

co+Impact Project: 12 Month Progress Report

1 Summary

The co+Impact project is a 2-year study on carbon monoxide (CO) poisoning conducted by Cranfield University at Shrivenham and funded by the Gas Safety Trust. The study aims to identify the true effect of carbon monoxide poisoning on the UK population in a number of environments. The project also aims to identify our current state of knowledge on carbon monoxide poisoning in the UK and to produce recommendations and proposals for further research in the areas where our understanding is lacking. Additionally, through research collation, the project has populated the Gas Safety Trust Academic Portal with journal articles and other media of interest to research.

This study began in August 2014 and 1 year into the project has seen much growth in the references collated, the development of the project’s scope and preparations for the final report. Additionally, many areas are already identified for further research through project proposals. Below, the development of the project is observed as growth in the project objectives 1-5 in 6 to 12 months, and the addition of specific research areas included by 12 months.

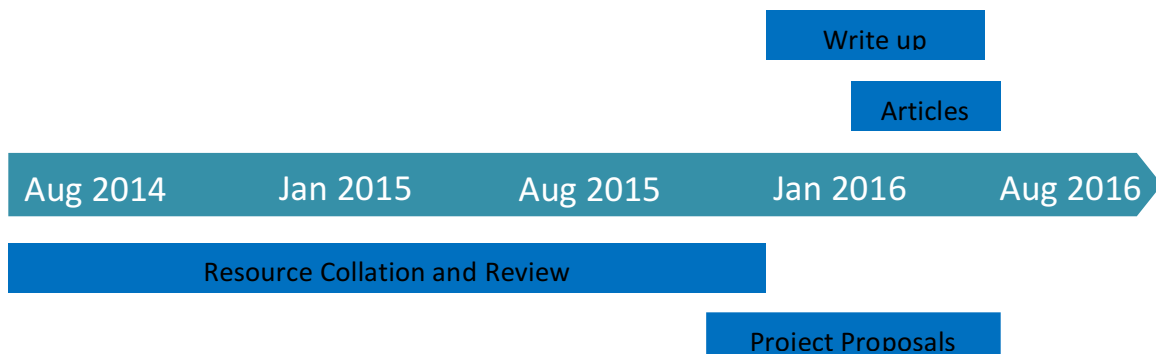
6 Months

Project Objectives		
1	Source Collation	50%
2	Research Collaboration	40%
3	Project Proposals	20%
4	Exposure Limit	50%
5	Poisoning Database	40%

12 Months

Project Criteria		
1	Source Collation	60%
2	Research Collaboration	60%
3	Project Proposals	50%
4	Exposure Limit	60%
5	Poisoning Database	50%
6	Alarms	40%
7	ICD codes	60%
8	Environments	10%
9	Council Support	10%

Moving into the second year the focus of the project will move from source collation and review to investigating specific areas, liaison for project proposals and write-up. The main outcome of this project will be a final report discussing the objectives and the suggested research areas from the perspective of identifying the true numbers of individuals in the UK affected by carbon monoxide and our knowledge on these factors. Additionally, the university aims to produce at least two journal articles from the project which should further the study’s reach and maximise its impact.



2 Project Background & Description

The co+ Impact project is a current two-year study that started on the 1st August 2014. Its aim is to understand the impact of carbon monoxide on the UK population in a number of environments including the home, tents, caravans and boats.

Currently only vague estimates for the total number of individuals affected by carbon monoxide exist and these are thought to be grossly underestimated possibly due the difficulty in detecting CO poisoning, the sub-classifications of poisoning, misdiagnosis and its variable affect on individuals. The co+Impact project therefore attempts to discern the true impact on people in the UK affected by carbon monoxide and our current state of knowledge of CO and its effects.

3 Introduction

The project on the whole is progressing well and on track to meet its objectives in the given timeframe. The project process has taken a turn since the last review towards a more direct focus on specific subjects that are of interest to research, and the GST objectives.

