

Assessment and recommendations

Chile has a well-functioning, well-organised and effectively governed health system and public health architecture. The public health challenges that Chile is facing would, however, strain any health system. Smoking rates are relatively high, alcohol consumption is low but rising, and mortality from cancer is high in comparison to cancer incidence. Chile's biggest challenge, though, is that in Chile 34.4% of adults are obese, and 44.5% of children are obese or overweight.

In the face of these significant public health challenges Chile has introduced a comprehensive package of policies designed to improve Chileans' health status. In particular, the response to the obesity epidemic has been ambitious, with the introduction of a food labelling scheme on packaged food, a move to ensure that food consumed in schools is healthier, and comprehensive weight-loss services led by primary care. The world is now waiting to see whether this strategy can turn the tide of the obesity epidemic. However, the difference between success and failure will lie in the details. Existing programmes must be rigorously implemented – policies such as the nutritional labelling scheme should be monitored for adherence, and evaluated to assess their effectiveness. There is also space for fine tuning, and for expansion: the healthy food programme for school meals should be expanded to cover all the canteens in public institutions; limits should be put on unhealthy products sold around schools; and physical activity should be promoted more vigorously.

In other areas, too, attention to the detail of public health policy implementation will be key – for example, further development of epidemiological surveillance, a rigorous evaluation and costing strategy, stronger data governance, and alignment of incentives for all stakeholders. When it comes to cancer, Chile has built effective mechanisms to screen for cervical and breast cancers, but without sufficient availability of key equipment such as colonoscopes the programmes will not reach as wide a population as they should. Genetic medicine could serve to strengthen public health and preventive care in Chile, but while ambition for genetic medicine is high in Chile, the translation of ambition into policy remains partial. Regulation of genetic testing, health care coverage entitlements and laws governing use of data from genetic tests all need to be carefully developed.

Along with a need for careful attention to the details of public health policy, engagement across the Chilean society is required to make change happen at scale and at pace. Leadership from the government and the Ministry of Health, for instance to tackle obesity, is commendable. Yet, other key stakeholders – including patient groups, civil society actors, the food and beverage industry and private health insurers – have somewhat been left behind. In other OECD countries government and industry have collaborated, for example on healthy eating campaigns. The private health insurers (ISAPRES) have not become public health innovators of their own accord, and may need to be better incentivised or required to take a more proactive approach to preventive health. Perhaps most vitally, the Chilean population could be more systematically included in public health strategies. Gaps in population health literacy, for example, appear to be holding back early detection of cancer.

Policy recommendations for improving public health in Chile

When it comes to tackling obesity and unhealthy diets, improving cancer screening and prevention, and developing genetic medicine to strengthen public health and preventive care, ambition in Chile is high. The public health challenge facing the country is, however, considerable. Meaningful change in the years to come will depend on the Chilean authorities matching this ambition with careful, deliberate, detailed policy making which brings all stakeholders on board.

In order to improve the public health system, Chile should:

- Focus on reducing tobacco consumption by pressing ahead with the bill that has been before drafted for parliament since 2015, which would introduce plain packaging for tobacco products and limit smoking in public places;
- Strengthen epidemiological surveillance, in particular by undertaking the National Health Survey on a more regular basis, and report better prevention spending data;
- Push the private insurance providers (ISAPRES) to play a more active role in promoting healthy behaviours and preventing the complications of chronic diseases;
- Include all stakeholders in efforts to improve Chileans' health, in particular promoting patient participation and improving citizens' health literacy, and building stronger partnerships between government and private actors, including actors involved in the production, distribution and sales processes of food and drinks .

Tackle the significant burden of obesity:

- Strengthen the comprehensive set of prevention policies already in place to tackle unhealthy behaviours associated to obesity:
 - Expand the food labelling system to alcohol products and fast-food restaurants;
 - Expand the healthy food programme for school meals to cover all the canteens in public institutions (e.g. offices, public services and army).
- Target younger generations by putting limits on unhealthy products sold around schools, and promoting physical activity;
- Raise expectations or requirements for the ISAPREs to be more engaged in Chile's efforts to reduce obesity and related health risks;
- Put in place a rigorous monitoring system to assess the effectiveness of individual policies and to measure achievements, alongside improved data availability to monitor population-level obesity rates.

Increase cancer screening coverage and promote early detection of cancer:

- Further develop cancer strategies including cancer screening programmes by involving different key stakeholders such as regional health authorities, providers, insurers and representatives of the civil society;
- Facilitate access to cancer screening tests and diagnosis across regions, and seek innovative ways to overcome geographical barriers such as self-sampling device, mobile screening units and tele-radiology;
- Develop communication strategies to promote the importance of early detection to people with different socio-economic and cultural background;
- Take more systematic and personalised approach in cancer screening invitation, for example by sending personalised screening invitation letters to target populations and fixing the appointment date for screening in the letter;
- Assure and improve the quality of diagnosis for effective detection of cancer based on the evidence available internationally;
- Further develop national registries for different cancers in order to identify and invite people with high risks to cancer screening, and to monitor and evaluate the effectiveness of screening programmes.

Use public health genomics to strengthen public health and preventive care:

- Develop a coherent and comprehensive national precision medicine strategy that sets out a road-map for equitable and sustainable access to genomic medicine, including safeguards against genetic discrimination, workforce development and investment in basic research, ideally chaired at Ministerial level;
- Ensure that a rigorous cost-effectiveness analysis is applied to the continuing development of precision medicine, especially the use of newer technologies such as whole-genome sequencing in specific risk-groups;
- Develop a governance framework that can be applied to personal genetic data, that enables appropriate data sharing for precision medicine services and research, whilst protecting individual privacy;
- Establish quality assurance which guarantees minimum standards across all laboratories undertaking genetic analysis;
- Take a step wise approach to expanding the range of clinical genetic services covered by health insurers, ensuring continuity of individuals' insurance coverage and making treatment options available for any diagnoses that result;
- Increase "genetic literacy" amongst health professionals and the public, for example by promoting the potential of using family histories to inform genetic analysis even without testing.

Chile's public health system

While Chile has seen improvements comparable to those in other OECD countries in recent decades, the health status of the population nonetheless falls fairly consistently below the OECD average. The average life expectancy in Chile has risen faster than the OECD average in the past forty years, and in 2015 was 79.1 years – 76.5 years for men and 81.7 years for women – compared to the OECD average of 80.6 years (77.9 for men and 83.1 for women). Like Chile's OECD peers, the burden of disease is dominated by non-communicable diseases.

Health status in Chile across a number of key public health areas – tobacco consumption, alcohol consumption, obesity – is mixed, but still worrying. Alcohol consumption amongst adults is lower than the OECD average, although consumption is rising, running contrary to the general OECD trend towards lower consumption of alcohol. Prevalence of heavy episodic drinking in the population – wherein at least 60 grams or more of pure alcohol on at least one occasion in the past 30 days were consumed – was at 4.9% in 2010, but men were far more likely to be heavy episodic drinkers (9.8%) than women (0.1%).

Tobacco consumption, particularly amongst younger Chileans, and obesity, are high. Without an important change to these trends, Chile could well expect to see a rise in the burden of chronic diseases in the years and decades to come. Daily smoking rates amongst adults declining, but still relatively high, especially amongst men. Tobacco consumption rates in Chile have declined from 45.3% in 2003 to 39.8% in 2009-2010 to 33.3% in 2016-2017, while exposure in the home decreased from 31% to 15.2% in the same period. OECD-standardised data showed a drop in adult smoking in Chile from 33% of the population as daily smokers in 2000, to 24.5% daily smokers in 2016, a decline of 26%. The daily smoking rate in Chile remains above the OECD average, which is 18.4% of the population, and smoking rates have also declined more slowly. The OECD average rate of decline in smoking rates between 2000 and 2016 was 27%.

As in other OECD countries, male smoking in Chile is higher than female smoking; 28.2% of Chilean males were daily smokers in 2016, compared to 23.3% OECD-wide, and 20.9% of Chilean females were daily smokers, compared to 14.1% OECD-wide. Up to 2009 smoking rates had been falling, albeit more slowly than the OECD average. In particular, high smoking rates among adolescents and young adults, for whom daily smoking reached 50% in the early 2000s, and women aged 26-34 more than 40% of whom were smoking daily. The relatively young age of Chile's smokers means that the full health impacts of the high rates of tobacco consumption may well be seen in the years and decades to come.

