The effect of broadband internet on mental health-related disability insurance claims[a]

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Abstract

We examine the causal impact of high-speed internet on adult mental health using administrative data from Belgium. We exploit predetermined telecommunications infrastructure and broadband technology's distance-sensitive nature for identification. Our difference-in-differences estimates show internet increased mental health-related disability insurance claims by 0.054 percentage points—a 31% increase relative to the control group. These findings are supported by increased antidepressant use at the municipality level. Results point to a work-related mechanism: effects are concentrated among knowledge workers and those in high work-from-home potential jobs. Time-use data show a substitution from leisure to work and less social interaction on weekends.

Keywords: mental health, internet, disability insurance, employment
JEL codes: H55, I1, J2, L86

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1 Introduction

The rapid expansion of digital technology since the late 1990s has fundamentally transformed how people work, interact, and spend their time. While growing concern about the effects of internet use, particularly social media, has focused predominantly on children and teenagers, the impact on adults remains less understood. Yet over the same period of digital expansion, the economic burden of mental health problems among working-age adults has grown substantially. Mental health conditions have become a major cause of disability insurance claims in developed countries, with depression and burnout rates rising dramatically among prime-age workers (OECD, 2013, 2018).

Understanding the causal link between digital transformation and adult mental health deterioration presents significant challenges, not least because measuring mental health outcomes objectively remains difficult. Self-reported measures may be biased by changing social attitudes toward mental health disclosure, while extreme outcomes like suicide may fail to capture the broader scope of mental health problems. The policy urgency of this research question is evident in Belgium, where by 2022 mental health conditions accounted for over one-third of all long-term disability cases, with burnout and depression alone representing 25% of all disability claims lasting more than one year (INAMI, 2023).

This paper explores the relationship between access to broadband internet and adult mental health in Belgium using administrative records of disability insurance claims. Our empirical strategy exploits a technological feature of the telecommunication infrastructure that generated substantial variation in the availability and quality of internet: the distance of a household from a network node determined internet access and speed. Since these network locations were established decades before internet deployment for voice telecommunications, they provide plausibly exogenous variation in internet access. We merge information about the internet network topology with geocoded longitudinal data from the Belgian Crossroads Bank for Social Security, a rich collection of administrative microdata that contains information on Belgian workers' labor market trajectories and basic demographics. Using a difference-in-differences design, we compare mental health-related disability insurance claims of individuals with access to residential internet to those without access during 1998-2004. This period focuses on the initial broadband rollout that began in 2001 before widespread social media adoption. We additionally examine effects through 2010 to assess persistence over time.

Our findings reveal significant adverse effects of residential internet access on adult mental health. Internet access increases mental health-related disability insurance claims by 0.054 percentage points over 1998-2004, representing a 31% increase relative to the control group, with no corresponding effects on disability claims for other medical conditions. The mental health effects are concentrated among women and prime working-age adults (26-44 years), with women aged 26-34 showing the largest response (0.097 percentage points). These demographic patterns suggest that internet access may particularly affect individuals during peak career years when work-life balance pressures are most intense. The effects persist and intensify over time, more than doubling to 0.136 percentage points when examined over the extended period 1998-2010, indicating that mental health costs accumulate rather than diminish with technological adaptation.

We corroborate these findings using municipality-level data on antidepressant consumption from a large Belgian health insurer. A 10 percentage point increase in broadband availability is associated with a 0.22 percentage point increase in antidepressant consumption rates, representing a 20% increase relative to baseline levels. The patterns mirror our disability insurance results, with effects concentrated among working-age adults and showing similar gender and age distributions.

The mental health deterioration translates into meaningful economic consequences, with internet access reducing individual employment by 0.587 percentage points and labor force participation by 0.047 percentage points. These individual-level effects reveal how technology-induced mental health problems affect workforce participation and productivity.

Our investigation of potential mechanisms provides suggestive evidence that work-related internet use may be an important channel linking broadband internet access to mental health deterioration. The effects are concentrated among workers in knowledge-intensive sectors (0.071 percentage points) and jobs with high work-from-home potential (0.043 percentage points), consistent with internet access facilitating after-hours work activities that disrupt work-life balance and contribute to chronic stress and burnout.

We complement this analysis with time use data to examine how broadband access affects behavioral patterns. Using the Belgian Time Use Survey, we examine how internet availability affects the allocation of time across sleep, work, leisure, and social activities. We find suggestive evidence of substitution between leisure and work on weekends, as well as increased social isolation.

This paper connects to three strands of literature. The first includes empirical research exploring the relationship between digital technologies and mental health. Prior studies document negative effects of internet access on various self-reported mental health outcomes, including worsening young women's socializing behavior and emotional well-being (Golin, 2022), and negative relationships between social media access and body image among children (McDool et al., 2020) and young adults (Braghieri et al., 2022). More recent evidence using hospital administrative records shows that high-speed internet access increases mental health diagnoses and suicide attempts among adolescents in Spain (Arenas-Arroyo et al., 2025) and raises the prevalence of mental disorders resulting in self-harm, compulsory and urgent hospitalizations among teenagers in Italy (Donati et al., 2025). However, these studies find no statistically significant evidence of the impact of internet on these outcomes among adults (Donati et al., 2025; Golin, 2022). One exception is Johnson and Persico (2024), which shows a negative association between broadband coverage and suicides using aggregate data from the U.S.. We contribute to this literature in several ways. First, we use individual longitudinal data to track labor market trajectories before mental health diagnoses, enabling comparisons of similar individuals and assessment of pre-trends prior to internet rollout. Second, our objective measures—work-preventing mental health conditions and antidepressant prescriptions—capture more widespread issues related to stress and depression rather than the extreme outcomes previously studied. Finally, by focusing on the pre-social media period, we isolate internet's effects through non-social media channels. Importantly, our Belgian context—characterized by strong worker protections and long-standing mental health policies—allows us to examine these effects in an environment with substantial institutional safeguards, providing valuable insights for policy implications.[1]

Second, this paper is related to the literature that examines the causes and consequences of mental health-related conditions. A growing literature studies the relationship between labor market conditions—business cycle (Avdic et al., 2021), globalization (Colantone et al., 2019), and poverty (Ridley et al., 2020)—and individuals' self-reported mental health, happiness, and life satisfaction. Recent research also shows that workers in precarious employment (e.g., temporary job contracts) (Moscone et al., 2016) and pay-for-performance schemes (Dahl and Pierce, 2019) are more likely to take prescription medication (i.e., anti-depressant and anti-anxiety medication) for mental health problems. Moreover, there are labor market penalties associated with mental health conditions. Shapiro (2020) shows that increased spending on advertisement of anti-depressants in the US leads to more prescriptions and fewer lost days of work. Biasi et al. (2020) find positive career effects (i.e., increased earnings and a decline in the risk of disability) of access to mental health treatment. Here, we add to the literature on the determinants of increased disability insurance claims (Autor and Duggan, 2003, 2006; Liebman, 2015; Fevang et al., 2017), focusing on mental health-related conditions.

[1]Belgium has comprehensive worker protection laws addressing mental health. The 1996 "Law on the Welfare of Employees in the Performance of their Work" established mandatory well-being policies and health committees for larger firms. Key amendments in 2002 addressed workplace violence and harassment, while 2014 reforms expanded coverage to psychosocial risks including burnout prevention. Current regulations require employers to conduct risk analyses, implement early warning systems, and designate specialized personnel (confidential mediators, counsellors, prevention advisers) to address workplace mental health issues (Belgian Official Gazette, 1996; Conseil Supérieur de la Santé, 2017).

Finally, our paper contributes to a growing literature that examines the causal impact of broadband internet access on labor market and socioeconomic outcomes. Within labor markets specifically, prior research has documented effects on wage and employment growth (Atasoy, 2013; Forman et al., 2012), labor market search frictions and matching (Bhuller et al., 2020; Martellini and Menzio, 2020; Denzer et al., 2018), the skilled-to-unskilled pay gap (Akerman et al., 2015), married women's labor force participation (Dettling, 2017), and firm performance (Canzian et al., 2019). Beyond employment effects, studies have documented broadband's wide-ranging influence on diverse socioeconomic outcomes. These include political participation (Campante et al., 2017; Falck et al., 2014), sex crime (Bhuller et al., 2013), educational attainment (Faber et al., 2016), sleep (Billari et al., 2018), demand for healthcare (Amaral-Garcia et al., 2021; Van Parys and Brown, 2024), marriage rates (Bellou, 2015), fertility decisions (Billari et al., 2019; Guldi and Herbst, 2017), and social capital (Bauernschuster et al., 2014; Geraci et al., 2022). Our study adds to this literature by using a similar identification strategy to investigate the causal link between broadband internet expansion and mental health outcomes, and exploring the channels behind this relationship.

This paper proceeds as follows. In the next section, we provide background information and descriptive evidence on broadband internet roll-out, and the main drivers of disability insurance claims in Belgium. In Section 3, we describe our data and empirical strategy. Section 4 presents the results. Section 5 concludes.

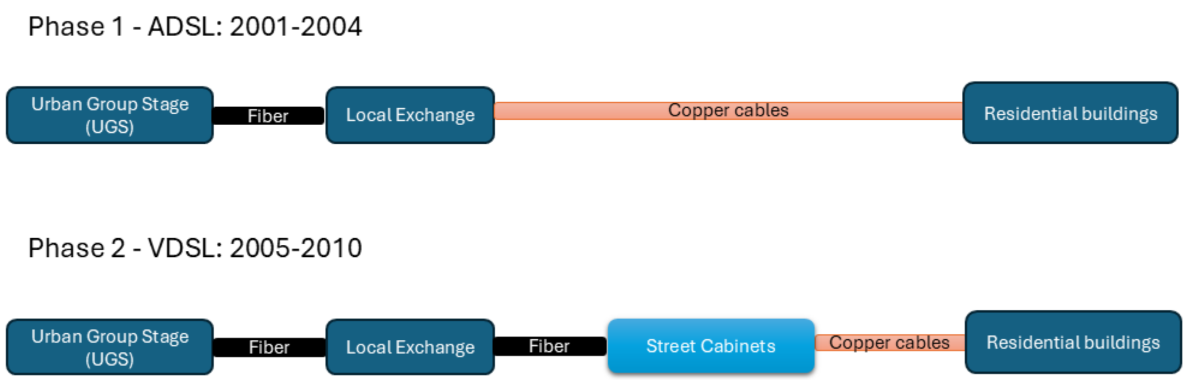
2 Institutional Background and Descriptive Evidence

2.1 Broadband Internet in Belgium

Broadband internet connection to residential customers through Asymmetric Digital Subscriber Line (ADSL) was introduced in 2001 in Belgium. The commercial roll-out of ADSL technology was conducted by the company Belgacom (now called Proximus). Belgacom, founded in 1991, had a monopoly of the copper telephone network, on which ADSL data transmission relies. In the 1990s, narrow-band dial-up internet services were used almost exclusively by Belgian universities for academic (non-commercial) purposes. Belgacom entered the internet market in 1996, and after a pilot project for testing ADSL over the copper network that covered mainly Belgian universities, the commercial rollout of ADSL technology for residential use started in 2001.

ADSL technology typically relies on data transmission over the user's copper telephone line, and as a result, access to ADSL depends crucially on the user's position in the pre-existing voice telecommunications infrastructure. The network is made up of several nodes, called local exchanges (LEs), connected to each other. Providing internet access over the telephone network required installing special equipment in the LEs, but the location of the LEs was determined several decades before internet deployment.[2]

Figure 1: Belgian broadband internet network in the 2000s



Note: This figure shows the evolution of Belgium's broadband internet infrastructure across two phases: Phase 1 (2001-2004) used ADSL technology with copper cables running directly from local exchanges (LEs) to residential buildings: ADSL1 used R4.1 racks with capacity for 340 households per LE; ADSL2+ used higher-capacity racks (R4.2 and R5) with capacity for 680 households per LE. Phase 2 (2005-2010) introduced VDSL technology by adding Street Cabinets as intermediate nodes, extending fiber connections closer to end users, adding additional 190 households per cabinet.

The Belgian telephone network consists of about 750 local exchanges; each LE is a node of the internet provider's local distribution network and is the physical building used to house internal equipment. LEs are connected back to higher levels (Urban Group Stage, UGS) by fiber lines. Figure 1 shows two phases of internet diffusion. During the initial phase of internet deployment—between 2001 and 2004—from each LE, lines were further distributed locally by copper cables to residential buildings. All technologies based on ADSL are distance sensitive because their performance decreases significantly as one gets further away from the relevant LE. Residential buildings had to be located within 3km of the LE to receive any internet signal.

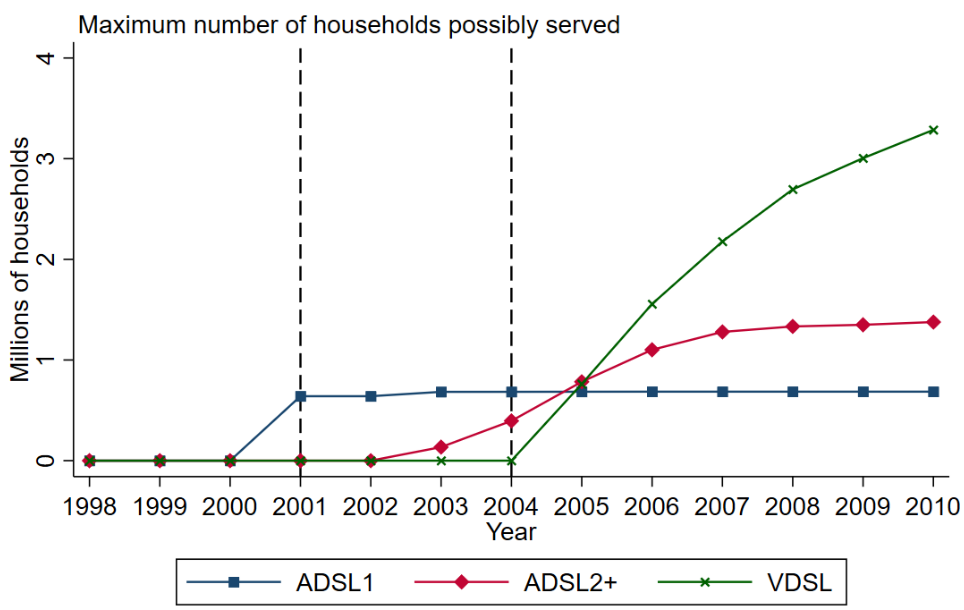
In 2005, Belgacom launched *Project Broadway*, which introduced fiber-to-the-street-cabinet by installing Remote Optical Platform (ROP) units. By the end of 2005, Belgacom

[2]The first introduction of the telephone in Belgium originated from the Belgian Parliament (1879) and the first local telephone network was built in 1886. In 1930, a new company was founded: the RTT (Regie Telegraaf en Telefonie), which received the monopoly over the whole telephone network (Wee et al., 2012). The Belgian telecommunication reforms in 1991 led to the creation of Belgacom, an autonomous telecommunications operator with a monopoly over the copper telephone network, and the BIPT (Belgian Institute for Postal Services & Telecommunications), the Belgian National Regulatory Authority (NRA).

had equipped 5,203 street cabinets with VDSL technology out of a total of about 20,000 street cabinets in Belgium. These fiber-fed cabinets were a new layer added after the initial ADSL (central office) deployment.

