

Asking about adverse childhood experiences (ACEs) in General Practice

Evaluation findings from a pilot study in Anglesey, North Wales



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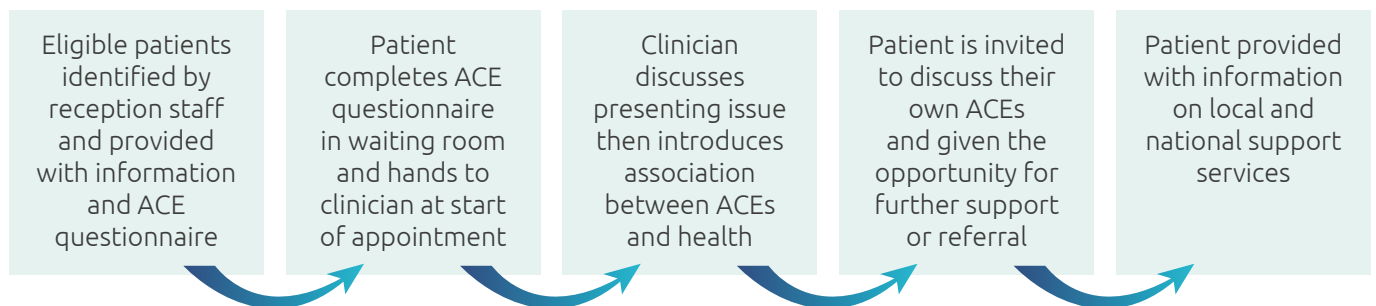
Asking about adverse childhood experiences (ACEs) in general practice

Findings from a pilot study in Anglesey

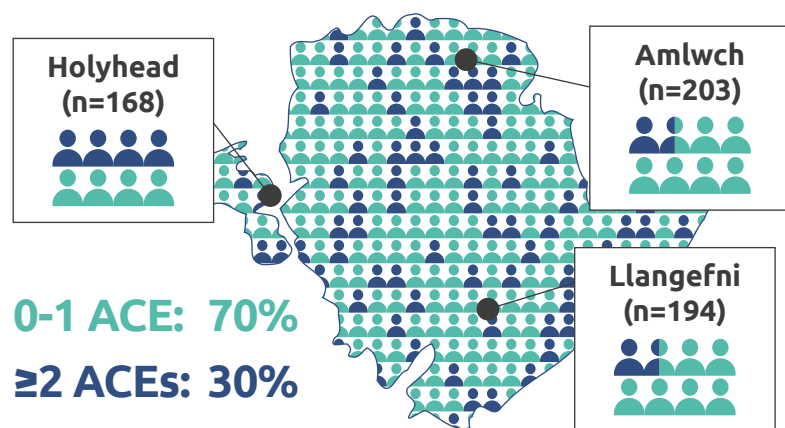
ACE enquiry was piloted during consultations with a general practitioner (GP) or nurse practitioner across three practices in 2017/18 with patients aged 18 years and over.

Process of ACE enquiry

91% of those patients asked agreed to take part in ACE enquiry (n=565)

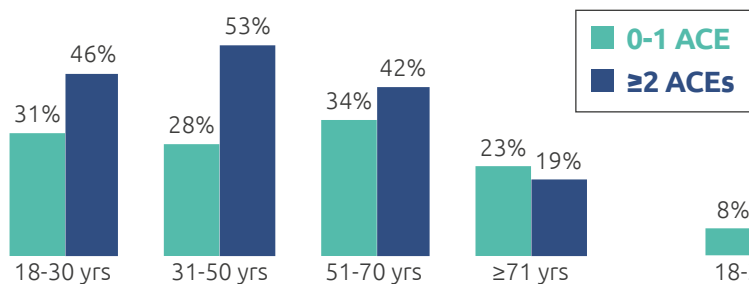


Prevalence of ACEs

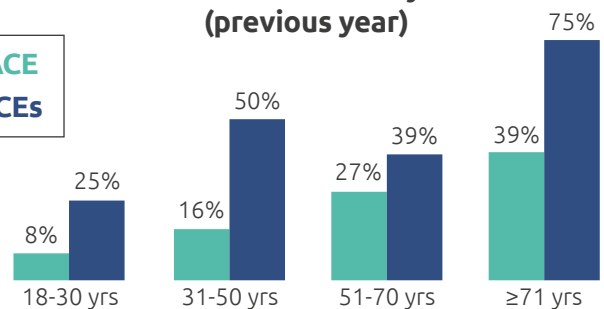


ACEs, health and service use^b

Experiencing current mental health issues



Referral to secondary care (previous year)



The process of ACE enquiry was designed and delivered by Betsi Cadwaladr University Health Board with the support of a consultant facilitator appointed by Cymru Well Wales Adverse Childhood Experiences (ACE) Support Hub. Public Health Wales were commissioned to independently evaluate this pilot. ^an=137 patients disclosed at least one ACE; ^bData extracted from patient records for n=549 patients.

What did patients say?^c

ACE questionnaires were...

Understandable & clear 96%

The GP surgery is...

A suitable place to ask 87%

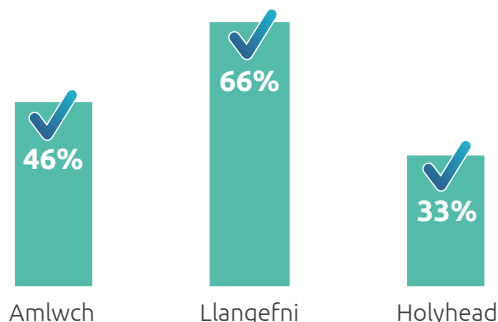
ACE enquiry is...

Important 81%

Acceptable 85%

Agreed/strongly agreed that...

My appointment was improved because the doctor/nurse understood my childhood better



What did practitioners say?^d

The use of a **structured tool** to enquire about ACEs was welcomed for **lessening the cognitive and emotional demand** on patients.

ACE enquiry resulted in largely **negligible impacts** on individual **consultation time**. However, some inherent features of general practice, such as patients arriving late for appointments, created **barriers to the completion of ACE questionnaires**.

Concerns about overall **service demand** and increased need for **specialist support** were **not realised during the pilot**. **No patient was upset or distressed** by delivery of agreed models of ACE enquiry.

Although **flexible** models of delivery allowed the ACE enquiry pilot to be adapted to other competing demands, **diversion from standard processes** (e.g. for booking in) resulted in some additional **burden for administrative staff and confusion for patients**.



Having knowledge of ACEs **improved understanding** of and **empathy** towards patients, allowing practitioners to provide a **more holistic approach** to patient care.

ACE enquiry provided **novel information** that countered prior assumptions about patients and was considered **important for informing future diagnoses and treatment**.

Conclusions

- ▶ This pilot evaluation finds considerable support for the acceptability of ACE enquiry in general practice to patients and practitioners, both of whom understand its relevance and added value in supporting individuals' health and wellbeing.
- ▶ Whilst ACEs are clearly associated with poor mental health outcomes, and findings provide tentative support to the notion of a therapeutic universal benefit derived from ACE enquiry, how practitioners may use an understanding of ACEs to inform the treatment and support provided to patients remains unclear.
- ▶ Although this pilot provides some encouraging insights into the feasibility of asking about ACEs, there continue to be complexities in this health setting that present challenges for engagement and the delivery of a sustained approach.
- ▶ Further research and evaluation is needed to build on these initial findings and explore the utility of scaled and sustainable approaches to ACE enquiry in general practice.

^cService user feedback questions completed by 333 patients (58.9% of those receiving ACE enquiry); response options on a likert scale (strongly agree; agree; not sure; disagree; strongly disagree); ^dQualitative findings from practitioner feedback interviews following implementation (n=12 participants).

Executive Summary

Background

During the early years, the exposures of the child to either safe, stable and nurturing relationships and environments or those that are characterised by toxic stress and trauma can have a considerable and lasting effect on physical, social and emotional development.

Adverse childhood experiences (ACEs), such as child abuse and neglect or growing up with caregivers who abuse alcohol or drugs, are strongly associated with poor health outcomes later in life. As part of the foundations of morbidity and premature mortality, preventing and responding to ACEs as well as mitigating their impacts on health and wellbeing is a critical consideration for health care services. Whilst some evidence indicates that those that have a high number of ACEs may place large burdens on primary and secondary care services, there is also some suggestion that those who have suffered childhood trauma may experience barriers to engagement with health promoting or preventative health services in particular. Providing health practitioners with the skills and confidence to ask about ACEs in general practice may offer an inherent therapeutic benefit to patients, support the engagement of those who may experience barriers to healthcare, or allow practitioners to identify more appropriate treatment and support options, based on an improved understanding of the root causes of ill health.

This report summarises key findings from the evaluation of a local pilot initiative delivering ACE enquiry with adult general practice patients. In this multi-site pilot implemented across three GP practices in Anglesey, North Wales (Amlwch, Llangefni and Holyhead) from November 2017 to April 2018, 565 patients were asked about their ACEs. Using qualitative and quantitative data, this report considers the feasibility and acceptability of ACE enquiry in general practice from both the patient and the practitioner perspective. The report also explores the relationship between ACEs and health outcomes in this population and offers insight into how such data may be used to explore the impact of ACE enquiry on future service utilisation.

Key findings

Design and implementation

- This pilot project was a local initiative driven and supported by Betsi Cadwaladr University Health Board and the Cymru Well Wales Adverse Childhood Experiences (ACE) Support Hub (ACE Hub). A consultant facilitator was appointed by the ACE Hub to provide training, materials and support to the GP practices and co-produce a model of ACE enquiry with the practice managers.
- Delivery was not universal, but the three participating practices selected different methods of systematic sampling to determine the surgery sessions in which ACE enquiry took place.
- A total of 565 patients agreed to provide ACE information; an estimated uptake rate of 90.5% of eligible patients. Complete data for analysis were made available for 549 patients. These patients ranged in age from 18 to 91 years (mean=53.4 years) and 61% were female.
- All patients that were engaged in the ACE enquiry process completed a written ACE questionnaire in the waiting room prior to their appointment and subsequently discussed this information with the practitioner during their consultation. In one practice, implementation of ACE enquiry differed from the agreed model of delivery.

ACEs and health

- Across the whole pilot, just under a third (29.5%) of general practice patients had experienced ≥ 2 ACEs; prevalence similar to that identified in national surveys in Wales. However, ACE prevalence differed significantly between practices, with almost half of all patients in Holyhead experiencing ≥ 2 ACEs, compared with around one in five patients in Amlwch and Llangefni.
- A significant relationship was found between ACE count and smoking status, with patients with ≥ 2 ACEs twice as likely to be a current smoker, when compared with patients with 0-1 ACE. No relationship was found between ACE count and obesity. Whilst patients with ≥ 2 ACEs

had a higher prevalence of chronic obstructive pulmonary disease (COPD), this association narrowly failed to reach statistical significance. No significant relationship was found between prior exposure to ACEs and prevalence of asthma, Type II diabetes, hypertension, cancer or cardiovascular disease (CVD) in adulthood.

- A strong significant relationship was found between ACE count and current mental health, with patients with ≥ 2 ACEs almost twice as likely to experience mental health problems such as depression and anxiety in adulthood, when compared with those with 0-1 ACE.
- Whilst overall no significant relationship was found between exposure to ACEs in childhood and frequent GP attendance or high medication use in adulthood, prescription of antidepressants (ever) and referrals into secondary care (previous 12 months) were both significantly higher among patients with ≥ 2 ACEs.

The practitioner experience

- Across all practices, flexible models of delivery allowed clinical practitioners to adapt the ACE enquiry pilot in line with other competing demands. However, diversion from standard processes (e.g. for booking in) resulted in some additional burden for administrative staff and confusion for patients. Although the use of a structured tool for ACE enquiry was welcomed for lessening the cognitive and emotional demand on patients, practitioners described concerns about the storage of resultant ACE data and the implications this may have for its future clinical relevance.
- ACE enquiry resulted in principally negligible impacts on individual consultation time, with practitioners generally willing to accept minor delays, as occurred regularly in primary care. Concerns about overall service demand and increased need for specialist support were not realised during the pilot. However, clinicians remained concerned about the lack of follow up mechanisms to understand how patients felt after leaving the surgery.

- Practitioners agreed that having knowledge of ACEs improved both their understanding of and empathy towards patients, providing a more holistic approach to patient care. Generally they felt that this information would not be known without directly asking. Therefore ACE enquiry provided counter-evidence to their prior assumptions about patients, supporting the need outlined in *A Healthier Wales: Our plan for Health and Social Care* to look beyond immediate symptoms or needs in supporting individuals to maintain or improve their health. Although practitioners felt this novel information may be potentially important for informing future diagnoses and treatment, and ACE enquiry was therefore an investment for the future, it remained unclear under what circumstances this information may be used by practitioners and how. The respective value of ACE information for universal or targeted approaches was an area of contention.
- Half of all respondents felt that their appointment was improved because the health practitioner understood their childhood better. However, here a further 35% of patients were unsure. For this measure, significant differences between practices were found, with two thirds of respondents from Llangefni reporting that their appointment was improved by ACE enquiry, compared with only 46% of those in Amlwch and less than a third of patients in Holyhead. In written patient feedback, a small number of patients queried the scope of the ACE questionnaire, expressing interest in having other experiences included.
- Whilst around half of all patients with ≥ 2 ACEs attended the practice less in the six months following ACE enquiry (when compared with the six months prior) and had increased repeat medication use, similar changes in patterns of consultation and prescribing for those with 0-1 ACE make it difficult to draw any firm conclusions concerning the impact of ACE enquiry on service use.

The patient experience

- Patients were described by practitioners as welcoming the ACE enquiry process for increasing their self-awareness and allowing them to reflect on both negative experiences and the resilience they had in coping with life's adversities. For two of the three practices, it was reported that no patient explicitly expressed upset, discomfort, or other signs of distress throughout the pilot. In the remaining practice, one person was described as becoming "very annoyed" during group-based delivery – an occurrence that deviated from the intended model of delivery. Practitioners suggested that some patients had emotive responses to the ACE questions and felt they were sensitive in nature, in particular those concerning sexual abuse.
- For just under 60% of patients with ACEs, this initiative represented the first time they had told a professional or service about these experiences. Overall, patients reported overwhelmingly positive views of ACE enquiry, with over 95% reporting the ACE questions were clear and understandable and 87% reporting that the GP surgery was a suitable place to be asked such questions. Across all sites, 85% of patients considered it acceptable to provide information about childhood experiences of adversity to a health practitioner and four in every five believed it was important for practitioners to understand this information.

Conclusions

This pilot evaluation finds considerable support for the acceptability of ACE enquiry in general practice to patients and practitioners, both of whom understand its relevance and added value in supporting individuals' health and wellbeing. Thus ACE enquiry in this setting offers a welcomed opportunity for patients to disclose ACEs within the context of a supportive relationship with a health professional. Whilst ACEs are clearly associated with poor mental health outcomes, and findings provide tentative support to the notion of a therapeutic universal benefit derived from ACE enquiry, how practitioners may use an understanding of ACEs to inform the treatment and support provided to patients remains unclear.

Although this pilot provides some encouraging insights into the feasibility of asking about ACEs, there continue to be complexities in this health setting that present challenges for engagement and the delivery of a sustained approach. Findings here suggest that the resilience of both individuals within the system and the system itself may play a key role in determining the suitability and effectiveness of enquiry.

Recommendations

Overall recommendation

- Further research and evaluation is needed to build on these initial findings and explore the utility of scaled and sustainable approaches to ACE enquiry in general practice, taking account of the points for further refinement and investigation below.

Implementation – Refining models of ACE enquiry

- Future developments of ACE enquiry in general practice should ensure that detailed and collaborative assessments of readiness are conducted. The scope of these assessments should be determined by stakeholders in line with the objectives of ACE enquiry and their delivery should engage frontline staff, management and, wherever possible, patient representatives. Key issues for consideration include (but are not limited to): current staffing and ongoing resource challenges; the need for adaptations to the patient pathway to support ACE enquiry (e.g. booking in systems); the existence of external pressures or other new initiatives that may divert attention and resource away from enquiry; the flexibility of any current processes to incorporate additional demand; and the availability of patient data to support monitoring and evaluation and the presence of ongoing resource to manage, extract and analyse data.
- Those responsible for commissioning or facilitating approaches to ACE enquiry should ensure that practices are provided with continued support in delivering agreed models of enquiry. Methods and tools for monitoring should be developed to ensure that delivery is as intended, or as a minimum that deviations from intended delivery are accurately recorded.
- Practices should identify how ACE data can be stored to ensure that it contains enough information and is accessible enough to clinicians to be clinically relevant, but maintains required standards of patient confidentiality and adherences to information governance principles.

- Stakeholders may wish to consider developing and piloting targeted models of ACE enquiry and/or those occurring in other settings (e.g. when general practice consultations are delivered in the home or in care settings). These opportunities should be determined on the basis of established relationships between ACEs and health outcomes; e.g. the involvement of discussion of childhood history in initial consultations for mental health problems. It is important that any new models of delivery are accurately described and that evaluation is undertaken to explore the feasibility and acceptability of these approaches with both patients and practitioners.
- Practices engaging in ACE enquiry should make a clear commitment to ensuring that models of enquiry are embedded, supported by all staff, and aligned to the values of the organisation. Practitioners must be supported by training and supervision to ensure that they enter a genuine dialogue with patients about their ACEs, and that use of a tool or questionnaire to gather ACE information is grounded in the context of a wider cultural change that moves the practice towards delivering trauma- or ACE-informed care.

