = 0) (-8 =.) (-7=.), gen(gettingaround)

egen ADL_sum = rowtotal(personalcare gettingaround), missing
label variable ADL_sum "number of ADL"

```

*IADL (Einteilung wie Pristavec, 2018)

```

recode cca7hwofthcs (1 2 3 = 1) (4 5 = 0) (-8 =.) (-7=.), gen(chores)
recode cca7hwofthsp (1 2 3 = 1) (4 5 = 0) (-8 =.) (-7=.), gen(shopitem)
recode cca7hlpbnkng (1 = 1) (2= 0) (-8=.), gen(billsbank)
recode cca7hwoftdrv (1 2 3 = 1) (4 5 = 0) (-8 =.) (-7=.), gen(drivingplaces)
recode cca7hwofthott (1 2 3 = 1) (4 5 = 0) (-8 =.) (-7=.), gen(othertransport)
gen transport = 999
replace transport = 1 if drivingplaces ==1 | othertransport ==1
replace transport = 0 if drivingplaces ==0 & othertransport == 0
replace transport = . if transport ==999

egen IADL_sum = rowtotal(chores shopitem billsbank transport), missing

```

*Medical care activities

```

recode cca7hlpordmd (1=1) (2 7 =0), gen(ordermeds)
recode cca7hlppteeth (1=1) (2 = 0) (-8=.), gen(teethcare)
recode cca7hlpfeet (1=1) (2=0) (-8=.), gen(feetcare)
recode chc7hlpdkdr (1=1) (2=0) (-8 -4=.), gen(talkmedprovider)
recode chc7hlpmdapt (1=1) (2=0) (-8=.) (-4=.), gen(makemedappoint)

```

```

recode chc7hlpinsrn (1=1) (2=0) (-4=.) (-8=.), gen(changeinsurance)
recode chc7hlpothin (1=1) (2=0) (-8=.) (-4=.), gen(handleotherinsurance)
recode cca7hlpmed (1=1) (2=0) (-8=.), gen(trackofmeds)
recode cca7hlpshot (1=1) (2=0) (-8=.) (-7=.), gen(takingshots)
recode cca7hlpmdtk (1=1) (2=0) (-8=.), gen(managemedtasks)
recode cca7hlpskin (1=1) (2=0) (-8=.), gen(skincare)
recode cca7hlpexrcs (1=1) (2=0) (-8=.), gen(helpexercises)
recode cca7hlpdiet (1=1) (2=0) (-8=.), gen(helpdiet)

```

```

egen MCA_sum = rowtotal(ordermeds teethcare feetcare talkmedprovider makemedappoint
changeinsurance handleotherinsurance trackofmeds takingshots managemedtasks skincare helpexercises
helpdiet),missing

```

*caregiving intensity (hours per month)

```

recode cdc7hlpdyswk (-1 -7 -8 =.),gen(daysperweek)
recode cdc7hlpdysmt (-1 -7 -8 =.), gen(dayslastmonth)
recode cdc7hlphrsdy (-1 -7 -8 =.), gen(hourshelped)
recode cdc7hlpbrmvf (-1 -7 -8 =.), gen(varifynumbermonth)
recode cdc7hlpbrlmt (-1 -7 -8 =.), gen(hourshelpedcorr)

```

```

gen CGintens = 999
replace CGintens = (daysperweek * hourshelped) * 4 if daysperweek !=. & varifynumbermonth ==1
replace CGintens = dayslastmonth * hourshelped if dayslastmonth !=. & varifynumbermonth ==1
replace CGintens = hourshelpedcorr if varifynumbermonth !=1
label variable CGintens "CG intensity (hours p. month)"

```

```

sum CGintens,detail //mean: 82.11 Median: 40
replace CGintens = 40 if CGintens==.

```

*caregiving duration (number of years providing care)

```

gen date = c7intmonth * 0.083 + 2017
label variable date "date of OP interview"

```

*{people who answered DC 9 with "no" (helped >1 year)}

