

# **METHODS FOR REPORTING POPULATION HEALTH STATUS**

**RELEASE 6: 2016**

PREVENTIVE HEALTH BRANCH  
PREVENTION DIVISION  
DEPARTMENT OF HEALTH

### About this report

This methodology report has been developed by epidemiology team, Preventive Health Branch (PHB) to inform and support population health status reporting within the Branch. While the report is intended for an audience of differing levels of training related to data analysis and reporting, it assumes a basic knowledge of epidemiology and biostatistics. It is not intended to recreate basic text books or other sources of information related to the topics covered, rather to focus on issues commonly encountered in population health status reporting in Queensland Health and provide a clear explanation and justification of the methods used by PHB. Although this report is written primarily for a technical audience, further information or explanation related to any topic is available on request.

This report is designed to provide a detailed description of methods to inform all epidemiological releases and publications from PHB. The release schedule is designed to coincide with the release of major publications from PHB such as annual survey reports and the Chief Health Officer report, with an update at least biennially.

This is the sixth report in the series which began in 2010.

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## **1 Introduction and purpose**

An overarching objective of PHB is to provide accurate, valid and timely information to enable Queensland Health and partner agencies to accomplish their goals and objectives in the public health domain in an efficient and efficacious manner.

To meet this objective, PHB develops and maintains primary data collection mechanisms, and undertakes primary and secondary data analysis, disseminating information to inform the wider public health functions of Queensland Health and the Queensland Government more broadly.

The role of PHB is to:

- provide targeted, useful, high quality and evidence based epidemiological information and knowledge to influence statewide policy and practice
- promote innovative, creative use and understanding of information and research in health issues and how to present that information
- promote the proactive use and value of epidemiology in public health policy and practice
- demonstrate professionalism in statewide delivery of high-quality services.

PHB operates under the following principles:

- Provide services of the highest quality.
- Work within resource constraints to meet the business needs with the highest quality service in the most equitable way.
- Work in partnership with others. Working in collaboration with our stakeholders and partners is critical to generating useful information—the right information, at the right time, in the right format, to the right people.
- Continuously assess the evidence base. Enable and support evidence based change in the provision and application of epidemiological services.
- Be accountable for resources and actions.

PHB is located within the Prevention Division, Preventive Health Branch, Department of Health.

## 2 Legislative context, privacy and confidentiality

Confidentiality is concerned with protecting individuals and organisations against the disclosure of confidential information supplied to an agency by that individual or organisation.

PHB operates within Queensland legislation which provides privacy and confidentiality responsibilities and protections as follows: *Information Privacy Act 2009*, *Public Health Act 2005*, *Private Health Facilities Act 1999*, *Health Act 1937*, *Statistical Returns Act 1896* and the *Hospital and Health Boards Act 2011*. PHB also operates under the *Commonwealth Privacy Act 1988* (the Information Privacy Principles and the National Privacy Principles).

Disclosure of confidential information can occur in any release of information when the following events both happen:

- A third party must be able to recognise an individual or organisation from that release.
- A third party must learn something that they did not already know about the individual or organisation.

The ways in which disclosure can occur include:

- Direct disclosure—includes cells which would fail a cell concentration or contributors rule.
- Inadvertent disclosure—linear relationships within the data allow cells to be estimated within a very narrow interval.
- Residual disclosure—comes from comparing a number of tables, thereby obtaining values.
- Disclosure from external information—a user may have other information to match against (including personal knowledge).

The principles of disclosure avoidance or confidentiality are widely discussed in the literature. Commonly, there are four major factors involved in determining the degree of confidentialising which a table or file needs:

- the number of classification variables
- the level of detail in the classification variables
- the degree to which some cells dominate the table
- the number of contributors in each cell.

A common strategy is to identify a minimum set of cells which need confidentiality treatment, with 'sensitive' cells defined on the basis of dominance by one or a small number of contributors. The dominance rule can be chosen according to the nature of the data. It may require for instance a minimum number of contributors or minimum contribution from fewer contributors.

A confidentialised file or table is output which has had all identifying variables removed and the risk of disclosure via inadvertent, residual or external information has been reduced below an acceptable level.

A de-identified unit record file refers to a file that has had name, address or any other identifying variable removed.

A non-identified unit record file has never included identifying information.

Although PHB does not generally work with confidential data, there remains a small risk of identification from some datasets. To reduce this risk and maximise reliability of estimates, data release and data reporting strategies have been developed and are described in sections 5.4 and 5.5.

### **3 Quality assurance and quality improvement**

This quality assurance statement developed by PHB has been adapted from the Australian Bureau of Statistics (ABS) Quality Framework, and is consistent with the Queensland Health Data Quality Framework.<sup>1,2</sup> It is a statement which reflects both the principles and operational activity undertaken by PHB to achieve its quality objectives. While this statement refers to the specific activity of PHB, it is recognised that the broader processes and frameworks of Queensland Health are fundamental to the activity and outputs of the unit. This statement relates to a range of outputs and publications from the unit, thus not all points will relate to every output.

#### **Relevance**

- PHB is committed to providing relevant information to meet the strategic and policy needs of the organisation.
- PHB consults widely to achieve this objective.
- PHB works in collaboration with stakeholders and partners.
- PHB consults to determine data collection requirements that meet the business needs of relevant stakeholders.
- PHB collects data in a manner sensitive to changing trends in health behaviours and disease occurrence, within established constraints.

#### **Timeliness**

- PHB provides timely information to meet reporting purposes of Queensland Health.
- PHB uses the most contemporary available data from a variety of sources for the preparation of the biennial Chief Health Officer (CHO) report and related reports.

#### **Accuracy**

- PHB develops data documentation, management and handling procedures that minimise the potential for error.
- PHB ensures that data collection is conducted in a professional manner by a qualified specialist provider.
- PHB collects data in a manner that is acceptable to the participants and is representative of the broader population.
- PHB is transparent regarding the accuracy and reliability of estimation procedures and data limitations.
- PHB routinely reports data with error bars for example, point estimate with 95% confidence intervals (CI) when possible. Non-significant differences and/or estimates that do not meet standards for reliability are not reported.
- PHB has a thorough data verification protocol to support accuracy of results in reporting.
- Where appropriate, several types of data are combined to enhance the analytical rigour and quality of the interpretation. This may be achieved through triangulation of estimates or pooling of datasets to generate greater statistical power.
- Where applicable, PHB publishes errata—usually on internet release only.

#### **Coherence**

- PHB actively seeks to maintain coherence with national reporting for example, alignment with nationally defined International Classification of Disease (ICD) codesets.
- PHB adopts standard frameworks, definitions and variable characteristics where relevant and available.
- PHB seeks to maintain consistency in collection, analysis and reporting where such frameworks are not developed (for example, development of standard Queensland Health codesets for reporting health outcome data).
- PHB actively seeks to build coherent reporting over time and across outputs by maintaining data dictionaries and documenting metadata.
- PHB uses consistent terminology to promote coherence and seeks to align with national terminology for reporting, for example, codes for selected potentially preventable hospitalisations (PPHs) to match the indicator for reporting under the National Healthcare Agreement.

## Methods for reporting population health status Release 6:

- PHB ensures that data collection is guided by best practice and in a manner consistent with state and national reporting obligations.
- PHB adheres to all relevant state and national regulations regarding privacy and confidentiality during collection, management, analysis and dissemination of results.
- Internal and external validity of results is corroborated by assessing the coherence with other comparable findings.

### **Interpretability**

- All reports undergo expert review of contents and communication editing before release.
- PHB is committed to providing sufficient information to users about the statistical measures and processes of data collection through publication of this report which provides technical detail on data collections, analytical techniques and specific technical issues related to the outputs of PHB.
- PHB is also guided by the need to communicate complex data in a meaningful way to a wide readership and broad audience.
- To achieve both these objectives, PHB is committed to principles for communicating and advocating for science and medicine while building methodological and technical supporting documents.<sup>3</sup>
- PHB provides information in a format that enables population health data to be translated into effective public health policy.
- All reports provide due acknowledgement and referencing of the data sources used.

### **Accessibility**

- PHB seeks to make information available for a variety of audiences.
- PHB utilises a number of strategies to ensure potential users of information are aware of and able to access such information including briefs to senior managers, alert emails, internet release and comprehensive dissemination strategies for hard copy release of reports such as the biennial CHO report.
- PHB maintains dedicated generic email addresses and for surveys a phone number to process enquiries and provide feedback on request.

## 4 Datasets

### 4.1 Australian Early Development Index

The Australian Early Development Index (AEDI) is a population measure of young children's development.<sup>4</sup> It involves collecting information to help create a snapshot of children's development in communities across Australia. Teachers complete a checklist for children in their first year of full-time school. The checklist measures five key areas, or domains, of early childhood development:

- physical health and wellbeing
- social competence
- emotional maturity
- language and cognitive skills (school based)
- communication skills and general knowledge

These areas are closely linked to the predictors of good adult health, education and social outcomes.

As a population measure, the AEDI places the focus on all children in the community and examines early childhood development across the whole community. By moving the focus of effort from the individual child to all children in the community a bigger difference can be made in supporting efforts to create optimal early childhood development.

Although the AEDI is completed by teachers, results are reported for the communities where children live, not where they go to school. The AEDI results allow communities to see how local children are doing relative to, or compared to other children in their community, and across Australia.

The AEDI was first implemented nationwide in 2009. The Australian Government's commitment to the AEDI will enable data to be collected nationally every three years for around 270,000 children in their first year of full-time school. The second data collection was undertaken in 2012, with results released in 2013. Results from the 2012 collection will be provided through a national report, online community maps and community profiles (around 96% of Australian communities).

### 4.2 Australian Childhood Immunisation Register

Vaccination data for children were derived from the Australian Childhood Immunisation Register (ACIR). Administered by Medicare Australia, the ACIR was established in 1996 and records details of vaccinations given to children under seven years of age who live in Australia. The ACIR is almost a complete population register as all children under seven years of age are automatically included when they are enrolled in Medicare, which incorporates approximately 98% of the target population. Children who are not enrolled in Medicare are added subsequently to the ACIR when details of a vaccination are received from an immunisation provider, further increasing completeness.<sup>5</sup> Coverage estimates at the key milestones of 12, 24 and 72 months are calculated for children in three-month cohorts beginning in the first quarter of 1996.<sup>6</sup> It is assumed that receipt of a later vaccine dose implies that earlier doses were received, even if they are not recorded in the register ('the third dose assumption') as this improves the accuracy of classification of children who are fully immunised.<sup>7</sup> These data can assist health professionals to monitor immunisation rates and identify 'at risk' populations/regions during disease outbreaks.

The ACIR included two million children at 30 June 2009 and 4.6 million valid immunisation episodes were recorded during the previous 12 months.<sup>8</sup> The primary objectives of the ACIR are to enable a child's immunisation status to be checked by parents and providers, to issue reminder notices, and provide national data to determine if immunisation programs are meeting coverage targets.<sup>9</sup> It should be noted that only those vaccines that were on the schedule prior to 1993 were considered when determining whether a child is 'fully immunised' for the calculation of coverage rates and payment of parental and provider incentives (diphtheria, tetanus, pertussis containing vaccine; polio vaccine; *Haemophilus influenzae* type b vaccine; hepatitis B vaccine; and measles, mumps and rubella containing vaccine).

A limitation of ACIR is that vaccination data are only available for children under the age of seven years. National coverage data are very incomplete for immunisation of adolescents and adults.<sup>9</sup>

Pneumococcal, influenza and hepatitis B vaccination data for older persons and Indigenous Queenslanders are derived from the Queensland Health Vaccination Information and Vaccination Administration System (VIVAS).

### **4.3 AusDiab**

The Australian Diabetes, Obesity and Lifestyle Study (AusDiab) is a national longitudinal population based survey coordinated by the International Diabetes Institute and primarily funded by the Australian Government through the National Health and Medical Research Council (NHMRC). The baseline AusDiab study was conducted during 1999–2000 in a national survey of 11,247 adults aged 25 years and older.<sup>10</sup> The objectives of the survey were to estimate the prevalence of diabetes and related conditions (using blood tests) and to assess the distribution and relationships of cardiovascular risk factors and trends in risk factor levels as compared with those obtained in previous surveys in Australia.

The AusDiab study employed stratified cluster sampling to recruit subjects. In Queensland, 1,634 adults from six urban centres completed the biomedical examinations.<sup>11</sup> The response rate for the physical examination was 55.3% nationally and varied from 49.5% in Queensland and South Australia to 61.8% in Western Australia.<sup>10</sup> Data from the Queensland cohort suggest that the Queensland AusDiab participants may have been from more disadvantaged areas and/or may have been more health conscious than the general Queensland population, with lower smoking rates and higher intakes of vegetables and fruit than the general population.<sup>12</sup> These possible biases may result in underestimates of the true prevalence of cardiovascular risk factors.

A five-year follow-up AusDiab study was conducted in 2004–2005 of 10,788 eligible participants from the previous 1999–2000 baseline study.<sup>13</sup> Unlike the baseline study that provided prevalence estimates, the 2004–2005 follow-up study provided incidence estimates for diabetes and associated conditions. Close to 6,500 (59.3%) participants returned to attend on-site testing, 1.3% (137) attended external pathology labs and a further 21.0% (2,261) responded to telephone questions (on self-reported health) but did not provide a blood sample. The Queensland response rates were close to the national AusDiab rates with 55% of the eligible Queensland sample providing on-site testing or external pathology lab results; a further 24.8% provided self reported health information. Much of the data presented in the 2005 AusDiab report relates to the 6,537 (Queensland: 961) participants who provided blood sample results. Weighting based on physical examination data was applied to adjust for difference in age and gender distribution.<sup>13</sup>

In 2011–12 a 12-year follow-up was undertaken. This study provided incidence data for the selected risks, replicated the measurement tools of the original study and included mortality outcomes within the cohort. Data on sample, response rates and results were released in 2013.<sup>14</sup>

The AusDiab study is used for reporting the prevalence of clinically measured diabetes, high blood pressure and high blood cholesterol, and percentage of renal related diabetes complications.

### **4.4 Australian Health Survey**

The Australian Health Survey (AHS) which commenced in the field in April 2011, and is the most comprehensive study of the health of Australians ever undertaken. It was conducted by ABS in close consultation with the Department of Health and Ageing and funded through the combination of ABS health survey program funding and additional funds from Department of Health and Ageing and the National Heart Foundation of Australia.

The AHS included four components:

- National Health Survey (NHS)—the existing household survey
- National Aboriginal and Torres Strait Islander Health Survey (NATSIHS)—the existing household survey of Indigenous Australians

- National Nutrition and Physical Activity Survey (NNPAS)—a new household survey
- National Health Measures Survey (NHMS)—a new pathology collection.

In total, the survey included about 50,000 adults and children from all across Australia. Households were selected using standard ABS area based sampling processes to represent the Australian population (though some very remote areas will be out of scope for some components of the collection). A detailed sampling strategy was developed by the ABS. Interviewers from the ABS visited people in their homes beginning around April 2011 to conduct personal interview components of the survey under the Commonwealth *Census and Statistics Act 1905*. Participants were asked a set of core questions on demographics, risk factors, health status and medications, followed by questions from either the NHS or the NNPAS.

After completion of the household interview, participants were invited to consider taking part in the NHMS—the biomedical component of the survey. This component of the survey was conducted on an explicitly voluntary basis. These survey participants attended a local pathology collection centre to provide samples of blood and urine. Children aged five years and over were eligible to provide urine, and children twelve years and over to provide blood samples.<sup>15</sup>

The public release of data the AHS commenced at the end of 2012 and continued through 2013 and 2014.

#### **4.5 Bettering the Evaluation and Care of Health program**

The Bettering the Evaluation And Care of Health program or BEACH, is a continuous national study of general practice activity in Australia, conducted by the Australian Institute of Health and Welfare (AIHW) and the Australian General Practice Statistic and Classification Centre, University of Sydney.<sup>16</sup> The program aims to establish an ongoing database of doctor–patient encounter information and to assess patient risk factors and the relationship these factors have with health service activity. Information is collected on general practitioner (GP) and patient characteristics and the content and type of encounters including problems managed; services, treatments and medications provided/prescribed for each problem; referrals made; and test orders.

Each year approximately 100,000 encounters between GPs and patients (0.1% sample of all general practice encounters) from a random sample of approximately 1,000 recognised practising GPs from across the country are surveyed. Each participating GP completes details for 100 consecutive GP–patient encounters on structured paper encounter forms. The patient presenting problems managed in these encounters are classified and coded according to the International Classification of Primary Care (Version 2).

BEACH is used to report on general practice activity in Queensland.

#### **4.6 Cancer screening**

The Queensland Health BreastScreen Queensland Program is a population based, public health program and is the state component of the national breast cancer screening program, BreastScreen Australia.<sup>17</sup> The BreastScreen Queensland Program operates in accordance with national standards and guidelines.

Screening mammography every two years is available to women aged 40 years and older in Queensland through the Queensland Health BreastScreen Queensland Program. The program is specifically designed to target women 50 to 69 years as this is the age group most at risk of developing breast cancer. However, the program also accepts women in their 40s or 70 years and older.

Women aged 50 to 69 years are specifically targeted for the Queensland Health BreastScreen Queensland Program for biennial screening because this is the age group where studies have demonstrated significant reductions in morbidity and mortality from breast cancer among those participating in regular screening mammography.

BreastScreen Queensland is the dominant but not the sole provider of breast screening in Queensland, and therefore data from this program does not reflect the full participation of women in screening. Data from BreastScreen Queensland is used to report participation rates among Queensland women.

The Queensland Cervical Screening Program (QCSP) is part of the National Cervical Screening Program.<sup>18</sup> The QCSP is jointly funded by the Australian Government and Queensland Government. The QCSP supports the national policy of a coordinated approach to routine Pap smears every two years for asymptomatic women (aged 20 to 69 years). The Queensland Health Pap Smear Register (PSR) is a central database that contains a complete history of Pap smears and other related test results for women in Queensland. The PSR commenced operations on 8 February 1999. This register is a confidential 'opt-off' central database of Pap smears and related follow-up tests including human papillomavirus (HPV) DNA results. Data from the PSR is used to report participation rates in the QCSP among Queensland women.

The Queensland Bowel Cancer Screening Program started in August 2006 in Mackay and has now commenced in all parts of the state. It was first implemented with men and women turning 50, 55 or 65 years of age between 2008 and 2010 being invited to participate over the three years. The program is an Australian Government initiative in collaboration with state and territory health departments.<sup>19</sup> The program has moving from a pilot program to more comprehensive delivery of screening services. The Australian Government is currently inviting men and women turning 50, 55, 60 and 65 years to participate in screening for bowel cancer around the time of their eligible birthday. From 2015, Australians turning 70 will also be invited to participate.

#### **4.7 Deaths**

Death data are derived from the Cause of Death file which was released by ABS up until about 2009. At that time, deaths were registered in the state of occurrence, the data provided to ABS for coding and released back to the jurisdictions and other parties on a planned process. In 2009 a process for returning the data to the state Registers commenced, noting that they were the custodians. This protocols and legalities of this process were complex and lengthy. In 2013 for the first time in four years, death data was released to Queensland Health and some other jurisdictions. The death data used by Queensland Health in 2013 derives from this release and includes only the deaths that occurred in this state. Queensland residents who died outside the state are not included in death data from 2007 onwards.

The ABS use the ICD version 10 (ICD-10) for coding deaths.<sup>20</sup> Generally disease specific mortality data are derived using the underlying cause of death, that is, the disease or injury which initiated the train of morbid events leading directly to death. In some instances, the multiple causes are reported, that is, all causes and conditions reported on the death certificate that contributed to the death, or were associated with the death or the underlying cause of death. Deaths of overseas residents are excluded, as are deaths of persons of unknown sex. Data elements or characteristics of Cause of Death file include items such as age, sex, residence, Indigenous status and country of birth.

For consistency with national reporting, year of registration of the death rather than year of death is used for all indicators. Approximately 95% of deaths registered in a particular year occurred in that year.<sup>21</sup> However, variations can occur in certain subsets of the population and for particular causes of death. For instance, while 96% of the total registered deaths in 2005 occurred in that year, only 89% of deaths of Indigenous Australians and 93% of deaths due to external causes registered in 2005 occurred in that year. In Queensland, year of death is used for reporting of Indigenous health outcomes due to the variable time between death and registration in some Indigenous communities in Queensland. Where Indigenous and non-Indigenous population health outcomes are being reported together or contrasted, year of death is used.

Death data is critical to reporting health status in the Chief Health Officer report series. Summary methodological information is included in the relevant sections of Chapter 7.

## 4.8 Notifiable conditions

Notifiable conditions data were derived from the Queensland Health Notifiable Conditions System (NOCS). This notifiable conditions registry is mandated under the *Public Health Act 2005 (Qld)* and earlier legislation. A list of current notifiable conditions and the mechanisms for notification is contained within the Public Health Regulation 2005 (Qld).

Notification data generally underestimate the actual number of cases occurring in the community, with a bias towards notification of severe disease and conditions diagnosed by laboratory testing. In general, in order for a notification to occur, a number of steps are required<sup>22</sup>:

- The person becomes ill.
- The person seeks medical care.
- The person is clinically diagnosed and/or a specimen is obtained.
- A positive test result is obtained from a specimen collected.
- The clinician or pathology provider notifies Queensland Health.

The gap between the true incidence rate and the notification rate can vary by characteristics of the condition (attack rate, case definition, age groups affected and severity of the condition), the individuals affected (health-seeking behaviours, ages, and predisposing conditions), and community/health system factors (public awareness, access to health care, professional testing/reporting patterns and laboratory test characteristics). Conditions which cause severe symptomatology in most people may have notification rates which approximate true incidence rates. Notification rates can also be affected by mass screening programs (for example, for sexually transmissible infections); new technologies which make testing cheaper, simpler, or more acceptable; changes in case definitions; and sentinel surveillance programs. For those conditions for which a reliable laboratory test is not available, clinical misdiagnosis may also be an important consideration.

## 4.9 Perinatal Data Collection

The Queensland Perinatal Data Collection (QPDC) includes information about mothers and babies in Queensland.<sup>23</sup> Data are collected under state legislation requiring perinatal data to be provided to the Chief Executive Officer of Queensland Health for every child born in Queensland. These data provide a source of information to assist with the planning of Queensland's health services, monitoring of neonatal morbidity and congenital anomalies, and research into obstetrics and neonatal care. Data are forwarded to Queensland Health by all public hospitals, private hospitals and home birth practitioners via perinatal data collection forms or electronic extracts.

Collection includes all live births and stillbirths of at least 20 weeks gestation and/or at least 400 grams in weight. Neonatal morbidity is collected up until the baby is discharged from the birth admission or up until the baby reaches 28 days of age. Data collected via the perinatal data forms and electronic extracts are supplemented by histopathology reports, post mortem reports and information from Medical Certificates of Cause of Perinatal Death from the Registrar-General's Office.

## 4.10 Population and other demographic data

The concept of a population can vary, depending on the specific situation at hand, the purpose for which the count or estimate is needed, and the methods used to collect or estimate data for that population.<sup>24</sup>

### 4.10.1 Census of population and housing

The national census is conducted every five years by the ABS to collect detailed demographic information about individuals and households which can be reported at various levels, ranging from a small area through to national data. The most recent census was conducted on 9 August 2011.

The ABS releases quarterly estimates of total population for states, territories and Australia which include the most recent estimates of the population, and numbers (and some rates) of births, deaths, infant deaths, and interstate and overseas movements.<sup>25</sup> Australian Demographic Statistics

also include projected resident populations, projected population in households, projected number of households and projected average household size for states, territories and Australia.

#### **4.10.2 Estimated resident population**

The estimated resident population (ERP) is the official measure of the population of Australia (or geographic area of interest).<sup>26</sup> It refers to all people, regardless of nationality or citizenship, who usually live in Australia, with the exception of foreign diplomatic personnel and their families. It includes usual residents who are overseas for less than 12 months. It excludes overseas visitors who are in Australia for less than 12 months. The ABS releases ERPs by age and sex annually for Australia and for states/territories and regions based on the relevant geographic standard, the Australian Standard Geographic Classification up to 2010 and from 2011, Australian Statistical Geographic Standard. Since September 2010, ERP revisions have been released six-monthly.

ERPs are used by Queensland Health for all rate and prevalence estimates including reference population for standardisation where appropriate.

#### **4.10.3 Population projections—Australian Bureau of Statistics**

The ABS uses the cohort-component method for producing population projections of Australia, states, territories, capital cities and balance of state.<sup>27</sup> This method begins with a base population for each sex by single year of age and advances it, year by year, for each year in the projection period by applying assumptions regarding future fertility, mortality and migration. The assumptions are based on demographic trends over the past decade and longer, both in Australia and overseas. The projections are not predictions or forecasts, but are simply illustrations of the change in population which would occur if the assumptions were to prevail over the projection period. A number of projections are produced by the ABS to show a range of possible future outcomes.<sup>27</sup>

#### **4.10.4 Population projections—Queensland Government**

The Queensland Government population projections are released about every three years based on census data, estimated trends in the inter-censal period and new intelligence on fertility, mortality and migration. Projections are available at the state level to 2056 and for sub-state geographies to 2031.<sup>28,29</sup>

The Department of Health uses population projections derived by the Queensland Government, rather than those developed by ABS.

#### **4.10.5 Experimental estimates and projections—Aboriginal and Torres Strait Islander people**

In 2009 the ABS released experimental estimates of the population of Aboriginal and Torres Strait Islander people (Indigenous Australians) from 30 June 1986 to 30 June 2006, and projections of the Indigenous Australian population from 30 June 2007 to 30 June 2021.<sup>30</sup>

Estimates for 1986 to 2005 were produced by reverse-surviving the experimental estimated resident Indigenous population at 30 June 2006, using 2005–2007 experimental Indigenous life tables as a basis on which to make assumptions about past Indigenous life expectancy at birth. Projections for 2007 to 2021 were produced by applying a range of assumptions regarding future levels of components of population change to the 30 June 2006 population. The significant volatility in Indigenous census counts and the quality of data on births, deaths and migration of Indigenous persons do not support the use of the standard approach to population estimation, in which observed numbers of births, deaths and migration during a specified period are added to the population at the start of the period to obtain an estimate of the population at the end of the period.<sup>30</sup>

Synthetic population estimates by Indigenous status for Queensland are maintained and released by the Government Statistician, Queensland Treasury.<sup>31</sup> These projections are released populations by age and sex for sub-state regions in Queensland.<sup>32</sup> The methodology for these projections was jointly developed by Queensland Health and Queensland Treasury.

#### **4.11 Queensland Cancer Registry**

The Queensland Cancer Registry (QCR) is a register of cancer in Queensland. The registry is managed by Cancer Council Queensland (CCQ) on behalf of Queensland Health. Cancer is a notifiable disease in Australia and each state and territory has a registry that assembles local information about new cases of cancers and about cancer deaths. Cancer is the only major disease where an almost complete coverage of incidence data is available. Current legislation requires health institutions in Queensland to notify the registry about cancer diagnoses and deaths within one month.<sup>33</sup>

Together with other state and territory data, QCR data is used to compile national statistics on cancer incidence and mortality.<sup>34,35</sup> Data from the registry are published regularly or are available as an online source.<sup>36</sup>

Notification of cancer is a statutory requirement for all public and private hospitals, nursing homes and pathology services. Notifications are received for all persons with cancer separated from public and private hospitals and nursing homes. Queensland pathology laboratories provide copies of pathology reports for cancer specimens. Data on all persons who die of cancer or cancer patients who die of other diseases are abstracted from the mortality files of the Registry of Births, Deaths and Marriages and linked to hospital and pathology data. Death data derived from the QCR differs from the ABS release in so much as additional information is used to identify causes and factors associated with the death. Mortality data from QCR is based on those deaths notified to the registry of persons who died from cancer during a specified time period and who usually resided in Queensland at the time of diagnosis of cancer. This means that mortality information is not directly comparable with death data released from the ABS which is based on the state where the death was registered.

Data from QCR is used to report incidence of cancer in Queensland and where applicable death data is used to support reporting from the Cause of Death file released by the Queensland Registrar of Births Deaths and Marriages.

#### **4.12 Queensland Hospital Admitted Patient Data Collection**

Hospitalisation data (also referred to as admitted patient episodes of care) are derived from the Queensland Hospital Admitted Patient Data Collection (QHAPDC), including public acute and psychiatric hospitals and licensed private facilities and day surgery units in Queensland. Generally disease specific hospitalisation data are derived using the principal diagnosis of admitted patient episodes of care, although for some conditions, for example dementia, both principal cause and other diagnoses are used. The external cause of injury and poisoning is reported. All episodes were coded using the ICD version 10 Australian modification (ICD-10-AM).<sup>20</sup>

In Australia, both public and private hospitals provide hospital services. The state and territory governments mainly own and manage public hospitals. Public acute hospitals mainly provide acute care for short periods, although some provide longer term care, such as for rehabilitation. Public psychiatric hospitals specialise in the care of people with mental health problems, sometimes for long periods of time. Private hospitals are mainly owned and managed by private organisations, either for-profit companies or not-for-profit non-government organisations. They include day hospitals that provide services on a day-only basis, and hospitals that provide overnight care.

A hospital admission can involve more than one episode of care. If the type of care the patient receives changes during the patient's stay in hospital, then a new episode of care is created for reporting (and other) purposes. The creation of a new episode of care involves (statistically) discharging the patient from the old episode and creating a new episode reflecting the new care type. The admission date of the new episode reflects the date on which the new type of care began. The only valid care types a patient can change between are acute, newborn, rehabilitation, palliative, geriatric evaluation and management, psycho geriatric, maintenance, and 'other care'.<sup>37</sup>

QHAPDC contains one record for each admitted patient episode of care in Queensland hospitals. This is consistent with the situation in other states, and it is consistent with national reporting

requirements. Episodes of care are the standard reporting unit for QHAPDC data (and equivalent national data). When required, it is possible to group episodes of care on a hospital admission basis (that is, covering the entire hospital stay for the particular patient admission).

The vast majority of hospital admissions are comprised of only one episode of care. For acute public hospitals in 2008–2009 only 1.3% of hospital admissions involved more than one episode of care, and only 0.3% of admissions involved more than two episodes of care. The total number of episodes of care in acute public hospitals is approximately 2% higher than the total number of admissions and the total number of episodes of care in private hospitals is about 0.5% higher than the total number of admissions.<sup>38</sup>

Data elements or characteristics of QHAPDC include items such as age, sex, residence, Indigenous status and country of birth. The latter is based on the Standard Australian Classification of Countries. It is the most easily collected and consistently reported of a range of possible data items that may indicate cultural or language diversity.

#### **4.13 National Aboriginal and Torres Strait Islander Social Survey**

National Aboriginal and Torres Strait Islander Social Survey (NATSISS) is conducted by the ABS and collects a broad range of social data, including smoking and alcohol consumption, relevant to Indigenous Australians. The most recent survey (2008) was conducted throughout Australia, including remote areas, from August 2008 to April 2009, with previous surveys in 2002 and 1994. In 2008 the sample size was 13,307 persons (7,823 adults aged 15+ years and 5,484 children aged 0–14 years) with a 78% response rate. For the 2008 survey, experienced ABS interviewers undertook personal interviews at selected private dwellings. Interviews were predominantly conducted using a computer-assisted interviewing questionnaire.

Data from this survey is used to inform reporting about risk factor prevalence in Indigenous Australians recognising the more culturally appropriate collection methods used compared to Queensland Health telephone surveys.