Figure 2 shows the number of households that could be served by ADSL (blue squares and red diamonds) and VDSL (green crosses) technologies during these two phases of internet diffusion. Initially, all LEs had ADSL1 technology R4.1 racks, which could serve at most 340 households within 3 km from the LE (blue squares). Over time, ADSL2+ technology was incorporated into the racks in the same LEs to increase the number of potential consumers served: racks R4.2 and R5 could serve at most 680 households (red diamonds). The VDSL technology introduced by street cabinets could serve 190 additional households (green crosses).

Figure 2: Broadband internet diffusion in Belgium



Note: This figure shows the evolution of broadband internet capacity in Belgium from 1998 to 2010, measured by the maximum number of households that could potentially be served by different technologies. The blue line (ADSL1) represents the initial ADSL deployment starting in 2001 using R4.1 racks with capacity for 340 households per LE. The red line (ADSL2+) shows the upgrade to higher-capacity racks (R4.2 and R5), capable of serving 680 households per LE. The green line (VDSL) illustrates the introduction of street cabinets in 2005, adding an additional 190 households per cabinet. The vertical dashed lines mark the beginning of ADSL deployment (2001) and the start of VDSL rollout (2005). Capacity calculations assume racks operate at 85% capacity.

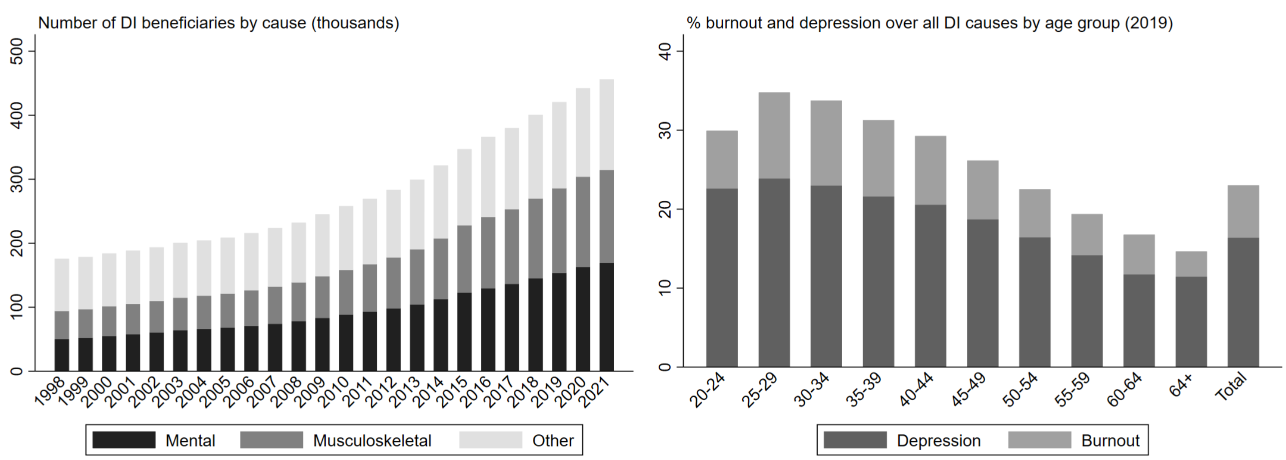
The rapid expansion of broadband internet access in Belgium occurred alongside significant changes in mental health outcomes among working-age adults. To investigate this potential relationship, we next examine the institutional features of Belgium's disability insurance system and document trends in mental health conditions during the period of internet rollout.

2.2 *Mental Health and Disability Insurance in Belgium*

The total costs of mental health problems—including health systems and social security, and lower employment and worker productivity—are estimated to be more than 4% of GDP across EU countries, equivalent to over EUR 600 billion per year (OECD, 2018). In Belgium, the estimated costs related to mental health problems represented about 5% of GDP in 2015.

Mental health conditions account for an increasing share of work incapacity, sickness, and disability claims. The employment rate of people with mental disorders in Belgium declined between 1997 and 2008, resulting in an increase in the employment gap compared to those without mental health problems from 9 to 15 percentage points. Both the absolute number of disability recipients and the share of mental disorders among new disability insurance claims have increased over the last several decades.[3] By the late 2000s, 6.2% of the population aged 20-64 in Belgium was receiving sickness or disability benefits, up from 4.6% in the mid-1990s. By 2010, one third of all new disability claims were related to mental disorders. The increase was largest among younger people (aged 20-39 years), where the share of mental health problems among new claims within that age group reached nearly 50% in 2010 compared to about 20% among those aged 50-64 (OECD, 2013).

Figure 3: Long-term disability insurance claims: main medical conditions



(a) Main medical conditions

(b) Mental health conditions

Notes: Authors own elaboration based on INAMI (*Institut national d'assurance maladie-invalidité*) reports.

[3]Figure A.1 shows these long-term trends in disability receipt by gender.

Figure 3 illustrates these trends in Belgian disability insurance claims from 1998 to 2021. Panel 3a shows the evolution of disability beneficiaries by medical condition, revealing steady growth in mental health-related claims (black) alongside musculoskeletal disorders (dark grey) and other conditions (light gray).[4] Mental health conditions have become an increasingly prominent component of total disability claims over this period. Panel 3b provides a detailed breakdown of mental health conditions by age group for 2019, showing that burnout and depression together represent 64% of all mental health-related disability cases. Notably, the burden is highest among prime working-age adults, with those aged 25-44 showing particularly high rates of these conditions (see Figure A.2 for detailed age-specific disability entry patterns).

The rise in mental health conditions is also reflected in pharmaceutical treatment patterns. Table 1 shows antidepressant consumption rates among insured individuals by one large Belgian health insurer between 2000 and 2005, a period that coincides with the early rollout of broadband internet. The data reveal substantial increases in antidepressant use across all demographic groups, with consumption rates rising particularly sharply among working-age adults. For women aged 25-35, antidepressant consumption increased from 0.71% to 9.31%, while for men in the same age group, it rose from 0.69% to 5.67%. These patterns suggest that the period of internet expansion coincided with significant changes in mental health treatment utilization, providing additional context for our analysis of internet's effects on mental health outcomes.

Figure 4 illustrates the pathway into disability insurance and reveals important institutional features of the Belgian system. The figure tracks employment status around the time of disability insurance entry, measured in quarters relative to when individuals first receive long-term disability benefits (quarter 0). Most individuals maintain stable employment (solid line)—around 80-85%—until twelve months before entering the long-term disability system, when employment drops sharply. This decline coincides with a sharp transition from employment to short-term disability status (dashed line) before individuals move to long-term disability (dotted line). After entering long-term disability, employment rates stabilize at lower levels (around 60%), underscoring that disability insurance entry represents a persistent change in labor market participation. The continued employment of some DI recipients reflects that employment and disability status are not mutually exclusive categories in the

[4] Other conditions include: infectious and parasitic diseases, tumors, endocrine/nutritional/metabolic diseases, blood and hematopoietic organ disorders, nervous system and sensory organ diseases, circulatory system diseases, respiratory system diseases, digestive system diseases, genitourinary organ diseases, pregnancy and childbirth complications, skin and subcutaneous tissue diseases, congenital anomalies, perinatal conditions, ill-defined symptoms and signs, and traumatic injuries and poisoning. Categories follow the International Classification of Diseases (ICD).

Table 1: Antidepressant consumption by gender and age group

Age Group	2000 Number insured	2000 % Antidepressant consumers	2005 Number insured	2005 % Antidepressant Consumers
Panel A: Women				
0-24	204,409	0.16	218,401	1.91
25-35	111,868	0.71	115,508	9.31
36-44	103,607	1.13	109,774	15.57
45-55	105,435	1.51	117,325	20.55
56+	226,256	3.45	235,855	23.98
Panel B: Men				
0-24	208,732	0.12	221,896	1.18
25-35	98,294	0.69	101,360	5.67
36-44	93,608	0.96	102,681	8.63
45-55	96,412	1.27	110,420	11.84
56+	170,254	2.53	183,727	13.98

Notes: This table shows the antidepressant consumption rate among insured individuals by one large Belgian health insurer, *Mutualité Libres*.

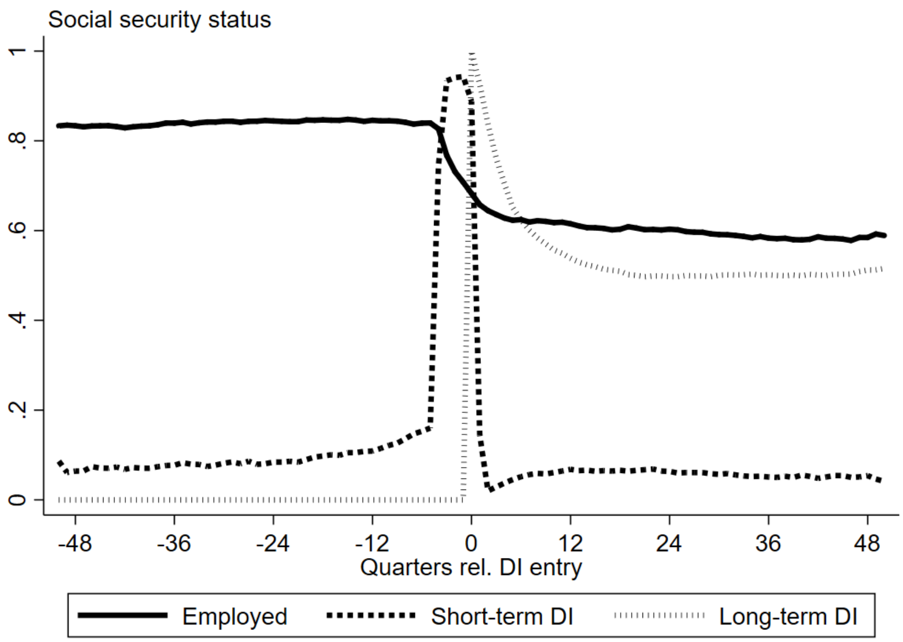
Belgian system, allowing individuals to maintain multiple social security statuses simultaneously.

This institutional context is crucial for interpreting our results. The National Institute for Sickness and Invalidity Insurance (INAMI) coordinates the public health insurance system at the federal level. This institution is responsible for both sickness benefits (up to one year) and disability benefits (beyond one year); consequently, all disability beneficiaries necessarily go through one year of sickness benefits before becoming eligible for long-term disability. Individuals may also have shorter-duration disability spells at any point in time that do not lead to long-term disability. Throughout this paper, we refer to the former as short-term disability and to the latter as long-term disability.[5] At the operational level, INAMI relies on accredited mutual insurance providers that act as the interface between the health insurance system and the insured.

The disability insurance screening process follows multiple stages for salaried workers: first, a general practitioner certifies sickness absence during the sick leave period. After this period, a worker must apply to the health insurance fund to receive short-term disability benefits. If necessary, a doctor from the health insurance fund determines eligibility. Eligibility for long-term disability benefits is determined by the INAMI's medical board upon request from the advisory doctor.

[5]Figure A.3 shows the evolution of short-term disability claims by age group.

Figure 4: Transition into disability insurance



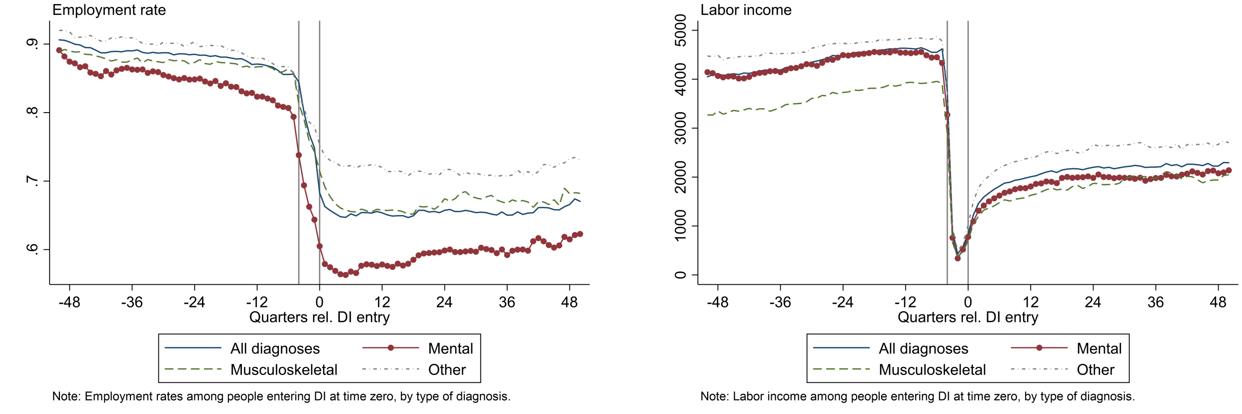
Source: This figure shows labor market status rates in quarters relative to long-term disability insurance entry (quarter 0). Lines represent the percentage employed (solid line), receiving short-term disability (dashed line), and receiving long-term disability (dotted line). Individuals may have multiple statuses. Short-term disability data available from 2003 only.

