Volume 13, Number 1, 2015

WHO Family of International Classifications (FIC)

NEWSLETTER

2015 WHO-FIC Annual Network Meeting

Interoperability: Meaningful Exchange of Health Information

The 2015 Annual Meeting of the WHO Family of International Classification (WHO-FIC) Network will be held in Manchester, United Kingdom, from 17 to 23 October 2015. The meeting venue will be at the Palace Hotel in Manchester.

The WHO-FIC network is an international collaboration that aims to promote the appropriate selection of classifications in the range of settings in the health field across the world. The primary mandate of the Collaborating Centres for the WHO Family of International Classifications (WHO-FIC) is to support and promote the development and use of WHO classifications, such as ICD (the International Classification of Diseases) and ICF (the International Classification of Functioning and Disability) in support of health and health services.

Hosted by the Health and Social Care Information Centre, the Manchester meeting will consist of two events under the theme: "Interoperability: Meaningful Exchange of Health Information".

- The WHO-FIC **Committee and Reference Group sessions** from 17 to 21 October 2015. These sessions provide the framework for intensive face-to-face meetings of each of the WHO-FIC committees and reference groups; a conference component, which provides the opportunity to share experiences related to the conference theme; and for the WHO-FIC Network Advisory Council to meet to review progress in relation to the strategic work plan of the WHO-FIC network and plan for the future (*participation is by invitation only*).
- An **Open Meeting** on the Family International Classification as well as the storage, retrieval, analysis, and interpretation of data held from 22 to 23 October 2015. The Open Meeting will be a good opportunity for all those professionals interested in the conference theme to attend plenary sessions with key international speakers and to share knowledge and experiences on the WHO Family of International Classifications, as well as the to provide participants with the opportunity to discuss the theme of the conference, share knowledge and experience and present posters.

For more information: http://www.hscic.gov.uk/whofic2015uk

WHO-FIC NETWORK
ANNUAL MEETING
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WHO Collaborating Centre
for the FIC
in The Netherlands

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For receiving forthcoming issues of the WHO-FIC newsletter, please send an empty e-mail with "WHO-FIC Newsletter" in the subject line to: who-fic.newsletter@rivm.nl

Editorial

In this issue we publish contributions from Colombia, Finland, Germany, Canada, the US, and the Netherlands. A true international cooperative product! In the rubric 'FIC around the world' we have articles about reorganizing vital statistics registration in Colombia, the use of ICF in a system of rehabilitation assessment from Finland, the German initiative to use ICF as a standard for reporting about functioning, research contributions about ICF-based correlates of perceived quality of life from Canada, the impact of weather conditions on participation from the US, and the effect of transition to automated coding of causes of death on mortality statistics from the Netherlands. Other contributions report about progress on developing a mobile ICF application (mICF) and about progress in harmonizing disability statistics (Washington Group).

Regarding some other members of the family (e.g. ICHI) we unfortunately do not have enough substantial information for the time being. As always, the last pages are filled with ICF literature references from our ICF literature database.

Many of the topics in the newsletter at hand have been picked up during the annual meeting of the WHO-FIC Network in October 2014 in Barcelona. And I am confident that the 2015 Network meeting will produce a lot of new potential items regarding the family (FIC) and we will be happy to report on them for you in the next issue of this newsletter. In the meantime, please share your thoughts and experiences on using WHO classifications with us, and send us your contributions! Please also feel free to send us your feedback on Newsletter articles should you feel compelled to do so.

Enjoy reading and let us know your WHO-FIC news!

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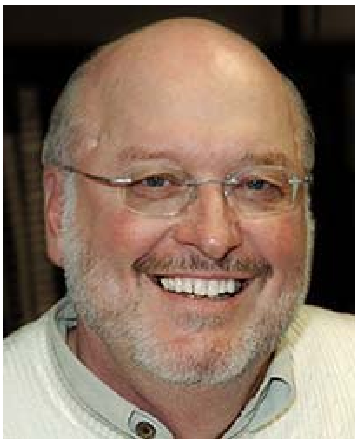
Latest News

An **external review of the ICD-11** Revision has been completed. This external report was commissioned by WHO in 2014, and provides the framework for moving into Phase II of the Revision process. The report notes the progress in the ICD Revision, and makes clear recommendations about forward progress in the revision. The full report can be downloaded from: http://www.who.int/classifications/icd/externalreview. WHO welcomes the constructive messages of the report of the ICD-11 Revision review. In WHO's response to the review it has taken taking immediate action to progress the JLMMS (joint linearization for mortality and morbidity statistics), as advised in the report. In addition, the project and communication plan will be revised. These are expected to be ready in June 2015. WHO's full response can be downloaded from: http://www.who.int/classifications/icd/externalreview.



In memoriam: David Gray. Professor of occupational therapy and neurology David B. Gray, age 71, passed away Thursday, Feb.12, 2015, in St. Louis, Missouri, USA. He contributed greatly to advancement of ICIDH to ICF. He was a great support to the North American Collaborating Centre.

David Gray worked tirelessly to improve the lives of people with disabilities; a scientist who relentlessly campaigned the right of people with disabilities to live independent, satisfying lives. He was on a mission to build a more accessible environment to help ensure that others would face fewer obstacles than he had.

All who had the pleasure and privilege to know him, both on a professional and on a personal level, will sorely miss him.

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Mobile Application for the International Classification of Functioning, Disability and Health (mICF)

Universal health coverage, promoted by the World Health Organization (WHO), aims at re-engineering primary health care with emphasis on community-based, person-centered care.[1] Mobile phone based applications are increasingly used in both developed and developing countries to collect health information and facilitate decision-making, however, no app is capturing functioning data. The International Classification of Functioning, Disability and Health (ICF), an information structure and common language across professionals, can be used to describe the lived experience of a person's real life situation. An international collaborative of the Functioning and Disability Reference Group of the WHO's Family of International Classifications Network and many others was established to investigate the development for a mobile application for the ICF (mICF).

Survey results
A global online survey for social and health care specialists was conducted June-December 2014 in 40 countries to assess needs requirements to develop a mICF to collect patient-centered data for clinical decision-making. Nearly all respondents want to use electronic devices for collecting and reporting health data. Most benefits are seen in improving patient care through better supported clinical reasoning, decision-making about interventions, and in monitoring functioning health over time.

App functionalities
It is envisaged that a mICF app will:
1) empower users and providers of health and related services;
2) facilitate universal health coverage;
3) enable continuity of care;
4) ensure accurate and efficient capture of functioning status and interactions between ICF components to facilitate understanding of the complexity of interactions between health and contextual factors;
5) facilitate clinical decision-making and goal-setting by making person-centered data readily available;
6) convey information securely;
7) enable amalgamation of data to help strengthen the health systems.

Upcoming event
There are 254 partners from 38 countries who signed up to collaborate in developing the mICF. To sign up as partner, please do so at: http://tiny.cc/micfpartner. Between June 2-4 the international mICF collaborative will have a workshop in Helsinki, Finland to further the work on mICF.

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1 Snyman S, Kraus de Camargo O, Welch Saleeby P, Paltamaa J, Anttila H. Mobile application for the International Classification of Functioning, Disability and Health (mICF). (p49). In: EFRR2015 Conference program and abstract book. Helsinki, Finland. ISBN: 978-952-93-5548-8

International Organizations

Washington Group on Disability Statistics

Report of the Washington Group (WG) on Disability Statistics: Summary of the 14th Annual Meeting (Buenos Aires)

Previous contributions from the WG to the WHO-FIC Newsletter are available in the 2013-2 (page 3 and 4) and 2011-2 (page 5-8) issues.

The Washington Group has held 14 annual meetings since its inception: (1) 2002, Washington, D.C., USA; (2) 2003, Ottawa, Canada; (3) 2004, Brussels, Belgium; (4) 2004, Bangkok, Thailand; (5) 2005, Rio de Janeiro, Brazil; (6) 2006, Kampala, Uganda; (7) 2007, Dublin, Ireland; (8) 2008, Manila, Philippines; (9) 2009, Dar es Salaam, United Republic of Tanzania; (10) 2010, Luxembourg; (11) 2011, Southampton Parish, Bermuda; (12) 2012, Bangkok, Thailand; (13) 2013, Amman, Jordan; and (14) 2014 Buenos Aires, Argentina. Annual meetings are rotated through major geographic regions to facilitate participation, especially by low resource countries.

