Mental Health Resilience During the Covid Pandemic: Evidence from a Sample of Irish Women

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Abstract: This paper examines the dynamics of mental health for a sample of Irish women before, during and after the Covid-19 pandemic. Using longitudinal data from the Infant cohort of the Growing Up in Ireland (GUI) survey we analyse changes in the CES-D8 scale and transitions across the critical threshold associated with depressive symptoms. We find an increase in the fraction of women with depressive symptoms following the onset of Covid, but by the end of the pandemic approximately two thirds of those women had returned to not having such symptoms. Transitions across the key threshold in both directions is most pronounced for those with low education. Statistical associations are also found for those who experience parental stress and those whose mental health was fragile pre-Covid.

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Introduction

The Covid 19 Pandemic officially arrived in Ireland on February 29, 2020 with the first confirmation of a positive case. Over subsequent weeks various restrictions were introduced to stem the spread of the disease (becoming collectively known as the "lockdown"). These included the closure of all educational establishments and childcare facilities, the banning of various sporting and cultural events and then on March 27, everyone, apart from providers of essential care and services, was advised to stay at home apart from essential visits (e.g. to the supermarket) and exercise within a 2km radius. There was a ban on non-essential travel and on meeting people outside the immediate household.

As Covid cases declined over the summer of 2020 there was a gradual removal of the most severe of these restrictions, but an upsurge in autumn 2020 led to a reimposition of high level (level 5) restrictions in October. As the second wave of Covid receded there was an easing of restrictions from early December with the opening of non-essential shops and services, including bars and restaurants, and by December 18 limited within-country travel and household visits were permitted. However, there was a significant resurgence of cases in the immediate run-up to and aftermath of Christmas and level 5 restrictions were again imposed in January 2021.

The easing of level 5 restrictions began around March 2021 with limited re-openings of in-person education, while at the same time a comprehensive vaccination programme had been put in place since January. In the subsequent months there was significant further easing of restrictions and by February 2022 mandatory mask-wearing was lifted and by April 2022 the daily reporting of Covid cases ceased. Testing facilities for Covid were stood down in July 2022. While it is obviously a subjective assessment to make, it seems reasonable to suggest

that by the second quarter of 2022 the Covid pandemic, as an ongoing health crisis, was effectively over, even though cases were (and still are) occurring.[1]

Amongst the many health impacts of Covid was its effect on mental health, especially in the early stages of the pandemic. This can include anxiety and depression related to the pandemic itself and also in relation to the lockdown policies introduced. This has been documented in many countries e.g. WHO(2022), Banks and Xu (2020), Davillas and Jones (2021), Hajek et al (2022a, 2022b) and with evidence for Ireland in Hyland et al (2021) and Madden (2024). However, there is less evidence on whether people *recovered* from the Covid-related deterioration in mental health. To analyse this what we ideally need is data on mental health, *for the same group of people*, before, during and after the pandemic. The longitudinal Growing Up in Ireland (GUI) survey provides such data. GUI collected data on mental health (the precise measure is outlined below) for two cohorts of children (one born in 1998 and one born in 2008) and their primary caregivers (almost exclusively their birth mothers). In this paper we concentrate on the primary carers for the 2008 cohort and we have measures of mental health for before Covid-19 (2017/2018), during Covid-19 (December 2020) and after Covid-19 (September 2021-June 2022). While it is true that these periods may not align exactly with a strict interpretations of "before/during/after Covid", we argue that they are close enough to give an accurate sense of how mental health deteriorated during Covid and may have recovered after it.

The specific research question we address here is the degree to which mental health for our sample "recovered" in the post-Covid period, after its decline with the onset of Covid. We also check for heterogenous experiences within our sample, according to factors such as education and pre-existing health conditions.

Our results confirm the deterioration outlined in Madden (2024) using the same dataset (apart from some attrition) and we see partial, though not complete, recovery post-Covid. We also observe significant differences by education in terms of changes in mental health dynamics, albeit with some caveats owing to sample size.

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[1] For a detailed timeline of Covid related events in Ireland see
https://www.cso.ie/en/releasesandpublications/ep/p-covid19/covid-19informationhub/covid-19inirelandtimeline2020-2023/ . An abbreviated version of this which also includes the timing og the GUI surveys is available in appendix figure 1.

The remainder of this paper proceeds as follows: in the next section we review other papers in the area. We then follow with a description of our data, followed by analysis of the dynamics of mental health for our sample before, during and after Covid. The paper concludes with a summary and discussion of the results.

2. Literature Review: Covid and Mental Health

In this section we review other work on Covid and mental health. To conserve space we confine our analysis to papers that try to look at the dynamics of mental health during Covid and not just the immediate effect.

While not directly related to our research question, the World Health Organisation (WHO, 2022) provided a very comprehensive review of the early impact of Covid-19 on mental health. They found a significant increase in mental health problems in the general population in the first year of the pandemic with young people and females particularly affected. They lamented the lack of evidence based upon longitudinal data, however. There was little evidence of changes in suicide-mortality but they did detect an increase in suicidal ideation. Risk of severe illness and death appeared to be higher for those with mental health disorders. Outpatient mental health services were also affected though this was partly mitigated by shifting services towards e-mental health.

Shang et al (2024) carried out a meta-analysis of the trend in anxiety and depression for Covid 19 patients allowing for a 2 year follow-up period after the onset of Covid in early 2020. They found a general decrease in both depression and anxiety after 2 years, but in some cases there was a temporary increase at 3-6 months. Their analysis however does not control for anxiety/depression *before* Covid. It is also confined to Covid patients only and thus cannot take account of mental health developments in the general population.

Sun et al (2023) carried out a meta-analysis of mental health symptoms before and during (but not after) Covid 19. Among general population studies they find very little change in general mental health, anxiety or depression. However, small but significant declines in all three were observed for females and for parents, precisely the sub-group analysed in this study.

Taxiarchi et al (2023) examine data for the GHQ measure of psychological distress for a representative longitudinal sample from England on a monthly basis from January 2015 to December 2021, thus incorporating three "waves" of Covid. They find a sustained increase in

psychological distress between the onset of Covid and the end of the second wave, May 2021. However, for the third wave (June-December 2021) distress had returned to very close to its pre-pandemic levels. Again, these effects were more pronounced for women. Importantly, by this period, June 2021, most adults in England had been vaccinated and most social restrictions had been lifted.

Fischer et al (2025) applied growth mixture modelling to a representative sample of the German population, observing their mental well-being over a four year period, starting in July-September 2018 and then again in October 2018-January 2019, April-June 2019, April-June 2021 and April-June 2022, thus fulfilling the before/during/after Covid criteria. They settle on three distinct groups by mental-health trajectory. One (78 percent) they label "steady high", another is "steadily increasing" (12 per cent) and interestingly they find a final group (10 per cent) who they label as "fluctuating". This group shows a decrease in mental health between April-June 2019 and April-June 2021 before recovering by April-June 2022. A multinomial logit analysis of latent class membership showed that being female increased the odds of being in the fluctuating group relative to the stable high group.

Perhaps the studies which most resembles ours are Dhensa-Kalon et al (2025) and Patzina et al (2025). Dhenas-Kalon et al (2025) look at mental health symptoms in the general English population using data from the UK Household Longitudinal Survey, comparing these during Covid (which they define as March 2020-March 2021) with the averages for a period preceding Covid (2009-2019) and for a period after Covid (2021-2023). Their results reveal elevated symptoms during Covid which remained relatively unchanged during each UK lockdown. The post-Covid period showed some reduction but they did not observe a full return to pre-Covid levels with some persistence of elevated symptoms. The authors stress caution in the interpretation of the post-Covid results suggesting that economic and political factors at work in that period may explain this, rather than Covid related factors. In terms of heterogeneity of results across subgroups they found greater effects for women, people working from home, those with pre-existing health conditions and also an age effect for the 30-45 year group.

Patzina et al (2025) look at measures of mental health before, during and after Covid with German longitudinal data. Similar to our study they have observations on mental health for the same people from a base period before Covid (2018), for a number of periods during the pandemic and then finally for what they regard as after the pandemic in summer 2022. This is very similar to the timeframe in this study, although Patzina et al have data for nine periods in

all, whereas our data is only in three waves. They find that mental health deteriorates from the onset of Covid, recovers somewhat in the summer of 2021, falls again with the "Delta wave" in autumn/winter 2021 before recovering to just below pre-pandemic levels in summer 2022. As we will see below, this approximate "U shaped" pattern is also observed in our data, although because of the longer interval between waves, we may miss out on some between wave variation. They also find a considerable degree of uniformity in terms of the mental health effects and no impact on health inequalities.

Overall, the results of this brief literature review are fairly consistent. The analyses of longitudinal data indicate a deterioration in mental health with the onset of Covid, relative to how it had been before the pandemic. Depending upon the time of measurement and the timing of various Covid waves, mental health showed some fluctuation during the pandemic. However, by the end of the pandemic, allowing for the fact that the timing of measurement may not coincide precisely with the end of the pandemic and that the end can vary from country to country, there seems to be clear evidence that mental health shows some recovery, in some cases reverting to its pre-Covid level.

We now investigate whether such a pattern is evident in our data from the GUI survey.

