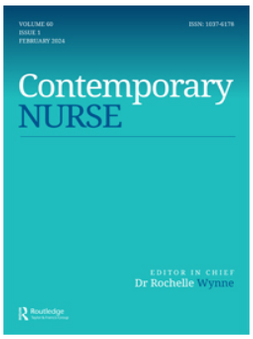

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REVIEW ARTICLE

An exploration of extreme obesity and weight loss management for adults in rural, remote, and regional areas: a systematic review

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Background: Extreme obesity is a global health issue impacting health and related health outcomes. Although extreme obesity is prevalent across all geographical settings, the condition is more common in geographically isolated locations. The success of mainstream weight loss strategies such as surgery, exercise, and dietary information within these communities remains unknown, and it is unclear if isolation facilitates or hinders treatment for weight management.
Aim: This review aimed to identify common themes around weight loss and health and social impacts for extremely obese adults living in rural, remote, and regional locations.
Methods: A systematic literature review of peer-reviewed publications from May 2013 to May 2023 was undertaken and appraised using the Mixed Method Appraisal Tool (MMAT). Sequential synthesis was thematically analysed and described within a narrative account. Earlier dates were not included as initial research indicated a global surge in obesity within the early 2010s (Wang, Y., Beydoun, M. A., Min, J., Xue, H., Kaminsky, L. A., & Cheskin, L. J. (2020). Has the prevalence of overweight, obesity and central obesity levelled off in the United States? Trends, patterns, disparities, and future projections for the obesity epidemic. *International Journal of Epidemiology*, *49*(3), 810–823) and a surge in bariatric treatments for the management of extreme obesity was noted around the same time (Mocanu, V., Dang, J. T., Sun, W., Birch, D. W., Karmali, S., & Switzer, N. J. (2020). An evaluation of the modern North American bariatric surgery landscape: current trends and predictors of procedure selection. *Obesity Surgery*, *30*, 3064–3072).
Results: This review identified 13 studies that reported negative trends in extreme obesity for isolated locations linked to gender, culture, and poor mental health. Individualised and community models of weight loss support can be positive for certain demographic groups, specifically females, through the promotion of cost-effective, and locally available traditional food choices.
Conclusion: Living with extreme obesity within geographically isolated locations and losing weight is challenging for women, Indigenous peoples, and people with low literacy and those from lower socio-economic backgrounds. Generalised advice about weight loss is often unsuccessful; however, weight loss is achievable with consumer engagement which considers the influence and impact of rurality. Further research focusing on individualised nursing models for managing morbid obesity within isolated locations is required.

Keywords: chronic disease; models of care; bariatric care; education; healthcare models: nursing

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Impact statement

It is commonly known that people who live in rural, remote, and regional locations are more likely to be extremely obese than city dwellers and that there is reduced access to fresh food, and health services within rural environments.

There is little recognition of the impact of extreme obesity on mental health or the management of extreme obesity within certain groups, such as women, or Indigenous peoples living in isolated locations. There is also little evidence to suggest that the treatment of extreme obesity, through the management of weight loss alone is actually effective.

This paper provides a synthesis of the literature available relating to extreme obesity for rural, remote, and regional residents and makes clear recommendations to improve outcomes by implementing nurse-led consumer-centred models of care.

Plain language summary

Extreme Obesity is a serious health condition that results from an abnormally high body mass and is also referred to as Class III/ 3 Obesity (Gudur, A. R., Geng, C., Radlinski, M., Yang, Z., Shami, V. M., Wang, A. Y., & Podboy, A. (2023). Endoscopic sleeve gastroplasty: a safe bariatric intervention for class iii obesity (BMI> 40). *Obesity Surgery*, *33*(4), 1133–1142). Before 2020, the condition was commonly referred to as "morbid obesity" (Garvey & Machanick, 2020). The term "Class III" or "extreme obesity" is diagnosed by having a body mass index (BMI) greater than 40 kg/m². People who are extremely obese often have serious obesity-related health conditions such as hypertension or diabetes. The proportion of people with extreme obesity living in rural and remote areas of the world is higher than for city populations.