Research – Addressing key emerging questions

- Further service evaluations should be delivered to replicate the objectives of this pilot evaluation and explore the feasibility and acceptability of different models of ACE enquiry (based on the recommendations for implementation outlined above) in different general practice settings. These evaluations should aim to recruit larger and more diverse samples of patients and analyse all available data over longer-term follow up periods.
- Detailed qualitative research should be undertaken with patients to explore the potential therapeutic benefit of ACE enquiry and the role of improved rapport between the practitioner and patients as a mechanism for this benefit.



- Detailed research should also explore with frontline health practitioners how understanding a patient's ACEs may affect or has affected their professional decision making for diagnosis, treatment and support or referral.
- To provide a baseline from which to consider the potential impact of ACE enquiry on service use behaviours, research should be undertaken to understand the primary care service use behaviours of adults with ACEs, including demographic, health and other factors that may influence preparedness to consult with a health practitioner, and willingness to disclose early adversity in health settings.
- To determine any reductions in demand for health services following ACE enquiry, research should explore the feasibility of and pilot methods for understanding impacts of ACE enquiry on the wider system of healthcare, for example including secondary care or use of emergency care services.

1. Introduction

This report summarises the key findings from a pilot evaluation of enquiry about adverse childhood experiences (ACEs) by clinicians in general practice in Anglesey, North Wales. As the first pilot of its kind in Wales, the report is intended to explore proof of concept for retrospective ACE enquiry with adult patients during their engagement with universal health services. Therefore, it focuses on the feasibility and acceptability of ACE enquiry from both the practitioner and patient perspective. The report may be of interest to those with responsibilities for the commissioning, design or delivery of general practice and other primary care services, or anyone with a more general interest in the response to ACEs, building resilience and mitigating the effects of early adversity on health and wellbeing outcomes.

The early years of life represent a critical period for physical, emotional and social development. Children that grow up in safe, stable, nurturing environments with the supportive relationships of caregivers have the foundations for healthy development and the greatest opportunity to thrive. However, for children that are neglected, abused or exposed to other trauma, development may become focused on short-term survival with the child experiencing a detrimental toxic stress response. Research in Wales and across the globe highlights both the prevalence and life course impacts of traumatic early life experiences. ACEs describe both the direct victimisation of the child (e.g. from child abuse and neglect) and factors that threaten the safety and stability of the environment in which they grow up (Box 1[1]). Increasingly evidence underlines the cumulative effects of multiple forms of adversity and the dose response relationship with adverse outcomes for health and functioning [2-5]. According to a nationally representative household survey conducted in 2017, around half of all adults in Wales have experienced at least one ACE, with 14% experiencing as many as ≥ 4 ACEs in the first 18 years of life (Box 1[1]).

Box 1: ACEs and their prevalence among adults in Wales

ACE	Prevalence	
Child maltreatment	Verbal abuse	20%
	Physical abuse	16%
	Sexual abuse	7%
	Physical neglect	4%
	Emotional neglect	7%
Childhood household included	Parental separation	25%
	Domestic violence	17%
	Mental illness	18%
	Alcohol abuse	13%
	Drug use	6%
	Incarceration	4%

Source: Hughes et al., 2018 [1]

1.1 ACEs, health and service utilisation

In the developing child, prolonged activation of the stress response in the absence of protective relationships can cause harm at even a cellular level [6]. Thus, for children who suffer ACEs, we now understand the neurobiological, immunological and hormonal changes that occur as the body adapts to toxic stress [7]. This places ACEs firmly in the remit of healthcare professionals as a foundational cause of mortality and morbidity. Evidence identifies a robust association between early life adversity and chronic health conditions, with those who experience more ACEs tending to experience increasing harms. In a meta-analysis of global research, ACEs were strongly associated with increased risk of cancer, heart disease and respiratory disease [8]. These findings were also reflected in a national survey in Wales, which found that adults with just one ACE were close to one and a half times more likely and those with ≥ 4 ACEs over two times more likely to be diagnosed with one or more chronic disease, when compared with those with no ACEs [9]. In this study, being in the highest category of ACEs (≥ 4) resulted in levels of chronic disease diagnosis that were equal to adults with no ACEs who were approximately ten years older [9]. Poor mental wellbeing can further contribute to physical ill health and drive negative changes in lifestyle and functioning [10-11]. Studies in Wales suggest that as many as 23% of adults with 2-3 ACEs and 40% of adults with ≥ 4 ACEs may experience low mental wellbeing, compared with 14-15% of those with 0 or 1 ACE [12]. Rates of diagnosed mental health problems also show a strong relationship with ACEs, with a history of adversity associated with increased likelihood of mood disorders such as anxiety and depression [13-14]. As well as direct effects of ACEs on child development, impacts of early adversity on long term health and wellbeing can be mediated by increased propensity for health harming behaviours such as substance use [15-16], which may be adopted in part as means to cope with early adversity [17]. In Wales, adults with ≥ 4 ACEs are four times more likely to be a high risk drinker and six times more likely to smoke e-cigarettes or tobacco [18].

Consistent with the relationship between early adversity and both poor physical and mental health, some studies suggest that adults with ACEs are more likely to access a range of health services, including primary care [19], hospital and outpatient care, and pharmacy services [20]. For example, in the 12 months prior, adults in Wales with ≥ 4 ACEs were twice as likely to have frequently visited their general practitioner (GP) (six or more times in 12 months), three times more likely to have attended Accident and Emergency and three times more likely to have spent a night in hospital, when compared to those with no ACEs [9]. Exposure to ACEs has been linked to more negative perceptions of one's own health and vitality [21] and adults with ACEs who frequently attend primary care are more likely to consult for somatic problems such as chronic pain and symptoms of fatigue [22]. However, not using healthcare services preventatively may also be a part of a larger pattern of risky behaviours or the result of the more 'chaotic lives' of those who have suffered ACEs [23]. For example, research from the US and Canada considering 'keeping well' services (i.e. as opposed to treatment services) has shown that experiencing ACEs is associated with decreased use of cancer screening [24] and of general health check-ups [25] or preventative dental care [26]. Further, international evidence is also beginning to emerge of the impact of childhood adversity on the management of chronic health conditions, such as non-adherence to preventative cardiovascular medication among men in Finland [27]. Whilst the negative health outcomes associated with ACEs have been shown to occur independently of deprivation [9], people living in more deprived areas, suffering poverty or other socio-economic disadvantage are likely to be a greater risk of ACEs [28]. Here there is the potential for multiple disadvantages, as deprivation is also linked to poorer quality services and greater difficulty accessing such services [29], meaning people may be more likely to lack the resources, skills or support mechanisms to mitigate the effects of adversity.

1.2 Asking about ACEs in healthcare settings

Despite widespread increases in our understanding of the links between early adversity and later health and wellbeing, and reflection of this understanding in core national policy [30], there remain some significant gaps between ACEs research and practice, particularly in health settings. Lack of attention to ACEs and early life trauma in the training curriculum of most health professionals may contribute to this gap [31-32], as studies suggest that health practitioners generally feel unprepared to discuss trauma and its effects with patients [33] and fear causing distress or 'opening a can of worms' by engaging in such conversations [34]. As a result, discussions around the wider determinants of health often appear to be the exception not the rule in primary care [35]. Nevertheless, primary care is implicated as the 'medical home' for trauma-informed practice, due to factors such as the continuity of relationships with patients and the delivery of patient-centred care that this context offers [36].

Whether or not screening for ACEs is appropriate considering the scarcity of evidence on response to and resources available for those who identify positively remains a source of debate [37-38].

However, asking about ACEs and initiating a wider discussion about childhood history and current health in healthcare settings (ACE enquiry) has the potential to:

- help those who have suffered ACEs to talk about their experiences;
- allow health professionals to understand some of the root causes of behaviour and ill health and structure more appropriate support within existing provisions;
- provide the opportunity to identify additional personal, community, health and other resources that can help mitigate some of the effects of early life trauma;
- prevent the compounding of trauma in the course of medical care or treatment; and
- help to break some of the taboos that still persist around these issues in society [39-40].



Initial studies in the US have reported high response rates to ACE enquiry with adults in primary health settings [41-42]. For example, patients visiting a health clinic in California indicated they were comfortable being asked about ACEs by clinicians and were happy to have this information included in their medical record [42]. Further, patients in another study in which a nurse practitioner asked about ACEs described a sense of empowerment as well as feelings of 'relief' and 'healing' [43]. Findings from a pilot study in England also provide tentative support to the feasibility and acceptability of ACE enquiry in general practice, with 93% uptake of patients and over 85% of these patients reporting that ACE enquiry was acceptable and important. As many as 70% of patients also suggested that their appointment was improved as a result of the health practitioner asking about their ACEs [44]. The feasibility and acceptability of ACE enquiry is also echoed in findings from an initial pilot with health visitors in North Wales [45]. In this local initiative, mothers were happy to talk about childhood experiences with a health visitor, with practitioners subsequently reporting improvements in the quality and openness of their relationships with service users [45].

1.3 General practice in Wales and the ACE agenda

Individuals who have experienced trauma most commonly receive care through general practice systems. However, in Wales, as across the UK, demand on these provisions continues to grow, with less than 2,000 GPs serving the entire nation of 3.1 million - approximately 6.5 practitioners per 10,000 population [46]. According to the British Medical Association, the average person attends their GP practice six times a year – double the number of visits of only a decade ago [47]. Although recent inspections have commended general practice in Wales for its continuity of care and focus on continuous professional development for all staff, challenges remain in ensuring that systems are accessible, in particular to those patients who have additional needs [48]. The direction and development of primary care in Wales is shaped both by the principles of prudent healthcare [49] and the revised health and social care plan - *A Healthier Wales* [30]. In line with the Well-being of Future Generations (Wales) ACT [50], collective national action is aimed at three key priority areas, including reducing unnecessary and inappropriate tests, treatments and prescriptions and ensuring that people are able to make informed decisions about the care they receive. Whole system values identified in the health and social care plan include proactively supporting people throughout their whole lives and ensuring care is of quality and value [30].

Following the delivery of the first national ACE survey in Wales in 2015, which described the extent of ACEs and their impacts on health [18], Welsh Government, public services and the voluntary sector have become united in a national agenda to prevent ACEs, build resilience and provide support those who have already suffered from their effects. Whilst programmes of work continue to develop in sectors such as education, housing and policing, the above policy frameworks provide an opportunity to begin to explore the role of front-line health practitioners in directly identifying and supporting individuals who have experienced childhood trauma. In 2017-18, this opportunity was recognised by the Cymru Well Wales Adverse Childhood Experiences (ACE) Support Hub (ACE Hub) and Betsi Cadwaladr University Health Board (BCUHB), who sought to pilot an approach to ACE enquiry within three GP practices in Anglesey, North Wales. Public Health Wales (PHW) were commissioned to provide an independent evaluation of this pilot.

1.4 Evaluation objectives

This evaluation had the following primary objective:

- 1 To explore with both patients and practitioners the feasibility and acceptability of conducting enquiry for ACEs within general practice settings.

Secondary objectives were:

- 2 To identify the prevalence of ACEs in an adult primary care sample and explore the association between ACEs and key demographic, lifestyle, health, wellbeing and service utilisation variables;
- 3 To consider the potential impacts of ACE enquiry on patients' general practice attendance and medication use over a six month follow up period.

2. Methods

2.1 Design and delivery of the pilot

The pilot project was a local initiative driven and supported by BCUHB and the ACE Hub. PHW were asked to provide an independent evaluation of the work but were not involved in the design and delivery of the ACE enquiry process. For information, the intended model of delivery conceived by BCUHB is summarised in Box 2.

Engagement and organisational readiness

The pilot was supported by a consultant facilitator (CF) appointed by the ACE Hub. During an initial meeting, CF, the area medical director (AMD) for BCUHB and the cluster research lead scoped out the broad design of the project. The AMD approached all practice managers within the cluster and invited them to submit expressions of interest for involvement in the pilot. Initial meetings took place between the CF and the managers at three identified practices in August 2017 to agree responsibilities and requirements for involvement in the pilot (see Appendix 1; Table I for information on the three participating practices). This was followed by planning meetings in September 2017 in which the CF worked with practice managers and some key clinicians to refine the ACE enquiry model (e.g. determine how patients would receive the ACE questionnaire). The CF offered ongoing support to practices throughout the pilot implementation, with approximately monthly-6 weekly telephone contacts and visits to the practices in December 2017 (Amlwch and Holyhead) and February 2018 (Llangefni).

Box 2: Model of delivery of ACE enquiry in general practice

Eligible patients identified by reception staff and provided with information sheet and ACE questionnaire

Patient completes ACE questionnaire in waiting area prior to appointment

Patient hands completed questionnaire to clinician at start of appointment

Clinician discusses presenting issue(s) then introduces association between ACEs and health and invites patient to discuss their own ACEs

Patient given the opportunity for further support or onward referral and provided with information on local and national support services

Training and materials

Training was provided by CF and introduced the purpose and rationale of ACE enquiry before outlining the delivery of the 4-stage enquiry process: **explain, ask, listen and close**. In Amlwch and Llangefni, training took place over one and a half hours and involved all staff (GPs, nurse practitioners, reception/administrative staff). In Holyhead, training was split into two sessions: (1) an ACE information and awareness course that was provided to all staff and lasted approximately 45 minutes; (2) a two hour step-by-step implementation course that was delivered to GPs and nurse practitioners only. Review meetings were conducted with each practice in April/May 2018.

The CF produced a practitioner guide/toolkit to support the information provided in training and a directory of local and national support services that clinicians could use to signpost patients if required. Patients completed a paper ACE questionnaire in English or in Welsh. This questionnaire was based on the Centres for Disease Control and Prevention (CDC) short form ACE questionnaire [51] but was adapted¹ for use in ACE enquiry by the CF. These questions retrospectively asked adults about adverse experiences occurring in *their* childhoods. The questionnaire did not consider current exposure to adversity (e.g. intimate partner violence from a current partner).

Eligibility criteria and sample selection

Eligibility criteria for the ACE enquiry pilot were set individually by each practice (see Appendix 1; Table II). Across all practices, only patients aged 18 years and over and determined by reception staff to be cognitively able to provide verbal consent for participation were invited to complete the ACE questionnaire. For the purposes of the pilot, practices chose to deliver ACE enquiry in English and Welsh only.² Further, in Amlwch, patients were not offered the ACE questionnaire if they were considered to be very distressed on arrival at the surgery (i.e. prior to being introduced to the pilot).

In Llangefni, very elderly patients identified as extremely frail were ineligible as were those that were considered to have significant mental health or developmental problems and patients with sight impairments. Very elderly and frail patients were also ineligible in Holyhead.

All practices identified a systematic sampling approach to select a subsection of eligible patients for inclusion in the pilot. In two practices (Amlwch and Llangefni), this sampling approach was only used on days/sessions determined by the enquiring clinicians (herein referred to as active sessions). Thus, at particularly busy times, clinicians could decide not to conduct ACE enquiries. In Holyhead, systematic sampling was applied to a set number of active sessions that were selected in advance by the practice manager. However, in this practice an additional group of patients were recruited as a convenience sample based on their attendance at a group conducted by the practice manager (see Box 3).

Variations in the process of delivery

Standard operation in all three practices involved the use of an electronic booking in system for arriving patients. In Amlwch and Holyhead, these machines were switched off during pilot implementation and patients were diverted via the reception desk. Eligible patients arriving at reception during active sessions were provided with a pack by reception staff which contained: a patient information sheet (which explained the purpose and process of the pilot); the ACE questionnaire; and a short patient feedback survey (see section 2.4). In Llangefni, patients continued to use the electronic booking in system. However, during active sessions, once an eligible patient had checked in electronically, reception staff intercepted them in the waiting area and provided them with a pack (as above) before they were seen by the clinician. In all practices, patients completed the ACE questionnaire in the waiting room prior to their appointment and handed their completed questionnaire to the clinician at the beginning of/during their consultation.

¹ Adaptations included condensing the sexual assault items into one question, and changing the responses from frequency based (e.g. never, sometimes, often) to simple dichotomous yes/no responses.

² During the design of the model of ACE enquiry, practices discussed the potential need to deliver ACE enquiry in other languages. Whilst they identified that this may be a future need for the scaled and sustainable use of such an approach, all three practices acknowledged that consultations were currently only delivered in English or Welsh and the use of an interpreter would not be appropriate without further exploratory work into the translation and cultural appropriateness of the ACE questionnaire.

Whilst in the majority of cases clinicians across all three practices chose to address the patient's presenting issue first before initiating a discussion about ACEs, this was not always possible and the process reportedly sometimes varied depending on the needs/intentions of the patient (see section 3.4). In Amlwch and Llangefni, enquiring clinicians added a patients' total ACE score to their patient record during or immediately following the consultation. Whilst this process was also used in Holyhead, at times a patient's EMIS number (their unique identification number for electronic records) was added to their ACE questionnaire by reception staff before the questionnaire was given to the patient. Completed questionnaires with patient EMIS numbers were passed to the practice manager for inputting electronically following ACE enquiry consultations.