3. Data and Analysis

Our data comes from the GUI Infant Cohort and consists of the primary carers (PCs) of a cohort of Irish children born in the period December 2007-June 2008. The specific GUI data we analyse is waves 5, 6 and the "Covid Wave" of the Infant cohort. The fieldwork for these waves was carried out in June 2017-February 2018 (wave 5), December 2020 (Covid wave) and September 2021-June 2022 (wave 6).[2]

The original sampling frame used for the Infant Cohort and their PCs was the Child Benefit Register. This is a universal payment (made on behalf of all children regardless of socioeconomic status) and payment is made directly to the principal carer of the child (most typically the resident mother or step mother) and must be claimed within six months of the child being born, in the six months after the child becomes a member of the family or six

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[2] Note that the GUI surveys for before, during and after Covid are also available for the children of the Child cohort, born in 1998. We hope to analyses this data in future research.

months after the family become resident in Ireland. Originally 11134 children born between 1st December 2007 and 30th June 2008 were surveyed at age 9 months (wave 1).

Our analysis starts with wave 5 of this cohort when the children were aged 9 and a total of 8032 questionnaires were returned. For wave 6 of the cohort, when the children were aged 13, a total of 6655 questionnaires were returned. In between waves 5 and 6 however, a special "Covid Wave" survey was carried out. This survey was web-based and was carried out from December 4 2020 to December 30 2020 and had 3901 responses from PCs.

The following exclusions were placed on the data: a balanced panel was used i.e. only the PCs who responded to waves 5, 6 and the Covid wave. In addition, observations where the questions on mental health were not answered were also excluded. Since attrition from the GUI dataset is not random (McCrory et al, 2013), unless otherwise indicated, longitudinal sampling weights from the wave 6 survey were used in all the analysis.

Measurements

The measure of mental health used is the CES-D8 scale (Melchior et al 1993). The original version of the CES-D scale has 20 items and has been used extensively across the world and has featured in many published journal articles. There are also shorter versions of the measure which take less time to administer but are still regarded as reliable measures of depressive symptoms. One of these is the CES-D8 and this is the version which is measured in GUI.

The CES-D8 measure consists of eight statements regarding how the respondent was feeling in the past week (e.g. "I felt depressed", "I felt fearful" etc). The respondent then indicates whether they experienced this feeling rarely/none of the time, some or a little of the time, occasionally or a moderate amount of the time or most or all of the time. Answers are coded 0, 1, 2 or 3 respectively, so that the minimum score possible is 0 and the maximum is 24. Higher scores indicate worse mental health and individuals with a score at or above 7 are regarded as having clinically significant levels of depressive symptoms (Devins et al, 1988, Melchior et al, 1993) though individuals cannot be formally diagnosed as depressed without a clinical examination. Our data is truncated at 13 (i.e. all CES-D8 scores greater than or equal to 13 are coded as 13) and hence the bulk of our focus is on rates of depressive symptoms rather than actual CES-D8 scores.

Summary Statistics and Analysis

Before analysing rates of depressive symptoms, we present some summary statistics for our sample. It is important to bear in mind that this is not a nationally representative sample. However, it is a representative sample of a particular demographic group: mothers who gave birth between 1ˢᵗ December 2007 and 30ᵗʰ June 2008. We present these statistics in table 1, at wave 5 (June 2017-February 2018) values as these are the variables which will enter the regression analysis later. The statistics show that the sample is quite highly educated with well over half having a post- secondary school qualification. Over 60 per cent of the sample are employed outside the home and over 90 per cent married or living with a partner.

We first take a look at the overall distribution of CES-D8 for each wave by examining their cumulative distribution functions. Figures 1a-1c shows the three pairwise comparisons. We note from figure 1a that the CDF for wave 5 lies above that for the Covid wave for all values of CES-D8. Bearing in mind that higher scores indicate worse mental health, this indicates that mental health for wave 5 was better than mental health for the Covid wave right across the distribution. The same applies for the pairwise comparison between the Covid wave and wave 6 (figure 1b).[3] What this also implies is that regardless of which value of CES-D8 we choose as the threshold for depressive symptoms, we will always have higher rates of depressive symptoms in the Covid wave relative to wave 5 and wave 6. Effectively that is also the case for the comparison between waves 5 and 6, where the crossing of the CDFs happens at a value of CES-D8 which could never realistically be the threshold for depressive symptoms.

Tables 2a and 2b (also summarised in figure 2) shows the rate of depressive symptoms, as defined by CES-D8 scores greater than or equal to 7, for each wave. This rate more than doubled between wave 5 and the Covid wave. It fell back considerably in wave 6, but not to its pre-Covid level. These tables also show the breakdown of the depressive symptoms rate into its growth and distribution components using the Shapley decomposition (Kolenikov and Shorrocks, 2005).

Suppose we characterise our measure of depressive symptoms as $D = D(\mu, L, CESD^*)$ where μ is the average level of CES-D8, L is the Lorenz curve for the distribution of CES-D8 and

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[3] For both of these pairwise comparisons the difference between the curves is statistically significant as can be seen via examination of the confidence intervals around the curve for difference between the CDFs (as provided by the DASP package of Arrar and Duclos, 2022). These curves are available on request.

CESD* is the critical threshold (note that the cumulative distribution function for CES-D8 will be completely characterised by its mean and Lorenz curve).

If subscripts "0" and "1" refer to the two time periods in question, then the change in depressive symptoms over time $D_1 - D_0$ can be written as

$$D_1 - D_0 = F_1(CESD^*) - F_0(CESD^*) = D_1(\mu_1, L_1, CESD^*) - D_0(\mu_0, L_0, CESD^*)$$

where F_i is the cumulative distribution function for period "i". This can then be decomposed into growth and redistribution effects denoted by $D(\mu_1, L_0, CESD^*) - D(\mu_0, L_0, CESD^*)$ and $D(\mu_1, L_1, CESD^*) - D(\mu_1, L_0, CESD^*)$ respectively.

However, as is the case with any path dependence type analysis, the choice of which configuration to use as the base period is arbitrary. In the above formulation we calculate the marginal effect of the change in mean CES-D8 with the distribution held constant at the *initial* configuration. However, we calculate the marginal impact of redistribution holding mean CES-D8 constant at the *final* configuration. We could just as easily have carried out a decomposition with the base periods changed and there is no logical reason for preferring one configuration over another. Following the approach outlined in Kolenikov and Shorrocks (2005) we take the average of the two effects respectively thus giving a growth effect of

$$\frac{1}{2}[D(\mu_1, L_0, CESD^*) - D(\mu_0, L_0, CESD^*)] + \frac{1}{2}[D(\mu_1, L_1, CESD^*) - D(\mu_0, L_1, CESD^*)]$$

and a redistribution effect of

$$\frac{1}{2}[D(\mu_0, L_1, CESD^*) - D(\mu_0, L_0, CESD^*)] + \frac{1}{2}[D(\mu_1, L_1, CESD^*) - D(\mu_1, L_0, CESD^*)]$$

These two expressions are the growth and distribution components for a two-way Shapley decomposition of the change in the rate of depressive symptoms. The Shapley decomposition arises from the classic co-operative game theory problem of dividing a pie fairly. The solution is that each player is assigned her marginal contribution averaged over all possible coalitions of agents. The interpretation here was to consider the various n factors which contribute together to determine the change in the value of an indicator such as depressive symptoms and then assign to each factor the average marginal contributions taken over the n! possible ways

in which the factors may be removed in sequence. Since we have two factors (n=2, growth and distribution) we have 2!=2 possible routes. The decomposition is always exact as the factors are treated symmetrically.

Note that this decomposition effectively treats the CES-D8 scale as a cardinal variable nor does it take account of the truncation. While strictly speaking the CES-D8 is a Likert score derived from the combination of ordered categorical variables, this decomposition is still useful in terms of analysis of the change in depressive symptoms between waves.

The results show that between wave 5 and the Covid wave, the increase in depressive symptoms was completely driven by a rise in the overall level of CES-D8 and that distribution made a negative contribution i.e. if average CES-D8 were the same in the Covid wave and wave 5, but the distribution changed to the Covid wave distribution, then the rate of depressive symptoms would have fallen. In terms of the change between the Covid wave and wave 6, again the overwhelming contribution comes from growth (or in this case, reduction!). The distribution component moves in the same direction but its magnitude is much smaller.

However, what we are particularly interested in is the *transitions* between waves. This is captured in figure 3 which shows the sequence index plot between waves.[4] We can see the relatively low fraction with depressive symptoms in wave 5. Of those who had such symptoms pre-Covid, about one third did not have them in the Covid wave. But this is heavily outweighed by the number of people who transition into depressive symptoms in the Covid wave. This is the large red block in the middle of the sequence index plot. In wave 6 we see that about two thirds of those who acquired depressive symptoms in the Covid wave go back below the threshold. It seems fair to interpret this as an example of the rebound/resilience that was discussed above, whereby Covid caused a temporary deterioration in mental health, but as the pandemic neared its end, mental health showed recovery.

Of course, it is also to be expected that we would have observed some between wave transitions even if Covid had never happened. This is reflected in the fact that there is a small number of people who acquire depressive symptoms between the Covid wave and wave 6, and also some who transition out of depressive symptoms between wave 5 and the Covid wave. It may also

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[4] Note this plot is based on *unweighted* data as the Stata command will not run on weighted data.

be reflected in movements out of depressive symptoms between the Covid wave and wave 6 for people who had also had depressive symptoms in wave 5.[56]

Overall, there is greater churning between the Covid wave and wave 6, than between wave 5 and the Covid wave, as measured by the Shorrocks-Prais mobility index. This is measured from the mobility matrices in table 2c and is calculated as $\frac{k-Tr(M)}{k-1}$, where $Tr(M)$ is the trace of the mobility matrix and k is the number of rows/columns. The values of the index for transitions into and out of depressive symptoms were 0.599 (0.035) and 0.686 (0.023) respectively (standard errors in brackets).

