



Rising to the Triple Challenge of Brexit, COVID-19 and Climate Change for health, well-being and equity in Wales

Spotlight on: Food Security

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Food Security, Health, Well-being and Equity in Wales

The Triple Challenge describes the cumulative and individual impacts of Brexit, COVID-19 and Climate Change. These impacts are multifaceted, are not static and will affect Wales in the immediate and long term.

Executive Summary

National and household food security are key determinants of health, well-being and equity which should be integral considerations as part of post Brexit, recovery planning from the COVID-19 pandemic and climate change adaptation.

Food Security is defined as: 'when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life' (Food and Agriculture Organization of the United Nations (FAO), 1996).

Summary of Findings:

1. Food security is an important determinant of health and well-being at both a national population level, but also at an individual and community level.
2. The Triple Challenge has already, and will continue to have, **major, multifaceted and inequitable impacts** on population groups across Wales which has highlighted the need to address this issue and explore it in more depth (See Section 3).
3. The Triple Challenge has impacted negatively on food security for a wide range of population groups including those on low incomes, women, families with children, farmers, fishers and those who live in areas of deprivation (See Section 3).
4. Wales does not have its own separate food system (See Section 2). It is shaped by wider international, national and local policies such as trade, the economy and environmental sustainability which interact in a complex and multidimensional way and present a series of 'unknown unknowns' for policy makers and health and well-being.
5. There are a number of opportunities to enhance the food security of the Welsh population in the short and long term such as the proposed Agriculture (Wales) Bill and through strategies such as 'Healthy Weight, Healthy Wales' (See Section 3).
6. There have been a range of policy responses and mitigations for the Triple Challenge to date including for food security (See Section 4). These need to be constructed in an integrated way with cross sector involvement, as actions intended to have positive impacts for one challenge could also have negative unintended impacts for health and well-being.
7. Using the multifocal lens of the Triple Challenge, and tools such as Health Impact Assessment, can enable decision and policy makers to better understand the cumulative impacts on a range of issues relating to the key determinants of health and population groups (See Section 3).

Population groups affected:

The whole population is affected by food security. Vulnerable population groups that are particularly negatively or positively affected include: those on low incomes, age related groups (e.g. children and older people), lone parents, families with children, agricultural and fishing related occupations and workers in sectors exposed to Brexit, COVID-19 and climate change.

Potential Actions

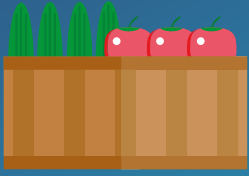
There are a wide range of actions which policy and decision makers can take to enable health and well-being in relation to food security in Wales. These actions relate to the following three dimensions of food security:

- Food Availability (including production, supply, food systems and trade and trade agreements).
 - Food Accessibility (including food as a human right and cost of food and economic factors).
 - Food Utilisation (including individual food behaviour) (See Section 5).
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SETTING THE SCENE

The United Kingdom is:



64%
self-sufficient
in all foods

(Department for Environment, Food and Rural Affairs et al, 2020).



77%
self-sufficient in
'indigenous type food'

(Department for Environment, Food and Rural Affairs et al, 2020).



26%

of food consumed in the UK in
2020 was imported from the EU
(Chatham House, 2020).



**WAS UP
89-175%**

Food bank dependence
year-on-year in April 2020 but had
already been increasing for the past
five years *(Chatham House, 2020).*

In Wales:



£0.529bn
food exports in
Wales in 2017



21%
increase from 2016
*(Food and Drink
Wales, 2019)*



In 2017, 217,000 of people were
employed across all food and drink
supply chain sectors (down from
232,000 in 2016)

In 2019, the food sector
represented 6% of all employment.
(Food and Drink Wales, 2019)

In 2021:

17%
WERE
CLASSIFIED AS
FOOD INSECURE
(FAO 2021)

83%
OF INDIVIDUALS
IN WALES WERE
CLASSIFIED AS
FOOD SECURE.
(FAO 2021)



Three in ten children were living in
poverty in 2020. 13% of adults in Wales
were classified as materially deprived
(that is, not able to afford basic things
like having a damp-free home)

(Joseph Rowntree Foundation, 2020).

In the United Kingdom:

- **17%** said their household had worried in the last 12 months about running out of food before there was money to buy more
- **13%** said that in the last 12 months they had experienced food running out when they did not have money to get more
- **10%** said that their household had experienced not being able to afford to eat balanced meals
- **44%** said they had made at least one change in their buying or eating arrangements in the last 12 months for financial reasons
- The Independent Food Aid Network, reported a **62% increase** in emergency food parcel distribution in October 2020 compared with October 2019 (*Food Standards Agency, 2020*)

Population Groups Affected by Food Insecurity



WOMEN



OLDER PEOPLE



LOW INCOMES



CHILDREN AND YOUNG PEOPLE



RURAL COMMUNITIES

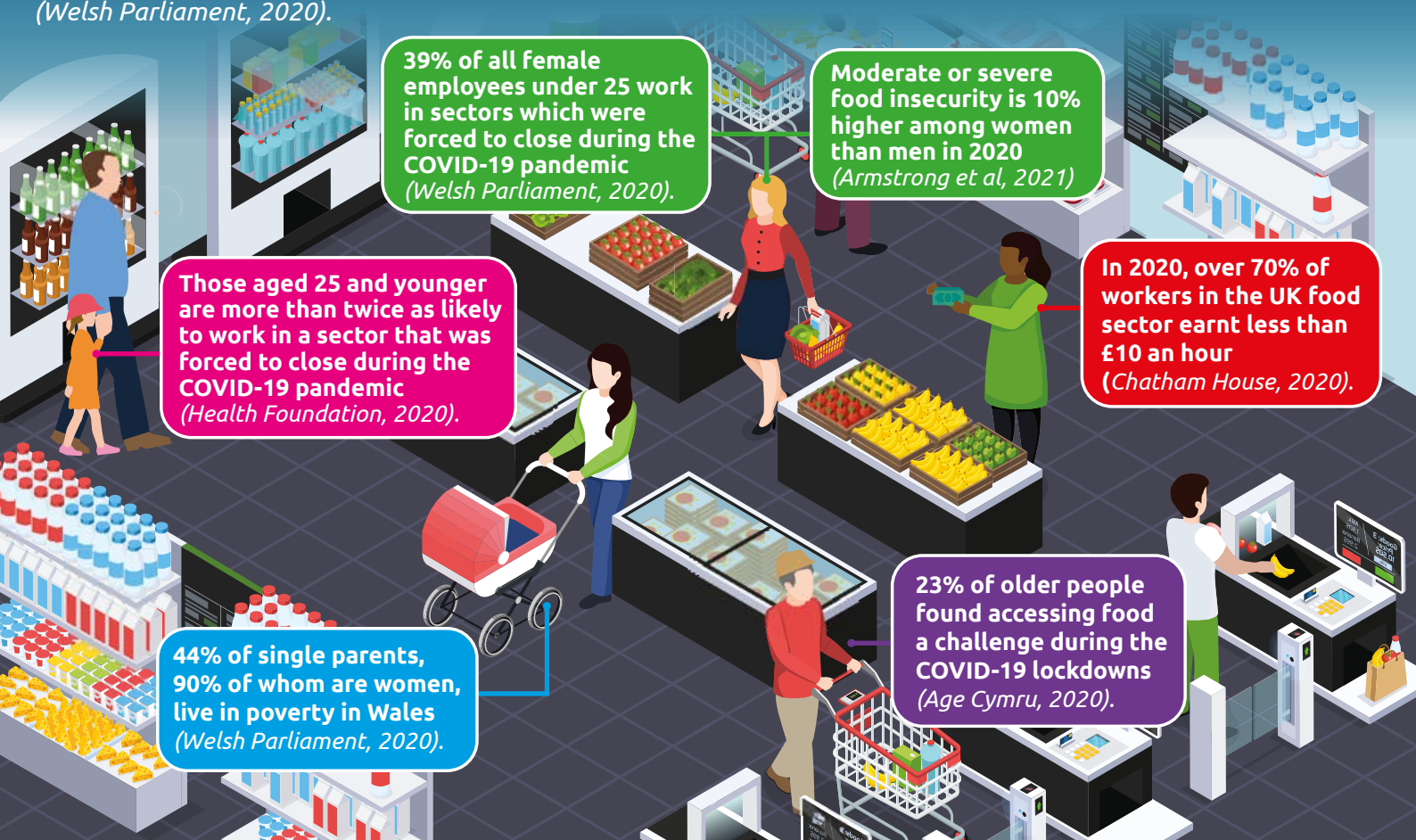


LONE PARENT FAMILIES

People on low incomes – During the COVID-19 pandemic, almost half of the lowest earners in Wales were employed in 'shut down' sectors. These include young people, women, and people of Bangladeshi, Black Caribbean and Pakistani ethnicity. (*Welsh Parliament, 2020*).

Farmers or agriculture workers - the agriculture sector had 78,000 workers in 2017 if all farmers and agricultural workers are included. The sector represents 6% of all employment in Wales (*Food and Drink Wales, 2019*).

Migrants in the UK are more likely to be working in industries such as accommodation and food services. They are also more likely to be self-employed, in temporary work, and less likely to own their own homes (*Welsh Parliament, 2020*).



Overview of the Triple Challenge

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The global Coronavirus SAR-COV-02 (COVID-19) pandemic has revealed the complex, interwoven relationships between health, well-being, inequalities, the economy, the environment, and society as a whole (Dyakova et al., 2021). In doing so, it has created new inequalities, but also exacerbated existing health inequalities. Events such as the United Kingdom's (UK) withdrawal from the European Union (EU) ('Brexit') and climate change are also having a cumulative impact on the Welsh population's health and well-being.

