

<b>Institution:</b> University of Nottingham		
<b>Unit of Assessment:</b> 2 – Public Health, Health Services and Primary Care		
<b>Title of case study:</b> Reducing childhood unintentional injuries in the home		
<b>Period when the underpinning research was undertaken:</b> 2000-2017		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>	<b>Role(s) (e.g. job title):</b>	<b>Period(s) employed by submitting HEI:</b>
Denise Kendrick (DK)	DK: Professor of Primary Care Research	DK: 1991 to date
Carol Coupland (CC)	CC: Professor of Medical Statistics	CC: 1990 to date
Elizabeth Orton (EO)	EO: Associate Professor in Public Health	EO: 2010 to date
<b>Period when the claimed impact occurred:</b> August 2013 to December 2020		
<b>Is this case study continued from a case study submitted in 2014? No</b>		
<p><b>1. Summary of the impact</b></p> <p>Hospital admissions for child home injuries in England decreased by 18% between 2013/14 and 2019/20 and our research played a major part in this reduction. A 17-year body of randomised controlled trials (RCTs), systematic reviews, meta-analyses and decision analyses by the Injury Epidemiology and Prevention Research Group at the University of Nottingham provides most of the evidence underpinning the introduction of UK home safety equipment schemes for preventing child unintentional (accidental) injuries. These schemes have been shown to significantly reduce hospital admission rates and have been provided by 43% of local authorities in England and Wales, nationally across Scotland and internationally. Our unique RCT and cost-effectiveness analysis of thermostatic mixer valves (TMVs) to prevent scalds, underpins their fitting in 400 social housing homes each year in Scotland. Our systematic reviews show home visiting programmes reduce child injuries, with programmes now delivered internationally to numerous families each year. Our research has made major contributions to national and international injury prevention strategies and guidelines on reducing child injuries and led to production of implementation resources, extensively used in the UK. Training based on our implementation resources has been provided to more than 550 health and social care practitioners across England, resulting in 90% of practitioners increasing knowledge, 87% increasing confidence and a demonstrated increase in home safety promotion following training.</p>		
<p><b>2. Underpinning research</b> (<i>Superscript=section 3 references, E=evidence source</i>)</p> <p>This case study is based on a 17-year body of work building the evidence base for the prevention of unintentional (accidental) injuries at home in the under-fives. Unintentional injury is a leading cause of child death in many countries including the UK. National data shows it results in an average of 55 deaths each year in the under-fives, approximately 40,000 hospital admissions and 370,000 emergency department attendances. Childhood injuries can result in long-term health, educational and social consequences and there are much higher rates of death and serious injury among children from the most deprived areas. Most unintentional injuries are preventable.</p> <p>Five of our randomised controlled trials<sup>(e.g. 1,3)</sup> and 10 of our systematic reviews<sup>(e.g. 2,6)</sup> show home safety education and provision of safety equipment to families with children aged under 5 significantly improves uptake and use of home safety equipment (e.g. smoke alarms, stair gates, cupboard locks, socket covers) and home safety behaviours (e.g. safe storage of poisons, reducing hot water temperature, reducing use of hazardous nursery items such as baby walkers). Our network meta-analyses<sup>6</sup> show that more intensive interventions (e.g. education, plus home safety assessment, provision and fitting of safety equipment) are the most effective in improving safety equipment uptake and use and home safety behaviours. Our decision analyses<sup>6</sup> show interventions provided to disadvantaged families to reduce hot tap water temperature, promote smoke alarm use and safe storage of medicines are cost effective. Our unique RCT<sup>3,4</sup> evaluating the effectiveness and cost-effectiveness of TMVs (devices to reduce hot tap water temperature and scald risk), demonstrated a significant reduction in hot water temperature, acceptability to families and a saving of GBP1.41 for every GBP1 spent. These findings provide much of the evidence underpinning home safety equipment schemes that are now widely implemented nationally and internationally.</p>		