#### **4.14 National Aboriginal and Torres Strait Islander Health Survey**

The National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) was conducted by ABS in remote and non-remote areas throughout Australia with an aim to collect a range of information from Indigenous Australians (self-assessed) about health related issues, including health status, risk factors and actions, and socioeconomic circumstances.<sup>39</sup>

A total of 10,044 Aboriginal and Torres Strait Islander adults and children from across Australia were surveyed in the NATSIHS, which was conducted from August 2004 to July 2005—the most recent survey. In addition, 395 Indigenous Australians were enumerated in the 2004–05 NHS sample of 25,906 persons. The Indigenous results are based on the combined sample of 10,439 Indigenous Australians, comprising 5,757 adults and 4,682 children. Of note, the estimated resident Indigenous population of Australia at 31 December 2004, excluding those living in non-private dwellings, was 474,310.

The NATSIHS was designed to produce reliable estimates at the national level and for each state and territory. In addition, the Torres Strait Islander population was over-sampled in order to produce data for the Torres Strait Area and the remainder of Queensland.

Data collection was undertaken by ABS interviewers. Persons aged 18 years or more were interviewed personally, with the exception of persons who were too sick or otherwise unable to respond personally. There were a number of differences between the data collection methods used in remote communities (in Western Australia, South Australia, Queensland and the Northern Territory) and those used in other geographic areas. In remote communities, the standard household survey approaches were modified to take account of language and cultural issues. Interviews were conducted using a paper questionnaire. In addition, interviewers worked in teams of two, one male and one female, to collect the survey information. Male interviewers collected personal information from male respondents, and female interviewers collected personal

information from female respondents. The interviewers were accompanied in the communities, wherever possible, by local Indigenous Australian facilitators, preferably one male and one female, who assisted in the conduct and completion of the interviews. The Indigenous Australian facilitators explained the purpose of the survey to respondents, introduced the interviewers, assisted in identifying the usual residents of a household and in locating residents who were not at home, and assisted respondents' understanding of the questions where necessary.

NATSIHS data is used to report Queensland and national prevalence of key risk factors and represents the most accurate source of such data available.

In 2013, the first release of Aboriginal and Torres Strait Islander data from the Australian Health Survey were released. This will be followed in 2014 with biomedical, nutrition and related data releases.

#### **4.15 National Drug Strategy Household Survey**

The National Drug Strategy Household Survey (NDSHS) collects information from people aged 12 years and over from the population of all states and territories on knowledge of and attitudes towards drugs, drug consumption histories, and related behaviours. The most recent survey was conducted in 2013 but data and methodological detail is not due for release until 2014. This was the eleventh survey in a series which began in 1985, and was the sixth to be managed by the AIHW.<sup>40-43</sup> The NDSHS datasets are maintained by the Australian Social Science Data Archives of the Australian National University. Queensland Health accesses the dataset for more in-depth analysis and reporting as required.

Households are selected from each state and territory using stratified, multi-stage random sampling strategies ensuring reliable estimates across strata with varying population density. The NDSHS uses mixed methods for data collection. In 2001 data was collected by face to face interviews, drop and collect paper questionnaires and telephone interviewing (CATI). In 2004 face to face interviewing was dropped and drop and collect and CATI methods were used. In 2007 again drop and collect and CATI methods were used but in differing proportions with 84% drop and collect questionnaires. In 2010 data was collected exclusively by drop and collect paper questionnaire. The latest collection was 2013 with data released in 2014.

The NDSHS is used by Queensland Health for interstate and national comparisons of prevalence of alcohol consumption, tobacco smoking and illicit drug use. Since 2009, the Queensland Health survey program has routinely collected data on smoking and alcohol prevalence in Queensland, however, the state survey does not currently collect such data on persons younger than 16 years. The state collection is often designed to provide sub-state estimates such as HSDs and LGAs.

#### **4.16 National Health Survey**

An NHS is conducted by the ABS every three years to collect information on the prevalence of conditions, diseases, selected risk factors and selected health-seeking behaviours (such as health insurance and doctor and specialist attendance). The most recent NHS was completed in 2014–15. This was the sixth NHS conducted by the ABS with previous surveys conducted in 1989–90, 1995, 2001, and 2004–05 and 2011–12. A three-yearly cycle of data collection commenced in 2001.

The 2007–08 NHS selected dwellings at random using a stratified multi-stage sampling, then within selected dwellings, a random sub-sample of residents was selected; this included one adult (aged 18 years and older) and one child aged 0 to 17 years (where applicable). Persons living in non-private dwellings (3%) and in very remote Australia (1%) were excluded with only a minor impact on aggregate estimates, with the exception of the Northern Territory (where 22% of the population is living in very remote areas). Collection was spread evenly and randomly over four sub-periods to take into account possible seasonal effects on health.

The 2007–08 survey was conducted through personal computer assisted interview in 15,792 private dwellings throughout urban and rural Australia, with 20,788 completed questionnaires from

these dwellings (15,779 adults and 5,009 children). The household response rate (fully/adequately responding) was 79% (including sample losses). Person-level responses varied by states and territories; Queensland represented 15% of all completed questionnaires (3,134 persons). Separate household and person weights were calculated. Population estimates were adjusted according to the age and sex distribution and the number of adults per household.

Consistent with 2004–05, the 2007–08 survey collected information on the demographic and socioeconomic characteristics, long term medical conditions, health service usage and other actions recently taken in regard to health and various lifestyle factors (smoking, alcohol consumption, diet and exercise). Physical measurements were taken for the first time in 2007–08, including measured height and weight, measured body mass index (BMI), waist circumference, hip measurements and waist to hip ratio. Measured height and weight and dietary indicators were collected from children aged five years and over, also a first for the NHS. Medications data for mental and behavioural problems were collected for the first time in 2007–08.

Of note, the 2007–08 NHS collected information on smoking and alcohol consumption from persons aged 15 years and over, whereas the 2004–05 NHS only collected from persons aged 18 years and over. BMI for persons aged 15–17 years was based on children's cut-off points in 2007–08 whereas the 2004–05 NHS used adult cut-off points. Finally, symptoms and medication data were used to verify asthma as a current condition. Other key topics not covered in 2004–05, but collected in 2007–08 included check-ups; healthy lifestyle discussions or consultations for a selected condition with a GP, specialist or other health professional; information on disability or restrictive long-term health conditions; bodily pain; and personal stressors for the respondent or anyone close to them. The ABS user guide provides comprehensive information regarding data quality of the 2007–08 NHS and its comparability with the 2004–05 NHS.<sup>44</sup>

The Australian Health Survey 2011–12 is the most recent in the NHS series and is described more fully on page 10.

State and territory summary level statistics are available from the ABS website, with updates and revisions posted.<sup>45</sup> Queensland Health uses this data source for reporting jurisdictional comparisons and for selected key health status and risk behaviour patterns.

#### **4.17 National Nutrition Survey**

The National Nutrition Survey (NNS) was undertaken in 1995 and was the only source of nutrition data for the nation until the AHS was conducted in 2011–12 (page 10).<sup>46,47</sup>

In 1995, a sample of 13,800 people was invited to participate in the NNS having previously been included in the 1995 NHS.<sup>48</sup> A sub-sample of 1,490 NNS participants provided additional (day 2) food intake data. Detailed information was collected from people aged two years and older and nutrient information was later derived from reported food and beverage intake. Population estimates were weighted according to the age and sex distribution of the Queensland population and the number of adults per household. The results were not age-standardised.

Recommended daily intakes (RDI) of micronutrients are the amount of nutrients considered to be sufficient to meet the requirements of practically all healthy members of the population. All RDIs calculated from the 1995 NNS were based upon the 1982–1988 revised nutrient intake requirements and the 1989 revised energy requirements. All RDIs were based upon estimates of requirements with a generous 'safety factor' added.

#### **4.18 National Survey of Mental Health and Wellbeing**

The national Survey of Mental Health and Wellbeing (SMHWB) collect data on mental health and wellbeing in the Australian population using internationally recognised diagnostic interview tools. The first national SMHWB was conducted by the ABS in 1997, as part of the National Mental Health Strategy. The second and most recent survey was undertaken in August–December 2007.<sup>49</sup> The 2007 SMHWB was designed to provide national estimates and allow for international

comparison. Therefore caution should be applied when using data at state/territory level, noting that data are available for those states with large populations.

The 2007 survey collected information from people aged 16–85 years living in private dwellings across Australia (excluding remote areas). The diagnosis criteria were based on both lifetime diagnosis and the existence of symptoms of the disorder in the 12 months prior to completing the survey. The 1997 survey included adults aged 18 years and over and the diagnosis criteria were based solely on respondents' experiences in the 12 months prior to completing the survey.

In the 2007 SMHWB, private dwellings were selected from each state and territory at random using stratified, multi-stage area sampling to ensure a proportional representation of dwellings across areas with varying population density. To improve estimates for younger/older persons, the sample design allowed for a greater chance of selection in people aged 16–24 and 65–85 years. Due to the complexity and sensitive nature of the survey and feasibility of additional costs, proxy, interpreted or foreign language interviews were not undertaken.<sup>50</sup>

The 2007 survey was conducted by personal interview in 8,841 fully responding private dwellings, representing a 60% national response rate from all eligible dwellings selected—this varies considerably from the 1997 response rate of 78%. Queensland represented 20% of all completed questionnaires (1,800) in the 2007 survey. Due to a lower than expected response rate in 2007, non-response analyses were undertaken to assess the reliability of the survey estimates. The 2007 SMHWB population characteristics were compared with other data sources along with a Non-response Follow-up Study. Adjustments were made to the weighting strategy based on findings from the non-response analyses. Separate households and person weights were calculated. Population estimates were adjusted according to the age and sex distribution and the number of adults per household.<sup>50</sup>

Diagnoses of mental disorders in the 2007 SMHWB were based on the World Health Organization (WHO) Composite International Diagnostic Interview—Version 3 (WHO-CIDI 3.0) adapted for an Australian context. The 2007 survey captured three major group disorders (Anxiety disorders, Affective disorders and Substance Use disorders) along with information on health service usage for mental health problems, physical conditions, disability and functioning, and demographic and socioeconomic characteristics. Several new data items were included for the first time in 2007 including information on medication, social support and care giving, sexual orientation, homelessness, incarceration, and services in the Australian Defence Force, along with more comprehensive information on suicidal behaviour and consequences of attempted suicide.<sup>50</sup>

Comprehensive information regarding data quality of the 2007 survey and its comparability with 1997, as well as details on the non-response analyses, have been reported.<sup>50</sup> Data from 1997 survey are not rigorously equivalent to the results from the 2007 survey due to differences in how and when the data were collected. Differences in survey timing may have introduced varying seasonal effects. Higher prevalence estimates for 12-month mental disorders may have resulted from the inclusion of lifetime diagnosis.

#### **4.19 Oral health surveys**

Data to report on the dental status and risk factors for oral health are limited. The AIHW in collaboration with Australian Research Centre for Population Oral Health conducts the Child Dental Health Survey (CDHS) annually and the National Dental Telephone Interview Survey (NDTIS) less frequently.

The CDHS is an annual surveillance survey which monitors the dental health of children enrolled in school and community dental services that the health departments or authorities of Australia's six state and two territory governments operate. In all jurisdictions children from both public and private schools are eligible for dental care through a school dental service (SDS). The care typically provided in a SDS includes dental examinations, preventive services and restorative treatment as required. However, there are some variations among state and territory programs with

respect to priority age groups and the nature of services. In some jurisdictions, caries risk assessment is used to determine recall interval and preventive treatment. Consequently, there are variations in the extent of enrolments in SDS, with some jurisdictions serving more than 80% of primary school children and others serving smaller proportions.

Reporting on the oral health status of Australia's children in 2007 included CDHS data collected from the following jurisdictions: Queensland, South Australia, Western Australia, Tasmania, the Northern Territory and the Australian Capital Territory. In addition, data for New South Wales were derived from the New South Wales Child Dental Health Survey conducted in 2007. Care should be exercised when reporting from this source, due to differences between states and territories in school dental service coverage, level of enrolment, services policy focus, or access to services in rural or remote areas and may affect the overall differences. For the 2007 survey there were a total of 110,014 children aged between 5 and 15 years where 4,028 were from Queensland.

The NDTIS is usually run every two and a half years by the AIHW's Dental Statistics and Research Unit. The most recent surveys were run in 2007–08 and 2010. The purpose is to collect information on the dental visiting patterns and oral health status of Australians to inform national reporting.<sup>51</sup> In the 2007–08 survey, a total of 13,733 unique telephone numbers were called, resulting in 7,587 completed interviews, and included 6,602 adults aged 18 years and over and 985 children aged 5 to 17 years. The overall participation rate was 59.4% and ranged from 50.9% in Melbourne to 69.7% in non-metropolitan South Australia. For Queensland, there were 566 Brisbane residents surveyed representing a participation rate of 50% and 642 from the balance of the state, a 59.3% participation rate.

In Queensland as part of the evaluation of the introduction of fluoridation, a survey series which commenced in 2012<sup>52</sup> was used for population health monitoring in the Chief Health Officer report commencing with the 2014 release.

#### **4.20 Queensland preventive health surveys**

Health surveys are a primary source of information on health behaviours and health service utilisation. These are not captured through administrative datasets or registries which are designed to capture health service admissions (for example, hospital or emergency department) or medical diagnoses (for example notifiable diseases or cancer). National health surveys are typically conducted once every three years and provide state-level data only (although some surveys report major cities compared to the rest of the state). At the state level, health planning often requires information more frequently or at a more regional level. Many states and territories therefore conduct their own statewide surveys, as part of a formal or informal surveillance system, to fulfil this need for local level information.

A formal and ongoing surveillance system for key preventive health indicators was established in PHB in 2009. Previously, these data were irregularly collected by Queensland Health as part of the annual Omnibus surveys managed by the Health Statistics Centre (HSC). Accountability for reporting in this area was transferred to PHB under the Council of Australian Governments (COAG) National Partnership Agreement on Preventive Health (NPAPH). The surveys were referred to as the Self Reported Health Status (SRHS) and Child Health Status (CHS) surveys. Table 1 summarises the survey series included in this surveillance framework.

##### **4.20.1 Adult surveys**

Data are collected by computer assisted telephone interview (CATI). The survey sampling frame was landline telephone random digit dialling (RDD) for surveys prior to 2015. From 2015 onwards the sampling frame is the list-based Queensland Household Frame (QHF). The QHF is maintained by Queensland Treasury for official statistical purposes and includes both landline and mobile telephone numbers. In all years, an adult is randomly selected from contacted households to participate. Data for key health indicators are collected annually (for example healthy weight, fruit and vegetable consumption, daily smoking) with additional health modules included on a rotational or one-off basis. Information regarding data processing and coding is included in Section 5.2. Data are not collected during school holidays.

## 4.20.2 Child surveys

Data are collected by CATI with the primary parent or caregiver reporting on the health and lifestyle of a child randomly selected in the household. This survey is conducted approximately biennially. As with the adult survey, health indicators for state and national chronic disease reporting obligations are collected on each survey, with additional health modules included periodically. Data are not collected during school holidays. Data were collected concurrently with the adult survey in 2013 and 2014.

## 4.20.3 Infant surveys

Data are collected by CATI with the primary parent or caregiver reporting on the health and behaviour of the infant. Data were collected in 2003, 2008 and 2014.

Table 1: Queensland preventive health surveys

Year	Survey title	Response rate	Sample size	Age group (years)	Comments
1998	Statewide Health Survey	72%	5594	18+	
2000	Chronic Diseases Survey	80%	1625	18+	
2001	Omnibus Survey	77%	3083	18+	
2002	Omnibus Survey	75%	2481	18+	
2002	Social Capital Survey	79%	2667	18+	Oversampled rural and remote
2003	Omnibus—General Population	73%	1575	18+	
2003	Older Persons Survey	87%	2200	50+	
2003	Omnibus—Child Health	87%	1596	5–12	
2003	Omnibus—Infant Nutrition	92%	1200	0–4	
2004	Omnibus Survey	71%	2231	18+	
2005	Omnibus Survey	70%	1846	18+	
2006	Omnibus Survey	66%	1521	18+	
2007	Omnibus Survey	68%	2004	18+	
2008	Omnibus Survey	64%	2002	18+	
2008	Child survey		1,612	5–12	
2008	Infant Nutrition	96%	1200	<1	
2009	Self Reported Adult Health Status	57%	7721	18+	Oversampling by HSD
2009	Child Health Status	85%	1200	5–15	
2010	Self Reported Health Status	65%	9281	16+	
2011	Self Reported Health Status	44%	12,563	16+	Oversampling by HSD
2011	Child Health Status	86%	2484	5–17	
2012	Self Reported Health Status	81%	19,781	16+	Oversampling by LGA
2013	Self Reported Health Status	77%	7994	16+	Oversampling by HSD
2013	Child Health Status	82%	2467	5–17	
2014	Self Reported Health Status	68%	14,787	18+	Oversampling by LGA
2014	Child Health Status	94%	2,986	5–17	
2014	Infant Health Status	94%	2,498	0–4	
2015	Adult preventive health telephone survey	65%	12,568	18+	Oversampled by LGA
2015	Child preventive health telephone survey	80%	2,521	5–17	Oversampled by HHS
2016	Adult preventive health telephone survey	64%	11,568	18+	Oversampled by LGA
2016	Child preventive health telephone survey	84%	2,504	5–17	Oversampled by HHS

Note: The adult and child surveys included both landline and mobile telephone numbers as of 2015.

## 5 Statistical methods

### 5.1 Rates and ratios

#### 5.1.1 Rates

Much of public health assessment involves describing changes in health status over time or by comparing health events between population groups, communities, districts or states. In making these comparisons, the number of health events need to be accounted for, and this is a product of population size. To account for population growth or to compare populations of different sizes, rates are reported to provide the number of events per population unit.

A rate consists of a numerator and a denominator. The numerator is generally the number of health events. This is often the same as the number of people who experience an event, but for some health conditions, one person may experience the event more than once. For example, one

individual may have multiple hospitalisations for the same condition in a given year. The denominator is the population at risk. Everyone in the population at risk must be eligible to be counted in the numerator if they have experienced the event of interest. For example, if the event of interest is breast cancer in females, men in the population at risk cannot be included, because men with breast cancer would not be included in the numerator.

The crude rate provides a summary measure of the number of health events per population unit. However, the frequency with which health events occur is often related to age and when comparing rates between populations with different underlying age structures it is necessary to remove the effects of differences in age structure by calculating age adjusted and age specific rates.

For comparison of health status across areas, rates are age standardised to eliminate differences due to differing age structures and this is the most sound epidemiological approach. However, this method is likely to overestimate the actual burden in areas with a younger age profile and underestimate the burden in areas with an older age profile. This is discussed in greater detail in section 7.13.2, page 67

Age specific rates are useful for comparing age defined subgroups when rates are strongly age dependent (five-year age categories are used unless otherwise specified). Age specific rates are also used when specific services are targeted at a certain age group, for example, mammography screening in women aged 50–69 years.

### 5.1.2 Age-standardised rates and proportions

When comparing rates of disease between different periods of time, different geographic areas or different population groups it is important to ensure that the observed differences in crude rates are not simply due to differences in the age–sex structure of the populations of interest. This possibility can be overcome by comparing age–sex specific rates but this requires examining multiple pairwise comparisons. An alternative approach is age-standardisation. This method provides an overall rate for a population, adjusted to a standard population age structure. There are two methods used for age-standardising: direct and indirect. For the purposes of monitoring health status in Queensland, direct age-standardisation is usually used. This includes death, hospitalisation and incidence reporting.

Direct age-standardised rates are calculated using the following formula:

$$\text{Age-standardised rate} = \frac{\sum(r_i P_i)}{\sum P_i}$$

where  $r_i$  is the age specific rate in age group  $i$  of the study population and  $P_i$  is the standard population for  $i^{\text{th}}$  age group.

Direct age-standardisation converts the crude overall rate estimate to the rate that would have occurred if the age structure was that of the standard population. Age-standardised rates calculated using different standard populations cannot be directly compared.

Indirect age-standardisation is used to compare study populations for which the specific rates are either statistically unstable or unknown.<sup>53</sup> The indirectly standardised rate itself is the product of the standardised mortality (or morbidity) ratio and the crude rate for the standardised population.

The convention adopted by ABS and the AIHW is to use the age distribution from the rebased ERP as of 30 June in the most recent census year ending in '1' as the standard or reference population for direct age-standardisation. However in 2012 a decision was taken by ABS to continue to use Australia 2001 as the reference population. Of note, both male and female age-standardised rates are standardised to the total Australian population age structure, not the sex-specific age structure.

Age-standardised prevalence estimates for the preventive health telephone survey were used for regional comparisons in 2009–10 (standardised to the 2001 population) and 2011–12 (standardised to the 2011 population).

For reporting low prevalent conditions, such as some cancers or lower level geographies, the cases over a number of years are aggregated. Using the Poisson distribution the rate is the total number of cases divided by person years at risk. The variance is number of cases divided by the square of the person years. Aggregation of cases over a number of years results in narrow confidence intervals (CIs). As non-overlap of CIs is the standard test for statistical difference, this increases the likelihood that difference will be reported.

For routine health status reporting by PHB, generally no more than three years of data will be aggregated. For hypothesis generated investigations this limit does not apply. The rationale for this decision is based on the balance of statistics and public health reporting. It is acknowledged that aggregating years of data will narrow the CIs and may lead to reporting a difference where the public health significance is limited and may prompt unfounded community concern. For example, among three geographic areas of interest (GAI) with significantly higher or lower cancer incidence rates than the state average (cancer X) when considered over a full six year period, only in one individual year for each GAI did they differ significantly when each year was assessed independently. The decision to limit aggregation to no more than three years is an attempt to balance public health and statistical rigour.

## **5.2 Data processing—survey data collection**

### **5.2.1 Weighting**

Survey weighting is undertaken using two components:

- selection weight which adjusts estimates based on the probability of being selected
- population benchmarking to estimated residential populations for age and sex and specified geographies.

Selection weights are calculated based upon the number of phone lines and eligible persons in the household which is collected from respondents at the time of the interview. Weighting is based on the most recent release of annual ERP as of 30 June and is specified in the survey technical documentation. For surveys with sufficient sample size, survey weights may also be standardised to the Australian ERP reference population to calculate sub-state age standardised estimates. Where survey weighting is performed by the CATI service provider, accuracy is thoroughly verified by PHB. PHB also develops additional weighting schemes as appropriate to meet sampling and reporting objectives (for example, by LGA). PHB has calculated survey weights from 2010 to 2014. The Queensland Government Statisticians Office (QGSO) had performed the survey weighting using GRETWT from 2015 onwards.

### **5.2.2 Geographical coding**

During data collection, the location of each respondent residence was verified by asking their postcode and suburb. This information was used to identify the residential SLA using Australian Geographical Classifications from the ABS,<sup>54</sup> postcode data as supplied by the QGSO<sup>55</sup> and the Department of Energy and Resource Management.<sup>56</sup> The verified SLA locality for each respondent was then used to assign respondents to their LGA and HSD or HHS geography.

In some cases, a combination of postcode and suburb information was insufficient to identify the SLA of residence. When this occurred, and where possible, additional information was collected to resolve the discrepancy. For example, information on location of residence (street/cross-street) was used for SRAHS 2009 and SRHS 2011 to more precisely define SLA of residence. When SLA could not be definitively identified based on the information provided by the respondent, SLA was assigned based on standardised protocols (protocols varied across survey years and are described in the relevant technical specification documents associated with each dataset).

The following geographic coding rules were applied to these surveys:

### **SRAHS 2009**

- When a respondent's postcode/suburb fell entirely within an SLA (and thereby entirely within an HSD), SLA and HSD were coded automatically in accordance with geographical concordance specifications.
- Where a respondent's postcode/suburb was potentially located in more than one HSD and/or more than one SLA, residences were geo-coded based on supplied street and cross-street information to the appropriate postcode.
- Where street/cross-street did not resolve HSD/SLA location, respondents were assigned to an SLA/HSD based on the original allocation specified in the sample.

### **SRHS 2010**

- When a respondent's postcode/suburb fell entirely within an SLA (and thereby entirely within an HSD), SLA and HSD were coded automatically in accordance with geographical concordance specifications.
- Where a respondent's postcode/suburb was potentially located in more than one HSD and/or more than one SLA, residences were geo-coded to the most populous SLA.

### **SRHS 2011**

- When a respondent's postcode/suburb fell entirely within an SLA (and thereby entirely within an HSD), SLA and HSD were coded automatically in accordance with geographical concordance specifications.
- Where a respondent's postcode/suburb was potentially located in more than one HSD and/or more than one SLA, residences were geo-coded based on supplied street and cross-street information. Street/cross-street information resolved 295 respondents to their SLA and 371 respondents to HSD only. Two cases were not able to be resolved to either the SLA or HSD geography.

### **SRHS 2012**

- When a respondent's postcode/suburb fell entirely within an SLA (and thereby entirely within an HSD/HHS), SLA and HSD/HHS were coded automatically in accordance with geographical concordance specifications.
- Where a respondent's postcode/suburb was potentially located in more than one SLA, residences were geo-coded based on supplied street and cross-street information.
- Where street/cross-street did not resolve respondent's SLA of residence, assignment was made to the most populous SLA.

### **SRHS 2013**

- Conversion to the ABS Australian Standard Geographic Standard (ASGS)<sup>57</sup> was implemented with this survey, therefore, geocoding was by SA2.
- When a respondent's postcode/suburb fell entirely within an SA2 (and thereby entirely within an HHS), SA2 and HHS were coded automatically in accordance with geographical concordance specifications.
- Where a respondent's postcode/suburb was potentially located in more than one SA2, geocoding was based on street and cross-street information provided by the respondent.
- Where street/cross-street did not resolve the residential SA2, assignment was made by randomly selecting among possible SA2s, Randomisation was weighted by the population of the relevant SA2s. The respondent was then geocoded to the mesh block centroid closest to the original ambiguous location. This only applied to a small number of cases.
- SLA geocoding was also implemented to facilitate historical comparisons. Where a participant's SA2 assignment was ambiguous at SLA level, the weighted randomisation protocol above was employed to assign SLA.

### **SRHS 2014**

- Respondents were coded to SA2. SLA coding was not undertaken.

- When a respondent's postcode/suburb fell entirely within an SA2 (and thereby entirely within an HHS), SA2 and HHS were coded automatically in accordance with geographical concordance specifications.
- Where a respondent's postcode/suburb was potentially located in more than one SA2, geocoding was based on street and cross-street information provided by the respondent.
- Where street and cross-street did not resolve SA2, respondents were coded to either the street or cross-street geometric centre within the postcode/suburb information provided.
- Where street and cross-street could not be resolved, respondents were coded to the centroid of the suburb and/or postcode.

## 2015, 2016 adult and child preventive health telephone surveys

- Geocoding performed by Queensland Treasury

### 5.2.3 Data pooling for generation of sub-state estimates

The standardised survey methods used in the SRHS survey series introduce the potential to pool data across multiple years to increase sample size. Increasing the sample size is beneficial because it increases the precision of estimates or may be necessary to achieve minimal sample sizes for analysis of small geographic regions. Comparability of data collection in terms of sampling, timeframe, survey items and responses is closely scrutinised across the years of data to be pooled. This is assessed on a case-by-case basis. Appropriate data re-weighting procedures are developed and documented. Methodological information regarding the surveys and pooling process is provided in a data user manual for the pooled dataset.

## 5.3 ICD codes and classifications

The ICD is the international standard classification for epidemiological purposes and is designed to promote international comparability in the collection, processing, classification and presentation of causes of death statistics.<sup>20</sup> The classification is used to classify diseases and causes of disease or injury as recorded on many types of medical records as well as death records. The ICD has been revised periodically to incorporate changes in the medical field. Currently ICD 10<sup>th</sup> revision is used for Australian causes of death statistics.

The extensive nature of the ICD enables classification of causes of death at various levels of detail. A standard set of disease codesets is maintained by Queensland Health for health status reporting (for example the CHO report series) to maintain consistency over time and with national and other reports (Section 10.2).

The codesets for several indicators remain under review as described below.

### 5.3.1 Road transport related injury

The codes recommended by an internal Queensland Health review in 2005<sup>58</sup> were based on an AIHW publication<sup>59</sup> and were at the time and remain under review. They are:

V02–04 (.1,.9); V09.2; V12–V14(.3–.9); V19 (.4–.9); V20–28 (.3–.9); V29 (.4–.9); V30–V39 (.4–.9); V40–49 (.4–.9); V50–59 (.4–.9); V60–69 (.4–.9); V70–79 (.4–.9); V80 (.3–.5); V81.1, V82.1; V83–V86 (.0–.3); V87 (.0–.8); V89 (.2); V01 (.0,.1,.9); V06 (.0,.1,.9); V09 (.1,.3,.9); V10–V11 (.0–.5,.9); V16–V18 (.0–.5,.9); V19 (.3,.8,.9); V80 (.0–.2,.7–.9); V82 (.2–.7,.9); V87.9; V88.9, V89 (.1,.3,.9). They include any hospitalisation which has one of these codes in any field in the external causes, not just the first field.

This codeset was used in all population epidemiology reports including the 2010 CHO report. An assessment of reporting continuity between recommended ICD-9 codes and ICD-10 codes (see above) was conducted by Queensland Health in 2005.<sup>58</sup> Alternative published codesets include Australian Burden of Disease and Injury 2003 (where the reporting indicator is road traffic accidents),<sup>60</sup> and NSW Health (the indicator is referred to as motor vehicle crash).<sup>61</sup> This indicator and the relevant codeset may be reviewed in future

### 5.3.2 Falls

The CHO report series used the following codeset for reporting falls, based on AIHW reports:

- Mortality<sup>62</sup>: Multiple Cause of Death: S00–T75, T79 and W00–W19; or X59 and any S02, S21, S22, S32, S42, S52, S62, S72, S82, S92, T02, T08, T10, T12 or T14.2; and also Underlying Cause of Death: W00–W19; or X59 and any S02, S21, S22, S32, S42, S52, S62, S72, S82, S92, T02, T08, T10, T12, or T14.2. Note that the ABS does not code cause of death using S, T or Z codes and only uses the external cause codes (V–Y) for trauma related deaths.
- Hospitalisations<sup>63</sup>: Principal diagnosis S00–75 or T79 and first external cause of unintentional fall W00–W1999 and mode of transmission was not from another acute hospital. Note that the ABS code hospital separations with both cause of injury (V–Y) and consequence of injury (S–T) codes.

However from 2005 until 2009, the following codeset was used for population epidemiology reporting—mortality and hospitalisations (W00–W19).<sup>58</sup> This included the 2006 and 2008 CHO reports.

Alternative codesets include: Australian Burden of Disease and Injury 2003<sup>60</sup> (W00–19, M80–82) and NSW Health<sup>61</sup> (W00–W19—detailed caveats apply to the application of these codes).

### 5.3.3 Colorectal cancer

The following codeset was used in the CHO report series for reporting deaths: C18–20. This codeset was consistent with AIHW reporting, but not other jurisdictions who more commonly report C18–21 (Section 10.2). However, based on ‘Causes of death, Australia, 2008’, C18–20 represents 98.5% of deaths due to C18–21. Between 2005 and 2010, the recommended codes for colorectal cancer in Queensland Health were C18–21.<sup>58</sup> The decision to align with AIHW was taken at a joint meeting which included epidemiologists from the Division of the Chief Health Officer and data specialists and analysts from HSC (at the bi-annual health surveillance meeting) in May 2009. Recognising the lack of national consistency of codes for colorectal cancer, the current codeset may need to be reviewed.

### 5.3.4 Chronic Obstructive Pulmonary Disease

For the CHO report series the following codeset was used for Chronic Obstructive Pulmonary disease (COPD): J41–44. Whilst this codeset is consistent with NSW Health and AIHW, National Centre for Classification in Health recommends J44 only and between 2005 and 2010 Queensland Health also recommended J44 only.<sup>58</sup> However, J44 represents 86% of the deaths and 98% of hospitalisations due to the codeset J41–44. It includes individuals less than 30 years of age who would not be considered likely to be diagnosed with classical COPD. It is therefore likely that these are misclassifications. A further refinement of codes might be to restrict the age group to 64+ years. COPD codes may be reviewed in future.

