

# Childhood obesity: Reducing the risk through early-life measures

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## Key points

- Childhood obesity is a major public health concern in New Zealand. Affected children tend to experience a range of health problems and become adults with obesity and accompanying chronic health conditions.
- A child's risk of obesity is determined by many factors beyond their diet, starting from as early as conception.
- Prenatal influences include parents' nutritional state at conception and pregnancy complications such as gestational diabetes. Postnatal influences include early introduction to solid foods and caregiver feeding practices that affect children's eating self-regulation, such as excessive food restriction and using food as a reward.
- Policy measures should focus on the health of intending parents as well as pregnancy support to help mitigate prenatal influences. This should be combined with advice to parents and caregivers on age-appropriate introduction to solid foods and appropriate feeding practices that, in turn, encourage healthy eating behaviours in childhood.

## Introduction

The food that a child is exposed to plays an integral role in their current and future health. The early years of life are a period of rapid growth, and optimal development of both body and brain relies heavily on nutrients of an appropriate quantity and balance. Carrying excess weight increases a child's risk of health issues that often extend into adulthood.

While there is awareness that overconsumption of food – particularly high calorie, ultraprocessed products – may lead to excess weight in children, it is less recognised that other factors such as *in utero* nutrition and certain parent/caregiver feeding practices may also promote childhood obesity. Yet efforts to reduce childhood obesity typically focus on their dietary and exercise habits, and exclude multiple other factors that play a role.

This evidence brief focuses on how early life nutrition, including prenatal exposures, caregiver feeding practices and childhood eating behaviours, contributes to overweight and obesity risk in children.<sup>i</sup> Focusing on the early stages of life is especially important for informing effective preventive approaches.

## Childhood obesity in New Zealand

Obesity is a major problem among Aotearoa New Zealand children.<sup>3</sup> The prevalence of obesity among 2- to 14-year-olds remained stubbornly high from 2011 to 2021. In 2020/21, nearly one-third (31%) were found to be overweight or obese and 13% were obese.<sup>4</sup> But these data mask large inequities among ethnic groups, with Māori children (40%) and Pacific children (62%) being markedly overrepresented among those with excess weight. Furthermore, the more socioeconomically and educationally deprived a child is, the more likely they are to be obese.<sup>5</sup> Although the B4 School Check screening programme showed a gradual decline in obesity specifically in 4-year-old children from about 2012 to 2019, this promising trend appears to have since reversed.<sup>6,7</sup>

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i Other factors such as physical activity and the type of food eaten have been thoroughly explored elsewhere and are not discussed in this brief.<sup>1,2</sup>

Having obesity has important implications for children’s physical and psychosocial health and their overall wellbeing. It puts them at greater risk of developing asthma, type 2 diabetes, digestive problems and joint pain, as well as depression and anxiety. Importantly, children with obesity often grow up to become adults with obesity, with childhood health problems continuing throughout their life.<sup>8</sup> Adults carrying excess weight are at increased risk of many serious comorbid conditions such as type 2 diabetes, cardiovascular disease, stroke, and several types of cancer.

Adult obesity is also a significant public health concern in New Zealand, where about one in three adults have obesity, and a similar proportion are overweight.<sup>9</sup> In addition to the health and social burden, the condition is immensely expensive. The economic cost to the country has been estimated as \$2 billion per year in direct health care costs and \$4 to \$9 billion per year when indirect and intangible costs are factored in.<sup>10</sup> There is clearly a strong impetus to implement prevention strategies to help reduce the physical, psychological and economic impacts of obesity, starting from childhood.