We have also shown that improving uptake and use of safety equipment and safety behaviours reduced the burden of child injuries at a population level. Using a controlled interrupted time series analysis, we evaluated England's national home safety equipment scheme showing a 12.1% reduction in hospital admissions for child injury in scheme areas compared to a 6.7% reduction in areas without the scheme ( $p=0.001$  for difference in trends) over the 4 years after the scheme ended. (See our independent evaluation of the national scheme, E6). Importantly, our research also shows that, unlike many health promotion interventions, these interventions are not more effective amongst advantaged populations and are therefore unlikely to widen health inequalities<sup>2</sup>. Three of our systematic reviews<sup>(e.g. 5)</sup> also show other approaches are effective, e.g. parenting interventions and home visiting programmes improve home safety behaviours and reduce child injuries by 17%. These are multicomponent interventions aimed at improving a range of maternal and child health outcomes, including child injury. Such programmes are widely implemented nationally and internationally.

From 2009 to 2014 we received NIHR programme grant funding (GBP 2.1 million) for "Keeping children safe at home: a multicentre collaborative research programme to reduce childhood injuries"<sup>6</sup>. Outputs included evidence-based implementation tools ([Injury Prevention Briefing \(IPB\)](#) (2014) and a [Commissioners Guide](#) (2016)).

### 3. References to the research (University of Nottingham UOA2 researchers in bold)

1. Watson M, **Kendrick D, Coupland C** et al. Providing child safety equipment for the prevention of injuries: a randomised controlled trial. *BMJ* 2005; 330: 178-181. doi:10.1136/bmj.38309.664444.8F
  2. **Kendrick D**, Young B, Mason-Jones AJ et al (**Coupland C is an author**). Home safety education and provision of safety equipment for injury prevention. *Cochrane Database of Systematic Reviews* 2012, Issue 9. Art. No.: CD005014. doi: 10.1002/14651858.CD005014.pub3.
  3. **Kendrick D**, Stewart J, Smith S et al. (**Coupland C is an author**). Randomised controlled trial of thermostatic mixer valves in reducing bath hot tap water temperature in families with young children in social housing. *Arch Dis Child* 2011 Mar;96(3):232-9. doi:10.1136/adc.2009.175059
  4. Phillips CJ, Humphreys I, **Kendrick D** et al (**Coupland C is an author**). Preventing bath water scalds: a cost-effectiveness analysis of introducing bath thermostatic mixer valves in social housing. *Inj Prev*. 2011 Aug;17(4):238-43. doi:10.1136/ip.2010.031393
  5. **Kendrick D**, Mulvaney CA, Ye L et al. Parenting interventions for the prevention of unintentional injuries in childhood. *Cochrane Database Syst Rev*. 2013 Mar 28;3:CD006020. doi:10.1002/14651858.CD006020.pub3.
  6. **Kendrick D**, Ablewhite J, Achana F et al. (**Coupland C is an author**). Keeping Children Safe: a multicentre programme of research to increase the evidence base for preventing unintentional injuries in the home in the under-fives. Southampton (UK): NIHR Journals Library; 2017 Jul. doi:10.3310/pgfar05140 (Lists 36 publications arising from Keeping Children Safe; see pp 358-361. These are all referenced with 6 in the text of section 4)
- Grants: (Chief Investigator (ChI); Principal Investigator (PI))**
- a. National Institute for Health Research £2,124,754. Programme grant. "Keeping children safe at home: a multicentre collaborative research programme to reduce childhood injuries". 2009-2014. **Kendrick (ChI), Coupland (PI)**.
  - b. Department of Health £69,368. "Does the effect of home safety counselling or education with or without the provision of safety equipment differ between social groups? A systematic review and meta-analysis." 2004–2005. **Kendrick (ChI); Coupland (PI)**.
  - c. Department of Health £651,155. "Moving From Observation to Intervention" (2 RCTs evaluating interventions to reduce child injuries and a cohort study to measure the injury related disability. 2004-2008. **Kendrick (ChI on one trial and PI on other studies), Coupland (PI)**.
  - d. NHS Executive Trent £145,047. "Randomised controlled trial of the effectiveness of health visitor advice plus access to a low cost safety equipment scheme in reducing unintentional injury in childhood." 1999-2002. **Kendrick (ChI), Coupland (PI)**.