Obesity rates, which are discussed in detail in Chapter 2, are amongst the highest in the OECD.

Health care coverage in Chile is provided primarily either by the state-funded National Health Fund - *Fondo Nacional de Salud*, most commonly known as FONASA, or by the private coverage schemes, *Las Instituciones de Salud Previsional* (ISAPRE). FONASA covers around 78% of the population, ISAPRES cover around 17-18% of the population, while a further 3-4% are covered under an Armed Forces insurance scheme.

Since 2005 the benefit basket under the public health system in Chile has been set under a system of enforceable guarantees. Citizens are guaranteed access to those treatments defined under the '*Acceso Universal con Garantías Explícitas*', or AUGE, which is also

known synonymously as GES (Garantías Explícitas en Salud). Applicable to all Chileans, whether covered by FONASA or ISAPREs, the guarantees cover provisions around access, quality, timeliness and financial protection.

Chile has a robust public health system

In the face of such considerable public health issues, Chile has a robust and well-functioning public health system. Leadership from different levels of government, and in particular central government, is ambitious.

Leadership and accountability at the central and regional levels are clearly defined. The organisation of the Ministry of Health into two sub-secretariats, one for Health Networks and the other for Public Health, in itself elevates the importance of public health issues for the government. The Under-Secretariat for Public Health, which is led by a Vice-Minister for Public Health, has oversight over the Regional Health Authorities – which themselves have an important role in public health – over accreditation for public and private providers, and has oversight over FONASA and the ISAPREs. The leadership of the Ministry of Health on important public health reforms – in particular to reduce obesity rates – are notable. A series of reforms to tackle obesity, detailed in Chapter 2, include school-based interventions, the sugar-sweetened beverage tax, food advertising restrictions, food labelling. Additionally, in 2013, a legal architecture was created for a government-wide approach to promoting healthy living and well-being, under Law 20.670, which created the “*Sistema Elige Vivir Sano*” (‘Choose to Live Healthily’ system), including promotion of healthy living, of sport, of outdoor activities, of self-care and of family development.

While there is always room for broader and deeper collaboration across government on public health issues, the co-operation between the Ministry of Health and, in particular the Ministry of Education, but also the Ministries of Agriculture, Finance, Social Development, and Sport are effective. Most notably the Ministries of Social Development, Health, Education, Labour and Social Welfare, Housing, Sport and Finance have a common national strategy for promoting healthy living, linked to Law 20.670 under ‘*Elige Vivir Sano en Comunidad*’ (‘Choose Healthy Living in the Community’). Launched in 2014, and encompassing a series of strategic objectives, programmes and its own budget, *Elige Vivir Sano en Comunidad* aims to promote healthy living and healthy habits, for instance healthy eating and sport, with individual Ministries committing to undertake different activities to promote this overall goal. Collaboration around diet in schools is a particularly successful example of cross-government working to promote better public health. Under the *Contrapeso* (‘Against Overweight’) programme led by the National Board of School Aid and Scholarships (JUNAEB), the Ministries of Education, Health, Sport and Agriculture introduced 50 measures including restriction on the sales of unhealthy foods in schools, improving the quality of food provided to students, and teaching health cooking to families.

Chile has a decentralised administration, and responsibility for organising education, social services, primary health care, parks and recreation lies with municipalities rather than the central government. At the regional level the Regional Health Authorities in Chile (SEREMIS) – of which there are 15 – have an important role in designing and delivering public health actions. The SEREMIS ensure compliance with the national health norms, plans, programmes and policies established by the authority, and with sanitary and environmental laws and regulations, protect populations from environmental risk, carry on and co-ordinates epidemiological surveillance and outbreaks response, and adapt health strategic plans and programmes to the reality of the respective region. This

role includes, for instance, enforcement of Chile's Law 20.606 on food sales in any space where food is elaborated, dispensed, sold or publicised, for instance, supermarkets and schools. This law also bans the sale of food that exceeds the limits established by the Ministry of Health of sodium, calories, saturated fats and sugar in schools at all levels.

The flow of public health leadership and planning from the central to the regional and local levels appears well thought-out: SEREMIS help to deliver the national *Elige Vivir Sano en Comunidad* approach, and also develop cross-sectoral programmes according to the 'Health in All Policies' (Salud en Todas las Políticas) approach, led by regional health fora (Foros Regionales de Salud Pública). In addition, the Ministry of Health developed the 'Strategy of Healthy Cities and Communities', which is a comprehensive approach integrating health eating and physical activity in schools and neighborhood settings. Structural interventions have included improving the local environment for example by developing parks, bicycle parking and public sports facilities, and local regulations such as public tenders for healthy kiosks, health snacks, or including bike lanes in city planning regulations.

Local actors also appear to have the latitude to take leadership in public health issues when they see it as a priority. For example, in Santiago a multidimensional population health initiative is in place and the Mayor has made tackling childhood obesity a key priority. Under the 2013 *Sistema Elige Vivir Sano* law and associated strategy SEREMIS produced Regional Communication Plans that include actions for the dissemination of health promotion and citizen participation activities in the regional context.

The *Elige Vivir Sano* approach taken since 2013, a national strategy with support from across government departments, guides national public health policy and shapes regional-level action. Whereas building consensus and cross-government working can be difficult, even when issues demand a multisectoral response, *Elige Vivir Sano* has had high-profile buy-in from across the different Ministries. Equally, *Elige Vivir Sano* and *Elige Vivir Sano en Comunidad* have successfully engaged SEREMIS in public health activities.

That said, it may be now timely for a renewed cross-government approach, which includes a mechanism for engaging SEREMIS as the Regional Community Plans did. Public health issues and the need to encourage healthier habits are today no less critical than they were in 2013. Evaluating the impact of *Elige Vivir Sano*, potentially with a view to renewing plans and priorities, across Ministries and across national and local governments, should be a policy priority.

The public health system should give due attention to all public health risks

Ambitious efforts to tackle obesity have been undertaken in Chile, with a comprehensive multi-dimensional strategy in place. This approach, which is further discussed in Chapter 2 of this report, is timely, given the concerning high levels of obesity in Chile. However, greater attention needs to be given to other public health issues. In terms of primary prevention, smoking rates are high, while alcohol consumption is low but rising. In terms of secondary prevention a comprehensive set of screenings are covered, but coverage targets are not being met, suggesting that a reduced and more narrowly focused set of screenings could be a more effective approach.

As Chapter 2 sets out, efforts to address obesity in Chile – arguably the greatest public health threat at present – are impressive, even if room for expansion and improvement remains. Policies around preventing smoking could be approached with similar ambition. Chile is a Party to the WHO Framework Convention on Tobacco Control since

11 September 2005, and does relatively well in terms of following the Convention's guidelines on implementing and managing tobacco control. Smoking is prohibited in the majority of public places, health warnings must cover 50% of all tobacco products, advertising bans are strict and tobacco products cannot be sold or advertised in a certain radius around schools, although tobacco companies can still sponsor events and tobacco products can still be displayed at the point of sale. In 2014 taxes on tobacco products exceeded 75% of the retail price, and for the most-sold brand of cigarettes were estimated at 80.81%.

However, while the range of anti-smoking policies in Chile is adequate, a stronger approach could still be envisaged. In terms of population-wide policies, Chile should press ahead with the bill that has been before drafted for parliament since 2015, which would introduce plain packaging for tobacco products, as well as limit smoking at beaches and parks. Though plain-packaging for tobacco products has only been implemented in Australia, evidence suggests that this policy has had a small but measurable impact on smoking reduction. Having controlled for other variables, plain-packaging combined with graphic health warnings was found to be associated with an estimated 0.55% decline in smoking prevalence between late 2012 and late 2015 in Australia. A ban on menthol cigarettes – which sell particularly well amongst young Chilean women, a high-smoking group – proposed under the 2015 draft bill, would also be a powerful step. Chile could consider further mass media campaigns about the dangers of smoking which could also be tailored to youth populations, both in content and in where and when they are displayed. Chile may also wish to fund smoking cessation programmes, which are amongst the most cost-effective preventive measures available in health care. A number of OECD countries have already introduced coverage for smoking cessation and Chile should begin by following the example of Belgium and France, funding smoking cessation interventions with particularly at-risk groups such as COPD sufferers.

