

BMJ Open Children's unscheduled primary and emergency care in Ireland: a multimethod approach to understanding decision making, trends, outcomes and parental perspectives (CUPID): project protocol

Eilish McAuliffe ¹, Moayed Hamza,² Thérèse McDonnell ¹,
Emma Nicholson ¹, Aoife De Brún ¹, Michael Barrett ^{3,4},
Christopher Brunsdon ⁵, Gerard Bury ⁶, Claire Collins,⁷ Conor Deasy,⁸
John Fitzsimons,⁹ Marie Galligan,¹⁰ Conor Hensey¹¹

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For numbered affiliations see end of article.

Correspondence to

Dr Thérèse McDonnell;
therese.mcdonnell@ucd.ie

ABSTRACT

Introduction The aim of this project is to determine the patterns, decision-making processes and parental preferences associated with unscheduled paediatric healthcare utilisation in Ireland. Unscheduled paediatric healthcare is outpatient care provided within primary care settings by general practitioners (GPs), emergency departments (EDs) located in paediatric and general hospitals, and out-of-hours services provided by cooperatives of GPs operating on a regional basis. This project will take a multimethod approach to analysing the utilisation of unscheduled paediatric healthcare nationally within the context of a significant change to the provision of healthcare for young children in Ireland—the introduction of free at the point of delivery GP care for all children aged under 6.

Methods and analysis A multimethod approach consisting of three work packages will be employed. Using patient-level data, work package 1 will describe patterns of attendance at primary care, out-of-hours medical services and at EDs. Applying a difference-in-difference methodology, the impact of the introduction of free GP care for children under 6 on attendance will be assessed. Work package 2 will explore geospatial trends of attendance at EDs, identifying disparities in ED attendance by local area and demographic characteristics. Work package 3 will employ two discrete choice experiments to examine parental preferences for unscheduled paediatric healthcare and GP decision making when referring a child to the ED. The insights gained by each of the work packages individually and collectively will inform evidence-based health policy for the organisation of paediatric care and resource allocation.

Ethics and dissemination Ethical approval for this research has been granted by University College Dublin, The Irish College of General Practitioners and the five participating hospitals. Results will be disseminated via publication in peer-reviewed journals, national and international conferences, and to relevant stakeholders and interest groups.

Strengths and limitations of this study

- This study will adopt a large sample of paediatric patient records of attendance at primary care, out-of-hours and emergency departments (EDs), and hospital admissions from EDs, to assess the patterns of attendance by children in the context of the introduction of free general practitioner (GP) care for children aged under 6.
- Geospatial analysis will identify if, where and how spatial heterogeneity exists in the relationship between child attendance at EDs and area-level characteristics.
- The factors that influence the decision making of both parents and GPs when accessing unscheduled healthcare for paediatric patients will be identified through the use of discrete choice experiments.
- This study is subject to limitations due to the availability of data—the absence of a national patient database of primary and emergency care attendances will result in data capture inconsistencies between participating EDs and GPs; data protection regulations will not permit the linkage of data between GP and EDs where individual patient consent is not in place, preventing the exploration of pathways and outcomes from GP to EDs; geospatial mapping cannot be applied to primary care attendance as patient anonymity must be ensured.

BACKGROUND

WHO has identified universal health coverage as a key strategic priority.¹ This is reflective of international trends in primary care and wider health system reforms. Concurrently, emergency department (ED) attendances by children, both urgent and non-urgent, have been increasing in many countries.^{2,3} These



observations have prompted calls for a more in-depth understanding of the relationship between inequities in primary care access and avoidable hospitalisation.⁴ Establishing a model of first-contact care is an important priority for health systems seeking to improve child health outcomes and shift to a community-based health-care system.⁵

The value of accessible and high-quality primary care has been highlighted by numerous studies.^{6,7} In the USA, enhanced access to Medicaid, which grants entitlement to free healthcare to those on low incomes, has had beneficial effects on child health outcomes including mortality and later life outcomes.⁷ A UK study using data from the National Health Service, a system of universal healthcare coverage, investigated the relationship between patient-reported access to general practitioners (GPs) and the outcomes of ED visits and hospital admission.⁶ It found that high access to GPs was associated with a number of improved patient outcomes including reduced admissions for asthma, reduced hospital short stays for chronic conditions and reduced long-term admissions. However, patients reported varying levels of access to their GP and a modest relationship between high access and reduced ED visits was identified. This highlights that universal primary care coverage does not necessarily confer universal access to healthcare, nor does it confer equity of patient outcomes across the population. Furthermore, other studies have demonstrated that socioeconomic factors influence the care-seeking behaviour, utilisation practices and healthcare outcomes of individuals.^{8,9}