- e. NHS Executive Trent £102,864. "Cluster randomised controlled trial of the effectiveness of an educational package in reducing baby walker use." 1999-2002. **Kendrick (ChI)**.
- f. NIHR School for Primary Care Research (NSPCR) £62,211. "Evaluation of the impact of the national 'Safe At Home' scheme on injury rates in children under 5 using secondary care data." 2017-2019. **Orton (ChI), Kendrick, Coupland (PIs)**
- g. Nottingham Citycare (Big Lottery funding) £225,126. "The Stay One Step Ahead Home Safety Project." 2017-2021. **Kendrick and Orton (Co-ChIs), Coupland (PI)**.

**Awards: Kendrick (2001-2006):** Department of Health. National Public Health Career Scientist Award (£480,100) for a 5-year research programme into inequalities in childhood unintentional injuries. **Kendrick (2008):** Royal Society for the Prevention of Accidents Distinguished Service Award for Academic Achievement for services to home safety.

#### 4. Details of the impact (*Superscript=section 3 references, E=evidence source*)

##### a. Influencing national policy on provision of home safety equipment (E1-5)

Our research on the effectiveness of home safety education and safety equipment provision had a major impact on recommendations about home safety assessment and safety equipment provision across several national policy documents (see below). Our [2015 survey](#) shows wide use of these documents by local authorities: 75% using National Institute for Health and Care Excellence (NICE) PH29/30 and 57% using Public Health England (PHE) guidance in decision making about child injury prevention work.

The evidence underpinning NICE PH29/30 2010 was updated in 2015, citing 14 new papers<sup>(6)</sup>, all from our research group (E1 pp5-10). For example, our TMV study<sup>3</sup> strengthened evidence supporting existing recommendations on their installation: "*This study* [*reference 3*] *provides new evidence of specific interventions to prevent scalds in children. This evidence supports PH29 recommendation 9 and PH30 recommendation 3 on installation of TMVs in social and rented dwellings*" (E1 pg6).

Public Health England's (PHE) 2018 local authority guidance "Reducing unintentional injuries in and around the home among children under five years" cites 14 of our papers<sup>2,6</sup> and our implementation resources<sup>6</sup> (E2 pp4-7,13,14,18,19,26, 28-32), e.g. our Cochrane review demonstrating effectiveness<sup>2</sup>: "*Research* [*reference 2*] *shows that providing safety education and free or low-cost safety equipment is effective in improving home safety and can reduce inequalities in some home safety practices*" (E2 pg19).

The 2018 English National Accident Prevention Strategy cites 6 of our papers<sup>2,6</sup> (E3 pp15,19,26,27,59,60); e.g. our Cochrane review<sup>2</sup>: "*Evidence* [*reference 2*] *has shown that the most effective interventions are those that provide education alongside home safety checks and the provision and fitting of various items of safety equipment in the home*" (E3 pg19). In addition, DK/EO were members of the National Accident Prevention Strategy Advisory Group. Our Cochrane review was also cited in NHS Health Scotland's 2017 Unintentional injuries and home safety guidance<sup>2</sup> (E4 pp4,11). In 2013 the Chief Medical Officer (E5 ch3 pp13,40; ch6 pp4,11) cited our research<sup>2,4</sup> as evidence of effectiveness and cost-effectiveness of education and safety equipment provision, making a new policy recommendation for implementing home safety recommendations in NICE PH29/30.

##### b. Influencing national and international provision of home safety equipment (E6-9)

English Hospital Episode Statistics show a decrease of 18% in hospital admissions nationally for child home injuries between 2013/14 (unable to disaggregate; n=46,895) and 2019/20 (n=38,571). Home safety equipment schemes contributed substantially to this reduction, as shown by our independent evaluation of the national scheme which demonstrated a significant reduction in hospital admission rates following the scheme (E6, pg 5). Our [survey of local authorities](#) shows these schemes are widely implemented, with 43% of local authorities in England and Wales having a scheme in 2015. Many schemes cite our research as underpinning evidence, e.g. the Scottish home safety equipment scheme. The Royal Society for the Prevention of Accidents (RoSPA) confirmed "*research carried out by Nottingham University on home safety education, home safety checks and home safety equipment provided much of the UK evidence on which the Scottish home safety equipment scheme was based.*" (E7.1). Between April 2013 and June 2014 (unable to disaggregate),