4 Project Report Progress

The overall project report is going well and is on track to meet its objectives. Many different angles of research collation have been utilised to gain a rounded view of current CO knowledge in the UK.

The project has recently changed its focus, altering the way in which the source collation is conducted. The source collection process is now more streamlined, with the creation of specific topics for discussion and research. This came about through the initially very broad process of source collection and review, where issues were recognised and linked. A project report structure was created (detailed below in next section) with specific topics to be investigated. This has altered the way in which sources are collated, as the research is more focused and more specific search terms can be utilised to gather information, making best use of the time available.

Project Criteria	
1	Source Collation 60%
2	Research Collaboration 60%
3	Project Proposals 50%
4	Exposure Limit 60%
5	Poisoning Database 50%
6	Alarms 40%
7	ICD codes 60%
8	Environments 10%
9	Council Support 10%

4.1 Report Writing

A rough plan for the project report is detailed below. This is already guiding research however is preliminary and open to changes: specifically additions are welcomed, to accommodate every party's investment in the study.

Project outline

Summary

Introduction

Points/ Recommendations

Collaboration: Progress, Groups and Councils

Existing groups and their development during the project, current and prospective collaborations.

Alarm Installation

There exist dangerous differences between the advice given for alarm placement from media and installation guides and a gap between those who know, and the consumers of CO alarms, this is evident from anecdotal evidence. In addition, within the UK, there are marked differences in legislation of alarm installation which is periodically changing, that should be made clearly available.

Alarms: Detection and Technology

Where and how alarm development can be achieved for specific goals within the standards.

Reaching Councils: Research and Support

Councils are the frontline for many CO cases and have resources available for CO research. However there is no link between the councils and the researchers to utilise these.

Poisoning: Detection and Treatment

The definition of poisoning and the seriousness of COHb levels affect how CO poisoning is researched, diagnosed and treated.

Fire Related CO Poisoning

Fire related incidents are often excluded but where is line drawn with fire and non-fire related CO poisoning and how could International Classification of Disease (ICD) codes be used.

Home Environment

Advice on dangers and actions for CO prevention should be collated in one place and accurately disseminated. The increase in air tightness in the home is a big factor to consider in this area.

Leisure: Boats, Tents, Hotels

Advice on dangers and actions for CO prevention should be collated in one place, specifically focusing on alarm placement and technology.

Research Project Proposals

- What are CO fire deaths usually ICD coded as and why?
- Differences in advice for alarm placement, case studies, media and installation guides compared.
- Strategic map of CO groups how they link with the view to changing policy.
- A study into the lack of ventilation in the home affecting CO build-up should be conducted as we already assume the results.

Closing remarks

Acknowledgements

References

4.2 Source Collation

The review of the existing research concerning CO⁺ in the suggested environments is well underway and has coincided well with the Gas Safety Trust academic portal. As discussed earlier, the collation of sources is more streamlined now that the report has more specific research outcomes. Collation is easier with specific search terms and a more direct and focused approach. The reading of the sources is progressing well but at a steadier rate as articles are read for their insights into the aforementioned subheadings specifically, rather than just to populate the portal.

Sources have been collated from many areas including meetings, reports, conferences and academic journals. With regard to the latter specifically, the Cranfield library does not have access to all of these. Although they can be accessed through interlibrary loans, this is not cost or time effective considering the amount of articles that have been noted as required; therefore the most convenient way to obtain these articles is to visit the British library as the source of the interlibrary loans. The list of articles will be useful in applying for a reader card as it needs to be justified that the British library is the best place to obtain these sources.

As discussed previously, networking has been paramount to the progression of the project, the understanding of the internal process of raising CO awareness, where the project sits and where exactly it can aid development. The GST provided a list of CO researchers in the UK and their contact details. The researchers were contacted and asked if they would provide any information to the project, and over time, responses have come in. However very few of the contacts led to any data sharing; either because the area of CO research was not relatable, the researcher was retired, or they have never been involved in CO.