### 5.3.5 Pneumonia and Influenza

The codes for pneumonia and influenza were expanded to include J9 following the swine flu epidemic in 2009. Prior to that the standard codeset was J10–J18. This decision was taken in November 2013, based on advice from Health Statistics Unit.

## 5.4 Reporting the reliability of estimates

PHB uses two primary methods to assess and report the reliability and precision of estimates:

- 95% CIs
- Relative standard error (RSE).

The CI is a range of values that is expected to contain the true population value 95% of the time if the survey were repeated on multiple samples. Thus a large interval reflects less certainty in the precision of the estimate.

The RSE is calculated by dividing the standard error of the estimate by the estimate itself and is expressed as a percentage of the estimate. It is particularly useful when assessing the reliability of estimates with large CIs. Unless otherwise noted, from 2011 onwards PHB uses the following reporting criteria:

- Estimates with an RSE less than 25% are considered reliable and are reported.
- Estimates with an RSE between 25% and 50% should be interpreted with caution. When the RSE of an estimate lies within this range, this must be indicated in tabular output.
- Estimates with an RSE greater than 50% are not considered sufficiently reliable and are not reported (suppression indicated in tables).

The RSE criteria were implemented with the SRHS 2009–2010 survey reports and for health outcome reporting from 2011 onwards. (Prior reports did not include assessment of RSEs.)

### 5.5 Small area/small population analyses

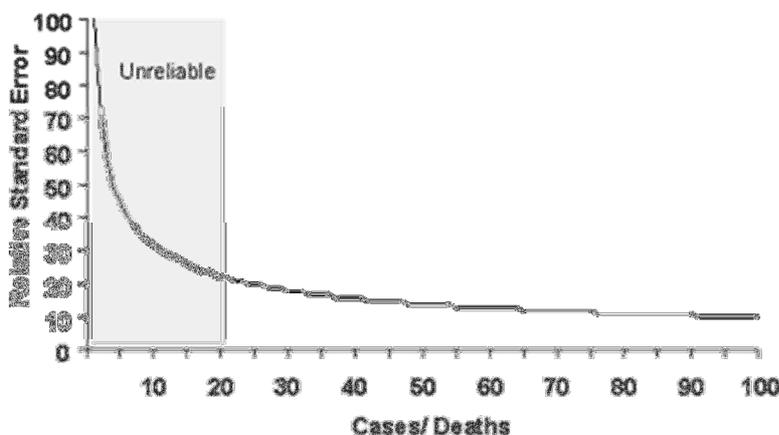
It is common for stakeholders to require data at a sub-state geographic or demographic level (for example, HSD, LGA, persons aged 55 years and older). The ability to provide this information is dependent upon a variety of factors such as the population of the sub-region or demographic group, the prevalence of the condition of interest, and the sample size.

Many administrative datasets (for example, births, deaths, hospitalisations) are a census of all events for an area. As such, there is typically sufficient sample to report reliably at sub-state levels (dependent upon privacy and confidentiality for small populations). Surveys, however, introduce the potential for sampling bias, especially where populations are small and/or a condition is relatively rare.

Release of data from administrative datasets:

Although many conditions are sufficiently prevalent to generate a large number of cases for health outcome reporting, there are some conditions which have few case numbers at state level annually, or may be a prevalent condition which is required for reporting at lower geographies. To address statistical reliability rates are not reported on fewer than 20 cases in a given period and or geography (Figure 1).<sup>64</sup> The RSE of an incidence or mortality rate is based on the number of cases or deaths, unlike the standard error and confidence intervals which are based on both the number of cases and the size of the population. Where necessary, the cases over a number of years are aggregated to report low prevalent conditions. Where this is required for routine health status reporting, the maximum number of years will be three. For hypothesis generated investigations this limit does not apply.

Figure 1. Relative standard error of an incidence or mortality rate as a function of number of cases<sup>65</sup>



Release of survey estimates:

PHB assesses the feasibility of releasing estimates at the sub-state level and is able to consider such data requests when statistically justified (Section 5.4). Estimates are not provided where a region has less than 50 survey respondents or where CATI data collection methods are

inappropriate (for example, in regions with a high proportion of Aboriginal and/or Torres Strait Islander Queenslanders). These are considered minimal standards and, depending upon the sensitivity of the particular estimate, PHB may not disseminate findings based on other criteria (for example, potential privacy or confidentiality implications). PHB does not disseminate results where estimates are based on fewer than five cases to protect respondents' privacy. Additionally, estimates based on fewer than 10 cases are not usually released as such estimates do not typically adhere to reliability criteria.

Sub-geographic analyses may still be possible in some cases by increasing the sample size available for analysis by methods other than during the actual conduct of the survey. The two primary ways of accomplishing this are by combining (pooling) data for the same area over multiple years or by aggregating several smaller areas into one contiguous area.

Release of survey datasets is discussed in Section 6.13.

## 5.6 Reporting statistical significance

Assessing differences between population groups is a very common epidemiological requirement. The method used to identify potential differences requires consideration of both the statistical characteristics of the data and the public health significance of any differences that may be revealed. Assessing the audience and the purpose of reporting is critical to determining the appropriate analytical approach.

Data collected or maintained by PHB are analysed to investigate a broad range of enquiries related to the health of Queenslanders. Two main analytical approaches are used in performing these functions:

- routine monitoring and reporting
- formal hypothesis testing.

These two approaches are complementary. However, it is recognised that they serve different purposes and address different analytical questions.

Routine monitoring and reporting activities are considered more fundamental in nature. Information needs are met by reporting various epidemiological measures (for example, prevalence) for conditions or risk factors, often stratified by socioeconomic variables (for example, age differentials). These analyses and associated dissemination approaches were developed in line with business objectives of other departments but also encompass ad hoc requests as Queensland Health responds to emerging population health information needs.

In contrast, hypothesis testing requires both null and alternative hypotheses. Hypotheses are often developed based on findings from routine monitoring or descriptive analysis. The choice of the statistical analysis depends upon the hypothesis and the characteristics of the dependent and independent variables. Analysis often involves using several independent variables to model complex disease determinants. Such investigations commonly require greater resources in terms of staff and time to comprehensively explore, model and interpret relationships associated with disease outcomes. Different dissemination methods may also be appropriate as findings may relate to system-level or multi-sectoral approaches rather than to inform discrete resource allocation or intervention strategies.

The two analytical approaches serve different information purposes and use different methods, and therefore statistical significance may be based on different, but equally valid, criteria. This does not preclude the use of identical methods or statistical significance criteria when warranted. The majority of the reporting performed by PHB requires assessment of significant differences between estimates from different populations (for example, males compared to females, younger compared to older ages, or regions compared to Queensland). The criteria to determine statistical significance, as well as the similarities, advantages and limitations of each method, are detailed below.

One method to determine statistical significance is using  $p$  values. Broadly, the  $p$  value is the probability of obtaining a test statistic at least as extreme as the one that was actually observed. If a  $p$  value is below a certain threshold (the  $\alpha$  level, typically defined as 0.05), then the result is considered statistically significant and the null hypothesis (typically that there is no difference between statistics) is rejected in favour of the alternative hypothesis (that there is a difference). There are two potential types of error that are possible when using  $p$  values to indicate statistical significance, specifically:

- Type I error—the null hypothesis is incorrectly rejected and two estimates are incorrectly considered different.
- Type II error—the null hypothesis is incorrectly accepted and two estimates are incorrectly considered the same.

Probabilistically, when  $\alpha$  equals 0.05, five Type I errors will occur for every 100 statistical tests. The two types of error are reciprocal—as the  $\alpha$  level is reduced to prevent Type I error, the likelihood of Type II error increases and vice versa. Advantages of the  $p$  value criterion for determining statistical significance are that it is widely accepted and can be efficient when making decisions between two straightforward options. Limitations of the  $p$  value criterion for determining statistical significance are that it only accepts or rejects the hypothesis based on the  $\alpha$  level threshold; it does not assess the magnitude, direction, or biological or public health significance of the finding.<sup>66</sup>

A second method of assessing statistical significance is by CIs. A CI is an interval estimate of a population parameter and is used to indicate the reliability of an estimate. It is based on the probability, defined as 1 minus  $\alpha$  (typically 95%), that the interval contains the population parameter. It can be interpreted as the range of values that would contain the true population value 95% of the time if this survey were repeated on multiple samples. The CI is a function of sample size, the prevalence of the health factor being investigated, and measurement precision. CIs provide a method to assess statistical significance through non-overlap of the CIs: if CIs do not overlap the estimates are significantly different. A limitation of CIs is that this significance assessment is conservative, meaning that there is more likelihood of Type II error than when applying  $p$  value significance testing. The advantage of using CIs is that they convey information regarding the magnitude and direction of associations. Because a CI also gives an indication of the precision of the data, it can also be used to judge when a finding of no difference may be due to a lack of precision.<sup>66</sup> These benefits are of particular value where an issue is of public health significance, but data may not be precise enough to achieve statistical significance using  $p$  value significance testing. CIs represent a feasible, time efficient and, more importantly, statistically valid strategy for assessing statistical significance for routine monitoring and reporting functions.

An issue that can arise in settings where data must meet various reporting, operational and research purposes is the issue of multiple comparisons. Briefly, because statistical assessment is based on the underlying probability of a value being observed, probabilistically some significant findings will be spurious. There are various methods to adjust for this problem, such as the Bonferroni correction, that basically reduce the  $\alpha$  level based on the number of comparisons. This is a feasible solution in formal hypothesis testing, where the number of comparisons can be determined a priori but are usually less feasible for routine monitoring and reporting. Several strategies can be used to determine when corrections for multiple testing are necessary. Firstly, scrutinise the underlying objective of the analysis to determine whether multiple comparisons are occurring. For example, ‘Does HSD X have the same prevalence for a risk factor as Queensland?’ is a different question to ‘Is there any difference in the prevalence of a risk factor between all the HSDs?’ The latter question would require an overall test of significance and, if that was significant, follow-up with individual comparisons using a Bonferroni correction. Secondly, limit unnecessary comparisons to avoid these spurious outcomes. Both strategies are compatible with either analytical approach. For routine monitoring and reporting, presenting CIs rather than running all potential comparisons (many of which may be of limited value in achieving public health objectives) is particularly efficient in this regard. Ultimately, decisions on whether multiple comparison corrections are required should be determined based upon the objective of the analysis being undertaken.

In summary, considering the benefits and limitations detailed above, the following strategy for reporting statistically significant differences has been adopted by PHB.

- For routine monitoring and reporting such as the CHO report and other general health status reporting, statistical significance will be based upon non-overlap of 95% CIs. Differences that are not statistically significant are not generally detailed in text, although this is subject to the precision of the estimate and the public health significance of the condition of interest. In addition, the focus of reporting statistical differences will be to present overall trends in data in consideration of the value and implication of the information from a public health standpoint and based on known precedents rather than to exhaustively describe all significant differences between sub-groups (although data will typically be presented in tabular format for stakeholders to interpret).
- Significance testing using  $p$  value thresholds will be used for formal hypothesis testing. This may include analysis of trends over time for state and national reporting, and for peer reviewed publications.

## 5.7 Regression analysis

Multivariate regression analysis enables the simultaneous examination of the relationships between an 'outcome' (or 'dependent' or 'response') variable and several 'predictor' (or 'independent' or 'explanatory') variables, while adjusting for the influence of other predictor variables in the model.

Briefly, a typical strategy for regression analysis can progress through the following steps:

- exploratory data analysis
- the development of one or more tentative models
- assessment of suitability of tentative models, with potential redevelopment of tentative models
- identification of the most suitable model
- using the most suitable model to make inferences<sup>67</sup>

In PHB, the primary purpose of regression analysis is to elucidate or describe relationships of public health importance. Regression analysis is conducted using Queensland Preventive Health Survey datasets (see sections 4.20.1 and 4.20.2). Limitations to the inferences which can be drawn from regression analysis of data from surveys have been described by Lohr.<sup>67</sup>

There are varying views regarding the usage and application of weights when conducting regression analysis of survey data.<sup>67-70</sup> Estimates can differ depending on whether a weighted or an unweighted model is used.<sup>67,69</sup> Unweighted models can be used with non-probability samples and generally produce lower standard errors than the corresponding design-based models, but potentially lose generaliseability.<sup>67</sup> One recommended approach involves comparison of the models produced from unweighted and weighted data.<sup>67,71</sup> PHB compares the coefficients and  $p$  values of the weighted and unweighted models when drawing inferences from an analysis.

Stata/SE 11.2 for Windows and SPSS (version 19) statistical software packages are used for regression analysis in PHB.

## 5.8 Trend analysis

It is recognised that Poisson regression is the most appropriate approach to analysing trends in count data, however, count data of a sufficient number of data points to undertake Poisson regression are not always available for all population health indicators. Unless otherwise stated, univariate linear regression has been used to analyse trends over time for key health risks. This method simply applies a straight line of best fit through the data and does not adjust for any potential confounding factors.

In 2014, Poisson regression methods were determined to be the most appropriate for trend analysis of the preventive health telephone survey data and were used to assess trends by sex, age group and socioeconomic status.<sup>72</sup> For health outcome reporting in the 2014 and 2016 Chief Health Officer reports, trends were based on linear fit to the log of the annual estimates. Selection of the most appropriate regression methodology is dependent upon many factors involving the research hypothesis and nature and availability of the data. PHB will ensure that analytical method is clearly identified or available.

Sampling variability makes survey data more susceptible to year to year variation. Trend analysis is the most appropriate method to assess changes over time because the effects of sampling variability are minimised as the number of data points increase. Change over time should not be assessed between only two data points because the effects of sampling variability are strongest in these cases.

## **5.9 Risk of death/diagnosis analysis**

The calculation of probability of developing or dying from a certain condition or disease is based on published methodologies.<sup>73,74</sup> The method estimates the age conditional probability of developing disease from surveillance data. The calculation was undertaken using the National Cancer Institute's "DevCan" software. The method used in DevCan did not change between 2003 (version 5.0) and the most recent release (6.7.3 in April 2015).

Cross-sectional disease and death rates are used to estimate lifetime and age-conditional probabilities of developing disease (or dying) in a hypothetical cohort. Rates can be calculated for sub-populations such as Indigenous Queenslanders or socio-economic status. The method provides confidence intervals on these rates.

We use age-specific rates (disease or mortality) and population for age groups as input. For example, mortality rates for cancer, other causes, and all causes mortality rates can be provided for five year age groups from 0 to 85, and for 85 plus, together with the population in each of these age groups over the relevant time period.

The output from DevCan is in the form of a life table – for each five-year age interval, the total alive at the beginning of the interval, the number who die from cancer and other causes during the interval, and the cumulative probability of dying from cancer, other causes, and all causes by the end of the interval are provided.

Similarly, if incidence rates are provided for a particular disease, the output life table consists of the total alive and disease free at the beginning of the interval, the number who develop the disease during the interval, and the number who die from other causes during the interval, plus cumulative probabilities of developing the disease or dying based on age group intervals.

## **6 Specific topics**

### **6.1 Aboriginal and Torres Strait Islander reporting**

Aboriginal and Torres Strait Islander people are also referred to as Indigenous Queenslanders or Indigenous Australians except where there is reference to either population separately. Under-identification of Indigenous status in death<sup>75</sup> and hospital<sup>76</sup> data is one of the main limitations of reporting on this population (Section 8.3).

### **6.2 Attributable fractions**

Attributable fractions also referred to as aetiological fractions, are used to measure the impact of risk factors on morbidity and mortality. Calculation of fractions takes into account both the age and sex specific prevalence of a risk factor in the population of interest, and the strength of the causal relationship between the risk factor and outcome conditions (relative risk) for that age group and sex. The number of events caused by (or preventable for) a risk factor can then be calculated by multiplying the number of age and sex specific cases of each outcome condition related to the risk factor, by the corresponding attributable fraction.

The 2016 CHO Report uses Australian population attributable fractions for morbidity to estimate the number of hospitalisations caused by a range of risk factors. The fractions were provided by the AIHW and were derived as part of the Australian Burden of Disease Study 2011<sup>77</sup>. Separate fractions for mortality are also available.

### **6.3 Avoidable deaths**

Potentially avoidable deaths are defined under nationally agreed criteria as: preventable conditions such as lung cancer, intentional and unintentional injury, COPD, alcohol and illicit drug disorders, hepatitis and HIV/AIDS; and healthcare amenable or treatable conditions such as most cancers, asthma, and maternal and infant causes of preventable and healthcare amenable conditions such as coronary heart disease, stroke and diabetes.

Using this method, deaths are classified as entirely preventable, entirely healthcare amenable, or equally preventable and healthcare amenable.<sup>78</sup>

## 6.4 Burden of disease and injury

Burden of disease is a measure of population health that aims to quantify the gap between the ideal of living to old age in good health, and the current situation where healthy life is shortened by illness, injury, disability and premature death. It is an important summary measure for health policy and planning because it quantifies the total impact of health conditions on the individual at the population level in a comparable and consistent way.<sup>60</sup>

Burden of disease is measured using the Disability Adjusted Life Year (DALY). The DALY combines fatal and non-fatal outcomes into a single measure by summing disease or injury specific years of healthy life lost to disability (YLD), and years of life lost due to premature death (YLL). One DALY is one year of 'healthy' life lost by either premature death or disability. The DALY gives a more comprehensive picture of health status compared to traditional statistics, such as disease incidence, prevalence, hospitalisation and death rates. This is because the DALY combines information regarding the prevalence and severity of disease or injury and the incidence of death. Burden of disease is calculated for a comprehensive list of specific conditions (200 in 2016) such as coronary heart disease or stroke that can be aggregated into broad cause groups such as cardiovascular disease, and then further aggregated into one of three higher order groups: communicable, maternal, neonatal and nutritional conditions; non-communicable conditions; and injuries.

Burden of disease estimates for Queensland were updated in 2016, and are based on the Australian Burden of Disease Study 2011.<sup>77</sup> Due to methodological differences and updated epidemiological knowledge, these estimates should not be compared to previous estimates

The Australian Burden of Disease 2011 study was built upon the methodological approach of the Global Burden of Disease 2010 and 2013(REF).<sup>79</sup> The models and methodologies used in 2010 were built on previous methodologies but included advancements such as new disability weights which limit comparability with previous assessments.

## 6.5 Measuring health inequality

The term 'health inequality' refers to the difference in health status in the population resulting from avoidable social, economic and geographic influences and the undesirable impact this can have on individuals and the community.

Health inequalities are described by examining measures of the effect and impact of socioeconomic disadvantage, remoteness and Indigenous status on selected health outcomes. Both absolute and relative differences have limitations if used in isolation and they are therefore important to consider together to provide a full description of health inequalities. For example, absolute differences are influenced by the number of cases in the whole population and relative differences are strongly affected by the size of the denominator (Table 2).

Table 2: Effect and impact measures of health inequality

	Absolute	Relative
Effect	Rate difference	Rate ratio
Impact	Number excess	Percentage excess

The interpretation for each measure is summarised in Table 3. The major advantage of the impact measures is that a summary value of the inequality across all categories can be calculated, whereas effect measures can only be used to compare differences between two categories. For this reason, impact measures are the preferred approach in PHB to summarise health inequalities. However, it is important to note that individual causes of excess deaths or hospitalisations are potentially interrelated and cannot be added together.

Table 3: Interpreting measures of health inequality

Measure	Interpretation
Rate difference	Additional cases per 100,000 population between categories

## Methods for reporting population health status Release 6:

Rate ratio	Comparative proportion in rates between categories
Number excess	Number of cases that would have been avoided if all groups had the same rate
Percentage excess	Percentage of total cases that would have been avoided if all groups had the same rate

There are two approaches to measuring the impact of health inequalities. The first approach can be calculated using age-standardised rates only as shown in Box 1 and is also described in detail by the AIHW in relation to socioeconomic inequalities in cardiovascular disease.<sup>80</sup> Although this method is easier to perform, it has limitations when the underlying age structure of the populations of interest differs markedly. In this instance the age-standardised rates artificially influence the excess calculations. The second approach requires age specific counts and population numbers as shown in Box 2 and while more complex, internally adjusts for differences in the underlying age structure of the categories.

Table 4 shows the impact of socioeconomic status, remoteness and Indigenous status on premature deaths in 2007 calculated using the two different methods. Both approaches provide very similar results for socioeconomic inequalities, relatively similar for remoteness, but markedly different for populations with a higher proportion of Indigenous Queenslanders. This is because the age-standardised rates used in the first approach (Method 1, Box 1) inflate the number of excess deaths in the Indigenous Queensland population due to the very different underlying age structure. Therefore this approach provides a reasonable approximation of the impact of socioeconomic and remoteness inequalities but cannot be used to calculate excess between groups where the underlying age structure is markedly different (for example, Indigenous and non-Indigenous populations). Where possible, the second approach (Method 2) will be used where age specific data are available and when not available, such as for burden of disease, the first approach will be used to report the impact of socioeconomic and remoteness only.<sup>81</sup>

**Table 4: Comparison of methods to calculate impact of socioeconomic status, remoteness and Indigenous status on inequalities in premature death in Queensland, 2007**

	Method 1		Method 2	
	Number excess	Percentage excess	Number excess	Percentage excess
Socioeconomic	2,240	23.6	2,306	23.7
Remoteness	504	5.2	448	4.6
Indigenous	648	6.5	308	3.2

**Box 1: Method 1—hypothetical worked example of impact of socioeconomic status on premature deaths in 2007**

There were 9,710 premature deaths in Queensland in 2007. The age-standardised rate and population in each socioeconomic category are shown below.

	Quintile 1—most disadvantaged	Quintile 2	Quintile 3	Quintile 4	Quintile 5—most advantaged	Total
Population	717,893	985,448	874,056	840,119	530,673	3,948,189
Age-standardised rate (deaths per 100,000)	298	253	247	207	184	
Rate difference	114	69	63	23	–	
Rate x population (age-standardised deaths)	2,137	2,491	2,155	1,742	976	9,501
Number excess	817	679	547	197	–	2,240
Percentage excess						23.6%

**Method 1**

**Number excess**

For each quintile, the population multiplied by the rate difference compared to quintile 5, that is the most advantaged group

**For example:**

$$\text{Quintile 1} = (114/100,000) * 717,893 = 817$$

$$\text{Quintile 2} = (69/100,000) * 985,448 = 679$$

$$\text{Quintile 3} = (63/100,000) * 874,056 = 547$$

$$\text{Quintile 4} = (23/100,000) * 840,119 = 197$$

$$\text{Total excess} = \text{sum of excess in each quintile} = 817+679+547+197 = 2,240$$

Interpretation: 2,240 cases would have been avoided if the rate for most advantaged population (quintile 5) applied to the whole population

**Percentage excess**

The total excess divided by the (age-standardised) total number of deaths

$$\text{Percentage excess} = 2,240 / (2,137+2,491+2,155+1,172+976)$$

$$= 2,240 / 9,501$$

$$= 23.6\%$$

Interpretation: 23.6% of deaths in Queensland would have been avoided if the rate for most advantaged population (quintile 5) had applied to the whole population.

**Box 2: Method 2—impact of socioeconomic status on premature deaths in 2007**

For each five-year age group, the age specific rate in quintile 5 is multiplied by the population in the relevant age group in all the other categories to determine the expected number of deaths.

Age	OBSERVED NUMBER OF DEATHS					POPULATION				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
0–4	92	77	82	68	24	51,908	70,365	63,262	55,691	32,536
5–9	6	12	8	4	2	54,506	72,356	64,764	55,411	32,111
10–14	7	12	4	4	8	57,905	75,745	66,985	58,012	33,384
15–19	27	39	25	26	12	52,482	73,016	64,478	62,311	40,180
20–24	32	49	47	36	16	45,170	68,049	62,437	69,756	54,882
25–29	35	42	35	39	31	43,752	66,397	62,230	65,029	47,212
30–34	46	71	37	46	21	45,403	69,524	66,466	65,598	43,641
35–39	80	85	65	48	27	50,720	75,429	71,839	68,184	44,991
40–44	84	99	82	61	33	51,388	74,443	69,210	65,409	41,443
45–49	124	156	140	96	53	53,084	75,088	68,811	64,380	40,262
50–54	179	204	167	128	67	50,537	68,398	60,227	58,441	35,824
55–59	282	306	223	192	100	50,260	64,599	54,075	53,457	32,015
60–64	368	408	292	263	134	46,103	55,653	44,127	44,038	24,533
65–69	468	485	343	307	168	36,712	42,926	31,660	30,859	16,071
70–74	621	603	501	386	160	27,963	33,460	23,485	23,543	11,588

For example in the 0–4 year age group the age specific rate in quintile 5 = 24/32,536. Therefore we would expect (24/32,536) x 51,908 = 38 deaths in quintile 1 had the rate been the same as in quintile 5.

The number of excess deaths is then calculated by subtracting the observed number of deaths from the expected number. The total number of excess deaths is the sum of the excess deaths across all categories.

For example, in the 0–4 year age group we observed 92 deaths. The excess in this age group is therefore 92–38 = 54. This is then repeated for each age group and summed as shown below.

Age	EXPECTED NUMBER OF DEATHS*					EXCESS DEATHS					Total excess
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5	
0-4	38	52	47	41	24	54	25	35	27	0	
5-9	3	5	4	3	2	3	7	4	1	0	
10-14	14	18	16	14	8	-7	-6	-12	-10	0	
15-19	16	22	19	19	12	11	17	6	7	0	
20-24	13	20	18	20	16	19	29	29	16	0	
25-29	29	44	41	43	31	6	-2	-6	-4	0	
30-34	22	33	32	32	21	24	38	5	14	0	
35-39	30	45	43	41	27	50	40	22	7	0	
40-44	41	59	55	52	33	43	40	27	9	0	
45-49	70	99	91	85	53	54	57	49	11	0	
50-54	95	128	113	109	67	84	76	54	19	0	
55-59	157	202	169	167	100	125	104	54	25	0	
60-64	252	304	241	241	134	116	104	51	22	0	
65-69	384	449	331	323	168	84	36	12	-16	0	
70-74	386	462	324	325	160	235	141	177	61	0	
Total						902	707	507	190	0	2,306

\* if death rates across all areas in Queensland were the same as they were in most advantaged quintile

Interpretation: 2,306 cases would have been avoided if the rate for quintile 5 applied to the whole population

Percentage excess = total excess divided by the total number of actual deaths  
 = 1,250/9,710 = 23.7%

Interpretation: 23.7% of cases would have been avoided if the rate for the most advantaged population (quintile 5) had applied to the whole population.

Note that negative number of excess deaths, indicates that the age specific rate in quintile 5 is not the lowest.

## 6.6 Measuring overweight and obesity

For population surveys within Queensland, including the Queensland Preventive Health Survey series, BMI (Table 5) is routinely collected by self report (participant reports their height and weight). Surveys that collect data face-to-face, such as the NHS (Section 4.16), may include measurement of the participant by trained interviewers. Although measured and self reported BMI are highly correlated, self reported BMI is subject to reporting bias resulting in lower prevalence of unhealthy weight and it is possible that the nature of bias may vary over time. For example, self report of overweight and obesity in Queensland adults were about 7% lower than the measured prevalence in 2007–08 with females more likely to under report overweight and obesity. Obesity was under reported almost twice as often as being overweight (15% lower compared with 9%).<sup>82</sup> Under-reporting is therefore not random and can introduce systematic bias. While a number of studies<sup>83-86</sup> have attempted to adjust for self reporting biases, the fact that the difference between self reported BMI and measured BMI has remained relatively constant through time means that, at the population level, increases in self report BMI generally reflect an increase in measured BMI. The most recent measured estimates of BMI in Queensland were in the AHS 2011–12.<sup>87</sup>

Table 5: **Adult BMI and waist circumference classifications**

<b>Body Mass Index</b>	<b>Criteria</b>
Underweight	<18.5
Healthy weight	≥18.5 but <25
Overweight	≥25 but <30
Obese	≥30 but <40
Severely obese	≥40

For determining an individual's risk of diseases associated with increased body fat, waist circumference has been demonstrated to be more reliable than BMI as a clinical measure.<sup>88</sup> Consequently, when an individual is measured for both BMI and waist circumference, approximately 20% of overweight individuals will not be at risk based on waist circumference.<sup>45</sup> Waist circumference is difficult to collect efficiently and reliably by telephone; therefore, BMI is the established population surveillance tool and is the required tool for reporting against the NPAPH for adults and children.

Queensland preventive health surveys employ a short survey module to collect BMI data. Participants self report height (feet/inches, centimetres), weight without clothes (pounds/stones, kilograms) and, if female, whether currently pregnant. Extremely high or low responses are validated and confirmed during the interview using pre-set criteria. For the CHS surveys, BMI was calculated from parent/carer reporting their child's height and weight. Results may also be biased as parents may not accurately report their children's height and weight for many reasons.<sup>89,90</sup> When parents are unable to report their child's height and weight, they are given a call back option so they may measure the child and report more accurately.

## 6.7 Measuring physical activity

Physical activity is difficult to measure due to multiple sources of bias, mainly recall bias and the propensity for the conscientious responder to overstate their true levels of physical activity. The CATI based Active Australia instrument<sup>91</sup> is commonly used and accepted as the standard tool for large population based CATI surveys of adult physical activity. This tool refers to physical activity completed in the previous week in an attempt to minimise recall bias. Active Australia is the endorsed instrument for reporting against the NPAPH. However, it is important to recognise that even where this instrument is used, minor variations in wording of questions or application of the instrument can result in markedly different results. This is currently evident in the differential in results from the AHS 2011–12 and Queensland Preventive Health Survey series, with AHS reporting about 40% of adults achieving sufficient physical activity for health benefit while SRHS reports 50–60%.

Survey respondents (confined to the age group 18–75 years) are asked for the number of sessions and total time spent walking, walking for active transport, vigorous gardening or yard work,

vigorous physical activity, and moderate physical activity. Any time estimate for a particular activity type that exceeds 840 minutes for the week is given a value of 840 to reduce the impact of outliers on mean times spent in that particular activity.

The primary indicator generated pools the total number of sessions and time for walking, and moderate and vigorous (doubled to account for increased intensity) physical activity. Individuals who have completed at least 150 minutes of activity across at least five sessions in the past week are considered to have completed sufficient physical activity for health benefit. This requirement is aligned to the *National Physical Activity Guidelines for Adults*<sup>92</sup> which indicate that at least 30 minutes of moderate intensity physical activity on most days of the week is required to achieve health benefits. Individuals who do not meet the required sessions and total minutes are classified as either insufficient physical activity for health benefit or sedentary. In 2013 the guidelines were being reviewed for an updated release.

Active Australia also recommends the use of a further five statements relating to awareness of physical activity messages using a five-point Likert scale. Queensland Health surveys have not utilised these additional statements in the past.

It is important to note that Active Australia methodology makes the assumptions that sessions are on different days of the week, and that total minutes are distributed equally in terms of individual session duration. This method does not account for intensity of activity particularly well, that is, it does not make use of energy expenditure estimates for specific types of activities or anything similar which are used by some physical activity instruments. After due consideration it was decided not to include this aspect in calculations for the Active Australia Survey as energy expenditure is directly influenced by both age and body mass. The complexity required to accurately account and control for these two additional factors when calculating energy expenditure would make the tool too complex.

Alternative methods for measuring physical activity include:

- direct behavioural observation
- mechanical or electronic devices such as pedometers or accelerometers
- physiological testing to estimate maximal or submaximal cardiorespiratory oxygen uptake (for example, using treadmill or cycle ergometers)
- activity diaries.

