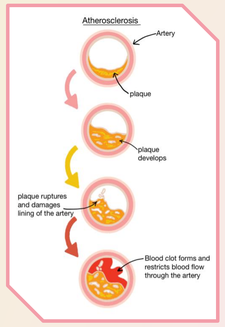
# HEART HEALTH STARTS IN THE HIGHCHAIR

App Logo:


References

## What is cardiovascular disease?




**Cardiovascular disease** (CVD) refers to all the diseases of the heart and circulation, including coronary heart disease, atrial fibrillation, heart attack, congenital heart disease, heart failure and stroke. The **primary cause** of cardiovascular disease is **atherosclerosis** – the build-up of fatty plaques on the walls of the arteries. These plaques are made up primarily of fat, cholesterol, calcium and other substances. Over time, the plaques harden, narrowing the opening of the arteries and restricting blood flow.

These **atherosclerotic plaques** can break, forming a thrombus (blood clot) that can further limit, or even block the flow of blood throughout the body. In the UK, around seven million people live with CVD, which is a **major cause** of **illness** and **death**.

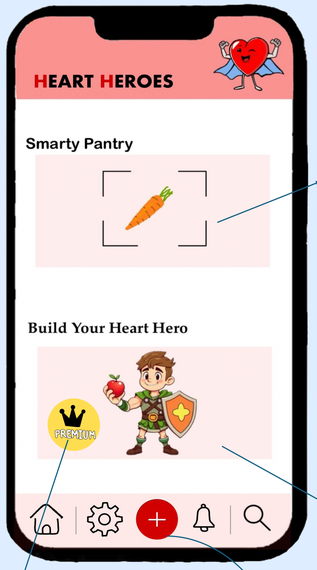
It causes about one in four early deaths and is the **biggest factor** in reducing healthy life expectancy. People living in the **most deprived areas** are almost twice as likely to die from CVD compared to those in the least deprived areas. Other **risk factors** include diabetes, a **family history** of heart disease and smoking.

## Novelty And Vision

Our aim is to introduce healthy eating habits in young children. Introducing healthy eating from a young age benefits children's health as it supports **brain development**, **healthy growth and immunity**. It reduces the child's chance of developing chronic diseases such as heart disease, type 2 diabetes, obesity and some cancers.

We decided to tackle this issue by developing an app called **'Heart Heroes'**, it encourages parents and children to developing healthy eating habits. Our app helps to equip children, families and schools with a scalable tool that will help **reduce national rates of childhood obesity and malnutrition**. It will also offer other features such tracking sleep patterns to offer more **holistic cardiovascular health management**.

### App Interface




One of the main features of our app is **'Smarty Pantry'**, which is a tool that uses **image recognition** to allow parents to scan foods available in the kitchen to generate healthy meals that promote cardiovascular health. The app will save all the items that it has scanned, and it will allow you to update it, such as when an ingredient runs out. The parent could input the type of meal they want such as **lunchbox ideas, breakfast, dinners**, etc and using AI integration, the app will generate a healthy meal for the child. The meal suggestions will aim to maximise the nutritional value of the meal using existing ingredients. The app will have a **filter option** found in the settings icon at the bottom which caters for **different dietary requirements** such as vegetarian and the child's age group. This will also support families who do not have the time or the money to follow strict recipes that use unavailable ingredients. It will also have additional features such as **budget friendly swaps** of healthier ingredients for the next shopping trip to maximise nutrients whilst minimising additional costs.

This is a **Premium feature** for £2.99 which unlocks games in multiplayer mode using the child's avatar. They can compete with friends or siblings in games and the stronger the avatar, the more advantage they've got in the game. This encourages healthy eating as it motivates them to have a stronger avatar and allows them to **associate healthy eating with positive, rewarding experiences** and form an overall healthy relationship with food. Revenue from the app will be used for **partnerships with schools and healthcare organisations** to expand the app to different communities.

**'Build Your Heart Hero'** is a **personalised avatar** that grows stronger, healthier and faster when a child eats a healthy meal such as gaining a shield and it becomes weaker and sluggish when poorer diet choices are made . This allows children to form an **emotion attachment** to their character which creates **more motivation** for eating healthier. . Parents or children, can input the food the child eats using this feature at the broom.
Not only does it shape the avatar but it also records eating habits to flag any unusual patterns and suggest improvements.

## What is Preventative Medicine?

Preventative medicine is a **proactive approach** to healthcare which focuses on maintaining wellbeing and **reducing the risk** of developing **chronic conditions** which can impact life long-term health, such as **heart disease** and diabetes.

By prioritising **healthy habits** such as regular exercise, a balanced diet and stress management techniques, individuals can significantly **improve their quality of life,** and all contribute to a **better overall wellbeing.**

One of the **major benefits** of preventative medicine is the **sense of empowerment** it provides to individuals. When individuals take control over their own health and actively engage in preventative measures, they become **more well-informed** about their bodies and the factors that can contribute to their well-being.