Health professionals often encourage individuals to lose weight when they have extreme obesity. Extremely obese people are often told to lose weight by eating healthy or by exercising. This is difficult for rural people as they do not have access to supermarkets or to gyms. This study aimed to explore the implications of weight loss recommendations for people living in isolated locations with a focus on what works, and what does not work.

We found that women and Indigenous people living in isolated locations were more at risk of developing extreme obesity. Other at-risk groups included those with mental health problems, the poorly educated, and those with lower incomes. However, in isolated locations, there can be a strong community spirit which can used to drive weight loss. We make three recommendations: (1) health professional recognition of community role in weight loss; (2) nursing collaboration with clients for health goals; and (3) improved education for clinicians and for clients experiencing extreme obesity.

1. Introduction

Extreme obesity and obesity rates have increased over the last three decades across the world impacting both developed and developing countries (Ameye & Swinnen, 2019). Extreme obesity is a condition that carries significant illness and mortality (Cogswell et al., 2016). This is predicted to increase steadily and by 2035 westernised society will have the highest prevalence of the condition (Keaver et al., 2020). 2019 research data suggest that 32% of rural dwellers experience obesity in comparison to 26% of city inhabitants (Keramat et al., 2021). No data exists for the rates of severe obesity within rural areas although Tan (2021) states that across Australia the general proportion of people experiencing extreme obesity is approximately 4%. Worldwide, rates of obesity range from between 12 and 82.8% of entire country populations (Ahmed & Konje, 2023) so the issue is certainly not unique to Australia. Indeed, researchers from Korea refer to Class III through to Class V obesity (Huh & Nam, 2021). Jackson Leach

et al. (2020) compared 68 countries to survey rates of obesity concluding that both wealthy and poorer countries appeared to be both at risk of developing the condition. Current evidence from the Australian Department of Health (DOH., 2021) and the Australian Institute of Health and Welfare (AIHW., 2020) indicates that there is a population health crisis related to morbid extreme obesity across regional, rural, and remote areas of Australia (AIHW, 2021) and indeed every international rural and remote corner (Chan, 2018).

The health impact of both obesity and extreme obesity on individuals includes the development of multiple chronic diseases. Healthcare professionals often provide support for weight loss and management of associated chronic diseases (Schleu & Barbosa, 2020). Additionally, as people live longer, the population of older adults living with extreme obesity is growing (Shlisky et al., 2017). The role of healthcare professionals inclusive of nurses, is central to the care and management of those with chronic disease and extreme obesity. Providing education focused on weight loss, diet, and medications and providing holistic consumer-centred care designed for chronic illness management is essential in promoting positive healthcare outcomes (Bartlett et al., 2020).

For many, extreme obesity is not solely a physiological issue. Inactivity, low educational levels, financial disadvantage, and food insecurity can contribute to higher rates of extreme obesity particularly for rural regional and remote people (Allen, 2019) living in isolated areas with fewer than 10,000 residents (Kipp et al., 2019). (The Royal Australian College of General Practitioners (RACGP, 2022)) assert that the "tyranny" of distance is rooted in many health, financial, and literacy issues for isolated Australian people and limits access to a range of amenities.

In the southern hemisphere, both obesity and extreme obesity rates across rural, regional, and remote areas continue to be higher than in metropolitan locations (Australian Institute of Health and Welfare [AIHW], 2020). The Australian Government's Department of Health (DOH) has identified that almost seventy per cent of all adults living across Australia can be classified as overweight or obese (12.5 million people) (DOH, 2021). Demand for bariatric surgery remains high in Australia, with Bariatric Surgery Registry annual reports indicating that rates of surgery increased by 27.3% between 2020 and 2021 and climbed to 58.3% between 2020 and 2022 (Monash University., 2023).

Despite well-documented effective weight loss interventions such as diet, exercise, and behavioural therapies (Yazdani et al., 2020), extreme obesity rates in isolated locations remain high and social influences upon extreme obesity weight loss such as food insecurity, available clinicians, and the impact of extreme obesity upon the ability to titrate essential medications are often not addressed in studies on people with extreme obesity living in rural, regional, and remote locations.

This systematic review summarises the available evidence for current weight loss management for people living with extreme obesity across rural, remote, and regional locations.

2. Methods

2.1. *Protocol registration*

This systematic review was registered with the International Prospective Register of Systematic Reviews (PROSPERO). Reference number CRD42020200713.

