



# Medicaid Expansion and the Mental Health of Spousal Caregivers

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## Abstract

Health insurance expansions can exert wellbeing effects on individuals who provide informal care to their loved ones, reducing their experience of depression. This study exploits evidence from the Patient Protection and Affordable Care Act's Medicaid expansion (ACA Medicaid) to *examine the effects on the mental wellbeing of informal caregivers*. Drawing on an event study and a Difference-in-Differences (DID) design we investigate the policy impact of ACA Medicaid using longitudinal evidence (from the Health and Retirement Study, HRS) for low-income individuals aged 64 or below. We find that *ACA Medicaid reduced the likelihood of depressive symptoms among spousal caregivers*. We document that exposure to ACA Medicaid gives rise to 8.2% points (on average, equivalent to 30% decrease) reduction in the feeling of depression and 8.7% points increase in the feeling of happiness (on average, 11% increase). The estimates are robust to various specifications, are driven by reductions in out of -pocket expenses and labor supply and, as expected, increased after Medicaid uptake. The evidence from falsification tests confirms that the estimated effects are likely due to ACA Medicaid.

## 1 Introduction

From January of 2014, several states expanded Medicaid eligibility criteria, as a part of Affordable Care Act (ACA), to all adults under the age of 65 earning up to 138% of Federal Poverty Level (FPL). The ACA Medicaid significantly increased the number of individuals enrolled in Medicaid and reduced the number of those without insurance, affecting the health, access to care, and health and care utilization for those gained access to health coverage (Courtmanche et al. 2017;

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Kaestner et al. 2017, Miller and Wherry 2017; Simon et al. 2017; McInerney et al. 2020; Miller et al. 2021). ACA Medicaid became extremely popular amongst economists and policy makers as it's proven to have impacted several other socio-economic outcomes. Such outcomes include improvements in child support, financial health, housing security, and food security at a little or no cost to state budgets (Council of Economic Advisors, 2021; Miller et al. 2021). However, so far we know very little about the indirect effects of ACA Medicaid on informal caregivers. The exception is Van Houtven et al. (2020) studies how ACA Medicaid was associated with the use of long-term care in the US. The lack of affordable health insurance can add burden to already stressed lives of informal caregivers through additional hours spent on work to keep up with their private health insurance plan. Thus, it can negatively affect mental health and wellbeing of such informal caregivers, who otherwise would prefer to stop working to provide care to their loved ones. To the best of our knowledge, no study has explored the impact of ACA Medicaid on the mental health and wellbeing of spousal caregivers, even though spousal caregiving forms the major portion of informal care provided in the US. In this paper, we attempt to identify the impact of ACA Medicaid on mental health outcomes of spousal caregivers using the rich dataset from the Health and Retirement Study.

Medicaid expansion may affect informal family caregivers who are the backbone of the long term supports and services infrastructure. 19% of Americans are providing unpaid care to an adult with health or functional needs and 61% of family caregivers are employed (AARP 2020). Family caregivers provide substantial cost savings to Medicare and Medicaid, and very limited research has examined the effect of insurance expansions on spousal caregiver's wellbeing. Only one papers has examined the effect, but it relies on a proxy measures of caregivers' mental health and focuses on quality-of-life measures (Torres et al. 2020) rather than depressive symptoms.

In most western countries, care needs of old age individuals with disability are sustained by the duties performed by family caregivers. However, the informal supply of care by family caregivers can negatively affect individual's unmet needs and can reduce her likelihood of being supported by government (Adelman et al. 2014; Wolff et al. 2016). However, the reliance on an informal system of long-term care comes at the cost of significant wellbeing sacrifices by caregivers, more specifically spousal caregivers. Caregiving spouses exhibit a unique emotional and financial connection to disabled individuals, and for them providing care might results from a strong intergenerational social norm, and hence might not feel optional. The latter calls for potential government policies to protect such caregivers to continue with their caregiving duties. Informal caregiving is only sustainable if caregivers are supported, because caregiving limits the independence of caregivers as well as their ability to maintain dual roles as caregivers and workers. Reductions in caregivers labor supply (Van Houtven et al. 2013; Chari et al. 2015) such as temporary or permanent labor market exit (including early retirement) are common adjustments to cope with caregiving duties. Work reductions also can take place gradually through reducing hours or foregoing promotions, which also reduces caregiver income and financial wellbeing.

The wellbeing of caregivers can improve in countries, such as the US, where individuals with limited income generating sources are entitled to health insurance. In

the U.S., aside from low-income individuals who can qualify for public insurance (Medicaid) throughout their working years, historically health insurance benefits have come from employment until citizens qualify for public governmental insurance (Medicare) at age 65. Given that health insurance typically is connected to employment decisions, limited employment opportunities can increase the prospect of not having any form of health insurance, thereby increasing exposure to the health and financial risks of ill health (including mental health). Limited health insurance can exert important detrimental consequences to caregiver wellbeing more generally, as it impacts the ability to engage in preventative activities (e.g., flu shots, preventive care, and screenings) and increases the stress associated with their daily duties (Finkelstein et al. 2012; Baicker et al. 2013). If uninsured caregivers delay or forgo needed health care, it may give rise to depressive episodes<sup>1</sup>. Thus, understanding the experiences and mental health of low-income caregiver spouses is critical, as there are not ready direct programs and tools to ameliorate consequent negative economic and health consequences of caregiving in the US.

Health insurance reform in the US, and more specifically the passage of associated Medicaid expansion law in 2010 (hereafter called ACA Medicaid) allows for testing the effect of Medicaid on caregiver's wellbeing. Medicaid is the historical public insurance program that serves low-income residents. ACA Medicaid occurred through increasing the income limits for eligibility, generally to 138% of the federal poverty level in states that expanded. For individuals without children, the eligibility for Medicaid prior to ACA Medicaid expansion was restricted to people with extremely low or no incomes in almost 85% of states. For example, to qualify for Medicaid in the state of California, it was required to have income of 0% of FPL in 2013, but it increased to 138% of FPL in 2014 after the ACA Medicaid expansion (Kaiser Family Foundation, 2022). This also means that such adults were not eligible at all for Medicaid before the ACA Medicaid expansion. We observe that such individuals constitute almost 5% of the sample observations we study. In this way the Affordable Care Act (ACA) expanded health coverage for residents, yet the Supreme Court decision of 2012 made such expansion optional, allowing states to decide whether to continue with the Medicaid expansion. Hence, it is possible to exploit state variation in ACA Medicaid on the wellbeing of spousal caregivers.

This paper draws on longitudinal data from the Health and Retirement Survey (HRS) including state geographic identifiers to examine the effect of exposure to Medicaid expansion on caregiver's wellbeing, and especially the presence of depressive symptoms. We document evidence that suggests that ACA Medicaid reduces depressive symptoms, increases happiness, and that this effect primarily is the case among low-income individuals who are most likely to gain insurance through the expansion.

The rest of the paper is organized as follows. The next section reports the related literature that overall summarizes the effects expanding caregiver's health insurance and other benefits on proxies for caregiver's wellbeing. Section three describes the

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<sup>1</sup> Specifically, given that caregivers experience burden, stress and strain at higher rates compared to non-caregivers, lack of health insurance could prevent treatment of consequent mental health conditions such as anxiety and depression.

data employed and the empirical strategy followed in this paper. Section four reports the results, fifth section extends the paper, and a final section concludes.

## 2 Related Literature

This paper contributes to the literature on the effects of health insurance on caregiving, as well as, more specifically, the wellbeing effects of caregiving and spillover effects of the expansion of Medicaid.

### 2.1 Health Insurance and Caregiving

In the US, health insurance can be broadly categorized into public and private health insurance. Public health insurance consists of insurance programs such as Medicare and Medicaid. Medicare primarily serves elderly individuals and certain individuals with disabilities, whereas Medicaid is a means tested insurance and provides coverage to low-income individuals and families. Private health insurance coverage, on the other hand, is mainly offered by employers or purchased directly by individuals from health insurance providers/firms, through a federal or state Marketplace (Keisler-Starkey and Bunch 2020). It provides a wide range of plans with varying levels of coverage and premiums. The types of individuals buying health insurance coverage in the US varies greatly. For example, many employed individuals are usually covered under employer-sponsored health insurance plans, while those without employer coverage, self-employed individuals, and others including students may purchase individual health insurance plans. Employer sponsored insurance is typically affordable as an individual requires to pay only a fraction of the total premium (Austin 2010). Moreover, elderly individuals above the age of 65 often enroll in Medicare, and poor income families mostly rely on Medicaid for coverage. As for the caregivers, in general, they're usually not enrolled in employer-sponsored health insurance plans and must rely on individual private health insurance plan if they do not qualify for means tested insurance such as Medicaid. The choice of health insurance type for caregivers may depend on their specific needs and budget. Thus, for caregivers, the expansion of Medicaid plays a crucial role in providing them access to health insurance.

Caregiving increases an individual's risk of poverty (Wakabayashi and Donato 2006), earning losses at the peak of ones earning power (Schulz and Martire 2009), as well as lapsing on health insurance coverage without qualifying for Medicaid. This is especially true for intensive caregivers (e.g., 20 hours or more per week), who must either work fewer hours or leave their jobs entirely, resulting in lower annual incomes. Hence, Medicaid or health insurance expansions can have a particularly beneficial effect for caregivers who work longer hours to qualify for insurance coverage. Medicaid expansion results in both an effective income increases and/or a reduced need for long working hours, thus improving their work-life balance. Such an effect improves one's well-being. Furthermore, health insurance coverage among those who would otherwise be uninsured may allow access to health care, which may improve welfare if carers are in poor health. This paper will attempt to document empirical evidence of these effects.

## 2.2 Caregivers' Mental Health

We build on Coe and Van Houtven (2009) which documents that providing care for a sick mother increases the number of depressive symptoms reported by a caregiver in 47% (compared to caregivers whose mother died). Consistently, some literature documents an association with the increased use of antidepressants, tranquilizers, painkillers, and gastrointestinal agents (Schmitz and Stroka, 2013). One paper that examined correlations found that the caregiver's number of prescription drugs increases (including SSRIs) among intensive caregivers compared to less intensive caregivers of persons with dementia (Van Houtven et al. 2005). Thus, there may be differential effects on mental health based on intensity of caregiving provided. Smith et al. (2019) provide preliminary evidence that the Program of Comprehensive Assistance for Family Caregivers (PCAFC), a program for Veteran soldiers' families, reduced the perception of financial burden and controlled the depressive symptoms among treatment group participants. Finally, caregiver supports could spill over to care recipient wellbeing. Van Houtven et al. (2019) find that family caregiver enrolment in the PCAFC program increased Veteran use of mental health care.

