Social Science & Medicine 279 (2021) 113988

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Policy of free GP care for children under 6 years: The impact on emergency department attendance

Thérèse McDonnell [a,*], Emma Nicholson [a], Michael Barrett [c,i,j], Gerard Bury [g], Claire Collins [h], Fergal Cummins [d], Conor Deasy [e], Kevin Denny [b], Aoife De Brún [a], Conor Hensey [f], Eilish McAuliffe [a]

[a] IRIS Centre, School of Nursing, Midwifery & Health Systems, University College Dublin, Ireland
[b] School of Economics & Geary Institute of Public Policy, University College Dublin, Ireland
[c] Children's Health Ireland at Crumlin, Dublin, Ireland
[d] ALERT, REDSPOT, Emergency Department, Limerick University Hospital, Limerick, Ireland
[e] Cork University Hospital, Cork, Ireland
[f] Children's Health Ireland at Temple St, Dublin, Ireland
[g] School of Medicine, University College Dublin, Ireland
[h] Irish College of General Practitioners (ICGP), Dublin, Ireland
[i] Women's and Children's Health, School of Medicine, University College Dublin, Ireland
[j] National Children's Research Centre, Dublin, Ireland

ARTICLE INFO

Keywords:
Universal health care
Emergency care
General practice
Difference-in-difference
Ireland

ABSTRACT

Universal health coverage (UHC) aims to improve child health. Ireland, the only country in the European Union without universal access to primary care, introduced general practitioner (GP) care at no charge for children aged under six in 2015. This paper aims to evaluate the impact of this policy on attendance at the emergency department (ED).

A difference-in-difference (DiD) analysis was applied to visit records of 367,000 paediatric patients at five hospitals over a period of five years, with treatment and control differentiated by age. DiD was also used to assess if GP referrals and the severity of presentations altered as a consequence of this policy.

While existing research estimates that this policy increased attendance by children aged under six at general practice by over 25%, this policy did not lead to a reduction in ED attendance. Hospital level effects on attendance varied from no impact to increased attendance by children aged under six of 28.9%. While increased GP referrals, particularly for injury and medical reasons, indicated more patients presented to their GP prior to ED attendance, walk-ins without referral did not decrease.

Attendance increased at both regional hospitals, which also had the highest proportion of GP referred visits. While the marginal probability of a visit being GP referred increased at four of the five hospitals in this study, only in two of these can the entire effect be attributed to the introduction of this policy (effects 1.4 and 1.8 percentage points).

Previous unmet need, capacity constraints in general practice, regional variability in the GP to population ratio, restricted hours of access to GPs, coupled with faster access to diagnostics in the ED setting, may explain variability in the effect and why the expected reduction in ED attendances did not occur.

1. Introduction

Child health is an important form of human capital (Currie, 2020; Mitra et al., 2017), with childhood health linked to longevity, higher levels of education, and higher wages in adulthood. Policymakers can promote better child health by relaxing constraints on families by providing access to health care (Currie, 2020). Universal health coverage (UHC), defined as access to effective and affordable health

* Corresponding author. IRIS Centre, UCD School of Nursing, Midwifery & Health Systems, B113 Health Sciences, University College Dublin, Belfield, Dublin 4, Ireland.
E-mail address: therese.mcdonnell@ucd.ie (T. McDonnell).

https://doi.org/10.1016/j.socscimed.2021.113988
Received in revised form 30 March 2021; Accepted 29 April 2021
Available online 4 May 2021

services, has been identified by the World Health Organisation (WHO) as a key strategic priority in achieving more equitable health outcomes (Narbutas et al., 2015; O'Connell et al., 2014). Free at the point of delivery healthcare provision to those on low incomes in the US through enhanced access to Medicaid has had beneficial effects on health outcomes for children, including improving mortality and later life outcomes (Currie et al., 2008). The provision of accessible high-quality primary care is viewed as a critical step to achieving equity (Currie et al., 2008; Cecil et al., 2016), with greater access to general practitioners (GPs) associated with improved patient outcomes and a reduced likelihood of visiting an ED (Cecil et al., 2016), and high uptake of preventive primary care from birth associated with fewer unplanned and ambulatory care sensitive hospital admissions in children (Cecil et al., 2018). Paediatric ED attendances are increasing in many countries (Benahmed et al., 2012; Centers for Disease Control and Prevention, 2015), prompting calls for a more in-depth understanding of the relationship between inequities in primary care access and avoidable hospital attendance (Centers for Disease Control and Prevention, 2015). Reducing attendances at EDs, particularly low urgency presentations, could have a significant effect on the quality and continuity of care provided to patients, and also on the overall cost of this service (McHale et al., 2013).

Ireland is the only country in the European Union that does not offer universal coverage for primary care (Thomson, 2014). As of 2017, 43% of the population qualified for free access to general practice care (Department of Health, 2019) as holders of either a General Medical Services (GMS) (33%) or GP visit (10%) card, with the remainder paying an average of €51 per visit to their GP (The Competition Authority, 2010) or an out-of-hours service. The GMS scheme entitles patients with incomes below a threshold or with specified illnesses to publicly funded GP visits, medication at a nominal cost, as well other services, while a GP visit card, also granted on an income basis with a threshold above that of the GMS scheme, provides access at no charge to a GP. GPs in Ireland are self-employed and are reimbursed for treating public patients through an annual capitation payment for patients that hold a GMS or GP visit card. In an effort to initiate the transition from a mixed public and privately funded health system to a system of universal healthcare (Department of Health, 2014), all those aged under six and over 70-years became entitled to GP visit cards in July 2015, regardless of income. 132,000 children aged under six were entitled to free GP care as holders of either a GMS or GP visit card at the time this policy was introduced. An additional 309,000 children became entitled to attend their GP at no charge from July 1, 2015 (Health Service Executive, 2015). Reimbursement for the under-six scheme is at an annual rate of €125 per registered patient, plus additional payments for specific services such as asthma care. The policy was introduced at a time of decreasing numbers of GPs, and some GPs were in opposition to its' introduction due to concerns about capacity within general practice (Goodey, 2015). Evidence from other countries following the expansion of health insurance for children does suggest that an increase in general practice attendance by this cohort was to be expected. The expansion of the Medicaid/Children's Health Insurance Program in the US led to increased use of medical care (Howell and Kenney, 2012), with the introduction of health insurance programs for children in a number of low- and middle-income countries also having a positive effect on utilisation (Mitra et al., 2017). Indeed, this policy is estimated to have increased attendance by children aged under six at general practice in Ireland by 25–29% (Nolan and Layte, 2017; O'Callaghan et al., 2018). Using data from two waves of Growing-up in Ireland, Nolan and Layte (2017) use a change in healthcare entitlements to assess changes in healthcare utilisation and find that gaining a medical card increased GP attendance for the infant cohort (aged three at wave 2) by 25%. However, the authors do caution that the effect of gaining a GP visit card may be less due to the broader entitlements that attach to the medical card.

Emergency Department care in Ireland is available through 29 publicly funded hospitals that operate on a 24/7 basis (Smith et al., 2019). Attendance costs €100 per visit, although it is free to holders of a GMS card, those referred by a GP, or patients arriving by emergency ambulance. Local injury units (LIUs) also treat minor injuries, though not all see paediatric patients. Out-of-hours general practice co-operatives provide urgent care at multiple sites throughout the country, with 1.12m visits in 2019 (Health Service Executive, 2020). In addition, private hospitals provide emergency care on a limited basis, with defined opening hours and age restrictions.

