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What evidence is there to support the employment of trained and professionally registered library, information and knowledge workers?

A systematic scoping review of the evidence

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1 Introduction, aims and objectives

This report seeks to provide evidence that CILIP can use to advocate on behalf of the information professions.
The report addresses three aims:
1. To create an initial evidence base which can be used to advocate on behalf of the information professions.
2. To develop clear propositions outlining the value that trained and professional registered staff provide.
3. To identify options for further research which can be commissioned by CILIP

It will do this by:
1. Reporting on a systematic scoping review of the literature to identify the evidence base for trained and professionally registered library, information and knowledge (LIK) workers
2. Mapping the evidence according to library sector
3. Identifying which evidence bases need updating
4. Drawing up a set of propositions from the results of the review and mapping
5. Identifying further research needed and what methods could be used to achieve this.

2 Methods

2.1 Systematic scoping review of the literature

A systematic scoping review of the literature was conducted to identify the evidence base for trained and professionally registered LIK workers. The objectives of the review were:
- To identify and summarise the research which provides an evidence base for trained or professionally registered library, information or knowledge workers
- To identify evidence according to sector
- To identify the research methods used

The review sought to examine all library/information/knowledge sectors and include international literature. To remain within the resources and time frame allocated by CILIP, the data was extracted to provide a map of the evidence, but not critically appraised in detail.

The review was undertaken following the framework proposed by Arksey and O'Malley (2005). Scoping studies seek to provide in depth and broad results, and take an iterative and reflexive approach (Arksey and O'Malley, 2005). The scoping review framework has been used for conducting scoping studies of complex health care interventions, the nature of which can be seen as comparable to interventions in library and information Science (LIS) (i.e. the interventions have a number of interacting components, different behaviours are required from those delivering or receiving the intervention, variability in possible outcomes, and there is a degree of flexibility or tailoring of the

intervention (Hawes, 2004; Craig et al., 2008). According to Arksey and O'Malley (2005) systematic scoping reviews are appropriate to:

1. "Examine the extent, range and nature of research activity and provide a way of mapping fields of study

2. Determine the value of undertaking a full systematic review

3. Summarise and disseminate research findings

4. Identify research gaps in the existing literature"

These elements mapped onto the scope of the brief and the project deliverables as outlined in the objectives above, and thus were determined as an appropriate method of conducting the study.

The remainder of this section describes the approach taken, following Arksey and O'Malley's framework (2005). Initial scoping searches were conducted (Koufogiannakis and Brettle, 2015), which indicated a lack of high level review evidence on the effectiveness and impact of LIS services across most library sectors. This suggested a need to locate a range of individual studies across library sectors to inform the review findings.

2.2 Stage 1: Identifying the research question

The final research question was agreed in discussion with CILIP to be: What evidence is there to support the employment of professionally trained or registered library, information and knowledge staff? This included the identification of studies that demonstrated the effectiveness, value or impact of libraries and LIK workers across sectors. In conjunction with CILIP the project team agreed definitions for library, information and knowledge workers and libraries; value, impact and effectiveness; trained and professional to ensure that the work had a suitable focus. The sectors to be covered were also agreed with CILIP. These definitions and the sectors can be found below.

Definitions	Sectors considered
Professionally trained - academic qualification such as BA, Masters in relevant subject OR professionally registered (chartership, certified or fellowship) Effectiveness or effects – outcomes demonstrating whether a service works Impact – outcomes measuring whether a service makes a difference Value – outcomes related to costs, economics, value for money, extrinsic value, savings	Armed forces Commerce/Business (Inc. Industry/Science) Consulting Further Education Government – Local Government – National Health Care Social Care Higher Education Law Museums, Archives and Galleries National Library Not for Profit/Third Sector Prison Public Library Research and Academia School (Primary)

	School (Secondary)

Table 1: Definitions and sectors

2.3 Stage 2: Identifying relevant studies

2.3.1 Literature searches

A comprehensive and iterative approach to the literature searches for evidence was taken due to the broad nature of the brief, the need to identify evidence from a range of study designs and in line with the scoping review framework. As LIK professionals work across disciplines, the search incorporated resources that reflected these disciplines at the same time as taking a pragmatic approach to meet the required deadlines and resources committed.   A protocol that outlined the resources to be searched, search terms and search parameters was developed by the project team following discussions and in liaison with CILIP.

2.3.2 Resources searched

The search built on the approach taken in a recent review (Koufogiannakis and Brettle, 2015) that included LISA, LISTA, Library Literature, Scopus, Medline and Cinahl. The review findings and searches (Koufogiannakis and Brettle, 2015), together with the advocacy resources provided on CILIP's web pages (http://www.cilip.org.uk/cilip/advocacy-awards-and-projects/advocacy-and-awards) also provided useful starting points. These approaches were supplemented with a focussed Internet search of key relevant organisations, a search of Ethos to identify relevant doctoral theses and a hand search of the Evidence Based Library and Information Practice Journal. A summary of the resources searched can be found in Appendix 1.

2.3.3 Search terms

The review question was broad with the potential to encompass a wide range of LIK services, which in turn led to a wide search encompassing a range of thesaurus and free text terms to describe the services and different aspects services in question.   Initial scoping searches indicated the need for a sensitive search approach followed by sifting to ascertain relevance. Search terms were identified from a recent review (Koufogiannakis and Brettle, 2015) and discussions amongst the project team and CILIP.

2.3.4 Process of searching

The search followed the agreed protocol and was undertaken by the project team. Results of the searches were stored on Endnote web reference management software to enable sharing across the project team. The group function was used to enable the team to track references throughout the systematic review process and notes were added to each record to justify inclusion and exclusion decisions made. Search strategies were recorded, together with details of the date the search was undertaken and the number of results obtained and issues arising during the searching in order to provide a complete history of the search process and provide transparency of the review process. This information was stored on a project wiki in PBWorks.

2.4 Stage 3: Study selection

2.4.1 Inclusion and exclusion criteria

The inclusion/exclusion criteria were refined via discussion amongst the project team and CILIP following scoping searches as follows:

Inclusion criteria:

- Studies that assess the effects, value or impact of any library/information/knowledge management intervention or service. (Table 1)
- Library, information, knowledge or IT workers whose work relates to information or knowledge which needs to be organised or use of a system in which the information is located
- Roles which include archives or study records
- Evidence of measurable outcome (e.g. time saved, improved business, improved patient care, improved grades, impact on community)
- All types of evidence (including experimental or observational evaluation studies with controlled or uncontrolled prospective design or controlled retrospective design, return on investment, cost analysis, correlational studies)
- Studies in English

Exclusion criteria:
- Interventions which are provided by information workers that relates to information systems and how these work
- Descriptions of interventions/services with no evaluation component or measurable outcomes
- Studies which only include process type outcomes such as user satisfaction, numbers of users, books loaned etc.
- Archivists
- Evaluation or impact theory testing
- "How to" articles on measuring performance, impact, evaluation, value
- Citation impact analysis and methods of citation impact
- Studies in languages other than English

2.4.2   Outcomes considered

Measuring the outcomes or impact of library services is difficult as the outcomes are often diffuse or will be realised over a long term. It has been argued that it makes more sense to measure the effectiveness or impact of the contribution made by libraries rather than a direct outcome (Abels et al., 2002; Urquhart, 2004; Brettle et al., 2011). The outcomes considered took this into account and thus could include for example,
- Measures of time saved
- Measures of money saved
- Measures of outcomes relevant per sector (e.g. impact on patient care – health, impact on community – public libraries, impact on assessment – academic)

2.4.3   Screening/Sifting of studies

The broad nature of the search question and sensitive approach to searching located a high volume of potentially useful studies. On the basis of titles and abstracts, each potentially relevant study was screened by one of a team of reviewers against the inclusion/exclusion criteria. Two reviewers to ensure inter-rater reliability screened a 20% sample of studies; a set of 91 studies that were deemed as "maybe or potentially relevant" were screened by CILIP. Those studies that were clearly irrelevant were immediately excluded, and full papers obtained for those studies where it is impossible to tell from the title and abstract. Full papers were accessed for all those meeting the inclusion criteria and these studies proceeded to the next stage of the review.

Figure 1 explains how the located studies passed through the searching and sifting process
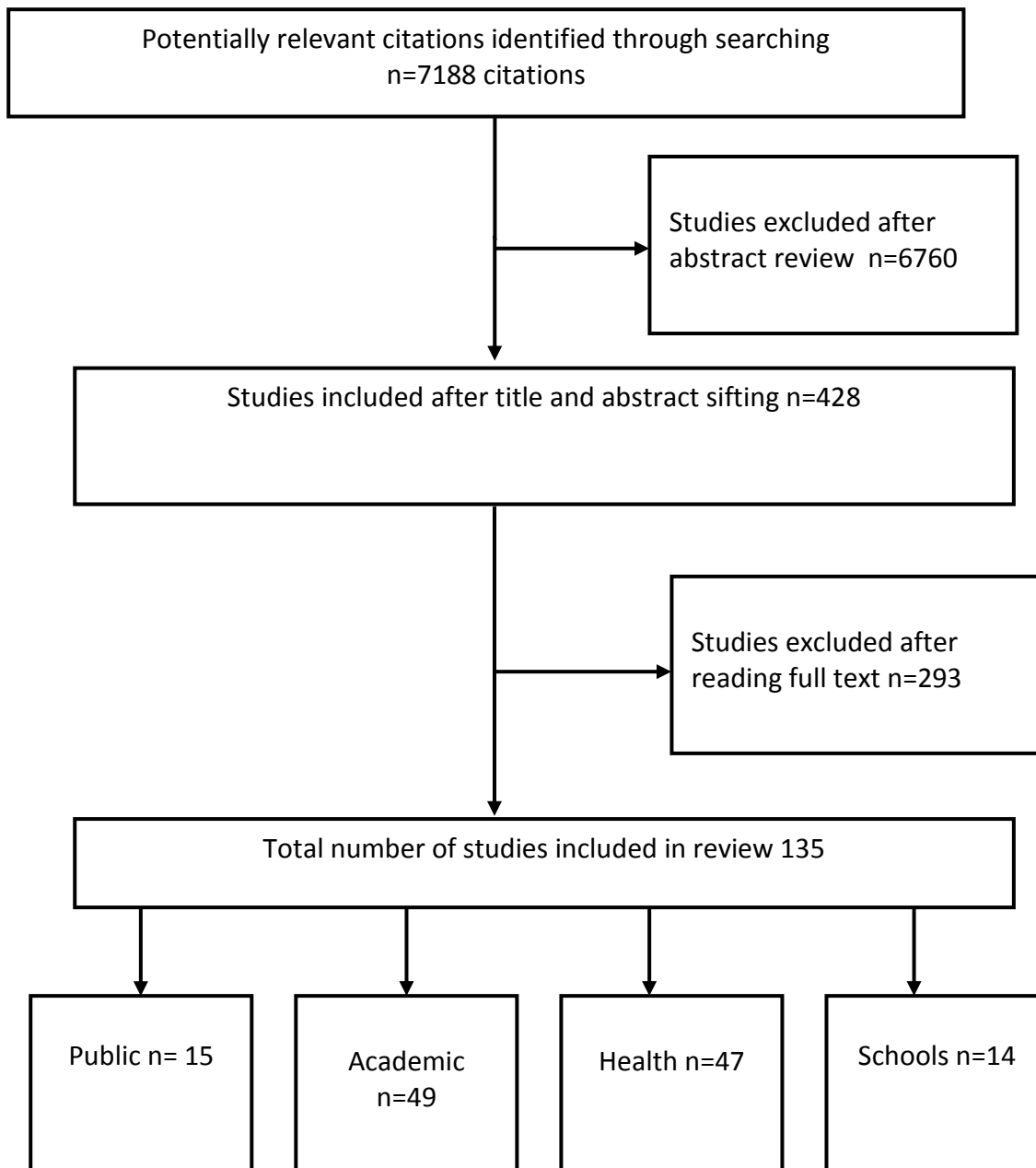
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┌─────────────────────────────────────────────────────┐
│  Potentially relevant citations identified through   │
│  searching                                           │
│              n=7188 citations                        │
└─────────────────────────────────────────────────────┘
                    │
                    │        ┌──────────────────────────┐
                    ├───────▶│  Studies excluded after   │
                    │        │  abstract review  n=6760  │
                    │        └──────────────────────────┘
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┌─────────────────────────────────────────────────────┐
│  Studies included after title and abstract sifting   │
│  n=428                                               │
└─────────────────────────────────────────────────────┘
                    │
                    │        ┌──────────────────────────┐
                    ├───────▶│  Studies excluded after   │
                    │        │  reading full text n=293  │
                    │        └──────────────────────────┘
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┌─────────────────────────────────────────────────────┐
│  Total number of studies included in review 135      │
└─────────────────────────────────────────────────────┘
        │           │           │              │
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┌──────────┐  ┌──────────┐  ┌──────────┐  ┌──────────────┐
│ Public   │  │ Academic │  │ Health   │  │ Schools n=14 │
│ n= 15    │  │ n=49     │  │ n=47     │  │              │
└──────────┘  └──────────┘  └──────────┘  └──────────────┘
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Figure 1: Searching, sifting and extracting process

2.5   Stage 4: Charting the data

This stage of the review involved extracting key elements of the papers to provide an overview or map of the evidence contained in each paper. These elements included:

1. Author details and date
2. Country
3. Aims of study
4. Library sector
5. Evidence of professional or trained or registered staff
6. Study design

7. Outcomes measured
8. Key findings

These were recorded in tabular form in excel spreadsheets and then converted into the evidence tables in Appendix 3.

2.6   Stage 5: Collating, summarising and reporting the results.

Separate tables were created to summarise the evidence in each library sector (Appendix 3, for summaries). These were used to provide an overview for each sector area, highlight studies of note and develop the propositions. Although no library sectors were excluded from the search, not all sectors provided evidence that met the inclusion criteria of the review. Therefore the evidence presented below represents only a small number of library sectors: public, schools, health and academic which generated evidence of clear outcomes in relation to the value of trained professional LIK workers.

Within each evidence table (or sector), studies are numbered; these numbers are used in the propositions to refer to the studies that contribute to each proposition. Illustrative examples from the findings of key studies (selected on the basis of quality of evidence (based on study design) or applicability to the UK setting) are provided under each proposition. These aim to illustrate the nature and extent of each impact.

3   Findings

3.1   Public Librarians

3.1.1   Overview

Fifteen studies were included which used a range of study designs: economic evaluation, qualitative, mixed methods, a literature review and a meta-analysis. The majority of studies were conducted in the US, and there may be some issues regarding transferability of the results to a UK setting (Arts Council England, 2014).

A wide range of outcomes were measured including: Return on Investment (ROI), learning, change in knowledge, change in activity, reading levels, attitudes to reading, impact on education, personal development, skills and employability, health and well being, community cohesion, self esteem, social inclusion and information needs.

In two studies it was clear that the work related to professionally trained librarians, in 11 studies it was assumed and in two studies it was unclear. However, all the included studies were about libraries, rather than professionally qualified or trained librarians. Many of the studies were examining the impact of large-scale library projects or libraries, therefore it could be assumed that professionally qualified librarians had been involved and some of the impacts would be due to the librarians as well as the services the librarians provided.

Studies fell into 3 main categories:
*   Return on investment (ROI)

- Social and community impacts
- Impact on reading

3.1.2 Studies of note

Aabo (2009) conducted a meta-analysis of ROI studies that provides an overview of the international literature on ROI, Becker et al (2010) conducted a large scale mixed methods study providing good quality evidence of impact of Public Access Computers in US public libraries (known as the US Impact Study), and a literature review by BOP Consulting for Arts Council England (2014) provides an overview of evidence applicable to UK public libraries and uses logic models to highlight direct and indirect impacts to which libraries contribute.

3.1.3 Propositions

Public librarians contribute to:

A good return on investment[1, 3,4,9,10,12]

- "The ROI mean and median for all public libraries are 4.5 and 4.4, respectively (i.e. For every dollar spent the return is 4.5 or 4.4 dollars)" (Aabo, 2009,p.320)
- "The economic value the British Library delivers for society is £5 for every £1 invested. The Library generates a net economic value of £419m for its users and UK society as a whole. Accounting for value placed on the Library internationally, the benefit cost ratio is 5.1.The value of the Library's Reading Rooms as estimated by their users is £70m per annum, including over £20m for the Business & IP Centre which was launched in 2006.The value that the public places on the continued existence of the Library is £412.8m per annum."(British Library, 2013, p.1; Tessler, 2013;)

Helping people improve their education, health, employment prospects and their sense of belonging to a community.[2,5,6,7,8,12,13,14,15]

- "58 people responded to the impact questions: 79% Learned something new, 28% Became interested in a new topic, 45% Understood something more clearly, 66% Triggered memories or experiences, 19% Improved computer skills, 24% Decided to go and look at original material, 0% None of the above. " (Anderson, 2007, p.380)

- "Many of these benefits had a positive impact on participants' individual assurance and self-esteem; the groups also had positive consequences for social inclusion and involvement in the local community and economic activity. Benefits were shown to stem from the social nature of the groups, the texts read, and from the unique experience of shared reading as a creative, collaborative, and interpretive act." (Walwyn and Rowley, 2011, p.302)

- "Nearly 1/3 of the U.S. population over the age of 14 used library Internet computers and those in poverty relied on these resources even more. Internet access is now one of the most sought after public library services, and it is used by nearly half of all visitors. Over the past year, 45 % of the 169 million visitors to public libraries connected to the Internet using a library computer or wireless network during their visit, even though more than three- quarters of these people had Internet access at home, work, or elsewhere." (Becker et al., 2010, p.1)

- "Apart from addressing their own computing needs, nearly 2/3 of library computer users (63 %) logged on to help others. 56% reported helping friends or family with health matters, 46 % helped find information on education and learning opportunities, and 37 % helping friends or family find employment or career information. An estimated 48 million people reported using library computers and Internet access to helping their friends, family, co-workers, and even strangers with a wide range of problems, from resolving tax questions to finding medical equipment." (Becker et al., 2010, p.4)

- "The findings show considerable evidence of National Year of Reading related activities in supporting the three first-tier social outcomes: 'Stronger and Safer Communities', 'Health and Well-Being' and 'Strengthening Public Life." (Rankin, 2012, p.7)

Improved attitudes to reading and potentially improving reading ability.[6, 8,13]
- "Students who reported participating in a public library summer reading programme started with higher reading scores and stayed ahead of those who did not participate" (Roman et al., 2010, p.48)
- "The majority (74.6%) of parents/caregivers experienced a gain in confidence and competence in using story-time materials and activities due to their participation in the program, The majority (88.1%) of parents/caregivers reported that they are using what they learned at home and this has continued over the longer term." (Graham and Gagnon, 2013, p.117)

3.1.4   Areas for further research

1. A large scale UK wide study which replicates the US IMPACT study by Becker et al., (2010)(i.e., mixed methods examining numbers of people using libraries, what they use the library for and what happens as a result of their library use e.g.: how many use the library computers to for example write cvs, look for employment and whether this leads to an interview or job offer). This study also developed a toolkit that can be used at a local level. The development and implementation of such a toolkit on the back of a national study would enable the collection of a common data set of outcome information which would help build a national evidence base for public libraries.