We can investigate these transitions in more detail in figures 4a-4d. These figures give more detail regarding wave to wave transitions. First, note that around 80 per cent of the sample locate along the main diagonal, and thus do not transition. In terms of the comparison between the different waves, what is most noticeable is the balance between transitions in and out. The north-east cell, reflecting transitions into depressive symptoms is much more heavily populated between wave 5 and the Covid wave, whereas it is the south-west quadrant (transitions out of depressive symptoms) which is more heavily populated between the Covid wave and wave 6.

We can drill down a little deeper into this by looking just at those who transitioned into depressive symptoms between wave 5 and the Covid wave, and ignore people who already had depressive symptoms in wave 5. It seems plausible that the bulk of these transitions were Covid related but of course we cannot rule out non-Covid related churning. Figure 4c shows that of those without depressive symptoms in wave 5, nearly one fifth acquired depressive symptoms in the Covid wave. Of that group, around two-thirds transitioned back to non-depressive symptoms in wave 6.

We now investigate if these transitions differed across education (which we also take as a proxy for socioeconomic status (SES)). We use the highest level of education attained, breaking

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[5] It is possible that some transition into depressive symptoms between wave 5 and the Covid wave are seasonal in nature, given that the Covid wave survey was carried out exclusively in the month of December. Zhang et al (2021), using data from Sweden and the US, find that psychiatric disorders spike in darker periods and recede in warmer and brighter times of the year and this pattern is common to both countries.

[6] It is also possible that the lockdowns associated with Covid may have *improved* mental health for some people. For example, using UK Time-Use data, Gimenez-Nadal et al (2025) find that the well-being penalty for social isolation decreased during Covid lockdowns, presumably because it was mandated and shared across the whole population and there was a greater range of initiatives to ameliorate such isolation. Conversely, that penalty increased post-Covid, perhaps indicating a rebound effect.

education into four categories: (1) up to and including completion of lower secondary schooling (2) completion of all secondary schooling, including vocational schooling (3) obtaining a post-secondary school diploma or cert and (4) completion of third level education.[7]

Figure 5 shows the fraction with depressive symptoms by wave and by education level (with 95% confidence interval) and this is also reproduced in table 3. There is a clear gradient by SES in wave 5 and this continues in the Covid Wave. Wave 6 however shows that the greatest transition back to non-depressive symptoms in wave 6 occurs for the least educated group and this confounds the SES gradient, though it is noticeable that the gradient for the other three levels of education remains.

Figures 6a and 6b show the actual transitions by education. As shown in figure 6a, between wave 5 and the Covid wave we see higher transitions for the least educated, with nearly 30 per cent acquiring depressive symptoms, whereas for other education levels it is 20 per cent or below. As with figure 4d we just show transitions between the Covid wave and wave 6 for those who acquired depressive symptoms in the Covid wave. We must caution that sample sizes are small here (we do apply sampling weights) but nevertheless those with lower secondary education only show an astonishing rate of transition back to non-depressive symptoms. 99 per cent make this move as opposed to rates between 60 and 70 per cent for other levels of education. Lower secondary mothers thus show much higher rates of churning during and after Covid. Of this sample, almost every one with this level of education who acquired depressive symptoms during Covid had shed them by mid 2022.

We also employ regression analysis to examine the transitions, using various socio-demographic factors evaluated in wave 5 in table 4.[8] The right hand variables we use are a quadratic in age, education level as described above, whether the study child in GUI has a chronic health condition, whether the mother has a chronic health condition, whether the individual had long term caring responsibilities, whether employed or self-employed, marital status, smoking status, whether the individual was a problem drinker (according to the FAST Alcohol Screening Test, Hodgson et al., 2002), body mass index, the parental stress scale (Berry and Jones, 1995), a five point scale of how easy it is to make ends meet and finally a measure capturing the extent to which an individual was engaged in activities in wave 5, the

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[7] These map to the options available on the GUI questionnaire.

[8] This is also the approach taken in Dhensa-Kalon et al (2025)

type of activities which would be curtailed in lockdown (a more detailed account of these measures and their summary statistics is found in the appendix).

We use a simple logit model to model transitions into depressive symptoms between wave 5 and the Covid wave and out of depressive symptoms between the Covid wave and wave 6 (effectively these are discrete time hazard models). We present results for three regressions: first for those who transition *into* depressive symptoms between waves 5 and the Covid wave. The second column of results are for the transition back to non-depressive symptoms between the Covid wave and wave 6. The final column presents results for the same transition but this time restricting the sample to those who moved into depressive symptoms during Covid. Note that the sample sizes for these regressions will differ as we can only run the analysis on those who were in a position to make the transition in case. Note also that what the analysis shows us is the factors statistically associated with the transitions. We are not claiming that these are causal factors, though in many cases the intuition of how these factors affect the transition seems plausible.

Taking the results for transitions into depressive symptoms first, we see a strong role for the CES-D8 score in wave 5. Recall that the sample here comprises people who did not have depressive symptoms in wave 1, so everyone here had a CES-D8 score of below 7. Nevertheless, having a higher score (though still below 7) is associated with a higher probability of transitioning during Covid. One way to interpret this is that people with a higher CES-D8 score were more vulnerable to the increased stress which Covid brought. Problem drinking and parental stress are also positively associated with the transition. Again, these could be regarded as indicators of individuals who were already suffering from issues with respect to mental health and well-being.

In terms of protective factors, we see that being employed, being married/cohabiting and family affluence (as measured in terms of ease of making ends meet) are negatively associated with the transition. However, it is also possible that we are observing reverse causality here in the sense that having robust mental health is associated with these factors and hence a transition into depressive symptoms following a shock like Covid is less likely.

The second column in table 4 looks at the reverse transition between the Covid wave and wave 6, and the estimation includes all who could make that transition, including those who already had depressive symptoms before the Covid wave. The high rate of transition already noted for those with the lowest level of education is reflected in the highly significant coefficient on this

variable. Other statistically significant associations, this time negatively associated with the transition, are observed for age (marginal), suffering from parental stress and also having a high value of CES-D8 in wave 5 (recall that this sample includes people who were already depressed in wave 5 and who have high values of CES-D8 in that wave).

The final column of table 4 analyses the reverse transition between the Covid wave and wave 6, but this time only includes those who transitioned into depressive symptoms during the Covid wave (this reduces the sample size from 380 to 301). We again observe the highly significant coefficient on the lowest level of education and we also observe significant associations with smoking (negative) and family affluence (positive).

Finally, we also run a first difference regression for the change in CES-D8 between waves 5 and 6, effectively a pre and post Covid regression.[9] As the Covid survey was limited in the amount of information it connected (with virtually no information on the right hand variables in table 4) we cannot run a standard panel regression over the three waves. Our range of right hand variables is also limited by what variables were collected on a consistent basis for both waves 5 and 6. The unit of measurement for the dependent variable is the CES-D8 scale so we are effectively treating it as a cardinal variable.[10] The results suggest that in terms of how people entered and exited the pandemic and what variables affected their mental health, the critical ones were own-health (in terms of acquiring a chronic condition, which of course could be Covid related), an increase in parental stress and reduced family affluence (in the sense of it becoming harder to make ends meet, which might also be Covid related, although we do control for employment). Of course, we are limited by what data is available, and there may be other, unobserved, factors, which might have been influenced by Covid over the wave 5 to wave 6 period.

4. Discussion, Limitations/Strengths and Conclusion

This paper uses longitudinal data on a sample of Irish mothers to analyse changes in their mental health (as measured by having depressive symptoms using the CES-D8 scale) before,

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[9] Note the sample size here is larger as it is not just confined to people who are in a position to make the transitions analysed in tables 4.

[10] We also carried out the analysis using the change in depression as the dependent variable and the qualitative results were very similar.

during and after the Covid 19 pandemic. While there is fairly widespread evidence of a deterioration in mental health at the onset of the pandemic, there is less evidence concerning whether this deterioration persisted or mental health returned to its pre-Covid state. Our evidence here, admittedly for a sample which is not nationally representative, is that mental health did recover but not completely. Of the women who acquired depressive symptoms during Covid, around two-thirds shed them post-Covid. Overall, there was more mobility for the second transition from the period during Covid to the period after Covid. While the paper did not focus upon the distribution of mental health, a Shapley analysis of the changes in CES-D8 scores indicates that in terms of movements across the threshold for depressive symptoms the main driving factor was the average level of CES-D8 and not it's distribution, suggesting that Covid led to a general deterioration in mental health and not just to a mean preserving spread in CES-D8.

One of the most striking features of the results is how the transitions differed according to education. Those with the lowest level of education, i.e. who left school before the completion of secondary school education at 17/18, exhibited the highest mobility in both directions. This phenomenon was not too pronounced for transitions into depressive symptoms between wave 5 and the Covid wave but it was striking for the transition back out of depressive symptoms between the Covid wave and wave 6. Admittedly the sample size is small, but sampling weights were applied in all the analysis.