Paediatric attendance patterns at unscheduled healthcare

Ireland is the only country in the European Union (EU) that does not offer universal coverage for primary care.¹⁰ In 2011, the programme for government outlined the intent to transition Ireland from a mixed public and privately funded health system to a system of universal healthcare.¹¹ In July 2015, all those aged under 6 and over 70 years old became entitled to GP visit cards, allowing free at the point of delivery access to primary care. As of 2017, 43% of the entire population qualified for general practice care which is free at the point of delivery¹² as holders of either a general medical services (GMS) (33%) or GP visit only (10%) card, with the remainder paying an average of €51 to visit their GP¹³ or an out-of-hours service. The GMS scheme entitles patients with incomes below a certain threshold to publicly funded GP visits, certain other primary care services and free medication (subject to a small prescribing charge). Attendance at an ED at a public hospital costs €100, though access to holders of a GMS card, those referred by a GP, or patients arriving by emergency ambulance is free.

Following the introduction of free GP care for the under 6-year-old population, the magnitude of the increase in GP attendances has continued to be disputed, though recently published studies estimate an increase in attendance for this cohort in the region of 25%.^{14,15} However, these findings are based on localised patient records¹⁵

and survey responses to a longitudinal study of children¹⁴ rather than a national sample of patient visit records. A study of attendances at 29 Irish EDs identified a 2% increase in GP referrals of children aged under 6 years to EDs¹⁶ following the introduction of this policy. While this study does provide a national estimate, the lack of access to patient visit records meant the authors were unable to explore the reasons behind this increase in referrals.

Increases in scheduled and unscheduled attendance at paediatric health services may be due to many factors such as changes in the management of paediatric illness, worsening child health, changes in behaviour by parents and clinicians, or due to access and supply constraints within the health system. Using a large sample of paediatric patient records of visits to GPs, EDs and out-of-hours services, work package 1 of this project will document the patterns of attendance by paediatric patients across these services and will assess more general patterns of service use and, coupled with the implementation of discrete choice experiments (DCEs) with parents and GPs, will enhance the understanding of the choices and preferences of parents and GPs when accessing unscheduled healthcare for children.

Exploring geographical trends and patterns

Work package 2 of this study will apply geospatial analysis to unmask the patterns and determinants of ED access and associated outcomes for paediatric patients. The inclusion of geography in analysis can add granular information at small area level allowing the incorporation of demographic differences, socioeconomic inequities, regional and local contexts in the analysis of attendance and outcome data.¹⁷ This is evident in many national and international experiences.¹⁸ A cluster analysis of overdose locations in Dublin and their association with social deprivation using Dublin Fire Brigade and National Ambulance Service response location data identified hot spots of increased incidence.¹⁸ Opportunities for educational interventions and naloxone distribution in the overdose hot spots were highlighted. Using billing data from three hospitals in Camden, London, clusters of high spending resulting from frequent preventable ED attendance and hospitalisations among a subset of patients were identified.⁸ The Camden Initiative of Healthcare Providers was established to act on these insights and developed a targeted care management initiative. As of 2014, patients enrolled at least 6 months had a 47.5% reduction in average hospital admissions in the 6 months after enrolment.⁹ The use of geospatial analysis in the context of unscheduled emergency care will allow us to identify if, where and how spatial heterogeneity exists in the relationship between child attendance and area level deprivation. This can in turn identify opportunities for community and primary care interventions in affected areas. Many health service and public health initiatives have benefited and resulted from an understanding of the spatial relationship between outcomes and socioeconomic disadvantages.

Understanding preferences and decision making of parents and GPs

The third work package will explore the factors that influence the decision making of both parents and GPs when accessing unscheduled healthcare for paediatric patients through the use of DCEs. Patient preferences for healthcare are increasingly being recognised as an important element in health service planning,¹⁹ while the opinions and routines of healthcare professionals can influence their utilisation and adherence to guidelines.²⁰ This discrete choice experimental approach has been widely used in health economics to explore clinical decision making or preferences across a variety of specific contexts along the continuum of primary, secondary and tertiary care.²¹ There are a variety of factors that dictate where parents and families seek unscheduled healthcare for their child, and these choices and behaviours can have a significant impact on resources in the health system. DCEs offer a means of systematically identifying the attributes of health services that influence a choice or decision, quantifying and statistically modelling what may be competing trade-offs that lead to variation between individuals.²²

The first DCE will seek to identify and estimate the value of specific attributes of health services that influence parents' and families' preferences and decision making when seeking unscheduled paediatric healthcare. Such choices are influenced by a complex array of patient and systems factors that can influence visitation rates to primary care and the ED, and also dictate where unscheduled healthcare is sought. Parental/family decision making is influenced by experiences, information, knowledge, behaviour and preferences. This complexity presents a challenge for policy-makers and at present, there is incomplete understanding of how parents and families make decisions when accessing unscheduled healthcare. It is equally important to identify the patient, clinician and practice-level factors that influence the decision-making processes of GPs regarding the referral of children to the ED and paediatric services. A thorough understanding of the competing priorities, pressures and considerations that Irish GPs must counterbalance on a daily basis can provide a more holistic view of the impact of new health policies and interventions on primary care. The findings from the DCEs will help contextualise the results from work packages 1 and 2.

