

## PERSPECTIVE

## Periconception weight management in the Women, Infants, and Children program

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### Summary

### Introduction

Reproductive age women, particularly low-income and minority women, are at risk for obesity. As an integral service provider for these women, the US Department of Agriculture Special Supplemental Nutrition Program for Women, Infants, and Children is uniquely positioned to refine its focus and efforts.

### Methods

Strategies for accomplishing this goal include identifying pregnant, inter-partum and post-partum women in need of targeted patient-centred services including education, counselling and support to address weight loss or appropriate gestational weight gain.

### Results

These services may include calorie-controlled diets, behavioural strategies, alternative methods of education delivery and extending post-partum benefits. Implementation of these strategies is feasible through collaboration with related government subsidized programs and reallocation of funds, staff and other resources.

### Conclusions

Given the magnitude of the problem and the adverse outcomes that obesity has on health and quality of life, Women, Infants, and Children can more positively impact the lives of our most vulnerable families, which face an obesogenic environment.

**Keywords:** Obesity, periconception, weight management, WIC.

## The problem of maternal obesity and the unprecedented position of Women, Infants, and Children to intervene

The US Department of Agriculture Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) was established to safeguard the health of low income at risk pregnant, post-partum and breastfeeding women and infants and children up until the age of 5. WIC was conceived and established as a pilot when childhood and prenatal hunger among the low-income population was recognized to be a critical problem in the USA. Currently, more than 40 years since its inception, WIC operates in every state in the USA and Puerto Rico. It is well documented that WIC has enhanced

certain aspects of nutrition for pregnant women, infants, post-partum and breastfeeding women and children up to the age of 5 by providing healthy foods, nutritional education and counselling, breastfeeding support and referrals to other health and social services (1).

The face of malnutrition, however, has shifted from one of insufficient nutritional intake due to low-calorie intake to insufficient nutrient intake due to excessive caloric intake contributing to the national epidemic of obesity. More than one-third of women in the USA are obese, and more than one half of pregnant women are overweight or obese (2). Pregnancy and the post-partum period are critical nutritional time points that influence the immediate and long-term health of both the mother and child. While the health and nutritional status of women prior to pregnancy is now arguably the most important

to long-term health outcomes, the nutritional status of women during pregnancy including gestational weight gain influences birth outcomes, health and long-term risk for chronic disease (3). Currently, only one-third of pregnant women gain the amount of weight recommended by the Institute of Medicine (IOM) to minimize risks for adverse outcomes in the mother (e.g. gestational diabetes, pregnancy-induced hypertension and medically indicated caesarean sections) and neonate (e.g. preterm birth, large or small for gestational age, congenital anomalies and infant mortality) (4–6). Excess weight gain in pregnancy leads to increased post-partum weight retention, which averages 3.3–5.5 lb with 20% of women retaining at least 11 lb 6–18 months post-partum. At 24 months, 50% of obese women retain  $\geq 11$  lb of pregnancy weight gain (6,7). Excessive weight retention leads to gradually increasing body mass index (BMI) and health risks, as well as likely complications in future pregnancies.

Low-income minority women are at particular risk of obesity, and the prevalence of obesity is increasing most significantly among African-American and Hispanic women, with the highest prevalence of 50% occurring in African-American women (8). Consequently, these populations are especially vulnerable to obesity-related chronic diseases such as diabetes mellitus, cardiovascular disease, hypertension and certain cancers, all which impact quality of life as well as increasing government spending on elevated healthcare costs (9). The obesity epidemic in the low-income WIC population suggests that a realignment of policy governing the provision of WIC services is needed not only to improve nutrition and overall health but also to specifically address overweight and obesity.