Understandably, amongst the other factors associated with transitions was the actual CES-D8 score. We chose to focus on whether a woman was above or below the critical CES-D8 threshold of 7, but for a woman who did not have depressive symptoms pre-Covid, but who has a CES-D8 score which was high but not quite at the 7 threshold, there was a higher risk of crossing the threshold. It seems fair to regard these women as having *relatively* poorer mental health pre-Covid but not quite at "depressive-symptoms-level". They were then more vulnerable to the stress and trauma associated with the pandemic. Other variables that were significantly associated with transitions were also associated with pre-existing vulnerabilities in mental health, such as problem drinking and parental stress. In terms of the policy implications which could be drawn from these results, while it may seem obvious, it is still useful to know that when sudden exogenous shocks occur, the mental health effects can be widely felt, but those with pre-existing vulnerabilities and with less financial resources are more exposed. What is perhaps not so obvious and perhaps somewhat counter-intuitive is that

in terms of recovery from this mental health shock, it is less well-educated women who fared best.

The principal strength of this paper is that we have longitudinal data with measures of mental health for the same women before, during and after Covid, which is the "gold-standard" type of data for this analysis. We also have a wealth of other information concerning the women, particularly for the pre-Covid period and we are able to investigate statistical associations between these variables and subsequent changes in the CES-D8 mental health measure.

In terms of limitations of this paper, one of the principal ones is that it only analyses mental health for a specific demographic group: those who are the principal carers of children born between December 2007 and June 2008. It is representative of that group but clearly the results obtained here should only be extrapolated to other demographic groups with great caution. However, it is worth pointing out that in terms of transitions into depression during Covid, the results obtained for the group from this survey are qualitatively similar to results obtained from a sample of young adults in the GUI Child Cohort (Madden, 2024). It is also noteworthy that our results are qualitatively similar to those outlined in the literature review in section 2 for this particular subgroup in other countries.

A second limitation of this paper is the alignment between the timing of the survey and the arrival and development of the Covid pandemic (see appendix figure 1). The pandemic entered consciousness in Ireland in the first couple of months of 2020 with the first confirmed case on February 29. Ideally our measure of mental health before Covid would be sometime towards the end of 2019. However, the last pre-Covid survey of GUI for this cohort (wave 5) was in 2017/18 and thus it is highly likely that some of the transitions we observe between wave 5 and the Covid wave happened *before* the arrival of Covid. In the same way, given the gap between the onset of Covid in March 2020 and the Covid wave survey (December 2020) and then the further gap until the post-Covid survey (wave 6) in 2021/22 it is again likely that some transitions were non Covid related and that also we may have missed transitions into and out of depressive symptoms (or vice versa) between waves. This is an unavoidable limitation of our data and we do at least have the advantage of the data being longitudinal. We can also regard the wave 5 levels of mental health as a useful pre-Covid benchmark, even if they are not directly before the onset of the pandemic.

A further potential limitation of our data is the measure of mental health employed. The CES-D8 is a well-regarded screening instrument for depressive symptoms but like any such measure

it is not perfect e.g. it may not capture anxiety, or quality of life. Our choice of the binary measure of having or not having depressive symptoms (as determined by the CES-D8 threshold level of 7) also means that we do not investigate the depth of depressive symptoms. Nor do we distinguish between people who have "full mental health", as evidenced by a CES-D8 score of, say, zero, and those who may be just below the threshold of 7. This is partly addressed by the Shapley decomposition which breaks down changes in depression into growth and distribution components, albeit with the reservations concerning the interpretation of CES-D8 as a cardinal variable alluded to earlier. Note also that for some people mental health improved between wave 5 and the Covid wave as reflected in the, admittedly small, number of people who moved out of depressive symptoms.

Are there any policy conclusions which can be drawn from this paper? There seems to be fairly universal agreement that there will be future pandemics, though their nature and duration relative to Covid 19 is uncertain (Ukoaka et al, 2024). Despite this uncertainty, it is highly likely that future pandemics will have adverse effects upon mental health. The results from this paper suggest that there is considerable mental health resilience both in terms of the initial reaction to the pandemic and also in terms of recovery. The statistical associations established in this paper indicate that those with pre-existing mental fragility, even if they had not crossed the threshold associated with depressive symptoms, were more at risk when Covid arrived. The role of education is puzzling, with those with the lowest level of education showing greatest vulnerability in the early stages of the pandemic but greater powers of recovery subsequently. Other measures of mental fragility such as parental stress, problem drinking and financial hardship are also associated with acquiring and shedding depressive symptoms.

Overall the results seem consistent with the arrival of Covid presenting challenging circumstances which those people who were already fragile in some sense found most difficult to overcome. Greater resilience, in terms of coping with Covid and also recovering following the acquisition of depressive symptoms was associated with greater resources, in a wide interpretation of this term, including not just financial resources but also underlying mental health. Awareness of and providing support to people who already have underlying mental health problems would seem to be the principal policy implication arising from this study.

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Table 1: Summary Statistics for Sample (evaluated at Wave 5)

Variable	Mean (std. dev)
Age	32.89 (10.19)
Education: Lower Secondary	0.09
Education: Completed Secondary	0.31
Education: Diploma/Cert	0.23
Education: Third Level	0.37
Marital Status: Married	0.76
Marital Status: Divorced/Separated/Widowed	0.06
Marital Status: Other (incl. cohabiting)	0.18
Principal Economic Status (PES): Employed	0.56
PES: Self-Employed	0.06
PES: Home Duties	0.30
PES: Other	0.08
CESD (Wave 5)	2.27 (2.96)

Table 2a: Presence of Depressive Symptoms (CES-D≥7) by Wave 5 and Covid Wave

Wave 5	Covid Wave	Change	Growth Contribution	Distribution Contribution
0.09	0.22	+0.13	+0.16 121.9%	-0.03 -21.9%

Table 2b: Presence of Depressive Symptoms (CES-D≥7) Covid Wave and Wave 6

Covid Wave	Wave 6	Change	Growth Contribution	Distribution Contribution
0.22	0.14	-0.08	-0.077 96.8%	-0.003 3.2%

Table 2c : Mobility Matrices

Mobility Matrix from Presence of Depressive Symptoms in Wave 5 (rows) to Presence of Depressive Symptoms in Covid Wave (columns)

Depressed Wave 5	Depressed Covid Wave	
	0	**1**
0	0.82	0.18
1	0.42	0.58

Mobility Matrix from Presence of Depressive Symptoms in Covid Wave (rows) to Presence of Depressive Symptoms in Wave 6 (columns)

Depressed Covid Wave	Depressed in Wave 6	
	0	**1**
0	0.93	0.07
1	0.61	0.39

Table 3: Presence of Depressive Symptoms by Education and Wave

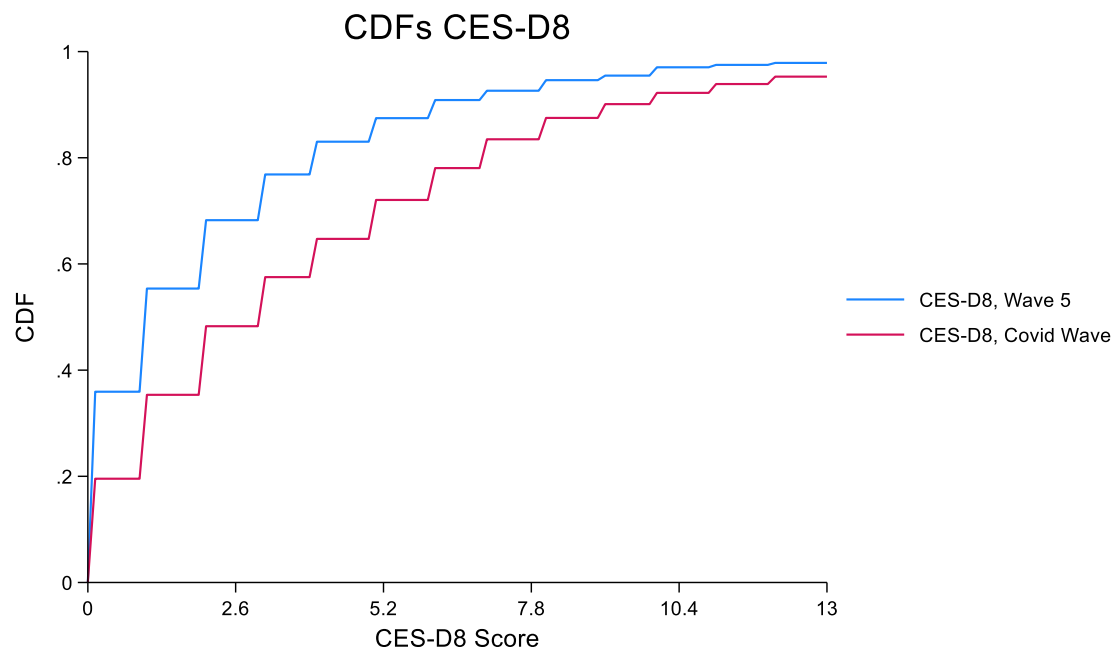|	Wave 5	Covid Wave	Wave 6
Lower Secondary	0.160 (0.051-0.269)	0.314 (0.179-0.449)	0.065 (0.003-0.127)
Completed Secondary	0.105 0.064-0.145)	0.251 (0.200-0.303)	0.182 (0.135-0.230)
Degree/Certificate	0.090 (0.050-0.131)	0.192 (0.144-0.241)	0.131 (0.087-0.176)
Third Level	0.065 (0.046-0.084)	0.188 (0.159-0.216)	0.128 (0.101-0.154)