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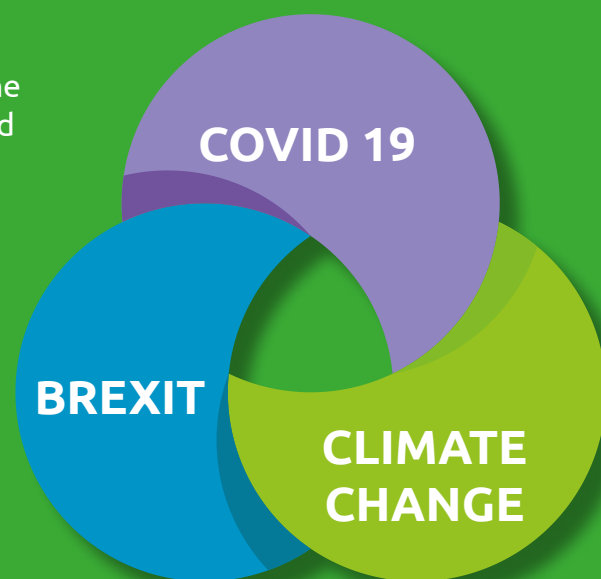
The UK's recovery from the pandemic needs to consider, and interact seamlessly, with the UK's exit from the EU. It must also consider how to develop national and local resilience and provide support to many vulnerable industries and communities which are also facing the increasing challenge of climate change and extreme weather events. Wales as a nation has to grapple with the multifaceted and evolutionary nature of Brexit, COVID-19 and climate change not only in isolation, but as a cumulative whole. This is further complicated by the fact that these are not static events and will ebb and flow over the short, medium and long term. In short, Wales and the UK are facing an unprecedented '**Triple Challenge**' that must be tackled in a coordinated fashion – one which considers the future of the planet and its population and identifies solutions to the well-being and economic challenges which Brexit and COVID-19 have brought sharply into focus.

In 2019, the Wales Health Impact Assessment Support Unit (WHIASU), World Health Organization Collaborating Centre (WHO CC) on 'Investment for Health and Well-being' at Public Health Wales carried out a Health Impact Assessment (HIA) on the public health implications of Brexit to better understand the wide health and equity implications of these separate challenges (Green et al., 2019). HIA is a systematic and flexible evidence based process which identifies the positive and negative impacts of policies, plans and events such as Brexit on the health and well-being of a population. It also identifies opportunities for health gain and unintended negative impacts which require mitigation. It is equity focused and as part of the process highlights the distinct impacts for particularly affected vulnerable population groups for example, children or those on low incomes (WHIASU, 2012).

Using the same multi-focal lens that covers immediate, medium and long-term perspectives the HIA approach was also applied to direct aspects of the COVID-19 pandemic for example, the 'Staying at Home and Social Distancing Policy' (commonly referred to as 'lockdown') and home and agile working (Green et al., 2020a; Green et al., 2020b). Furthermore, a HIA is currently being finalised which assesses the health and well-being impacts of climate change in Wales (Green et al., 2021 forthcoming). The work to date has already demonstrated many commonalities and synergies in these three challenges in terms of impact across health inequalities, and the wider determinants of health.

Triple Challenge Spotlight Papers:

This paper is one of a series of short reports which aim to provide a high-level, strategic overview of the complex interactions between Brexit, COVID-19 and climate change (hereafter referred to as the 'Triple Challenge') and key determinants of health, well-being and equity. Using a range of evidence, each paper focuses on a key determinant of health or specific population group and aims to support strategic and organisational stakeholders to better understand the Triple Challenge facing Wales both now, and in the future. It provides decision and policy makers, organisations and communities with suggestions about how these impacts could be addressed and identifies the potential actions that they can take.



This Spotlight Paper focuses on the issue of **Food Security** and **health, well-being and equity** in the context of the Triple Challenge in Wales.

Aim:

- Enable a better understanding of the potential positive health, well-being and equity impacts or opportunities and negative impacts of the Triple Challenge on food security for the population of Wales.
- Provide an overview of the population groups in Wales who will be primarily affected by the Triple Challenge in relation to food security.
- Analyse the current and future Welsh, UK and international policy context, including consideration of policy levers.
- Articulate potential actions for the future for a wide range of stakeholders to consider and implement including potential mitigation for any negative or unintended negative impacts and how to maximise opportunities.

Methodology:

Building on evidence and findings from the previous HIAs carried out, rapid evidence searches of both the academic and grey literature were undertaken, alongside a policy synthesis of both the policy context and policy response. In addition, interviews were carried out with key stakeholders within Wales. More information on the Search Methodology used for the evidence search can be found in Annex A.

Audience:

This paper aims to inform policy and decision makers across a wide range of sectors and settings including public health and health care services and systems, environment and sustainable development, spatial planning and strategic organisational stakeholders including public bodies and the third sector.

Acknowledgements:

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1 WHAT IS FOOD SECURITY?

Food is a basic need and an essential ingredient for a good life (Oxfam Cymru, 2021). Food security is a dynamic measure of poverty and an important key determinant of health, well-being and equity at both a national population level but also at an individual and community level. (Box 1; World Health Organization, 2019).

Box 1: Definition of Food Security

Food security has been defined as being “...when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 1996).

The House of Commons Library (2020) consider that food security ‘includes practically everything about how people access food; from global availability, to the resilience of the supply chain and household spending’.

There are three pillars of food security: availability, access and utilisation (Aborisade, 2014). These three dimensions summarise the myriad of issues involved in creating food insecurity and can be used to identify the areas for action. The need for stability across all three is also required.

2 WHY IS FOOD SECURITY IMPORTANT FOR HEALTH, WELL-BEING AND EQUITY IN WALES?

The links between food security (and insecurity) and health, well-being and equity are well established (Jaron and Galal, 2009; Leddy et al., 2020). Different groups within the population are more vulnerable to experiencing food insecurity than others, with evidence indicating that the following characteristics are at the highest risk of food insecurity (Loopstra, Reeves and Tarasuk, 2019; Sosenko et al., 2019, Food and Agriculture Organisation, 2021):

- Women
- Younger age groups
- Non-white identity
- Households with children
- Low levels of education
- Unemployed and low income groups
- Life-limiting health problems or disability
- Lone parents/single parent households

Evidence suggests that if basic needs aren't met, resulting food insecurity can have major impacts on physical and mental, and social and emotional well-being (Leddy et al., 2020; Lee et al., 2012). Poor diet and nutrition arising from food insecurity are associated with a range of adverse health outcomes, including obesity and related metabolic conditions including Type 2 diabetes and cardiovascular diseases, as well as a range of cancers and liver disease (National Institute for Health Research (NIHR), 2020). Poor access to food, and in particular healthy food, contributes to malnutrition especially for population groups such as children in low-income households or deprived areas (Gundersen and Kreider, 2009; Lee et al., 2012). Obesity is also an issue for lower-income households as more nutritious food tends to be higher priced and as such families opt for less nutritious energy-dense but cheaper alternatives (FAO, 2018).

Food insecurity can also compromise individuals' ability to manage their health conditions, with concern about a rise in nutritional deficiency and malnutrition in the UK - with food bank users particularly at risk (Loopstra and Lalor, 2017). Food insecurity can have negative impacts for the general population's diet and health with, for example, fruit and vegetables often being more expensive than cheaper foodstuffs which are energy and calorie dense, with the consequence of an unhealthier diet as people living with food insecurity are less likely to eat fruit and vegetables regularly (FAO, 2018). In addition, food insecurity is linked with higher rates of stress and poor mental health (Yau, Adams and White, 2020). There is also evidence to suggest that food insecurity negatively impacts upon children's development (NIHR, 2020).

Living in poverty and on a low income are both contributing factors to food security (Gundersen and Kreider, 2009). Box 2 highlights some key statistics in relation to food security in Wales.

Box 2: Key statistics

Prior to the COVID-19 pandemic, 700,000 people in Wales were living in poverty, which included three in ten children (Joseph Rowntree Foundation, 2020).

In 2020, 13% of adults in Wales were classified as materially deprived (that is, not able to afford basic things like having a damp-free home) (National Survey for Wales, 2020). High levels of relative deprivation exist within the cities and valleys of south Wales and coastal and border towns in north Wales (Welsh Index of Multiple Deprivation, 2019).

In terms of public health and obesity, overall, 61% of people in Wales are classified as overweight or obese; 25% were obese. 67% of men were overweight or obese and 55% of women (National Survey for Wales, 2020). In total, 25% ate at least the guideline amount of five portions of fruit or vegetables the previous day. Those who are defined as materially deprived were less likely to do this (Statistics for Wales, 2020).

In 2019, 10% of households in Wales reported living with low or very low food security (Food Standards Agency, 2019).

Additionally, in 2019, 17% of the Welsh population stated their household had worried in the last 12 months about running out of food before there was money to buy more. Similar proportions said that in the last 12 months they had experienced food running out when they did not have money to obtain more (13%) or that their household had experienced not being able to afford to eat balanced meals (10%). 44% said they had made at least one change in their buying or eating arrangements in the last 12 months for financial reasons (Food Standards Agency, 2019).

2.1 POLICY CONTEXT

International

International food policy measures have consequential impacts on domestic food security in Wales and the UK, especially given the UK's reliance on imports. According to the Global Food Security Index 2020 (The Economist Intelligence Unit and Corteva, 2021), the UK ranks sixth highest for food security, with its rankings based upon affordability, availability, natural resources, and the quality and safety of food (McCarthy, 2021).

The United Nations Sustainable Development Goals (UN SDGs) feature goals that are connected to the issue of food security, most notably Goal 2 (Zero Hunger), Goal 3 (Good Health and Well-being), Goal 9 (Industry, Innovation and Infrastructure) and Goal 12 (Responsible Consumption and Production) (United Nations, 2020b; United Nations, 2021a; United Nations, 2021b; United Nations, 2021c). Goal 2 aims for zero hunger, and the UN reflects upon the global concern about acute hunger, highlighting that COVID-19 may double the number of people suffering (United Nations, 2020a). In addition, the world is not on track to achieve its aim of Zero Hunger by 2030, with the number surpassing 840 million by 2030 (FAO, 2020). The Food and Agriculture Organisation has stated in its recent review of 'Food security and nutrition across the world' that the pandemic has now made this significantly more challenging (FAO, 2021).

United Kingdom

The COVID-19 pandemic, the consequences of Brexit and international trade negotiations, and a new National Food Strategy Independent Review for England, has triggered greater Parliamentary scrutiny on food security and its precarious nature for some in England and the UK. Trade and negotiations for Free Trade Agreements (FTAs) are a reserved matter for the UK Government and are not devolved to Wales.