2. Studies that focus on outcomes not outputs (outcomes may need development first), which are longitudinal and/or larger in scale

3. Systematic reviews of the evidence on particular public library related questions, e.g. do public libraries improve health and well being? Do public libraries improve reading? Or do public libraries improve education?

4. Empirical studies that examine the impact of public libraries on reading, literacy (including health literacy), employability, physical well being, mental well being, community trust and cohesion or digital inclusion are needed.

5. Mixed methods approaches have proven effective in other sectors (e.g. academic and health) and may provide a useful approach in the public library sector.

3.2 School Librarians

3.2.1 Overview

Fourteen studies were included, which were mainly conducted in the US; only one empirical study was conducted in the UK but only reports pilot data (Gildersleeves, 2012). Most used a mixed methods design, including two that used the critical incident technique. A series of studies undertaken in different states throughout the US, used correlational techniques to link libraries with student achievements. There were also two literature reviews.

Included studies focussed on measuring the impact of libraries on student achievement, student engagement and reading skills. A number of studies also looked at librarian and teacher collaboration and stakeholder views of what was effective in a school library service.

Outcomes measured included student achievement, reading, motivation and how the library contributes (or helps) the student with a general trend that schools that have a professionally staffed library impact on reading, learning and achievement.

It was clear in two studies that the evidence was regarding professionally trained library staff and it was assumed in the remaining studies.

The majority of studies looked at secondary schools rather than primary education and there was a lack of studies that focussed on information literacy or digital skills.

3.2.2 Studies of note

Gildersleeves (2012) was a UK pilot study that combined the approach from some of the larger US studies to develop appropriate UK tools. The study had promising results and developed tools and techniques for use in a later wide scale study, (but no results of the wider study have been published to date). The study by Todd and Kulthau (2003) also known as the Ohio study was a very large scale, high quality mixed methods study that measured multiple outcomes of how the school librarian (or library media specialist) can contribute within a school and to the student experience and achievement. Finally a series of studies by Lance and colleagues (Francis and Lance, 2010; Lance et al., 2010; 2012) has provided a methodology and correlational evidence of the links between a professionally staffed library and student achievement as measured by reading and other assessment scores. Much of this research is summarised and discussed by Williams et al., (2013) who provides details of the implications for Scotland and a graphic representation that can be used for advocacy.

3.2.3 Propositions

Schools librarians contribute to:

Improved student achievement[1, 3,4, 6,10, 11,12, 14]
- o "One of the most effective outcomes has been the increase in student achievement scores on the Connecticut Academic Performance Test (CAPT); this increase appears to have resulted from collaboration on assured experiences between library media specialists (school librarians) and science teachers. The percentage of students meeting state goals on the science portion of CAPT has increased to 80.7% compared to 75% the previous year" (Snyder and Roche, 2011, p.24)
- o "Over half of the students (52.5%) said that the school library was quite or most helpful in helping them get better grades in their projects and assignments. Almost 3,000

student statements expressed a relationship between what the library has done for them and getting a good grade" (Todd and Kulthau, 2003; p.13)

Positive pupil engagement[4, 5,6,7,10,14]
- o "Findings from the pilot phase supported the hypothesis that a correlation may be traced between good library provision and positive pupil engagement with reading and information skills." (Gildersleeves, 2012, p.303)

Improved reading skills[3, 4,6,7,10,14]
- o "For all 12 library measures, students with access to —a better-staffed, funded, equipped, and stocked, and more accessible school library—are more likely to score advanced and less likely to score below basic on the PSSA Reading and Writing tests." (Lance and Schwarz, 2012, pii)
- o "The measure that correlated most closely with library program principles was standardized reading scores. The following principles were positively correlated at the .01 significance level to three measures of student academic achievement (reading scores, API, rank): collaborative planning, program planning, administrative support, and program communication" (Farmer, 2006)
- o "Elementary schools with at least one full-time endorsed librarian averaged better CSAP performance than those with less than one full-time endorsed librarian. Elementary schools that spent more on their libraries averaged better CSAP reading performance than those spending less."(Francis and Lance, 2011, p.64)

Facilitating student learning[2, 3, 9, 10, 12,14]
- o "69 per cent of students visit their school library at least once a week, and most to do research" (Small and Snyder, 2010, p1)
- o "99.44% indicated that the school library and its services, including roles of school librarians, have helped them in some way, regardless of how much, with their learning in and out of school." (Todd and Kulthau, 2003, p.5)
- o "25.54% said that the library has helped them, regardless of how much, with their learning on all 48 statements. 60.3 % said that the school library has helped them in some way, regardless of how much, on at least 43 of the statements." (Todd and Kulthau, 2003, p.5)

3.2.4 Areas for further research
1. There is a significant lack of studies conducted in the UK; evidence for all of the above proposition areas is needed for the UK. Replicating the designs used in the Lance studies or the Todd and Kulthau (Ohio, 2003) study would make useful starting points, as would publications of the findings from Gildersleeves (2012) larger scale study.
2. Studies are needed on the impact of librarians at primary school level.
3. Systematic reviews that bring together the evidence in a rigorous way would provide a baseline of the evidence available and clearly highlight the gaps where research is needed. These should be focussed around specific questions e.g. Do school librarians improve student reading ability? Do school librarians contribute to student engagement?

4. More qualitative research or case studies are needed to help understand the links between the quantitative (correlation) evidence and how librarians actually make a difference.

3.3 Health Librarians

3.3.1 Overview

Forty-seven studies were included that looked at the impact of health library services. Surveys were the most common method used to measure impact, but with an increasing number of mixed-method studies supplementing a survey with interview or a critical incident technique, in order to capture specific instances of impact. In addition, a number of high levels of evidence measuring impact were found including 8 systematic reviews and 3 randomised controlled trials. Other study designs include an economic analysis; literature review, rapid review and prospective observational study were undertaken.

Nineteen of the studies were undertaken in the US, 15 in the UK, with the remainder undertaken in Canada, New Zealand, Italy and Pakistan. Six of the 8 systematic reviews were undertaken in the UK. The acute hospital setting was the focus for the majority of the studies.

Included studies measured the impact of literature searches and/or information skills training provided by professionally qualified librarians, the majority of which focused on the impact of clinical librarian services. Just over half of the included studies measured the impact of health libraries in general, therefore as studies in other library sectors, it could be assumed that professionally qualified librarians had been involved and that the librarians rather than the services themselves would have contributed some of the impacts.

Outcomes measured tended to be quite focused on specific aspects relating to impact on the delivery of healthcare, on patient care, on the organisation and on the health professional.
- Clinical decision-making (Diagnosis, choice of assessment/test, choice of intervention)
- Patient centred care (Improved healthcare outcomes, advice to patient/carer, reduced length of stay, improved quality of life for patients/carers, increased patient involvement/ shared decision making, improved patient experience, improved patient access to information)
- Risk management & safety (Improve patient/staff safety, avoidance of referral/readmission/ clinical test/hospitalisation/medication errors, legal/ethical issues, improve accountability/ transparency of services)
- Quality of care (Meet quality standards, improved quality care, interventions based on best practice or current evidence, evaluation or audit, innovative practice)
- Service development or delivery (Address inequalities in access to care or unmet service need, service development or delivery underpinned by evidence base, working with other health and social care providers, commissioning/decommissioning of services, development or revision of care pathways, guidelines or protocols)
- Continuing professional development & research (Delivering/supporting education or training staff, supervision/leadership, gain qualifications, support research, comply with requirements of regulatory bodies, update knowledge/skills)
- Efficiency/cost-effectiveness (Saved time, support organisation financial strategies, business development)

It was clear in 33 studies that the evidence was regarding professionally trained staff, in 14 this was assumed and in one study it was unclear.

3.3.2 Studies of note

Eight systematic reviews[6, 7,18,32,39,44, -46] and RCTs*(Randomised Controlled Trials)*[16, 24,30] clearly demonstrate the positive impact of the health librarian/library services across multiple outcomes. However, it was not possible to tell whether the evidence directly measured the impact of being a 'professional' librarian as opposed to a 'trained' librarian.

The evidence base demonstrating the impact of health librarians is strongest for outcomes relating to CPD, clinical decision-making and time saved. Each literature search provided by a health librarian impacts on multiple outcomes throughout their organisation thus highlighting the complexity of the evaluation process.

3.3.3 Propositions

Health librarians contribute towards

Improved clinical decision making[1, 3-10,12,13,15,19,22,25,28-32,37,41-43,45,46]

- "The largest most specific impact reported was that CLs *(Clinical Librarians)* have a positive effect on better informed decisions; this was found in 12 studies (67%)." (Brettle et al., 2010, p.17)
- "The cognitive impact of the provided information on participants' decision-making is reported in Table 4. Of the responses provided to intervention questions, participants rated 63% as having a highly positive impact" (McGowan et al., 2008)

Improving patient centred care[2, 3,5-10,12,14,15,19,24,25,27-29,31-33,37,38,40-45]

- "The cumulative evidence supporting the conclusion that CML *(Clinical Medical Librarian)* services have contributed to improved patient care by their health professional users is also relatively strong. This evidence includes 20 studies, 41 results statements, and a relatively large number of individual users (837) and uses (361) studied." (Wagner & Byrd, 2004, p.30).
- "75% of those in patient-facing roles had used the training in patient care. The most frequent use was to inform choice of treatment (28%), followed by advice given to patients/carers (27%), and guideline and pathway development (23%)" (Ayre, 2015, p.54)
- "Of the 27 respondents who reported an immediate impact on the treatment or management of a patient, six (22.2%) said the information provided by the HSL *(Health Services Librarian)* determined their choice of drug(s), eight (29.6%) said the information confirmed their proposed choice of drug(s) used, and five

(18.5%) said the information changed the choice of drug(s) used." (Farrell & Mason, 2014, p.118)

Aiding risk management & safety[3-5, 7,8,10,15,19,25,28,31,39,41,46]

- "A quarter reported direct impact in improving patient and staff safety (n=85, 25%) as well as in risk management (n=79, 23%)…*"I would say so because if a child gets their head trapped in a bedrail, that's going to have a huge impact on the financial situation of the Trust through litigation". (Nurse, Acute)*". (Brettle et al., 2015, p.26)
- "A number of key outcomes related to patient safety such as misdiagnosis (13%), adverse drug reaction or interaction (13%), medication error (12%), and hospital acquired infection (3%) were all listed by respondents as outcomes that were avoided as a result of the information." (Marshall et al., 2013, p.41)

Improving quality of patient care[4, 7,8,22,25,28,37,41-43]

- "All respondents who had used the CML service indicated that the information they received was relevant, accurate, current, of clinical value, and contributed to higher quality care. "(Vaughan 2009, p.149)
- "When asked directly if the library-provided information contributed to a higher quality of care, more than 56% of survey respondents agreed that it did." (Bayrer et al., 2014, p.246)

Health service development or delivery[2, 4,5,8-10,15,18,28,40,42,]

- "29% of respondents indicated they had implemented learning for service development and planning activities, and 24% for guideline and pathway development." (Ayre et al., 2015, p. 57)
- "Evidence of more immediate impact was also reported for service development (127, 37% critical incidents) and working with other health and social care providers (99, 29% critical incidents), providing integrated care and addressing inequalities or an unmet need in care. Contributions to immediate service developments were also reported in the interviews across the acute and community sectors" (Brettle et al., 2015, p. 24)

Helping to demonstrate efficiency/cost-effectiveness (including saving health professionals time)[2,4,5,7-9,12,19,24-26,28-32,35,37-39,41-46]

- "The research examining librarians providing literature searching as a service,[25] [39 43 44 46] showed a positive effect on decreasing the time to providing relevant information for clinical decision-making [43 44 46] and decreased the length of hospital stay.[25 39]." (Perrier et al., 2014, p1122)

- "Although the numbers are relatively small, clear evidence is provided where clinical librarians are contributing to reduced costs by impacting on LoS *(Length of Stay)* (40 incidents, 12%) and avoidance of referral, tests or readmission (55 incidents, 16%)." (Brettle et al., 2015)

- "There is also evidence, notably from the clinical librarian studies, of time savings to health-care professionals and cost-benefits. Of two studies attempting to measure the costs of the clinical librarian service, one found that the cost per question was approximately equivalent to that of a chest radiograph.[42] Another estimated a cost saving of a clinical librarian versus a consultant search of £26 per hour in 2002.[32]" Weightman & Williamson, 2005, p. 17).

Assist healthcare professionals in pursuit of CPD[1-3, 5,6-10,13,15-20,22-25,28,30,32,33-36,38,40-42,44]

- "98% of respondents saw a benefit in their teaching or learning following an information skills training session." (Ayre et al., 2015, p.57)

3.3.4 Areas for further research
1. From a wider perspective, more impact evaluation is required in the non-acute setting (community, primary care, outreach library services)
2. Impact from an organisational perspective needs to be considered over the longer term
3. There is a gap in how health librarians can impact on the knowledge management activities of the organisation
4. Further studies should examine the cost-effectiveness of health library services
5. There is a need for a more tailored approach to measuring impact that is closely aligned to their stakeholder objectives
6. Using quantitative methods alone and narrowing the focus of an impact study may well result in underestimating the contribution of the health librarian, therefore future research should consider a mixed-methods approach
7. Interviews are essential for illustrating the complexity of the impact incidents
8. Standards for reporting impact evaluation studies need to be improved

3.4 Academic Librarians

3.4.1 Overview
Forty-nine studies were included on academic libraries and these were mainly from the US, although a small number took place in the UK. One of the main foci of studies was on the evaluation of information literacy programmes and methods of teaching information literacy. A second focus of studies was the impact of the library on student achievement or retention. This was measured by examining the money spent on the library or the use of the library by students and correlating this with student grades or final degree or whether they returned for further years of study. A number of studies also examined the impact of the library on academic research or researchers.

A range of study designs were employed, often pre and post-test or quasi-experimental studies for information literacy. Many of the pre and post-test designs were limited and also restricted to singular

one-shot courses that limited their generalisability. Only one randomised controlled trial was located (Brettle and Raynor, 2013). Three systematic reviews have been conducted in relation to information literacy (Koufogiannakis and Weibe, 2006: Zhang et al., 2007 and Weightman et al., 2015). The latter has not yet been formally published, but has been included here as it provides up to date high quality evidence and suggests there is no need for further information literacy studies of certain types. For studies that examined the impact of the library on student achievement or retention correlational analyses using library and university statistics were used. A small number of studies used mixed methods, so information on how the library actually contributes to some of the outcomes on which impact claims are made are lacking.

It was clear in 11 studies that the evidence was about professionally trained staff and it was assumed in the remaining 37 that the staff were professionally trained.

3.4.2   Studies of note

Two well-conducted mixed methods studies demonstrate the value of UK libraries on research and researchers, as well as highlighting promising methodologies (RIN and RLUK, 2011) and Tenopir et al., (2012). Stone et al., (2012) demonstrates a link between use of library resources and student achievement across 8 UK Universities. There are a number of systematic reviews (Koufogiannakis and Weibe, 2006; Zhang et al., 2007; demonstrating the effectiveness of information literacy interventions, as well as a randomised controlled trial (Brettle and Raynor, 2013) which demonstrates the effectiveness of information literacy teaching over the short and medium term. Kingma and McClure (2015) demonstrate that the ROI method can be transferred to academic libraries.
Emmons and Wilson (2012) and Haddow (2013) show how institutional data can be used to demonstrate the impact of the library on retention. Finally a comprehensive review of the literature funded by the ACRL (Oakleaf, 2013) is available but not included in the evidence tables, as it does not report the outcomes of each study in a way that could be easily represented in the evidence tables in the time available.

3.4.3   Propositions

Academic librarians contribute to:
Improved retention [15,22,40]
  o "The only variable which made a significant impact on retention and graduation was the number of professional library staff. This equated to a 10 per cent increase in the ratio of professional library staff predicts a 0.72 percent increase in retention." (Emmons and Wilkinson, 2011, p.144)
  o "A higher proportion of the withdrawn students logged into authenticated resources between one and 28 times over the semester, a much higher proportion of the retained students logged in more than 28 times. At the other end of the scale, withdrawn students had zero log-ins at nearly twice the proportion of retained students over the semester" (Haddow, 2013, p.131)
  o "The results of two separate logistic regression analyses suggest that logging into databases and using library workstations were actions consistently and positively associated with students' retention" (Soria et al., 2014, p.84)

Better grades or degrees[1, 11,15, 40, 42]

- "Undergraduates with a GPA above the mean university GPA used the library more than those with a GPA below the mean. There was a correlation between greater use of the library and increases in GPA between the two years—that is, as one grew, so did the other" (Allison, 2015, p.29)
- There is a very strong nonlinear relationship between average usage of resources and average student marks (R-squared = 0.91). Average mark for students who never used UWL electronic resources =58 per annum. Average mark for students that spent up to one hour a year accessing UWL electronic resources per year = 62." (Cox and Jannti, 2012, http://er.educause.edu/articles/2012/7/discovering-the-impact-of-library-use-and-student-performance.)
- "Nonusers are 40 times more likely to fail than high users of library electronic resources" (Cox and Jannti, 2012, http://er.educause.edu/articles/2012/7/discovering-the-impact-of-library-use-and-student-performance .)
- "The results of two separate regressions predicting students' GPA by 10 different types of library use suggest that four library use areas were consistently and positively associated with students' GPA: database logins, book loans, electronic journal logins, and library workstation logins. "(Soria et al., 2014, p.84)
- The only variable that made a significant impact on graduation was the number of professional library staff. A 10 % increase in the ratio of professional library staff predicts a 1.55 % increase in graduation." (Emmons and Wilkinson, 2011, p.145)
- The project has successfully demonstrated that there is a statistically significant relationship between student attainment and two of the indicators: e-resources use and book borrowing. This relationship has been shown to be true across all eight UK partners in the project." (Stone et al., 2012, p.26)

Improved skills for coursework, assessments or research[2, 4,5,12-14,17,19,20,24-26,29,30,32-34,37,38,41,45-49]
- "The searching skills of first year pre-registration nursing students improve following information literacy sessions ($p<0.001$), and remain unchanged 1 month later, regardless of teaching method. The two methods (online v face to face) produce a comparable improvement ($p=0.263$). There is no improvement or degradation of skills 1 month post-session for either method ($p=0.216$)."(Brettle and Raynor, 2013, p.103)
- "16 studies compared traditional instruction with no instruction, and 12 found a positive outcome. Meta-analysis of the data from 4 of these studies agreed with the positive conclusions favouring traditional instruction". (Koufogiannakis and Wiebe, 2006, p.4)
- "Traditional and web based teaching strongly increases IL skills when assessed pre and post teaching. For controlled studies, traditional teaching increases IL skills but the effect size is smaller than the pre and post studies." (Weightman et al., 2015)
- "Nine of the ten studies found CAI and face-to-face instruction to be equally effective."(Zhang et al., 2007, p.480)

Better research, researchers and research achievement [31,35,44]
- "A significant relationship exists between successful academics, defined as those who publish more and earned an award in the past two years, and the number of article, book and other publication readings." (Tenopir et al., 2012, p.132)
- "Annually, academic staff spend 197 hours of their work time with library-provided material, or the equivalent of 25 eight-hour days. (Tenopir et al., P.137)

o In the short term libraries contribute to: increased visibility of research, improved institutional understanding of information assets, better research management, improved co-ordination of research activities, good reputation of institution for research. In the longer term the library contributes to increased readership of research, more research income, higher quality research, recruitment and retention of higher quality researchers, more efficient research, more satisfied researchers, higher quality research, greater research output and more motivated researchers (RIN and RLUK, 2011).