4.3 Research Area Collaboration

Considerable ground has been covered during the project in the collaboration efforts of universities and other institutions for CO research and the push for policy changes. There are many agencies who are somehow involved in CO research that should be collaborated with.

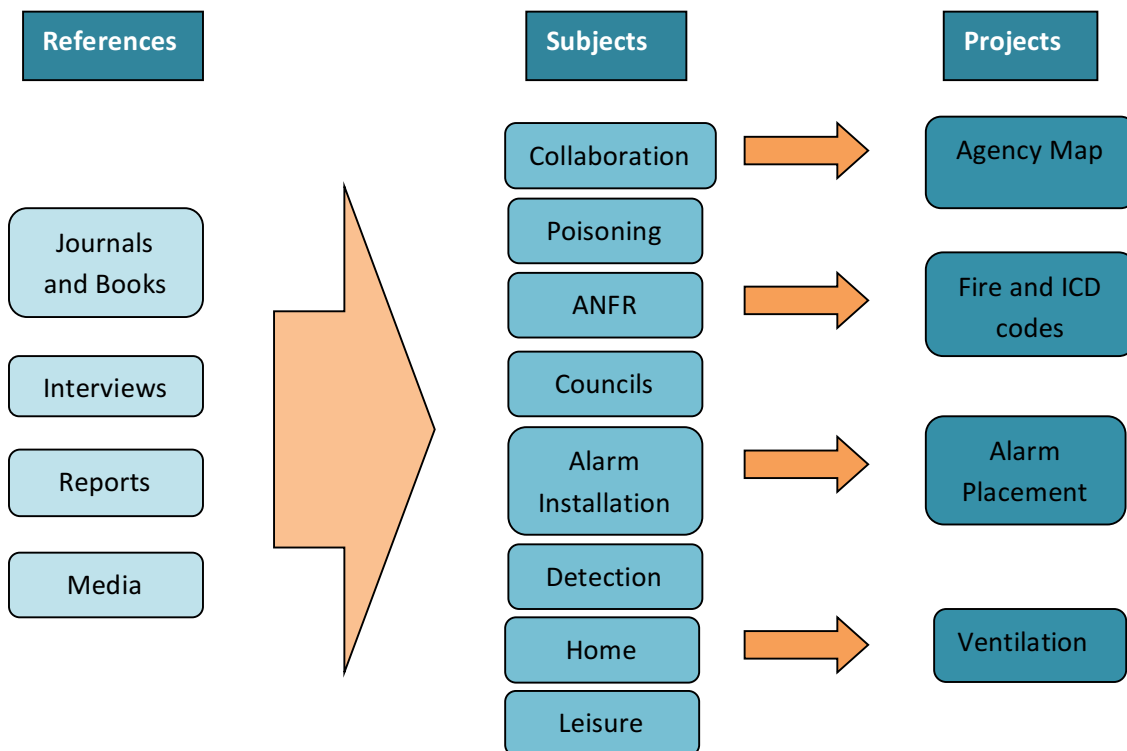
One of the largest advancements in bridging the gap between technology, science and medicine has been the creation of the Science and Technology group on CO (part of the All Fuels Forum and its close collaboration with the Medical and Healthcare group (also part of the All Fuels Forum). A major demonstration of the current level of collaboration and intent to promote research is the CO⁺ SciTech joint bid for the maintenance of the Academic Portal. Another example would be the work of Cranfield University and Public Health England and their imminent pilot study on coroner's data.

With regard to policy, some of the recent changes in legislation concerning CO have been pushed by the housing sector in conjunction with changes to smoke alarm laws. It is clear from what has been achieved recently that there are many more agencies with an interest or the capacity to promote CO

research than first realised. It is therefore a proposed section of the report that the progress and current actions be discussed and that a project is proposed to map all the involved agencies with a link to CO, and how they can, and do, work together. This is discussed in more detail in the next section.

4.4 Project Proposals for Future Research Projects

Much headway has been made recently in ideas for project proposals, drawing from the new report sections. The current suggestions mentioned above and detailed here are still in their early stages, not exhaustive and open to changes and additions.