Fostering international collaboration
The Washington Group has sought to foster international collaboration and, in particular, to ensure that the efforts of the group are broad-based and include voices from every region of the world. Therefore, representatives of national statistical authorities, disabled people's organizations and international organizations participate in the Washington Group. Currently, representatives of the national statistical offices of 119 countries and territories, 7 international organizations, 6 organizations that represent persons with disabilities, the Statistics Division of the Department of Economic and Social Affairs and other United Nations system entities are members of the Washington Group.

From 2008 to 2014, the Washington Group has participated in or facilitated several training workshops that have introduced Washington Group products and helped build capacity locally and nationally in understanding and measuring disability for censuses and surveys.

Overview of the Fourteenth meeting
The 14th meeting of the WG was held 8-10 October 2014 in Buenos Aires, Argentina. Highlights from the meeting are presented below:

Use of the WG Short Set
The WG routinely monitors the collection of disability data internationally, and annually requests detailed information from representatives from National Statistical Offices covering survey periodicity, sample size and frame, mode of

data collection, language(s) used, exact question wording along with response options and prevalence estimates.

Data were received from 51 countries: Twenty-six countries reported census results and 25 countries reported survey results. Some countries reported census or survey data that pre-date the 2006 adoption of the WG short set of questions; and there was a clear distinction between countries that took a more medical-model approach to identifying disability on their census or survey (i.e. by listing impairments or types of disability) and those that operationalized a social-model approach (by addressing activity limitations).

Although countries have reported disparate disability prevalence rates; with few exceptions, those that use the WG as intended (Israel [census/2008]; Aruba [census/2010]; Zambia [survey/2006]; Maldives [survey/2009] and USA [survey/2010-13] have reported disability prevalence rates that are comparable: 6.4%, 6.9%, 8.5%, 9.6% and for the USA 8.9%, 8.5%, 7.9% and 9.5% respectively. Israel, Aruba and Zambia included all ages in their census/survey, while Maldives included only those 5 years of age and older and the USA included those 18 years of age or older. This may have resulted in a slightly higher reported prevalence rates for Maldives and USA. Further analyses of these data are pending and a paper based on these findings will be published in 2015.

The following milestones were presented with respect to the further endorsement of the WG short set of questions:
- At a meeting in Paris in July 2014, a UN Expert Meeting endorsed WG questions as a means for disaggregating disability data for the post-2015 Sustainable Development goals.
- DFID (Department for International Development/UK) has recommended the WG short set for all programs and projects that include disability as a measurement or demographic.
- DFAT (Australian Government Department of Foreign Affairs and Trade) is working with the WG to build capacity to implement the questions in censuses and surveys and to facilitate the analysis and dissemination of the resulting data.
- UNSD and UN Economic Commission for Europe (ECE)/Conference of European Statisticians (CES) have recommended the WG short set of questions for the 2020 round of censuses.
- US AID will prepare a disability module for their Demographic and Health Surveys that will include the WG short set of questions.

WG Extended Set on Functioning
The extended set of disability questions on functioning (ES-F) were added to the US National Health Interview Survey (NHIS) beginning in 2010. During the past year, analyses of individual domains were finalized using 2010 and 2011 NHIS data. Algorithms for combining multiple domain questions into single domain indicators of disability and developing standards for determination of cut-points were presented. All analyses will be compiled and presented in a document describing the properties of individual domains of functioning.

Methodological Issues Concerning Surveys
The workgroup on the development of an extended set for measuring disability among children and youth (ES-C) presented the work accomplished in the previous year as part of its collaboration with the United Nations Children's Fund (UNICEF). Presentations were provided on the development of the module including past and recent developments and the results of the cognitive testing carried out in Oman, Belize, India, Montenegro and the USA. A revised version of the Module on Child Functioning and Disability based on the cognitive testing results was discussed. The revised module will be field tested in 2015. A release of the final version of the Module is planned for the 46th Session of the Statistical Commission in March 2015.

Recent work on measuring facilitators and barriers to school participation was also presented and a survey module will be developed in 2015 for cognitive and field testing. Results are anticipated for the 2015 meeting of the WG in October.

New initiatives
The WG continues to explore how issues related to mental health could be incorporated into its work plan; and the use of data registers in the compilation of disability statistics using WG approaches to disability measurement.

Plans for the Fifteenth meeting
The 15th meeting is scheduled to take place in Copenhagen, Denmark; 27-29 October, 2015.

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FIC around the World

Colombia

Automation of Vital Statistics in Colombia 2008-2014

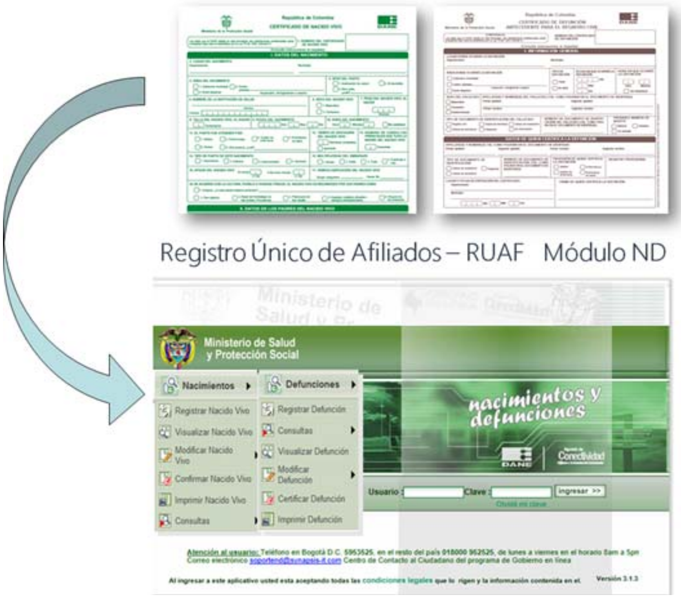
In Colombia, the Civil Registration System and Vital Statistics (SRCEV) consists of two subsystems: the Civil Registration that is in charge of the National Registry of the Civil State (RNEC), and the Vital Statistics in charge of the Ministry of Health and Social Protection (MSPS); the National Institute of Legal Medicine (INML) and the National Administrative Department of Statistics (DANE).

From 1998, because of laws, the networks of public and private health service providers under the direction of the Ministry of Health and Social Protection, are in charge of the medical certification of births and deaths. Doctors certify over 95% of the births and deaths that happen in the country; they use standardized formats as a requirement for the Civil Registration of vital events; while less than 2% are registered under a token base.

Modernization

In 2008, a technological modernization process was initiated in order to find a way to improve 1) opportunity, quality and coverage of vital statistics with the automated online registration, 2) and the acceleration of reviews and feedback processes. Nowadays, the system consolidates the transition of medical certification in physical forms to electronic forms in an administrative health record environment that uses the RUAF-ND web-based application (figure 1). It allows system interoperability - linking to related records - in order to simplify procedures for the citizens and optimize the exchange of information processes among government agencies involved in the management of Vital Statistics.

Figure 1: Migration from paper forms to a records web application



Methods and materials

The modernization process of the technological platform for data capture and management of vital events started with the development and implementation of the ND module (Nacimientos y Defunciones [Births & Deaths]) into the Unique Registry of Affiliates (RUAF-ND). These technological developments, testing and gradual implementation of the RUAF-ND application and the induction, training and technical assistance to most departmental and district territorial entities was carried out between 2008-2010. The implementation of the electronic platform web environment was managed by the Ministry of Health, and allows registering the births and deaths in a synchronous way by capturing the information of the vital events certificates online since 2009. Contrary to expectations, the web system had very good acceptance by users, and its use was implemented ahead of schedule.

Real time data capture

The data capture in real time or deferred to a short-term is executed by doctors and other authorized personnel; while the vital statisticians and epidemiologists of Health Services perform processes of pre-review and statistical amendment, when appropriate to correct information. People that are involved in the administration of this kind of data have the primary function of quality control of the recorded data, where the Ministry of Health is in charge of the definition of its standards and the National Administrative Department of Statistics (DANE) is in charge of the data integrity evaluation for the final production and public diffusion of Strategic Statistics.

In the years 2011-2014 computer maintenance and routine review of the ND database was performed in order to verify completeness, consistency and timeliness of data based on pre-established criteria for quality control. Likewise, developments in the data exploration and mining of vital statistics cube-based information, design and development of virtual courses for doctors on the certification of vital events are advanced applications.