A good return on investment for the University[26]
o Every $1 spent on the library returns $4.49 in return for Syracuse University (Kingma and McClure, 2015)

3.4.4 Areas for further research

1. Individual libraries need to determine what their stakeholders believe is important and capture impacts that relate to their own institution which are based on outcomes relevant to their stakeholders.
2. Libraries could develop easier means of collecting data routinely that can be used to correlate with items such as student grades or retention.
3. Mixed methods approaches that have been used in health may be an appropriate way forward, this will show which outcomes the library contributes to alongside evidence that demonstrates how this happens.
4. A UK version of the ROI study (Kingma and McClure, 2015) would provide additional evidence on whether libraries generate similar ROI across sectors as well as providing evidence appropriate for the UK.
5. Collect local data to benchmark and compare with the larger scale UK studies (such as those on the contribution of the library to grades and retention or research quality) (e.g. Stone et al., 2012; Tenopir et al., 2012).
6. The evidence for the use of academic libraries is available, individual libraries therefore need to focus on ensuring their internal practices are effective and efficient – but base these on evidence that is already available and then monitor routinely.
7. No more research is needed on comparing traditional methods of information literacy instruction with online or web based instruction, instead research should focus on exploring the effects of different formats of teaching on behavioural measures (e.g. actual improvements in skills) rather than cognitive measures (tests of knowledge) as these reflect a more accurate understanding of incorporating IL skills in practice (Weightman et al., 2015)
8. Information literacy studies that measure and demonstrate impact over the longer term.

4 Discussion

This report has provided an overview of the evidence for professionally trained library, information and knowledge workers. Despite casting the net wide, evidence is only available in a small number of sectors where LIK professionals work. This includes public, school, academic and health libraries. Evidence on all other sectors is clearly lacking. A number of the studies provided clear evidence of the effect, impact or value of professionally trained library and information staff, in many other cases it was assumed that the work undertaken was being conducted by professionally trained staff,

nevertheless there is a strong trend of the positive impacts of professionally trained library, information and knowledge staff in four key sectors. The evidence regarding professional registration however was lacking, as it was impossible to determine whether staff providing the services on the studies examined were professionally registered as well as trained.

4.1   Evidence for professionally trained and registered LIK workers

The brief was to provide evidence that would support the employment of trained and professionally registered library, information and knowledge workers. A trained professional was viewed as one who had undergone an academic course related to library, information or knowledge such as an undergraduate or postgraduate degree. Professionally registered was viewed as an individual who was registered or accredited by an appropriate professional body. Very little research set out to explore exactly this issue, however it was possible to make some deductions, or in some cases assumptions about this issue so that conclusions can be drawn (or propositions made). For each paper examined it was noted whether there was evidence of professionally trained or registered LIK professional involvement. In some studies e.g. Lance et al., (2010; 2012) when examining the impact of libraries on reading attainment compared schools which had professionally trained and qualified library staff (in the US known as library media specialists) with schools which didn't have such staff, we can say with some confidence that there is evidence that being professionally trained makes a difference. One rapid review (Sutton and Grant, 2011) also examined where it was appropriate to use untrained versus trained library professionals at the reference desk. In cases where a librarian wrote the research paper about their service and the librarian's qualification was provided in the authorship details, this was taken as a proxy for evidence regarding the professional training of the librarian involved. Finally for large scale studies about libraries, e.g. Tessler (2013), it was assumed that there would be some professional librarians running library services such as the BL and this was take as assumed evidence of the impact of a professionally trained LIK worker. Identifying whether LIK workers were professionally registered was more difficult, and therefore it has been impossible to determine the value, effectiveness or impact of professionally registered LIK workers. One study examined this issue (Henczel, 2014) by using the ISO framework to examine the value of belonging to a professional library body. This was an international qualitative study that presented impacts across themes that mapped to the ISO framework outcomes, however although links are made to the outcomes there was no detail about the impact made as a result of being a member of a professional organisation.

4.2   Methods and methodologies

As noted earlier, this report worked on the premise that the services or interventions provided by librarians are complex and thus it is likely that it is only possible to demonstrate that librarians can make a contribution to most impacts rather than establishing that any impact is directly attributable to them. For example librarians may be involved in reading schemes but they cannot be solely responsible for improving a child's reading ability – as this will also depend on the child, the teachers and parents and it would be impossible to distinguish what else is impacting on the child's attainment. Similarly hospital librarians may provide information that contributes to a reduced length of stay for a patient or group of patients, but this will also be affected by the patient's illness, prior health and the work of all the clinical staff and the hospital environment. For the most part, experimental studies, which would be used in other fields to establish cause and effect and actual impacts, are not appropriate in the library field. The exception to this is measuring the effect of information literacy over the short term, which can perhaps be attributed to short courses. Logic models have been used in a number of reports (Becker et al., 2010; Arts Council England, 2013) to illustrate the complexity,

diffuse nature and wide range of outcomes to which libraries contribute. These are an effective means of graphically demonstrating the impact of libraries, and an example of one for health is provided in Appendix Four.

There are a number of large-scale studies that have successfully provided quantitative data and correlated this with outcomes (e.g. Stone et al., 2012; Kingma and McClure, 2015; Haddow 2013; Tenopir et al., 2012). For this to be meaningful and convincing, this needs to be combined with in-depth qualitative methods that explain HOW the librarians are actually making a difference. To date this has been most successfully done in the health field and there is an increasing number of mixed methods studies which provide quantitative data that is supplemented by qualitative approaches to explain the claims or impacts (e.g. Brettle et al., 2015).

Particular methods appear to have been favoured by specific sectors, however these could be transferred into others. For example there are a number of studies within public libraries which use the Return on Investment Approach (ROI) that has shown consistent results across the public library field (Aabo, 2009), one study has also demonstrated that there is a similar ROI in the academic library sector (Kingma and McClure, 2015) suggesting that it would be worth exploring the use of this method more widely in other library sectors. The critical incident technique approach has been used in both health and also in school libraries (Todd and Kulthau, 2003) and to some extent in one large-scale public library study (Becker et al., 2010). This technique asks users about one particular instance of library service use and tracks how the information was used. If this is combined with asking about contributions about particular outcomes (e.g. Brettle et al., 2015; Becker et al., 2010) this can provide powerful data on the wide ranging impacts that the interaction had, and can be used either qualitatively or quantitatively. Correlational techniques have been used in both academic and school libraries to link library data with institutional data, and good progress has been made in establishing appropriate methods and techniques to do this, particularly in the US. It would be useful to see these techniques adapted and applied in a UK context.

There is a lack of systematic reviews that draw together the work that has been done into a more coherent body of evidence. Much library research is undertaken on a small scale, local level that has little impact. A systematic review can provide a baseline for the field and highlight what needs to be done to improve the evidence base for the future (e.g. Brettle, 2003) as well as highlight a weight or overall trend in the evidence (e.g. Aabo, 2009; Weightman et al., 2015) for specific questions. Furthermore conducting systematic reviews can improve research skills (Brettle and Maden, 2015). An initiative which uses a "hive" approach of mentorship such as that taken by Brettle et al., 2011 and across the Medical Library Association (MLA) systematic review project (http://repository.unm.edu/handle/1928/27127) would significantly improve the evidence base across the LIK sector as well as improve the quality of future studies whilst building librarian's confidence in undertaking research.

4.3   Gaps in the evidence base

One of the purposes of a scoping review is to highlight gaps in the evidence base. The largest gap is the lack of published evidence on the effectiveness, impact and value of the majority of library, information and knowledge sectors.   Secondly there is general lack of UK evidence, although there are some notable exceptions. Thirdly in some sectors (notably public libraries) the evidence relates to the impact of the libraries, rather than the librarians. Finally there is a lack of comparative studies, with

only a few comparing the use of professionally trained or registered LIK workers versus those who are untrained or unpaid or where there is no service at all.

Across the board, it is important to determine what outcomes stakeholders believe are important – and then provide the evidence to fill these needs. When conducting the sifting process, it was clear that much of the literature in this field is about discussing how to measure impact rather than providing evidence of the impact based on important outcomes.

There is also no evidence on the benefit of professionally registered library, information and knowledge workers as this hasn't been examined in its own right in terms of impact and it is more difficult to ascertain using the proxy measures we used to assume training. It would be relatively easy for CILIP or one of its special interest groups to conduct a study of their members on the impact of professional registration, combining the ISO framework with the Critical Incident Technique or adapting the methods used by Kloda et al (2014) would provide CILIP with specific examples of how professional registration can make a difference.

4.4   Strengths and limitations of the method

The project was undertaken over a short time frame with limited resources. The systematic scoping method used, provides a means of systematically identifying the available literature, highlighting the approach used and explicitly stating the gaps in searching and identifying the evidence. The purpose of a scoping review is to use a rigorous, non-biased approach to map the available literature; this allows broad questions and areas to be considered.

The search approach was sensitive but due to the broad nature of the question, it is likely that some studies have been missed; indeed literature reviews that were picked up have indicated that this may well have been the case. Within the project time frame and resources, further searching to identify and include these papers was not possible. Ideally citation tracking would have been conducted as well as a more extensive search for grey literature. It was noted that much of the evidence was contained in reports, which were hidden within organisational websites. This is particularly the case for the US literature that is further complicated by the organisation of the professional bodies into sectors and then regions.

Finally, a scoping review does not critically appraise or assess the papers in great detail. Data was extracted regarding the outcomes of interest, but detailed critical appraisal of the studies was not performed. Thus the propositions and recommendations for further research are based on a high level overview of the studies available rather than an in-depth examination of the literature in each area.

5   Conclusion

There is clear evidence of the contribution to the effectiveness, impact and value of trained and professional public, school, health and academic librarians.

Public librarians contribute to a good return on investment, helping people improve their education, health, employment prospects and their sense of belonging to a community and improved attitudes to reading.

School librarians contribute to improved student achievement, positive pupil engagement, improved reading skills and facilitating student learning.

Health librarians contribute to improved clinical decision making, patient centred care, risk management and safety, quality of patient care, health service development or delivery and making efficiency savings.

Academic librarians contribute to improved retention, better grades or degrees, improved skills for coursework, assessments or research, better research, researchers and research achievement and a good return on investment for the university.

There is a lack of UK studies and a lack of studies across many library sectors and a lack of comparative studies. More systematic reviews would provide an understanding of the quality of available evidence, focussed evidence of impact and a baseline for future high quality research.

A range of methods can be transferred between sectors and studies from other countries (mainly the US) can be adapted or replicated for the UK context. Large quantitative studies are important, but these need supplementing with mixed methods or qualitative approaches that explain how the services provided by librarians work and make a difference. At a local level, librarians need to determine what outcomes are important to their stakeholders and provide the evidence that meets these needs.

6 References (those highlighted with * can be found in the propositions and the evidence tables in Appendix 3)

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Appendix 1: Resources searched

Databases	Websites
Ethos	http://www.cilip.org.uk
LISA	http://www.ala.org
LISTA	https://www.alia.org.au
Web of Knowledge/Science	http://www.sconul.ac.uk
Business Source Premier	https://www.mlanet.org
Medline	http://www.arl.org
Cinahl	http://www.carl-abrc.ca/en.html
Eric	http://www.artscouncil.org.uk/what-we-do/supporting-libraries/
	https://lis-systematic-reviews.wikispaces.com/
	http://ejournals.library.ualberta.ca/index.php/EBLIP

Appendix 2: Search strategies

General keywords for incorporating into searches

- information sciences (non mesh)"/ or information science/ or book collecting/ or classification/ or information management/ or health information management/ or information services/ or library services/ or "information storage and retrieval"/ or exp library science/
- exp Knowledge Management/

(((((((ti(value OR effective* OR impact) AND su((research OR research methods)) OR su((evaluation OR surveys)) OR su((focus groups OR qualitative methods)) OR su(scientific method))

LISA - searched via proquest, 25 August 2015 AB
(((((((ti(value OR effective* OR impact) AND su((research OR research methods)) OR su((evaluation OR surveys)) OR su((focus groups OR qualitative methods)) OR su(scientific method)) AND stype.exact("Conference Papers & Proceedings" OR "Scholarly Journals" OR "Other Sources")) AND la.exact("English")) AND stype.exact("Conference Papers & Proceedings" OR "Scholarly Journals" OR "Other Sources")) AND la.exact("English")) AND peer(yes)) AND stype.exact("Conference Papers & Proceedings" OR "Scholarly Journals" OR "Other Sources")) AND la.exact("English")
Restricted to 2005-2015

Web of Science
  1. (TS=(information scienc* OR book collect* OR classification OR information manage* OR information service* OR library OR librarian* OR libraries OR information storage OR information retrieval OR knowledge management)) AND **LANGUAGE:** (English)
2. (TI=(information scienc* OR book collect* OR classification OR information manage* OR information service* OR library OR librarian* OR libraries OR information storage OR information retrieval OR knowledge management)) AND **LANGUAGE:** (English)
3. #2 OR #1
       Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=2005-2015
4. (TI=(value OR effective* OR impact)) AND **LANGUAGE:** (English)
       Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=2005-2015
5. (TS=(value OR effective* OR impact)) AND **LANGUAGE:** (English)
       Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=2005-2015
       6.#5 OR #4
       7.#6 AND #3

       8.(TI=(research OR research method* OR quantitative OR qualitative OR evaluation))
       9.(TS=(research OR research method* OR quantitative OR qualitative OR evaluation))
       10.#9 OR #8
       11.#10 AND #7
       12. **TOPIC:** (information scienc* OR book collecting OR classification OR information manage* OR information servic* OR library OR librarian* OR libraries OR knowledge management OR information storage OR information retrieval)
       13. #8 AND #4 AND #1
14.#8 AND #4 AND #1

Refined by: **WEB OF SCIENCE CATEGORIES:** (INFORMATION SCIENCE LIBRARY SCIENCE OR COMPUTER SCIENCE INFORMATION SYSTEMS OR EDUCATION EDUCATIONAL RESEARCH OR MEDICAL INFORMATICS OR BUSINESS OR EDUCATION SCIENTIFIC DISCIPLINES OR SOCIAL SCIENCES BIOMEDICAL OR SOCIAL SCIENCES INTERDISCIPLINARY)

15. #12 AND #9 AND #4

Refined by: **WEB OF SCIENCE CATEGORIES:** (MANAGEMENT OR INFORMATION SCIENCE LIBRARY SCIENCE OR COMPUTER SCIENCE INFORMATION SYSTEMS OR HEALTH CARE SCIENCES SERVICES OR COMPUTER SCIENCE INTERDISCIPLINARY APPLICATIONS OR COMPUTER SCIENCE THEORY METHODS OR SOCIAL SCIENCES INTERDISCIPLINARY OR COMPUTER SCIENCE ARTIFICIAL INTELLIGENCE OR COMPUTER SCIENCE SOFTWARE ENGINEERING OR PSYCHOLOGY MULTIDISCIPLINARY OR SOCIAL SCIENCES BIOMEDICAL OR SOCIAL WORK OR MEDICAL INFORMATICS OR EDUCATION EDUCATIONAL RESEARCH OR COMPUTER SCIENCE CYBERNETICS)

Business Search Premier

1. (DE "LIBRARY science" OR DE "COMMUNICATION in library science" OR DE "INFORMATION storage & retrieval systems" OR DE "COMMUNICATION in library science" OR DE "INFORMATION storage & retrieval systems" OR DE "DOCUMENTATION" OR DE "INFORMATION resources management" OR DE "INFORMATION retrieval" OR DE "INFORMATION science" OR DE "INFORMATION services" OR DE "INFORMATION technology" OR DE "LIBRARIANS" OR DE "LIBRARIES" OR DE "RECORDS management") AND (DE "KNOWLEDGE management" OR DE "INFORMATION ...
2. TI effective* OR impact OR value
3. AB effective* OR impact OR value
4. ((DE "RESEARCH" OR DE "QUANTITATIVE research" OR DE "QUALITATIVE research") OR (DE "EMPIRICAL research")) OR (DE "INTERVIEWING")
5. S2 OR S3
6. S1 AND S4 AND S5

MEDLINE

1. exp "information sciences (non mesh)"/ or exp information management/ or exp information services/ or exp "information storage and retrieval"/ or exp knowledge/ or exp library science/
2. exp Knowledge Management/
3. 1 or 2
4. limit 3 to systematic reviews
5. "information sciences (non mesh)"/ or information science/ or book collecting/ or classification/ or information management/ or health information management/ or information services/ or library services/ or "information storage and retrieval"/ or exp library science/
6. 2 or 5
7. limit 6 to systematic reviews
8. impact.ti.
9. effectiv*.ti.
10. value.ti.