The present research

The aim of this project is to develop a thorough understanding of the current model of paediatric unscheduled healthcare provision in Ireland and the impact of a recent policy intervention. The insights gained by each of the work packages individually and collectively will inform evidence-based health policy for the organisation of paediatric care and resource allocation. It will assess the effectiveness of the current model of unscheduled paediatric healthcare delivery and identify opportunities for improvement or intervention by building on

international experiences while appreciating the specific contextual differences in the Irish setting. The limitations of existing analyses on the impact of free GP care for children under 6 due to the narrow focus on primary or emergency care individually, coupled with the lack of patient-level data, means a comprehensive assessment of the impact of this policy change remains outstanding. Furthermore, the importance of contextual and demographic factors demonstrated by international research highlights that an exploration of determinants of access in the Irish context is required to facilitate effective evidence-informed policies.

RESEARCH DESIGN AND METHODOLOGICAL APPROACH

The research design for this project consists of three work packages. It combines a multimethod approach including statistical and econometric analysis of temporal trends of attendance at primary and emergency care, geospatial and demographic exploration, systematic review, qualitative enquiry and discrete choice modelling. Methodological rigour will be paired with a patient and parent centred approach to answer related questions regarding various facets of paediatric healthcare utilisation and outcomes in Ireland. Each work package will further the insights gained in other streams of the project to form a context rich overall picture of this complex issue.

Work package 1

The purpose of work package 1 is to examine temporal trends of paediatric attendance at primary care and EDs across Ireland and to determine the impact of the introduction of free GP care for children under 6 years old on attendance. This work package consists of two streams:

Temporal trends of paediatric attendance at EDs

The pattern of attendance by children aged 15 (The agreed age for paediatric ED attendance in Ireland is 16, the eve of 16 birthday²³) and under at three paediatric and two mixed adult/ paediatric EDs between 1 July 2013 and 30 June 2018 will be analysed to determine temporal trends in attendance. Visit records will be used to quantitatively assess the impact on attendance of the introduction of free GP care on 1 July 2015 for children aged under 6 years. Attendance data will be extracted from the administrative data management systems of the ED in each hospital, as detailed in [table 1](#).

The analysis of attendance will examine paediatric attendance overall and by factors such as age, source of referral (GP referral and out-of-hours vs self-referral), urgency and time of attendance (GP consulting hours vs out of hours).

Primary diagnosis, procedure/intervention code and hospital length of stay will also be collected from the hospital in-patient enquiry (HIPE) database of each hospital for paediatric patients admitted from the ED. Analysis of outcomes will examine trends in hospital

Table 1 Variables to be extracted from emergency department systems

Patient static record	Visit data
Unique patient identifier (randomly generated and anonymised); year and month of birth; gender; small area geo-code (mapped from address).	ED visit date and time; GMS status (indicator of medical card status); mode of arrival; source of referral (self-referral, referral from GP or cooperative GP, other); triage score; diagnosis; discharge outcome (home, admission, referral, transfer).

ED, emergency department; GMS, general medical services; GP, general practitioner.

admission, short stay admissions, hospital length of stay and ambulatory care sensitive (ACS) hospitalisations.

Temporal trends of paediatric attendance at primary care

The temporal trends of paediatric attendance at GP practices throughout Ireland between 1 July 2013 and 30 June 2018 will be analysed to quantitatively assess the impact on attendance of the introduction of free GP care for children aged under 6 on 1 July 2015. Recruitment of GP practices will be targeted at county/regional level to ensure the distribution of practices participating in the study reflects the national distribution of the population of children aged under 6 years as per the 2016 Census. A minimum of one practice from each of the 26 counties in the Ireland will be sought, with a greater representation required across more populated counties and major urban areas. Consequently, the participation of between 35 and 40 practices will be required.

All practices recruited must use the Socrates practice management system, which is used by approximately 45%

Table 2 Variables to be extracted from GP practice management system

Patient static record	Medical data
Unique patient identifier (randomly generated and anonymised); year of birth (date of birth cannot be extracted due to the risk of patient identification); gender; date registered as a patient.	Date of consultation; medical card/GP visit card status at time of visit; healthcare professional seen (coded to preserve anonymity); consultation type (eg, general, immunisation, bloods); diagnosis & pre-existing conditions (ICPC2 and/or ICD-10 codes); medication prescribed (ATC codes).