Automated coding of causes of death

Simultaneous with implementing automated registration, in 2009 the Mortality Medical Data System was implemented (MMDS for its acronym in English) for automated coding of causes of death. In Colombia, the coding of cause of death is an operation performed by the Coding Central Office Team of the National Administrative Department of Statistics - DANE -, using the 2008 version in Spanish of MMDS system, which is adapted and shared by INEGI of Mexico. Once the certificates have been compiled, reviewed and checked for critical data quality, DANE core team applies the MMDS, then obtaining automated codes for more than 75% of the diagnoses recorded around an annual average of 230,000 deaths. From the beginning of this process until the publication of final mortality data, it takes between 12 and 18 months.

Decentralization

In 2014, decentralized use of MMDS system was proposed as a strategy for improving the timeliness and quality of the data. Also it was considered good practice for vital statisticians, epidemiologists and medical examiners, to facilitate review and quality control of death certificates in real time, through routine review of bug reports generated by the MMDS: archives.MRJ (terms that could not code), archives.SER (description of terms that could not code) and archives.LOT (results of automated coding). In that way each Regional Directorate of Health is able to monitor and oversee aspects of quality in medical certification; and able to act as soon as errors are detected (e.g., geographic and institutional differences, poor quality information).

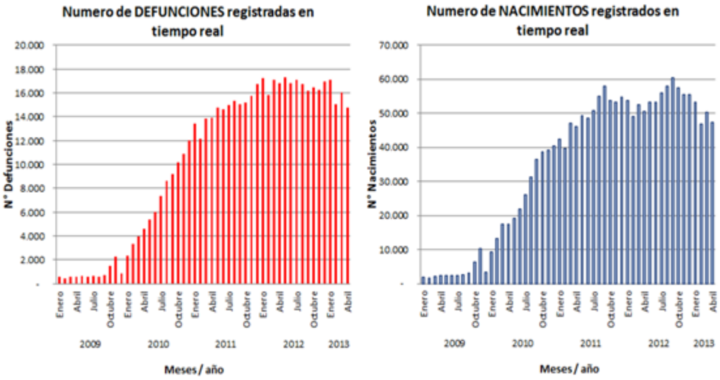
Autopsy reports information in RUAF-ND
Furthermore, to address gaps in coverage and timing of deaths from external causes certified by Legal Medicine, a model of data exchange between the Information System Network of Missing and Dead Bodies (SIRDEC for its acronym in Spanish) of the Legal Medicine Institute, and the RUAF-ND system was designed and implemented. This allows migrating data from autopsy reports to the RUAF-ND automatically and daily through a web service.

Finally, as an optimal way of using information of Vital Statistics, in the last year the integration of RUAF-ND as a primary source for demographic and epidemiological surveillance of maternal mortality has been promoted, based on active, intentional and routine search of possible maternal deaths in all the records of deaths of women of childbearing age, between 10 and 54 years. After identifying confirmed and doubtful cases of maternal death, in accordance with the definitions of ICD-10, operators of surveillance proceed with the verification, confirmation and completion of each story, by actively seeking information on health care records, interviewing family and verbal autopsies, gathering medical and non-medical data. Later, it is proceeded to RUAF-ND feedback with the return of complete and verified data in the surveillance cycle. During the last quarter of 2014 this strategy has been spreading out nationwide with the intention to extend it to the monitoring of perinatal mortality, mortality in Children and other premature and avoidable mortality.

Results of modernization process
Today, the medical certification of births and deaths in Colombia has made significant progress in its modernization process, most notably in:

1. Proportional increase of vital events captured by the health system and registered in the RUAF-ND module, when compared with the data of concluding Vital Statistics published by DANE, show a higher level of coverage in 2013 to 90% in most departments. Among the enabled Health Institutions in the country, all IPS providing midwifery services, hospitalization and emergency room, estimated at more than 1,900 institutions throughout the country, produce records of births and deaths which are recorded in real time (86%) or on a deferred basis (figure 2).

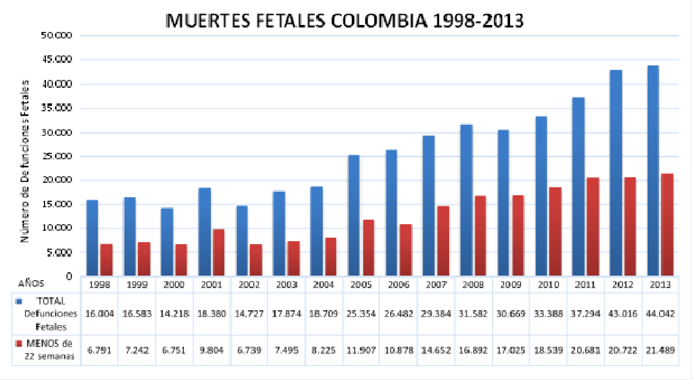
Figure 2: RUAF-ND Registration in real time 2009-2013



2. Stabilization and consolidation of online registration and real time top 90% vital events of births and 70% of deaths. However, approximately 25% of deaths related to external cause cannot be recorded in the RUAF-ND directly yet because administrative procedures require death certificates to go from the offices of Legal Medicine to the Territorial Health Entities following DANE where they are entered into the database. Currently, the monthly averages of births and deaths that are registered online behave according to the expected incidence of each event; there are 16,500 deaths and 50,000 births per month.

3. Certification of stillbirth not only shows improvement in their record in terms of numbers, but also in terms of the quality of data that allow analysis of cause. Since 1998, when the registration of fetal deaths under the definition of WHO was established, certification of fetal deaths has increased from 16,004 fetal deaths in the year 1998 to 33,388 in 2010, 37,294 in 2011, 43,016 in 2012 and 44,042 in 2013 (figure 3). Moreover, in 2013 nearly 49% are early fetal deaths of less than 22 weeks of gestation, which can be characterized by causes of death and other relevant epidemiological variables of interest.

Figure 3: Fetal Mortality in Colombia, 1998-2013

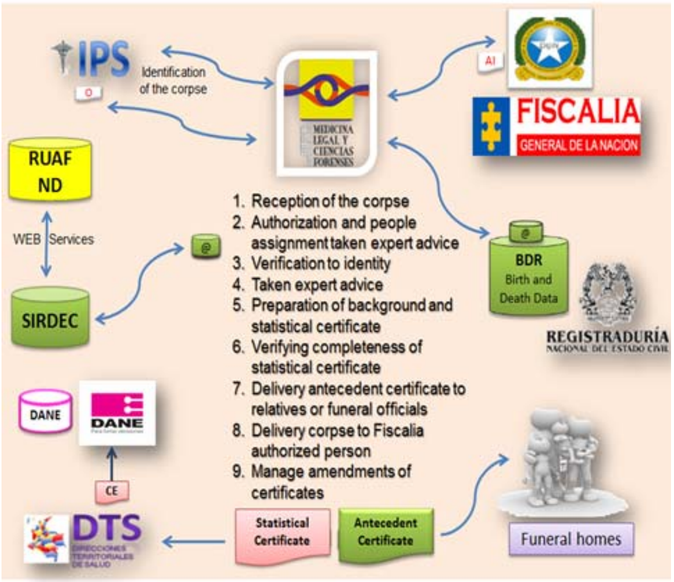


AÑOS	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
🟦 TOTAL Defunciones Fetales	16.004	16.583	14.218	18.380	14.727	17.874	18.709	25.354	26.482	29.384	31.582	30.669	33.388	37.294	43.016	44.042
🟥 MENOS de 22 semanas	6.791	7.242	6.751	9.804	6.739	7.495	8.225	11.907	10.878	14.652	16.892	17.025	18.539	20.681	20.722	21.489

4. Interoperability with the Network Information System for Missing and Dead Bodies (SIRDEC) of the Institute of Legal Medicine not only will integrate certification of violent deaths in real time while improving coverage of death registration; but it will also strengthen inter-agency cooperation to reduce the time spent in log data migration from one system to another, avoiding duplication and transcription errors; and improving the quality of data according to the timeliness to review records for the amendment and those who carry out monitoring and coding death certificates (figure 4). In December 2014, deaths records in SIRDEC automatically migrate to RUAF-ND, while supervision and quality control of the process starts from January 2015.

5. The synergistic interaction between the Registry of Births and Deaths - RUAF-ND - and the Epidemiological Surveillance System of Maternal Mortality Web-based (SVEMMBW) provides the automated transfer of all records of deaths of women of childbearing age from RUAF-ND to the capture module of SVEMMBW cases,

Figure 4: Institutional interaction for certification of death from external causes



supplemented with a direct entry system of reported cases to Public Health Surveillance (SIVIGILA) and other sources. Remarkable results during implementation and adjustment of this mechanism have been the identification of cases of maternal deaths not captured in routine surveillance, and the masking recognition of maternal deaths and strengthening of epidemiological surveillance with the weekly active search of deaths of public health interest in the register of Vital Statistics.