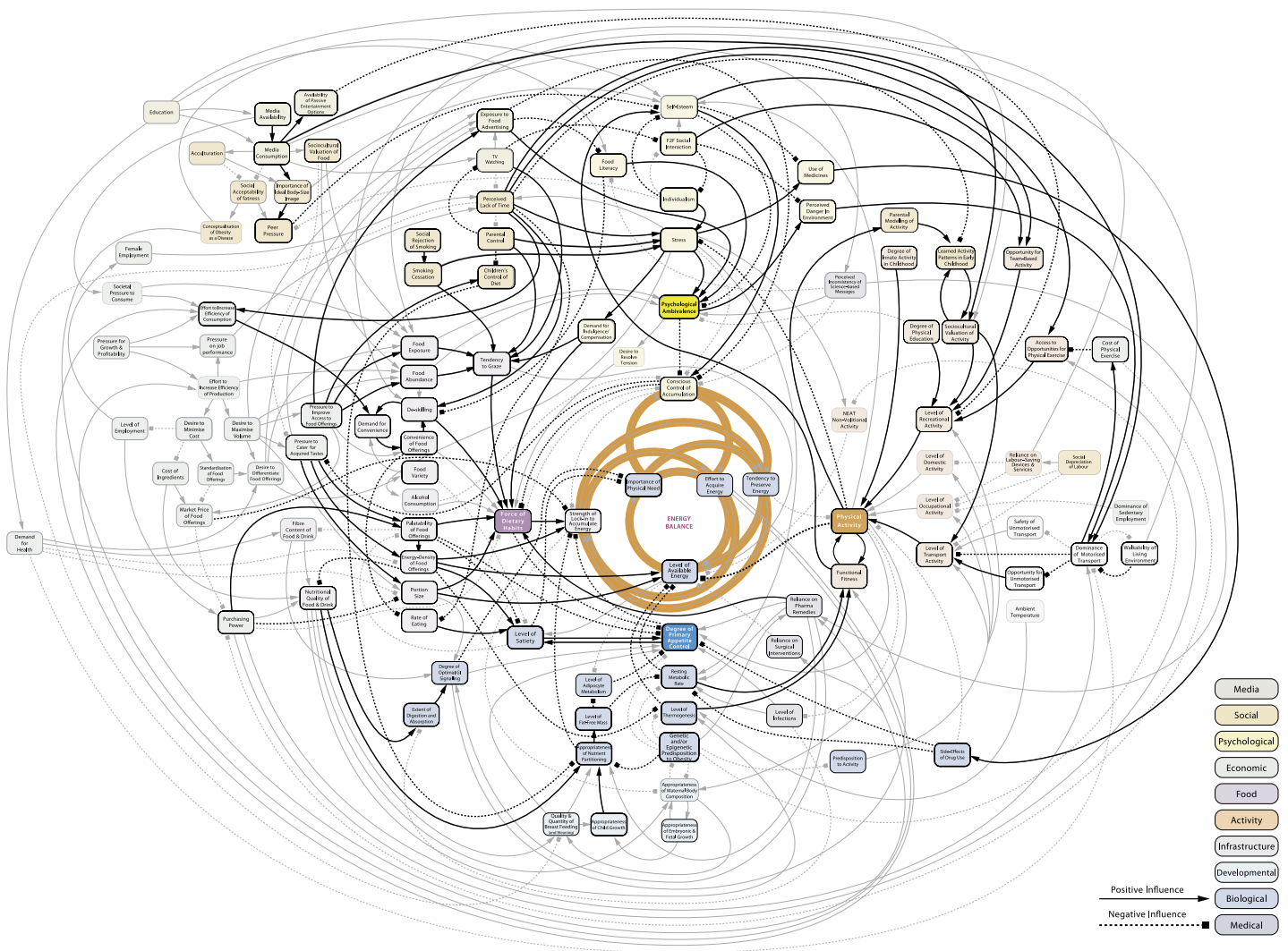


Figure 1: An obesity system map visualising the strength of interactions between the many factors associated with childhood obesity risk. It illustrates that although energy balance plays a key role (see thick orange lines at the centre), it is related to and reinforced by numerous other variables. The full-size map is available at reference 12.

However, the reason it is very difficult to reduce childhood and adult obesity is because the causes are numerous, highly complex and interrelated (Figure 1).<sup>11,12</sup> Very broadly, they include biological factors such as genetics and metabolic ‘set point’, behavioural factors such as the nature of the diet, environmental factors such as socioeconomic status and influences of family and culture, and developmental exposures during early life. The traditional focus on ‘energy in, energy out’ has given rise to the conventional argument that fighting obesity is a matter of an individual’s choice to simply eat less. Nevertheless, in recent years there have been attempts to introduce more nuance to discussion around mitigation strategies, as well as to take a life course approach to obesity prevention.<sup>13</sup> There is a strong and growing evidence base that the risk of childhood obesity is not determined simply by the quantity or quality of food consumed but is also significantly influenced by many other early life factors.

