

IMPERIAL

EPITOME end of grant showcase: WP1

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MRC
Centre for Environment & Health



Medical
Research
Council

Imperial College
London

Outline

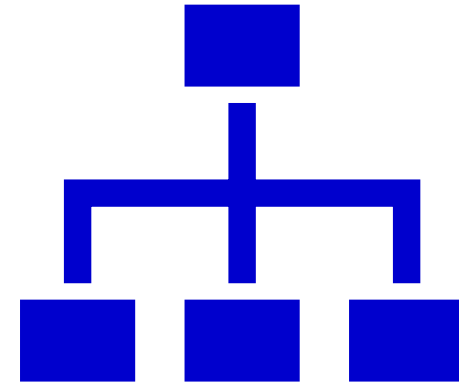
1. Method Development
2. 2010s Welfare Reform
3. 2012 Suicide Prevention
 - a) Suicide trends
 - b) Suicide prevention

Outline

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Backbone of the Grant

- General structure of research problems:
 - Outcome (e.g., measure of depression) measured over time.
 - Intervention applied (i.e., welfare reform).
 - Measure the same outcomes before and after intervention.
 - Unit depends on context (i.e., individual, administrative region).
- Things to consider:
 - Individuals exposed to but not effected by intervention (controls).
 - Important confounders (e.g., age, sex, ethnicity).