The growing importance of mental health conditions in disability claims is evident in recent trends. Mental health and musculoskeletal disorders together explain about three-quarters of the increase in the number of long-term disability insurance recipients between 2005 and 2018 in Belgium, and constitute about 70% of all DI recipients today (De Brouwer and Tojerow, 2023). This trend makes mental health-related disability insurance claims a particularly relevant outcome for studying the health effects of technological change.

The transition onto disability insurance has substantial effects on both employment and earnings for program entrants. Figure 5 shows employment rates and earnings around disability insurance entry (quarter 0) for DI entrants, by diagnosis type. The figure reveals distinct patterns across different medical conditions. For mental health diagnoses (red dotted line), employment rates (figure 5a) drop sharply at DI entry from approximately 85% to 60%, while quarterly earnings (figure 5b) fall from around 4,500 to roughly 2,000. Musculoskeletal conditions (green dashed line) and other diagnoses (dotted line) show less severe drops in employment rates (to about 70%), but similar earnings losses.[6]

[6]The employment and earnings effects extend beyond DI entrants to their partners. Figure A.4 shows that partners of DI beneficiaries also experience changes in employment rates and labor income around the

Figure 5: Employment rates and earnings of DI entrants



(a) Employment rate

(b) Earnings

Notes: This figure shows employment rates (panel a) and earnings (panel b) around disability insurance entry (quarter 0), by diagnosis type. Lines show all diagnoses (solid), mental health (red dots), musculoskeletal (dashed), and other conditions (dotted).

The trends documented above suggest a potential relationship between the expansion of broadband internet and rising mental health problems among Belgian adults. However, establishing causality requires addressing the endogenous nature of internet adoption. We next describe our empirical strategy, which exploits technical features of ADSL technology and historical telecommunication infrastructure to identify the causal effects of residential internet access on mental health outcomes.

3 Data and Empirical Strategy

The potential effects of internet use on mental health are multidimensional because of the many ways the Internet is used. Examining the impact of internet access on mental health-related outcomes is difficult due to the potential endogeneity of internet diffusion. Internet subscriptions are correlated with other observable demographic characteristics (such as income, employment, and education) that are also correlated with mental well-being.

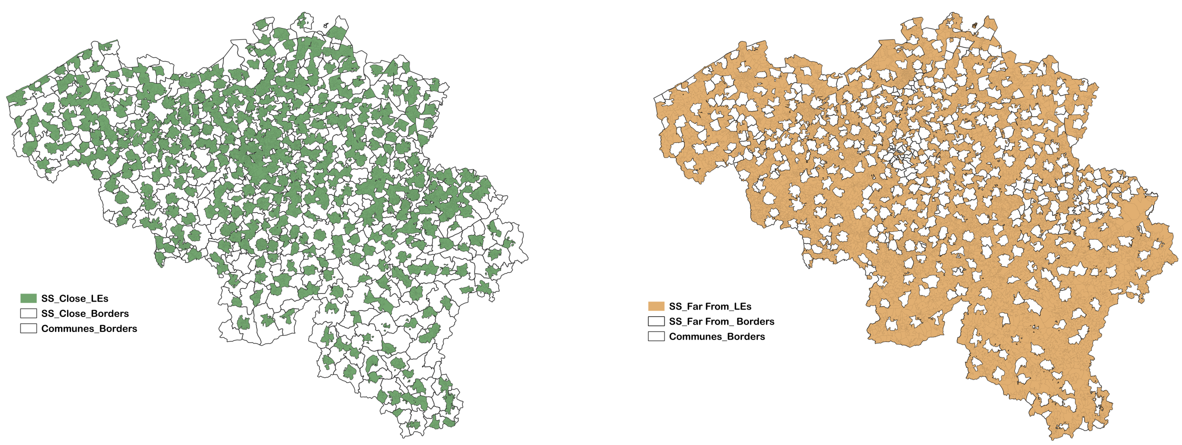
3.1 Individual-level analysis

We combine data from several administrative registers collected by the Belgian Crossroad Bank for Social Security (CBSS). This is a linked employer-employee longitudinal database

time of DI entry, with patterns varying by the type of diagnosis of the DI entrant.

that covers the universe of Belgian workers in the private sector. We have access to data on a 10 percent sample of prime working-age individuals (who are 26-45 years old in year 2000), spanning the period 1998-2010. We combine the geocoded Belgian CBSS with unique information on the topology of the voice telecommunication infrastructure provided by the internet provider Proximus (formerly Belgacom, which held the monopoly of the copper telephone network at the time of initial ADSL deployment). We have the exact location of all Proximus' local exchanges (see figure A.5). Using this information, the CBSS calculated the distance from each individual's statistical sector of residence (using their centroids) to the closest LE. Our distance variable is measured in 500m intervals (see figure A.6).[7] Figure 6 shows the geographic variation in potential internet access given by the distance between 20 thousand statistical sectors and 750 local exchanges.

Figure 6: Geographic variation in access to internet



(a) Statistical sectors within 3km of LE

(b) Statistical sectors beyond 3km of LE

Notes: Elaborated by the authors using the centroid of the statistical sectors (StatBel) and the coordinates of the local exchanges (Proximus).

Our identification strategy exploits exogenous discontinuities in internet quality and access that stem from DSL technology's distance-sensitive characteristics. During the initial internet rollout, household connections to the ADSL network depended on voice telecommunication infrastructure that had been established decades earlier. DSL performance decreases significantly with distance from the relevant LE, creating variation in internet access based on individuals' proximity to their closest LE (Amaral-Garcia et al., 2021; Ahlfeldt et al., 2017; Campante et al., 2017; Falck et al., 2014).

[7]Belgium has about 20,000 statistical sectors (*secteurs statistiques*), 589 municipalities (*communes*), and 43 districts (*arrondissements*). For data privacy reasons, the CBSS only allows us to observe individuals' district in addition to the distance variable mentioned above.

Our approach to identify the causal effect of residential high-speed internet access on mental well-being is based on a comparison between individuals who lived in areas with access to broadband internet—within the LE catchment area—(treatment group) and individuals who lived in areas with no access to high-speed internet (control group). For our analysis, we define 273 areas based on district-distance combinations. Due to data privacy reasons, we do not observe individuals' statistical sector or commune of residence. Instead, we observe distance intervals to an LE at the individual level (calculated by the CBSS using the LE coordinates we provided) and individuals' district of residence. We use propensity score matching based on pre-treatment characteristics to obtain a comparison group that provides the appropriate counterfactual disability insurance trends for the treated individuals in our design. We estimate the following dynamic difference-in-differences (DD) model:

$$y_{iat} = \sum_{t=-P}^{T} \delta_t (Close2LE_{ia} \times Time_t) + \phi_t + \lambda_a + X_{iat}\beta + t.Z_j\gamma + \epsilon_{iat} \tag{1}$$

where y_{iat} represents the outcome of individual i who lives in area a in year t. $Close2LE_{ia}$ is a dummy indicating that the individual lives in a statistical sector within 3km from the closest local exchange at baseline. The set of dummy variables $Time_t$ identify years since internet roll-out started (i.e., 2001). The coefficients $\delta_0, ..., \delta_T$ identify dynamic treatment effects, whereas $\delta_{-P}, ..., \delta_{-2}$ estimate anticipation effects. δ_{-1} is the baseline omitted period. The specification includes ϕ_t to absorb time-varying shocks, λ_a to absorb unobserved time-invariant area characteristics, X_{iat} is a vector of individual-level controls such as age, age squared and gender, $t.Z_j$ are job-type-specific time trends, and ϵ_{iat} is the error term. Standard errors are clustered at the area level to allow for correlation of error terms across different time periods within each area.

We use propensity score matching based on pre-treatment characteristics to account for differential trends between treatment and control groups. We use year 2000 percentile-based categorical variables for annual salary and age, 2-digit industry of employment, and gender. Using these variables, we estimate propensity scores representing the predicted probability of treatment (i.e., being within 3km of an LE) conditional on observable characteristics. Each treated unit is then matched to the control unit with the closest propensity score using nearest neighbor matching with replacement (one-to-one matching). The procedure generates matching weights that we use in our regression analysis to ensure that treated and control units are weighted appropriately based on their matched status.

The main coefficients of interest are δ_t, which measure the change in outcomes of individuals who live close to a LE with respect to the baseline year, relative to the evolution of outcome variables among individuals who live far from the LE. The key identifying assumption is that in the absence of treatment, the trend in mental health outcomes would be the same for individuals living close and far from a LE. The results obtained based on this identification strategy can be interpreted as an intention to treat (ITT), where the exogenous variation that we exploit are the discontinuities in the distances to the LE.

We complement our event study analysis with static DD estimates that summarize the treatment effect across all post-treatment years. This approach uses the same specification but replaces the event study indicators with a single interaction term $Close2LE_{ia} \times Post_t$, where $Post_t$ equals 1 from 2001 onward. When estimating the static DD model, we also discretize the continuous distance measure into categories—$\sum_{d=1}^{4} \delta_d(Distance2LE_{iad} \times Post_t)$—to examine how treatment effects vary with proximity, reflecting the expected signal and speed decay over distance.[8] We use separate interaction terms for different distance intervals: 0-1km, 1-2km, 2-3km, and 3-4km, with areas beyond 4km serving as the omitted category.

3.1.1 Identifying assumptions

We present short-term estimates (1998-2004) and medium-term results (1998-2010) for two reasons, one conceptual and one econometric. The first reason is that looking at 1998-2004 allows us to fully abstract from social media as a mechanism driving our results. This channel has been analyzed in previous work, but we know less about the effects of the internet before social media was introduced.[9] The early rollout of high-speed internet in Belgium relative to other countries allows us to explore mechanisms other than social media, which we think is an interesting contribution.

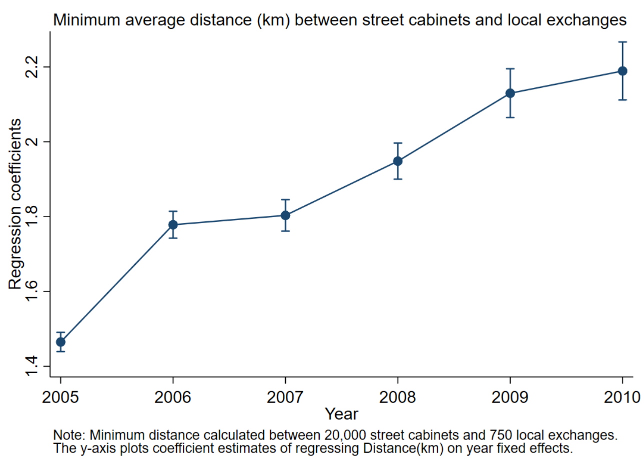
The second reason is related to our identification assumptions. The broadband internet rollout during the 2001-2004 period relied exclusively on LEs, which allows us to use a clean identification strategy already used multiple times in the literature (Amaral-Garcia et al., 2021; Ahlfeldt et al., 2017). The fact that the rollout relied on the location of buildings whose location preceded any demand for internet is reassuring in terms of the exogeneity of internet access. However, between 2005 and 2010, the internet technology changed—extending the fiber connection from the LEs to street cabinets equipped with VDSL technology (see section 2)—which presents an empirical challenge for causal inference. This identification strategy requires that the technologies installed in the street cabinets be uncorrelated with the error term. While street cabinets already existed (so their location was not chosen at this point in time), the rollout of internet in this period was staggered. Consequently, we need to examine

[8] ADSL1 (R4) offered speeds up to 4Mbps; ADSL2 (R5) offered speeds between 4.6 and 9 Mbps; VDSL on the street cabinets offered speeds of 30-60 Mbps (within 700-1000m) and 70-100 Mbps (within 0-400m). Customers could be reached up to 3km from the LEs and 1.6km from the street cabinets (2.8km after 2016).

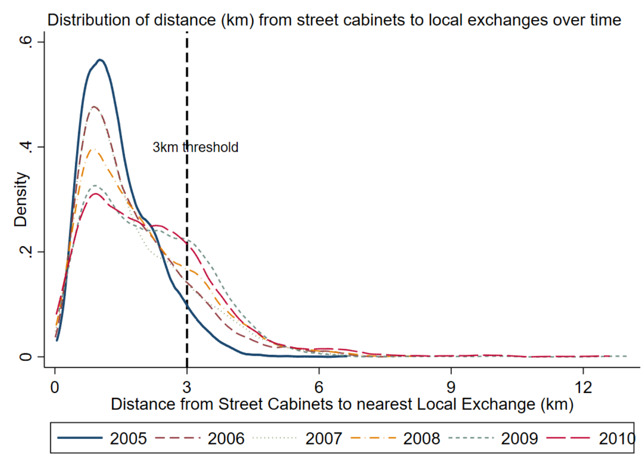
[9] See figure A.7.

whether the timing of the rollout is exogenous. To do this, we test whether distance from the LE is correlated with the timing of the rollout. This is essentially the identification strategy that earlier papers used when exploiting the location of UGS and arguing that given the cost of fiber, the municipalities that were located closer to the UGS were more likely to have internet earlier (Campante et al., 2017; Falck et al., 2014). Figure 7a shows that distance from the LE is indeed correlated with the timing of the street cabinets' rollout, allaying concerns about demand-driven staggered treatment.

Figure 7: Street cabinets rollout 2005-2010



(a) Minimum average distance



(b) Distribution of distance

Notes: This figure shows the rollout pattern of street cabinets from 2005-2010. Panel (a) displays the minimum average distance between street cabinets and local exchanges by year, with regression coefficients and 95% confidence intervals from regressions of distance on year fixed effects. Panel (b) shows the distribution of distances from street cabinets to the nearest local exchange across years, with kernel density plots for each year from 2005-2010. The vertical dashed line at 3km marks the threshold used in the analysis.