```

recode cdc7hlpmtst (-9 -8 -1 =.),gen(monthstarhelping)
recode cdc7hlpyearst (-9 -8 -1 =.),gen(yearstarhelping)
gen datestarhelping = monthstarhelping * 0.083 + yearstarhelping
gen monthhelping = (date - datestarhelping)/0.083 // einige, die eigentlich mehr als 1 Jahr schon pflegen
(laut Datum)!
recode monthhelping (0/5.99999 = 0) (6/12.9999 = 0.5) (13/24 = 1) (25/36 =2) (37/48=3) (49/60=4) (61/72=5)
(73/84=6), gen(durathelping)

```

*{people who answered DC 9 with "yes" (helped >1 year)}

```

recode cdc7hlpqrst (-9 -1 = .),gen(yearstarhelping1) //DC11B R7
recode cdc7hlpqrs (-9 -1 = .),gen(yearshelping) //DC11A R7

```

*{people who were re-interviewed from NSOC II}

```

recode cdc5hlpmtst (-1 =.) (-8 =.), gen(monthhelping5) //DC10 R5
recode cdc5hlpqrst (-9 -1 = .),gen(yearstarhelping5) //DC11B R5
replace yearstarhelping5 = 2015 if monthhelping5 !=.
recode cdc5hlpqrs (-9 -1 = .),gen(yearshelping5) //DC11A R5

```

```

gen CGdurat = 999
replace CGdurat = yearshelping if yearshelping !=.
replace CGdurat = 2017 - yearstarhelping1 if yearstarhelping1 !=.

```



```

replace CGdurat = durathelping if durathelping != .
replace CGdurat = yearshelping5 + 2 if yearshelping5 != .
replace CGdurat = 2017 - yearstarhelping5 if yearstarhelping5 != .
replace CGdurat = . if CGdurat ==999

```

```

sum CGdurat,detail //median: 5
replace CGdurat = 5 if CGdurat ==.

```

```

recode CGdurat (0 0.5 = 0) (1 2 = 1) (3/5 = 2) (6/10 = 3) (11/60 = 4),gen(CGduratCat)
label define CGduratCat 0 "up to 12 month" 1 "1-2 yrs" 2 "3-5 yrs" 3 "6-10 yrs" 4 ">10 yrs"
label values CGduratCat CGduratCat
recode CGdurat (0 0.5 =0),gen(CGdurat_neu)

```

*composite measure of CG intensity

```

foreach X of varlist CGintens ADL_sum IADL_sum MCA_sum {
centile `X',centile(75)
}
recode CGintens (0/95=0) (96/744=1),gen(CGintens75)
recode ADL_sum (0/1=0) (2=1),gen(ADL75)
recode IADL_sum (0/3=0) (4=1),gen(IADL75)
recode MCA_sum (0/5=0) (6/13=1),gen(MCA75)

```

```
egen CGintens_composite = rowtotal(CGintens75 ADL75 IADL75 MCA75),missing
```

*number of chronic conditions CR

```

foreach X of varlist hc7disescn1 hc7disescn2 hc7disescn3 hc7disescn4 hc7disescn5 hc7disescn6 hc7disescn7
hc7disescn8 hc7disescn9 hc7disescn10 {
recode `X' (1 7 =1) (2=0) (-1 -3 -4 -8 -7=.),gen(`X'_dicho)
}
egen CRchroncond = rowtotal(hc7disescn1_dicho hc7disescn2_dicho hc7disescn3_dicho
hc7disescn4_dicho hc7disescn5_dicho hc7disescn6_dicho hc7disescn7_dicho hc7disescn8_dicho
hc7disescn9_dicho), missing

```

*dementia

```

recode r7demclas (-1=.) (2 3 =0) (1=1),gen(dementia_dicho)
label variable dementia_dicho "CR having probable dementia yes/no"
label define dementia_dicho 1 "yes" 0 "no"

```

*Relational Deprivation

```

recode cac7joylevel (1=0) (2=1) (3=2) (4=3) (-1 -4 -7 -8=.),gen(enjoy)
recode cac7arguelv (4=0) (3=1) (2=2) (1=3) (-1 -4 -7 -8=.),gen(argue)
recode cac7spapprlv (1=0) (2=1) (3=2) (4=3) (-1 -4 -7 -8=.),gen(apprec)
recode cac7nerveslv (4=0) (3=1) (2=2) (1=3) (-1 -4 -7 -8=.),gen(goingnerv)

```

```
egen RelatDeprivSum = rowtotal(enjoy argue apprec goingnerv),missing
```

*Overload