GP and ED care frequently have a symbiotic relationship. Increasing access to primary care services by the removal of out-of-pocket charges while a fee of €100 for attendance at an ED for those without a medical card remained, could reasonably be expected to incentivise parents of children with less-urgent conditions to attend their GP in preference to the ED (Lawless, 2019), resulting in better overall health system resource utilisation. Indeed, a UK study found that increasing access to general practice did lead to a reduction in ED attendance (Dolton and Pathania, 2016). However, there are multiple complex factors that influence parents' decision-making regarding where, when and why they seek unscheduled healthcare for their children (Nicholson et al., 2020). Issues around availability, access to, and confidence in GP care are frequently cited as reasons for increased attendances at the ED, with the perceived urgency of the condition also noted (Cecil et al., 2016; Coster et al., 2017) Cost and the availability of transport to and from healthcare services also matter (Coster et al., 2017).

However, the availability of GP care at no charge may not decrease ED attendance for a number of reasons. GPs should act as a gatekeeper for the more expensive secondary and tertiary care services, referring patients to the ED only when in need of emergency diagnostic and specialist resources. In the aforementioned UK study (Dolton and Pathania, 2016), increased accessibility meant the provision of a seven-day GP service, and the fundholding payment structure meant GPs were financially incentivised to act as gatekeepers. As the under-six policy changes GPs remuneration from a fee-for-service to a capitation basis, their gatekeeping role is clinical and not financial as they do not bear the cost of ED utilisation by their patients. Therefore, the increased workload arising from this policy (O'Callaghan et al., 2018) may incentivise some GPs to rely more heavily on the ED. Furthermore, while the under-six policy removed the barrier of cost, supply constraints within general practice may mean accessing timely appointments is more challenging for parents, leading to a continued dependence on the ED. Increased attendance at general practice may also indicate previously unmet need, with GPs needing to refer additional patients to the ED.

The only study of attendances at Irish EDs following the introduction of this policy used national attendance data available from January 2015 and identified no change in the rate of attendance by children aged under six, though a 2-percentage point increase in GP referrals to EDs for this cohort was identified (Walsh et al., 2019). However, data constraints meant this study could not examine the common trend assumption that underpins the difference-in-difference estimation. In order to assess this assumption and the impact of this policy in more detail, data was extracted from five hospitals which collectively represent approximately 48% of annual paediatric ED attendances nationally (Smyth et al., 2017). Applying an estimation strategy consistent with Walsh et al. (2019), our study uses data for a five-year period from July 1, 2013 to June 30, 2018, with the two-year pre-policy period allowing for a robust assessment of the common trend assumption. As the hospital level data includes diagnosis/presenting complaint not available at national level at this time, our study also allows variation in the impact of this policy by reason for attendance to be assessed. Furthermore, the three-year post-policy period also better represents the establishment and embedding of patient behaviours. Finally, our study probes how local factors and constraints may lead to regional/hospital level variation in the policy effect, factors which may be masked at a national level.

This study hypothesises that if cost is a major factor for parents accessing healthcare for their children, and GP incentives and supply

remain constant, the introduction of free GP care for children aged under six will lead to a reduction in ED attendance by this cohort. Increased attendance at general practice (O'Callaghan et al., 2018) will result in a proportionate increase in GP referrals to the ED, which should be offset by a larger overall decrease in walk-ins at the ED as more parents of this young cohort opt for care by their GP.

2. Method

2.1. Study population

This paper aims to assess the impact of the provision of a GP visit card to eligible children aged under six on ED attendance (McAuliffe et al., 2020). The study uses data from three paediatric EDs located in Dublin (D1, D2 and D3) and two mixed adult/paediatric EDs located in Cork (R1) and Limerick (R2).

As the definition of a paediatric patient in Ireland is below the age of 16 (Health Service Executive & Royal College of Physicians in Ireland, 2018), visits by children aged 15 and under were assessed to determine the impact of this policy. Patients referred from other hospitals and repeat visits for the same complaint (including scheduled return visits) were excluded. Data on the following variables were extracted from the administrative systems of the ED at each of the five hospitals: ED visit date and time, gender, month and year of birth, anonymised patient identifier that connects visits at each hospital (though not between hospitals) for each patient, a binary indicator of medical card status, mode of arrival (car, walking, ambulance, other), source of referral (walk-in or GP referral), presenting complaint, diagnosis (Dublin hospitals only), triage score (1 is most urgent and 5 is least urgent) and discharge outcome (home, admission, referral, transfer). The recording of diagnosis did not follow a uniform coding structure at the three participating Dublin hospitals. Using ICD-10 classification by chapter (WHO, 2020) as a guide and with expert clinical oversight, a detailed mapping exercise was undertaken to ensure consistent categorisation of diagnosis both across hospitals and over time (Appendix Table A1).

This study expressed visits as a rate per population to provide a proportionate measure of utilisation. The population of children aged under six decreased over the five years of this study period and the population of the comparison cohort, children aged six to 15, increased year-on-year. Therefore, to ensure changes in population did not influence the assessment of the policy impact, the analysis of visits was expressed as a rate per 10,000 per each single year of age (SYOA) based on Ireland's Census 2016, with movements in population for post-census periods based on changes in births. As patients are free to attend the ED of their choice, private EDs or LIUs, each hospital does not have a delineated catchment area. Therefore, this study assumed a catchment area using regional authority areas as a guide. As the three Dublin hospitals are in close proximity and draw most patients from Dublin and the surrounding counties, this study assessed the impact of this policy on attendance rates for these three hospitals in aggregate. However, the impact of the policy on the rate of GP referrals, admissions and severity were assessed at hospital level as these outcomes are not dependent on population measures.

2.2. Statistical methodology

The difference-in-difference (DiD) quasi-experimental design makes use of longitudinal data to obtain a relevant counterfactual to estimate a causal effect by comparing the changes in outcomes over time between a population that is enrolled in a programme (children aged under six) and a population that is not (children aged six to 15). DiD removes biases that could result from permanent unobserved differences between both groups, and from comparisons over time in the treatment group that could be the result of trends due to other causes of the outcome (Angrist and Pischke, 2008).

Adopting an estimation strategy consistent with that used by Walsh et al. (2019), the impact of the policy on visits is assessed using the following model:

$$\Sigma \frac{V_{am}}{Pop_{am}} = b_0 + b_1 Under6 + b_2 Post + b_3 Under6{*}Post + b_4 X_{am} + b_5 Month + U_{am} \quad (1)$$

where V is visits per age cohort (a) per month (m) per 10,000 SYOA, *Under6* is a binary indicator of an age group under six with children aged six to 15 as the control. *Post* indicates a period after the introduction of the policy with the control being months in the two-year period pre-policy. The coefficient b_2 captures time trends common to both treatment and comparison groups. The b_3 parameter measures the effect of the policy and is estimated using ordinary least squares regression. $\boldsymbol{X}$ is a vector of controls at the age and month level, and includes the proportionate attendance by gender, medical card, GP referred, severity (admission rate, triaged as urgent), and evening or weekend attendance rate. Calendar month (*Month*) captures fixed effects for seasonality and U is the error term. The total model includes hospital level fixed effects (R1, R2 and Dublin). As this outcome may not be normally distributed, estimates were cross-checked against estimates using a maximum likelihood Poisson estimator.

A linear probability model (OLS) was also estimated at the individual level to assess the marginal effect of the policy on GP referrals:

$$y_i = b_0 + b_1 Under6 + b_2 Post + b_3 Under6{*}Post + b_4 X_i + b_5 Month + U_i \quad (2)$$

where y_i is the probability of the visit by individual i being a GP referral, including out-of-hours, versus a walk-in, and covariates X_i includes gender, medical card status, indicator of weekend or weekday late attendance, triage urgency and whether the patient was admitted. Similar estimation is carried out to assess the impact of the policy on admissions and of the visit being triaged as either urgent or low urgency. Models were estimated in aggregate with hospital fixed effects, and at hospital level to determine variability in the policy effect.

All models were estimated with and without controls that may be influenced by the policy (GP referral, out-of-hours, severity, admission). Variation in the effect over the three years post-policy was also assessed. Sub-group analysis was carried out by GP referral status, diagnosis/presenting complaint and by time of attendance, to better understand the variation in the impact of the policy.