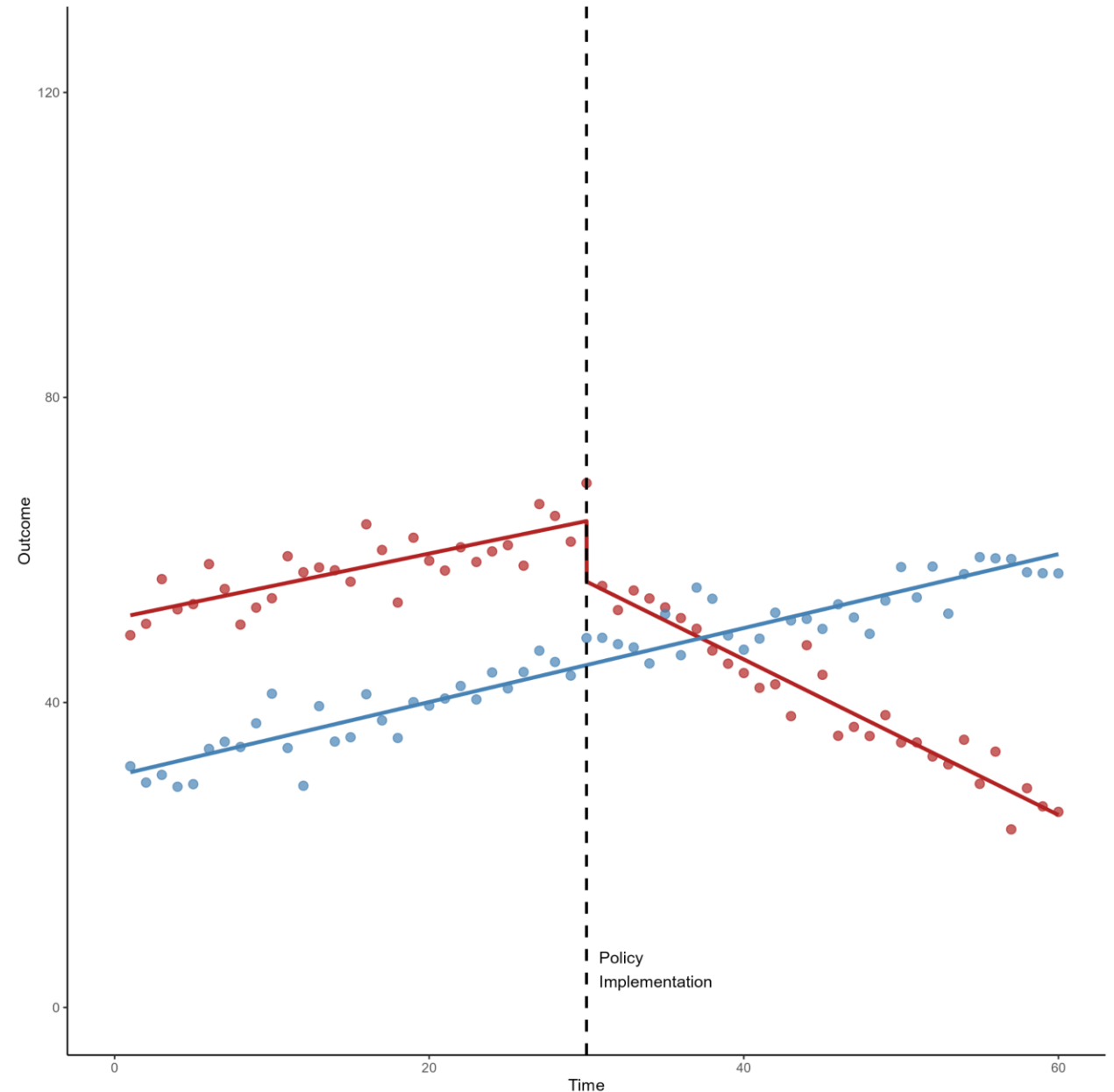


Quasi-Experimental Design

- Cause-and-effect relationships:
 - Gold standard are randomised controlled trials.
 - Ethically impossible when considering real-world policy.
 - Cannot withhold policy from a population for research purposes.
 - Often, we consider policies retrospectively.
- What do we want:
 - Use real-world data.
 - Can be applied retrospectively.
 - Applied to population level analysis.
 - Approximate *potentially* causal inference without randomisation.
- Quasi-experimental designs:
 - Difference-in-difference: compares groups before and after policy implementation.
 - **Interrupted time series**: examines trends in a single population before and after a policy .

Interrupted Time Series

- Basics:
 - Observes outcomes over time.
 - A known 'interruption' points (i.e., policy implemented, shock to system, exposure event, etc...).
 - Compare trends before and after the intervention.
- Measured quantities:
 - Overall temporal trend (or pre policy): what is happening before.
 - Short-term effect: the immediate effect after the policy.
 - Long-term effect: the sustained change from the policy.
- Why this works?
 - Uses routinely collected data.
 - Accounts for pre-existing trends.
 - Can easily extend:
 - Known confounders.
 - Unknown confounders.
 - Control populations.



Now Some Time for the Maths....

Let us assume that $j = 1, 2, \dots, j^*, \dots, J$ and $k = 1, \dots, K$ so that Y_{jk} is the outcome of interest at the j^{th} time point for the k^{th} unit.

Then Y_{jk} comes from the following distribution

$$Y_{jk} \sim \mathcal{D}(\mu_{jk}, \phi)$$

Where:

- $\mathcal{D}$ is a distribution suitable for Generalized Linear Models (GLMs; Normal, Poisson, Binomial,).
- $\mu_{jk} = \mathbb{E}[Y_{jk}]$ is the expected value of the outcome at time j for unit k .
- ϕ is a dispersion parameter available in some distributions (e.g., Normal's variance).

A Little More....

To capture the trends in time and effect of policy on the outcome, we use the following linear predictor

$$g(\mu_{jk}) = \beta_0 + \beta_t t_j + \beta_I I_{jk} + \beta_{t^+} t_{jk}^+$$

Where:

- $g(\cdot)$ is the link function connecting expected value to outcome (e.g., Poisson's log).
- β_0 is the baseline level of the outcome (i.e., when $j = 0$).
- β_t captures the overall temporal trend.
- β_I captures the short-term effect of policy.
- $I_{jk} = \begin{cases} 0, & \text{if } j < j_k^* \\ 1, & \text{if } j_k^* \leq j \end{cases}$
- β_{t^+} captures the short-term effect of policy.
- $t_{jk}^+ = \begin{cases} 0, & \text{if } j < j_k^* \\ j - j_k^* + 1, & \text{if } j_k^* \leq j \end{cases}$

Okay Last One....

Assume Y_{jk} is the outcome of interest at the j^{th} time point for the k^{th} unit, then

$$g(\mu_{jk}) = E_{jk} * (\beta_0 + \beta_t t_j + \beta_l I_{jk} + \beta_{t+} t_{jk}^+) + x'_{jk} \beta_{jk} + z'_{jk} \gamma_{jk}$$

$E_{jk} \in \{0,1\}$ if unit k is treated at time j



To Summarise

Assume Y_{jk} is the outcome of interest at the j^{th} time point for the k^{th} unit, then

$$g(\mu_{jk}) = E_{jk} * (\beta_0 + \beta_t t_j + \beta_I I_{jk} + \beta_{t+} t_{jk}^+) + x'_{jk} \beta_{jk} + z'_{jk} \gamma_{jk}$$

Where:

- $\beta_0, \beta_t, \beta_I$, and β_{t+} account for the baseline and ITS terms.
- $x'_{jk} \beta_{jk}$ accounts any known confounders.
- $z'_{jk} \gamma_{jk}$ accounts for any unknown confounders.
- E_{jk} allows for ITS components to vary by different exposure group(s).