Of over 6 million pregnancies in the USA each year, the WIC program provides service for approximately 15%, and more than 50% of pregnant women enrol in WIC during their first trimester (10). An average first-time mother will enrol in WIC during her first trimester of pregnancy and will remain engaged with the WIC program until that child is 5 years of age (8). With an average inter-pregnancy interval in the USA of 34 months (11), the post-partum period of one pregnancy is also the prepregnancy period of another, and therefore, the likelihood that a woman will become pregnant again before ending WIC benefits with the enrolled child is high. WIC is therefore well positioned to reach the population most at risk, given that it reaches a sizable percentage of low-income women and families. The aim of this paper is to highlight the unprecedented opportunity for WIC to contribute to prevention of maternal overweight and obesity. Through its existing four pillars of health and nutrition services, programmatic shifts requiring no additional resources can be accomplished with an allowable change to the Federal mandate. Furthermore, with additional funds, states could request

an expansion or redirection in services to better serve the needs of populations in America most vulnerable for over-nutrition and sedentary behaviours.

Specific recommendations for the proper management of overweight and obesity (12) and gestational weight gain (6) have been developed and are currently being used by healthcare providers. The first guidelines for the treatment of obesity were established in 2014 by the American College of Cardiology and American Heart Association. These guidelines provide specific recommendations for delivery of effective lifestyle modification programs including minimum number for contacts, rate of weight loss and method of delivery to achieve a weight loss efficacy replicated in clinical trials (12). Using these guidelines as a foundation, and considering the economic and personal barriers faced by populations served by WIC, the program can develop an expanded strategy including identifying clients in need of weight management services and extending post-partum WIC benefits. Moreover, through collaborations with other government-funded programs to focus on maternal obesity, WIC can consequently improve overall health and reduce chronic diseases in families, starting with mothers. Instituted to guide the development of weight management strategies for pregnant WIC participants are the 2009 IOM guidelines for weight management in pregnancy. These guidelines provide evidence-based recommendations that reflect the changing US demographics, particularly the surge in overweight and obesity in adults (6).

## Four pillars of Women, Infants, and Children service

Women, Infants, and Children provides four pillars of health and nutrition services: healthy food, nutrition education, breastfeeding support and healthcare referrals. Since the inception of WIC as a pilot program in 1972, the adoption of Federal policy and guidance around these key initiatives has led to well-documented improvements in diet quality (13,14), decreased rates of anaemia (15), increased rates of breastfeeding (16,17) and decreased rates of low birth weight infants (18,19) and neonatal deaths (18), respectively.

### Healthy foods

Probably the cornerstone of WIC is to provide nutritious foods to improve the health of women and children who are at nutritional risk. WIC has been receptive to changes in the food environment and undergone numerous structured evaluations to better tailor the food packages for women and infants. For example, in 1992, the WIC

Farmers' Market Nutrition Program was established by the US Congress to provide fresh, unprepared, locally grown fruits and vegetables to WIC participants. In fiscal year 2015, 1.7 million WIC participants received food benefits as a result of this program. However, not all State agencies operate the Farmers' Market Nutrition Program on a statewide basis (20).

Congress mandates that an evaluation of the WIC food packages must occur every 10 years. WIC responded to the IOM's 2006 recommendations to align the food packages with the Dietary Guidelines for Americans, Health People 2020, and to address 30 health objectives including improving adult weight (21). Changes to the food packages based on the 2006 recommendations were successfully implemented in 2009. The IOM reevaluated the WIC food packages once again in 2016 and made the following recommendations regarding the mother's food package: (1) increase the dollar amount of the cash value voucher (CVV), add fish and reduce the amounts of juice, milk, legumes and peanut butter, (2) allow CVV substitutions to address individual needs (i.e. cultural preferences and food allergies) and (3) modify WIC food specifications to improve alignment with dietary guidance (21). To enable women receiving WIC food packages to modify their energy intake to successfully gain the recommended amount of weight during pregnancy and lose weight post-partum, an additional consideration for the existing IOM review panel is to authorize WIC nutritionists to modify food packages to better address the nutritional needs and goals of individual participants. Such modifications may include further reducing or excluding juice and providing CVV substitutions for additional fruit and vegetables, portion-controlled foods, and meal replacements will aid women in following a calorie-controlled diet and achieving their weight gain or loss goals.

