**Title**: A systematic review of obesity as a barrier to accessing cancer screening services

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**Key words**: Obesity, barriers, cancer screening

**Running title**: obesity and cancer screening

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**Abstract**

Obesity is a known risk factor for the development of cancers, and a significant proportion of the population may be at risk of developing cancer owing to their weight status. There is acknowledged societal stigma towards people living with obesity which can influence health behaviours and deter help seeking, such as cancer screening. Healthcare professionals’ attitudes and views towards people living with obesity may adversely affect the patient-professional interface and treatment. This review aimed to explore the impact of living with obesity on the uptake of three main cancer screening services; breast, cervical and colorectal. Ten studies were included in the review. Three main areas were identified from both a patient and healthcare professional perspective; barriers and challenges to screening, gender issues, and disparities in the population living with obesity. It is recommended that further research is undertaken with people living with obesity to understand how to improve uptake of cancer screening services, and for education on weight bias, which is often unconscious, to be considered for healthcare professionals working in cancer screening services. This may help to increase the incidence of early differential diagnosis of potential cancers and improve health outcomes for people living with obesity.

**Introduction**

Obesity (BMI kg/m2) is a known risk factor for development of cancers (1, 2)with evidence suggesting an increase in cancers such as breast in postmenopausal women, colorectal (higher risk in males), endometrial, oesophageal adenocarcinoma, gall bladder and renal (1, 3). Gender differences in cancer risk among people living with obesity, including the incidence of oesophageal, liver and colorectal cancer, due in part to disparities in body fat distribution between men and women (4), The rates of obesity have tripled globally since 1975, and as of 2016, the World Health Organisation estimated there were 650 million people living with obesity (5). By 2030, the rates are predicted to increase to 1 in 5 women and 1 in 7 men, meaning over 1 billion people across the globe will be living with obesity (6) Notably, the percentage of women with obesity is higher than that of men, highlighting a gender disparity among people with obesity. This could be due to an increase in the obesity rate observed in women post menopause, or could also be related to the longer life expectancy among women than men (4)

Many healthcare providers hold strong negative views and attitudes towards people with obesity who present in healthcare settings, with evidence to show that such viewpoints can influence perceptions about the patient, judgement, behaviour towards the patients and influence decision-making on treatment (7)

Many negative healthcare encounters for people living with obesity may be associated with individual, subjective experiences, perceptions, anticipation and internalisation of weight stigma(8), with weight stigma, whether felt or enacted, negatively impacting on mental health (9, 10)

 People with obesity may be reluctant to seek healthcare interventions for fear of being stigmatised by healthcare professionals (11). Studies show patient-reported experiences of being stigmatised by healthcare professionals (12) and also existing levels of negative attitudes and opinions towards people living with obesity by physicians and other healthcare professionals (13, 14). A synthesis of 30 studies based in community and family physician settings (no specialist or hospital settings) found twelve studies focused on patient experiences and perspectives, ten on professional experiences and perspectives and eight studies on patient and professional interaction. From each standpoint, it was consistently reported that obesity negatively influenced the patient-healthcare professional interface (15).

This systematic review aimed to explore the impact of obesity and obesity stigma on access and uptake of cancer screening services through reviewing all literature on the subject within community and general practice settings where a high percentage of routine preventative screening takes place.

**Methods**

The protocol for the review was registered with PROSPERO database, reference CRD42021223378 (16), and the reported followed the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) statement (17).

**Eligibility criteria**

All types of studies were included except review articles, conference abstracts, and articles with no full-text access. Studies published between 2010-2020 and in the English language were included. Studies published outside the timeframe, or in other languages where an English translation was not provided were excluded. Studies which included people living with obesity (BMI kg/m2 30>) and cancer screening were eligible for inclusion.