Eligibility inclusion criteria included published data between 2013 and 2023; Journals only: Peer-reviewed; full text; English language only; with terms appearing anywhere in the article (Chronic Disease* OR Lifestyle OR Health OR Surgery) AND (Morbid Obes* OR Severe Obes* OR Class 3 Obes*) AND (Rural OR Remote OR Outback OR Regional); and then the

same terms appearing within the abstract only. Exclusion criteria included papers for paediatric participants; acute management studies; duplicates; surgical technique papers; medical and genetic screening studies; and non-obese studies.

2.2. *Literature search*

This review was conducted in 2023. Searches were completed by one author (RS) and a librarian from the university library. Five databases were searched through the ProQuest and EBSCO platforms plus Google Scholar for initial searches: EBSCO Academic, ProQuest Health & Medicine, PUBMED Central, CINAHL Complete, and Informit. Exclusion and inclusion criteria narrowed search fields to peer-reviewed published papers, in English, between 2013 and 2023.

Both qualitative and quantitative approaches were accepted. Inclusions included journals only, published between 2013 and 2023, peer-reviewed and full-text only journals published only in English, the following keywords were used "Chronic Disease* OR Lifestyle* OR Health OR Surgery*" AND "Morbid Obes* OR Severe Obes* OR Class 3 Obes* AND Rural OR Remote OR Outback OR Regional". The term "morbid obesity" was retained and used as it remained commonly used in the literature before 2020 (Garvey & Mechanick, 2020).

2.3. *Data extraction*

Throughout the study, an Excel spreadsheet was used to record the number of studies identified and following application of exclusion/ inclusion criteria, data extraction. Around 2806 papers were initially identified and slowly narrowed down to 516 by the one reviewer and librarian following the application of eligible titles, duplicate removal, and exclusion application. An appraisal was conducted on 516 papers through a brief review of the abstracts. Once duplicates were removed, and papers had been subjected to exclusion following evaluation of title and abstract, evaluation was completed in full of remaining papers with two reviewers. The screening and selection phase involved independent reviewing of abstracts by two reviewers to determine if full text review was necessary (see Figure 1) with follow-up assessment of full texts to establish eligibility for inclusion. Any disagreements were resolved by discussion and consensus with a third reviewer, then paper eligibility was decided and recorded on an Excel spreadsheet following a broad paper review through abstract review. Post-review of the 516 papers, 13 were deemed suitable for inclusion. Included papers were evaluated and cross-checked using the Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018).

A thematic approach for extreme obesity, experiences, and weight loss approaches was used for the analysis of all final extracted papers. This approach was chosen as the papers included were not homogenous and therefore the structured thematic approach as outlined by Thomas and Harden (2008) was used. This involved observing patterns of data, the development of overarching themes, and similar findings between the studies. In the included papers, there were four overarching themes identified.

3. Results

3.1. *Study characteristics (see Table 1)*

Of the 13 studies, 10 were quantitative and 3 were qualitative. They originated from locations including the United States of America/Mexico ($n = 4$), Norway ($n = 2$), Australia ($n = 1$), Italy ($n = 1$), South Africa ($n = 1$), Canada ($n = 1$), Iran ($n = 1$), Turkey ($n = 1$), and Denmark ($n = 1$). Study settings ranged from hospitals ($n = 4$) to rural community programmes ($n = 9$). The