Another way to improve the wellbeing of caregivers is by making sure that healthcare needs are met by providing health insurance to caregivers. Given that Medicaid expansion extended health insurance among eligible individuals after the ACA, one could expect an effect on wellbeing of such caregivers. However, health insurance is only one of the numerous barriers to caregiver access to health care, as caregivers are known to have trouble accessing care for themselves or delaying their own care compared to non-caregivers (Slaboda et al. 2021). Hence, it is an empirical question whether insurance expansion did manage to improve wellbeing of informal caregivers.

## 2.3 Medicaid expansion

Evidence so far has documented that Medicaid expansion reduces preventable hospitalizations (Wen et al. 2019), increases some indicators of quality of care and outcomes (Sommers et al. 2017), lowers hospital readmission rates and improves financial wellbeing (Courtemanche et al. 2017; Han et al., 2015; Miller et al. 2021) including a reduction in eviction rates (Allen et al. 2019). Positive effects may result from several mechanisms such as higher disposable income (e.g., by reducing out of pocket expenses), better access to health care (to address acute and chronic conditions that destabilize one's life in other domains such as work) and lower costs in the event of needing care (averting catastrophic costs). Similarly, Medicaid expansion improved the access to formal paid long-term care (Van Houtven et al. 2020). However, the effects of ACA Medicaid are specifically important among a population that otherwise has limited access to insurance – low-income caregiving spouses. Understanding the effects of ACA Medicaid on caregiver mental health among those most likely to gain insurance through the policy change is the objective of this paper. Table 1 represents the categorization of states based on the implementation of ACA Medicaid on a given year, thus creating two groups, expansion states and non-expansion states.

**Table 1** ACA Medicaid Expansion Status and Selection of States into the Sample

ACA-Medicaid Expansion Status	States	Sample Status
Early Expansion States (Expanded in 2014)	CA, CO, CT, DC, MN, NJ, WA, AZ, AR, DE, HI, IL, IA, KY, MA, MD, NV, NM, NY, ND, OH, OR, RI, VT, WV, MI, NH	Included as Expansion States
Expanded after 2014 and in 2016	AK (9/1/2015), IN (2/1/2015), PA (1/1/2015), LA (7/1/2016), MT (1/1/2016)	Included as Expansion States
Expanded after 2016	ME (1/10/2019), VA (1/1/2019), ID (1/1/2020), UT (1/1/2020), NE (10/1/2020), MO (7/1/2021), OK (7/1/2022)	Included as Non-Expansion States
Not Expanded (As of 09/20/2022)	AL, FL, GA, KS, MS, NC, SC, SD, TN, TX, WI, WY	Included as Non-Expansion States

The inclusion criteria for states to be included into the sample as a specific group is taken from Kaiser Family Foundation (2022)

Source: <https://www.kff.org/medicaid/issue-brief/status-of-state-medicicaid-expansion-decisions-interactive-map/>.

### 3 The Data

The ACA Medicaid became a clean natural experiment after the Supreme court's ruling allowed states a freedom to decide whether or not to expand Medicaid. The most suitable dataset to explore our research question is the Health and Retirement Study (HRS), which includes extensive information on health, long-term care, and socio-demographic indicators<sup>2</sup>. This study draws on data from the HRS data from 2010 to 2018 to capture the effect of ACA Medicaid Expansion and avoid the data reflecting the effect of the Great Recession. The HRS is a nationally representative publicly available longitudinal data for people aged 50 years or older. It is a biennial survey that interviews respondents who were born in 1931–1941, 1942–1947 (War baby sample), and 1924–1930 (the children of the depression age-CODA) sample (National Institute on Aging and The Social Security Administration 2018). It collects the comprehensive information about the important aspects of elderly life. Given that our analysis is focused on Medicaid expansion for individuals up to the age of 65 years, we restrict our sample to individuals aged 64 and below.

*Sample Selection.* First, we select individuals who are in need of ADL or IADL support because of poor health or disability due to aging. Next, we reduce the sample to individuals who receive informal care from their family members and friends. We further restrict our sample to respondents who receive care from their spouses (only spousal caregivers) because of the un-availability of comprehensive information on the health and socio-demographic indicators of other caregivers, including children and friends, in the HRS. Finally, as the HRS interviews both respondents as well as their spouses, we select spouses as respondents who provided care to their partners (who needed ADL and IADL support). Therefore, we believe that our sample is less likely to

<sup>2</sup> Although numerous annual health surveys provide several years of pre- and post- ACA data to carryout parallel trend test. (e.g, the National Health Interview Survey, the Behavioral Risk Factor Surveillance System, and the American Community Survey), they do not contain information on caregivers and, hence are not suitable for our study.

suffer from self-selection issue as the spousal caregivers are selected based on their partners' needs - mainly ADL and IADL requirements (typically resulting from health shocks due to aging or other health conditions) of their partners. The sample of spousal caregivers, who provided care to their partners, is retrieved from "Functional Limitations and Helpers - Respondents" section of HRS Core file. The sample of these respondents is merged with the RAND HRS Longitudinal file to obtain the detailed information, including mental health, wellbeing, and health behaviors, for the selected respondents who cared for their partners. Further, we restrict our sample to low-income respondents only, using the income criterion followed by (Van Houtven et al. 2020). We restrict the income level such that the average income household should be the representative of households benefitting from the ACA Medicaid. The average income household comprised of 2 to 3 members in the family must have income below the eligibility threshold (FPL in 2014: \$15,730 for 2 and \$19,790 for 3 members households) to become eligible for ACA Medicaid. The representative household of our sample has an average income of \$17,588, which falls in the range of FPL threshold of 2014. In addition, we have removed those respondents who are disabled and are already enrolled in the Medicare program, as they are not eligible for the ACA Medicaid expansion. Finally, our data contains restricted geographical identifiers that include information about individuals' state of residence and combine our main sample with this restricted file. The geographical identification file maps an individual with her state of residence. We find that no individuals moved from one state to another in the sample. The final sample consists of at least one observation per caregiver, with overall 2489 observations for 1147 individuals. The sample is relatively small because we are only focusing on spousal caregivers who belong to low-income families and whose partners are interviewed in the HRS.

The outcome variables are binary types indicating 1 if individual felt happy (depressed) but indicating 0 otherwise. These variables are part of the CESD<sup>3</sup> score scale, which is used to indicate individuals' mental health status. The CESD score of Mental Health is composed of eight different components that forms this score. The CESD stands for The Center for Epidemiologic Studies Depression (CESD) scale. The CESD score consists of both negative and positive components. The Negative Components of the CESD score include depression, everything is an effort, sleep is restless, felt alone, felt sad, and could not get going, whereas felt happy and enjoyed life fall under the positive category. The treatment variable ACA Medicaid is defined as a binary variable equals 1 if states expanded Medicaid after January 2014 and equals 0 if state never participated in ACA Medicaid. In terms of selecting control variables, we follow the previous literature, such as Goda (2011). The included control variables consist of health, education, age, ethnicity, retirement status, income, and children variables to be included in our main specification. Table 13 of the Appendix represents the detailed description of variables used in the analysis. We have also included, as a part of a robustness check, another set of controls such as

<sup>3</sup> The higher CESD score represents a worsening mental health. For our main analysis, we use one component (felt happy) from positive category and another (Depression) from negative category. The HRS RAND Longitudinal File states, "RwCESD is the sum of RwDEPRES, RwEFFORT, RwsLEEP, (1-RwWHAPPY), RwFLONE, RwFSAD, RwGOING, and (1-RwENLIFE). Thus, the higher the score, the more negative the Respondent's feelings in the past week. RwCESDM counts the number of missing values among the individual measures."

**Table 2** Descriptive Statistics

	Individual Level Characteristics of the Sample				
	<i>N</i>	Mean	Sth Dev	Min	Max
<i>CESD Score</i>	2489	2.48	2.44	0	8
<i>Felt Happy</i>	2484	0.77	0.423	0	1
<i>Felt Depressed</i>	2487	0.26	0.44	0	1
<i>ACA Medicaid</i>	2489	0.29	0.45	0	1
<i>Age</i>	2489	56.2	6.1	27	64
<i>Any Health Insurance (Public or Private)</i>	2460	0.677	0.47	0	1
<i>Medicaid</i>	2467	0.30	0.46	0	1
<i>Private-Health Insurance (HI)</i>	2474	0.264	0.44	0	1
<i>Number of HI plans</i>	2474	0.27	0.46	0	3
<i>Individual HI Plan</i>	2468	0.0814	0.274	0	1
<i>Male</i>	2489	0.42	0.49	0	1
<i>Family Income</i>	2489	17,588	9827	0	35,200
<i>College/More</i>	2489	0.28	0.45	0	1
<i>Have Children</i>	2489	0.95	0.22	0	1
<i>White American</i>	2489	0.512	0.5	0	1
<i>Retired</i>	2489	0.49	0.5	0	1
<i>Fair/Poor Health</i>	2489	0.51	0.5	0	1

This table reports the descriptive statistics of the main variables we employ in the analysis. This includes the first four dependent variables measuring mental health symptoms, alongside demographic private health insurance uptake, socio-economic and ethnicity variables alongside self-reported health.

number of chronic diseases and private health insurance uptake to check if it affects our baseline estimates. We find that our baseline estimates remain unaltered after a specification change (Panel I of Table 6).