What are CO fire deaths usually ICD coded as and why?

The current ICD-10 has fewer codes available for carbon monoxide as a cause of death than the past ICD-9 coding system. However there are many codes for fire related deaths which can often be linked with CO. Very often, fire-related carbon monoxide deaths are excluded from research as they are deemed not preventable by the same strategies as carbon monoxide. However, through anecdotal evidence, there appears to be much more overlap between fire and non-fire related cases than assumed by researchers. For example, a case where the fireplace or smouldering or a barbeque brought inside causes CO poisoning. Very few cases are actually attributed as fire related CO poisoning, however some form of combustion has to be related, even if not the primary cause of death. A study should be conducted to determine what fire codes are often related to CO and why, to determine a more efficient prevention strategy.

ICD Codes explained

The International Classification of Disease is a standardised diagnostic tool for epidemiology published by WHO which is currently in its 10 revision. A series of codes are used to determine cause of death and intent.

Furthermore could fire codes be utilised in CO cases to provide more information about the circumstances of death, which is lacking in ICD-10.

Differences in advice for alarm placement, case studies, media and installation guides compared.

Several studies have been conducted into alarm placement and the conclusion of most is that CO alarms should be positioned 'just above door frame height' 1-3m away from a fuel burning appliance. There will never be a 'one size fits all' answer, as homes will vary in shape, size, and the number of detectors. However, many sources of advice to consumers will state different positions for CO alarms; suggesting they be knee height or 1m from the floor etc. Alarms provide accompanying guides for where they should be situated and a recommendation of the APPCOG 2014 inquiry is that the guides become more user-friendly. Providing easily-accessible 'wrong information', such as on the internet, is dangerous to the public, especially if installation guides do not improve. A study should be conducted to establish how accurate information can be disseminated and why individuals deviate from the guidelines established in the installation guide.

Strategic map of CO groups with the view to changing policy. A recent study in the field of energy efficiency in the home demonstrated the positive impact of creating a detailed map of related agencies, how they interact and affect each other and the effect of policies on each in a knock-on effect. In this study, agencies met physically to advise the map during its construction. With an eye on collaboration and a desire to change policy, it would be beneficial to produce one of these for CO research that can be updated. This would be more than the current lists of involved agencies but would clearly show where pros and cons exist and changes that can be made, areas that can push for changes in CO legislation and where areas may be disadvantaged by changes. Research areas could be mapped and related visually with the issues of industry and local councils.

A study into the lack of ventilation in the home caused by increased insulation affecting CO build-up. Several recent studies have examined the health and cost, pros and cons of energy efficient housing, specifically increased insulation, air tightness and ventilation. Whilst these studies have included a multitude of harmful substances in their analyses, as far as this study is concerned, CO has not been investigated. The increased air tightness of homes is commonly quoted in CO circles as a cause for accidental carbon monoxide poisoning in the home, however this is an assumption based on studies looking at other toxins. For policy to be taken seriously and for CO to be considered amongst energy efficiency debate, this research must be conducted with CO, not generalised.

4.5 Exposure Limit

The progress of the exposure limit objective has not really changed since the last review (30/04/2015) aside from a more thorough collection of sources on the topic. The position of this study still remains the same, exposure limits with regard to alarms are consistent with data on the effects of CO poisoning with disregard to some demographics included the elderly or infirm who would be more susceptible. This can be countered by alarms that display at lower ppm thresholds but more could be done to lower this level as a precaution. Furthermore the debate on the effectiveness of hyperbaric oxygen therapy and at what carboxyhaemoglobin level it should be used continues with no clear process to follow in such a situation. More research would be needed. COHb levels not only define the severity of the exposure and the treatment, but are also a factor in

determining whether CO was the cause of death, specifically in fire related poisonings. A level of error could exist in this process and could cause some CO deaths to be misclassified as fire deaths.

4.6 Poisoning Database

The need to create a system for monitoring and determining the true effect of CO poisoning on the population has shown a lot of progress externally, with several projects taking on aspects of the research, their progress is outlined here.