A fairly large range of health checks and diagnostic tests are covered by AUGE in Chile under the *Examen de Medicina Preventiva* or EMP. EMP are in particular targeted at key populations, defined based on age, sex and risk, for example pregnant women, new-borns, or older adults. They include, for example, tests for hypertension and diabetes, cancer screening, as well as recording of tobacco consumption and obesity. However, uptake of the EMS tests is low. FONASA is not meeting the EMP set targets; for example, while the percentage of insured persons who had received an EMP check rose between 2012 and 2016, in 2016 21.1% of the population received an adult blood glucose tests check, still not meeting the 25% goal for coverage.

The explanation for some of the low rates of EMP checks can be expected to be similar to the drivers of low cancer screening coverage explored in Chapter 3, notably low public awareness of availability and importance of the tests, problems with access, and weak monitoring of the rate that the tests are undertaken. The effective approaches for increasing the rate of checks should be focused on improving public health literacy, more targeted attempts to invite high risk groups for screenings, and ensuring good geographical access. However, given the large number of EMP checks for which the targets are missed, it may be that Chile should put particular focus on increasing the uptake of fewer key checks with proven evidence of cost-effectiveness, in line with public health priorities. For example the current approach to diabetes screening, where a high proportion of the population is expected to undergo blood glucose tests, may not be a cost effective approach. The undertaking of these tests could then be encouraged, both amongst health professionals in clinics and primary care settings and the population. A

more focused approach could also mean undertaking some tests on a less regular basis, or targeting only high-risk groups with systematic tests.

Engagement of civil society and the private sector is weak

While the Chilean government, both Ministries at the central government level and local and regional governments appear strongly engaged in public health issues, the private sector is far less present. There is more that the government could do to engage with non-governmental actors. In particular greater engagement with private health insurers – the ISAPRES –, with the food and beverage industry, with workplaces as well as with civil society groups, would be welcome.

There are some notable examples of non-governmental involvement with public health. The involvement of the Ministry of Agriculture in providing a platform for the reformulation of food is notable; the National Federation of Independent Street Markets (*Confederación Gremial Nacional de Organizaciones de Ferias Libres, persas y afines*) has been involved in promoting healthy diets both independently and in partnership with Ministries. *Coalición Mover* (Movement Coalition), founded by Chile's medical societies promotes physical activity amongst the public, and encourages doctors to prescribe exercise to patients. Civil society groups have also been engaged in monitoring food labelling, as well as local cycle schemes. The government has also supported the implementation of voluntary actions to promote healthy living in workplaces; around 200-250 workplaces have implemented interventions such as physical activity courses and bicycle parking spaces. Citizen dialogues have also been promoted by the Chilean government, including 'Healthy Parliaments of Children' in which children discuss health-related topics and vote on issues around them.

However, engagement of civil society and the private sector does not appear to be a main pillar of Chile's efforts to improve public health. In general the voice of civil society organisations also remains relatively weak; civil society in Chile tends to be arranged in small organisations, which limits their ability to influence and support public health objectives. A number of OECD countries have successfully pursued a far more collaborative approach with civil society, and with industry, and Chile could follow their example. For instance in Canada and Denmark healthy eating campaigns have been implemented as a joint venture with the industry, and Ireland's obesity policy includes a voluntary code of practice on food advertising and marketing. In Denmark the government collaborated with several retail chains to promote a food labelling scheme which marked out healthful products, with an evaluation showing that the informational campaign impacted shopping behaviour. In other countries public-private collaboration have led to agreements between government and business stakeholders work to improving health, including through reducing alcohol consumption.

The ISAPRES are key actors in the Chilean health system, covering 17-18% of the population. However, the engagement of the ISAPRES in public health and prevention is weak. According to the Association of ISAPRES, the high rate of turnover in the insured population reduces the incentive for ISAPRES to invest in prevention and public health initiatives. ISAPRES should be playing a greater role in promoting healthy living and prevention strategies, for example by developing prevention and promotion packages as a way to attract enrolees. Insurance providers in other countries have incentivised participation of enrolees in schemes to improve their health. In Japan and the State of Alabama (United States), health insurance discounts have been offered to those who participate in wellness programmes. Well-designed secondary and tertiary prevention

programmes have also been found to be effective in preventing the development of complications, and can produce savings for insurance companies. Above all though there should be an expectation that ISAPREs provide care that is at least equal to provision by FONASA, which is for example covering counselling and diet programmes in primary care. While ISAPREs should see the potential benefits of investing in public health programmes for their enrolees, it may be that more prescriptive requirements by the Ministry are needed, for example through setting minimum prevention requirements across the industry through regulation.

There is scope to strengthen epidemiological surveillance and monitoring

Epidemiological data in Chile is primarily based on the National Health Survey, which was carried out in 2017, and prior to this in 2009 and 2003. The National Health Survey offers a rich source of data on the health status of the Chilean population. For example the National Health Survey includes both measured and self-reported height and weight -- and not many surveys include both dimensions. Other sources of data in Chile such as the WHO Global Information System on Alcohol and Health (GISAH) include data for Chile on alcohol consumption (for 2014) and patterns of consumption (for 2010), while JUNAEB's *El Mapa Nutricional* tracks obesity rates in children and adolescents.

However, given that the National Health Survey is a very important source of key population health data, it needs to be undertaken on a more regular basis. Undertaking the survey every seven years – which is the time elapsed between the most recent two Health Surveys – is not sufficient to effectively monitor changes in non-medical determinants of health, or to assess the impact of public health policies. Many other countries OECD countries, for instance Italy, France, Canada and England, have surveys much more regularly, even annually. Mexico's health survey (ENSANUT) takes place every 4 years (last one was in 2016), and includes measures of height and weight. The survey should not be seen as an ad-hoc undertaking, but rather be a regular part of public health policy. An established timetable for undertaking the survey needs to be set – for example every 2 to 4 years – and/or responsibility for the survey be shifted out to an arm's length institution. For instance the Public Health Institute might include the survey as part of their core business. The survey should be designed to provide data in line with Chile's guidelines and thresholds for public health issues. For example, the recommended frequency for consumption of certain foods (daily, weekly, etc.) does not always match the survey questions, and the survey does not cover all food types, such as pulses, potatoes, meat, and eggs, which are included in the guidelines.

Another weakness is the monitoring of economic data. Overall Chile's data on prevention and public health (and indeed any detail beyond overall health spending) is very poor; no overall estimates of preventive spending or any subcomponents are available, nor can be shared with the OECD under the System of Health Accounts Framework (SHA). To be able to more effectively identify public health and prevention spending, an overall improvement in health accounts is needed. Chile should continue the efforts that have begun, working with the OECD and PAHO, to improve SHA reporting, including the new SHA protocol to produce data by disease.

In addition, greater monitoring of some of the public health and prevention programmes that Chile has introduced is needed. In many respects, a richer and more regularly updated epidemiological surveillance data will help with this monitoring. However, specific efforts to monitor and, particularly to evaluate some programmes, are needed, for

instance cancer screening and early diagnosis as stressed in Chapter 3, and the comprehensive package of obesity prevention measures as Chapter 2 sets out.

Tackling obesity and unhealthy diets in Chile

Obesity and associated unhealthy behaviours are top causes of chronic diseases and burden of disease in Chile, and represent the largest and fastest-growing single risk to health in the country. To address this issue, a package of policies – including fiscal policies, food policies and public information – is needed, as any single measure is unlikely to have a major impact.

In 2016, 39.8% of the Chilean population was overweight, and another 34.4% was obese. This is one of the highest rates observed among OECD countries. The National Health Survey shows that there has been no reduction in the prevalence of overweight and obesity in the last 15 years.

The rate of childhood overweight and obesity in Chile is nearly 45%, which is considerably higher than the OECD average of around 25%. This is a significant public health issue in itself, but also poses risks for the future. Children who are overweight are more likely to be overweight as adults, and are at greater risk of poor health in the future. Chile's high prevalence of childhood overweight and obesity can be considered a 'health time-bomb'.