We only observe the distance from the statistical sector of the individuals in our sample to the LEs, so if the street cabinets are located very far from the LE, the 3km threshold that we set would become useless after the rollout of street cabinets in 2005. In other words, if street cabinets were located more than 3km away from the individuals, some individuals in our control group would become treated in 2005. Figure 7b shows that almost all the 20,000 street cabinets were located within 3km from the LEs. Consequently, our treatment and control groups do not change. Within the treatment group, we may have more compliers after 2005 given that within the LE catchment area, more people can have access to internet. This is especially relevant in high population density areas.

3.2 Municipality-level analysis

The individual-level analysis allows us to follow individuals over time and to estimate the average ITT effect of residential internet access on mental health-related disability insurance claims at a very granular level. These data also allows us to match individuals on pre-treatment characteristics to obtain a comparison group that provides the appropriate counterfactual disability insurance trends for the treated individuals in our design.

However, the employer-employee data does not have any other health-related outcomes that may complement our analysis and shed light on potential mechanisms. Thus, we also gathered information available at municipality level. In this section, we describe these additional data sources and the empirical strategy we use.

The ideal experiment in this case would be to randomize broadband adoption at municipality level. This would break any correlation between availability rates and unobserved determinants of mental health. Since randomization is not feasible, we use exogenous variation in the installation of technology in the local exchanges. While the decision to increase the number of people served by each local exchange may be demand-driven, access to internet is determined by the location of the LEs in the first place which preceded the broadband internet rollout. The red line in figure 2 shows that the number of households that could be served by ADSL increased when new racks with ADSL2+ technology were installed. We aggregate the number of households possibly served by each LE at municipality level, and divide this number by the total number of households in a municipality-year—$Availability_{mt}$.

To estimate the intention-to-treat effects of the increased availability of broadband internet, we specify the following regression:

$$y_{mt} = \alpha + \beta(Availability_{mt} \times Post_t) + \phi_t + \lambda_m + \epsilon_{mt} \tag{2}$$

where y_{mt} is the availability rate of broadband internet in municipality m in period t. The indicator $Post_t$ takes value one from 2001 and the variable $Availability_{mt}$ denotes the internet availability rate at municipality level. We include municipality fixed effects, λ_m and year fixed effects, ϕ_t to account for time-invariant unobservable determinants of mental health at the municipality level and common time shocks, respectively. We cluster standard errors at municipality level.

3.2.1 Data at municipality level

We obtained data on antidepressant consumption rates among insured individuals from one large Belgian health insurer, *Mutualité Libres*, for years 2000 and 2005[10]. We have

[10]We thank Mutualité Libres for providing this data.

information disaggregated by gender and age group, allowing us to examine heterogeneous effects across demographic categories. This dataset provides an alternative measure of mental health treatment that complements our disability insurance analysis.

To explore potential mechanisms related to time use patterns, we use data from the Belgian Time Use Survey conducted by Statbel (the Belgian Statistics Office) in 1999 and 2005. This survey provides detailed information on how individuals allocate time across various activities, including leisure, sleep, and technology use. While the survey samples are small and the data is limited in temporal coverage, it offers valuable insights into behavioral changes that may mediate the relationship between internet access and mental health outcomes.

Having described our data sources and empirical strategy, we now turn to the empirical results. Our analysis proceeds in several stages to establish the causal relationship between internet access and mental health outcomes, assess their broader economic implications, and explore the underlying mechanisms.

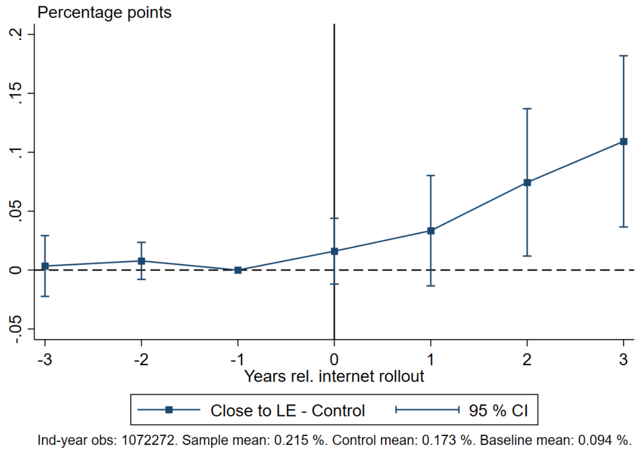
4 The Effect of Broadband Internet on Mental Health and Disability

This section presents our main empirical findings on the relationship between residential internet access and worker mental health. We show that internet access significantly increases mental health-related disability insurance claims while having no effect on disability claims for other medical conditions. We explore how these effects vary across demographic groups, evolve over time, and translate into broader labor market consequences. We complement our disability insurance findings using municipality-level antidepressant consumption data and provide suggestive evidence that work-related internet use may be an important mechanism linking residential access to mental health deterioration. Finally, we examine municipality-level time use patterns to explore potential broader behavioral changes.

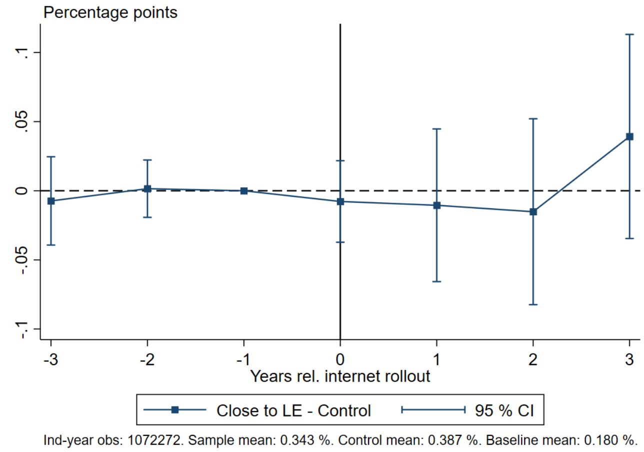
4.1 The effect of internet on work disability (1998-2004)

Figure 8 shows the change in long-term disability rates for individuals with residential internet access with respect to the reference year (2000), relative to the evolution of long-term disability rates among individuals without access to residential internet. Two patterns emerge clearly. First, residential internet access increases disability claims, but this effect is entirely driven by mental health conditions. Second, the effects emerge gradually, becoming statistically significant about two years after internet deployment, consistent with mental health deterioration accumulating over time rather than occurring immediately.

Figure 8: Effects of internet on disability insurance claims 1998-2004



(a) Mental health



(b) Other causes

Notes: This figure displays the coefficients δ_t from equation 1, showing the dynamic effects of living within 3km of a local exchange on disability insurance claims relative to the baseline year (t=-1) for the period 1998-2004. Panel (a) shows effects on mental health-related disability claims, while panel (b) shows effects on disability claims for other medical conditions. The x-axis represents years relative to internet rollout. Points represent coefficient estimates with 95% confidence intervals. The vertical line at year 0 marks the start of internet deployment (year 2001). Sample statistics are provided below each panel.

Specifically, Figure 8a shows that residential access to internet is associated with an increase in long-term disability due to mental health conditions. In contrast, Figure 8b shows that there is no statistically significant effect of internet access on disability insurance claims due to other diagnoses. We do not observe an immediate increase in the DI rate, which is consistent with the idea that access to internet at home might take years to have effects on health. We find a statistically significant increase in DI rates due to mental health conditions starting among treated individuals about two years after internet is deployed. Importantly, the data support our identification strategy: before internet rollout, people living close to and far from local exchanges show similar disability insurance claim rates, indicating no pre-existing differences that could confound our results.

The event-study plots show a year-by-year dynamic, with each coefficient representing the δ_t coefficients from equation 1. When averaged over 2001-2004, the results indicate that the likelihood of claiming disability due to mental health conditions increased by 0.04 percentage points (p-value= 0.009). This represents a 40 percent increase with respect to the baseline mean ($t = -1$) of 0.09. By comparison, the 4-year average change in disability insurance claims due to other conditions is 0.001 percentage points and is not statistically significant (p-value=0.949).

Table 2: The effect of internet availability on mental health-related DI

Dependent variable: Mental health-related DI (×100)	(1)	(2)
$Close2LE_{ia} \times Post_t$	0.054**	
	(0.023)	
$Distance2LE_{ia1} \times Post_t$		0.117***
		(0.038)
$Distance2LE_{ia2} \times Post_t$		0.058**
		(0.028)
$Distance2LE_{ia3} \times Post_t$		0.002
		(0.031)
$Distance2LE_{ia4} \times Post_t$		0.033
		(0.034)
Sample mean	0.215	0.215
Control mean	0.173	0.170
Baseline mean	0.094	0.094
Observations	1072272	1072272

Notes: This table presents static difference-in-differences estimates of the effect of internet access on the probability of receiving disability insurance due to a mental health diagnosis from 1998-2004. The dependent variable is multiplied by 100 to interpret the coefficient as the percentage point change. Column (1) uses a binary treatment indicator where $Close2LE_{ia}$ equals 1 if the local exchange is within 3km of the statistical sector where individual i lives. Column (2) uses distance-based treatment categories, with separate interaction terms for different distance intervals: 0-1km, 1-2km, 2-3km, 3-4km—$\sum_{d=1}^{4} \delta_d (Distance2LE_{iad} \times Post_t)$. The omitted category in column (2) is $Distance2LE_{ia5}$ =4+km; all coefficients are relative to this reference group. $Post_t$ equals 1 from 2001 onward. All regressions include year fixed effects, area fixed effects, individual-level controls, and job-specific time trends. Standard errors are clustered at the area level and reported in parentheses.

The static difference-in-differences estimates presented in Table 2 reveal a significant positive relationship between internet access and mental health-related disability insurance claims and show a clear distance gradient in treatment effects. Column (1) shows that individuals living within 3km of a local exchange experience a 0.054 percentage point increase in the probability of receiving disability insurance for mental health diagnoses following internet rollout. Given the control mean of 0.173, this translates to approximately a 31% increase relative to the control group.

Column (2) further shows that this effect exhibits a clear distance gradient, with the strongest impact occurring in areas closest to local exchanges. Individuals living within 1km of an exchange show a 0.117 percentage point increase, while those within 2km experience a 0.058 percentage point increase. The treatment effects become statistically insignificant and economically smaller for areas 3-4km from exchanges, with coefficients of 0.002 and 0.033 percentage points respectively. This pattern aligns with the expected deterioration in internet signal strength and connection speed as distance from telecommunications infrastructure increases, supporting a causal interpretation of our findings.[11]

4.1.1 Heterogeneous effects by gender and age

To understand which demographic groups are most affected by internet access, we examine heterogeneous treatment effects by gender and age. Table 3 presents the results for our main sample period (1998-2004), showing that internet access affects mental health disability claims differently across demographic groups.

Table 3: The effect of internet availability mental health-related DI 1998-2004

	Dependent variable: Mental health-related DI (×100)							
	By gender		By age		By age and gender			
	(1) Men	(2) Women	(3) Age26-34	(4) Age35-44	(5) Men26-34	(6) Men35-44	(7) Women26-34	(8) Women35-44
$Close2LE_{ia} \times Post_t$	0.032	0.076**	0.052**	0.057*	0.001	0.060*	0.097**	0.057
	(0.022)	(0.037)	(0.024)	(0.034)	(0.023)	(0.032)	(0.040)	(0.059)
Sample mean	0.131	0.302	0.148	0.284	0.098	0.161	0.194	0.424
Control mean	0.106	0.240	0.109	0.234	0.079	0.130	0.136	0.355
Baseline mean	0.063	0.127	0.054	0.136	0.035	0.089	0.072	0.191
Observations	542312	529960	541812	530460	259931	282381	281881	248079

Notes: This table presents static difference-in-differences estimates of the effect of internet access on the probability of receiving disability insurance due to a mental health diagnosis from 1998-2004. The dependent variable is multiplied by 100 to interpret the coefficient as the percentage point change. The treatment variable is a binary indicator where $Close2LE_{ia}$ equals 1 if the local exchange is within 3km of the statistical sector where individual i lives. $Post_t$ equals 1 from 2001 onward. Heterogeneous results by gender (columns 1-2), by age groups (columns 3-4), and by both age and gender (columns 5-8). All regressions include year fixed effects, area fixed effects, individual-level controls, and job-specific time trends. Standard errors are clustered at the area level and reported in parentheses.

Gender differences reveal distinct patterns of vulnerability. Women show a statistically significant response to internet access, experiencing a 0.076 percentage point increase in mental health disability claims (column 2), representing a 32% increase relative to their control mean. Men show a smaller, non-significant effect of 0.032 percentage points (column 1). The absolute magnitude is nearly twice as large for women, suggesting greater susceptibility to the mental health consequences of residential internet access.

[11] With area and time fixed effects and no constant term, the omitted category (Distance>4km) serves as the reference group with an effect normalized to zero, and all other distance coefficients represent the differential treatment effect relative to areas more than 4km from the local exchange.

Age patterns show that prime working-age adults are most vulnerable. Effects are concentrated among individuals aged 26-44 in 2000, with both age groups (26-34 in columns 3 and 35-44 in column 4) showing statistically significant increases. Workers aged 26-34 experience a 0.052 percentage point increase (48% relative to control mean), while those aged 35-44 show a 0.057 percentage point increase (24% relative to control mean). This concentration among prime working-age adults is consistent with internet access affecting work-related mental health.

The intersection of gender and age reveals important nuances. Women aged 26-34 show the largest response, with a 0.097 percentage point increase representing a 71% increase relative to control mean (column 7). For men, effects are concentrated in the 35-44 age group (0.060 percentage points, column 6), while younger men show essentially no effect. This suggests the mechanisms linking internet access to mental health may operate differently across gender and age groups.

These results establish that residential internet access causally increases mental health-related disability claims, with effects that are both statistically significant and economically meaningful. To build on these findings and explore their broader implications, we now turn to complementary evidence from multiple sources. We first examine municipality-level data on antidepressant consumption to support our mental health findings using an alternative outcome measure. We then investigate whether these mental health effects translate into broader labor market consequences and assess the persistence of effects over a longer time horizon. Finally, we explore potential mechanisms that could explain the link between internet access and mental health deterioration, including work-related internet use and changes in time allocation patterns.