The UK Government's Department for Environment, Food and Rural Affairs (DEFRA) published Part One of England's National Food Strategy Independent Review in July 2020 (Dimbleby, 2020), which notes the intersectionality of COVID-19, climate change and trade. It reflects upon how the COVID-19 pandemic raised attention to the subject, considering that the food system didn't break down because the global pandemic was a 'succession of very local, very severe restrictions on the demand side of the economy', indicating that they believe that any future pandemics may have more serious repercussions for domestic food security in the UK. Part Two of the Strategy, published in July 2021, features recommendations for government including introducing a sugar and salt reformulation tax and then using some of the revenue to help get fresh fruit and veg to low-income families thus reducing the impact on the NHS; to reduce diet-related inequality for example by extending eligibility of free school meals and funding the Holiday Activities and Food programme and maximising land use by guaranteeing the budget for agricultural payments until at least 2029 to help farmers Brexit transition. It also highlights the need to create a long term shift in the UK's food culture by investing money to create a better food system and monitoring Food System Data programme (National Food Strategy (2021)). Whilst this strategy is focused on England, the interconnectedness of the UK food system means that the strategy will be influential for Wales too.

International Trade

According to the FAO, one in every five calories a person eats has crossed at least one international border (FAO, 2020). Brexit has enabled the UK to develop fully independent international trade policies for the first time in nearly 50 years. This is a non-devolved area of policy, and as such is an area where Welsh Government must influence the debate at a UK-level and policy makers and health and trade negotiators.

Throughout the Brexit debate, future food policy formed a cornerstone of debates about whether the UK would become more or less regulated once outside of the EU, with some contention about whether specific food products would be imported through future trade policies (Green et al., 2019; Faculty of Public Health, 2019). These debates are not inherently connected to food security but as a pathway to health and well-being via trade agreements, it is noted that the lower the tariffs on a product, the lower the price charged to consumers should be. As the UK is reliant on importing some essential food types, future trade policy can have significant impacts including for household food security and health (Green et al., 2019; Faculty of Public Health, 2019).

England's National Food Strategy reiterates that in future trade negotiations there will be no compromise on food standards (Dimbleby, 2020; National Food Strategy, 2021). This statement has been present within all of the Department for International Trade's negotiating positions to date, for instance with New Zealand and Japan (Department for International Trade 2020; Department for International Trade 2020a). The impact assessment for the UK-Japan trade agreement (Department for International Trade 2021) states that the Government 'stands firm in trade negotiations to ensure any future trade deals live up to the values of farmers and consumers across the UK.'

Recommendations to the UK Government regarding trade made within the National Food Strategy include:

- A call for tariffs in new Free Trade Agreements to only be cut if the UK's 'core standards' are met, including environmental and climate protections;
- Commissioning an independent report into all proposed FTAs, to assess impacts on economic productivity, food safety, public health, the environment and climate change, society and labour, human rights and animal welfare.

The Trade and Agriculture Commission (TAC), an independent body advising the UK Government, present a vision of food which is 'safe, healthy, affordable, produced in a way which does not harm the planet, respects the dignity of animals and provides proper reward for those involved' (Department for International Trade 2021a). The TAC recommends six principles that the UK should aim for in trade negotiations. These are specified in Box 3.

Box 3: Six principles recommended by the Trade and Agriculture Commission:

- Promoting trade liberalisation, to positively influence innovation and productivity, and price and choice for consumers
- Prioritising a thriving domestic agri-food sector supported by domestic and trade policies
- Ensuring that agri-food imports meet relevant UK/international standards on food safety and biosecurity
- Matching tariff-free market access to relevant climate, environment, animal welfare and ethical standards
- Leading change to the international framework of rules on trade and relevant standards, to address the global challenges of climate change and environmental degradation
- Supporting developing countries to access the benefits of global trade

Whilst these principles do not explicitly consider food security, it is clear that there could be some positive impacts on food security in Wales and the UK if implemented, for example, reduced costs to consumers. From a health and well-being perspective, it remains that lower priced food must maintain high food quality standards and nutritional content.

Amongst its 22 recommendations, the Trade and Agriculture Commission (TAC) report recommends that the UK Government develops a strategy for agri-food trade and aligns policies on trade, aid and climate change – this latter recommendation is seen as a mechanism to ‘support our food security goals’. Further recommendations call for a strengthening of impact assessments of trade policies through improved qualitative assessments for health, welfare, biosecurity and the environment.

Wales

Wales does not have its own separate, explicit ‘food system’ but is part of an overall complex and enmeshed UK internal and international food system which is influenced by trade, production, policies, behaviours and events such as Brexit or the COVID-19 pandemic. A greater focus on establishing a more sustainable food system in Wales may emerge in the near future, owing to the recent announcement of the selection of the proposed Food (Wales) Bill in the first Member Bill Ballot in the Sixth Senedd (Welsh Parliament, 2021).

Food production and food supply

The latest Welsh Government action plan for the food and drink industry ran from 2014-2020, and briefly considered food security (Welsh Government, 2014).

There is a clear link in current policy documents between food production and climate change and the impact of food on public health. This is observed in policy documents such as Food for Wales, Food from Wales 2010-2020 (Welsh Assembly Government, 2010) and Towards Sustainable Growth: An Action Plan for the Food and Drink Industry 2014-2020 (Welsh Government, 2014). There has also been a connection between food security and environmental sustainability, for example the Towards Sustainable Growth action plan emphasised the need for balance between *‘feeding our own population, alongside export ambitions and all within environmental limits’*, stating that *‘if the environment is not sustained then food security will not be possible in the longer term’* (Welsh Government, 2014).

Amongst other calls, the plan highlighted the need for the food chain to deliver a low carbon pathway, resource efficiency and investment in natural capital (Welsh Government, 2014). Whilst some of these documents have expired, the recently proposed Agriculture (Wales) Bill White Paper (Welsh Government, 2021d) promotes sustainable land management and is an opportunity for Wales to develop and promote future policies to support farmers and others to produce food in a sustainable way in a post Brexit world. The Welsh Government have also outlined its international trade position (Welsh Government, 2021a) and in 2020 published Healthy Weight, Healthy Wales which focuses on reducing levels of obesity and promoting healthier food choices, diets and nutrition in Wales (Welsh Government, 2020e).

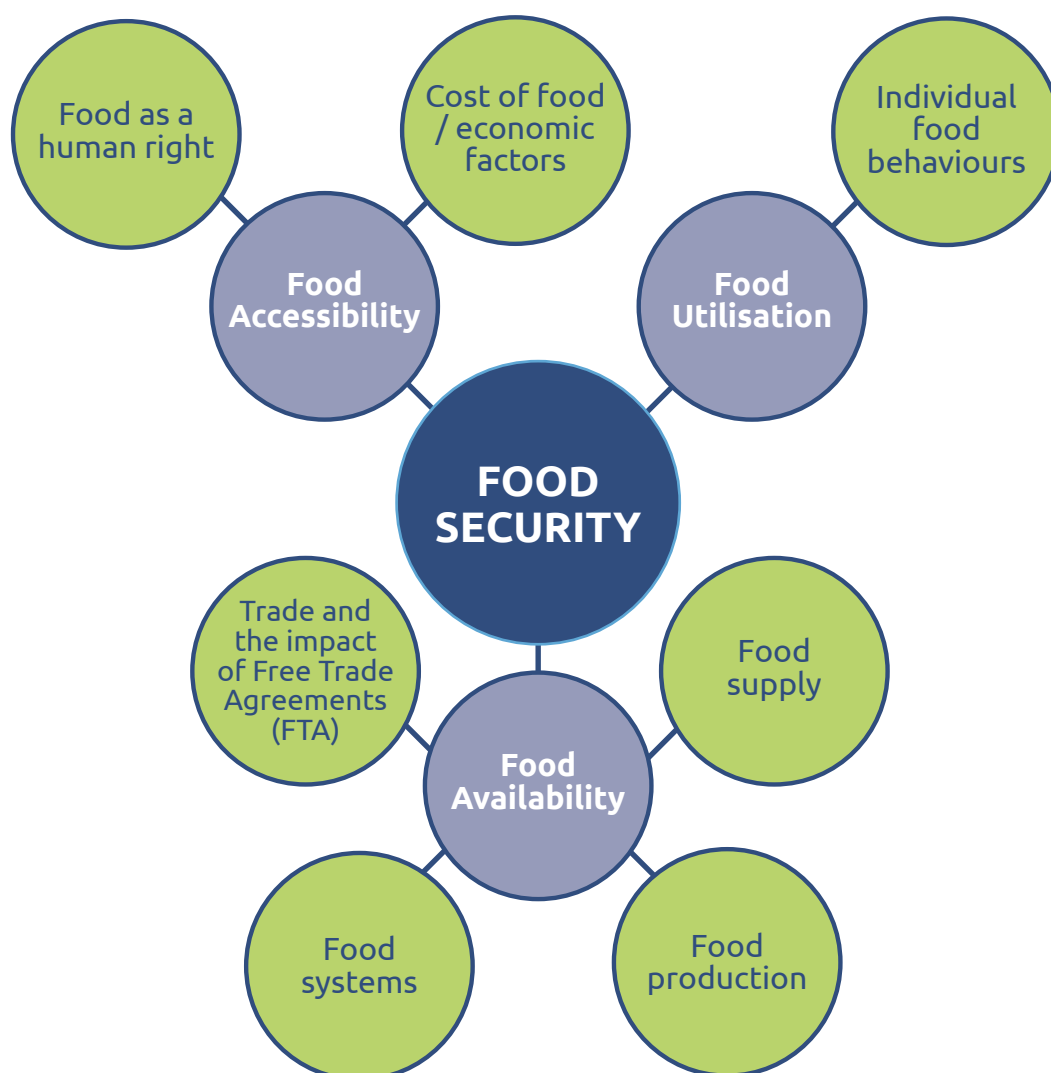
3 HEALTH, WELL-BEING AND EQUITY IMPACT OF THE TRIPLE CHALLENGE ON FOOD SECURITY

Evidence identified in the Brexit, COVID-19 and climate change HIAs and their analysis identified that food security in Wales has been **majorly impacted by the Triple Challenge**. This paper discusses the potential (and where observed actual) **direct, major, cumulative impact (positive, negative and opportunities) of the Triple Challenge on food security across a range of determinants and vulnerable population groups only**. There are other food security and health related issues for example, food fraud which individual HIAs highlighted but these are not included unless they are affected by all three challenges. The impact definitions for example, positive or negative in Annex A: Methodology.