## Prenatal influences

The environmental conditions encountered from conception through to the first few years after birth play a major role in shaping a person’s health status in later life. This concept of the *developmental origins of health and disease* arose from extensive research demonstrating that factors such as poor nutrition *in utero* and in early childhood is linked to multiple chronic conditions in adulthood including cardiovascular disease, type 2 diabetes and obesity.<sup>14,15</sup>

As a fetus develops, its growth is fuelled by nutrients received from its mother through the placenta. The placenta limits the passage of some, but not all, nutrients to the fetus. This means that if a mother’s nutritional state is imbalanced, such as through obesity, excessive weight gain and/or uncontrolled gestational diabetes, the fetus likewise receives imbalanced nutrition. Increased delivery of nutrients, particularly glucose in the case of gestational diabetes, prompts the fetus to produce insulin and develop more fat mass.<sup>16</sup> An imbalanced maternal nutritional state may also affect the way neurons form and hormone signalling systems develop in the main brain region that regulates the baby’s energy balance, the hypothalamus.<sup>17</sup>

Higher maternal body mass is an established risk factor for excessive weight gain during pregnancy and for gestational diabetes.<sup>18,19</sup> As a result, maternal obesity, excessive weight gain and gestational diabetes often co-occur in a pregnancy. Each of these conditions may lead to a range of adverse maternal, neonatal and childhood outcomes. For example, babies are more likely to be born pre-term, to have low blood sugar at birth which increases risk of brain injury, or to be larger than average leading to difficult or obstructed labour. They are more likely to be heavier or obese in infancy and childhood and to have more body fat.<sup>20-22</sup> Several large studies have found associations between mothers having a higher body mass index (BMI) and their children having a higher BMI as adolescents or adults, suggesting that this effect can persist for at least a considerable part of life.<sup>23</sup>

A father’s nutritional state may be important too: there is increasing evidence that children whose fathers had a high BMI at the time of conception also tend to have higher BMI and clinical indicators of obesity, heart disease and diabetes.<sup>24,25</sup> This association may persist throughout life, with multiple studies finding associations continuing through to adolescence, early adulthood and late adulthood.<sup>26</sup>

## The New Zealand context

Two-thirds of New Zealand women carry excess weight, and Māori and Pacific women are more likely to do so (77% and 91%, respectively).<sup>9</sup> The rates of overweight and obesity in women aged 15 to 44 (regarded for statistical purposes as ‘childbearing age’) range from 53% to 64%, suggesting that maternal obesity rates are a potential concern. Fathers’ excess weight poses a similar concern, with 71% of New Zealand men being overweight or obese.<sup>9</sup>

The best available estimates of gestational diabetes rates in New Zealand are 6-7% of pregnancies, and a trend in increasing prevalence has been noted.<sup>27,28</sup> This is probably an underestimate, as many women are not screened. Moreover, some data suggest that Asian (including Indian and Chinese) women are disproportionately represented;<sup>29</sup> this fast-growing demographic may therefore require targeted support. Collectively, the data suggest that a large proportion of New Zealand babies may be exposed to prenatal factors that impact their health, both in the short-term through negative birth outcomes and in the long-term through persisting effects on weight and metabolic health. This emphasises the critical importance of acting at the preconception/prenatal stages in order to intervene most effectively.

## Postnatal influences

### Early introduction to solid food

World Health Organization and New Zealand Ministry of Health guidelines recommend that solid food is introduced at around six months of age. Before this point, breast milk or infant formula can meet all the nutritional requirements of the infant, but beyond that they increasingly need additional nutrients such as iron. Six-month-olds also generally have sufficiently mature digestive and kidney functions and are developmentally ready to chew and swallow.