4.2 The effect of internet on antidepressant consumption

Table 4 shows that increased availability of broadband internet is associated with increased consumption of antidepressants at the municipality level. For instance, the estimates in Panel A Column 1 imply that a 10 percentage point increase in broadband availability in a municipality is associated with a 0.15 percentage point increase in the antidepressant consumption rate, or 1.5 additional antidepressant users per 1,000 insured people. The table also shows the coefficients rescaled by the interquartile range of availability; moving a municipality from the 25th to the 75th percentile (i.e., a 37 percentage point increase) of internet availability is associated with 6 additional users per 1,000 insured. At the baseline rate of 9 consumers per 1,000 insured people, this represents about a 66 percent relative increase.

Table 4: The effect of internet availability on the antidepressant consumption rate (2000-2005)

Dependent variable: Antidepressant consumption rate (municipality level)				
	(1) All	(2) Ages 25-35	(3) Ages 36-44	(4) Ages 45-55
PANEL A: ALL				
Internet availability	0.015**	0.013***	0.015*	0.013
	(0.007)	(0.005)	(0.008)	(0.009)
Rescaled 25th-75th pctile	0.006**	0.005***	0.006*	0.005
	(0.002)	(0.002)	(0.003)	(0.003)
Average change 2000-2005	0.062	0.040	0.063	0.083
Baseline rate	0.009	0.006	0.009	0.012
PANEL B: MEN				
Internet availability	0.008	0.005	0.002	0.014*
	(0.005)	(0.004)	(0.007)	(0.008)
Rescaled 25th-75th pctile	0.003	0.002	0.001	0.005*
	(0.002)	(0.002)	(0.003)	(0.003)
Average change 2000-2005	0.045	0.030	0.044	0.061
Baseline rate	0.008	0.005	0.007	0.010
PANEL C: WOMEN				
Internet availability	0.021**	0.019***	0.025**	0.013
	(0.008)	(0.007)	(0.010)	(0.011)
Rescaled 25th-75th pctile	0.008**	0.007***	0.009**	0.005
	(0.003)	(0.003)	(0.004)	(0.004)
Average change 2000-2005	0.078	0.049	0.082	0.105
Baseline rate	0.010	0.007	0.010	0.014
Observations	1178	1178	1178	1178

Notes: This tables shows the estimates of the effect of internet availability rate (i.e., the share of households with potential access to internet in a municipality) on the antidepressant consumption rate among insured individuals by one large Belgian health insurer, *Mutualité Libres*. Internet data was provided by the internet provider Proximus. The number of households per municipality and year is from StatBel. Data is at municipality level (N=589) and available for 2000 and 2005. Regressions include municipality fixed effects and are weighted by the number of insured in individuals in each municipality. Standard errors are clustered at municipality level.

The heterogeneous effects across demographic groups reveal important patterns in how internet availability relates to mental health medication utilization. Panel C shows that the average increase in antidepressant consumption at the municipality level is driven by working-age women. For women aged 25-44 (columns 2 and 3), the results indicate that a municipality at the 75th percentile of internet availability has approximately 7-9 additional antidepressant users per 1,000 insured compared to one at the 25th percentile. For men in the same age group, the economic magnitude of the coefficients is smaller (1-2 additional users) and imprecisely estimated. For adults aged 45-55, the coefficient magnitude implies 5 additional users, which is marginally statistically significant only for men.

The evidence from both individual-level disability insurance claims and municipality-level antidepressant consumption consistently demonstrates that residential internet access adversely affects mental health for working-age adults. Given that mental health conditions can significantly impact work capacity and productivity, a natural question arises: do these mental health effects translate into broader labor market consequences? In the following section, we examine whether internet access affects employment, unemployment, and labor force participation, providing insight into the economic implications of the mental health deterioration we have documented.

4.3 The effect of internet on labor market outcomes

Table 5 examines individual-level labor market outcomes to understand whether internet access affects work capacity beyond the mental health channels we have documented. The results reveal significant negative impacts on employment and labor force participation at the individual level, though the economic magnitude of these labor market effects is modest compared to the control mean given the high labor market attachment that individuals in our sample have to begin with, which makes sense since our data comes from social security contributions.

Internet access reduces individual employment and labor force participation while increasing unemployment. Individuals living within 3km of a local exchange experience a 0.047 percentage point decrease in labor force participation (column 1), a 0.587 percentage point decline in employment (column 3), and a 0.649 percentage point increase in unemployment (column 5). The distance gradient reveals stronger effects closer to local exchanges. The most pronounced impacts occur within 1km of exchanges, where employment falls by 0.731 percentage points and unemployment rises by 0.754 percentage points (columns 4 and 6). Labor force participation drops by 0.113 percentage points for this closest group (column 2). Effects generally diminish with distance, becoming statistically insignificant for areas 3-4km from exchanges, consistent with the deterioration of internet signal quality over distance.

The effect on unemployment and overall disability is larger than the employment and labor force participation effects. Internet access increases overall disability claims at the individual level, with results showing a 0.056 percentage point increase in disability insurance claims (column 7) and the strongest effect of 0.139 percentage points for individuals within 1km of exchanges (column 8). The fact that individuals may be on disability while maintaining employment—thus having multiple labor market statuses—helps explain why we don't see a complete drop from the labor force.[12] This is consistent with our earlier findings on mental health-specific disability claims and suggests that internet access affects individual work capacity through health channels.

Table 5: The effect of internet availability on labor market outcomes 1998-2004

Dep. var. (×100)	Labor force participation		Employed		Unemployed		Disability	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Close2LE_{ia} \times Post_t$	-0.047*		-0.587***		0.649***		0.056*	
	(0.025)		(0.119)		(0.202)		(0.032)	
$Distance2LE_{ia1} \times Post_t$		-0.113***		-0.731***		0.754***		0.139***
		(0.037)		(0.172)		(0.276)		(0.046)
$Distance2LE_{ia2} \times Post_t$		-0.032		-0.704***		0.680**		0.042
		(0.029)		(0.181)		(0.289)		(0.039)
$Distance2LE_{ia3} \times Post_t$		-0.009		-0.261*		0.605**		0.030
		(0.040)		(0.138)		(0.279)		(0.050)
$Distance2LE_{ia4} \times Post_t$		-0.012		-0.010		0.156		0.057
		(0.039)		(0.160)		(0.329)		(0.061)
Sample mean	99.770	99.770	95.321	95.321	11.741	11.741	0.558	0.558
Control mean	99.794	99.794	96.123	96.149	10.881	10.893	0.560	0.558
Baseline mean	99.890	99.890	96.189	96.189	10.378	10.378	0.274	0.274
Observations	1072272	1072272	1072272	1072272	1072272	1072272	1072272	1072272

Notes: This table presents static difference-in-differences estimates of the effect of internet access on the probability of labor force participation (1-2), employment (3-4), unemployment (5-6) and overall disability (7-8) over 1998-2004. The dependent variable is multiplied by 100 to interpret the coefficient as the percentage point change. Odd columns use a binary treatment indicator where $Close2LE_{ia}$ equals 1 if the local exchange is within 3km of the statistical sector where individual i lives. Even columns use distance-based treatment categories, with separate interaction terms for different distance intervals: 0-1km, 1-2km, 2-3km, 3-4km—$\sum_{d=1}^{4} \delta_d (Distance2LE_{iad} \times Post_t)$. The omitted category in column (2) is $Distance2LE_{ia5}$ =4+km; all coefficients are relative to this reference group. $Post_t$ equals 1 from 2001 onward. All regressions include year fixed effects, area fixed effects, individual-level controls, and job-specific time trends. Standard errors are clustered at the area level and reported in parentheses. Individuals may have multiple labor market status in a given year.

The labor market effects documented above demonstrate that internet access has significant economic consequences beyond its impact on mental health, affecting individual work capacity—findings that align with the descriptive evidence shown in Section 2 (e.g., figure 5). These results raise important questions about the persistence of internet's effects over time. Our main analysis focused on the 1998-2004 period to isolate the effects of internet access before the introduction of social media and to exploit the cleanest identification strategy.

[12] Bloom et al. (2024) show that work-from-home opportunities increased the labor supply of workers with a physical disability, possibly due to reduced commuting costs and better control of working conditions.

However, understanding whether these effects persist, evolve, or dissipate over a longer time horizon is crucial for assessing the full scope of internet's impact on worker well-being and for informing policy decisions about digital infrastructure investments.

4.4 The effect of internet on work disability (1998-2010)

To assess the persistence and evolution of internet's effects on mental health over a longer time horizon, we extend our analysis to cover the period 1998-2010. Table 6 presents the static difference-in-differences estimates for the extended period. Column (1) shows that individuals living within 3km of a local exchange experience a 0.136 percentage point increase in mental health disability claims over 1998-2010, representing a 34% increase relative to the control mean. This effect is more than twice as large as the 0.054 percentage point effect observed over the shorter 1998-2004 period, suggesting that the mental health consequences of internet access accumulate over time.

Table 6: The effect of internet availability on mental health-related DI 1998-2010

Dependent variable: Mental health-related DI (×100)	(1)	(2)
$Close2LE_{ia} \times Post_t$	0.136***	
	(0.035)	
$Distance2LE_{ia1} \times Post_t$		0.252***
		(0.071)
$Distance2LE_{ia2} \times Post_t$		0.122***
		(0.031)
$Distance2LE_{ia3} \times Post_t$		0.080
		(0.051)
$Distance2LE_{ia4} \times Post_t$		0.065
		(0.047)
Sample mean	0.481	0.481
Control mean	0.401	0.394
Baseline mean	0.094	0.094
Observations	1987126	1987126

Notes: This table presents static difference-in-differences estimates of the effect of internet access on the probability of receiving disability insurance due to a mental health diagnosis from 1998-2010. The dependent variable is multiplied by 100 to interpret the coefficient as the percentage point change. Column (1) uses a binary treatment indicator where $Close2LE_{ia}$ equals 1 if the local exchange is within 3km of the statistical sector where individual i lives. Column (2) uses distance-based treatment categories, with separate interaction terms for different distance intervals: 0-1km, 1-2km, 2-3km, 3-4km—$\sum_{d=1}^{4} \delta_d (Distance2LE_{iad} \times Post_t)$. The omitted category in column (2) is $Distance2LE_{ia5}$ =4+km; all coefficients are relative to this reference group. $Post_t$ equals 1 from 2001 onward. All regressions include year fixed effects, area fixed effects, individual-level controls, and job-specific time trends. Standard errors are clustered at the area level and reported in parentheses.

The distance gradient pattern documented in our main analysis remains robust over the extended period. Column (2) shows the strongest effects within 1km of exchanges (0.252 percentage points), with effects declining but remaining significant for areas within 2km (0.122 percentage points). The pattern of diminishing effects with distance continues to support a causal interpretation of our findings.

These long-run results demonstrate that the mental health effects of internet access are not merely temporary adjustment costs but represent persistent changes in worker well-being that grow more pronounced over time. This persistence has important implications for understanding the full social costs of digital infrastructure expansion and highlights the need for policies that address the mental health consequences of technological change.

The evidence presented across multiple outcomes, time periods, and levels of analysis consistently demonstrates that residential internet access has significant adverse effects on mental health, with consequences that persist and intensify over time. Having established the robustness and magnitude of these effects, we now turn to understanding the underlying mechanisms that could explain why internet access leads to increased mental health problems and disability claims. While our data cannot definitively isolate a single causal pathway, we can examine several potential channels through which internet access might affect mental health, including work-related internet use, changes in time allocation patterns, and other behavioral mechanisms suggested by theory and prior research.

4.5 Potential mechanisms

Understanding the mechanisms through which internet access affects mental health is crucial for interpreting our findings and informing policy responses. Several potential channels could explain the observed effects. First, internet access might simply make it easier to file online applications for disability insurance. However, we observe increases only in mental health-related claims, not in claims for other medical conditions, suggesting that administrative convenience cannot solely explain our results.[13] Second, a growing body of research documents negative effects of social media on mental health, particularly among young people (McDool et al., 2020; Braghieri et al., 2021; Arenas-Arroyo et al., 2025). While our study focuses on working-age adults who may respond differently to social media exposure, we demonstrate that our results hold when restricting the analysis to 1998-2004, a period that largely predates widespread social media adoption.

[13] We do not have data to test this channel directly. Statbel, the Belgian National Statistics Institute, conducted the first ICT Household Survey in 2006, which is after our main period of analysis. The survey shows that less than 25% of individuals 16-74 who had accessed the internet within the three previous months used government services (OECD, 2008). Table B.1 summarizes other descriptive statistics available from that survey.

Third, residential internet access can fundamentally alter time use patterns—affecting sleep, social interactions, and leisure activities—as well as change information access and consumption patterns (Billari et al., 2018; Golin, 2022; Amaral-Garcia et al., 2021; Van Parys and Brown, 2024). Fourth, internet access may facilitate work-related activities at home, potentially disrupting work-life balance and contributing to chronic stress. In the following subsections, we examine evidence for the work-related channel and explore descriptive patterns in time use, while acknowledging that multiple mechanisms likely operate simultaneously.

4.5.1 Work-related internet use

One potential mechanism linking residential internet access to mental health deterioration is work-related internet use at home.[14] The expansion of high-speed internet may have enabled or intensified after-hours work activities, disrupting work-life balance and contributing to chronic stress and burnout. To explore this channel, we examine whether the mental health effects vary systematically across industries and occupations based on their propensity for work-related technology use.

We classify workers into categories based on two dimensions that proxy for work-related internet use potential, based on their job at baseline. First, we use Eurostat indicators to distinguish between high knowledge-intensive services (High-KIS) and less knowledge-intensive sectors (Less-KIS), based on NACE Rev. 2 2-digit classifications (see table B.2). Second, we employ the work-from-home classification developed by Dingel and Neiman (2020) to categorize jobs by their potential for remote work, under the assumption that occupations more amenable to remote work in recent times were also early adopters of work-related ICT use at home.

Table 7 presents the results of this analysis. The evidence provides suggestive support for a work-related channel. Column (1) shows that workers in high knowledge-intensive sectors experience a statistically significant 0.071 percentage point increase in mental health disability claims, representing a 46% increase relative to their control mean. In contrast, workers in less knowledge-intensive sectors show a smaller, statistically insignificant effect of 0.024 percentage points (column 2).

