ICRP

International Cancer
Research Partnership

Cancer Research Funding from an International Perspective

Report from the International Cancer Research Partnership

ICRP Partners

Contents

This report is available in electronic format at www.icrpartnership.org/Publications.cfm
Canadian English spelling has been used throughout.

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For more information about this report or the ICRP, please contact:

Operations Manager
operations@icrpartnership.org

Executive Summary

The ICRP's MISSION is to add value to cancer research efforts internationally by fostering collaboration and strategic co-ordination between cancer research organizations.

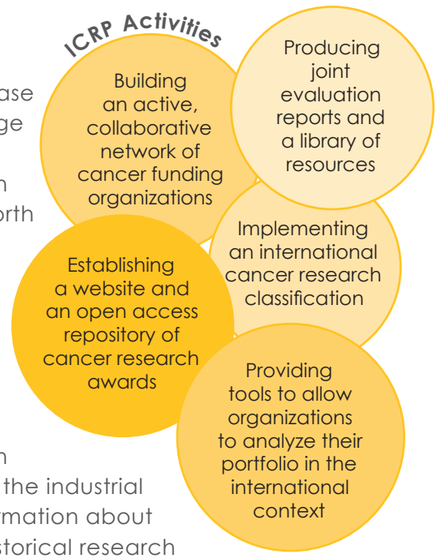
The VISION is that all funders of cancer research collaborate to enhance the impact of research on individuals affected by cancer.

Introduction

The International Cancer Research Partnership (ICRP) is an alliance of governmental and charitable organizations funding regional, national and international cancer research grants and awards.

Globally, while there have been notable successes in the fight against cancer, statistics underscore the fact that further research, improvements in healthcare delivery and international collaboration are needed if we are to see a decline in both the incidence and mortality resulting from cancer (**Figure 1** overleaf).

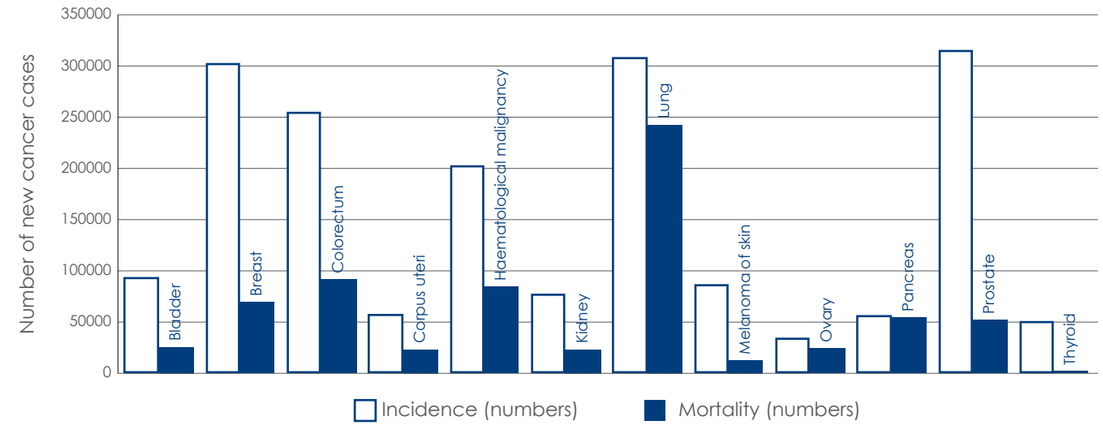
Members of the ICRP are connected by a sense of responsibility to enhance the impact of research for the benefits of all individuals affected by cancer, and recognize that global collaboration starts with the sharing of information on funded research using a common framework. To this end, the partners submit current and historical research funding information to a common database and share best practices to increase the efficiency of research administration and management.



The ICRP database represents a large portion of the cancer research performed in North America and Europe, and is estimated to cover a significant proportion of worldwide cancer research funding outside the industrial sector. Key information about ongoing and historical research funding is made available to the public[1] and to the research community. Financial data at the level of individual awards are made available to partner organizations.[2]

1 *https://www.icrpartnership.org/database.cfm*
2 *https://www.icrpartnership.org/Partners/login.cfm*

Figure 1: Cancer Incidence and mortality statistics (Globocan, 2008)



NOTE:
Incidence (numbers) - data from GLOBOCAN 2008 (http://globocan.iarc.fr/). Estimated global cancer incidence, all ages, both sexes
Mortality (numbers) -Data from GLOBOCAN 2008(http://globocan.iarc.fr/). Estimated global cancer mortality, all ages, both sexes

This report

This report provides information about the ICRP, its development and evolution as well as current and future directions. In addition, key analyses for the calendar years 2005 to 2008 give information about the cancer research landscape and trends in research activity in that timeframe. This international analysis of cancer research investment in terms of areas of research and types of cancers sets a benchmark for future public releases of research funding data by the ICRP. For participating organizations, the partner website provides the latest available information on cancer research funding for use in strategic planning and analysis – the latest data submitted to the site includes funding allocated in 2012.

Research investment 2005-2008: highlights

- ICRP's member organizations' funding allocations resulted in over 20,000 active awards in each of calendar years 2005 to 2008 (see **page 7**).
- Annual investment in cancer research ranged between $4.6 and $4.8 billion (USD) over this period (see **Table 1**).
- The cancer type profiles (**Figure 4**) of 2005 and 2008 show small variations in percentage investment in specific cancer types and a slight decline in investment not associated with any specific type of cancer (Not site-specific).
- The research type profile (CSO categories) shows some small variations over the period 2005-2008, the largest change being a 4 percentage point decline in etiology. Overall however, the profile has not changed significantly between 2005 and 2008 (**Figure 7**)

Future directions

The ICRP aims to publish updates to this data report periodically. With the coming years, the Partnership hopes to expand to include more of the world's cancer research funding organizations, and strive to enhance its role in facilitating research collaboration and coordination at the international level.

About the ICRP

History

The ICRP[3] was formed in 2000, with 10 funding organizations, under the leadership of the United States (US) National Cancer Institute (NCI) and the Congressionally Directed Medical Research Programs (CDMRP) of the US Department of Defense (DoD). Recognizing that increasing access and coordination demands an equally concerted effort to establish an integrated system for addressing these needs, the partners applied and developed a common classification system developed by NCI – the Common Scientific Outline (CSO, see **Appendix C**) – for discussing, comparing and presenting their cancer research portfolios (see sidebar). The CSO, originally developed as a tool for research management by the NCI, is organized around seven broad areas of science, along with a standard cancer site coding scheme. The CSO has laid the groundwork for collective portfolio analysis and enables coordinated strategic planning among partner organizations.

Over the past decade, a number of refinements have been made to improve users' ability to interpret and apply the CSO, although the group is committed to maintaining the structure to ensure that longitudinal analyses will not be impeded. It is important to note that the CSO is intended to add value to existing coding schemes rather than replace them. It provides a "view from the top" based on broad scientific questions, and a means to classify the cancer research into easily understandable scientific topics. The CSO is now also available in French and Spanish. Extending the accessibility of the CSO by providing further translations is a future goal for the partnership.

Figure 2, below, shows key milestones for the ICRP. Since 2000, the ICRP has expanded from 10 organizations and now represents 54 individual research funding organizations (see **Table 1** and **Appendix A**). Brief descriptions of all partner organizations are provided on the ICRP website (https://www.icrpartnership.org/partners.cfm).

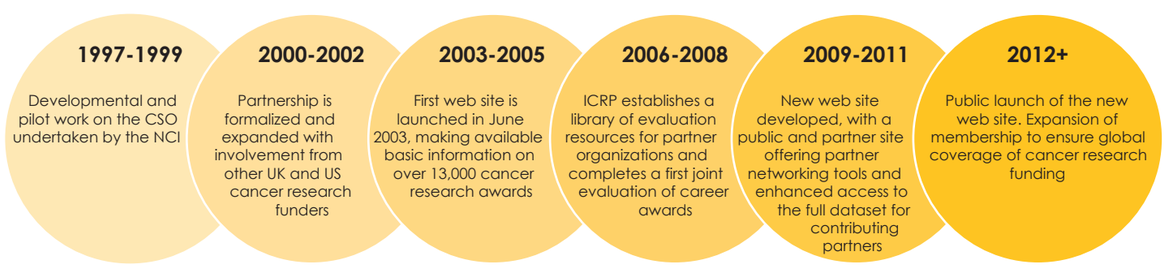
COMMON SCIENTIFIC OUTLINE

The CSO is organized around seven major areas of scientific interest:

1 - Biology
2 - Etiology (causes of cancer)
3 - Prevention (interventions)
4 - Early Detection, Diagnosis, and Prognosis
5 - Treatment
6 - Cancer Control, Survivorship, and Outcomes Research
7 - Scientific Model Systems

Each of these areas is subdivided into minor CSO codes. To see the CSO in its entirety, please refer to the ICRP web site at: https://www.icrpartnership.org/CSO.cfm

Figure 2: ICRP Milestones



3 *Originally, the Common Scientific Outline (CSO) Partners*

While much of the focus in the early stages of the Partnership was on developing and promoting use of the CSO, the current mission reflects an expanded view of what can be accomplished with international collaboration. With further international expansion of the partnership, the ICRP has the potential to be a truly integrated global system of information on cancer research.

Current activities

Website development

Having developed a robust classification tool in the CSO, the partners have since taken steps to ensure that information about individual cancer research awards can be shared with each other and the wider community.