2.2.1. Common trend assumption

One of the most common problems with DiD estimates is the failure of the common trend assumption. This assumption is untestable, as the counterfactual is not observed. However, by examining pre-intervention trends using a number of methods, we assessed if this assumption was reasonable. Firstly, each model was estimated using data for the two pre-policy periods only, with year two (2014/15) treated as a placebo post-treatment period. A significant effect between year one and year two would suggest that the pre-treatment time trend for both groups was not comparable (Test 1). Secondly, a fully flexible difference-in-difference model proposed by Mora and Reggio (2012) was used to test for common pre-treatment dynamics (Test 2) (Mora and Reggio, 2012; Mora, 2015). Furthermore, a DiD model was estimated for each of the two pre-treatment periods allowing the consistency of estimated results to be assessed. Finally, the trend in outcomes over time for both cohorts were assessed graphically.

3. Results

3.1. Profile of participating hospitals

Table 1 details key statistics on each participating hospital. ED attendance at each of the Dublin hospitals (D1, D2 and D3) was

Table 1
Characteristics by hospital: visits by patients aged 15 and under over the 5-year study period.

	Total	R1	R2	D1	D2	D3
Number of visits (excluding hospital transfers and returns)	**670,975**	60,894	65,703	150,509	157,359	236,510
Number of patients	**367,405**	42,227	47,469	85,673	81,516	110,520
Average visits per patient	**1.83**	1.44	1.38	1.76	1.93	2.14
Male	**55.6%**	56.2%	55.8%	55.5%	55.7%	55.3%
GP referral rate (includes Out-of-hours)	**34.7%**	59.4%	60.4%	39.6%	26.8%	23.4%
Triaged as urgent (Score of 1 or 2)	**19.8%**	26.2%	18.5%	22.2%	18.3%	18.2%
Triaged as low urgency (Score of 4 or 5)	**37.5%**	18.8%	9.2%	37.0%	42.8%	46.8%
Visits that result in a hospital admission	**14.3%**	22.7%	24.8%	16.6%	12.9%	8.68%
Age profile:						
Under 2	**28.1%**	25.7%	28.2%	23.6%	31.6%	29.3%
Aged 2 to 5	**29.2%**	29.9%	29.7%	28.7%	29.3%	29.3%
Aged 6 to 9	**17.1%**	18.7%	16.6%	17.9%	16.5%	16.6%
Aged 10 to 12	**12.7%**	12.0%	11.9%	14.8%	11.8%	12.2%
Aged 13 to 15	**12.9%**	13.7%	13.7%	15.0%	10.9%	12.6%
Visits by time:						
Monday-Friday 8am to 5.59pm	**43.2%**	41.8%	43.2%	43.3%	42.7%	43.9%
Monday-Friday Late: 6pm to 7.59am	**30.6%**	32.2%	31.2%	30.8%	30.6%	29.9%
Weekend (Saturday, Sunday and bank holidays)	**26.2%**	26.0%	25.6%	25.9%	26.8%	26.2%
Average monthly paediatric attendance	**11,183**	1015	1095	2508	2623	3942

substantially greater than attendance at each of the two regional hospitals (R1 and R2), reflecting the size of the local population. The average number of visits per patient was also higher for the Dublin hospitals, while GP referrals and admissions were lower. 57.3% of paediatric visits were by children aged under six, with children aged under two accounting for 28.1% of overall visits.

Fig. 1 shows the annual population adjusted number of visits by age for each of the five years of this study. Visits by children aged under six increased year-on-year, though attendance by children aged between six and eight also increased in the post-policy period. The increase across all ages is concentrated over two hospitals, R1 and R2.

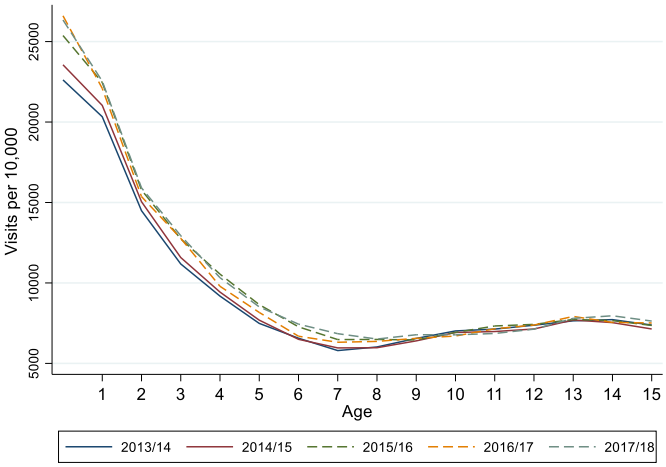

Fig. 1. Annual emergency department attendance.

Table 2
Under 6 and 6 and Over - key statistics.

Mean (*std dev*)	Under 6			Aged 6 and Over		
	Pre	Post	% Δ	Pre	Post	% Δ
Monthly visits	6305 *(719)*	6485 *(832)*	3%	4535 *(569)*	4926 *(654)*	9%
GP referral rate	31% *(2%)*	35% *(2%)*	10%	32% *(3%)*	32% *(3%)*	0%
Triaged as urgent (score of 1 or 2)	20% *(2%)*	23% *(2%)*	16%	15% *(1%)*	17% *(1%)*	15%
Triaged as low urgency (score of 4 or 5)	36% *(3%)*	32% *(2%)*	−10%	46% *(2%)*	44% *(2%)*	−4%
Hospital admissions	17% *(1%)*	16% *(1%)*	−2%	14% *(1%)*	14% *(1%)*	−5%
DUBLIN – MONTHLY VISITS BY DIAGNOSIS						
Injury	1272 *(198)*	1243 *(192)*	−2%	1948 *(423)*	2054 *(453)*	5%
Respiratory	1137 *(523)*	1226 *(558)*	8%	196 *(68)*	232 *(83)*	18%
Digestive	694 *(232)*	563 *(153)*	−19%	371 *(68)*	385 *(83)*	4%
Medical	689 *(38)*	681 *(48)*	−1%	457 *(42)*	514 *(56)*	13%
Infectious Disease	500 *(79)*	590 *(130)*	18%	122 *(31)*	173 *(82)*	41%
Ear Nose Throat	401 *(83)*	383 *(81)*	−4%	183 *(36)*	193 *(32)*	6%
Surgical	99 *(13)*	85 *(11)*	−15%	120 *(14)*	129 *(18)*	8%
Normal	214 *(22)*	257 *(33)*	20%	105 *(23)*	141 *(26)*	34%
Did not wait	193 *(72)*	203 *(82)*	5%	112 *(43)*	126 *(51)*	13%
REGIONAL – MONTHLY VISITS BY PRESENTING COMPLAINT						
Injury	344 *(60)*	354 *(63)*	3%	432 *(101)*	401 *(93)*	−7%
Respiratory	126 *(58)*	181 *(94)*	43%	44 *(10)*	53 *(15)*	21%
Other	633 *(104)*	722 *(3)*	14%	401 *(46)*	468 *(83)*	17%

Standard deviations are in parenthesis.
Diagnosis is not available for R1 & R2. Presenting complaint is assigned on arrival at the ED. Categorisation is not based on clinical examination and is therefore not directly comparable with diagnosis.
Normal refers to patients for whom no illness was diagnosed. *Did not wait* refers to patients who left before diagnosis – often a function of wait-time during busy periods.

3.2. Profile of attendance: pre- and post-policy

Table 2 details key statistics before and after the introduction of the policy. Visits by both children under six and those six and older increased and the level of increase was greater for the older cohort. The proportion of visits by children under six that were GP referred increased post-policy, admissions decreased, while the proportion of patients triaged as urgent increased and low urgency decreased post-policy for both cohorts.