The rise of obesity in Chile in the past decades can be linked to several factors, such as change in calorie and nutrient availability. Since 1961, total food availability has increased by nearly 20%, from just under 2 500 kcal/capita/day to nearly 3 000 kcal/capita/day in 2013. This increase is almost entirely attributable to an increase in calories from sugar, other sweeteners and meat.

There are inequalities in the distribution of obesity across population groups. A large number of determinants influence lifestyle, including housing, education, gender, the environment, income and age, and these factors are causing differences in obesity rates. For example, women are more likely to be obese than men. It is important to understand how these determinants interact with each other in different population groups, to ensure interventions are targeting the right people.

Chile has implemented a comprehensive set of prevention policies to tackle unhealthy behaviours associated to obesity

Faced with an alarming status of the population, Chile has recently introduced a comprehensive and impressive set of policies and interventions to tackle obesity. Governments can use a wide range of different policies and interventions to tackle obesity, from population-level fiscal policies to individual-level support interventions. Combining different approaches in a multi-intervention strategy, targeting different population groups and settings, significantly enhances the impact on health, which Chile has embraced. Through a wide-ranging portfolio of actions Chile has started to address the main causes of obesity: physical inactivity, and in particular unhealthy diets. These interventions, many of which are still in the early stages, will hopefully help turn the tide on obesity over the years to come.

At the national level, mass media campaigns educate the public on healthy choices. Since 2004, when Chile launched a major campaign to promote the consumption of five portions of fruit and vegetables a day, websites, twitter, TV and radio adverts and

educational material have been used to promote healthy eating. National laws on marketing, labelling and sugar taxes have been implemented in an effort to improve diets, and are particularly important. Chile implemented a total restriction on marketing unhealthy food at children, or when a television audience consists of more than 20% children.

Chile also introduced front-of-package labels in 2016 on packed foods, which indicate whether a certain foodstuff is high in calories, salt, sugar or fat, with threshold values that are among the strictest in the world. It is clear that the policy has already had an impact. An evaluation by the Ministry of Health found that 44% of consumers used the labels to compare products, and 92% of them were encouraged to buy less or to buy different products.

In addition, the food industry has reformulated some products to avoid having to add labels. Chile also introduced a sugar-sweetened beverage (SSB) tax in September 2016; SSBs with more than 6.25gr of sugar/100ml (or 15gr/240ml as stated in the law) are taxed at 18%, while SSBs below this threshold are taxed at 10%.

At the regional level, regional governments and city-wide programmes are bringing together different stakeholders to deliver multifaceted interventions, and transform local spaces. For example, the *Santiago Sano* programme delivers interventions on alcohol, sexual health, activity in the elderly, and childhood obesity, bringing together stakeholders from every municipal department into 40 dedicated committees. *Elige Vivir Sano en Comunidad* (Choose Healthy Living in the Community) includes a number of initiatives that aim to create a healthier environment, which promotes and enables a healthy lifestyle.

A particularly impressive nation-wide portfolio of school-based interventions has been developed to improve diet and exercise in students. The *Contrapeso* programme aims to promote healthy eating and physical activity among school children, including restrictions on the sale of unhealthy products in schools and increasing the healthy food choices available for school meals. While Chile does not have a centrally mandated workplace-based programme, the Chilean government has supported the implementation of voluntary actions in workplaces. So far, about 200 to 250 workplaces have implemented interventions including dedicated walking breaks, physical activity courses, and bicycle parking spaces.

Chile's primary care system plays a key part in the obesity strategy through the *Vida Sana* counselling and physical activity programme. This one-year programme aims to improve physical activity and diet in patients with obesity, or overweight patients with other risk factors. While the sessions take place in primary care centres, the programme is completely independent and run by dedicated councillors, and is covered by FONASA. However, currently the programme covers less than 1% of people with obesity.

Population-based primary prevention actions should be further reinforced and extended to target a larger share of the population

While Chile's comprehensive multi-dimensional policy approach to reducing obesity has been impressive, there are still potential areas where policies should be expanded.

Chile is ahead of the trend with its strict labelling laws. The use of simple front-of-package warning labels, as has been implemented in Chile, prompts a higher response rate from consumers than a list of nutrients, and the scheme has already proven effective in incentivising the reformulation of unhealthy products. Nestle, for example, has

changed the recipe of popular breakfast cereal Chocapic to include artificial sweetener Stevia.

However, there are some technical limitations of the policy that could be addressed: for bottles and other non-square packaging the label can be printed towards the side of the front label, potentially obscuring it if the product is slightly rotated when displayed in store. Including the label on the front and the back of the product could help ensure that it is always visible.

In addition, non-packaged food, for instance in restaurants or fast-food establishments, are not subject to the labelling law (though restrictions on advertising and school sales do apply). Further expansion of the labelling, for instance to alcoholic beverages or fast-food restaurants could be considered. The labelling laws could be expanded to include menus in chain restaurants, as has been done in states and cities in the United States, Canada and Australia, or to prepared, take-away food.

Chile should continue to focus, in particular, on preventing obesity in the younger generations. Building on the school-based programme, *Contrapeso*, Chile should now work towards creating an environment that favours healthy lifestyle choices. Working with municipalities and privately-owned schools to extend the coverage of the programme and to stop marketing and sales of unhealthy products around schools, as has been done for tobacco, would be the most natural next step. The healthy food procurement policy in schools – led by JUNAEB – could be extended to cover all the canteens in public institutions, notably canteens in offices, public services and the army.

At the same time a renewed focus on policies to promote physical activity would be appropriate; Chile's current policies to reduce obesity are heavily focused on improving Chileans' diets.

Private insurance should play a more active role in promoting healthy behaviours and preventing the complications of chronic diseases

FONASA plays an important role in managing obesity through the *Vida Sana* counselling and physical activity programme. The private health insurers (ISAPREs) however cover around 17-18% of the Chilean population, but their involvement in promotion and prevention activities is very limited. According to the Association of ISAPREs the mobility of the covered population – 10% of individuals change their insurance scheme each year – reduces the incentive as well as the opportunity for individual providers to invest in prevention and public health initiatives. In addition, as the ISAPREs can unilaterally charge a risk-rated premium, the large majority of elderly patients are covered by the public FONASA. This further reduces the incentive for the ISAPREs to invest in prevention and healthy aging.

For the ISAPREs, efforts to reduce obesity would deliver medium-to-long term health savings, and these efficiencies would be even greater if ISAPREs could act together to introduce a common obesity and overweight prevention approach. In doing this, ISAPREs would be protected from some of the impact changes in their covered population, or at least for those individuals changing between ISAPREs.

One example of a prevention programme managed by a private health insurer is the *Vitality* programme, which is run by South Africa's largest private health insurer, Discovery Health. This incentive-based programme is based on four pillars: assessment and screening, healthy choices, health knowledge, and physical activity. Beneficiaries are encouraged to participate in different activities such as health checks and visits to

dieticians through a points system. In addition, gym memberships are subsidised, and fruit and vegetable purchases are eligible for a 25% cash rebate. The cash rebate has been effective in increasing expenditure on healthy foods by 9.3%, and decreasing spend on less healthy food by 7.2%. The *Vitality* programme has resulted in a reduction in medical claims for Discovery Health, thus providing a direct incentive for private insurers to invest in prevention.

Even in the absence of agreement between the ISAPREs – the Association of ISAPREs has indicated that it would support changes to the required involvement of private insurers in public health – individual ISAPREs should be encouraged to play a more active role in promoting healthy behaviours and preventing the complications of chronic diseases. For the ISAPREs, offering an attractive prevention and promotion package to enrollees – for instance following the *Vitality* programme model – could give a competitive advantage. If this is insufficient, the Ministry might look for ways to encourage greater engagement by the ISAPREs, for example by setting minimum prevention requirements across the industry through regulation. As coverage providers of close to 20% of the Chilean population the ISAPREs must become a more active partner in the effort to reduce obesity.

Chile should better assess the effectiveness of the policies and measure achievements in reducing obesity

Chile's obesity strategy is multifaceted and includes many different stakeholders, interventions, target populations and outcomes. To assess the effectiveness of the implemented policies and to measure achievements, Chile should put in place rigorous monitoring systems. Well-designed monitoring systems are also a fundamental tool to support the design of further innovative policies or to address potentially unwanted consequences of policies already in place.