### 3.1 Descriptive Evidence

The descriptive statistics is shown in Table 2 along with sample size. The mean CESD score of mental health is 2.48. The CESD score is a sum of eight components, which ranges from 0 to 8 and the lowest CESD score indicates the best mental health. Slightly more than three quarters of sample individuals felt happy, whereas 26% reported to feel depressed. The average individual has an annual family income of \$17,588 and is 56 years old although the age range of the caregivers examines in the study range from 27 to 64. Approximately, 95% of individuals have at least one child. In addition, we show descriptive statistics for other individual level indicators such as health, retirement status, and other

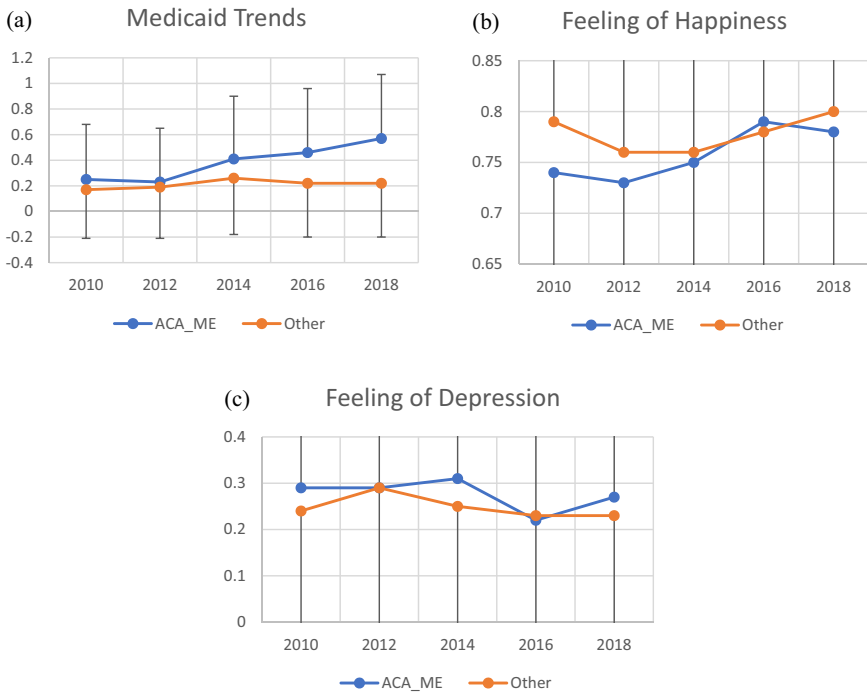


demographic variables. As far as insurance status of sampled individuals is concerned, almost 67.7% of individuals are insured with any form of health insurance (public or private). We also observe that 30% of spousal caregivers are enrolled in the Medicaid program. Further, almost 26.5% of the sample individuals have some form of private-health insurance out of which 8.14% holds individual health insurance plan. The descriptive statistics for important variables of care receivers or spouses being cared for are reported in Table 16 of the Appendix.

The pre- and post- ACA Medicaid trends for Medicaid uptake, happiness, and depression are shown in the Fig. 1a–c. The trends for Medicaid uptake of individuals living in ACA Medicaid states compared to non-expansion states clearly indicate that ACA Medicaid increased the coverage among states that expanded Medicaid. However, the trend for happiness does not provide enough evidence of the existence of parallel trends before the adoption of ACA Medicaid.

### 4 Empirical Strategy

The empirical strategy of this paper relies on an event study estimation as we are interested in identifying changes in the mental health of spousal caregivers in the expansion states versus the non-expansion states after the states’ implementation of ACA Medicaid. The event study method allows us to track the evolution of changes in



**Fig. 1** Trends (2010–2018) for **a** Medicaid uptake, **b** Feeling of Happiness, and **c** Feeling of Depression. The time trends of individuals exposed and not exposed to Medicaid expansion (2010–2018)

outcome variables for expansion states relative to non-expansion states. In addition to event study estimation, we perform generalized difference-in-differences (DID) estimation to summarize the effect of ACA Medicaid across years. We use the same equation but modify it a little to use a single variable indicating ACA Medicaid expansion states. We explain both strategies in the following sub-sections.

#### 4.1 Event Study Design

Equation 1 represents our specification for a non-parametric event study. As ACA Medicaid expansion was brought in effect in the year 2014, most states expanded their coverage in 2014 while a few of the remaining did so in 2016. We define the event ( $r = 0$ ) for the year 2014 that is when the expansion of Medicaid began. The biennial nature of HRS survey makes us assign events once in every two years. We define indicator variables representing events relative to the event of Medicaid expansion. The following model of non-parametric event study treats year 2012 ( $r = -1$ ) as a baseline category.

$$Y_{it} = \beta X_{it} + \lambda_s + \varphi_{-2} + \sum_{r=0}^2 \varphi_r + (\gamma_{-2} + \sum_{r=0}^2 \gamma_r) * ACA\_ME + \mu_i + \epsilon_{it} \quad (1)$$

Where  $Y_{it}$  corresponds to the outcome variables i.e., the feeling of happiness and of depression. The  $\lambda_s$  and  $\mu_i$  represent state as well as individual level fixed effects. The  $\gamma_r$  indicates coefficients on leads and lags on ACA Medicaid states (ACA\_ME) relative to omitted baseline category,  $\gamma_{-1}$ . The  $X_{it}$  represents the control variables included in the model, whereas  $\varphi_r$  indicates coefficients on leads and lags for no-ACA Medicaid states relative to the omitted category of  $\varphi_{-1}$ . One of the major advantages of the event study is that it allows us to identify the significant outcome pattern relative to the adoption of Medicaid reform of 2014. For the event study to be credible, we need to satisfy the parallel trend assumption, also known as mean-independence of the timing of the reform and no-anticipation of treatment assumptions.

#### 4.2 Difference-in-Differences

To identify the impact of ACA Medicaid on the mental wellbeing of spousal caregivers, we use a difference-in-differences design, which is a quasi-experimental approach widely used for causal identification (Angrist and Krueger 1999; Athey and Imbens 2006; Bertrand Duflo and Mullainathan 2004; Ai and Norton 2003; Puhani 2012; Greene and Liu 2020; Lechner et al. 2016). We divide the data into two groups, ACA Medicaid states and No-ACA Medicaid states, based on the Medicaid expansion reform took place in 2014 onward as a part of affordable care act.

We use the linear probability model (LPM/OLS) to obtain both event study and DID estimates. The advantage of LPM is that, unlike non-linear models such as logit and probit, the interpretation of interaction term coefficient is straightforward (Ai and Norton 2003; Athey and Imbens 2006; Puhani 2012). Because the treatment effect in non-linear difference-in-differences is the difference of two cross differences, which is a difference between the cross difference of conditional expectation of the observed outcome and of the potential outcome without treatment (Puhani 2012). However, unlike non-linear models, in linear models the cross-difference of the conditional expectation of the potential outcome without treatment is zero. Therefore,

we prefer to use linear probability model for all our estimates. Our model for the generalized difference-in-differences is depicted in Eq. 2.

$$Y_{ist} = \beta_0 + \rho X_{ist} + \sigma_s + \vartheta_t + \beta_1 * ACA\_ME + \beta_2 * Post + \beta_3 * ACA\_ME * Post + \theta_i + \epsilon_{ist} \quad (2)$$

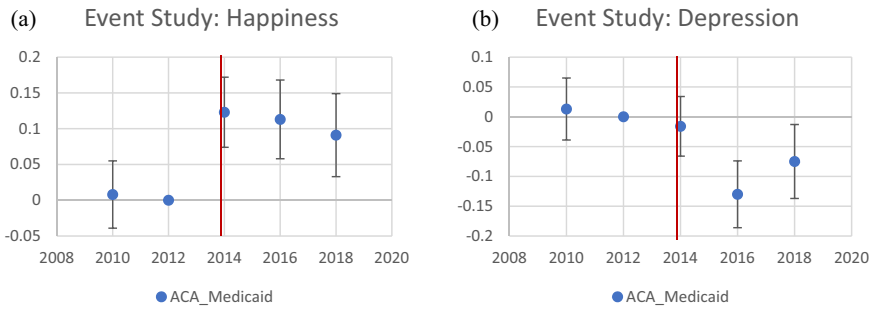
Where  $Y_{ist}$  is any outcomes related to Mental health (Happiness and Depression) for individual ( $i$ ) in state ( $s$ ) at time ( $t$ ).  $ACA\_ME$  denotes the states that expanded Medicaid coverage as per the reform suggested under the Affordable Care Act, whereas  $Post$  refers to time-period when the reform began in 2014 onward. We are interested in the coefficient,  $\beta_3$ , as it estimates the causal impact of ACA Medicaid on the mental wellbeing of spousal caregivers living in states that expanded coverage post reform. The  $\sigma_s$  is the state specific controls to account for state-specific factors that may affect wellbeing, whereas  $\vartheta_t$  accounts for variation in outcomes across time. The  $X_{ist}$  incorporates the set of individual and household level controls into the model. Using a Fixed Effects Models, Eq. 2 removes the person specific time-constant unobserved heterogeneity ( $\theta_i$ ) that can be a potential source of endogeneity. We incorporate individual fixed effects in our baseline specification and all of the subsequent models are estimated with individual fixed effects. As FE model also removes time invariant variables, we cannot find the effect for gender, race, and college education. Nevertheless, we also perform sub-sample analyses across the categories of gender (males vs female), race (white Vs others), and college education (college education vs no-college education) and report it in the Table 15 of the Appendix.

## 5 Results

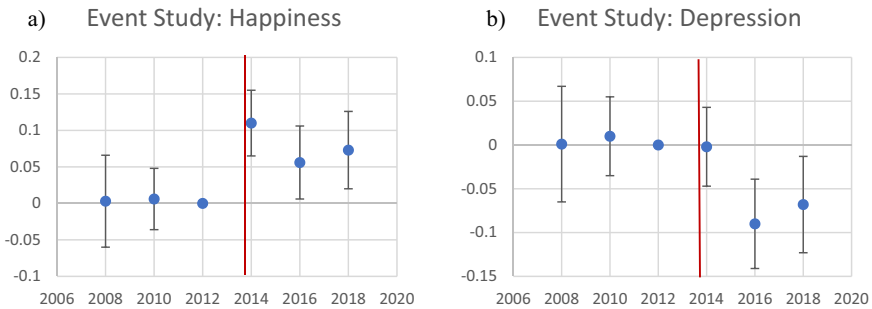
### 5.1 Event Study Design

After running the model specified in Eq. 1, we then subsequently plot the estimated coefficients of the non-parametric event study regression as depicted in Fig. 2. Figure 2a, b display the event study plots for happiness and depression. We observe that ACA Medicaid increases the feeling of happiness and decreases the feeling of depression, when the event occurred at  $t = 0$ , for spousal caregivers living in expansion states compared to their counterparts in non-expansion states, with respect to year 2012 (or  $t = -1$ ). We observe that the parallel trends assumption appears to be satisfied for happiness and feeling depressed. Next, Fig. 3 reports the event study estimates, as a part of robustness checks, examining the impact of ACA Medicaid expansion on the mental health. We draw on a larger sample starting from year 2008 through 2018. In contrast, our main sample removes the year 2008 to avoid picking up the effect of the Great Recession. Thus, we further check whether our estimates including the year 2008 affect our main event study estimates. Figure 3a, b display the event study trends after using a full sample from year 2008 to 2018. Consistently with our main results, we find that the post reform trends are unaffected for both the outcomes examined, and the pre-reform trends continue to satisfy parallel trends assumption in case of happiness and depression. At last, we also run the event study analysis for potential Mechanisms<sup>4</sup>

<sup>4</sup> Please refer to the Figure A1 of Appendix for the event study trends for another set of mechanisms i.e., Out-of- pocket expenses (extensive margins for OOP, \$100 or More OOP, and \$500 or more OOP).