### Nutrition education

Women, Infants, and Children is the only Food and Nutrition Services nutrition assistance program federally mandated to provide nutrition education free to participants. Since its inception in 1999, as a result of two studies that recommended WIC to strengthen nutrition education through a more client-centred behavioural approach to develop healthy behaviours for life, Revitalizing Quality Nutrition Services continues to evaluate and improve nutrition education within WIC (22). To tailor nutrition services to the individual needs of participants, participants are engaged in prioritizing topics that best meet their needs and interests (23). Each state is responsible for interpreting the nutrition education mandates and implementing a program that fits the needs of their constituents. Often toolkits are developed to help staff deliver nutrition information

consistently and effectively to participants. In addition to in-person education, technologies such as mobile or web-based programs have been used to enhance information delivery and program management (24).

The weight management recommendations provided by the IOM and the treatment guidelines for obesity align with the WIC education objectives. The first charge issued by the IOM Gestational Weight Gain report is to increase the proportion of women who gain within the 2009 Gestational Weight Gain Guidelines. The first step to achieving this goal is to educate women on the weight gain recommendations and to assist women in setting their BMI-specific gestational weight gain goals. The IOM has developed a Pregnancy Weight Gain Guidelines Toolkit (25) which includes material to aid healthcare professionals to disseminate guidelines and appropriately educate and utilize a weight tracker for individualized weight monitoring. WIC services for weight management would be formalized, universal and led by a trained nutritional professional WIC staff, assisted by other WIC staff. The ideal behavioural weight loss program consists of  $\geq 14$  in-person counselling sessions in 6 months (12). The IOM suggests that charting and discussing weight gain at each patient contact is important. Pregnancy weight gain charts allow assessment of the overall pattern of weight gain in relation to the IOM recommendations and help women to identify if they are on track with the IOM recommendations. WIC clients would be encouraged to track their weight weekly throughout pregnancy using the IOM gestational weight gain tracker. While manually graphing incremental increases in weight may be difficult for some WIC participants, eHealth/mHealth platforms have integrated the IOM gestational weight gain guidelines and eased self-monitoring through wireless Bluetooth scales and near real-time, automated graphing (<https://www.pbrc.edu/research-and-faculty/calculators/gestational-weight-gain/>). There is emerging evidence that electronically delivered programs (e.g. eHealth or mHealth) that provide near real time and personalized feedback can result in significant weight loss sufficient to return participants to a healthier weight. Telehealth or eHealth strategies will allow for increased contact with HIGH RISK individual through phone, texts or other social media resulting in cost-effective monitoring, education and support for clients to reach their individualized weight goals. In addition to self-monitoring weight, other strategies that consistently improve weight management programs and can be integrated into an eHealth/mHealth program include (1) utilization of behaviour change techniques especially those that compare individual's behaviour with others (26–28); (2) increased counsellor-participant contact (26,29); and (3) counselling with a dietitian focusing on energy intake (11,26,30,31). There are a

few examples now of efficacious eHealth interventions delivered in WIC for management of weight during pregnancy or post-partum that show promise for wide-scale testing and dissemination (32–36).

A recent survey study of almost 650 WIC nutritionists reported that weight gain during pregnancy and prenatal nutrition/diet were topics discussed in 75% of one-on-one appointments with pregnant women (23). Interestingly, neither weight gain in pregnancy nor prenatal nutrition was discussed in one-on-one sessions observed (37). These data highlight that WIC staff acknowledge the importance of these topics but may need better assistance in delivering new material.

### Breastfeeding

In 1992, Congress mandated the provision of breastfeeding education and support to mothers receiving WIC services, and the Loving Support Makes Breastfeeding Work campaign was launched. Periodic additions to WIC program in support of encouraging the establishment and maintenance of breastfeeding include the use of past WIC participants to support women learning to breastfeed through the WIC Breastfeeding Peer Counselor Initiative in 2004, modification of the WIC food package in 2009 to include more healthy foods for breastfeeding mothers and in 2011, an IOM-led evaluation of the initial Loving Support Makes Breastfeeding Work Campaign to include expansion of the program to technological interfaces such as text messaging. The success of these programs on breastfeeding is clearly evident with more than a 20% increase in the number of WIC infants' breastfed from 1998 to 2010 (38).