The Gas Safety Trust's addition to the portal, the Incident Database, will include collated databases of CO poisoning cases. This will be a huge benefit to the CO research and policy whoever maintains the portal.

After the release of the All Part Parliamentary Carbon Monoxide Group 2014 inquiry, which suggests the need for collaborative data collection in its recommendations, Baroness Finlay spearheaded a project collaborating Public Health England and Cranfield University with coroners and their sample laboratories which has the chance to determine the true figures for carbon monoxide poisoning for a sample population. The project has received funding from the GST and Cranfield will begin recruiting shortly.

Finally the Incident Response process at Cranfield University which aims to diagnose cases of chronic CO poisoning and collect the data, has not progressed in this time, partly because of current developments by other organisations and partly due to the fact that it is a very challenging, collaborative and forward thinking proposal that will take a long time to come to fruition.

5 Academic Portal Progress

Much of the progress in the involvement of the project with the academic reference portal has been discussed above but to summarise, the population of the database has gone well and will continue retrospectively throughout the project, collaborating with the institution that provides the annual portal updates.

Sources from many different areas have been reviewed and this work will continue; the current literature available on the portal provides a broad analysis of the current areas related to carbon monoxide making the portal a very useful instrument of research for many individuals. As discussed earlier the process of collating sources for the portal has been changed to a more directed approach. The sources are entered in batches based on topic sections and reviewed whilst note taking under umbrella headings.

The list of researchers active in CO that was provided by the GST has been maintained and updated and could form a useful portion of the database with the consent of the individuals concerned. This would make research and collaboration easier in the future as researchers would be easily accessible. This could even be linked to details of current and future projects and funding opportunities on the portal which has been suggested by some in the field as a valuable tool that has worked in other database style settings. The GST portal can be viewed as a platform for all sorts of CO information from various areas and for all those considering work in CO-related aspects. The

portal has the potential to be expanded for use as a point of call for current and future CO research projects, not just the results of studies.

6 Issues Faced

A few issues persist in this later stage of the study. Still, where many institutions have been happy to offer their input into the project and its proposed further actions, others have been less interested in being involved. As mentioned previously, the list produced by the Gas Safety Trust of CO researchers was utilised to obtain contacts in the field, however, after many months, few replied and those that did were not in relevant CO research or were retired. The list was maintained and updated as replies came in and will continue to be.

The issue of attempting to review challenging articles with reduced relevance to this research project and the portal's aim has been reduced by their periodic removal and the use of the project structure to direct the collation to sources to specific themes. This is of great benefit to the project and everyone using the portal.

7 Future Timescale

The project has so far progressed according to plan and continues with the collation of sources and the reading and reviewing of information for the final report. The visit to the British Library should be confirmed soon as is likely to occur in this project year.

Communications with those actively involved in areas of CO has been a large part of the project so far and will continue throughout for the collation of sources, collaborative research, project proposals and the opinions of experts on the project content.

The final write-up of the report is still likely to occur in the last four months of the project followed by the project proposals for further research originating from the project. This could take some time if collaborations are to be suggested as separate financing will have to be determined etc.

Cranfield University maintains that based on the length of the project, two journal articles will need to be submitted following the report. The requirement to do so is viewed as a positive sign as it demonstrates the university's faith in Carbon Monoxide as a continuing area for research and will increase the impact the report has by reaching a significantly larger scientific audience. Ideas for the articles are already considered as two smaller versions of the report with different agendas such as more scientific and a more political/strategic stance. Alternately the project sections could be considered for articles on more specific research areas.

8 Conclusion

The project is currently on track to reach its objectives and outlined here are the methods by which this progress will continue as well as what has been learnt so far. As with all good scientific research, the aims and objectives are regularly reviewed to ensure that they remain relevant and achievable. All the suggested areas for specific research are demonstrated here and open to discussion such that the aims and objectives of all those involved in the project are met in the timeframe.