Each of the above methods is considered to have greater reliability and reduced bias in comparison with self-reported measures, however, each has its own inherent problems. Direct observation, physiological testing and use of devices are expensive and unsuited to population-level surveys. It is also possible that these methods, as well as activity diaries, may influence behaviour and consequently provide inaccurate results. All of the methods listed have been used as validation tools for various self reported measures of physical activity.

There is little agreement regarding appropriate methods to assess physical activity among children in population based CATI surveys. The issue of reliability associated with parents reporting their child's physical activity is of particular concern. The CHS survey series has used a variety of survey items to assess physical activity such as active transport to and from school and participation in various sports activities. For the CHS 2011, PHB incorporated the items selected by the NPAPH as the required children's physical activity indicators for the age group 5–12 years. The Australian guidelines for children aged 5–12 years recommend<sup>93</sup>:

- A combination of moderate and vigorous activities for at least 60 minutes a day is recommended.
- Most importantly, kids need the opportunity to participate in a variety of activities that are fun and suit their interests, skills and abilities. Variety will also offer your child a range of health benefits, experiences and challenges.
- Children shouldn't spend more than two hours a day using electronic media for entertainment (for example computer games, TV, internet), particularly during daylight hours.

The 2005 Australian physical activity guidelines<sup>94</sup> were revised in 2014 and recommendations used to inform the 2014 guidelines.<sup>95-99</sup> Highlights from the 2014 guidelines are included (Table 6). One of the key changes is the inclusion of recommendations for reducing sedentary behaviour for adults. The revised guidelines are supported by a rigorous review of the evidence and were subject to stakeholder and expert consultation and consensus.

**Table 6: Australia's physical activity and sedentary behaviour guidelines 2014<sup>95-99</sup>**

Age group	Physical activity	Sedentary
0-<5 years (and not yet started school)	0-1 yrs: Encourage PA, especially floor-based play in safe environments	0-5 yrs: less than 1 hour per day sedentary, restrained or kept inactive (excluding sleep)
	1-5 yrs: Be physically active every day for at least three hours, spread throughout the day	0-<2 yrs: no television watching or use of other electronic media
		2-5 yrs: less than 1 hour per day sitting and watching television or using other electronic media
5-12 years (and started school)	For health benefits, accumulate at least 60 minutes every day of moderate to vigorous physical activity	Limit use of electronic media for entertainment to no more than 2 hours per day
	Include a variety of aerobic activities (including some vigorous intensity activity)	Break up long periods of sitting as often as possible
	At least 3 days each week, engage in activities that strengthen muscle and bone	
	For additional health benefits, engage in more PA (up to 3 hours per day)	
13-17 years	For health benefits, accumulate at least 60 minutes every day of moderate to vigorous physical activity	Limit use of electronic media for entertainment to no more than 2 hours per day
	Include a variety of aerobic activities (including some vigorous intensity activity)	Break up long periods of sitting as often as possible
	At least 3 days each week, engage in activities that strengthen muscle and bone	
	For additional health benefits, engage in more PA (up to 3 hours per day)	
18-64 years	Be active on most, preferably all, days every week	Minimise amount of time in prolonged sitting
	Each week, accumulate 2.5 to 5 hours of moderate intensity or 1.25 to 2.5 hours of vigorous intensity PA (or equivalent combination)	Break up long periods of sitting as often as possible
	Do muscle strengthening activities at least 2 days each week	
	If you currently do no PA, start with some and build up to the recommended amount	
65+ years	Do some form of PA, irrespective of age, weight, health problems or abilities	
	Be active every day in as many ways as possible, with a range of PA including fitness, strength, balance and flexibility	
	Accumulate at least 30 minutes of moderate intensity PA most days (preferably all)	
	If you have stopped PA, or started new PA, start easy and build up the recommended amount, type and frequency	
	If you have enjoyed a lifetime of PA, continue doing so in a way suited to your capability and following safety recommendations	

## 6.8 Measuring alcohol consumption

Estimates of alcohol consumption in the Queensland population have been obtained by two different surveys using differing questioning methods. The first method, used for high level reporting prior to 2010, derives estimates from the NDSHS (Section 4.15). This survey uses a mixed methodology with self completed questionnaires (drop and collect), CATI and, in earlier collections, face to face interviews. The questions measure both regular and periodic alcohol

consumption using the graduated quantity frequency method but also include quantity frequency questions to allow for comparisons to NDSHS surveys prior to 2001.

The second method, used for reporting annually, is based upon questions from the SRHS survey series. Prior to 2009, the SRHS used only the quantity frequency method (known internally as 'short alcohol'). As of 2009, the SRHS included both the quantity frequency and graduated quantity frequency methods using identical questions from the NDSHS.

Both methods ultimately assign individuals to alcohol consumption risk categories for risk of harm in the long term, with the graduated quantity frequency method also able to assign short term risk categories. Categories are defined by the NHMRC (Table 8). PHB coding methodology is identical to that used by the AIHW for the NDSHS. Amounts are defined in terms of 'standard drinks', where an Australian standard drink contains 10 grams (equivalent to 12.5 ml) of alcohol. This ensures that consumption of drinks with different alcohol content are comparable.<sup>82</sup>

Considering the 2001 NHMRC measurement of long term harm, the method generates an average weekly alcohol consumption measure for individuals. This estimate is then used to allocate individuals to a consumption risk. For short term harm, the method calculates consumption thresholds which enable allocation of individuals to at least weekly, at least monthly or at least yearly alcohol consumption risk categories. In this way, an individual who has very low average consumption calculated for long term harm can still be allocated to the category for risky/high risk drinking for short term harm. The average weekly consumption estimate is used for classification into the consumption risk categories (Table 8).

The NHMRC has developed the *2009 Australian Guidelines to Reduce Health Risks from Drinking Alcohol*.<sup>100</sup> The 2009 alcohol guidelines take a different approach to the 2001 guidelines<sup>101</sup> as they consider the cumulative lifetime risk of alcohol related harm and provide guidance on how to lower the risk of harm. Although the guidelines changed in 2009, the estimation of alcohol consumption for the 2010 CHO report, the Queensland Household Survey 2009, and the 2010 to 2012 SRHS surveys were reported using both methods to facilitate the transition to the new guidelines. The methods used in the estimation of alcohol consumption for these purposes have been reported.<sup>102</sup>

A third method of estimation of alcohol consumption is employed by the ABS for collection and reporting in the NHS. In the 2007–08 NHS, information about intake of alcohol was derived from information about the types and quantities of alcoholic drinks (including homemade wines and beers) consumed on the three most recent days in the week prior to interview on which alcohol was consumed, and the frequency of consuming 'at risk' amounts of alcohol in the previous 12 months. Amounts were defined in terms of 'standard drinks', where an Australian Standard Drink contains 10 grams (equivalent to 12.5 ml) of alcohol. Note that intake of alcohol refers to the quantity of alcohol contained in any drinks consumed, not the quantity of the drinks themselves.<sup>44</sup> The estimated prevalence of alcohol consumption in Australia derived from both the NDSHS and the NHS is substantially different and should not be compared.

The reliability and validity of survey tools for measuring alcohol consumption and risks associated with alcohol consumption are continually being debated and are outside the scope of this methods report.

In 2014, further analysis was undertaken. It was based on the 2009 NHMRC *Guidelines*.<sup>100</sup> While the guidelines have been used to monitor risky drinking among Queensland adults in the Chief Health Officer report series and associated documents, reporting against the guidelines has limitations. Many of those who consume alcohol, do so at levels that exceed both Guideline 1 and Guideline 2, generating overlapping categories of consumers. For more effective characterisation of drinking patterns and trends, a new analysis was undertaken. This new assessment of risk is based on the NHMRC recommendations, that is, not to exceed two drinks per day every day or four drinks on a single occasion, as described below and associated documents.<sup>72</sup>

For monitoring the prevalence of risky alcohol drinking, Guideline 1 and Guideline 2 are generally reported as independent categories. However, reporting is limited by usual consumption patterns—a large proportion of adults are engaged in both behaviours. As a result, it is difficult to determine changes in drinking pattern and to assess the sociodemographic characteristics of consumers. The overlapping risk groups show that 65% of lifetime risky consumers also drank at weekly single occasion risk levels and conversely 90% of single occasion risky drinkers also consumed alcohol at lifetime risky levels (Figure 2). In effect, prevalence of risky drinking whether for lifetime risk or single occasion risk was primarily attributable to those who were risky drinkers by both guidelines.

To more accurately describe the consumption patterns, mutually exclusive categories were created (Table 7). Consumers were categorised into six groups based on their daily consumption (less than or greater than 14 drinks per week) as well as single occasion consumption (that is, never consuming more than four drinks on a single occasions as well as the frequency of doing so). In 2013, among Queensland adults, the prevalence of these drinking patterns, from the least to the most risky was:

- 17% were abstainers
- 30% were low risk consumers
- 1% were lifetime risky drinkers—only
- 20% were less than monthly single occasion risky drinkers—only
- 13% were monthly single occasion risky drinkers—only
- 2% were less than monthly single occasion risky drinkers and lifetime risky drinkers
- 18% were monthly single occasion risky drinkers and lifetime risky drinkers combined, that is, the riskiest drinkers.

Figure 2: Overlap between NHMRC 2009 alcohol guidelines

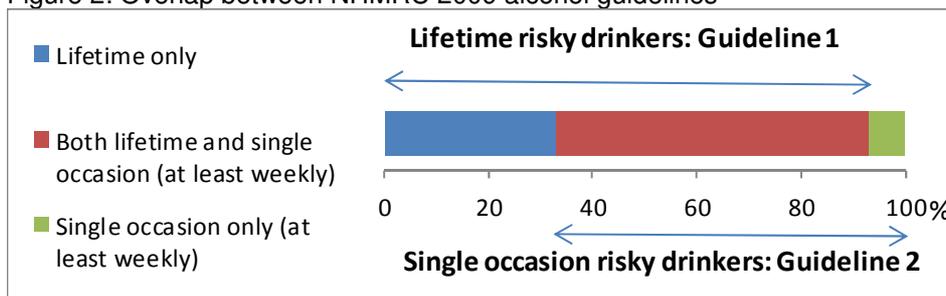


Table 7: Alcohol consumption categories, new analysis, and prevalence, adults, Queensland 2013

		Guideline 1, single occasion risk: greater than 4 drinks on any occasion		
		Never	Less than monthly	At least monthly (includes weekly)
<b>Guideline 2, lifetime risk: no more than 2 drinks per day even if daily (less than 14 drinks per week)</b>	<i>Less than or equal to 14 drinks per week</i>	Low risk 30.4%	Less than monthly single occasion only 19.8%	At least monthly single occasion only 12.5%
	<i>Greater than 14 drinks per week</i>	Lifetime only 0.7%	Less than monthly single occasion <u>and</u> lifetime 1.6%	At least monthly single occasion <u>and</u> lifetime 18.2%

Abstainers made up the remaining 16.8% of adults in 2013

Table 8: Australian guidelines to reduce the health risks from drinking alcohol, 2001 and 2009

		2001 NHMRC guidelines	2009 NHMRC guidelines
		<b>Long term</b>	
Males	Low risk	≤ 4 drinks/day	≤ 2 drinks/day
	Risky	> 4 ≤ 6 drinks/day	> 2 drinks/day considered risky
	High risk	> 6 drinks/day	
Females	Low risk	≤ 2 drinks/day	≤ 2 drinks/day
	Risky	> 2 ≤ 4 drinks/day	> 2 drinks/day considered risky
	High risk	> 4 drinks/day	
		<b>Short term</b>	
Males	Low risk	≤ 6 drinks/episode	≤ 4 drinks/episode
	Risky	> 6 < 11 drinks/episode	> 4 drinks/episode considered risky
	High risk	≥ 11 drinks/episode	
Females	Low risk	≤ 4 drinks/episode	≤ 4 drinks/episode
	Risky	> 4 < 7 drinks/episode	> 4 drinks/episode considered risky
	High risk	≥ 7 drinks/episode	

2009 Guidelines do not distinguish between risky and high risk consumption; therefore, consuming greater than the low risk guidelines is considered risky.

## 6.9 National Partnership Agreement on Preventive Health reporting

Although the National Partnership on Preventive Health (NPAPH) was abolished in 2014, the following section describes key issues associated with performance reporting that influenced the Queensland preventive health surveys during the period 2009–2012.

In Queensland, the eligibility age for child surveys changed over time to meet current business needs. In 2009, CHS survey age eligibility was 5 to 15 years. Under the NPAPH, children were defined as those aged 5–17 years, with data required to be collected by parent proxy interviewing. Therefore from 2011, the CHS survey has included 5–17 year olds, however, data are not available on the entire age range for the 2009 baseline year. Data for 16–17 year olds are available from the SRHS 2010, albeit by self report rather than parent proxy report.

PHB conducted a range of investigations to determine the validity of using proxy reported data for 5–15 year olds combined with self reported data for 16–17 year olds as a surrogate for proxy reported data for 5–17 year olds for the NPAPH 2009 baseline year. Firstly, estimates for 16–17 year olds from the CHS 2011 and SRHS 2011 are compared directly. Second, estimates for 5–17 year olds, the official NPAPH health indicator, are compared. This was undertaken using two datasets:

- the actual CHS 2011 dataset containing proxy reported data for 5–17 year olds
- a hypothetical dataset created using data for 5–15 year olds from the CHS 2011 (proxy reported) plus data for 16–17 year olds from the SRHS 2011 (self reported).

For the indicators included under the NPAPH, there were no statistically significant differences between self reported and proxy reported health status for 16–17 year olds (Table 9). Additionally, there were no statistically significant differences between 5–17 year olds when the data were based on all proxy reported data (CHS 2011) compared to a dataset that was a combination of proxy reported (CHS 2009 5–15 years) and self reported (SRHS 2010 aged 16–17 years) data (Table 10).

Table 9: Proxy reported and self reported estimates, proportion/mean and CIs for children 16–17 years, 2011

Indicator	Source	Sample size	%/ mean	Estimate		Statistical significance
				%/ mean	95% CI	
Unhealthy weight	CHS 2011	402	24.877	20.292	30.105	P> z =0.951
	SRHS 2011	268	24.671	19.523	30.660	
Mean fruit	CHS 2011	405	1.665	1.526	1.804	P> t =0.0767
	SRHS 2011	289	1.834	1.679	1.989	
Mean vegetables	CHS 2011	407	2.270	2.116	2.423	P> t =0.2611
	SRHS 2011	286	2.388	2.218	2.558	

Table 10: Actual and hypothetical estimates, proportion/mean and CIs for children aged 5–17 years, 2011

Indicator	Source and age sampled	Sample size	%/ mean	Estimate		Statistical significance
				%/ mean	95% CI	
Unhealthy weight	CHS 2011 5–17 years	2,401	33.595	31.498	35.758	P> z =0.795
	2011 CHS 5–15, SRHS 16–17	2,267	33.953	31.808	36.166	
Mean fruit	CHS 2011 5–17 years	2,477	1.886	1.833	1.938	P> t =0.370
	2011 CHS 5–15, SRHS 16–17	2,361	1.916	1.863	1.969	
Mean vegetables	CHS 2011 5–17 years	2,479	2.087	2.028	2.145	P> t =0.831
	2011 CHS 5–15, SRHS 16–17	2,358	2.095	2.036	2.155	

Given the lack of proxy data for 16–17 year olds in 2009 and the consistency of estimates irrespective of mode of data collection in the 2011 CHS and SRHS hypothetical dataset, the ability to use self reported data as a surrogate for proxy reported data is supported for the indicators investigated. Based on these findings, PHB produced estimates using the 2009 proxy reported

data for 5–15 year olds from the CHS combined with the 2010 self reported data for 16–17 year olds from the SRHS. Results are presented in Table 11.

Table 11: **NPAPH 2009 baseline indicator estimates for children aged 5–17 years**

		Age	Unhealthy weight % (95% CI)	Mean daily fruit intake mean (95% CI)	Mean daily vegetable intake mean (95% CI)
CHS 2009	Persons	5–15 years	33.6 (30.5-36.9)	2.03 (1.96-2.11)	2.13 (2.05-2.21)
SRHS 2010	Persons	16–17 years	21.2 (16.5-26.8)	1.60 (1.45-1.75)	2.19 (2.02-2.36)
Combined dataset	Persons	5–17 years <sup>†</sup>	31.6 (28.8-34.5)	1.96 (1.89-2.03)	2.14 (2.07-2.21)
CHS 2009	Male	5–15 years	33.0 (28.9-37.4)	2.00 (1.89-2.11)	2.16 (2.05-2.27)
	Female	5–15 years	34.3 (29.7-39.2)	2.07 (1.96-2.18)	2.10 (1.98-2.22)
SRHS 2010	Male	16–17 years	21.7 (15.5-29.6)	1.56 (1.36-1.75)	2.35 (2.12-2.57)
	Female	16–17 years	20.6 (14.1-29.2)	1.64 (1.41-1.87)	2.03 (1.78-2.29)
Combined dataset	Male	5–17 years <sup>†</sup>	31.2 (27.5-35.1)	1.93 (1.83-2.02)	2.19 (2.09-2.29)
	Female	5–17 years <sup>†</sup>	32.0 (28.0-36.4)	2.00 (1.90-2.10)	2.09 (1.98-2.20)

<sup>†</sup> Data for 16-17 year olds from SRHS 2010 (data collected by self report) and data for 5–15 year olds from CHS 2009 (data collected by parent proxy)

### 6.10 Disaggregation of causes

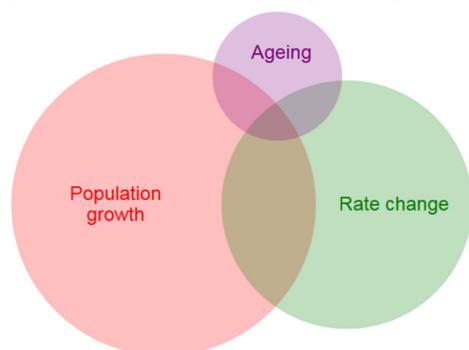
Change in the number of hospitalisations (or deaths, or cases) in a population over time is influenced by changes in the number of people in the population, the age distribution of the population, and other changes irrespective of these demographic factors. Partitioning is a method of estimating the proportion of the change in numbers attributable to one of these three factors, or to the interaction of the factors (Figure 3).

To estimate the relative contribution of each factor, the number of cases and population in any given year is compared with a base year. The components of change between the base year and year X are:

- Impact of population size alone: The number of cases expected due to population growth (age specific rates at baseline, applied to the population size in year x, distributed as per the age distribution at baseline) minus baseline number.
- Impact of rate change alone: The number of cases expected due to rate change (age specific rates at year x, applied to the population size at baseline, distributed as per the age distribution at baseline) minus baseline number.
- The impact of change in age distribution alone: The number of cases expected due to change in population age distribution (age specific rates at baseline, applied to the population size at baseline, distributed as per the age distribution at year x) minus baseline number
- The impact of the overlaps between the three components: The number of cases expected due to the overlap between the three factors (net change minus impact of each of the three factors)

The overlap can be further disaggregated to the overlap between each pair of components and all three, although this is not usually reported.

Figure 3: Factors influencing change in numbers



### 6.11 Potentially preventable hospitalisations

Potentially preventable hospitalisations (PPHs) are defined by the AIHW as ‘conditions where hospitalisation is thought to be avoidable if timely and adequate non-hospital care had been provided’.<sup>103</sup> The list of conditions within this category does not include all hospitalisations that are potentially preventable and for this reason they are referred to nationally as ‘selected PPHs’. PPHs are a key indicator of primary care provision under the National Healthcare Agreement.<sup>104</sup> They are also referred to as Ambulatory Care Sensitive Conditions in some documents.<sup>105</sup> This latter term is a more precise description of the conditions included—these are conditions that could have been prevented in the ambulatory or non-hospital setting, rather than all those that could have been prevented by primary prevention. In this report the initialisation PPH refers to selected PPHs due to Ambulatory Care Sensitive Conditions.

It is important to note that for the purpose of PPH reporting within areas of Queensland (such as HSDs/HHSs, and socioeconomic and remoteness reporting), hospitalisations for renal dialysis are excluded from the chronic conditions category due to inconsistencies in coding practices across Queensland.<sup>106</sup> However, for all state reporting such as Queensland’s CHO report series and for national comparisons, the codes as defined by NHISSC that include renal dialysis are used (Appendix 10.2, Table 28).

The condition and code inclusions and rules for generation of PPHs, and in particular diabetes complications are subject to change so it is important to refer to the national definitions.<sup>107</sup> The definition of PPH for diabetes between Queensland Health and the AIHW has diverged—the national definition includes diabetes for principal diagnosis only, while the Queensland definition includes diabetes and its complications as a primary or other diagnosis.

A high PPH rate may indicate limitations in access to, or quality of, primary healthcare such as GPs and community health centres, but may also reflect an increased prevalence of the conditions in the community.<sup>108</sup> PPHs can be classified into three broad categories:

- vaccine preventable diseases that can be prevented by vaccination (influenza, certain types of bacterial pneumonia, tetanus, diphtheria, whooping cough, measles, mumps, rubella, certain types of bacterial meningitis, hepatitis B and polio)
- acute conditions that are not necessarily preventable, but if treated appropriately, should not result in hospitalisation (dehydration/gastroenteritis, pyelonephritis, perforated/bleeding ulcers, cellulitis, pelvic inflammatory disease, ear, nose and throat infection, dental conditions, appendicitis with generalised peritonitis, convulsions and epilepsy and gangrene)
- chronic conditions that may be preventable through behavioural and lifestyle modification and, if treated appropriately, should not result in hospitalisation (asthma, congestive cardiac failure, diabetes complications, COPD, angina, iron deficiency, hypertension, nutritional deficiencies and rheumatic heart disease).

These categories are not mutually exclusive. Summing episodes of care from the three categories will exceed the total PPHs as some episodes of care are coded for more than one condition.

## 6.12 Socioeconomic indices

Socio-economic Indexes for Areas (SEIFA) is a product developed by the ABS for the assessment of the welfare of Australian communities. The ABS has developed four indexes to allow ranking of regions/areas, providing a method of determining the level of social and economic wellbeing in each region.<sup>109</sup>

SEIFA is a suite of four summary measures that have been created from census information—the most recent release is based on the 2011 census.<sup>110</sup> The indexes can be used to explore different aspects of socioeconomic conditions by geographic areas. For each index, every geographic area in Australia is given a SEIFA score which shows how disadvantaged that area is compared with other areas in Australia. Each index summarises a different set of social and economic information. The indexes provide more general measures of socioeconomic status than are given by measuring income or unemployment alone.

The four indexes derived from the 2006 census are:

- Index of Relative Socio-economic Disadvantage (IRSD): is derived from census variables related to disadvantage, such as low income, low educational attainment, unemployment, and dwellings without motor vehicles.
- Index of Relative Socio-economic Advantage and Disadvantage (IRSAD): is a continuum of advantage (high values) to disadvantage (low values) which is derived from census variables related to both advantage and disadvantage, like households with low income and people with a tertiary education.
- Index of Economic Resources: focuses on census variables such as the income, housing expenditure and assets of households.
- Index of Education and Occupation: includes census variables relating to the educational and occupational characteristics of communities, like the proportion of people with a higher qualification or those employed in a skilled occupation.

The concept of relative socioeconomic disadvantage is neither simple, nor well defined. SEIFA uses a broad definition of relative socioeconomic disadvantage in terms of people's access to material and social resources, and their ability to participate in society. While SEIFA represents an average of all people living in an area, it does not represent the individual situation of each person. Larger areas are more likely to have greater diversity of people and households.

### 6.12.1 How are indices developed?

Each index includes a suite of socioeconomic variables, for example, percentage employed as labourer, percentage aged 15+ years with no post school qualifications, percentage with low household income, and percentage with no internet connection. The full suite of indicators varies with each index. The variables are weighted to generate an area score for the relevant index. Areas are ranked, either within the state or nationally, and divided into groups for example, deciles or quintiles to create categories, where quintile 1 is always equivalent to 'poorer' outcomes not 'less of'. The ranking can be of CDs or SLAs, or LGAs or Postal Areas. However, the larger the area used for ranking, the greater the degree of averaging of individual differences within an area. This leads to 'the ecological fallacy'. SEIFA indexes are area level measures—they are summary measures of all people living in the area (on census night). They do not describe individuals in the area.

### 6.12.2 Generation of quintiles/deciles

SEIFA quintiles or deciles are generated by ranking areas, where the first quintile is the 20% of areas with lowest scores and similarly for the other quintiles. Because the areas (especially SLAs and above) have different populations, the total quintile populations differ. A common solution to the unequal area problem used by some jurisdictions and agencies for example, New South Wales, Victoria, Population Health Information Development Unit (SA) is to population-weight the areas to generate quintiles of similar population size. The ABS releases SEIFA data where categories (for example, quintiles) are area ranked—but acknowledges that users may population-

weight to meet their specific purposes. In April 2009, it was agreed that Queensland Health (discussion involved key stakeholders from population epidemiology, HSC and the Research and Economic Analysis Unit) would be consistent with other jurisdictions and proposed that in future Queensland Health will also publish and use population weighted quintiles as well as area ranked quintiles, noting that the population weighting is based on total population or ERPs if these are available.<sup>111</sup>

### 6.12.3 Review of methodology for generation of quintiles/deciles

In 2013, the earlier decision (2009) to use population weighting was reviewed. The goal was to undertake a quantitative assessment of the impact and discriminatory capacity of the two methods, that is, whether population weighted quintiles/deciles increased or reduced the difference between disadvantage and advantage when compared with area-based quintiles/deciles. Four approaches were used to assess the two methodologies:

- comparing the Indigenous Queensland population distribution by quintile/decile
- comparing disease rate outcomes across the quintiles/deciles
- comparing the distribution of sample by quintile/decile from the CATI survey sample
- comparing risk factor prevalence across the quintiles/deciles

#### 1. Comparing Indigenous Queensland population distribution

In Queensland with a relatively large number of SLAs based on Indigenous communities it is likely that an area-based method for generating quintiles/deciles might over-represent Indigenous population and reflect Indigenous disadvantage rather than socioeconomic disadvantage. As it was necessary to utilise SLA based Indigenous population files, the 2006 SEIFA was used along with ABS demography files for 2006 census release. When Indigenous population by SA2s are released, this assessment can be undertaken for SEIFA 2011 if required.

Of the Queensland population 3.5% identified as Indigenous in 2006 census (Table 12). The Indigenous Queensland population is distributed unevenly across the state, with higher proportions living in disadvantaged areas than advantaged. If there were an even distribution of Indigenous Queenslanders, 3.5% of each decile and quintile populations would have been Indigenous. Using the area-based categorisation of SLAs, 22% of the decile 1 population were Indigenous Queenslanders (Table 12). In contrast less than 1% of decile 10 were Indigenous. Considering quintile populations, 10% of quintile 1 by area-based categorisation were Indigenous and 8% of population weighted quintile 1.

This assessment confirms that Indigenous Queenslanders are more likely to live in areas of disadvantage irrespective of the method for categorisation of quintiles/deciles. However there is less bias from this clustering with a population weighted approach to categorisation than the area-based method. Population weighted quintiles are the preferred approach to reporting as they broaden the characteristics of the most disadvantage population to include both Indigenous disadvantage and socioeconomic disadvantage. It is of course recognised that these characteristics cannot be independently assessed using an ecological measure such as SEIFA.

Table 12: Indigenous Queensland population by Index of Relative Advantage and Disadvantage (2006), all persons, Queensland 2006

Decile/ Quintile	Area based decile		Area based quintile		Pop weighted decile		Pop weighted quintile	
	number	%	number	%	number	%	number	%
1	26,281	22.4	51,620	10.1	43,315	10.5	67,291	8.1
2	25,339	6.4	37,644	4.3	23,976	5.7	36,502	4.5
3	20,313	4.5	35,017	3.2	16,756	4.1	20,042	2.4
4	17,331	4.1	14,972	1.6	19,746	4.9	13,587	1.6
5	20,966	3.9	5,632	0.9	12,208	2.9	7,463	0.9
6	14,051	2.5			7,834	1.9		
7	7,897	1.7			6,892	1.7		
8	7,075	1.5			6,695	1.6		
9	3,929	1.1			4,571	1.1		
10	1,703	0.6			2,892	0.7		
TOTAL*	144,885	3.5	144,885	3.5	144,885	3.5	144,885	3.5

\* Based on ABS release (note not all areas can be categorised into a SEIFA decile)

2. Comparing death rates across quintiles/deciles

Death rate differences were reported for Queensland by both area-based and population weighted deciles/quintiles. Death data were for 2010 and areas (SA2s) were classified according to SEIFA 2011. Death rates by quintile and decile were reported for all causes (Figure 4), coronary heart disease (CHD) (Figure 5) and potentially avoidable deaths (Figure 6).

In a quintile comparison, death rates did not differ between area-based and population weighted methods for death due to all causes, CHD, or potentially avoidable deaths. The death rate ratio is a measure of the discriminatory power of the Index. The rate ratio between most disadvantaged and most advantaged populations was similar across the three causes although for potentially avoidable deaths, the area-based quintile ratio was greater (but not significantly different) to the population weighted quintile ratio (Table 13).

In a decile comparison there was a difference. For each of the three causes of death, rates in area based decile 1 (most disadvantaged decile) were greater than population weighted decile 1 (Figure 4, Figure 5, Figure 6). For all other deciles the rates were the same. However as a result of the decile 1 difference, the death rate ratio (most disadvantaged decile to most advantaged decile) was greater for area-based than population weighting (Table 13). It is likely that the death rate in decile 1 for the area-based approach is due to a higher proportion of Indigenous Queenslanders, as described above. Thus the use of area-based methods for decile analysis is not recommended.