**Fig. 2** Event study estimates—the effect of ACA Medicaid on happiness and depression. The figure depicts the results of the events study design of the ACA Medicaid expansion on mental health (feeling of happiness and of depression) for the period 2010–2018. The red line indicates that the ACA Medicaid reform began in the January of 2014. The estimated coefficients are obtained after estimating Eq. (1) for the outcomes of happiness (a) and depression (b). The scale is same for both panels (a and b). Panel (a) coefficients represent the change in the feeling of happiness for expansion states relative to non-expansions states, whereas panel (b) coefficients report the change in the feeling of depression for expansion states relative to non-expansion states

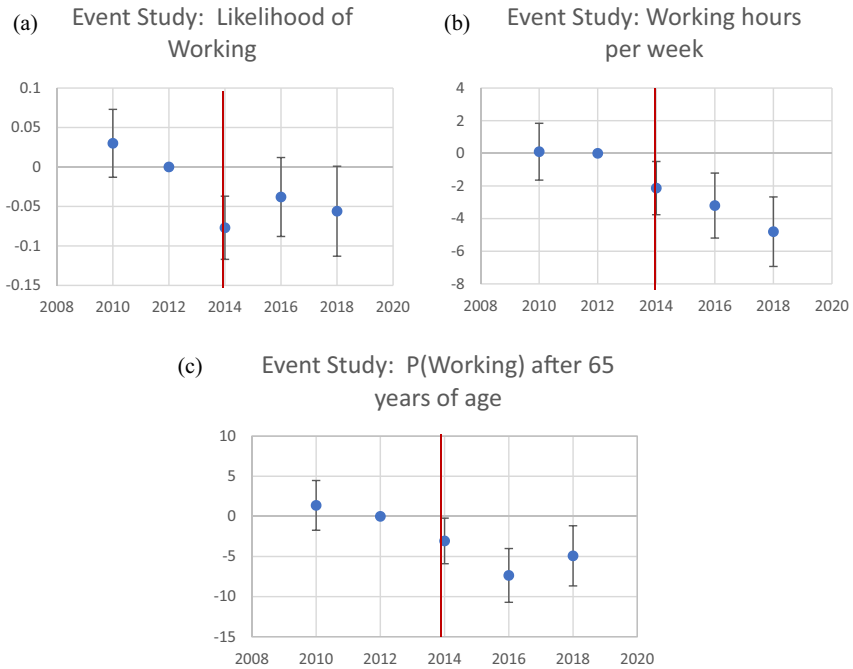


**Fig. 3** Robustness check for event study estimates—using a sample from 2008 to 2018. The figure depicts the results of the events study design of the ACA Medicaid expansion on mental health (feeling of happiness and of depression) for the period 2008–2018. The red line indicates the ACA Medicaid reform began in the January of 2014. The estimated coefficients are obtained after estimating Eq. (1) for the outcomes of happiness (a) and depression (b). The scale is same for both the panels (a and b). Panel (a) coefficients represent the change in the feeling of happiness for expansion states relative to non-expansion states, whereas panel (b) coefficients report the change in the feeling of depression for expansion states relative to non-expansion states

(Labor outcomes - Likelihood of working, work hours/week, and probability of working after the age of 65) and find that labor market outcomes are one of the reasons driving the effect which is quite evident in Fig. 4a–c. The negative estimated coefficients in Fig. 4a indicate that the ACA Medicaid expansion decreases the likelihood of working for spousal caregiver by approximately 5% points. Similarly, Fig. 4b, c indicate that the ACA Medicaid expansion resulted in decrease in working hours/week and probability of working after the age of 65.

### 5.2 Baseline Estimates

Next, Panel A, B and C in Table 3 report the baseline results. All the models specified in Table 3 incorporate person level fixed effects. Column 1 reports the



**Fig. 4** Event study estimates—the effect of ACA Medicaid expansion on potential mechanisms (labor outcomes—likelihood of working, work hours/week, and probability of working after 65 years of age). The figure depicts the results of the events study design of the ACA Medicaid expansion on likelihood of working, work hours/week, and probability of working after 65 years of age for the period 2010–2018. The red line indicates the ACA Medicaid reform began in the January of 2014. The estimated coefficients are obtained after estimating Eq. (1) for the outcomes. The scale differs across panels. Panel (a) coefficients represent the change in the likelihood of working for expansion states relative to non-expansions states, whereas panel (b) coefficients report the change in the number of hours worked per week for expansion states relative to non-expansion states. Panel (c) indicates the event study estimates for an individual’s forecasted probability of working after she turns 65 years of age. Although the sample we use is restricted to individuals up to the age of 64 years, the question was asked in HRS to record their willingness to remain in labor market after the age of 65 years

baseline model without any controls, state, and year fixed effects. Columns 2 & 3 indicate the estimates of the impact of Medicaid expansion on the feeling of happiness, feeling of depression, and on CESD score of mental health after the inclusion of year and state level fixed effects, respectively, into the models maintaining that ACA Medicaid expansion did improve the mental wellbeing of individuals living in Medicaid expansion states when compared with other states.

Finally, we run a fully specified model and reports its results in Column 4 after the inclusion of a set of controls into the model along with year and state fixed effects. We observe an approximately 9% points increase in the feeling of happiness among the states adopting Medicaid expansion, compared to the remaining states. Similarly, we estimate that the likelihood of feeling depressed decreases by more than 8% points after the ACA Medicaid reform. We also find in Panel C that Medicaid expansion was responsible for 0.373 points (average 4–5%) reduction in the CESD score of mental health among for the states adopting Medicaid expansion. A decrease in CESD score of

**Table 3** Baseline Linear Estimates of the effect of ACA Medicaid on Mental Health

PANEL A	Dependent Variables			
	Felt Happy			
	(1)	(2)	(3)	(4)
ACA Medicaid	0.069***	0.076**	0.09**	0.087**
(SE)	(0.0245)	(0.034)	(0.036)	(0.036)
Number of Observations	2484	2484	2484	2484
PANEL B	Felt Depressed			
	(1)	(2)	(3)	(4)
	ACA Medicaid	-0.083***	-0.077**	-0.085**
(SE)	(0.0254)	(0.035)	(0.038)	(0.0375)
Number of Observations	2487	2487	2487	2487
PANEL C	CESD Mental Health Score			
	(1)	(2)	(3)	(4)
	ACA Medicaid	-0.37***	-0.36**	-0.391**
(SE)	(0.12)	(0.169)	(0.18)	(0.176)
Number of Observations	2487	2487	2487	2487
Year Fixed Effects	NO	YES	YES	YES
State Fixed Effects	NO	NO	YES	YES
Control Variables	NO	NO	NO	YES
Individual Fixed Effects	YES	YES	YES	YES

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

The estimates are obtained using the sample from Health and Retirement Study, Waves 10–14 (2010–2018), and Age <65. Each coefficient indicates OLS estimates of Eq. (2). The variable ACA Medicaid is a treatment variable, which is a binary indicator for whether Medicaid expansion occurred in the state at a given year. We estimate the impact of ACA Med Exp on the feeling of happiness in Panel A, the feeling of depression in Panel B, and on the CESD score of mental health in which Column (1) includes no variables other than treatment or ACA Med Exp. Column (2) introduces years fixed effects into the model. Column (3) adds states fixed effects. Column (4) includes control variables namely age, gender, age<sup>2</sup>, income, health status, retirement status, race, education, non-housing wealth, and children. All the models include individual fixed effects

mental health means that Medicaid expansion had a positive impact on the mental health of spousal caregivers. We find that these results are significant at 5% level and suggests that ACA Medicaid expansion is associated with improvement in mental wellbeing. The full set of estimated coefficients for Post, ACA states, and the control variables included in the model are presented in Table 10 of the Appendix.

The CESD score of Mental Health is composed of eight different components that forms this score. We regress these remaining components along with overall CESD score on treatment variable, controls, state, and year dummies in a Fixed effects model. Table 4 represents the results correspond to these remaining components. We

**Table 4** The effect of ACA Medicaid Expansion on Other CESD Components

CESD Components	CESD Score (1)	Can't Get Going (2)	Felt Sad (3)	Felt Alone (4)	Enjoy Life (5)	Sleep Restricted (6)	Everything Effort (7)
ACA Medicaid	-0.37** (0.176)	-0.0325 (0.0427)	-0.0754** (0.038)	-0.07** (0.0346)	0.056* (0.0294)	0.0123 (0.0441)	0.00324 (0.039)
State + Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Control Variables	YES	YES	YES	YES	YES	YES	YES
Individual Fixed Effects	YES	YES	YES	YES	YES	YES	YES
No. of Observations	2487	2479	2487	2487	2486	2487	2483

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

The estimates are obtained using the sample from Health and Retirement Study, Waves 10–14 (2010–2018) and Age<65. Each coefficient indicates OLS estimates of Eq. (2). The variable ACA Medicaid is a treatment variable, which is a binary indicator for whether ACA Medicaid expansion occurred in the state at a given year. We estimate the impact of ACA Medicaid on CESD score and each of remaining components of CESD score of Mental Wellbeing, from Column (1)–(7). All models include state, year, and person level fixed effects, along with control variables namely age, gender, age<sup>2</sup>, income, health status, retirement status, race, education, and children

observe that not all the components of CESD score are significant or affected by ACA Medicaid. We find that ACA Medicaid reduced the feelings of sadness and loneliness, and consistently *increased the enjoyment of life*. Other components' estimates found to be not significantly associated with the ACA Medicaid. These decomposed results help us identify which aspects of mental health are affected due to Medicaid expansion. Most importantly, we report that the reform brought happiness and reduced the feeling of depression for such spousal caregivers, who otherwise could not access Medicaid services in the absence of ACA Medicaid reform. In addition, we present in Table 11 of the appendix the impact of ACA Medicaid on CESD score components for non-caregiver's sample.