However, infants are often introduced to solid food earlier than recommended, sometimes as early as less than four months old. The reasons for this include parents feeling that their babies are ready or appear hungry, healthcare advice, other outside pressure to introduce solids, or to try to improve sleep.<sup>30,31</sup>

Yet multiple studies have shown that there is an association between introducing solid food before four months and increased risk of overweight or obesity in childhood, particularly when children were not breastfed.<sup>32-34</sup> There is mixed evidence as to whether starting solids at four to six months is associated with higher childhood body fat,<sup>35,36</sup> suggesting that the critical age at which solid food introduction potentially influences obesity risk is less than four months old.

It is not yet clear exactly how early exposure to solid food promotes obesity, but it may involve shifted biological pathways such as the way gastric hormones are regulated, macronutrients are metabolised, and gut bacteria interact with the household feeding environment and wider social context.<sup>37</sup>

### The New Zealand context

The Growing Up in New Zealand study of 5,770 infants found that 40% had started consuming solid food by the age of four months,<sup>38</sup> suggesting that a substantial proportion of New Zealand children are at greater risk of overweight or obesity during childhood solely from early exposure to solids. This prevalence is substantially higher than in studies of infants in Australia, the USA and Europe. The New Zealand study did not examine parents' reasons for introducing solids so early, but in common with the overseas studies, it did find it was more likely to happen if infants had never been breastfed or were breastfed for shorter periods.

Infants who exclusively breastfeed before eating solids or continue to breastfeed after starting solid foods are at reduced risk of gaining excess weight in childhood.<sup>34,39</sup> There is also increasing evidence that feeding directly from the breast, rather than on bottled breast milk, may provide better protection.<sup>40,41</sup> This may be because these babies are better able to self-regulate their milk intake and not overeat. The Growing Up in New Zealand study showed that at age four to five months, nearly one quarter of all infants had never received any breastmilk, with infants of Māori and Pacific women overrepresented.<sup>42</sup>

Another study group, the New Zealand Asthma and Allergy cohort, found that 27% of four-month-old infants were not or no longer receiving breastmilk.<sup>43</sup> Due to limited availability of breastfeeding data, including whether babies receiving breastmilk were fed from the breast or from a bottle, it is not yet clear precisely what proportion of babies who started eating solid food earlier than recommended did not benefit from the protective effect of breastmilk. Still, it is likely to be sizeable given that stopping breastfeeding is a predictor of starting solid food early. These issues must nonetheless be considered alongside the recognition that many mothers choose not to or are unable to breastfeed either directly or by expressing milk.

## Caregiver feeding practices

Healthy eating guidelines for infants and children generally provide guidance on *what* types of food to eat (or not to eat) to ensure a diet has an appropriate balance of macronutrients and is rich in micronutrients.<sup>44</sup>

However, it also matters *how* food is eaten. Parents and caregivers' feeding practices can influence a child's ability to regulate their own food intake in ways that promote excessive energy intake.<sup>45</sup> For example, children served larger portions tend to consume more food.<sup>46</sup> However, children whose caregivers strictly restrict the amount and type of food tend in later childhood to eat in the absence of hunger. Snacking despite not feeling hungry is more likely to lead to higher overall energy intake,<sup>47</sup> and a small study found that five-year-old New Zealand children snacked more frequently than recommended, with snacking contributing to substantial amounts of their saturated fat, sugar and sodium intake.<sup>48</sup>

Children whose caregivers use food as a reward are more likely to engage in long-term emotional overeating. On the other hand, caregiver practices that provide structure by moderately monitoring and guiding (but not restricting) food intake can protect against emotional overeating.<sup>49,50</sup>

Several aspects of how a family eats together can have a positive impact on children's BMI and nutritional health. These include eating together more frequently, a longer meal duration, having a positive atmosphere, parents demonstrating healthy eating, and not having a television playing during meals.<sup>51,52</sup> As long as nutritious food and appropriate portion sizes are offered, extending a family's typical meal time by just 10 minutes appears to help reduce children's overall eating rates, and may even encourage children to eat substantially more fruits and vegetables.<sup>53</sup>

Some other childhood eating behaviours, such as eating speed and responding to feelings of fullness, are more strongly influenced by biological factors than feeding practices. Eating faster leads to greater calorie consumption and is associated with higher body fat levels.<sup>54</sup> Therefore, if a child tends to eat noticeably fast, parents and caregivers can provide support by teaching them to slow their eating speed. This promotes feelings of fullness, so children stop eating earlier without overconsuming and also feel less hungry between meals.

