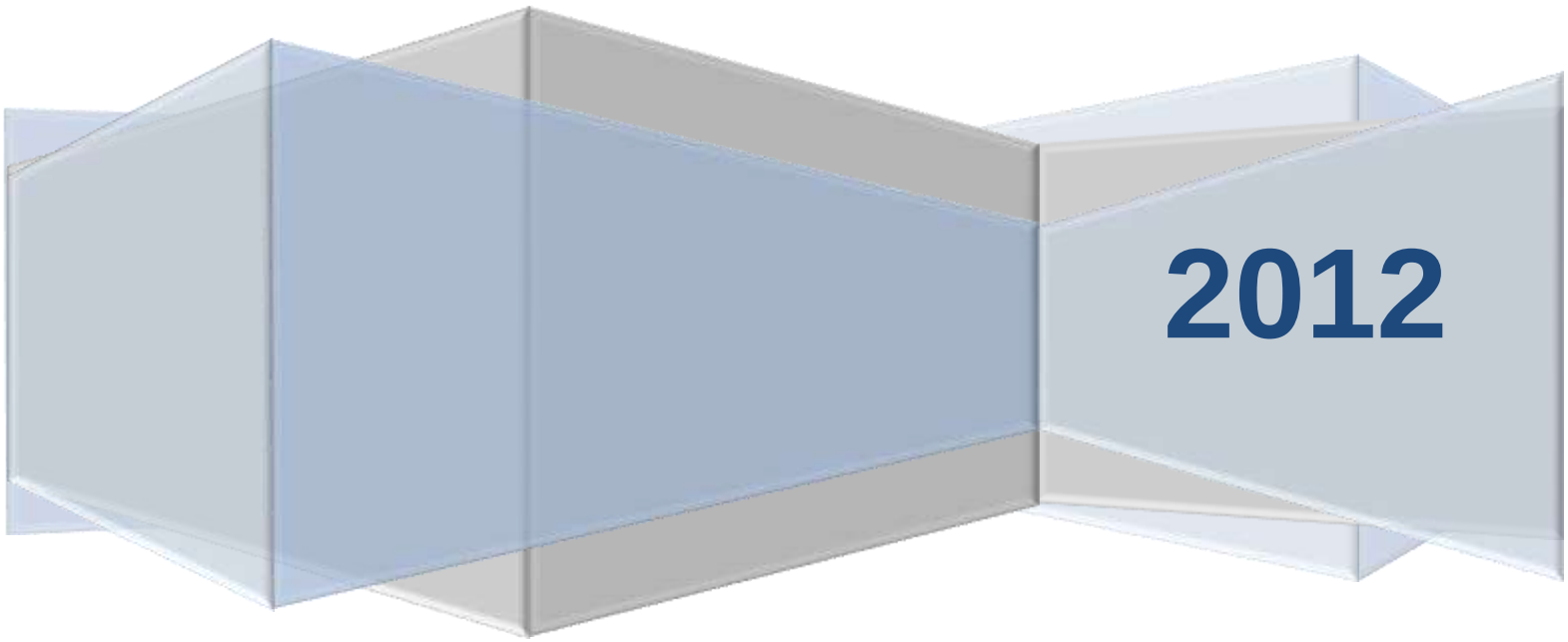
Annual Report of the Chief Medical Officer

Population Health and Improvement Science



2012

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CHAPTER 1

Creating Health

In my last annual report, I described some of the social theories underpinning the idea that health can be created by the way society is organised and by the way individuals interact with others in society. The broad term applied to those theories is “salutogenesis”. At a recent conference, Don Berwick, the founder of the Institute for Healthcare Improvement and one of the world’s leading thinkers on health systems, described salutogenesis as possibly the way we will measure the effectiveness of healthcare in the future.

So, what is “salutogenesis?” Mother Theresa once said that she would not join a march against war but would join one for peace. Such a march, she argued, would not only empower people to end war, but also help them create the basis for peace. In her view, the process of creating peace was different from merely ending war. In the same way, the concept of salutogenesis implies that professionals – and not just health professionals - should work to create health rather than simply focusing on treating or preventing disease.

The word "salutogenesis" comes from the Latin *salus* meaning health and the Greek *genesis* meaning origin or source. It is a term which was originally coined by the American sociologist Aaron Antonovsky (1). He developed the concept in the course of studies of how some people are able to manage stress and stay well while others are damaged by continuous exposure to stressful events. He observed that, while stress is ubiquitous, not all individuals have negative health outcomes in response to stress. Instead, some people achieve health despite their exposure to potentially disabling stress factors. He set out to discover the reasons some were protected while many succumbed to difficult circumstances.

He produced what he considered the most likely explanation for this observation in his book, “Health, stress and coping” (2). In it, he postulates that, in early life, we acquire a set of psychological and social resources which allow us to manage our way in the world. These resources, he suggests, include insight and intelligence, social networks, material resources and cultural anchors such as belonging to a church or social organisations or even simply having a large circle of friends. Together, these resources allow an individual to feel that he has insight into the events of his life, that he feels he can influence them and that he can be optimistic that things will work out as well as can be expected. He described this psychological outlook as having a “sense of coherence”. Individuals who have a strong sense of coherence, he suggested, would be more likely to create and maintain a high level of health.

Antonovsky’s social theories have been tested in a number of settings. He predicted that individuals who did not acquire a sense of coherence at an early age would experience a state of chronic stress and this state would reduce their chances of being healthy. The literature on the relationship between adverse social conditions and chronic elevation of markers of stress is extensive (3) and shows a clear, strong relationship between socioeconomic status and a range of biochemical changes which are predictors of a range of problems.

The salutogenic approach to health implies that it is insufficient to try to prevent disease if the intention is to create health. Indeed, the idea of disease prevention seems overly idealistic since it implies a belief that humans are basically all healthy until they encounter some external cause of disease. This would suggest that action to increase health is unnecessary until some external cause of disease is encountered. Clearly, this idea is unrealistic. In recent times, it has become accepted that action is required by individuals continually to keep moving towards a state of better health through techniques such as exercise. The assumption that health professionals, using a pathogenic model need only react to situations that threaten to cause disease is gradually being eroded as professionals respond more holistically to the needs of people. They are becoming more proactive in supporting people create better health better health for themselves through managing all aspects of their lives more successfully.

At its heart, the salutogenic approach focuses on the maximisation of those assets which create health, wellbeing and successful lives for individuals. The traditional pathogenic approach focuses more on avoiding problems than on enhancing potential.

Creating wellness is not just a matter of creating health

The salutogenic approach sees health creation as a matter of capacity building. Health is created by being in control of one's life and by developing a sense of being able to navigate the complex challenges of modern existence. However, the skills and attributes that allow us to be resilient in the face of challenging events and support the creation of health are also the same qualities that produce success in other areas of life. They are not health specific. Understanding how the world works and feeling confident that we can cope with events also allows us to be successful in education, in relationships and in the workplace. Failure to respond appropriately to external events leads to increased risk of failure in all areas of life.

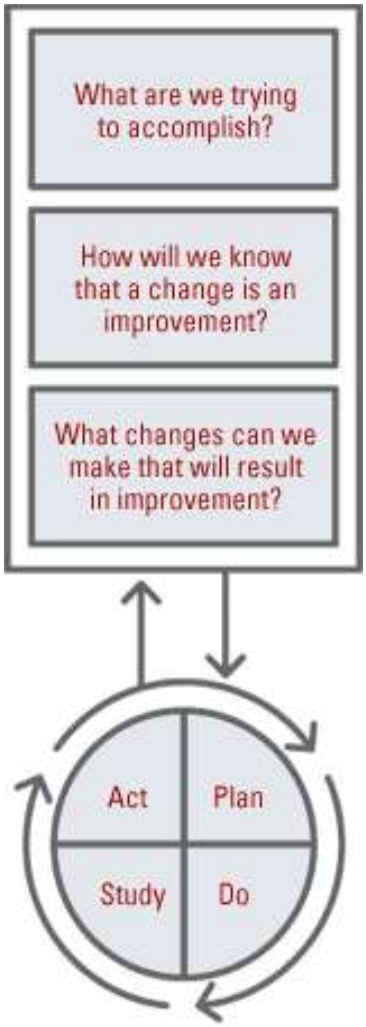
Recognition of the way in which positive outcomes across many domains of life are connected to each other and to a salutogenic outlook leads us to the view that we should not restrict efforts to simply improving health. Instead, we believe that salutogenic approaches can be used to strengthen many aspects of life in modern Scotland. These include making Scotland the best place in the world to grow up, reducing offending and reoffending by young Scots and in helping older Scots age in ways that enhance and prolong their wellbeing.

Improvement science – a means of delivering salutogenesis?

Critical to the successful implementation of this approach, however, has been the use of improvement science (4). Many reports and policy documents have been written over the years that have been aimed at improving outcomes in the Scottish population. Some have had great impact but many have, at best, been of limited benefit. The introduction of implementation methods based on improvement science techniques has been revolutionary in terms of changing the complex system of health care in Scotland, improving its quality and safety. The use of such techniques to improve population health has the potential to be equally revolutionary.

Improvement science has been defined as a way of improving decisions about the organisation and delivery of healthcare by using systematic observation and experimentation to produce generalisable knowledge which can then be applied.

As used in Scotland, it involves "The Model for Improvement", a tool developed by Associates in Process Improvement (www.apiweb.org). The model is a means of accelerating the pace of change in a complex system. It has been used extensively in improving health care processes and outcomes in many different settings. It involves getting a team together to answer 3 basic questions.



What are we trying to accomplish?

Improvement requires setting aims. The aim should be time-specific and measurable; it should also define the specific population of patients or other systems that will be affected.

How will we know that any change is an improvement?

Teams use quantitative measures to determine if a specific change actually leads to an improvement.

What changes can we make that will result in an improvement?

Ideas for change may come from the insights of those who work in the system, from change concepts or other creative thinking techniques, or by borrowing from the experience of others who have successfully improved.

Once answers to these questions are agreed, the proposed changes are tested in a Plan-Do-Study-Act (PDSA) cycle to see if the changes work in real life settings. By planning change, trying it, observing the results, and acting on what is learned, action-oriented learning is embedded in the system. The way in which this method is applied to improving the experience of young children in Scotland, reducing the chances of young people entering the criminal justice system and supporting older Scots remain well as they age will be described.

Figure 1 The model for improvement

The team designing and testing change includes those involved in the delivery of care and the agreed aims are set to ensure that a timely difference to the quality of that care is delivered. It requires a close partnership between the people who are making decisions about how best to organise and deliver care and those who use health services. In short, these improvement methods involve managers and clinicians in making better use of evidence in making decisions, and researchers to focus on the usefulness of their work.