### 5.3 Placebo-Tests

Next, we run a set of falsification tests to confirm that an improvement in mental wellbeing of caregivers is likely caused only by ACA Medicaid and that it affected spousal caregivers as well as a specific age group of such caregivers, i.e., not all spousal caregivers. In a first instance, we separate a sample for individuals up to age 64, who became eligible for ACA Medicaid but were different than spousal caregivers. There is mixed evidence that ACA reform affected the mental wellbeing of eligible low-income adults. However, most studies find no significant impact of ACA Medicaid on mental health of eligible individuals (Cowan and Hao 2021; McInerney et al. 2020), whereas others find that access to Medicaid can improve self-reported mental health (Finkelstein et al. 2012) and fewer days spent in poorer mental health (Griffith and Bor 2020). Panel A of Table 5 reports that ACA Medicaid had no impact on happiness, depression, and on CESD score of mental health for low-income non-caregivers or low-income individuals other than spousal caregivers. Secondly, we assume that Medicaid expansion reform began in 2012 instead of 2014 and check whether we find our falsification test to be true. Estimates from Panel B of Table 5 indicate that Medicaid reform began in 2012 had no significant impact on the mental health of spousal caregivers. This finding confirms that the effect on mental health of caregivers occurred only after 2014, when the passage of law allowed states to expand Medicaid coverage. At last, we carry out analysis using our fully specified model on individuals aged 65 and above and check whether our main results are valid. Panel C of Table 5 estimates that ACA Medicaid had no significant impact on the mental wellbeing of people aged 65 and above as well as people living in states that adopted Medicaid expansion, relative to remaining states. This is an important finding and allows us to infer that the reform affected the lives of only those who were eligible for extended coverage of Medicaid but did not have spillovers such as through the woodwork effect, an additional enrolment in Medicaid that happens when an individual usually signs-up together with his/her previously unenrolled kids.

### 5.4 Robustness-Checks Analyzing Alternative Specifications

We test the robustness of our main estimates to different alternative specifications, and more specifically we test whether or not our estimates are consistent when we change our mainline specification after controlling for number of chronic diseases, remove the state fixed effects from our mainline specification, use the bigger sample



**Table 5** Placebo Tests – The effect of ACA Medicaid Expansion on Mental Wellbeing

	Happy	Depressed	CESD Score
<i>Panel A – Non-caregivers Sample</i>	(1)	(2)	(3)
ACA Medicaid	0.0016	0.0023	–0.01
(SE)	(0.016)	(0.016)	(0.08)
<i>N</i>	13,245	13,266	13,275
<i>Panel B – Assuming ACA Medicaid in 2012</i>	(1)	(2)	(3)
ACA Medicaid	0.022	–0.015	–0.045
(SE)	(0.033)	(0.034)	(0.17)
<i>N</i>	2482	2485	2487
<i>Panel C - Age 65 and above</i>	(1)	(2)	(3)
ACA Medicaid	–0.01	–0.017	0.05
(SE)	(0.026)	(0.024)	(0.114)
<i>N</i>	3596	3604	3605
State + Year Fixed Effects	YES	YES	YES
Control Variables	YES	YES	YES
Individual FE	YES	YES	YES

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

The estimates are obtained using the sample from Health and Retirement Study, Waves 10–14 (2010–2018). Each coefficient indicates OLS estimates of Eq. (2). The variable ACA Medicaid is a treatment variable, which is a binary indicator for whether ACA Medicaid expansion occurred in the state at a given year. We estimate the impact of ACA Medicaid on Mental Wellbeing (happiness, depression, and CESD score of mental health) as a part of falsification tests shown in Panel A, B, and C. All models include state, year, and person level fixed effects, along with control variables namely age, gender, age<sup>2</sup>, income, health status, retirement status, race, education, and children

that is inclusive of year 2008 through 2018, and restrict our sample to individuals with total wealth below \$100k. The Panel I of Table 6 shows a robust and consistent result after controlling for various chronic diseases level information into our baseline specification. As expected, the magnitude of estimated effect increases only slightly compared to our baseline estimates, and the effect is significant indicating that the effect is mainly driven by the states expanding Medicaid coverage in 2014. Similarly, Panel II of Table 6 shows the estimated effects without the inclusion of state-fixed effects into the main baseline specification. Thus, we want to check what happens to our baseline estimates if we do not account for an unobserved heterogeneity across states, even if no mobility of respondents between the states. We find that the estimates for happiness and depression reduces in size by 1% points, respectively. We also see a slight reduction in CESD score of mental health. Next, we analyze the expanded sample that also includes the data from year 2008 consistently with the event study estimates. Panel III in Table 6 indicates that the inclusion of year 2008 in the main sample slightly lowers the precision of our estimates, although it

**Table 6** Robustness Checks – Effect of ACA Medicaid Expansion on Mental Health

	Happiness (1)	Depression (2)	CESD Score (3)
<i>Main Baseline Estimates</i>			
ACA Medicaid	0.087** (0.036)	-0.082** (0.0375)	-0.37** (0.176)
No. of Observations	2484	2487	2487
<i>Panel I – Using additional set of controls for chronic diseases</i>			
ACA Medicaid	0.093** (0.036)	-0.085** (0.038)	-0.407** (0.18)
No. of Observations	2468	2471	2473
<i>Panel II – Estimation without inclusion of state-fixed effects</i>			
ACA Medicaid	0.073** (0.035)	-0.074** (0.037)	-0.34* (0.18)
No. of Observations	2482	2485	2487
<i>Panel III – Using a sample of individuals from 2008 to 2018</i>			
ACA Medicaid	0.082* (0.034)	-0.08** (0.035)	-0.32* (0.17)
No. of Observations	2829	2832	2834
<i>Panel IV – Restricting wealth to \$100k and below</i>			
ACA Medicaid	0.1*** (0.04)	-0.1** (0.042)	-0.43** (0.191)
No. of Observations	2052	2053	2055

**Table 6** continued

	Happiness (1)	Depression (2)	CESD Score (3)
<i>Panel V – Using non-linear model (Fixed Effects Logit)</i>			
ACA Medicaid	0.7** (OR = 1.9)	-0.59** (OR = 0.55)	-
(SE)	(0.296)	(0.283)	-
No. of Observations	802	879	-
<i>Panel VI – Using observations with only very sick and disabled spouses</i>			
ACA Medicaid	0.074*	-0.024	-0.184
(SE)	(0.044)	(0.05)	(0.24)
No. of Observations	1774	1775	1777
State (Panel I & III) & Year FE	YES	YES	YES
Control Variables	YES	YES	YES
Individual FE	YES	YES	YES

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

The estimates are obtained using the sample from Health and Retirement Study, Waves 10–14 (2010–2018), and Age<65. Each coefficient indicates OLS estimates of Eq. (2). The variable ACA Medicaid is a treatment variable, which is a binary indicator for whether ACA Medicaid occurred in the state at a given year. We estimate the impact of ACA Medicaid on happiness, depression, and CESD score of mental health as a part of Robust-ness check for baseline estimates shown in Panel I, II, III, and IV of Table 6. All models include state, year, and person level fixed effects, along with control variables namely age, gender, age<sup>2</sup>, income, health status, retirement status, race, education, and children. A considerable number of observations are dropped because of all positive or all negative outcomes, meaning that individuals who reported being happy or being depressed all the time or being not happy or not depressed all the time. Unlike xtlogit, xtreg doesn't cost us so many dropout cases. Even the single observations are considered in xtreg.

barely changes the magnitude of effects sizes for happiness, depression, and CESD score of mental health. Again, we find that our main results are mostly robust to such a change in specification as the effect only varies slightly. Additionally, Panel IV of Table 6 shows a robust and consistent result when restricting total household wealth to \$100k and below. We find a slight increase in magnitude of the estimated effect compared to our baseline estimates, and the effect is statistically significant. Finally, in Panel V, we report the estimates obtained after running conditional logit fixed effects model, a non-linear model, because happiness and depression are binary dependent variables. We report coefficients and odds ratio of conditional logit models in column 1 and 2. The odds ratio of 1.9 in column 1 indicates that the odds of being happy for an individual living in ACA Medicaid states are almost twice as high as those living in non-ACA Medicaid states. Similarly, the odds of being depressed for individuals living in ACA Medicaid states are almost half compared to the odds of those living in non-ACA Medicaid states. This again confirms the robustness of our baseline estimates in a non-linear setting as the direction and the significance of the effect persists.

Further, we note that we have several years of data points for most caregivers. We find that less than 15% of the sample provided care only once. We analyze the sample of caregivers with at least two observations using the fixed effects model. The FE estimates for the reduced sample are extremely like our main baseline estimates using full sample and are reported in Panel II of Table 12 in the Appendix. Next, we also try imposing a restriction that the respondents provide care both before and after ACA Medicaid Expansion. The estimates reported in Panel I of Table 12 of Appendix indicate that respondents who cared for their spouses all along (both before and after the Expansion) are reported to have better mental health after the ACA Medicaid Expansion. Finally, as individuals can possibly self-select themselves into the sample of caregivers due to the availability of Medicaid after the expansion, this self-selection may lead to biasing our estimates. Thus, to check whether that's the case or not, we restricted the sample to couples where spouse (care-receiver) reaches a certain level of disability. We especially focus on spouses (care-receivers) who are chronically ill with diseases such as cancer, chronic heart disease, arthritis, lung disease, or stroke. Panel III of Table 12 in the Appendix represents these results where we find that, for happiness and depression, the effects are slightly higher in magnitude compared to our baseline estimates.