Implementation in Holyhead, as described by the practice manager, enquiring clinicians and reception staff during practitioner feedback (section 2.3/3.4), differed from the other two practices. A description of these key differences is provided in Box 3. Due to these differences, which occurred without the knowledge and support of the CF, findings from patient follow-up data (see section 2.5) and patient feedback surveys (2.4) are analysed and presented collectively and by practice. Where differences in implementation are relevant and may account for differences in practitioner feedback, the different practices are also identified in qualitative practitioner feedback (section 2.3).

Box 3: Alternative delivery in Holyhead

The process of delivery implemented in the Holyhead practice differed from the intended and agreed model of delivery originally conceived by the CF and the practice in five notable ways:

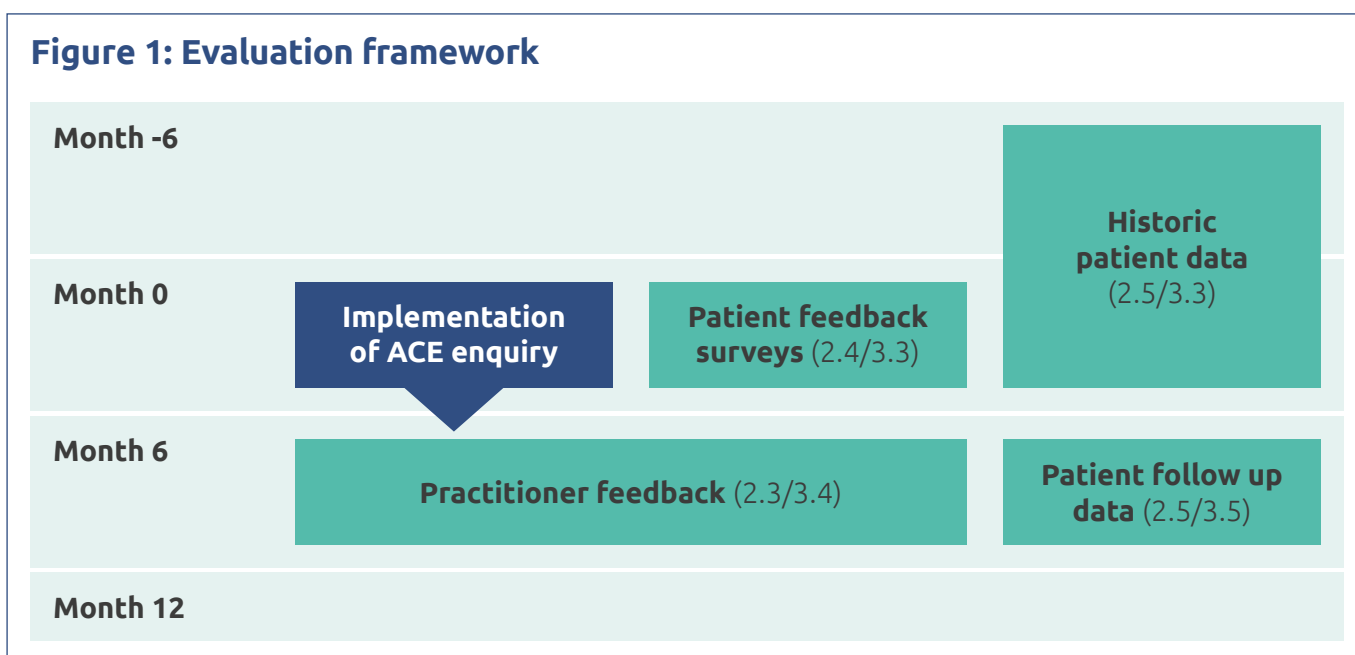
- 1 During training, clinicians were encouraged to initiate the conversation about ACEs with patients by first contextualising the potential impact of early adversity on later health and wellbeing outcomes, before then reflecting on a patients' given answers to the ACE questionnaire – e.g. 'I see you have identified that you experienced three of these ACEs when you were younger. Do you think this is currently impacting on your health at all?'. Whilst this intended model of delivery was described by practitioners in Amlwch and Llangefni, in Holyhead enquiring clinicians alternatively described introducing the ACE questionnaire to patients as a pilot study and as a means of understanding the prevalence of ACEs in the population.
- 2 Although the practice identified a systematic sampling procedure, reception staff were also described as 'filtering out' patients when they felt that ACE enquiry with those individuals would not be appropriate. There was no clear indication as to on what grounds reception staff may make such a decision.
- 3 Some patients who asked to do so were allowed to take the ACE questionnaire away from the practice to complete at home. Whilst these questionnaires were later returned and had been completed, typically patients had indicated no ACEs.
- 4 In addition to the agreed 1:1 delivery of ACE enquiry with GPs and nurse practitioners, ACE enquiry was also delivered in a group session by the practice manager. Patients were provided with the ACE questionnaire and information sheet at the beginning of the session and completed questionnaires individually, before responses were reflected on during a group discussion. Following the group session, patients were given the opportunity to talk on a 1:1 basis with the practice manager.
- 5 During the pilot, alongside the trained GPs and nurse practitioners, ACE enquiry was delivered by two locum doctors who had not received training from the CF but were introduced to the concept of ACEs and the process of ACE enquiry delivery by their trained colleagues.



2.2 The evaluation framework

The evaluation framework designed by PHW is outlined in Figure 1. A range of quantitative and qualitative data collection methods were used to assess the feasibility, acceptability and initial impact of ACE enquiry with both patients and practitioners in general practice. A target of 600 completed ACE enquiries (200 per practice) was agreed between partners on the basis of providing an adequate sample for basic statistical analyses.

Figure 1: Evaluation framework



2.3 Practitioner feedback

Sample and procedure

Following implementation of the pilot, a series of focus groups/semi-structured interviews were conducted with practitioners in each practice to gain their feedback on:

- The objectives and the implementation of ACE enquiry in general practice, including different practitioner roles and engagement;
- Perceived changes in practice during and following ACE enquiry consultations;
- Initial impacts of ACE enquiry on patients and staff;
- Barriers and challenges to ACE enquiry in the general practice setting;
- Suggestions for successful future implementation, including scale up to a whole-practice level.

A total of 12 practitioners took part in practitioner feedback discussions across the three practices. Participants and their roles are summarised in Table 1. Focus groups or interviews took place on site at the practices and were facilitated and recorded by the lead author. All participants provided informed consent. Semi-structured questions were used to direct the discussions, which lasted approximately 45-60 minutes. It is important to note that clinicians were not directly observed during the pilot. Therefore any insight into the actual implementation of ACE enquiry, the nature of discussions with patients and fidelity to the intended model of delivery comes from practitioner feedback and one item of anonymous patient feedback (section 2.4) only.³



Table 1: Practitioner feedback participants

Practice	Enquiring clinicians	Managers	Admin
Amlwch	1	1	0
Llangefni	2	1	0
Holyhead	3	2*	2
Total			12

*One manager also delivered ACE enquiry (see Box 3)

Data analysis

Transcripts from practitioner feedback were analysed manually for coding and thematic analysis, with the support of an experienced qualitative researcher (operating as a second reviewer). Particular attention was paid to instances where practitioners were in disagreement and, where appropriate, views were compared and contrasted with findings from patient feedback (see section 3.3).

³ Question: I think my appointment with the GP/nurse was improved because they understood my childhood better. Response options: strongly agree, agree, neither agree nor disagree, disagree, strongly disagree.

2.4 Patient feedback questionnaires

Sample and procedure

All patients that completed the ACE questionnaire and engaged with their GP or nurse practitioner in a discussion about ACEs and health were invited to provide anonymous feedback for the evaluation in the form of a short questionnaire. Questionnaires included a set of statements with likert-scale responses (strongly agree; agree; not sure; disagree; strongly disagree) that also included space for respondents to provide any other comments directly to the research team. Patients were instructed to deposit completed surveys in locked collection boxes in the waiting area at each site or hand them in to reception upon exiting the surgery. Questions were designed to assess patients' views as to the comprehensibility and acceptability of the ACE questions and the enquiry process. One further question considered the impact of being asked these questions on their consultation with the health practitioner. Patients who had disclosed ACEs were also asked to identify if this was the first time they had told a professional service (i.e. not their friends and family) about these childhood experiences. Patients had the option to complete feedback questionnaires in English or in Welsh (n=1 completed in Welsh). Across all three surgery sites, 333 patients completed the feedback questionnaire, representing an overall response rate of 58.9% (for differences between sites, see Appendix 1: Table II).

Data analysis

Patient feedback questionnaires were analysed using basic frequencies. To encourage uptake and provide all participants with the opportunity to feedback directly to the evaluation team, patient feedback questionnaires were anonymous and cannot be linked to any patient demographic or other information. However, responses were compared across practices, for those with and without ACEs, and by first disclosure (vs. having previously disclosed to a professional or service).

2.5 Patient data (from practice records)

Sample and procedure

A flow diagram of patient participation in the pilot is outlined in Figure 2. The practice manager in each practice extracted pseudo-anonymised data (using a unique patient ID number; extracted data did not contain identifiable information, e.g. name, date of birth or address) from EMIS into Microsoft Excel for all patients who experienced ACE enquiry based on a list of required variables identified in advance by the lead author. Excel data files were sent to the lead author by secure email. Particular care was taken to ensure that data did not identify patients on the basis of a unique diagnosis (e.g. if only one patient from a practice had a rare form of cancer). Data extraction occurred at two time points – immediately following the implementation period (circa April 2018; in which historic data for the six months prior to ACE enquiry were also extracted) and after a follow up period of six months (circa October 2018). At six months, only data on service use were collected (see Figure 2).

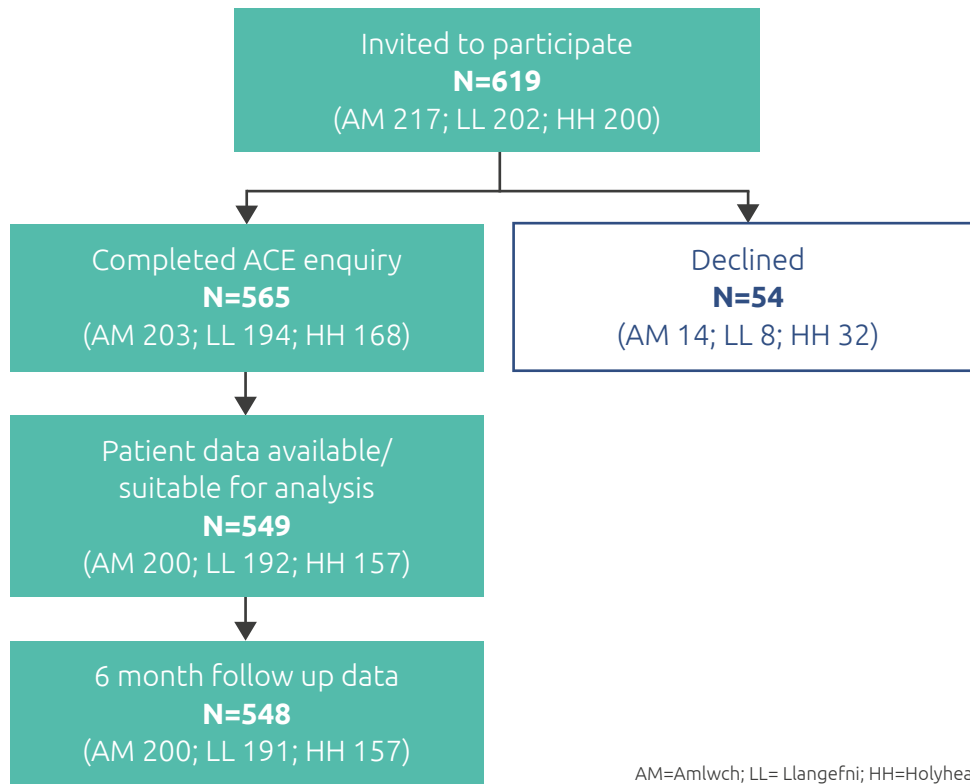
Data analysis

Pseudo-anonymised patient data were imported into IBM SPSS v24 software for cleaning and statistical analysis. Cases were excluded from analyses if data from the patient record was not accessible or was incomplete. This resulted in a final analytical sample of n=549 (Figure 2).

Demographic data

Data were provided on patient gender (male; female). Patient age was categorised into four discrete age categories (18-30; 31-50; 51-70 and ≥71 years old). Ethnicity was recorded by some practices in 2011 census categories, but due to the high frequency of missing data, this variable was not included in analyses. None of the three practices were able to provide data on deprivation or other demographic variables (e.g. marital status; education or employment data; see limitations section 4.1).

Figure 2: Flow diagram of patient participation in the ACE enquiry pilot



Adverse Childhood Experiences (ACEs)

Questions adapted from established ACE questions from the Centers for Disease Control and Prevention short ACE tool [51] and used extensively in previous research [8] were used to measure childhood exposure to forms of abuse and household dysfunction (see Appendix 2). Patients responded yes/no to experiencing each of the 10 ACEs and these data were used to calculate an overall ACE score. All three practices opted to record only the patient's total ACE score. Therefore data on the different categories of ACEs were not available. For the purposes of analysis, ACE scores were dichotomised into ACE count categories: 0-1 ACE; ≥ 2 ACEs.⁴ NB. These categories were selected for consistency with previous empirical research and are intended only to illustrate potential differences in outcomes by number of ACEs. These categories do not represent thresholds for experiencing negative impacts of ACEs and have not been identified as having any practical application for screening or intervention.

Lifestyle factors

Lifestyle data on body mass index (BMI) and smoking status were included in analyses if they were collected or updated by the practice in the last five years (current data available for 80.0% and 89.4% of the total sample respectively). BMI was categorised into healthy weight (BMI = 18-25); overweight (26-30) and obese (>30). Obesity (Y/N) was used as the outcome of interest in subsequent analyses. Categories for self-reported smoking status were dichotomised as: current smoker; or ex-/non-smoker. Measures of patient alcohol consumption and physical activity/exercise level were poorly completed (current available data for <50% of patients) and were therefore not used in analyses.

⁴ Use of 0-1 as an ACE category is to support the statistical analyses of increased exposure on outcomes. It is not intended to suggest that there cannot be potentially considerable impacts of experiencing a singular ACE. The use of this ACE category is also discussed in limitations (see section 4.1).

Physical and mental health

Practices provided extracted data on patients' chronic health conditions based on identified READ codes⁵ for existing conditions. Included physical health conditions were: asthma; chronic obstructive pulmonary disease (COPD); Type II diabetes; cardiovascular disease (including coronary heart disease, myocardial infarction; heart failure; angina; stroke and transient ischemic attack); hypertension and cancer. Across all practices, patients who had two or more of the above health conditions were further identified as having multiple long term conditions (MLTC).

Patients with a READ code for any mental health condition were also identified. Where this READ code was supported by either a record of historic antidepressant use (see below) or a consistent listed acute medication, this variable was re-coded into the following sub-categories: depression; anxiety (including panic disorders); psychosis; post-natal depression; fatigue and somatic symptoms; eating disorders; alcohol and substance abuse; psycho-sexual problems. However, due to the low frequency of many of these mental health conditions, only depression and anxiety were used in further analyses (by condition). Where there was no evidence of medication use but mental health problems were identified for that patient over multiple different years, a separate category of 'multiple low level mental health presentations' was created.

Health service use

Data were extracted on the number of appointments patients attended in the six months prior to ACE enquiry. This included a face-to-face appointment with any clinician but did not include appointments that were booked but subsequently categorised as DNA (patient did not attend).

Due to the large variation in frequency of attendance between practices, the mean number of attendances was calculated per practice and patients in that practice that attended more frequently than the practice mean were identified as a 'frequent attender' (Amlwch ≥ 4 attendances in 6 months; Llangefni > 1 attendance in 6 months; Holyhead ≥ 7 attendances in 6 months). Two practices (Amlwch and Llangefni) also provided data on the number of times patients had received a referral into secondary care in the previous 12 months. Across all practices, patients who had ≥ 4 referrals were identified as 'high secondary care demand'.

Large between-practice variations also resulted in the use of a relative measure (i.e. above practice means) for high medication use. For repeat scripts, patients from Amlwch with ≥ 4 current repeat scripts at the time of ACE enquiry, patients from Llangefni with ≥ 2 and patients from Holyhead with ≥ 5 were identified as having 'high repeat medication use'. Additional data were extracted to identify those patients that had ever been on antidepressant medication (yes/no). Where available, data on the number of attendances in the six months following ACE enquiry were also collected (N=548 patients; see Figure 2) to tentatively examine the possible impact of ACE enquiry on subsequent service use.

Statistical analyses

The relationship between ACEs and lifestyle factors, chronic health and health service use was explored using bivariate (Chi squared) and multivariate (binary logistic regression; Cox regression) statistics.

⁵ READ codes are a thesaurus of clinical terms that provide a standard vocabulary for clinicians to record patient findings and procedures in health and social care.