The ICRP web site (www.icrpartnership.org) represents a critical achievement in providing information about ongoing research prior to its appearance in biomedical publications in a structured way, in a single data repository, providing a number of benefits to its partner organizations as well as other stakeholders in the cancer research community. This structured dataset improves researchers' ability to identify potential collaborators, helps avoid duplication and/or facilitates replication by giving information on current research awards funded by other organizations and provides opportunities for identifying appropriate peer reviewers. Awards contributed to the database are adjudicated using an external scientific peer-review system, and are coded according to CSO and cancer disease codes. In addition, the Partners have put in place data-sharing agreements to enable full project data to be shared between the participating organizations, with appropriate policies and procedures for safeguarding and sharing the data. In 2012, the Partners re-launched the ICRP web site and database to include a public site and a partner site.

Current members of the ICRP (September 2012)
54 funding organizations

US

1. American Cancer Society*
2. American Institute for Cancer Research
3. Avon Foundation Breast Cancer Crusade
4. California Breast Cancer Research Program*
5. Congressionally Directed Medical Research Programs, US Department of Defense*
6. National Institutes of Health (including the National Cancer Institute)*
7. National Pancreas Foundation
8. Oncology Nursing Society Foundation*
9. Pancreatic Cancer Action Network
10. Susan G. Komen for the Cure®*

Australia
National Breast Cancer Foundation

Canada
Canadian Cancer Research Alliance (currently representing 19 funding organizations/programs)

France
Institut National du Cancer (French National Cancer Institute) & research co-funded with Direction Générale de l'Offre des Soins (Ministry of Health)

Japan
National Cancer Center

Netherlands
KWF Kankerbestrijding (Dutch Cancer Society)

UK
National Cancer Research Institute* (representing 20 funding organizations)

Note: the founding partner organizations are marked with an asterisk (*) above. The NCRI was not in existence in 2000, but two of the founding partners of NCRI were represented in the original group. For more information, see **Appendix A**

The public site includes:

- Structured, up-to-date information about the cancer research portfolio for the wider research and cancer community
- Information about using the CSO and resources to enable this
- Membership information for interested organizations

The partner site includes:

- Secure access to full data, including project financing
- Enhanced analysis tools
- Document exchange and networking tools

Key benefits of the international portfolio

The ICRP's web site (www.icrpartnership.org) provides the foundation for contributing partners to analyze their own research portfolios in the context of the international dataset, use analyses to enhance research planning and scientific resource decisions and to coordinate research efforts across agencies at either a national or international level. Analyses and trends over time are intended only as a springboard for further detailed assessment of the 'health' of a research field and to identify research gaps that could benefit from additional effort and international co-ordination. This approach has been used by organizations and by national groups to map the landscape and to leverage additional targeted investment for research fields,[4] to overcome research barriers, or provide stimulus to the field.

There are many additional benefits to ICRP. Funding organizations, for example, can improve efficiency by sharing key information about research funding, management and evaluation, and identify possible scientific experts for review panels, workshops, and working groups. Patient advocates can use the information to identify research on specific areas of science (e.g., patient outcomes, end-of-life) and disease types. Scientists/grantees can glean information on contacts for multi-disciplinary and multi-institutional collaborations, and gather information about potential funding organizations as well as information that may be useful in formulating or refining their applications for research funding.

Future plans for ICRP

The ICRP database contains over 54,000[5] awards and is growing annually. Partner recruitment, leveraging and building upon its existing database, and looking for strategic opportunities for collaboration at the international level are the key activities of the Partnership.

4 *For examples, please refer to the following publications (CCRA: http://www.ccra-acrc.ca/PDF%20Files/Annual_2009_EN.pdf, NCRI: http://www.ncri.org.uk/includes/Publications/reports/ncri_prevention_and_risk_report_2004.pdf)*
5 *As of September 2012*

Research Investment 2005-2008

In this report, analyses are focused on research active in the calendar years 2005 to 2008.[6] This report is unique in that it presents analyses based on individual awards, coded to the CSO. Previous analyses of cancer research activity have been based on aggregated or estimated figures dating from 2004.[7]

The 2005-2008 timeframe was selected in part to allow trend analysis. In addition, although the database contains a wealth of information on current cancer research, and indeed information on awards that have yet to begin, due to different granting cycles, fiscal years, and data upload schedules, there is a short delay until the portfolio for the most recent calendar years is complete for all organizations.[8]

The ICRP plans to release updates to this report regularly for the benefit of the cancer community. Trend analyses will be updated and as new partners join their data will be included. In this report, the data of three current ICRP partners – the Dutch Cancer Society, the National Breast Cancer Foundation (Australia) and the National Cancer Center (Japan) – are not included. The Dutch Cancer Society's data begins with research funded in 2009 and will be included in future ICRP reports. The National Breast Cancer Foundation (Australia) and National Cancer Center (Japan) have recently joined ICRP and are preparing their data for inclusion in the online database.

It is important to note at the outset that figures may vary from what is published by individual partner organizations. This is to be expected given differences in reporting years, methodological/reporting conventions, and inclusion/exclusion criteria. Some data caveats are included in Appendix B and source documents from the partner organizations should be accessed for information related specifically to the scope of cancer research investment for those organizations. In addition, NCRI, NIH and CCRA provide data on behalf of a number of national member organizations or Institutes. Reports published by the NCRI, NIH and CCRA[9] provide detailed information about their respective member organizations, and should be consulted for the most comprehensive data regarding their regional research investments.

This section highlights key analyses which are based on the CSO and cancer disease sites typology. Further information on methodology is presented in the following section.

Trends in research investment by ICR Partners 2005-2008

Annual investment in cancer research was calculated for each organization over this time period. **Table 1** shows the number of awards (N) included for each partner organization and the annual investment in US dollars ($ USD).[10] It is notable that over the period in question, the overall investment has remained fairly static, as have the number of awards. Subsequent analyses focus on the calendar year 2008 – the most recent common analysis dataset – as a representative picture of cancer research funding. **Figure 3** (page 11), focusing on 2008, demonstrates that the investment picture also is dominated by the US National Institutes of Health. Please note that **figures 3** and **4** are organized by level of investment ($USD) and number of awards, respectively (lower investments are expanded in each figure for clarity). The US National Institutes of Health also has the highest number of awards (**Figure 4**).

6 *An award is defined as active if the research spans any or all of a given calendar year according to the start/end dates. Active does not refer to awards funded or agreed in that calendar year.*
7 *Eckhouse, S. et al. European Cancer Research Funding Survey. March 2005. European Cancer Research Managers Forum. London: ECRM Secretariat.*
8 *Partners are provided with data status reports monthly to give context to their analyses.*
9 *NCRI: http://www.ncri.org.uk/includes/Publications/reports/NCRI_NCRN_Decade_Web.pdf, CCRA: http://www.ccra-acrc.ca/PDF%20Files/Annual_2009_EN.pdf, NIH: report.nih.gov/biennialreport/*
10 *For information on currency conversion and exchange rates see the Methodology section.*

Table 1: Numbers of awards (N) and calendar year annual investment ($M USD)

PARTNER	2005		2006		2007		2008		2005-2008	
	N	$M	N	$M	N	$M	N	$M	N[1]	$M[2]
Canada										
Canadian Cancer Research Alliance	3,285	$216.4	3,610	$240.5	3,836	$258.5	3,978	$279.4	6,836	$994.8
France										
Institut National du Cancer[4] (including collaborative funding with Direction générale de l'offre de soins[3])	n/a	n/a	n/a	n/a	n/a	$0.0	127	$9.1	127	$9.1
United Kingdom										
National Cancer Research Institute	2,920	$603.0	3,388	$670.1	3,823	$849.4	3,952	$892.8	6,136	$3,015.4
United States										
American Cancer Society	858	$100.9	947	$106.0	1,012	$107.5	1,078	$120.6	1,784	$435.0
American Institute for Cancer Research	30	$1.6	72	$4.3	73	$4.0	49	$2.6	96	$12.5
Avon Foundation Breast Cancer Crusade[4]	n/a	n/a	35	$3.7	85	$16.1	77	$22.0	107	$41.8
California Breast Cancer Research Program	170	$12.6	171	$12.6	142	$9.6	120	$6.4	329	$41.2
Congressionally Directed Medical Research Program, DOD	2,655	$229.9	2,378	$214.8	2,030	$201.9	1,963	$198.8	4,130	$845.4
National Institutes of Health	10,440	$3,572.7	9,678	$3,353.4	8,868	$3,307.6	8,930	$3,255.3	14,438	$13,488.9
National Pancreas Foundation	11	$0.2	10	$0.1	11	$0.2	11	$0.2	24	$0.6
Oncology Nursing Society Foundation	57	$0.7	49	$0.4	38	$0.3	37	$0.5	97	$1.8
Pancreatic Cancer Action Network	9	$0.3	11	$0.3	20	$0.6	27	$0.9	37	$2.1
Susan G. Komen for the Cure®	564	$25.8	683	$39.5	777	$41.2	719	$50.2	1,129	$156.7
Total	**20,999**	**$4,764.1**	**21,032**	**$4,645.7**	**20,715**	**$4,796.9**	**21,068**	**$4,838.8**	**35,270**	**$19,045.3**

Table 1: Footnotes

[1] Total number of awards for the 2005–2008 period will be less than the sum of the number of awards for each of the four years as awards spanning multiple years are only counted once.

[2] $M represents millions of US Dollars

[3] A proportion of Institut National du Cancer (INCa) awards are co-funded with the French Ministry of Health (DGOS). The ICRP database includes these collaborative awards, but not other DGOS funding.

[4] Data reporting to ICRP for Avon Foundation Breast Cancer Crusade and Institut National du Cancer commenced in 2006 and 2008, respectively.