**Search Strategy**

Searches of the following electronic databases, PubMed, Google Scholar, HDAS, CINAHL, Web of Science, Medline, and EMBASE were made. Combinations of the following key words were used in the searches: *obesity, weight, weight bias, stigma, cancer, screening, colorectal cancer screening, breast cancer screening, cervical cancer screening, lung cancer screening, screening uptake, people, public, barriers*. Hand searches of grey literature were undertaken. Two members of the research team carried out two independent literature searches across the included databases.

**Screening, data extraction and data synthesis**

Studies retrieved by the two researchers were downloaded into an Endnote® database (163 articles). Duplicates were removed, leaving a total of 152. The research team screened the abstracts of the studies for relevance, with 106 excluded following a consensus between all members of the research team. The full texts of the 46 remaining studies were divided amongst four members of the research team, who screened these articles, guided by the inclusion criteria and the Critical Appraisal Skills Programme (CASP) Assessment tools to assess the credibility, rigour, and relevance of included studies. This quality assessment process was used not to exclude studies, but to allow results and conclusions from the review to be weighted accordingly. A final consensus was agreed by all member of the research team for studies to be included (see Figure 1)

*Insert Figure 1 here*

**Results**

A total of 10 studies were included in the review (see Table 1). The studies were carried out across five countries, Australia (n=1), Denmark (n=1), Estonia (n=1) France (n=2) and the USA (n=5). The majority of the studies involved survey methodology (n=6), followed by qualitative studies (n=2), mixed methods research (n=1), and prospective cohort studies (n=1). Studies examined both individual and multiple screening types, including colorectal (n=3), breast (n = 2) cervical (n=1), breast and cervical (n=3), and breast, cervical and prostate (n=1). The findings from the 10 studies are grouped into five areas namely; 1) barriers to screening from the patient perspective, 2) barriers to screening from healthcare professional perspectives, 3) gender issues, 4) disparities in the screening population living with obesity, and 5) issues specifically related to the population living with obesity. Two studies included both overweight and obesity but met the appraisal criteria and the aims of the review and were included.

*Insert Table 1 here*

**Barriers to screening from the patient perspective**

There were two qualitative studies (18, 19) which had self-reported views on barriers to cancer screening from the patient perspective, but the latter also included perspectives from healthcare providers Primary research from the patient perspective allowed for a greater understanding of the experiences of the patient, which has potential to inform service development in relation to reduce self-reported barriers to increase screening uptake rates.

 A survey of colorectal cancer screening uptake found that people of all weights reported a lack of awareness of the need for screening as the biggest barrier to screening uptake (20). Men with obesity in this study were more likely than their normal weight counterparts to report a lack of physician recommendation as a barrier to screening uptake, while women with obesity were more likely to report barriers related to the test experience such as pain and embarrassment (20)

Many of the barriers experienced by women with obesity were the same as women of normal weight, including modesty/embarrassment, fear of pain, competing demands/time, and a belief that they were at a low risk of developing cancer, and that the magnitude of these barriers may be intensified as a result of weight-related issues and stigma (18).

Focusing on women with obesity aged 45-80 and their views on breast cancer screening, McBride et al (2019) found three themes which emerged from the patient perspective; understanding and awareness of screening and the effect on participation (*family history, influencers, lack of priority, and fear of pain*), body image concerns and their impact on screening attendance (*body image concerns, self-consciousness, sensitivity and attitude of radiographer*),and finally, negative experiences of screening as a potential barrier to future uptake of screening (*psychological or physical events, perceived impact on the radiographer*) (19) (See Table 2).

*Insert Table 2 here*

**Barriers to screening from healthcare professional perspectives**

Two of the studies examined screening and people living with obesity from the perspective of healthcare providers, using qualitative methodologies which are useful for providing rich, descriptive narratives and underlying meanings (21).

Firstly, Ferrante et al. (2010) utilising interviews, followed by a postal survey, found that physicians were reluctant to perform cervical smears on women living with obesity owing to inability to get women onto the examination table, lack of larger speculums, and other medical issues (22). Of the 255 physicians who took part in the survey, 11% stated that they did not perform cervical smears on women living with obesity. Many physicians found it difficult to palpate lumps in breast tissue (80%) and required extra time to perform breast examinations. Participants reported using specific techniques to examine women living with obesity, such as palpating breasts in a different manner to patients of a normal body weight. Physicians expressed a need for further education and training in examination techniques to facilitate breast and cervical screening in women with obesity (22).