## 5.5 Heterogeneity

The US population differs, across various socio-economic characteristics, in the level of Medicaid coverage. Therefore, the expansion of Medicaid differs for several state with some states immediately expanding their coverage compared to others. The use of Health and Retirement Study allows us to assess responses across various groups of population. Thus, we estimate our fully specified baseline model using the interactions of our treatment variable with different observable so characteristics such as gender, education, retirement status, ethnicity, health status and the number of children. Table 7 reports the heterogenous effect of ACA Medicaid on the mental wellbeing of spousal caregivers across different socioeconomic categories. We observe that Medicaid expansion significantly improves the mental wellbeing of

**Table 7** Heterogeneity of ACA Medicaid Expansion on Mental Wellbeing

		Happiness	Depression	CESD Score
State & Year FE + Controls		YES	YES	YES
Individual FE		YES	YES	YES
		(1)	(2)	(3)
ALL				
Health	Good/Best/ Excellent	0.04	-0.037	-0.158
	Fair/Poor	0.13***	-0.12***	-0.551***
Gender	Female	0.084**	-0.081*	-0.453**
	Male	0.092**	-0.083	-0.27
Education	High School/ Less	0.083**	-0.076**	-0.42**
	Some/More College	0.1	-0.1	-0.23
Marketplace	Federal Exchange	0.08*	-0.08	-0.314
	State Exchange	0.09**	-0.083**	-0.405**
Have Children	No	-0.006	-0.2*	-1.14**
	Yes	0.09**	-0.078**	-0.35**
Spouse Medicaid	No	0.08*	-0.095*	-
	Yes	0.075*	-0.032	-
Ethnicity	Non-White	0.096**	-0.11**	-0.51**
	White	0.076*	-0.045	-0.20
Type of Work	Full-Time	0.05	-0.044	-0.24
	Part time or No-work	0.089**	-0.092	-0.36**

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

The estimates are obtained using the sample from Health and Retirement Study, Waves 10–14 (2010–22018), and Age<65. Each coefficient indicates OLS estimates of Eq. (2). The variable ACA Medicaid is a treatment variable, which is a binary indicator for whether ACA Medicaid expansion occurred in the state at a given year. Column (1) shows the estimates of the impact of ACA Medicaid on the feeling of happiness across different sub-populations. Column (2) represents the estimates for the feeling of depression for spousal caregivers across various sub-populations. Column (3) represents the estimates for the CESD score of mental health for spousal caregivers across various sub-populations. All models include state, year, and person level fixed effects, along with control variables namely age, gender, age<sup>2</sup>, income, health status, retirement status, race, education, and children

caregivers with fair or poor health, whereas it doesn't significantly affect the healthy caregivers. The female caregivers see significant improvement in mental wellbeing after the reform, when compared with their counterparts in terms of the effect on the feeling of depression. In addition, the lesser educated caregivers are more likely to see improvement in their mental wellbeing when compared with highly educated individuals. It is also observed that individuals without children have shown lesser or no improvement in mental wellbeing post reform compared to individuals with

children. One of the major reasons that explains this can be that almost 95% of individuals in the sample have at least one child.

Non-White Americans are more likely to see improvement in their mental wellbeing compared to White Americans, this is because relatively more non-white Americans fall under low-income categories and rely on Medicaid for insurance. Furthermore, we estimate a greater improvement in mental wellbeing among caregivers living in Medicaid expansion states with state market exchanges compared to Medicaid expansion states with federal level market exchanges<sup>5</sup>. This is a novel observation consistent with the greater flexibility of state exchanges over federal exchanges in meeting individuals' insurance preferences. The state level exchanges usually have better navigator program, better ability to innovate insurance products (e.g., public option), better integration with other state programs, and better enrollment outreach compared to federal exchanges (Davis 2010, Jost 2010; McGuire et al. 2014; Panhans 2019; Dillon 2021). Finally, we find that full-time workers show lower but statistically non-significant improvement in mental health than individuals with part time or no work. This indicates that individuals with full-time work have less or no-time for caregiving, whereas individuals with part-time work or no work are more likely to provide care to their spouses. In addition, these results are likely possible because depression and happiness are opposite to each other. Thus, if ACA Medicaid impacted the likelihood of depression negatively, it means improvement in mental health. Similarly, the positive coefficient for happiness means that ACA Medicaid increased the feeling of happiness i.e., improvement in mental health. Although the variables are opposite, one measures the clinical symptoms (depression) and the other reflects individuals' life evaluation (happiness). However, the effect on depression for individuals with part time or no work is not statistically significant. It is because the depression is relatively rare event compared to happiness. Approximately, 26% of the spousal caregivers reported having depression as opposed to 77% of them reported being happy. Therefore, because of fewer occurrences of depression, it is difficult for the model to capture meaningful pattern or accurate association, leading to less precise estimates.

## 5.6 Potential Mechanisms

We examine several potential mechanisms driving the effect of ACA Medicaid expansion on mental wellbeing of caregivers as reported in Table 8. First, we identify the impact of ACA Medicaid on the Medicaid uptake of individual as the reform is expected to increase the coverage for individual caregivers. The alternate provision of long-term care via Medicaid coverage can be relaxing and relieving for spousal caregivers. Thus, increase in Medicaid coverage due to ACA Medicaid reform can have positive impact on the welfare of caregivers. Nevertheless, this mechanism is

<sup>5</sup> The state-based market exchanges are state level insurance marketplace platforms where the state government maintains and regulates individual health insurance plan eligibility, enrolment, customer support, and other marketplace functions through state-marketplace websites. Whereas the federal level market exchanges are platforms where the federal government decides and controls all the marketplace activities of individual health insurance plans through federal marketplace website. There are 18 states that have their own state-based marketplaces, 3 states have state-based marketplaces that use federal platforms, and the remaining 30 states use federally facilitated marketplace (Source: Kaiser Family Foundation - <https://www.kff.org/state-category/affordable-care-act/health-insurance-marketplaces/>).

**Table 8** Potential Mechanisms

	Medicaid (1)	OOP (2)	Private HI (3)	Employer HI (4)	Working (5)	Hours/Week (6)	P(Work) after 62 (7)	P(Work) after 65 (8)
ACA Medicaid	0.13*** (0.036)	-0.079* (0.0439)	-0.035 (0.035)	-0.0123 (0.023)	-0.062* (0.035)	-2.62* (1.44)	-4.83* (2.84)	-4.86** (2.26)
N	2467	2489	2478	2461	2489	2462	1949	2405
State & Year FE + Controls	YES	YES	YES	YES	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES	YES	YES

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

Note: The estimates are obtained using the sample from the Health and Retirement Study, Waves 10–14 (2010–2018), and Age<65. Each coefficient indicates OLS estimates of Eq. (2). The variable ACA Medicaid is a treatment variable, which is a binary indicator for whether ACA Medicaid expansion occurred in the state at a given year. We estimate the impact of ACA Medicaid on various outcomes, which potentially drive the effect, as a part of potential mechanisms. All models include state, year, and person level fixed effects, along with control variables namely age, gender, age<sup>2</sup>, income, health status, retirement status, race, education, and children

**Table 9** The effect of ACA Medicaid Expansion on Mental Health of Caregiver's Spouses and their Medicaid status

	Happiness	Depression		Medicaid Status
	(1)	(2)	(3)	(4)
Admitted to Nursing Home				
ACA Medicaid	0.048 (0.0332)	0.023 (0.035)	0.05 (0.05)	0.0344* (0.02)
State + Year Fixed Effects	YES	YES	YES	YES
Control Variables	YES	YES	YES	YES
Individual Fixed Effects	YES	YES	YES	YES
Number of Observations	1800	1806	1785	1726

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

Note: The estimates are obtained using the sample from Health and Retirement Study, Waves 10–14 (2010–2018). Each coefficient indicates OLS estimates of Eq. (2). We estimate the impact of ACA Medicaid on happiness, depression, Medicaid status, and nursing home status for spouse being cared for (Age<65), as a part of spillover effect of ACA Medicaid on household. Column 1–4 include state, year, and person level fixed effects, along with control variables namely age, gender, age<sup>2</sup>, income, health status, retirement status, race, education, and children

only applicable for those who actually take-up the Medicaid after ACA Medicaid reform. Perhaps the availability/announcement of Medicaid in the state itself can be relieving for spousal caregivers and can result in improvement in mental wellbeing. Another potential channel occurs via Out-of-pocket expenses (OOP). We find a negative and significant effect of ACA Medicaid on the extensive margin of out-of-pocket expenses e.g., the likelihood of paying expenses out of pocket. We also find that ACA Medicaid expansion reduced the likelihood of purchasing private health insurance as well as employee sponsored health insurance. However, we observe that the results are not statistically significant at the conventional level of significance.

Finally, the ACA Medicaid reform is estimated to have negative impact on the likelihood of working for wages (extensive margin) and on the number of hours worked per week (intensive margin). This is because low-income caregivers without insurance are usually constrained to work for funding their medical costs (or to be insured by their employers). In contrast, if they are on Medicaid then, they can reduce or adjust the number of hours on employment. This finding is suggestive of a potential causal link between caregiver's labor market participation and her mental health. We also find that ACA Medicaid reduces caregiver's probability of working after 62 as well as 65 years, respectively.

## 5.7 The Effect on the Mental Health of Spouses

We also investigate whether ACA Medicaid resulted in household spillover due to improvement in wellbeing of caregivers. We find the impact of ACA Medicaid on the mental wellbeing of the spouse being cared for. Column 1 and 2 of Table 10 indicate that ACA Medicaid has an impact on happiness as well as depression, but these estimates are not statistically significant. In addition, Column 3 of Table 9 shows that the ACA Medicaid also increases the uptake of Medicaid for spouses being cared for, but these estimates are not statistically significant. Finally, we find



that we lack the statistical evidence to conclude the presence of spillover effects of ACA Medicaid, at the household level, due to improvement in the wellbeing of caregivers. Nevertheless, we find that the care-receiver spouses, aged below 65 years, are approximately 3.5% points more likely to be admitted to nursing home after the ACA Medicaid reform. This is one of the pathways that affects the wellbeing of spousal caregivers as institutionalizing spouse reduces the care burden drastically.

## 6 Conclusion

Family caregivers, especially spousal caregivers, care for their loved ones by assisting them with their day-to-day life activities. These activities not only help protect the health and wellbeing of care receivers but also reduce burden associated with the formal health and care systems in the US. However, we hypothesize that informal care giving, perhaps comes at the cost of potentially compromising caregivers' personal health and wellbeing. This cost to caregivers has spillover effects on their social and professional lives. It affects the work-life balance of individuals due to their caregiving obligations. It negatively affects their labor market outcomes such as retiring early, quitting work, loss of income, and reduction in retirement savings. Therefore, family caregivers require urgent support to carry out their duties without putting at risk their health, wellbeing, and labor market outcomes. Some of the recently introduced policies such as the Recognize, Assist, Support and Engage (RAISE) Family Caregivers Act, American Rescue Plan act, and other proposed legislations can help mitigate on-going care crisis due to rapidly aging populations in the US (Ralls 2021). The proposed legislations, the American Families plan and the American Jobs Plan, expects to introduce national paid family leave as well as medical leave program to help caregivers maintain balance between caregiving duties and work (The White House Briefings 2021a, 2021b). Overall, combined with access to health insurance via ACA Medicaid and recently proposed policies for caregivers in the US can go together to help maintain the wellbeing of spousal caregivers, in particular, and caregivers, in general.