11. 8 or 9 or 10

12. 5 and 11

13. exp Research Design/

14. exp clinical trials as topic/ or randomized controlled trials as topic/ or feasibility studies/ or intervention studies/ or pilot projects/ or epidemiologic research design/

15. 13 or 14

16. 5 and 11 and 15

17. 12 or 16

18. imit 17 to (english language and yr="2005 - 2015")

19. impact.mp.

20. value.mp.

21. effective*.mp.

22. 19 or 20 or 21

23. 5 and 15 and 22

24. 18 or 23

25. limit 24 to (english language and yr="2005 - 2015")

LISTA

1. TI (effective* or impact or value) OR KW (effective* or impact or value)

2. (DE "RESEARCH -- Methodology" OR DE "INTERNET research" OR DE "PRIMARY research" OR DE "RESEARCH methodology evaluation" OR DE "SECONDARY research") OR (DE "EXPERIMENTAL design" OR DE "REPLICATION (Experimental design)")

3. DE "RESEARCH" OR DE "EXPERIMENTAL design" OR DE "EXPERIMENTS" OR DE "LIBRARY science research" OR DE "LONGITUDINAL method" OR DE "QUALITATIVE research" OR DE "QUANTITATIVE research" OR DE "RETROSPECTIVE studies" OR DE "RESEARCH -- Methodology"

4. (DE "RESEARCH" OR DE "EXPERIMENTAL design" OR DE "EXPERIMENTS" OR DE "LIBRARY science research" OR DE "LONGITUDINAL method" OR DE "QUALITATIVE research" OR DE "QUANTITATIVE research" OR DE "RETROSPECTIVE studies" OR DE "RESEARCH -- Methodology") AND (S2 OR S3)

5. ((DE "RESEARCH" OR DE "EXPERIMENTAL design" OR DE "EXPERIMENTS" OR DE "LIBRARY science research" OR DE "LONGITUDINAL method" OR DE "QUALITATIVE research" OR DE "QUANTITATIVE research" OR DE "RETROSPECTIVE studies" OR DE "RESEARCH -- Methodology") AND (S2 OR S3)) AND (S1 AND S4)

Ethos

abstract:"librar* or information or knowledge management" AND abstract:"value or effective* or impact"

ERIC

1. ((DE "Information Science" OR DE "Information Skills" OR DE "Knowledge Economy" OR DE "Libraries" OR DE "Academic Libraries" OR DE "Electronic Libraries" OR DE "Public Libraries" OR DE "Research Libraries" OR DE "School Libraries" OR DE "Special Libraries" OR DE "Information Services" OR DE "Community Information Services" OR DE "Information Dissemination" OR DE "Information Processing" OR DE "Library Services" OR DE "Reference Services" OR DE "Librarians") OR (DE "Library Science")) OR (DE "K ...

2. TI value or impact or effective*

3. AB value or impact or effective*

4. (AB (value or impact or effective*)) AND (S2 OR S3)

5. ((AB (value or impact or effective*)) AND (S2 OR S3)) AND (S1 AND S4)

6. DE "Research" OR DE "Action Research" OR DE "Architectural Research" OR DE "Behavioral Science Research" OR DE "Case Studies" OR DE "Cohort Analysis" OR DE "Communication Research" OR DE "Community Study" OR DE "Cross Cultural Studies" OR DE "Dropout Research" OR DE "Educational Research" OR DE "Environmental Research" OR DE "Exceptional Child Research" OR DE "Feasibility Studies" OR DE "Field Studies" OR DE "Institutional Research" OR DE "Investigations" OR DE "Language Research" OR DE "Library ...

7. S5 AND S6 **Limiters** - Peer Reviewed; Date Published: 20050101-20151231

Narrow by Language: - english

Search modes - Boolean/Phrase

Appendix 3: Evidence Tables

Public Librarians

Authors	Aim of study	Outcomes measured	Study design	Main findings
1. Aabo, S. (2009)	To provide a review of library valuation studies	Return on investment	Meta analysis	A total of 38 studies were included in the analysis, 32 in public libraries and the majority undertaken in the US, although 2 were undertaken in the UK. Studies undertaken at the national level have the lowest mean (3.0) and median (3.5), indicating that the studies at this level return a value of 3.5 to each dollar invested, while library valuation studies at the state level have the highest median and return as much as five times per dollar invested. Studies at the individual level and the county level lie within this range. The ROI mean and median for all public libraries are 4.5 and 4.4, respectively. The results shown in these studies indicate that for each dollar of taxpayers' money invested in public libraries, the libraries – on average – return a value to the citizens of four to five times more. This conclusion is drawn on basis of a considerable amount of studies that have strong similarities all over the world.
2. Anderson, I. G. (2007)	To present an evaluation of The Glasgow Story (TGS) digitisation project.	User interactions across the site, web logs impact questions	Questionnaires, focus groups, data logs, online surveys	The site is receiving over 1 million hits per year, with almost 1 million user actions on the images it contains. Significantly, there have been almost 600,000 user actions on the essays section of the site as well as significant use of other features. 2,500 users registered on the site to use features such as a personal album folder. Half of the top 30 quick search terms, and 17 of the top 30 essay search terms, have been on neighbourhoods, indicating the value of providing comprehensive geographical information as part of the image metadata. 58 people responded to the impact questions: 79% Learn something new, 28% Become interested in a new topic, 45% Understand something more clearly, 66% Trigger memories or experiences, 19% Improve your computer skills, 24% Decide to go and look at original material, 0% None of the above.

3. Arts Council England (2014)	To understand what it is about public libraries than can make an economic contribution and the scale of contribution a library can make.	ROI, reading, health literacy, employability, physical well being, mental well being, community trust and cohesion, digital inclusion	Literature review, logic modelling	Uses a logic model approach to illustrate how public libraries provide positive outcomes for people and communities in many areas – far exceeding the traditional perception of libraries as just places from which to borrow books. Suggests that public libraries, contribute to long-term processes of human capital formation, the maintenance of mental and physical wellbeing, social inclusivity and the cohesion of communities. Most of the financial benefits arise downstream from libraries' activities, and libraries make only a contribution to what are multi-dimensional, complex processes of human and social development. The logic model in relation to outcomes suggests that the impact of public libraries for reading is promising for children and emerging in adults; for health literacy is promising for children and limited for adults; employability is emerging; physical well being for adults is limited and for mental well being in adults is emerging; community trust and cohesion is limited and digital inclusion in adults is limited
4. British Library (2004)	To demonstrate the impact of a cultural institution (the British Library) on the wider society	ROI	Contingent valuation, economic analysis	The first-ever economic measure of BL's direct and indirect value to the nation. Taking a conservative estimate the BL generates £363m value for the UK economy each year, equivalent to £4.40 for every £1 of public money invested. If the British Library did not exist, the UK would lose £280m of economic value per annum. The total value each year of the British Library (3) is £363m of which £304m is indirect value and £59m direct value. Provides examples of how services impact on creative industries, SME's, higher education, science technology and medicine, education, public libraries, social inclusion and modernisation. Also points out the limitations of the method.
5. Dolman, H. and S. Boyte-Hawryluk (2013)	To measure the impact a Reading Buddies program would have on participating children's reading levels and attitudes towards reading.	Reading levels, attitudes to reading	Quasi experimental	There were 37 Reading Buddies participants who completed both the pre- and post-test for the study. On average, the program had a small positive effect on participants' reading levels and a small negative effect on their attitudes towards reading. There was a larger range of changes to the ERAS scores than to the reading test scores, but most participants' scores did not change dramatically on either measure.

6. Roman, S. et al Dominican Study (2010)	Evaluation of the impact of public library summer reading programs on summer reading loss	Reading levels, reading habits as surveyed by children and parents,	Pre and post, survey	367 children, from 11 schools, 9 school librarians, 11 public librarians, 51 teachers and 110 parents participated. Those taking part were self-selecting and appeared to like reading more than those who didn't take part, making this a non-balanced comparison. In terms of reading scores There was no significant difference between Spring 2008 SRI scores and Fall 2008 SRI scores. Students who returned reading logs showed no significant difference in SRI scores between Spring and Fall. There were significant differences between the amount of reading and reading related activities between the groups, in favour of those who took part in the programme

7. Fried, S. et al (2010)	To explain how the Global Libraries (GL) Initiative of the Bill and Melinda Gates Foundation plans for and assesses the impact of its programs on libraries and communities.	Library reach, community information needs	Ongoing program design and impact assessment - 2 case studies. Case study 1 used a market research type survey of a random sample of the population of a particular area	Case study Poland: Results of the study indicate that the reach of libraries is considerably higher than the number of registered readers would suggest. 29 percent of respondents in the survey declared that they had visited a public library within the last 12 months, regardless of the purpose. Data on registered readers put this number at 22 per cent. People of course visit libraries to borrow books or magazines – 91 percent of visitors declared this activity during the last three visits but two frequent library uses, did not involve books. First is using computers in libraries (31%)and the opportunity to socialize or network with others. For 26 percent of visitors, the library is a place in which they meet with somebody, and as many as 36 percent go to the library just to chat with the librarian or ask him/her about something (especially the elderly – more than 50 percent). This shows a potential role that a library may play in social communication and integration. Case study Romania: Information needs assessment that can be used as a baseline following PAC implementation: Citizens reported interest in the following topics (listed in descending order of the frequency with which they were mentioned): . Healthcare for all (medical advice, finding the closest practitioner, clinics, pharmacies); . Information regarding local government; . Information as to how to access funds or credit for small businesses; . Job placement; . Funding sources for community development; . Communication on-line: creating an email address, talking on Skype; . Developing a business plan; . Information regarding accessing Eu funds; . Banking information; and . How to write a CV, and job interview skills.

8. Graham, S. and A. Gagnon (2013)	To evaluate the Regina Public Library's Mainly Mother Goose program for children under 24 months and their parents/caregivers.	Parent report of: early literacy skill development activities, confidence,	Quasi experimental	24 programmes were delivered to 312 parents (6 participating libraries); 119 responded to pre and post questionnaires (38%); 20 participated in interviews. The MMG program did not significantly increase the frequency by which parents/caregivers engage their children in these nine early literacy skill development activities, two-thirds of parents/caregivers increased the frequency with which they visited the library, the majority (74.6%) of parents/caregivers experienced a gain in confidence and competence in using story-time materials and activities due to their participation in the MMG program, The majority (88.1%) of parents/caregivers reported on their post-program questionnaire that they are using what they learned from the MMG program at home. The latter two variables were confirmed as still being the cases on a longer term follow up at interview.
9. Hider, P. (2008)	To describe An application of the contingent valuation method (CVM) for estimating the economic value of a regional public library service	ROI	Contingent valuation, economic analysis	Using similar methods and comparing similar variables to previous studies, it was found that the Wagga Wagga City Library, in New South Wales, Australia, provides good value for the money, in line with that of other comparable studies in the United States and Norway.
10. Imholz, S. and J. W. Arns (2007)	To review library valuation studies, with emphasis on how libraries have used them to demonstrate their value in their communities	Cost benefit analysis, economic impact and social returns on investment.	Review, economic analysis, return on investment	An executive summary that includes key findings and recommendations on studies that examine ROI on public libraries in the US. No outcomes or ROI are reported. However Aabo et al (2009) systematic review meta-analyses the studies which are used in this report

11. Lyons, R. (2011)	To review a national study of the impact of public library summer reading programs in the United States	Improvement in reading scores	Quasi	Critiques the Dominican study (Roman et al., 2010) which examined the impact of a summer reading programme on reading scores and suggests that due to attrition and non equivalent groups that the study results were inconclusive rather than positive
12. Tessler, A. (2013)	An updated evaluation of the British Library's services to determine how it generates economic value for its users and the wider public.	ROI	ROI and case studies	The economic value the Library delivers for society is £5 for every £1 invested. The Library generates a net economic value of £419m for its users and UK society as a whole. The benefit cost ratio increased to 4.9 from 4.4 in 2003. Accounting for value placed on the Library internationally, the benefit cost ratio is 5.1.The value of the Library's Reading Rooms as estimated by their users is £70m per annum, including over £20m for the Business & IP Centre which was launched in 2006.The value that the public places on the continued existence of the Library is £412.8m per annum.
13. Rankin, C. (2012) Rankin, Carolynn	Qualitative research project on the impact of National Year of Reading in Yorkshire.	Generic social outcomes framework	Qualitative	The findings using the GSO framework show considerable evidence of NYR related activities in supporting the three first-tier social outcomes: 'Stronger and Safer Communities', 'Health and Well-Being' and 'Strengthening Public Life.' The strongest evidence was for: Stronger and Safer Communities, improving group and inter-group dialogue and understanding, supporting cultural diversity and identity, improving services, helping children and young people to enjoy life and make a positive contribution, encouraging healthy life styles and contributing to mental and physical well-being. The GSO appears to provide a useful framework - but as a purely qualitative study it is difficult to ascertain the extent of the impact.

| 14. US IMPACT Study (Becker, et al) (2010) | To understand the relationship between free access to computers and outcomes that benefit individuals, families, and communities. | Impact on health, using government services, education, PAC use | Mixed | Nearly one-third of the U.S. population over the age of 14 used library Internet computers and those in poverty relied on these resources even more. Internet access is now one of the most sought after public library services, and it is used by nearly half of all visitors. Over the past year, 45 percent of the 169 million visitors to public libraries connected to the Internet using a library computer or wireless network during their visit, even though more than three- quarters of these people had Internet access at home, work, or elsewhere. Lots of evidence is provided in the report to back up the following propositions: Libraries offer a technological lifeline to children and families in need: Patrons use library computers to help others in their community. Public libraries provide access to government agencies. Public libraries are extensions of the nation's education system. Librarians enhance the computing and Internet experience. Overall, two-thirds of people who used library computers received help from library staff or volunteers on computer or wireless network issues. Library patrons reported using computers and the Internet to address a range of basic needs. The three most common uses were: education (42 percent), employment (40 percent), and health (37 percent). Roughly half of the people who used a public library computer to find doctors or health care providers reported that they made follow-up appointments. |

15. Walwyn, O. and J. Rowley (2011)	To examine the benefits of therapeutic reading groups that are run by public libraries,	Self esteem, social inclusion, sense of community,	Qualitative	Narrative interviews were conducted with 14 members of one of three therapeutic reading groups. Participants were very positive about the value of the groups and the way that they were facilitated. The 11 benefits they discussed were clustered into two groups associated with reading and access to books, and group interaction. Many of these benefits had a positive impact on participants' individual assurance and self-esteem; the groups also had positive consequences for social inclusion and involvement in the local community and economic activity. Benefits were shown to stem from the social nature of the groups, the texts read, and from the unique experience of shared reading as a creative, collaborative, and interpretive act.

School Librarians

Auth ors	Aim of study	Outcomes measured	Study design	Main findings
1. Chan, C. (2008)	To critically examine the literature relating to the impact that school libraries have on student achievement, and what implications this impact has had for school library advocacy.	Achievement	`Literature review, located qual and quant studies	Almost all of the studies considered endorse the view that school library services have a positive impact on student achievement. The results are not synthesised in a way that highlights the actual outcomes and findings. A number of studies are cited that provide quantitative evidence of the links between a successful school library and improved grades in the US.
2. Collier, J.S. (2007)	To investigate the literacy autobiographies of pre-service teachers using a narrative approach.	Qualitative study no outcomes measured	Qualitative, narrative autobiograp hies	137 participants. Every narrative cited the predictable impacting forces of family and teachers. Most candidates in the study included the school librarian/library as an impacting factor in their literacy autobiography.
3. Farmer, L. (2006)	To examine the relationship between student academic achievement and the degree to which schools fully implement national standards for library media programs?	Achievement	Statistical correlations	For the population examined (60 southern California schools), the measure that correlated most closely with library program principles was standardized reading scores. The following principles were positively correlated at the .01 significance level to three measures of student academic achievement (reading scores, API, rank): collaborative planning, program planning, administrative support, and program communication The following principles were positively correlated at the .05 significance level or better to the three measures of student academic achievement: integrated information literacy standards, effective teaching, and networked access to resources. The following principles were correlated at the .05 significance level or better to at least two of the three measures of achievement: assessment of students (API and rank), program assessment (API and reading), and staff development conducted by LMSs (reading and rank).

| 4. Francis, et al. (2010) | To examine links between school libraries and better assessment scores | Reading performance | Correlations | Elementary schools with at least one full-time endorsed librarian* averaged better CSAP performance than those with less than one full-time endorsed librarian. Elementary schools that spent more on their libraries averaged better CSAP reading performance than those spending less. More students earned proficient or advanced reading scores and fewer students earned unsatisfactory scores where there was a full-time endorsed librarian. Elementary schools with librarians averaged 68 to 72 percent of students scoring proficient or advanced and 9 to 11 percent scoring unsatisfactory. Schools without librarians averaged 64 to 68 percent scoring proficient or advanced and 12 to 13 percent unsatisfactory. The proportional difference in unsatisfactory scores for elementary schools with stronger and weaker library programs is more than three times the difference in proficient or advanced scores. This suggests that effective school libraries can be of even greater help to students who are struggling most than to those already performing at grade level or better. Indications are that all students can benefit from effective libraries, but that students who suffer most because of the achievement gap can also benefit most from the resources and services offered by libraries and librarians. |
| 5. Gildersleeves, L. (2012) | To identify whether there are key contributions afforded by a school library / librarian. To explore whether the methods used in the US can be transferred to the UK. | Reading, information skills, school rankings | Mixed methods, survey and interviews | An online survey has been developed for circulation to secondary school students in all four of the UK home nations, mapping their perceptions and expectations of the place of the LRC and of the librarian within their school experience. Secondary schools in all four home nations were ranked according to Ofsted evaluation and league table performance. A sample of schools was selected from each nation and interviews are currently being conducted with management, teaching staff, librarians and with focus groups of school pupils. This is complemented by a survey of a sample of higher education students in different disciplines to identify their view of the contribution of the school library to preparedness for university study. Findings from the pilot phase of the research support the hypothesis that a correlation may be traced between good library provision and positive pupil engagement with reading and information skills. |

6. Lance, K. C., et al. (2010)	What is the relationship between perceptions of librarians and administrators about library media program implementation?		Survey	More students earned proficient or advanced reading scores and fewer students earned unsatisfactory scores where there was a full-time endorsed librarian. Elementary schools with librarians averaged 68 to 72 percent of students scoring proficient or advanced and 9 to 11 percent scoring unsatisfactory. Schools without librarians averaged 64 to 68 percent scoring proficient or advanced and 12 to 13 percent unsatisfactory
7. Lance, K. C. & Schwarz, B. (2012)	Using 2011 data from a Pennsylvania State Board of Education school library survey and test score data from the Pennsylvania Department of Education, this study explored:	Reading performance and links with libraries	Correlations, survey	Took place in Pennsylvania, Of 500 school districts, 389 districts (78%) responded. Consistently, for all 12 library measures, students with access to these resources—a better-staffed, funded, equipped, and stocked, and more accessible school library—are more likely to score Advanced and less likely to score Below Basic on the PSSA Reading and Writing tests. A general finding of this phase is that the impact of school library programs is more pronounced proportionally for Writing than Reading scores. Generally, these patterns were found for All students as well as students who are Economically Disadvantaged, Black, and Hispanic and who have Individualized Education Programs (IEPs).
8. Mardis, M. (2007)	To determine whether school libraries impact on science achievement in US middle schools	Achievement in science	Mixed, survey, statistical analysis (correlations), qualitative	2002 eighth-grade Michigan Educational Assessment Program (MEAP) science test scores had a significant positive relationship only with the size of the SLMC video collection. In subsequent qualitative follow-up activity, participants emphasized the importance of providing video in their services to science educators, as well as their challenges in providing high-quality, current science collections. Participants also pointed to teacher collaboration as a primary but underutilized way of improving their link with science teachers.