```

recode cac7exhaustd (3=0) (2=1) (1=2) (-8 -7 -4 -1=.),gen(exhaus)
recode cac7toomuch (3=0) (2=1) (1=2) (-8 -7 -4 -1=.),gen(toomuch)
recode cac7notime (3=0) (2=1) (1=2) (-8 -7 -4 -1=.),gen(notime)
recode cac7uroutchg (3=0) (2=1) (1=2) (-8 -7 -4 -1=.),gen(routchang)

```

```
egen OverloadSum = rowtotal(exhaus toomuch notime routchang),missing
```

Secondary role strains

*Constriction of Social life

```
recode cpp7hlpkptvs (1=1) (2=0) (-3 -4 -1 -8 =.),gen(keptvisfriends)
recode cpp7hlpkptrl (1=1) (2=0) (-3 -4 -1 -8 =.),gen(keptrelig)
recode cpp7hlpkptgr (1=1) (2=0) (-3 -4 -1 -8 =.),gen(keptgroupact)
recode cpp7hlpkptgo (1=1) (2=0) (-3 -4 -1 -8 =.),gen(keptgoingout)
```

```
egen ConstrSocLifeSum = rowtotal(keptvisfriends keptrelig keptgroupact keptgoingout),missing
```

```
recode ConstrSocLifeSum (1/4=1),gen(ConstrSocLife_dicho)
```

*financial difficulty

```
recode cac7diffinc (1=1) (2=0) (-8 =.) (-7=.) (-4=.), gen(difffinanc)
label variable difffinanc "financial difficulty"
label define difffinanc 1 "yes" 0 "no"
label values difffinanc difffinanc
```

*job-caregiving-conflict

```
recode cpp7hlpkptwk (-4 -3 -1=.) (1=1) (2=0),gen(misssworkhelping)
recode cec7hlpafwk1 (-8 -7 -4 -3 -1=.) (1=1) (2=0),gen(affectwork)
```

Intrapsychic strains/appraisal

*Gain

```
recode cac7moreconf (3=0) (2=1) (1=2) (-8 -7 -4 -1 =.),gen(gainconfid)
recode cac7dealbetr (3=0) (2=1) (1=2) (-8 -7 -4 -1 =.),gen(gaindeal)
recode cac7closr2sp (3=0) (2=1) (1=2) (-8 -7 -4 -1 =.),gen(gainrelat)
recode cac7moresat (3=0) (2=1) (1=2) (-8 -7 -4 -1 =.),gen(gainsatis)
```

```
egen GainSum = rowtotal(gainconfid gaindeal gainrelat gainsatis),missing
```

Mediators

*Social support

```
recode cse7frfamtlk (1=1) (2=0) (-1 -8 -7 -4 =.),gen(frfamtalk)
recode cse7frfamact (1=1) (2=0) (-1 -8 -7 -4 =.),gen(frfamact)
recode cse7frfamhlp (1=1) (2=0) (-1 -8 -7 -4 =.),gen(frfamhelp)
```

```
egen SocSupp = rowtotal(frfamtalk frfamact frfamhelp),missing
```

```
egen EmoSocSupp = frfamtalk
```

```
egen InstruSocSupp = rowtotal(frfamact frfamhelp),missing
```

```
recode InstruSocSupp (1 2=1),gen(InstruSocSupp_dicho)
```

*support service use

```
recode cse7spptgrp (1=1) (2=0) (-1 -8 -7 -4 =.),gen(suppgrp)
recode cse7srv2hlp (1=1) (2=0) (-1 -8 -7 -4 =.),gen(servtimeaway)
recode cse7training (1=1) (2=0) (-1 -8 -7 -4 =.),gen(traininghelp)
recode cse7fndfnhlp (1=1) (2=0) (-1 -8 -7 -4 =.),gen(foundfinanchelp)
recode cse7hlpdpdhlp (1=1) (2=0) (-1 -8 -7 -4 =.),gen(paidhelper)
```

```
egen SuppServ = rowtotal(suppgrp servtimeaway traininghelp foundfinanchelp paidhelper),missing
```

```
recode SuppServ (1/5=1),gen(SuppServ_dicho)
```

//// DESCRIPTIVE STATISTICS ////

* Depression