Broken down into the three core pillars of food security (availability, access and utilisation) which are supported by political, economic and environmental stability, evidence has indicated the impacts of the Triple Challenge (Figure 1) across a range of food determinants and population groups (Box 4).

This section provides an understanding of the individual and cumulative direct health and well-being impacts and the groups potentially affected.

Figure 1: Summary of key determinants and pathways



Box 4: Population groups affected

- Whole population
- Age related groups including children, young people and older people
- Women
- Families and particularly lone parents who are women with children
- Those who were already critically exposed before COVID-19 (low income, unemployed, single parent families, adults with disabilities, Black, Asian and minority ethnic groups)
- Shielding individuals with pre-existing health conditions and those classified as clinically vulnerable
- Individuals having to self-isolate
- Low income groups (including disabled people, unemployed, younger age groups, Black, Asian and minority ethnic groups and households with children)
- Those who are unemployed
- People living in isolated / over-populated areas, including families in rural areas (related to occupation)
- Adults with disabilities
- Those living in deprived communities
- Farmers
- Fishers
- Workers in sectors exposed to Brexit, COVID-19 control measures and climate change (retail, hospitality, food manufacturing plants, large employers who may relocate from Wales)
- Seasonal agricultural workforce, for example pickers and packers
- Those employed in the food industry (rural youth, migrant and seasonal workers, rural poor)



3.1 FOOD AVAILABILITY

Food Supply

Positively impacted by:			Negatively impacted by:		
Brexit	COVID-19	Climate Change	Brexit	COVID-19	Climate Change
✓	✓	✓	✓	✓	✓
Population Groups affected: <ul style="list-style-type: none">• Whole population• Farmers• Low income groups					

Positive impacts

Positively, there has been little evidence of food supply chains being dramatically affected by the Triple Challenge to date, resulting in the continued wide availability of food. The outset of the COVID-19 pandemic highlighted the effects that consumer behaviour can have on food supply, with panic buying and stockpiling pushing the food supplies in the UK towards an unstable situation (Ranta and Mulrooney, 2021; Yuen et al., 2020; Green et al., 2020a). However, once panic buying dissipated, supply chains remained resilient thereafter (Matthews, 2021; Green et al., 2020a; Parliamentary Office of Science and Technology (POST), 2020). Brexit has not had the major anticipated impact on supply chains predicted (Deloitte, 2021; Hallam, 2020) although some evidence acknowledges it as an issue, particularly at ports with requirements for new paperwork and COVID-19 containment precautions (Canty, 2021). Extreme weather events in early 2020 and 2021 did not disrupt supply chains.

The present situation provides an opportunity for Wales and the UK to rethink food policy and supply including looking at ways which will be good for environmental sustainability, for example, shorter supply chains could mean less packaging, processing and reduced food miles and could strengthen the importance of Welsh farmers in the UK food system (Petetin, 2020). Evidence suggests this may have a knock-on impact on diet and health behaviours as people adapt to buying more seasonal and locally produced food (OECD, 2020; Davis, Downs and Gephart, 2021).

Negative impacts

Although food supply has been maintained, the Triple Challenge has also had some negative effects, creating hurdles for food supply to overcome. During the COVID-19 pandemic, constraints on the transport of particular types of food to market has restricted supply (UN, 2020a). For example, airfreighted fruit and vegetables have experienced disruption as a combination of the EU withdrawal and the COVID-19 pandemic and has been exacerbated by a shortage of HGV drivers (Chatham House, 2020; Canty, 2021). Brexit planning has indicated that any food distribution and disruption in food supply chains could have a negative impact on vulnerable groups including those who are on a low income (Shanks et al., 2020).

Alongside the COVID-19 pandemic and Brexit, climate change has highlighted additional challenges for food supply in both the short and long term (Carey, Murphy and Alexandra,

2020). The Climate Change Risk Assessment Evidence Report for the UK assessed that extreme weather events have the potential to affect global food production, trade and supply chains, making prices more volatile and / or altering productivity in the long-term (UK Climate Change Committee, 2017). This was reinforced by the 2021 Food Strategy review in England which highlights that the next major shock to the UK's food supply will be caused by climate change (National Food Strategy, 2021).

Although managed effectively, initial panic buying witnessed in the first wave of the pandemic has exposed the UK's over reliance of 'just in time' deliveries, strategies and imported food and other products (Carey, Murphy and Alexandra 2020; Ranta and Mulrooney, 2021). Combined with Brexit and the potential impact of climate change, the importance of shorter supply chains to maintain food security has been revealed by the pandemic which also has the ability to disrupt global supply chains. For example, cereal exporting countries could reduce their level of exports, or be affected by lack of harvesters and this could cause a crisis in countries heavily reliant on this produce and shortages in others such as the UK (Mottaleb, Mainuddin and Sonobe, 2020).

Trade and the impact of Free Trade Agreements (FTAs)

Positively impacted by:			Negatively impacted by:		
Brexit	COVID-19	Climate Change	Brexit	COVID-19	Climate Change
✓	✓	✓	✓	✓	✓
Population Groups affected: <ul style="list-style-type: none"> • Whole population • Families on low incomes • Farmers • Fishers 					

Positive impacts

The Triple Challenge provides an opportunity to rethink, amend, and enforce current Trade and Free Trade Agreements (FTAs) which could have a positive impact on food security. UK trade ambitions state that the UK will not diminish food related or environmental regulations and maintain supply chains. This includes the recently signed UK-EU Trade and Cooperation Agreement (TCA) (Department for International Trade, 2021b). Whilst the Welsh Food Strategy expired in 2020, the new English National Food Strategy calls for no compromise on food standards and could be influential for all UK nations with trade policy making reserved to Westminster Government (Dimbleby, 2020). In Wales, Healthy Weight, Healthy Wales (the Welsh Obesity Strategy) and supplementary policies feature strong food regulation and nutritional standards as actions to implement (Welsh Government, 2021e).

If Trade Tariff Barriers (TTB) come into force they could drive imported produce costs up as a result of Brexit, industries such as agriculture may benefit as the Welsh population switches to more locally grown produce (Levell et al., 2017; Levell and Keiller, 2018). However, the uncertainty around these currently make this one of several 'unknown unknowns' which can make food security planning and policy challenging, particularly as trade is not a devolved matter for the Welsh Government.

Negative impacts

Negatively, evidence highlights that future FTAs as a result of Brexit could allow more imported cheap and genetically modified produce into the UK (Shanks et al., 2020) or lead to changes in current strict legislation around this issue (Law Library of Congress, 2014). This could potentially lead to less healthy options entering the UK market at a cheaper cost. This would have negative impacts on health and well-being, particularly for families on lower incomes and at risk of food insecurity (Friel, Gleeson, Thow et al., 2013).

In a post Brexit future, some EU protections will no longer apply to food imports, which may result in the importation of lower quality food. Whilst guarantees are currently in place presently around standards this may change with changes in future government trade, economic or environmental policy (The Affordable Food Deal, 2020).

Food Production

Positively impacted by:			Negatively impacted by:		
Brexit	COVID-19	Climate Change	Brexit	COVID-19	Climate Change
✓	✓	✓	✓	✓	✓
Population Groups affected: <ul style="list-style-type: none">• Farmers• Seasonal agricultural workforce i.e. pickers• Fishers• Families in rural areas (related to occupation)• Workers in manufacturing plants• Pregnant women• Older people• Children					

Positive impacts

The Triple Challenge could provide an opening to consider in more depth how food is grown in Wales, and more widely in the UK, with opportunities to increase food production and be less reliant on imports (Green et al., 2021 forthcoming). Welsh Government have proposed a new Agriculture (Wales) Bill and it outlines a 'green shoots' approach for sustainable food production working with figures from the food and drink industry in Wales (Welsh Government, 2021a).

A warmer Welsh climate in the future could positively lead to diversity in the types of food produced (Green et al, 2021 forthcoming) with longer, milder growing seasons which could also increase yield (An et al., 2018; Mbow and Rosenzweig, 2019; Molotoks, Smith and Dawson, 2020). Climate change could also facilitate the use, and maximisation of, knowledge and expertise which Welsh growers and professions such as farmers and fishers already have in respect to preserving resources and ecosystems (Savo et al., 2017).

Local food production and growing can provide positive social, health and well-being benefits for example, reduced isolation, improved mental health (Green et al., 2021 forthcoming; Sustain, 2021). It has been highlighted that community gardens can act as 'informal food

banks' for fresh produce and that this could help to minimise food insecurity and poverty, and could provide people with essential gardening skills (Sustain, 2021). There is an opportunity for Wales to change population patterns of behaviour by becoming more self-sustainable and grow its own food and making better use of local community services and assets. The land within some communities in Wales has a huge potential for the growth of local fruit and vegetables and can encourage the production of not only local produce but local foundational economies (Social Farms and Gardens, 2021; Welsh Government, 2021c).

Additionally, the reduction in imports provides an opportunity to be more self-sufficient, diversify and grow and retail produce locally which can bring benefits such as more financial security for farmers and more supply chains to outdoor markets and local retailers (Mora et al., 2020; Green et al., 2021 forthcoming). However, caution must be noted – whilst it is true that there are positive benefits to increasing local produce and sales - it must be recognised that the amount of food produced in Wales is small compared to the produce needed to sustain the population (The Grocer, 2020).

In relation to the COVID-19 pandemic, restrictions on movement of people, combined with Brexit immigration regulations and changes in climate patterns could provide an opportunity to mobilise a new 'land army' of seasonal produce pickers in the UK post Brexit and in the aftermath of the pandemic (Kaplan, 2020). The pandemic could also provide an opportunity for increased standards for food production across the world for example, more stringent hygiene rules for the workforce and production and more frequent deep cleaning and social distancing (Petetin, 2020).