9. Newell, T. S. (2010)	To compare the effectiveness of simulation-based and didactic instructional approaches in improving middle school students' understanding of information literacy (IL) concepts and practices.	Knowledge and understanding increases in IL indicators	Portfolio assessment	The researchers found a correlation between simulation-based approach and increase in the students' ability in various areas. These include the ability to recognize the need for information, formulate questions, identify information sources, explain strategies for accessing information, judge accuracy, relevance and completeness of sources and analyze information. The higher proficiency level shifts among students in simulation are attributed to situated practice, community of practice, authenticity and expanded landscape of sources
10. Small, R. V., et al. (2009; 2010)	To undertake a three-phase study on the impact of the New York State's school libraries' services and resources on student achievement and motivation	Learning and Motivation (including Research & IL Skills Reading Librarian-Teacher Collaboration, Technology Use, Inclusion, Administrative Support, Outreach, and Library Environment	In-depth survey, focus groups, interviews, observations (ethnographic approach)	A representative sample of more than 1,600 classroom teachers, students, and school library media specialists (SMLSs) from 47 schools throughout New York State participated in the second phase, the in-depth survey. The survey was divided into three sections: Likert-type multiple-choice item, Likert-type rating item, and critical incident item. Results reveal that (1) all groups perceive greater emphasis on skills for finding information than on skills for using or evaluating information; (2) elementary students perceive the SLMS as more autonomy supportive than middle or high school students; (3) students are largely unaware of librarian-teacher collaboration; (4) 69 percent of students visit their school library at least once a week, and most to do research; (5) students perceive "maintaining a neat and orderly collection" and "maintaining a quiet study environment" as the two most important services provided by the LMS; and (6) there is a lack of library services to students with disabilities. A qualitative component to the research showed how the librarians impacted on these areas.

11. Snyder, M. M. and J. Roche (2008)	Perceptions of administrators, teachers, and librarians about libraries and librarians and the relationships between those perceptions, academic standards, and PSSA scores	Student achievement	Ongoing collection of statistics	One of their most effective outcomes has been the increase in student achievement scores on the Connecticut Academic Performance Test (CAPT); this increase appears to have resulted from collaboration on assured experiences between library media specialists and science teachers. The percentage of SHS students meeting state goats on the science portion of CAPT has increased to 80.7 percent (2008) compared to 75 percent the previous year. Provides links to their ongoing statistic collection
12. Todd, R. & Kulthau, C. (Ohio Educational Library Media Association (2003)	To understand how students' benefit from school libraries through elaborating conceptions of helρ̂ and providing some measure of the extent of these "helps" as per-ceived by students and faculty.	Multiple	Two surveys, one based on critical incident technique	An effective school library, lead by a credentialed school librarian, one who is particularly engaged in an instructional process centering on the development of students intellectual scaffolds for engaging with and using information for building knowledge, clearly plays a vital role in facilitating student learning. An effective school library and its professional, curriculum-centered school librarian, represent a major opportunity for students in Ohio to learn. Over half of the students (52.5%) said that the school library was quite or most helpful in helping them get better grades in their projects and assignments. Almost 3,000 students statements expressed a clear, albeit simple relationship between what the library has done for them and getting a good grade. Statistically, 99.44% of the sample (13,050 students) indicated that the school library and its services, including roles of school librarians, have helped them in some way, regardless of how much, with their learning in and out of school as it relates to the 48 statements. Only 73 students out of 13,123 indicated that none of the 48 statements applied to them. 25.54% of the sample (3,352 students) said that the library has helped them, regardless of how much, with their learning on all 48 statements. This would indicate that the school library plays a major and obvious role in helping students with their learning in and out of school. One Grade 8 boy poignantly expressed this: I'm inGrade8. I don't get it. Why do I need to do this survey? Isn't it obvious to everyone that we have to have our school library to do all our schoolwork? It is impossible to do it without it, that is for sure.

13. Whittingham, J., et al. (2013)	To determine the impact of the use of audiobooks with struggling readers in a school library audiobook club.	Reading skills, attitudes to reading	Standardised tests, pre and post tests	Indicated that struggling readers' use of audiobooks had a positive impact on reading skills and attitudes toward reading. These findings are significant given the dearth of research directly related to the impact of audiobooks, despite the prevalent usage of audiobooks.
14. Williams, D. et al. (2013)	To critically review the literature on the impact of school libraries	Learning	Literature review	Draws together international evidence showing that school libraries impact on: Higher test or exam scores equating to academic attainment: this includes academic attainment in the form of higher standardised test scores in reading, language arts, history and maths, and better grades in curriculum assignments or exams; Successful curriculum or learning outcomes, including information literacy: this includes higher quality project work, the development and practice of information literacy, increased knowledge and reading development; and positive attitudes towards learning: including increased motivation, improved attitude towards learning tasks, self-esteem, and wider reading for pleasure.

Health Librarians

Authors	Aim of study	Outcomes measured	Study design	Main findings
1. Aitken, E.M. et al., (2011)	To measure the effect of including a clinical librarian in the health care team on medical residents and clinical clerks.	Clinical decision-making, CPD	Comparative study (pre and post survey)	Clinical librarians had a positive effects on self-reported provider attitudes, provider information retrieval tendencies, and clinical decision making; 30/34 (88%) respondents on the intervention team reported changing a treatment based on new information skills taught; 27/34 (79%) changed a treatment plan based on a search done by the librarian; 14/32 (44%) respondents on the intervention team reported changing a diagnosis based on new information skills taught; 12/33 (36%) changed a diagnosis based on a search done by the librarian.
2. Ayre, S., et al., (2015)	This study aimed to evaluate the impact of learning using all four levels on the outcomes identified in the Hill Report.	Patient care, service development /delivery, efficiency/cost-effectiveness, CPD	Survey	Information skills training is influencing point of care decisions and practice. Following training 98% of respondents saw a benefit in their teaching or learning; 60% of used the knowledge and skills to support research activities. 29% implemented learning for service development and planning activities, and 24% for guideline and pathway development. Only 1.4% of respondents had used the training for commissioning; 70% of respondents indicated they had used knowledge or skills learned during information skills training to support some aspect of patient care.
3. Bartlett, JC., & Marshall, JG. (2013)	To assess the value of health library and information services and their impact on patient care	Patient care, clinical-decision-making, risk management, CPD	Survey (secondary analysis + new interview data)	Overall, this study showed that hospital library and information services have a positive impact on patient care outcomes, with outcomes of their use including the avoidance of death: Advice given to patient or family 458 (48.4%), Choice of drugs 295 (31.2%), Choice of treatment 280 (29.6%), Handled the situation differently 194 (20.5%), Diagnosis 192 (20.3%), Choice of test 168 (17.8%), Post-hospital care or treatment 109 (11.5%), Reduced length of stay 58 (6.1%), Avoided Patient misunderstanding of disease 209 (22.5%), Avoided Additional tests or procedures 164 (17.7%), Avoided Adverse drug reaction or interaction 114 (12.3%), avoided Misdiagnosis 98 (10.6%), avoided Medication error 87 (9.4%), avoided Patient mortality 49 (5.3%), avoided Hospital re-admission 37 (4.0%), avoided Hospital admission 31 (3.3%), avoided Surgery 29 (3.1%), avoided Language and (or) cultural misunderstanding 23 (2.5%), avoided Hospital acquired infection 22 (2.4%), avoided Regulatory non-compliance 11 (1.2%)

4. Bayrer, R., et al., (2014)	To assess how the librarians' work directly supported the organization's mission and goals	Clinical decision-making, service development / delivery, efficiency/cost-effectiveness, risk management, quality of care	Survey	Improvements reported in patient care and organizational cost savings and high-quality and affordable health care. 100% reported that the librarian-mediated search saved them time, helped avoid unnecessary tests or procedures (n=92), hospital admissions (n=57), wrong tests or medications (n=56), hospital-acquired infections (n=50), and surgeries (n=33), n>200 updates to existing policies or procedures, n=150 choices of medication, n=140 ordered tests, and n=120 diagnoses. 56% said it contributed to a higher quality of care
5. Beals, B. (2009)	To establish a dollar value for literature searches, and to document the impact these searches had on patient care activities	Clinical decision-making, efficiency, risk management, CPD, cost-effectiveness, service development	Survey	The total value of time saved was $5914.66 for the 12 months from October 2006 to September 2007 and $2627.97 for the 12 months from October 2007 to September 2008. As a result of the information: 2 would change a diagnosis, 11 would change treatment, 3 would change a test ordered, 5 would change a drug prescribed, and 1 would change surgery. One said the information reduced length of stay, 14 indicated it helped to avoid adverse medical consequences, 4 avoided a process or procedure, 10 intended to develop a policy or procedure, 3 would use it for an in-service, 14 for continuing education, 12 to develop a diagnosis/treatment plan, 12 for patient/family education, and 3 for root cause analysis.

6. Brettle, A. (2003)	To undertake a systematic review to determine the effectiveness of information skills training, to identify effective methods of training and to determine whether information skills training affects patient care.	CPD, patient care, clinical decision-making	Systematic review	3/15 studies indicated that training improved skills. 1 showed a non-significant improvement in skills, 1 demonstrated that training can provide a basic level of competence; 1 study reported that participants believed training would improve patient care, 1 study reported that use of the library made them handle a clinical situation differently. Limited evidence to show that training does improve search skills. No conclusions could be drawn regarding effective training methods. Two studies (using subjective methods) indicated a positive effect on patient care.
7. Brettle, A., et al., (2011)	To undertake a systematic review which examines models of CL services, quality, methods and perspectives of clinical librarian service evaluations.	Clinical-decision-making, efficiency/cost-effectiveness, patient care, quality of care, risk management, CPD	Systematic review	There are four clear models of clinical library service provision. Clinical librarians are effective in saving health professionals time, providing relevant, useful information and high quality services. Clinical librarians have a positive effect on clinical decision making by contributing to better-informed decisions, diagnosis and choice of drug or therapy. The quality of CL studies is improving, but more work is needed on reducing bias and providing evidence of specific impacts on patient care.

| 8. Brettle et al., (2015) | To undertake a rigorous mixed methods evaluation study on the impact of Clinical Librarian services | CPD, decision-making and efficiency, cost-effectiveness, risk management, patient care, quality of care, service development /delivery | Mixed, survey and interviews | Updated knowledge and skills n=243 (71%); supporting research (n=193, 57%), complying with the requirements of regulatory and professional bodies (n=162, 48%), 154 respondents (45%) used the information to deliver training and educate other staff, 93 (27%) used information to supervise or lead staff, gain qualifications (n=98, 29%). Reduced length of stay (n=40, 12%), avoidance of referral, readmission, clinical tests, hospitalisation (n=55, 16%), revision of care pathway/guidelines/protocol (n=126, 37%), service development or delivery (n=170, 50%), advice to patients/carers (n=124, 36%), choice of intervention (n=124, 36%), choice of assessment or test (n=98, 29%), diagnosis (n=88, 26%). Legal/ethical issues (n= 43, 13%), improve accountability/transparency of services (n=46, 14%), improve patient safety (n=85, 25%), commissioning/decommissioning of services (n=29, 9%), business development (n=29, 9%), risk management (n=79, 23%), value for money/cost-effectiveness (n=71, 21%), support QIPP (n=54, 16%), support trust financial strategies (n=38, 11%). Improved patient access to information (n=83, 24%), Improved patient care experience (n=109, 32%), Increased patient involvement/shared decision making (n=88, 26%), Improved quality of life for patients (n=86, 25%), improved healthcare outcomes (n=105, 31%). Innovative practice (n=88, 26%), evaluation or audit (n=88, 26%), interventions based on best practice (n=155, 46%), implement clinical guidelines /best practice (n=134, 39%), improved quality of care (n=133, 39%), meet quality standards (n=119, 35%). Integrated care (n=85, 25%), working with other healthcare professionals (n=99, 29%), service development (n=127, 37%), address inequalities in access to care (n=68, 20%) |
| 9. Bryant, SL., & Gray, A. (2006) | To review the literature on the positive impact of information services, or information resources, on patient care in primary care. | CPD, patient care, service development /delivery, clinical decision-making, efficiency/cost-effectiveness | Rapid review | Positive outcomes on saving time, education and training, develop practice guidelines, evaluation of outcome, improved quality of life for patient, audit or standards of care, monitoring of care, informing legal or ethical issues, initial assessment, practical nursing techniques, the administration of patient care are reported from 6 studies but not quantified. The review highlighted evidence that information provision can have a beneficial impact on the care of future patients. The review found scant evidence of cost savings that can be attributed to the impact of library services in primary care. |

10. Cuddy, T.M. (2005)	To demonstrate the value of the Health Sciences Library at Capital Health. System (CHS)/Fuld Campus to the administrators and institution it serves.	Patient care, CPD, service development /delivery, clinical decision-making, risk management	Survey	The study showed that libraries can contribute to patient health care. 32% reported improvement in ''patient care'', 14% used the information in ''presentations at CHS and elsewhere,'' 11% used the information to develop policy and procedures'', 6% used the information to ''develop new CHS programs.'', 4% used the information to ''Write an article for publishing'', 4% said they used it to ''educate/teach staff and personnel''. 3% to develop ''care paths'' and 3% used the information in ''marketing strategies'' at CHS, 2% for JCAHO surveys'' and 2% used it for ''educational program development''
11. Cullen, R., et al., (2011)	To investigate the extent to which junior doctors in their first clinical positions retained information literacy skills taught as part of their undergraduate education	CPD	Survey	The study found no evidence of impact on current skills of participants and reported that little of the training has been retained.
12. D'Alessandro, MP., et al., (2006)	To determine whether the Virtual Naval Hospital (VNH) (a digital library) promoted health and improved patient care in a cost-effective manner.	Patient care, efficiency/cost-effectiveness, clinical decision-making	Economic analysis/survey	The authors report positive impact on patient care and costs. 70% thought that VNH usage improved patient care. 70% reported an improvement in diagnosis. 60% said it improved their treatment (60%). Respondents stated that the VNH affected 81 medical evacuations and 668 sick-in-quarter days. The VNH had a net savings of $143,848/yr. and a cost/benefit ratio of 55.9%

13. Duggar, DC., & Christopher, K.A. (2006)	To evaluate the impact of an electronic outreach program to Area Health Education Center (AHEC) physicians in north and central Louisiana.	Patient care, CPD, clinical-decision making	Survey	The authors found that e-mail distribution of full-text library resources based on cases discussed in Morning Report had a positive impact on education and patient care decision making - 4 reported changes in lab tests ordered, 7 in diagnosis, and 5 in treatment.
14. Fanner, D., & Urquhart, C. (2008)	To determine (i) whether bibliotherapy is effective in assisting treatment of mental health conditions and (ii) how can the information needs of mental health service users be assessed?	Patient care	Systematic review	The author suggests that literature review shows that the evidence supports the value of using bibliotherapy and associated interventions in the treatment of mental illness. However the data is not presented in terms of outcomes so difficult to ascertain exact valued without going to each individual paper. Author suggests effectiveness is significantly increased when bibliotherapy is used in conjunction with psychotherapies, suggesting that treatment of in-patients could be beneficial, although further studies are required. Provides evidence of effectiveness for bibliotherapy for certain conditions.

15. Farrell, A., & Mason, J. (2014)	To evaluate the impact of literature searching services on patient care	Patient care, clinical decision-making, risk management, CPD, service development /delivery	Survey	The authors found a positive impact on patient care. 42 reported immediate impact on patient care. 27 (64.3%) treatment or management of a patient. 8 (19%) said it aided refreshing memory, 4 (9.5%) avoiding an adverse event or critical incident, 3 (7.1%) diagnosing a patient, 2 (4.8%) prevented a referral or consultation. Of these 27 respondents, six (22.2%) said the information determined their choice of drug(s), 8 (29.6%) said the information confirmed their proposed choice of drug(s) used, and 5 (18.5%) said the information changed the choice of drug(s) used, 8 (29.6%) said the information provided determined proposed treatment(s), 7 (25.9%) said information confirmed proposed treatment(s), 3(11.1%) said the information changed other specific treatment(s). 3 (7.1%) reported an impact on the diagnosis of a patient. Future impacts were also reported.
16.Gardois, P., et al., (2011)	To verify whether the assistance of biomedical librarians significantly improves the outcomes of searches performed by paediatricians	CPD	RCT (comparing assisted versus non-assisted searches)	The authors found a significant difference in search performance between physicians assisted by a librarian and those searching the literature alone. Results found a statistically significant difference (P=0.013) between the median values in the results obtained by the assisted vs. the non-assisted group was 23.2 points (95% CI 4.8–33.2), in favour of the assisted group. The only statistically significant difference between the outcomes of the assisted vs. non-assisted group was found in the scores for the number of PICO terms translated into search terms
17. Grad, RA., et al., (2008)	To determine usage and construct validity of a method to gauge the cognitive impact of information derived from daily e-mail of research-based synopses	CPD	Prospective observational	Reported impact on knowledge; Learned something new 21,657 35.2%; No Impact 10,508 17.1%; Information confirmed the right thing 5,886 9.6%; Learned something new AND will improve practice 5,793 9.4%; Reassured 3,435 5.6%; Practice will be improved 2,356 3.8%; Recalled something because of this POEM 1,948 3.2%; Information confirmed the right thing AND reassured 1,634 2.7%; Not enough information or nothing useful 1,120 1.8%; Learned something new AND reassured 639 1.0%.