```
foreach X of varlist CGdepres employ_dicho CGrace CGsex CGedu Relat coesid partner child_u18
dementia_dicho difffinanc EmoSocSupp CGchroncond RelatDeprivSum OverloadSum ConstrSocLifeSum
GainSum InstruSocSupp SuppServ {
tab `X' if CGdepres !=. & employ_dicho !=. & CGrace !=. & difffinanc !=. & GainSum !=. & EmoSocSupp !=.
& CGedu !=.,m
}
foreach X of varlist CGage_cont CGchroncond CGintens_composite CGdurat_neu RelatDeprivSum
OverloadSum ConstrSocLifeSum GainSum InstruSocSupp SuppServ {
sum `X' if CGdepres !=. & employ_dicho !=. & CGrace !=. & difffinanc !=. & GainSum !=. & EmoSocSupp
!=. & CGedu !=.,detail
}
foreach X of varlist CGdepres CGrace CGsex CGedu Relat coesid partner child_u18 dementia_dicho
difffinanc EmoSocSupp CGchroncond RelatDeprivSum OverloadSum ConstrSocLifeSum GainSum
InstruSocSupp SuppServ {
tab `X' if CGdepres !=. & CGrace !=. & difffinanc !=. & GainSum !=. & EmoSocSupp !=. & CGedu !=. &
employ_dicho ==1.,m
}
foreach X of varlist CGage_cont CGchroncond CGintens_composite CGdurat_neu RelatDeprivSum
OverloadSum ConstrSocLifeSum GainSum InstruSocSupp SuppServ {
sum `X' if CGdepres !=. & CGrace !=. & difffinanc !=. & GainSum !=. & EmoSocSupp !=. & CGedu !=. &
employ_dicho ==1,detail
}
```

```
foreach X of varlist CGdepres CGrace CGsex CGedu Relat coesid partner child_u18 dementia_dicho
difffinanc EmoSocSupp CGchroncond RelatDeprivSum OverloadSum ConstrSocLifeSum GainSum
InstruSocSupp SuppServ {
tab `X' if CGdepres !=. & CGrace !=. & difffinanc !=. & GainSum !=. & EmoSocSupp !=. & CGedu !=. &
employ_dicho ==0.,m
}
foreach X of varlist CGage_cont CGchroncond CGintens_composite CGdurat_neu RelatDeprivSum
OverloadSum ConstrSocLifeSum GainSum InstruSocSupp SuppServ {
sum `X' if CGdepres !=. & CGrace !=. & difffinanc !=. & GainSum !=. & EmoSocSupp !=. & CGedu !=. &
employ_dicho ==0,detail
}
```

* emotional difficulty

```
foreach X of varlist diffemo employ_dicho CGrace CGsex CGedu Relat coesid partner child_u18
dementia_dicho difffinanc EmoSocSupp CGchroncond RelatDeprivSum OverloadSum ConstrSocLifeSum
GainSum InstruSocSupp SuppServ {
tab `X' if diffemo !=. & employ_dicho !=. & CGrace !=. & CGedu !=. & difffinanc !=. & GainSum !=.,m
}
foreach X of varlist CGage_cont CGchroncond CGintens_composite CGdurat_neu RelatDeprivSum
OverloadSum ConstrSocLifeSum GainSum InstruSocSupp SuppServ {
sum `X' if diffemo !=. & employ_dicho !=. & CGrace !=. & CGedu !=. & difffinanc !=. & GainSum !=.,detail
}
foreach X of varlist diffemo employ_dicho CGrace CGsex CGedu Relat coesid partner child_u18
dementia_dicho difffinanc EmoSocSupp CGchroncond RelatDeprivSum OverloadSum ConstrSocLifeSum
GainSum InstruSocSupp SuppServ {
tab `X' if diffemo !=. & CGrace !=. & CGedu !=. & difffinanc !=. & GainSum !=. & employ_dicho ==1,m
}
foreach X of varlist CGage_cont CGchroncond CGintens_composite CGdurat_neu RelatDeprivSum
OverloadSum ConstrSocLifeSum GainSum InstruSocSupp SuppServ {
```