Figure 3: Investment by organization (2008)

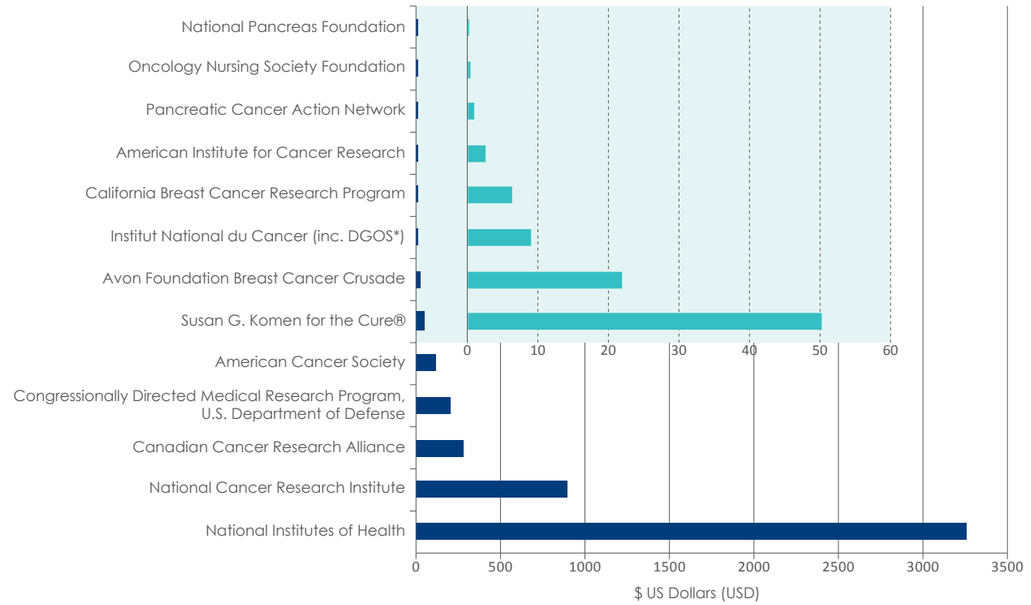
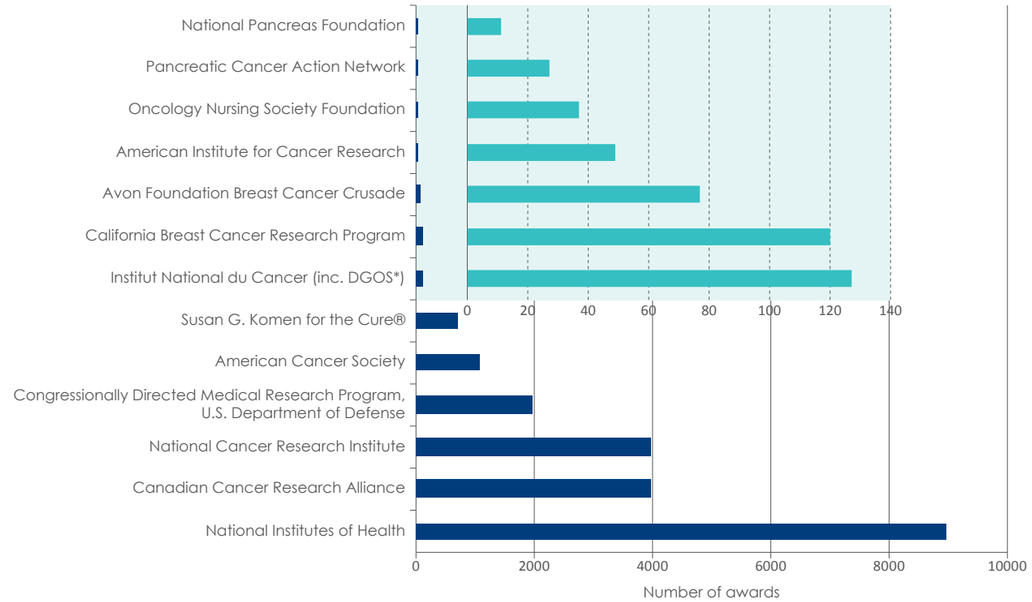


Figure 4: Numbers of awards (2008)



Investment by cancer sites/types

Figure 5 shows the percentage change in annualized investment by major types of cancer from 2005-2008 (percentage bars) and the annualized investment for 2008 in USD (blue line). Investment on breast cancer surpassed all other cancer sites, followed by prostate cancer, haematological malignancies (leukemia, lymphomas, myeloma), colorectal and lung cancers.

"Other specific sites" includes investment on over 50 different cancers such as bone, cervical and stomach cancers. For a full list of all cancer types recorded in the ICRP database please refer to https://www.icrpartnership.org/CancerTypeList.cfm. "Not site-specific" refers to research that is not yet applicable to a specific cancer type (e.g., basic research) or is equally applicable to all types (e.g., research into pain control for all cancers). In addition, it should be noted that this reflects the research focus of the current partnership and a number of those organizations focus on single cancer sites.

Figure 6 shows the distribution of the 2008 annualized investment by major types of cancer for each partner organization. Several organizations are single cancer site funders (e.g., Susan G. Komen for the Cure®, Avon Foundation Breast Cancer Crusade and California Breast Cancer Research Program are exclusively focused on breast cancer).

Figure 5: Annualized investment by cancer site 2005-2008

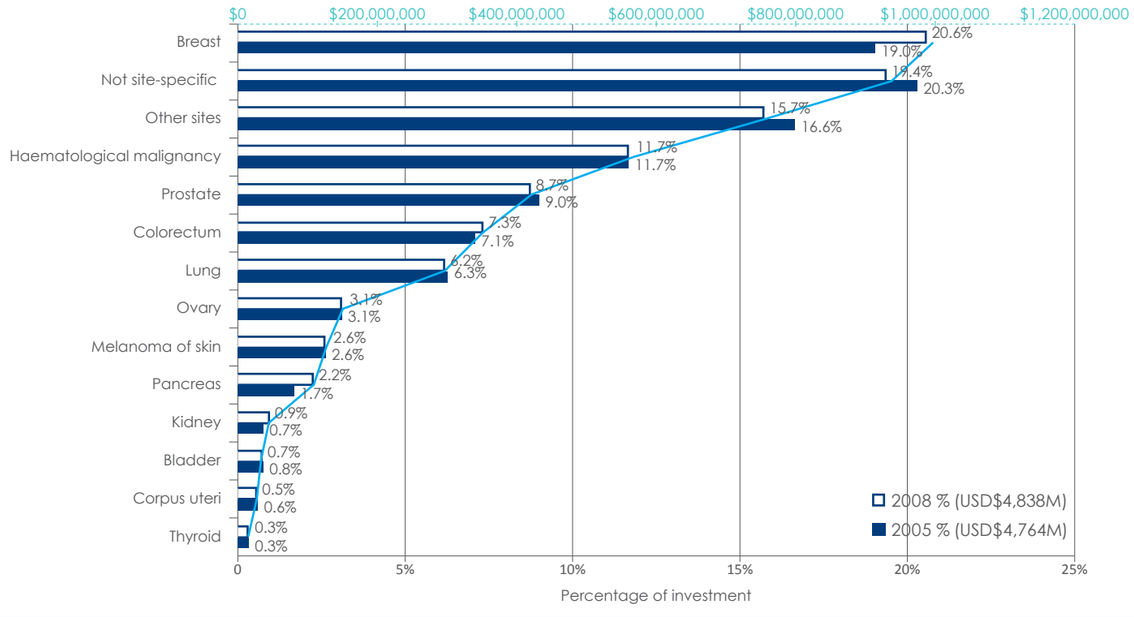


Figure 6: Percentage annualized investment by cancer site for each organization (2008)

	Bladder	Breast	Colorectum	Corpus uteri	Haematological malignancy	Kidney	Lung	Melanoma of skin	Ovary	Pancreas	Prostate	Thyroid	Other sites	Not site-specific
Canadian Cancer Research Alliance	0.4%	16.7%	3.7%	0.4%	9.8%	0.7%	4.5%	1.2%	1.9%	0.5%	4.6%	0.2%	12.4%	43.1%
Institut National du Cancer		14.8%	5.7%		23.1%	0.1%	9.5%	0.6%	0.1%		0.9%	0.3%	40.5%	4.4%
National Cancer Research Institute	0.7%	8.8%	4.9%	0.4%	9.7%	0.6%	2.1%	1.0%	2.5%	0.8%	3.0%	0.1%	8.1%	57.4%
American Cancer Society	0.8%	17.7%	9.4%	1.0%	10.5%	0.5%	6.3%	2.1%	2.6%	2.4%	6.7%	0.7%	15.0%	24.3%
American Institute for Cancer Research		31.3%	14.6%		1.6%		6.3%		3.6%		18.2%		13.9%	10.6%
Avon Foundation Breast Cancer Crusade		100.0%												
California Breast Cancer Research Program		100.0%												
Congressionally Directed Medical Research Program		60.9%			1.2%				4.4%		33.5%			
National Institutes of Health	0.8%	19.9%	8.8%	0.6%	13.4%	1.1%	8.0%	3.5%	3.4%	2.9%	9.4%	0.4%	19.3%	8.4%
National Pancreas Foundation										100.0%				
Oncology Nursing Society Foundation		47.8%	7.3%		1.5%		9.7%	0.2%	5.4%				2.1%	26.0%
Pancreatic Cancer Action Network										100.0%				
Susan G. Komen for the Cure®		100.0%												

Investment by CSO

Overall investment by major CSO category in 2008 for all partner organizations is given in **Figure 7** (blue line). The percentage change in annualized investment by CSO from 2005-2008 is also shown (percentage bars).