CHAPTER 2

Healthy Ageing

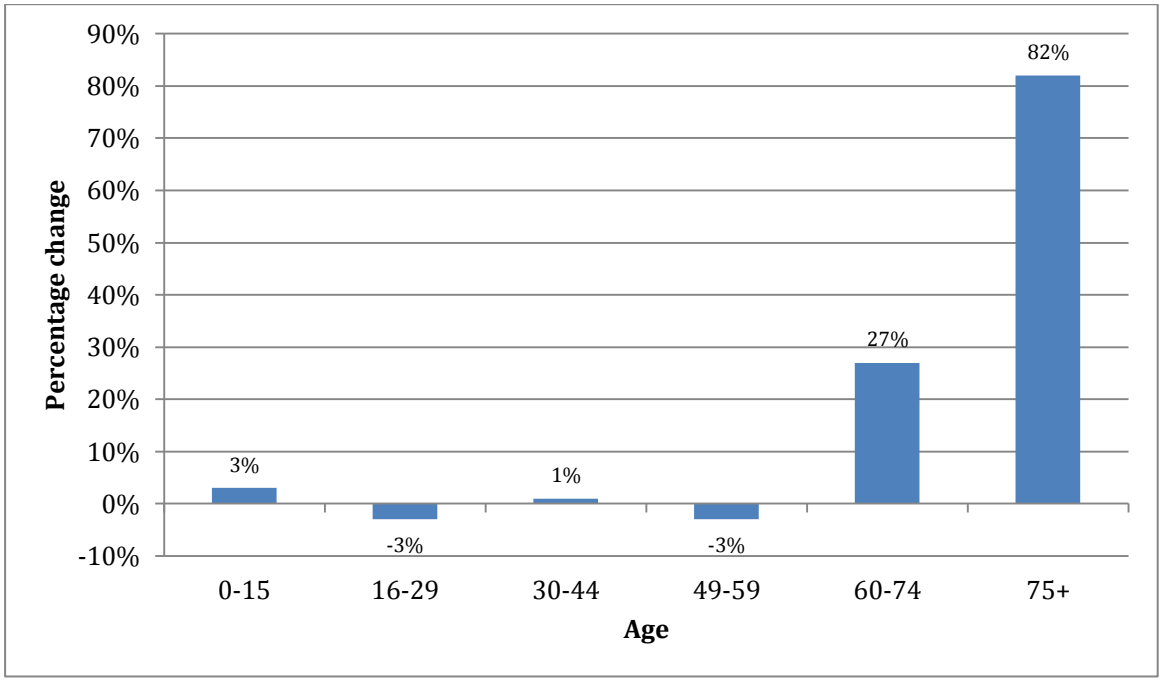
In 2006, EuroHealthNet, a partnership of European organisations involved in promoting health and wellbeing, published a review of future trends in the health of older people in European countries. "Healthy ageing - a challenge for Europe" (available at www.healthyageing.eu) defined the challenge as "the process of optimising opportunities for physical, social and mental health to enable older people to take an active part in society without discrimination and to enjoy an independent and good quality of life."

The authors of the report suggested that the need for policies to promote healthy ageing is a challenge for all European countries. They estimated that by 2025 about one-third of Europe's population will be aged 60 years and over, and there will be a particularly rapid increase in the number of people aged 80 years and older.

The population of Scotland on Census Day in 2011 was estimated to be 5,295,000 – the highest ever. The population had increased by 233,000 (5%) since the last census in 2001. This was the fastest growth rate between 2 census years in the last century and projections indicated that there would be a substantial increase in the number of people of pensionable age in Scotland between 2010 and 2035. Figure 2 shows the potential scale of the increase.

Figure 2: The projected percentage change in Scotland's population by age group.

2010-2035



A more elderly population also means a more dependent population. The dependency ratio is defined as the ratio of people aged under 16 and over

pensionable age to those of working age. This ratio is projected to rise from 60 per 100 in 2010 to 64 per 100 in 2035 and in the most elderly sections of the population that are projected to increase most dramatically. Between 2010 and 2035 the number of those aged 75 and over are projected to increase by 82%. At present, there are estimated to be around 820 people in Scotland over 100. This number is projected to increase to 7,600 by 2035.

Implications for society

There is considerable economic interest in the ageing population. The phenomenon is frequently referred to as the "demographic time bomb" by economists because of the possible impact of a relative reduction in the size of the workforce on economic growth and the increasing need for public expenditure to support an increasingly dependent group of elderly people.

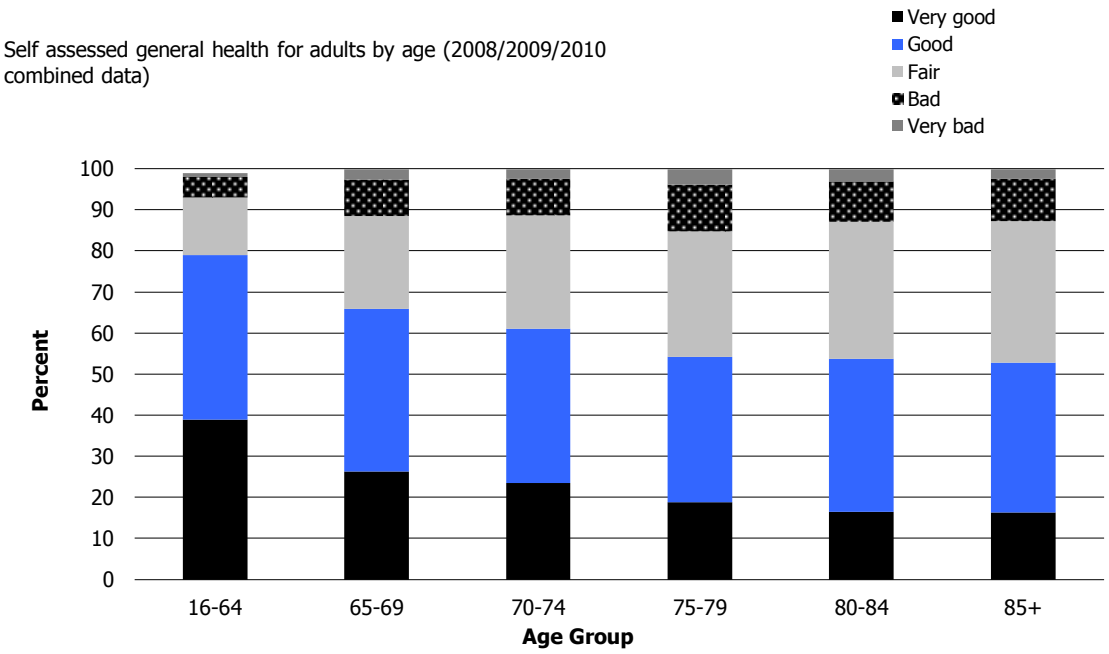
However, ageing should not be seen as a burden. It does not necessarily decrease a person's ability to contribute to society. Older people can enjoy a high quality of life and make important contributions to society. If we are to maximise wellbeing and support older people to make their contribution to society, we need to see an opportunity rather than a burden. This means taking an assets approach to older people's wellbeing.

It would be a mistake to focus exclusively on older people's problems, seeing them simply as dependent individuals requiring services. We should concentrate on what people can do, rather than what they cannot. If we are to minimise the economic impact of the ageing population but, more importantly, if we are to do the right thing for older people, we should try to create a positive sense of control amongst the elderly. In doing so, we create the conditions to promote healthy behaviours amongst older people.

The health of older Scots

The Scottish Health Survey has reported on the health of older Scots. Twenty-two percent of adults aged 65 and over describe their health as 'very good', compared with 39% of adults aged 16-64 years. Predictably, there was a decline in the number of people reporting very good health as age increased and only 16% in those aged 85 years and over felt themselves to be in good health. (Figure 3)

Figure 3



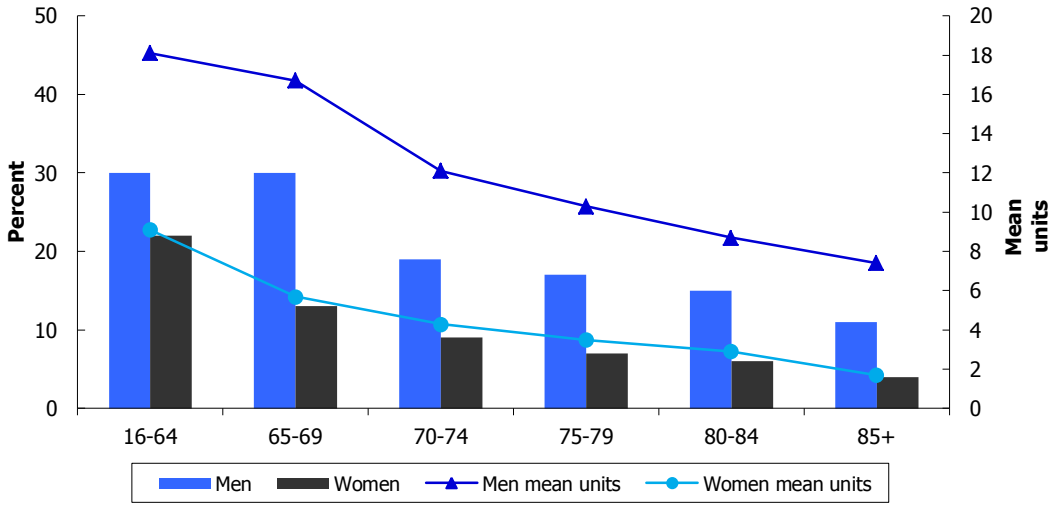
The factors independently associated with poor or very poor health in over 65s were living in an area of deprivation and being a current or an ex-smoker. Wellbeing, as measured by the Warwick-Edinburgh Mental Wellbeing Scale, was higher among adults aged 65 and over than those aged 16-64, though it decreased with age among older adults, particularly among men. Among adults aged 65 and over, the odds of having poor wellbeing were higher in people living alone. People who were married or cohabiting reported higher levels of wellbeing.

Sixty-six percent of men and 67% of women aged 65 years and over had a long-term health condition compared with 33% of men and 37% of women aged 16-64. The 3 most common categories of conditions reported by adults aged 65 and over were musculoskeletal conditions, conditions of the heart and circulatory system, and endocrine and metabolic disorders such as diabetes. Interestingly, older people had lower rates of mental disorders and skin complaints than in the 16-64 age group.

Health related behaviours remain a significant issue for the elderly. Although the proportion of the population exceeding recommended weekly limits for alcohol consumption declines after the age of 70, it remains significant. (Figure 4)

Figure 4

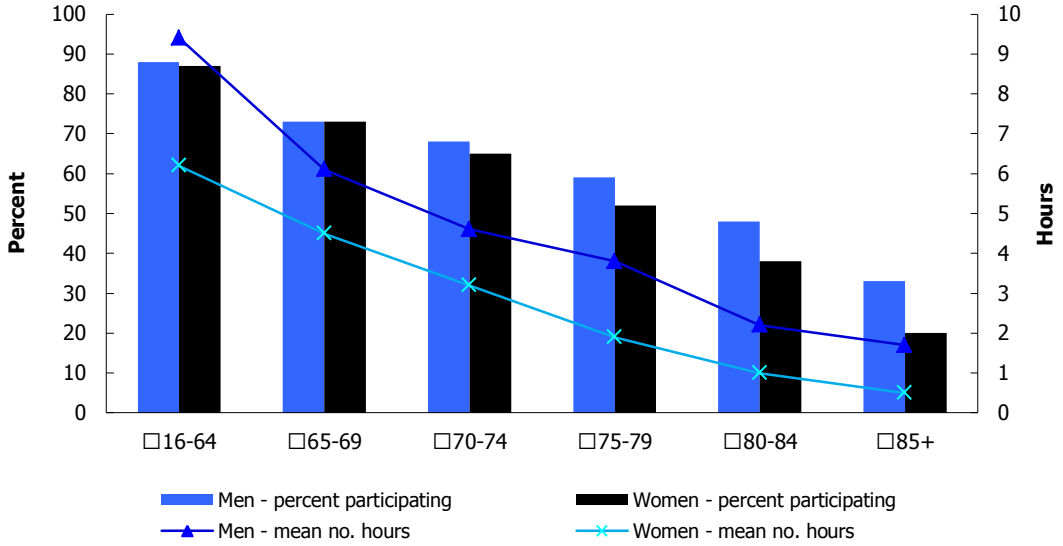
Proportions exceeding Government guidelines on weekly alcohol consumption (21 units for men, 14 units for women), and mean weekly number of units, by age and sex (2008/2009/2010 combined data)



Physical activity is also a challenge after the age of 65 with a decline in the number reporting participation in any activity lasting more than 10 minutes. (Figure 5). While it is a challenge, physical activity can also be seen as an opportunity for the elderly to increase social connectedness by participating in activities in group settings.