Table 4: Logit Regessions for Transitions

| Variable	Transition into Depressive Symptoms	Transition out of Depressive Symptoms	Transition out of Depressive Symptoms (restricted)
Age	0.059	0.145	0.303
	(0.113)	(0.154)	(0.188)
Age^2	-0.001	-0.003	-0.005*
	(0.002)	(0.002)	(0.003)
Lower Secondary	0.468	3.180***	4.806***
	(0.452)	(1.031)	(1.381)
Complete Secondary	-0.006	-0.015	0.423
	(0.221)	(0.385)	(0.433)
Degree/Cert	-0.186	0.312	0.408
	(0.218)	(0.416)	(0.496)
CES-D8 Wave 5	0.305***	-0.123***	-0.027
	(0.051)	(0.047)	(0.090)
Child with chronic condition	0.038	-0.441	-0.546
	(0.217)	(0.382)	(0.401)
Chronic Condition	0.007	0.076	0.115
	(0.221)	(0.380)	(0.426)
Carer	0.333	0.641	0.265
	(0.249)	(0.468)	(0.456)
Employed	-0.548***	-0.165	-0.298
	(0.192)	(0.320)	(0.350)
Self-employed	-0.598*	0.484	-0.025
	(0.329)	(0.550)	(0.515)
Married	-0.428*	0.576	0.379
	(0.239)	(0.394)	(0.416)
Smoker	0.427	-0.353	-1.197**
	(0.294)	(0.506)	(0.539)
Problem Drinker	0.686**	0.279	-0.044
	(0.285)	(0.503)	(0.627)
Body Mass Index	-0.020	-0.004	0.003
	(0.018)	(0.029)	(0.032)
Parental Stress	0.046**	-0.101**	-0.047
	(0.023)	(0.042)	(0.043)
Ease making ends meet	-0.226**	0.099	0.307**
	(0.089)	(0.127)	(0.146)
Activities	0.019	-0.074	0.106
	(0.065)	(0.111)	(0.112)
Constant	-1.643	0.616	-4.184
Observations	**1919**	**380**	**301**

Table 5: First Difference Regression for Change in CES-D8

Variable	Change between wave 5 and wave 6
Δ Educational Level	-0.298
	(0.281)
Δ Child with chronic condition	0.056
	(0.210)
Δ Chronic Condition	0.692***
	(0.237)
Δ Employed	0.281
	(0.221)
Δ Self-employed	-0.189
	(0.274)
Δ Parental Stress	0.163***
	(0.026)
Δ Ease making ends meet	-0.205*
	(0.105)
Constant	0.776***
	(0.096)
Observations	**2202**

Figure 1a: Cumulative Distributions for CES-D8, Wave 5 and Covid Wave
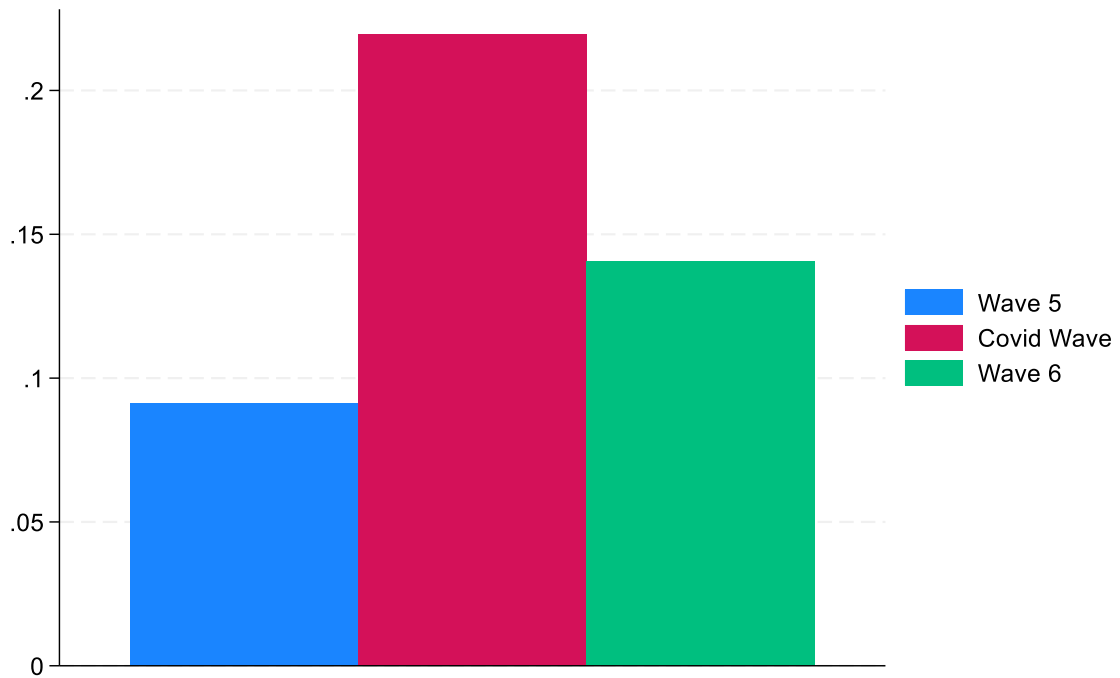

CDFs CES-D8

Figure 1b: Cumulative Distributions for CES-D8, Covid Wave and Wave 6
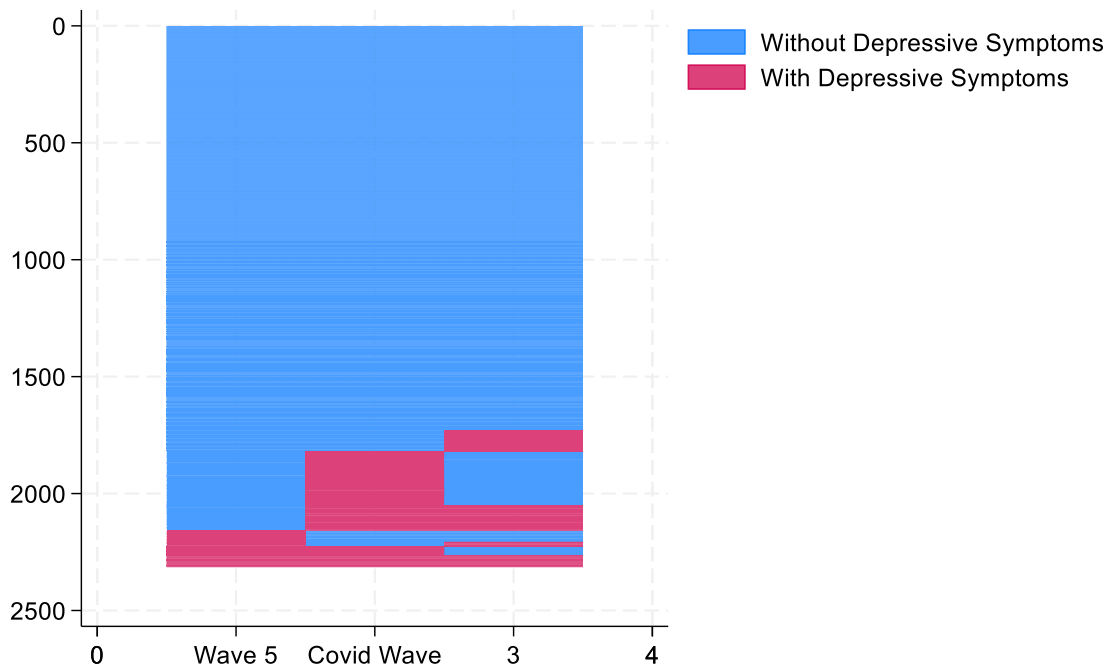