Individual graphs showing the distribution of 2008 annualized investment for each partner organization are provided in **Figure 8.1 – 8.12**, "Distribution of 2005 and 2008 annualized investment for partners by CSO categories". CSO categories are listed by number in the x-axis for legibility. These graphs reveal differences in the programmatic emphases of the different organizations.

Key to figures

CSO 1: Cancer biology
CSO 2: Etiology/causes of cancer
CSO 3: Prevention
CSO 4: Early detection, diagnosis & prognosis
CSO 5: Treatment
CSO 6: Cancer control, survivorship & outcomes
CSO 7: Scientific model systems

Figure 7: Investment in 2005 and 2008 by CSO category

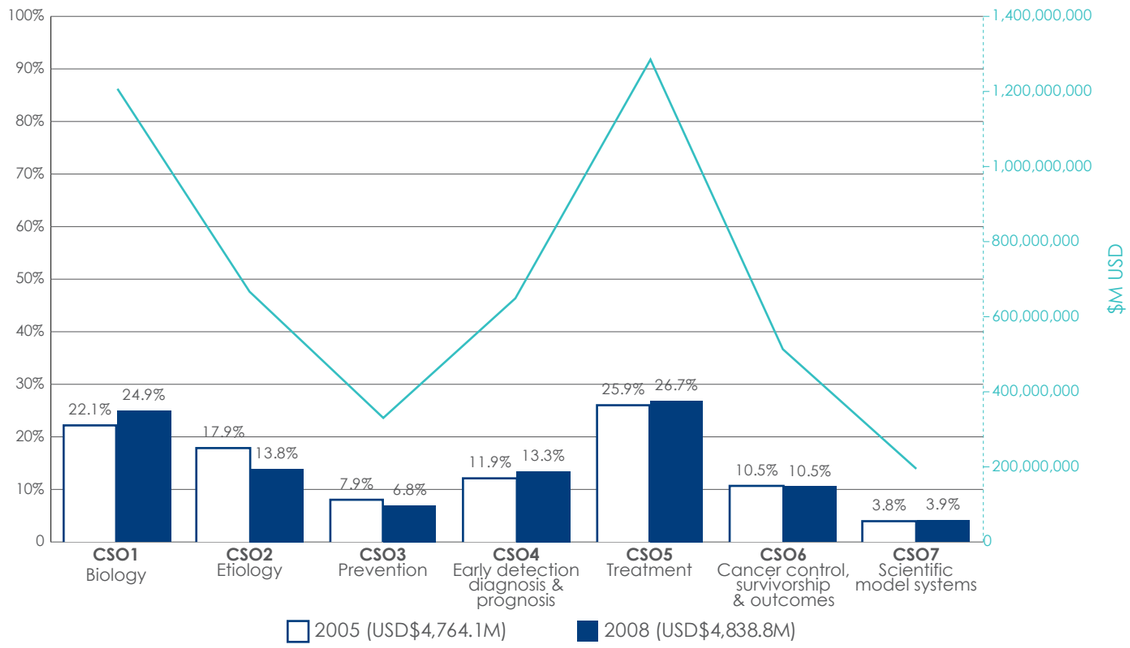
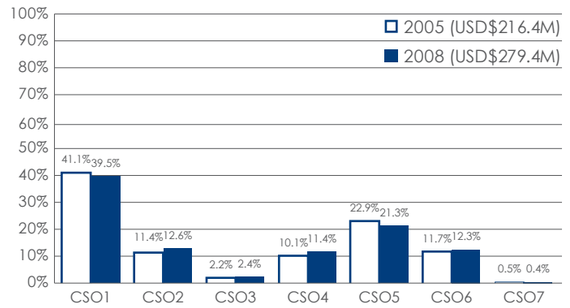
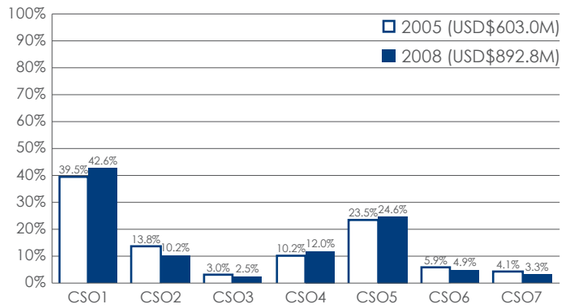


Figure 8: Distribution of 2005 and 2008 annualized investment for partners by CSO categories

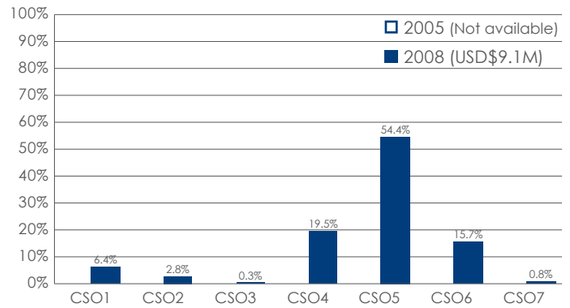
8.1 Canadian Cancer Research Alliance (Canada)



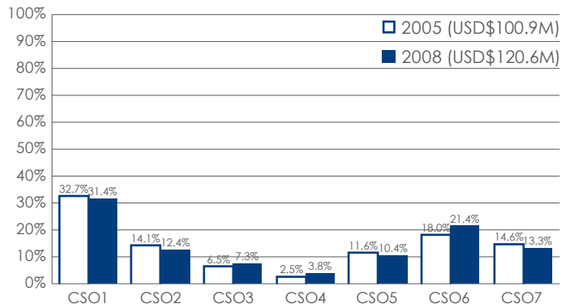
8.2 National Cancer Research Institute (UK)



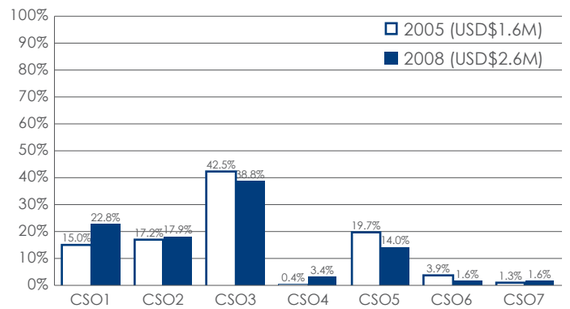
8.3 Institut National du Cancer (France) inc. DGOS*



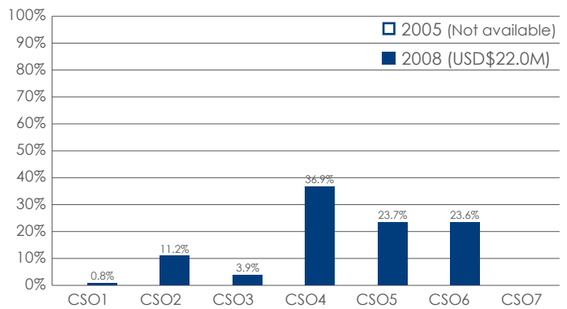
8.4 American Cancer Society (US)



8.5 American Institute for Cancer Research (US)

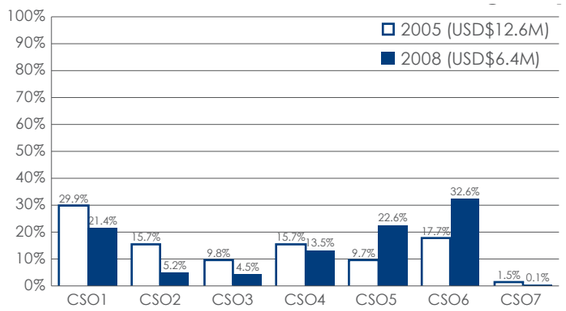


8.6 Avon Foundation Breast Cancer Crusade (US)

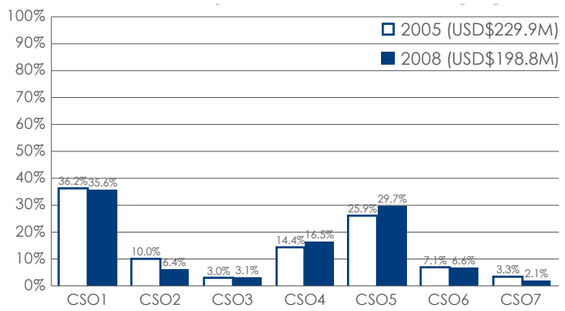


* awards co-funded with the Ministry of Health

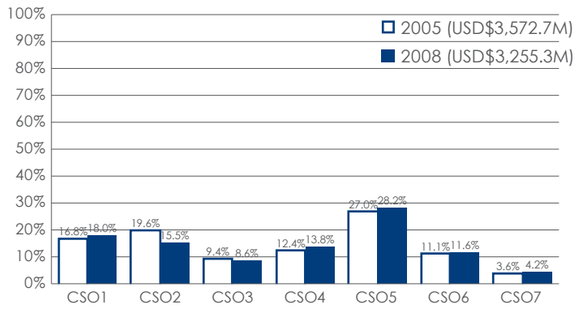
8.7 California Breast Cancer Research Program (US)