Figure 5

Percent of adults participating in any physical activity in the last 4 weeks (for at least 10 minutes), and mean hours per week, by age and sex (2008/2009/2010 combined data)



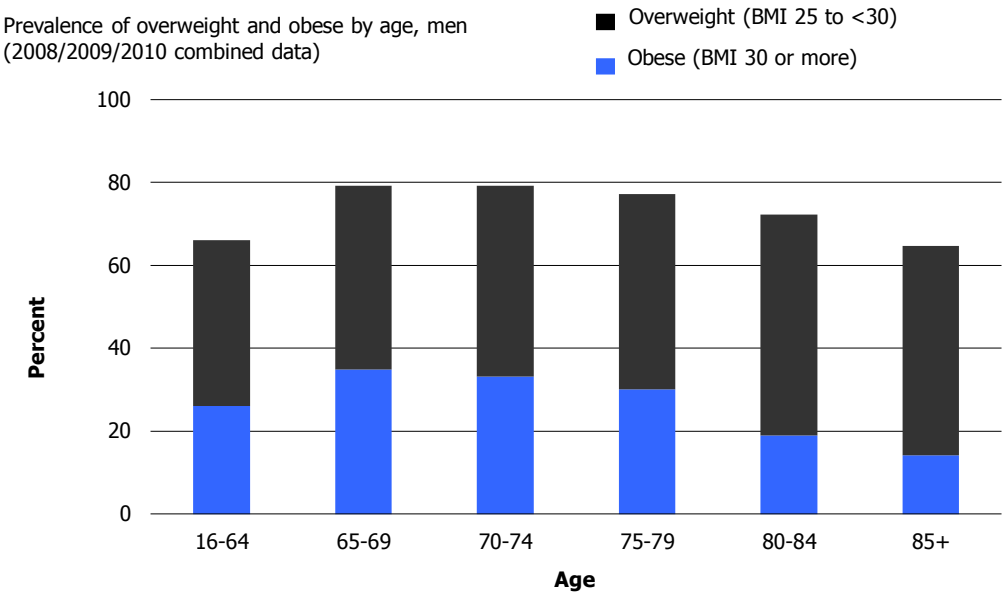


Figure 6

The proportion of the population who are overweight or obese increases after the age of 65 (Figure 6). The reducing levels of physical activity associated with retiral from work may contribute to this effect.

A healthy ageing collaborative?

The approach being taken to improve care of children in the Early Years Collaborative seems applicable to improving wellbeing of older people. It begins by setting aims for improvement and then identifying the drivers of change. Identifying those drivers which help maintain wellness in the older Scottish population could allow us to identify interventions likely to enhance wellness.

The World Health Organisation in Europe has identified a number of policies and interventions which it believes could produce significant gains. These include:

- prevention of falls;
- promotion of physical activity;
- vaccination of older people and prevention of infectious disease in health-care settings;
- public support for informal care giving with a focus on home care, including self-care;
- building capacity in geriatrics and gerontology among the health and social care workforce;
- prevention of social isolation and social exclusion;
- strategies to ensure the quality of care for older people, with a focus on dementia care and palliative care for long-term patients;
- prevention of elder maltreatment.

Some drivers of wellbeing in the elderly

Physical activity

Undoubtedly, the broad benefits of physical activity for older people are well documented and associated with improved length and quality of life. People tend to become progressively less active as they get older and more imaginative ways of helping them remain involved in taking regular exercise are important. The 3 leading causes of death due to injury in older people in Europe are self-inflicted injuries, falls and road traffic injuries. Exercising balance and strengthening muscles reduce falls in older people.

Health promotion programmes

Management of conventional risk factors such as tobacco and alcohol would also improve fitness in the elderly. A majority of smoking-related deaths in the EU occur in older people and smokers who stop at the age of 65–70 halve their excess risk of premature death. Smoking cessation remains the most effective method of altering such risk. Health problems caused by alcohol use are often under-detected and neglected among older people. Also, considerable gains in terms of mortality and function could be achieved if older people adopted a healthier lifestyle with healthy eating habits. (Figures 4,5 and 6)

Healthcare

Access to health care may be difficult for the elderly. Older people with low socioeconomic status may have low “health literacy”; that is, they may know significantly less than other people about disease and how to maintain good health. Health literacy is a more meaningful predictive factor than education for older people’s use of preventive services, and has implications for the design of interventions.

In addition, older people are the largest per capita users of medication. The risk of adverse reactions increases with the number of individual drugs taken. Lack of overall knowledge of what medicines and treatment a patient is receiving is an important explanation of drug problems. As well under-use, over-use and unsuitable combination of medication are other common problems.

Pre-retirement planning

Ageing is a gradual process and there is much we can do to promote good mental health and well-being in later life. In the retirement and pre-retirement phase of working life, employers and employees alike need to take responsibility for the health of the older members of the workforce so that these can work to higher ages. Anticipatory social interventions concerning pre-retirement have positive effects and contribute to empowerment.

Connectedness

There is strong evidence that complex patterns of social connectedness enhance a sense of control and wellbeing. Providing opportunities for older people to do voluntary work with others improves the quality of life of the volunteers and those who receive the services. Low social capital correlates with mortality. In addition, mental health is improved with social connectedness. Participation in meaningful activities, strong personal relationships and good physical health are key factors, while age discrimination has a negative impact.

Strained family relations are risk factors for the abuse of older people or for violence. The issue of "elder abuse" is not particularly visible and it is an area which merits further research and attention. Promoting social interaction and involving older people in a wide circle of friends is likely to be a mitigating factor for domestic violence in isolated homes

Environment

A supportive environment which encourages physical activity and socialization is helpful in promoting wellness. Accessible green areas allow older people with poor mobility or disability to spend time outdoors, are an important determinant of good health and the quality of the environment in terms of safety, freedom from crime and freedom from exposure to hazards such as air pollution is important in encouraging participation.

Economic support

Poverty is an important socioeconomic health determinant, with negative effects on health, life expectancy, disease and disability. In healthy-ageing strategies, health promotion should give priority to addressing the health of the more disadvantaged older people. Poverty is also a risk factor for mental ill-health.

Gender differences

Gender has to be taken into account when planning and implementing health promotion. Women living alone often risk poverty in later life because their lifetime earnings are less than those of men, as are their pension entitlements. Women live longer than men in all European countries but report more psychological symptoms and consult health professionals more often and receive more treatment than men do. Men and women need to be motivated differently to participate in health promotion activities. The relationship between belonging to a minority group and ageing and health needs more exploration.

Sustainable policies and programmes

Most European countries seem to have policies and strategies for healthy ageing and there are many examples of good practice. However, policies are often disjointed and rarely present a holistic view of older people's needs. As a result, funding is precarious. Most policies do not refer to or apparently collect health data. Policies seldom allocate funds explicitly for health promotion, which may hinder local

implementation. There is a need to involve older people in planning, and to promote positive images of ageing, avoiding any arbitrary focus on chronological age.

The EuroHealthNet Report indicate the importance of sustainability, i.e. transforming projects into programmes, and collaboration by people throughout the community. It describes a number of healthy ageing projects already working in Europe. Most of the projects are described as being suitable for implementation in other countries. Building social capital and promoting physical activity are the most common major topics in the 'good practice' projects. Often in combination, they may lead to improved physical health and the alleviation of loneliness. The key issue for Scotland is to commit to a programme to promote healthy ageing. We should set aims with timescales and start work on the drivers of change.

CHAPTER 3

The Early Years Collaborative and Transforming Childhood

One year ago, the Early Years Collaborative (EYC) first met. Teams from across all Community Planning Partnerships began the process of agreeing aims, timescales in which they might be delivered and ideas for changes that might deliver those agreed aims. Three main aims have been agreed:

1. To ensure that women experience positive pregnancies which result in the birth of more healthy babies as evidenced by a reduction of 15% in the rates of stillbirths (from 4.9 per 1,000 births in 2010 to 4.3 per 1,000 births in 2015) and infant mortality (from 3.7 per 1,000 live births in 2010 to 3.1 per 1,000 live births in 2015). This is the aim of workstream 1.

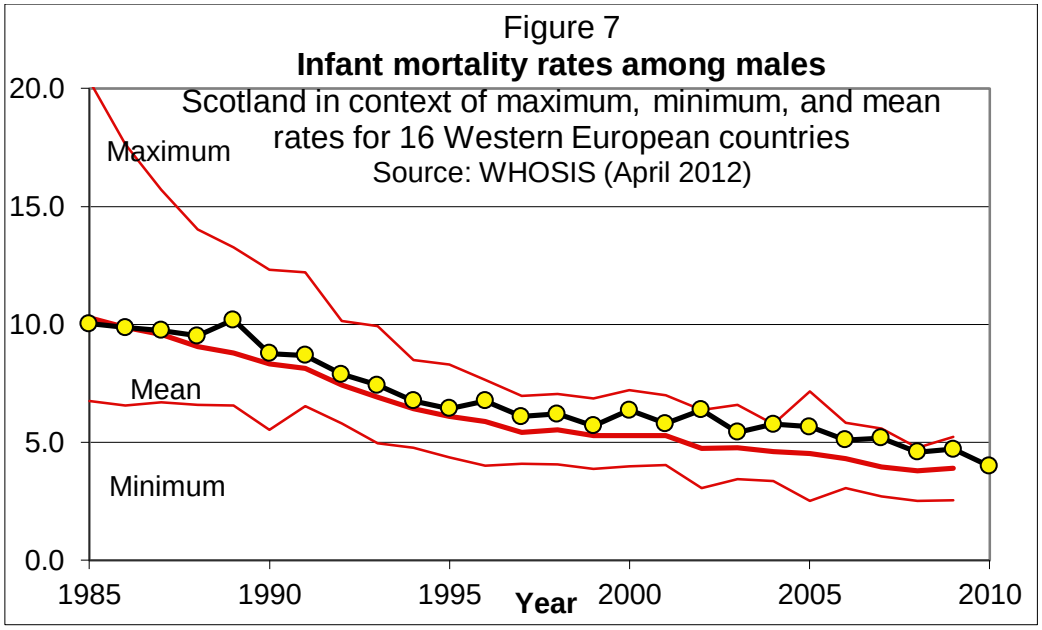
2. To ensure that 85% of all children within each Community Planning Partnership have reached all of the expected developmental milestones at the time of the child's 27-30 month child health review, by end-2016. This aim is dealt with in workstream 2.