In general, as stressed in Chapter 1, Chile needs to improve the availability of epidemiological surveillance data, including data on obesity and overweight. Chile has fairly robust data on child obesity rates, given the data collected under the JUNAEB programme with *El Mapa Nutricional*, and through regular child health checks especially in infancy. However, data availability for adult health risk factors, including obesity, depends on a periodic National Health Survey. There was no health survey undertaken between 2009 and 2017, which meant that for much of the period in which Chile has introduced its ambitious obesity strategy the impact on population health has been obscured. Regularly updated, robust data on obesity levels in the population will be critical for better tailoring the prevention approach in the years to come. The importance of improving the information availability for public health is further explored in Chapter 1, along with examples of different approaches taken by other OECD countries to collect more regular data.

At the same time as population-level monitoring with more regular data on obesity rates, Chile should take action to rigorously monitor the impact of individual obesity policies. The official evaluation of Chile's SSB policy is a good example of an academically rigorous approach to policy review. Other interventions should receive similar reviews to ensure their cost-effectiveness.

Monitoring of the implementation of policies will also be key. For instance, enforcement of the food labelling law, and sales of food in schools, is the responsibility of the SEREMIs, who monitor the labelling of food products through random inspections (sampling a higher number of food products aimed at children). However for products

that are on-sale nation-wide, a national approach for some products may be more efficient than having each region do their own inspection. There may also be a question around the accuracy of the labels, but while one study showed that a number of foods were inaccurately labelled (or unlabelled), it is unclear how representative these results are.

Cancer screening and prevention in Chile

In Chile, cancer incidence is low but cancer could become the first cause of mortality in the near future. In 2015, based on the mortality rates adjusted to the OECD population, cancer accounted for 202 deaths per 100 000 population and was the second highest cause of mortality after diseases of circulatory system. But in recent decades, the burden of cancer has been increasing relative to other diseases, and in some regions in Chile cancer has already become the first cause of death.

Among men, prostate, stomach, colorectal, lung and kidney cancer have the highest incidence rate while among women, incidence is high for breast, colorectal, cervical, gallbladder and lung cancer. In terms of mortality, among men, cancer with highest rate is prostate, stomach, lung, colorectal and liver cancer. Among women, the leading cause of cancer mortality is breast, colorectal, lung, stomach and pancreas cancer. Following trends across OECD countries, cancer mortality rates in Chile are also higher among men than among women, and this can be explained at least partly by a higher prevalence of risk factors among men.

Although overall cancer mortality rates have been declining in Chile as seen in many OECD countries, progress has not been as fast as elsewhere for some cancers. Many cancers with high incidence and mortality rates in Chile such as prostate, breast, stomach, colorectal, and lung cancer share common risk factors including poor lifestyles such as obesity, physical inactivity, smoking, diet and/or alcohol consumption which are prevalent in Chile.

Chile has developed its cancer care system incrementally to tackle the increasing burden of cancer

In order to tackle the burden of cancer, Chile has strengthened cancer care governance and delivery. Chile has been strengthening the cancer care system incrementally over the past several decades. Since the late 1980s, Chile has implemented five nationwide programmes to reduce the burden of cancer and they focused on cervical cancer, cancer drugs for adults, cancer for children, and breast cancer; the programme also includes improved palliative care. Since the 2000s, Chile has been also tackling cancer as one of the major diseases as manifested in Health Priorities 2000-2010 and 2011-2020. In addition, in 2005, in view of achieving universal health care, Universal Access with Explicit Guarantees (AUGE) was introduced to improve access, quality, financial protection and timeliness of care for priority diseases including cancer. Initially, AUGE included 10 cancers but the types of cancer and cancer care interventions covered by AUGE have been increasing since then and 17 cancer-related interventions are now included.

Many other OECD countries also implemented specific cancer programmes, and most developed overarching and comprehensive cancer control policies through National Cancer Strategies or National Cancer Plans. These strategies or plans initially focused on prevention and screening but have since expanded policy focus on treatment, follow-up, care co-ordination, palliative care, patient-centred care delivery and monitoring. With a

view to further developing the cancer care system, Chile could learn from countries such as Australia, and Spain which systematically involved various local stakeholders when developing cancer strategies. For instance, the cancer care strategy in the Spanish National Health System was designed through co-ordination between the Minister of Health and the regional governments and close collaboration with all stakeholders including civil society. Such stakeholder involvement facilitated the implementation of cancer care strategy across health authorities in regions.

Chile has not introduced an overarching National Cancer Strategy or Plan, but important governance structures and policy tools for cancer control exist. The Ministry of Health is responsible for cancer care and as in other OECD countries with strong governance of cancer care systems, cancer-specific targets and timeframes for achieving them are specified in national health policy strategies called Health Priorities. Health Priorities 2000-2010 included targets such as decreasing age-standardised mortality rate by 40% for cervical cancer, by 25% for breast cancer and by 25% for gallbladder cancer. Although targets were not necessarily met during the decade, progress was made for these cancers particularly for cervical and gallbladder cancer. Subsequent Health Priorities 2011-2020 also sets a goal of decreasing cancer mortality by 5% by 2020 and between 2011 and 2015, Chile already decreased mortality rate by 4.1%. Additional resources were also made available in the cancer care system. For instance, the number of public cancer care centres was increased and the introduction of AUGÉ and its coverage expansion also increased public funding for covered procedures and treatment for cancer.

Chile has also sought efficiency gains and quality improvements in its cancer care system. In view of increasing efficiencies, cancer care delivery has been centralised by concentrating resources and expertise at specialised institutions as seen in other OECD countries. Cancer networks have been also established in order to facilitate co-ordination among professionals engaged in oncology care. With regards to the quality of cancer care, the Programa Adulto Nacional de Drogas Antineoplásicas – PANDA develops clinical guidelines to standardise and assure quality of cancer care. Reimbursement is linked with evidence-based care delivery according to the guidelines and only those treatments and procedures that are complied with the guidelines are reimbursed. The compliance level and quality of cancer care is considered to be improving as a result.

However, Chile still lags behind many OECD countries in terms of cancer control. Despite its very low cancer incidence (35% lower than the OECD average), cancer mortality in Chile is not substantially lower than the OECD average (only 3% lower). Room for improvement remains, including through further public health interventions.

The cervical cancer screening programme has contributed to substantial reduction in mortality rates but screening coverage could be increased

Chile has a well-established cervical cancer screening programme. Chile's cervical cancer screening programme was developed and rolled out nationwide relatively early, starting in 1987. Cervical cancer screening coverage has since increased. Free access to screening, stakeholder involvement for setting screening programme goals, provider incentives for higher coverage, quality assurance of screening tests and information systems to monitor the progress of the programme have contributed to improved cervical screening coverage, and the proportion of patients diagnosed with early stage of cervical cancer has increased. Together with policies aiming at improved health care access and quality of care, systematic approaches taken for cervical cancer screening have contributed to a mortality decline of 63% since the start of screening programme.

Following a trend in the OECD a school-based HPV vaccination is also in place in Chile as part of the National Immunisation Programme since 2014. To assure high coverage of HPV vaccination a comprehensive multi-stakeholder approach has been taken. This has enhanced the knowledge of HPV vaccination among the population and led to high vaccination coverage since its start, suggesting that the incidence of cervical cancer is likely to decrease in the country in the years to come.

Nonetheless, Chile needs to continue its efforts to increase cervical cancer screening coverage. The incidence of cervical cancer remains higher than the OECD average, and although the gap is generally narrowing over time, the mortality rate in Chile (8 deaths per 100 000 women) remains higher than that of the OECD average (4 per 100 000) in 2015. High cervical cancer screening coverage can reduce the disease burden but since its peak in 2008, the coverage has declined, reaching 56%, lower than the OECD average of 61% in 2015. Furthermore, despite the successful implementation of HPV vaccination, there are still non-participants of the immunisation programme and existing vaccines do not protect against all high-risk HPV types. In order to reduce the burden of cervical cancer, Chile will need to increase screening coverage.

Chile could adopt a more systematic and personalised approach in inviting target populations to screening programmes, as has been implemented in many OECD countries with high screening coverage. These countries identify each individual in the target group and send a personal invitation letter for screening, issued through a registry. The letter includes information on the benefits and risks of screening and asks for informed consent for screening, to increase public awareness and promote health literacy. More efforts are also made to invite people with positive screening results in the past for further assessment, and in some countries the appointment date is fixed in the letter to further facilitate access. As it can cost more to implement these strategies, cost-effectiveness would need to be assessed for the Chilean context.