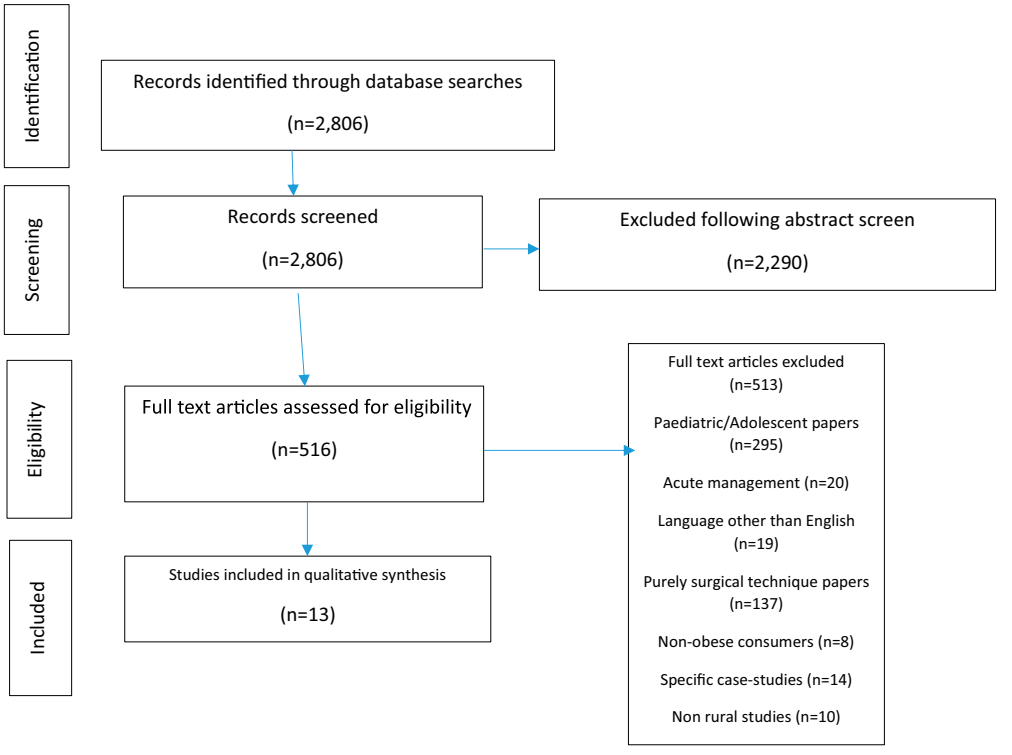

Figure 1. Systematic review process chart with study counts and reasons for exclusion.

studies focused on a range of health-based interventions, from lifestyle focus (Aasbrenn et al., 2018; Berge et al., 2019; Jonikas et al., 2016; Kegler et al., 2017; Migliore et al., 2013; Otang-Mbeng et al., 2017; Skovsby et al., 2020; Wilson et al., 2015) to evaluation pre-or post-bariatric surgery (O'Brien et al., 2016; Padwal et al., 2014; Roberson et al., 2016; Sivas et al., 2020; Yazdani et al., 2020).

4. Findings

Following the evaluation of the 13 papers, 4 themes emerged which illustrate the impact of rural, remote, and regional living on weight loss for people living with extreme obesity. The four themes include chronic disease and physical health; gender and mental health; culture and the role of food; and lifestyle, economics and education. One additional finding emerged which included the range of options that people are typically offered or are available in isolated areas to manage their condition including telehealth (O'Brien et al., 2016) and psychological support by clinicians living in other locations (Berge et al., 2019).

4.1. *Chronic disease and physical health*

All 13 studies acknowledged that extreme obesity was associated with developing chronic diseases including diabetes (Jonikas et al., 2016; Otang-Mbeng et al., 2017; Yazdani et al., 2020), hypertension, respiratory and cardiac problems (Otang-Mbeng et al., 2017; Yazdani et al., 2020), pain (Aasbrenn et al., 2018), and generalised cancers (Otang-Mbeng et al., 2017; Yazdani et al.,

Table 1. Characteristics of studies included in the review.