The work-from-home (WFH) analysis yields similar patterns. Workers in jobs with high WFH potential experience a 0.043 percentage point increase in mental health disability claims (column 3), representing a 40% increase relative to their control mean. Workers in jobs with low work-from-home potential show a smaller, statistically insignificant effect of 0.022 percentage points (column 4).

[14] Figure A.8 shows the evolution of telework in Belgium over time.

Table 7: The effect of internet on mental health-related DI by type of job 1998-2004

Dependent variable: Mental health-related DI (×100)				
	(1) High KIS	(2) Less KIS	(3) High WFH	(4) Low WFH
$Close2LE_{ia} \times Post_t$	0.071**	0.024	0.043*	0.022
	(0.030)	(0.028)	(0.023)	(0.026)
Sample mean	0.194	0.155	0.131	0.148
Control mean	0.156	0.134	0.108	0.127
Baseline mean	0.055	0.057	0.042	0.056
Observations	463991	373255	472086	534273

Notes: This table presents static difference-in-differences estimates of the effect of internet access on the probability of receiving disability insurance due to a mental health diagnosis from 1998-2004. The dependent variable is multiplied by 100 to interpret the coefficient as the percentage point change. The treatment variable is a binary indicator where $Close2LE_{ia}$ equals 1 if the local exchange is within 3km of the statistical sector where individual i lives. $Post_t$ equals 1 from 2001 onward. Column (1) shows results for high knowledge-intensive sectors, column (2) for less knowledge-intensive sectors, column (3) for jobs with a high share of work-from-home (WFH) potential, and column (4) for jobs with a low share of WFH potential. All regressions include year fixed effects, area fixed effects, individual-level controls, and job-specific time trends. Standard errors are clustered at the area level and reported in parentheses.

These patterns suggest that the mental health consequences of internet access are concentrated among workers whose jobs are more likely to involve knowledge work and technology use, consistent with internet access facilitating work-related activities at home.[15] However, we acknowledge that this evidence is suggestive rather than definitive, as we cannot directly observe work-related internet use or hours worked at home. The heterogeneity patterns could also reflect other factors correlated with industry and occupation type.

To provide an additional test of the work-related channel, we examine whether internet access affects mental health among individuals who were unemployed at baseline, as these individuals would not experience work spillover effects from residential internet access. Table 8 examines whether the relationship between internet access and mental health-related disability insurance claims operates through work-related channels by restricting the analysis to individuals who were unemployed at baseline. Columns 1-2 show estimates for individuals with an unemployment spell during year 2000, allowing for another social-security status (e.g., employment or disability) in the year; columns 3-4 show estimation results for the

[15] Table B.3 shows similar results for combinations of these subsamples. Internet access significantly increases mental health-related disability insurance claims by 0.052 percentage points in high-KIS with high-WFH potential and by 0.061 percentage points in low-KIS with high-WFH potential. There are no statistically significant effects for sectors with low work-from-home potential, regardless of their knowledge intensity.

Table 8: The effect of internet on mental health-related DI for the unemployed at baseline 1998-2004

Dependent variable: Mental health-related DI ($\times$100)				
	(1)	(2)	(3)	(4)
$Close2LE_{ia} \times Post_t$	-0.011		0.121	
	(0.086)		(0.146)	
$Distance2LE_{ia1} \times Post_t$		0.166		0.119
		(0.156)		(0.181)
$Distance2LE_{ia2} \times Post_t$		-0.033		0.225
		(0.096)		(0.208)
$Distance2LE_{ia3} \times Post_t$		-0.040		0.097
		(0.109)		(0.204)
$Distance2LE_{ia4} \times Post_t$		0.196		0.171
		(0.144)		(0.296)
Sample mean	0.272	0.272	0.298	0.298
Control mean	0.269	0.249	0.301	0.263
Baseline mean	0.019	0.019	0.000	0.000
Observations	106380	106380	37596	37596

Notes: This table presents static difference-in-differences estimates of the effect of internet access on the probability of receiving disability insurance due to a mental health diagnosis from 1998-2004 for the subsample of individuals who were unemployed at baseline. The dependent variable is multiplied by 100 to interpret the coefficient as the percentage point change. Columns (1-3) use a binary treatment indicator where $Close2LE_{ia}$ equals 1 if the local exchange is within 3km of the statistical sector where individual i lives. Columns (2-4) use distance-based treatment categories, with separate interaction terms for different distance intervals: 0-1km, 1-2km, 2-3km, 3-4km—$\sum_{d=1}^{4} \delta_d(Distance2LE_{iad} \times Post_t)$. The omitted category in column (2) is $Distance2LE_{ia5}$ =4+km; all coefficients are relative to this reference group. $Post_t$ equals 1 from 2001 onward. Columns (1-2) show results for individuals with an unemployment spell during year 2000, allowing for another employment status in the year. Columns (3-4) show estimation results for the subset of individuals whose only labor market status during year 2000 was unemployed. All regressions include year fixed effects, area fixed effects, individual-level controls, and job-specific time trends. Standard errors are clustered at the area level and reported in parentheses.

subset of individuals whose only labor market status during the year 2000 was unemployed. The results show no statistically significant effects of internet access on mental health claims among the unemployed across all specifications. These null results among the unemployed, contrasted with the significant positive effects found in the full sample, provide some support for a work-related mechanism underlying the internet-mental health relationship. However, the interpretation should be cautious given the relatively large standard errors in this subsample.

While the industry and occupation-based analysis provides suggestive evidence for work-related mechanisms, internet access likely affects mental health through multiple pathways beyond just work spillover effects. Internet access fundamentally changes how individuals allocate their time across various activities, potentially affecting sleep patterns, social interactions, leisure activities, and other behaviors that influence mental well-being. To explore these broader behavioral changes, we turn to descriptive evidence from the Belgian Time Use Survey, which allows us to examine how time allocation patterns evolved during the period of internet expansion.

4.5.2 Behavioral changes in time allocation

We use data from the Belgian Time Use Survey (BTUS) waves 1999 and 2005 to investigate whether internet availability is associated with changes in the allocation of time across activities. This analysis complements our previous findings on work-related mechanisms by examining suggestive behavioral evidence of how internet access affects the balance between sleep, leisure, housework, work, commuting, time spent alone, and time spent with others. Our approach builds on prior evidence showing internet's impact on specific behaviors. Billari et al. (2018) find that high-speed internet access reduces sleep duration using German data, while Arenas-Arroyo et al. (2025) document reduced time allocated to sleep, homework and social interactions using Spanish data. Golin (2022) provide suggestive evidence that broadband internet negatively impacts women's socializing behavior, also using German data.

We draw on the BTUS, a repeated cross-sectional survey that covers 176 municipalities with about 3,000 working-age respondents in 1999 and 2,400 in 2005. Given that the survey is not representative at the municipality level, these results should be interpreted as suggestive evidence of the association between internet availability and time use patterns rather than causal estimates for the general population. Figure A.9 shows the geographic coverage of the BTUS.

Table 9 shows coefficient estimates of equation 2 to examine how internet availability in Belgian municipalities affected time allocation across seven key activities: sleep, leisure,

Table 9: The effect of internet availability on broad time use patterns (1999-2005)

Dep. Var.	Log(Hours Sleep)	Log(Hours Leisure)	Log(Hours Housework)	Log(Hours Work)	Log(Hours Commute)	Log(Hours Alone)	Log(Hours with People)
PANEL A: Week							
Internet availability	-0.037	-0.012	-0.103	0.282	0.043	0.025	-0.025
	(0.041)	(0.098)	(0.101)	(0.177)	(0.095)	(0.140)	(0.092)
Mean hrs 1999	7.831	3.247	2.571	4.963	1.626	6.415	7.928
Observations	5511	5511	5511	5511	5511	5332	5358
PANEL B: Weekend							
Internet availability	-0.039	-0.179*	0.115	0.262**	-0.033	0.093	-0.205**
	(0.044)	(0.094)	(0.112)	(0.131)	(0.107)	(0.136)	(0.099)
Mean hrs 1999	9.108	4.821	2.978	0.853	1.555	5.763	10.559
Observations	5511	5511	5511	5511	5511	5174	5330

Notes: This table shows the estimates of the effect of internet availability rate (i.e., the share of households with potential access to internet in a municipality) on the time allocation to activities using repeated cross-sectional data from the Belgian Time Use Survey waves 1999 and 2005 (Statbel). Internet data was provided by the internet provider Proximus. The number of households per municipality and year is from Statbel. In column 4 the mean hours of work in 1999 conditional on reporting any hours is 7.25 hours during the week and 1 hour during the weekend. Observation counts differ in columns 6 and 7 due to survey answers missing.Regressions include municipality fixed effects. Standard errors are clustered at the municipality level (N=176).

housework, work, commuting, time spent alone, and time spent with others between 1999 and 2005. These categories allow us to test whether internet access facilitates the work-life balance disruption suggested by our administrative data findings.

During weekdays, internet availability appears to have little statistically significant impact on most activities. There is a positive coefficient for work hours (0.282) but it is not statistically significant, and small negative effects on sleep, leisure, and housework are also not significant. On weekends, the effects are more pronounced and align with our proposed mechanism of work-life balance disruption. Internet availability is associated with less leisure time (-0.179, statistically significant at the 10% level) and more work time (0.262, significant at the 5% level). Additionally, we find evidence of increased social isolation, with internet access significantly reducing time spent with others (-0.205, significant at 5%) during weekends. The effects on other activities are imprecisely estimated.

While our main analysis relies on high-quality individual longitudinal administrative data that enables clean causal identification of internet's effects on mental health-related disability insurance and labor market outcomes, the time use analysis faces important limitations. The Belgian Time Use Survey covers only 176 of Belgium's 589 municipalities and was not designed to be representative at the municipality level. This constrains our ability to draw broader population-level inferences from the time use patterns we observe. Nevertheless, these results provide valuable suggestive evidence of behavioral responses to internet access, offering direct insights into how internet availability affects the allocation of time across work, leisure, sleep, and social activities that complement our administrative data findings. To assess the consistency of our results within this limited geographic scope, we re-estimate our antidepressant consumption analysis (Table 4) using only the 176 municipalities covered by the TUS. Table B.4 shows that the patterns remain consistent with our main findings, with internet availability significantly increasing antidepressant consumption rates, particularly among women and younger adults. This provides reassurance that our core results hold even within the geographically restricted sample where time use data are available.

Overall, these results provide suggestive evidence that internet availability during its early adoption period was associated with meaningful shifts in time allocation patterns, particularly on weekends. The findings point to two key changes: a substitution from leisure time to work-related activities, and a shift toward more time spent alone during weekends. While the magnitudes of these effects are modest, they align with broader concerns about internet technology's potential to alter social interactions and work-life boundaries.

5 Conclusion

This paper provides causal evidence on the relationship between residential broadband internet access and workers' mental health using administrative data from Belgium during the initial rollout of broadband internet in the early 2000s. Our empirical strategy exploits the distance-sensitive nature of ADSL technology and the predetermined location of local exchanges to identify the effects of internet access on mental health outcomes. The findings reveal significant and persistent adverse effects of internet access on worker mental health.

Our main results show that residential internet access increases long-term disability insurance claims due to mental health conditions by 0.054 percentage points (31% relative to the control group) over 1998-2004, with no corresponding effects on disability claims for other medical conditions. These effects exhibit a clear distance gradient, with the strongest impacts occurring closest to local exchanges, supporting a causal interpretation. The mental health effects are supported by municipality-level evidence showing increased antidepressant consumption. Importantly, the effects are concentrated among women and prime working-age adults, suggesting particular vulnerability during peak career years. The labor market analysis reveals that mental health effects translate into meaningful economic consequences. At the individual level, internet access reduces employment and labor force participation while increasing unemployment and overall disability claims.

The extended analysis covering 1998-2010 reveals that these mental health consequences are not temporary adjustment costs but represent persistent changes in worker well-being that intensify over time. The effect more than doubles to 0.136 percentage points (34% relative to control) when examined over the longer period, indicating that the mental health costs of internet access accumulate rather than diminish with experience.

Our investigation of potential mechanisms provides suggestive evidence that work-related internet use may be one important pathway linking residential internet access to mental health deterioration. The effects are concentrated among workers in knowledge-intensive sectors and jobs with high work-from-home potential, consistent with internet access facilitating after-hours work activities that disrupt work-life balance. Additional analysis of time use patterns suggests that changes in time allocation and social interactions may also contribute to the observed mental health effects. Internet availability appears associated with increased work time, reduced leisure time, and more social isolation use on weekends—behavioral shifts that may represent additional pathways through which internet access affects mental health.

While our main findings provide robust causal identification, some limitations should be noted. Our identification strategy relies on distance to local exchanges as a source of exogenous variation, which provides intention-to-treat estimates rather than effects of actual internet use. While our mechanisms analysis provides suggestive evidence for work-related channels, we cannot definitively isolate specific causal pathways or quantify their relative importance. Additionally, our focus on the early period of internet expansion may not capture the full range of mechanisms relevant in today's digital environment, though it allows us to abstract from social media effects that have been studied elsewhere.

The policy implications of our findings are significant. Our results provide causal evidence relevant to ongoing debates about "right-to-disconnect" legislation, which aims to protect workers from constant connectivity outside work hours. Second, while broadband expansion generates substantial economic benefits, policymakers should account for the mental health consequences we document, particularly given their persistence and growth over time. Our findings contribute to broader discussions about technology and well-being by demonstrating that even beneficial technologies can have unintended health consequences that merit policy attention.

References

Ahlfeldt, G., Koutroumpis, P., and Valletti, T. (2017). Speed 2.0: Evaluating access to universal digital highways. *Journal of the European Economic Association*, 15(3):586–625.

Akerman, A., Gaarder, I., and Mogstad, M. (2015). The Skill Complementarity of Broadband Internet. *Quarterly Journal of Economics*, pages 1781–1824.