```

sum `X' if diffemo !=. & CGrace !=. & CGedu !=. & difffinanc !=. & GainSum !=. & employ_dicho ==1,detail
}
foreach X of varlist diffemo employ_dicho CGrace CGsex CGedu Relat coresid partner child_u18
dementia_dicho difffinanc EmoSocSupp CGchroncond RelatDeprivSum OverloadSum ConstrSocLifeSum
GainSum InstruSocSupp SuppServ {
tab `X' if diffemo !=. & CGrace !=. & CGedu !=. & difffinanc !=. & GainSum !=. & employ_dicho ==0,m
}
foreach X of varlist CGage_cont CGchroncond CGintens_composite CGdurat_neu RelatDeprivSum
OverloadSum ConstrSocLifeSum GainSum InstruSocSupp SuppServ {
sum `X' if diffemo !=. & CGrace !=. & CGedu !=. & difffinanc !=. & GainSum !=. & employ_dicho ==0,detail
}
* Differences between employed/unemployed
foreach X of varlist CGage_cont CGchroncond CGintens_composite RelatDeprivSum OverloadSum {
ttest `X' if CGdepres !=. & employ_dicho !=. & CGrace !=. & difffinanc !=. & GainSum !=. & EmoSocSupp
!=. & CGedu !=., by(employ_dicho)
}
foreach X of varlist CGsex white_dicho black_dicho edu_dicho ConstrSocLife_dicho difffinanc
InstruSocSupp_dicho SuppServ_dicho {
tab `X' employ_dicho if CGdepres !=. & employ_dicho !=. & CGrace !=. & difffinanc !=. & GainSum !=. &
EmoSocSupp !=. & CGedu !=., chi V
}
foreach X of varlist CGage_cont CGchroncond CGintens_composite RelatDeprivSum OverloadSum {
ttest `X' if diffemo !=. & employ_dicho !=. & CGrace !=. & difffinanc !=. & GainSum !=. & EmoSocSupp !=.
& CGedu !=., by(employ_dicho)
}
foreach X of varlist CGsex white_dicho black_dicho edu_dicho ConstrSocLife_dicho difffinanc
InstruSocSupp_dicho SuppServ_dicho {
tab `X' employ_dicho if diffemo !=. & employ_dicho !=. & CGrace !=. & difffinanc !=. & GainSum !=. &
EmoSocSupp !=. & CGedu !=., chi V
}
}

```

///ANALYSIS 1A DEPRESSION & EMPLOYMENT STATUS///

*bivariate associations

```

pwcorr CGdepres employ_dicho CGage_cont CGsex CRsex coresid CGchroncond partner child_u18
CGintens_composite CGdurat_neu dementia_dicho CRchroncond RelatDeprivSum OverloadSum
ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp SuppServ if CGdepres !=., obs star(.05)

foreach X of varlist CRage_cat CGedu CGrace Relat {
tab `X' CGdepres, chi2 V column row
}
foreach X of varlist CGedu CGrace Relat CGdurat_neu employ_dicho CGage_cont CGsex CRsex coresid
CGchroncond partner child_u18 CGintens_composite dementia_dicho CRchroncond RelatDeprivSum
OverloadSum ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp SuppServ {
tab `X' CRage_cat if CGdepres !=., chi2 V
}
foreach X of varlist CGrace Relat CGdurat_neu employ_dicho CGage_cont CGsex CRsex coresid
CGchroncond partner child_u18 CGintens_composite dementia_dicho CRchroncond RelatDeprivSum
OverloadSum ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp SuppServ {
tab `X' CGedu if CGdepres !=., chi2 V
}
foreach X of varlist Relat CGdurat_neu employ_dicho CGage_cont CGsex CRsex coresid CGchroncond
partner child_u18 CGintens_composite dementia_dicho CRchroncond RelatDeprivSum OverloadSum
ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp SuppServ {
tab `X' CGrace if CGdepres !=., chi2 V
}

```

```

}
foreach X of varlist CGdurat_neu employ_dicho CGage_cont CGsex CRsex coresid CGchroncond partner
child_u18 CGintens_composite dementia_dicho CRchroncond RelatDeprivSum OverloadSum
ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp SuppServ {
tab `X' Relat if CGdepres !=., chi2 V
}

```

*crude Odds Ratios