Figure 4: All cause death rates by Index of Relative Advantage and Disadvantage 2011, all persons, Queensland 2010

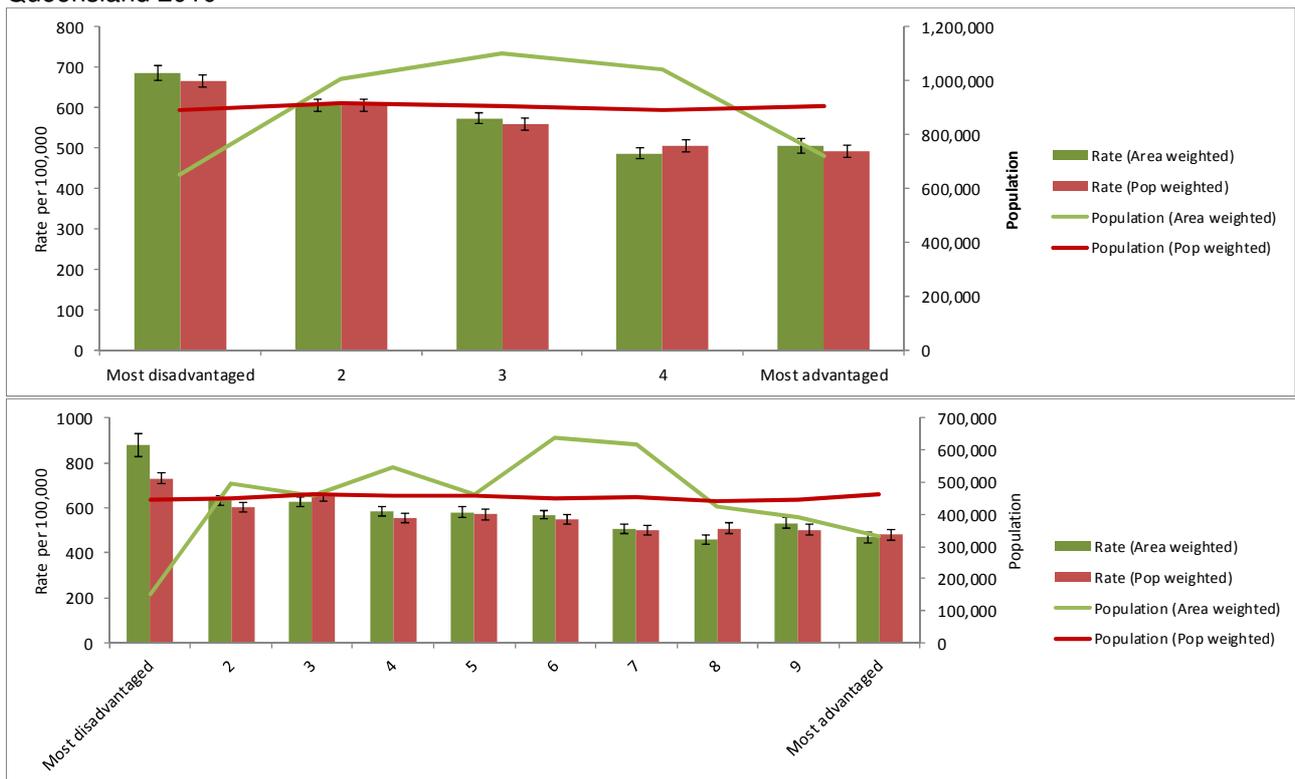


Figure 5: Coronary heart disease death rates by Index of Relative Advantage and Disadvantage 2011, all persons, Queensland 2010

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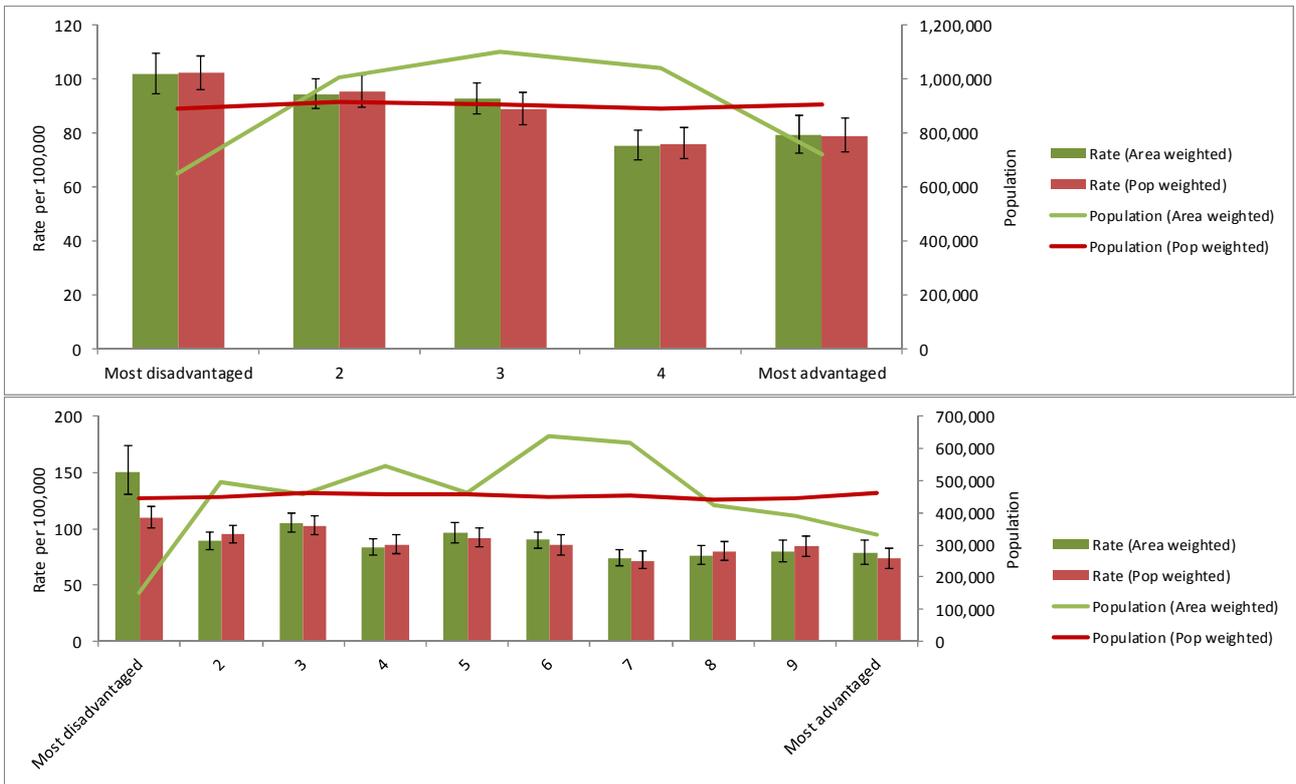


Figure 6: Potentially avoidable death rates by Index of Relative Advantage and Disadvantage 2011, all persons, Queensland 2010

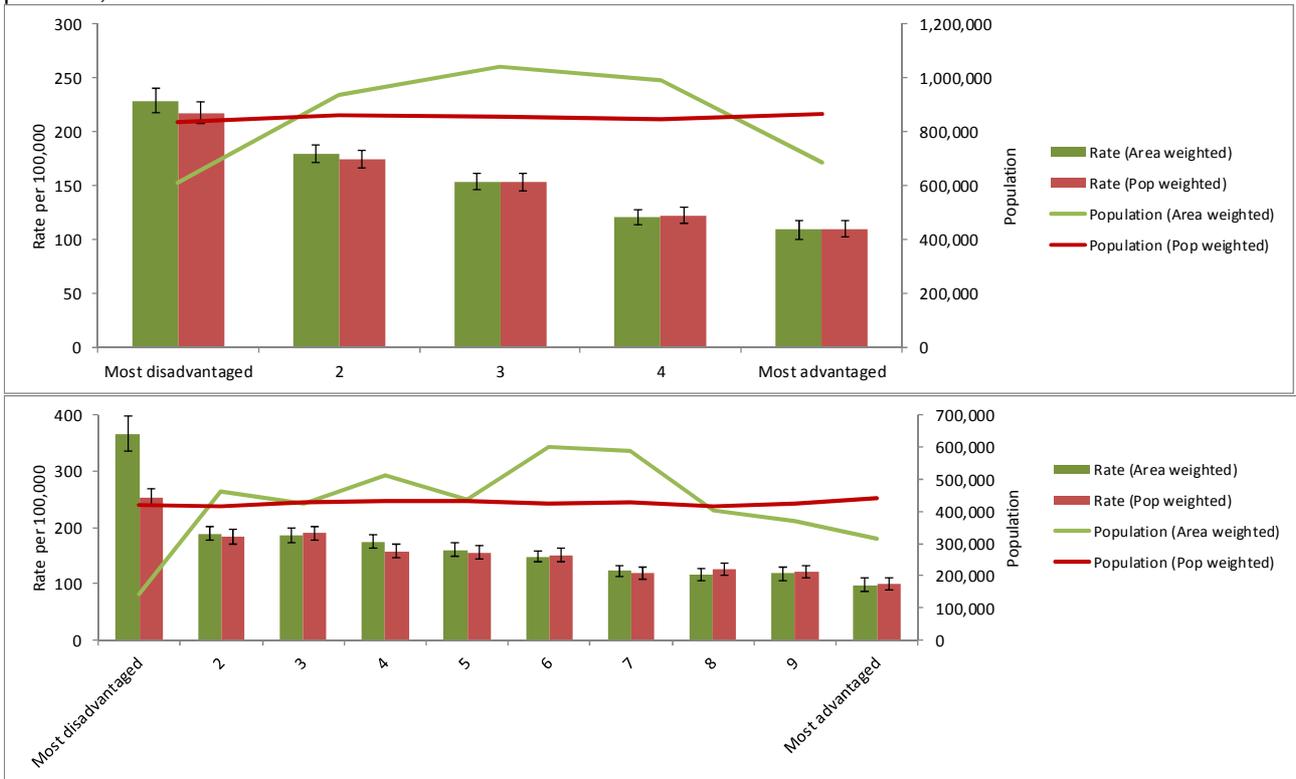


Table 13: Death rate ratio by area based and population weighted quintiles and deciles, selected causes, Queensland 2010

	Death rate ratio (disadvantaged/advantaged)	
	Area based	Pop weighted
<b>Quintile comparison</b>		
All causes	1.36	1.35
Coronary heart disease	1.28	1.29
Potentially avoidable deaths	2.10	1.97
<b>Decile comparison</b>		
All causes	1.88	1.52
Coronary heart disease	1.92	1.49
Potentially avoidable deaths	3.72	2.54

### 3. Comparing the sample distribution from the CATI survey sample

The CATI survey sample is a random selection of phone numbers using random digit dialling techniques supported by industry strategies to maximise efficiencies in dialling. CATI methodologies are currently limited to fixed phone connections and do not sample some population groups as effectively as others, e.g. young people, Indigenous Queenslanders, and populations with limited resources to organise and fund fixed phone lines. The representativeness of the CATI survey to sample SLAs based on area based and population weighted quintiles/deciles was assessed by investigating the number of respondents in each area in the 2012 Self Reported Health Status survey—total sample of about 20,000 persons aged 16 years and older. It would be expected that each decile would be represented by about 10% of the sample population and each quintile by about 20%.

The results of this assessment show that the expected distribution was not achieved for the area based decile or quintiles, while the population weighted deciles and quintiles more closely met the expected distribution (Table 14). For example, only 2% of the sample population were from area-based decile 1 rather than the expected 10%. In contrast 9% of the sample was drawn from population weighted decile 1, close to the expected proportion of 10%. Similarly, 13% of sample was from area-based quintile 1, while 18% was from population based quintile 1, where the expected sample was 20%. These findings suggest population weighting is a more effective method for the survey sample methodology in Queensland than area based methods.

Table 14: Total survey sample by Index of Relative Advantage and Disadvantage 2011, persons 16 years and older, Queensland 2012

Decile/ Quintile	Area based decile	Area based quintile	Pop weighted	Pop weighted
1	2.4	13.3	8.7	18.3
2	10.9	21.9	9.6	20.5
3	10.5	23.9	10.6	19.4
4	11.4	23.7	9.9	19.7
5	10.0	17.3	10.2	22.1
6	13.9		9.2	
7	13.2		9.6	
8	10.5		10.1	
9	9.5		10.7	
10	7.8		11.4	
TOTAL*	100	100	100	100

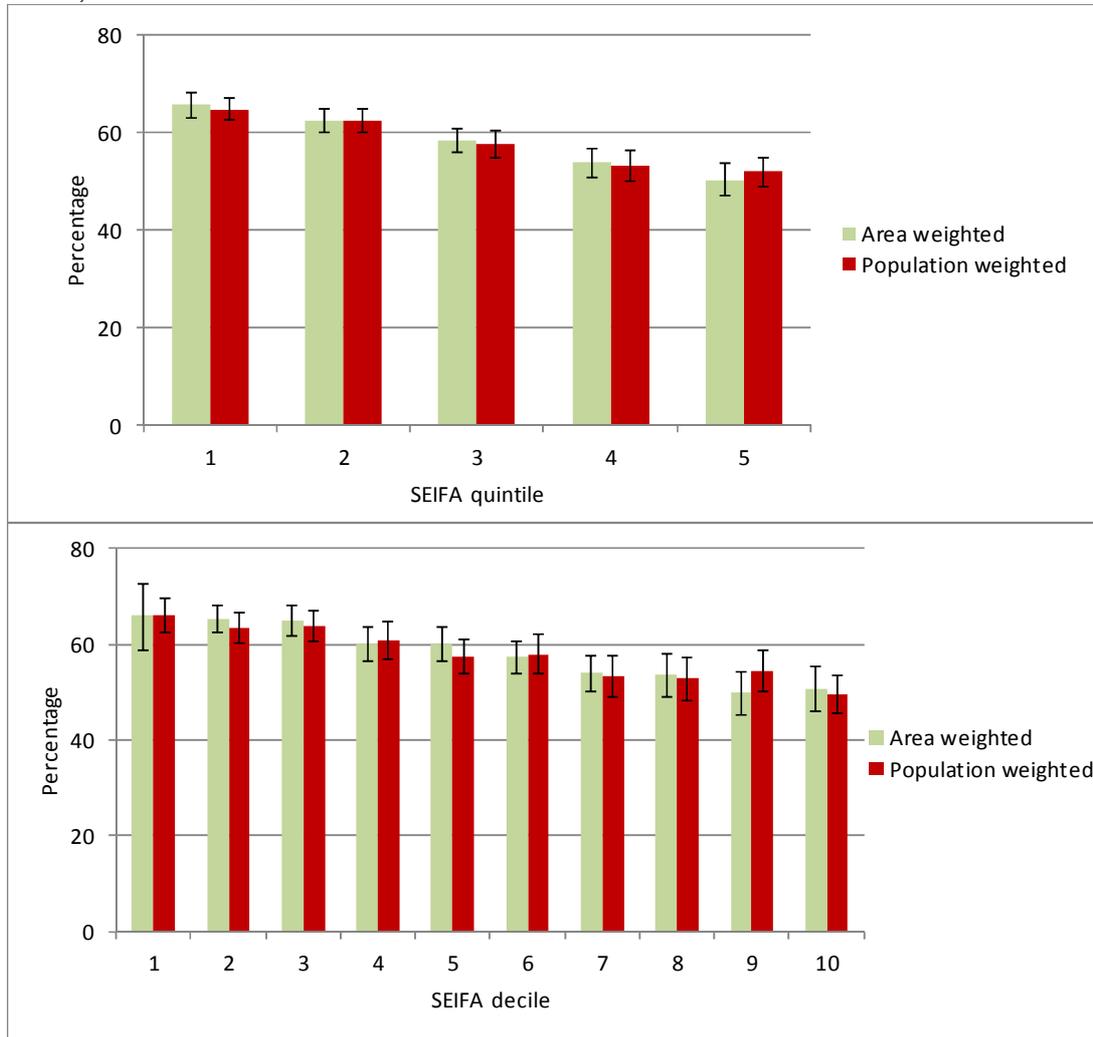
\* Based on total survey sample (note not all areas can be categorised into a SEIFA decile)

### 4. Comparing prevalence of overweight and obesity across quintiles/deciles

The proportion of adults who self report overweight and obesity was compared by SEIFA quintile and decile where the two methods of generation were used. This comparison was based on the 2012 SRHS survey using SEIFA 2011. The results of the analysis are displayed (Figure 7). While there is a 30% difference in the proportion who report being overweight or obese between quintile

1 and quintile 5 (similarly for decile 1 and decile 10), there is no difference between the population weighted and area based method.

Figure 7: Self reported overweight and obesity by Index of Relative Advantage and Disadvantage 2011, adults, Queensland 2012



In summary:

Recognising the multiple uses and applications of SEIFA in the epidemiological analyses and outputs in PHB, and the demographic characteristics of Queensland, that is, areas of high Indigenous Queensland population, population weighting is the more effective method for generation of SEIFA quintiles/deciles. The rationale for this decision is as follows:

- The area based methodology over represents Indigenous Queenslanders in the quintiles/deciles of disadvantage. For example, the observed proportion of Indigenous Queenslanders was 22% in area-based decile 1 where the expected proportion was 3.5%. Although the expected proportion was not achieved for either method, the difference between observed and expected was greater for the area-based approach than the population weighted approach.
- While the observed death rates for selected key conditions do not differ whether using population weighted or area based methods when considering quintiles, for deciles there is a substantial difference for decile 1. The observed death rates for decile 1 suggest that Indigenous disadvantage is driving up the rates, due to higher proportion of Indigenous Queenslanders in this group of SLAs. The effect of the clustering of Indigenous population is diminished by reporting by quintile, where area-based and population weighting are equally effective.

- The Queensland CATI survey methodology was assessed to more effectively sample the most disadvantaged population when SEIFA was based on population weighted methods. The expected proportion of the survey sample in decile was about 10%, where the observed proportion was 9%. Similarly the expected proportion of sample in quintile 1 was about 20% where the observed proportion was 18%. In contrast the area-based method showed greater difference between observed and expected—for decile 1, the observed sample was 2% where about 10% was expected and for quintile 1 the observed proportion was 13% while the expected was about 20%.
- While the prevalence of self reported adult overweight and obesity varied by quintile/decile with higher prevalence in disadvantaged areas than advantaged, it did not differ by method of quintile/decile generation, based on SEIFA 2011.

### **6.13 Release of survey datasets (unit record data)**

The PHB aims to maximise the benefits of survey data by making unit record data available to investigators outside the unit. This may include investigators from Queensland Health as well as from external research institutions.

These data are collected under specific legislative requirements and ethical approval. All data disclosures must adhere to these requirements. The data are not identified (do not contain respondents' names or contact details) and undergo further confidentialisation before release.

The PHB has developed a strict protocol on data disclosure to protect privacy and to deliver high quality information to improve the health of Queenslanders. Furthermore the protocol adopts a strategic approach to analysis in order to avoid duplication as a result of multiple parties addressing the same research question.

A flowchart has been developed to describe the different pathways for requesting data based on the type of research question. Requests for the flowchart, or the data or questions relating to this process, should be emailed to: [Population\\_Epidemiology@health.qld.gov.au](mailto:Population_Epidemiology@health.qld.gov.au)

The Executive Director, Preventive Health Branch, Prevention Division is the Data Custodian.

The Manager, Epidemiology is the Delegate for the Data Custodian. The Delegate can be contacted at [Population\\_Epidemiology@health.qld.gov.au](mailto:Population_Epidemiology@health.qld.gov.au)

### **6.14 Reporting guidelines**

PHB has adopted and developed a number of guidelines to maintain alignment with Queensland Government publications and for consistency of reporting within the unit. These include text style guidelines, preferred graph and table display, bibliography and authorship guidelines.

#### **6.14.1 Text style guide**

The style guide for PHB is largely based on the current Queensland Health style guide<sup>112</sup>, while adopting some of the specific features of specialist style guides for epidemiological data reporting such as the AIHW style guide.<sup>113</sup> A style guide with a summary of key conventions is maintained by PHB as a working document and is supplemented by a tip sheet for the Chief Health Officer report as required.<sup>114</sup>

#### **6.14.2 Table and graph format**

PHB has developed a set of general formatting guidelines for development of tables and graphs in reports. While there may be some variation between report series and in those documents which are graphically designed, the following general formats are adopted:

- Caption should be sufficiently detailed to be interpreted in isolation using the following format 'X by Y, (location), (years)'
- Place males before females.
- Axis label should be 'Rate (per 100,000)' where appropriate.
- 'Percentage' should be used in axis titles not '%' in data points.

- No decimals should be used in axis data labels unless unavoidable. If decimals must be used, then the number of decimal places for each label should be the same.
- Use full years, that is, '1980' not '80'.
- Avoid Excel default colours.
- Ensure the order of the legend matches the order of the data (that is, in a line chart, the top line should appear first in the legend).
- Thousand separators should be used for all numbers.
- 95% confidence interval error bars (+ and -) should always be displayed if available.

A detailed set of graph and table format instructions and templates is maintained for preparation of the biennial CHO report.

### **6.14.3 Bibliography guidelines**

A small number of Endnote libraries are maintained as master libraries within PHB to ensure a single repository for information is available specific to each of the teams in the unit and to provide easier access to individuals within PHB. The accuracy and completeness of the library is critical to its usefulness and is the responsibility of the relevant team to manage.

A master Endnote style has been created to ensure consistency of referencing across all documents produced by PHB. The master Endnote style is based on the Journal of American Medical Association (JAMA) style and is designated as QH-PES. A working guide to manual entry of references into Endnote is maintained by PHB to enhance compatibility and accuracy of the libraries.<sup>115</sup>

### **6.14.4 Authorship guidelines**

Authorship guidelines have been developed by PHB to provide consistency of attribution in the reports, papers and associated documents released by the unit. These guidelines are based on international and national good practice. They address a number of issues including establishing authors and ordering of authors, and also include an authorship authorisation form. They are reviewed biennially.<sup>116</sup>

## **6.15 Reporting clinical conditions from self report surveys**

In 2015 an assessment of the suitability of using self report data to monitor clinical indicators was conducted to inform future investments in the Queensland Preventive Health Survey series. This assessment included five indicators that had been used in Queensland Health surveys over the past 15 years: diabetes, high blood pressure and cholesterol, cancer and cardiovascular disease. Each of these represents clinical outcomes and risks of great significance to the population and are individually important for monitoring. For cardiovascular conditions there is no known monitoring survey to report on clinical prevalence, so the goal of this assessment was to compare the Queensland Preventive Health Survey data with the established data source, the National Health Survey.

### **6.15.1 Diabetes**

Diabetes is a clinically defined condition which is diagnosed by blood test. The initial blood test to detect high levels of glucose in a patient is fasting plasma glucose (FPG) and the diagnosis of diabetes is confirmed by oral glucose tolerance test (OGTT). A blood measurement survey was conducted nationally in 1999 providing estimates for Queensland adults aged 25 years and older. Diabetes was diagnosed in the sample population using the OGTT, the gold standard for diagnosis. Since then, there has only been one blood measurement survey, the Australian Health Survey conducted in 2011–12 which is likely to have underestimated the true prevalence of diabetes because the assessment was based on FPG alone (Table 15).

Lack of blood measurement data, and lack of continuity in tests used to diagnose diabetes, has significantly constrained an understanding of trend in diabetes prevalence in the population. Data sources to monitor diabetes prevalence were discussed in a report released by Queensland Health

in 2014.<sup>117</sup> Using composite information from national studies and surveys, it was estimated that about 1 in 12 adult Queenslanders had diabetes in 2011–12 (Table 15).<sup>117</sup> A more precise estimate is not possible due to lack of comprehensive blood measurement data.

Self reported diabetes was first collected in the Queensland Health telephone survey in 2000, and again in 2006 and annually since 2009. Consistent questions have been used throughout. The survey questions ask whether a person has ever been told by a doctor, nurse or at a hospital they had diabetes, high blood sugar or a touch of sugar. In 2012, 8.6%, of Queensland adults (excluding pregnant females) self reported diabetes or high blood sugar, in 2013 9.2% did so and in 2014, 9.7% (Table 15).<sup>118-120</sup>

Table 15: Prevalence (%) of diabetes in adults by clinical estimation and self report, Queensland

Year and blood test	Blood measurement survey	Self report
1999 (OGTT)	7%	
2011–12 (FPG)	5%	
2011–12 (collated measured data)*	1 in 12	
2012 (SRHS)		8.6%

\*prevalence estimated from multiple data sources, precise estimate not available<sup>117</sup>

*Conclusion:* The limitation of self report to monitor a clinically diagnosed condition is recognised. However, in the absence of blood measurement data, and the relatively close alignment between blood estimates and self reported data as well as evidence of expected trend in self reported prevalence due to rising rates of obesity, ongoing monitoring of diabetes will be based on self report collections.

### 6.15.2 Cancer

Cancer is a complex disease which is diagnosed by histological and associated tests. It is a notifiable condition with Cancer Registries established in each state. These registries collect clinical and demographic information about cases and include diagnostic information to specifically code to cancer type. Deaths are based on data supplied to the Queensland Registry of Births, Deaths and Marriages. Cancer incidence and death are routinely reported by cancer type in the Chief Health Officer report series using data from these sources.

Prevalence of cancer by type is reported nationally, and is calculated from incidence and survival statistics collated in the AIHW Australian Cancer Database.<sup>121</sup> In 2012, it was reported that by the end of 2007, there were about 774,700 prevalent cases of cancer in Australia, that is people who had been diagnosed with any notifiable cancer in the previous 26 years and who had survived.<sup>121</sup> This 26-year prevalence equated to roughly 3.6% of the total Australian population. Prevalence increased with age, with about 19% of Australians aged 80 and over having had a diagnosis of cancer within the previous 26 years.

Using the same methodological approach for prevalence of melanoma: at the end of 2007, there were more than 136,000 prevalent cases in Australia.<sup>121</sup> This represented a 26-year prevalence of 0.6%.

Assuming all cases of cancer diagnosed in the previous 26 years in Australia in 2007 were adults, the prevalence in the adult population in 2007 would be 4.9%. It is necessary to make this assumption because the national prevalence data was not released by age group. For melanoma the prevalence in the adult population would be 0.9%. Similarly, the prevalence of female breast cancer would be 1.9% and prostate cancer 1.7% (Table 16).

By self report in 2012, 16% of Queensland adults reported having been told by a doctor or nurse that they had any type of cancer, 2.9% reported having been told they had melanoma, 2.8% of adult females reported breast cancer, 2.1% of adult males reported prostate cancer (Table 16).<sup>122</sup> There are two skin cancers which are not notifiable and not included in the Australian Cancer Database, basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). By self report in 2012 the prevalence in Queensland adults was 4.7% and 1.5% respectively. Using the number of non-

melanocytic skin cancer cases reported for 2002 based on GP consultations and medical records<sup>123</sup>, and assuming cases occurred in adults, the prevalence of BCC was 9.4% and SCC was 4.4%, substantially higher than self report.

There are significant limitations in this comparison:

- prevalence in Australian adults is compared with Queensland adults and as skin cancer is more prevalent in Queensland, this is a more significant limitation for these cancers
- there is a difference in the reporting periods (2002 and 2007 compared with 2012)
- all prevalent cases in Australia were assumed to occur in adults as adult case numbers were not released.

Table 16: Prevalence of cancer in adults by clinical estimation (Australia, 2007) and self report (Queensland 2012)

Cancer type	Adult prevalence (%)	
	Australian Cancer Database estimates*	Self report (SRHS)
All cancers		16.2%
All notifiable cancers	4.9%	10.0%
Melanoma	0.9%	2.9%
Basal cell carcinoma**	9.4%	4.7%
Squamous cell carcinoma**	4.3%	1.5%
Female breast cancer	1.9%	2.8%
Prostate cancer	1.7%	2.1%

\* 2007: Australian cancer registries

\*\* 2002: GP medical records

*Conclusion:* Noting the data limits to the comparison between clinically derived information and self report, it is evident that self reporting overestimates the true prevalence of cancer. Data limitations are not considered of sufficient magnitude to explain the difference between clinical and self report findings. It is not recommended that self report cancer prevalence be reported in future Chief Health Officer reports to describe these clinical conditions. Without this requirement, there is little or no justification to include such questions in future self report surveys conducted by Queensland Health.

### 6.15.3 High blood pressure

High blood pressure, often referred to as hypertension, is prolonged elevation of the blood pressure. It is frequently measured by a clinician in a primary healthcare setting or at a pharmacy, but any person with a blood pressure cuff may monitor their own or another person's blood pressure. For the AHS measurement module, it was measured by trained interviewers using an automated blood pressure monitor.<sup>124</sup> This is described as a physical measurement. The AHS defined hypertension as a person who had high blood pressure when measured or was taking medication to control blood pressure. It includes undiagnosed and diagnosed cases, recognising that not all diagnosed cases are effectively treated.

Self report surveys such as the SRHS Queensland Health series rely on respondent recall of ever having been told they have high blood pressure or as in the self report module in the AHS, that they have hypertension.

In 2011–12, 30% of Queensland adults were hypertensive by physical measurement—13% were untreated and 17% were treated for high blood pressure (where 6% were inadequately treated and 11% were successfully treated). In the same survey, by self report, 13% of adults self reported hypertension as a long term condition, suggesting that people do not identify their condition, irrespective of those who had undiagnosed high blood pressure (Table 17).

For comparison, self report survey data from 2012 showed that 29% of Queensland adults reported having ever been told by a doctor or nurse that they had high blood pressure (Table 17). Self report data from 2014 was used to assess whether high blood pressure was a long term condition: 11% of adults reported they currently had high blood pressure and that it had lasted or

was expected to last for 6 months. This was similar to what the AHS reported by self report in 2011–12 for Queensland adults, 13%.

The diagnosis of high blood pressure is dependent on physical measurement, in part because not all cases are known, and in part because knowledge and recall varies by survey settings and definitions. The Ausdiab follow-up study showed a 33% increase in the prevalence of hypertension over 12 years<sup>125</sup>, based on physical measurement. No change in the prevalence of self reported hypertension was reported over a similar period from the National Health Survey series (which includes the 2011–12 AHS).<sup>126</sup>

Table 17: Prevalence of hypertension by clinical estimation and high blood pressure by self report, adults, Queensland 2011–12

	Physical measurement	Self report
Hypertensive* (AHS)	30%	
Ever told by doctor or nurse have high blood pressure (SRHS)		29%
Long term condition (AHS)		13%
Long term condition (SRHS) 2014		11%

\*Defined as measured high blood pressure or taking anti-hypertensive medication

*Conclusion:* High blood pressure or hypertension is recorded in a clinical setting using a blood pressure cuff. Very few population surveys conduct physical examinations, and as a consequence, data to monitor high blood pressure is limited. Added to this, not all cases of hypertension or high blood pressure are diagnosed. Self report data does not capture the undiagnosed proportion. Furthermore, some people may not understand their diagnosis and are unable to report the condition during a telephone interview.

The Queensland SRHS survey reported a prevalence of 29% of adults who have ever been told they have high blood pressure, and the AHS measured prevalence was 30% with hypertension—and while these estimates are similar, it cannot be concluded that they are measuring the same clinical diagnosis. Self report data collected in Queensland over the past decade has shown no variation over time and neither has the national self report data. In contrast, by physical measurement, the prevalence of high blood pressure has increased. Given the limitations of self report data to adequately reflect the clinical condition of hypertension, further investment in self report data collection to report prevalence should be minimised or focused on particular aspects of testing and management of the condition.

#### 6.15.4 High blood cholesterol

Cholesterol is measured in a blood sample taken from a subject who has fasted for at least eight hours prior to collection. Blood cholesterol and triglycerides are measured by specialised procedures in a pathology laboratory. This testing is sometimes referred to as a clinical test. Dyslipidaemia refers to a number of different lipid disorders, that is, conditions where there are too many fats in the blood.<sup>117</sup>

Self reported high cholesterol is obtained from a survey such as the SRHS series where a respondent is asked whether they have ever been told by a doctor or nurse that they had high cholesterol.

In 2011–12, 64% of Queensland adults were dyslipidaemic by blood measurement—51% were untreated and 13% were treated for abnormal lipids (where 8% were inadequately treated and 5% were successfully treated). In the same survey, 8% of adults self reported high blood cholesterol (Table 18).

For comparison, self report survey data from 2012 showed that 29% of Queensland adults reported having ever been told by a doctor or nurse that they had high blood cholesterol (Table 18). Self report data from 2014 was used to assess whether high blood pressure was a long term condition: 8% of adults reported they currently had high cholesterol and that it had lasted or was

expected to last for 6 months. This was the same as the AHS reported prevalence for Queensland adults in 2011–12, 8% by self report.

Table 18: Prevalence of dyslipidaemia by clinical estimation and high blood cholesterol by self report, adults, Queensland 2011–12

	Blood measurement	Self report
Dyslipidaemia*	64%	
Ever told by doctor or nurse have high cholesterol		29%
Long term condition (AHS)		8%
Long term condition (SRHS) 2014		8%

\*Defined as measured abnormal blood lipids or taking lipid lowering medication

*Conclusion:* Cholesterol and other lipids are measured by blood test, with very few population surveys established to undertake biomedical testing in Australia. As a consequence, there is limited information on blood lipids in the population. Importantly, the AHS has shown that many people with abnormal lipids are unaware of their condition—the Australian Bureau of Statistics estimated that of those Australians with high cholesterol as diagnosed by blood measurement, 9 out of 10 were undiagnosed. Self report data does not capture the undiagnosed proportion. Furthermore, some people may not understand their diagnosis and are unable to report the condition during a telephone interview. Given the limitations of self report data to adequately reflect the clinical condition of dyslipidaemia, further investment in self report data collection should be minimised or focused on particular aspects of testing and management of the condition..