18.Gray, H., et al., (2012)	To identify the reported outcomes of utilising quality improvement systems in health libraries.	Service development /delivery, CPD	Systematic review	Many health libraries utilise quality improvement systems without translating the data into service improvements. Included studies demonstrate that quality improvement systems produce valuable outcomes including a positive impact on strategic planning, promotion, new and improved services and staff development. No impact of quality improvement systems on library users or patients is reported in the literature.
19.Jones, DA., et al., (2010)	To demonstrate value of library services by focusing on (1) value provided by literature searches (2) interlibrary loan cost savings and 3) efficiency of electronic resources	Clinical decision-making, patient care, risk management, efficiency/cost-effectiveness, CPD	Survey	Authors found a positive impact on health care decision making, hospital cost savings, interlibrary loans' cost benefits, and low cost per use of regional, virtual library resources. Impact of searches on clinical decision-making: 45.45% Altered Mode of Treatment; 77.27% Reinforced Mode of Treatment; 100% Useful to Direct Patient Care; 100% Provided New Knowledge; 56% Advice to Patient or Family; 9% Choice of Tests; 23% Choice of Drugs; 18% Diagnosis; 23% Change in Length of Stay; 45% Choice of Other Treatment; 9% Avoided Hospital Admission; 50% Avoided Adverse Events 5% Avoided Surgical Procedure; 14% Avoided Patient Mortality. Cost benefit of $150,000 (ILLs); avoided purchase costs would have been over $2 million. Cost Effectiveness of Shared Electronic Resources: Cost per search was 94 cents.
20.Just, ML. (2012)	To summarise current literature measuring the impact of literature searching skills training in medical education	CPD	Literature review	Instruction generally resulted in improvement in clinical question writing, search strategy construction, article selection but, authors conclude that whilst instructional methods are effective, there is little evidence that learning persists over time. The evidence base is weak with few validated methods of skill measurement.
21. Kean, EB. (2013)	To determine the impact of librarian involvement in		Survey	42.6% (n=23) of OJC members strongly agreed that the librarian's contributions added value to the nurses' discussion (but study didn't explain what 'added value' meant).

	online journal clubs			
22.King, DN. (1987)	To "assess the ability of the hospital library to deliver, in a timely fashion, published information and library services which may be of value for clinical care."	Clinical decision-making, quality of care, CPD	Survey	Refreshed memory (93%), confirmed knowledge (84%), new knowledge (94%, Information was of clinical value 98%, Better-informed clinical decisions 98%, Contributed to higher quality care 94%, Handle case differently: Definitely (22%), Probably (55%)
23. Lapidus, M., et al., (2009)	To assess the effectiveness of a drug literature evaluation course	CPD	Survey	Positive impact on evaluation skills and knowledge. Pre vs. post-tutorial: 16% vs. 53% of students' strongly agreed and 42% vs. 47% agreed that they had the ability to select an appropriate secondary database to answer a specific question. 42% disagreed that they were able to select an appropriate secondary database. 16% vs. 42% of respondents strongly agreed they conduct an effective search using these databases, 53% vs. 58% agreed, and 31% vs. 0% disagreed.
24. McGowan, et al., (2008)	To evaluate whether information provided by librarians positively impacted time, decision-making, cost savings and satisfaction.	Patient care, efficiency/cost-effectiveness, CPD	RCT	Authors report a highly positive impact on decision-making. Average time to respond: JIT librarians 13.68 minutes/question (95% CI, 13.38 to 13.98) vs. participants 20.29 minutes/question (95% CI, 18.72 to 21.86). Average salary cost for a project librarian to respond to a question was approximately $7.15 (based on 15 minutes) vs. a FGH or FHN physician to respond to question in 15 minutes ranges from $20.75 to $27.69. High positive impact: Practice involvement - clinical decision-making was enhanced: Intervention 285 (20.1%) vs. Control 24 (5.1%); Learned something new/updated knowledge: 528 37.3% vs. 41 (8.7%); Recalled something forgotten: 79 (5.6%) vs. 5(1.1%). Moderate positive impact: More confident: 114 (8%) vs. 11 (2.3%); Confirmation: 128 (9%) vs. 17 (3.6%); No impact: 111 (7.8%) vs. 117 (24.8%). The authors conclude that "providing timely information to clinical questions had a highly positive impact on decision-making"

25. Marshall JG., (1992)	To determine the impact of library services on clinical decision-making.	Clinical decision-making, patient care, risk management, quality of care, efficiency/cost-effectiveness, CPD	Survey	Changes in the following specific aspects of care were reported by the physicians: diagnosis (29%), choice of tests (51%), choice of drugs (45%), reduced length of hospital stay (19%), and advice given to the patient (72%, post-hospital care (39%). Physicians also said that the information provided by the library contributed to their ability to avoid the following: hospital admission (12%), patient mortality (19%), hospital-acquired infection (8%), surgery (21%), and additional tests or procedures (49%), additional outpatient visits (26%), saved time (85%), higher quality care (94%), info was of clinical value (97%), better informed clinical decisions (97%), refreshed memory (95%), substantiated knowledge (80%), new knowledge (93%). 80% of the 208 physicians who returned their questionnaires said that they probably or definitely handled some aspect of patient care differently than they would have handled it otherwise.
26.Marshall, JG., et al., (2014a).	To explore the influence of nurses' use of library resources on both nursing and patient outcomes. The study reports on a subgroup analysis of nursing outcomes from a larger study reported elsewhere (Marshall et al., 2013 Library and information services: Impact on patient care quality.)	Efficiency/cost-effectiveness	Mixed-methods	The authors report a positive impact on nursing and patient outcomes: 80% said it saved them time; Authors used multivariate analyses and found that access to and use of library-provided information resources had positive relationships with key nursing and patient outcomes, including changes in advice given to patients, handling patient care situations differently, avoiding of adverse events, and saving time. No specific details provided.

27. Marshall, JG., et al., (2014b).	To explore the influence of nurses' use of library resources on both nursing and patient outcomes. This paper reports on a subgroup analysis of impact on patient care quality from a larger study reported elsewhere (Marshall et al., 2013.)	Patient care	Mixed-methods	The authors found a positive impact on patient care. 4,520 respondents, 75 per cent said that they definitely or probably handled patient care differently using information obtained through the library
28. Marshall, JG., et al., (2013).	To determine the value and impact of library and information services on patient care.	Clinical decision-making, patient care, risk management, quality of care, service development /delivery, efficiency/cost-effectiveness, CPD	Mixed-methods	The authors found a positive impact on patient care. Refreshed memory of details or facts (12,522, 96%); substantiated prior knowledge/belief (12,322, 95%); provided new knowledge (12,083 92%); will be of use in future (13,050 99%); was of clinical value (13,098 98%); better informed clinical decision (12,329 95%); contributed to a higher quality of care (12, 529 95%); saved time (11 887 (85%); changed advice given to patient (6251 48%); choice of drugs (4309 33%); diagnosis (3252 25%); choice of tests (2992 23%); post-hospital care/treatment (1626 12%); handled situation differently (2769 21%); reduced length of stay (942 7%); avoided patient misunderstanding of disease (2957, 23%); avoided additional tests or procedures (2514, 19%); avoided misdiagnosis (1728 13%); avoided adverse drug reaction or interaction (1654 13%); avoided medication error (1485 12%); avoided patient mortality (730 6%); avoided hospital readmission (611 5%); avoided language/cultural misunderstanding (423 3%); avoided regulatory non-compliance (314 2%). Interview results confirmed the survey results.

29.Medernach, C., & Franko, J. (2007)	To assess library usage after the implementation of new services; To assess the impact of information provided by the library to health-care professionals.	Clinical decision-making, patient care, efficiency/cost-effectiveness	Survey	The authors found direct and indirect impacts upon patient care. Users most frequently needed information to find out about the condition (n = 87; 37%), to determine a treatment plan (n= 78; 33%) and to provide patient advice (n= 59; 25%). Physicians most frequently needed information to determine a treatment plan (n = 24; 45%), to find out about the condition (n= 18; 33%), and to confirm a diagnosis (n = 8; 15%). Respondents indicated that they did not use information to change a test request, reduce length of stay, avoid transfer, change a diagnosis, change an X-ray request or avoid hospital admissions.
30. Mulvaney, SA., et al., (2008)	To determine the effectiveness of providing synthesized research evidence to inform patient care via a Clinical Informatics Consult Service (CICS)	Clinical decision-making, efficiency/cost-effectiveness, CPD	RCT	Intention to treat (ITT) analyses showed that consults in the CICS Provided condition had a greater actual and potential impact on clinical actions and clinician satisfaction than No CICS consults. Evidence provided by the service primarily impacted the use of a new or different treatment (OR 8.19 95% CI 1.04–64.00): (CICS vs. no CICS) - Immediate Impact (103 vs. 46), Future Impact (103 vs. 55), Time Searching (108 vs. 57); Add diagnostic test (6 vs. 3), Change diagnostic test (6 vs. 0), Cancel diagnostic test (6 vs. 1), Other diagnostic test (2 vs. 0), Change drug dose (6 vs. 0), Change drug (8 vs. 2), Add drug (5 vs. 0), Different or new treatment (14 vs. 1), Duration of treatment (12 vs. 4), Timing of treatment (11 vs. 4), Stop treatment (9 vs. 2), Add component of treatment (4 vs. 3), Influence others (5 vs. 1)

| 31. Naeem, SB., et al., (2013) | To determine the impact of information they received/gathered from the hospital libraries on patient care and clinical decision-making. | Clinical decision-making, patient care, risk management, efficiency/cost-effectiveness | Survey | Information provided by hospital libraries is perceived by doctors to have a significance impact on patient care and clinical decision-making. 131 (87.3%) respondents stated that information gained from their hospital library had an effect on clinical decision-making. 133 (88.7%) indicated that information contributed new knowledge to or confirmed treatment choices, 116 (77.3%) agreed that information contributed new knowledge to or confirmed diagnostic decisions. 107 (71.3%) respondents reported that the hospital library provided information on prognosis, 106 (70.7%) indicated that it provided new evidence-based care information, and 93 (62%) pointed out that the hospital library provided medication management information. As a result of the information, 79 (52.7%) respondents handled some aspects of patient management differently. A. Confirm diagnosis n= 104; B. Change diagnosis n=66; C. Change requests for laboratory tests n=54 (36%); D. Change requests for x-ray, ultrasound, computed tomographic (CT) scan, magnetic resonance imaging (MRI) n=23(15%); E. Change the medication prescribed n=55(36%); F. Avoided additional test/procedures n=66 (44%); G. Reduced the length of stay in hospital n=56 (37%); H. Avoided admission to hospital n=36(24%); I. Avoided the transfer to another hospital n=33(22%); J. Changed the advice given to patients n=55(37%) |
| 32.Perrier, L. (2014) | To assess the effects of librarian-provided services in healthcare settings on patient, healthcare provider, and researcher outcomes. | Clinical decision-making, patient care, CPD, efficiency/cost-effectiveness | Systematic review | Authors report a positive impact on search skills, clinical decision-making and saving time. No studies were found that investigated librarians providing direct services to researchers or patients in healthcare settings. Librarian-provided services directed to participants in training programs (e.g., students, residents) improve skills in searching the literature to facilitate the integration of research evidence into clinical decision-making. Services provided to clinicians were shown to be effective in saving time for health professionals and providing relevant information for decision-making. Two studies indicated patient length of stay was reduced when clinicians requested literature searches related to a patient's case. |

33.Powelson, SE., & Reaume, RD. (2012)	To assess user satisfaction and to determine whether information and resources provided through the HINC were making an impact on patient care.	Patient care, CPD	Survey	The study found a positive impact on patient care: 43% agreed / strongly agreed that information contributed to better patient care decisions; 60% of the respondents agreed/strongly agreed that the information obtained was valuable to their research; 84 (62%) are more confident performing online searches after library training; 76 (56%) were able to use skills learned when making healthcare decisions.
34. Raynor, M., & Craven, J. (2015)	To establish: • whether learning takes place as a result of attending a course • how new skills are used in attendees' day-today work	CPD	Survey	Participants showed a mean increase of 2.7 (2.5) points post-course equivalent to an increase in score of 75%, t (10) = 3.371, p = 0.007 (95% CI). 3 participants reported new knowledge and skills. Participants reported acquiring some skills that enabled them to do their job more effectively. Access new information more efficiently. Staff felt better equipped to understand the nature of search queries from users
35.Robinson, L., & Bawden, D. (2007)	To identify the impact being made by London Health Libraries,	Efficiency/cost-effectiveness	Mixed-methods	Service recipients felt better informed, more up-to-date, more aware of resources, more confident and supported in their work, and saved time. Services contributed to a richer information environment. Direct impacts, demonstrably improved patient care, cost savings etc., were more difficult to establish.
36.Sastre, E.A., et al., (2011)	To assess impact of a brief workshop designed to teach literature searching skills to third-year medical students	CPD	Survey (pre-post)	The study found a positive impact on students' confidence and improved integration of EBM into inpatient notes. Students reported improved comfort using EBM (pre: 73%, post: 96%) and increased utilization of EBM resources. EBM integration into the discussion component of the notes also showed significant improvement. Computer log analysis of students' searches demonstrated increased utilization of EBM resources following the workshop

37.Sievert, M., et al., (2011)	To assess whether health sciences libraries impacted patient care/ clinical decision making	Clinical decision-making, patient care, quality of care, efficiency/cost-effectiveness	Survey	The authors found a positive impact on patient care. 78.3% physicians reported a change in patient care via choice of tests; 40% changed advice given to patients; 27.1% reduced length of stay; 71.9% physicians handled diagnosis differently, 88.2% handled therapy differently
38.Sulimanoff, I., et al., (2011)	To evaluate evaluation the CML program, specifically of the services offered to the Nursing Department and Psychiatry Service	Patient care, CPD, efficiency/cost-effectiveness	Survey	The study found a positive impact on patient care, research, and publication efforts. Patient care (psychiatry n=10; nursing n>70); time saved (psychiatry n=9; nursing n>60); keep up-to-date (psychiatry n=10; nursing n>90); improve knowledge; assist with research (psychiatry n=11; nursing n>80); prepare for presentations (psychiatry n=9; nursing n>70); prepare for meetings (psychiatry n=7; nursing n>20)
39.Sutton, A., & Grant, M J. (2011)	This rapid review aims to examine the evidence for the most cost-effective ways of delivering enquiry services.	Efficiency/cost-effectiveness, risk management	Rapid review	Point-of-care' librarians for primary care practitioners are a cost-effective way of answering questions. Librarians find the information more quickly, answer more questions, are cheaper and provide better quality information. Student employees or general reference staff can cost-effectively staff reference desks, although librarian referral must be provided for more complex and subject-specific enquiries. It is not possible to draw any conclusions on virtual/digital reference services because of the limited literature available. However some of the data regarding virtual services suggested that these were not cost effective.

40.Trinder, VM., et al., (2007)	To assess whether information literacy skills training taken up by health professionals impacts on their confidence and skills in using electronic sources of health information.	CPD, patient care, service development /delivery	Survey	The studies found a positive impact on information literacy skills and confidence and demonstrated potential for impact on patient care. Use to which learning *would* be applied: Patient care >70%; Inform patients >60%; develop guidelines 50%; personal development >85%; research >60%. Confidence in using all resources showed substantial improvement. Over two-thirds of trainees increased their use of search techniques
41. Urquhart, CJ. & Hepworth, JB (1995)	1. To examine the value to postgraduate and continuing medical education, of information supplied by NHS information and library services.	Clinical decision-making, patient care, risk management, quality of care, efficiency/cost-effectiveness, CPD	Mixed-methods	89% of the clinicians agreed that the information would affect one or more categories of clinical decision-making. 88% said information provided was new, 66% said it confirmed what they already knew. 57% said it refreshed their memory. 76% would share with their colleagues. Library group vs. dial-up Medline group: Recognition of abnormal or normal condition (36% vs. 31%); Identification /evaluation of alternative therapies (35% vs. 55%); Improved quality of life for patient and/or family (33% vs. 30%); Confirmation of proposed therapy (32% vs. 43%); Differential diagnosis (31% vs. 30%); Minimisation of risks of treatment (27% vs. 44%), Audit or standards of care (26% vs. 62%), Revision of treatment plan (25% vs. 42%), Choice of diagnostic test (22% vs. 29%), Legal or ethical issues (16% vs. 36%)

| 42.Urquhart, C., et al., (2010) | To provide an action plan for the Knowledge, Resource and Information service through assessing the impact of the current service, extent of satisfaction with existing services and views on desirable improvements. | Clinical decision-making, CPD, patient care, quality of care, service development /delivery, efficiency/cost-effectiveness | Mixed-methods | The study found positive impact on cognitive impact, patient care, organisational development, and time saved. Immediate cognitive impact: 1. I obtained relevant information n=141 (92.8%) 2. I obtained current information n= 115 (75.7%) 3. I obtained accurate information n=109 (71.7%) 4. I will distribute information to others n= 105 (69.1%) 5. I will share or discuss information with colleagues n=103 (67.8%) 6. I saved time n=74 (48.7%) 7. I substantiated my prior knowledge n=59 (38.8%) 8. I refreshed my memory of information n=56 (36.6%) 9. I can make a better decision n=54 (35.5%). Impact on current care: 1 Advice or information to patients or clients or carers n=104 (68.4%) 2. Advice to colleagues n=84 (55.3%) 3. Healthier lifestyle choices n=74 (48.7%) 4. Improved quality of life for patient or client n=51 (33.6%) 5. Organisational development (e.g. of work team) n=37 (24.3%) 6. Revision of care pathway or clinical guidelines n=29 (19.1%) 7. Changes to health or social care service delivery n=27 (17.8%) 8. Commissioning or possible service redesign (n=24 (15.8%) 9. Minimisation of risks of treatment n=19 (12.5%) 10. Legal and ethical issues n=18 (11.8%). Impact on future work activities: 1st Advice or information to patients or clients or carers n=78 (51.3%) 2nd Advice to colleagues n=63 (41.4%) 3rd Healthier lifestyle choices n=61 (40.1%) 4th Improved quality of life for patient or client n=46 (30.3%) 5th Changes to health or social care service delivery n=36 (23.7%) 6th Commissioning or possible service redesign n=35 (23.0%) 7th Revision of care pathway or clinical guidelines n=32 (21.1%) 8th Organisational development (e.g. of work team) n=30 (19.7%) 9th Legal and ethical issues n=15 (9.9%) 10th Minimisation of risks of treatment n=13 (8.6%) |
| 43.Vaughn, CJ. (2009) | To determine the impact of the CML on clinical decision making and to chart future directions for the service | Clinical decision-making, patient care, quality of care, efficiency/cost-effectiveness | Mixed-methods | The authors report a positive impact on patient care. All respondents said the information they received was relevant, accurate, current, of clinical value, and contributed to higher quality care. 86% said that information provided by the CML influenced a change in patient care, most often in the choice of drugs or other treatments. Examples were provided (but not reported in paper) about how the CML helped to shape clinical practice. |