3. To ensure that 90% of all children within each Community Planning Partnership have reached all of the expected developmental milestones at the time the child starts primary school, by end-2017. This is workstream 3.

Infant mortality in Scotland

The aim of the EYC to reduce infant mortality rate by 15% is a real and significant challenge. The past decades have seen significant reductions in infant mortality across European countries. The Glasgow Centre for Population Health has shown that, in the 1950s, there were large differences between countries in terms of infant mortality rate (5) There were very high rates in Southern Europe, and Portugal in particular. However, over the last 60 years infant mortality rates have decreased consistently in all countries and the differences between countries are now small: in 2008, minimum and maximum rates ranged between 2.5 and 4.8 per 1000/year for boys and 2.1 and 4.8 per 1000/year for girls. Infant mortality rates in Scandinavian countries, with the exception of female infant mortality in Denmark in recent years, have been consistently among the lowest in Western Europe. In 2012, infant mortality in Scotland was 3.7.

Figure 7 shows how male infant mortality in 16 western European countries has converged. However, since the 1990s, male infant mortality has gradually increased above the mean and Scotland's ranking relative to other countries in Europe has deteriorated for both sexes. Achieving a 15% reduction will require a major effort across all of Scotland. The methods introduced by the Early Years Collaborative offer the best hope of attaining this goal.



Progress so far

Over the course of the year, teams from each Community Planning Partnership have developed ideas for change and are now undertaking small scale tests of change in each of the work stream areas. As expected, common themes are now emerging from this testing through discussions with local teams and the shared learning sessions in which CPPs tell each other of the results of their testing.

The pattern of testing carried out has looked for small, incremental improvements in drivers of wellbeing. However, as the Collaborative enters its second year, there is an opportunity to review the information gathered so far and consider how to focus improvement efforts on the key changes across the work streams that have the greatest potential for impact on the lives of children and their families.

Accelerating progress

Instead of making small incremental changes and testing them in PDSA cycles, Breakthrough Improvement (6) often entails introducing a few big high impact interventions, with potentially a high cost and limited staff engagement, but rapid improvement can be achieved. Incremental Improvement casts its net much wider, seeks small gains, engages the broad range of the improvement community and can also result in improvement. It has been suggested that combining these approaches increases the improvement that can be achieved exponentially.

The approach taken to date across the EYC has been to make small improvements incrementally. There is early evidence of improvement across a range of child and family services. These experiences have been shared through the network in various ways and also by use of an Extranet which allows teams to share experience electronically.

The themes emerging from the work match well with the evidence base that supports the underpinning theory for better child development but there is scope to learn more from colleagues testing approaches in different localities and the time now seems right to consider concentrating improvement efforts on higher impact interventions and to share that learning across the country using data for improvement.

It is likely that the EYC will accelerate the pace of its improvement work by identifying and focusing some improvement effort to develop high impact interventions which we are calling 'Key Changes'.

So what are the 'Key Changes'?

Essentially these are those highly significant changes that really make a difference. This WHO/IHI description of the Breakthrough approach sums it up from a healthcare perspective but the principles are the same for population change:

> "All too often in health care, evidence-based interventions that have been shown to produce superior results in certain locations do not spread to other sites. Therefore, practitioners of health care improvement have broadened their focus to not only develop superior models of care but also to take such models to larger scale by focusing on intentional spread, to more rapidly meet the needs of large numbers of patients. Such spread requires making changes in the organisation of care delivery, policies, resources, and other factors that will influence the uptake of the superior model."

However, if we are to set out to disseminate a superior practice model or to scale up a practice that has proven itself on a small scale, it needs leadership and commitment from the top in spreading a superior model. We would need to ensure that these interventions were ready for optimal adoption across the EYC and in other important partners in the sector. They need especially to be aligned with agreed Single Outcome Agreements.

The relative advantage of the new intervention over current practice needs to be clear and understood by front line practitioners and understand how the new interventions may fit with the practitioner's current beliefs and work context. Put simply, we need to ensure that there are opportunities to test the intervention; and also that its results are visible to the practitioner.

Without this approach there will only be small pockets of activity (islands of excellence) and it is possible that the aims of EYC would never be realised. The first stage of testing the potential of a scaled up "Breakthrough" approach started in November 2013. National improvement partners and EYC programme managers met with Scottish Government colleagues to explore the evidence base and emerging intelligence across the EYC.

The Key Change areas that have emerged following that work are described below, but clearly there is more work to do so that the actual intervention (the 'what') is more clearly articulated and the associated measurement plan clearly sets out the measures, operational definitions and data collection guidance.

The EYC representatives at the Key Changes event have been asked to feedback the work to date to their colleagues and to identify sites in each CPP that are working on any aspects the Key Changes. They have also been asked to seek expressions of interest from areas that would consider being a 'Key Change Pioneer' site, where we can offer more improvement support and ability to share that learning.

The next Learning Session will present the work to date on Key Changes; present the evidence base and local intelligence that supports the work; and begin to explore the very early learning on work already underway with Key Change interventions and also highlight the Pioneer sites identified.

This diagram shows the main areas for improvement that have been suggested in the first year of the collaborative as being most likely to drive Scotland towards the achievement of the aims. Within each area, it is expected that front line workers will test and refine actions which they believe will effect improvements.

Cross cutting themes	**Workstream 1**	**Workstream 2**	**Workstream 3**
Key change area	**Key change area**	**Key change area**	**Key change area**
Workforce development – reliably delivering ways of working - such as the Solihull Approach – that enable the whole team to ensure that children have a good emotional start in life.	1. Improving access to maternity services.	1. Developing parenting skills to meet parents needs where and when they need it age stage 1 year to 30 months.	1. Develop parenting skills to meet parents needs where and when they need it – age stage 30 months to P1 entry.
Nutrition interventions across the age ranges, for children and families: • Obesity (inc interpregnancy) • Folic acid • Healthy start vitamins	2. Attachment and child development–by age stage conception to one year. To include (not exhaustive) • Breastfeeding/feeding • Touch/contact • Talking to baby • (reference to McQIC interventions)	2. Attachment and child– development bundle - by age stage 12-30 months (not exhaustive) • Play at home • Ready steady baby • Play talk read • Bookbug	2. Attachment and child– development bundle by age stage 30 months to P1 entry.
Income maximisation achieved for families that require it - across the age ranges.	3. Point of contact checklist. Transfer of care to next service (or from the last one). Continuity of care and carer Workforce development. Solihull.	3. 27-30/12 review undertaken and appropriate pathway of intervention delivered.	3. Children eligible for pre-school hours are identified and receive 95% of their allocation.
Stillbirth review process.	4. Smoking cessation – delivering interventions in pregnancy reliably.		

Chapter 4

Looked after Children and Young People

The Early Years Collaborative aims to improve wellbeing of children through care and nurturing from the womb to early school years. There are, however, a large group of children who are already experiencing the problems of failure of nurturing. These are those children and young people who are looked after because their family lives have not been able to provide for their needs.

If, as Antonovsky suggested, health creation depends on having the psychological and social resources which allow us to manage our way in the world and these resources include insight and intelligence, social networks, material resources and cultural anchors, then looked after children are in a difficult position. These resources allow an individual to feel that he has insight into the events of his life, that he feels he can influence them and that he can be optimistic that things will work out as well as can be expected. Too often, children experience adverse events that damage their capacity to manage challenging events. Looked after children are often at the extreme end of the spectrum of damaging experiences. As a result, outcomes for looked after children and young people are generally poor but need not be so.

Mental health of looked after children

In a report published in 2004 - The Mental Health of Young People Looked after by Local Authorities in Scotland' (7) , the authors studied a group of young people aged 5–17 years, looked after by local authorities. They found that:

- 45% were diagnosed with a mental disorder
- 38% had clinically significant conduct disorders;
- 16% were assessed as having emotional disorders – anxiety and depression
- 10% were rated as hyperactive.

In another study carried out in an English local authority, McCarthy and colleagues (8) found that:

- 40% of a sample of children looked after were experiencing significant difficulties in 3 of 4 key areas: home life, friendships, learning and leisure activities.
- They concluded that 'children and young people with multiple adjustment problems are at high risk of developing a range of very significant psychosocial outcomes in later adolescence and early adulthood'.

In another Scottish study, Minnis and Del Priore (9) found that looked after and accommodated children were more likely to have some form of attachment disorder, indicating that problems began in very early life.

Scott, Hattie and Tannahill (10) have produced a Health Needs Assessment for looked after children published under the auspices of the Scottish Public Health Network. They clearly found the task difficult. They concluded that, despite the fact that they represent a significant proportion of the general population of children and young people in Scotland (1.6%), there is no consistent or comprehensive health and wellbeing profile collected for them across all local authority areas.

This seems surprising given that it is likely that children and young people looked after in Scotland will have poor outcomes relative to the general population. In addition, they also have poorer outcomes than children and young people who have experienced similar levels of material deprivation. They seem to accumulate additional risk by being looked after and the consequences are significant.

There is some evidence of this poorer outcome in educational terms but there is a lack of consistent data across health and social care to provide the necessary evidence. Where there was appropriate multi-agency collaboration and data sharing for individual case management, services seemed to be effective. The researchers also pointed out that there is a great deal of health data within individual case records that is often duplicated across different agencies and is not collated. Accordingly, opportunities to identify problems and provide appropriate support are often missed. They commented that the lack of systematic information on needs of children and the limited capability to share information electronically across services is a real barrier to good practice.

Despite these difficulties they were able to use routinely published data to explore reasons for care in some areas of Scotland Children's Social Work Statistics (CSWS), published annually, provided some high level epidemiological information for the national population and by administrative area, including incidence and prevalence of local authority care. Both the Scottish Children's Reporter Administration (SCRA) and local authorities hold data on children and young people. From data on a point prevalence sample of all LACYP with Supervision Requirements (provided by SCRA) and data on a point prevalence sample of all children and young people looked after by Glasgow City Council (provided by Glasgow City Council Social Work Services) they were able to build a picture of the population of looked after children.

Conclusions

Combining the information from the literature and each of these data sources allows the following conclusions to be drawn:

- 1.6% of 0-17 year olds in Scotland are looked after (July 2011 data);
- the number and proportion of 0-17 year olds in Scotland who are looked after has been increasing over the last 10 years;
- children looked after at home (where the parental care of children at home is supervised by the local authority) are the biggest care setting sub-group nationally (representing 33.6% of LACYP in 2011);
- kinship care has seen the largest growth in numbers of any care setting sub-group since 2001;
- most recent data (2011) indicate that "lack of parental care" is likely to be the most frequent reason children and young people become looked after;
- material deprivation is likely to be a major upstream determinant of need for care;
- care setting sub-groups differ in terms of a number of important determinants of health including age, sex, reasons for care, parent's area deprivation and previous number of placements in care;
- health intelligence is least good for children at home, yet this care setting sub-group may be particularly vulnerable;
- it is likely that being looked after is associated with an increased risk of mental illness, particularly conduct disorder, although the extent to which this association is related to the causes rather than the consequences of care is not clear; and
- placement instability is likely to be associated with adverse health outcomes, yet may be relatively common for looked after children and young people in Scotland.