34% of visits to the Dublin EDs and 36% of visits to the regional hospitals related to *Injury*, and children aged six and over were more likely to present for this reason. *Respiratory* attendances represented approximately 15% of all attendances at the Dublin EDs and 10% of visits at regional hospitals. The only note-worthy decrease for the under sixes was *Digestive* presentations at the Dublin hospitals, which decreased by 17% post-policy, while attendance by the older cohort increased by 5%.

3.3. Rate of attendance

Table 3 details the impact of the policy on the number of ED visits per month for each single year of age (SYOA) expressed as a rate per 10,000 of population at that age (i.e. the proportionate use) for the two Regional hospitals (R1 and R2) and for the three Dublin hospitals in aggregate (*Dublin*). The overall policy effect, identified by the interaction between *Under 6* and *Post,* increased the aggregate monthly rate of attendance at the ED by 0.16 percentage points (2.13 pp annually). However, the effect was concentrated over the regional hospitals, with a marginal effect for R1 of 0.34 representing a 28.9% increase in the mean monthly population adjusted visit rate for children aged under six, and 14.8% at R2. The effect was persistent and increasing for R1 over each of the three post-policy years, while the R2 effect was significant and increasing in years two and three post policy. The overall effect was only statistically significant in 2017/18, three years after the policy was introduced. There was no statistically significant effect for the consolidated Dublin hospitals.

Table 3
Measuring the effect of free GP care for Under 6s on rate of visitation to Emergency Departments.

	All	R1	R2	Dublin
Under6	82.743***	38.878***	79.727***	64.013***
	(5.905)	(3.790)	(6.683)	(11.940)
Post	−4.580	−1.933	−9.467*	−43.553***
	(5.152)	(3.149)	(5.371)	(11.684)
Under6 * Post	**16.059***	**33.837*****	**26.431*****	**−1.709**
	(8.238)	(5.166)	(8.278)	(15.411)
Hospital fixed effects	Yes	n/a	n/a	n/a
Observations	2880	960	960	960
R-squared	0.701	0.648	0.616	0.777
Pre-policy mean monthly visits/SYOA (per 10,000):				
All	210.20	91.01	131.47	276.17
Under 6s	281.05	117.85	178.10	364.76
Test 1 (p-value)	0.412	0.138	0.378	0.388
Test 2 (p value)	0.442	0.246	0.498	0.492
Policy Effect by Year				
Under6 * 2015/16	**10.442**	**26.520*****	**14.557**	**−2.528**
	(11.215)	(6.726)	(9.700)	(22.334)
Under6 * 2016/17	**12.150**	**36.064*****	**19.831***	**−17.269**
	(10.961)	(6.976)	(11.341)	(20.694)
Under6 * 2017/18	**25.790****	**38.970*****	**47.865*****	**19.472**
	(11.431)	(6.817)	(11.184)	(19.351)
Policy Effect by GP referral status				
GP Referred	**20.524*****	**32.812*****	**14.851*****	**7.284**
	(4.012)	(3.338)	(5.487)	(5.233)
Walk-in	**5.044**	**4.169****	**11.303*****	**9.938**
	(4.310)	(1.988)	(3.048)	(10.105)

Each SYOA weighted by annual volume of attendance at hospital level.
Robust standard errors in parentheses ***p < 0.01, **p < 0.05, *p < 0.1.
Standard errors are clustered at month level.
Test 1: placebo test: p-value of coefficient model is restricted to 2013/14 and 2014/15 and *Post* is set as 2014/15.
Test 2: p-value for common pre-treatment dynamics.
Policy effect in bold

3.4. GP referrals

Table 3 also splits the interaction effect (*Under6*Post*) by referral source, and both regional hospitals experienced an increase in visits by children aged under six referred to the ED by a GP. None of the hospitals experienced a statistically significant decrease in the rate of attendance by walk-ins, with both regional hospitals experiencing an increase. GP referred visits for children under six increased from 2013/14 to 2014/15, and for each of the three post-policy years (Fig. 2).

Consistent with this, the overall marginal probability of an ED visit being a GP referral versus a walk-in increased for children aged under six relative to the older cohort in each of the three years following the introduction of the policy (Table 4 and Appendix: Figure A4), with significant increases across four hospitals. However, R2 experienced a decrease of 1.8pp.

3.5. Examination of the common trend assumption

Inspection of pre-policy trends in attendance (Appendix: Figure A3) reveals a consistent monthly trend between both cohorts for the sample as a whole and both regional hospitals for much of the pre-policy period, although trends did diverge over the winter months. Monthly pre-policy trends did, however, vary considerably for the Dublin hospitals. Seasonal variation between cohorts might be expected, particularly during winter months. Annual pre-policy trends were broadly consistent for all hospitals and we are unable to reject the null hypothesis that the pre-policy yearly trends in the treatment and controls were the same for all hospitals. Effects were also consistent using either pre-treatment period as a baseline (Appendix: Table A4). Therefore, while the counterfactual assumption cannot be assured, the annual trend, statistical non-significance of the placebo tests and consistency of effects over choice of baseline provides some assurance that the common trend assumption is reasonable.

However, the common trend assumption for the estimated effect of the policy on the marginal probability of a visit being GP referred is not supported for all hospitals. Inspection of the monthly and annual pre-policy trends (Appendix: Figure A4) reveals that referral rates for under sixes trended below the older cohort in 2013/14 and above the older cohort in 2014/15 for the sample as a whole and for R1 in particular. The null hypothesis that the pre-policy yearly trends in the treatment and controls were the same is rejected for R1, D1 and the

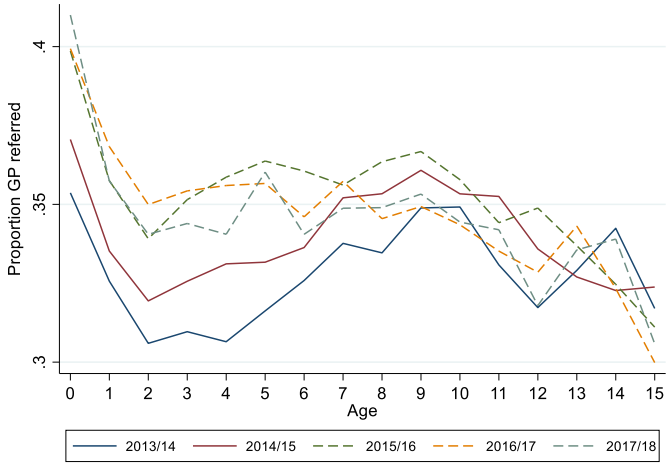

Fig. 2. Proportion of Emergency Department visits referred by a GP.

Table 4
Impact of the introduction of free GP care for Under 6s on the probability (marginal effect) of an ED visit being GP referred.