Breastfeeding rates are associated with maternal BMI. Compared with women of normal body weight, breastfeeding is less likely to be initiated in women with overweight or obesity (39), and obese mothers are less likely to maintain breastfeeding (39), even after adjusting for psychosocial and demographic factors such as social and emotional support, breastfeeding knowledge, behavioural beliefs and confidence (40,41).

Exclusive breastfeeding expends approximately 500 kcal d<sup>-1</sup>, which may promote weight loss (42). Studies show that women who have breastfed have lower risks of visceral adiposity, diabetes, hypertension, hyperlipidaemia and cardiovascular disease (42). Furthermore, breastfeeding, particularly higher intensity breastfeeding (greater proportion of breastfeeding as compared with formula feeding), has also been associated with lower risk for type 2 diabetes mellitus after a pregnancy complicated by gestational diabetes (43). And for children, in comparison with infants who were never breastfed, breastfed infants have a 12% to 24% reduction in the future risk of

overweight/obesity (44). It is important to note that the difference in overweight/obesity risk between breastfed and non-breastfed infants is also likely influenced by other factors including differences in parental feeding styles (45,46), the infant pattern of feeding self-regulation (47,48) and maternal factors such as sociodemographic characteristics (49) and impaired lactogenesis (41).

Although weight loss is often discouraged during breastfeeding because there is concern that energy restriction may impair lactation performance, studies indicate that weight loss can be safe during breastfeeding. Combining dietary restriction and increased physical activity to promote approximately 500-kcal d<sup>-1</sup> deficit (about 1 lb per week of weight loss), beginning after breastfeeding patterns are stable, can be safely undertaken without affecting the composition of breast milk or infant growth (50,51).

The programmatic infrastructure of breastfeeding in WIC is solid. The provision of additional education to WIC staff about the vulnerability of women with overweight or obesity for breastfeeding will allow a more focused effort on those WIC mothers who are most likely to not breastfeed at all or to discontinue breastfeeding early.

### Referral

Finally, referral to healthcare and social services based on individual client needs identified during the nutrition assessment is the final pillar of WIC. An essential aspect of a successful weight management program is to assess which individuals need intervention. Women not at weight-related risk (BMI of 18.5 to <30 kg m<sup>-2</sup>) would receive nutrition education regarding weight and goal setting strategies for adopting a healthful diet and lifestyle habits. However, non-pregnant participants who have a (1) BMI 25–29.9 kg m<sup>-2</sup> and are high risk for cardiovascular disease due to obesity-related comorbidities (e.g. hypertension, dyslipidaemia and diabetes) or (2) BMI ≥30 kg m<sup>-2</sup> would be uniformly labelled as HIGH RISK and receive nutrition education, counselling and support to address weight loss, including a 'prescription' for a comprehensive lifestyle program that includes (1) provision of a moderately reduced calorie diet (5–10% weight loss in 6 months), (2) a program of increased physical activity and (3) the use of behavioural strategies to facilitate adherence to a healthier lifestyle. Additional methods for weight loss including pharmacotherapy and bariatric surgery are outside of WIC practices, but WIC staff would be knowledgeable of such treatments and be trained to provide appropriate referrals to outside health service providers.