## The New Zealand context

A further parent/caregiver factor involves awareness of their child's weight status. The New Zealand Health Surveys reveal a mismatch between children's weight and their caregivers' perception of it: just 12% of caregivers of children who were overweight and 49% of caregivers of children with obesity correctly identified their children's weight status.<sup>55</sup> Similarly, the Growing Up in New Zealand study found that 73% of mothers of children who were overweight or obese perceived that their child had a normal weight.<sup>56</sup> Moreover, another 10% of mothers whose children had normal weight perceived their child to be underweight. More accurate understanding by caregivers of their child's weight may lead to more appropriate feeding practices for the child's nutritional needs.

Another predictor of childhood obesity, according to the Growing Up in New Zealand study and the NZ Health Surveys, is household food insecurity, and the association is a strong one.<sup>57,58</sup> Food-insecure households have limited means or uncertain ability to access nutritious, culturally acceptable food. This situation is much more likely to be experienced by Māori and Pacific children and those who are most socioeconomically deprived. In 2021/2022, one in eight New Zealand children lived in a household where food runs out sometimes or often.<sup>58</sup> Financial hardship and food insecurity influence not only what and how much children eat, but also caregiver feeding practices that interfere with eating self-regulation, such as pressure to finish meals.<sup>59</sup>

## Implications for policy and parenting

Given that childhood obesity risk is determined by a complex interaction between biological, developmental and socio-environmental factors, it is unsurprising that focusing primarily on diet and exercise alone is ineffectual in addressing the issue both at an individual and a population level.<sup>60</sup> Instead, there is a clear opportunity for policies to support preventive action through promoting preconception health of both biological parents and the mother's health during pregnancy, followed by informing parents and caregivers of appropriate feeding practices that support healthy growth and encourage healthy eating behaviours in the child.

### Policy makers and healthcare practitioners

The robust body of research recognising the contribution of prenatal factors strongly suggests that **mitigation needs to start as early as before pregnancy**, including for fathers, and must be a key focal point for prevention.

This can be achieved in several ways:

- Educational efforts are needed to improve preconception health literacy, including the benefits of staying within the recommended weight range before conception, among youth and adults. This should start with adolescents in school, well before parenthood is planned,<sup>ii</sup> and reemphasised among adults who plan to start a family;
- All pregnant women should be offered information about the importance of moderate weight gains and being screened for gestational diabetes;
- Where slower weight gain and/or improved glucose control are clinically recommended, continual professional support should be provided in a clinically and culturally sensitive manner to help women through the rest of their pregnancy.

It is extremely important that in raising awareness and providing clinical support, care is taken to ensure mothers do not feel shamed or dismissed.<sup>13,63</sup> Having limited resources can be a source of stress for many intending parents, and advice and information offered should acknowledge constraints they may face such as finances, time and social support.<sup>64</sup>

**During infancy**, new parents should be informed of the importance of waiting until their baby is six months old, or at least no younger than four months, before introducing solid food. The reasons for doing so – including that it is one way to help their child to find it easier to maintain a healthy weight, potentially throughout life – should be overtly explained.

**In childhood**, parents should receive guidance around feeding practices that help their child develop helpful eating self-regulation skills (detailed in the next section). They should also be made aware if their children are clinically assessed as overweight or obese, such as by their healthcare professional or at the B4 School Check. Such advice, sensitively delivered, helps parents recognise there is an issue to be managed and is a prerequisite for encouraging optimal eating behaviours.