### 6.15.5 Cardiovascular disease

Cardiovascular disease includes a range of clinical conditions including acute events with ongoing consequences such as heart failure and stroke as well as long term conditions such as hypertension and atherosclerosis. Prevalence data is collected every three years in the National Health Survey and reported for Queensland. A module on cardiovascular disease was included in the 2014 SRHS to provide greater detail including regional data on prevalence of selected cardiovascular diseases. The data from the SRHS survey is contrasted with data from AHS 2011–12.

The same questions were used for collection in both surveys. The age group for comparison did not match as the AHS did not release data for Queensland for the population 18 years and older—25 years and older was therefore used. The data collection periods did not match exactly, 2011–12 compared with 2014. Importantly, the AHS collated conditions and used additional information to categorise respondents into clinically similar condition categories. This was not replicable with SRHS analysis, due to lack of additional information and/or the algorithms used in the AHS. As a result there are very few indicators for comparison. Furthermore the AHS was a face to face survey which allowed use of prompt cards and associated supporting material to enhance data collection.

Nevertheless, it is abundantly clear that the overall prevalence of having a heart or circulatory condition differed markedly. Acknowledging the data limitations discussed above, it is apparent that the SRHS was not able to replicate AHS—17.5% compared to 24.1% (Table 19). The prevalence of most conditions is very low, even when aggregated for release as undertaken for AHS, with the exception of hypertensive disease. Those few conditions that were jointly reported by both surveys showed little agreement, although statistically it is unlikely they differ.

Table 19: Prevalence of cardiovascular disease by self report, Australian Health Survey, and Self Reported Health Status survey, adults, Queensland

	AHS 2011–12 25+ years	SRHS 2014 18+ years
Ever had a heart or circulatory condition		17.5%
Total heart or circulatory condition-long term	24.1%	
Long term conditions		
Rheumatic heart disease		1.1%
Heart attack	2.8%	3.4%

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Heart failure		1.5%
Stroke	1.8%	2.5%
Angina	1.1%	2.9%
Low blood pressure		3.9%
Atherosclerosis		1.3%
Oedema		2.0%
Rapid or irregular heart beats	2.5%	3.5%
Heart murmur or heart valve disorder		2.7%
Haemorrhoids		2.8%
Varicose veins		6.8%
Hypertensive disease	13.6%	

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*Conclusion:* Reporting cardiovascular disease prevalence from the 2014 SRHS survey did not sufficiently align with the AHS to establish it as a reliable source of such information for Queensland. The issue is not so much about reporting a clinical indicator from self report data, rather whether the state survey can replicate the more established source of such information. Therefore, as the National Health Survey series has been reporting prevalence of a range of conditions, including cardiovascular disease, for Australia and the jurisdictions every three years for a number of years, and is expected to continue to do so, there is no justification to further invest in such data collection in the state surveys.

## 7 Publication specific issues

### 7.1 Chief Health Officer report 2010

The 2010 CHO report was developed using the data sources and methodologies as described in the report itself and in relevant sections of this Methods report. In addition, the following key issues should be noted. Errata to the report are posted on the Queensland Health website, and include methodological and data quality issues as relevant.

The 2007 death file used for health status reporting in 2010 CHO report did not include deaths of Queenslanders registered in New South Wales, Victoria and Tasmania at the time of the extraction. Subsequent ABS releases indicated this represented an under-count of 369 deaths. Deaths flagged with the SLA code 9299 (overseas) were also excluded from the count.

All coroner certified deaths registered after 1 January 2007 are subject to revision. This is a change from previous years which required certain conditions to be finalised approximately 13 months after the end of the reference period. As a consequence of this change, the suicide data used for stratification of rates by sub-population in the 2010 CHO report was based on the pre-2007 revision release. However, suicide deaths by sex for the most recent period are based on the revised release.<sup>127</sup> This data limitation was described in the report.<sup>128</sup>

The term hospitalisation is used throughout to refer to admitted patient episodes of care, where episodes of care are restricted to Queensland residents. In the 2010 CHO report episodes flagged as unqualified newborns, organ donors or boarders, admissions to public psychiatric hospitals and separations where patient sex is indeterminate/intersex are excluded.

Hospitalisation data were based on principal diagnosis field indicating that a condition in that specific cause category was the reason for admission. Exceptions to this rule are as follows:

- Road transport injuries where hospital separations with any ICD-10 code from the road transport injury definition (Section 5.3) in the external cause fields were counted.
- Suicide and self inflicted injuries where hospital separations with any ICD-10 code in the range X60–X84, Y87.0 in the external cause fields were counted.
- Dementia where hospital separations with any ICD-10 code in the range F00–F03 in the principal or other diagnosis fields were counted.
- Falls where hospital separations with a source of referral other than 'admitted to another acute hospital', a principal diagnosis S00–T75 or T79 and first external cause W00–W19 were counted.

For calculation of Indigenous death and hospitalisation rates, the Queensland ERP of Indigenous Queenslanders older than 65 years has been expanded to 65–69, 70–74, ..., 85+ age group by applying the age distribution of Australia-wide Indigenous ERP from the ABS experimental estimates and projections Indigenous Australians (Section 4.10.5). Note that for death data, the year of registration was used for all data including Indigenous deaths.

In Chapter 2 of the 2010 CHO report, the number of maternal deaths as recorded in the QPDC was reported. While the QPDC takes all possible steps to gain identification of the maternal deaths in Queensland, the data is by no means a definitive dataset as maternal deaths are not within the scope of the collection but are sourced and stored as a courtesy to Queensland Health. Maternal deaths are not comparable with AIHW reporting.<sup>129</sup> However, this information was subsequently rescinded due to recommencement of the Queensland Maternal and Perinatal Quality Council that has primary responsibility for reporting of perinatal and maternal morbidity and mortality. Maternal deaths have been released in subsequent reports from the council. This information was posted as an erratum on the website in March 2011.

In chapters 3 and 5 of the 2010 CHO report, the reporting of the effect of poor diet on burden of disease and injury differed from previous estimates. Prior to 2010, the estimation of the impact of poor diet was based on a United Kingdom study<sup>130</sup> which summed the individual population

attributable fractions for overweight and obesity, low fruit and vegetables and high cholesterol.<sup>131,132</sup> While this method was recognised as a relatively crude proxy for diet related impacts, it is acknowledged that the specific impact of poor diet has not been assessed in Queensland, Australia or indeed globally. For the 2010 CHO report, the joint effect of the four risk factors with substantial dietary determinants (high body mass, low fruit and vegetable consumption, high blood pressure and high blood cholesterol<sup>133</sup>) and inclusive of physical activity was estimated. While this method is an advance on the earlier estimation, because it includes the joint effect of the selected risk factors, it too has limitations. It does not accurately represent the causal pathways between dietary components, intermediate risks and health outcomes and is likely to overestimate the effect of diet acting through these factors. However, as the 2010 method does not capture the effect of other dietary risks such as sub-optimal infant feeding, micronutrient deficiencies (for example, calcium, iron, folate, fibre) or over consumption of sugars or energy-dense foods, it is possible that it underestimates the true impact of poor diet. Until a more comprehensive assessment has been conducted, the specific impact is unknown despite these recent attempts to estimate it.

In Chapter 4 of the 2010 CHO report, the increase of over 700% in the deaths attributed to the broad cause symptoms, signs and abnormal findings (R00–R99) in 2007 compared with 2000 should be interpreted with caution as the increase could be due to data collection issues. For example, the ABS notes that deaths attributed to ill-defined causes (R00–R99) increased by 24% compared to 2006.<sup>134</sup> The number of open coronial cases remaining on the National Coroners Information System (NCIS) at the end of the ABS processing period is suggested as a possible cause for the increase. The majority of open cases, for which no information was available, were coded to other ill-defined and unspecified causes (R99). Deaths coded to this cause increased by 14% in 2007 compared with 2006.

In the cancer section of Chapter 4 of the 2010 CHO report, cancer survival rates were based on data obtained from the CCQ online data source. The codes for all cancers excluded non-melanoma skin cancers, consistent with Queensland Health reporting. However, the codes used by CCQ for colorectal cancer differ from Queensland Health standard codes (Section 5.3.3). The codes used by CCQ were C18–20, 21.8.

Throughout Chapter 4 of 2010 CHO report, for Organisation for Economic Cooperation and Development (OECD) reporting, the number of deaths for Queensland and Australia were the counts of deaths registered in 2004, 2005 or 2006, while for other OECD countries counts were derived from annual death registration data reported to WHO for 2004, 2005 and 2006 with the following exceptions: Italy and Portugal where the mortality counts are for 2001, 2002 and 2003; Canada where the mortality counts are for 2002, 2003 and 2004; and Hungary, Luxembourg, New Zealand, Slovak Republic, Spain and United States where the mortality counts are for 2003, 2004 and 2005.

The reliability of diabetes hospitalisation reporting in Chapter 4 is limited by lack of consistency in coding rules since 2000. Year-to-year variation in the application of coding guidelines is recognised as a significant limitation in reporting diabetes. Based on personal communication with NSW Health during 2010, a decision was taken to report diabetes hospitalisations with a caveat about lack of consistency, recognising that coding of diabetes for principal diagnosis was less affected than coding for other diagnoses.

Within chapters 4 and 5 of the 2010 CHO report, the economic impact of diseases and risk factors was reported based on national assessments, largely reported by AIHW. With the exception of one report, only national expenditure is reported publicly, not state estimates.<sup>135</sup> In the absence of state specific data, an estimate of state expenditure for specific diseases and risks was made based on the relative proportion of the national population in Queensland at the time of the estimations. For example, in 2004, 19.4% of the Australian population lived in Queensland, with yearly incremental increases reaching 20.2% in 2009.<sup>136</sup> Factors which support this approach are the proportion of total unallocated national health expenditure that occurred in Queensland (17.9% in 2004–05 and 19.4% in 2007–08)<sup>137</sup> and the proportion of national burden of disease borne by Queenslanders

(18.6% in 2003) with similar proportions for specific diseases.<sup>60</sup> This estimation assumes national rates of treatment and, more importantly, costs associated with service delivery. Clearly, these assumptions may not be valid for many diseases. The population proportion approach is also adopted by Access Economics.<sup>135</sup>

In Chapter 6 of the 2010 CHO report, the measurement of health inequalities was based on the 2001 IRSAD, with deciles/quintiles generated from equal numbers of SLAs. Some Indigenous Queensland communities were recognised after the 2001 SEIFA release, and these new SLAs were placed in the most disadvantaged quintile. As a consequence, the number of SLAs in this quintile is greater than would be expected, although the allocation made very little difference to the expected population share. All other SLA changes over the period were allocated according to relative population change and the SEIFA score of relevant SLAs.

## 7.2 Self Reported Adult Health Status 2009 survey

For the SRAHS 2009 survey, a total, 6,881 interviews were completed (approximately 300 to 630 per HSD) with an effective base of 2,903.54. The statewide response rate was 56.7% of contracted, in-scope people and the contact rate was 80.3% of telephone numbers. The survey provides HSD specific data, along with statewide information for the following measures: quality of life, general health status, satisfaction with health, risk factors for chronic disease (that is, smoking, alcohol consumption, nutrition, physical activity, sedentary behaviour, BMI, psychological distress, blood pressure and cholesterol), sunburn, sun-protective behaviours and diabetes. The nutrition component includes fruit and vegetable consumption, type of milk consumed, takeaway food consumption and food security. Further detailed information is available in the survey report.<sup>138</sup>

The misclassification of HSD affecting 11 cases was identified during aggregation of data from this survey with that of the SRHS 2010 survey. At that time reports had been released. Action taken was to document the errors but not to amend any released data or reports.

## 7.3 Child Health Status 2009 survey

In total, 1,200 interviews were completed with an effective base of 915.61. The statewide response rate was 84.8% of contacted, in-scope people and the contact rate was 78.0% of telephone numbers. The survey provides information for the following measures: fruit and vegetable consumption, takeaway consumption, soft drink and sports drink consumption, physical activity (including active transport and organised sport), small screen time and BMI.<sup>139</sup>

Physical education time estimates over 600 minutes per week were excluded, but still included as a participant in physical education. Outliers for active transport time estimates were excluded if they were outside of the following assumed acceptable range of speeds (applied consistently across all ages):

- walking min speed 2.5 km/h, max 6 km/h
- cycling min speed 10 km/h, max 25 km/h
- skating min speed 5 km/h, max 15 km/h.

These outliers were removed from calculations of time spent in active transport, but remained in the numerator for the proportion participating in active transport as an indicator.

Calculation of child BMI using Cole's method requires knowledge of the child's age to within six months.<sup>89,90</sup> There were 204 missing values for BMI because date of birth was missing. To reduce the number of missing values, the BMI category was calculated for the two possible age categories (age was known for all, but not whether the child was in the first or second six-month category for that year). Where the BMI category was identical for both possible ages, that category was used. Where the two ages yielded categories of overweight and obese, it was assumed that the child was at least overweight. No other unmatched combinations were considered appropriate for further assumptions. This imputation method provided 184 additional data items for BMI, with only 20 remaining missing.

#### **7.4 Self Reported Health Status 2010 survey**

For the SRHS 2010 survey a total, 9,281 interviews were completed (ranging from 21 to 1,860 per HSD) with an effective base of 5,440.58. The statewide response rate was 64.5% of contacted, in-scope people and the contact rate was 75.8% of telephone numbers. The survey provides statewide information for the following measures: smoking, alcohol consumption, fruit and vegetable consumption, physical activity, BMI, blood pressure and cholesterol, sunburn, sun-protective behaviours and diabetes. Sampling frames were not designed to provide HSD specific samples. However, the sample was sufficient to provide adequate respondents for separate reporting for all HSDs except Cape York and Torres Strait–Northern Peninsula.<sup>140</sup>

Due to an internal error, the physical activity module was not asked of individuals aged 75 years (should be 18–75 years, consistent with the Active Australia instrument). In an effort to correct this, matching on age, sex and HSD was undertaken using the SRAHS 2009 survey. The 2009 data was used to substitute 44 records, with 51 individuals remaining as missing.

#### **7.5 Self Reported Health Status 2011 survey**

A total of 12,564 persons aged 16 years or older participated in the SRHS 2011 survey. Selected HSDs were oversampled. The SRHS 2011 survey employed a complex split survey design to incorporate additional survey items such as knowledge and attitudes regarding nutrition and physical activity, indicators collected periodically (for example, takeaway consumption), and one-off topics (for example, impact of the summer floods and cyclones). Topics with closer conceptual relationships, as determined by expert advice, were placed in the same split or splits. Participants were randomly allocated to a survey split; allocation was not based on any participant characteristics. Additionally, weighting was undertaken for each split independently, to ensure accurate weighting of demographic characteristics across splits with varying sample sizes.

Data collection was delayed due to the natural disasters in Queensland in early 2011 with the survey in-field from 11 March 2011 to 6 June 2011. The final average survey duration was approximately 15:45 minutes with a response rate of 44%. Further details of this survey are available from the suite of SRHS 2011 reports published on the Queensland Health website (<http://www.health.qld.gov.au/epidemiology/publications/health-surveys.asp>).

#### **7.6 Child Health Status 2011 survey**

Data were collected for 2,484 children aged 5 to 17 years with all data provided by proxy reporting by the primary caregiver (predominantly the parent). Data were collected between 8 June 2011 and 28 July 2011 with collection halted during the school term break. The response rate for the CHS 2011 survey was 86% with a final average interview duration of just over 12 minutes. Further details of this survey are available from the CHS 2011: Queensland report published on the Queensland Health website (<http://www.health.qld.gov.au/epidemiology/publications/health-surveys.asp>).

#### **7.7 Self Reported Health Status 2012 survey**

The 2012 preventive health telephone survey was conducted from 3 October 2011 to 28 March 2012 with data collection halted during the summer holidays. In total, 19,390 adults 18 years or older participated. The response rate was 81% and the survey was 13.5 minutes in duration.

The survey provides statewide information for the following measures: smoking, alcohol consumption, fruit and vegetable consumption, physical activity, BMI, blood pressure and cholesterol, sunburn, sun-protective behaviours and diabetes.

#### **7.8 Self Reported Health Status 2013 survey**

A total of 7,994 persons aged 16 years or older participated in the SRHS 2013 survey, with interviews conducted from 15 February 2013 to 25 May 2013 with collection halted during the school term break. Sampling was stratified and oversampled by HHS. The final average duration of the survey was about 15:30 minutes with a response rate of 77%. In 2013, the SRHS and CHS

were conducted simultaneously, with one eligible adult and one eligible child selected per household. The combined survey duration was about 29 minutes.

The survey provides statewide information for the following measures: fruit and vegetable consumption, physical activity, BMI, smoking, alcohol consumption, sunburn, blood pressure and cholesterol, diabetes and knowledge of adult fruit, vegetable, and physical activity guidelines. Further details of this survey will be available from the suite of SRHS 2013 reports currently under preparation and anticipated for publication in mid-2014 on the Department of Health (<http://www.health.qld.gov.au/epidemiology/publications/health-surveys.asp>).

## **7.9 Child Health Status 2013**

Data were collected for 2,467 children aged 5 through 17 years with all data provided by proxy reporting by the primary caregiver (predominantly the parent). Data were collected between 15 February 2013 to 25 May 2013 with collection halted during the school term break. The response rate for the CHS 2011 survey was 82% (preliminary) with a final average interview duration of about 11:30 minutes. In 2013, the SRHS and CHS were conducted simultaneously, with one eligible adult and one eligible child selected per household. The combined survey duration was about 29 minutes.

The survey provides statewide information for the following measures: fruit and vegetable consumption, physical activity, BMI, screen time behaviour, active transport, soft drink consumption, sunburn, oral health, and parental knowledge of child fruit, vegetable and physical activity guidelines. Further details of this survey will be available from the CHS 2013 report currently under preparation and anticipated for publication in mid-2014 on the Department of Health (<http://www.health.qld.gov.au/epidemiology/publications/health-surveys.asp>).

## **7.10 Chief Health Officer report 2012**

The 2012 CHO report was developed using the data sources and methodologies as described in the report itself and in relevant sections of this Methods report. In addition, the following key issues should be noted. If required, errata to the report will be posted on the Queensland Health website, and include methodological and data quality issues as relevant.

### **7.10.1 Prevalence**

The prevalence of a disease or condition is assessed by population survey, conducted nationally or by the Queensland Government. For example, the SRHS surveys conducted annually by Queensland Health are used to assess the prevalence of self reported diabetes (noting limitations) and mental health factors as well as a range of health risks, knowledge and attitudes as described on page 20. Most of the prevalence data for children is derived from the Queensland CHS surveys which use parental or guardian reporting, termed proxy reporting. The generation of performance estimates for the NPAPH including estimates for children aged 5–17 years is described on page 42.

### **7.10.2 Deaths**

The most recent death data for Queensland was provided by ABS on request by Queensland Health as well as publicly released data.<sup>141-143</sup> Deaths of Queensland residents were included, based on year of registration, whether the death occurred in Queensland or interstate, but not deaths that occurred overseas. All death data is reported according to the underlying cause.<sup>142</sup>

The request to ABS for rates and case numbers of deaths for Queensland from 2008 onwards was made because the cause of death unit record file previously released by ABS was no longer available. The reason for this was that release was being migrated from ABS to the jurisdictional Registry of Births, Deaths and Marriages.<sup>144</sup> This affected release of death data from 2008 onwards and affected the capacity of all government departments and entities to access cause of death unit record files to undertake the customised collation and analysis for the routine and other

release of death statistics. The request Queensland Health made directly to the ABS was for summary statistics to meet specific reporting requirements of the 2012 CHO report.

The death data provided on request by ABS included suicide deaths which had been retrospectively assessed through the national review process as described in associated documents<sup>145</sup> and as noted on page 75. In the 2012 CHO report suicide deaths from 2006 through to 2010 had been subject to this review. Rates of death due to suicide prior to the review should not be compared with rates since the review. For suicide, socioeconomic, remoteness and Indigenous Queenslanders comparisons were based on data prior to the coronial review.

The source data for socioeconomic, remoteness and Indigenous Queenslanders comparisons were derived from 2006–2007 deaths, were preliminary at the time of the release, and excluded deaths of Queensland residents in New South Wales, Victoria and Tasmania.<sup>128</sup> The most recent complete set of data for OECD reporting was 2004–2006.

In November 2010, the Queensland Registrar of Births, Deaths and Marriages advised the ABS of an outstanding deaths registration initiative undertaken by the Registry.<sup>142</sup> This initiative resulted in the November 2010 registration of 374 previously unregistered deaths which occurred between 1992 and 2006 (including a few for which a date of death was unknown). Of these, around three-quarters (284) were deaths of Aboriginal and Torres Strait Islander Queenslanders.

### **7.10.3 Hospitalisations**

Hospitalisation data (separations or episodes of care) were derived from the Queensland Hospital Admitted Patient Data Collection, including admissions of Queensland residents to private and public hospitals, with certain exclusions which are noted. All disease-specific hospital separations were derived using the principal diagnosis of inpatient episodes of care unless otherwise specified. Hospitalisation rates by SEIFA up to 2010–11 were based on 2006 population weighted SEIFA quintiles. Length of stay was based on overnight and same day admissions in public and private acute hospitals.

### **7.10.4 Statistical inference**

The reporting of difference between categories is noted only when the difference is statistically significant, based on non-overlap of 95% CIs. Estimates for certain population subgroups may be based on small numbers and have large relative standard errors and this is noted in relevant tables. This may include suppression of data where relative standard error of an estimate exceeds 50%. These issues are discussed more fully on pages 26 and 28.

### **7.10.5 Format for reporting years**

Financial and hospitalisation data are reported by financial years and displayed using the format 2006–07. The same format is used for data collected over two years but not the full period such as the National Health Survey 2007–08. Data which refers to two full years is displayed in the format 2006–2007.

### **7.10.6 Incidence, notifications and population**

Cancer incidence data was derived from the Queensland Cancer Registry (QCR) using the online portal, OASys<sup>146</sup> to extract information not publicly released by QCR.

All notification data came from Queensland's notifiable conditions system (NOCS).

Estimated resident population data at 30 June for each year were used for calculation of all rates, including the 2012 self reported prevalence data using the re-based 2011 estimates.<sup>147</sup>

### **7.10.7 ICD codes**

The codesets for all conditions are listed on page 84.

### 7.10.8 Illicit drugs

The National Drug Strategy Household Survey includes questions on the illicit use of the following legal and illegal drugs—painkillers, tranquilisers, steroids, meth/amphetamines, cannabis, heroin, methadone, other opiates, hallucinogens, ecstasy, ketamine, GHB, inhalants and any injected drug.<sup>43</sup>

### 7.10.9 Oral health data

There is currently no national collection system to inform dental service delivery, as most dental services are delivered by private providers. Data for children is based on the school dental services in each state and child dental health surveys.<sup>148</sup> Data for adults is derived from surveys conducted by the Australian Research Centre for Population Oral Health. There are acknowledged limits on these collections relating to completeness and representativeness of the sample.<sup>149</sup>

### 7.10.10 Analysis

Analytical methods are also described on pages 21, 26, 30, 33. In addition, the following analytical approaches were used:

**Reporting of difference** between two populations or time points where statistical significance had been established was based on percentage difference or percentage point difference. For example, if the disease prevalence in population A was 60% and in population B it was 50%, then A is 20% higher than B, and the prevalence in population A is 10 percentage points higher than B.

**Trend analysis for survey data** was based on line of best fit assuming a linear relationship using point estimates, rather than unit record files. Line of best fit was generated from historical point prevalence data using the 'forecast' function within the Microsoft Excel program.<sup>150</sup> The 'forecast' function (x, known\_y's, known\_x's) returns the predicted value of the dependent variable (represented in the data by known\_y's) for the specific value, x, of the independent variable (represented in the data by known\_x's) by using a best fit (least squares) linear regression to predict y values from x values. The forecast function includes slope and intercept, as well as predicted values.

**Trend analysis for death data** was based on line of best fit, assuming a linear relationship using the 'forecast' function within the Microsoft Excel program.<sup>150</sup> In the absence of unit record death files from 2008 onwards (as discussed above), assessment of trend was primarily based on extrapolation of more rigorous trend analysis (2000–2007) undertaken for the 2010 CHO report by HSC. If the trend up to 2007 had been identified as statistically significant, this trend was reported only where the 2008 to 2010 rates were congruent with the tested period up to 2007. This involved a degree of subjective judgement with several staff independently involved in the assessment and where agreement was reached, a conservative approach was adopted.

**Trend analysis for hospitalisation rates** was undertaken by HSC, Queensland Health using unit record data to develop more complex regression models.

**Excess cases** due to socioeconomic and remoteness differences and those due to Indigenous status were based on methods previously published<sup>81</sup>, and described on page 33.

**Deaths averted due to reduction in smoking** were based on the impact of rate difference over a defined period, on case numbers adjusted for risk factor attribution by sex, with an adjustment for differences in age structure (Table 20). For example, over the period 2000 to 2010 there were 14,363 deaths due to lung cancer and 9,713 due to COPD. If the death rates in 2000 were applied to the population (by sex) over subsequent years there would have been 15,487 deaths due to lung cancer and 13,188 to COPD. This assumes that the factors that have resulted in the decline (or otherwise) in death rates can be attributed to a certain factor or factors. In this instance, smoking is the presumed driver of rate change. Therefore adjusting the difference in expected case numbers if rates had not changed, against the observed case numbers by the burden of disease methodology attribution fraction for smoking for deaths for the two diseases was

undertaken. In addition, an adjustment was made for the lack of age adjustment when applying the 2000 death rate to the subsequent year populations to generate the expected case numbers. These adjustments resulted in 2,609 fewer male deaths due to COPD and lung cancer over the 11 years and 196 more female deaths, that is, 2,413 fewer deaths in total. This was conservatively reported as about 2,000 fewer deaths due to reduction in smoking, pages iii, vii, 2 and 90 of the 2012 CHO report.<sup>151</sup>

Table 20: Estimation of impact of smoking rate reduction on deaths due to lung cancer and COPD through death rate reduction, 2000 to 2010

	ERPs from Australian Demographic Statistics			Death data from ABS public and customised release									
	ERPs		Males	Lung cancer rates		Lung cancer cases		COPD rates		COPD cases			
	Persons	Females		Females	Males	Females	Males	Females	Males	Females	Males		
2000	3,561,537	1,786,017	1,775,520	20.5	58.6			16.9	47.8				
2001	3,628,946	1,822,506	1,806,440	21.8	55.0	398	859	17.6	39.1	334	557		
2002	3,714,798	1,863,157	1,851,641	25.0	56.4	472	924	19.5	45.4	384	668		
2003	3,809,214	1,911,249	1,897,965	21.0	51.2	411	873	18.1	38.0	367	587		
2004	3,900,910	1,956,307	1,944,603	23.6	51.8	483	910	19.8	35.7	411	579		
2005	3,994,858	2,002,545	1,992,313	24.0	49.0	504	902	17.1	32.0	371	533		
2006	4,090,908	2,049,617	2,041,291	22.9	50.2	500	946	15.1	30.9	346	529		
2007	4,177,089	2,092,390	2,084,699	21.6	45.8	485	908	14.1	31.1	329	555		
2008	4,270,091	2,138,670	2,131,421	24.0	51.9	549	1050	16.4	34.2	398	630		
2009	4,365,426	2,186,035	2,179,391	24.9	46.3	595	959	17.0	33.5	420	644		
2010	4,424,158	2,217,307	2,206,851	25.4	47.1	615	1020	18.1	30.5	463	608		
Total cases over the period						14,363		9,713					
Observed cases- based on simple rate calculation, that is rates by ERP. This is a quasi for observed cases				Expected cases if rate did not change from 2000				Expected minus observed					
Lung cancer cases		COPD cases		Lung cancer cases		COPD cases		Lung cancer cases		COPD cases			
Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males		
2000	366	1040	302	849	389	977	314	849	23	-64	13	0	
2001	397	994	321	706	397	994	321	863	0	0	0	157	
2002	466	1044	363	841	406	1018	328	885	-60	-26	-35	44	
2003	401	972	346	721	417	1044	336	907	15	72	-10	186	
2004	462	1007	387	694	426	1070	344	930	-35	62	-43	235	
2005	481	976	342	638	437	1096	352	952	-44	120	10	315	
2006	469	1025	309	631	447	1123	361	976	-23	98	51	345	
2007	452	955	295	648	456	1147	368	996	4	192	73	348	
2008	513	1106	351	729	466	1172	376	1019	-47	66	26	290	
2009	544	1009	372	730	477	1199	385	1042	-68	190	13	312	
2010	563	1039	401	673	483	1214	390	1055	-80	174	-11	382	
14,876		10,499		15,487		13,188		-337		948		74 2614	
% attributed to smoking (from BoD RF death 2007)								75.7		87.5		72.4 74.8	
Number case difference that could be attributed to smoking								-254.8		829.3		53.7 1955.4	
Total cases by disease attributed to smoking								574.5		2,009.1			
Adjust for lack of age-standardisation, ie reduce by estimated factor								554.7		1,858.6			
Adjusted total for both								2413.3					

The impact of risk factor prevalence on the number of prevalent cases (smoking and obesity) was based on expected and observed prevalence in any particular year and estimated resident population for the age group of interest. For example, in 2012 there were 3.5 million adults aged 18 years and older in Queensland (Table 21). Based on trend generated from historical data, 14% smoked daily, that is 0.492 million daily smokers. If the smoking rate had not changed between 2001 and 2012, there would have been 0.784 million smokers, a difference of 0.291 million persons now not smoking. If the number of fewer smokers each year is averaged (column A), over the 12-year period there were on average 10,074 fewer smokers each year. This was reported as about 10,000 fewer smokers per year and the same method was used to estimate the increased number of persons overweight or obese per year for CHO 2012 report, pages v, vi, vii, 2, 3, 70, 95.

Table 21: Calculation of 'smokers averted' per year, 2001 to 2012

Year	18+ ERP	'Forecast' smoking trend based on historical data	Number of smokers based on trend (A)	Number of smokers based on 2001 prevalence (B)	Smokers saved (B-A)	Number fewer each year
2001	2,699,425	22.3	603,277	603,277	-	
2002	2,772,082	21.6	598,554	619,515	20,961	4,723
2003	2,853,014	20.8	594,456	637,602	43,145	4,098
2004	2,931,244	20.1	588,592	655,085	66,493	5,864
2005	3,007,182	19.3	581,102	672,056	90,954	7,490
2006	3,083,905	18.6	572,609	689,202	116,593	8,493
2007	3,155,025	17.8	561,958	705,096	143,138	10,651
2008	3,230,978	17.1	551,056	722,070	171,015	10,902
2009	3,308,645	16.3	539,284	739,428	200,143	11,772
2010	3,361,054	15.5	522,412	751,140	228,728	16,872
2011	3,405,462	14.8	503,565	761,065	257,500	18,848
2012	3,509,835	14.0	492,459	784,390	291,931	11,106
Average per year						10,074

**Regression analysis** was used to assess the relationship between key variables in a multivariable model as described on page 30.

Data from the SRHS 2011 (Section 4.20.1) were used for multivariate regression analysis.

Outcome variables were selected on the basis of factors including public health importance and consistency with national and other indicators. All outcome variables selected, with the exception of one, were binary and modelled using logistic regression. The exception was minutes of physical activity per week, which was modelled as a log-transformed continuous variable using Normal linear regression.

The pool of potential predictor variables for regression analysis with a particular outcome was dictated by the SRHS 2011 survey splits, with variables from survey modules in the split but not considered to have a close conceptual relationship with either the outcome or other potential predictor variables excluded from the pool. Exploratory data analysis included the univariate analyses published in the SRHS 2011 reports.<sup>152-157</sup>

A likelihood ratio test (LRT) was performed for each potential predictor variable with each outcome<sup>158</sup> using unweighted data and with routine inclusion of four variables (for sex, age, SEIFA and ARIA). Routine inclusion of the four variables occurred, both in the LRTs and tentative models, due to their expected confounding influences. The remaining predictor variables were generally included in tentative models if the LRT was significant at a raised level<sup>158</sup> ( $\alpha=0.25$ ), that is when  $p$  values were less than 0.25. If variables meeting the LRT threshold were similar, only one variable was included in the tentative model, to reduce the likelihood of important collinearity effects. On occasion, models were redeveloped using variables in a different form, for example BMI as a categorical rather than a continuous variable.