**Table 1** Scalability of successful weight management program characteristics for periconception health in WIC

WIC program pillar	Recommendations for implementation
Healthy foods	(1) Identify women with a BMI $\geq 30$ kg m <sup>-2</sup> as HIGH RISK and flag for weight management services (6,12,23). <sup>a</sup> (2) Include portion-controlled foods in WIC food packages for individuals in need of weight management. <sup>b</sup>
Nutrition education	(3) Provide basic bathroom scale and pedometer for weight and activity tracking (32,52). <sup>b</sup> (4) At each WIC visit, measure weight and plot on a weight gain or weight loss chart showing an ideal weight zone. Counsel WIC client on weight change (12,23,25,37). <sup>a</sup> (5) Provide opportunities for implementation of a weight management syllabus (i.e. support groups and exercise, cooking and gardening activities). <sup>a</sup> (6) Provide education on free government-supported self-monitoring smartphone apps or other tools (53). <sup>a</sup> (7) Bolster WIC programs with access to remote services and contacts with WIC staff between visits (email, phone, Internet, smartphone applications, etc.) (54). <sup>b</sup>
Breastfeeding	(8) Identify women with a BMI $\geq 30$ kg m <sup>-2</sup> as HIGH RISK and flag for increased breastfeeding support (40,41). <sup>a</sup> (9) Match peer-counsellors to breastfeeding mothers with consideration of BMI (55). <sup>b</sup>
Referral	(10) Evaluate need for weight management services and structure of services at the first pregnancy visit, first post-partum visit and other weight and life cycle milestones (6,12,56). <sup>a</sup> (11) Increase frequency of WIC visits for high-risk individuals to allow for behaviour change interventions (12,23,37). <sup>b</sup> (12) Provide continuity and integration of care and consistent messages through additional government-subsidized programs (SNAP, HeadStart, community centre, Medicaid providers and community health units, and Nurse Family Partnership Program) (23,37). <sup>b</sup>

<sup>a</sup>Could be implemented within current WIC structure.

<sup>b</sup>Would require shift in focus and reallocation of WIC resources.

BMI, body mass index; SNAP, Supplemental Nutrition Assistance Program; WIC, Women, Infants, and Children.

## Implications for practice and/or policy

Table 1 proposes how weight management strategies could be integrated into the WIC program and within the four pillars of existing services. Many weight management strategies outlined such as uniformly identifying high-risk individuals in need of weight management services, measuring and tracking weights on a weight graph in relation to an ideal weight zone based on established recommendations, focusing weight management counselling sessions on energy intake and encouraging behaviour change through motivational interviewing, self-monitoring, goal setting, etc. can be integrated into the current WIC program without additional resources or significant restructuring beyond the current WIC appropriation. However, although easy to implement, passive programmatic changes such as client education through handouts or brochures may result in health benefits but have a limited effect on weight management (57,58). New approaches need seamless integration within the WIC clinic without additional burden for the nutritionist to be sustainable (56).

More intensive weight management approaches including increased contact (in-person or remote), extending WIC services to all post-partum moms to 1 year, allowing for the modification of food packages for inclusion of portion-controlled foods, and collaboration with related government-funded programs will require funds to support a feasibility study and then funds beyond the current WIC and government appropriation. Government policies

addressing weight management similar to those developed for ensuring a healthy food package and breastfeeding promotion are needed to expand current WIC services and allow WIC to continue its promotion of the optimal health and nutritional status of a population that is particularly at risk for poor pregnancy and post-partum outcomes.

Approximately 70% of WIC recipients participate in other governmental programs. Participation in qualifying programs such as Medicaid, Temporary Assistance to Needy Families and the Supplemental Nutrition Assistance Program classifies them as income eligible for the WIC program. It is feasible and preferable that WIC collaborates with allied health providers and other government-funded programs particularly related to nutrition and population health, to assist at risk women by improving their current and future health, as well as that of their children (59). Through collaborations between government-funded programs, services will no longer be duplicated therefore reducing current government spending and allowing for reallocation of funds to important aspects of weight management programs not currently implemented. According to the Obesity Guidelines, a high-intensity lifestyle program requires approximately 14 in-person contacts within a 6-month period (12). Indeed, WIC participants most often only receive two contacts (more if breastfeeding). Combining government resources including universal participant data records for easy transmittal of health information between the entities allows for a continuity of care and implementation of more efficient and effective



weight management programs. The sharing of vital information of WIC recipients between providers will result in a cohesive and integrated plan to provide frequent and targeted healthy lifestyle programs to take advantage of the WIC window of opportunity.