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2010s Welfare Reform



Context

- UK government overhauled welfare in 2010s.
- Change from existing benefits to Universal Credit caused delay in payments, reduced payments, and no payments.
- Vulnerabilities in mental ill-health due to social inequalities.



Aim

- Evaluate the effect of Universal Credit on mental wellbeing.
- Account for difference due to geographical location.
- Propose Bayesian hierarchical controlled Interrupted Time Series.

YOUR QUESTIONS ANSWERED

How often is Universal Credit paid?
Your Universal Credit payment is made directly into your bank account on the same date each month.
Your first payment will usually be made five weeks after the date of your claim. BUT if you need it, the Jobcentre will organise an advance payment, usually made on the very same day if you need money urgently. This can be up to the full amount of the first month's payment, and can be paid back over 12 months, interest free.

What support will I get to find work?
Your work coach will support you every step of the way – and even after you start work if you need them. They can help you access the specific support you need, such as help with writing CVs, identifying job and training opportunities and helping with job applications.
Worrying about childcare costs can also create a real barrier for people looking for work. If you're a working parent on Universal Credit you can claim back up to 85 per cent of your childcare costs, no matter how many hours you work, as long as the childcare provider is registered or approved.
So, what happens if I find a job while I'm on Universal Credit?
With Universal Credit you can now work more than 16 hours and still be supported, so taking a job will always be worthwhile. When you start working or increase your hours, Universal Credit will top up your earnings, so even if you find a temporary job, or just take on a few hours a week, you'll be supported while building your skills and strengthening your CV.
As you begin to earn more, your monthly Universal Credit payment will gradually decrease.

MYTH Universal Credit doesn't work
FACT It does. People move into work faster on Universal Credit

How does it affect me?
If you are currently claiming any of the old benefits, you don't need to do anything at the moment. However, if your circumstances change before then, you may need to make a claim but your Jobcentre can provide more information.
You might not be in a position where you need Universal Credit right now, but if things change for you, Universal Credit will be there to act as a safety net and offer urgent financial and work-related support.

How do I make a claim?
You may be eligible for Universal Credit if you're out of work, or on a low income, are over 18 and a UK resident. To make your claim, all you need to do is visit gov.uk, or visit your local Jobcentre and apply there if that's easier for you.

Find out more about Universal Credit at metro.co.uk/universalcredit

Universal Credit is just one single application – meaning it's much more straightforward

GOV.UK Universal Credit BETA
This is a new service: your feedback will help
Sign in to your Universal Credit account

THOUSANDS OF UNIVERSAL CREDIT CLAIMANTS TO RECEIVE LOWER DWP PAYMENTS FROM APRIL

UC Universal Credit

RETRO Making history in the brigade
PNE fans to see red as new away kit revealed

Lancashire Post WEDNESDAY
Max 16 Min 10
Max 19 Min 11

'Pushed to the brink'

JPIMedia Investigations probe reveals crisis in new benefits system

sky news
EXPLAINS
THE UNIVERSAL CREDIT CONTROVERSY



2010s Welfare Reform



Key Findings

- UC led to 2.36% (95% CrI: 0.57%, 4.37%) increase in GHQ-12 in exposed.
- Geographical areas with largest GHQ-12 increases where more deprived.
- Impact of UC was not uniform across England.



Key Contributions

- Novel Bayesian hierarchical controlled ITS framework.
- Combining policy evaluation with accounting for unmeasured confounding.
- Replicable framework for others...

Original Research

A Bayesian Interrupted Time Series framework for evaluating policy change on mental well-being: An application to England's welfare reform

Connor Gascoigne^a  , Annie Jeffery^b, Zejing Shao^c, Sara Geneletti^d, James B. Kirkbride^b, Gianluca Baio^c, Marta Blangiardo^a