CDFs, CES-D8
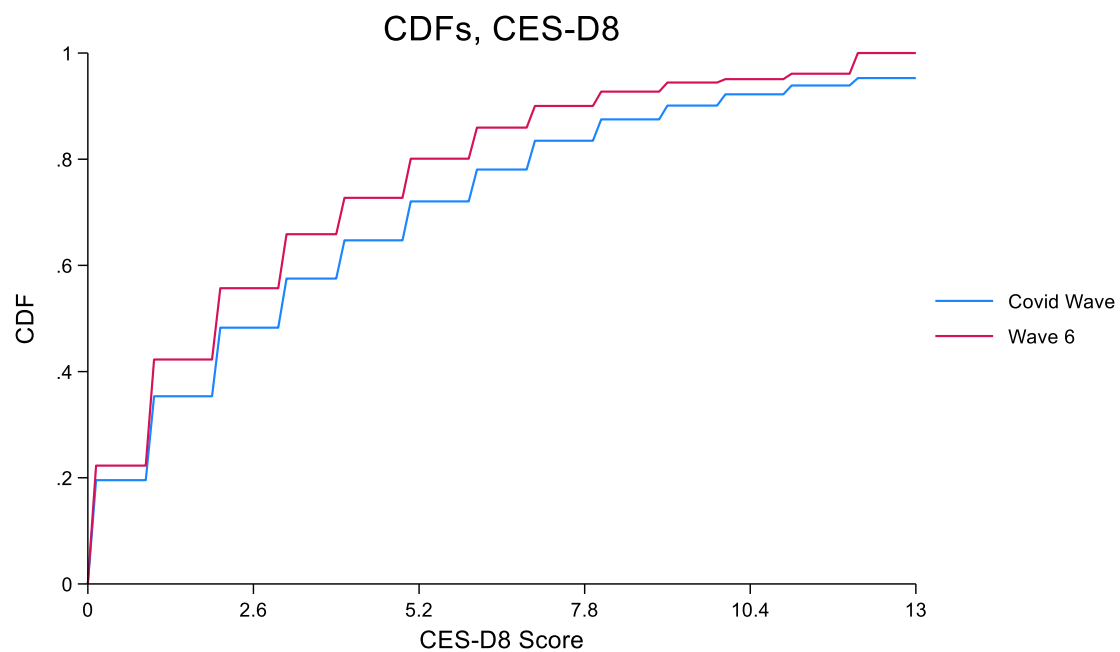
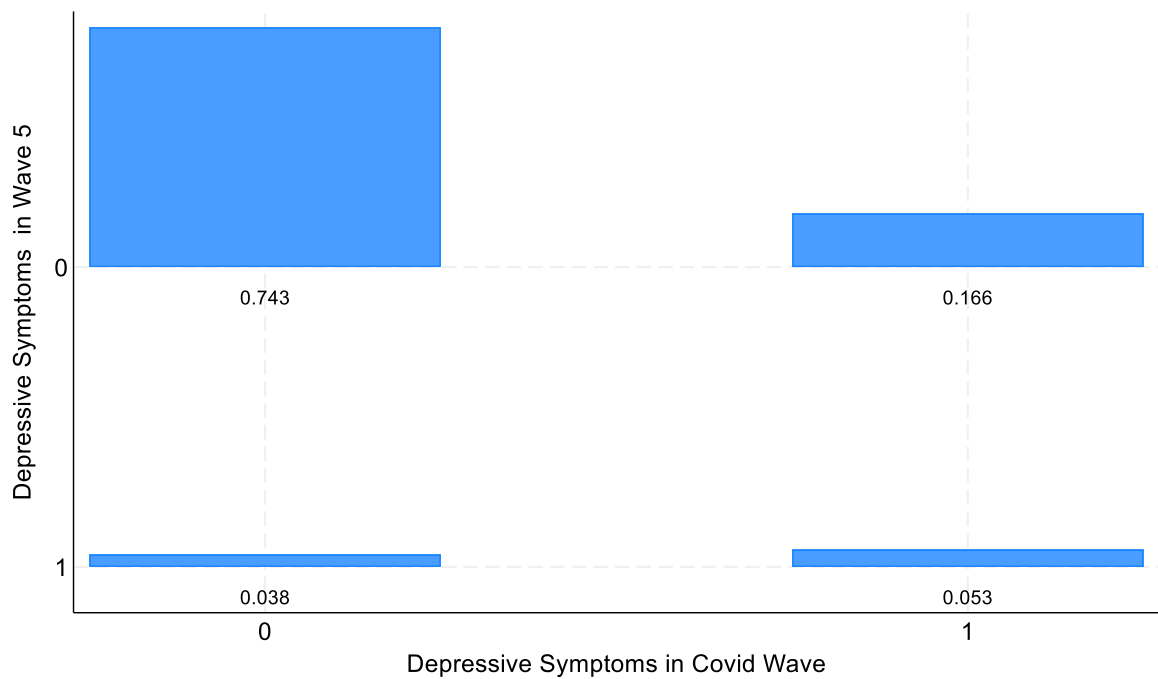**Figure 1c: Cumulative Distributions for CES-D8, Wave 5 and Wave 6**
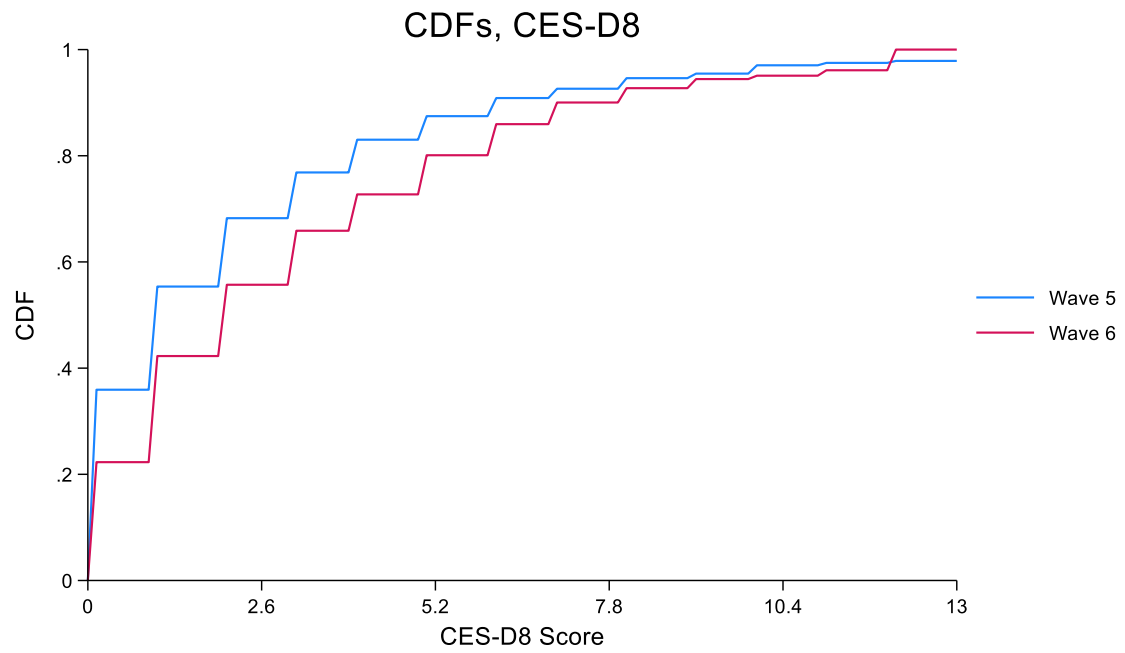
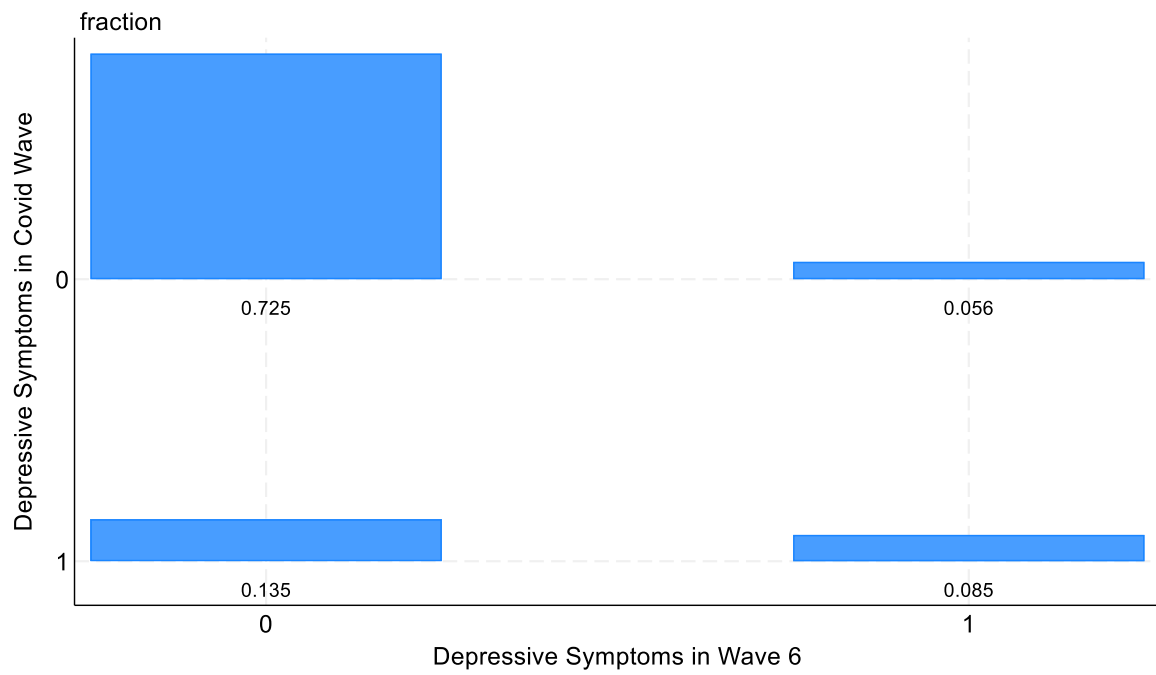**Figure 2 : Proportion with Depressive Symptoms by Wave**

