# Exposure to Plant Closure and Mental Health Effects on Parents, Partners, and Children

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## Short Abstract

Losing a job has a negative impact on mental health, and it has been suggested that effects of job loss go beyond the directly affected person. This paper examines to what extent job loss affects the mental health of the partner and children of individuals who were exposed to job loss. Different from previous studies, this study is among the first to allow comparability of spillover effects on mental health for both partners and children by using the same data and methodology as for the directly affected person. This study further reduces issues of selection into job loss by exploiting more exogenous variation in employment status arising from exposure to plant closures. Not least, the study exploits doctor diagnoses of mental health problems and thereby circumvents some of the challenges of both self-report and hospitalization data used in other studies. The data used are Norwegian population registers about employment, income, family, and health care service usage. Individual fixed effects models are used to trace development in mental health in the years before, during, and after the plant closure. Preliminary results point towards an increase in consultations for mental health problems of directly affected individuals, and a reduction in income. While the mental health of partners seems to be barely affected, results are in line with spillover effects to children. Illustrating that employment changes in adults have implications for their children, these results have important implications for both employment and health policies.

## Introduction

Employment plays a pivotal role in individuals' lives, providing not only income to satisfy basic needs, but also non-material benefits like social connections and personal identity. However, job loss can profoundly disrupt these aspects, and adverse effects on individuals' mental health are well-documented (Eliason & Storrie, 2009a, 2009b; Gathmann et al., 2020; Kuhn et al., 2009; Rocco et al., 2018). Research has also revealed spillover effects of job loss on the mental health of partners and their health behaviors. However, the extent to which parental job loss affects the mental health of children remains less clear.

While observational studies have linked parental unemployment to lower mental health and life satisfaction in children, only a few studies have attempted to establish causal relationships. Some investigations have focused on school performance (Filiz, 2016; Rege et al., 2011), social behaviors and non-cognitive skills (Peter, 2016), indicating a negative impact on child well-being. However, studies directly measuring child mental health are limited, and their results are mixed (Bubonya et al., 2017; Mörk et al., 2020; Schaller & Zerpa, 2015).

Against this background, this study makes several contributions. First, the study analyzes children's mental health consultations before, during and after parental plant closure. This analysis is complimented by analysis of the effects on the directly affected parent and the parent's partner. By making use of the same data and methods for all family members, spillover effects to children (and partners) can be assessed against the direct effects on individuals losing work. Second, the study allows for credible causal interpretation by exploiting exposure to plant closure as a arguably exogenous source of job loss. Third, the study explores whether the mental health implications of job loss are more severe when re-employment chances are low. To that aim, local unemployment rates and the probability of technological replacement of occupations will be exploited. The analyses presented in this study use full population Norwegian register data on employment, income, family, and health care service usage in combination with family fixed effects models to trace development in family members' mental health in the years before, during, and after plant closure.

## Theoretical framework

Moving into and out of unemployment is associated with declines and improvements in mental health, respectively (Paul & Moser, 2009). Since the causes for entering and leaving unemployment might be endogenous and associations with mental health might blend causal effects and confounding, a strand of the literature exploits exogenous variation in (the risk of) job loss. These studies make use of involuntary job losses, for example in the context of a plant closure where all employees are displaced, irrespective of their tenure, health, human capital, productivity and other characteristics (Browning & Heinesen, 2012; Kuhn et al., 2009). Such designs have also been used to study health spillovers to partners and children (e.g., Everding & Marcus, 2020; Gathmann et al., 2020; Peter, 2016).

Explanatory mechanisms for individuals *directly affected* by a plant closure include economic and psychosocial pathways. These include income losses (also in new positions), and lower self-esteem, loss of purpose, control and daily structure, an experience of moving downwards within a social hierarchy, and stigmatization in social interactions (Brand, 2015; Giuntoli et al., 2014). Importantly, it is even conceivable that working in a closing plant might affect the mental health of individuals transitioning from a closing plant to a new job without experiencing income loss or unemployment, by means of concerns about losing work and

insecurity related to one's employment situation (Chum et al., 2022; Cottini & Ghinetti, 2018; Green, 2011; Ronnblad et al., 2019). Accordingly, being affiliated with a closing plant might not only cause mental health declines after the individual leaves the plant, but also in anticipation of the shutdown.

*Indirectly affected* partners and children will also be impacted by means of economic and psychosocial factors. Three distinct channels of transmission can be distinguished (Luhmann et al., 2014). Firstly, *household level changes* like reductions in income and resulting financial strain, which may spread out to the family by triggering conflict and increasing the risk for parental relationship dissolution. Secondly, *indirect effects on family members* through challenges faced by the individual directly experiencing job loss. This includes mental distress and negative coping behaviors, which also alter family interactions. Thirdly, *direct impact of job loss on partners and children* through concerns about financial stability, status loss, self-esteem, and potential stigmatization.