	All	R1	R2	Dublin	D1	D2	D3
Under 6	−0.000	0.006	0.029***	−0.004	−0.018***	−0.003	0.008**
	(0.003)	(0.008)	(0.007)	(0.003)	(0.004)	(0.004)	(0.003)
Post	−0.000	0.023***	0.007	−0.004	−0.019***	0.011***	−0.005
	(0.003)	(0.007)	(0.007)	(0.003)	(0.005)	(0.004)	(0.004)
Under 6 * Post	**0.021*****	**0.058*****	**−0.018****	**0.023*****	**0.032*****	**0.019*****	**0.014*****
	(0.004)	(0.010)	(0.009)	(0.004)	(0.005)	(0.005)	(0.004)
Hospital fixed effects	yes	n/a	n/a	yes	n/a	n/a	n/a
Observations	670,975	60,894	65,703	544,378	150,509	157,359	236,510
Test 1 (p-value)	0.070	0.005	0.567	0.079	0.089	0.563	0.698
Test 2 (p-value)	0.043	0.001	0.546	0.055	0.042	0.442	0.490
Policy Effect by Year							
Under6 * 2015/16	**0.016****	**0.044*****	**−0.011**	**0.017*****	**0.022*****	**0.017***	**0.012**
	(0.006)	(0.013)	(0.011)	(0.006)	(0.007)	(0.008)	(0.007)
Under6 * 2016/17	**0.026*****	**0.080*****	**−0.016**	**0.026*****	**0.032*****	**0.020****	**0.019*****
	(0.006)	(0.012)	(0.015)	(0.005)	(0.009)	(0.008)	(0.005)
Under6 * 2017/18	**0.025*****	**0.047*****	**−0.016**	**0.029*****	**0.040*****	**0.026*****	**0.019*****
	(0.005)	(0.012)	(0.013)	(0.005)	(0.006)	(0.008)	(0.007)

Robust standard errors in parentheses ***p < 0.01, **p < 0.05, *p < 0.1.
Covariates are at individual visit level.
Standard errors are clustered at month level.
Test 1: placebo test: p-value of coefficient when model is restricted to 2013/14 and 2014/15 and *Post* is set as 2014/15.
Test 2: p-value for common pre-treatment dynamics.
Policy effect in bold

overall sample. Furthermore, effects are sensitive to the choice of pre-treatment period as a baseline (Appendix: Table A5). Therefore, estimates for these hospitals are not entirely attributable to the effect of the policy. There was no statistically significant effect between the two years pre-policy (placebo) for the remaining two Dublin hospitals and R2, and inspection of monthly and annual trends suggest that a common trend is a reasonable assumption.

3.6. Diagnosis/presenting complaint

Table 5 presents the policy effect by diagnosis for the three Dublin hospitals, and by presenting complaint for the two regional hospitals. What is striking is that the marginal probability of a visit being GP referred increased overall for *Injury* and most other categories, though there was some variability by hospital. The only categories to experience a statistically significant decrease in attendance were *Digestive* and *Surgical* at the Dublin hospitals.

3.7. Severity of attendance

More serious illness is likely to lead to a child being admitted as an inpatient. A priori, one might expect that the policy would lead to a higher proportion of urgent cases, with less urgent cases being diverted to general practice. However, there was no significant increase in the marginal probability of a visit for a child aged under six resulting in admission following the introduction of the policy (Appendix: Table A2). There was an increase in the marginal probability of visits being triaged as urgent and a decrease in the marginal probability of the visit being triaged as low urgency, though effects were small (<1pp).

The effects for R2 are, however, worth noting. The marginal probability of a visit resulting in an admission decreased by 2pp post-policy and, consistent with this effect, there was a 1.8pp decrease in the marginal probability of a child under six being triaged as urgent. These effects are consistent with the reduction in the probability of a visit being GP referred. R1 and D3 both experienced an increase in the marginal probability of a child aged under six being triaged as urgent, also consistent with the increased probability of a visit being a GP referral identified in Table 4.

3.8. Time of visit

Visits split between GP referred and walk-ins, and the marginal probability of a visit being GP referred, are assessed by the time of attendance in Table 6. Out-of-hours GP services generally operate from 6pm to 8am on weekdays and throughout the weekend, and this is reflected in the categorisation of the time of visits. 43.2% of all visits occurred between 8am and 6pm Monday to Friday, 30.6% out of hours on weekdays and 26.2% at the weekend. Overall, GP referred visits increased across all time periods. While there was no increase in walk-ins at the Dublin hospitals at any time period, both regional hospitals experienced an increase in walk-ins and GP referred visits during the daytime on weekdays. R2 alone experienced an increase in walk-ins at the weekend and R1 saw an increase in walk-ins out-of-hours on weekdays. The marginal probability of a visit being a GP referral generally increased at all hospitals during all time periods and was notably large out-of-hours for R1. However, there was no change in the marginal probability of a visit being GP referred during the weekdays at R2, and a decrease at the weekend due to the relatively large increase in walk-ins. While information on whether the GP referral came from an out-of-hours service or the child's own GP was not available, the source of referral may be inferred from the time of attendance.

3.9. Robustness checks and sensitivity analysis

As estimation depends on the use of an appropriate comparison group, sensitivity analysis was conducted (Appendix: Table S1 and S2) to determine if the removal of older children (aged 12 and over) altered the results and neither the rate of attendance nor the marginal probability of a visit being a GP referral were significantly altered. The control group was further restricted to children aged six to eight. The overall estimated effect on visits remained positive, though the effect size reduced for R1 and increased for Dublin. GP referral estimates also remained consistent, although the effect for both R2 and D3 loses significance. To explore whether the effect of the policy might be largely attributable to children aged under two, this cohort were removed from the estimation sample. Results varied by hospital, with the estimate for R1 reducing substantially, a smaller decrease for R2, and with the effect on visits for *Dublin* showing a significant increase. There was no notable change in the marginal probability of a visit being GP referred.

Fig. 1 does show that ED visits by children aged between six and

Table 5
Emergency Department Visits & Probability (marginal effect) of ED visit being GP referred by Diagnosis/Presenting Complaint.

Under6 * Post	Dublin (Total)		D1	D2	D3
	Visit rate	GP Referred	GP Referred		
Injury	**1.951**	**0.027*****	**0.033*****	**0.026*****	**0.017*****
	(3.366)	(0.004)	(0.009)	(0.008)	(0.005)
N	*195,968*		*63,548*	*50,262*	*82,158*
Respiratory	**9.785**	**0.015**	**0.014**	**0.027**	**0.007**
	(10.514)	(0.009)	(0.017)	(0.019)	(0.013)
N	*84,468*		*21,922*	*24,364*	*38,182*
Medical	**−1.259**	**0.023*****	**0.026****	**0.020**	**0.018***
	(1.798)	(0.007)	(0.011)	(0.013)	(0.011)
N	*70,530*		*16,903*	*19,679*	*33,948*
Surgical	**−0.987*****	**0.042*****	**0.042**	**0.024**	**0.039***
	(0.262)	(0.015)	(0.036)	(0.030)	(0.020)
N	*12,957*		*2800*	*3441*	*6716*
Digestive	**−8.807****	**0.018***	**0.026***	**0.015**	**0.015**
	(3.694)	(0.01)	(0.014)	(0.019)	(0.013)
N	*59,676*		*17,056*	*16,438*	*26,182*
Infectious Disease	**7.756*****	**0.018**	**0.009**	**0.017**	**0.027**
	(1.803)	(0.012)	(0.02)	(0.02)	(0.018)
N	*42,400*		*11,934*	*15,545*	*14,921*
Ear Nose Throat	**0.577**	**0.019****	**0.023**	**0.022**	**0.01**
	(1.193)	(0.009)	(0.017)	(0.017)	(0.015)
N	*34,739*		*9963*	*10,050*	*14,726*
Normal	**2.887*****	**0.024***	**0.089**	**0.016**	**0.048*****
	(0.834)	(0.013)	(0.159)	(0.018)	(0.018)
N	*21,946*		*1623*	*11,530*	*8793*
Did Not Wait	**1.302**	**0.026****	**0.038**	**0.022**	**0.02**
	(1.089)	(0.012)	(0.024)	(0.019)	(0.015)
N	*19,144*		*3972*	*5520*	*9652*
Mental Health	*2825*		*788*	*523*	*1514*
Dublin Total	*544,339*		*150,509*	*157,352*	*236,478*

	Regional (Total)		R1		R2	
	Visit rate	GP Referred	Visit rate	GP Referred	Visit rate	GP Referred
Injury	**1.021*****	**0.015***	**0.669*****	**0.022*****	**1.412*****	**0.005**
	(0.176)	(0.008)	(0.211)	(0.008)	(0.223)	(0.008)
N	*45,797*		*26,674*		*19,123*	
Respiratory	**9.664*****	**0.022**	**16.913*****	**0.047**	**2.764**	**−0.011**
	(2.968)	(0.021)	(3.247)	(0.028)	(3.000)	(0.031)
N	*12,497*		*6868*		*5629*	
Other	**12.298*****	**0.019****	**18.543*****	**0.053*****	**2.375**	**−0.003**
	(3.505)	(0.008)	(2.972)	(0.012)	(5.525)	(0.009)
N	*67,631*		*27,059*		*40,572*	
Mental Health	*672*		*293*		*379*	
Regional Total	*126,597*		*60,894*		*65,703*	
Total	*670,936*					

Robust standard errors in parentheses ***p < 0.01, **p < 0.05, *p < 0.1 Standard errors are clustered at month level. Policy effect in bold

Table 6
Emergency Department Visits & Probability (marginal effect) of visit being GP referred by time of visit.