Author	Year	Location	Sample size	Study type	Aim	Major finding
Aasbrenn et al	2018	Norway	88	Prospective Cohort Study	Compare symptoms pre and post weight loss	Improvement in symptoms with weight loss
Berge et al	2019	Norway	195	Retrospective Cohort Study	Investigate association of symptoms and weight loss	Improvement in symptoms with weight loss
Jonikas et al	2016	USA	452	Screening Study	Investigate gender differences and mental health among patients	No associations between mental health and morbid obesity
Kegler et al	2016	USA	301	Prospective Cohort Study	Investigate association of home environment and physical activity	Association between home environment and morbid obesity
Migliore et al	2013	Italy	6516	Retrospective Cohort Study	Investigate hospitalisation rates and cost	High cost and rates associated with morbid obesity
O'Brien et al	2015	Australia	30	Prospective Cohort Study	Feasibility study of weight loss for Indigenous people	Acceptability of remote weight loss model for Indigenous people
Otang-Mbeng et al	2017	South Africa	118	Population based survey	Investigation of lifestyle factors	Inactivity, chronic disease and diet all influences on development of morbid obesity
Padwal et al	2014	Canada	500	Prospective Observational Study	Evaluation of bariatric surgery	Surgery was clinically effective to reduce morbid obesity
Roberson et al	2016	USA	24	Qualitative Descriptive Study	Factors influencing decision to undertake surgery	Influences were worsening health, low energy
Wilson et al	2015	USA/ Mexico	335	Prospective Cohort Study	Evaluate cost effectiveness of community weight loss program	Community weight loss programmes can be effective
Skovsby-Toft et al	2020	Denmark	16	Interview based study	Evaluation of feelings of wellbeing and activity	Themes of wellbeing sought for morbidly obese people
Sivas et al	2020	Turkey	27	Prospective Cohort Study	Evaluation of quality of life pre and post-surgery	Post-operative improvement in sleep, BMI and aspects of Quality of life
Yazdani et al	2020	Iran	200	Case Control Study	Evaluation of quality of life pre and post-surgery	Post-operative improvement in body image and aspects of health

2020). Although obesity can be a cause of disease, the mark where disease starts and obesity takes over is grey. For example, hypertensive individuals are more disposed to obesity (Jonikas et al., 2016); however, obese individuals can develop hypertension (Otang-Mbeng et al., 2017; Sivas et al., 2020). Chronic disease is a strong predictor for obesity surgery (Roberson et al., 2016), surgical intervention was often recommended (O'Brien et al., 2016; Padwal et al., 2014), and surgical management for extreme obesity was identified as a popular choice with medical practitioners for weight loss, as it can reverse some chronic disease (O'Brien et al., 2016; Padwal et al., 2014).

There were other health benefits resulting from weight loss including improved energy (Yazdani et al., 2020) and better pain control (Aasbrenn et al., 2018; Sivas et al., 2020). Studies reported improved sleep patterns with post-surgical weight loss (Aasbrenn et al., 2018; Sivas et al., 2020).

Two studies recorded respiratory difficulties associated with extreme obesity (Otang-Mbeng et al., 2017; Roberson et al., 2016). Daily problems including wheezing, asthma, and breathing difficulties were reported in the study by Otang-Mbeng et al. (2017), and Roberson et al. (2016) reported breathing problems as limiting completion of childcare duties, any kind of recreational exercise or sexual activity.

4.2. *Gender and mental health*

There was direct correlation between a negative mental health state and extreme obesity in multiple studies. The negative psychological effects of extreme obesity included mood disorders, depression (Sivas et al., 2020), social phobias (Jonikas et al., 2016), low self-esteem, and feelings of suicide (Skovsby et al., 2020) as well as dissatisfaction with body image for social media particularly among females (Yazdani et al., 2020). Mental health was particularly problematic for extremely obese females with higher hospitalisation rates for psychosis, depression, anxiety, drug dependence, and hysteria (Migliore et al., 2013) with higher rates of admission for schizophrenia, depression, or anxiety/ personality disorder than males (Migliore et al., 2013) and non-obese people (Jonikas et al., 2016). One study acknowledged that whilst pharmacological treatments are available, weight gains can affect antipsychotic levels, so clients require awareness and education for this (Jonikas et al., 2016). Two other studies identified that physical activity remains important for good mental health, with walking (Wilson et al., 2015), biking, swimming, and skiing (Aasbrenn et al., 2018), suggested if weight loss is desired.

Among females, the home environment was influential on weight. Females were increasingly sedentary around the home (Sivas et al., 2020) and less active in daily activities (Skovsby et al., 2020), whilst caring for children, family cooking, and watching TV increasing the likelihood of extreme obesity among stay-at-home mothers (Aasbrenn et al., 2018). It was also found that women from lower incomes are increasingly susceptible to extreme obesity because exercise equipment is financially inaccessible (Kegler et al., 2017). Extra support and encouragement were required to increase activity levels because of the apathy that stay-at-home mothers' experience (Aasbrenn et al., 2018). Additionally, owning a pet was not found to promote activity among females (Kegler et al., 2017) with increased ambivalence towards walking the dog due to feelings of objectification and alienation due to weight (Skovsby et al., 2020).