Unfortunately, neither the SCRA nor Glasgow City Council data sources explored in this study had health outcome data. Four NHS boards reported collating health outcome data for looked after children and young people. The majority of outcomes described were very high level and it was not clear how these were defined or measured. Clearly, there is an urgent need for health data to be used to establish the extent and pattern of health problems encountered by these children.

In addition, to measuring absolute health outcome frequencies for looked after children, there is a need to determine how much of the observed morbidity and mortality is in excess of that seen in children and young people from similarly deprived backgrounds and neighbourhoods. This comparison is necessary in order to assess the level of investment and intervention that would be proportionate to the needs of this group specifically.

Responses to the stakeholder interviews highlighted that national directives and performance targets are important in determining what data are collated

at a local level. There is currently no such directive or target for health outcomes for looked after children, and while the challenges of introducing one are recognised, national leadership of this type is needed to ensure more systematic understanding of the needs of these children in Scotland, better targeting of intervention, and routine monitoring of progress.

In the absence of improved health intelligence it is of obvious importance to continue to meet the health needs of children and young people identified through individual health assessments. It is hoped that a planned NHS Greater Glasgow and Clyde health and wellbeing survey of 11 to 16 year olds looked after by Glasgow City Council will be helpful in improving understanding of health needs for this group.

The Looked After Children Strategic Implementation Group (http://www.celcis.org/lacsig) was set up in 2010 with the aim of "improving the way services work for looked after children, young people and their families. Focused primarily on service leaders, it facilitates the joint development and implementation of policy and innovative practice." It worked through the creation of "hubs" of activity which focussed on areas such as mentoring, aftercare and foster care. Clearly, these are important areas to get right. However, in the absence of properly constructed data, the hubs would find it difficult to monitor impact of their activities.

Recommendations

The Scottish Public Health Network Report made a number of specific recommendations on information.

1. Health boards and local authorities (or their integrated health and social care partnerships) should have systems which allow them to record and report on the health of looked after children information in a systematic way. Core indicators should by compatible, where possible, with those available for the general population of children and young people, thereby enabling quantification of any excess morbidity associated with being looked after. The multi-informant strengths and difficulties questionnaire (including impact questions) is recommended as a comparable, pragmatic measurement instrument for mental health. A recommended starting point is the incorporation of this core set of measures into the comprehensive physical and mental health assessment for looked after children.

2. A series of approaches should be considered to establish the routine recording of looked after status, and to enable linkage across different data sets. These include:

   a. incorporating a looked after care setting code into existing child health data sets (e.g. Child Health Surveillance System, Scottish Immunisation Recall System, Special Needs System, relevant local surveys);

b. including looked after measures in national child health surveys (Growing Up in Scotland, as a prospective cohort, would be particularly useful);

c. using a single unique identifier across education, social care and health to facilitate record linkage; and

d. data linkage across agencies

3. In addition to a consistent set of health indicators, they recommended that a more consistent set of definitions of 'reasons for care' is developed. Currently, 'reasons for care' categories differ between agencies and the distinction between categories is sometimes unclear. A smaller number of categories, or a typology that could merge into broader categories, would enable analysis to be carried out in a way that helps direct preventative action.

4. To ensure progress on the above, they recommended that Directors of Public Health should assign a national lead for GIRFEC/LACYP health information, working with the Scottish Government and other national bodies to derive a strategy and timescale for delivering:

a. a standard minimum data set, and a means by which data can be linked across agencies for each child;
b. shared protocols and facilities for sharing good practice and experience; and
c. guidelines for regular local and national standard reporting.

5. At a local level, they recommended that Directors of public services should work together to share information on a systematic basis and report jointly on the experience and performance of services supporting looked after children.

Application of these principles consistently and at scale is likely to make a real difference to the lives of these children. Being looked after in childhood is a high risk factor for failure in later life. "A nation's greatness is measured by how it treats its weakest members" is a statement attributed to many people. Ghandi offered this version. Scotland has an opportunity to lead the world in its care of children. The will to change is apparent at all levels of society. In our application of improvement techniques, we have learned much about how to change complex systems. Putting the will for change and the method for change together will transform the lives of the most vulnerable young people in Scotland.

Chapter 5

Offending behaviour in young adults

We have highlighted frequently the importance of a safe, nurturing environment in ensuring children have the opportunity to grow and achieve their potential in life. Where such salutogenic environments are not present, harm can come to the child in the form of behavioural problems and physical and mental health issues. We have considered the problems of looked after children and the sad fact is that many of them will come to the notice of the criminal justice system at some point in their lives. It is important to see offending behaviour in the context of adverse events in early life. As the Early Years Collaborative takes effect, we should see a reduction in offending behaviour in young people. This will take some years to become apparent. We can, however, suggest approaches which reduce the impact of adversity in early life already experienced by today's teenagers. An improvement approach to offending and reoffending could reduce significantly such behaviour in Scottish society

The prison population

The prison population in Scotland has been increasing by around 4 per cent per annum over the past decade and, in 2012, it reached a daily average of 8,178. During 2011-12, the average daily population increased by 4 per cent to 7,710 for men, while the female population increased by 8 per cent to 468. The young offender sentenced population showed a marked drop of 8 per cent to 556 (11).

The current increase is driven by an increase of 11 per cent in the adult remand population and a somewhat smaller increase of 4 per cent for the adult direct sentenced population.

The total sentenced population (including recalls) has increased, primarily due to marked increases in the length of sentences of between 3 months and 2 years (9 per cent overall), and more modest increases for the life sentence and recall populations which have increased by 5 and 3 per cent respectively.

The evidence for intervention

The Justice Directorate of the Scottish Government is leading a programme to reduce reoffending in young people (12). It has produced a review of the evidence of the effectiveness of different approaches to reduce reoffending or, in other, more technical words, promote desistance from crime among young people and adults. The document provides compelling evidence for the determinants of offending and reoffending to be similar to the determinants of poor health.

The authors found evidence that offending begins in early adolescence, peaks during the late teens and tapers off in young adulthood. A key feature of this reduction in offending behaviour is a growth of connections with others. The

parallels with the problems of childhood are striking. Failure of attachment in the first few years of life is significantly associated with behavioural problems and mental and physical health issues.

Inadequate attachment increases the risk of failure and alienation as a young person goes through school and, it appears that the risk of offending behaviour reduces as ties with family, friends and the wider community are rebuilt. Connectedness with others in positive social relationships seems to be a powerful motivator to desist from offending.

It is a consistent finding in the literature that the occurrence of key life events such as obtaining and remaining in suitable employment, acquiring a stable partner and completing education increase the likelihood of desistance from offending by adding structure to offenders' lives and acting as a source of informal monitoring and emotional support. The same effect has been observed when offenders move away from criminal peers. Women, for example, are more likely to desist from offending once they develop attachments to a law-abiding husband and enter a good-quality marriage.

Predictably, therefore, it appears that offenders who feel a welcomed part of society are less likely to reoffend compared to those who feel stigmatised. Discussions with young offenders highlight this issue. "How will I ever get a job when I'm competing with others who have qualifications and work experience and have a Disclosure certificate?" This comment highlights the hopelessness felt by many young people who have offended and it calls for action to ensure that mechanisms for positive reintegration into society are strengthened. The economic benefits of effective rehabilitation are significant but more important are the human consequences of putting a young life back together.

Therefore, evidence stresses the importance of work not only with offenders but also with their family, friends and the wider community of employers and organisations that support reintegration into community in the development and sustaining of positive relationships.

Other approaches to supporting offenders include specific therapeutic interventions such as cognitive behaviour therapy (CBT). The report points out that antisocial attitudes are among the strongest predictors of reoffending and there is good evidence from experiments conducted in the United States that programmes of CBT that aim to change offenders' thinking styles and attitudes can result in modest reductions in reoffending when rigorously implemented. Evidence from the UK is more mixed, with some studies reporting modest reductions in reconviction rates and frequency of reoffending among programme participants and others no significant effects. However, differences in results of American and UK studies may reflect variations in the quality and rigour of programme implementation rather than genuine differences in effectiveness. Programmes may work better in the U.S. simply because they are implemented better, though differences in the characteristics of programme participants may also account for some of the variation in outcomes.

In Scotland, no outcome evaluations of therapeutic programmes have been conducted as yet but a recent review of the quality of interventions argued that such programmes cannot operate effectively if they do not simultaneously address the broader context in which offending takes place and the multiplicity of offenders' needs.

The role of improvement science

Reading the evidence for what works in terms of encouraging desistence, one is struck by how similar the themes are to the issues faced by chaotic families in bringing up children and by looked after children as they emerge into adolescence. Alienation and lack of connectedness with others are recurring themes.

The authors of this report produce a series of key messages that emerge from their review of the literature on how offenders desist from offending. Viewed from an improvement science perspective, they look like a series of drivers of change that might produce a consistent societal response to the problem of repeat offending and reconnection with society. They concluded that:

- Key events in offenders' lives such as parenthood and re-integration in the local community impact on their motivation to stop reoffending.
- Desistance is a highly individualised process and one-size-fits-all interventions do not work.
- Compared to recidivists, desisters show higher levels of self-efficacy and commitment to change, and have stronger social support networks.
- Offenders value getting support to solve practical problems, being listened to and believed in. Supervision is unhelpful when it amounts to simply reporting at social work offices.
- Interventions that help offenders find employment, develop positive social networks, enhance family bonds and increase levels of self-efficacy and motivation to change are those more likely to have the strongest positive impact on the risk of reoffending.
- Rehabilitative interventions with the strongest evidence base are cognitive-behavioural programmes and supportive and interpersonally skilled supervision.
- Intensive supervision that is not accompanied by some form of support in addressing the drivers of offending behaviour is unlikely to lead to reductions in reoffending.

The basis of change in complex systems is accumulating small gains across many parts of the system and seeing them add up to large gains. There is evidence that the interventions identified in the report, done consistently and at scale, could influence significantly the risk of reoffending. It is also clear

that those working in Scotland with offenders in the prison service, social work, health and the voluntary sector are highly motivated and skilled in these ways of working.

Improvement science offers a method for change and Scotland could lead the world in its application in this setting.

CHAPTER 6

Communicable Disease

Inequalities play an important role in the epidemiology of infectious diseases, and illness caused by environmental hazards. Globally the main burden of infectious diseases falls on developing countries where infection rates are exacerbated by poverty, environmental degradation, poor sanitation and extreme weather events; and where attempts at prevention and control are hampered by lack of resources and political will.

In Scotland infectious diseases and environmental hazards disproportionately affect marginalised populations and can be linked to upstream determinants such as low socio economic status and migration, which can lead to downstream risk factors such as tobacco, alcohol and drug use, poor living conditions, limited social networks and difficulty in accessing services.