3. Results

3.1 Implementation

Initial engagement between the CF and the GP practices began in August 2017 when practice managers were informed of the aims and objectives of the pilot and requirements for their participation (e.g. the extraction of patient data for analyses). Initially a target sample size of 200 ACE enquiries per practice was agreed to allow a sufficient sample for multivariate statistical analysis.

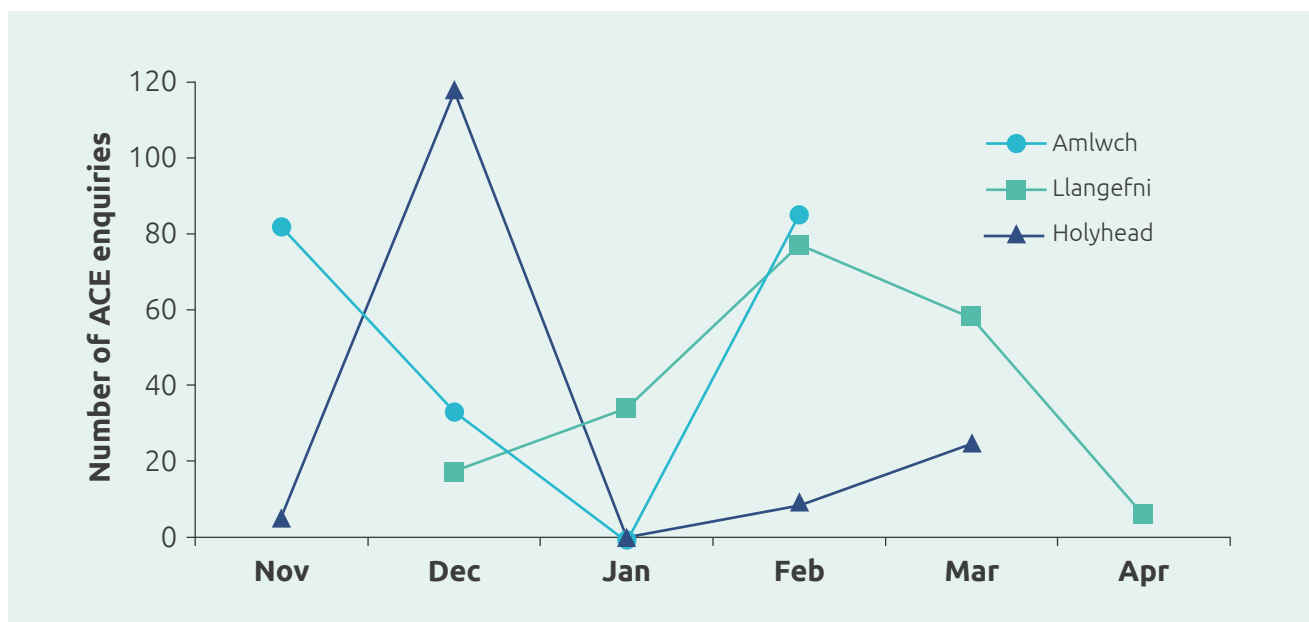
Following training in October 2017, implementation of ACE enquiry began in the first practice (Amlwch) in early November 2017 and in subsequent practices in late November/December 2017. A total of 565 ACE enquiries were completed during implementation across the three practices. For all practices, implementation varied considerably by month, with two of the three practices completing no enquiries at all in January (Figure 3). Across practices, a total of 54 patients declined to take part in the ACE enquiry pilot (see Figure 2), representing an overall uptake rate of 90.5%. Uptake differed significantly between practices (93.5% in Amlwch; 96.0% in Llangefni; 84.0% in Holyhead; $X^2=13.730$, $p=0.001$). Although declining patients were not required to provide reasons for non-participation, where reasons were spontaneously volunteered, these are described in practitioner feedback (see section 3.4). Demographic data on decliners was provided by the Holyhead practice only and is briefly summarised in Box 4.

As all practices opted for a systematic sampling procedure, but with added flexibility around which surgery sessions they used (see Appendix 1: Table II), it was not possible to quantify how many eligible appointments occurred during active sessions or if all patients who should have been asked (by reception) to complete an ACE questionnaire were provided with this opportunity. Fidelity to the agreed enquiry process (Box 2) was not measured and findings cannot quantify or qualify the interactions between patients and reception staff or clinicians (i.e. during consultation). Insights into the nature of appointments are provided from practitioner feedback (section 3.4) and anonymous patient feedback (section 3.3) only.

Box 4: Patients declining participation in Holyhead

Just over half of those patients declining ACE enquiry in Holyhead were female (59.4%; $n=19$). Whilst only two declining patients were from the youngest age category (18-30 years), just under half of decliners were aged over 71 years (46.9%; $n=15$). This means of all those patients aged 71 year and over who were approached to take part in the pilot ($n=52$), over one in four (28.8%) declined participation.

Figure 3: Number of ACE enquiries completed at each practice by month



3.2 ACEs and their association with health and service use

3.2.1 Sample characteristics and ACE prevalence

Across the three pilot practices, data were provided on 549 patients who completed an ACE questionnaire and discussed childhood adversity with a health practitioner (Figure 2). A summary of these ACEs, and patients' demographic and other lifestyle and health variables extracted from health records is provided in Table 2. Participating patients ranged in age from 18 to 91 years (mean age: 53.4 years) and just over sixty percent were female. Overall prevalence of chronic health conditions ranged from 7.8% of patients with cancer through to 25.5% with hypertension and 33.3% experiencing mental health issues. Just under a third (29.5%) of patients had experienced ≥ 2 ACEs during the first 18 years of life. Overall ACE prevalence was very similar to that identified in previous research of the general population in Wales collected via self-selected household surveys (29.5% vs, 31.0% ≥ 2 ACEs for this sample and general population respectively; [1]).⁶

Key differences in sample characteristics were found between practices (Appendix 3: Table I); with a younger cohort of patients in Llangefni and a significantly greater proportion of male patients in Holyhead. Rates of current smoking also differed between practices, with a greater prevalence among those from Llangefni and Holyhead. Between-practice differences were found in the prevalence of all chronic health conditions except cancer, which had a low occurrence across all practices. In general, reporting of all chronic health conditions and mental health problems was significantly lower in Llangefni. Whilst the prevalence of ACEs did not differ by age category or gender, significant differences were found between practices, with a higher prevalence of ACEs reported in Holyhead ($X^2=40.620$, $p<0.001$; Figure 4). Differences between these geographic areas may account for some of the variation in ACE prevalence. For example, levels of deprivation are considered higher in Holyhead than the other two areas (Appendix 1: Table I).

⁶ Data from general population surveys includes only those aged 18-69 years.

A practice variable is included in subsequent multivariate analyses to control for the potential confounding effects of deprivation (and other unknown differences by geographic area).

Information from patient health records was used to explore the relationship between ACEs, demographic factors and lifestyle and health variables, using bivariate and multivariate statistics. Tables of full bivariate and multivariate analyses can be found in Appendix 3.

Figure 4: ACE prevalence (%), shown by practice

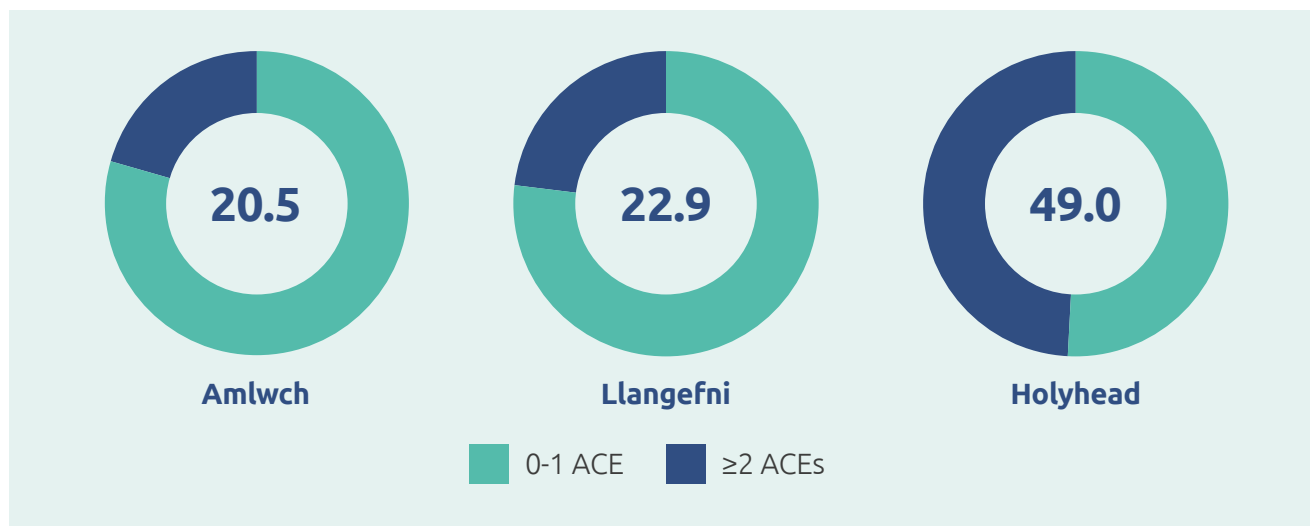


Table 2: Sample characteristics

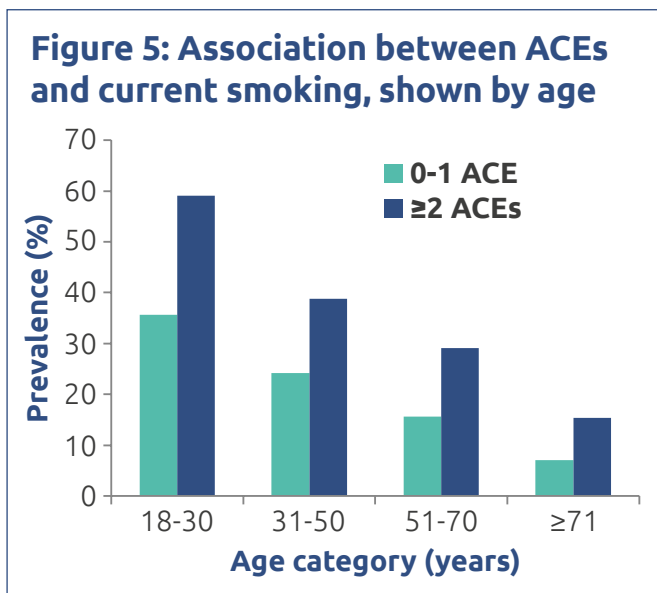
		N	%
All		549	-
Demographics			
Age (years)	18-30	76	13.8
	31-50	163	29.7
	51-70	196	35.7
	≥71	114	20.8
Mean age (years)		53.4	-
Gender	Male	216	39.3
Lifestyle factors			
BMI ^a	Obese (≥30)	186	42.4
Mean BMI		29.4	
Smoking ^b	Current smoker	114	23.2
Health			
Chronic conditions	Asthma	110	20.0
	COPD	48	8.7
	Diabetes (Type II)	45	8.2
	CVD	63	11.5
	Hypertension	140	25.5
	Cancer	43	7.8
	MLTC	151	27.5
Mental health	Any	183	33.3
	Depression	72	13.1
	Anxiety	41	7.5
	Antidepressants*	204	37.2
Health service use			
Frequent attender** ^c		225	41.4
High repeat medication/prescription use ^{§,d}		194	35.9
High secondary care demand ^{£,e}		94	29.6
ACEs			
ACE count category	0-1	387	70.5
	≥2	162	29.5

Footnote: BMI=Body mass index; COPD= Chronic obstructive pulmonary disease; CVD=Cardio vascular disease; MLTC=Multiple long term conditions; ACE=Adverse childhood experiences. *Ever been prescribed antidepressants; **Above practice mean for number of face-to-face appointments attended in six months prior to ACE enquiry (≥4 Amlwch; ≥1 Llangefni; ≥7 Holyhead); †Above practice mean for total number of active repeat medication scripts at the time of enquiry (≥4 Amlwch; ≥2 Llangefni; ≥5 Holyhead); ‡≥4 referrals into secondary care in previous 12 months; data on secondary care provided by Amlwch and Llangefni only; §Data on BMI available for n=439 patients only; †Smoking data available for n=491 patients only; ‡Complete attendance data available for n=543 patients only; †Medication data available for n=541 patients only; ‡Secondary care demand data provided for n=318 patients by Amlwch and Llangefni only.

3.2.2 ACEs and lifestyle factors

A positive significant relationship was found in bivariate analyses between status as a current smoker and increased ACE count for patients across all age categories (Figure 5; $X^2=14.923$, $p<0.001$). After accounting for available socio-demographic confounders (e.g. age, gender, GP practice) in multivariate analyses, patients with ≥ 2 ACEs were twice as likely to be a current smoker when compared with patients with 0-1 ACE (AOR=2.10; 95% CI=1.33-3.34, $p=0.002$; Appendix 3: Table IV).

ACEs were not found to be associated with obesity in this primary care sample (Appendix 3: Table II). Data on alcohol consumption were extracted by practices but were insufficiently complete to allow analysis.

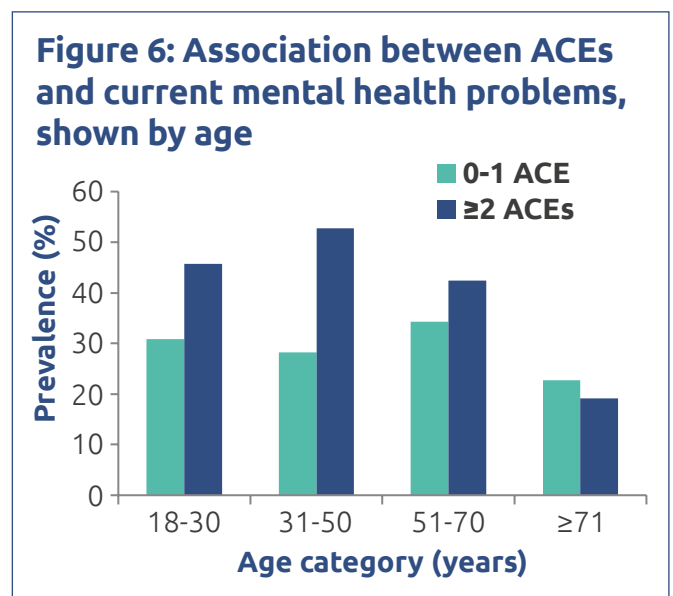


3.2.3 ACEs and chronic health conditions

With the exception of asthma, the prevalence of all diagnosed chronic health conditions increased with age (Appendix 3; Table III). Across all age categories, the prevalence of COPD was higher in patients with ≥ 2 ACEs (compared to those with 0-1 ACE), although the relationship between ACE count and COPD narrowly failed to reach statistical significance in both bivariate and multivariate analyses (Appendix 3: Table II and Table V). No significant relationship was found between prior exposure to ACEs and prevalence of asthma, type II diabetes, hypertension, cancer or CVD in adulthood (Appendix 3: Table V).

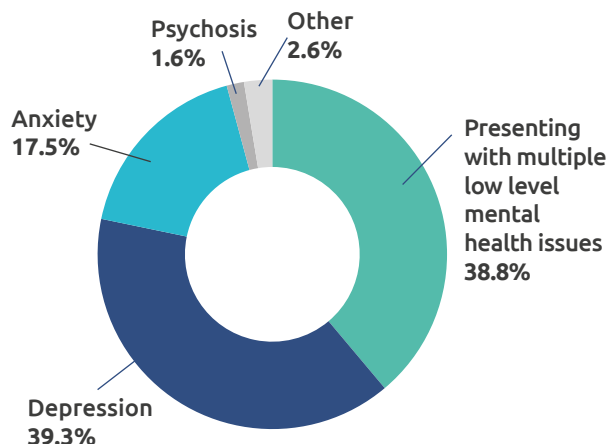
3.2.4 ACEs and mental health

The strongest association between childhood adversity and a negative adult health outcome was found when considering current mental health ($X^2=8.866$, $p=0.003$; Appendix 3: Table II). Unlike the physical health conditions examined, prevalence of current mental health problems did not show a stepwise increase with age, instead peaking marginally in the 31-50 age category (Figure 6). Multivariate analyses controlling for socio-demographic confounders revealed that patients with ≥ 2 ACEs were almost twice as likely to experience mental health problems in adulthood, compared with those with 0-1 ACE (AOR=1.92; 95% CI=1.27-2.89, $p=0.002$; Appendix 3: Table IV).



Patients were identified as having a range of different primary mental health problems (Figure 7). Just over a third of those whose patient record indicated mental health issues were not READ coded for a diagnosed condition, but instead had multiple low level mental health presentations spanning >1 year (e.g. low mood; work related stress). Whilst multiple low level mental health presentations did not show an association with prior ACE exposure, patients with ≥ 2 ACEs were significantly more likely to experience depression (as a primary or secondary mental health issue), when compared with those with 0-1 ACE (AOR=2.29, 95% CI=1.33-3.93, $p=0.003$; Appendix 3: Table IV).