Under6 * Post	All	R1	R2	Dublin	D1	D2	D3
			MONDAY TO FRIDAY – DAYTIME				
Visits (per 10,000 SYOA)							
GP referrals	9.770***	12.309***	9.547***	3.614			
	(2.001)	(1.462)	(2.575)	(3.129)			
Walk-ins	0.912	1.485**	3.400***	1.364			
	(1.169)	(0.688)	(0.841)	(2.837)			
GP Referral (marginal probability)	0.029***	0.029**	−0.012	0.035***	0.057***	0.022***	0.024***
	(0.005)	(0.014)	(0.011)	(0.005)	(0.008)	(0.008)	(0.008)
N	280,852	24,497	27,407	228,948	62,579	65,486	100,883
			MONDAY TO FRIDAY – EVENING				
Visits (per 10,000 SYOA)							
GP referrals	6.040***	12.140***	2.414	3.602***			
	(1.281)	(1.432)	(1.632)	(1.330)			
Walk-ins	2.389	1.713**	2.166	2.937			
	(1.620)	(0.800)	(1.479)	(3.714)			
GP Referral (marginal probability)	0.017**	0.070***	−0.007	0.015**	0.017*	0.019*	0.006
	(0.007)	(0.017)	(0.016)	(0.007)	(0.010)	(0.010)	(0.007)
N	198,285	19,222	19,956	159,107	45,276	45,733	68,098
			WEEKENDS				
Visits (per 10,000 SYOA)							
GP referrals	4.980***	9.154***	3.487*	2.289**			
	(1.268)	(1.216)	(2.021)	(1.103)			
Walk-ins	2.962	1.547	5.716***	2.580			
	(2.230)	(1.090)	(1.502)	(4.908)			
GP Referral (marginal probability)	0.017***	0.085***	−0.034**	0.035***	0.013	0.019**	0.014***
	(0.004)	(0.019)	(0.015)	(0.005)	(0.009)	(0.007)	(0.005)
N	191,555	17,175	18,332	228,948	42,645	45,901	67,502

Robust standard errors in parentheses ***p < 0.01, **p < 0.05, *p < 0.1.
Standard errors are clustered at month level.

eight, who are not eligible for the under-six GP visit card, also increased in the post-policy period. When children aged under nine but over five were assessed as a placebo treatment group and measured against children aged nine and over (Appendix: Table S3), a small positive effect on the visitation rate was identified, and this effect was only significant for the regional hospitals. There was no overall effect for this cohort on the marginal probability of a visit being GP referred, though an effect was identified for D1 (0.014*) and D3 (0.012**).

Maximum-likelihood Poisson models were estimated for the visit rate models to determine if estimates remained robust to the assumption of normality. Results were consistent in terms of significance, while estimates were also consistent with the log-linear OLS models. Finally, the denominator for visits is based on SYOA per Census 2016. When this is replaced with births for each age cohort, estimates remain consistent.

4. Discussion

While the number of visits to the EDs participating in this study increased over the five-year period from July 1, 2013 to June 30, 2018, much of this increase is attributable to attendance by children aged six and over, partly explained by an increase in the population of this age cohort. Conversely, while the population of children aged under six decreased year-on-year over the five years of this study, this was not reflected in ED attendance levels. The introduction of this policy on July 1, 2015 provided access to a GP at no charge for children aged under six who were not existing holders of a GMS or GP visit card, while direct access to the ED for those without a GMS card remained at a fee (€100). It might therefore be expected that this policy prompts many parents to opt for care at no cost by their GP, resulting in a reduction in walk-in ED attendance. Indeed, the introduction of free GP care for children under six is estimated to have increased attendance at general practice by this age group by 25–29% (Nolan and Layte, 2017; O'Callaghan et al., 2018). This study finds that ED attendance, walk-ins in particular, did not reduce as a result of this policy and, while the likelihood of an ED visit by this younger cohort being GP referred increased, referrals were increasing prior to the introduction of this policy (Appendix: Figure A4).

The aim of this policy was not to reduce pressure on EDs but rather to achieve better health outcomes for children (Oireachtas Library and Research Service, 2014). However, understanding the consequence of this policy for other areas of the health system is important. The increase in GP referrals is likely due to a substantial increase in GP attendance by this cohort (O'Callaghan et al., 2018). However, as economic agents, GPs respond to incentives, and the move from fee-for-service to an annual capitation fee may have changed GP behaviour. GPs may manage increased attendance by relying more heavily on the ED, particularly as the financial cost of ED referrals is not linked to their remuneration. However, UK studies on the impact of NHS fundholding which incentivised the efficient management of referrals, found that GPs did not reduce referrals following the introduction of changes to fundholding (Hausman and Le Grand, 1999; Toth et al., 1997; Lopez Bernal et al., 2017) as GP's incentives are also influenced by caring concerns about their patients (Hausman and Le Grand, 1999).

No hospital experienced a decrease in children aged under six accessing the ED directly as a result of this policy. Parental decision making on accessing unscheduled healthcare is complex, and for many parents, the specialist care and diagnostics available at the ED is preferred to care by a GP (Nicholson et al., 2020). While research from other countries has shown that guaranteed same-day access to the ED is a factor in selecting care at an ED over general practice (Nicholson et al., 2020), it is still the norm in Ireland that children, particularly those perceived as requiring urgent attention, are provided with same-day access to their GP. Some parents may also find accessing a local ED more convenient than attending their GP (Cecil et al., 2016; Coster et al., 2017). This may be particularly relevant for the Dublin hospitals, with a large population living within a short distance of an ED, also potentially explaining a higher rate of walk-ins.

Increased attendance at both general practice and EDs as a result of this policy may also be an indication of unmet need. Previous research has identified that those without free primary care are more likely to report an unmet healthcare need (Connolly and Wren, 2017). Parents may also choose to access the ED through a GP referral, a route that avoids a financial cost. However, GP referrals were increasing

pre-policy, and this may be indicative of increased pressure on general practice. Nationally, over one third of GPs are aged over 55, many of whom are close to retirement age or unable to retire due to the lack of a replacement, particularly in rural areas (House of the Oireachtas, 2019). The challenge of filling GP vacancies and of supply imbalance between rural and urban areas, is one faced by many countries, including the UK and Australia (Iacobucci, 2019; Royal Australian College of General Practitioners, 2019).

Local area characteristics are likely to explain the variation in the policy effect. The policy had no effect on the overall visit rate for children aged under six at the Dublin hospitals, with an increase of 28.9% in the mean monthly visit rate at R1. The effect on general practice attendance might be expected to be larger in areas with low levels of GMS and GP visit card ownership prior to the introduction of the policy. Four of the hospitals in this study have catchments areas with GMS and GP visit card ownership below the national average, and one (R2) has an ownership rate just above the national average. Yet the policy effect varied regionally, suggesting other local or regional factors are impacting ED attendance. While R1 is located in a region with a GP/population ratio above the national average (Smith et al., 2019), not all areas within reach of the hospital are equally served by primary care (Mudiwa, 2019). As the two regional EDs serve a more rural population, many children attending these EDs do not live close to the ED and attend their GP as a first point of contact. Nonetheless, R2 experienced an increase in walk-ins by this younger cohort during weekday surgery hours and at weekends, and the marginal probability of a weekend visit being GP referred at R2 decreased relative to walk-ins after the introduction of this policy. Capacity constraints within general practice locally, including out-of-hours, may mean GPs were unable to absorb the higher demand for appointments following the introduction of this policy, increasing the number of children accessing the ED directly.