Amaral-Garcia, S., Nardotto, M., Propper, C., and Valletti, T. (2021). Mums Go Online: Is the Internet Changing the Demand for Healthcare? *The Review of Economics and Statistics*, pages 1–45.

Arenas-Arroyo, E., Fernandez-Kranz, D., and Nollenberger, N. (2025). High speed internet and the widening gender gap in adolescent mental health: Evidence from Spanish hospital records. *Journal of Health Economics*, 102(September 2024):103014.

Atasoy, H. (2013). The effects of broadband internet expansion on labor market outcomes. *Industrial and Labor Relations Review*, 66(2):315–345.

Autor, D. and Duggan, M. (2003). The Rise in the Disability Rolls and the Decline in Unemployment. *Quarterly Journal of Economics*, 118(1):157–206.

Autor, D. and Duggan, M. (2006). The growth in the social security disability rolls: A fiscal crisis unfolding. *Journal of Economic Perspectives*, 20(3):71–96.

Avdic, D., de New, S. C., and Kamhöfer, D. A. (2021). Economic downturns and mental health in Germany. *European Economic Review*, 140(December 2020):103915.

Bauernschuster, S., Falck, O., and Woessmann, L. (2014). Surfing alone? The internet and social capital: Evidence from an unforeseeable technological mistake. *Journal of Public Economics*, 117.

Belgian Official Gazette (1996). Act of 4 August 1996 on well-being of workers in the performance of their work. Technical Report September 1996.

Bellou, A. (2015). The Impact of Internet Difussion on Marriage Rates: Evidence from the Broadband Market. *Journal of Population Economics*, 28(2).

Bhuller, M., Havnes, T., Leuven, E., and Mogstad, M. (2013). Broadband internet: An information superhighway to sex crime? *Review of Economic Studies*, 80(4):1237–1266.

Bhuller, M., Kostol, A., and Vigtel, T. C. (2020). How Broadband Internet Affects Labor Market Matching. *SSRN Electronic Journal*, (1).

Biasi, B., Dahl, M., and Moser, P. (2020). Career effects of mental health.

Billari, Giuntella, and Stella (2019). Does broadband Internet affect fertility? *Population Studies*, 73(3).

Billari, F. C., Giuntella, O., and Stella, L. (2018). Broadband internet, digital temptations, and sleep. *Journal of Economic Behavior and Organization*, 153.

Bloom, N., Dahl, G., and Rooth, D. (2024). Working from home and disability employment. *NBER*.

Braghieri, L., Levy, R., and Makarin, A. (2021). Social Media and Mental Health.

Braghieri, L., Levy, R., and Makarin, A. (2022). Social Media and Mental Health. *American Economic Review*, 112(11):3660–3693.

Campante, F., Durante, R., and Sobbrio, F. (2017). Politics 2.0: The multifaceted effect of broadband internet on political participation. *Journal of the European Economic Association*, 16(4).

Canzian, G., Poy, S., and Schüller, S. (2019). Broadband upgrade and firm performance in rural areas: Quasi-experimental evidence. *Regional Science and Urban Economics*, 77:87–103.

Colantone, I., Crinò, R., and Ogliari, L. (2019). Globalization and mental distress. *Journal of International Economics*, 119:181–207.

Conseil Supérieur de la Santé (2017). Burnout et travail.

Dahl, M. S. and Pierce, L. (2019). Pay-for-Performance and Employee Mental Health: Large Sample Evidence Using Employee Prescription Drug Usage. 6(1):12–38.

De Brouwer, O. and Tojerow, I. (2023). The Growth of Disability Insurance in Belgium: Determinants and Policy Implications. *IZA DP 16376*.

Denzer, M., Schank, T., and Upward, R. (2018). Does the Internet Increase the Job Finding Rate? Evidence from a Period of Internet Expansion. Technical report.

Dettling, L. J. (2017). Broadband in the labor market: The impact of residential high-speed internet on married women's labor force participation. *Industrial and Labor Relations Review*, 70(2).

Dingel, J. I. and Neiman, B. (2020). How many jobs can be done at home? *Journal of Public Economics*, 189.

Donati, D., Durante, R., Sobbrio, F., and Zejcirovic, D. (2025). Lost in the net? Broadband internet and youth mental health. *Journal of Health Economics*, 103:103017.

Faber, B., Sanchis-Guarner, R., and Weinhardt, F. (2016). ICT and Education: Evidence from Student Home Addresses. *NBER WP No. 21306*.

Falck, O., Gold, R., and Heblich, S. (2014). E-lections: Voting Behavior and the Internet. *American Economic Review*, 104(7).

Fevang, E., Hardoy, I., and Røed, K. (2017). Temporary Disability and Economic Incentives. *Economic Journal*, 127(603):1410–1432.

Fontenay, S. and Tojerow, I. (2020). Work Disability after Motherhood and how Paternity Leave can help. *IZA DP No. 13756*.

Forman, C., Goldfarb, A., and Greenstein, S. (2012). The Internet and local wages: A puzzle. *American Economic Review*, 102(1):556–575.

Geraci, A., Nardotto, M., Reggiani, T., and Sabatini, F. (2022). Broadband Internet and Social Capital. *Journal of Public Economics*, 206:104578.

Golin, M. (2022). The Effect of Broadband Internet on the Gender Gap in Mental Health : Evidence from Germany.

Guldi, M. and Herbst, C. M. (2017). Offline Effects of Online Connecting: The Impact of Broadband Diffusion on Teen Fertility Decisions. *Journal of Population Economics*, 30(1):69–91.

INAMI (2023). Incapacités de travail en 2023: Combien d'invalidités en raison d'une dépression ou d'un burnout ? Quel coût pour l'assurance indemnités ? Technical report.

Johnson, K. and Persico, C. (2024). Broadband Internet Access, Economic Growth, and Wellbeing. *NBER Working Paper Series*.

Liebman, J. B. (2015). Understanding the Increase in Disability Insurance Benefit Receipt in the U.S. *Journal of Economic Perspectives*, 29(2):123–150.

Martellini, P. and Menzio, G. (2020). Declining Search Frictions, Unemployment and Growth. *Journal of Political Economy*.

McDool, E., Powell, P., Roberts, J., and Taylor, K. (2020). The internet and children's psychological wellbeing. *Journal of Health Economics*, 69.

Moscone, F., Tosetti, E., and Vittadini, G. (2016). The impact of precarious employment on mental health: The case of Italy. *Social Science and Medicine*, 158:86–95.

OECD (2008). *OECD e-Government studies: Belgium*, volume 13.

OECD (2013). Mental health and work challenges in Belgium.

OECD (2018). *Health at a Glance: Europe 2018*.

Ortiz-Espinosa, E. (2019). The rise of social media. *Published online at OurWorldinData.org. Retrieved from: 'https://ourworldindata.org/rise-of-social-media'*.

Ridley, M. W., Rao, G., Schilbach, F., and Patel, V. H. (2020). Poverty, Depression, and Anxiety: Causal Evidence and Mechanisms. *NBER Working Paper*, page No. 27157.

Shapiro, B. (2020). Promoting Wellness or Waste? Evidence from Antidepressant Advertising. *American Economic Journal: Microconomics*, pages 1–55.

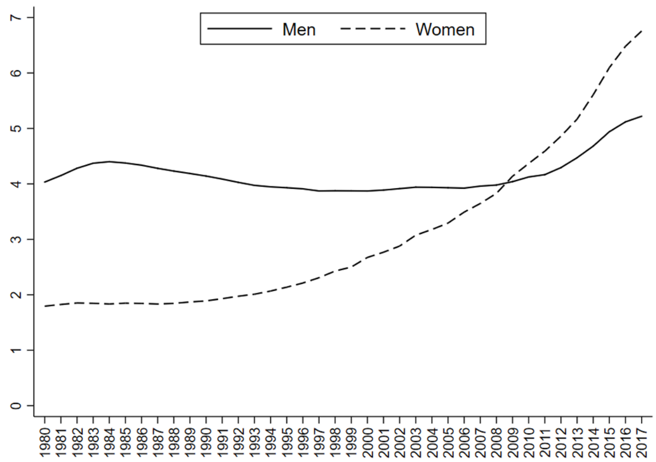
Van Parys, J. and Brown, Z. Y. (2024). Broadband Internet access and health outcomes: Patient and provider responses in Medicare. *International Journal of Industrial Organization*, 95(August 2023):103072.

Wee, M. V. D., Verbrugge, S., and Lemstra, W. (2012). Understanding the Dynamics of Broadband Markets. *European Regional International Telecommunication Society*.

A (Online) Appendix

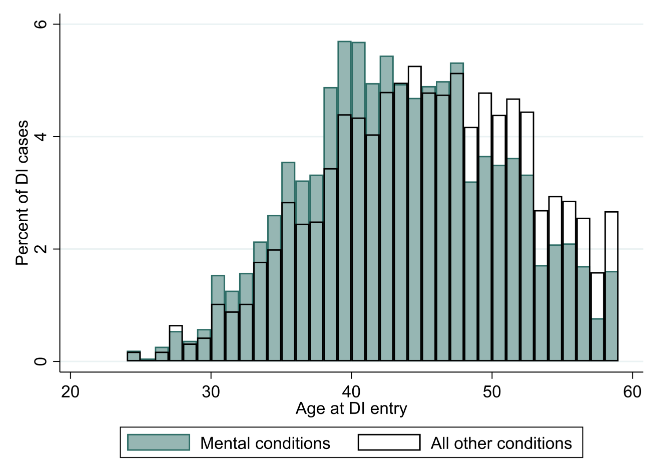
A.1 Additional figures

Figure A.1: Percent of working-age (20-64) population receiving (long-term) DI benefits



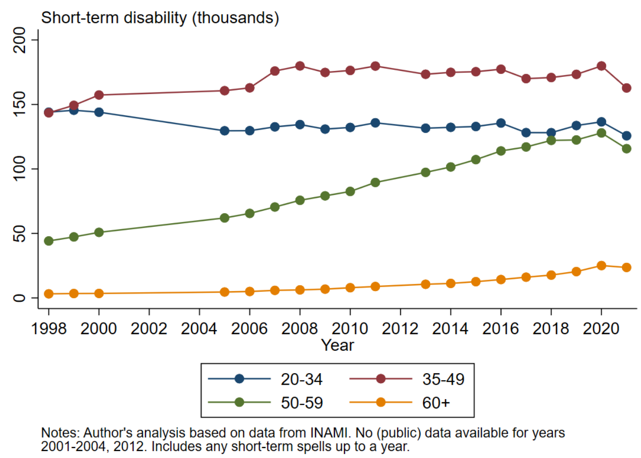
Notes: Fontenay and Tojerow (2020) based on data from INAMI (*Institut national d'assurance maladie-invalidité*).

Figure A.2: Disability insurance claims age profile



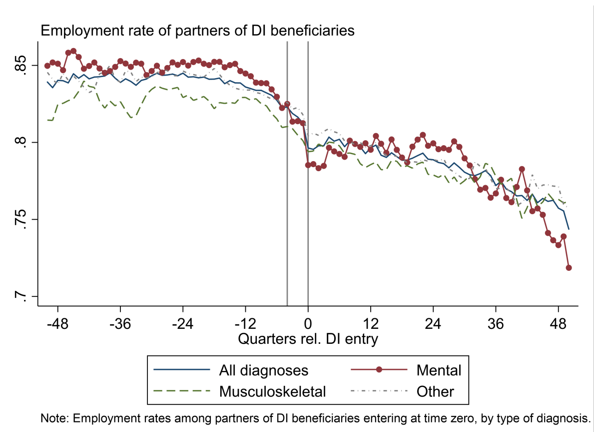
Source: Authors analysis based on data from CBSS.

Figure A.3: Short-term disability claims

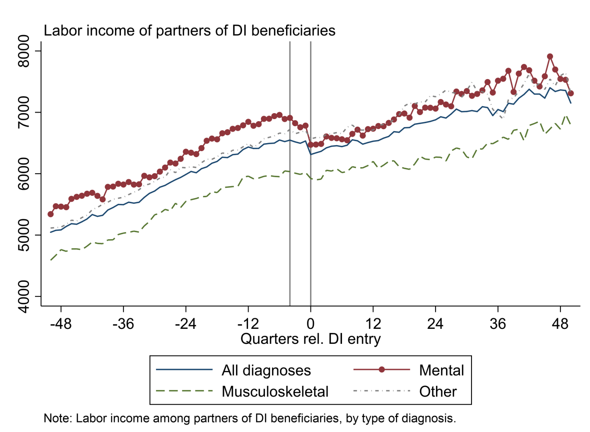


Source: Authors analysis based on data from INAMI's reports.

Figure A.4: Employment rates and Earnings of DI entrants' partners



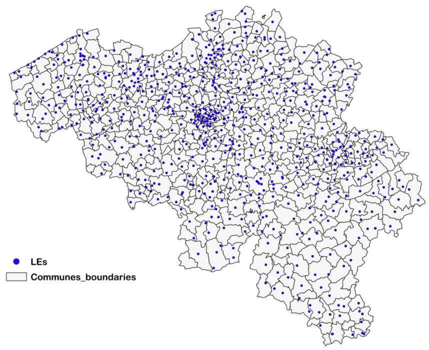
(a) Employment rates



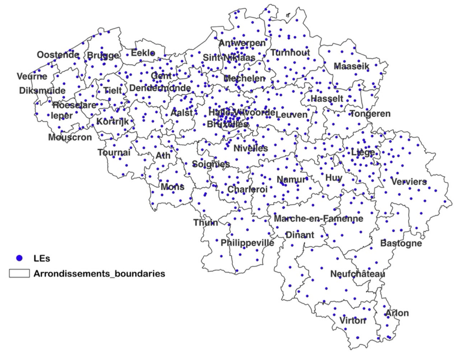
(b) Earnings

Notes: Notes: This figure shows employment rates (panel a) and earnings (panel b) around disability insurance entry (quarter 0) for DI entrants' partners, by diagnosis type. Lines show all diagnoses (solid), mental health (red dots), musculoskeletal (dashed), and other conditions (dotted).