```

foreach X of varlist employ_dicho coresid CGchroncond partner child_u18 CGintens_composite
RelatDeprivSum OverloadSum ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp {
logistic CGdepres `X' if CGdepres !=. & employ_dicho !=. & CGrace !=. & difffinanc !=. & GainSum !=. &
EmoSocSupp !=. & CGedu !=.
}
foreach X of varlist CGrace CGedu {
logistic CGdepres i.`X' if CGdepres !=. & employ_dicho !=. & CGrace !=. & difffinanc !=. & GainSum !=. &
EmoSocSupp !=. & CGedu !=.
}

```

*initial model - with variables which where sign. in bivariate analysis bw. DV & IV (plus variables with correlation >0.2 with other IV)

```

logistic CGdepres employ_dicho i.CGedu i.CGrace CGchroncond partner child_u18 coresid
CGintens_composite RelatDeprivSum OverloadSum ConstrSocLifeSum difffinanc GainSum EmoSocSupp
InstruSocSupp
lstat classification
fitstat
lfit, group(10) table

```

***** model with interactions *****

*final model

```

logistic CGdepres employ_dicho child_u18 i.CGedu i.CGrace CGchroncond partner
coresid##c.CGintens_composite RelatDeprivSum OverloadSum difffinanc GainSum EmoSocSupp
c.ConstrSocLifeSum##c.InstruSocSupp
estat classification
fitstat
lfit,group(10) table
margins,at(ConstrSocLifeSum = (0(1)4) InstruSocSupp=(0 (1) 2))
margins,at(CGintens_composite = (0(1)4) coresid=(0 1))
collin employ_dicho child_u18 CGedu CGrace CGchroncond partner coresid CGintens_composite
RelatDeprivSum OverloadSum difffinanc GainSum EmoSocSupp ConstrSocLifeSum InstruSocSupp

```

*model with ordinal employment variable

```

logistic CGdepres i.employ1 child_u18 i.CGedu i.CGrace CGchroncond partner
coresid##c.CGintens_composite RelatDeprivSum OverloadSum difffinanc GainSum EmoSocSupp
c.ConstrSocLifeSum##c.InstruSocSupp

```

//ANALYSIS 1B Emotional Difficulty and Employment//

*bivariate associations

```

pwcorr diffemo employ_dicho CGage_cont CGsex CRsex coresid CGchroncond partner child_u18
CGintens_composite CGdurat_neu dementia_dicho CRchroncond RelatDeprivSum OverloadSum
ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp SuppServ if diffemo !=., obs star(.05)

```

```

foreach X of varlist CRage_cat CGedu CGrace Relat {
tab `X' diffemo if diffemo !=., chi2 V column row
}

```

```

}
foreach X of varlist CGedu CGrace Relat CGdurat_neu employ_dicho CGage_cont CGsex CRsex coesid
CGchroncond partner child_u18 CGintens_composite dementia_dicho CRchroncond RelatDeprivSum
OverloadSum ConstrSocLifeSum difffinanc GainSum SocSupp EmoSocSupp InstruSocSupp SuppServ {
tab `X' CRage_cat if diffemo !=., chi2 V
}
foreach X of varlist CGrace Relat CGdurat_neu employ_dicho CGage_cont CGsex CRsex coesid
CGchroncond partner child_u18 CGintens_composite dementia_dicho CRchroncond RelatDeprivSum
OverloadSum ConstrSocLifeSum difffinanc GainSum SocSupp EmoSocSupp InstruSocSupp SuppServ {
tab `X' CGedu if diffemo !=., chi2 V
}
foreach X of varlist Relat CGdurat_neu employ_dicho CGage_cont CGsex CRsex coesid CGchroncond
partner child_u18 CGintens_composite dementia_dicho CRchroncond RelatDeprivSum OverloadSum
ConstrSocLifeSum difffinanc GainSum SocSupp EmoSocSupp InstruSocSupp SuppServ {
tab `X' CGrace if diffemo !=., chi2 V
}
foreach X of varlist CGdurat_neu employ_dicho CGage_cont CGsex CRsex coesid CGchroncond partner
child_u18 CGintens_composite dementia_dicho CRchroncond RelatDeprivSum OverloadSum
ConstrSocLifeSum difffinanc GainSum SocSupp EmoSocSupp InstruSocSupp SuppServ {
tab `X' Relat if diffemo !=., chi2 V
}

```

**crude odds ratios*