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ii The efficacy of such programmes has been demonstrated in the New Zealand context and internationally.<sup>61,62</sup>

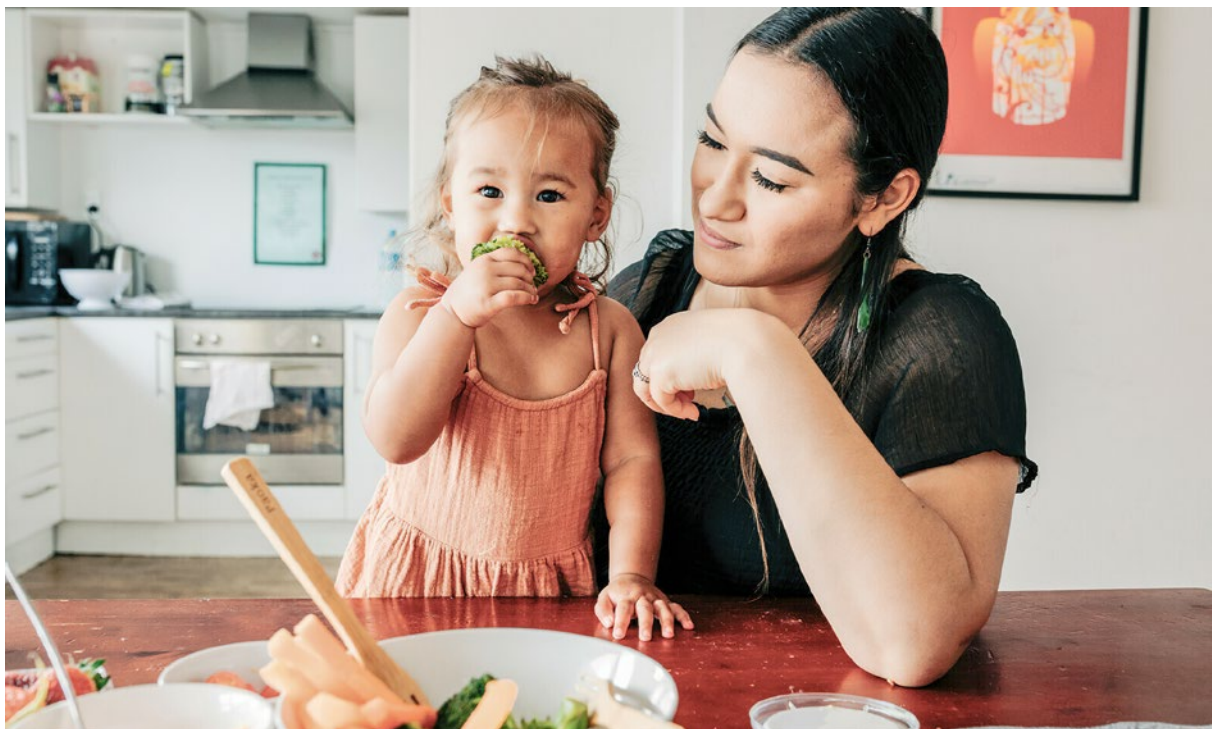


## Recommendations for parents

Being exposed to prenatal risk factors for childhood obesity does not necessarily mean children will, without exception, become overweight or obese. Rather, the risk of becoming so is cumulative: the greater the number of risk factors a child is exposed to in early life, the greater the likelihood of becoming overweight or obese in childhood.<sup>57,65</sup> It is therefore important that parents recognise that the risk can be lessened, in some cases substantially, by engaging in optimal eating behaviours during childhood.<sup>66,67</sup> Some measures include:

- Wait to start solid food after four months of age and preferably six;
- Monitor food intake without being overly restrictive on the amount and type of food the child consumes;
- Don't use food as a reward;
- Discourage snacking when not hungry;
- Favour moderate portion sizes, and slow the eating rate if needed by encouraging smaller bites and chewing more;
- Where possible, have healthy family meals that are unrushed and relaxed.

Given the highly complex and multifactorial basis for childhood obesity, and the potential for different influences to interact and reinforce obesity risk across generations, these policy and parental measures should be considered as part of wider whole-of-government efforts to help mitigate the substantial public health challenge, as detailed by other authors in the New Zealand context.<sup>68,69</sup>



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