The existing body of literature provides strong evidence that ACA Medicaid improves the health and wellbeing of low-income individuals by providing them with access to public health insurance via Medicaid. However, none of the studies, to our knowledge, has examined the impact of ACA Medicaid on the wellbeing of spousal caregivers from the perspective of a social policy for informal caregivers. The lack of access to health insurance may negatively affect the mental health of informal carers as the activity of caregiving comes at the cost of significant wellbeing losses. The research that investigates the impact of access to health insurance on the health and wellbeing of informal caregivers is developing at a slower pace compared to the research on general population, mainly due to lack of survey data available that comprehensively record the information on informal caregivers.

This paper has examined the effect of the expansion of public health insurance (Medicaid) resulting from the introduction of the Affordable Care Act to caregivers who previously had limited access to private health insurance (due to low-income and low-benefit work activities and/or limited employment opportunities

derived from their caregiving duties). Drawing on evidence from Affordable Care Act's Medicaid expansion; we document evidence of Medicaid expansion effects on the mental health of caregiving spouses. We exploit the quasi-experimental change that occurred due to the expansion of Medicaid coverage under ACA. We observe that ACA Medicaid improved the mental wellbeing of caregivers where we find 8.2% points (on average, equivalent to 30% decrease) reduction in the feeling of depression and 8.7% points increase in the feeling of happiness (on average, 11% increase).

These results indicate that availability of health insurance to adult spousal caregivers can significantly reduce the mental burden associated with informal caregiving. Such the ACA Medicaid benefits spousal caregivers by significantly improving their otherwise deteriorating mental health. In turn, such benefits might allow for longer sustained caregiving episodes, an inquiry for future research. However, we do not find statistically significant evidence that the ACA Medicaid results in spillover effects at household level by improving the wellbeing of the spouse care recipients. The existing literature does not yet study the ACA Medicaid expansion through the lens of caregiver support policy. However, our results suggest that ACA Medicaid is considered to have played the role of an indirect caregiver support policy, improving mental health of spousal caregivers. Therefore, indirect and direct programs supporting the modal providers of long-term care in the United States – unpaid informal caregivers – could help minimize the negative mental health impacts of caregiving, while supporting the preference of disabled older adults to remain safely in their own homes.

**Author contributions** All authors contributed in developing the initial idea. The task of writing manuscript was divided section-wise. The corresponding author executed the data analysis and produced results as per ideas and procedures discussed in regular meetings. All authors read and provided feedback on the manuscript.

#### **Compliance with ethical standards**

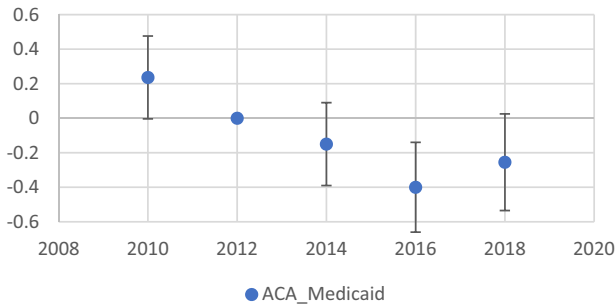
**Conflict of interest** The authors declare no competing interests.

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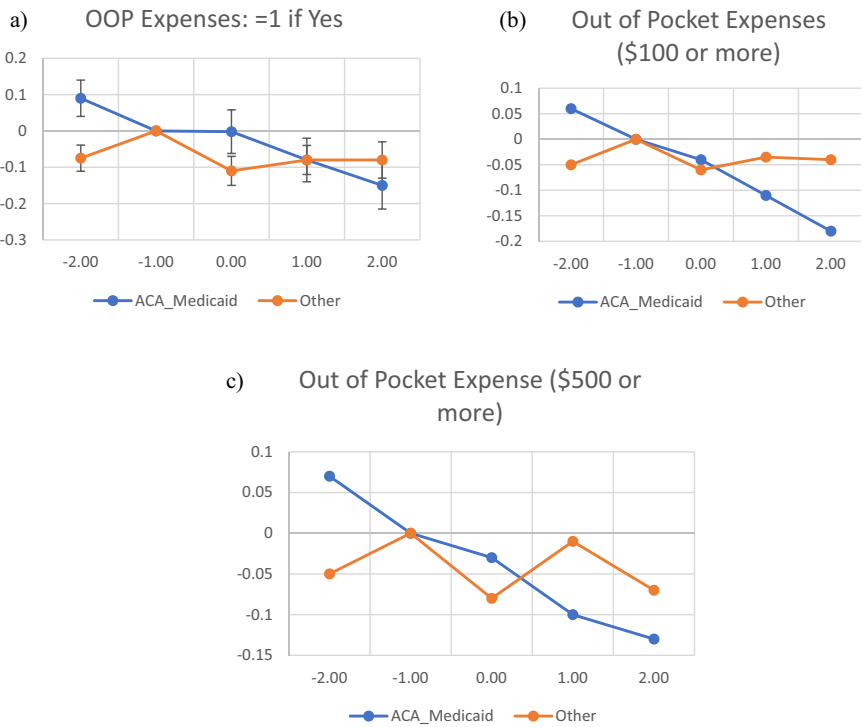
## **7 Appendix**

Figures 5 and 6; Tables 10–16

### Event Study: CESD Score



**Fig. 5** Event study design of ACA Medicaid Expansion exposure on CESD score and the feeling of Sadness



**Fig. 6** Event study estimates—the effect of ACA Medicaid expansion on potential mechanisms (out-of-pocket healthcare expenses—likelihood of spending on out-of-pocket healthcare expenses, out-of-pocket healthcare expenses of \$100 or more, and out-of-pocket healthcare expenses of \$500 or more). The figure depicts the results of the events study design of the ACA Medicaid expansion on likelihood of spending on out-of-pocket healthcare expenses, out-of-pocket healthcare expenses of \$100 or more, and out-of-pocket healthcare expenses of \$500 or more for the period 2010–2018. The red line indicates the ACA Medicaid reform began in the January of 2014. The estimated coefficients are obtained after estimating Eq. (1) for the outcomes. The scale is same across panels. Panel (a) coefficients represent the change in the likelihood of spending on out-of-pocket healthcare expenses for expansion states relative to non-expansions states. Panels (b) and (c) repeat panel (a) analysis for out-of-pocket healthcare expenses of \$100 or more, and out-of-pocket healthcare expenses of \$500 or more, respectively

**Table 10** Linear Estimates of the effect of ACA Medicaid Expansion on happiness, depression, and CESD Score

	Dependent Variables		
	Felt Happy	Felt Depressed	CESD Score
Post	0.135 (0.204)	0.276 (0.2)	1.98** (0.96)
ACA States	-0.038 (0.143)	-0.79*** (0.245)	-2.29*** (0.84)
ACA Medicaid = Post*ACA_States	0.087** (0.036)	-0.082** (0.0375)	-0.373** (0.176)
Age	-0.061 (0.0477)	0.0394 (0.0428)	-0.0175 (0.257)
Age2	0.0004 (0.0004)	-0.0007** (0.00032)	-0.002 (0.00204)
Non-HousingWealth	1.95e-07 (1.27e-07)	1.47e-07 (1.44e-07)	5.4e-08 (5.79e-07)
Income	8.23e-07 (1.18e-06)	4.74e-07 (1.11e-06)	-1.51e-06 (5.46e-06)
Fair/Poor Health	-0.0712*** (0.0252)	0.111*** (0.0272)	0.66*** (0.120)
Child	-0.227* (0.127)	0.154 (0.099)	0.612 (0.572)
R_retire	-0.037 (0.031)	0.0315 (0.033)	0.171 (0.161)
Year Fixed Effects	YES	YES	YES
State Fixed Effects	YES	YES	YES
Control Variables	YES	YES	YES
Individual Fixed Effects	YES	YES	YES
N	2484	2487	2487
R-squared	0.045	0.063	0.086
Number of respd_id	1061	1061	1061

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

The estimates are obtained using the sample from Health and Retirement Study, Waves 10–14 (2010–2018), and Age<65. Each coefficient indicates OLS estimates of Eq. (2). The variable ACA Medicaid is a treatment variable, which is a binary indicator for whether Medicaid expansion occurred in the state at a given year. We estimate the impact of ACA Medicaid on the CESD score of mental health in which Column (1) includes no variables other than treatment or ACA Med Exp. Column (2) introduces years fixed effects into the model. Column (3) adds states fixed effects. Column (4) includes control variables namely age, gender, age<sup>2</sup>, income, health status, retirement status, race, education, and children. All the models include individual fixed effects

**Table 11** Linear Estimates of the effect of ACA Medicaid Expansion on CESD components of non-caregivers

CESD Components (Non-caregivers Sample)		EnjoyLife (1)	CantGetGoing (2)	FeltSad (3)	FeltAlone (4)	Happy (5)	SleepRestricted (6)	EvrytngEffort (7)	FeltDepressed (8)
ACA Medicaid		-0.0137 (0.013)	0.0048 (0.018)	0.0036 (0.017)	-0.0128 (0.0163)	0.0016 (0.016)	-0.029* (0.018)	0.0073 (0.017)	0.0023 (0.016)
State + Year Fixed Effects		YES	YES	YES	YES	YES	YES	YES	YES
Control Variables		YES	YES	YES	YES	YES	YES	YES	YES
Individual Fixed Effects		YES	YES	YES	YES	YES	YES	YES	YES
No. of Observations		13,253	13,228	13,259	13,265	13,245	13,256	13,259	13,266

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

The estimates are obtained using the sample from Health and Retirement Study, Waves 10–14 (2010–2018), and Age<65. Each coefficient indicates OLS estimates of Eq. (2). The variable ACA Medicaid is a treatment variable, which is a binary indicator for whether Medicaid expansion occurred in the state at a given year. We estimate the impact of ACA Medicaid on the components CESD score of mental health. All the models include controls, state as well as year fixed effects, and individual level fixed effects

**Table 12** Additional Robustness Checks

	Happiness (1)	Depression (2)	CESD Score (3)
<i>Panel I - Reducing sample to spousal caregivers provide care both before and after ACA Medicaid</i>			
ACA Medicaid	0.073*	-0.077*	-0.29
(SE)	(0.039)	(0.041)	(0.19)
No. of Observations	1477	1480	1482
<i>Panel II - Reducing sample to at least two observations per spousal caregivers</i>			
ACA Medicaid	0.0873**	-0.082**	-0.373**
(SE)	(0.036)	(0.038)	(0.18)
No. of Observations	2122	2125	2127
<i>Panel III - Reducing sample to spousal caregivers with chronically ill spouse (care-receiver)</i>			
ACA Medicaid	0.123**	-0.092*	-0.28
(SE)	(0.047)	(0.055)	(0.24)
No. of Observations	1491	1492	1494
State + Year FE	YES	YES	YES
Control Variables	YES	YES	YES
Individual FE	YES	YES	YES

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

The estimates are obtained using the sample from Health and Retirement Study, Waves 10–14 (2010–2018), and Age <65. Each coefficient indicates OLS estimates of Eq. (2). The variable ACA Medicaid is a treatment variable, which is a binary indicator for whether Medicaid expansion occurred in the state at a given year. This table represents the estimates for robustness checks after we reduced the sample to carers who provided care both before and after ACA Medicaid (Panel I), to at least two observations per spousal caregivers (Panel II), and to spousal caregivers with chronically ill spouse (Panel III). All the models include controls, state as well as year fixed effects, and individual level fixed effects.