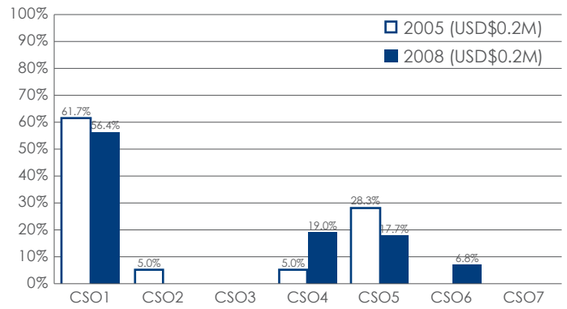
8.8 CDMRP, US Department of Defense (US)



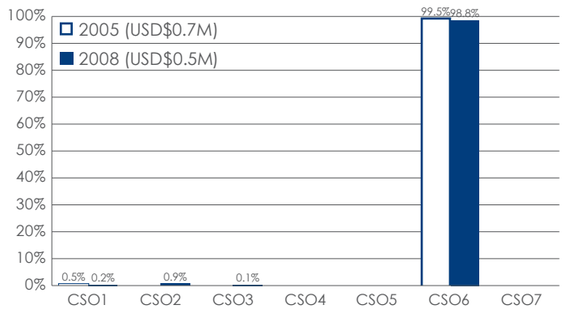
8.9 National Institutes of Health (US)



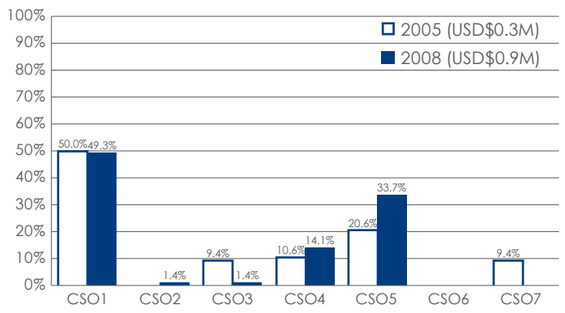
8.10 National Pancreas Foundation (US)



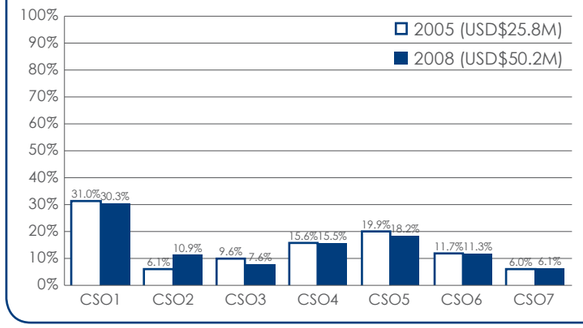
8.11 Oncology Nursing Society Foundation (US)



8.12 Pancreatic Cancer Action Network (US)



8.13 Susan G. Komen for the Cure© (US)



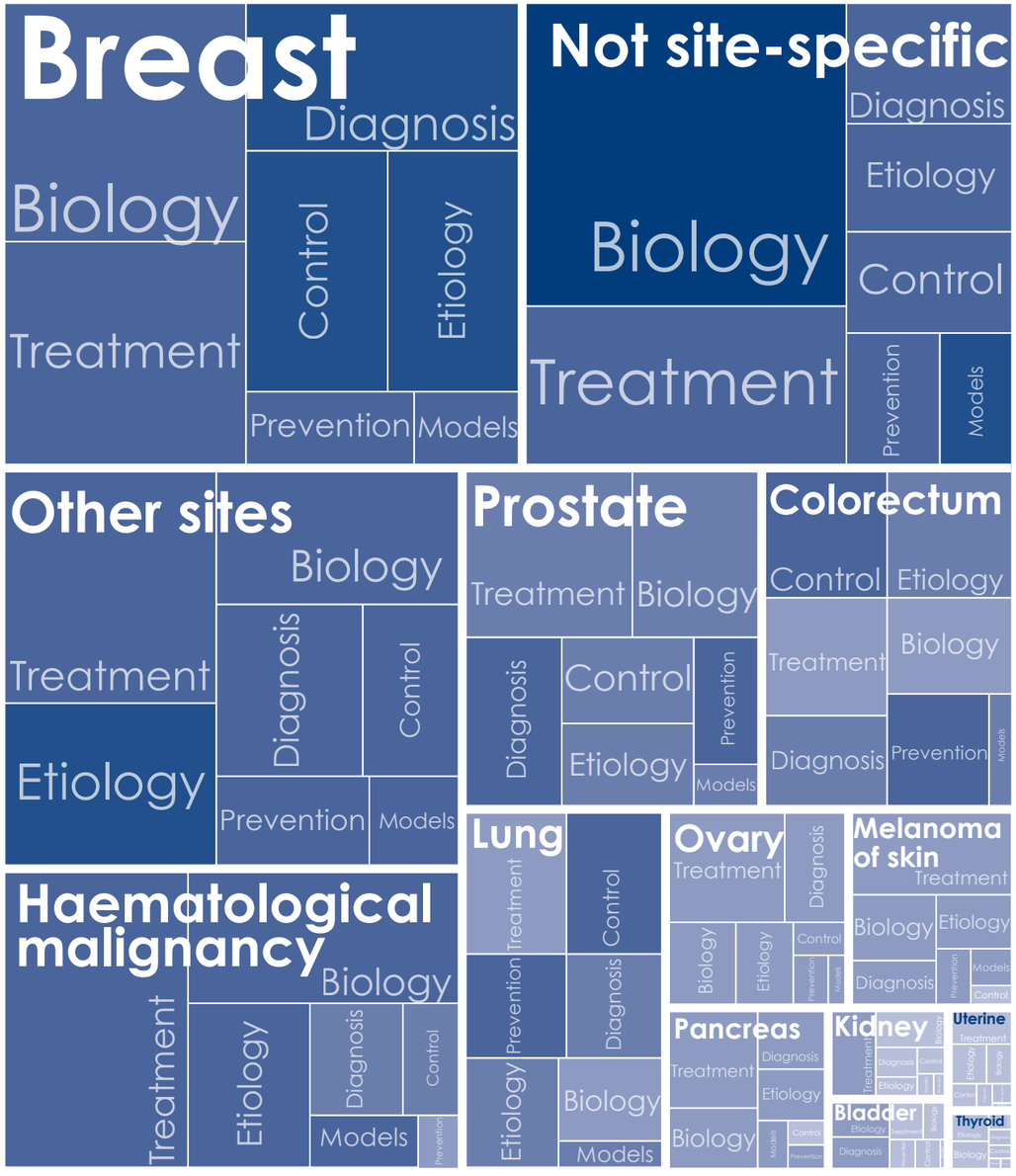
Investment by cancer sites/types and CSO categories

The ICRP database allows us to look at specific cancer types and the research profile of these cancers. This can be used as an indicator to help us understand relative strengths in cancer fields and also to understand potential barriers to research progress. The research profile of individual cancer types can be very different. **Table 2** and **Figure 9** offer alternative visualisations of how research investment is distributed across a few selected cancer sites (for more information see the Methodology section on page 21).

Table 2: CSO profile of high investment cancer sites (all partners) in the calendar year 2008
(Investment (USD $M))