Conclusions

The results demonstrate the benefit derived from the online registration, especially because of the timeliness in the count of vital events and the possibility of improving the statistical quality of the recorded data by verifying and correcting them much more closely to the occurrence of events. The real-time information not only allows more frequent use and dissemination of vital statistics but also stimulates quality improvement and registration coverage by suppliers. This implies a permanent management to implement best practices and standards in healthcare information systems and certification of vital events.

Acknowledgements

Thanks to the entities responsible for SRCEV and the certifiers who enable continuous improvement of vital statistics.

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Finland

Using VAT to Guide Rehabilitation Assessment within the ICF Classification Structure

The idea behind the VAT (Valmennuksen Arvioinnin Tukijärjestelmä [system to guide the assessment of rehabilitation activities]) development work has been the need of a system that would provide information on factors that either restrict or support the rehabilitating person’s progress on his or her personal path to rehabilitation. This information should be available as early as possible in the rehabilitation process, and in addition, it must be possible to update the information during the process.

System requirements

We set the following requirements for such a system:
- The system must produce information directly applicable to guiding the progress of a person’s rehabilitation;
- The information produced by the system must be transferrable in a standard, readable form between the party creating the information (such as a rehabilitation unit or a vocational rehabilitation unit) and another user (such as a public official or a multidisciplinary team);
- The information produced must be graphic to make sure it provides a good framework for feedback discussions with the customer;
- In order to combine the produced data with functioning status assessment data created elsewhere, the data must be compatible with the ICF classification structure;
- The methodology must be flexible and adaptable both to the rehabilitating person’s situation and his or her working environment.

Assessments

Information on functioning status is received from several assessments:
- A self-assessment by the customer concerning his or her functioning in the environment (workplace, home, etc.) in which the functioning status is to be described.
- Written notes on observations by one or two other people in the particular environment. These may be professionals in rehabilitation or, for example, family members of the rehabilitating person.

The purpose of self-assessment is to form a picture of the customer’s own subjective understanding of his or her functioning level. Observations taken down by other observers in the studied environment give us a picture of how the customer actually fares in the environment. It is essential that the other observers note down only their observations instead of their opinions, and that they refrain from judging performance in any way.
Both the self-assessment and the noting down of observations are done using extended qualifier selected in advance, combined with the respective verbal descriptions. Extended qualifier groups are formed of the selected extended qualifiers so as to make possible the gaining of the

unique information that is needed along each customer's personal path to rehabilitation. As rehabilitation progresses, the extended qualifier groups can be modified to match the progress of the process. This ensures that the data used is up-to-date and that the customer gets feedback as to the progress of his or her rehabilitation.

Information analyses
The system allows the compilation of information concerning the different components of the customer's functioning status in accordance with the ICF structure, thus allowing also the describing of the customer's:

- physical prerequisites required in the working environment;
- psychological prerequisites required in the working environment;
- social prerequisites provided for him or her by the working environment.

Information received in this way can be examined in accordance with the ICF structure per area and domain, and in addition, through the concrete observation data (expressed by the extended qualifiers) from the attributes in the VAT-system.

Using data outputs
Data outputs are available in graphical form to make them easy to comprehend and illustrative for, for example, multidisciplinary teams. In addition, the graphics make it easier not only to focus the rehabilitation activities correctly but also provide progress feedback for the customer.
The purpose of a functioning status assessment at a vocational rehabilitation unit is two-fold. First of all, it enables focusing the rehabilitating activities on elements that disturb or hinder the person's integration into society.

For example, an assessment may bring up a sphere of impairments (such as learning difficulties) that other professionals can go into deeper and then focus the rehabilitation activities accurately. From the point of view of multidisciplinary cooperation, the importance of access to this in-formation is highlighted in mild cases where the impairment is not so strong that it would have been diagnosed. The other purpose of a functioning status assessment at a vocational rehabilitation unit is to bring up the strengths the rehabilitating person already has. When strengths and factors facilitating rehabilitation are made manifest it is easier to plan rehabilitation paths forward.

Transferring and combining information
Because all information produced by VAT is ICF-compatible and outputs are structured accordingly, information can be transferred and combined with ICF-compatible data produced elsewhere. This makes it possible to use the same scales for studying the impacts of a diagnosed disorder or disability on functioning status in different working environments.
For example, diagnosed worn joints of the shoulder region are said to form a moderate barrier (ICF s7201.2). The impacts of the detected physical wear on the person's functioning in different working environments can be studied and described in a way that allows multidisciplinary teams to plan either rehabilitating activities or, alternatively, aids to lessen the impacts of the impairment. Another possibility is to search for alternative forms of work where the detected impairment is not a hindrance and where the customer has all other prerequisites of successful functioning.

Variability of the method
The methodology is structured to be freely varied according to the operating environment, customer group (groups in rehabilitation), and the personal starting point and progress of any individual customer. For example:

- When observing physically demanding work, the qualifier attributes used are different from those used for office work.
- Rehabilitating people can have qualifier attributes of their own to assess the impacts upon their work functioning that the special delimiting factors detected in their case may have.
- Early in rehabilitation, the focus of assessment can be on factors connected to daily routine management skills and self-confidence. In later phases of rehabilitation, the focus of assessment can be switched to the prerequisites necessitated by the working environment.

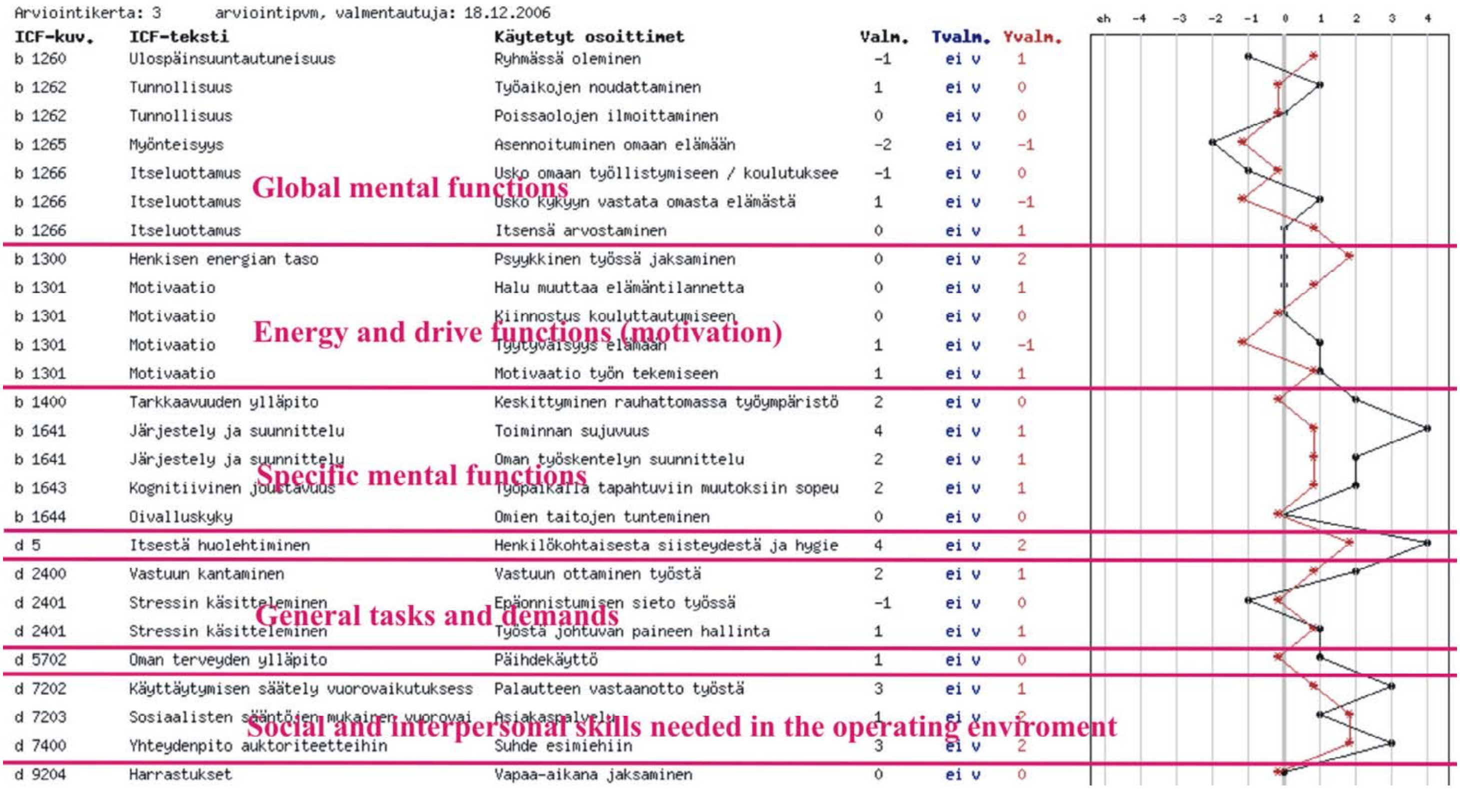
This variability according to need supports the uniqueness and the progress of each individual rehabilitation process, providing the professionals (those guiding the rehabilitation) and the multidisciplinary teams the information they need at each point.