The analysis by diagnosis does suggest some re-routing of patients. Approximately 51% of presentations at the Dublin EDs are *Injury* or *Medical* related, and while overall presentations are unchanged, the marginal probability of these presentations resulting from a GP referral has increased, suggesting more of these patients attended their GP prior to the ED following the introduction of the policy. While *Digestive* presentations have decreased at the Dublin hospitals, this may be explained by the implementation of the national rotavirus vaccine programme for all infants born on or after October 1, 2016 (Coveney et al., 2020).

ED attendance by children aged between six and 15 also increased over the study period, with some of this increase attributable to population changes. However, there may also be a spill-over effect, with GP capacity constraints arising from this policy resulting in parents of older children attending the ED to access same-day healthcare. Attendance by children aged six to eight did increase post-policy and this increase is concentrated over the two regional hospitals. The policy impact may therefore be understated. Capacity constraints due to increased GP attendance by the under six cohort may also have a knock-on effect on access to GPs by adults.

This study makes a valuable contribution to the understanding of the impact of this policy on ED attendance through the robust examination of the common trend assumption, the assessment of regional variation and the exploration of the effect by type of presentation, none of which have been examined in the existing literature on the subject. Findings are also applicable to health systems internationally. EDs in many countries are struggling to meet demand (Benahmed et al., 2012; Centers for Disease Control and Prevention, 2015), and much attention has been given to redirecting patients, particularly those presenting with low acuity conditions, to the care of GPs. This study shows that the removal of a fee for attending a GP for a cohort of patients did not reduce ED attendance, in fact attendance increased at some hospitals. Policy makers should assess how the introduction of national policies can have varying effects depending on local area characteristics such as GP supply in the case of this study, with appropriate planning and resourcing incorporated into policy implementation to ensure equity.

This study is subject to some limitations, primarily due to data availability. As data capture does vary in terms of coding and definitions, a detailed mapping exercise was completed to ensure diagnosis/presenting complaint categorisation was consistent between hospitals and over time. While errors of classification may have occurred, such errors are likely to have a negligible effect due to the large size of the sample. This data could not be reconciled to the payments system at each hospital, therefore an analysis of the variation in the effect by medical card status (GMS) was not undertaken. The calculation of catchment populations required assumptions and the denominator for each hospital is not adjusted for other public hospitals or private facilities available in the catchment area. Consequently, this may lead to a low effective attendance rate. However, this should not impact the overall marginal effect of the policy. While the EDs in this study collectively represent approximately 48% of national public paediatric ED attendances and key statistics are comparable with national figures (Appendix: Table A6), findings are based on data from a limited number of EDs and therefore may not be representative of overall effects in the population nationally. Furthermore, LIUs in the catchment areas of both R1 and R2 opened in 2014, with children from age five able to attend. Therefore, some attendance by the older cohort may have diverted from R1 and R2. However, as attendance by children over five increased at these regional EDs, the influence of the LIUs may be modest. Finally, a limitation of the difference-in-difference approach is that it cannot account for differences in time-varying characteristics that may influence these results. Alternative estimation strategies, such as regression discontinuity design, may alter these findings and will be considered in future research.

5. Conclusion

In July 2015, children in Ireland aged under six became entitled to GP visit cards, allowing free at the point of delivery access to general practitioner care. Policy makers viewed this as an initial step in the transition from a mixed public and privately funded health system to a system of universal healthcare (Department of Health, 2019). While, a priori, one would expect that the removal of the barrier of cost might lead to an increase in attendance at general practice by children aged under six, it may not have been envisaged that it would also lead to an increase in attendance at the ED. These results show that the introduction of free GP care for children aged under six has not alleviated the pressure on EDs and has led to an increase in attendances at some hospitals, particularly in locations with a known shortage of GPs. Prior unmet need, parental preference for ED care over general practice care, coupled with altered incentives and general practice supply constraints, may explain why visits by children aged under six accessing the ED directly have not decreased following the introduction of this policy.

Funding

The CUPID Project is funded by the Health Research Board (HRB) under the National Children's Hospital Foundation Scheme 2017 (grant number: NCHF-2017-009).

Justification of number of authors

This is a large study with a national focus that required substantial regional, specialist and methodological input from a number of authors who all contributed in a way that merits authorship.

Authorship statement

Thérèse McDonnell: Data curation, Conceptualization, Methodology, analysis, Writing – original draft, Eilish McAuliffe: Funding acquisition, project management, Conceptualization, review, Emma Nicholson: Data curation, Conceptualization, review, Michael Barrett: Funding

acquisition, Conceptualization, review, Gerard Bury: Funding acquisition, Conceptualization, review, Claire Collins: Funding acquisition, Conceptualization, review, Fergal Cummins: Conceptualization, review, Conor Deasy: Funding acquisition, Conceptualization, review, Kevin Denny: Methodology, review, Aoife De Brún: Conceptualization, review, Conor Hensey: Funding acquisition, Conceptualization, review.

Declaration of competing interest

The authors report no conflicts of interest.

Acknowledgements

We would like to acknowledge the assistance of Ciara Martin, Ciara Conlon, Marie Gallagher and David Joyce, and the system managers and data analysts at each of the hospitals for compiling the data including Zoja Trenz, Cathal McKinley, Breda Boyle, Damian McGovern, Neil Ryan, Helen Kiernan, Bryan Lynch, Sylvia O'Donnell and James Carr. We would also like to thank the reviewers for their constructive feedback.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2021.113988.

References

Angrist, J., Pischke, J., 2008. Mostly Harmless Econometrics. Princeton University Press, NJ (Chapter 5).2 (169-182).

Benahmed, N., Laokri, S., Zhang, W.H., Verhaeghe, N., Trybou, J., Cohen, L., et al., 2012. Determinants of nonurgent use of the emergency department for pediatric patients in 12 hospitals in Belgium. *Eur J Pediatr*. Dec 171 (12), 1829–1837.

Cecil, E., Bottle, A., Cowling, T.E., Majeed, A., Wolfe, I., Saxena, S., 2016. Primary care access, emergency department visits, and unplanned short hospitalizations in the UK. Pediatrics 137 (2), e20151492. Feb 1.

Cecil, E., Bottle, A., Ma, R., Hargreaves, D.S., Wolfe, I., Mainous, A.G., Saxena, S., 2018. Impact of preventive primary care on children's unplanned hospital admissions: a population-based birth cohort study of UK children 2000–2013. BMC Med. 16 (1), 151. Dec 1.

Centers for Disease Control and Prevention, 2015. Health, United States [Internet]. [cited 2016 Nov 15]. Available from: http://www.cdc.gov/nchs/data/hus/hus15.pdf.

Connolly, S., Wren, M.A., 2017. Unmet healthcare needs in Ireland: analysis using the EU-SILC survey. Health Pol. 121 (4), 434–441.

Coster, J.E., Turner, J.K., Bradbury, D., Cantrell, A., 2017. Why do people choose emergency and urgent care services? A rapid review utilizing a systematic literature search and narrative synthesis. Acad. Emerg. Med. 24 (9), 1137–1149.

Coveney, J., Barrett, M., Fitzpatrick, P., Kandamany, N., Mcnamar, R., Koe, S., Okafor, I., 2020. National rotavirus vaccination programme implementation and gastroenteritis presentations: the paediatric emergency medicine perspective. Ir. J. Med. Sci. 189 (1), 327–332.

Currie, J., 2020. Child health as human capital. Health Econ. 29 (4), 452–463. Apr.