**Data and Methods**

*Data.* Our primary data sources include the Norwegian Population Register, the Employer-Employee Register, and the KUHR-database (Norwegian Control and Payment of Health Reimbursements Database) spanning from 2006 to 2019. The population register contains key demographic data, such as parent-child relationships and household members. The Employer-Employee Register provides employment start and end dates, along with employer identification numbers. The KUHR database contains information about general practitioner visits, including visit dates and registered diagnoses/symptoms.

*Sample.* Our sample comprises fathers and mothers who were registered in a stable or closing private sector plant in the base year. These individuals were aged between 25 and 55, had a married or cohabiting partner, and had at least one child aged 7 to 16. The base year is defined as the year occurring two years prior to the plant closure, which took place between 2009 and 2016. For the control group, the base year is randomly assigned within the same time window. We explore potential spillover effects on the partners of the directly affected persons and on their oldest child in the age range of 7 to 16 years. The analysis encompasses five years before and after the plant closure and is conditional on individuals being alive and registered as a resident of Norway during this period

*Variables.* A plant closure is observed when the number of employees in a plant on December 31st drops by 100% compared to the previous year and an organizational re-structuring can be ruled out. We focus on plant closures happening between years 2009 and 2016, with corresponding base years 2007 to 2014. The control group consists of individuals employed in stable plants during the base year, which are plants that did not close between 2009 and 2016. Our primary outcome variable is the number of face-to-face consultations with general practitioners (GPs) where a mental health diagnosis (coded under chapter P in the ICPC-2 system) was recorded within a given year. Diagnoses in chapter P encompass conditions such as depressive disorders, anxiety disorders, post-traumatic stress, suicide attempts, among others.

*Methods.* We employ linear regression and difference-in-differences models to estimate the impact of plant closure on the number of consultations before, during and after the event.

These models quantify the difference in the trajectory of mental health consultations between individuals subjected to plant closures and control individuals. Our primary independent variables consist of plant closure status (yes/no), time elapsed since the plant closure (specifically, two years after the base year for the control group), and their interaction. The control group serves to account for age- and time-related trends in the outcome. All models incorporate fixed effects for the individual and for the interaction of age and year to control for both individual-specific, time-constant confounding factors and year-age-specific variations in the outcome. Cluster-robust standard errors are applied, with clustering at the individual level.

**First results**

Descriptive analyses show that individuals in closing plants are more likely to be male and minimally younger than those in stable plants (Table 1). Individuals in closing plants also have slightly shorter tenure and lower income. While there is practically no difference in the share of employment between both groups, those in closing plants have a higher probability of receiving unemployment benefits in the base year (i.e., two years ahead of the plant closure). Individuals in closing plants have more mental health diagnoses than those in stable plants; the same observation is true for their partners, and to some extent their children. Children are on average 11 years old in the base year (i.e., 13 years at plant closure).

*Table 1: Sample descriptives (base year)*

| | Full sample | In closing plants | In stable plants | Difference |
|---|---|---|---|---|
| Male (%) | 50 | 61 | 49 | -12*** |
| Age (years) | 40.1 | 39.8 | 40.1 | 0.2*** |
| In closing plant (%) | 10 | 100 | 0 | -100 |
| Base year | 2010.56 | 2010.47 | 2010.56 | 0.09*** |
| Plant size (employees) | 431 | 93 | 469 | 365*** |
| Tenure (years) | 3.9 | 3.7 | 3.9 | 0.2*** |
| Employment income (NOK) | 518,634 | 525,328 | 517,881 | 10208*** |
| Unemployed (%) | 3 | 5 | 2 | -5*** |
| Employed (%) | 97 | 97 | 97 | 2*** |
| Parent psych. diagn. (#) | 0.13 | 0.15 | 0.12 | -0.02*** |
| Partner psych. diagn. (#) | 0.16 | 0.19 | 0.15 | -0.04*** |
| Child psych. diagn. (#) | 0.04 | 0.04 | 0.04 | -0.01*** |
| Child age (years) | 11.46 | 11.40 | 11.47 | 0.03* |
| *N* | 181,354 | 18,341 | 163,013 | |

*Note: Numbers are subject to rounding error, therefore the displayed difference might differ from the difference between those in closing and stable plants. # = number. Base year = two years before the plant closure.*

Figure 1 shows the development in the number of mental health consultations for parents, partners, and children in closing and stable plants. While the top row depicts the results from the fixed effects regression models, the bottom row shows the estimated mean values for closing (red) and stable (blue) plants. The mental health trajectories of parents in closing and stable plants run parallel in the period spanning 5 to 3 years before the plant closure, despite the differences in sample characteristics described in Table 1 (note that years on the y-axis in

Figure 1 are grouped to increase statistical power). This supports the parallel-trend assumption, which is necessary for interpreting changes in the differences around the time of the plant closure between both groups as causal. Interestingly, those in closing plants consult GPs more often already one to two years before the plant closure, and the effect is sustained at least until the year after the closure. While the mental health consultations of partners of those in closing plants seem unaffected, we observe a small but significant increase in children's consultations in the year of the plant closure and the following year.