Negative impacts

Climate change and extreme weather events across the world are negatively compounding issues around food production in exporter nations and has led to reduced yields in some major crops across the world (Mbow and Rosenzweig, 2019) thus potentially affecting the UK and the food system in Wales. Such an example is fisheries which can also be affected by overfishing (sharing the same fishing areas with EU and other states), increased pollution and coastal degradation (Savo et al., 2017).

Those on low incomes are more at risk of food insecurity from the Triple Challenge as prices increase due to shortages with an inability to have the ability to bulk buy or stockpile through lack of disposable income (Green et al., 2020a; Mbow and Rosenzweig, 2019). Climate change may increase the risk of diseases, impact on nutritional quality of food and crops and disrupt fair and just mechanisms for the production and provision of food (Hoegh-Guldberg et al., 2018; Veenema et al., 2017; Pozarny, 2016; Mbow and Rosenzweig, 2019). Climate related factors may impact seagrass meadows, which are prevalent in Wales, and fish/animal ecosystems. Impacts on biodiversity may have further effects on the ecosystem and therefore, the human determinants of health (Li, 2017; Hancock, Spady and Soskolne, 2015).

There has been a major negative impact of the COVID-19 pandemic and Brexit on the seasonal migrant workforce (Green et al., 2019; Mitaritonna and Ragot, 2020; National Farmers Union, 2020) due to migration regulation and visa changes, quarantine, and the potential for increased incidence and risk of COVID-19 infection. Lockdown restrictions have negatively impacted food production across the world through workforce self-isolation, worker shortages, increased hygiene regulations and social distancing (Petetin, 2020).

There has been reduced production at plants across the world (including in Wales) due to virus transmission in cold food production plants (Chatham House, 2020; Welsh Government, 2020e). National and international travel restrictions have also impacted planting seasons for

example, delaying the growing and harvesting of produce (Petetin, 2020; Chatham House, 2020). Decreased income from spoiled crops and unpicked produce due to global and local climate change events and Brexit immigration changes has compounded these effects for producers and their workforce (Petetin, 2020; Chatham House, 2020).

Agriculture alone produces 10% of UK greenhouse gases despite only contributing less than 1% of our GDP (Dimbleby, 2021). It has been highlighted that increased dairy production (a main produce of Wales and the UK) contributes to increased climate change which then impacts health and well-being via other determinants of health for example, via extreme weather events such as the flooding (Grout et al., 2020) which occurred in Wales in 2020 and 2021. Increased regularity of such events has implications for the food system in Wales.

There is also an increased risk to farmers and fishers from climate change and effect on extreme weather events for example, more storms and increased flooding (Savo et al., 2017). Changes to UK rainfall patterns and more frequent extreme temperatures and environmental changes can lead to an overall negative impact on food production in the UK (Environmental Audit Committee, 2019). Conversely water scarcity can have an impact on the loss of crops and there have been extended periods of drought in Wales which could affect industry (agriculture is a water intensive industry) (James, 2020; UK Climate Change Committee, 2017; Savo et al., 2017) and households.

Changes in production, and through climate change, has also been identified as affecting the nutritional content and quality of crops and food (Hoegh-Guldberg et al., 2018; Mbow and Rosenzweig, 2019). In terms of groups affected by malnutrition those most likely to be affected include those on low incomes, pregnant women, older people and children (UN, 2018; DeFries et al., 2019).

Finally, in relation to food security and employment, there is the important associated issue of job security for those who are employed in the food industry and those in supporting sectors such as hospitality and seasonal produce pickers and workers (UN, 2020a; Welsh Parliament, 2020).



Food Systems

Positively impacted by:			Negatively impacted by:		
Brexit	COVID-19	Climate Change	Brexit	COVID-19	Climate Change
✓	✓	✓	✓	✓	✓
Population Groups affected: <ul style="list-style-type: none"> • Whole population • Farmers • Fishers 					

Positive impacts

Industrialised food systems across the world have remained resilient in the face of the pandemic despite challenges (Matthews, 2021). The aftermath of the pandemic and Brexit has been highlighted as providing a window of opportunity to build a democratic food model which provides citizens with the opportunity to actively participate in how sustainable food systems are constructed and delivered (Petetin, 2020). This can provide an opportunity for different perspectives about how food should be produced and consumed at a national and local level to be captured (Petetin, 2020).

Diversity in the way which food is produced for the population, and income generated by different methods by farmers and other producers, could ensure food and nutritional security and it could also provide farmers and fishers with more financial security once financial assistance / subsidies from the EU for example has ceased (Mora et al., 2020; Shanks et al., 2020). Additionally, the Food Standards Agency (FSA) have stated that food standards will not be diminished as a result of changes in the food system due to Brexit (Environmental Audit Committee, 2019) and to date this remains so.

Food security and its precariousness has been recognised as a key issue by the Future Generations Commissioner for Wales and the 2020 Future Commissioner's report made a policy recommendation to develop a food system strategy for Wales which links all elements of the system from '*farm to fork*' (Welsh Government, 2020d). This was also linked to the concept of a sustainable environmental focussed Green Recovery budget in a post pandemic, post Brexit world (Pyke, 2021). The consultation on the new Welsh Agriculture (Wales) Bill (Welsh Government, 2021d) could provide opportunities to do this.

Internationally, food system security is similarly recognised as a critical issue and a high level UN Food Systems Summit will be held in autumn 2021 which will consider the role of food systems in meeting the UN SDGs and the reduction of emissions to meet the Paris Agreement targets (Hobert and Negra, 2020). A Pre-Summit meeting took place virtually from Rome, Italy from 19th-21st July 2021 (UN, 2021d). This again provides an opportunity for dialogue and action globally.

Negative impacts

Negatively, there has been criticism that there has been an insufficient focus on the food system as an 'upstream' determinant of health and well-being (Shanks et al., 2020). The paper notes that public health as a profession needs to change the narrative around the issue of food systems in a post pandemic and post Brexit world so that there is a focus on its role in facilitating good health and well-being, in exacerbating or reducing inequality. It also calls for improvements to the evidence base around health and food systems.

It has been stated by the House of Commons' Environmental Audit Committee that there is not enough emphasis on fruit and vegetable production within the current food system in the UK and that it focuses too much on other types of processed and fresh produce (Environmental Audit Committee, 2019). It has also been suggested that the UK Agriculture Act 2020 could be a missed opportunity to integrate public health aims into the new UK agricultural policy and lead the world in resetting the food system to be focused in part on food security, health and climate change goals (Seferidi et al., 2019).

The impact of COVID-19, Brexit, climate change and extreme weather events has impacted food production (FAO, 2020a) as outlined in Section 3a (Food Production). The COVID-19 pandemic and the economic stress which has occurred due to it has also highlighted the interconnected nature and weaknesses in global food systems such as the fragility of supply chains and how poverty and income have major impacts on food security and health and well-being (Hobert and Negra, 2020).

Waste within the food system has an important negative impact on food security. It has been identified that agriculture systems worldwide need to become more productive with less waste in order to improve food security as a whole (UN, 2020a). At the same time, the population as a whole also needs to view food as a vital and potentially scarce future resource and reduce wastefulness across the system accordingly. Much food waste was generated by stockpiling in the early days of the pandemic (Newman, 2020).

Food waste due to transportation damage and poor conditions when in storage has a major impact on food security and this was compounded by additional paperwork requirements and regulations which resulted from Brexit and the pandemic (Chavez-Dulanto et al., 2020). Sustainable agricultural practices and food systems, including both production and consumption, should be pursued from a holistic and integrated perspective.



3.2 FOOD ACCESSIBILITY

Food as a human right

Positively impacted by:			Negatively impacted by:		
Brexit	COVID-19	Climate Change	Brexit	COVID-19	Climate Change
✓	✓		✓	✓	✓
Population Groups affected: <ul style="list-style-type: none">• Children• Families with children in the household• Those individuals who were already critically exposed to food security:<ul style="list-style-type: none">• Low income groups• Unemployed• Lone-parent families• Children and young people• Adults with children• Adults with disabilities• Black, Asian and minority ethnic groups• Farmers• Individuals living in isolated / over-populated areas• Older people• Women					

Positive impacts

The COVID-19 pandemic has increased attention on the issue of food security and has reiterated the importance of food as a human right, as outlined in the United Nations Sustainable Development Goals (UN, 2020a). This includes discussions and focus on free school meals (FSMs), food packages (and their nutritional content) for vulnerable population groups such as older people, individuals who are shielding and those at risk of or living in food poverty and food insecurity (Welsh Government, 2020a; 2020b; 2020c). Whilst measures and schemes were established and implemented to limit the impact this did not totally address the negative impacts (Food Sense Wales, 2021).

A Brexit 'no-deal scenario' would have had implications for individuals and households as supply chains could have been severely disrupted and economic implications for the price of food increasing which could have affected for example, those on low incomes, lone parents and exacerbate food poverty in the UK and a person's right to food (Human Rights Watch, 2019a; Human Rights Watch, 2019b). However, the Trade and Cooperation Agreement has averted this.

Negative impacts

A UK Children's Food Inquiry established in 2018, reported that 160,000 children living in Wales were unable to afford the government recommended diet (Food Foundation, 2019). The COVID-19 pandemic has compounded this with many more children noted to now be living in food insecurity (Food Sense Wales, 2021). The Food Foundation YouGov survey conducted in early April 2020 found that households with children were 50% more likely to be experiencing food insecurity than those without (Food Foundation, 2020a).

In Wales specifically, it reported that 14% of families reported food insecurity, compared to 17% for the UK as a whole (Food Foundation, 2020b). Access to free school meals and breakfast clubs in Wales was also restricted due to school closures (Loopstra, 2020; Shanks et al., 2020). During lockdown, both the number of food banks and the quantity of emergency food parcels has increased and the Trussell Trust reported a 47% increase in the number of three-day emergency food parcels it distributed in the six months from March to September 2020, compared to the same period in 2019 including a particularly marked increase in the number of food parcels going to children (House of Commons Public Accounts Committee, 2021).

Evidence indicates that unstable food security affects a number of population groups. Women have been identified as being disproportionately negatively affected as they are more likely to skip meals to feed their children and it was highlighted that the right to food could be affected by Brexit and increased price rises and supply chain disruption (Richardson, 2021; Human Rights Watch, 2019a; Sosenko et al., 2019).