44.Wagner, C. & Byrd, G. (2004)	To determine if a systematic review of the evidence from thirty years of literature evaluating clinical medical librarian (CML) programs could help clarify the effectiveness of this outreach service model.	Patient care, CPD, efficiency/cost-effectiveness	Systematic review	Reviewers conclude, "no study to date has attempted to measure the direct or indirect impact of CML services on the outcomes of patient care (such as hospital length of stay, patient mortality, adverse drug effects, etc.)" 20 studies reported 41 specific ways in which CML services made an impact on the provision of patient care. 12 studies reporting positive opinion percentages about the value of CML services for patient care. 10 studies reported on education impact, 6 of which reported positive opinion percentages.7 studies reported the CML saved time, of which 3 reported positive opinion percentages. 2 studies reported patient impacts of which 1 study reported positive opinion percentage. 4 studies reported impact on research of which 2 reported positive opinion percentages.
45. Weightman, A.L., & Williamson, J. (2005)	To examine the value and impact of library services on health outcomes for patients and time saved by health professionals	Clinical decision-making, patient care, efficiency/cost-effectiveness	Systematic review	There is evidence of positive impact from both traditional and clinical librarian services. The higher quality studies of traditional services measured impacts of 37-97% on general patient care, 10-31% on diagnosis, 20-51% on choice of tests, 27-45% on choice of therapy and 10-19% on reduced length of stay. Four studies of clinical librarian projects suggested that professionals saved time as a result of clinical librarian input, and two of these studies showed evidence of cost-effectiveness.
46.Winning, M.A., & Beverley, C.A. (2003)	To determine, from the literature, whether clinicians use CL services, have an effect on patient care, and/or clinicians' use of literature in practice and/or are cost-effective.	Clinical decision-making, risk management, efficiency/cost-effectiveness	Systematic review	The authors found insufficient evidence available for impact on patient care, clinicians' use of literature in practice, and cost-effectiveness. The quality of reporting of the literature was generally poor. CL programmes appear to be well-used and received by clinicians. However, there is insufficient evidence available on their effect on patient care, clinicians' use of literature in practice, and their cost-effectiveness, thus highlighting the need for further high-quality research. 3 studies reported time saved. 1 estimated at 2 hours saved per request. 4 studies reported impact on diagnosis. 3 studies reported impact on treatment choice and 4 reported impact on choice of test/avoiding test

47.White, C., et al., (2005)	To develop and evaluate a programme of information skills training for social-care practitioners and health-care librarians	Use of skills in future; confidence	Mixed-methods	Limited evidence of immediate impact found, authors report on future impact. When asked if they would be able to use the skills learnt in the future, all felt they would be taking some new skill back. Positive comments were also directed at the opportunity to learn to appraise research.

Academic Librarians

Authors	Aim of study	Outcomes measured	Study design	Main findings
1. Allison, D. (2015)	To analyze library use against grade point averages (GPAs) of undergraduates and graduates at a large US Midwestern library.	Checkouts, access to electronic resources, grade point average	Statistical correlations	The study found that undergraduates with a GPA above the mean university GPA used the library more than those with a GPA below the mean. There was a correlation between greater use of the library and increases in GPA between the two years—that is, as one grew, so did the other. The study also showed that students who checked out materials in one year returned for additional checkouts.
2. Anderson. R.P. & Wilson, S. (2009)	To determine whether a passive or an interactive tutorial design improves understanding of key concepts, as measured by pre- and post-test data.	Knowledge of library resources	Quasi experimental	The control group consisted of 21 students; the passive group, 27 students; and the interactive group, 34 students. The control group did not show any statistically significant change from pre-test to post-test for the three learning questions. The interactive tutorial group improved statistically significantly from pre-test to post-test for all three learning questions. While the passive tutorial group improved from pre-test to post-test on all three questions, the improvement was statistically significant for just two of the three questions.
3. Bowles-Terry, M. (2012)	To examine the connection between student academic success and information literacy instruction.	Grade point average, level of information literacy instruction	Mixed methods, focus group, transcript analysis	Students value library instruction for orientation purposes as beginning students, and specialized, discipline-specific library instruction in upper-level courses. Following an analysis of 4489 transcripts, it was shown that the only group different from the control group is the upper-level instruction group with a mean difference of .0748, p<.0005. Thus, students who receive upper-level instruction at the library also have higher GPAs, while there is no significant difference in GPA for students who have only freshman-level library instruction.
4. Brettle, A. & Raynor,	To compare the effectiveness of an online	Search skills, retention of skills	RCT	The searching skills of first year pre-registration nursing students improve following information literacy sessions (p<0.001), and remain unchanged 1 month later, regardless of teaching method. The two methods produce a

M. (2013)	information literacy tutorial with a face-to-face session			comparable improvement (p=0.263). There is no improvement or degradation of skills 1-month post-session for either method (p=0.216).
5. Chang, N.C. & Chen, L.M. (2014)	Evaluating the learning effectiveness of an online information literacy class based on the Kirkpatrick framework	Knowledge and skills, ROI	Mixed methods, online questionnaire, semi structured interviews	206 students at Tatung University, Taiwan were evaluated over two academic years. It produced a total of 194 online questionnaires used to evaluate levels 1-4 in the Kirkpatrick model. In general, the results demonstrated that students were more confident in their future study and daily life after learning the online material. Based on the Kirkpatrick model (level 2 knowledge and skills) the results provide favourable evidence for course effectiveness and its value. The results also demonstrated a reasonable Return of Expectation (ROE) and Return on Investment (ROI) to the MoE and to the University in terms of cost evaluation versus potential benefits.
6. Chen, H.C. et al., (2009)	To compare IL teaching methods	Improvement in citations	Quasi experimental	A total of 2,415 LIs containing 6,717 citations from 429 students were scored. Among the Workshop/Librarian, Workshop, and control groups, respectively, the percentage of LIs without citations was 9.3%, 11.0%, and 14.0%, the percentage of citations with complete documentation was 64.9%, 61.0%, and 29.4%, and the frequency of citing primary articles was 24.7%, 13.2%, and 18.8% (P<.05). Conclusions An IRAM curriculum that includes workshop plus librarian participation produced the best student citation habits.
7. Cook, J.M. (2014)	To determine the impact of credit-bearing information literacy skills course on student success rates.	Attendance at library class and graduation	Observational, statistical analysis	Graduation rates were positively associated with students who took the library course at some point during their studies. Students who took the library course graduated at higher rates than students who did not: 56% of those students who took the library course graduated within the study's time frame, compared to 30% of those who did not take the course. On average, there was no significant difference in college graduation GPAs between students who did and did not take LIBR 1101. During the time period of the study, more students who took the course graduated than those who did not, but those students who took the course did not have higher graduating GPAs.
8. Cook, L. et al., (2011)	To investigate the perceived impact and value of the Academic Library Liaison service at	Awareness of ALL, how their ALL had helped them,	Mixed methods	22/28 respondents indicated awareness; 24 able to provide examples of where ALL had helped them; subject knowledge, ability to keep up to date and IT skills were 3 top rated skills; Academic staff place a high value on the service offered by their ALLs and understand the contribution that they have to offer to the learning experience of their students, and to their own research; Recognition

	a UK university			of the contribution and availability of academic liaison services, and take-up of the services, appears to differ significantly according to the specific discipline; In terms of services that ALLs provide, academic staff appear most to value assistance with copyright matters and institutional repositories.
9. Coulter, P. (2007)	To compare average course grades in course sections that receive IL instruction to grades in sections that do not.	Course grades and receipt of library instruction		Compared a range of courses and a range of teaching methods and teachers. The results varied, revealing no clear benefit to information literacy instruction. Potential weaknesses in study design discussed
11. Cox, B. and Jannti, M. (2012)	Describes use of a tailored database and reporting function that joins library usage data with student data	Course grades, e-resource usage,	Ongoing data collection and correlations	The system has been built into general data collection to provide regular reporting, examples given include data reveals a strong correlation between the use of information resources and student grades. For example, the average mark for students who never used UWL electronic resources in 2011 was 55. The average mark for students who spent up to one hour a year accessing UWL electronic resources per year was 61. There is a very strong nonlinear relationship between average usage of resources and average student marks (R-squared = 0.91). Average mark for students who never used UWL electronic resources =58 va. Average mark for students that spent up to one hour a year accessing UWL electronic resources per year = 62. There is a very strong nonlinear correlation between average usage of resources and average student marks (R squared = 0.87). Authors found an even stronger correlation between library usage and academic performance (R squared = 0.90) after very poor performing students are excluded. Nonusers are 40 times more likely to fail than high users of library electronic resources.
12. Craig, A. & Corrall, S. (2007)	To investigate the effectiveness of an information literacy programme for pre-registration nursing students	Skills, confidence	Mixed, pre and post test, semi structured interviews re confidence	N=29, Twenty-one students (72%) improved their scores; five (17%) scored the same and three (10%) performed worse. The data yielded much useful information about individuals, which was beyond the scope of this study, but could be explored in future research. Figure 1 compares pre- and post-test scores for the group: the mean scores were 9.10 and 10.59, respectively. The Wilcoxon signed ranks test showed that the change was statistically significant.

13. Craig, C.L. & Friehs, C.G. (2013)	To compare two common types of online information literacy tutorials:	Skills, confidence	Pre and post test	One hundred and fifty-four students completed the survey and quiz. The students who watched the video tutorial scored higher on all five quiz questions than the other two groups. Comparing the Hi MI. and video groups, the difference in scores was statistically significant ($p < .05$) for questions 1, 2, and 5. Students may learn more from video tutorials than tutorials that use static Web pages. Also, interactivity in tutorials may not necessarily enhance learning.
14. Emmett, A. & Emde, J. (2007)	To obtain preliminary evidence over a three-year period on the efficacy of a curriculum designed to foster information literacy skills	Information skills	Pre and post test	26 students in the class. The rates of improvement from the pre-test to the post-test for the students enrolled in the class were 44 per cent while the four students not enrolled only improved 17 per cent. Student scores improved significantly between the pre- and post-test, although the six students not enrolled in the course had significantly lower rates of improvements from their pre-semester score to their post-semester scores. Out of a total possible score of 120 that an individual student could receive on either the pre- or post-test, the mean score on the pre-test was 61 for the enrolled CHEM 720 students, and the post-test was 99. The control group students had a mean score on the pretest of 73 (higher than the students enrolled) but a post of 85. As was found in previous years the rates of improvements were high. Out of a total possible points of 80 that could be earned on either pre- or post-test, the pre-test average score of the 16 students enrolled in CHEM 720 was 47.5 and the post-test average score was 74.5 The assessment results from all three years indicate marked improvements in the average student score from the pre- to the post-test
15. Emmons, M & Wilkinson, F.C. (2011)	To explore the relationship between traditional library input and output measures with fall-to-fall retention and six-year graduation rates	Retention and graduation	Statistical correlations	A wide range of variables was studied using the ARL and Integrated Post Secondary Education Data Sets. These include staff (total wages paid and the number of professional staff per student), collections (volumes, volumes added during the past year, and total expenditures for collections, initial circulation), services (number of reference questions, percent of students receiving instruction). The only variable that made a significant impact on retention and graduation was the number of professional library staff. This equated to a 10 percent increase in the ratio of professional library staff predicts a 0.72 percent increase in retention and a 10 percent increase in the ratio of professional library staff predicts a 1.55 percent increase in graduation.
16. Eng, S.	To analyze	Student	Statistical	The authors report only weak relationships across all outcomes (with the

| (2015) | correlations between library expenditure and student retention and whether there is a link between library instruction and retention | retention | correlations | exception of library expenditure and retention at bachelors level in 2010/11 and doctoral level in 2011 where a moderate relationship was found): - Relationship between total library expenditure and retention: A moderate positive relationship in 2010 (r = + 0.531) and 2011 (+ 0.592) for the bachelor degree-granting institution, but a negative relationship for the for the master degree-granting college in both 2010 (r=- 0.002) and 2011 (- 0.220). Results from the doctoral degree-granting institution were inconsistent, in 2010 there was a negative relationship (r=- 0.033) and in 2011 a moderate positive relationship (r=+ 0.500). For the Associate Degree-granting Institutions results were inconsistent and showed a weak negative relationship in 2010 (r= - 0.031) and a weak positive relationship in 2011 (r= + 0.007). Relationship between retention and professional salaries: A weak positive relationship in 2010 (r =+ 0.376) and 2011 (+ 0.447) for the bachelor degree-granting institution, the value of r for the master degree-granting college was negative in 2010 (- 0.046) and 2011 (- 0.196). Results from the doctoral degree-granting institution were inconsistent, in 2010 there was a negative relationship (r=- 0.037) and in 2011 a weak positive relationship (r=+ 0.486). For the Associate Degree-granting Institutions results there was a weak negative relationship in both 2010 (r=- 0.041) and 2011 (r= - 0.039). Relationship between retention and Professional Staff FTE correlation: correlation is consistent between the years: For the bachelor, master, and doctoral degree-granting institutions in both 2010, r=+ 0.447, + 0.311, + 0.242 respectively and in 2011, r= +0.432, +0.297, and +0.513 respectively. For the Associate Degree-granting Institutions results there was a weak positive relationship in 2010 (r=+ 0.185) and 2011 (r=+ 0.102) |
| 17. Fain, M. (2011) | To examine the changes in students' information literacy skills after receiving a one-shot library instruction session. | Library skills | Pre and post test | Re-examining data from previous years of assessment is a worthwhile undertaking. Looking at the results through the lens of statistical analysis shows us where statistically significant changes are taking place in student learning, regardless of the year or class in which students were tested. As suggested in the literature review, students showed significant change on those items that reflected resources or services that they used over the course of the semester. Library instruction, as part of the overall first year experience, contributes to the early stages of information literacy development. Students are beginning to find their way through the plethora of resources and services that make up the research experience in the 21st century. First year students |

				may have a way to go, but assessment indicates they are making progress.
18. Finch, J.L. (2010)	To evaluate a virtual academic library.	Saturation rate of student population, the percentage of bibliographic sessions and orientations compared to number of courses offered, and Web site traffic patterns.	Case study	Suggests that the approach is non complicated and could be replicated by other small libraries
19. Fitzpatrick, M.J. & Meulemans, Y.N. (2011)	To determine the impact of an assignment and workshop intended to increase students' information literacy skills	Information skills	Quasi experimental	Results of an independent-samples t-test revealed a significant difference on posttest scores on students' information literacy skills between those who participated in the workshop and those who did not. As hypothesized, students in the workshop group (M = 3.86, SD = 1.23) scored significantly higher on the posttest than those in the control group (M = 3.06, SD = 1.33); t (155) = 3.88, p = .00. This difference on the posttest reflected a large effect size (d = .63). Through examination of the workshop group data we found a significant improvement in students' knowledge of reference materials and use of APA style as revealed through a paired samples t-test; t (75) = -4.90, p = .00. Posttest scores (M = 3.86, SD = 1.23) were significantly higher than pretest scores (M = 2.93, SD = 1.15); this difference reflects a moderately strong effect size (d = .55). On the other hand, although the students in the control group improved their scores, this difference was not significant; t (80) = −1.52, p = .13. Posttest scores (M = 3.06, SD = 1.33) were not sig- nificantly higher than pretest scores (M = 2.93, SD = 1.62), thus demonstrating that it was the workshop and assignment together that made an improvement in information

				literacy skills and not the assignment alone. There was also a positive change in students' subjective views of their ability to use the library and online library resources.
20. Friehs, C.G.& Craig, C.L. (2008)	To test the effectiveness of an online information literacy tutorial	Knowledge retention and preference of instruction	Pre and post test	140 students participated. 25% preferred online instruction, 49% preferred face to face. 30% were able to successfully perform one of the skills tests post instruction, 60-70% were able to perform second skills test.
21. Gardois, P.et al ., (2012)	To find out: the Web 2.0 services implemented by medical, academic and research libraries;	Wide range and heterogeneo us amongst studies individual outcomes not listed	Scoping review	Conferencing/chat/instant messaging, blogging, podcasts, social networking, wikis and aggregators were frequently examined. Services were mainly targeted at general academic users of English-speaking countries. Data prohibit a reliable estimate of the relative frequency of implemented Web 2.0 services. Case studies were the prevalent design. Most articles evaluated different outcomes using diverse assessment methodologies. A systematic review is recommended to assess the effectiveness of such services.
22. Haddow, G . (2013)	To demonstrate how institutional data can be combined to examine library use and retention at a single institution.	Library use retention (i.e. not withdrawing from university)	Correlation al	The findings show retained students login to authenticated resources and borrow from the library at higher rates than withdrawn students. Mature age students withdraw from the university at higher rates than younger students. Log-ins to authenticated resources increase as students' progress over time through their university programs. Retained students tend to have higher rates of library use than withdrawn students. While a higher proportion of the withdrawn students logged into authenticated resources between one and 28 times over the semester, a much higher proportion of the retained students logged in more than 28 times. At the other end of the scale, withdrawn students had zero log-ins at nearly twice the proportion of retained students over the semester.
				The results show that students who remained enrolled logged into authenticated resources in much higher proportions than the students who withdrew (82.4% compared with 37.2%). Logically, this is the only possible finding; when a student withdraws from their studies they cease to have access to the library's resources. However, the results suggest that regardless of the timing of their withdrawal from the university, withdrawn students' log-ins are lower than log-ins by retained students throughout the semester.