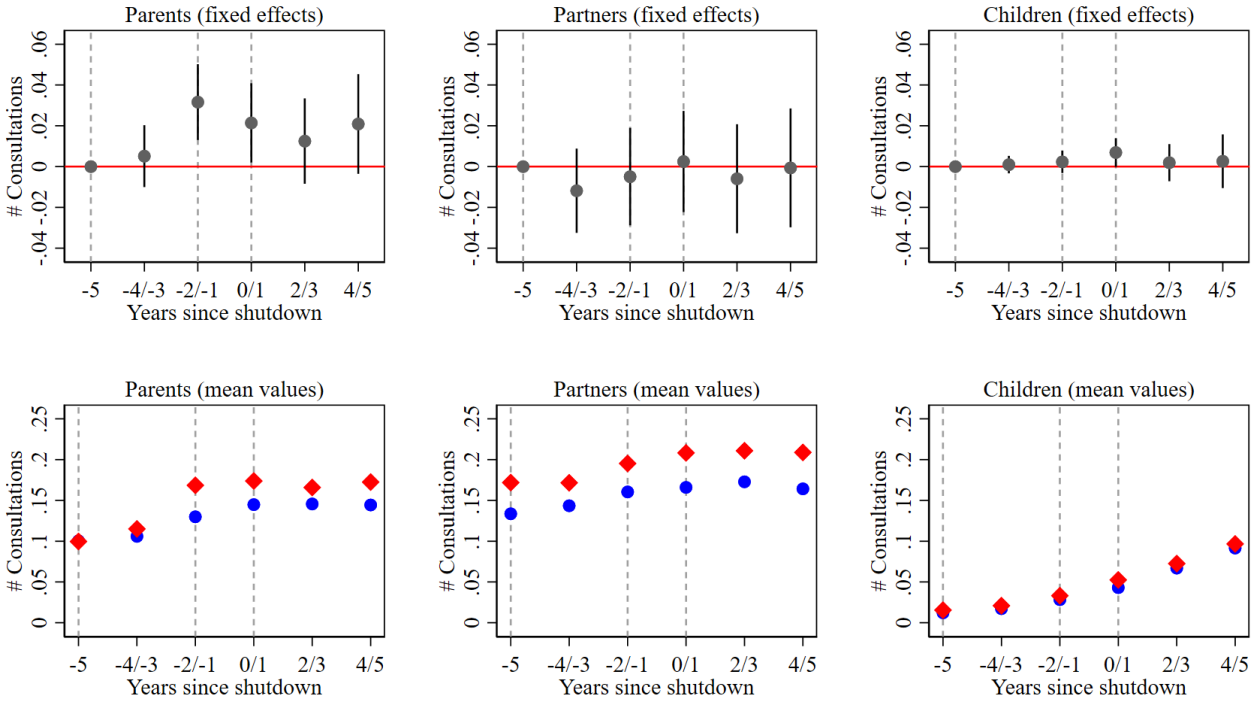


*Figure 1: Number of consultations where a mental health diagnosis is given, for directly affected individuals (parents), their partner, and their children. Top row: fixed effects estimates, reference category -5; bottom row: mean values.*

**Abridged Conclusions**

Using full population register data from Norway, we found that children consult doctors more for mental health problems around the time their parent are exposed to a plant closure. Given the small number of mental health consultations in children, the increase is substantial. The pattern differs from that observed in directly exposed parents, who show the strongest increase in consultations in the years ahead of the plant closure. This could be explained by job insecurity during that period, which has been shown to affect mental health negatively (e.g., Green, 2011). However, it cannot be ruled out that parents consult doctors strategically for sick leave during that period.

The early results of this study demonstrate spillover effects of job loss to children. With no spillover effects to partners, this suggests that family members react differently and might differ in terms of vulnerability to adverse events.

Results presented at the EPC 2024 will include insights into the extent to which the patterns are driven by an increase in the number of persons who seek help versus by persons consulting their GP more frequently. Furthermore, analysis of heterogeneities by two indicators of re-employment probability (local unemployment and technology-replacement risk) will be presented.

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