ATC, Anatomical Therapeutic Chemical; GP, general practitioner; ICD-10, International Statistical Classification of Diseases and Related Health Problems - 10; ICPC2, International Classification of Primary Care-2.

of GP practices and has national coverage. Primary care attendance and supporting covariates (table 2) will be extracted from Socrates through a data extraction tool specifically designed for the project. The report extracted will be fully anonymised at patient level and will detail all visits to the practice by children born during or after 2000 from 1 July 2013, 2 years prior to the introduction of free GP care for children under 6, to 30 June 2018. All practices recruited must use Socrates to record consultations for the 5-year period of this study. Initial research into the completeness and quality of GP data suggests that consultations are well recorded on Socrates, although some information on consultations, diagnosis and prescriptions in particular, is not recorded by all GPs, with paper records continuing to supplement the electronic records of some practices. Subject to this limitation, the variables to be extracted are detailed in table 2.

Each practice will also complete a Practice Profile Questionnaire detailing information such as levels of resourcing within the practice, appointment policy in terms of scheduling and duration, and distance from the nearest out-of-hours service and ED with the capacity to handle paediatric patients. The questionnaire will also detail the number of patients registered with the participating practice, allowing the relative percentage of children attending each practice to be assessed. Local area contextual data will be added by the research team on receipt of the data from each practice, including a regional indicator and decile of local area deprivation.

Attendance data for paediatric patients will also be collected from a sample of out-of-hours GP cooperatives. These cooperatives are managed through a centralised control centre and operate during evenings, overnight and at weekends with the aim of providing emergency primary care on an appointment basis. All calls are initially triaged by phone by a qualified nurse and are prioritised as emergency, urgent or less urgent. Telephone advice is provided and, if deemed necessary, the patient is provided with an appointment at their local out-of-hours service. Information on levels of resourcing, operating hours, distance from the nearest ED or injury unit, and area served will also be captured for each cooperative. Local area contextual data will also be added by the research team.

The analysis of primary care attendance will examine the pattern of attendance by paediatric patients and will determine if the introduction of free GP care for the under 6 population has impacted overall paediatric attendance, age-specific attendance and subject to data availability, attendance for select conditions (asthma, other ACS conditions, etc). The analysis will also determine how these trends may differ for out-of-hours services.

Methods and data analysis

Difference in difference

The analysis of primary care and ED attendance, together with hospital admissions from ED, will be carried out using difference-in-difference (DiD) estimation. DiD is a

widely used econometric methodology in the evaluation of the impact of policy changes. This 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 (the treatment group) and a population that is not (the control group).²⁴ In its simplest form, a treatment and control group are compared before and after the introduction of a policy change. The key assumption of DiD is that, in the absence of the treatment, the unobserved differences between treatment and control groups are the same over time. This approach removes biases in postintervention period comparisons between the treatment and control group that could result from permanent differences between both groups, as well as biases from comparisons over time in the treatment group that could be the result of trends due to other causes of the outcome.²⁴ In this context, DiD estimation assumes that:

1. Allocation of the GP visit card is not based on the number of visits.
2. Both the under 6 cohort and the control group have parallel trends in visitation patterns, such that the pattern of visitation by both cohorts over time in the absence of the policy change are similar—it is therefore important that an appropriate control group is selected.
3. The composition of the treatment group (children under age 6 entitled to the GP visit card) and the comparison group is stable over the study period.
4. No spill-over/contamination effects, such that the introduction of the policy has no impact on the visitation patterns of patients not subject to the policy change.

One of the most common problems with DiD estimates is the failure of the parallel trend assumption, such that the outcome follows a different trend for the treatment and comparison group. One way to avoid this problem is to obtain data on sufficient time periods before the introduction of the policy to determine the comparability of trends between the treatment and potential comparison groups. Therefore, having visitation data for the 2 years prior and 3 years following the policy change should help identify trends in attendance by patients who became entitled to the GP visit card and the potential comparison cohorts. Also, by obtaining visitation records for all paediatric patients, it will be possible to ensure the most appropriate comparison group is selected when estimating the impact of the policy. The lengthy 24-month period before and 36 months after the introduction of the policy on 1 July 2015 also allows for any anticipatory behaviour around this time to have settled, and ensures any delay in sign-up for the scheme by GPs does not influence this assessment.

The analysis will be extended to investigate the impact on attendance by specific age groups by using comparisons by single year of age and the variation in the impact of the policy change over time will also be explored for all

models through the interaction of the under 6 indicator with the time variables.