The integration of **health education programmes** in **schools** is particularly important, as it promotes nutritious meals in school canteens, and encourages a **balanced lifestyle** as part of the daily school life of children. This can also help foster healthy eating habits and positive routines in children from a young age.
Embracing preventive measures should be a priority for individuals, and healthcare providers alike, as it has the potential to **revolutionise healthcare** and create a healthier and more sustainable society for all.

## Childhood obesity: effects

Childhood obesity has reached **epidemic proportions** globally, especially in urban areas.

As one of the **leading factors** that contribute to CVD, our app will help to **prevent** and **overcome** childhood obesity, by encouraging healthy eating habits from a young age. Overweight and obese children face serious physical, psychological, and social health challenges, including increased risks of non-communicable diseases like type 2 diabetes, **cardiovascular disease**, and other chronic conditions, often beginning in childhood and continuing into adulthood.

Globally, more than 42 million children under five were overweight in 2010, with about 35 million in developing countries, indicating a rapid rise in childhood obesity worldwide. The **growing prevalence** of obesity is part of a broader malnutrition issue that also includes undernutrition, necessitating integrated **public health approaches** to address nutrition and growth.

## Childhood obesity: causes

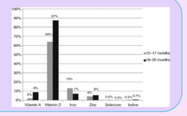
An **increase** in obesity results from an **imbalance** between the amount of energy taken in and the energy expenditure. The **ecological model** which is described by Davison et al. suggests that risk factors for childhood obesity include diet, physical activity levels and sedentary behaviour.

**Family characteristics** such as parenting style, parental lifestyles and **environmental factors** such as school policies and demands of parental work influence eating and activity behaviours.

The **causes** of obesity are **multifactorial**, involving environmental, lifestyle, and cultural factors. Key contributors include excessive calorie and fat intake, high sugar consumption from soft drinks, increased portion sizes, and declining physical activity. Obesity is linked with poor academic performance, lower quality of life, and multiple co-morbidities affecting various body systems.

## Scientific Approach

Percentage of children with intakes below the lower reference nutrient intake (LRNI) (or estimated LRNI)[3]



A study showed that **10-14%** of children in all age groups eat **less than the LRNI for iron** and 10% of children aged 4-6 months have below the LRNI for **magnesium**[2]. Only 2% of 12–17-month-olds and 9% of 18–35-month-olds have been shown to have a **vitamin A** intake below the LRNI and the mean intake of 1–3-year-olds was well over the RNI (140%) however, because of the wider variation of vitamin A intakes and the format of the study being 4 days of dietary recording, this is less reliable than other findings[3]. In the 4-day study, 12–18-month-olds were found to only receive 55% of the **vitamin D** RNI while mean **18–35-month-old intakes were only 33% of the RNI** and an estimated **87%** of 18–35-month-olds would be below the LRNI and could become **deficient in winter months** when less vitamin D is made in the skin[1]. In winter months, our app would suggest more foods containing vitamin D such as oily fish, red meat, eggs, fortified foods, and liver to help combat this[4].

It has also been found that **sodium intakes** for 4–6-month-olds were at 85% of the RNI and 12–18-month-olds had increased intakes of 181%[2]. This brings up the concern that young children are **exceeding salt recommendations** which could lead to problems such as **high blood pressure**; childhood and adolescent blood pressure levels have been shown to be associated with blood pressure levels later in life[5, 6] and **early intervention** is important to reduce the prevalence of heart related health problems and diseases. By decreasing sodium intake over a long period of time, it has been shown that age related blood pressure rising can be slowed or prevented[7, 8]. Studies have demonstrated that **antioxidant vitamins** can protect against coronary heart disease, for example **vitamin E** intake is inversely associated with coronary deaths in both men and women, and **vitamin C and carotenoids** have similar observations in women[9]. Research also indicates that increasing your **fruit and vegetable intake** from less than 3 to more than 5 decreases CHD risk by 17%[10]

**LRNI**: lower reference nutrient intake – the amount of a nutrient needed by people with low nutritional needs so the majority require more than this to prevent deficiency[1]

**RNI**: The Reference Nutrient Intake - the amount considered enough for almost every individual, including those with high needs so an individual consuming the RNI of a nutrient is very unlikely to be deficient[1]

## Affordability

Our app is **straightforward** to make, and we do not expect massive manufacturing costs. We estimate it can be **done for £17,000.** This cost includes salaries for the team in charge, designing the app, maintaining privacy and legal data, marketing. This would gradually reduce the amount of money spent annually on CVD by the NHS. There are various research grants from the NHS that we could apply for to fund our app. Therefore, by having adverts on the app, we can make it free and available to all online: increasing **accessibility for low-income families.** Which, additionally, makes Heart Heroes more attractive to schools and hospitals as the fact that there's no cost involved means there will not be a large barrier preventing extensive use. Adhering to one of the pillars of medicine – **Justice** – our app will be **available to everyone regardless of their socioeconomic status.**

The app also involves scanning food items in the household to cultivate a healthy meal plan, allowing people to make **affordable, yet nutritious** food choices for themselves and their children. By helping to stretch household budgets, this budget-friendly initiative makes healthy not a chore – but rather realistic and even easier!