Results
The VAT method has substantially facilitated assessments required in rehabilitation. It produces transferrable, combinable ICF-compatible data that is being used for guiding rehabilitation activities and to support multidisciplinary work.

The following example (figure 1) illustrates the use of assessment results. Information gained from individual qualifier attributes is used in guiding the rehabilitation process and training activities as well as in feedback discussions. When information is passed on to multidisciplinary teams, the totality is grouped into areas and domains describing the functioning status according to the ICF framework. The grouping can be modified according the requirements of the customer's situation and his or her working environment. In our example, it is as follows:

- Global mental functions, ICF domains b110 – 129;
- Energy and drive functions (motivation), ICF domains b1300-1301;
- Specific mental functions, ICF b140 – 189;
- Physical functions (if assessed);

Figure 1: Example of assessment results



Arviointikerta: 3 arviointipvm, valmentautuja: 18.12.2006

ICF-kuv.	ICF-teksti	Käytetyt osoittimet	Valn.	Tvaln.	Yvaln.
b 1260	Ulospäinsuuntautuneisuus	Ryhmässä oleminen	-1	ei v	1
b 1262	Tunnollisuus	Työaikojen noudattaminen	1	ei v	0
b 1262	Tunnollisuus	Poissaolojen ilmoittaminen	0	ei v	0
b 1265	Myönteisyys	Asennoituminen omaan elämään	-2	ei v	-1
b 1266	Itseluottamus	Usko omaan työllistymiseen / koulutuksee	-1	ei v	0
b 1266	Itseluottamus	Usko kykyyn vastata omasta elämästä	1	ei v	-1
b 1266	Itseluottamus	Itsensä arvostaminen	0	ei v	1
b 1300	Henkisen energian taso	Psyykkinen työssä jaksaminen	0	ei v	2
b 1301	Motivaatio	Halu muuttaa elämäntilannetta	0	ei v	1
b 1301	Motivaatio	Kiinnostus kouluttautumiseen	0	ei v	0
b 1301	Motivaatio	Tyytyväisyys elämään	1	ei v	-1
b 1301	Motivaatio	Motivaatio työn tekemiseen	1	ei v	1
b 1400	Tarkkaavuuden ylläpito	Keskittyminen rauhattomassa työympäristö	2	ei v	0
b 1641	Järjestely ja suunnittelu	Toiminnan sujuvuus	4	ei v	1
b 1641	Järjestely ja suunnittelu	Oman työskentelyn suunnittelu	2	ei v	1
b 1643	Kognitiivinen joustavuus	Työpaikalla tapahtuviin muutoksiin sopeu	2	ei v	1
b 1644	Oivalluskyky	Omien taitojen tunteminen	0	ei v	0
d 5	Itsestä huolehtiminen	Henkilökohtaisesta siisteydestä ja hygie	4	ei v	2
d 2400	Vastuun kantaminen	Vastuun ottaminen työstä	2	ei v	1
d 2401	Stressin käsitteleminen	Epäonnistumisen sieto työssä	-1	ei v	0
d 2401	Stressin käsitteleminen	Työstä johtuvan paineen hallinta	1	ei v	1
d 5702	Oman terveyden ylläpito	Päihdekäyttö	1	ei v	0
d 7202	Käyttäytymisen säätely vuorovaikutuksess	Palautteen vastaanotto työstä	3	ei v	1
d 7203	Sosiaalisten sääntöjen mukainen vuorovai	Asiakaspalvelu	1	ei v	2
d 7400	Yhteydenpito auktoriteetteihin	Suhde esimiehiin	3	ei v	2
d 9204	Harrastukset	Vapaa-aikana jaksaminen	0	ei v	0

- General tasks and demands (domains concerning activities and participation);
- Social and interpersonal skills needed in the operating environment.

This grouping helps us to understand the totality and to assess the impacts of the interaction of the various factors, making it easier to create an interpretation of the customer's functioning status in the multidisciplinary team. An assessment result gained with the method is stored in a database (MySQL) so that it is possible to produce outputs from there that differ from the ICF hierarchy.

Conclusions

The ICF-classification by WHO offers an excellent basis for compiling and transferrng information. Practice has shown, however, that a tool is required to make information production easy and also to support the customer's self-assessment. The VAT system provides the following benefits, for example:

A. The rehabilitating person can describe his or her functioning status so that the in-formation gained is ICF-compatible and easily accessible by different professionals.

B. The external observer does not need to know the ICF. He or she is an expert on the environment in which the assessment takes place.

C. An assessment event is fast and easily done so that assessments can be performed whenever it is necessary to have guidance for the rehabilitation process.

D. The use of graphics in presenting the results helps both the rehabilitating person and the multidisciplinary team grasp the strengths of the person's functioning status and understand his or her possible impairments.

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Outlining the Methods to Strengthen the ICF as a Standard for Reporting on a Person's Functioning

Measures that go beyond incidence and prevalence of health conditions - capturing how biological health plays out in daily life - are crucial for assessing functioning. Ideally, such measures provide timely, reliable and relevant information for evidence-based decision-making at all levels of health and related systems. For instance, in clinical practice, such measures can help health professionals involved in multidisciplinary rehabilitation to evaluate and monitor targets and goals relevant to interventions. At the levels of service provision, policy and program planning, persons' functioning scores inform accurate planning and management of multidisciplinary rehabilitation programs and the appropriate allocation of resources. Often this kind of information is already collected. However, for this information to be most useful, it would need to be comparable across visits, persons, health conditions, ages, care divisions, regions, and preferably also countries. Standards of health information are essential to achieve this.

Need for standardized reporting

With the International Classification of Functioning, Disability, and Health (ICF) the World Health Organization (WHO) offers a conceptual framework and classification to better understand and describe functioning and disability in a comprehensive and standardized way. Although the ICF has been available for more than 10 years, its utility as a standard for reporting functioning has not yet been exploited to its fullest. Considering this, it would be essential to develop a unified system of reporting that builds upon best practices for routinely collecting functioning information as well as existing data collection processes. We therefore propose one approach towards reporting functioning in a standardized manner.

This approach addresses the key questions: What to assess, How to assess, and How to report. Relevant tools and methods include ICF Core Sets and existing outcome measures, as outlined in Table 1.

Table 1: Aspects to consider and relevant methods in the process toward standardized reporting

Questions to be answered	Specification of the relevant elements from the ICF and relevant tools and methods
What to assess	*ICF Core Sets* provide short lists of the ICF categories most relevant for a particular health condition or in a given setting.[3] Thus, ICF Core Sets can guide the process of identifying the domains to be assessed for a given purpose.
How to assess	Given that numerous *methods and modes for data collection* already exist, e.g. self-report instruments, clinical tests and investigations, expert observations, there is no a priori need to develop new instruments. *ICF Linking Rules*[4,5] provide the method for linking the content of existing instruments and their items to the ICF.
How to report	A *standard scale from 0 to 100* serves as a foundation for any reporting. The *Rasch measurement model*[6] provides the method to establish comparability between instruments or tests linking on to a common ICF category.

The ICF Generic and Disability Set (1, 2), as well as health condition-specific ICF Core Sets guided the specification of the ICF categories to be assessed. Literature reviews identified existing instruments and corresponding items for assessing each ICF category. To aggregate the information within chapters, the Rasch measurement model (6) is applied to co-calibrate the data from the instrument items identified. Once the items are co-calibrated and satisfy the requirements of the Rasch model, they can be integrated into a scale from 0-100 and reported in alignment with the percentage distribution that corresponds to ICF qualifiers.

This project called ICF INFO© outlines one approach toward standardized reporting of functioning information based on existing methods for data collection. It integrates an internationally accepted conceptualization and classification of health that, when operationalized, fosters a comprehensive and reliable foundation for decision-making at all levels of the health system. ICF INFO© was presented at the WHO-FIC Network Meeting in October 2014; the approach is currently deployed in an international collaborative project. This project is conducted under the auspice of the ICF Research Branch in cooperation with the WHO-FIC collaborating centre in Germany (at DIMDI).