Attendances at EDs: referrals from primary care and self-referrals

This study will assess the pattern of visits at five EDs using anonymised retrospective visit records. In order to determine the impact of this policy change on attendance at EDs, the outcome will be expressed as a rate of visits for the population of children at each age, as no information is available for patients who do not attend. The following model will be estimated:

$$\frac{\sum V_{am}}{Pop_{am}} = b_0 + b_1 Under6 + b_2 Post + b_3 Under6 \cdot Post + b_4 X_{am} + Month + U_{am} \text{ Eq (1)}$$

where V is visits per age cohort (a) per month (m) expressed as a rate per population at that age, $Under6$ is a binary indicator of a patient aged under 6 (the treatment group), $post$ indicates that the year is after the introduction of the policy and the coefficient b_2 will capture the time trend common to both treatment and comparison groups. Given our assumptions, the b_3 parameter measures the effect of the policy and can be estimated using ordinary least squares regression. X is a vector of controls at the age cohort and month level relevant to attendance at emergency care, such as the rate of evening or weekend attendance and the admission rate. Estimation will be carried out with and without these covariates. $Month$ captures fixed effects for seasonality and U is the residual term.

A multinomial logit model will also be estimated at the individual level to assess the impact of the policy on GP and out-of-hours referrals:

$$V_i = b_0 + b_1 Under6 + b_2 Post + b_3 Under6 \cdot Post + b_4 X_i + b_5 Month + U_i \text{ Eq (2)}$$

where V_i is the likelihood of the visit by individual i being a GP referral or out-of-hours referral versus a self-referral, and covariates X_i will include, where relevant, gender, day and time of attendance, urgency and discharge status. Similar estimation will be carried out to assess the impact of the policy on admissions using a probit model.

Further analysis will assess the variability of attendance by factors such as urgency (based on triage score), age and condition (eg, respiratory). The models will also be estimated at hospital level to determine the variability in the effect of the introduction of this policy for each of the five participating hospitals.

Attendance at GP and out of hours

This study will assess the pattern of visits at primary care, including out of hours, using anonymised retrospective visit records from a sample of GP practices and out-of-hours services. As with EDs, the primary outcome will be expressed as a rate of visits for the population of children at each age and/or registered patients. As month of birth is not available for patients attending primary care, children aged 6 will be excluded from the estimation of the policy impact on primary care attendance, as the date at which their entitlement to free GP care ceases is unknown. Estimation will be as per equation 3:

$$\frac{\sum V_{amp}}{Pop_{amp}} = b_0 + b_1 Under6 + b_2 Post + b_3 Under6 \cdot Post + b_4 X_{amp} + b_4 Y_p + b_5 Month + U_{amp}$$

Eq (3)

with the outcome V_{amp} referring to visits at age, month and practice level. X is a vector of controls relevant to attendance such as proportion of attendance by day of the week, and Y a vector of practice-level factors such as accessibility to local ED and/or out-of-hours service, appointment policy and relative area socioeconomic status. This model will be estimated with and without visit and practice-level covariates. Analysis will assess the variability of attendance by factors such as age and year and, where data permit, by condition. As GPs are nested in regions, a hierarchical approach to the DiD estimation will also be applied using random-effect (multilevel modelling) in order to identify variation in primary care attendance due to the policy change at both practice and regional level.

Patterns of attendance

While the introduction of free GP care for children aged under 6 is at the heart of this analysis, this work package also aims to document patterns of attendance by paediatric patients at unscheduled healthcare over time, patterns that may or may not be impacted by this policy. Therefore, general trends in attendance will be investigated, for example, attendance for particular conditions, attendance by medical card holders and age groups not eligible for free GP care.

Work package 2

The aim of work package 2 is to analyse geospatial trends of paediatric ED attendance at ‘small-area’ level, and to identify if there are any statistically significant areas within the spatial pattern of attendance. Geospatial analysis at small-area level of ED attendance rates before and after the introduction of free GP care for the under 6 year old cohort will identify the variability in the impact of this policy. Small areas are areas of population comprising between 50 and 200 dwellings. Small areas were designed by the Central Statistics Office (CSO) as the lowest level of geography for the compilation of statistics in Ireland in line with data protection considerations, and generally comprise either complete or part of townlands or neighbourhoods.²⁵ CSO small area data are readily available online and contains detailed sociodemographic information for each area on factors such as age, education, housing tenure, health and employment.

Geospatial mapping will be carried out on records of attendance at EDs only. Addresses recorded within the ED system will be mapped on-site to small area codes before extraction. Due to the need to preserve anonymity, GP patient records will not be mapped to local areas. Also, due to the absence of patient address in the HIPE system, it is not possible to carry out geospatial mapping on hospital admissions.