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2012 Suicide Prevention



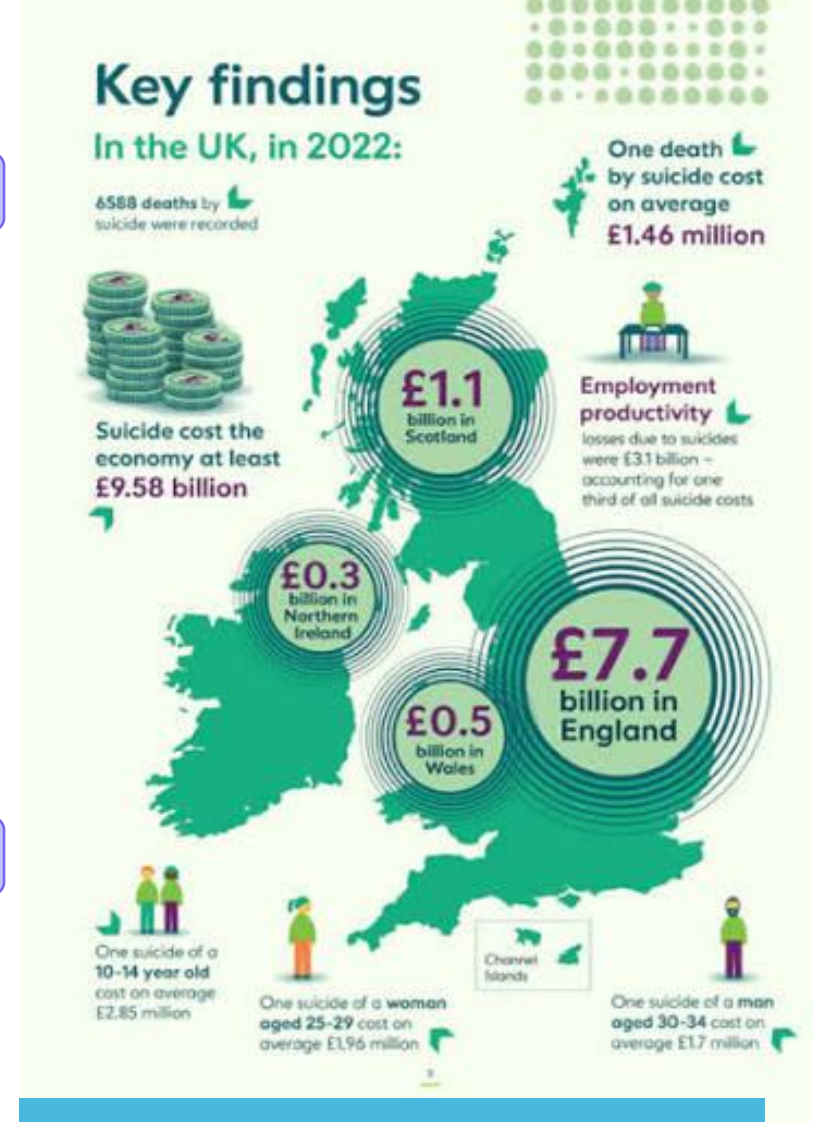
Context

- Between 6,000 - 7,000 suicide deaths in England.
- One suicide death
 - Costs NHS £1.46 million.
 - Affects 5 family and up-to 135 community members.
- England is 1 of 38 countries with suicide prevention.
- In 2012 UK government updated suicide prevention strategy with focus on local, targeted strategies.
- No study looking at suicide trends in time across England.
- No study evaluating UK governments suicide prevention in England.



Aim

1. Update literature on suicide trends in England.
 - i. High resolution in space and time.
 - ii. Examine effect of local community characteristics.
2. Evaluate 2012 suicide prevention scheme:
 - i. Evaluate national effect.
 - ii. Evaluate the implementation of local targeted policies.



**ONE IN FIVE
OF US WILL HAVE
SUICIDAL
THOUGHTS
WITHIN OUR LIFETIME**

**MORE THAN 700,000
PEOPLE DIE DUE TO
SUICIDE EVERY YEAR**

10 SEPTEMBER

World Suicide



**SUICIDE
PREVENTION UK**

**In the UK
14 men
die by suicide
each day**

2012 Suicide Prevention: Suicide Trends



Key Findings

- No substantial change -4.26% (95% CrI: -8.95%, 0.72%) in overall risk of suicide from 2002-2022.
- North East and West consistently above average suicide risk.
- Deprivation and transport risk factors.



Key Contributions

- First high spatio-temporal resolution study on suicides in England.
- Identified community characteristics linked with high suicide risk.
- Gained media attention.