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North America

Exploring ICF-Based Correlates of Perceived Quality of Life for Youth with Chronic Health Conditions

According to the World Health Organization Quality of life (WHO-QOL) Group (1), QOL is defined as, “individuals’ perceptions of their position in life in the context of culture and value systems in which they live, and in relation to their goals, expectations, standards, and concerns” (p. 1570). Increasingly, countries, governments, and institutions are coming to believe that collecting information about individuals’ perceptions of their subjective well-being (e.g., life satisfaction, happiness) is equally as important for assessing QOL as collecting information about their objective well-being (2). It is now recommended by the WHO (3) that countries include a measure of general life satisfaction in their national surveys. This indicates the WHO’s support for overall life satisfaction or global perceived QOL as being relevant for policymaking and societal improvement.

Exploring how functioning relates to QOL

Optimization of QOL for children and youth with chronic health conditions is a primary goal of pediatric rehabilitation services and a central focus of child health and rehabilitation research. However, there has been no empirical evidence about the contribution of potentially important factors to the global perceived QOL of these children and youth. This article briefly summarizes a published paper (4; available through Open Access) that used baseline data from a longitudinal study to conduct an initial exploration of aspects of functioning and contextual factors associated with global perceived QOL for youth with chronic conditions, drawing on separate perspectives of youth and their parents. The hypothesized correlates of perceived QOL were chosen to reflect the functioning components and contextual factors included in the International Classification of Functioning, Disability and Health (ICF) and the ICF-Child and Youth Version.

Methods

A random sample of 439 youth aged 11 to 17 years with chronic health conditions (e.g., cerebral palsy, spina bifida, autism spectrum disorder, brain injury, communication disorder) was recruited from eight children's treatment centers in Ontario, Canada. For each youth enrolled, one parent (most often the birth mother) also participated. Perceived QOL of the youth was measured in youth- and parent-completed questionnaires using adapted versions (5) of the Students' Life Satisfaction Scale (SLSS; 6), each of which included five items (e.g., My life is just right; My child feels his/her life is just right). The hypothesized correlates of perceived QOL were measured using standardized instruments in either the parent or the youth questionnaire. Correlates included aspects of functioning (i.e., impairments, activities, and participation) and contextual factors (i.e., personal and environmental factors).

Analyses

Two multivariate linear regression analyses were performed: one exploring correlates associated with youths' own perceptions of their QOL, and the other evaluating correlates associated with parents' perceptions of youths' QOL. Basic socio-demographic and youth health information were included as control variables (see published paper for greater detail).

Results

Functioning, personal and environmental factors were all significantly related to youth perceived QOL, indicating the benefits of a biopsychosocial approach to both assessment and enhancement of QOL for youth with chronic conditions.

Significant positive correlates ($p \leq .05$) of youth perceptions of their QOL were family social support and school belongingness/safety. Family functioning was positively correlated with parent perceptions of youth QOL. Factors positively correlated with both youth and parent perceptions of youth QOL included school productivity/engagement and spirituality. Significant negative correlates ($p \leq .05$) of both youth and parent perceptions of QOL for youth included pain/other physical symptoms and emotional symptoms. Youth social anxiety (fear of peer rejection), home, school, and community barriers were also negatively correlated with parent perceptions of youth QOL.

Discussion

The ICF framework goes well beyond consideration of the physical impairments and functional limitations of individuals with chronic conditions. In addition to working toward alleviating these problems, youth and families would benefit from the provision of services that encompass the full scope of the ICF and that are designed to enhance other aspects of life, such as youth emotional wellbeing and family wellbeing, as well as additional supports such as spiritual care for youth and their families, and advocacy for supportive school and community environments where youth can thrive and develop to their full potential.
Once three years of longitudinal data for this study have been collected, researchers will examine the inter-relationships among functioning, contextual factors, and perceived QOL over time. Understanding change is of paramount importance when children and youth are considered within the context of rehabilitation service provision. Knowing the important combinations of predictors and mechanisms of change over time can assist in the development and continuation of preventive strategies, programs, and policies to enhance perceived QOL.

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The Impact of Weather on Participation in American Adults

Increasing attention is being paid to the impact of extreme weather (e.g., heat waves, hurricanes) on population health (1-7). But the challenges of day-to-day weather have not received as much attention, particularly among older adults who are more vulnerable to weather-related factors because of their limited mobility and social isolation (2, 8). As a result, we know little of how weather-related factors (e.g., reduced daylight hours during winter, slippery surfaces due to rain or snow) affect activities and participation, and how these effects vary across persons, region, and season.

Climate-related environmental factors in ICF

The International Classification of Functioning, Disability and Health (ICF) (9) conceptualizes participation as part of a complex biopsychosocial model of health and function that includes interactions with environmental factors, including climate and weather (ICF e225), which can either act as barriers to participation (9) or facilitate participation. The purpose of this work was to use nationally representative data to examine the impact of weather-related factors on the daily lives of Americans in order to understand which populations are most vulnerable to weather conditions, and exactly what those conditions are.

Data

Data came from the University of Michigan/Thomson Reuters Surveys of Consumers (SCA), a nationally-representative telephone survey of approximately 500 adults in the contiguous United States (27% response rate) (10). In June 2013 a supplement was administered in a 10 minute series of questions on weather and mobility to 502 respondents. The research was approved by the Institutional Review Board at the University of Michigan.

Measures

Respondents were first asked to identify the one weather condition that was most likely to change the way they go about their day-to-day activities (separately for summer and winter). Options for summer weather conditions included heat (ICF e2250), humidity (ICF e2251), poor air quality (an ozone day), rain or thunderstorms (ICF e2253), and tornadoes/hurricanes (if volunteered); winter weather conditions included cold temperatures (ICF e2250), rain, snow (both ICF e2253), ice, fog, or wind (ICF e2254).

Respondents were then asked to indicate how much difficulty they had when leaving their home to go about their day-to-day activities when that weather condition was present. Response options were "no difficulty", "a little", "some", and "a great deal". Respondents could also indicate that they didn't leave home in that condition, or they took extra precautions (if volunteered), and these were coded as having "a great deal" of difficulty. They were also asked how much difficulty they had driving (themselves) when that weather condition was present using the same set of response options.

Respondents were also asked about participation in work/volunteer activities when that weather condition was present, as well as grocery shopping, and outdoor exercise. For example, the wording for summer and grocery shopping was "Thinking about the last time you had planned to go grocery shopping and (it was hot/it was humid/there was poor air quality or an ozone day/it was raining or thundering in the summer/there were risks of tornadoes or hurricanes), did you use your usual means of transportation, did you use a different means of transportation, or did you stay home on that day?" A binary indicator of participation in grocery shopping (and work/volunteer activities) was created by contrasting those who engaged in the activity (either by usual or different means of transportation) with those who stayed home. Similarly, a binary indicator of participation in outdoor physical activity was created by contrasting those who exercised as planned in that weather condition with those who did not (either by skipping exercise or exercising indoors instead).

Key covariates included age, gender, race/ethnicity, education, annual household income, and region of residence in the United States. Activity limitations were captured using self-reported inability to walk a half mile independently (without assistive technology) and driving restrictions (usually limits driving to short distances).

Statistical analyses

Logistic regression was used to examine the odds of participation restriction (reporting a great deal of difficulty leaving home vs. none/a little/some; staying home from work/volunteer activities, grocery shopping and outdoor physical activity) in the face of weather conditions. All analyses were weighted by the SCA adult weight, which makes the results representative of all United States adults living in private households.

Results

Women comprised about half (54%) of the population; mean age was 54.2 years (±18.2) (range 18-99). Over half lived in the southern (34%) or mid-western (27%) United States. Fifteen percent reported difficulty walking a half mile independently and 36% reported self-imposed driving limitations (i.e. by avoiding driving long distances).
The most common weather condition identified that was most likely to change the way adults went about their day-to-day activities was ice, reported by 47% of Americans. Almost half (40%) of Americans reported a great deal of difficulty leaving home when icy, and 35% reported a great deal of difficulty driving. While most Americans (56%) left home to engage in work or volunteer activities when it was

icy, they tended to put off more discretionary activities, like grocery shopping (73%) and outdoor exercise (92%). There were notable age differences in the effect of ice on participation. Compared to adults under age 65, older adults had a two-fold higher odds of reporting a great deal of difficulty leaving home (Odds Ratio (OR)=2.22, 95% Confidence Interval (CI)=1.12, 4.42) and a three-fold higher odds of difficulty driving (OR=3.33, 95%CI=1.62, 6.86) when icy. Older adults were also more likely to stay home from work/volunteer activities when there was ice (OR=2.01, 95% CI=1.01, 406).