Figure 3 : Sequence Index Plot Between Waves

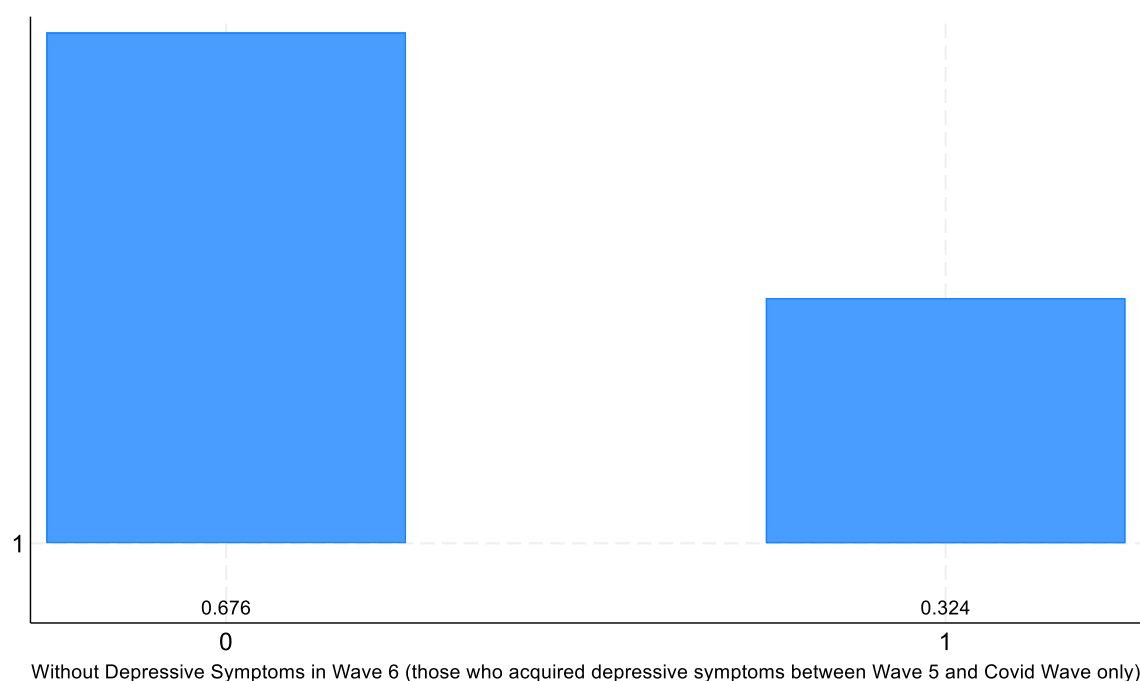## Figure 4a: Transitions between Wave 5 and Covid Wave

Figure 4b: Transitions between Covid Wave and Wave 6

fraction

Depressive Symptoms in Covid Wave

0

0.725

0.056

1

0.135

0.085

0

1

Depressive Symptoms in Wave 6

Figure 4c: Transitions into Depressive Symptoms between Wave 5 and Covid Wave

0

0.817

0.183

0

1

Depressive Symptoms in Covid Wave (of those without depressive symptoms in wave 5)
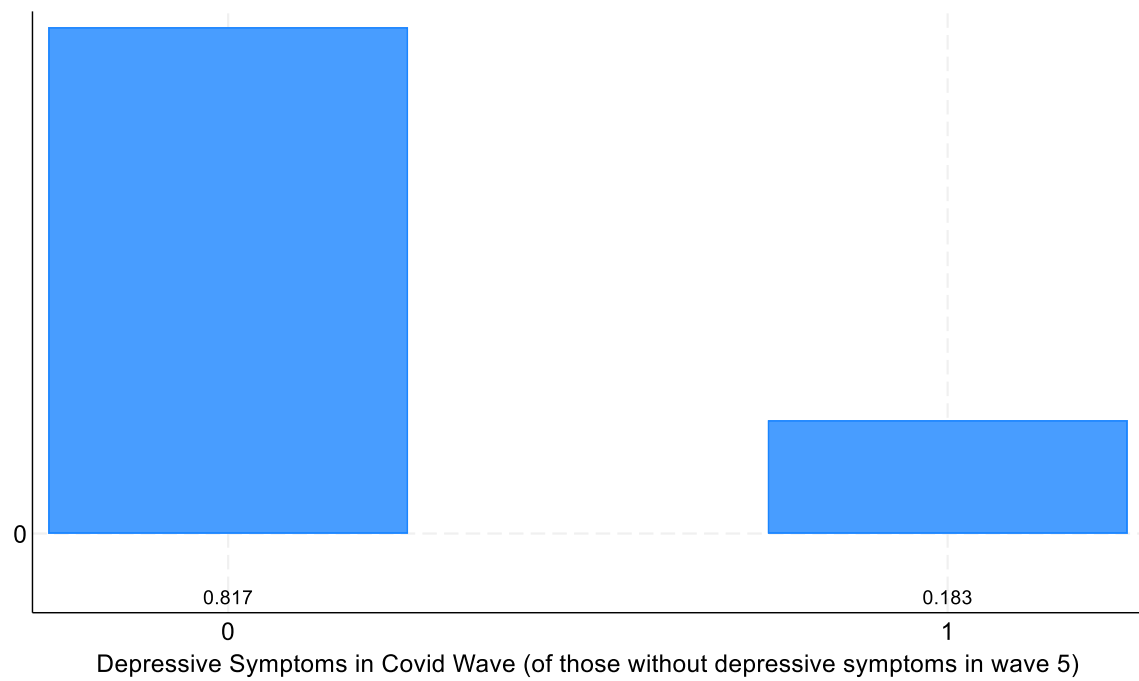
Figure 4d: Transitions into Depressive Symptoms between Covid Wave and Wave 6 (those who transitioned into Depressive Symptoms between Wave 5 and Covid wave only)

Without Depressive Symptoms in Wave 6 (those who acquired depressive symptoms between Wave 5 and Covid Wave only)