```

foreach X of varlist employ_dicho CGage_cont CGsex CGchroncond partner coesid CGintens_composite
dementia_dicho CRchroncond RelatDeprivSum OverloadSum ConstrSocLifeSum difffinanc GainSum
SuppServ {
logistic diffemo `X' if diffemo !=. & employ_dicho !=. & CGrace !=. & CGedu !=. & difffinanc !=. & GainSum
!=.
}
foreach X of varlist CGedu CGrace Relat {
logistic diffemo i.`X' if diffemo !=. & employ_dicho !=. & CGrace !=. & CGedu !=. & difffinanc !=. & GainSum
!=.
}

```

**initial model (all variables which were sign. in bivariate analysis or had correlation coefficients of $r \geq 0.2$ with other variables which are sign. associated with the outcome)*

```

logistic diffemo employ_dicho CGage_cont CGsex i.CGedu i.CGrace i.Relat CGchroncond partner coesid
CGintens_composite dementia_dicho CRchroncond RelatDeprivSum OverloadSum ConstrSocLifeSum
difffinanc GainSum SuppServ
/*outreg2 using EmotionalDifficulty_initial_model, label word ci eform alpha(0.001, 0.01, 0.05) aster auto(2)
ct("all") replace
*/

```

****** model with interactions ******

**final model*

```

logistic diffemo employ_dicho CGage_cont CGsex##CGrace i.CGedu i.Relat CGchroncond partner coesid
dementia_dicho CRchroncond c.CGintens_composite##c.ConstrSocLifeSum
c.CGintens_composite##difffinanc c.RelatDeprivSum##difffinanc c.OverloadSum##difffinanc GainSum
SuppServ
lstat
fitstat
lfit,group(10) table
margins,at(CGsex = (0 1) CGrace=(0 1))
margins, at(CGintens_composite = (0 (1) 4) ConstrSocLifeSum = (0 (1) 4))

```

```

margins, at(CGintens_composite = (0 (1) 4) difffinanc = (0 1))
margins, at(RelatDeprivSum = (0 (2) 8) difffinanc = (0 1))
margins, at(OverloadSum = (-1 (1) 1) difffinanc = (0 1))
collin employ_dicho CGage_cont CGsex CGrace CGedu Relat CGchroncond partner coresid
dementia_dicho CRchroncond CGintens_composite ConstrSocLifeSum difffinanc RelatDeprivSum
OverloadSum GainSum SuppServ

```

**model with ordinal employment variable*

```

logistic diffemo i.employ1 CGage_cont CGsex##CGrace i.CGedu i.Relat CGchroncond partner coresid
dementia_dicho CRchroncond c.CGintens_composite##c.ConstrSocLifeSum
c.CGintens_composite##difffinanc c.RelatDeprivSum##difffinanc c.OverloadSum##difffinanc GainSum
SuppServ

```

///ANALYSIS 2A PREDICTORS OF DEPRESSION IN DEPENDENCE OF EMPLOYMENT STATUS///

**** EMPLOYED ****

**initial model*

```

logistic CGdepres i.CGedu i.CGrace coresid CGchroncond partner child_u18 CGintens_composite
RelatDeprivSum OverloadSum ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp if
employ_dicho==0
lstat
fitstat
lfit,group(10) table

```

******* model with interactions *******

**final model*

```

logistic CGdepres i.CGedu i.CGrace coresid CGchroncond partner child_u18 CGintens_composite
c.OverloadSum##c.RelatDeprivSum ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp if
employ_dicho==0
lstat
fitstat
lfit,group(10) table
margins, at(OverloadSum=(0(2)8) RelatDeprivSum=(0(2)12))
collin CGedu CGrace coresid CGchroncond partner child_u18 CGintens_composite OverloadSum
RelatDeprivSum ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp if employ_dicho==0

```

****additional analysis****

**job-caregiving conflicts and work hours included in the model*

```

gen workhours = 999
replace workhours = cec7hrsweek if cec7wrkmulti == 2
replace workhours = cec7hrswork if cec7wrkmulti == 1
replace workhours = . if workhours ==999 | workhours == -7 | workhours == -8

```