We also plan on using adverts to generate an extra income to keep the app running and enable us to keep the app **free for all.** We will also have the option to purchase a **premium version that has extra features,** but this won't affect/diminish the free version whatsoever.

## Diversity + Inclusion

The **IDDSI framework** is the global standardization of definitions for texture modified diets (TMDs) and thickened liquids for safety and care of individuals with **swallowing difficulties**: it is used as a framework for health care facilities to provide food to **at-risk patients**[11].
By providing information based on the IDDSI on the app, we can reach a more diverse audience and cater to a wider variety of families, including those with digestive conditions. The IDDSI framework could also be beneficial for parents with children who have **sensory sensitivities**, specifically for **textures** of foods, or disorders such as **ARFID** which is prevalent in people with **autism**[12].

**Avoidant/restrictive food intake disorder** (ARFID) is a relatively new eating disorder diagnosis which is being used to understand children, adolescents, and adults who are **unable to meet appropriate nutritional and/or energy needs**, for reasons other than dissatisfaction with body weight or image that can lead to significant psychological or medical conditions[13]. The *Smarty Pantry* feature on our app would allow parents and older children to scan an ingredient they enjoy and find a list of meals that incorporate this to **help access a greater variety of foods** and **meet nutritional needs**. This app feature would also be particularly useful with picky eaters.

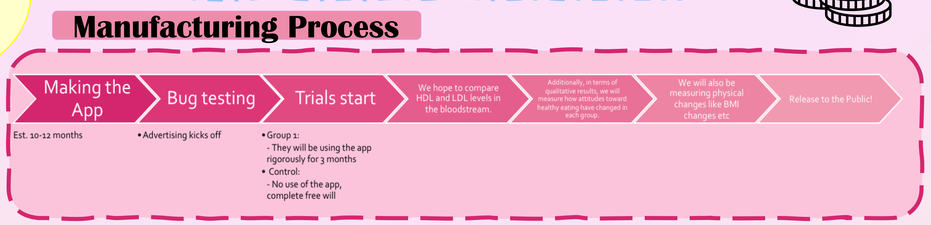
The prevalence of picky eating is hard to measure due to different definitions of picky eating as well as different assessment methods but reported prevalence varies from 5.6% in the Netherlands from Tharner et al. (2014) and 59.3% prevalence in China from Xue, Lee, et al. (2015). A study in the UK revealed that 48% of parents consider their children to be 'fussy' eaters and **86% of children under 5 aren't eating** their suggested **five fruit or vegetables a day**[14]. Although it has been suggested that picky eating is highly due to genetics rather than parenting, it is also believed that exposing young children to a **wider range and variety of foods** can be helpful[15] especially as 80% of children eat mostly 'bland food' and 34% of UK parents habitually give their children 'English' food leading to 83% of children's diets lacking in 'exotic' flavours and spices[14].

## Medical Ethics

When developing a healthy eating app that allows children to play and compete with each other, we understand that strict compliance with data privacy regulations (the GDPR-K for the EU) is key. **GDPR-K** ensures that children have specific **protection regarding their personal data**, especially in online environments involving profiling and social features. Our app includes interactive elements like leaderboards and challenges, but it will ensure that **no personally identifiable information (PII) is shared** without verifiable parental consent. Also, we will prioritise data minimisation, meaning **only information necessary for gameplay will be collected and stored**, with strong encryption and anonymisation where possible.

Unlike other nutrition apps, our app **doesn't focus on calorie counting** and prioritises nutrients intake instead. This is so that we don't cultivate unhealthy food relationships such as restrictive eating disorders into small children, adhering to the ethical principle of **non-maleficence** and **beneficence**.

## Manufacturing Process




## Feasibility

As a **low-cost initiative** that is extremely easy to access, we believe 'Heart Heroes' is very feasible. The UK government and NHS have already established a clear focus on tackling childhood obesity and the cardiovascular diseases that will eventually occur because of this, e.g. through campaigns like 'Better Health,' strict school food standards and the NHS food scanner app.

An app like ours that aligns with these priorities and offers guidance on healthy eating has the **potential to gain NHS endorsement and widespread exposure** through NHS resources. With the right partnerships in hospitals, our app could be included in **paediatric clinics** and **maternity departments**, further strengthening its public health alignment. To further increase widespread awareness, we hope to **collaborate with family social media influencers** and showcase them using the app.

In 2022, 15% of children aged 2 to 15 were living with obesity, and 27% were overweight or living with obesity. **Parents increasingly look for digital solutions** and/or advice; our app provides both and so fills a real gap in the market, whilst also providing a visual stimulus for children and having an impact on them.

There were 571,000 live births in the UK in 2023, meaning over a **million parents annually** will be searching for advice on their child's health, diet, and development – Heart Heroes helps with all of that.

### TEAM MEMBERS + ROLES:

**Kavya Chandrasegaran** (Biology, Chemistry, Physics, Maths) - Co-designer, Researcher, financial analyst, illustrations (Affordability, Feasibility, Manufacturing, Medical Ethics)
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