For example:

- in 2012 the main groups at risk of TB were those who consume excess alcohol and migrants/new entrants from countries with a high TB prevalence (9.9% and 56.2% of cases where risk factors and country of birth were recorded)

- around 62% of the 3,490 new cases of HIV diagnosed in 2012 are presumed to have acquired infection abroad with an increase in the numbers of previously infected individuals migrating from areas of high prevalence such as Sub Saharan Africa http://www.hps.scot.nhs.uk/bbvsti/hivandaids.aspx; http://www.documents.hps.scot.nhs.uk/bbvsti/annual-data-tables/2012/hiv-cases-exposure-2012.pdf

- those at highest risk of extreme cold weather events are the elderly and those on low income. In 2011 29% of the Scottish Households lived in fuel poverty, 56% of these being single pensioner households http://www.scotland.gov.uk/Resource/0041/00410389.pdf. Of the 2,000 excess winter deaths over 2012/13, 95.5% occurred in people over 65 years. http://www.gro-scotland.gov.uk/files2/stats/winter-mortality/2012-2013/winter-mortality-2012-13.pdf

However, inequalities are only one of many challenges facing Health Protection. For example, global interconnectedness affects population, and individual, health risks through influences on health related sectors (such as agriculture, water and food safety), increased travel and migration, and, via emerging global health threats such as extreme weather, epidemic and pandemic infections and bioterrorism.

Key Scottish challenges are:

- Gastro intestinal and foodborne infections: The global food industry maintains complex transnational foods chains which are hard to regulate and can contribute to local and international incidents. Of 1,604 food and environmental contamination incidents in the UK in 2012 50% involved food originating from outside the UK http://www.food.gov.uk/multimedia/pdfs/incidents-report-2012.pdf. Out of an estimated total of around one million cases of foodborne disease each year in the UK, Campylobacter is considered to be responsible for around 460,000 cases, 22,000 hospitalisations and 110 deaths, and 80% of infections are estimated to be foodborne.

- Travel and international health: In 2012 there were an estimated 3.6 million journeys made by travellers from Scotland. Imported infections included the first confirmed case of Crimean Congo fever virus to occur in the UK.

- Environmental factors: Environmental factors are estimated to account for 14% of the UK's disease burden and 23% of worldwide deaths. http://www.who.int/quantifying_ehimpacts/national/countryprofile/unitedkingdom.pdf http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf

- Emerging and re-emerging infections: *Zoonoses* (infectious diseases that can be transmitted from animal to humans)**,** account for 61% of all human infections including established infections such as *Campylobacter, Salmonella*, *Cryptosporidia,* VTEC /*Ecoli* O157; and, potentially emerging problems such as Hepatitis E, Hantavirus, Lyme disease, Avian Influenza and rabies; *Antimicrobial resistance* such as carbapenemase producing Enterobacteriaceae is recognised by the European Centre for Disease Control as a significant threat to public health in Europe; *Epidemic infections* – 2012 saw the re-emergence of pertussis infection, plus, the largest outbreak Scotland has ever seen of Legionnaires disease; *Pandemic infections* - in 2012 a further 32 cases and 20 deaths brought the global total of cases of avian influenza A(H5N1) to 610 with 360 deaths.

- Resilience and emergency preparedness: Scotland needs to predict and respond to established and emerging global health threats posed by infectious diseases, environmental hazards, natural disasters and bioterrorism. Delivery of effective Health Protection services requires development of the workforce, standards, protocols and governance structures to maintain quality, and, preparation for major disruptive challenges involves clear emergency planning. For example, following the very large 2011 outbreak in Germany of the novel infection *E Coli* 0104:H4, associated with fenugreek sprouts, the threat of an emerging zoonotic or foodborne infection may be considered for the national risk register along with pandemic influenza.

Experience shows that partnership working between statutory agencies, the private sector and voluntary sectors and communities is essential and that is why for complex issues such as the control of TB, Legionnaires' disease and VTEC/*E Coli* 0157 the Scottish Government supports multiagency action plans and the development of national guidance. Further, since 2008, Health Protection in Scotland has successfully taken a network approach, to develop guidance, share good practice and maintain quality in areas such as immunisation, Hepatitis C, sexual health, infection control and TB.

Communities have an important role in reducing risk from infectious disease and environmental hazards: voluntary sector organisations are key to the successful delivery of care for vulnerable groups such as those who are difficult to reach, difficult to engage with statutory services, and living with conditions such as TB, blood borne viruses and alcohol misuse. Furthermore, individuals can mitigate risk to themselves and others by measures such as seeking advice on travel health, maintaining domestic hygiene, avoiding exposure to tick bites and by vaccination.

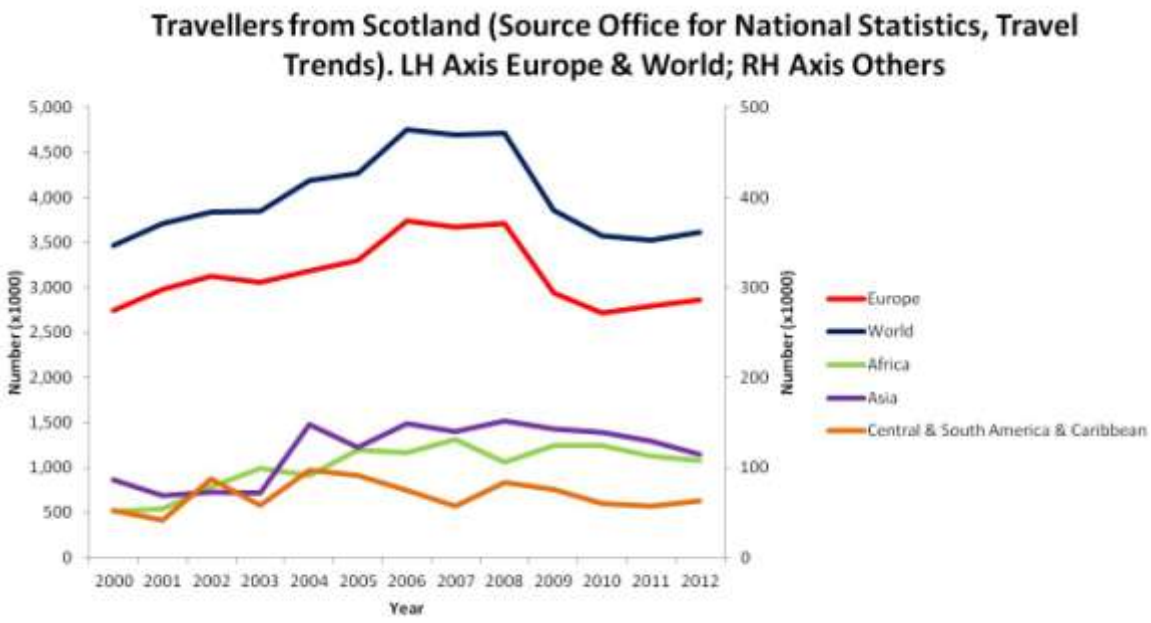
Communication is key to partnership working and research shows that simply providing information and expecting individuals, communities and professional groups to change their behaviour is ineffective. Equally, when hazards are not immediately obvious, innovative approaches to distributing information are required. For example *'Know and Respond-Scotland'* is a free service, which provides subscribers with text message alerts when air pollution is predicted to be moderate, high or severe. Texts are accompanied by health advice. The service is of particular benefit to those with medical conditions exacerbated by air pollution, such as respiratory or cardiac conditions. http://www.scottishairquality.co.uk/know-and-respond/about.php

Innovative approaches are also needed to increase linkages between policy and service delivery areas. For example interventions to reduce alcohol consumption, smoking and overcrowding; testing and adopting new food hygiene processing and packaging technologies; the development of policies to provide high quality and accessible services for migrants/new entrants; the extension of immunisation programmes; promotion of best practice in management of petting farms and private water supplies; and closer working of health protection with primary care all have a part to play in reducing the impact of infectious diseases and environmental hazards on vulnerable populations.

What follows is a summary of significant trends, incidents and responses during 2012 that reflect these current challenges to Health Protection in Scotland.

During 2012, there were an estimated 3.6 million journeys by travellers from Scotland abroad. The majority of these journeys were to Europe (79%) followed by North America (8%), Asia (3%), Africa (3%) and Central, South America and the Caribbean (2%).[2] (Figure 8).

Figure 8



In 2012:

- The most commonly identified infection in persons returning from overseas was travellers' diarrhoea.

- The most common vector-borne virus reported was dengue fever (19 cases). Dengue is transmitted by the day-biting *Aedes aegypti* species of mosquito, and is present in the Americas, Asia, and Pacific regions and sporadically in Africa. Dengue is an example of a re-emerging infection, with the mosquito vector spreading to more temperate regions and higher altitudes than previously witnessed.

- The first laboratory confirmed case of Crimean Congo Haemorrhagic Fever (CCHF) to have occurred in the UK, was diagnosed in a 38 year old male who had returned to Glasgow following a three week visit to Afghanistan. Although rapidly admitted to the local infectious disease hospital, he unfortunately died despite intensive treatment. No secondary transmission occurred. Areas endemic for CCHF include Africa, the Balkans, the Middle East and Asia. Transmission is through tick bites, or close contact with contaminated animal or

human blood or tissues. In this particular case it was likely transmission occurred during animal slaughter. (HPS weekly Report 10 October 2012 Volume 46 No. 2012/41 ISSN 1753-4224 (Online) http://www.documents.hps.scot.nhs.uk/ewr/pdf2012/1241.pdf)

- Schistosoma was the most commonly reported parasite, with 146 positive episodes. Individuals potentially exposed by bathing in freshwater in endemic countries are advised to be screened for this infection on return to Scotland. In response to surveillance data and concerns about pathogen exposures by those participating in school trips HPS has developed guidance specifically for schools (Anon. Travel Health Guidance for Schools. Available at: http://www.fitfortravel.nhs.uk/media/405657/travel%20health%20guidance%20for%20schools%20feb%202013.pdf).

- Malaria reports indicate that of the 1,378 UK malaria episodes recorded, 54 (4%) were imported into Scotland. These 54 episodes represent a decrease of 18% since 2011(66). Of the Scottish episodes in 2012, 67% were associated with *P. falciparum* and 26% were associated with *P. vivax*. *P. ovale* 6% and *P. malariae* 2% made up the remainder. No deaths from malaria were reported. The quality of the Scottish malaria data requires continuous improvement and there is work underway to increase the proportion of episodes with accompanying data on country of origin and reason for travel. (HPS Weekly Report 24 July 2013 Volume 47 No. 2013/30 ISSN 1753-4224 (Online) http://www.documents.hps.scot.nhs.uk/ewr/pdf2013/1330.pdf)

- TRAVAX (http://www.travax.nhs.uk) is an important resource for health care professionals in Scotland, particularly with regards information on current international disease outbreaks. Outbreaks are published on TRAVAX to highlight increased risk for travellers, and are accompanied by advice and recommendations to help reduce the risk. Scottish public can access similar information on www.fitfortravel.nhs.uk.