Methods and data analysis

The national Ordinance Survey Geodirectory database contains all addresses in the country along with their associated small area codes. Addresses within the ED system will be matched to Geodirectory addresses and hence to small area codes using Excel. ArcGIS V.10.3, QGIS and the R statistical package will be used to manipulate, visualise and interrogate spatial data. A quantitative analytical approach will be adopted and will comprise the following statistical methodologies:

Spatial cluster analysis and scan statistics

Spatial cluster analysis and scan statistics will identify if there are any statistically significant ‘hot spots’ in the spatial pattern for attendance at EDs.²⁶ Space-time extensions of these methods can visualise emerging ‘hot spots’ and identify new, intensifying and diminishing trends in attendance, with a particular focus on the changes in these trends following the introduction of free GP care for the under 6 population.

Ordinary least squares regression

Individual-level (patient), GP-level and area-level (small-area sociodemographics) data will be included in the constructed model to ascertain the factors influencing ED attendance. The overall (global) impact of free GP care for the under 6 population and these other covariates on outcomes of interest will be modelled using an ordinary least squares regression. In Ireland, researchers working with the government have produced a geographical deprivation index at the small area level, the Pobal HP Deprivation Index, which is similar to the Index of Multiple Deprivation used in the UK. The Pobal index will be used to determine the impact of area level socioeconomic status on patterns of ED attendance.

Geographically weighted regression analysis

Geographically weighted regression analysis (GWR) will be employed to investigate, map and model spatial variations in the relationship between explanatory variables and ED attendance. GWR creates local regression models by assigning a local weight to each area using a weighting scheme that includes neighbouring locations in the construction of the local model. The effect estimated by the global model will give an overall impression across all areas studied and the local regression models will give area-specific results, while also testing the statistical significance of geographical variability. This will allow us to identify if, where and how spatial heterogeneity exists in the relationship between ED attendance and area-level deprivation. This can in turn identify opportunities for community and primary care interventions in affected areas.

Work package 3

There will be evident value in understanding the choices and preferences of GPs and parents that contribute to the observed utilisation patterns identified by work packages 1 and 2. The availability of in-depth knowledge can aid

policy-makers in ensuring that services are used appropriately, resources are allocated where most needed, clinicians are supported in delivering quality care and parental preferences are considered. Work package 3 will explore the decision-making processes that influence unscheduled healthcare utilisation in the Irish paediatric population by employing two DCEs.

A DCE of parental preferences for access to unscheduled health services

The first stream will aim to elicit and quantify the stated preferences of parents for children's access to unscheduled healthcare including primary, emergency and out-of-hours healthcare in Ireland. DCEs are a methodology which has been widely used in health economics and to explore clinical decision making or preferences across a variety of specific contexts along the continuum of primary, secondary and tertiary care.¹⁹ They offer a means of systematically identifying the factors that influence a choice or decision-making scenario, quantifying and statistically modelling what may be competing trade-offs that lead to variation between individuals.²² A recent DCE assessed parental preferences for enhanced access to primary care in the USA and found that same day access and professional continuity were key preferences for parents.²⁷

A DCE of GPs decision making for referral of paediatric patients to emergency services

The second stream will seek to identify the non-clinician factors that influence the decision-making processes of GPs regarding the referral of children to the ED. DCEs have been employed to elicit preferences of GPs for the organisation of primary care with factors such as practice type (solo or shared), age and working hours influencing a GPs willingness to accept organisational change.²⁸ However, decision making regarding the referral of paediatric patients to emergency care has not been addressed. A thorough understanding of the competing priorities, pressures and considerations that GPs must counterbalance on a daily basis is warranted.

Methods and data analysis

In keeping with best practice in DCE design, a systematic process consisting of several distinct phases will be adopted to develop and administer both DCEs. This approach has been previously described and used to explore clinicians' decisions to offer thrombolysis to patients with acute ischaemic stroke.²⁹

The aim of the first phase, the exploratory phase, will be to elicit factors that influence parental preferences and GP decision making and will inform the selection of the attributes and levels for the DCE. This phase can inform, specify and narrow the scope of the DCEs to a single issue or number of related issues. It is important that the attributes are grounded in evidence derived from systematic review and qualitative enquiry,³⁰ and thus, there will be two elements in this phase.

1. A systematic review will be conducted to identify relevant evidence from the existing literature.
2. Qualitative inquiry including semistructured interviews and focus groups will be conducted with parents and GPs to gather their experiences and perceptions of existing services.