Digital exclusion for some vulnerable population groups, for example those living in rural areas with poor access to broadband and older people meant that they were unable to access online shopping at the start of, or throughout, the COVID-19 pandemic, negatively impacting on their health and well-being (Green et al., 2020a). Almost a quarter (23%) of older people in Wales found accessing food a challenge during lockdown (Age Cymru, 2020). In addition, 27% of disabled people said access to groceries, medication and essentials was a concern. This compares to 12% of non-disabled people (Office for National Statistics (ONS), 2021).

Cost of food / economic factors

Positively impacted by:			Negatively impacted by:		
Brexit	COVID-19	Climate Change	Brexit	COVID-19	Climate Change
			✓	✓	✓
Population Groups affected: <ul style="list-style-type: none"> • Women • Low income groups • Unemployed • Older people • Families with children in the household • Individuals living in deprived areas • Women • Black, Asian and minority ethnic groups 					

Negative impacts

Evidence highlights there are a range of negative impacts in relation to food cost and economic factors such as income and employment and food security from the Triple Challenge. Climate change is projected to negatively impact access to food through changes in cost (UK Climate Change Committee, 2017). Climate change is also impacting food security as a result of the global impact on agriculture and fishing (Pozarny, 2016; Roy et al., 2018; Mbow and Rosenzweig, 2019). This can have a knock on effect and can create a risk for domestic and international food production and trade (House of Lords, 2019). As a result of a potential reduction in the agricultural food supply, it is projected that food prices are expected to increase (Gautier, Denis and Locatelli, 2016; Mbow and Rosenzweig, 2019; Pozarny, 2016) which will have a subsequent detrimental impact on the food security of groups such as those on lower incomes, those who are economically inactive and older people (Mbow and Rosenzweig, 2019; Vos, 2015).

A move towards more environmental sustainability and decarbonisation could also lead to unintended negative impacts with increased food and supply chain costs (OECD, 2015). It has been estimated that increases in logistics prices could lead to food cost increases and increase inflationary pressures, for example, cargo costs by as much as 60% (Lin et al., 2021). Inflation in June 2021 in the UK rose to 2.5% which represented a 3.3% increase since 2018 (ONS, 2021). Additionally, in relation to Brexit, most UK fresh food imports are derived from the EU and trading patterns and regulatory changes could have an impact on both cost and supply (Lang, 2019).

Food price rises at the start of the COVID-19 pandemic due to shortages from disrupted supply chains and panic buying placed additional strain on families and individuals – particularly for those on low incomes or who had been furloughed (Loopstra, 2020; Chatham House, 2020; Green et al., 2020a; Yuen et al., 2020). Food cost was, and could be again, impacted by reduced international production and the harvesting of crops which led to an increase in food prices. However, by the start of 2021 food prices had fallen to their usual levels and trends with only minor market increases to some produce as supply and demand altered in line with normal market conditions (Welsh Government, 2021a).

Directly relating to cost and price increases for food, it has been projected that there could be a UK economic downturn created by the impact of the COVID-19 pandemic and Brexit, which could lead to increased food insecurity and food poverty (Barons and Aspinall, 2020) due to increased unemployment and job precariousness, particularly among groups such as women, young people and those on low incomes who also work in those sectors shut down (Loopstra, 2020; King and Wellesley, 2020; Green et al., 2020a; Yuen et al., 2020, ONS, 2021).

In the recent 'Food and You' report by the Food Standards Agency (Armstrong, King, Clifford et al, 2021), more than 90% of respondents with a household income over £32,000 stated they were food secure whilst 32% of households with an income below £19,000 were experiencing food insecurity – making a direct connection to income and food security. Recent figures identify that 279,297 people in Wales are on Universal Credit – 133,201 men and 146,028 women - as at 14th January 2021 (Department for Work and Pensions, 2021a). There has been an increase of 80% of people on Universal Credit in Wales between March 2020 to January 2021 (Department for Work and Pensions, 2021b) and this could potentially increase. Whilst the Coronavirus Job Retention Scheme (CJRS) has protected individuals in the Welsh population who were furloughed from their jobs it still reduced incomes by up to 20% per person and as at 28th February 2021, 175,200 employments in Wales were furloughed under the CJRS, a take up rate of 13% (Welsh Government, 2021b).

Lockdowns have also led to an increase in unemployment as non-essential sectors for example, hospitality and leisure and non-essential retailers were affected and closed down or reduced their workforce (Joyce and Xu, 2020). Research highlights that a lower food budget due to unemployment, minimal growth in real earnings and increasing prices can lead to a poorer diet as individuals are more likely to buy lower nutritional quality and higher energy dense processed foods which are traditionally cheaper to buy (The Affordable Food Deal, 2020; Barons and Aspinall, 2020; Lang, 2019). This can lead to an increased risk of poorer physical health and well-being and diet which can in turn, lead to a more frequent need to access health care services due the impact this and / or the poor management of diet sensitive conditions such as diabetes (Food Research and Action Center, 2017; Harvard School of Public Health, 2019).

It has been noted that the fundamentals of food poverty need to be addressed first including precarious employment and low wages in order to then address unstable food security in more depth (Kaplan, 2020).

3.3 FOOD UTILISATION

Individual food behaviours

Positively impacted by:			Negatively impacted by:		
Brexit	COVID-19	Climate Change	Brexit	COVID-19	Climate Change
✓	✓	✓	✓	✓	✓
Population Groups affected: <ul style="list-style-type: none"> • Low income groups • Individuals living in deprived communities • Clinically vulnerable • Older people • Adults with disabilities • Unemployed • Young people • Black, Asian and minority ethnic groups • Households with children • Shielding individuals with pre-existing health conditions and classified as clinically vulnerable • Individuals having to self-isolate • Women 					

Positive impacts

Positively, there has been a shift towards a more plant based diet and less meat intensive ones due to heightened awareness of the impact of climate change, intensive food production practice and its role in creating carbon emissions (Green et al., 2021 forthcoming). 'Veganuary' in 2021 captured the imagination of many population groups, particularly young people to try a plant based diet (Morris, 2021; Vegan Food and Living, 2021) and The EAT-Lancet Commission has developed the concept of the 'Planetary Health Diet' which could support both health and planetary benefits (Willett, Rockström, Loken

et al., 2019) as part of a healthy diet. This could be beneficial for population health as part of a balanced diet (Tuso et al., 2013; Kim et al., 2019). It has also been highlighted that post Brexit, post COVID-19 agricultural policy and food strategies could have the potential to increase the intake of fruit and vegetables and reduce health inequalities alongside public health measures by increasing land allocated to grow fresh produce (Welsh Government, 2021c).

A modelling study for England carried out by Seferidi et al. (Seferidi et al., 2019) estimated that this change in policy or strategy could help to prevent, or postpone, approximately 3,890 and 18,010 Cardiovascular Disease (CVD) deaths depending on the CVD mortality rate at the time. Reducing processed food in the diet could also lead to a reduction in bowel cancer (Bowel Cancer UK, 2021). Promoting sustainable, home grown diets is also a cheaper and healthier mitigation option for both food insecurity and environmental sustainability which also has co-benefits for health and well-being for example, poor nutrition is a major contributor to ill health (Food Research and Action Center, 2017).

The recent Food and You Survey carried out by the Food Standards Agency in 2020 reported that respondents' main concerns about the food they are eating centred on the amount of sugar in food (59%), food waste (58%) and animal welfare (57%) (Armstrong, King, Clifford et al. (2021). One method of addressing this is through fiscal measures. Evidence suggests an increase in sugar prices and associated food products through changes to food policy and strategies to address the increase in population levels of obesity could interact positively with the UK Soft Drinks Industry Levy (SDIL) (informally known as the 'Sugar Tax') as a result of Brexit and lead to reduced sugar consumption in the population. According to a modelling study carried out in 2018 Seferidi et al., 2018), this could potentially reduce coronary heart disease (CHD) deaths per annum in England by approximately 370 and gain 4,491 life years. However, as with other examples of fiscal measures aimed at reducing consumption of unhealthy foods, the SDIL is also more likely to affect those in less affluent households than those in more affluent ones (Seferidi et al., 2018; Jones et al., 2019). However, it is also noted that lower income consumers would likely enjoy greater health benefits from fiscal measures, given that these households are more likely to buy foods higher in sugars, saturated fat and sodium (Sassi, Belloni, Mirelman et al., 2018; Thow, Jan, Leeder and Swinburn et al., 2010; Eyles, Ni Mhurchu, Nghiem et al., 2012; Jones et al., 2019).

As a result of the COVID-19 pandemic and measures to address it, some studies and authors have noted that more individuals are cooking 'from scratch' and growing food at home and with an increase in demand for allotments and more gardening / home growing occurring during the pandemic including in urban areas (Chang et al., 2020; Petetin, 2020; Lambie-Mumford, Loopstra and Gordon, 2020; Public Health Wales, 2021b). This change not only helps to increase the populations' self-sufficiency but can also increase and enable an individual's sense of food security (Petetin, 2020). The pandemic has shown an increase in the population accessing more locally grown food products (Carey et al., 2020), switching to Welsh and UK produced products, and buying from local shops and markets (Petetin, 2020). By buying fruit, vegetables, meat and bread produced and sold locally, some individuals and households are actively making positive choices around their food consumption, choosing what they want to eat, where from and contributing to building a participatory agricultural food system (Petetin, 2020).

Evidence also flags up opportunities which the Triple Challenge can facilitate including raising awareness of the need for the population to change its behaviour and become less wasteful in relation to the food it consumes (UN, 2020a). Individuals and organisations should view food as a vital, and at times, scarce resource as demonstrated by the recent effects of the pandemic, Brexit and extreme weather events in Wales related to climate change, which can alter patterns of supply and behaviour.

Negative impacts

The pandemic has led to an increase in the use of food banks and food related charities (Lambie-Mumford, Loopstra and Gordon, 2020; Ranta and Mulrooney, 2021).