Improved quality of life is often sought by those who opt for surgery (Roberson et al., 2016; Yazdani et al., 2020) and i was measured by family activity participation, role-modelling for children, and reduction in public shame (Roberson et al., 2016). Roberson et al. (2016) cited that the shame of not fitting comfortably into a chair in public demonstrated anxiety (Roberson et al., 2016). Skovsby et al. (2020) also documented embarrassment and "fear that everybody is looking at you" (Skovsby et al., 2020).

4.3. *Culture and the role of food*

Race and culture can often lead to extreme obesity and chronic diseases (Jonikas et al., 2016; Otang-Mbeng et al., 2017; O'Brien et al., 2016; Wilson et al., 2015). Morbidly obese Indigenous Australians (O'Brien et al., 2016), and other native populations such as Africans (Otang-Mbeng et al., 2017), African American (Kegler et al., 2017) and Hispanic people (Wilson et al., 2015) are predisposed to diabetes, hypertension, and sleep apnoea although bariatric surgery is a culturally accepted way of managing obesity within some Australian Indigenous communities (O'Brien et al., 2016). Two studies identified that people from Mexico and South Africa are also high risk for developing chronic diseases due to high fat diets (Otang-Mbeng et al., 2017; Wilson et al., 2015). Few racial differences exist for extreme obesity (Jonikas et al., 2016) with the exception of African American women who were twice as likely to be obese than non-African American women (Kegler et al., 2017). Although the impact of traditional diets was omitted in studies on African communities, it was identified that consumption of westernised diets of fast fried foods had been problematic (Otang-Mbeng et al., 2017).

Targeting women (who traditionally cook) was suggested as a weight loss strategy for families and communities (Jonikas et al., 2016; Otang-Mbeng et al., 2017; Wilson et al., 2015) as community spirit was a way that residents can support each other (O'Brien et al., 2016; Wilson et al., 2015). Westernised food consumption by Indigenous populations between 3 and 6 times per week increased the risk of extreme obesity, therefore native foods are recommended (Otang-Mbeng et al., 2017; Wilson et al., 2015) with culturally sensitive education on food choices suggested for inclusion within weight loss programmes (O'Brien et al., 2016; Wilson et al., 2015). Culture requires prioritisation with lifestyle and cost-effective community consideration (Wilson et al., 2015) leading to improved health outcomes.

Within African culture, traditional foods were mentioned as having become unfashionable over the years (Otang-Mbeng et al., 2017) although where community cooking groups were prioritised, weight loss still occurred particularly within South Africa (Otang-Mbeng et al., 2017), America (Kegler et al., 2017), Mexico (Wilson et al., 2015), and Australia (O'Brien et al., 2016). Community cooking classes were useful following community bariatric surgery post-operative initiatives as a maintenance plan (O'Brien et al., 2016; Padwal et al., 2014; Roberson et al., 2016) if inclusive of dietary advice and nutritional deficiency monitoring. Community support was also viewed as a long-term solution for clinician scarcity in isolated locations (O'Brien et al., 2016) and where there is often reduced access to fresh foods requiring substitutions (Otang-Mbeng et al., 2017). Incorporation of food sampling demonstrations (Wilson et al., 2015), group lunches (Aasbrenn et al., 2018), and low-calorie dietary plans (Padwal et al., 2014) were found to be helpful for weight loss and maintenance. Offering realistic low-cost, home-based solutions (Kegler et al., 2017) has the potential to reduce stress about accessing healthy foods or implementing unrealistic plans.

4.4. *Lifestyle, economics and education*

Lifestyle factors can contribute to extreme obesity and sedentary behaviour with infrequent exercise leading to weight gain (Berge et al., 2019; Jonikas et al., 2016; Migliore et al., 2013; Otang-Mbeng et al., 2017) pain, and low energy (Roberson et al., 2016). Inactivity and weight gain can be overcome with exercise to boost morale and increase interaction, although exercise equipment, shoes and clothing can be unaffordable in disadvantaged rural areas (Kegler et al., 2017). Although for one study by Wilson et al. (2015), the provision of some equipment increased participation and weight loss. Despite this, free utilisation of the local environments can be made for walking and hiking with biking or swimming if affordable (Aasbrenn et al., 2018; Otang-Mbeng et al., 2017; O'Brien et al., 2016). Skovsby et al. (2020) suggests that

walking outdoors alone "in nature" can eliminate both costs and fear of judgements about collective exercising.