Attributes selection is critical to the design of the DCE and those selected should be deemed important in the decision-making process and should not be too close to the latent construct the DCE is investigating such that a single attribute might dominate all others.³¹ Similarly, a single attribute should not be deterministic such that there is zero probability that an individual might choose the alternative, and no attribute should be intrinsic to an individual's personality such that it cannot be reasonably expected to be manipulated.³¹

The second phase will consist of a structured prioritisation exercise, carried out with the involvement of relevant stakeholders and the advisory board of the project, to rank the relative importance of the identified factors for inclusion as either fixed or variable attributes in the DCE. The attributes will be ranked in order of priority and the number of levels within each will be determined. The factors and associated levels of importance will be used to construct hypothetical choice sets. Combinations of factors and associated levels will be selected using a fractional factorial design which entails the selection of a fraction of all available combinations.²² Choice sets will be presented in table format or as descriptive vignettes to increase face validity and will be delivered using on-line and paper-based surveys where participants will select between alternative choice sets in a manner which will derive the greatest utility or benefit for them.

A pilot testing phase will be carried out for both the clinician and the parental DCEs. Cognitive interviewing³² will be employed to test the DCE in the pilot phase by letting respondents think aloud or asking them specific questions. It allows researchers to evaluate whether the intended audience understands, mentally processes and responds to the instrument's items as intended by the DCE design. This will enable the detection of flaws and breakdowns of the process which may otherwise be unrecognised. Missing and incomplete factors in the DCE construct will be identified, ensuring the production of reliable results.

The results from the DCE will be modelled to quantify which specific attributes drive or inhibit the decision of interest and critically, the relative preferences between the attributes in the choice sets. A mixed logit model will be used to model the probability of an individual choosing one alternative which yields the greater utility over alternatives, as presented in the choice sets. Mixed logit models are random utility models that have been used in healthcare, marketing, transport and other fields due to their flexibility.^{22 33 34} Mixed logit modelling can also explore heterogeneity in decision making and explore which factors create most variability between clinicians and parents. This may have policy and education

implications, by identifying opportunities for targeted intervention or training.

Patient/public and stakeholder involvement

This project is underpinned by a patient-centred approach that appreciates that children, parents, communities and those who provide care are key stakeholders in any health system. We aim to involve the public as partners in this research by recruiting two parent representatives to sit on the project advisory board. Embedding public and patient contribution throughout the project management structure, patient and public involvement will contribute to the governance and conduct of the research.

Ethics and dissemination

Ethical approval is required for each work package in the CUPID (children's unscheduled primary and emergency care Ireland - decision-making and trends) project. Given the large number of participants (n=450 000 approximately), it would not be possible to obtain explicit consent for the data collected in work packages 1 and 2. In accordance with data protection regulations, the data will be anonymised at each site by relevant staff before being transferred to the research team. No identifiable data will be included in the final dataset. Ethical approval has been granted from University College Dublin, from each of the participating hospital sites and the Irish College of General Practitioners. Written informed consent will be obtained for both streams of work package 3. Parents and GPs will provide consent before participating in the focus groups, semistructured interviews and DCEs.

Research findings will be shared on completion of each phase of the research and will be presented by the research team at national and international conferences and published in peer-reviewed journals. Communication of research findings and updates targeted at parents, children and the general public will be through accessible mediums of lay summaries, posters and social media, designed to reach a wide public audience. Social media can place the research in the public eye and will enable feedback throughout the timeline of the project and beyond. Peer-reviewed publications will be made available as open access articles and advertised on public forums to eliminate a common barrier between the wider public and healthcare research findings. The CUPID project has a dedicated website on which all resources and research findings will be posted as they become available. Materials and resources will also be made available through the Irish Health Service Executive's online repository.

DISCUSSION

This protocol details the approach and methods that will be adopted in assessing and documenting the pattern of paediatric attendance at unscheduled healthcare services in Ireland. This paper describes the quantitative and qualitative methods that will be applied to the extraction of data and the evaluation of attendance, preferences

and choices relevant to the utilisation of unscheduled paediatric healthcare. The CUPID project will review the constituent parts of the system of unscheduled paediatric healthcare provision in Ireland individually and collectively through collaboration with key stakeholders, including clinicians involved in the delivery of these services and parents engaging with these services on behalf of their children. A health systems approach will be applied to the development of a detailed understanding of the patterns of visitation and the factors driving the utilisation of unscheduled healthcare for paediatric patients in Ireland.

Health systems must evolve to meet the changing needs of the populations they serve and assessing the impact of free GP care for children under 6 in Ireland will provide valuable insights into the potential effects of moving from a part-privately funded model of primary care to a publicly funded model for a particular cohort, which is critical in the context of the proposed incremental roll-out of universal healthcare across Ireland. Findings from the geospatial mapping of ED attendance on how local area characteristics and services may influence patterns of attendance will be valuable for policy and planning purposes regarding the delivery of unscheduled healthcare to paediatric patients. Understanding the decision making and behavioural factors that govern the interface between primary and secondary care can provide evidence that could support the development of integrated care for this population.