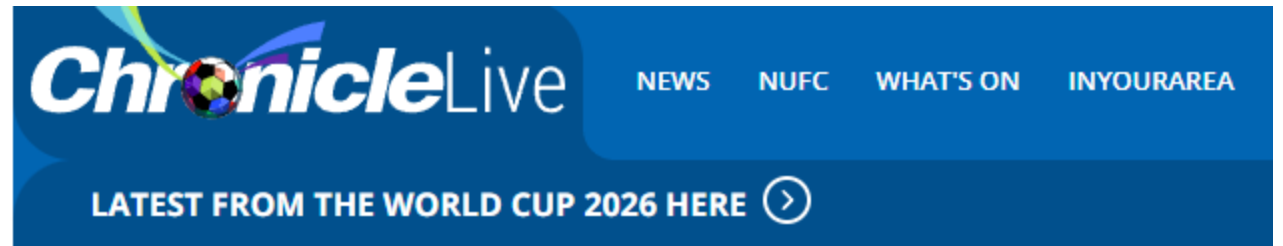


Doctors.net.uk

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Deprivation, transport and population levels all linked to suicide risk in England



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'Little surprise' that North East suicide rates are 40% worse than in London says charity boss

A new study has highlighted the North East's continuing struggle against high suicide rates

2012 Suicide Prevention: Suicide Prevention



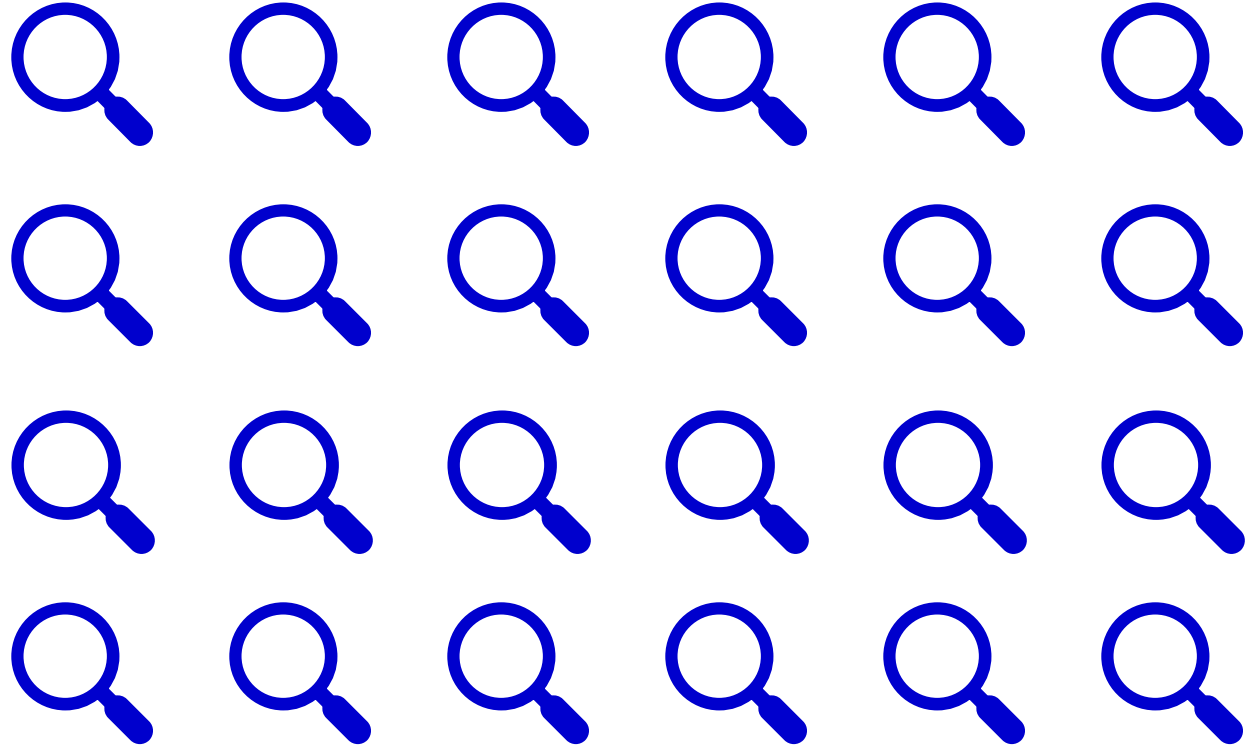
Key Findings

- No substantial evidence of national short- or long-term effect.
- Large local differences in short-term effect.
- No local difference in long-term effect.



Key Contributions

- First quantitative evaluation of 2012 suicide prevention.
- Long-term convergence across local authorities.
- Evidence driven decision making when defining future policies.



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Thank you



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