900 families benefitted from the scheme (E7.2 pg23). A similar scheme in Ontario, Canada provided equipment to 3,458 families, from April 2013 to March 2015 (unable to disaggregate), resulting in a significant reduction in emergency department attendances for home injuries ( $p=0.01$ ) (E8 pp535-6). This ongoing programme was explicitly based on our Cochrane systematic reviews<sup>2,5</sup>: *“interventions providing safety equipment seem to be more effective in improving some safety practices than those not doing so.”*<sup>[references 2,5]</sup> *Based on these findings.... we developed a home safety program”* (E8 pp533,540). Our TMV trial<sup>3,4</sup> was a research collaboration with Glasgow Housing Association (GHA), who subsequently fitted 24,000 homes with TMVs in 2011. GHA has been taken over by the Wheatley Group, who manage 93,7000 affordable homes in Scotland and have fitted TMVs in bathroom refurbishments in a further 1,929 homes between April 2015 and March 2020 (E9).

#### c. Influencing international policy and provision of parenting and home visiting programmes (E10)

Our systematic reviews of parenting and home visiting interventions demonstrating significant reductions in child injuries<sup>5</sup> provide evidence underpinning Israel’s injury prevention programme in 9 hospitals reaching more than 3,000 families between April 2013 and December 2014 (unable to disaggregate) (E10.1 pp2,10, E10.2 p10), and Maternal, Infant, and Early Childhood Home Visiting Programs in the USA, e.g. 4,587 families in New Mexico in 2017 (E10.3 pp1,24) and 1,184 families in Utah in 2016 (E10.4 pg1;E10.5).

#### d. Informing national and international practitioner guides (E11,12)

Our research, [Injury Prevention Briefing \(IPB\)](#) and [commissioners’ guide](#) have informed home safety recommendations in international and national practitioner guides. DK made a substantial contribution to PHE’s 2017 “Preventing unintentional injuries: A guide for all staff working with children under five years” which cites 3 of our papers<sup>6</sup> (E11.1 pp3,17,19,20) as evidenced by the Child Accident Prevention Trust (CAPT) stating *“Nottingham had extensive input into the evidence-based safety advice and safety messages, drawing on findings from the Keeping Children Safe Programme.”*<sup>[reference 6]</sup> *Members of the Keeping Children Safe team also attended each of the four launch events, setting out the evidence base for the safety advice and safety messages in the guide. When we promoted the PHE guide in a recent CAPT e-bulletin, there were 428 unique views of the article by a range of professionals”* (E12).

Our research informed the Institute of Health Visiting Local Authority Child Public Health Briefing: The Health Visiting contribution to Child Accident Prevention in 2016 which cites 6 of our papers,<sup>2,6</sup> (E11.2 pp1-6) and the New Zealand’s Ministry of Health “Well Child Practitioner Handbook” in 2014 which cites our Cochrane parenting review<sup>5</sup> as good evidence stating *“See Kendrick et al 2013 [reference 5] for good evidence that injury prevention activity reduces unintentional injury in children and can improve home safety”* (E11.3 pp151,155). Our research also informed the Canadian Injury Prevention Resource in 2015 which cites 6 of our papers<sup>1,5,6</sup> (E11.4 pp52,54,268,278,377,383,400,404,405,408) and the US Children’s Safety Network Resource Guide for Preventing Unintentional Medication Poisoning in Children in 2016 which cites 3 of our papers<sup>6</sup> (E11.5 pp5,6,9).

#### e. Informing international injury prevention strategies (E13)

Our research informed international strategies including Child Unintentional Deaths and Injuries in New Zealand and Prevention Strategies in 2015 which cites 4 of our papers<sup>2</sup> (E13.1 pp47,59,71,77,90-93); the New South Wales Child Safety Good Practice Guide: Good investments in unintentional child injury prevention and safety promotion in 2016 which cites 14 of our papers<sup>1,2,5</sup> (E13.2 pp23,41,42,44-46,48,52,53,55,60,61,114,116) and the European Child Safety Alliance’s Child Safety Reference Frameworks for evidence-based injury prevention strategies in 2014 which cites 5 of our papers<sup>2,5</sup>(E13.3 pp6-8,14,15).