Figure 7: Prevalence of different (primary) mental health problems



3.2.5 ACEs and health service use

Overall, no significant relationship was found between exposure to ACEs in childhood and frequent GP attendance ($X^2=0.735$, $p=0.391$; Appendix 3: Table II). Among those patients aged 18-30, 31-50 and 51-70 years, those with ≥ 2 ACEs actually had fewer face-to-face appointments than patients with 0-1 ACE in the previous six months. Further, no difference was found in current high repeat medication/prescription use by ACE count category (Appendix 3; Table II). However, an overall positive significant relationship was found between ACE count category and ever use of antidepressants ($X^2=6.343$, $p=0.012$; Figure 8; Appendix 3: Table II). In multivariate analyses controlling for demographic confounders and practice location, patients with ≥ 2 ACEs were over one and a half times more likely to have ever been prescribed antidepressants, when compared with patients with 0-1 ACE (AOR=1.61, 95% CI=1.05-2.48, $p=0.031$; Appendix 3: Table IV). A positive significant relationship was also found between ACE count category and high secondary care demand across all age categories (Figure 9). Patients with ≥ 2 ACEs were three times more likely to have received a high number of referrals (≥ 4) to secondary care in the previous 12 months, when compared with patients with 0-1 ACE (AOR=2.99, 95% CI=1.64-5.46, $p<0.001$; Appendix 3: Table IV).

Figure 8: Association between ACEs and antidepressant use (ever), shown by age category

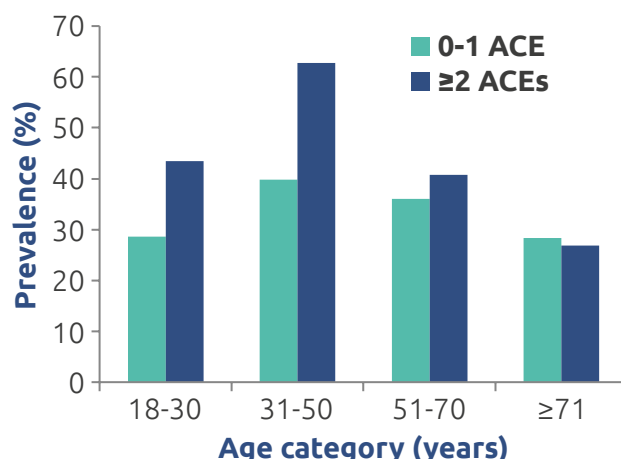
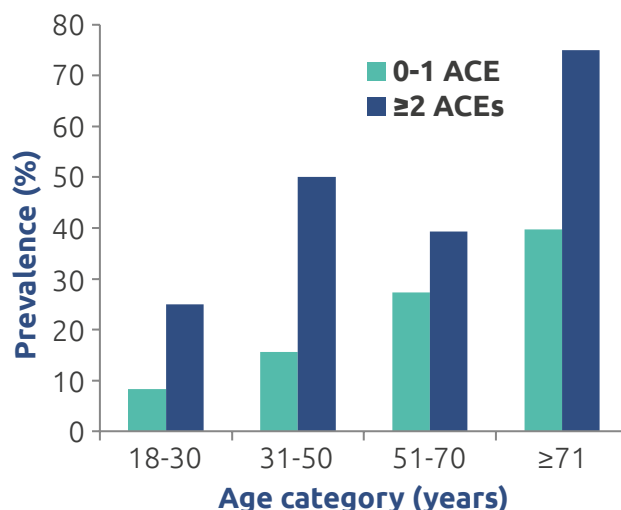


Figure 9: Association between ACEs and high secondary care demand, shown by age category



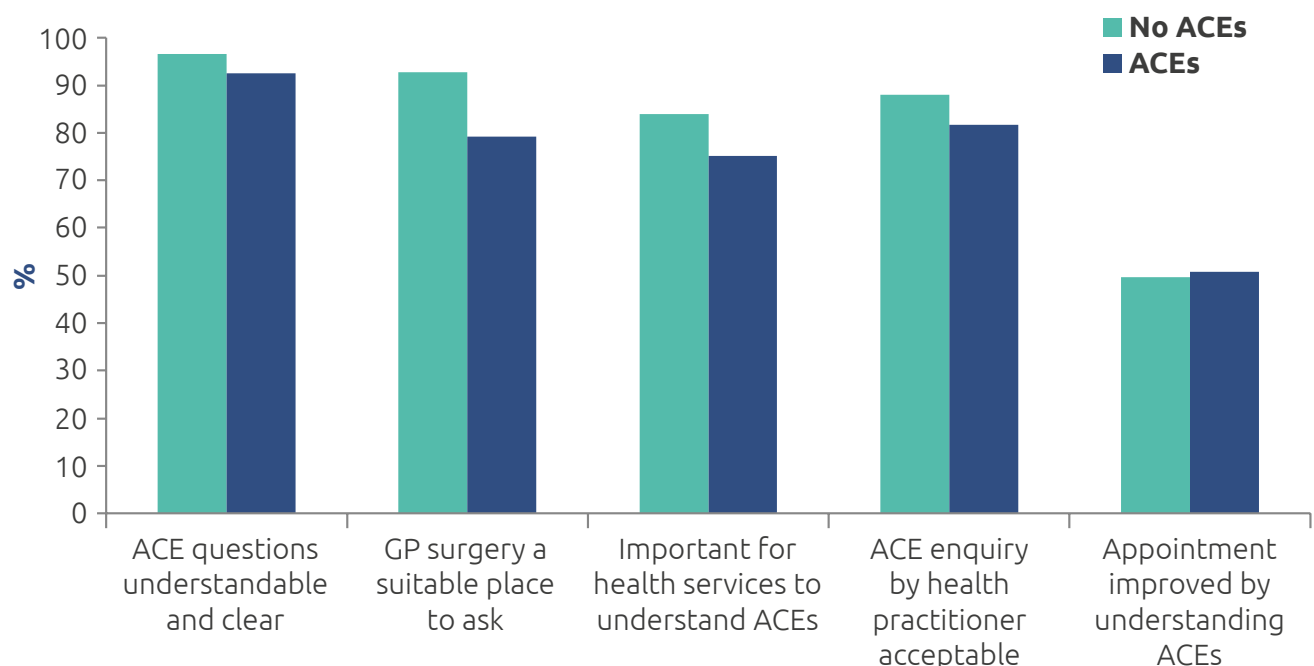
3.3 Patient feedback surveys

Across all pilot sites, 333 patients completed patient feedback questionnaires. Assuming that all patients were provided with the appropriate form to complete their feedback (not measured), this suggests an overall response rate of 58.9%. Response rates varied between practices, with almost three quarters (72.4%) of patients in Amlwch completing a feedback questionnaire, compared with less than half of those in Holyhead (43.5%; see Appendix 1: Table II). Of feedback respondents, 294 completed the item on their disclosure of ACEs (see section 2.4) and 46.6% of those identified themselves as having at least one ACE. Generally, patients held overwhelmingly positive views of the ACE enquiry in general practice. Over 95% of all respondents agreed or strongly agreed that the ACE questions were clear and understandable and 87% felt the GP surgery was a suitable place to be asked these questions. Similarly, 85% of respondents reported that ACE enquiry by a health practitioner was acceptable and four in every five (80.7%) felt that it was important for health services to understand what happens in a person's childhood (Figure 10). There were no significant differences between practices in responses to these four patient feedback items. Although half of all respondents indicated that

their appointment was improved because the GP understood their childhood better, opinion on this measure was overall more divided, with a further 35% of respondents indicating they were unsure. Here significant differences between practices were found, with two thirds (66.1%) of respondents from Llangefni reporting their appointment was improved, compared with only 45.7% of those in Amlwch and less than a third (32.8%) of patients in Holyhead ($X^2=19.842$, $p<0.001$).

Although patients with and without ACEs showed general agreement, views as to the suitability of the GP setting for ACE enquiry were significantly more positive among patients without ACEs (92.9% agree/strongly agree vs. 79.4% of those with ACEs; $X^2=11.505$, $p=0.001$; Figure 10). Of the 137 respondents who indicated that they had at least one ACE, for 59.9% this was the first time they had told a professional or service (i.e. someone other than their friends and family) about these experiences. Those for whom ACE enquiry was their first disclosure held significantly more positive views as to the importance of ACE enquiry (81.7% agree/strongly agree vs. 65.5% of those for whom it was not their first disclosure; $X^2=4.661$, $p=0.031$).

Figure 10: Percentage of patients with (N=137) and without (N=157) ACEs strongly agreeing or agreeing with the items positively describing ACE enquiry in general practice



Twenty eight patients submitted additional free text comments in the spaces provided on their patient feedback surveys. Four of these responses were incomprehensible. The remaining 24 comments (from Amlwch – 8 patients; Llangefni – 12 patients; Holyhead – 4 patients) were categorised into four primary themes and are described in Table 3 below with examples derived from each theme. Two comments were unrelated to ACE enquiry and represented more general reflections on the practice overall (e.g. “The doctors are good to me and have supported me with my COPD”).

Table 3: Comments provided in patient feedback

Theme	N	Examples
Positive reflections on experiences and relevance of ACE enquiry	8	<ul style="list-style-type: none"> • I think this is a valuable questionnaire. The more information available and the more open people/children are about problems the better things will come to future children/adults. • I think getting feedback from people who have been affected by one or more of the items on the questionnaire might help that person to recognise possible reasons for their own behaviour. • Good to see research with a view to improving health and care.
Concerns about the implementation of ACE enquiry	2	<ul style="list-style-type: none"> • I hope the survey is not an additional burden on GPs - they have enough paperwork! Time is short for additional discussion. • I would have preferred to have been asked sensitive questions in a more private surrounding. It was an emotional shock and was upsetting to a degree to fill in questions sitting in a waiting room full of strangers. Not good to be suddenly tearful unexpectedly. Postal questionnaire would have been better. I agree with the survey being done though.
Limitations of the ACE questionnaire and suggestions for its extension	7	<ul style="list-style-type: none"> • There could have been a question asking whether we felt that negative childhood experiences had affected us in the long term. • I think a few questions about your own household environment now would be useful, not just when you're growing up. • These questions should be addressed to young people, not the elderly.
Providing additional information of their ACEs	5	<ul style="list-style-type: none"> • My mother had a nervous breakdown and was hospitalised when I was four years old.

3.4 Practitioner feedback

Practitioner feedback focused on three core themes: the process of delivery; the impact of ACE enquiry on practice; and the benefits of understanding about childhood adversity for the practitioner-patient relationship and patients' health and wellbeing. Within each of these themes, various subthemes were identified and are outlined below. Emphasis is given to those themes in which practitioners reported a consensus, those which prompted more detailed or enthusiastic discussion, or issues in which there was a clear divergence of opinion.

3.4.1 Reflections on the process of delivery

Administrative staff, clinical staff and practice management described their experiences of delivering ACE enquiry across the three sites, focusing on both the perceived strengths of the conceived pilot approach and potential areas for future development.

Identifying and engaging eligible patients:

- Clinicians who volunteered to take part reported retaining varying degrees of control over when they enquired (i.e. which sessions on which days), which resulted in flexible (non-standardised) delivery adapted to other competing demands. This non-routine delivery and the diversion of patients from standard electronic booking-in systems presented some problems for reception staff in initially identifying and engaging eligible patients, although staff reported that with time and positive reinforcement from patients, their confidence to do this grew.

“ It was easier than I expected to be honest. I had previously raised concerns about doing it, but I was pleasantly surprised at how open people were to it.

(Receptionist, Holyhead)

- Enquiring clinicians reported incorporating reference to the ACE questionnaire into their own style of open ended questioning/ history taking by drawing on links between early adversity and health and wellbeing. They therefore did not feel the need to rely on prompts provided by the CF.
- The process described in one practice (Holyhead) deviated from the intended model of delivery as alongside enquiry by clinicians in 1:1 pre-booked consultations, ACE enquiry was delivered by the practice manager in group sessions (e.g. slimming group; see Box 3).
- Overall patients were happy to engage in the ACE enquiry process, with many reportedly acknowledging the value and importance of these discussions. Throughout all three pilots very few patients declined participation, with practitioners suggesting that those that did decline typically did so because they were feeling unwell (e.g. severe tonsillitis), not because they had seen and were concerned with the nature of the ACE questionnaire.

Collecting and storing ACE information:

“ A structured questionnaire is a good way of delicately asking about a range of experiences. It is quick, easy and not too intrusive, therefore practitioners will use it. (GP, Amlwch)

- The use of a structured tool was welcomed for lessening the cognitive and emotional demand on patients and overcoming the challenge of introducing the concept of ACEs when patients are presenting for a (seemingly) unrelated issue. However, practitioners did note that in some cases the use of the questionnaire, which was then at the forefront of patients' minds, interrupted the normal flow of the consultation (i.e. when practitioners would like to deal with presenting issues first).

“ Patients were particularly concerned with the audit trail. They wanted to know how that information was being stored and who would see it. They wanted to know if it would be on their record permanently and were fearful of this. (Practice Manager, Holyhead)

“ Overall it didn't add any considerable time to appointments and didn't affect the running of the practice. Appointments running over is part and parcel of life in a GP practice. (GP, Holyhead)

- Practitioners described how concerns about confidentiality and access to medical records, particularly in small communities, have to be balanced against the need to record information of clinical relevance in a usable way. In Amlwch and Llangefni, these concerns were raised by staff but not explicitly by patients. However, in Holyhead, some patients reportedly expressed anxieties about data security and required reassurance from staff.

3.4.2 Understanding impacts on practice

Practitioners described how the ACE enquiry pilot had influenced their individual practice and the overall service delivery of the surgery.

Time and service needs:

- Some clinicians described a negligible impact of ACE enquiry on individual consultation time, whilst others suggested more time was sometimes needed. One clinician from Holyhead suggested that reflecting on the ACE questionnaire and the relevance of ACEs for health, even among those who had not disclosed any ACEs added at least 3 minutes to each consultation, and therefore there was the potential for considerable knock on effects across the total surgery session. However, for the most part, other practitioners across all sites were willing to accept that minor delays are an inherent part of general practice. For example, when patients arrived late for their appointments. Staff in one practice suggested that around a third of patients needed more time than the intended 5 minutes to complete the ACE questionnaire. In Holyhead, the practice manager suggested that the biggest burden of ACE enquiry was actually for reception staff, who are already overstretched and are required to hand out questionnaires and field

questions from patients, all whilst booking in and answering the phones.

- However, there was agreement across all practices that initial concerns about service demand and increased need for specialist support were not realised, with no patient requesting a follow up appointment and only one patient requiring onward referral as a direct result of ACE enquiry (see below). According to practitioners, generally patients with ACEs indicated that they did not want to talk about their early life experiences in any great detail, with many suggesting that they had already dealt with these issues (with and without support from health and social care services).
- Nevertheless clinicians remained concerned about lack of follow up mechanisms to understand what happened to patients, how they felt, and what other support they may have accessed after leaving the surgery. There was a clear sense that practitioners want to see evidence of the positive impacts of this change in service delivery and that a clear understanding of the future use of ACE information would be needed to encourage practitioners to embed and sustain ACE enquiry in routine practice.

Challenging practitioners' assumptions:

- Across all three sites practitioners suggested that it often was not the patients they expected that actually disclosed the highest number of ACEs. Therefore, they reported that undertaking a formal ACE enquiry process had challenged some of their assumptions about patients. In particular, practitioners were surprised by the high ACE prevalence among the youngest age category (18-30 years old), in which they felt they could subsequently see clear links with current mental health issues.

“ I wouldn't necessarily have previously thought about young people as having lived with childhood adversity. This has highlighted a real problem among this younger age group...I think about these issues now more generally during consultations and see opportunities where it may be relevant to have that discussion with patients. (GP, Llangefni)

“ Here in the UK we have a very different system of care. Where healthcare is state supported, patients have an attitude of not wanting to bother the doctor. The challenge is therefore getting people with symptoms early enough. Generally they won't volunteer additional information that they think will take up the doctor's time. (GP, Amlwch)

- Whilst some practitioners felt that ACE enquiry was most beneficial as a universal approach, others suggested that it would be more appropriate to consider how ACE information may have particular diagnostic value, for example in relation to medically unexplained symptoms. There was a sense among practitioners in Amlwch that ACE information was actually more clinically relevant than other currently collected information such as ethnicity. Practitioners in Holyhead suggested that ACE enquiry may be better targeted at those who are managing chronic health conditions as patients that may be more likely to have ACEs but also more likely to benefit from support. Further, existing 15 minute chronic health review appointments were suggested as a more feasible time to initiate the enquiry process and the relevance of diagnosis of chronic health problems in childhood (e.g. diabetes) was highlighted as a potential ACE.
- Practitioners were generally in agreement that patients would not ordinarily volunteer this type of information, and that clinicians actually have to ask (rather than assuming that this understanding will be developed organically). Only one practitioner suggested that they already knew about some patients' childhood experiences and had discussed these previously, although this was only true for patients that they saw regularly and who had diagnosed mental health issues.
- Clinicians described a positive change in their consultation style, increased empathy for patients and a more holistic approach to care. It was also felt that ACE enquiry fostered a sense of trust and openness with patients that was described on two occasions as contributing to patients' willingness to spontaneously disclose other (current) traumatic experiences (e.g. domestic abuse). Further, one GP in Holyhead suggested that knowing a patient's ACEs can allow a practice to make certain allowances for that patient, for example if they react in an unfavourable way towards staff.
- Practitioners considered the information obtained during ACE enquiry, although often not relevant at the time of presentation, may be potentially important for future diagnoses and support for patients. However, it was unclear under what circumstances this information may be used and how.