Currie, J., Decker, S., Lin, W., 2008. Has public health insurance for older children reduced disparities in access to care and health outcomes? J. Health Econ. 27 (6), 1567–1581. Dec.

Department of Health, 2014. The Pathway to Universal Healthcare: White Paper on Universal Health Insurance. Department of Health, Dublin, Ireland.

Department of Health, 2019. Health in Ireland, Key Trends, 2018. Available at: https://www.gov.ie/en/publication/2b3ade-health-in-ireland-key-trends-2018/Accessed 01/09/2020.

Dolton, P., Pathania, V., 2016. Can increased primary care access reduce demand for emergency care? Evidence from England's 7-day GP opening. J. Health Econ. 49, 193–208. Sep. 1.

Goodey, C., 2015. Why GPs oppose free care for children under 6. Available at: http://nagp.ie/news-media/why-gps-oppose-free-care-for-children-under-6. . (Accessed 28 July 2016). Accessed 01/03/2020.

Hausman, D., Le Grand, J., 1999. Incentives and health policy: primary and secondary care in the British National Health Service. Soc. Sci. Med. 49 (10), 1299–1307, 1999 Nov 1.

Health Service Executive National Doctor Training and Planning, 2015. Medical_workforce_planning_future_demand_for_general_practitioners_2015-2025. Planning Health Service Executive. Available at: http://hdl.handle.net/10147/621068.

Health Service Executive & Royal College of Physicians in Ireland, 2018. A national model of care for paediatric healthcare services in Ireland. Available at: https://www.hse.ie/eng/services/publications/clinical-strategy-and-programmes/model-of-care-for-paediatric-healthcare-executive-summary.pdf. .

Health Service Executive, 2020. Annual Report and Financial Statements 2019. Available at: https://www.hse.ie/eng/services/publications/corporate/hse-annual-report-and-financial-statements-2019.pdf.

Houses of the Oireachtas, 2019. Dáil eireann debate, general practice service provision. Available at: https://www.oireachtas.ie/en/debates/question/2019-11-26/41/#pq-answers-41. .

Howell, E.M., Kenney, G.M., 2012. The impact of the Medicaid/CHIP expansions on children: a synthesis of the evidence. Med. Care Res. Rev. 69 (4), 372–396. Aug.

Iacobucci, G., 2019. Ongoing GP shortage puts NHS long term plan at risk, warn experts. BMJ: British Medical Journal (Online) 364. https://doi.org/10.1136/bmj.l686. Available at:

Lawless, J., 2019. Spending Review 2019: Emergency Departments Trends 2014-2017. Government of Ireland. Accessed 16/10/20. Available at: http://www.budget.gov.ie/Budgets/2020/Documents/Budget/Emergency%20Department%20Trends%202014-2017.pdf.

Lopez Bernal, J.A., Lu, C.Y., Gasparrini, A., Cummins, S., Wharham, J.F., Soumerai, S.B., 2017. Association between the 2012 Health and Social Care Act and specialist visits and hospitalisations in England: a controlled interrupted time series analysis. PLoS Med. 14 (11), e1002427. Nov 14.

McAuliffe, E., Hamza, M., McDonnell, T., Nicholson, E., De Brún, A., Barrett, M., et al., 2020. Children's unscheduled primary and emergency care in Ireland: a multimethod approach to understanding decision making, trends, outcomes and parental perspectives (CUPID): project protocol. BMJ open 10 (8), e036729.

McHale, P., Wood, S., Hughes, K., Bellis, M.A., Demnitz, U., Wyke, S., 2013. Who uses emergency departments inappropriately and when-a national cross-sectional study using a monitoring data system. BMC Med. 11 (1), 258. Dec 1.

Mitra, S., Palmer, M., Pullaro, S., Mont, D., Groce, N., 2017. Health insurance and children in low-and middle-income countries: a review. Econ. Rec. 93 (302), 484–500.

Mora, R., 2015. didq: a command for treatment-effect estimation under alternative assumptions. STATA J. 15 (3), 796–808, 13.

Mora, R., Reggio, I., 2012. Treatment effect identification using alternative parallel assumptions. Working Paper 12–33, Economic series (48). Departamento deEconomía (Universidad Carlos III de Madrid).

Mudiwa, L., 2019. Figures Reveal Biting GP Shortage in East Cork. Irish Medical Times, 5th September 2019. Available at: https://www.imt.ie/opinion/editorial/figures-reveal-biting-gp-shortage-east-cork-05-09-2019/Accessed on 01/09/2020.

Narbutas, Š., Hristov, G., Brizga, L., Flood-Coleman, J., Torras, T.C., Chrostowski, S., Cassidy, C., Anghel, M., Morantz, L., Basaguren, H.B., 2015. Priorities for health systems strengthening in the WHO European Region 2015–2020: walking the talk on people centredness. Available at: https://www.euro.who.int/_data/assets/pdf_file/0003/282963/65wd13e_HealthSystemsStrengthening_150494.pdf?ua=1. .

Nicholson, E., McDonnell, T., De Brún, A., Barrett, M., Bury, G., Collins, C., et al., 2020. Factors that influence family and parental preferences and decision making for unscheduled paediatric healthcare–systematic review. BMC Health Serv. Res. 20 (1), 1–23.

Nolan, A., Layte, R., 2017. The impact of transitions in insurance coverage on GP visiting among children in Ireland. Soc. Sci. Med. 180, 94–100.

O'Callaghan, M., Zgaga, L., O'Ciardha, D., O'Dowd, T., 2018. Free children's visits and general practice attendance. Ann. Fam. Med. 16, 246–249.

O'Connell, T., Rasanathan, K., Chopra, M., 2014. What does universal health coverage mean? Lancet 383 (9913), 277–279.

Oireachtas Library, Service, Research, 2014. Spotlight: GPs and the Irish primary care system: towards universal primary care? Available at: https://data.oireachtas.ie/ie/oireachtas/libraryResearch/2014/2014-03-27_spotlight-gps-and-the-irish-primary-care-system-towards-universal-primary-care_en.pdf. .

Royal Australian College of General Practitioners, 2019. General Practice: Health of the Nation 2018 (East Melbourne, Victoria).

Smith, S., Walsh, B., Wren, M.A., Barron, S., Morgenroth, E., Eighan, J., Lyons, S., 2019. Geographic Profile of Healthcare Needs and Non-acute Healthcare Supply in Ireland. *ESRI*, Dublin.

Smyth, B., Marsden, P., Donohue, F., Kavanagh, P., Kitching, A., Feely, E., Collins, L., Cullen, L., Sheridan, A., Evans, D., Wright, P., O'Brien, S., Migone, C., 2017. Planning for Health: Trends and Priorities to Inform Health Service Planning 2017 (Report from the Health Service Executive).

The Competition Authority, 2010. Competition in professional services; general medical practitioners. Part 1: overview of the GP profession. Available at: https://www.ccpc.ie/business/research/market-studies/report-general-medical-practitioners/. .

Thomson, S., 2014. Health system responses to financial pressures in Ireland. Policy Options in an International Context. WHO Regional Off, Copenhagen for Europe. Available at: http://zbw.eu/econis-archiv/bitstream/11159/42/1/821868292_Health-system-responses-to-financial-pressures-in-Ireland.pdf.

Toth, B., Harvey, I., Peters, T., 1997. Did the introduction of general practice fundholding change patterns of emergency admission to hospital? J. Health Serv. Res. Pol. 2 (2), 71–74. Apr.

Walsh, B., Nolan, A., Brick, A., Keegan, C., 2019. Did the expansion of free GP care impact demand for Emergency Department attendances? A difference-in-differences analysis. Soc. Sci. Med. 222, 101–111, 2019.

WHO. International classifications of Disease. Accessed on 16/10/2020. Available at: https://www.who.int/classifications/icd/en/.