Adults with underlying walking difficulty were at an increased risk of reporting difficulty leaving home (OR=3.09, 95% CI=1.08, 8.86), and those who usually restrict their driving to short distances had a two-fold higher odds of reporting a great deal of difficulty leaving home when it was icy (OR=2.00, 95% CI=1.01, 4.06).

Discussion

While research has identified extreme heat as a risk for morbidity and mortality (2, 11, 12), there has been little work on the impact of day-to-day weather conditions. Using nationally representative data from American adults, we found that ice was the most commonly reported hazard, resulting in a great deal of difficulty leaving home and driving and in avoiding or delaying activities such as grocery shopping or outdoor exercise. In comparison to younger adults (age<65), ice creates much more difficulty for older adults leaving their house to go about their day-to-day activities or driving. Older adults are also more likely to stay home from work, volunteer or other social activities when there is ice. Also, adults with walking difficulty and self-imposed driving restrictions (which could reflect vision impairment, especially in winter with fewer daylight hours (13)) reported greater difficulty leaving home when icy.

This is the first study to provide national data on weather conditions most likely to result in participation restrictions among American adults. Results indicate that older adults and those with activity limitations are at risk for being housebound in the winter months, with implications for social isolation, health, well-being, and mortality (14-17).

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The Netherlands

Automated Coding of Causes of Death in The Netherlands

In 2013, Statistics Netherlands started to use IRIS for the automated coding of causes of death. This is a change of a more than one hundred year old tradition of manual coding of death certificates. An improved international comparability and reliability of data were important motives for this change. The introduction of automated coding causes shifts in cause of death statistics. In order to describe and analyse these shifts we performed a bridge coding study. In this article, we describe the results of this bridge coding study in relation to the observed shifts between 2012 and 2013 causes of death data. In this way, the reader can compare the expected shifts, based on the bridge coding study, with the shifts observed at the actual change from manual (2012) to automated coding (2013). A more detailed report on the results of our bridge coding study will be published in the summer of 2015.

Definitions

IRIS: name of software for automated coding of causes of death. Declared European standard by Eurostat (1). Developed during the first decennium of the 21th Century by Sweden (Lars Age Johansson) and France (Gerard Pavillion). To date, under the administration of DIMDI, Cologne, Germany. After data entry, medical terms encountered on a death certificate are translated into ICD-10 codes by use of a dictionary, enabling users to adapt IRIS to their own language. Then codes are (i) combined or modified as prescribed by the ICD-10, and (ii) the underlying cause of death is selected according to ICD-10 rules. For (i) and (ii), IRIS uses the tables of MMDS (2).

MMDS: Medical Mortality Data System. Software for coding causes of death and selection of the underlying cause of death. Developed since the 1970s. Maintained and administered by the National Centre of Health statistics (NCHS). The software consists of several modules: tables for selection of an underlying cause of death (ACME), control on appropriateness for age and sex of the ICD-10 code (MICAR200), translation of a code in entity reference numbers (ERNs) so that the systems becomes independent of changes in ICD (MICAR100), and an English data entry module (SUPERMICAR). In fact, IRIS replaced the SUPERMICAR module and by using a dictionary made the system language independent.

ICD: International Classification of Diseases and Related Health Problems. Published and maintained by the World Health Organization (WHO). Currently in its tenth version/revision of 1993. Statistics Netherlands uses the tenth version of the ICD for coding causes of death since 1996 and has not implemented the yearly updates in the era of manual coding (3).

Comparability ratio (CR): frequency of ICD-10 code as underlying cause of death when coded automatically (IRIS) divided by the frequency of the same code when coded manually in the same sample of n death certificates:

$$CR\ x\ = \frac{(\text{Number in IRIS})/\text{n}}{(\text{Number when coded manually})/\text{n}}$$

A CR indicates an expected shift in frequency of causes of death when we change from manual to automatic coding. It is a measure of stability, not of validity. For example, a CR of 1,00 can mask a change of coding when the influx of cases coded differently, equals the outflow of cases coded differently. Such a change is captured by the perfect compatibility percentage (PCP).

Perfect compatibility percentage (PCP): the percentage of death certificates with exactly the same ICD-10 code (i) when coded manually or automatically:

$$PCP\ i\ = \frac{\text{Number (i in IRIS | i coded manually)}}{\text{Number i coded manually}}\ x\ 100\%$$

The PCP is a measure of validity. However, there is not a golden standard here. Some causes of death are better coded manually, others can rely on automated coding. Because we change from manual to automatic coding, the number of manually coded death certificates in the sample seems to be the obvious denominator of choice. We compare the new method with the method in use. The perfect compatibility is calculated on a three digit level of ICD-10 codes.

Bridge coding study

A bridge coding study is a comparison of two different methods on the same data set. We intended to compare automated and manual coding. All manual coded death certificates of the year 2009 (n = 134 262) were entered electronically during 2010-2011 and coded by IRIS (version 4.2.0). In this way, we could compare the code for the underlying cause of death of both manual and automated coding for the same death certificate. Our most important findings are:

-IRIS codes 65 per cent of the cause of death certificates fully automatically, i.e. all terms are coded and an underlying cause of death is selected without a human intervention. About 27 per cent of the death certificates was rejected by IRIS, because of spelling errors or the absence of a medical term in our dictionary. In these cases a human intervention is necessary to select an underlying cause of death. Almost 8 per cent of the death certificates could not be coded by IRIS, because the software is not (yet) suitable for handling the records (external causes of death, maternal deaths, perinatal deaths and stillbirths). These cases were coded manually as before.

-Of the death certificates, 78 per cent showed exactly the same underlying cause of death in manual or automated coding (ICD-10, four digits). On the three digits level of the European short list, the overall agreement between manual and automated coding is 85 per cent and on ICD-10 chapter level (one digit) the agreement is 90 per cent. This agreement differs by ICD-10 code or ICD-10 chapter.

-The percentage of agreement between automated and manual coding decreases significantly with an increase in age of the deceased, an increase in the number of codes on the death certificate and with an increase in detail of the ICD-10 code, i.e. in general with an increase in the complexity of the death certificate.

Manual and automatic coding of the European short list

Table 1 shows a comparison of manual and automatic coding for causes of death on the European short list (COD

Table 1: Manual and automated coding of the European short list for causes of death