To assist in the assessment of model suitability, a Hosmer-Lemeshow goodness of fit test was performed for logistic models.<sup>159</sup> For Normal linear regression analyses, models' proportion of linear variance explained (r-squared) were considered. As the modelling approaches did not account for the stratified sampling design, CIs generated may have been overly precise.

For each outcome, in addition to an unweighted model and a model weighted to Queensland (by age, sex and HSD using the total sample), a model was developed using the weight designed for the variable contributing the highest proportion of its observations to the tentative model.

Predictor variables showing a significant ( $\alpha=0.05$ ) association with the outcome across the three final weighting scenario models for an outcome were considered for reporting. A conservative approach was adopted, with associations exhibiting  $p$  values greater than 0.04 not generally reported.

For logistic models, when the weighted prevalence of an outcome was at least 20%, the term 'odds' was used to describe associations. When the weighted prevalence was considered rare,

that is less than 20%, risk terminology was used, as the odds ratio approximates the risk ratio when the outcome is rare.<sup>158</sup>

### **7.11 Analysis of the AIHW National Drug Strategy Household Survey**

PHB undertook additional analyses of the 2010 and 2013 NDSHS for Queensland.<sup>160</sup> The reports present Queensland findings and selected interstate comparisons for alcohol consumption and tobacco smoking. It also includes Queensland results for numerous questions regarding opinions on drug policy and legislation.

Population weighted prevalence was calculated using weights provided with the dataset. PHB analysed summary measures of tobacco and alcohol use derived by AIHW (also included with the dataset) and therefore applied AIHW definitions of smoking and alcohol behaviours. In the course of analyses, a minor discrepancy was noted between a derived variable and the AIHW definition of 'ex-drinker'. For a very small number of cases, it is possible that the ex-drinker classification may contain some individuals who no longer drink but who did consume alcohol at some point within the previous 12 months.

### **7.12 Preventive health telephone survey 2014**

The 2014 survey integrated data collection for infants (less than 5 years of age), children (5–17 years), and adults (18 years and older) into a single survey. Data were collected from 2 December 2013 to 1 July 2014. From each household, an adult was randomly selected to participate based on the next birthday rule. If the household included children, a child was also randomly selected to be the study child with questions answered by a parent by proxy. The parent proxy was the primary caregiver which is consistent with previous, non-integrated, child health surveys. When the adult respondent was not also the primary caregiver, the participant either passed the phone to the parent proxy or scheduled an alternative time for the child interview. A similar protocol was followed if there was an infant in the household.

The response rates were 68% for the adult survey and 94% for the child and infant survey combined. The survey times were approximately 16 minutes (adult survey), 12 minutes (child survey), 16 minutes (infant survey). Sample sizes were 14,782 (adult survey), 2,985 (child survey), and 2,498 (infant survey).

### **7.13 Chief Health Officer report 2014**

The 2014 CHO report was developed using the data sources and methodologies as described in the report itself and in relevant sections of this Methods report. In addition, the following key issues should be noted. If required, errata to the report will be posted on the Queensland Health website, and include methodological and data quality issues as relevant.

#### **7.13.1 Prevalence**

The prevalence of a disease or condition is assessed by population survey, conducted nationally or by the Queensland Government. The 2014 CHO report included public release prevalence data from the Australian Health Survey 2011–12 as well as data obtained on request. This included prevalence of long-term conditions, risk factors, biomedical and physical measurement estimates and 24-hour food recall estimates. All sources are cited and reporting was consistent with ABS data analysis and release. The ABS data portal, Table Builder was used to extract Queensland estimates for a limited number of data items, specifically self reported health by selected long-term conditions.

#### **7.13.2 Deaths**

Final release death data was used throughout the report. The most recent cause of death file available to Queensland Health through the Queensland Registrar of Births, Deaths and Marriages was 2010. This is consistent with final cause of death data released by the ABS.

Deaths of Queensland residents who died in Queensland were included. Queensland residents who died interstate or overseas were not included, nor were interstate or overseas visitors who

died in Queensland. Aggregated years were used to provide more robust estimates for socioeconomic, remoteness and Indigenous status differentials (two years of data) and for HHS reporting (three years of data). All death data was reported according to the underlying cause.<sup>161</sup>

Deaths were reported by year of registration (reference year) for all state level reporting, remoteness and sociodemographic differentials. For Indigenous Queensland reporting and all HHS reporting, year of death was used. The Registrar of Births, Deaths and Marriages undertook a project in 2010 to capture outstanding unregistered deaths in Queensland. This resulted in the registration of deaths that had occurred in the previous two decades (Table 22). Many of these were of Indigenous Queenslanders and from northern areas of the state. As a result there were more deaths registered in 2010 than expected based on usual registrations, particularly for Indigenous Queenslanders (Figure 8). To overcome this bias, year of death data was used for HHS reporting and for Indigenous Queensland reporting. For median age of death, year of death was used exclusively, to ensure comparability of statistics across multiple populations. The use of median age of death and its limitations was noted on page ii of the report. To reduce year to year variability in areas with smaller populations and therefore fewer deaths, three years of data were aggregated. Noting such variability in selected HHSs, considered overall, the median age of death varied very little from year to year for the majority of HHSs (Table 23).

Table 22: Deaths registered in Queensland in 2010 by year of death and Indigenous status<sup>143</sup>

	Indigenous Queenslanders	Non-Indigenous	Total(b)
Year of occurrence	persons	persons	persons
1991 and earlier	-	-	-
1992-2006(c)	289	31	381
2007	9	3	13
2008	12	5	18
2009	64	1 220	1 360
2010	574	24 389	25 512
<b>Total(d)</b>	<b>948</b>	<b>25 652</b>	<b>27 289</b>

- nil or rounded to zero (including null cells)

(a) Deaths of usual residents of Queensland.

(b) Includes deaths for which Indigenous status was not stated.

(c) A majority of the deaths that occurred between 1992 and 2006 were registered as part of the initiative to register outstanding deaths.

(d) Includes deaths for which year of occurrence was not stated.

Figure 8: Deaths of Indigenous Queenslanders by year of death and year of registration, 1996 to 2010<sup>143</sup>

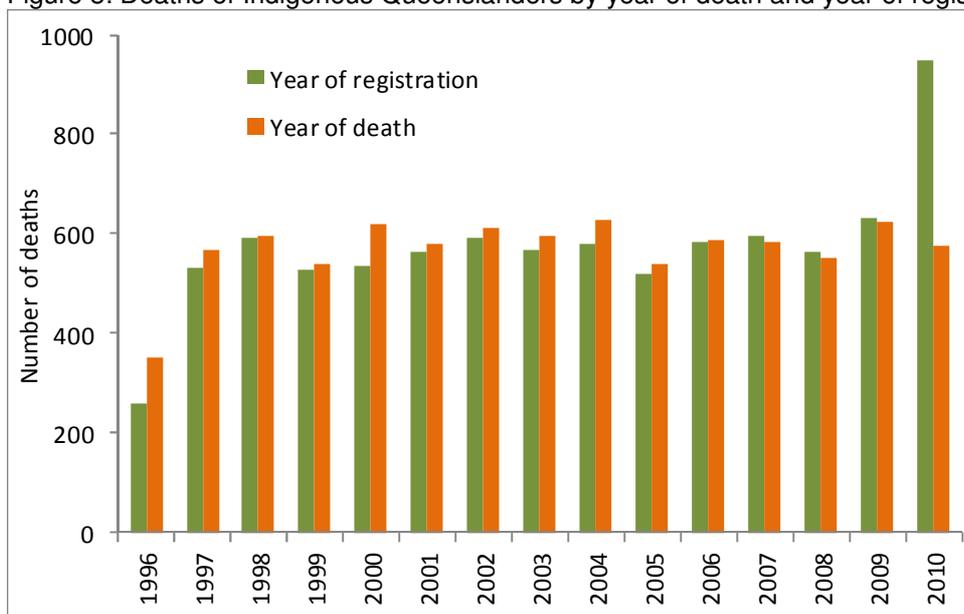


Table 23: Median age of death\* by year, sex, Indigenous status and HHS, Queensland 2001–2010

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Queensland										
persons	78	78	78	78	79	79	79	80	80	80
males	74	75	75	76	76	76	76	77	76	77
females	81	82	82	82	82	82	83	83	83	83
Non-Indigenous	78	79	79	79	79	79	80	80	80	80
Indigenous Queenslanders	54	54	55	56	53	56	57	58	56	57
HHS (persons)										
Cairns and Hinterland	75	76	76	76	76	76	74	76	77	77
Cape York	62	51	57	57	59	57	62	61	61	63
Central Queensland	76	76	77	77	77	78	78	78	78	78
Central West	70	77	78	77	77	78	79	79	77	75
Darling Downs	78	79	78	80	80	79	80	80	80	81
Gold Coast	78	79	79	79	79	80	81	81	80	81
Mackay	75	77	76	76	75	77	76	78	78	78
Metro North	79	80	80	80	80	81	81	81	81	81
Metro South	78	78	78	79	79	79	80	81	81	81
North West	65	61	63	64	62	64	65	67	67	63
South West	75	79	76	77	75	77	76	77	76	77
Sunshine Coast	79	79	79	79	80	79	81	81	80	81
Torres Strait-Northern Peninsula	60	66	63	64	60	71	66	63	56	60
Townsville	75	77	76	76	77	77	78	77	77	78
West Moreton	76	77	77	77	77	78	78	78	76	77
Wide Bay	79	78	78	77	78	79	79	80	79	80

\* based on year of death

For the first time in the CHO report series, HHS data was reported. All death, hospitalisation rates were based on age standardised release. For prevalence estimates, data was not age standardised. All comparisons whether against the state average or the HHSs with the ‘best’ outcome were based on age standardised estimates. While this is the most sound epidemiological approach, it is likely to overestimate the actual burden in areas with a younger age profile (such as Torres Strait–Northern Peninsula and Cape York HHSs) and underestimate the burden in areas with an older age profile (such as Wide Bay HHS). Comparisons based on crude rates eliminate the effect of age standardisation and the relative impact is evident in Table 24. Taking Wide Bay HHS as an example, the crude premature death rate was 36% higher than the Queensland rate, while the age standardised rate was 5% higher. In contrast for Torres Strait-Northern Peninsula, the age standardised premature death rate was 89% higher than the state average, whereas the crude rate difference was 27% higher. Such differences reflect differences in the age profile compared to the state with the higher proportion of older people in Wide Bay leading to a larger health burden.

Table 24: Comparison of crude rates and age standardised rates to assess difference in death burden for selected conditions in HHSs, Queensland 2008–2010

	Premature (0-74 years)			Preventable*			CHD			Cancer			Stroke (2007-2010)		
	Count (3 years)	Crude Rate Ratio	ASR ratio	Count (3 years)	Crude Rate Ratio	ASR ratio	Count (3 years)	Crude Rate Ratio	ASR ratio	Count (3 years)	Crude Rate Ratio	ASR ratio	Count (4 years)	Crude Rate Ratio	ASR ratio
Queensland	29,517	1.00	1.00	12,380	1.00	1.00	13,025	1.00	1.00	23,461	1.00	1.00	8,922	1.00	1.00
Torres Strait-Northern Peninsula	96	1.27	1.89	31	0.98	1.57	13	0.40	n/a	35	0.60	1.04	14	0.63	n/a
Cape York	119	1.29	1.73	62	1.59	2.21	15	0.38	n/a	52	0.74	1.27	7	0.26	n/a
Cairns and Hinterland	1,901	1.16	1.17	818	1.19	1.20	597	0.83	0.97	1,176	0.91	1.00	423	0.86	1.03
Townsville	1,672	1.07	1.17	705	1.08	1.17	647	0.95	1.10	1,136	0.92	1.04	387	0.83	0.97
Mackay	1,133	0.97	1.07	492	1.00	1.10	489	0.96	1.28	795	0.87	1.06	220	0.63	0.87
North West	324	1.50	2.09	149	1.65	2.32	75	0.81	1.48	144	0.87	1.57	24	0.38	0.79
Central Queensland	1,499	1.04	1.13	650	1.08	1.16	656	1.04	1.26	1,090	0.96	1.10	331	0.77	0.93
Central West	115	1.41	1.29	54	1.57	1.44	49	1.35	1.31	80	1.22	1.13	32	1.27	1.23
Wide Bay	1,872	1.36	1.05	824	1.42	1.13	762	1.23	0.92	1,605	1.43	1.06	541	1.27	0.96
Sunshine Coast	2,478	1.02	0.85	1,002	0.98	0.84	1,006	0.92	0.72	2,355	1.20	0.93	856	1.15	0.89
Metro North	4,901	0.86	0.90	1,971	0.83	0.86	2,367	0.94	0.93	4,281	0.95	0.97	1,876	1.09	1.06
Metro South	5,878	0.88	0.96	2,465	0.88	0.96	2,939	1.00	1.09	4,747	0.90	0.99	1,960	0.97	1.06
Gold Coast	2,990	0.86	0.80	1,230	0.84	0.79	1,416	0.91	0.80	2,742	0.98	0.88	1,059	1.00	0.87
West Moreton	1,620	1.03	1.09	703	1.07	1.13	639	0.93	1.15	1,093	0.89	1.02	418	0.90	1.12
Darling Downs	2,069	1.15	1.05	887	1.18	1.10	1,054	1.32	1.13	1,616	1.12	0.98	718	1.30	1.11
South West	223	1.27	1.26	96	1.30	1.30	79	1.02	1.05	142	1.01	1.02	56	1.04	1.09

n/a not reportable

\*as defined by national indicator for avoidable deaths

Comparison to the ‘best’ was based on the HHS with the lowest level of health risk, taking into account the 95% confidence intervals.

### 7.13.3 Hospitalisations

Hospitalisation data (separations or episodes of care) were derived from the QHPADC, including admissions of Queensland residents to private and public hospitals, with certain exclusions which are noted. All disease-specific hospital separations were derived using the principal diagnosis of inpatient episodes of care unless otherwise specified. Hospitalisation rates by SEIFA up to 2010–11 were based on 2011 population weighted SEIFA quintiles.

The annual number of hospitalisations reported differed between sources based on inclusion and exclusion criteria. AIHW releases may vary slightly depending on the timing of the reporting requirement and may precede final release data.

Hospitalisation rates may differ between areas for a number of reasons including the availability of ambulatory care services, access to hospital care and hospital admission practices. As access and admission practices vary across Queensland, particularly for mental health conditions, caution is required when interpreting rates between areas such as HHSs as a measure of health status. Differences in median age of hospitalisation for anxiety and depression were evident between HHSs and between areas of socioeconomic disadvantage. Closer examination of this data showed a clear relationship between:

- the availability of specialist clinics and hospitalisation rates
- the characteristics (age and sex) of potential clients/patients of these clinics and the median age of hospitalisation.

### 7.13.4 National and international comparisons

Jurisdictional comparisons of death rates and cancer incidence were sourced from published reports including those released by AIHW and ABS.<sup>162,163</sup> Data sources for risk and protective factor comparisons were cited although the majority were based on the Australian Health Survey.<sup>126</sup>

Death rates for selected conditions were compared with those of OECD countries, including Australian ranking. Queensland rates were compared against the best performing OECD country for each condition and the OECD country average.<sup>164</sup> The diverse nature of health and healthcare systems across countries adds a level of complexity to international comparisons. Different definitions and data collection methods can produce variation that is not due to an underlying pattern or trend. Cultural factors may contribute to this complexity.<sup>165</sup>

### 7.13.5 Statistical inference

The reporting of difference between categories is noted only when the difference is statistically significant, based on non-overlap of 95% CIs. Estimates for certain population subgroups may be based on small numbers and have large relative standard errors and this is noted in relevant tables. This may include suppression of data where relative standard error of an estimate exceeds 50%. These issues are discussed more fully on pages 26 and 28.

### 7.13.6 Format for reporting years

Financial and hospitalisation data are reported by financial years and displayed using the format 2006–07. The same format is used for data collected over two years but not the full period such as the National Health Survey 2007–08. Data which refers to two full years is displayed in the format 2006–2007.

### 7.13.7 Incidence, notifications and population

Cancer incidence data was derived from the Queensland Cancer Registry (QCR) using the online portal, OASys<sup>146</sup> to extract information not publicly released by QCR.

All notification data came from Queensland's notifiable conditions system (NOCS).

Estimated resident population data at 30 June for each year were used for calculation of all rates.<sup>147</sup>

### 7.13.8 ICD codes

The codesets for all conditions are listed on page 84.

### 7.13.9 Maps

A number of maps were used to display data in the report. Of note, the display of population density in Figure 2 which was based on mesh block populations while in Figure 3, socioeconomic status was based on SA2 geographies.

### 7.13.10 Analysis

Analytical methods are also described on pages 21, 26, 30, 33. In addition, the following analytical approaches were used:

**Reporting of difference** between two populations or time points where statistical significance had been established was based on percentage difference or percentage point difference. For example, if the disease prevalence in population A was 60% and in population B it was 50%, then A is 20% higher than B, and the prevalence in population A is 10 percentage points higher than B.

**Trend analysis for survey data.** For risk factor reporting, Poisson regression methods were used and cited, as well as linear fit of point prevalence estimates.

**Trend analysis for deaths and hospitalisations** Trends in health outcome reporting were based on linear fit to the log of the annual estimates.

**Excess cases** due to socioeconomic and remoteness differences and those due to Indigenous status were based on methods previously published<sup>81</sup>, and described on page 33.

**Deaths averted due to reduction in smoking** were based on the impact of rate difference over a defined period, on case numbers adjusted for risk factor attribution by sex, with an adjustment for differences in age structure.

**The impact of risk factor prevalence on the number of prevalent cases** (smoking and obesity) was based on expected and observed prevalence in any particular year and estimated resident population for the age group of interest.

## 7.14 Queensland survey analytic system (QSAS)

QSAS is available from [www.health.qld.gov.au](http://www.health.qld.gov.au).

As of November 2015, QSAS became the main dissemination mechanism for the adult and child preventive health telephone survey series. QSAS organises survey results into two distinct products:

1. Most current Queensland data and trends:
  - a. Current results for Queensland persons, males and females (adults and children)
  - b. Up to date trend information (adults only).
2. Regional detailed data:
  - a. Population subgroups (age / age by sex / socioeconomic status / remoteness)
  - b. Geographic regions (Hospital and Health Service areas / PHNs / local government areas)

For statewide reporting, **always use the most current Queensland data and trends**. These data are released annually so will be the most up-to-date. These results are released as an on-screen interactive visualisation.

Regional results are released biennially because, for most areas, two years of data must be combined to generate reliable results. Queensland data are also included in these spreadsheets so that regional results can be compared to the statewide results over the same time period. These results are released as downloadable, interactive Excel 2010 spreadsheets. Excel 2010 is

recommended, a non-interactive version in Excel 2003 can be requested by emailing [Population\\_Epidemiology@health.qld.gov.au](mailto:Population_Epidemiology@health.qld.gov.au).

Supporting documentation is available from the above location. Documentation includes methodology, variable descriptions, and conditions of use.

## 7.15 Chief Health Officer report 2016

### 7.15.1 Statistical inference

The reporting of difference between categories is noted only when the difference is statistically significant, based on non-overlap of 95% CIs. Estimates for certain population subgroups may be based on small numbers and have large relative standard errors and this is noted in relevant tables. This may include suppression of data where relative standard error of an estimate exceeds 50%. These issues are discussed more fully on pages 26 and 28.

### 7.15.2 Format for reporting years

Financial and hospitalisation data are reported by financial years and displayed using the format 2006–07. The same format is used for data collected over two years but not the full period such as the National Health Survey 2007–08. Data which refers to two full years is displayed in the format 2006–2007.

### 7.15.1 Analysis

Analytical methods are also described on pages 21, 26, 30, 33. In addition, the following analytical approaches were used:

- **Reporting of difference** between two populations or time points where statistical significance had been established was based on percentage difference or percentage point difference. For example, if the disease prevalence in population A was 60% and in population B it was 50%, then A is 20% higher than B, and the prevalence in population A is 10 percentage points higher than B.
- **Trend analysis for survey data.** For risk factor reporting, Poisson regression methods were used and cited, as well as linear fit of point prevalence estimates.
- **Trend analysis for deaths and hospitalisations** Trends in health outcome reporting were based on linear fit to the log of the annual estimates.

### 7.15.2 Deaths

State level reporting of death data, including median age at death is based on deaths registered in 2014<sup>166</sup> — the most recent available at the time of drafting. Data for deaths registered in 2014 are preliminary and subject to revision. ABS cause of death data undergoes a revision process whereby over subsequent years the data for a specific year moves from preliminary to revised to final. While the total number of deaths remains the same over this time, the distribution by cause is revised as coroner cases close.

Premature mortality, avoidable deaths, trends, sociodemographic and regional data are based on year of death, with 2012 being the most recent year of available data. Data on deaths that occurred in 2012 is considered preliminary and subject to change.

Aboriginal and Torres Strait Islander deaths are more likely to be subject to late registration, 2011 is therefore the most recent year of data reported for deaths that occurred prior to 50 years, and data is aggregated over the two year period 2010–2011.

Lifetime risk of dying prematurely is reported by year of death. All cause risk is based on two years of data, 2010–2011, while cause specific risk is for 5 years of aggregated data 2007–2011. HHS level deaths are reported for the three years 2010–2012, and trends based on annual data 2002–2012.

All death rates are age standardised to the 2001 Australian standard population. Deaths of Queensland residents who died in Queensland were included. Queensland residents who died interstate or overseas were not included, nor were interstate or overseas visitors who died in Queensland.

### **7.15.3 Hospitalisations**

Hospitalisation data (separations or episodes of care) were from the Queensland Hospital Admitted Patient Data Collection, including admissions of Queensland residents to private and public hospitals, with certain exclusions which are noted. All disease-specific hospital separations were derived using the principal diagnosis of inpatient episodes of care unless otherwise specified.

Rates of hospitalisation were presented as crude rates unless otherwise noted as this gives a more precise picture of the relative demand on the health system.

The impact of population growth, change in age distribution and rate change irrespective of these factors (e.g. change in admitting practices, or change in disease prevalence) on the change in number of hospitalisations were presented using the partitioning method described earlier in the document (Section 6.10).

### **7.15.4 Hospitalisations attributable to risk factors**

Population attributable fractions (PAFs) for Australia, supplied by the AIHW (see page 32), were used to estimate the number of hospitalisations that were due to selected risk factors in Queensland Hospitals in 2013–14. Primary diagnosis ICD codes were used to classify hospital episodes by burden of disease category. Age, sex, and disease category specific PAFs were then applied to the hospital data to produce the number of episodes attributed to specific risk factors. In addition, based on data from the ANZDATA registry<sup>167</sup>, 36.5% of dialysis was assumed to be due to diabetes, and these had the relevant PAF applied for high body mass only. Data is reported as a number and percentage of total hospitalisations.

It is likely that this method produces an underestimate of the number of episodes attributable to some risk factors due to coding of primary diagnosis. For example, where an episode has a primary diagnosis of chemotherapy these are not mapped to a specific burden condition and therefore not attributed to a risk factor. Also, only a portion of dialysis episodes are attributed to one condition (diabetes) and then to only one risk factor (high body mass), whereas it is likely that dialysis is related to additional conditions, with multiple risk factors.

Given PAFs are generally dependent on the size of the effect of the risk factor on disease outcome and the prevalence of the risk factor in the population, where the prevalence of risk factors is considerably different in Queensland compared to the whole of Australia, the PAF will become less appropriate for the Queensland population. In future, it is hoped Queensland specific PAFs will become available.

### **7.15.5 Incidence, notifications and population**

All notification data was from Queensland's notifiable conditions system (NOCS).

Cancer incidence data was derived from the Queensland Cancer Registry (QCR) using the online portal, OASys<sup>146</sup> to extract information not publicly released by QCR.

Estimated resident population (ERP) data at 30 June for each year were used for calculation of all rates.<sup>168</sup> As new components of data becomes available (e.g. births, deaths, migration) ERP data changes status from preliminary, to revised, to final over time. As such, ERP data used in this report may differ slightly from preliminary and revised data used in previous Chief Health Officer Reports.

Population data for 2015 only are based on the more recently released Australian Demographic Statistics, Jun 2015.<sup>168</sup>

### 7.15.6 Alcohol related emergency department presentations

Data relating to emergency department presentations by patients that have ingested alcohol are available from the Queensland Health, Emergency Department Information System and the Emergency Data Collection. This data however is limited to those presentations where the primary diagnosis was explicitly alcohol related (i.e. F10.0 Alcohol intoxication, F10.3 Alcohol withdrawal syndrome, F10.5 Alcoholic hallucinations, or K29.2 Gastritis – Alcoholic). Those presentations where the symptom is not explicitly alcohol related, e.g. head injury due to fall, but the person was intoxicated would not be flagged as alcohol related.

There were 27 reporting facilities over the period 2013–2015:

Bundaberg Hospital	Lady Cilento Children's Hospital	Redland Hospital
Caboolture Hospital	Logan Hospital	Robina Hospital
Cairns Hospital	Mackay Base Hospital	Rockhampton Hospital
Caloundra Hospital	Maryborough Hospital	Royal Brisbane & Women's Hospital
Emerald Hospital	Mater Hospital Brisbane Public	The Prince Charles Hospital
Gladstone Hospital	Mount Isa Base Hospital	Toowoomba Hospital
Gold Coast University Hospital	Nambour Hospital	Townsville Hospital
Gympie Hospital	Princess Alexandra Hospital	
Hervey Bay Hospital	Queen Elizabeth II Jubilee Hospital	
Ipswich Hospital	Redcliffe Hospital	

The Gold Coast Hospital closed in October 2013 and the Gold Coast University Hospital opened late September 2013  
The Mater Children's Public Hospital and the Royal Children's Hospital closed in December 2014 and the Lady Cilento Children's Hospital opened in November 2014.

## 8 General limitations

### 8.1 Cause of death or hospital separation

Recorded 'cause of death' and 'cause of hospital separation' are well known to suffer from significant error throughout the world. Notably, hospital separation statistics reflect events of separation rather than individuals, thus re-admissions to another hospital or the same hospital are included in the statistics. Despite this, over 98% of hospital separations relate to one episode of care in Queensland in 2010. Further to these general sources of error, specific mention must be made of the underestimation of recording of diabetes, mental disorders and self-inflicted injury burden of disease in these databases and the exclusion of psychiatric hospitals from the hospital separation data prior to 1997. Death and hospitalisation results are presented without attempts at correction for underlying cause. Furthermore, coding practice may vary over time and between areas. These limitations are noted in the text, where applicable.

### 8.2 ICD related coding changes

#### 8.2.1 Dementia

Since 2006, there has been a significant increase in the number of deaths coded to Dementia (F01–F03). Updates to the coding instructions in ICD-10 have resulted in the assignment of some deaths shifting from Cerebrovascular diseases (I60–I69) to Vascular dementia (F01). In addition, changes to the Commonwealth *Veterans' Entitlements Act 1986* and *Military Rehabilitation and Compensation Act 2004*, and a subsequent promotional campaign targeted at health professionals, now allow for death from vascular dementia of veterans or members of the defence forces to be related to relevant service.

#### 8.2.2 Suicide

The number of deaths recorded as suicide or intentional self harm has decreased over the last 10 years, from 2,492 nationally in 1999 to 2,191 in 2008. This decrease can be partly attributed to the variances in the way the ABS has coded coroner certified deaths over time.<sup>169</sup> For 2008, the ABS has invested additional effort into coding coroner cases which remained open at the time of processing. This process involved making increased use of police reports, toxicology reports, autopsy reports and coroners' findings to assign a more specific cause of death. This will have an influence on the number of deaths due to suicide, as the majority of open coroner cases are deaths due to external causes. In addition, the number of deaths attributed to suicide for 2008 is expected to increase as coroners' findings are released and data is subject to the revisions process.

Suicide deaths in children are an extremely sensitive issue for families and coroners. The number of child suicides registered each year is low in relative terms and is likely to be underestimated. There was an average of 17 suicide deaths per year of children in Queensland over the period 2004–05 to 2008–09. For boys, the average number of suicides per year was 11.2, while for girls the average number was 5.8 and the average rate was almost six times higher for Aboriginal and Torres Strait Islander children.<sup>170</sup>

For processing of deaths registered from 1 January 2007, revised instructions for ABS coders were developed in order to ensure consistency in the coding of suicide deaths and compliance with the revised notes for coding to the undetermined intent categories. At the time that the ABS ceases processing, each coroners record on the NCIS will have a status of 'open' or 'closed'.<sup>127</sup> The NCIS case status impacts on how deaths are coded with regard to suicides. With the introduction of the revisions process for all deaths registered from 1 January 2007, additional information received by the ABS may lead to a more specific cause of death code being assigned.

#### 8.2.3 Diabetes

Over the past decade there have been a number of changes to the Australian Coding Standards for hospitalisations for diabetes and its complications that have made it difficult to interpret changes in the impact of these conditions. This uncertainty is recognised nationally<sup>171</sup> and across jurisdictions including Queensland.<sup>128,132,172</sup>

### 8.3 Indigenous identification

Aboriginal and Torres Strait Islander people are under identified in many health related data collections. In addition there are conventions for describing these populations. PHB generally adopts the alternative of Indigenous Australians or Indigenous Queenslanders.

Reliable data on the health of Indigenous Australians is essential for measuring the effectiveness of health services in meeting the needs of this population, and for further policy development, planning and improvement in service delivery. Under identification occurs when Indigenous status is not correctly collected or accurately recorded for all people. Incorrect or inconsistent data collection can lead to Indigenous Australians being incorrectly reported as non-Indigenous, or as not stated. These records are not included in systems for monitoring and understanding the health of Indigenous Australians, which raises problems for conducting analysis and drawing conclusions from the data available.

There are several data collection forms on which people are asked to state whether they are of Indigenous origin. Due to a number of factors, the results are not always complete or consistent. Propensity to identify as Indigenous is determined by a range of factors, including how the information is collected, who completed the form, the perception of how the information will be used, education programs about identifying as Indigenous, and cultural issues associated with identifying as Indigenous.<sup>173</sup> In recent years, Queensland Health has made efforts to improve the accuracy of Indigenous identification in the health system through ongoing education of the health workforce and in liaison with Indigenous Queenslanders.

While it is considered likely that most deaths of Indigenous Australians are registered, a number of these deaths are not identified as Indigenous by the family, health worker or funeral director during the death registration process. For example, the death registration form records either non-Indigenous or status unknown because the status question is not always asked of relatives and friends of the deceased by the funeral director.<sup>174</sup> In 2008, there were 513 deaths registered in Queensland for which Indigenous status was not stated, representing 1.9% of all deaths registered. Despite the relatively low number of deaths with Indigenous status not stated, it is likely that some Indigenous deaths are included in the not stated category, contributing to the under coverage of Indigenous deaths.<sup>175</sup>

The ABS Indigenous Mortality Quality Study conducted data linkage of all deaths registered in Australia between 9 August 2006 and 30 June 2007 to census records.<sup>75</sup> Deaths that were identified as Indigenous, or of individuals who had identified as Indigenous in the census, or both, were recorded as Indigenous after data linkage. In Queensland, 429 deaths were identified as Indigenous in mortality data of the 493 identified after data linkage (87% completeness<sup>174</sup>), a substantial increase from 51% completeness over the period 2002–2006.<sup>176</sup>

Indigenous Queenslanders under identification also exists in hospital admitted patient data. Completeness of Indigenous Queenslanders identification in hospital admissions data in Queensland in 2007 and 2006 was estimated to be 86%<sup>76</sup> representing an increase from 83% in 2000.<sup>177</sup> Work is continuing to train data collection staff and establish processes to improve ascertainment of Indigenous status.