23. Howard, K. et al., (2014)	To examine the presumption that library research workshops will increase the quality, quantity and diversity of sources students use	Diversity and quality of source use	Quasi experimental	For virtually all sources, having an instruction session had no significant impact on students' use of those sources. These were two exceptions to this finding: Websites and the OVCR database.
24. Lalor. J.G. et al., (2012)	To show how collaboration between faculty (JL and MC) and the subject librarian (GS) in library-based instruction improved undergraduate midwifery students' library research skills	Library research skills (information literacy)	Quasi experimental	108 undergraduates took part in the study from 2008 to 2011; At least one within-year comparison is available for 80 students. We found that the sessions in the first and second years of their undergraduate programmes produced the hoped-for improvements in the ability of midwifery students to search appropriate resources for a topic relevant to maternity care, with the majority of students whose searches were rated as poor or fair in the pre-instruction phase showing better information literacy after the sessions: 59 (97%) of the 61 students who were poor or fair pre-instruction in the first and second years combined improved. Among the 27 students whose searches were categorised as good in the pre-instruction phase in these two years, 17 (63%) remained good, 9 (33%) became fair and 1 (4%) became poor. In general, the improvements were sustained by the start of the following year, with none of the students for whom data are available slipping back to poor.
25. Kavaganah, A. (2011)	To evaluate an embedded IL module	Search skills, reference skills, critique of information sources	Longitudinal	Just over half of the project groups (52%) passed the IL component of the assignment, with a mean mark of just 44%. The range of marks for the 2008-9 cohort was somewhat narrower: from 24% to 88%. In addition, the 2008-9 cohort's mean mark for the IL component was 47%, representing a 3% increase on the previous year, and 65% of project groups achieved a passing grade, which was a 13% increase on 2007-8. The mean mark in the IL assessed component increased from 47% in 2008-9 to 58% in 2009-10, and the pass rate increased to 84%. In addition, there was a markedly greater correlation in 2009-10 between each group's IL marks and their marketing marks in the marketing plan assessment task (see Figure 3). The correlation coefficient for 2009-10 was 0.8566; a closer correlation than in the previous two years of the course.

26. Kingma, B. & McClure, K. (2015)	Measures the return on investment (ROI) of the Syracuse University library.	ROI - in time and money for academic library services	ROI - contingent valuation	Travel time and use of the online library was measured to determine the environmental value of the academic library. The economic and environmental value of the Syracuse University library show an ROI of $4.49 returned to the university for every $1.00 spent each year.
27. Koufogiannakis, D. et al., (2005)	To determine whether having a librarian present in the small group, problem-based learning modules improved understanding of evidence-based medicine concepts, the nature of medical literature, and information access skills.	Skills, student attitude to librarian in group	RCT	One hundred and sixty-four first-year medical and dental students participated in the study. There were a total of 18 PBL groups, each with approximately nine students and one faculty tutor. Six librarians participated and were assigned randomly to the six intervention groups. Post-test scores showed that there was a small positive librarian impact, but final exam scores showed no impact. There was also no difference in attitudes or comfort levels between students who had a librarian in their group and those who did not. Impact was not sufficient to warrant continued participation of librarians in PBL. In future instruction, librarians at the John W. Scott Health Sciences Library will continue to teach at the larger group level.
28. Koufogiannakis, D. & Wiebe, N. (2006)	To assess which library instruction methods are most effective for improving the information skills of students at an introductory, undergraduate level, using cognitive outcomes (measuring	Change in knowledge	Systematic review and meta analysis	The overwhelming majority of studies were conducted in the United States (88%). 79 studies (65%) used experimental or quasi-experimental research methods. Teaching methods used in the studies varied, with the majority focused on traditional methods of teaching, followed by computer assisted instruction, and self-directed independent learning. Studies measured outcomes that correlated with Bloom's lower levels of learning (Remember, Understand, Apply). 16 studies compared traditional instruction with no instruction, and 12 found a positive outcome. Meta-analysis of the data from 4 of these studies agreed with the positive conclusions favouring traditional instruction. 14 studies compared computer-assisted instruction with traditional instruction. 9 of these showed a neutral result, and meta-analysis of 8 of these studies agreed with this neutral result. 6 studies compared self-directed independent learning with no instruction, and meta-analysis of 5 of these

				agreed that the result was positive in favour of self-directed independent learning. There is sufficient evidence to suggest that computer assisted instruction is as effective as traditional instruction. Evidence also suggests that both traditional instruction and self-directed independent instruction are more effective than no instruction.
29. Mery, Y. et al., (2014)	To evaluate the Guide on the Side (GotS), an online learning tool developed by the University of Arizona Libraries, and a screencast tutorial for teaching information literacy and database searching skills	Information literacy skills	RCT	90 participants split into 3 groups, control v online v screencast. Participants in the control group received significantly lower scores on the post-test, M = 8.17, 95% CI [7.08,9.25] than those who viewed the screencast, M = 11.43, 95% CI [10.35,12.52] or completed the GotS, tutorial, M = 10.77, 95% CI [9.68,11.85]. As hypothesized, there was a significant difference in post-test scores among the control and the screencast groups (p < .001) and the control and the GotS groups (p = .003). However, the differences between the screencast and GotS groups failed to reach the significant level (p =.664), indicating that there was no difference in the effectiveness of the two types of instruction methods
30. Meyer, K.R. et al., (2008)	To assess the effectiveness of information literacy instruction in the basic course.	Information literacy skills	Quasi experiment al	155 in experimental group, 165 in control. The MANOVA yielded a significant difference between the groups Wilks l $.91 [F (6, 192) $3.21, pB.05, h2 $.09]. Univariate follow-up tests indicated that the experimental group produced a significantly higher mean for the information literacy measure [F (1, 170) $4.34, pB.05, h2$.03] on the posttest. In addition, paired-samples t-tests indicated that the experimental group improved significantly over time on the information literacy measure [t (133) $$2.47, pB.05]. In contrast, the control group did not improve their performance over time on the information literacy measure [t (131) $.93, p$.05].
31. Noh, Y. (2012)	To investigate the correlation between university libraries and	Library resources, research achievement	Statistical correlations - using a structural equation	Based on data analysis from 13 Korean university libraries. It has been confirmed that primary input factors had an impact (0.05 or lower) on secondary input factors while secondary input factors influenced (0.05 or lower) output factors. Therefore, it can be said that if library input factors increase, output factors increase as well: The library resource use rate had a

	academic research achievement		model	direct impact on research achievement. Therefore, if a library use rate is increased, research achievement is enhanced as well.
32. Payne, P. (2006)	Provides a final overview of the two phases of the LIRG/Sconul *Impact Initiative* and highlights some of the findings.	Range-different for each project: information skills, knowledge and use of services,	Evaluation	Positive improvements for information literacy projects, lack of awareness for a number of library initiatives, no real impact data reported
33. Rafferty, R.S. (2013)	To determine if first- year medical students consulted and cited resources specifically highlighted during library instructional sessions.	Use of resources highlighted	Evaluation	Three years (2008–2011) of data analyzing 2,983 citations showed that 49.55% of all citations were from resources discussed during library instructional sessions; 21.86% came from resources with links on the course LibGuide; 77.51% were from library resources; and 90.68% came from electronic resources.
34. Rinto, E. and Cogbill-Seiders, E. (2015)	To examine the impact of two factors on student information literacy skill development: library instruction and section theme	IL skills	Pre and post test	Sample size was unclear. The analysis demonstrated a significant impact in the ability to develop a topic and assess the relevance and authority of the material for those students who attended a library workshop.
35. RIN & RLUK	To undertake a systematic study of the value of	Research performance	Quantitativ e analysis of statistics –	Results are presented in a logic model which shows that in the short term libraries contribute to: increased visibility of research, improved intuitional understanding of information assets, better research management, improved

	the services that libraries in the UK provide to researchers, and of the contributions that libraries from a wide range of institutions make to institutional research performance.		from SCONUL, HESA, and the RAE, along with bibliometric data	co-ordination of research activities, good reputation of institution for research. In the longer term the library contributes to increased readership of research, more research income, higher quality research, recruitment and retention of higher quality researchers, more efficient research, more satisfied researchers, higher quality research, greater research output and more motivated researchers
36. Saxton, M.L. (1997)	To evaluate the effectiveness of reference services and highlight methodological issues in evaluation	Library expenditure and reference accuracy	Systematic review	Library expenditure, volumes added, collection fluctuation, size of service population and hours of operation consistently exhibit a moderate positive association with reference accuracy
37. Schaffer, B.A. (2011)	To compare online tutorials, with students receiving hands-on classroom instruction	Library skills, confidence	Pre and post test	59 students, 29 in online group and 30 in face to face. Online instruction was as effective as face-to-face instruction, however for both methods only 65% of the skills taught appeared to have been retained/understood. All hypotheses were analyzed using two-tailed t-tests. Significant improvement in test scores occurred for all students following library instruction, with an average improvement of 23.05 points (out of 100) and the significance of the mean gain measuring .000 (p < .05). This data strongly supports hypothesis 1. Both online and face-to-face (F2F) groups demonstrated significant improvement, with online students (N = 29) improving their scores by an average of 23.62 points, and F2F students (N = 30) by an average of 22.5 points (see Table 1). The analysis of pre- and posttest scores indicates that there is no significant difference in student learning between online and F2F groups, supporting hypothesis 2 (p = .784). There was also little difference in skill level between groups, both before and after the instruction (shown by pre- and posttest

				scores, respectively). Despite the improvement, however, the average score was only 62.76 for the online group and 63.33 for the F2F group, indicating that students were on average able to achieve the desired learning outcomes on less than 65% of the total questions. Improvement between pre- and posttest also did not vary among instructors (nor, therefore, by length of time between instruction and posttest).
38. Silk, K.J. (2015)	To compare the effectiveness of online versus in-person library instruction	Search skills	Quasi experiment al	The class consisted of 232 undergraduate students divided into six, once-weekly recitation sections of between 38 and 40 students. The library instruction, regardless of the delivery method, proved to be successful in increasing knowledge as well as self and response efficacy related to finding academic research via online resources. However, there were no differences in any measures between the online and face-to-face conditions except in the individual behavioral measure (i.e., the success of finding an empirical article to summarize).
39. Silver, S.L. & Nickel, L.T. (2005)	To determine whether librarians can effectively teach library skills using an online tutorial?	Search skills	Pre and post test	Two hundred sixteen students elected to be in the online tutorial group and 79 elected to be in the classroom instruction group. Table 1 shows that the mean number of correct responses for the tutorial group was 5.47, while the mean number of correct responses for the classroom group was 5.29.There were no significant differences in the numbers of correct and incorrect answers for most questions.
40. Scoria, K.M. et al., (2014)	To investigate the relationships between first-year undergraduate students' use of the academic library, academic achievement, and retention.	Grade point average, retention, use of library resources	Logistic regression analysis, correlationa l study	5,162 student records were analysed. Results of ordinary least squares regressions predicting first-year students' cumulative grade point averages (GPA) and logistic regressions predicting students' first-year to second-year retention suggest that students who used academic library services and resources at least once dur- ing the academic year had higher GPA and retention on average than their peers who did not use library services. The results of two separate regressions predicting students' GPA by 10 different types of library use suggest that four library use areas were consistently and positively associated with students' GPA: database logins, book loans, electronic journal logins, and library workstation logins. The results of two separate logistic regression analyses suggest that logging into databases and using library workstations were actions consistently and positively asso- ciated with students' retention.

41. Spievak, E.R. & Hayes Bohanan, P. (2013)	To evaluate the efficacy of the "one-shot" library session	Ability to evaluate the quality of websites, use and knowledge of library services	Psychological decision making experiment	119 undergraduate college students. Analysis of variance results revealed that participants who reported having a librarian visit their class also reported they would be significantly more likely to continue searching for more information for their project (Mno = 6.39, Myes = 7.69; F (2, 107) = 3.74, p = .027 Those exposed to a classroom orientation took significantly less time to complete their participation than those who reported no classroom library orientation (Mno = 46.95 min, Myes = 42.02 min; F (1, 81) = 5.28, p = .024).
42. Stone, G. et al., (2012)	To investigate whether there is a statistically significant correlation across a number of universities between library activity data and student attainment.	Library use (visits, books borrowed, use of electronic resources), class of degree achieved	Correlational	33 074 students studying undergraduate degrees at the eight partner UK universities. The project has successfully demonstrated that there is a statistically significant relationship between student attainment and two of the indicators: e-resources use and book borrowing. This relationship has been shown to be true across all eight partners in the project that provided data for these indicators. One area where a statistical significance was not found was library gate entry data. However, it does look as if there is a difference between those students who were awarded a first class degree and those who were awarded a third. This can be explained in part by the nature of use of the library: students enter the library building for many reasons, such as to use group study facilities, lecture theatres, cafés, social spaces and student services. These reasons may or may not have an impact on final grade. The exact figures are not given in the report - links are provided to a downloadable toolkit and spreadsheet for further analysis.
43. Streatfield, D. & Markless, S. (2008)	To review progress in evaluating the impact of information literacy work in Higher Education in the UK.	Mixed	Review	Describes a collaborative UK national initiative in which various university library teams engaged in evaluating information literacy.
44. Tenopir,	To measure the value and	Age, gender, percentage	Survey, using	Academic staff report reading from a variety of materials, but they read the most articles. Respondents read from an average of 39 scholarly readings per

C. et al., (2012)	outcomes to academic staff members from access to scholarly publications in six universities in the United Kingdom.	of work time spent on various activities, number of personal subscriptions and two measures of recent academic success: publication record and record of recent awards.	critical incident technique	month, comprising 22 articles, seven books, and ten other publications. On this basis an annual total could132be estimated at 468 readings per year (i.e. 39 X 12). A significant relationship exists between successful academics, defined as those who publish more and earned an award in the past two years, and the number of article, book and other publication readings. Successful "be estimated at 468 readings per year (i.e. 39 X 12). Academics who spend more time per book reading also spend more time per article and other publication reading. A significant relationship between the number of article readings and the number of other publication readings also exists. While we cannot draw a cause and effect relationship, these relationships show that scholarly reading is an important part of the work activities of successful academics. Approximately three-quarters (76%) of the articles obtained through the library are principally for research and writing (Table 9). Just over half (57%) of article readings from a personal subscription are for research and writing (29 of 54). Seventy-two percent of article readings obtained from other sources are read for research and writing. Approximately 73% of book readings and 68% of other publication readings obtained from the library are primarily for research and writing. Most time is spent on library-provided article readings, approximately 144 hours each year. Approximately 40 hours is spent on library-provided book readings and 13 hours on library- provided other publication readings each year. Annually, academic staff spend 197 hours of their work time with library-provided material, or the equivalent of 25 eight-hour days.
45. Tewell, E. & Angell, K. (2015)	To determine whether playing library-related online games during information literacy instruction sessions improves student performance	Identifying citation types and keyword and synonym development.	Quasi experiment al	86 students in seven introductory English composition classes at a large urban university in the northeastern United States served as participants. Each class visited the library for library instruction twice during a given semester. In the experimental group students received information literacy instruction that incorporated two online games, and the control group received the same lesson plan with the exception of a lecture in place of playing games. A six-item pre- and posttest questionnaire was developed and administered at the outset and conclusion of the two-session classes. The 172 individual tests were coded, graded, and analyzed using SPSS.A paired sample t-test comparing the control and experimental groups determined that that there was a statistically significant difference between scores on pre-tests and post-tests in the

				experimental group but not the control group suggesting that participating in games related to the instruction they received resulted in an improved ability to select appropriate keywords and ascertain citation formats.
46. Walton, G. & Hepworth, M. (2013)	To compare a blended information literacy learning and teaching intervention with standard face-to-face delivery.	Information literacy: the ability to evaluate source material effectively	Quasi experiment al	The intervention that incorporated social media learning proved to be the most successful learning and teaching approach. The data indicated that undergraduate students' information literacy can be developed. However, additional long-term data is required to establish whether this intervention would have a lasting impact.
47. Wang, R. (2006)	To determine the impact of a credit bearing library skills course	Citation use, assessment grades	Not clear	This study found that there were statistically significant differences in citation use and grades between students who took a library credit course and students who did not. The results of independent samples t-tests indicated that the student group that took a library credit course cited more scholarly resources, produced fewer incomplete citations, and received higher grades for its papers and courses. The data included 836 citations produced by 120 student papers and the students' grades for their papers and courses in the fall of 2004. Additionally, the survey results revealed that the students' acquisition of bibliographic research and citation skills was directly attributable to the library credit course, whereas their counterparts tended to rely on informal sources. The evidence supports the lasting impact of a library credit course on student learning.
48. Weightma n, A. et al., (2015)	To conduct a systematic review and meta analysis of information literacy interventions	IL skills	Systematic review, meta-analysis	28/55 studies compared online versus traditional face-to-face teaching. Meta-analyses could be conducted for 18 studies and suggests. Traditional and web based teaching strongly increases IL skills when assessed pre and post teaching. For controlled studies, traditional teaching increases IL skills but the effect size is smaller than the pre and post studies. Increase in skills is broadly comparable between traditional and web based teaching methods. No more research is needed to compare traditional and web based teaching as this confirms previous systematic reviews and meta-analyses. Further research should explore teaching methods on behavioural measures rather than cognitive outcomes, as these are more reflective of a true understanding of skills.

| 49. Zhang, L., et al., (2007) | To determine how effective CAI was compared to face-to-face instruction for teaching library skills to academic library patrons | Information literacy, affective outcomes, confidence | Nine of the ten studies found CAI and face-to-face instruction to be equally effective. A single study (Churkovich) found face-to-face to be more effective than CAI. As for affective outcomes, Wilhite found that the face-to-face group was more satisfied with their instruction, while Beile found the CAI group to be more confident in their skills. Koenig, however, found no difference in confidence levels between the CAI and face-to-face groups, but that both were more confident than those who had not received instruction. Holman found that the CAI and face-to-face groups thought that the two methods were equally effective but felt that they "learned better" with face-to-face instruction. Two studies (Cherry, and Holman) found that instruction of any kind was superior to no instruction, while Koenig found that face-to-face, CAI, and no instruction were equally effective. |

Appendix 4

Logic model: professionally trained health librarians contribution

Input	Activity	Output	Outcomes		

Health Librarians

Literature Searches

Training

Filtered/ Synthesised Evidence

Health professionals who can find or use evidence

Short

Support CPD

Improved Clinical decision making

Medium

Risk management And Safety

Long

Improved Patient care

Health service Development and delivery

Efficiency and Cost savings

External Factors