Figure 5: Fraction with Depressive Symptoms by Wave and Education Level (95% confidence interval)
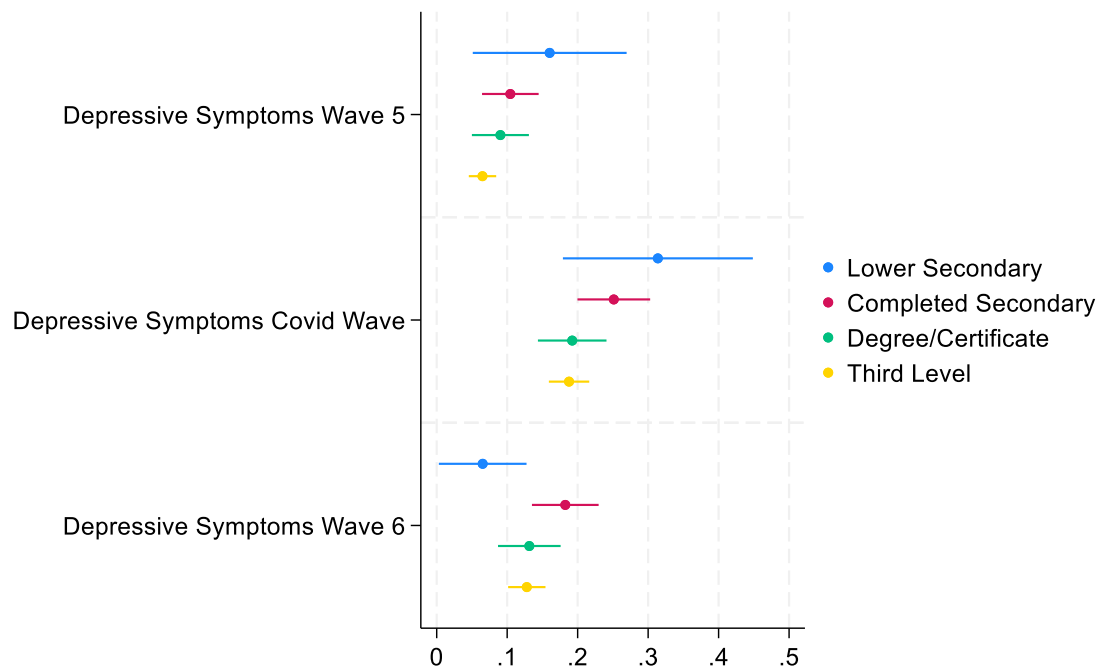
Figure 6a: Transitions into Depressive Symptoms between Wave 5 and Covid Wave, by education
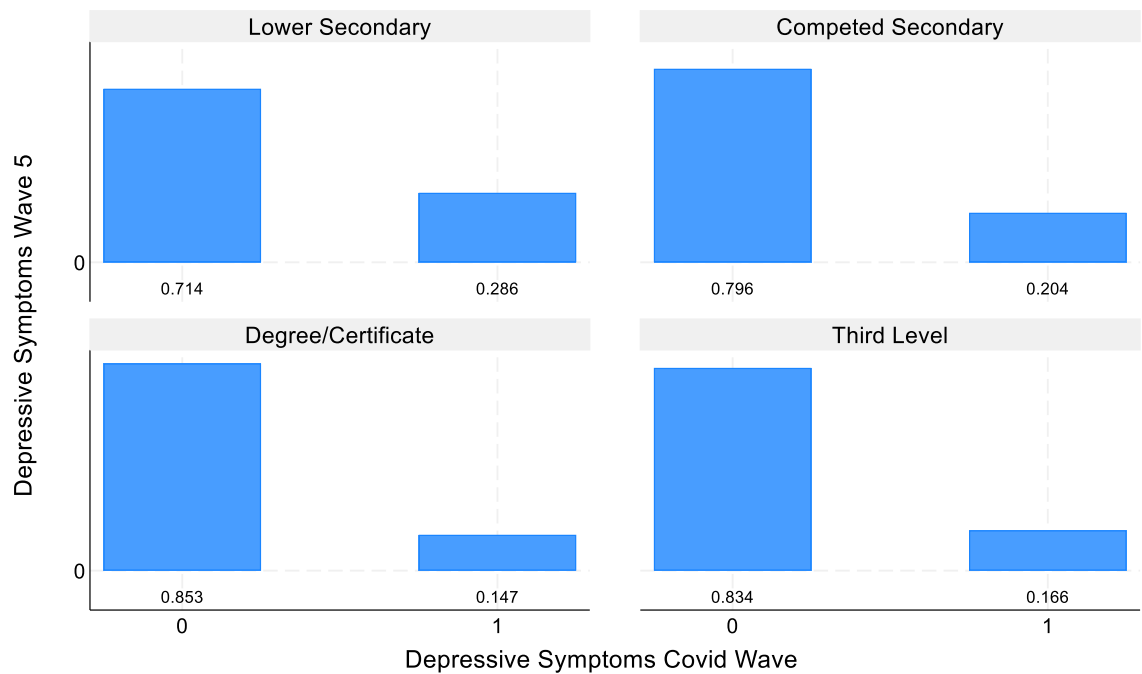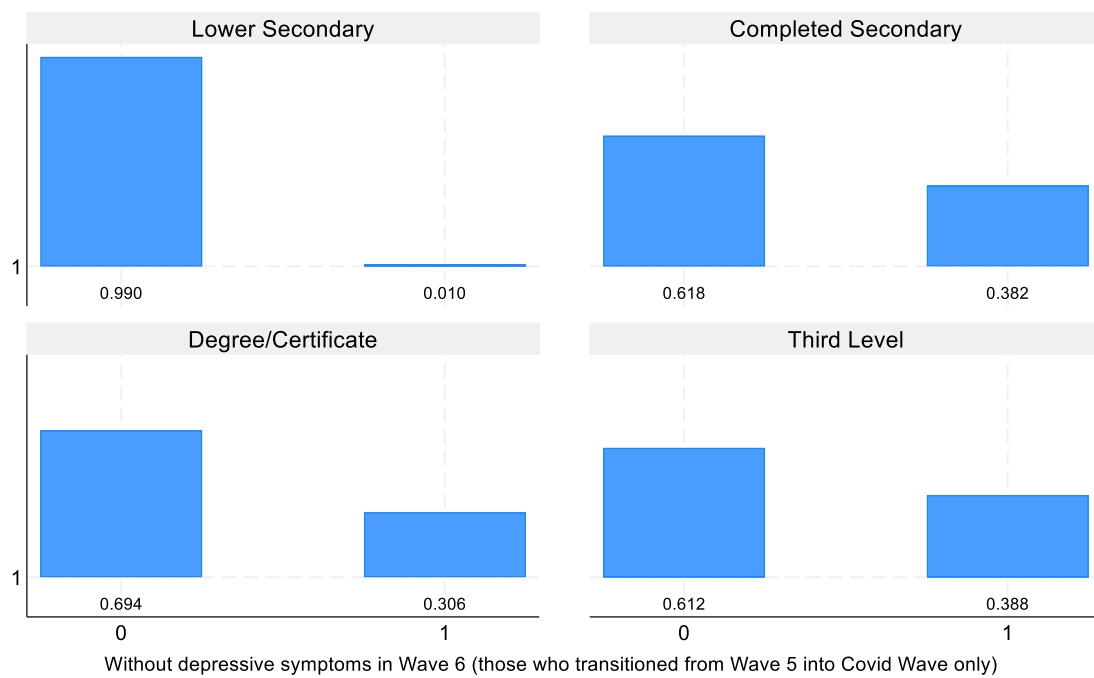
Figure 6b: Transitions out of Depressive Symptoms between Covid Wave and Wave 6 (those who transitioned into Depressive Symptoms between Wave 5 and Covid wave only), by education
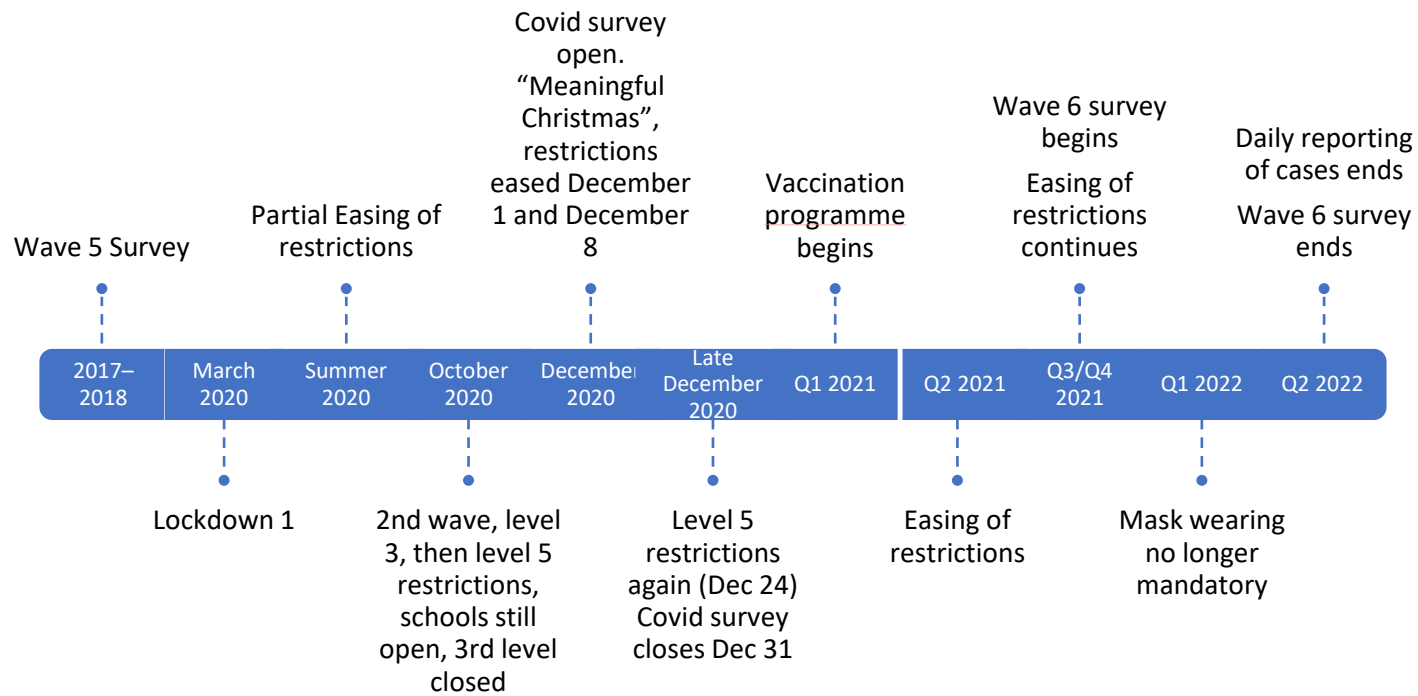

Without depressive symptoms in Wave 6 (those who transitioned from Wave 5 into Covid Wave only)

Appendix Table 1: Details Re Wave 5 Variables Used in Logistic Regression

Variable	Description
Age	Age of respondent in wave 5 (fieldwork, 2017/18)
Education	Response to question "What is the highest level of education you have completed to date?". Responses were combined into four categories: (i) did not complete secondary school (ii) completed secondary school (iii) obtained post-secondary school degree/certificate but not university degree. Omitted category is obtained university degree or higher
CES-D8	Score obtained on Centre for Epidemiological Studies Depression score, values above 13 truncated at 13.
Child Chronic Condition	Response to question "Does child have any longstanding illness, condition or disability?"
Chronic Condition	Response to question "Do you have any on-going chronic physical or mental health problem, illness or disability?".
Carer	Response to question "Do you look after anyone who needs special help or care, for example, someone who is elderly or has a long term illness or who has special needs?"
Employed/Self-employed	Response to question "Which of these descriptions BEST describes your usual situation in regard to work?". Omitted category is home duties/retired/student/unemployed/long-term sick
Married	Response to question "Can you tell me which of these best describes your current marital status?". Omitted categories are divorces/separated/widowed/never married.
Smoker	Response to question "Do you currently smoke daily, occasionally or not at all?".
Problem Drinker	Classification based upon responses to a series of questions regarding alcohol consumption.
Body Mass Index	Measured BMI in wave 5
Parental Stress	One subscale of the Parental Stress Scale (Berry & Jones, 1995), which was designed to assess both positive and negative aspects of parenthood.
Ease of making ends meet	Based upon response to a question "Concerning your household's total monthly or weekly income, with which degree of ease or difficulty is the household able to make ends meet?". 6 possible answers ranging from "with great difficulty" to "very easily".

Activities	Sum of whether person engaged in following activities: going to cinema, sports, cultural events, library, religious attendance, swimming, walking/hiking.

Appendix Table 1: Covid Timeline

Covid survey open. "Meaningful Christmas", restrictions eased December 1 and December 8

Wave 6 survey begins

Daily reporting of cases ends

Vaccination programme begins

Easing of restrictions continues

Wave 6 survey ends

Partial Easing of restrictions

Wave 5 Survey

| 2017–2018 | March 2020 | Summer 2020 | October 2020 | December 2020 | Late December 2020 | Q1 2021 | Q2 2021 | Q3/Q4 2021 | Q1 2022 | Q2 2022 |

Lockdown 1

2nd wave, level 3, then level 5 restrictions, schools still open, 3rd level closed

Level 5 restrictions again (Dec 24) Covid survey closes Dec 31

Easing of restrictions

Mask wearing no longer mandatory

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