### 8.4 Survey biases

Bias is defined as 'the lack of internal validity or incorrect assessment of the association between an exposure and an effect in the target population in which the statistic estimated has an expectation that does not equal the true value'.<sup>178</sup> All surveys, to a greater or lesser extent, are affected by bias. Types of bias include selection bias, where the sample population is not representative of the target population, sample bias, where the sample deviates in a consistent direction from the true population parameter, or response bias, where respondents' answers to questions may not be accurate. Higher response rates reflect lower levels of potential bias and therefore remain an objective of all Queensland Health surveys. Of note, the AusDiab study in

2000 achieved relatively low response rates due to the more onerous requirements for participants to submit biological samples (Section 4.3).

## 8.5 Using survey data for Indigenous reporting

Accurate data for Indigenous persons are required to assess progress towards health goals such as Closing the Gap.<sup>179</sup> Administrative datasets provide the majority of these data, although an acknowledged limitation is under reporting of Indigenous background upon presentation for services. Survey data have historically experienced greater under representation among Indigenous persons due to factors such as a higher proportion using mobile phones only, cultural appropriateness of questionnaire design, and reduced engagement opportunities inherent in telephone surveys. In recognition of these issues, ABS conducts designated surveys of Indigenous persons using different methodologies. Descriptions of these methodological differences are included in the National Aboriginal and Torres Strait Islander Social Survey and the National Aboriginal and Torres Strait Islander Health Survey (sections 4.13 and 4.14).

To determine whether data from the SRHS survey series was reliable for reporting of Indigenous health status indicators, PHB compared results for three behavioural risk factors for chronic disease between the SRHS data and the NATSISS and NATSIHS. Data for the NATSISS and NATSIHS were from aggregate data files available from the ABS website for the relevant reports.<sup>180,181</sup> Data are presented in Table 25. Methodological differences most relevant to interpretation of results are:

- Both the NATSISS and the NATSIHS used computer assisted interviewing (face-to-face interviewing with data entered directly into a computer) whereas the SRHS used CATI.
- Sample size differences—NATSISS Australia 7,823 (15+ years) and 5,484 (0–14 years), NATSIHS Australia 5,757 (18+ years) and 4,682 (0–17 years), and SRHS 2009–10 Queensland 556 (18+ years).
- Data for the NATSISS and the NATSIHS are presented for those aged 15 years and over whereas data are available for the SRHS only for those aged 18 years and over.

Table 25: **Percentage point difference in health indicators: SRHS to NATSISS and NATSIHS**

Health status	SRHS compared to	
	NATSISS 2008 % point difference	NATSIHS 2004–05 % point difference
Condition A	-10	-16
Condition B	n/a	+11
Condition C	-6	-5

The large percentage point differences between the SRHS and ABS surveys demonstrate that the methodology used in the SRHS survey series does not result in reliable estimates that are generalisable to the Indigenous population of Australia more broadly. Based on these findings, analysis of the SRHS stratified by Indigenous status is not supported.

## 9 Definitions and abbreviations

**ABS** – Australian Bureau of Statistics

**Accessibility/remoteness** – Remoteness was determined using the Accessibility/Remoteness Index of Australia (ARIA+)<sup>182</sup> which is used to create the six-category Remoteness areas (RA) classification: Major cities, Inner regional, Outer regional, Remote, Very remote, and Migratory.<sup>54</sup> ARIA scores are based on how far the population must travel to access services.

**ACIR** – Australian Childhood Immunisation Register

**Alcohol consumption** – Updated alcohol guidelines were released by the National Health and Medical Research Council in 2009,<sup>100</sup> however, for continuity purposes, reporting of alcohol consumption is currently still undertaken against the 2001 guidelines.<sup>101</sup> A comparison of the guidelines for males and females is provided (Table 8).

**AHS** – Australian Health Survey

**AIHW** – Australian Institute of Health and Welfare

**ASGS** – The Australian Statistical Geography Standard (ASGS) is the Australian Bureau of Statistics' new geographical framework and it is effective from July 2011.<sup>57</sup> The ASGS replaces the Australian Standard Geographical Classification (ASGC). The ASGS has been utilised for release of data from the 2011 Census of Population and Housing. However, 2011 Census data is also available on ASGC Statistical Local Areas (SLAs). The vast majority of ABS spatial data will be based on the ASGS by 2014.

**BEACH** – Bettering the Evaluation and Care of Health program

**Body mass index (BMI)** – a measure correlated closely with body density and skinfold thickness, calculated as  $BMI = \text{weight (kg)}/\text{height (m)}^2$ .<sup>53</sup> For children, BMI is compared with the published age and gender specific BMI percentile charts.<sup>89,90</sup>

**CATI** – Computer Assisted Telephone Interview

**Cause of death** – deaths are classified to the International Classification of Diseases 10th Revision.<sup>20</sup> Cause of death statistics for Queensland, as with all states and territories, are compiled by usual residence of the deceased, regardless of where in Australia the death occurred and was registered. Deaths of overseas usual residents which occur in Australia are included in the state/territory in which their death was registered although they may be excluded for state reporting.

**CCQ** – Cancer Council Queensland

**Children – fully immunised** – children recorded as having received all the required vaccinations scheduled for their age, or who are following a prescribed catch-up schedule, as a proportion of all children on the Australian Childhood Immunisation Register. The required vaccinations are based on the Australian standard vaccination schedule funded vaccines recommended under the National Immunisation Program.<sup>183</sup> It should be noted that only those vaccines that were on the schedule prior to 1993 were considered when determining whether a child is 'fully immunised' for the calculation of coverage rates and payment of parental and provider incentives (diphtheria, tetanus, pertussis containing vaccine; polio vaccine; *Haemophilus influenzae* type b vaccine; hepatitis B vaccine; and measles, mumps and rubella containing vaccine).<sup>184</sup>

**CHO** – Chief Health Officer

**Cholesterol** – Cholesterol is a type of fat and (like all fats) is not soluble in water.<sup>185</sup> Lipoproteins help transport cholesterol in the bloodstream (as blood is water based). Low-density lipoprotein (LDL), or ‘bad’ cholesterol, is a strong risk factor for coronary heart disease<sup>186</sup>, while high-density lipoprotein (HDL) or ‘good’ cholesterol, is protective.<sup>187</sup> Although risk of heart disease increases with total blood cholesterol even at low levels, the risk increases substantially at higher levels.<sup>188</sup>

**CHS** – Child Health Status survey

**COPD** – Chronic Obstructive Pulmonary Disease

**Death** – the permanent disappearance of all evidence of life after birth has taken place. The definition excludes deaths prior to live birth. For the purpose of the Deaths and Causes of Death collections conducted by the ABS, a death refers to any death which occurs in, or en route to, Australia and is registered with a state or territory Registry of Births, Deaths and Marriages. For this report, death is reported by year of registration, not year of death.

**Diabetes** – a condition where there is too much glucose (a type of sugar) in the blood. The normal levels of blood glucose are between 3.5 and 7.8 mmol/L.<sup>189</sup> If the blood glucose level reaches 15 mmol/L symptoms of diabetes may occur. However, fasting blood glucose levels of 7 mmol/L or higher or a random level of 11 mmol/L or higher indicate diabetes is present.

**ERP** – Estimated resident population is produced by ABS and is the official estimate of population in Australia and by states/territories and other administrative regions. ERP is used to weight survey data so that sample data accurately reflect the Queensland population.

**External Causes of Death** – where an accidental or violent death occurs, the underlying cause is classified according to the circumstances of the fatal injury, rather than the nature of the injury, which is coded separately.

**Fetal death (stillbirth) rate** – the number of fetal deaths as a proportion of the total number of births.

**GP** – General Practitioner

**HALE** – Health adjusted life expectancy – an estimate of the number of healthy years (free from disability or disease) that a person born in a particular year can expect to live based on current trends in deaths and disease patterns.<sup>190</sup> The average number of years spent in unhealthy states is subtracted from the overall life expectancy, taking into account the relative severity of such states.

**HHS** – Hospital and Health Service

**Hospital separation rate** – the total number of separations in all hospitals (public and private) providing acute care services per 100,000 estimate resident population at 31 December of the reference year. A separation is an episode of care which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay ending in a change of status (for example from acute care to rehabilitation). The inclusion of status changes has been progressively introduced since 1995–96. Hospitals providing acute care services are those in which the treatments typically require short durations of stay. Rates and case numbers are reported using financial years.

**Hospital stay** – an admitted patient hospital stay is the period of treatment and/or care and/or accommodation provided between a formal hospital admission and separation. An admitted patient hospital stay is composed of one or more episodes of care, each of which is defined by a single care type (for example acute care, palliative care or rehabilitation care).

**HSC** – Health Statistics Centre

**HSD** – Health service district

**Hypertension** – Although risk related to blood pressure is a continuum with no defined lower cut-point, for diagnostic purposes blood pressure levels can be grouped into several categories.<sup>191</sup> Hypertension is generally considered to be systolic blood pressure of at least 140 mmHg with diastolic blood pressure of at least 90 mmHg

**Infant mortality rate** – the number of deaths of children under one year of age per 1,000 live births.

**Indigenous Queenslanders/Australians** – refers to Aboriginal and Torres Strait Islander people

**International Classification of Diseases (ICD)** – the international standard diagnostic classification of diseases and other health problems which is used for health records.

**Life expectancy** – the average number of years a newborn infant of a given sex would be expected to live if the age specific death rates of the reference period continued throughout his or her lifetime is described as life expectancy at birth. Life expectancy at any given age can be determined as the average additional years of life expected if the age specific death rates of the reference period continued throughout his or her remaining life.

**Live birth** – the delivery of a child weighing at least 500 grams at delivery (or when birth weight is unavailable, of at least 22 weeks gestation) who, after being born, breathed or showed any other evidence of life such as a heartbeat.

**LGA** – Local government area

**Metabolic syndrome** – the term given to a clustering of cardiovascular risk factors with insulin resistance at its core.<sup>192,193</sup> The European Group for the Study of Insulin Resistance defines metabolic syndrome as the presence of insulin resistance and at least two of the following components: impaired glucose metabolism (impaired glucose tolerance (IGT) or impaired fasting glycaemia (IFG) or diabetes, hypertension, dyslipidaemia or central obesity.<sup>194</sup>

**Morbidity** – refers to ill health in an individual and to levels of ill health in a population or group.

**NATSIHS** – National Aboriginal and Torres Strait Islander Health Survey

**NATSISS** – National Aboriginal and Torres Strait Islander Social Survey

**NCIS** – National Coroners Information System

**NHMRC** – National Health and Medical Research Council

**Neonatal death** – death of any child weighing at least 500 grams at delivery (or, when birth weight is unavailable, of at least 22 weeks gestation) who was born alive (as defined under live birth) and who died within 28 days of birth.

**NDSHS** – National Drug Strategy Household Survey

**NHS** – National Health Survey

**NHISSC** – National Health Information Statistical Standards Committee

**NNS** – National Nutrition Survey

**Notifiable conditions** – Under Section 64 of the *Public Health Act 2005 (Qld)*, medical conditions of significant risk to public health may be considered notifiable conditions. Doctors, hospitals and

pathology laboratories are required to notify the Chief Executive of persons with notifiable conditions. The current list of notifiable conditions is published in the schedules of the Public Health Regulation 2005 (Qld).

**NOCS** – Notifiable Conditions System. Under Section 7 of the *Public Health Act 2005 (Qld)*, the Chief Executive must establish and keep a notifiable conditions register.

**NPAPH** – National Partnership Agreement on Preventive Health

**OECD** – Organisation for Economic Co-operation and Development

**OESR** – Office of Economic and Statistical Research

**PAF** – Population attributable fraction

**Perinatal mortality rate** – the annual number of fetal and neonatal deaths per 1,000 live births and fetal deaths combined.

**PHB** –Epidemiology, Preventive Health Unit

**PPHs** – Potentially preventable hospitalisations

**Psychological distress** – derived from the Kessler 10 Scale (K10). This is a scale of non-specific psychological distress based on 10 questions about negative emotional states in the four weeks prior to interview. The K10 is scored from 10 to 50, with high scores indicating a high level of distress, and low scores indicating a low level of distress. Scores are grouped as follows (consistent with those reported by ABS<sup>82</sup>):

- Low (10–15)
- Moderate (16–21)
- High (22–29)
- Very high (30–50)

**QCR** – Queensland Cancer Registry

**QHAPDC** – Queensland Hospital Admitted Patient Data Collection

**QPDC** – Queensland Perinatal Data Collection

**QSAS** – Queensland survey analytic system

**RDI** – Recommended daily intake

**RSE** – Relative standard error

**Statistical Areas Level 2 (SA2s)** is a general-purpose medium sized area built from SA1s which are the smallest unit for the release of Census data from the. SA1s generally have a population of 200 to 800 persons, and an average population of about 400 persons. The aim of the SA2 is to represent a community that interacts together socially and economically. SA2s generally have a population range of 3,000 to 25,000 persons, and have an average population of about 10,000 persons. The SA2 is the lowest level of the ASGS structure for which Estimated Resident Population (ERP), Health and Vitals and other non-Census ABS data are generally available. There are 2,196 SA2s covering the whole of Australia.<sup>57</sup>

**Secondary prevention** – is defined as the measures available to individuals and populations for the early detection and prompt and effective intervention to correct departures from good health. Secondary prevention may lower the rate of established disease in the community.<sup>195</sup>

**SEIFA** – Socio-economic Indexes for Areas—five indexes are compiled by the ABS following each population census. Each index summarises aspects of the socioeconomic condition of areas. The Index of Relative Socio-economic Disadvantage is the SEIFA index most frequently used in health analysis. The particular attributes summarised by this index include low income, low educational attainment, high unemployment and jobs in relatively unskilled occupations.

Most commonly, SEIFA indexes are used to group survey respondents into quintiles or deciles of a particular index. Comparisons can then be made between respondents living in areas based on SEIFA quintiles (or deciles) across a range of health related characteristics such as self assessed health status. The indexes are compiled at the level of the collection district in which a person lives but are most commonly reported at the statistical local area level.

**SLA** – Statistical Local Area

**SRAHS** – Self reported adult health status survey

**SRHS** – Self reported health status survey, also called the preventive health telephone survey.

**Standardisation of rates** –enables the comparison of rates between populations with differing age structures by relating them to a standard population (Section 5.1). These rates are the overall rates that would have prevailed in the standard population if it had experienced at each age the rates of the population being studied. The standard population generally used is the rebased estimated resident population for Australia (persons) as of 30 June for the most recent Census year ending in a '1'. Two methods are available: direct and indirect standardisation. The direct rate is the rate experienced by a standard population if the age specific rates of the population in the geographical area of interest are applied to the standard population. The indirect rate is the ratio of the total number of people observed (actual number) having an attribute compared to the total number of people expected (expected number) having an attribute (disease or condition, cause of death) in the geographical area of interest. The expected number is calculated based upon the assumption that the population in the geographical area of interest experienced the same age specific rates as the standard population.

**WHO** – World Health Organization

## 10 Appendices

### 10.1 National Health Performance Framework

Table 26: National Health Performance Framework

<b>HEALTH STATUS AND OUTCOMES</b>				
How healthy are Australians? Is it the same for everyone? Where is the most opportunity for improvement?				
Health conditions	Human function	Life expectancy and wellbeing		Deaths
Prevalence of disease, disorder, injury or trauma or other health related states	Alterations to body, structure or function (impairment), activities (activity limitation) and participation (restrictions in participation)	Broad measures of physical, mental, and social wellbeing of individuals and other derived indicators such as Disability Adjusted Life Expectancy (DALE)		Age and/or condition specific mortality rates
<b>DETERMINANTS OF HEALTH</b>				
Are the factors determining health changing for the better? Do the determinants affect everyone in the same way? Where and for whom are they changing?				
Environmental factors	Socioeconomic factors	Community capacity	Health behaviours	Person-related factors
Physical, chemical and biological factors such as air, water, food and soil quality resulting from pollution and waste disposal	Socioeconomic factors such as education, employment, per capita expenditure on health, and average weekly earnings	Characteristics of communities and families such as population density, age distribution, health literacy, housing, community support services and transport	Attitudes, beliefs, knowledge and behaviours e.g. patterns of eating, physical activity, excess alcohol consumption and smoking	Genetic related susceptibility to disease and other factors such as blood pressure, cholesterol levels and body weight
<b>HEALTH SYSTEM PERFORMANCE</b>				
How well is the health system performing in delivering quality health actions to improve the health of all Australians? Is it the same for everyone?				
Effective		Appropriate	Efficient	
Care, intervention or action achieves desired outcome		Care/intervention/action provided is relevant to the client's needs and based on established standards	Achieving desired results with most cost effective use of resources	
Responsive		Accessible	Safe	
Service provides respect for persons and is client orientated and includes respect for dignity, confidentiality, participation in choices, promptness, quality of amenities, access to social support networks, and choice of provider		Ability of people to obtain healthcare at the right place and right time irrespective of income, physical location and cultural background	The avoidance or reduction to acceptable limits of actual or potential harm from healthcare management or the environment in which healthcare is delivered	
Continuous		Capable	Sustainable	
Ability to provide uninterrupted, coordinated care or service across programs, practitioners, organisations and levels over time		An individual's or service's capacity to provide a health service based on skills and knowledge	System or organisation's capacity to provide infrastructure such as workforce, facilities and equipment, and be innovative and respond to emerging needs (research, monitoring)	

## 10.2 Chief Health Officer Branch recommended codesets 2013

Table 27: Chief Health Officer Branch recommended codesets 2013

	Recommended title disease/condition	Recommended codes ICD-10/ ICD-10-AM
<b>Musculoskeletal system</b>	Diseases of the musculoskeletal system and connective tissues	M00-M99
	Arthropathies	M00-M25
	Rheumatoid arthritis	M05-06
	Osteoarthritis (Arthrosis)	M15-M19
	Osteoporosis	M80-82
	Chronic back pain	M469, 47, 480-3, 488-9, 538-9, 545-9
<b>Cancer mortality</b>	All cancers excluding non-melanocytic skin cancer	C00 - C97 (excluding C44)
	Colorectal cancer	C18-C20
	Lung cancer	C33, C34
	Melanoma	C43
	Breast cancer	C50
	Cervical cancer	C53
	Prostate cancer	C61
	Non-Hodgkin's lymphoma	C82-C85, C96
	Non-melanocytic skin cancer	C44
	Mesothelioma	C45
<b>Cardiovascular</b>	All circulatory diseases	I00-I99
	Acute rheumatic fever	I00-I02
	Chronic rheumatic heart disease	I05-09
	Hypertensive diseases	I10-I15
	Coronary heart disease	I20-25
	Unstable angina	I20
	Myocardial infarction	I21
	Heart failure	I50
	Stroke	G45, G46, I60-I69
	Diseases of the arteries, arterioles, and capillaries	I70-I79
<b>Diabetes</b>	Diabetes Mellitus deaths and hospitalisations	E10-E14
	Hospitalisations for Type 1 diabetes	E10
	Hospitalisations for Type 2 diabetes	E11
<b>Injury</b>	Injury and poisoning, excluding complications of medical and surgical care	V01-Y36, Y85-Y89
	Injury and poisoning, excluding self inflicted harm and complications of medical and surgical care	V01-Y98, excluding X60 - 84 and Y40-84
	Fires, burns and scalds	X00 - X19
	Accidental poisoning	X40 - X49
	Suicide	X60 - X84, Y87.0
	Drowning	W65 - W74
	Falls-hospitalisations	Principal diagnosis S00-75 or T79 and first external cause of unintentional fall W00 - W1999 and mode of transmission was not from another acute hospital
	Falls-deaths	Multiple Cause of Death: S00-T75, T79 and W00-W19; or X59 and any S02, S21, S22, S32, S42, S52, S62, S72, S82, S92, T02, T08, T10, T12, or T14.2; OR Underlying Cause of Death: W00-W19; or X59 and any S02, S21, S22, S32, S42, S52, S62, S72, S82, S92, T02, T08, T10, T12, or T14.2
	Assault	X85 - Y09, Y87.1
	Road transport related injury	V02-04 (.1,9); V09.2; V12-V14(.3-.9); V19 (.4-.9); V20-28 (.3-.9); V29 (.4-.9); V30-V39 (.4-.9); V40-49 (.4-.9); V50-59 (.4-.9); V60-69 (.4-.9); V70-79 (.4-.9); V80 (.3-.5); V81.1, V82.1; V83-V86 (.0-.3); V87 (.0-.8); V89 (.2); V01 (.0,1,9); V06 (.0,1,9); V09 (.1,3,9); V10-V11 (.0-.5,9); V16-V18 (.0-.5,9); V19 (.3,8,9); V80 (.0-.2,7-9); V82(.2-7,9); V87.9; V88.9, V89 (.1,3,9)
<b>Mental health</b>	Mental and behavioural disorders	F00 - F99
	Dementia	F00 - F03
	Mental and behavioural disorders due to psychoactive substance use	F10 - F19
	Mood (affective) disorders	F30-F39
	Schizophrenia	F20-F29
<b>Respiratory</b>	Influenza and pneumonia	J10-J18
	Chronic Obstructive Pulmonary Disease (COPD)	J41-44
	Asthma	J45-J46
<b>Other</b>	Sudden infant death syndrome (SIDS)	R95
	Renal dialysis - hospitalisations	Z49
	Renal failure - deaths	N17-N19

**Table 28: PPH recommended codesets 2012: NHISSC and Queensland Health NHSC standard preventable hospitalisations definitions**

Category	ICD-10-AM codes
<b>Vaccine-preventable</b>	
Influenza and pneumonia	J10, J11, J13, J14, J15.3, J15.4, J15.7, J15.9, J16.8, J18.1, J18.8 in any diagnosis field, excludes cases with additional diagnosis of D57 (sickle-cell disorders) and people under 2 months
Other vaccine-preventable conditions	A35, A36, A37, A80, B05, B06, B16.1, B16.9, B18.0, B18.1, B26, G00.0, M01.4 in any diagnosis field
<b>Chronic</b>	
Asthma	J45, J46 as principal diagnosis only
Congestive cardiac failure	I50, I11.0, J81 as principal diagnosis only, exclude cases with the following procedure codes: 33172-00, 35304-00, 35305-00, 35310-02, 35310-00, 38281-11, 38281-07, 38278-01, 38278-00, 38281-02, 38281-01, 38281-00, 38256-00, 38278-03, 38284-00, 38284-02, 38521-09, 38270-01, 38456-19, 38456-15, 38456-12, 38456-11, 38456-10, 38456-07, 38456-01, 38470-00, 38475-00, 38480-02, 38480-01, 38480-00, 38488-06, 38488-04, 38489-04, 38488-02, 38489-03, 38487-00, 38489-02, 38488-00, 38489-00, 38490-00, 38493-00, 38497-04, 38497-03, 38497-02, 38497-01, 38497-00, 38500-00, 38503-00, 38505-00, 38521-04, 38606-00, 38612-00, 38615-00, 38653-00, 38700-02, 38700-00, 38739-00, 38742-02, 38742-00, 38745-00, 38751-02, 38751-00, 38757-02, 38757-01, 38757-00, 90204-00, 90205-00, 90219-00, 90224-00, 90214-00, 90214-02.
Diabetes complications	E10–E14.9 as principal diagnoses and E10–E14.9 as additional diagnoses where the principal diagnosis was: <ul style="list-style-type: none"> <li>– hyperosmolarity (E87.0)</li> <li>– acidosis (E87.2)</li> <li>– transient ischaemic attack (G45)</li> <li>– nerve disorders and neuropathies (G50–G64)</li> <li>– cataracts and lens disorders (H25–H28)</li> <li>– retinal disorders (H30–H36)</li> <li>– glaucoma (H40–H42)</li> <li>– myocardial infarction (I21–I22)</li> <li>– other coronary heart diseases (I20, I23–I25)</li> <li>– heart failure (I50)</li> <li>– stroke and sequelae (I60–I64, I69.0–I69.4)</li> <li>– peripheral vascular disease (I70–I74)</li> <li>– gingivitis and periodontal disease (K05)</li> <li>– kidney diseases (N00–N29) [including end-stage renal disease (N17–N19)]</li> <li>– renal dialysis (Z49)</li> </ul>
COPD	J20, J41, J42, J43, J44, J47 as principal diagnosis only, J20 only with additional diagnoses of J41, J42, J43, J44, J47
Angina	I20, I24.0, I24.8, I24.9 as principal diagnosis only, exclude cases with procedure codes not in blocks [1820] to [2016]
Iron deficiency anaemia	D50.1, D50.8, D50.9 as principal diagnosis only.
Hypertension	I10, I11.9 as principal diagnosis only, exclude cases with procedure codes according to the list of procedures excluded from the Congestive cardiac failure category above.
Nutritional deficiencies	E40, E41, E42, E43, E55.0, E64.3 as principal diagnosis only.
Rheumatic heart disease	I00 to I09 as principal diagnosis only. (Note: includes acute rheumatic fever)
<b>Acute</b>	
Dehydration and gastroenteritis	A09.9, E86, K52.2, K52.8, K52.9 as principal diagnosis only.
Pyelonephritis	N10, N11, N12, N13.6, N39.0 as principal diagnosis only.
Perforated/bleeding ulcer	K25.0, K25.1, K25.2, K25.4, K25.5, K25.6, K26.0, K26.1, K26.2, K26.4, K26.5, K26.6, K27.0, K27.1, K27.2, K27.4, K27.5, K27.6, K28.0, K28.1, K28.2, K28.4, K28.5, K28.6 as principal diagnosis only.
Cellulitis	L03, L04, L08, L88, L98.0, L98.3 as principal diagnosis only, exclude cases with any procedure except those in blocks 1820 to 2016 or if procedure is 30216-02, 30676-00, 30223-02, 30064-00, 34527-01, 34527-00, 90661-00 and this is the only listed procedure
Pelvic inflammatory disease	N70, N73, N74 as principal diagnosis only.
Ear, nose and throat infections	H66, H67, J02, J03, J06, J31.2 as principal diagnosis only.
Dental conditions	K02, K03, K04, K05, K06, K08, K09.8, K09.9, K12, K13 as principal diagnosis only.
Appendicitis with generalised peritonitis	K35.0 in any diagnosis field
Convulsions and epilepsy	G40, G41, O15, R56 as principal diagnosis only
Gangrene	R02 in any diagnosis field

**Queensland Health selected preventable hospitalisations definition**

(refer: Technical Report #5, Introduction of reporting of 'Queensland Health selected potentially preventable hospitalisations', November 2009)

[http://www.health.qld.gov.au/hic/tech\\_report/techreport\\_5.pdf](http://www.health.qld.gov.au/hic/tech_report/techreport_5.pdf)

Category	ICD-10-AM codes
<b>Vaccine-preventable</b>	
Influenza and pneumonia	J10, J11, J13, J14, J15.3, J15.4, J15.7, J15.9, J16.8, J18.1, J18.8 in any diagnosis field, excludes cases with additional diagnosis of D57 (sickle-cell disorders) and people under 2 months
Other vaccine-preventable conditions	A35, A36, A37, A80, B05, B06, B16.1, B16.9, B18.0, B18.1, B26, G00.0, M01.4 in any diagnosis field
<b>Chronic</b>	
Asthma	J45, J46 as principal diagnosis only
Congestive cardiac failure	I50, I11.0, J81 as principal diagnosis only, exclude cases with the following procedure codes: 33172-00, 35304-00, 35305-00, 35310-02, 35310-00, 38281-11, 38281-07, 38278-01, 38278-00, 38281-02, 38281-01, 38281-00, 38256-00, 38278-03, 38284-00, 38284-02, 38521-09, 38270-01, 38456-19, 38456-15, 38456-12, 38456-10, 38456-07, 38456-01, 38470-00, 38475-00, 38480-02, 38480-01, 38480-00, 38488-06, 38488-04, 38489-04, 38488-02, 38489-03, 38487-00, 38489-02, 38488-00, 38489-00, 38490-00, 38493-00, 38497-04, 38497-03, 38497-02, 38497-01, 38497-00, 38500-00, 38503-00, 38505-00, 38521-04, 38606-00, 38612-00, 38615-00, 38653-00, 38700-02, 38700-00, 38739-00, 38742-02, 38742-00, 38745-00, 38751-02, 38751-00, 38757-02, 38757-01, 38757-00, 90204-00, 90205-00, 90219-00, 90224-00, 90214-00, 90214-02.
Diabetes complications	E10–E14.9 as principal diagnoses and E10–E14.9 as additional diagnoses where the principal diagnosis was: <ul style="list-style-type: none"> <li>– hyperosmolarity (E87.0)</li> <li>– acidosis (E87.2)</li> <li>– transient ischaemic attack (G45)</li> <li>– nerve disorders and neuropathies (G50–G64)</li> <li>– cataracts and lens disorders (H25–H28)</li> <li>– retinal disorders (H30–H36)</li> <li>– glaucoma (H40–H42)</li> <li>– myocardial infarction (I21–I22)</li> <li>– other coronary heart diseases (I20, I23–I25)</li> <li>– heart failure (I50)</li> <li>– stroke and sequelae (I60–I64, I69.0–I69.4)</li> <li>– peripheral vascular disease (I70–I74)</li> <li>– gingivitis and periodontal disease (K05)</li> <li>– kidney diseases (N00–N29) [including end-stage renal disease (N17–N19)]</li> </ul>
Note renal dialysis (Z49) is removed from Queensland Health codes	
COPD	J20, J41, J42, J43, J44, J47 as principal diagnosis only, J20 only with additional diagnoses of J41, J42, J43, J44, J47
Angina	I20, I24.0, I24.8, I24.9 as principal diagnosis only, exclude cases with procedure codes not in blocks [1820] to [2016]
Iron deficiency anaemia	D50.1, D50.8, D50.9 as principal diagnosis only.
Hypertension	I10, I11.9 as principal diagnosis only, exclude cases with procedure codes according to the list of procedures excluded from the Congestive cardiac failure category above.
Nutritional deficiencies	E40, E41, E42, E43, E55.0, E64.3 as principal diagnosis only.
Rheumatic heart disease	I00 to I09 as principal diagnosis only. (Note: includes acute rheumatic fever)
<b>Acute</b>	
Dehydration and gastroenteritis	A09.9, E86, K52.2, K52.8, K52.9 as principal diagnosis only.
Pyelonephritis	N10, N11, N12, N13.6, N39.0 as principal diagnosis only.
Perforated/bleeding ulcer	K25.0, K25.1, K25.2, K25.4, K25.5, K25.6, K26.0, K26.1, K26.2, K26.4, K26.5, K26.6, K27.0, K27.1, K27.2, K27.4, K27.5, K27.6, K28.0, K28.1, K28.2, K28.4, K28.5, K28.6 as principal diagnosis only.
Cellulitis	L03, L04, L08, L88, L98.0, L98.3 as principal diagnosis only, exclude cases with any procedure except those in blocks 1820 to 2016 or if procedure is 30216-02, 30676-00, 30223-02, 30064-00, 34527-01, 34527-00, 90661-00 and this is the only listed procedure
Pelvic inflammatory disease	N70, N73, N74 as principal diagnosis only.
Ear, nose and throat infections	H66, H67, J02, J03, J06, J31.2 as principal diagnosis only.
Dental conditions	K02, K03, K04, K05, K06, K08, K09.8, K09.9, K12, K13 as principal diagnosis only.
Appendicitis with generalised peritonitis	K35.0 in any diagnosis field
Convulsions and epilepsy	G40, G41, O15, R56 as principal diagnosis only
Gangrene	R02 in any diagnosis field

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