European Short list (COD SL-2012)	*IRIS (number)*	*MC (number)*	*CR*	*95%-CI*	*2013/ 2012*	*PCP*
1 Infectious and parasitic diseases	1 805	1 226	**1,47**	1,37-1,58	1,43	82,0
2 Neoplasms	28 845	29 071	0,99	0,98-1,00	0,99	97,5
2.1 Malignant Neoplasms (MN)	28 096	28 584	0,98	0,97-1,00	0,98	96,7
2.1.1 MN of lip, oral cavity, pharynx	280	308	0,91	0,78-1,08	1,03	88,6
2.1.2 MN of oesophagus	1 081	1 100	0,98	0,90-1,07	0,96	96,8
2.1.3 MN of stomach	1 047	1 059	0,99	0,91-1,08	0,98	97,0
2.1.4 MN of colon, rectum and anus	3 260	3 356	0,97	0,93-1,02	0,93	95,3
2.1.5 MN of liver, intrahepatic bile ducts	448	465	0,96	0,85-1,10	0,90	91,8
2.1.6 MN of pancreas	1 754	1 791	0,98	0,92-1,05	0,96	96,9
2.1.7 MN of larynx	118	117	1,01	0,78-1,31	1,00	93,2
2.1.8 MN of trachea, bronchus & lung	7 590	7 749	0,98	0,95-1,01	1,00	96,5
2.1.9 MN of skin	495	502	0,99	0,87-1,12	1,04	98,0
2.1.10 MN of breast	2 366	2 397	0,99	0,93-1,04	0,99	95,6
2.1.11 MN of cervix	148	146	1,01	0,81-1,27	1,03	97,3
2.1.12 MN of uterus	241	246	0,98	0,82-1,17	1,02	93,9
2.1.13 MN of ovary	709	729	0,97	0,88-1,08	0,98	96,7
2.1.14 MN of prostate	1 895	1 912	0,99	0,93-1,05	0,99	94,8
2.1.15 MN of kidney	584	593	0,98	0,89-1,10	0,93	96,1
2.1.16 MN of bladder	848	874	0,97	0,88-1,07	0,99	94,0
2.1.17 MN of brain and central nervous system	426	496	**0,86**	0,75-0,98	0,77	82,5
2.1.19 Hodgkin disease and lymphomas	701	679	1,03	0,93-1,15	0,97	96,5
2.1.20 Leukaemia	821	791	1,04	0,94-1,14	1,01	96,2
2.1.22 Other malignant neoplasms	2 010	1 929	1,04	0,98-1,11	1,03	96,9
2.2 Non-malignant neoplasms (benign and uncertain)	749	487	**1,54**	1,37-1,72	1,41	95,3
3 Diseases of the blood (-forming organs), immunol. disorders	296	258	1,15	0,97-1,36	1,05	67,4
4 Endocrine, nutritional and metabolic diseases	2 874	2 479	**1,16**	1,10-1,22	*1,05*	85,2
4.1 Diabetes mellitus	2 072	2 030	1,02	0,97-1,09	1,03	85,6
5 Mental and behavioural disorders	7 250	5 516	**1,31**	1,27-1,36	*1,22*	95,2
5.1 Dementia	6 624	5 263	**1,26**	1,22-1,30	*1,17*	94,1
5.2 Alcohol abuse (including alcoholic psychosis)	265	132	**2,01**	1,63-2,47	2,13	90,9
6 Diseases of the nervous system and the sense organs	3 225	2 746	**1,17**	1,12-1,24	1,20	92,0
6.1 Parkinson's disease	750	830	0,90	0,82-1,00	*1,03*	82,8
6.2 Alzheimer's disease	1 480	1 181	**1,25**	1,16-1,35	1,29	94,2
7 Diseases of the circulatory system	28 271	27 876	1,01	1,00-1,03	1,00	93,4
7.1 Ischaemic heart diseases	7 582	7 713	0,98	0,95-1,01	0,95	90,8
7.1.1 Acute myocardial infarction	5 190	5 351	0,97	0,94-1,01	0,92	89,6
7.3 Cerebrovascular diseases	7 173	6 486	**1,11**	1,07-1,14	1,11	94,4
8 Diseases of the respiratory system	7 803	10 065	**0,78**	0,75-0,80	*0,85*	71,6
8.2 Pneumonia	2 131	3 931	**0,54**	0,51-0,57	*0,64*	49,3
8.3 Chronic lower respiratory diseases	4 536	4 801	**0,95**	0,91-0,98	0,96	87,8
9 Diseases of the digestive system	2 238	2 625	**0,85**	0,81-0,90	0,85	76,5
9.2 Cirrhosis, fibrosis and chronic hepatitis	343	362	0,95	0,82-1,10	0,93	83,7
10 Diseases of the skin and subcutaneous tissue	114	162	**0,70**	0,55-0,89	0,77	49,4
11 Diseases of the musculoskeletal system/connective tissue	327	295	1,11	0,95-1,30	1,17	76,3
13 Diseases of the genitourinary system	1 694	2 171	**0,78**	0,73-0,83	0,82	65,0
13.1 Diseases of kidney and ureter (N00-N20, N22-N29)	1 093	1 128	0,97	0,89-1,05	0,95	76,6
15 Congenital malformations and chromosomal abnormalities	167	166	1,01	0,81-1,25	1,01	84,9
16 Symptoms, signs, abnormal findings, ill-defined causes	2 006	2 242	**0,89**	0,84-0,95	*1,03*	77,7
16.2 Unknown and unspecified causes	393	399	0,98	0,86-1,13	*1,15*	79,7
Total	86 929	86 929	1,00	-	1,03	84,6

Note: The automated coding system (IRIS) is not (yet) applicable to maternal deaths (13), perinatal deaths (14) and external causes of death (17). Therefore these causes of death are not shown in table 1. Also not shown are causes of death with less than 100 cases in automatic or manual coding, because a statistical test could not be performed meaningfully. The categories "other" are not shown either, because they do not differ very much from the chapters as a whole. **CR bold**: significant difference between automatic and manual coding in the bridge coding study. *Ratio 2013/2012 italics*: the observed shift is also caused by other factors than the change to automated coding.

SL-2012; 4). The figures of the bridge coding study are based on the set of fully coded death certificates (i.e. 65 per cent of the 2009 data, n = 86 929). Death certificates rejected by IRIS are not taken into consideration. This is not so in the 2013 data; here rejected death certificates are processed manually by a coder so that an underlying cause of death is provided for each and every case. For a number of causes of death table 1 shows the number of occurrence when the same sample is coded automatically (IRIS) and manually (MC). The CR shows the expected shift in frequency when changing from manual to automatic coding. We can compare this expected shift as observed in the bridge coding study with the observed difference between 2012 (manual) and 2013 data (automatic). This observed shift is caused by more factors than the difference in method alone. The 95% confidence interval (95%-CI) can be used for interpreting the shifts in frequencies. When the number one is in the range of this interval, the CR of the bridge coding study is not significant, i.e. there is no significant difference in frequency of the ICD-10 code between automatic and manual coding. When the ratio 2013/2012 is not in the range of the 95%-CI, the expected CR of the bridge coding study is not observed at the introduction of automatic coding, i.e. the differences between 2012 and 2013 data are caused by other factors than the introduction of automated coding alone, for example, by the human intervention when coding the rejected death certificates or by correction of coding errors.

Results

The change of manual (2012) to automated coding (2013), caused a significant increase of infectious diseases (43%), non-malignant neoplasms (41%), Dementia (17%), alcohol abuse (113%), Alzheimer's disease (29%) and the cerebrovascular accident (11%) as a cause of death. There was a significant decrease of malignant neoplasms of the brain (23%), pneumonia (36%), diseases of the digestive system (15%; mainly by a shift of non-infectious diarrhoea n.o.s. from ICD-10 chapter nine to ICD-10 chapter one; an ICD-10 update), diseases of the skin (23%) and diseases of genitourinary tract (18%; mainly by a decrease of urinary tract infections) as a cause of death. These shifts are caused by a different selection of the underlying cause of death and in line with the expected shifts as observed in the bridge coding study.

The remarkable decrease in malignant neoplasm of the brain (23%) was explained by the absence of an inquiry system in 2013. With (just) "brain tumour" mentioned on the death certificate, cases were coded as benign or undetermined neoplasm of the brain (part of the non-malignant neoplasm). This code could not change after inquiry as in the previous years. The same holds for the malignant neoplasm of the lung. There is a strong increase of the benign or undetermined neoplasm of lung in the 2013 data (not mentioned in table 1) which (in absolute numbers) corresponds to the slight decrease of the malignant neoplasm of the lung. In 2015, Statistics Netherlands will reinstall the inquiry system and start asking the certifier to specify the cause of death in case a tumour is mentioned.

The PCP-s show strong agreement between coders and IRIS for most malignancies and cardiovascular disorders as causes of death (> 90 per cent; 5). Low agreement was found for diseases of the blood forming organs (67%) and diseases of the genitourinary tract (65%) as causes of death. Very low agreement was found for pneumonia (49%) and diseases of the skin (49%) as a cause of death. Explanations for these discrepancies are:
* Differences in selection principle of the underlying cause of death (i.e. local versus international interpretations);
* Technical constraints of IRIS, such as:
  -Several code combinations, prescribed by the ICD-10, are not in the IRIS decision tables;
  -IRIS cannot correct obvious writing errors such as a wrong order of diseases or a wrong place of the underlying cause of death on the death certificate;
  -The use of additional information when coding a death certificate (free text read/used by coders, not by IRIS);
  -The ICD-10 updates: used in automated coding, not used in manual coding at Statistics Netherlands.

Conclusions

The introduction of automated coding causes major shifts in cause of death statistics in the Netherlands. We calculated CR-s for describing these shifts, and PCP-s indicating agreement between manual and automated coding. The CR-s can be used for correcting time trends, the PCP-s for interpreting the validity of coding. With the introduction of automated coding, Statistics Netherlands aimed to improve international comparability of its death statistics. The 2013 data reflect the ICD-10 principles of coding and selecting underlying causes of death more closely now in both their strengths and weaknesses. Major weakness of the automated coding system is captured by the age old saying: "nonsense in" is "nonsense out", i.e. the quality of the death certificate (input) determines the quality of the data produced by IRIS (output). Currently, Statistics Netherlands is trying to improve this quality of input by developing an electronic certification system. Thus, we work on to improve the cause of death statistics step by step.

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