The literature revealed that weight loss has a direct link to education via participation (Aasbrenn et al., 2018; Berge et al., 2019; Padwal et al., 2014; Wilson et al., 2015). There is a powerful connection between inactivity and extreme obesity (Kegler et al., 2017) which some people are unaware of (Jonikas et al., 2016) and theorised to be caused by lower educational levels (Wilson et al., 2015). One study suggested that educated women are more likely to be slimmer, thus stigmatising extremely obese women as uneducated and disadvantaged (Jonikas et al., 2016). Judgements based on physical appearance may cause anxiety and reduced self-esteem (Sivas et al., 2020). Although formal education reduces extreme obesity risk, other educational forms, such as role modelling between mothers and children was found to be important (Roberson et al., 2016).

5. Discussion

The literature shows that extremely obese people can have difficulty with weight loss for many reasons. These include environmental, social, cultural, educational, and gender-based reasons. The health impact of extreme obesity is great and there is poor support for weight loss in locations where there are few neighbours living close by (Kegler et al., 2017).

Appreciation of barriers and facilitators in weight loss for extremely obese people living in rural and remote areas is important to consider. Incorporation of these elements into health policy and practice is essential for successful outcomes for both patients and healthcare services within these areas. Research demonstrates that as the number of people with extreme obesity increases, clinical services need to think about how health access can be achieved within logistically isolated regions (Batsis et al., 2021). Batsis et al. (2021) suggests that healthcare services need to improve access through the use of wearable devices, remote monitoring and telehealth technologies which have become an increasingly cost effective way to collaborate and walk alongside isolated people experiencing extreme obesity (Batsis et al., 2019). Community collaboration has also been suggested as a driver for reducing loneliness for people living in rural locations (Henning-Smith, 2020) and can have multiple benefits in addition to comradeship for exercise and communal cooking. This approach can promote good nutritional habits right throughout the lifespan, from rural children (Fulkerson et al., 2021) right through to the most vulnerable rural older person (Rafie et al., 2021).

Identification and acknowledgement of the role of culture cannot be underestimated, particularly for those within isolated communities with chronic disease and extreme obesity prevalence. Ainsworth and Li (2020) state that this is even more important to now consider given the disruption to socialisation and food availability caused by COVID-19. Encouraging collaboration through development of culturally adapted care models, which include community, and traditional foods may provide options for isolated and lonely people (Ellender & Bonner, 2021).

There is a role for clinical education and communication for extremely obese people regarding mental health risks, medication, and the importance of exercise. Educating clinical providers on the practicalities of remote access may increase uptake and although all rural clinicians including nurse practitioners remain scarce, telehealth for chronic disease monitoring specifically post operatively, directly to community teams or to clients' homes can improve access. Spetz et al. (2017) suggest that nurses, and in particular, nurse practitioners can help support the health needs of rural people, specifically in the absence of General Practitioners. Models of holistic nursing care delivered by nurse practitioners working within isolated locations have been successfully implemented, with nurse practitioners filling the health void of the chronic workforce shortage (McLendon, 2017). Spetz et al. (2017) advocates that the role of

the nurse practitioner can increase the health of rural locations, respond to community needs and develop individual and community-based programmes, unique to each location. This approach has been successfully implemented by nurse practitioners working in remote areas for monitoring chronic conditions, clinical education, and facilitating access to the wider healthcare community when needed (Poghosyan et al., 2018).

6. Conclusion

Although extreme obesity is not unique to rural, remote, and regional settings, many of the increased risks for extreme obesity *are* unique to these environments. Integration and acknowledgement of rurality into health policy and strategic direction is essential. Investigation into incorporating nurse practitioners into practices within isolated areas which have workforce shortages and extreme obesity would be beneficial. Implementation of an adaptive Co-Designed Models of Care which can be changed to suit people and their communities is required. This can be rooted in collaborative and individualised care provision and incorporate education for both clinicians and residents to improve the health of extremely obese people living in isolated locations.

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