Chile could also consider taking another route in parallel to increase coverage. Several OECD countries such as the Czech Republic, Denmark, Finland and Norway have undertaken trials and sent a self-sampling device for cervical cancer screening to target women who had previously declined screening participation. These trials were found effective in reaching out to non-participants, women's experiences were generally positive and sample devices were well received. If Chile were to follow this route, effective communication strategies for this alternative intervention would also need to be developed.

Chile needs to develop and implement more effective strategies for breast cancer screening programme

In terms of breast cancer, Chile began a National Screening Programme relatively late, in 1998. Screening coverage is only 37%, which is much lower than the OECD average of 60%, despite its free access and extended availability, for instance through mobile mammographs, a truck carrying mammographs. Screening coverage is particularly low among those with low socio-economic background including low educational attainment.

Through the screening programme the share of patients diagnosed at early stage among all patients with breast cancer has increased in Chile, but the burden of breast cancer is still relatively significant. While the incidence rate in Chile is about half of the OECD average, the mortality rate is only about 20% lower than the OECD average. Furthermore, since the introduction of breast screening programme in 1998, the mortality decline has been slower in Chile than in most OECD countries (9% in Chile compared to 22%

OECD-wide). This may be due to factors such as lifestyle changes and relative progress in the quality of breast cancer care compared to other OECD countries, but low screening coverage also poses a question of the screening programme's effectiveness in reducing the burden of breast cancer in the country.

In fact, many target women are not aware of the benefit of mammography screening in Chile. Among women aged between 50 and 75 who did not undergo mammography, more than half of them believed that they did not need it or it did not apply to them, or did not know that they needed to do it. About 30% of women forgot to do it, did not have time or reported that the test scared them or distressed them. Another study also found that secrecy, shame, fear and fatalism were associated with mammography, and some women had greater confidence in breast self-examination which was previously promoted as the appropriate screening method.

Chile should also look to develop more effective communication and implementation strategies for the breast cancer screening programme. First, as mentioned for cervical cancer screening, more systematic and personalised invitations could be developed for breast cancer screening. Second Chile needs to involve different key stakeholders when developing implementation strategies for breast cancer screening. For HPV, Chile has involved not only health professionals but also the education sector in developing implementation strategies, and it prepared manuals for teachers, and informed parents or guardians of target children about risks and benefits of HPV vaccination to their girls. Such efforts in involving different stakeholders could be extended for Chile's breast cancer screening programme. Barriers may be specific to regions, and different among people with different cultural and socio-economic background within the country. Voices of local stakeholders such as regional administrations, health care providers and representatives of the civil society need to be sought to identify specific barriers to accessing breast cancer screening, and to address specific needs particularly among the disadvantaged as early detection of cancer is often more challenging among them. Third, specific policy goals could be set in relation to mammography for local health systems. A stronger policy focus on mammography at the health system level is likely to promote public awareness not only among the public but also among health care professionals. Last, although the number of mammographs has been increasing in recent years, Chile could also seek ways to assure access to mammographs particularly in the isolated regions through a greater use of mobile mammography units.

For other cancers Chile should improve health literacy and promote access to screening and diagnostic tests

In order to reduce risks of developing some other cancers with a high disease burden, vaccinations and screening tests are provided for free at the primary health centres. Vaccination of Hepatitis B, one of the main risk factors for liver cancer in Chile, has been provided as part of the National Immunisation Programme since 2005 and the vaccination rate has been high, covering over 90% of children in 2017. Screening tests are also available for colorectal, stomach, prostate and liver cancer. In relation to lung cancer, as mentioned earlier, while Chile has a range of anti-smoking policies, the cost of smoking cessation treatment is not yet covered.

Access to these screening tests, however, is not well understood but is considered low. In general, public awareness of the importance of early detection for cancer appears low and there is a lack of provider incentives and long waiting time in primary care, leading to low access to cancer screening tests.

These challenges contribute to relatively poor outcomes of prostate, colorectal, stomach, lung and liver cancer. Between 2005 and 2015, the mortality rate for prostate cancer decreased slower in Chile (by almost 8%) compared to the OECD average (by 15%), and it remains much higher than the OECD average (44 deaths per 100 000 men compared to 33). With regards to colorectal cancer, although the mortality rate is still lower in Chile (20 deaths per 100 000 population) than the OECD average (24), it increased by almost 20% over the decade while the OECD average decreased by 15%. As for stomach cancer, mortality rates declined with a similar pace between Chile and the rest of the OECD, and the mortality rate remains high at 26 deaths per 100 000 population in Chile compared to 10 in the OECD. For lung cancer, mortality remained stagnant at 23 while the OECD average decreased by 10%, reaching 41 per 100 000. As for liver cancer, over the last decade, the increase in mortality rates was fast (by 13% compared to by 5% on average across OECD countries), reaching 10 deaths per 100 000 population and deviating from the OECD average (8).

Recommendations to increase screening coverage for cervical and breast cancer screening are relevant. Chile could develop a more systematic and personalised approach in inviting the target population to screening such as for colorectal and stomach cancer. Chile can also seek systematic involvement of key stakeholders in order to develop people-centred strategies for cancer prevention and screening.

There are also other approaches that Chile could consider – likely in tandem – to improving access to early diagnosis including screening. First, Chile would need to develop effective information-sharing strategies to improve health literacy of the population. Examples from other OECD countries could be useful. For instance, Denmark, England and Estonia have developed a platform such as a website or e-Health account to share evidence-based information related to care for different diseases throughout patient pathway with a view to promoting health literacy of the population and to support them to seek health care including cancer screening and diagnostic tests appropriately and in a timely manner. Second, Chile should ensure that necessary medical technologies are in place across all regions. In some settings this may mean that innovative technological solutions, mobile clinics or tele-radiology, can help overcome geographic challenges in access in a cost-effective way. Third, given geographic characteristics of Chile, financial support to cover travel cost may be needed particularly among low-income groups with high risks to assure access to different diagnostic tests if geographic access is still considered problematic even after expanding the use of technological solutions. Furthermore, for effective early detection of cancer, Chile needs to continue assuring the quality of diagnosis. Chile has taken steps to standardise and improve the quality of diagnosis through international collaboration and such efforts needs to be continued across providers for different type of cancer.

Last but not least, improving early detection of cancer also needs to be approached in the broader context of health system strengthening. Although slowly decreasing, the share of those with unmet health care needs is still high at around 8% in 2015, indicating overall challenges in assuring access to health care and achieving universal health coverage. Although the quality of primary care is important to effectively identify target population for cancer screening, people with risk factors for cancer and patients still at an early stage of cancer, resources are stretched in primary care, resulting in long waiting time, short consultation time and poor care coordination. .

Chile should develop more systematic monitoring for cancer control

Chile has developed a cancer monitoring system based on population surveys and regional cancer registries which include incidence and cancer types. Chile also participates in the international surveillance and monitoring of cancer care through its participation in international data collections, including with the OECD and the WHO including Pan American Health Organization and the CONCORD Programme. However cancer registries have only been developed in four regions. Conversely, many OECD countries have cancer registries covering all their populations, allowing regional and international comparisons of cancer incidence and survival.

In order to develop population-based screening programme further, Chile would need to develop its information system to bring together individual-level data around cancer screening and diagnosis in a more systematic manner across regions, providers and cancer types, and to facilitate identifying individuals with high risks more efficiently and effectively. This has already been done for cervical cancer and childhood cancer in the country to some extent; Chile has expanded the information system for cervical cancer and data are linked across providers including both in the private and public sector and registries; for childhood cancer, data from private and public sectors have been integrated in the national cancer registry since 2011. An information system based on registries is essential to send personalised invitations and reminders in view of increasing screening coverage, so information system developments should be extended across regions and to other cancers. Rich data generated from such systems could be explored periodically to assess the effectiveness of existing screening protocols such as target group, screening frequency and/or methods and across population groups.