**Table 13** Variable Description

Variables	Definition
<b>Dependent Variables</b>	
<i>Happiness</i>	Equals 1 if respondent felt happy, else 0.
<i>Depression</i>	Equals 1 if respondent felt depressed, else 0.
<i>CESD Score</i>	It is a sum of eight components, which ranges from 0 to 8; the lowest CESD score indicates the best mental health.
<i>Sadness</i>	Equals 1 if respondent felt sad, else 0.
<b>Treatment</b>	
<i>ACA Medicaid</i>	Equals 1 if state adopted ACA Medicaid after 2014/2016, else 0.
<b>Demographic Controls</b>	
<i>Married</i>	Equals 1 if respondent is married, else 0.
<i>Income</i>	Total household income.
<i>Male</i>	Equals 1 if respondent is Male, else 0.
<i>Child</i>	Equals 1 if respondent has any children, else 0.
<i>Age</i>	Age of a respondent.
<i>College</i>	Equals 1 if respondent has college education or more, else 0.
<i>Retirement Status</i>	Equals 1 if respondent is retired, else 0.
<i>White</i>	Equals 1 if respondent is white American, else 0.
<i>Any Health Insurance (Public or Private)</i>	Equals 1 if respondent has any form of health insurance, else 0.
<i>Medicaid</i>	Equals 1 if respondent is covered under Medicaid, else 0.
<i>Private-Health Insurance (HI)</i>	Equals 1 if respondent has private health insurance, else 0.
<i>Number of HI Plans</i>	Total number of private health insurance plans
<i>Individual HI Plan</i>	Equals 1 if respondent has private individual HI plan, else 0.
<i>Fair/Poor Health</i>	Equals 1 if respondent has fair or poor health, else 0.
<b>Chronic Diseases</b>	
<i>Cancer</i>	Equals 1 if respondent has cancer, else 0.
<i>Lung Disease</i>	Equals 1 if respondent has lung disease, else 0.
<i>Stroke</i>	Equals 1 if respondent has stroke, else 0.
<i>Heart Disease</i>	Equals 1 if respondent has heart disease, else 0.
<i>Arthritis</i>	Equals 1 if respondent has arthritis, else 0.
<i>Psychological Disease</i>	Equals 1 if respondent has psychological disease, else 0.
<i>Diabetes</i>	Equals 1 if respondent has disease, else 0.

**Table 14** Instrumental Variable Estimates of ACA Medicaid Expansion on Mental Wellbeing

	CESD Score		Felt Happy		Felt Sad		Felt Depressed	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Medicaid	0.0181 (0.153)	-3.001** (1.453)	-0.0180 (0.0332)	0.666** (0.32)	-0.00886 (0.035)	-0.59* (0.312)	-0.0063 (0.0342)	-0.661** (0.31)
First Stage F-Statistic		18		18		18		18
State + Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES
Individual Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
N	2467	2108	2462	2103	2466	2107	2465	2106

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

The estimates are obtained using the sample from Health and Retirement Study, Waves 10–14 (2010–2018), and Age<65. Each coefficient indicates OLS estimates of Eq. (4). The variable Medicaid is a treatment variable, which is a binary indicator for whether an individual is enrolled in Medicaid in the state at a given year. We estimate the impact of Medicaid on CESD score of Mental Wellbeing and on its components. Column (1,3,5,7) & (2,4,6,8) represent OLS and IV estimates, respectively. All models include state, year, and person level fixed effects, along with control variables namely age, gender, age<sup>2</sup>, income, health status, retirement status, race, education, and children



**Table 15** The impact of ACA Medicaid on mental wellbeing across gender, race, and college education categories – A sub-sample analysis

		Males			Females		
		Happiness (1)	Depression (2)	CESD Score (3)	Happiness (4)	Depression (5)	CESD Score (6)
ACA Medicaid (SE)		0.068 (0.05)	-0.031 (0.056)	0.045 (0.24)	0.097** (0.048)	-0.107** (0.0495)	-0.62 (0.24)
No. of Observations		1046	1047	1048	1436	1438	1439
<b>Panel B: Race or Ethnicity</b>							
		White			Non-White		
		Happiness (1)	Depression (2)	CESD Score (3)	Happiness (4)	Depression (5)	CESD Score (6)
ACA Medicaid (SE)		0.083 (0.05)	-0.057 (0.055)	-0.19 (0.28)	0.078 (0.049)	-0.093* (0.054)	-0.48** (0.23)
No. of Observations		1272	1274	1247	1210	1211	1213
<b>Panel C: Education Level</b>							
		College Education			No-College Education		
		Happiness (1)	Depression (2)	CESD Score (3)	Happiness (4)	Depression (5)	CESD Score (6)
ACA Medicaid (SE)		0.079 (0.073)	-0.105 (0.085)	-0.2 (0.4)	0.086** (0.04)	-0.075* (0.042)	-0.4** (0.2)
No. of Observations		698	698	698	1784	1787	1789

**Table 15** continued

	College Education		No-College Education	
	Happiness	Depression	Happiness	Depression
	(1)	(2)	(4)	(5)
State & Year FE	YES	YES	YES	YES
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
		CESD Score (3)		CESD Score (6)

\*Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. The robust standard errors are reported in the parentheses

The estimates are obtained using the sample from Health and Retirement Study, Waves 10–14 (2010–2018), and Age<65. Each coefficient indicates OLS estimates of Eq. (2). It is a sub-sample analysis done using fully specified model across categories of gender (Males vs Females), race (White Vs Non-White), and education level (College Education Vs No-College Education). The variable ACA Medicaid is a treatment variable, which is a binary indicator for whether Medicaid expansion occurred in the state at a given year. We estimate the impact of ACA Medicaid on the feeling of happiness Column (1&4), the feeling of depression Column (2&5), and CESD score of mental health in which Column (3&6). All the models include state individual fixed effects

**Table 16** Descriptive Statistics for Spouses Being Cared for (Care receivers)

	Individual Level Characteristics of the Sample				
	N	Mean	Std Dev	Min	Max
<i>CESD Score</i>	2038	3.06	2.5	0	8
<i>Felt Happy</i>	2026	0.72	0.45	0	1
<i>Felt Depressed</i>	2033	0.35	0.48	0	1
<i>Age</i>	2180	58.83	8.05	26	94
<i>Any Health Insurance (Public or Private)</i>	2083	0.791	0.407	0	1
<i>Medicaid</i>	2085	0.38	0.485	0	1
<i>Private-Health Insurance</i>	2101	0.202	0.4	0	1
<i>Number of HI Plans</i>	2101	0.21	0.43	0	5
<i>Individual HI Plan</i>	2094	0.073	0.26	0	1
<i>Male</i>	2489	0.573	0.495	0	1
<i>College/More</i>	2466	0.35	0.48	0	1
<i>White American</i>	2155	0.53	0.5	0	1
<i>Retired</i>	1883	0.63	0.48	0	1
<i>Fair/Poor Health</i>	2124	0.683	0.47	0	1

This table provided the descriptive statistics of the main variables we employ in the analysis

**Robustness Check Using IV Approach**

Additionally, we also extend our robustness analysis to instrumental variable (IV) approach and run the baseline *models* using Medicaid uptake as a treatment variable, which is one of the important mechanisms responsible for the effect on mental wellbeing. We use this approach to test alternatively the impact of ACA Medicaid on the mental wellbeing of caregivers ( $Y_{ist}$ ) who are mainly low-income adults in the US. Equation 3 and 4 represent the first and second stage regressions, respectively.

$$Medicaid_{ist} = \beta_0 + \rho X_{ist} + \sigma_s + \vartheta_t + \beta_1 * ACA\_ME_{st} + \theta_i + \epsilon_{ist} \tag{3}$$

$$Y_{ist} = \eta_0 + \lambda X_{ist} + \delta_s + \Psi_t + \eta_1 * \widehat{Medicaid}_{ist} + \theta_i + V_{ist} \tag{4}$$

Table 7 denotes the IV estimates in which we use ACA Medicaid as an instrumental variable for Medicaid update. The exogeneity assumption requires that ACA Medicaid must affect Mental wellbeing only through Medicaid uptake. This assumption can be satisfied when ACA Medicaid solely impacts states introducing Medicaid expansion. The states without ACA Medicaid do not expand Medicaid coverage. The F-statistics of the first stage is 18, which is well above the threshold of 10. Thus, this represents the strength of our instrument. Column (1) indicates the OLS estimates of impact of Medicaid on CESD score of mental health, whereas column (2) represents IV estimates. We find that CESD score of mental health decreases for individuals with Medicaid by 3 points as compared to individuals without Medicaid. This is quite a strong effect and indicates the importance of Medicaid for improving the mental health of individual. Similarly, we repeat our models in Eq. 3 and 4 for other important components of CESD score, namely

happiness, Sadness, and depression. We find that the uptake of Medicaid increases the happiness and decreases the feeling of sadness as well as depression. Overall, we infer that ACA Medicaid expansion improves the mental wellbeing of an individual living in the state that expanded Medicaid relative to other states.

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