Gastrointestinal and foodborne infections

During 2012, case numbers declined for 4 of the 5 pathogens that are responsible for the greatest burden of foodborne gastrointestinal infections (GI) in Scotland (http://www.documents.hps.scot.nhs.uk/giz/annual-report/hps-fsa-joint-annual-report-2012.pdf). Laboratory reports of *Campylobacter* fell by 1%, *Listeria* by 21% ,*E. coli* O157 by 8% and *Salmonella* by 1%. Reports of Norovirus, however, increased markedly by 75%. Despite their contribution to foodborne GI disease, however, not all outbreaks or cases of these 5 pathogens are due to foodborne transmission (http://www.documents.hps.scot.nhs.uk/ewr/pdf2013/1320.pdf). Of 148 GI outbreaks involving confirmed cases with *Campylobacter* (1 outbreak), *E. coli* O157 (6), *Salmonella* (4) or Norovirus (137), in only one outbreak was

foodborne spread identified as the main mode of transmission (an outbreak of *Salmonella* Newtown involving watermelon, mentioned above). No *Listeria* outbreaks were identified. Two other foodborne outbreaks involved Scombrotoxin (tuna mayonnaise sandwiches) and an unknown infectious or toxic agent (rice).

A fourth foodborne outbreak highlighted the importance of ready-to-eat food, which has been increasingly identified in gastrointestinal infection outbreaks in recent years. This involved *Cryptosporidium* cases who were part of a UK-wide outbreak in which bagged salad was the suspected food vehicle.
On the other hand, the importance of environmental exposures (e.g. contact with environments contaminated by farm animal faeces) or waterborne spread, was demonstrated by their being identified as the main mode of transmission in nine outbreaks in 2012 (5 involving *E. coli* O157, 3 *Cryptosporidium*, and one *Campylobacter* and *Cryptosporidium*).

The above data from Health Protection Scotland routine and enhanced surveillance systems, and from outbreak investigations, nicely illustrates some of the key priorities in future work on GI and foodborne infections. These include the continuing importance of multi-agency work to tackle - in particular - novel and ready-to-eat food vehicles and drinking water quality; and to improve public awareness and management of risks from animal and environmental exposures. These factors - which have all involved large, multi-national outbreaks, and zoonotic transmission - also highlight the overlapping nature of different areas of health protection work. This is exemplified by the multi-agency VTEC/*E. coli* O157 Action Plan for Scotland 2013-2017 (http://www.scotland.gov.uk/Resource/0043/00437879.pdf) and the currently underway multi-disciplinary revision of guidelines for the investigation of zoonotic disease in Scotland.

Vaccine Preventable Disease

Measles: In 2012, there were 28 cases of laboratory confirmed measles and 23 probable cases, a number well in excess of the maximum of 5 cases a year required for accreditation by the WHO as having eliminated measles. The majority of these cases were in small clusters among partially and un-immunised patients with no evidence of transmission to the wider community. Most cases were seen in the second half of the year coinciding with a widespread measles outbreak in England, Wales and France and, in members of the Traveller Community. A risk assessment by Health Protection Scotland in 2011 identified young people caught up in the controversy generated by the Wakefield paper to be at increased risk of measles transmission. NHS boards now routinely offer vaccine to under-immunised individuals at the teenage DTP vaccine booster appointment.

Pertussis (whooping cough): In 2012 , the national outbreak across the UK was the largest seen for over a decade. During 2012, 1,926 laboratory confirmed cases of *Bordetella* pertussis were reported in Scotland, and 2,034 clinical notifications. This is 16 times more cases than were reported in 2011. The highest morbidity and mortality occurs in infants too young to be

protected through routine vaccination, and in 2012, 7.3% of the laboratory confirmed cases were infants <1 year. A temporary programme to protect young infants by offering vaccine to pregnant women began in October 2012 and had an uptake rate of approximately 70% when estimated in January 2013 among women delivering in selected maternity units in Scotland.

Influenza and other Acute Respiratory illnesses: In 2011/12, 14 acute respiratory illness outbreaks (ARI) in closed settings (predominantly in nursing/care homes) were reported which was much higher than the previous year. Most of these outbreaks were confirmed to be due to influenza A, with a small number involving other pathogens such as rhinovirus and para-influenza. One unusual feature of these outbreaks was that they occurred at the end of the usual flu season and continued into early May. Individuals affected were predominantly elderly and in a highly vaccinated population. A relatively small number of deaths were associated with these outbreaks and incidents were managed by NHS Boards in partnership with private sector nursing homes and primary care.

Extension of the immunisation programmes: Following receipt of advice from the Joint Committee on Vaccination and Immunisation (JCVI), the independent expert advisory group, in September 2012, the Scottish Government along with the other UK Administrations announced significant extensions to the existing immunisation programmes to be phased in over a number of years. These include:

- Extending the seasonal flu immunisation programme to all children and young people aged 2-17 years to be implemented over a number of years starting from 2013;

- Changes to the scheduling of the Meningococcal C vaccine, including introducing vaccination for adolescents.

- Adding Rotavirus vaccination to the universal childhood vaccination programme in July 2013; and

- Introducing Herpes Zoster (shingles) vaccine for all those aged 70 years as a routine programme from 2013 with a phased catch-up for those aged 71 and 79 years.

Implementing these new programmes in Scotland will pose a huge challenge over the next few years and colleagues from the Scottish Government will be working closely with Health Protection Scotland and NHS Boards to ensure programmes are implemented with minimal impacts on other vaccination programmes.

Hepatitis C Virus Infection

Considerable achievements have been secured in the nearly 5 years since the launch of Scotland's Hepatitis C Action Plan, now embedded in the Sexual Health and Bloodborne Virus Framework; these include:

- Scaling up of antiviral therapy from approximately 450 initiates per year pre-Action Plan to just over 1,000 during 2012.

- The number of people diagnosed with Hepatitis C is now more than 50% of those estimated to be infected, the rate having been 39% in 2006.

- The spread of the virus among people who inject drugs has declined by two-thirds to around 5% per year following considerable investment to improve injection equipment, and oral substitution therapy uptake.

- Prevalence of Hepatitis C is now on a downward curve and a little bit lower than that observed in 2006 (38,000 to 37,600 chronically infected people); this observation may not appear to be that pronounced but had the plan not been introduced, the numbers of chronically infected people in Scotland would now be well above the 40,000 mark.

Scotland is now in an excellent position to capitalise on therapeutic advances which have seen Hepatitis C "cure" rates increase from 50% to 80% in just over a decade. In the context of the great majority of the country's infected population being vulnerable and marginalised (90% have never injected drugs), Scotland's response to aggressively tackle a problem which, in 2004, was described by Scotland's Health Minister as one of the country's greatest public health challenges, has been hailed as a paradigm of outstanding practice globally. In the recent Report of the Global Commission on Drug Policy *"*The negative impact of the war on drugs on public health: the hidden Hepatitis C epidemic*",* the only cited best practice example of a national Hepatitis C Action Plan is that for Scotland. The Report states that *"*the Hepatitis C Action Plan for Scotland is an impressive example of a national strategy that is successfully focused on people who use drugs*"*. Furthermore, recent presentations of the Plan at the WHO, World Health Assembly, European Parliament and the White House further indicate Scotland's position at the vanguard of action to address a problem estimated to affect 170 million people worldwide.

HIV Infection

In 2012, approximately 4,400 individuals were known to be infected with HIV and living in Scotland. Services have developed over the last 25 years and, the great majority of diagnosed people are now embedded in specialist care, and those eligible receiving antiviral therapy. Over 90% of those administered therapy achieve an optimal response in terms of virus suppression. This is not only good for the individual concerned but is also important in terms of preventing onward transmission of infection through, in particular, sexual intercourse. Nevertheless, challenges still exist; about 25% of all infected persons in Scotland remain undiagnosed, HIV transmission among gay men continues and certain other sexually transmitted infections such as gonorrhoea (1,065 diagnoses in 2008 to 1,904 in 2012) are on the

increase. Further effort is required in encouraging those at high risk of infection to be tested. Preventing infection occurring in the first place through safer sex practice is the priority but detection of an infection as soon as possible after acquisition is crucial to prevent spread of virus at a time when circulating levels are extremely high. The Scottish Government's Sexual Health and Bloodborne Virus Framework has thus identified this challenge as a critical one.

Tuberculosis

TB is a global public health problem. In the WHO European Region, TB rates have been decreasing since 2005 but some states in Eastern Europe have much higher rates than those in the European Union (EU)/ European Economic Area (EEA) and multidrug resistant (MDR) TB is emerging as a serious threat with rates increasing 12-13% between 2009 to 2010.

In Scotland, TB rates have been increasing since 2005 and there is a mean increasing 5 year trend from 7.8 per 100,000 in 2008, to 8.8 per 100,000 in 2012. Rates have begun to level off and in 2012 incidence decreased by 9.4% compared to 2011; but it is too early to say that this is the beginning of a downward trend. Of 408 cases reported in 2012, the majority were from Greater Glasgow and Clyde (48.5%), Lothian (20.1%) and Grampian (8.8%) NHS Boards. The main risk factors for infection are being non-UK born and problem alcohol use. However, cases are becoming increasingly complex as individuals may have dual infection with blood borne viruses; they may have underlying chronic conditions such as diabetes or coronary heart disease; they may be employed as care workers; they may share multiple occupancy accommodation; and they may be both internationally and internally mobile.

Progress with recommendations from *A TB Action Plan for Scotland 2011* and the ECDC indicators is generally good. National strategies, guidance, quality control and reporting systems are available; patients have access to appropriate diagnostic services, and clinical care, provided by expert and multidisciplinary teams; there are low levels of drug resistance; and public health services contribute to the prevention of transmission. However, there are challenging areas where programmes need to improve. Treatment success rates for pulmonary smear positive cases in 2011 were 75.6% against an 85% target (10% below target); and although differences in measurement and the smaller number in Scotland prevent direct comparison, there are indications that the case fatality rate for TB in Scotland is higher than the UK as a whole (9.9% vs 4.9%).

Key recommendations to address these challenges are:

- Explicit adoption of the ECDC target 'To eliminate, by 2050, TB as a public health problem (incidence <1 per million population)'.
- Clear articulation of a strategic and monitoring framework to manage implementation and measure progress towards achievement of this goal.

- Strengthened linkages to other policy areas such as long term conditions, primary care, health improvement (smoking, alcohol, diet), blood borne viruses, mental health, occupational health, migrant health and the third sector.
- Systematic and standardised approaches to case finding and follow up of TB among new entrants and those at risk due to excess alcohol intake.
- Clear guidance on, and support for the use of, new technologies to identify and follow up cases and clusters of illness, such as Interferon Gamma Release Assay (IGRA) testing, MIRU strain typing cluster analysis and electronic surveillance systems.
- Supportive networking to share good practice, reduce variation and maintain quality in TB services.

Legionnaires' Disease

The annual incidence rate of Legionnaires' disease in Scotland was 6.0 cases per million population in 2011 and 19.6 cases per million in 2012. For 2011 and 2012 the mean case fatality rate was 8.8%; below the European mean case fatality rate which was 10% in 2011: http://www.hps.scot.nhs.uk/resp/wrdetail.aspx?id=55879&wrtype=9.