3.4.3 The perceived benefits of ACE enquiry

Practitioners described how asking patients about their ACEs increased their knowledge of the wider determinants of health for each patient and improved the overall openness of the practitioner-patient relationship.

Understanding and applying new information about patients:

- There was consensus that having knowledge of ACEs helped practitioners to better understand patients and their family histories, and that gathering this information by questionnaire was a strength of this pilot approach.

“ Using the questionnaire has brought up issues that were incredibly useful. I feel I know my patients better than I did before. Certainly for patients with chronic depressive issues; I understand that better than have a new level of tolerance for patients. (GP, Llangefni)

Potential impacts on patients:

- Across two of the practices (Amlwch and Llangefni), staff reported that no patient explicitly expressed upset or discomfort, or showed any other signs of distress throughout the pilot. At the remaining practice (Holyhead), one patient with ACEs was described as becoming “very annoyed” at being made to think about issues that she felt she had tried to forget. This related to an enquiry conducted by the practice manager during a group session (see Box 3). The practice manager also reported that some patients felt uncomfortable disclosing ACE information as they were concerned about being “disloyal” to their parents by sharing private information that could lead to negative judgements against the whole family. Again, these reflections were drawn from group-based delivery.

“ It [ACE enquiry] created a sense that the doctor was there to talk about these wider issues and patients therefore felt able to do so. (GP, Llangefni)

- Although the ACE questionnaire was generally considered very acceptable to patients, practitioners suggested that the sexual abuse questions in particular produced a very emotive response from patients. In some cases with older patients, practitioners felt that the ACE questions may be interpreted differently, reflecting the ways in which the norms and general views of society had changed (e.g. in relation to physical punishment for children).
- Practitioners suggested that the ACE enquiry process was useful for patients’ self-awareness, helping them to understand why they are the way that they are, but also allowing them to reflect on how they had coped with their adversities and how their resilience had since enabled them to cope with different stressors in their adult life. Only one example was described of a patient being referred for additional support, although practitioners across sites suggested that patients welcomed the information provided on local and national support services.

“ I did have one person who was upset as this was the first time she had told anyone about this [her ACEs]. I referred her for counselling. She hadn’t thought of having it before. I know she went for it, but I don’t know what the follow up has been. (Nurse, Holyhead)

3.5 Potential impacts of ACE enquiry on service use

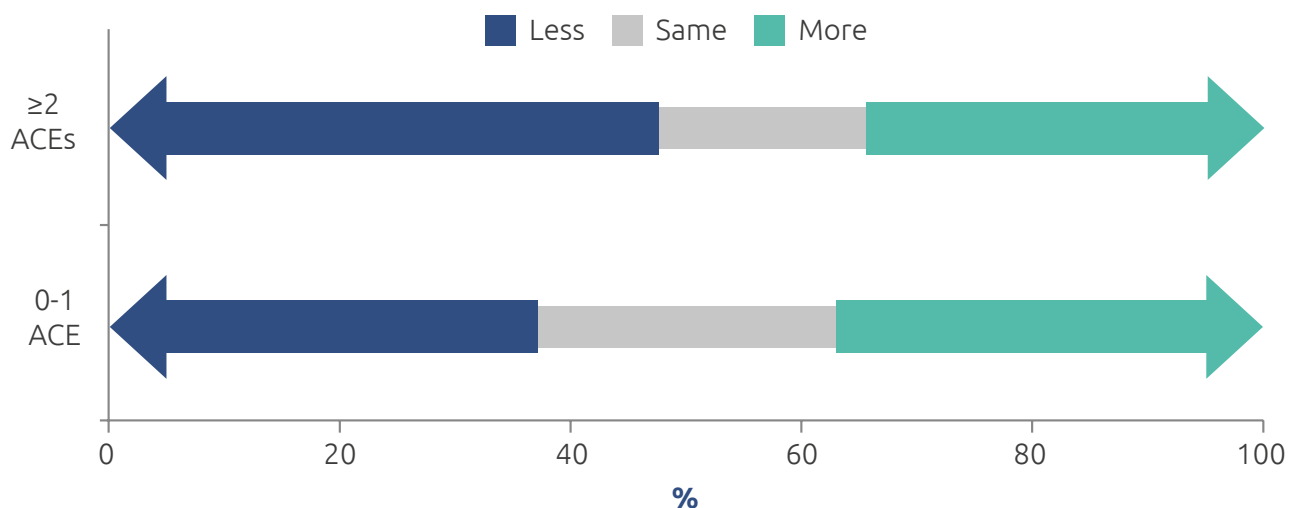
The number of times patients attended the practice for a face-to-face appointment with any GP or nurse practitioner was compared on a matched case basis in the six months before and following ACE enquiry (Figure 11). Almost half (47.5%) of all patients with ≥ 2 ACEs attended the practice less in the six months following ACE enquiry, whilst decreased attendance over the same period was found in only 37.2% of those with 0-1 ACE. Change in attendance during the six months following ACE enquiry was significant for those with ≥ 2 ACEs ($Z=-2.624$, $p=0.009$), but not among those with 0-1 ACE ($Z=-1.057$, $p=0.290$). However, overall the difference in the proportion of patients in each follow up attendance category (less; same; more) by ACE count narrowly failed to reach statistical significance ($X^2=5.654$, $p=0.059$).

The total number of repeat prescriptions patients were in receipt of at six months post-ACE enquiry in the two practices that provided this data (Amlwch and Llangefni) ranged from 0 to 19, with a mean of 4.1 ($SD=3.94$). When compared with repeat medication issue prior to enquiry, over half of patients with 0-1 ACE and ≥ 2 ACEs (53.3% and 51.8%) had increased repeat medication

prescribing post-enquiry (Wilcoxon Signed rank $Z=-8.696$, $p<0.001$ and $Z=-3.872$, $p<0.001$ respectively). Overall there was no difference in the proportion of patients in each follow up repeat medication category (less; same; more) by ACE count ($X^2=0.801$, $p=0.670$).

With the available data it is not possible to identify whether patients with higher ACEs may be attending less due to reduced need, reduced access/availability of appointments or a change in willingness to present at the practice. It is also not possible to identify or account for seasonal and other extraneous effects in attendance. However, useful insight can potentially be gained from considering the proportion of patients that had zero attendances at the practice following ACE enquiry. Of the 548 patients for which six month follow up data were available, 137 patients did not attend the practice at all during that period. There was no significant difference in rates of complete non-attendance over those six months for those with 0-1 and ≥ 2 ACEs (25.6% and 23.5% respectively; $X^2=0.292$, $p=0.589$).

Figure 11: Changes in patients' attendance in the six months following ACE enquiry, shown by ACE count category



4. Discussion

Between November 2017 and April 2018, 11 clinicians across three GP practices in Anglesey, North Wales piloted an approach to ACE enquiry with patients over 18 years of age attending pre-booked face-to-face appointments. During the pilot, a total of 565 patients agreed to self-complete the 10-item ACE questionnaire in the waiting area prior to their appointment, and subsequently shared this information with a health practitioner during their consultation. Over this same period, as few as 54 patients were recorded as declining participation (section 3.1). Non-identifiable data from practice records were obtained for 549 patients to explore health and service use and anonymous patient feedback was provided by 333 patients. Participating clinicians, practice management and administrative staff provided detailed qualitative feedback on their personal experiences of asking about ACEs in general practice and reflected on the challenges and successes of the approach.

The feasibility of delivering ACE enquiry in general practice

Overall practitioners reported positive views of the ACE enquiry process, considering it appropriate in and relevant to general practice (section 3.4.1). As demonstrated with practitioners in other settings [45], with training and support increasing their awareness and understanding of ACEs, practitioners felt confident to include conversations about childhood adversity within their consultations. This was not considered a major deviation from their normal practitioner-patient dialogue, but instead complimentary to existing methods of history-taking. Practitioners described the structured ACE questionnaire as supporting the consultation by providing an efficient and non-intrusive mechanism to initially gather novel (ACE) information from patients (section 3.4.2). Generally they felt that this information would not be known without directly asking. Therefore ACE enquiry often provided counter-evidence to their prior assumptions about patients. This supports the need outlined in *A Healthier Wales: Our Plan for Health and Social Care* to look beyond immediate symptoms or needs in supporting individuals to maintain or improve their health [30; page 11].

According to practitioners, ACE enquiry was considered not only a valuable process for increasing understanding of patients' history, but also had wider application in increasing empathy and fostering a greater openness in the patient-practitioner relationship (section 3.4.3). Practitioners felt that the value or relevance of ACE enquiry would rarely be apparent to patients at the time of consultation. However, it was their view that this information was clinically relevant and may provide helpful diagnostic value in future. Thus, ACE enquiry was framed as an investment for their future practice. This is consistent with practitioner reports that no patient requested a follow up consultation and only one was considered for onward referral to specialist support following ACE enquiry. Although practitioners believed that ACE enquiry enhanced their relationship with patients, a small number of comments provided during patient feedback included requests to have the ACE questionnaire extended to include a breadth of historic experiences (e.g. abuse by a sibling or bullying) and to reflect on current experiences in adulthood (e.g. domestic violence; Table 3; section 3.5).

This suggests that some patients may not perceive the ACE enquiry process as supporting spontaneous disclosure and consequently addressing underlying causes of ill health. Instead they may regard it as only an opportunity to respond to direct questions from health practitioners.

There is a considerable global evidence base connecting ACEs and poor health and wellbeing outcomes [8,10] and preliminary studies elsewhere have revealed a higher prevalence of ACEs among those seeking GP and other health services (when compared with the general population; [44]). A high ACE prevalence was identified for some primary care patients in this pilot (section 3.2.1). However, levels of exposure to childhood adversity were similar to those established by national surveys in Wales [1]⁷, with just under a third of all patients disclosing ≥ 2 ACEs. This could call into question the willingness of patients to reliably report ACEs, as one may expect GP practices to be oversampling populations that are unwell. Thus, lower than expected prevalence may represent either a general reduction in willingness to disclose all ACEs, or a more specific reluctance to report certain ACEs only (e.g. sexual abuse; see section 3.4.3). However, whilst people attending health services for treatment may be expected to have experienced more ACEs, some people may also engage with primary care health services to maintain their health and promote a positive healthy lifestyle. These individuals can also place demands on health services but may be less likely to have a history of ACEs. Nevertheless, relationships between ACEs and positive health behaviours are less well studied [e.g. 52].

Significant differences in ACE prevalence were found between practices, with almost half of all patients in Holyhead reporting ≥ 2 ACEs, compared with around one in five in both Amlwch and Llangefni. As practices were located in areas of differing deprivation (Appendix 1: Table I) and differed in profiles of known patient demographics and health and lifestyle factors (see Appendix 3: Table I), it is not possible to determine whether variation in ACE prevalence may accurately relate to recorded or unknown characteristics of the patient population, or may reflect differences in the way in which ACE enquiry was delivered across the sites.

For example, although one patient expressed concerns about the delivery of ACE enquiry during a group support session (see 3.4.3), it is possible that this deviation from intended delivery may have allowed access to a population with a higher prevalence of ACEs (i.e. a group selected for additional health and wellbeing needs). To better understand potential barriers to reporting and inform the refinement of ACE enquiry models for scaled delivery, further research should consider the role of confounding factors on willingness to disclose. This may include whether or not patients have/are able to see a named GP. For example, a study of women in primary care in Canada highlighted the importance on continuity of care for supporting ACE enquiry [53].

In the complex and dynamic environment of general practice, perhaps unsurprisingly inherent challenges were faced in introducing a process that required the adaptation of existing patient pathways (e.g. booking in processes) and the cooperation of different elements of the system (e.g. reception teams and clinicians). Many of these challenges related directly to patient behaviours which were beyond the direct control of the practice, such as arriving late for appointments and requiring more time to complete the ACE questionnaire (section 3.4.2). Identifying and engaging eligible patients placed pressures on reception and administrative teams and it is possible that this was a key contributing factor at times when agreed processes were not adhered to (section 3.4.1). However, these are somewhat predictable barriers and serve to highlight the need to carefully consider the resilience of a system to the introduction of an enquiry process. Practitioners across the pilot sites agreed that the ACE enquiry process had the potential to impact the duration of individual consultations with knock on effects for the overall running of the surgery session. Although for the most part this did not happen, the majority of practitioners agreed that delays to individual consultations may happen in general practice at any time for a large number of different reasons. Thus, most practitioners were willing to accept minor delays if there was a potential benefit to patients. The flexibility and resilience of practitioners within the system should be a key consideration in determining readiness for ACE enquiry.

⁷ It is not possible to make a direct comparison between total prevalence identified in this sample and in general population surveys as such surveys only included those aged 18-69 years. In contrast, patients in this pilot study ranged in age from 18 to 91. Nevertheless, whilst there is some evidence to suggest that the prevalence of ACEs decreases with age, when the oldest age category was excluded from analysis, ACE prevalence among patients aged 18-70 years only did not differ significantly from the full sample (31.3% vs. 29.5% ≥ 2 ACEs respectively).

The acceptability of ACE enquiry to general practice patients

Very positive views of ACE enquiry were expressed in patient feedback surveys (section 3.3). Consistent with an emerging evidence base [42], the vast majority of patients considered the ACE questionnaire to be clear and understandable and ACE enquiry to be well-placed, acceptable and important in general practice. Despite differences in the implementation of ACE enquiry (see section 2.1 and Box 3), responses to four out of five items of patient feedback did not differ significantly by practice. Half of all patients felt that their appointment was improved as a result of the GP or nurse practitioner understanding their ACEs. However, as few as a third of patients in Holyhead reported improvements, suggesting that some of the changes in delivery at this practice may have limited the perceived utility of the process (e.g. having it framed as a prevalence study rather than an enhancement to the GP service; Box 3). Interestingly, as in other studies exploring patient preferences [42], no difference was found in perceived utility of ACE enquiry between those patients with and without ACEs, or between those for whom this was or was not their first disclosure. This provides a tentative suggestion of a universal benefit of ACE enquiry regardless of ACEs or disclosure history. Further research is needed to consider possible mechanisms for this benefit.

For over half of all patients with ACEs, the ACE enquiry pilot represented the first time they had disclosed childhood adversity to a professional service. As many as 80% of patients with ACEs who were disclosing for the first time felt it was important for health services to understand their ACEs, suggesting that patients already had or were able to develop during the pilot an appreciation of the significance of their childhood history on their current health and wellbeing.

The further finding that almost two thirds of patients with ACEs who had disclosed before also felt it was important and were willing to disclose again underlines the suggestion that patients understand the relevance to their current health and may have had positive experiences of disclosing to other services previously. The impact of experiences of ACE disclosure on wider views of health and social care and subsequent patterns of engagement with statutory services in particular may provide a valuable avenue for further research.

Across all practices, when following the agreed methods of implementation, there was no evidence of any patient becoming upset or experiencing harm as a result of the ACE enquiry process (section 3.4.3). Whilst one patient was reported as having a negative emotional response to ACE enquiry, this occurred following a group-based delivery and underlines the importance of carefully considering when best to enquire in the patient pathway, with whom, and by which practitioners. Empirical evidence that supports the use of a structured tool to facilitate asking about ACEs in individual consultations continues to emerge from a small range of settings [42,44,45,54]. However, to our knowledge, to date there have been no examinations of the feasibility and acceptability of explicitly asking about ACEs in a collective context (i.e. group support). Therefore, if such a model is to be pursued, it should have a clear theoretical underpinning and research should be undertaken to consider its feasibility and acceptability, with particular focus on the potential for unintended harms.

Exploring the relationship between ACEs and health in general practice patients

A strong significant relationship was found between ACEs and mental health outcomes in adulthood, including current diagnosis of common mental health disorders and having ever been prescribed antidepressant medication (Figure 6; section 3.2.4). Thus, patients with ≥ 2 ACEs were almost twice as likely to suffer mental ill health. These findings align with existing evidence from both national studies [8,12] and GP samples [44] and underline the importance of approaches in both prevention and response that support the mental health needs of those with a history of childhood adversity. According to a survey conducted by Mind in the UK, two in every five GP appointments concern mental health, with the proportion of patients needing help with their mental health reportedly increasing each year [55]. The Royal College of General Practitioners suggests that as many as 90% of people with mental health problems are cared for entirely in primary care [56] and therefore there are continued calls for more mental health training and support for GPs. Investing in staff is a core value for NHS Wales, and sits alongside whole system values such as reaching those most in need [30]. *A Healthier Wales* outlines a vision for Wales which includes a holistic approach to supporting health and wellbeing, whilst improving quality and value. General practice provides a clear entry point for people with mental health problems into healthcare. Consequently, ACE awareness training and providing practitioners with the skills and confidence to ask about ACEs in general practice has the potential to improve the patient experience, support the identification of those with a greater mental healthcare need, and facilitate more effective treatment and support for patients.