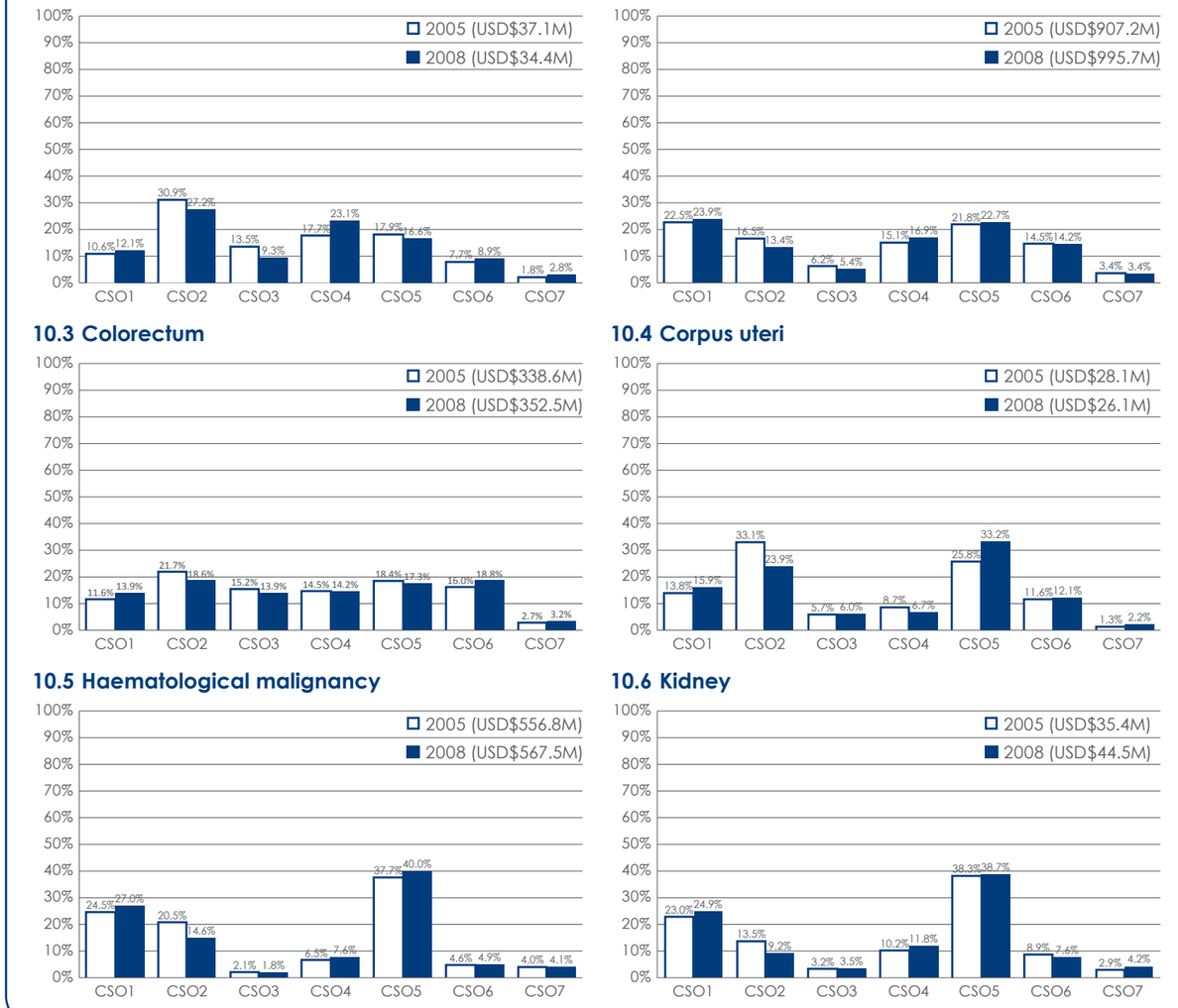
SITE	*CSO1* Biology	*CSO2* Etiology	*CSO3* Prevention	*CSO4* Early detection, diagnosis & prognosis	*CSO5* Treatment	*CSO6* Cancer control, survivorship & outcomes	*CSO7* Scientific model systems	2008 Total
Bladder	$4.2	$9.4	$3.2	$7.9	$5.7	$3.0	$1.0	$34.4
Breast	$238.4	$133.7	$53.3	$168.7	$226.1	$141.5	$33.8	$995.7
Colorectum	$49.1	$65.7	$49.1	$50.2	$60.9	$66.2	$11.2	$352.5
Corpus uteri	$4.2	$6.2	$1.6	$1.7	$8.7	$3.2	$.6	$26.1
Haematological malignancy	$153.2	$83.0	$10.4	$43.0	$227.0	$27.6	$23.4	$567.5
Kidney	$11.1	$4.1	$1.6	$5.3	$17.2	$3.4	$1.9	$44.5
Lung	$37.2	$42.7	$44.2	$43.3	$60.7	$59.4	$11.4	$298.7
Melanoma of skin	$22.7	$16.1	$8.5	$17.4	$53.3	$4.3	$6.0	$128.2
Ovary	$24.5	$20.2	$7.6	$31.6	$54.4	$8.1	$5.2	$151.7
Pancreas	$22.6	$15.2	$3.9	$18.0	$37.5	$4.1	$6.0	$107.4
Prostate	$90.3	$47.2	$35.8	$70.0	$117.7	$47.4	$12.3	$420.7
Thyroid	$4.9	$5.0	$.5	$1.5	$1.7	$1.3	$.6	$15.5
Other sites	$139.1	$144.4	$58.2	$104.1	$205.8	$70.9	$36.0	$758.5
Not site specific	$402.1	$74.5	$51.6	$82.7	$214.9	$69.7	$41.6	$937.2
TOTAL	**$1203.6**	**$667.5**	**$329.6**	**$645.4**	**$1291.7**	**$510.1**	**$190.9**	**$4838.8**

Figure 9: Investment by Cancer Sites and CSO Categories

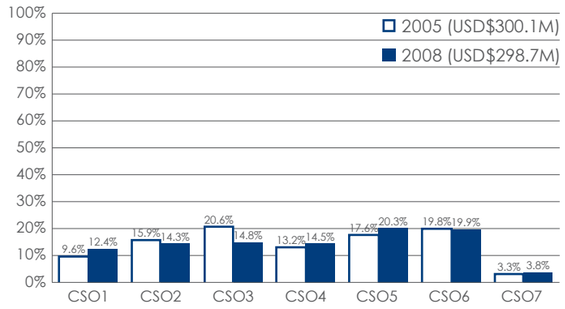


In **Figure 10**, charts of the distribution of the annualized investment in 2005 and 2008 across the CSO categories are shown for specific cancer types. The data presented here provide a baseline for future trend analyses.

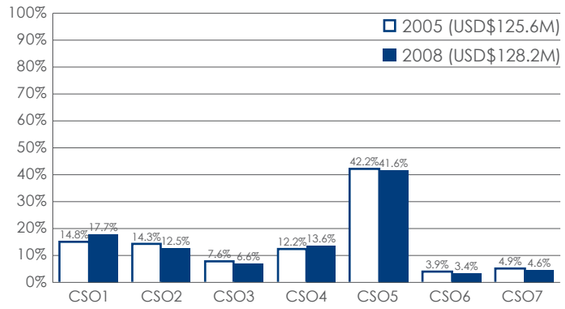
Figure 10: Distribution of annualized investment by CSO categories for selected cancer sites/types for all partners.



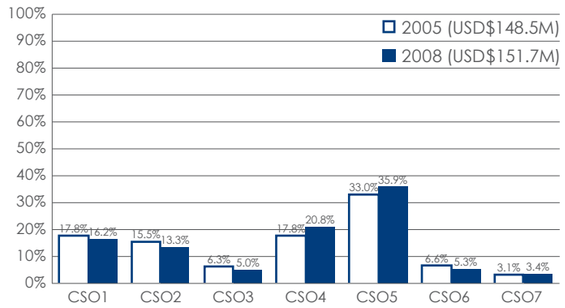
10.7 Lung



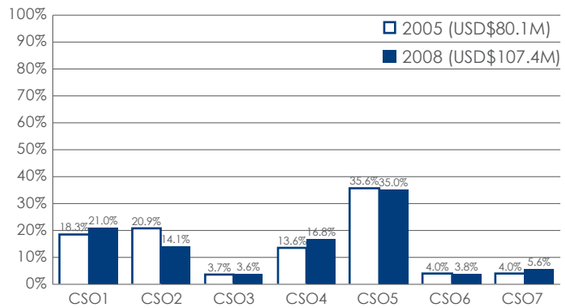
10.8 Melanoma of skin



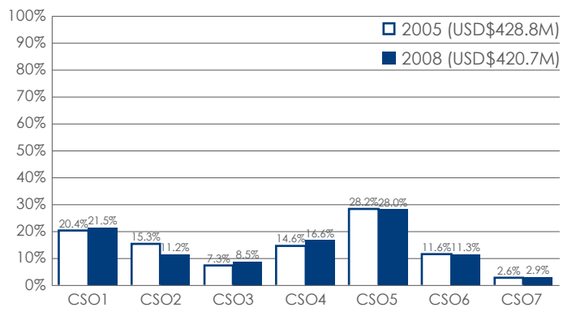
10.9 Ovary



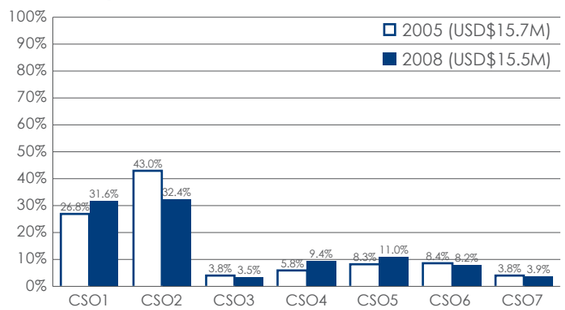
10.10 Pancreas



10.11 Prostate



10.12 Thyroid



Methodology

Inclusion/exclusion criteria

A number of exclusion criteria were applied. As the Dutch Cancer Society (KWF) portfolio was only fully submitted to ICRP from 2009 onwards, awards active at that point but starting in 2008 or earlier are excluded from this analysis. The Dutch Cancer Society's 2009 portfolio will be included in full in the next analysis. Awards without classification codes, with $0 investment – for example, no cost supplements, end dates of 1st January 2005 or where end dates preceded start dates were excluded from this analysis (n=3562; 10% of the total). Cleaning data that will impact on future analysis is a priority for the Partnership.

Partner organizations differ to some degree in terms of types of research and awards submitted to the database. NCRI, NIH and CCRA, for example, have some member organizations or Institutes that fund many types of medical/health-related research. Staff at NCRI, NIH and CCRA assess what should be included as cancer research, and in some instances, the award budgets may be weighted to estimate the percentage relevance to cancer research. Many other organizations within ICRP have a specific cancer research focus, and thus, they do not weight the award budgets. For these organizations, the full amount of the grant/award is attributed to cancer research.

Investment estimates

An annualized method was used to estimate the funds disbursed to new and continuing awards in the 2005-2008 calendar years and was adjusted to include only the proportion of awards relevant to a specific calendar year. For example, an award running for two years starting on 1st April 2005, ending on 31st March 2007 and awarded $12,000 per annum ($24,000 over the lifetime of the award) would be included in the portfolio as follows: 9 months in 2005 ($9,000), 12 months in 2006 ($12,000) and 3 months in 2007 ($3,000). This method overcomes variation due to the different methodologies used for reporting in partner organizations (e.g., awards made in a fiscal year, awards active by fiscal/financial year/calendar year).

Since partner organizations submit their data in different currencies, data were adjusted to a consistent currency (US dollars) using an average conversion rate over the calendar years ending 31 December 2005, 2006, 2007 and 2008. This approach was adopted to avoid trend analysis being confounded by variations in currency conversion rates. Figures have not been adjusted for inflation.

Award budgets with two or more cancer disease types or CSO codes had their budgets equally appropriated. There are some awards from the NCRI and CCRA portfolios, however, where different approaches to budget weightings were applied based on conventions determined by experts in the UK and Canada.