A stronger monitoring and evaluation system for screening programmes could also improve provider performance and public awareness. An increasing number of OECD countries make key health information, including screening coverage, available in the public domain by region and provider in a user-friendly manner. Some of them including Israel, Italy, Portugal and the United Kingdom (England) monitor core services of primary health care providers including screening coverage within the performance assessment framework of primary care. In some of these countries, feedback is provided to individual providers and benchmarking is possible.

As cancer is one major disease affecting OECD populations, many countries have enhanced their efforts in monitoring not only cancer screening but also cancer outcomes including patient-reported outcomes such as patient-reported experiences (PREMs) and outcome measures (PROMs) in view of improving quality of cancer care and putting patients at the centre when delivering cancer care. Evidence shows that the use of PROMs in oncology care leads to improved detection of symptoms, better care process such as communication between clinicians and patients and higher patient satisfaction. This may be a route that Chile may wish to consider in view of making their cancer care system more people-centred.

Developing public health genomics to strengthen preventive care in Chile

A number of public health priorities in Chile have the potential to benefit from wider application of precision medicine. From a public health and preventive care point of view, precision medicine is most likely to offer benefit in those conditions which generate a sizeable burden of disease (whether measured in terms of mortality, morbidity or cost); which have a significant inherited component; and whose prevention, early diagnosis or

management could be influenced by knowing the genetic associations in a given individual or community. These criteria apply to cancer (where, for example, 10-20% of cases may have a hereditary component); and to congenital anomalies at birth, such as lysosomal storage disorders.

Other conditions to which precision medicine could be applied are less relevant to the public health and preventive care agenda. Some, such as obesity, have undoubted public health importance. But the genetic variants associated with the condition are so strongly eclipsed by environmental and behavioural factors that genetic information has little predictive value. Other conditions, such as some forms of lymphoma, have stronger genetic associations. But it is unclear how knowledge of the genetic antecedent would translate into a public health or preventive care strategy.

In choosing to engage, at this stage, with the role of genetics in health and disease, Chile is showing a clear understanding of the potential for genetic science to both benefit and transform the field of preventive medicine. Taking steps to consider the role of genetic medicine for public health care at this point, when the range of genetic tests is relatively limited, should leave Chile well-prepared for the expansion of available genetic tests that will undoubtedly develop in the years to come.

Chile is already giving serious thought to the future development of precision medicine at national level

Chile has a goal of becoming a regional leader in provision of and research in the field of precision medicine. Both the government and professionals are committed to this development; in 2016 *Sociedad de Genética de Chile*, a professional body, and the Ministry of Health jointly produced an analysis of Chile's needs in the field, which signals a high degree of ambition. Chile also already has an active research community in genetic science, supported by government research institutes. Both the Comisión Nacional de Ciencia y Tecnología (hosted by the Ministry of Education) and the Corporación de Fomento de la Producción (CORFO, hosted by the Ministry of Economy) offer funding for genetic research. These, and other funds, have allowed Chile to develop a substantial research base in clinical genetics and the basic science underlying it. The country, in fact, has more sequencers per head of population than any other Latin American country, supported by a network of high performance computers. One particularly promising development is *Chile Genómico*, a research platform that investigates inherited risk-factors for disease, including diabetes, hypertension and several types of cancer. Research collaboration with the private sector is also developing. In particular, CORFO has recently established a Centre for Excellence in Precision Medicine with Pfizer Chile. Chile also participates in the two regional Latin America clinical genetics networks.

As well as a growing research community, Chile benefits from a specialist clinical genetics workforce, even if it is small by international standards. There are currently 33 clinical geneticists working in Chile, equivalent to 1.9 per million inhabitants, the majority of whom are based in Santiago. There is currently one post-graduate residency programme available in Chile, with around 1 new specialist graduating per year. International comparisons suggest a shortfall in clinical genetics consultants; many OECD countries employ 3 or more clinical genetics consultants per million population (and some, such as Norway and Finland, have more than 5). However, efforts are made to offer clinical genetics consultations (typically for other medical specialists) via telemedicine. In addition to clinical geneticists, some oncologists (cancer specialists) also

offer genetic screening, for the common translocations that are associated with leukaemia, for example. A small number of paediatricians and/or obstetricians specialising in foetal medicine and pre-natal care may also offer relevant genetic tests to potential parents. Chile currently does not have any genetics counsellors – professionals who specialise in explaining inherited risk of disease to patients and helping them decide appropriate courses of action in response.

Regulation and health care coverage have not kept up with clinical advances in precision medicine in Chile

While Chile is clearly ambitious about expanding its engagement with the field of precision medicine the translation of ambitions into policy remains partial. For example, there are no policies currently in place to promote the integration of genomics (the study of an individual's entire genetic material) into routine clinical practice, even though this bottom-up activity must clearly be the fundamental plank of any national roadmap. Similarly, there has not yet been any systematic effort to improve knowledge and understanding of genetic and genomic tests amongst doctors, nurses and other health care professionals, nor the public. This limits the potential uptake and impact of genetic medicine.

Regulation in Chile has not kept up with clinical advances in the precision medicine field. Chile has established some key regulatory elements covering clinical genetic services, such as the requirement for Clinical Geneticists to be registered with the Ministry of Health. But important gaps are also apparent. Minimum standard and quality assurance requirements for clinical labs are generic, for example, with no specific requirements relating to genetic tests. In Chile as elsewhere, an increasing number of commercial labs are being established, some of which offer direct-to-consumer testing, but for which there is currently no quality control.

Chilean laws governing personal health data also do not adequately reflect the emerging landscape of genetic technologies. Current regulations allow sharing of individuals' health data only in very limited circumstances. This, however, may hinder growth of clinical genetics, because research and development in the speciality depends upon the analysis of patterns of genetic markers at population level, and their correlation with disease, which demands sharing patient data (obviously with stringent privacy safeguards in place). Chile is preparing a draft law on the use of samples and the sharing of data derived from biobanks, but the provisions apply only to research and not to clinical practice. This risks leaving clinical applications in a grey area, that either weakens the protection of personal health data, hampers better understanding of genetic profiles across the Chilean population, or both.

In addition, health care coverage has not kept up with clinical advances in genetic science. Very few genetics services are covered by the public insurance system in Chile, limiting effective access. At present the only genetics services covered by FONASA are cytogenetics, namely: i) karyotyping (for chromosomal abnormalities, such as trisomy 21, also known as Down's syndrome); and, ii) Fluorescent in-situ hybridization (used to detect specific DNA sequences that are associated with some congenital syndromes, such as Prader-Willi syndrome, and some leukaemias). New-born screening for phenylketonuria (always genetically determined) and congenital hypothyroidism (sometimes genetically determined), are also well-established. There are no molecular genetics or genomic analyses offered within the public insurance system. The Ricardo Soto Law established coverage for some rare inherited diseases, including some

lysosomal storage diseases (such as Fabry's or Gaucher's disease), other inherited disorders of metabolism (such as tyrosinemia), and HER2+ve breast cancer. Because private insurers take their cue from public coverage package, no molecular genetics or genomic analyses are generally offered by ISAPREs either. This means that only those who can afford to pay out-of-pocket for private consultations and testing in independent laboratories can benefit from newer technologies.

These barriers in the accessibility of testing have important impacts in some areas, in particular for children born with a major congenital abnormality. In addition, a number of clinical conditions are included within AUGE where genetic testing can be crucial in determining the most appropriate treatment approach, but is unavailable unless paid for privately (notably several cancers). For many thousand such patients, there is an inconsistency in the coverage under AUGE: treatments are offered, but genetic testing that could offer a quicker and more precise diagnosis is not.

A national strategy for precision medicine in Chile should be developed

Chile starts from a strong position in seeking to develop its clinical genetics to become a regional and global leader. There are nevertheless substantial further steps that need to be taken to realise this ambition. First and foremost, a coherent and comprehensive national strategy should be agreed to steer development of precision medicine over the coming years, encompassing both the use of genetics in clinical practice, in public health policy, and in research. The development of this strategy, which should be directly overseen by the Minister of Health, should include considerations of key dimensions including determining the expansion of genetic services to be included in GES; deepening collaboration between existing labs (public, private and academic) and rationalising the provision of key genetic tests across laboratories as appropriate; ensuring that regulations (particularly around laboratory quality assurance, data sharing and consent) are fit for purpose; and, developing a programme of public and professional education around the role of genetic medicine. Patient groups should be fully represented in the development of the strategy.