Consistent with previous national and international research [8,15,18], among general practice patients in this sample, a positive association was found between ACEs and current smoking status (Figure 5; section 3.2.2). However, previously identified relationships between ACEs and chronic physical health outcomes [8] were not replicated. Possible reasons for this incongruity include issues of sample size, data quality and the accuracy of recording (e.g. based on practitioners identifying and applying the appropriate READ code to a

patient's record to allow accurate data extraction). Whilst the prevalence of both diabetes and hypertension in this sample aligns with national data for Wales in 2017/18 derived from the Quality and Outcomes Framework [57], asthma, COPD and hypertension all occurred at a greater rate in this sample than would be expected based on national prevalence data. This may represent a sample capture bias towards individuals who may be attending more regularly for certain health conditions or represent other bias or inaccuracy in data recording and/or extraction.

There was no evidence that patients with ACEs in these three practices created a greater demand for face-to-face appointments or repeat medication than other GP attenders (section 3.2.5). In actual fact, those with ≥ 2 ACEs in all but the oldest age category showed marginally less frequent attendance at their GP surgery, when compared with their counterparts with 0-1 ACE. However, prior service use data examined only the six months preceding ACE enquiry and it was not possible to identify reasons for presentation during that time. Therefore, whether differences in attendance and medication patterns represent acute health issues or reflect chronic health or longer-term service use behaviours cannot be determined here. The potential reluctance of those with more ACEs to engage with health services and in health protecting or promoting behaviours has been highlighted in other international research (e.g. missed appointments [23]; non-engagement with cancer screening [24]) and research in Wales suggests that experiencing ACEs may impact adults' perceptions of the supportiveness of health services [1]. However, further research is required to better examine service use patterns of adults and their relationships with ACEs in more detail. Providing equitable healthcare is a core focus of *A Healthier Wales* [30]. Whilst factors such as geography or deprivation are commonly considered as sources of inequality, experiences of childhood adversity may also disadvantage some individuals in accessing appropriate care and achieving healthy outcomes. Therefore understanding how to identify and address ACEs in a variety of healthcare settings may support tackling these inequalities.



Whilst here there were no apparent effects of early adversity on increasing overall adult primary care use, findings do suggest that patients with ACEs may be higher users of some secondary care services (Figure 9). This relationship warrants further study to explore the potential for differential referral pathways into secondary care for patients with ACEs and the extent to which these patients' uptake referrals, engage with the wider health service and adhere to subsequent treatment.

Findings tentatively suggest an overall decrease in attendance in the six months immediately following ACE enquiry (section 3.5). However, over the same period, prescribing of repeat medication increased. Without more detail as to the context and wider patterns of use, it is difficult to consider any potential impacts of ACE enquiry on health service use and support for research from the US that reported a 35% reduction in doctor office visits in the year following ACE enquiry [58] remains inconclusive. To date empirical evidence has largely failed to explore the potential mechanisms for proposed changes in service use patterns following ACE enquiry and more detailed research is needed (see section 5 for recommendations).

4.1 Limitations

The following limitations should be considered when interpreting findings from this local pilot initiative:

- Due to the confidential nature of consultations between patients and health practitioners, the evaluation team were unable to observe the actual length and content of discussions that took place following completion of the ACE questionnaire. Therefore, it was not possible to directly examine all aspects of fidelity to the intended model of delivery, the way in which practitioners reflected on ACE information and offered support to patients, or patients' behaviour/reactions in response. Whilst a small number of clinicians' made some additional notes on patients' records, these contained very little detail of the content of the discussions that took place (e.g. 'patient said they did not need any support'). Current understanding of what was actually delivered to patients during the pilot was therefore derived from qualitative practitioner feedback and one item of patient feedback only, making it difficult to draw any detailed conclusions about the potential therapeutic benefit of the ACE enquiry process.
- Feedback from practitioners identified variations in how ACE enquiry was delivered. There are some tentative suggestions that these variations (e.g. group delivery) may have resulted in different patient experiences of ACE enquiry. However, without a more detailed understanding of what was delivered, to whom and by whom, and a means of linking patient feedback survey results to the model of ACE enquiry received, it is not possible to explore how different models of delivery may relate to different outcomes for patients and practitioners.
- For the purposes of this initial pilot, practices opted to deliver ACE enquiry in English and Welsh only. Further, other patients were considered ineligible due to cognitive capacity, but this was determined in advance by reception staff. Due to the scale of the pilot and demographic profile of the three engaged practices (i.e. patient populations that were not very ethnically or culturally diverse), findings presented in this evaluation cannot be considered representative of general practice patients across Wales.
- Although reception staff retained a record of the number of people who were offered but declined to complete an ACE questionnaire, reasons for non-completion were not recorded. Therefore, it was not possible to identify any common factors (e.g. the demographic profile) of non-participants that may provide insight into possible barriers to ACE enquiry. Further, due to non-standardised intervention delivery, practices were not able to quantify how many eligible appointments were conducted by enquiring clinicians over any given time period (e.g. each week). Therefore, it was not possible to determine if all patients that should have been asked by reception to complete an ACE questionnaire were provided with this opportunity. Such process evaluation measures would provide valuable insight into the feasibility, sustainability and scalability of models of ACE enquiry.
- Data collection during the pilot was designed to be as unobtrusive and as inclusive as possible, with the aim of encouraging engagement and limiting any burden on patients and staff. This resulted in the following limitations:
 - Patient health and wellbeing data were drawn entirely from existing patient records (i.e. no additional questions were asked). In some cases these records were absent or were not considered timely enough for inclusion. Therefore it was not possible to explore the relationships between ACEs and other potentially relevant demographic (e.g. ethnicity; relationship status; deprivation) and health and wellbeing variables (e.g. alcohol use; life satisfaction; resilience).
 - Data were also limited to patients' general practice records and did not provide any evidence of the impact of ACE enquiry on service use within the wider health and social care system (e.g. A&E attendance; use of pharmacy services).

- Quantitative patient feedback was anonymous, not linked to patient data and asked only a small selection of questions concerning experiences of ACE enquiry. Consequently, it was not possible to explore experiences of ACE enquiry by patients' demographic factors, health status, or other behavioural/lifestyle factors (e.g. smoking), all of which may influence how comfortable patients feel engaging in ACE enquiry. For example, it is not clear from this pilot how socio-economic status and other current circumstances for the individual or their family may impact on willingness to engage in ACE enquiry. Overall the response rate for patient feedback, whilst similar to that reported elsewhere, was 58.9% and so may not provide a reliable representation of all patients' views (section 3.3).
- The relatively small sample size attained in this local pilot initiative increases the likelihood of Type II errors in the analyses of patient data. As such, the number of patients with ≥ 2 ACEs and any given health outcome of interest may be too small to produce an effect that reaches statistical significance, potentially resulting in a false negative, for example, when examining the differences in a certain health condition by ACE count category. Owing to this small sample size, analyses here moved away from the conceptualisation of four ACE count categories (0, 1, 2-3, ≥ 4) that has been commonly used in previous research [8] to produce two categories with a sufficient number of cases (patients) in each to allow comparison. Thus, patients with 0-1 ACE were selected as a comparison group, allowing exploration of the potential impacts of experiencing multiple forms of adversity or poly-victimisation. However, this means that there are patients in the comparison group that may have still experienced severe chronic stress from one ACE, which alone may still have lasting impacts on health and wellbeing.
- The report intends to triangulate patient feedback (self-reported) with practitioner reflections and process measurements derived from practice data. However, in this mixed methods approach, considering the small sample size and the scale of this initial pilot exploration of ACE enquiry, it is not possible to identify if and how the different data elements should be weighted. Instead, this preliminary evaluation intends to reflect data from both patients (quantitative) and practitioners (qualitative) in its recommendations, focusing on core learning points that are reflected by both sources.
- Due to the funding and timescales for project delivery, the data included here only considers a relatively short follow up period after ACE enquiry. Evidence elsewhere suggests that changes over such periods may not be continued over longer periods and frequent attendance is therefore best considered over a duration of a year or more [59]. Consequently, findings from the six month follow up period cannot be extrapolated over longer periods and may be impacted by seasonal and other confounding effects. Further, data were not available on the types of health complaint(s) patients were presenting for at the time of initial ACE enquiry. Consequently it is not possible to identify if patients had acute or ongoing health issues (beyond those identified by READ coding for chronic conditions), or if those with chronic health conditions were experiencing exacerbations of symptoms or required ongoing condition management/review at the time of enquiry, all of which may influence their attendance during the follow up period.

5. Conclusions and recommendations

Findings from this pilot evaluation in Anglesey, North Wales provide considerable support for the acceptability of ACE enquiry in general practice to patients and practitioners, both of whom understand its relevance and added value in supporting individuals' health and wellbeing. Thus ACE enquiry in this setting offers a welcomed opportunity for patients to disclose ACEs within the context of a supportive relationship with a health professional.

Whilst ACEs are clearly associated with poor mental health outcomes, and findings provide tentative support to the notion of a therapeutic universal benefit derived from ACE enquiry, how practitioners may use an understanding of ACEs to inform the treatment and support provided to patients remains unclear. Although this pilot provides some encouraging insights into the feasibility of asking about ACEs, there continue to be complexities in this health setting that present challenges for engagement and the delivery of a sustained approach. Findings here suggest that the resilience of both individuals within the system, and the system itself, may play a key role in determining the suitability and effectiveness of enquiry. Based on the findings of this evaluation, the following recommendations are made to support the future implementation and evaluation of ACE enquiry in general practice. These recommendations, and the future development of ACE enquiry, should be considered alongside wider research that explores the effectiveness of interventions to prevent or reduce poor health outcomes in individuals that have been exposed to ACEs.



Overall

Further research and evaluation is needed to build on these initial findings and support the development of scaled and sustainable approaches to ACE enquiry in general practice, taking account of the points for further refinement and investigation below.

Implementation – Refining models of ACE enquiry

- Future developments of ACE enquiry in general practice should ensure that detailed and collaborative assessments of readiness for ACE enquiry are conducted within sites. These assessments should engage frontline staff as well as management and should consider issues such as: current staffing and ongoing resource challenges; timing of and availability for training and suitable approaches for ensuring that knowledge and skills are disseminated to new staff; the need for adaptations to the patient pathway to support ACE enquiry (e.g. booking in systems) and the willingness and capability of staff to make these adaptations; the existence of external pressures or other new initiatives that may divert attention and resource away from enquiry; the management of late running patients or surgery sessions and the flexibility of any current processes to incorporate additional demand; and the availability of patient data to support monitoring and evaluation and the presence of ongoing resource to manage, extract and analyse data. This does not provide an exhaustive list and it is important that the content and delivery of readiness assessments is determined by stakeholders and in line with objectives for ACE enquiry. Where appropriate, engagement with a diverse sample of patient representatives may support practices in determining readiness for ACE enquiry.
- Alongside a readiness assessment (see above), those responsible for commissioning or facilitating approaches to ACE enquiry should ensure that practices are provided with continued support in delivering agreed models of enquiry. Methods and tools for monitoring should be developed to ensure that delivery is as intended, or as a minimum that deviations from intended delivery are accurately recorded. A process of timely feedback should be developed that allows stakeholders to explore why these deviations have occurred and what the potential impact(s) of these alternative approaches may be on patients and practitioners.
- The storage of ACE data continues to present an area for concern. Practices intending on engaging in ACE enquiry should identify how ACE data can be stored to ensure that it contains enough information and is accessible enough to clinicians to be clinically relevant, but maintains required standards of patient confidentiality and adheres to information governance principles.
- Due to continued interest from practitioners, stakeholders may wish to consider developing and piloting targeted models of ACE enquiry. These opportunities should be determined on the basis of established relationships between ACEs and health outcomes; e.g. the involvement of discussion of childhood history in initial consultations for mental health problems. Practices may also like to consider piloting delivery of ACE enquiry in non-surgery based settings; e.g. by health professionals consulting with patients in their home or in care settings. It is important that any new models of delivery are accurately described and that evaluation is undertaken to explore the feasibility and acceptability of these approaches with both patients and practitioners.
- Practices engaging in ACE enquiry should make a clear commitment to ensuring that models of enquiry are embedded, supported by all staff, and aligned to the values of the organisation. Practitioners must be supported by training and supervision to ensure that they enter a genuine dialogue with patients about their ACEs, and that use of a tool or questionnaire to gather ACE information is not tokenistic, but rather grounded in the context of a wider cultural change that moves the practice towards delivering trauma- or ACE-informed care. Changes may be needed at an organisational or process level to achieve principles of ACE-informed care and support the implementation of ACE enquiry. For example, this may include the way that patients access appointments when they want to discuss ACEs, or how information about ACE enquiry is initially communicated to patients to avoid triggering negative emotional responses.

Research – Addressing key emerging questions

- Further service evaluations should be delivered to replicate the objectives of this pilot evaluation and explore the feasibility and acceptability of different models of ACE enquiry (based on the recommendations for implementation outlined above) in different general practice settings. To extend learning beyond that outlined here, these evaluations should aim to: recruit larger and more diverse samples of patients; analyse data over longer-term follow up periods; provide more detailed data on those who decline to participate and, where possible, their reasons for not wanting to provide or discuss ACE information; include analyses of other data sources that practices are able to share (e.g. records of attendance at Accident and Emergency).
- Detailed qualitative research should be undertaken with patients to explore the potential therapeutic benefit of ACE enquiry and the role of improved rapport between the practitioner and patients as a mechanism for this benefit. Research with patients who have experienced ACE enquiry could also help to understand how positive or negative experiences of enquiry may change the patient's attitudes and behaviours towards primary care and other healthcare provisions. Such research should seek to engage patients from different socio-demographic, ethnic and cultural backgrounds.
- In support of this, detailed research should also explore with frontline health practitioners how understanding a patient's ACEs may affect or has affected their professional decision making for diagnosis, treatment and support or referral. Consideration should be given to how practitioners may be able to record information on patient pathways or outcomes following ACE enquiry to inform the evidence base around the impact of ACE enquiry.
- To provide a baseline from which to consider the potential impact of ACE enquiry on service use behaviours, research should be undertaken to understand the primary care service use behaviours of adults with ACEs, including demographic, health and other factors that may influence preparedness to consult with a health practitioner, and willingness to disclose early adversity in health settings.
- To determine any reductions in demand for health services following ACE enquiry, research should explore the feasibility of and pilot methods for understanding impacts of ACE enquiry not just on general practice but on the wider system of healthcare, for example including secondary care or use of emergency care services.

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Appendix 1

Table I: Description of the participating general practices

Service	Location	Urban/rural*	Number of sites	Deprivation (WIMD)**	Size of total patient population	Total number of staff (Clinical staff)	Number of enquiring clinicians (Role/s)
General Practice	Amlwch, Anglesey, Wales	Rural village and dispersed in a sparse setting (E2)	2	20-30% most deprived	10,027	28 (13)	4 (GP)
General Practice	Lllangefni, Anglesey, Wales	Rural town and fringe in a sparse setting (D2)	1	50% least deprived	6,982	11 (4)	2 (GP)
General Practice	Holyhead, Anglesey, Wales	Urban city and town in a sparse setting (C2)	1	10-20% most deprived	5,500	19 (7)	5 (GP; NP; PM)

Footnote: GP=General practitioner; NP=Nurse practitioner; PM=Practice manager; * Urban/rural by ONS categories (2011) for middle layer super output area (<https://ons.maps.arcgis.com/home/item.html?id=86fac76c60ed4943a8b94f64bf3e8b1>); **Welsh Index of Multiple Deprivation (WIMD, 2014) measure based on the lower super output area of the primary practice site (<http://wimd.wales.gov.uk/explore?lang=en#z=9&lat=53.031&lng=-3.656&domain=overall>).

Table II: Process of ACE enquiry implementation across practices

Location	Dates	Sampling technique	Exclusion criteria	Patient pathway	Record of ACE data	Total completed enquiries	Total recorded decliners	Patient feedback response rate (%)
Amlwch	Nov 2017 - Feb 2018	Systematic sampling - The first X* number of patients per afternoon session on selected (implementation) days. Implementation days chosen by enquiring clinicians.	Under 18 years of age; known memory problems; learning difficulties; considered distressed on arrival/ before booking in.	Self-arrival machine switched off. Patient provided with pack containing information sheet and ACE questionnaire by reception. Patient completed questionnaire in waiting room and handed to GP at start of appointment. GP discussed ACE with patient.	GP added total ACE score to patient record during/ immediately following appointment.	203	14	72.4
Llangefni	Dec 2017 - Apr 2018	Systematic sampling - The first 5 patients per morning session on selected (implementation) days. Implementation days chosen by enquiring clinicians.	Under 18 years of age; learning difficulties; sight impairments; elderly patients identified as extremely frail; significant mental health or developmental problems.	Patient checked in via self-arrival machine. Reception staff approached patient with envelope containing information and ACE questionnaire. Patient completed questionnaire in waiting room and handed to GP at start of appointment. GP discussed ACE with patient.	GP added total ACE score to patient record during/ immediately following appointment.	194	8	58.2
Holyhead	Nov 2017 - Mar 2018	(1) Systematic sampling - Every 2nd patient seen during selected sessions. Sessions selected in advance by practice manager. Reception teams filtered out patients when they felt ACE enquiry was not appropriate. (2) Convenience sampling – Patients attending group sessions delivered by the practice manager.	Under 18 years of age; learning difficulties; memory problems; very elderly.	(1) Self arrival machine switched off. Patient provided with pack containing information sheet, ACE questionnaire and feedback survey by reception. Patient completed questionnaire in waiting room and handed to GP or NP at start of appointment. GP or NP discussed ACE with Patient. (2) Patients provided with ACE questionnaire and information sheet at beginning of group session. Questionnaires completed individually. Responses reflected on in group discussion, followed by 1:1 sessions with the practice manager.	GP added total ACE score to patient record during/ immediately following appointment OR reception added patient EMIS number to questionnaire before handing to patient; completed questionnaires passed from doctor to practice manager for inputting.	168	32	43.5

Footnote: ACE=adverse childhood experiences; GP=general practitioner; NP=nurse practitioner. *Number decided by reception staff on a session-by-session basis based on demand and time keeping.