Women, Infants, and Children was recently permitted to expand services in order to tackle childhood obesity. The pilot project Fit WIC was a great success (60). Executed in five states (California, Arizona, Kentucky, Virginia and Vermont), the program confirmed that WIC is indeed positioned to play a key role in efforts to prevent obesity in preschool-aged children. Collectively, the individual state programs garnered specialized education materials focused on healthy behaviours and lifestyle choices (and not weight) along with staff training and increased time with WIC parents allowed staff to build a stronger rapport with parents and to focus on childhood overweight, parents preferred strategies that involved the entire family, physical activity should be included in nutrition education and assessment, the adoption of wellness opportunities for staff at the workplace fostered more effective health educators and finally stakeholders acknowledge WIC as a community leader and partner in obesity prevention efforts. While several of these initiatives can be realized within the current WIC program structure, it is also acknowledged that WIC would require additional funding to appropriately implement the Fit WIC program uniformly across the country. Nevertheless, these five individual Fit WIC programs highlight the receptivity of the WIC program for expanded services and that the backbone of WIC, being the four pillars are key stepping stones for implementation of an obesity prevention program beginning with the pregnant woman.

In contrast, a pilot study in rural Colorado (HeartSmartMoms) evaluating the feasibility of instituting a system-level change to include measurement of maternal weight at each post-partum visit (mother and child) and to discuss maternal health habits with motivational interviewing was not as successful (56). The program relied on use of an established bilingual, interactive health kiosk at WIC appointments (61). The kiosk provided feedback to the mother and WIC counsellor on maternal BMI along with information of associated health risks and tailored recommendations. The information provided by the kiosk would prompt the topics to discuss during one-on-one counselling, and the WIC nutritionist would use motivational interviewing to help establish a goal and plan for health behaviour change. Although enrolled participants significantly improved their weight status and reduced intake of sugar-sweetened beverages (56), uptake of the intervention was low. Only one in every six post-partum women targeted participated in the new program.

The primary difference between these two programs is the underlying infrastructure in which they were implemented which ultimately affected success. Fit WIC was well supported and implemented statewide, across five states. The HeartSmartMoms program was embedded into three rural clinics in a single state and as a research project. Although, intended to be fully immersed into these clinics, the program was ancillary to existing services. Moreover, WIC staff were responsible for introducing participants to the program and obtaining informed consent. It is not surprising that barriers raised by WIC staff to explain the low enrolment included lack of buy-in from staff, lack of knowledge regarding the study, resistance to change and lack of time.

These two examples underscore that any new program, even pilot in nature, requires buy-in from not only staff but also participants. Next steps should include formative research with participatory research models to garner the inputs of all stakeholders. Such an approach should aim to confirm the programmatic focus areas around maternal obesity and approaches to implementation developed with complex barriers for implementation considered.

## Conclusion

The WIC program, which was established to tackle issues of maternal and infant undernutrition, serves a population that is particularly vulnerable to societal trends, increased consumption of calorically dense foods and sedentary behaviours. Continued services for these populations would include development and implementation of programs to tackle the issue of excessive caloric intake, overweight and obesity. The WIC program can immediately improve care by uniformly and consistently (1) identifying those in need of weight management, (2) following established weight management guidelines during pregnancy and post-partum, (3) measuring and graph weights at each appointment and (4) discussing behaviours focused on managing proper energy intake. While working to uniformly adopt current practices, WIC can work with other government-funded programs to decrease duplicated services and increase the continuum of care allowing reallocation and restructuring of WIC resources to focus on the primary public health concern of this millennium. It is anticipated that the expanded services would defray the staggering healthcare costs associated with management of obese pregnancies (estimated to exceed the cost of care for normal weight pregnancies by 5.4- to 16.2-fold) and the downstream costs of the long-term management of obesity in children (62).

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## Conflict of Interest Statement

No conflict of interest was declared.

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