Figure A.5: Geographic Location of the Local Exchanges (LEs)



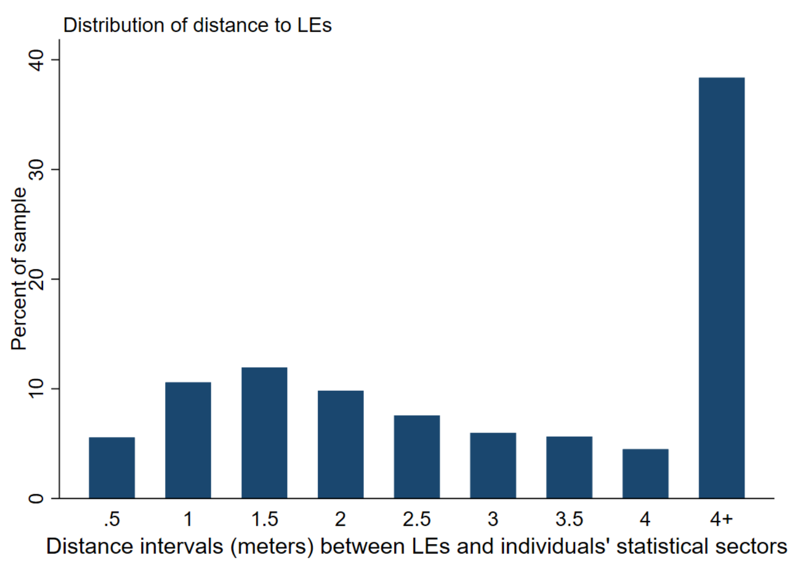
(a) Municipality boundaries



(b) District boundaries

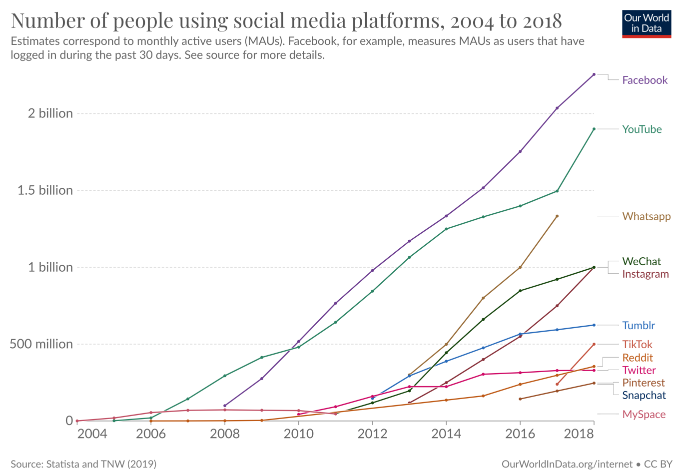
Notes: Authors own elaboration based on data from Proximus (ADSL internet provider).

Figure A.6: Distance intervals distribution



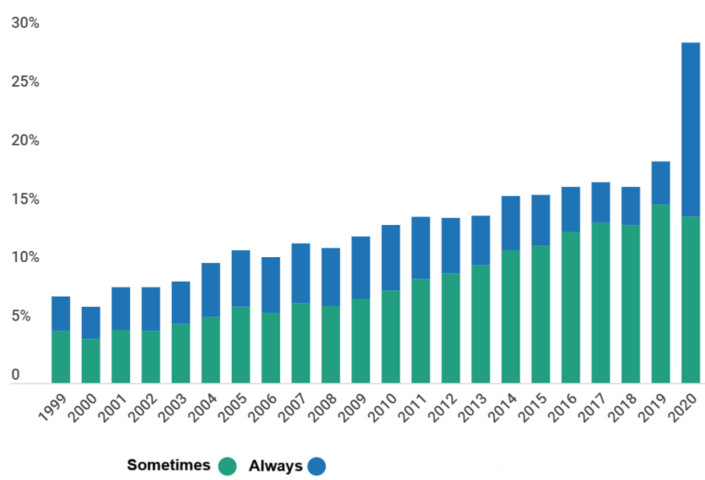
Note: This figure shows the distribution of individuals in our sample by distance intervals from the closest local exchange (LE). Each bar represents the percentage of sample individuals residing within the specified distance range from their nearest LE.

Figure A.7: Number of people using social media platforms, 2004-2018



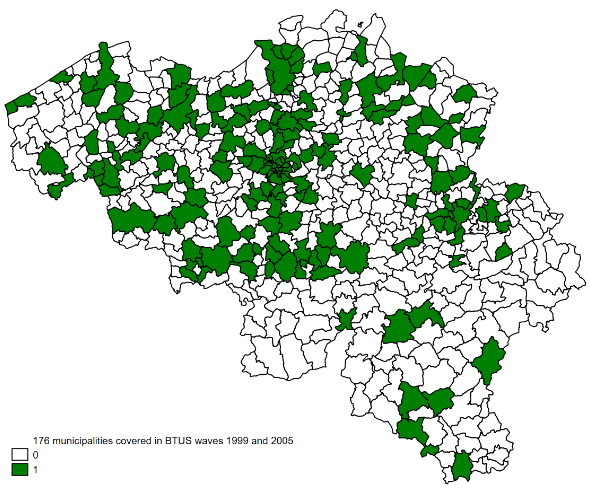
Source: Ortiz-Espinosa (2019) Retrieved from: 'https://ourworldindata.org/rise-of-social-media' [Online Resource]

Figure A.8: Work-from-home share among employed in Belgium 1999-2020



Source: Statbel

Figure A.9: Geographic coverage of the Belgian Time Use Survey - 176 municipalities



Notes: Elaborated by the authors using data from the Belgian Time Use Survey (BTUS), Statbel.

A.2 Additional Tables

Table B.1: Internet and E-Government Statistics for Belgium, 2005

Indicator	**2005**
Business Internet Access	
Share of businesses with access to the Internet in 2005	95
Share of businesses having a website/homepage in 2006	69
E-Government Indicators	
E-Government availability – Supply side	47
Population Internet Use for Public Authorities (past 3 months)	
Share of population having used the Internet	30
– For contacting public authorities	18
– For obtaining information	16
– For downloading forms	8
– For sending forms	4
Business Internet Use for Public Authorities	
Share of businesses having used the Internet	59
– For obtaining information	57
– For obtaining forms	44
– For returning filled in forms	33
– For full electronic case handling	15
Broadband and Internet Access	
Broadband access per 100 inhabitants	19.3
Households with Internet Access (%)	50
Households with broadband connection (%)	41
Population Internet Usage Frequency (%)	
– Within last three months	58
– Once a week in past 3 months	53
– Every day	38
– Few times a week	15
– More than a year ago or never	40
Internet Usage Location (past 3 months, %)	
– At home	47
– At work	18
– In an Education Environment	5
– At someone else's home	5
– In other places	3
Internet Activities (past 3 months, %)	
– Online banking activities	23
– Ordering/buying goods and services for personal use	11
– Sending or receiving e-mail	49
– Online gaming, listening or downloading music	17
– Searching information in relation to healthcare	19
– Searching information on goods and services	43
– Read/download newspapers and magazines	13

Source: OECD Statistics Database; OECD (2007), Communications Outlook (OECD, 2008).

Table B.2: Knowledge-Based Services Classification: NACE Rev. 2 Codes (2-digit level)

NACE Rev. 2 codes	Description
Knowledge-intensive services (KIS)	
50 to 51	Water transport; Air transport;
58 to 63	Publishing activities; Motion picture, video and television programme production, sound recording and music publish activities; Programming and broadcasting activities; Telecommunications; computer programming, consultancy and related activities; Information service activities (section J);
64 to 66	Financial and insurance activities (section K);
69 to 75	Legal and accounting activities; Activities of head offices, management consultancy activities; Architectural and engineering activities, technical testing and analysis; Scientific research and development; Advertising and market research; Other professional, scientific and technical activities; Veterinary activities (section M);
78	Employment activities;
80	Security and investigation activities;
84 to 93	Public administration and defence, compulsory social security (section O); Education (section P), Human health and social work activities (section Q); Arts, entertainment and recreation (section R).
Knowledge-intensive market services (excluding high-tech and financial services)	
50 to 51	Water transport; Air transport;
69 to 71	Legal and accounting activities; Activities of head offices, management consultancy activities; Architectural and engineering activities, technical testing and analysis;
73 to 74	Advertising and market research; Other professional, scientific and technical activities;
78	Employment activities;
80	Security and investigation activities;
High-tech knowledge-intensive services	
59 to 63	Motion picture, video and television programme production, sound recording and music publish activities; Programming and broadcasting activities; Telecommunications; computer programming, consultancy and related activities; Information service activities;
72	Scientific research and development;
Knowledge-intensive financial services	
64 to 66	Financial and insurance activities (section K).
Other knowledge-intensive services	
58	Publishing activities;
75	Veterinary activities;
84 to 93	Public administration and defence, compulsory social security (section O); Education (section P), Human health and social work activities (section Q); Arts, entertainment and recreation (section R).
Less knowledge-intensive services (LKIS)	
45 to 47	Wholesale and retail trade; Repair of motor vehicles and motorcycles (section G);
49	Land transport and transport via pipelines;
52 to 53	Warehousing and support activities for transportation; Postal and courier activities;
55 to 56	Accommodation and food service activities (section I);
68	Real estate activities (section L);
77	Rental and leasing activities;
79	Travel agency, tour operator reservation service and related activities;
81	Services to buildings and landscape activities;
82	Office administrative, office support and other business support activities;
94 to 96	Activities of membership organisation; Repair of computers and personal and household goods; Other personal service activities (section S);
97 to 99	Activities of households as employers of domestic personnel; Undifferentiated goods- and services-producing activities of private households for own use (section T); Activities of extraterritorial organisations and bodies (section U).
Less knowledge-intensive market services	
45 to 47	Wholesale and retail trade; Repair of motor vehicles and motorcycles (section G);
49	Land transport and transport via pipelines;
52	Warehousing and support activities for transportation;
55 to 56	Accommodation and food service activities (section I);
68	Real estate activities (section L);
77	Rental and leasing activities;
79	Travel agency, tour operator reservation service and related activities;
81	Services to buildings and landscape activities;
82	Office administrative, office support and other business support activities;
95	Repair of computers and personal and household goods;
Other less knowledge-intensive services	
53	Postal and courier activities;
94	Activities of membership organisation;
96	Other personal service activities;
97 to 99	Activities of households as employers of domestic personnel; Undifferentiated goods- and services-producing activities of private households for own use (section T); Activities of extraterritorial organisations and bodies (section U).

Source: Eurostat indicators on High-tech industry and Knowledge – intensive services Annex 3 – High-tech aggregation by NACE Rev.2.

Table B.3: The effect of internet availability on mental health-related disability insurance

	Dependent variable: Mental health-related DI (×100)			
	(1)	(2)	(3)	(4)
	High KIS High WFH	High KIS Low WFH	Low KIS High WFH	Low KIS Low WFH
$Close2LE_{ia} \times Post_t$	0.052*	0.063	0.061*	-0.032
	(0.029)	(0.066)	(0.035)	(0.031)
Sample mean	0.144	0.206	0.111	0.144
Control mean	0.114	0.165	0.106	0.129
Baseline mean	0.047	0.062	0.039	0.057
Observations	330806	121156	87617	275050

Notes: This table presents static difference-in-differences estimates of the effect of internet access on the probability of receiving disability insurance due to a mental health diagnosis from 1998-2004. The dependent variable is multiplied by 100 to interpret the coefficient as the percentage point change. The treatment variable is a binary indicator where $Close2LE_{ia}$ equals 1 if the local exchange is within 3km of the statistical sector where individual i lives. $Post_t$ equals 1 from 2001 onward. Column (1) shows results for high knowledge-intensive sectors (HKIS) and a high share of work from home potential (WFH), column (2) for less-KIS and low-WFH, column (3) for low-KIS and high WFH jobs, and column (4) for low-KIS and low WFH jobs. All regressions include year fixed effects, area fixed effects, individual-level controls, and job-specific time trends. Standard errors are clustered at the area level and reported in parentheses.

Table B.4: The effect of internet availability on the antidepressant consumption rate (2000-2005) on the sample of municipalities available in the Belgian Time Use Survey

Dependent variable: Antidepressant consumption rate (municipality level)				
	(1)	(2)	(3)	(4)
	All	Ages 25-35	Ages 36-44	Ages 45-55
PANEL A: ALL				
Internet availability	0.021*	0.016**	0.025*	0.013
	(0.011)	(0.007)	(0.014)	(0.015)
Rescaled 25th-75th pctile	0.007*	0.005**	0.008*	0.004
	(0.004)	(0.002)	(0.005)	(0.005)
Average change 2000-2005	0.063	0.040	0.065	0.084
Baseline rate	0.010	0.006	0.010	0.013
PANEL B: MEN				
Internet availability	0.008	0.001	0.009	0.007
	(0.009)	(0.007)	(0.012)	(0.013)
Rescaled 25th-75th pctile	0.003	0.000	0.003	0.002
	(0.003)	(0.002)	(0.004)	(0.004)
Average change 2000-2005	0.046	0.029	0.046	0.062
Baseline rate	0.009	0.006	0.009	0.012
PANEL C: WOMEN				
Internet availability	0.031**	0.028***	0.036**	0.019
	(0.014)	(0.010)	(0.017)	(0.018)
Rescaled 25th-75th pctile	0.010**	0.009***	0.012**	0.006
	(0.005)	(0.003)	(0.006)	(0.006)
Average change 2000-2005	0.079	0.049	0.082	0.105
Baseline rate	0.011	0.007	0.011	0.015
Observations	352	352	352	352

Notes: This tables shows the estimates of the effect of internet availability rate (i.e., the share of households with potential access to internet in a municipality) on the antidepressant consumption rate among insured individuals by one large Belgian health insurer, *Mutualité Libres*. Internet data was provided by the internet provider Proximus. The number of households per municipality and year is from StatBel. Data is at municipality level (N=176 to match the sample of municipalities surveyed in the BTUS) and available for 2000 and 2005. Regressions include municipality fixed effects and are weighted by the number of insured in individuals in each municipality. Standard errors are clustered at municipality level.