Furlough and the effect of lower incomes due to the impact of Brexit and climate change on employment or the economy could lead to households and individuals substituting food stuffs with less nutritionally valuable ones (Food and Agriculture Organization, 2020). Evidence indicates that young people who are moving away from home during the pandemic are particularly likely to do this as they feel constrained by a lack of budgeting and cooking skills (McPherson, 2020). Lockdowns and restrictions to address transmission in the pandemic has also largely eliminated the practice of sharing food and eating at the homes of friends and relatives, something that is known to be among the most common strategies for managing food insecurity among all age groups, but particularly young people and ethnic groups (McPherson, 2020; Connors et al., 2020).

Isolation could lead to older adults at increased nutritional risk due to lower incomes and socioeconomic insecurity (Rivan et al., 2021). Lockdowns also demonstrated a change in behaviour with regard to eating habits leading to consumption of more take away and an increased use of hot and fast food outlet delivery services, and less access to fresh, healthy food whilst self-isolating or shielding (Chang et al., 2020, Adams et al., 2020) which has led to weight gain in many in Wales (Green et al., 2021a). Combined with a lack of physical activity and a shift in patterns to more home working this has had a negative impact (Green et al., 2020a; Green et al., 2020b).

This was also compounded by some relaxation of labelling rules and fast food and alcohol outlet rules in relation to the classification of essential and non-essential businesses during lockdown which encouraged unhealthy food habits (POST, 2020; DEFRA, 2020). Evidence also indicates behaviour in relation to food choices is also dictated by having a low or reduced income, digital exclusion or precarious employment. For example, access to supermarket delivery services during lockdown was challenging to those groups who experience digital exclusion, such as older people, those who were on low incomes and those who lived on their own (Green et al., 2020b; Loopstra, 2020; Lambie-Mumford, Loopstra and Gordon, 2020).

Increased prices, changes to regulatory standards and increased inflation which may occur due to the impact of Free Trade Agreements and / or Trade Tariff Barriers can shape an individual's choices, but also lead to a reduction in the quality of a product available which in turn can lead to increased consumption of poorer nutritional quality food products (Revoredo-Giha et al., 2019). Climate change may bring about a reduction in the nutritional quality of some crops and the food it is used to produce (House of Lords, 2019; Mbow and Rosenzweig, 2019). Unhealthy diets and health behaviours are linked to the increasing incidence of non-communicable diseases across the world (UN, 2020a).

4 POLICY RESPONSES TO DATE AND MITIGATION

Both the Welsh and UK Governments have introduced a range of policy mitigation to address individual elements of the Triple Challenge which relate to food security and its role as a key determinant of population health and well-being.

A House of Commons Environment, Food and Rural Affairs Committee inquiry into COVID-19 and food supply highlighted how food insecurity had been 'exacerbated by the pandemic', with the use of food banks in March and April 2020 'effectively doubled' compared to the same period in 2019 (Environment, Food and Rural Affairs Committee, 2020). The Committee also recommends that the UK Government measure and report on levels of food insecurity and appoint a Minister for Food Security. The UK Government's Agriculture Act 2020 – which applies mainly to England-only – introduces a commitment to report on food security at least once every five years (House of Commons Library, 2021).

In Wales, Food Sense Wales has built on examples of good practice such as the Food Cardiff Programme to drive a cross sector approach to addressing food security in Wales in order to try and alleviate food poverty, including for groups such as those in deprived communities, children and their families who are at risk of food insecurity (Food Sense Wales, 2021). During the COVID-19 pandemic, it has continued to deliver its programmes including the creation of a Food Task Force in Cardiff (Food Sense Wales, 2021) and provide guidance, education and skills to food growing groups to support food sustainability.

Food Availability

The supply of food during the pandemic has remained sufficient due to specific policy actions including the relaxation of rules on competition so that retailers could collaborate and coordinate the delivery of supplies, the recognition of food production employees as key critical workers, and support around food imports and exports which also apply in relation to Brexit (Wentworth, 2020). This continued coordination between government departments to get food from '*farm to fork*' internally within the UK, particularly as a result of Brexit, could have positive implications for Welsh food security (Shanks et al., 2020). The proposed Agriculture (Wales) Bill 2020 (Welsh Government, 2021d) highlights the need for sustainable land management and food production and this is an opportunity to promote food security for Wales for the short and long term and employment security for producers such as farmers.

Food Accessibility

The UK Agriculture Act 2020 recognises that food security is also linked to individual households being able to have access to, and afford, the food they need (House of Commons Library, 2020) and that this is more than food production but also a social and economic issue and poverty and social circumstances can shape it dramatically.

In Wales, the Health, Social Care and Sport Committee (Welsh Parliament, 2020) conducted an inquiry looking into the immediate impact of the COVID-19 pandemic. This reflected on the impacts of online food delivery slots being filled immediately, presenting little capacity for new customers at a time when people were being asked to stay at home, particularly those most vulnerable to infection. A recommendation from this inquiry was for the Welsh Government to ensure sufficient capacity for online food shopping and home delivery.

¹ Food Sense Wales works with communities, organisations and policy makers and government across Wales to create a food and farming systems which is good for the population and the planet. <https://www.foodsensewales.org.uk/>

A Children's Right2Food Charter has been established in the UK and this outlines a plan to address children's food insecurity and protect every child's right to food. This was updated during the pandemic and could be used as a platform to enable positive future action (Food Sense Wales, 2021). In addition, when schools were closed during the pandemic, food supplies were provided to pupils who would normally receive free school meals, bringing the food insecurity of families with school-age children to wider attention. Whilst England's issues with offering free school meals throughout the pandemic were widely highlighted (National Audit Office 2020; House of Commons Public Accounts Committee 2021), in contrast, the Welsh Government ensured that the provision of free school meals continued from the outset of the pandemic (Welsh Government, 2020c), demonstrating resilience to do so in the event of future crises.

5 KEY FINDINGS

Summary of key findings:

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1. Food security is an important determinant of health and well-being at both a national population level, but also at an individual and community level.
2. The Triple Challenge has already, and will continue to have, a **major, multifaceted and inequitable impacts** on population groups across Wales which has flagged the need to address this issue and explore it in more depth (See Section 3).
3. The Triple Challenge has impacted negatively on food security for a wide range of population groups including those on low incomes, women, families with children, farmers, fishers and those who live in areas of deprivation (See Section 3).
4. Wales does not have its own separate food system (See Section 2). It is shaped by wider international, national and local policies such as trade, the economy and environmental sustainability which interact in a complex and multidimensional way and present a series of 'unknown unknowns' for policy makers and health and well-being.
5. There are a number of opportunities to enhance the food security of the people of Wales in the short and long term such as the proposed Agriculture (Wales) Bill and through strategies such as 'Healthy Weight, Healthy Wales' (See Section 3).
6. There have been a range of policy responses and mitigation for the Triple Challenge to date including for food security (See Section 4). These need to be constructed in an integrated way with cross sector involvement as actions intended to have positive impacts for one challenge could have negative unintended impacts for health and well-being on another.
7. Using the multi-focal lens of the Triple Challenge, and tools such as HIA, can enable decision and policy makers to better understand the cumulative impact on a range of key determinant issues and population groups (See Section 3).

1. Food security is an important determinant of health and well-being at both a national population level, but also at an individual and local community level. The impacts of food insecurity on mental and physical health are well-researched with vulnerable population groups experiencing the most exposure (Elgar et al., 2021; Stuff et al., 2004). Furthermore, the impacts of Brexit, COVID-19 and climate change have not been, nor will be, felt evenly across the population. This report provides evidence and insight into the impact of events such as Brexit, the COVID-19 pandemic and climate change has, or could have, on food security in Wales when viewed through the lens of both the Triple Challenge and the determinants of health.
2. The Triple Challenge has already, and will continue to have, **major, multifaceted and inequitable impacts** on population groups across Wales which has flagged the need to address this issue and explore it in more depth. Some of the impact on the determinants of food insecurity have distinct components which are specific in relation to one challenge for example, Brexit or COVID-19, but there are also commonalities and synergies in the way they form the Triple Challenge. The manner through which they manifest themselves may be different via different policy pathways for example, via health behaviours or Free Trade Agreements, but ultimately all have public health implications which leads to **cumulative, compounding impacts** and a disproportionate impact on population health and well-being and health inequalities (see Section 3).
3. Evidence shows the Triple Challenge has impacted negatively on food security for a wide range of population groups including those on low incomes, women, families with children, farmers, fishers and those who live in areas of deprivation (See Section 3). In addition, a range of food security determinants have been impacted upon including individual behaviours, food cost and supply, both positively and negatively (See Section 3). It has been noted that the fundamentals of food poverty need to be addressed first including precarious employment and low wages in order to then address food insecurity in more depth (Kaplan, 2020).
4. Wales does not have its own separate food system (See Section 2). It is shaped by wider international, national and local policies such as trade, the economy and environmental sustainability which interact in a complex and multidimensional way and present a series of 'unknown unknowns'. This makes anticipating and planning action for future long term security challenging in Wales. Therefore, evidence and models should be produced to support and advocate for explicit actions which will be beneficial to society in Wales and the UK as a whole.
5. The immediate post Brexit, post pandemic landscape can provide a number of opportunities to enhance the food security of the people of Wales in the short and long term. For example, the proposed Agriculture Bill (Wales) (Welsh Government, 2021d) can provide an opportunity to promote food security for the whole population and particularly those who may be vulnerable to it. The UK Agriculture Act 2020 has been highlighted as a missed opportunity to integrate public health aims into the new UK agricultural policy and lead the world in resetting the food system to be focused in part on health and climate change goals (Seferidi et al., 2019). The Act also recognises that food security is linked to households being able to not only have access to food but be able to afford the food they need (UK Parliament, 2020). The Well-being of Future Generations (Wales) Act 2015 and the delivery of 'Healthy Weight, Healthy Wales' can also provide stakeholders and public bodies with the

opportunity to create holistic policy approaches linking food security, food production, the economy, the environment and health, well-being and equity. For example, a 'Well-being Economy' or an eco-environmental model that considers environmental and health protection and promotes renewable energy, regeneration and sustainable transport systems (European Commission, 2019). This time can also provide space to reflect and act to mitigate against any unintended negative consequences of the Triple Challenge that may affect food security in Wales.