The particular focus on one of the factors documented as having significantly altered attendance at unscheduled healthcare services—the introduction of free GP care for children under 6—will provide a comprehensive assessment of the impact of this substantial change in policy at a time when further expansion in universal healthcare provision is planned. Through the creation of databases of paediatric attendance at primary care and EDs, and the use of appropriate evaluation methods, a national picture of attendance over time will be established and the impact of this policy change will be robustly determined. Geospatial analysis will unmask the patterns and determinants of paediatric ED access, identify variations in attendance by local area, and identify 'hot spots'. The DCEs will provide invaluable context to these findings, identifying parental preferences and choices when selecting unscheduled healthcare for their children, and the factors of relevance to GPs when referring paediatric patients to emergency care.

The key challenges associated with this study relate to data accessibility and quality. The absence of a national patient database of primary and emergency care attendances requires the collation of datasets from a sample of hospitals and GPs. The extent of data capture on hospital and GP patient management systems varies significantly and will result in missing or incomplete data for some observations. Compliance with data protection legislation means datasets established by the CUPID project are fully anonymised and linkage of patients between GPs and

EDs cannot be undertaken. This will prevent the exploration of pathways and outcomes from GP to EDs. Also, as datasets are limited to paediatric patients only, broader changes within the health system will be difficult to take into consideration, for example, the introduction of free GP care for over 70s which occurred at the same time as the provision of free GP care for children under 6. In a rapidly ageing population, such changes may influence outcomes such as GP attendance through the availability of fewer appointments. Finally, geospatial information is not available for primary care attendance as patient anonymity must be ensured.

Paediatric healthcare provision in Ireland is undergoing significant changes in configuration and healthcare coverage at primary, secondary and tertiary care levels and this necessitates the establishment of an evidence base regarding current trends in paediatric healthcare utilisation. By establishing and contextualising an evidence base regarding the organisation of services, this study will assess the effectiveness of the current model of unscheduled paediatric healthcare in delivering equitable healthcare for children. Identifying strategies and opportunities for improvement or intervention requires a systems-wide approach⁵ to support efficient use of health services, optimal child health outcomes and a high-quality paediatric healthcare system.

Many aspects of this project are of international relevance. While Ireland is the sole member of the EU without universal primary care, some countries outside the EU, the USA in particular, operate a part-private part-publicly funded model of primary care. Therefore, the assessment of the impact of moving from privately funded to free GP care for a particular cohort can provide a valuable insight into the potential effects of moving from a part-privately funded model of primary care to a publicly funded model. Similarly, findings from the geospatial mapping of ED attendance within Ireland on how local area characteristics influence patterns of attendance will be generalisable to many countries that face similar challenges in the delivery of unscheduled healthcare to paediatric patients. Finally, the insights gained from the DCEs and the identification of the key factors that influence the use of primary and emergency care are likely to be universal in their application to parents and GPs.

Author affiliations

¹Centre for Interdisciplinary Research, Education and Innovation in Health Systems (IRIS), School of Nursing, Midwifery and Health Systems, University College Dublin, Dublin, Ireland

²School of Nursing, Midwifery and Health Systems, University College Dublin, Dublin, Ireland

³Paediatric Emergency Medicine, Children's Health Ireland at Crumlin, Dublin, Co. Dublin, Ireland

⁴Women's and Children's Health, School of Medicine, University College Dublin, Dublin, Ireland

⁵National Centre for Geocomputation, National University of Ireland Maynooth, Maynooth, Ireland

⁶UCD Centre for Emergency Medical Science, School of Medicine, University College Dublin, Dublin, Ireland

⁷Research Department, Irish College of General Practitioners, Dublin, Ireland

⁸Department of Emergency Medicine, Cork University Hospital Group, Cork, Ireland

⁹Emergency Department, Children's Health Ireland at Temple St, Dublin, Ireland

¹⁰UCD Centre for Clinical Research, University College Dublin, Dublin, Ireland

¹¹Paediatrics, Children's Health Ireland at Temple St, Dublin, Ireland

Twitter Moayed Hamza @MoayedHamza, Thérèse McDonnell @ThereseMcDonn, Emma Nicholson @EmmaNich97, Aoife De Brún @aoife_db, Michael Barrett @PEMDublin and John Fitzsimons @johnfitzsimons

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ORCID iDs

Eilish McAuliffe <http://orcid.org/0000-0002-9714-5040>

Thérèse McDonnell <http://orcid.org/0000-0002-5890-3689>

Emma Nicholson <http://orcid.org/0000-0002-6652-2552>

Aoife De Brún <http://orcid.org/0000-0003-0124-0893>

Michael Barrett <http://orcid.org/0000-0003-1775-8347>

Christopher Brunson <http://orcid.org/0000-0003-4254-1780>

Gerard Bury <http://orcid.org/0000-0002-4441-6724>

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