In focusing attention on the exciting and innovative area of precision medicine, new insights into the causes and prevention of disease offered by clinical genetics should not overshadow traditional public health approaches. The core challenge, in Chile as elsewhere, in developing the role of genetics in public health and preventive care is to combine deeper understanding of the population's genetic profile with "traditional" public health approaches. Similarly, in order to personalise preventive care, insights from an individual's genetic makeup need to be combined with knowledge of their behavioural and environmental risk factors to tailor a package of preventive interventions.

Critically, a health system such as Chile's (especially one with relatively few resources) should only invest in new services with a robust and detailed cost-effectiveness and budget-impact analysis, as well as business case. Chile's national strategic plan should ensure that this principle is adhered to in the area of genetic medicine. Equally, Chile should not invest inappropriately in next generation sequencing, where value for money is likely to be lower than older technologies, especially if the lack of therapeutic options means that any diagnostic information gained (at considerable cost) is effectively unactionable. Turning to public health specifically, the core activities of risk-factor surveillance, screening, regulation, persuasion, education and so on will never diminish in importance, despite the growing profile of genetic medicine and genetic public health. Chile should balance overall investment in genetic technologies with recommendations

for strengthening traditional public health made in the other chapters of this report therefore.

Appropriate regulation should underpin analysis and sharing of individuals' genetic data

Regulations specific to genetic data, which permit sharing whilst protecting confidentiality, are needed to advance the potential benefits of genetic data while protecting from potential harms. Genetic data is not the same as other types of personal health data. To approach a diagnosis, an individual's genetic (and phenotypic) data must be compared to the wider population, so that relevant variants linked to particular diseases can be found. Currently, Chile has strict regulations governing how personal health data can be shared. The current framework treats all personal health data equally, and is reported to be overly restrictive with regards to genetic data, risking progress in the field. Revised regulations that specifically relate to the sharing of genetic information would be welcome, therefore, to supplement the current regulatory framework. This would enable sharing of genetic data whilst protecting the privacy of identifiable personal data.

Crucially, very careful attention must be taken to ensure that individuals are not discriminated against (whether in terms of access to insurance, employment of other markets) because of their genetic profile. Patients should be involved in revising the regulatory framework that applies to genetic data.

Once sufficient data protection provisions are in place Chile should take steps to maximise the utility of available genetic data. This could include the building of a national register of genetic variants, linked to phenotypes, to better understand inherited causes of disease. *Chile Genómico* already provides a basis upon which to build this register.

Robust quality assurance should also guarantee minimum standards across all laboratories undertaking genetic analysis. The precise approach should be agreed by all stakeholders in the Ministerial working party developing Chile's genomics strategy, and may involve peer-review or accreditation. Accreditation standards developed elsewhere are available to support this, such as those developed by the American College of Pathology. Rather than one-off assessment of minimum standards, however, it may be more effective to develop a programme of continuous quality improvement for labs and services, underpinned by regular audit cycles and other techniques, such as those developed by the Institute for Health Care Improvement.

The range of clinical genetic services covered by health insurers should be incrementally expanded

Agreement is needed on incrementally expanding the range of genetic services covered by insurers, given that AUGE has not kept up with novel diagnostic technologies offered in other health systems. Furthermore, several conditions with an important genetic component are included in AUGE, but genetic tests that could speed up, or clarify, their diagnosis are not included. Clearly, though, expansion of AUGE needs to be sustainable and incremental, guided by cost-effectiveness and budget-impact analyses.

An increasing body of research and international experience is available to support the approach to expanding AUGE coverage. It is recognised, for example, that whole genome sequencing (WGS) should be limited to rare or complex disorders whose diagnosis via

non-genetic pathways would otherwise be lengthy. In more common disorders, more focussed analysis of the selected regions of the genome is more efficient in determining genetic antecedents. Likewise, population-wide sequencing is also poorly cost-efficient, with targeting to specific groups first stratified by phenotype, again being more efficient. Although such techniques may capture the public imagination less than WGS, it is important that Chile should work to ensure equity, quality and sustainability of access to these “silver-level” technologies, and not invest inappropriately in “next generation sequencing”.

In determining additional genetics tests to be included in AUGE, Chile again is starting from a good position. Professional and scientific associations have already drawn up a list of priority services to be added to AUGE. In terms of disease areas, the stated priorities with an important public health or preventive care component include breast, gastric, colorectal and prostate cancer. In terms of new techniques, priorities include Multiplex ligation-dependent probe amplification (which can distinguish differences of just one nucleotide in up to 50 different genomic DNA or RNA sequences at a time), Sanger sequencing (which can analyse contiguous DNA sequences beyond 500 nucleotides), and molecular karyotyping, which can identify copy number variations.

The capacity of the Chilean health system to take action on significant genetic findings should also be explicitly addressed. A key criterion in determining the expansion of AUGE’s genetic component should be the existence of therapeutic options to respond to any abnormal results. A different – and more critical – aspect of actionability arises when a result becomes effectively unactionable because the health system in Chile does not make available interventions that are known to offer benefits. For example, if BRCA1 and BRCA2 testing were to be made widely available, AUGE’s omission of prophylactic mastectomy for women who want it, means that even in the case of a positive result from BRCA there is no pathway of care available to the women concerned in AUGE. Hence, the capacity of the wider system to take action on results from genetic testing needs to be explicitly addressed when considering expansion of the genetic component of AUGE.

Ambitious goals to increase “genetic literacy” amongst both professionals and the public should be pursued

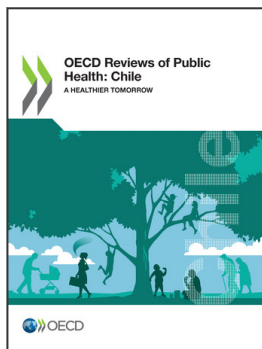
Increasing understanding of the costs and benefits of genetic testing, amongst health professionals and the public, will be key to both restricting use of genetic testing to the most appropriate indications, and spreading the benefits as far as possible.

In terms of health professionals, training in genomics as well as protocols and guidelines on use of genetic approaches to diagnosis, are needed. Clinicians can also be educated on the potential of genetic analysis, for instance in primary care. This need not be highly technical; one of the most useful genetic “investigations”, for example, is a thorough and well-documented family history. This can be easily performed in primary care, for example, and may reveal increased likelihood of cardiovascular disease, cancer or other important conditions. The United Kingdom offers a model here: 700 person-hours professional training in clinical genetics will be funded as part of a national strategy to increase genetic literacy. Alongside training for front line health professionals, developing a cohort of specially trained genetics counsellors should be a priority for Chile.

Clinicians, including those working in primary care, should be offered training in when and how to refer patients for genetic analysis. The protocols and guidelines within AUGE should also be updated to include a stronger focus on when a genetic component is likely,

when and how to record a family history, and when and how to refer for further genetic analysis. From a preventive and public health angle, such updating of AUGE guidelines is particularly important for cancers or cardiovascular disease presenting at a young age. A particular priority, for example, is breast cancer where 10-20% of cases may have a hereditary component. AUGE guidelines should require, therefore, that a detailed family history should be taken in every new case, so that early diagnosis or preventive care can be offered to family members at high risk. Similar considerations apply to gastric, colorectal and ovarian cancer. Guidelines that support the identification of hereditary cases of these cancers have been developed in other countries (such as the National Comprehensive Cancer Network guidelines of the United States, or the National Institute for Health and Care Excellence guidelines in the United Kingdom), and provide models for Chile to consider.

Initiatives to increase public understanding of clinical genetics and the value of sharing individuals' genetic data, will be just as important as initiatives directed toward professionals. Efforts to increase public understanding should focus on explaining genetics' role in disease prevention and treatment, with a particular emphasis on the fact that pursuing a healthy lifestyle will always be necessary, irrespective of genetic risk. The value of data sharing, and assuaging public concerns about genetic discrimination, will also be important. The model of counselling and consent used at the point of genetic testing will be critical here, and will underpin efforts to educate the public and inspire confidence in genomics. Again, the United Kingdom offers one approach to consider. There, consent is essentially permissive (allowing individuals' data to be used for research and quality improvement), but consent forms and linked educational resources are very detailed. Patient groups should be fully involved in developing a programme of public education.



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