6. There have been a range of policy responses and mitigations for the Triple Challenge to date. Any policies and actions intended to make positive differences for health, well-being, or other societal, economic, or environmental gain should be constructed and assessed across sectors in an integrated way as they can also lead to unintended negative impacts for other sectors, settings and population groups. This can include for the economy, employment or health and those on low incomes. (See Section 4). For example, an aggressive focus on decarbonisation could affect the economy, the cost of food, agricultural goods and affect imports and exports, thereby requiring the aligning of policies and cross sectoral development (OECD/IEA/NEA/ITF, 2015).
7. Using the multi-focal lens of the Triple Challenge and a spectrum of public health and other research, data, intelligence and methods such as HIA and health lens analysis, governments and policy makers can untangle and better understand the cumulative and compounding impact of Brexit, COVID-19, and climate change across the determinants of health and population. It will be able to assist in identifying a balanced evidence based way forward. The public health system can act as an enabler and can assist in changing the narrative around the issue of food system security in a post pandemic and post Brexit world so that there is a focus on food security's role in facilitating good health and well-being and reducing inequality. It can also add to the evidence base around health and food systems to enable improvement and action (Shanks et al., 2021).



Potential actions to promote food security and health in Wales: Availability (See Section 3.1):

- There have been a range of policy responses and mitigation measures which have been implemented to address the impacts of the three challenges on food related determinants of health. (See Section 4). These can be reviewed, built on and maintained where successful.
- Maintaining the provision of food supply support (such as food boxes and free school meal supplies) in future crisis events in an equitable way which also considers the nutritional content of the supplies and the needs of vulnerable groups, for example, those with specific dietary requirements, in order to avoid exacerbating health inequalities.
- Build on commitments for, and resurgence in, local foundational economies in Wales to enable local, accessible food security. Food provision is a key element of a Foundational Economy and good food partnerships can enable local partners to work together to benefit health and the economy in Wales.
- Panic and bulk buying in any future emergencies can be addressed via consistent multi-media messaging from the government, media and retailers that there is availability of stock. Workforce and replenishment contingency planning and sanctions and purchase quotas on necessities could be implemented.
- Identify ways to support 'just-in-time' delivery systems to reduce food shortages created either by longer supply chain break down or due to behaviour change such as bulk and panic buying in the face of emergency events (Biotechnology and Biological Sciences Research Council, 2020). This could also be enhanced by increasing food security resilience by deliberately choosing to rely on multiple suppliers (Matthews, 2021).
- Ensure protection of those working in the food production, marketing and distribution sector and keep safe corridors open within and among nations (UN, 2020a).
- Diversification in food production and income generation streams and the sharing of knowledge and expertise in eco- and food system management could provide benefits for the health and well-being of groups such as farmers and fishers.
- Public health policies to improve food security and nutrition can be implemented and the agriculture and food systems are key to global climate change responses.
- Involving a wide range of stakeholders including health, climate change, trade and food producers / retailers to develop policy action for food security can facilitate better health and reduce inequalities. Food security for health and well-being can only be addressed with the active engagement and support of a range of sectors including food producers and retailers in Wales.
- A unified dataset regarding food security would aid policy-makers in informing decisions and solutions. For example, a compendium 'dashboard' of data highlighting information related to food security, such as the levels of food imported, food production labour market figures, and agricultural land use, would help to identify matters of concern and emerging trends and enable mitigations to be considered. The UK Agriculture Act 2020 includes a requirement to collect food security data every five years which will be helpful to track, monitor and address food security. Welsh specific data would be very helpful to support policies, strategies and actions specific to Wales.

- The Triple Challenge provides the opportunity to change trading patterns and follow the Trade and Agricultural Commission (TAC) report recommendations in relation to trade negotiations and the six principles it sets out within it (Department for International Trade, 2021b).

Accessibility (See Section 3.2):

- Working with supermarkets and other food retailers and suppliers to develop accessible and easy to use methods for vulnerable individuals to arrange online food deliveries. Providing 'offline' means of arranging orders for those who are digitally excluded or have lower incomes which may limit their ability to pay delivery charges or meet minimum spend thresholds.
- Ensuring that those who will be affected most by food insecurity and food poverty plans and policies (including to related food, health, environment and economy) are targeted to enable them to be able to access safe, affordable and nutritious food via schemes such as those implemented by Food Sense Wales.
- Establishing systems in Wales to identify vulnerable citizens and deliver food to them. Some international city authorities (e.g. Wuhan, New York, Milan, Tel Aviv, Johannesburg) have done this to tackle rising food insecurity during the pandemic. Others such as the city of Toronto have been collaborating with third sector organisations to do this (Carey et al., 2020).
- Carrying out HIAs could strengthen policies and plans by viewing them through a social determinant and population lens in order to avoid and mitigate for unintended negative impacts which may arise in relation to food security and health and maximise any benefits.

Utilisation (See Section 3.3):

- Increase awareness of the 'Planetary Health Diet' and the importance of fruit and vegetables as part of a healthy, balanced and affordable diet.
- Improve awareness of food waste and circularity approaches amongst the population and link to the need to reduce food waste.
- As a result of the Triple Challenge, build on, and expand, the work carried out by organisations such as Food Sense Wales to reduce food insecurity / poverty and improve health and well-being outcomes for a range of vulnerable population groups including those who are newly at risk of unstable food security.
- There is an opportunity to enable food democracy and citizenship in Wales. A 'food democracy model' could provide Welsh society with opportunities to actively participate in and contribute to, how, when and where food is grown to promote physical health and mental well-being (Petetin, 2020).

6 CONCLUSION

Policy and decision makers require information and evidence to strengthen future long term planning and decisions so that any negative impacts of the *Triple Challenge* can be mitigated for, positive impacts or opportunities be maximised and inequalities which emerge can be addressed in a sustainable and integrated manner. This paper provides a unique insight into how these three challenges interact with, and impact upon the health and well-being of the population of Wales in relation to food security.

It has highlighted that it is important to consider future governmental and organisational policies in relation to the impact of the three policy streams. Using this lens can inform future economic, environmental, social, and health policy and actions and facilitate health improvement and protection. The need to address inequalities underpins this as a key crosscutting theme and efforts to address the three challenges must include a public health perspective to protect the most economically, physically and mentally vulnerable particularly in relation to food supply, access, cost and availability.

Whilst it would enhance domestic food security resilience to become more self-sufficient in the production and supply of food, this can only be a long-term ambition. Wales and the UK are reliant on high levels of food imports. It is also important that Wales and the UK uses its influence on the international stage to ensure the protection and enhancement of food security for health and well-being globally, and this requires a balanced and pragmatic approach to trade negotiations, the setting of standards and the preservation of the environment. Responding to all three aspects of the Triple Challenge depend on having a coherent message on the international stage.

The immediate adaption to respond to COVID-19 across the world has demonstrated explicitly that change can be made quickly and effectively when there is a significant driver to do so.

However, Brexit, COVID-19 and climate change represent the biggest combined Triple Challenge to health and well-being that Wales has faced in recent times. They also provide an opportunity for it to set a new direction and leverage policies and plans using health and well-being, equity and sustainability as a lens through which to view this. The Well-being of Future Generations (Wales) Act 2015 provides a key driver to do this. Decisions will be difficult to make in coming years as the economy, environment, health, and society mobilise to recover and renew from the pandemic, Brexit and events related to climate change. Building resilience in local food systems will be critical to averting future shortages, ensuring food security and good nutrition for everyone. This should be designed in a co-ordinated and integrated way for health, economy and environmental and social benefits.

Appendix A: Methodology

Rapid evidence searches

Building on the evidence collected through established HIAs on Brexit, climate change and COVID in Wales (Green et al, 2021 forthcoming; Green et al, 2020a; Green et al, 2020b; Green et al, 2019), rapid evidence searches were undertaken on both grey and academic literature. Academic searches were run in PubMed and ProQuest, with the grey literature identified through sources from Welsh and UK Governments, WHO, the COVID-19 Food Trade Policy Tracker (<https://www.ifpri.org/project/covid-19-food-trade-policy-tracker>) and the International Food Security Portal (<https://www.foodsecurityportal.org/>).

Table 1: Search terms

Search no.	Search terms
S1	"food security" OR "food insecurity" OR "food poverty"
S2	"Brexit" OR "EU withdrawal"
S3	"climate change" OR "global warming"
S4	"COVID-19" OR "coronavirus" OR "pandemic" OR "syndemic"
S5	"health" OR "wellbeing" OR "wider determinants" OR "inequalities" OR "health equity" OR "sustainability"
S6	S1 AND S2 AND S3 AND S4 and S5
S7	S1 AND S2 AND S3 AND S5
S8	S1 AND S2 AND S4 AND S5
S9	S1 AND S3 AND S4 AND S5
S10	S1 AND S2 AND S5
S11	S1 AND S3 AND S5
S12	S1 AND S4 AND S5

All results were screened by title and abstract using the inclusion criteria outlined in Table 2.

Table 2: Inclusion criteria

Inclusion criteria
• literature published in the English language
• published from 2016-2021
• prioritisation of evidence based in Wales, followed by UK, European then international evidence

For all included studies, a data extraction process was undertaken with the reviewers extracting all relevant information on the following:

- authors, year of publication, title, reference, country/region studied
- potential positive impacts or opportunities and negative or unintended negative impact of national food security on health and well-being
- the population groups primarily affected in the short and long term by this key determinant of health
- identifying potential mitigation for any negative or unintended negative impact.

This evidence was then appraised and synthesized into key themes to present in the report.

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Our Priorities 2018-2030

Building and mobilising knowledge and skills to improve health and well-being across Wales

Influencing the wider determinants of health

Improving mental well-being and resilience

Supporting the development of a sustainable **health and care system** focused on **prevention** and early intervention

Working to Achieve a Healthier Future for Wales

Promoting healthy behaviours

Protecting the public from infection and environmental threats to health

Securing a **healthy future** for the next generation

Our Values:

Working together with trust and respect to make a difference



GIG CYMRU NHS WALES
Iechyd Cyhoeddus Cymru
Public Health Wales



World Health Organization
Collaborating Centre on Investment
for Health and Well-being

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