CSO coding consistency

While all partners use the CSO and a common list of disease sites, a variety of methods for coding and quality control are in use. Funders such as NCI and CDMRP employ teams dedicated to coding research awards. Some funders (i.e., NCRI, CCRA) use the same individuals to code the awards/grants from a broad range of organizations, ensuring a degree of consistency. Other funders rely at least in part on the principal investigators to code their own research proposals. For the majority of funders, all awards are coded independently at least twice. All partners have established mechanisms for reconciling discrepancies in the coding, whether through internal groups or by consultation with ICRP's Operations Manager.

Statistical analysis of inter-rater coding agreement (Cohen's Kappa analysis[10,11]) in 2011 show that agreement is in the Good – Very good range overall and encourages confidence in the quality of coding on the ICRP dataset (see **Appendix D** for details). A previous analysis of consistency of major CSO category coding practice was performed on a subset of 200 ICRP awards in 2007. The kappa value was calculated within the "fair-to-good" range, suggesting that coding quality has improved since that point.

While some of the differences in coding can be attributed to the fact that some partners use more information than what is presented in the online abstracts to make their classification decisions, areas of consistent disagreement have been, and will continue to be used for coding improvement (through training and guidance) and CSO improvement (e.g., by adding examples to reduce miscoding resulting from ambiguity).

Graphical conventions

Information about the portfolio has been presented in a number of different ways: through use of tables, charts and treemaps, to make the portfolio information presented here as accessible as possible. Treemapping is a method of area-based visualization that uses nested quadrangles to summarize large amounts of hierarchically organized data. With the use of both color and size dimensions, a treemap allows patterns to be easily discerned in a single image.

A data package will be published on the ICRP website in due course to accompany this report.

10 Landis, J.R.; & Koch, G.G. (1977). "The measurement of observer agreement for categorical data". Biometrics 33 (1): 159–174. DOI:10.2307/2529310. JSTOR 2529310. PMID 843571.

11 Cohen, J. (1968). "Weighed kappa: Nominal scale agreement with provision for scaled disagreement or partial credit". Psychological Bulletin 70 (4): 213–220. DOI:10.1037/h0026256

Future Directions

ICRP will update its analyses periodically and continue to add to and expand the international dataset. Recruitment is a strong focus for ICRP. ICRP hopes that additional countries will be joining the Partnership over the next few years, and will continue to work towards expanding the geographic boundaries of the Partnership. Mining the existing database and developing it into a more comprehensive resource are also part of the future directions for the partners. ICRP aims to enable all cancer research funders to develop their future research strategies with the benefit of detailed knowledge of the international context of their research programs.

In addition to being a forum for research funders to meet and share ideas on the business of funding research, the ICRP has already developed resource tools on program evaluation which can be accessed by partner organizations. Joint evaluations, guided by partner interests, have also been conducted. Examples include evaluating career development awards, surveying peer review strategies, analysis of chemoprevention, environmental influences on cancer and cancer site-specific analyses. ICRP will continue to expand these activities to share expertise and reduce duplication where possible.

Appendix A
Descriptions of ICR partners

Organizations in the following countries currently contribute data to the ICRP international portfolio. Two new partners - the National Breast Cancer Foundation, Australia (http://www.nbcf.org.au) and the National Cancer Center, Japan (http://www.ncc.go.jp/en/) - are in the process of preparing data for inclusion in the ICRP database.

CANADA – Data shown for the Canadian Cancer Research Alliance (CCRA) includes the following organizations: http://www.ccra-acrc.ca

- Alberta Cancer Foundation (ACF): http://albertacancer.ca /
- Alberta Innovates – Health Solutions (AIHS): http://www.aihealthsolutions.ca/
- Canadian Breast Cancer Foundation (CBCF): http://www.cbcf.org/
- Canadian Cancer Society (CCS): http://www.cancer.ca/
- Canadian Institutes of Health Research (CIHR): http://www.cihr-irsc.gc.ca/
- Canadian Partnership Against Cancer (CPAC): http://www.partnershipagainstcancer.ca/
- CancerCare Manitoba (CCMB): http://www.cancercare.mb.ca/
- Cancer Care Nova Scotia (CCNS): http://www.cancercare.ns.ca/
- Cancer Care Ontario (CCO): http://www.cancercare.on.ca/
- Cancer Research Society (CRS): http://www.src-crs.ca/en_CA
- Fondation du cancer du sein du Québec/Quebec Breast Cancer Foundation (QBCF): http://www.rubanrose.org/
- Fonds de recherche du Québec – Santé (FRQS): http://www.frsq.gouv.qc.ca/en/index.shtml
- Genome Canada (GC): http://www.genomecanada.ca/
- Michael Smith Foundation for Health Research (MSFHR): http://www.msfhr.org/
- National Research Council of Canada (NRC): http://www.nrc-cnrc.gc.ca/index.html
- Ontario Institute for Cancer Research (OICR): http://www.oicr.on.ca/
- Prostate Cancer Canada (PCC): http://www.prostatecancer.ca/
- Saskatchewan Cancer Agency (SCA): http://www.saskcancer.ca/
- The Terry Fox Foundation (TFF): http://www.terryfox.org/

Data from 3 multi-funded initiatives that have ceased operation (Canadian Breast Cancer Research Alliance, Canadian Prostate Cancer Research Initiative, Canadian Tobacco Control Research Initiative) are included in the ICRP data report

FRANCE
- French National Cancer Institute/ Institut National du Cancer (INCa), including joint funding with the Ministry of Health (DGOS): http://www.e-cancer.fr/

THE NETHERLANDS
- Dutch Cancer Society/KWF Kankerbestrijding (KWF)*: http://dcs.kwfkankerbestrijding.nl/about-us/Pages/default.aspx
  * KWF's data submission to ICRP began with awards current in 2009. Its data is therefore not included in this report.

UNITED KINGDOM
Member organizations of the National Cancer Research Institute (NCRI): http://www.ncri.org.uk/

- Association for International Cancer Research (AICR): http://www.aicr.org.uk/
- Biotechnology & Biological Sciences Research Council (BBSRC): http://www.bbsrc.ac.uk/
- Breakthrough Breast Cancer: http://www.breakthrough.org.uk/
- Breast Cancer Campaign: http://www.breastcancercampaign.org/
- Cancer Research UK: http://www.cancerresearchuk.org/
- Chief Scientist's Office, Scottish Government Health Directorates: http://www.cso.scot.nhs.uk/
- CHILDREN with CANCER UK: http://www.childrenwithcancer.org.uk/
- Department of Health: http://www.dh.gov.uk/en/index.htm
- Economic and Social Research Council (ESRC): http://www.esrc.ac.uk/
- Leukaemia and Lymphoma Research: http://leukaemialymphomaresearch.org.uk/
- Macmillan Cancer Support: http://www.macmillan.org.uk/home.aspx
- Marie Curie Cancer Care: http://www.mariecurie.org.uk/
- Medical Research Council (MRC): http://www.mrc.ac.uk/index.htm
- Northern Ireland Health & Social Care Research & Development Office: http://www.publichealth.hscni.net/
- Roy Castle Lung Cancer Foundation: http://www.roycastle.org/
- Tenovus The Cancer Charity: http://www.tenovus.com/
- Prostate Cancer UK: http://www.prostatecanceruk.org/
- Wellcome Trust: http://www.wellcome.ac.uk/
- Welsh Government – National Institute for Social Care and Health Research: http://www.wales.nhs.uk/sites3/home.cfm?orgid=952
- Yorkshire Cancer Research: http://www.yorkshirecancerresearch.org.uk/

UNITED STATES
- American Cancer Society (ACS): http://www.cancer.org/
- American Institute for Cancer Research (AICR): http://www.aicr.org/
- Avon Foundation for Women, Breast Cancer Crusade (AvonFDN): http://www.avonfoundation.org/
- California Breast Cancer Research Program (CBCRP): http://www.cbcrp.org/
- CDMRP, US Department of Defense: http://cdmrp.army.mil/
- National Institutes of Health (NIH), including the National Cancer Institute (NCI): http://www.cancer.gov/
- National Pancreas Foundation (NPF): http://www.pancreasfoundation.org/
- Oncology Nursing Society Foundation (ONSF): http://www.onsfoundation.org/
- Pancreatic Cancer Action Network (PanCan): http://www.pancan.org/
- Susan G. Komen for the Cure® (SGK): http://ww5.komen.org/

Please note that full descriptions of all partner organizations can be accessed via the web links above or by following the links on the ICR partners' page (https://www.icrpartnership.org/partners.cfm)

Appendix B
Data Caveats

Data caveats specific to this report are noted below.

ACS **American Cancer Society**. Dollar amounts and number of grants reported in the ICRP data report differ from what is reported in the American Cancer Society's annual research and training program reports or website. The American Cancer Society reports total dollar amounts awarded for new grants in a given fiscal year. The data included in the ICRP data report includes all grants that were active during a calendar year with annualized dollar amounts.

AICR **American Institute for Cancer Research**. For this report specifically, AICR's investment and number of awards for years 2005 and 2006 do not include some grants that started funding in 2003 and 2004 and continued through 2005 and 2006.

Avon **Avon Foundation for Women, Breast Cancer Crusade**. Avon Foundation started submitting data to ICRP in 2006. Grants with an award date in 2005 or earlier are not included in this report.

CCRA **Canadian Cancer Research Alliance**. Caveats/limitations of the Canadian Cancer Research Survey (CCRS) as documented in CCRA reports are applicable. The ICRP dataset is only a portion of the full CCRS data. Please consult the available publications at the CCRA web site: http://www.ccra-acrc.ca/aboutus_publications_en.htm.