```

logistic CGdepres workhours i.CGedu i.CGrace coresid CGchroncond partner child_u18
CGintens_composite c.OverloadSum##c.RelatDeprivSum ConstrSocLifeSum difffinanc affectwork
missworkhelping GainSum EmoSocSupp InstruSocSupp if employ_dicho==0

```

**** UNEMPLOYED ****

***initial model**

```
logistic CGdepres i.CGedu i.CGace coresid CGchroncond partner child_u18 CGintens_composite
RelatDeprivSum OverloadSum ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp if
employ_dicho==1
lstat
fitstat
lfit,group(10) table
```

******* model with interactions *******

***final model**

```
logistic CGdepres i.CGedu i.CGace partner CGchroncond child_u18 coresid##c.CGintens_composite
RelatDeprivSum OverloadSum ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp if
employ_dicho==1
lstat
fitstat
lfit,group(10) table
margins,at(CGintens_composite=(0 (1) 4) coresid=(0 1))
collin CGedu CGace partner CGchroncond child_u18 coresid CGintens_composite RelatDeprivSum
OverloadSum ConstrSocLifeSum difffinanc GainSum EmoSocSupp InstruSocSupp if employ_dicho==1
```

///ANALYSIS 2B PREDICTORS OF EMOTIONAL DIFFICULTY IN DEPENDENCE OF EMPLOYMENT STATUS///

**** EMPLOYED ****

***initial model**

```
logistic diffemo CGage_cont CGsex i.CGedu i.CGace i.Relat CGchroncond partner coresid
CGintens_composite dementia_dicho CRchroncond RelatDeprivSum OverloadSum ConstrSocLifeSum
difffinanc GainSum SuppServ if employ_dicho==0
lstat
fitstat
lfit,group(10) table
```

******* model with interactions *******

***final model**

```
logistic diffemo CGage_cont CGsex i.CGedu i.CGace i.Relat CGchroncond partner coresid CRchroncond
dementia_dicho OverloadSum c.CGintens_composite##c.ConstrSocLifeSum c.RelatDeprivSum##difffinanc
GainSum SuppServ if employ_dicho==0
lstat
fitstat
lfit,group(10) table
margins,at(CGintens_composite=(0(1)4) ConstrSocLifeSum=(0(1)4))
margins,at(RelatDeprivSum=(0(1)12) difffinanc=(0 1))
collin CGage_cont CGsex CGedu CGace Relat CGchroncond partner coresid CRchroncond
dementia_dicho OverloadSum CGintens_composite ConstrSocLifeSum RelatDeprivSum difffinanc
GainSum SuppServ if employ_dicho==0
```

****additional analysis****

***job-caregiving conflicts and work hours included in the models**


```
logistic diffemo workhours CGage_cont CGsex i.CGedu i.CGrace i.Relat CGchroncond partner coresid  
CRchroncond dementia_dicho OverloadSum c.CGintens_composite##c.ConstrSocLifeSum  
c.RelatDeprivSum##diffinanc affectwork missworkhelping GainSum SuppServ if employ_dicho==0
```

```
** UNEMPLOYED **
```

```
*initial model
```

```
logistic diffemo CGage_cont CGsex i.CGedu i.CGrace i.Relat CGchroncond partner coresid  
CGintens_composite dementia_dicho CRchroncond RelatDeprivSum OverloadSum ConstrSocLifeSum  
diffinanc GainSum SuppServ if employ_dicho==1
```

```
***** model with interactions *****
```

```
*final model
```

```
logistic diffemo CGage_cont CGsex i.CGedu i.CGrace i.Relat CGchroncond partner coresid  
dementia_dicho OverloadSum RelatDeprivSum CRchroncond c.CGintens_composite##diffinanc  
ConstrSocLifeSum GainSum SuppServ if employ_dicho==1
```

```
lstat
```

```
fitstat
```

```
lfit,group(10) table
```

```
margins,at(CGintens_composite=(0(1)4) diffinanc=(0 1))
```

```
collin CGage_cont CGsex CGedu CGrace Relat CGchroncond partner coresid dementia_dicho  
OverloadSum RelatDeprivSum CRchroncond CGintens_composite diffinanc ConstrSocLifeSum GainSum  
SuppServ if employ_dicho==1
```