The 2012 increased incidence rate was a result of an outbreak of Legionnaires' disease, which largely affected a defined population in south-west Edinburgh. It had considerable impact on NHS services during June 2012. Over 1,000 patients were investigated and treated in primary care. Forty-five of the confirmed cases were admitted to acute hospitals in NHS Lothian. Twenty-two patients required admission to Critical Care; 19 were admitted to Intensive Care and 3 to a High Dependency Unit. In total, 92 cases were identified in the outbreak; 56 confirmed cases and 36 probable and possible cases. Four deaths have been reported among formally confirmed cases. The case fatality rate was 7.1% among confirmed cases and 4.3% among all cases.

The outbreak required a multiagency response and mutual aid from other health boards to maintain routine public health functions. Appropriate control measures were applied quickly by NHS staff and Local Authority Environmental Health Officers. Work is continuing to prevent and control any future similar outbreaks including revisions to the Health Protection Network guidance on Legionella outbreaks, development of a common approach to recording complex microbiological and environmental information across agencies and a review by each agency involved of the facilities and resources required for emergency planning and resilience in order to respond rapidly and maintain response to a major outbreak.

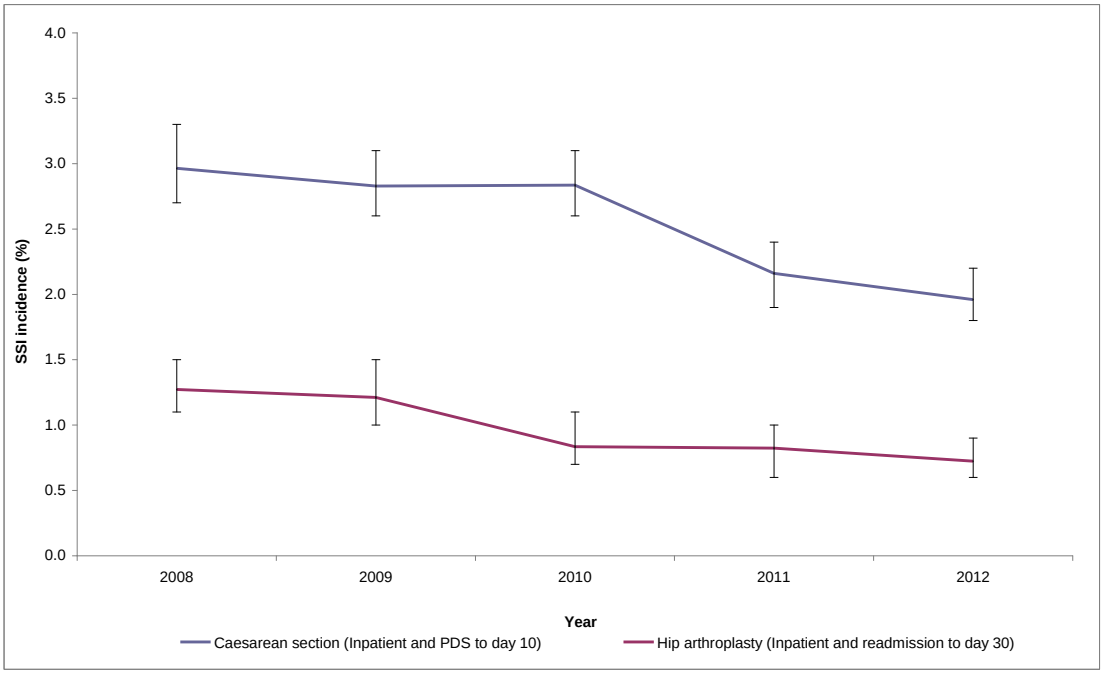
Healthcare Associated Infection

Healthcare associated infections (HAI) are increasingly caused by multidrug resistant organisms and represent a continuing threat to patient safety and healthcare delivery and place a significant financial burden on NHS Scotland. There are an estimated 31,502 HAI in NHS Scotland acute care hospitals each year costing £137.1 million and requiring more than 300,000 additional bed days to care for patients with HAI (Health Protection Scotland. Report for the SGHSCD HAI Task Force. The Estimated Cost of Healthcare Associated Infection in NHS Scotland. 2013)

Staphylococcus aureus bacteraemia: During 2012, a total of 1,509 cases of *Staphylococcus aureus* bacteraemia including methicillin resistant *S. aureus (*MRSA) were reported, a 5.8% decrease from 2011. This decrease was not statistically significant and represents a change in the decreasing trends observed in recent years. The majority of bacteraemias in 2012 were due to methicillin sensitive *S. aureus (*MSSA) (1322, 87.6%).

Surgical Site Infection*:* During 2012, the incidence of surgical site infection (SSI) following hip arthroplasty remained stable compared with previous years. A significant reduction was observed in the incidence of SSI following caesarean section. The majority of caesarean section SSI (84.5%) were identified after the patient had been discharged from hospital. This highlights that the role of post hosptial discharge surveillance is becoming increasingly important for HAI.

Figure 9. Incidence rates of SSI following caesarean section and hip arthroplasty procedures in Scotland, 2008 to 2012



Escherichia coli bacteraemia*:* The proportion of HAI caused by *Escherichia coli*, has increased from 3.1% in 2005/6 to 12.1% in 2011 (Health Protection Scotland. Scottish National Point Prevalence Survey of Healthcare Associated Infection and Antimicrobial Prescribing 2011. HPS 2011). *E. coli* HAI is now a key priority area for infection prevention and control in NHS Scotland. The number of *E. coli* bacteraemias reported to HPS has increased year on year from 3,486 cases in 2009 to 3,924 in 2012. Preliminary work to characterise the epidemiology of *E. coli* in Scotland was undertaken in 2012 and will be further developed in 2013.

Clostridium difficile infection: Overall Scottish incidence rates of *Clostridium difficile* infection (CDI) have showed a steep downward trend in patients aged ≥65 years from 2008 however from 2011 to 2012 the trend levelled. The number of cases decreased 6% from 1,465 in 2011 to 1,382 in 2012. Epidemic ribotypes such as 001, 027 and 106 have reduced significantly while new ribotypes such as 078 have emerged, for reasons that are not currently well understood, and thus CDI should continue to be a focus for infection prevention and control.

HAI Outbreaks*:* The most commonly reported outbreaks and incidents were caused by Norovirus and there were also several CDI outbreaks reported in 2012. In addition, outbreaks and incidents of a variety of infection types across a range of care settings were reported. These included outbreaks of respiratory tract infection, bloodstream infection, surgical site infection and skin and soft tissue infection caused by a variety of different organisms including *Acinetobacter* spp., *Klebsiella* spp., *Pseudomonas aeruginosa*, *Bordetella pertussis*, Parainfluenza virus, Group A and Group B streptococci and Panton-Valentine Leukocidin (PVL) positive MRSA. Colonisations with multidrug resistant (MDR) organisms were also reported due to the significant public health concern associated with resistance to key, and in some cases last line, antimicrobials. These included colonisation with vancomycin resistant enterococci (VRE) including an incident/outbreak of linezolid resistant VRE and a carbapenemase producing Enterobacteriaceae.

Key priorities*:* Whilst there have been significant declines in the rates of *Staphylococcus aureus* bacteraemia including MRSA, *Clostridium difficile* infection and surgical site infection following hip arthroplasty surgery in recent years, these reductions were not continued in 2012 highlighting the necessity to refocus priorities to ensure continuing success in reducing HAI. There is a need to focus on HAI which are emerging as a result of changes in patient populations, interventions and technologies that bring new risks to healthcare. A new joint UK strategy for AMR 2013-2018 (agreed between the governments of the 4 UK nations and involving human and animal health agencies), aims to slow the development and spread of antimicrobial resistance, has been published (Department of Health 2013). The new AMR strategy is intended to align the approach to containing antimicrobial resistance in all 4 UK nations and to stimulate collaboration with the veterinary sector. The new Scottish AMR Action Plan will be published in early 2014. Infection prevention and control measures require to be reassessed and targeted in new ways to ensure that NHS Scotland works towards zero

preventable HAI, contains AMR and maximises safe care for every patients, every time, everywhere in healthcare.

Antimicrobial Resistance

Antimicrobial resistance in *Escherichia coli:* The recent increase in burden of disease caused by *E. coli* bacteraemia does not seem to have been driven by resistant strains as decreases in resistance to key antimicrobials have been observed in this period. This includes an overall decreasing trend in resistance to the cephalosporins antimicrobial class from 10-14% in 2008 to 6-8% in 2012, and in extended spectrum beta-lactamases (ESBL) producers among *E. coli* (from 7.2% in 2008 to 6.6% in 2012). Resistance to gentamicin remained at 9% in *E. coli* in 2010-2012 despite increasing use of this agent.

Carbapenemase producing Enterobacteriaceae*:* Emergence of carbapenemase producing Enterobacteriaceae was recognised as a significant threat to public health in Europe by ECDC in 2010 (European Centre for Disease Prevention and Control (ECDC). Annual Epidemiological Report 2012. Reporting on 2010 surveillance data and 2011 epidemic intelligence data. Stockholm. ECDC 2013). ECDC have reported a higher 'state of spread' in 17 countries and the overall trend for the UK was reported to be increasing from 'sporadic hospital outbreaks' in 2010 to 'regional spread' in 2013. Overall, 85% of countries reported *Klebsiella pneumoniae* to be the most frequent species to carry carbapenemases (KPC). The UK continues to report more New Delhi Metallo-beta-lactamase-1(NDM)-producers than most other European countries. In Scotland, 25 carbapenemase producers were reported in 2012, bringing the total number of reports to 79 since 2003.

Vancomycin resistant enterococci: Since 2008, the proportion of *Enterococcus faecium* resistant to vancomycin (from bacteraemias) increased from 16.7% to 27.6% in 2011. In 2012 resistance reduced to 20.4% however this is still higher than the proportion reported for the whole of the UK (13.3%) and is the third highest percentage reported in Europe by ECDC. Ireland has the highest proportion in Europe (44.0%). In 2012 a strategy was developed to collect information on the epidemiology of vancomycin resistant enterococci in Scottish hospitals and molecular investigations will be conducted in order to target preventative measures.

Conclusions

Health Protection teams provide a world class service in Scotland. However, infectious diseases and environmental hazards still pose a considerable threat to the population and there is no room for complacency. Key areas for development over the coming years are:

- To become technologically smarter particularly around surveillance (e.g. TB, Anti-Microbial Resistance), communication of risk (e.g. Travel, Lyme disease, Legionella) and in linking case and outbreak management to national guidance and quality assurance. This will involve close integration of human and animal information sources and

expertise, within the broader context of trade, travel and the environment.

- To develop and implement national programmes and multiagency action plans such as the extended immunisation programme, the *Sexual Health and Blood Borne Virus Framework, A TB Action Plan for Scotland*, the *VTEC/E Coli 0157 Action Plan*, and the *Scottish Antimicrobial Action Plan*.

- To maintain the capacity and resilience to deliver quality assured services for Scotland that are flexible enough to deal with all kinds of disruptive challenges, from infectious disease outbreaks to terrorist attacks or flooding. This requires the development of innovative approaches which promote priority setting, linkages between policy areas, effective governance, quality assurance and collaborative working between statutory agencies, the private sector, the voluntary sector and communities.

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