CDMRP **Congressionally Directed Medical Research Programs, US Department of Defense**. CDMRP funding as depicted in this data report does not represent annual appropriations received by the respective CDMRP programs. The number of proposals newly funded each year for CDMRP programs is different from the active award counts represented in this analysis. For a complete accounting of annual funding and awards made by fiscal year by disease specific programs, please refer to the CDMRP website http://cdmrp.army.mil.

INCa **Institut National du Cancer/French National Cancer Institute**. INCa awards started in 2005 but data currently submitted to ICRP cover only 2008 and 2009. INCa submits data to ICRP on behalf of DGOS (Ministry of Health); In addition to its specific calls, INCa manages the yearly national cancer clinical research programme (PHRC) in coordination with DGOS, for which funds are provided by DGOS. The INCa grants are 2 to 4 year grants depending of the research programmes. Research projects are usually conducted by multiple research centres/units, the coordinator's name only is mentioned in the database. Some programmes are co-funded by INCa and cancer charities, or by INCa and DGOS, in this case, a specific note is added into the abstract of the project.

Komen **Susan G. Komen for the Cure®**. Dollar amounts found in the ICRP database and in the report are different than what is reported on Komen's website or in Komen's Annual Report for the following reasons:

(1) Komen commits all funds necessary to support a research grant in the year it is awarded. Therefore, Komen's website reports the full amount of each grant in its year of initiation, while the ICRP data is annualized, as described.

(2) Komen funds research grants to its Scientific Advisors (Scientific Advisory Board members and Komen Scholars) and also provides discretionary funding of research-related projects that are not traditional research grants (e.g. support of the Komen Tissue Bank, ASCO and AACR meeting support). These are included in the overall Research Program spending, as reported in Komen's Annual Report and on its website, but are not included in the ICRP database.

NIH **National Institutes of Health, including the National Cancer Institute**. Data included in the ICRP database includes that of NCI and relevant cancer-related data from the other Institutes and Centers of the National Institutes of Health. As the coordinator of the National Cancer Program, NCI represents the NIH on the ICRP. Starting in FY2007 NIH reports funding supplements, etc., for each grant separately instead of including them in the main project, therefore the number of projects may differ significantly from those of previous years. NIH dollars in the ICRP database may not match dollars from other NIH databases. "Research Management Services" are not included in the ICRP database. These include technical and administrative services, including central administration, overall program direction, grant and contract administration, human resources, program coordination, and financial management. NIH reports data by fiscal year. For the ICRP database, the figures are calculated to reflect the calendar year. Please note that due to exclusion of awards without CSO or site codes from this analysis, award numbers and overall values for NCI/NIH are lower than may be reported elsewhere for these years. Further details of inclusion/exclusion criteria can be found in the methodology section.

NCRI **National Cancer Research Institute.** NCRI submits data to ICRP on behalf of all UK NCRI members from its Cancer Research Database (CaRD). The database only includes entries where funding can be directly attributed to a set of clearly-defined research objectives. This means that the CaRD only contains information on direct research funding (e.g., project, programme, fellowship, unit or institute) financed by NCRI Members, for which an abstract has been submitted. Examples of funding that are currently outside the scope of CaRD are infrastructure, meeting grants and research management support. The NCRI CaRD contains projects which are active on 1 April of a given year, whereas the ICRP dataset includes all NCRI projects which are active within a given calendar year. ICRP data will therefore contain different project numbers/spend per year than are present in the corresponding CaRD for that year. For example, an award ending on 1 March 2010 will not be included in the 2010 CaRD, but will be included in the ICRP 2010 dataset.

ONSF **Oncology Nursing Society Foundation.** The ONS Foundation grants are two year grants – the entire amount of funding (two years) is reported in the year that the grant was awarded, thus these amounts will differ to the calendar year calculations in this report. Indirect costs of up to 10% are reflected in the ONS Foundation Major Grant funding totals.

PanCAN **Pancreatic Cancer Action Network**. Due to methodological differences, the funding levels reported in the ICRP database and in this report differ from the funding levels the Pancreatic Cancer Action Network presents on its websites and in Annual Reports. Since the Pancreatic Cancer Action Network commits all funds necessary to support a research grant in the year the grant is started, its website and Annual Report presents the full amount of each grant in its year of initiation. The ICRP data on the other hand, are based on an annualized calculation method as defined in this report.

Appendix C
Description of the CSO

The Common Scientific Outline or 'CSO' is a classification system organized into seven broad areas of scientific interest in cancer research and further divided into sub-categories:

CSO area:	1 - Biology	2 - Etiology	3 - Prevention	4 - Early detection, diagnosis and prognosis	5 - Treatment	6 - Cancer control, survivorship and outcomes	7 - Scientific model systems
1	Normal functioning	Exogenous Factors in the Origin and Cause of Cancer	Interventions to Prevent Cancer: Personal Behaviors That Affect Cancer Risk	Technology Development and/or Marker Discovery	Localized Therapies – Discovery and Development	Patient Care and Survivorship Issues	Development and Characterization of Model Systems
2	Cancer Initiation: Alterations in Chromosomes	Endogenous Factors in the Origin and Cause of Cancer	Nutritional Science in Cancer Prevention	Technology and/or Marker Evaluation With Respect to Fundamental Parameters of Method	Localized Therapies: Clinical Applications	Surveillance	Application of Model Systems
3	Cancer Initiation: Oncogenes and Tumor Suppressor Genes	Interactions of Genes and/ or Genetic Polymorphisms with Exogenous and/or Endogenous Factors	Chemoprevention	Technology and/ or Marker Testing in a Clinical Setting	Systemic Therapies: Discovery and Development	Behavior	Resources and Infrastructure Related to Scientific Model Systems
4	Cancer Progression and Metastasis	Resources and Infrastructure Related to Etiology	Vaccines	Resources and Infrastructure Related to Detection, Diagnosis, or Prognosis	Systemic Therapies: Clinical Applications	Cost Analyses and Health Care Delivery	--
5	Resources and Infrastructure Related to Biology	--	Complementary and Alternative Prevention Approaches	--	Combinations of Localized and Systemic Therapies	Education and Communication	--
6	--	--	Resources and Infrastructure Related to Prevention	--	Complementary and Alternative Treatment Approaches	End-of-Life Care	--
7	--	--	--	--	Resources and Infrastructure Related to Treatment and the Prevention of Recurrence	Ethics and Confidentiality in Cancer Research	--
8	--	--	--	--	--	Complementary and Alternative Approaches for Supportive Care of Patients and Survivors	--
9	--	--	--	--	--	Resources and Infrastructure Related to Cancer Control, Survivorship, and Outcomes Research	-

Subcategory

The CSO is complemented by a standard cancer type coding scheme. Full details of the system can be found at https://www.icrpartnership.org/CSO.cfm.

Appendix D
CSO Coding Consistency

Following advice from statistical experts, a subset of 2500 awards coded to a single CSO from 2005-2008 was selected for analysis of coding consistency. This represents over 10% of the average annual dataset. As far as possible, the awards numbers for inclusion in the sample set were based on the percentage distribution of awards by organization and by CSO code. In some cases percentages were adjusted, for example if the percentage resulted in fractions of awards.

This sample set was split between six different coders to blind code. None of the individuals received awards originating from their own organization, to avoid bias. The results were analyzed for;
(a) Percent agreement at the minor and major CSO levels between the initial ICRP codes and the second codes.
(b) Inter-rater reliability (Cohen's unweighted Kappa on nominal data, all disagreements considered to be total disagreements). The inter-coder reliability coefficient ("kappa") is a statistical value calculated by comparing the major CSO categories of a re-evaluated test set of ICRP awards to the major CSO categories assigned to those awards by the originating partner.

2487 awards were included in final analysis (13 awards were excluded as they were considered to be impossible to code by the verification coders). Of the final set, 34 awards were included where the second coder had applied 2 awards. If one of those codes was identical to the original code this was considered to be a match (i.e., 100% recall).

Results were analyzed at the major CSO category level (CSO 1 – Biology, CSO 2 – Etiology etc.) and at the minor CSO level (CSO subcategories, CSO 1.1, 1.2 etc.).

These results show that coding agreement is in the Good – Very good range overall and encourage confidence in the quality of coding on the ICRP dataset. A previous analysis of consistency of major CSO category coding practice was performed on a subset of 200 ICRP awards in 2007. The kappa value was calculated within the "fair-to-good" range, suggesting that coding quality has improved since that point.

Table 5(a): Agreement between ICRP and second coders at the Major CSO level

METHOD	Coeff.	StdErr	95% C.I.
Cohen's Kappa	0.817	0.009	0.799 to 0.835
Percent agreement	0.859	0.007	0.846 to 0.873

RESULT: Major CSO agreement in "Very good" range

Table 5(b) – Agreement between ICRP and second coders at the Minor CSO level

METHOD	Coeff.	StdErr	95% C.I.
Cohen's Kappa	0.620	0.010	0.600 to 0.640
Percent agreement	0.649	0.010	0.630 to 0.668

RESULT: Minor CSO agreement in "Good" range

Key

Value of K (Cohen's)	Strength of agreement*
< 0.20	Poor
0.21 - 0.40	Fair
0.41 - 0.60	Moderate
0.61 - 0.80	Good
0.81 - 1.00	Very good

Note: Coefficient considered to be precise if standard error is 1-2% of coefficient.

*Landis,J.R & Kocj, G.G (1977)
"The measurement of observer agreement for categorical data."
Biometrics 33(1):159-174, doi=10.2307/25293i0

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