Appendix 2

Measures - Adverse childhood experiences (ACEs)

ACE	Question: <i>All ACE questions were preceded by the statement "While you were growing up, during your first 18 years..."</i> Response options: Yes/No
Mental illness	Did you live with a parent or other adult in the household who was depressed, mentally ill or suicidal?
Alcohol	Did you live with a parent or other adult in the household who was a problem drinker or alcoholic?
Drug use	Did you live with a parent or other adult in the household who used illegal drugs or who misused prescription medications?
Incarceration	Did you live with a parent or other adult in the household who served time in a prison or young offender's institution?
Parental separation	Were your parents ever separated or divorced?
Domestic violence	Did your parents or other adults in your home ever slap, hit, kick, punch or beat each other up?
Verbal abuse	Did a parent or other adult in the household swear at you, insult you, or put you down, or humiliate you or act in a way that made you feel worthless or scared?
Physical abuse	Did a parent or other adult in the household push, grab, slap or throw something at you or ever hit you so hard that you had marks or were injured?
Sexual abuse	Did an adult or other person touch you or make you touch their body in a sexual way or attempt or actually have oral, anal, or vaginal intercourse with you?
Neglect	Did your parent(s) make you go without enough food or drink, clean clothes, or a clean and warm place to live for long periods of time?

Patient feedback survey

Question	Response options
The questions I completed in the waiting room were clear and I understood what was being asked	Strongly disagree; disagree; not sure; agree; strongly agree
I think it is important that health services understand what happened in my childhood	
I think that my GP surgery is a suitable place to be asked these questions	
I think my appointment today with the GP/nurse was improved because he/she understood my childhood better	
Overall I felt providing information to a health professional about experiences during my childhood was acceptable	

Appendix 3

Table I: Sample characteristics by practice

		Amlwch		Llangefni		Holyhead		X ²	p
		N	%	N	%	N	%		
Demographics									
Age (years)	18-30	22	11.0	24	12.5	30	19.1		
	31-50	49	24.5	73	38.0	41	26.1		
	51-70	81	40.5	66	34.4	49	31.2		
	≥71	48	24.0	29	15.1	37	26.3	18.377	0.005
Gender	Male	82	41.0	54	28.1	80	51.0	19.226	<0.001
Lifestyle factors									
BMI	Obese (≥30)	53	26.5	47	24.5	86	54.8	15.933	<0.001
Smoking	Current smoker	33	17.0	39	26.2	42	26.8	7.135	0.028
Health									
Chronic conditions	Asthma	54	27.0	31	16.1	25	15.9	9.525	0.009
	COPD	20	10.0	8	4.2	20	12.7	8.578	0.014
	Type II diabetes	19	9.5	7	3.6	19	12.1	8.918	0.012
	CVD	26	13.0	13	6.8	24	15.3	6.886	0.032
	Hypertension	60	30.0	31	16.1	49	31.2	13.670	0.001
	Cancer	19	9.5	14	7.3	10	6.4	1.314	0.518
	MLTC	69	34.5	34	17.7	48	30.6	14.891	0.001
Mental health	Any	82	41.0	54	28.1	71	46.4	8.449	0.015
	Depression	31	15.5	12	6.3	29	18.5	12.756	0.002
	Anxiety	18	9.0	3	1.6	20	12.7	16.576	<0.001
	Antidepressants*	33	16.5	112	58.6	59	39.6	74.092	<0.001
Health service use									
Frequent attender**		79	39.7	89	46.4	57	37.5	3.132	0.209
High repeat medication/prescription use [‡]		76	38.0	63	32.8	55	36.9	1.245	0.537
High secondary care demand [§]		57	28.5	37	31.4	-	-	0.291	0.590
ACEs									
ACE count category	0-1	159	79.5	148	77.1	80	51.0		
	≥2	41	20.5	44	22.9	77	49.0	40.620	<0.001

Footnote: BMI=Body mass index; COPD=Chronic obstructive pulmonary disease; CVD=Cardio vascular disease; MLTC=Multiple long term conditions; ACE=Adverse childhood experiences. *Ever been prescribed antidepressants; **Above practice mean for number of face-to-face appointments attended in six months prior to ACE enquiry (≥4 Amlwch; ≥1 Llangefni; ≥7 Holyhead); ‡Above practice mean for total number of active repeat medication scripts at the time of enquiry (≥4 Amlwch; ≥2 Llangefni; ≥5 Holyhead); §≥4 referrals into secondary care in the previous 12 months.

Table II: Bivariate association between ACEs and demographic variables and health and service use outcomes

		Lifestyle factors		Long term health conditions								Service utilisation			
		Obese	Current smoker	Asthma	COPD	Type II Diabetes	CVD	Hyper-tension	Cancer	Mental health	MLTC	Anti-depressants*	Frequent attender**	High repeat meds [§]	High secondary care demand [£]
Prevalence	%	42.4	23.2	20.0	8.7	8.2	11.5	25.5	7.8	33.3	27.5	37.2	41.4	35.9	29.6
ACE count category	0-1	41.7	18.3	20.4	7.2	7.8	12.9	25.1	8.5	29.5	27.1	34.4	42.6	34.3	25.6
	≥2	43.8	34.2	19.1	12.3	9.3	8.0	26.5	6.2	42.6	28.4	45.9	38.6	39.6	44.1
	X ²	0.166	14.923	0.116	3.738	0.345	2.694	0.131	0.877	8.866	0.091	6.343	0.735	1.386	8.804
	p	0.684	<0.001	0.733	0.053	0.557	0.101	0.717	0.349	0.003	0.762	0.012	0.391	0.239	0.003
Age category (years)	18-30	37.7	43.8	26.3	1.3	0.0	0.0	0.0	0.0	35.5	2.6	33.3	32.4	13.9	12.5
	31-50	53.4	29.3	19.6	2.5	3.7	3.7	8.6	3.1	36.2	11.7	47.2	38.1	25.2	26.1
	51-70	38.6	19.8	19.4	12.8	10.7	11.2	35.7	7.7	36.7	37.8	37.4	43.6	42.9	29.9
	≥71	38.3	9.1	17.5	15.8	15.8	30.7	49.1	20.2	21.9	49.1	28.1	48.2	52.6	41.8
	X ²	8.044	31.518	2.381	24.383	21.588	61.095	94.799	35.653	8.457	81.160	11.152	5.746	41.144	9.827
	p	0.045	<0.001	0.497	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.037	<0.001	0.011	0.125	<0.001
Gender	Male	40.8	23.2	18.1	11.6	11.6	15.3	30.1	10.6	25.5	31.5	24.9	35.4	36.2	23.6
	Female	43.4	23.3	21.3	6.9	6.0	9.0	22.5	6.0	38.4	24.9	45.9	45.3	35.6	32.7
	X ²	0.289	0.001	0.872	3.577	5.398	5.068	3.952	3.911	9.926	2.825	24.129	5.262	0.016	2.834
	p	0.591	0.980	0.350	0.059	0.020	0.024	0.047	0.048	0.002	0.093	<0.001	0.022	0.898	0.092
Practice	Amlwch	37.6	17.0	27.0	10.0	9.5	13.0	30.0	9.5	41.0	34.5	16.5	39.7	38.0	28.5
	Llangefni	33.3	26.2	16.1	4.2	3.6	6.8	16.1	7.3	28.1	17.7	58.6	46.4	32.8	31.4
	Holyhead	54.8	28.4	15.9	12.7	12.1	15.3	31.2	6.4	29.9	30.6	39.6	37.5	36.9	-
	X ²	15.933	7.135	9.525	8.578	8.918	6.886	13.670	1.314	8.449	14.891	74.092	3.132	1.245	0.291
	p	<0.001	0.028	0.009	0.014	0.012	0.032	0.001	0.518	0.015	0.001	<0.001	0.209	0.537	0.590

Footnote: COPD=Chronic obstructive pulmonary disease; CVD=Cardio vascular disease; MLTC=Multiple long term conditions; ACE=Adverse childhood experiences. *Ever been prescribed antidepressants; **Above practice mean for number of face-to-face appointments attended in six months prior to ACE enquiry (≥4 Amlwch; ≥1 Llangefni; ≥7 Holyhead); §Above practice mean for total number of active repeat medication scripts at the time of enquiry (≥4 Amlwch; ≥2 Llangefni; ≥5 Holyhead); £≥4 referrals into secondary care in the previous 12 months (reported for Amlwch and Llangefni only).

Table III: Bivariate association between ACEs and health and service use outcomes, stratified by age

Age category (years)	ACE count category	Prevalence (%)													
		Lifestyle factors		Chronic health								Health service use			
		Obese	Current smoker	Asthma	COPD	Type II Diabetes	CVD	Hyper-tension	Cancer	MLTC	Mental health (any)	Anti-depressants*	Frequent attender**	High repeat meds [‡]	High secondary care demand [‡]
18-30	0-1	41.7	35.7	23.1	0.0	0.0	0.0	0.0	0.0	0.0	30.8	28.6	35.3	14.3	8.3
	≥2	28.6	59.1	33.3	4.2	0.0	0.0	0.0	8.3	8.3	45.8	43.5	26.1	13.0	25.0
	X ²	1.067	3.206	0.891	2.196	-	-	-	-	4.450	1.627	1.565	0.613	0.020	1.524
	p	0.302	0.073	0.345	0.138	-	-	-	-	0.035	0.202	0.211	0.434	0.887	0.217
31-50	0-1	51.3	24.2	20.9	0.0	1.8	3.6	8.2	1.8	9.1	28.2	39.8	39.4	22.2	15.6
	≥2	57.5	38.8	17.0	7.5	7.5	3.8	9.4	5.7	17.0	52.8	62.7	35.3	31.4	50.0
	X ²	0.411	3.278	0.350	8.511	3.311	0.002	0.071	1.776	2.162	9.409	7.309	0.254	1.540	11.937
	p	0.522	0.070	0.554	0.004	0.069	0.965	0.789	0.183	0.141	0.002	0.007	0.614	0.215	0.001
51-70	0-1	37.4	15.6	20.4	11.7	10.2	13.1	35.8	9.5	39.4	34.3	36.0	45.3	39.4	27.3
	≥2	41.2	29.1	16.9	15.3	11.9	6.8	35.6	3.4	33.9	42.4	40.7	39.7	50.8	39.3
	X ²	0.210	4.366	0.321	0.474	0.117	1.674	0.001	2.171	0.534	1.155	0.380	0.520	2.201	1.502
	p	0.647	0.037	0.571	0.491	0.733	0.196	0.981	0.141	0.465	0.283	0.538	0.471	0.138	0.220
≥71	0-1	37.7	7.1	18.2	13.6	15.9	31.8	44.3	20.5	46.6	22.7	28.4	46.6	52.3	39.7
	≥2	40.0	15.4	15.4	23.1	15.4	29.6	65.4	19.2	57.7	19.2	26.9	53.8	53.8	75.0
	X ²	0.042	1.632	0.109	1.345	0.004	0.226	3.564	0.019	0.990	0.143	0.022	0.423	0.020	1.929
	p	0.838	0.201	0.742	0.246	0.949	0.634	0.059	0.891	0.320	0.705	0.882	0.515	0.888	0.165

Footnote: COPD=Chronic obstructive pulmonary disease; CVD=Cardio vascular disease; MLTC=Multiple long term conditions; ACE=Adverse childhood experiences. *Ever been prescribed antidepressants; **Above practice mean for number of face-to-face appointments attended in six months prior to ACE enquiry (≥4 Amlwch; ≥1 Llangefni; ≥7 Holyhead); [‡]Above practice mean for total number of active repeat medication scripts at the time of enquiry (≥4 Amlwch; ≥2 Llangefni; ≥5 Holyhead); [‡]≥4 referrals into secondary care in the previous 12 months (reported for Amlwch and Llangefni only).

Table IV: Logistic regression analyses of association between ACEs and adult health and service use outcomes (adjusted for demographics)

		Current smoker				Mental health (any)				Depression				Antidepressants*				Secondary care demand [‡]			
		AOR	Low CI	High CI	p	AOR	Low CI	High CI	p	AOR	Low CI	High CI	p	AOR	Low CI	High CI	p	AOR	Low CI	High CI	p
ACE count category^a	≥2	2.10	1.33	3.34	0.002	1.92	1.27	2.89	0.002	2.29	1.33	3.93	0.003	1.61	1.05	2.48	0.031	2.99	1.64	5.46	<0.001
Age category (years)	18 -30	(ref)			<0.001	(ref)			0.062	(ref)			0.067	(ref)			0.147	(ref)			0.001
	31 -50	0.50	0.27	0.95	0.037	1.00	0.55	1.79	0.991	1.41	0.65	3.10	0.387	1.78	0.94	3.36	0.076	2.38	0.73	7.71	0.149
	51 -70	0.31	0.16	0.59	<0.001	1.07	0.60	1.90	0.814	0.87	0.39	1.93	0.726	1.65	0.88	3.08	0.121	3.78	1.19	11.99	0.024
	≥71	0.13	0.06	0.30	<0.001	0.52	0.27	1.10	0.054	0.46	0.17	1.23	0.12	1.09	0.54	2.18	0.818	7.97	2.37	26.77	0.001
Gender^a	Female	0.79	0.49	1.28	0.339	1.89	1.27	2.81	0.002	2.26	1.26	4.06	0.006	2.48	1.63	3.78	<0.001	1.83	1.04	3.23	0.037
Practice	AM	(ref)			0.195	(ref)			0.002	(ref)			0.001	(ref)				(ref)			
	LL	1.61	0.93	2.80	0.092	0.47	0.30	0.74	0.001	0.28	0.13	0.57	0.001	6.82	4.20	11.09		1.13	0.66	1.91	0.661
	HH	1.49	0.85	2.59	0.165	0.53	0.33	0.86	0.009	1.069	0.585	1.956	0.827	3.47	2.039	5.905	<0.001				

Footnote: Ref=reference category; ACE=Adverse childhood experience; AOR=Adjusted odds ratio; CI=Confidence interval; AM=Amlwch; LL=Llangefni; HH=Holyhead; *Ever been prescribed antidepressants; [‡]≥4 referrals into secondary care in the previous 12 months; ^aReference categories for dichotomous variables are: 0-1 ACE and Male (reported for Amlwch and Llangefni only).

Table V: Cox regression survival analyses of modelled association between ACEs and risk of adult health outcome with age

		Asthma		COPD		Type II diabetes		CVD		Hypertension		Cancer	
		HR(95%CI)	p	HR(95%CI)	p	HR(95%CI)	p	HR(95%CI)	p	HR(95%CI)	p	HR(95%CI)	p
ACE count category^a	0-1	(ref)				(ref)		(ref)		(ref)		(ref)	
	≥2	1.28(0.79-2.06)	0.315	2.05(0.94-4.48)	0.071	1.69(0.84-3.38)	0.139	0.90(0.42-1.95)	0.793	1.09(0.72-1.64)	0.690	1.49(0.60-3.70)	0.388
Gender	Male	(ref)				(ref)		(ref)		(ref)		(ref)	
	Female	1.52(1.01-2.29)	0.047	0.90(0.49-1.64)	0.731	1.00(0.51-1.96)	0.989	1.11(0.66-1.85)	0.699	0.99(0.71-1.40)	0.971	0.92(0.49-1.73)	0.792
Practice	AM	(ref)	0.603		0.752	(ref)	0.999	(ref)	0.728	(ref)	0.074	(ref)	0.201
	LL	1.20(0.76-1.90)	0.424	1.28(0.53-3.10)	0.580	1.99(0.38-2.63)	0.992	1.03(0.52-2.02)	0.937	1.53(0.98-2.39)	0.059	1.92(0.94-3.93)	0.074
	HH	1.26(0.74-2.15)	0.400	0.86(0.39-1.88)	0.705	1.01(0.52-1.97)	0.981	0.78(0.40-1.53)	0.468	0.91(0.59-1.40)	0.672	1.33(0.52-3.44)	0.554

Footnote: Ref=reference category; ACE=Adverse childhood experience; HR=Hazard ratio; CI=Confidence interval; COPD=Chronic obstructive pulmonary disease; CVD=Cardiovascular disease; AM=Amlwch; LL=Lllangefni; HH=Holyhead.

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