#### f. Developing resources for practitioner use (E11.1, 12, 14)

As a result of our research<sup>6</sup> we produced: (i) a 75-page [IPB](#) in 2014 for practitioners, including 11 evidence-based home safety activities for use with families, which has been [endorsed by NICE](#); (ii) a 32-page [guide for commissioners of children’s services](#) in 2016

distributed to local authorities in England and health boards in Wales and by CAPT via targeted mailing to their subscribers; and (iii) evidence-based home safety checklists, monthly safety messages and safety sessions at Children's Centres for families in disadvantaged areas in Nottingham: Between October 2017 and June 2020, 4,451 families completed checklists, 24,400 home safety messages were distributed, 440 families attended safety sessions and 950 received home safety visits from family mentors using our evidence-based resources (E14).

The IPB and commissioners' guide are extensively cited by PHE's 2017 practitioner guide (E11.1 pp19,20) and promoted by the [Institute of Health Visiting](#) where they are the first 2 resources on their accident prevention resources page and the commissioners' guide is described as "the first of its kind". Their usefulness is evidenced by CAPT stating in 2017: *"This has been Nottingham University's strength: disseminating findings with clear implications for practice through a range of formats and channels, including working in partnership to extend the reach of your work"* and *"Our links with public health, health visiting and early years services... show that all three of the outputs mentioned above [IPB, commissioners guide and PHE practitioners guide] are useful to practitioners and commissioners, enabling them to easily integrate evidence-based approaches into their work. We continue to promote them as key resources to support child injury prevention in the UK"* (E12).

#### g. Training health and social care professionals (E14-16)

We developed and delivered child home safety training focussing on use of the IPB (resulting from<sup>6</sup>) for 550 health and social care practitioners and family mentors in 4 sites in England (Nottingham, Bristol, Newcastle, Norwich) between 2014 and 2020 (E14-16). The 2015 Nottingham evaluation shows 90% of practitioners increased knowledge and 87% increased confidence in home safety promotion. Three months later, practitioners had used each of the 11 home safety activities with between 100 and 250 families and at least 96% of practitioners found each activity to be useful/very useful (E15 pp3-5). The 2016 Bristol evaluation showed using the IPB enabled discussions with parents about home safety (E16 pg6), e.g. *"nice easily adaptable activities and guidance which get parents to think about dangers through the eyes of a child"* and *"encouraging parents to be aware of child development...promoting parental observation and encouraging them to be one step ahead"* and increased practitioner confidence, e.g. *"it has filled me with confidence in advising parents and families on how to prevent injury/accidents"*. Our IPB is also extensively cited in [module 2](#) of the Institute of Health Visiting 2015 online accident prevention training package.

#### 5. Sources to corroborate the impact

- E1. [NICE Guidance: PH 29 & 30 Evidence Review 2015](#)
- E2. [PHE Guidance: Reducing Unintentional Injuries in the under 5s 2018](#)
- E3. [RoSPA National Accident Prevention Strategy 2018](#)
- E4. [NHS Scotland Guidance: Unintentional injuries 2017](#)
- E5. [CMO Report. Prevention Pays - Our Children Deserve Better 2013](#)
- E6. Final Report National Equipment Scheme Evaluation 2020
- E7. Letter from RoSPA 2017 (E7.1), [Evaluation of Scotland's Home Safety Equipment Scheme 2014](#) (E7.2)
- E8. [Stewart et al J Trauma Acute Care Surg 2016](#). doi: 10.1097/TA.0000000000001148
- E9. Emails from Wheatley Group re TMVs 2017 to 2020
- E10. List of international parenting and home visiting programmes (Israel, USA)
- E11. List of national and international practitioner guides (UK, New Zealand, Canada, USA)
- E12. Child Accident Prevention Trust letter 2017
- E13. List of international injury prevention strategies (New Zealand, Australia, Europe)
- E14. Nottingham CityCare Letter 2020
- E15. Nottingham practitioner training evaluation report 2015
- E16. Bristol practitioner training evaluation report 2016 [weblink](#)