Secondly, McBride et al (2019) found four themes that underpinned healthcare providers experiences with breast screening in women with obesity; patient body size impacts on mammogram efficiency and safety (*size of breasts, problems positioning patients, technical difficulties, patient comfort),* women with obesity cannot use mobile screening vans (*accessibility to enter van, small waiting room, small changing rooms),*work health and safety (*ensuring provider safety in handling heavier bodies, potential increased physical manhandling),* and prioritising quality imaging over patient considerations (*needing to ensure adequate compression) (19)*. Providers reported feeling that weight was a difficult topic to discuss, there were other barriers such as cultural and lack of education, and that weight alone was not a barrier to screening (19) (see Table 3).

*Insert Table 3 here*

These studies identified strategies used to deal with the issues and/or barriers to screening given by patients, including continuous patient education, addressing fears and misconception, motivating patients to take care of themselves for the sake of their families, persistent engagement, referring to OB/GYN, using scare tactics, not persisting owing to feelings that the actions were futile, and asking patients to sign a waiver stating they have refused the screening offer.

**Emerging gender issues**

There appeared to be issues around gender reported in nearly half the studies, which were noted to exist both with healthcare professionals and with patients

**Physician involvement and likelihood of interprofessional referral**

Female physicians were more likely to perform cervical smears in their offices, whilst male physicians reported fewer difficulties palpating pelvic masses and were less likely to report incidence of embarrassment by female patients with severe and complex obesity. It was noted that male physicians were more likely to refer female patients who refused mammograms or cervical smears to OB/GYN colleagues (22); the reasons for this are not known.

**Screening uptake and risk awareness**

Women living with overweight and obesity were found to be less likely to undergo colorectal screening than women of normal weight, but this variation did not apply to men (23). The reasons why less women with obesity are less likely to present for colorectal screening compared with men were not clear. It was also noted that women with obesity were less aware of the risks of obesity and development of colorectal cancer compared with women of a normal weight, suggesting that further education and awareness is needed in this group, who may be at increased risk (23). In terms of reported motivations to attend screening, very few men replied to a survey question about what prompted them to have a prostate examination (24). Men living with obesity reported a lack of physician screening recommendation as the most important barrier to uptake of colorectal cancer screening, whereas women with obesity were more likely to report pain and embarrassment as barriers (20).

Women living with mild obesity were more likely to have a mammography following a written invitation to attend screening than normal weight women, who generally attended on their own initiative (24). Women living with severe obesity were most likely to have a cervical smear following a referral to screening by a doctor (24). Women living with obesity were found to be less likely to routinely visit a gynaecologist, and even when they did, they were less likely to be screened for cervical cancer than normal weight women (25). Physician recommendation for screening was also found to be a key factor in colorectal cancer screening uptake among both women living with obesity and women with overweight or normal body mass index (20, 26) and among men living with obesity (20). A smaller number of men and women with obesity reported a physician recommendation for colorectal cancer screening than those who were overweight or normal weight (23). Physician recommendation with a discussion of personal risk for colorectal cancer was the strongest predictor of colorectal cancer screening uptake among both men and women of any weight (23), highlighting the importance of physician recommendation and tailored information about cancer risk status in relation to screening uptake.

**Disparities in screening in the population living with obesity**

Several studies highlighted disparities in the population living with obesity. A prospective cohort study of breast screening participation in women aged 50-64 years found that both women with underweight or obesity had significantly higher levels of non-participation with mammography compared with normal weight women, but this was limited to postmenopausal women, with no effect modification with hormone replacement therapy (27). A mechanism of sequence analysis was utilised, clustering to illuminate specific patterns of attendance and experience of gynaecological diagnostic check-ups, within which obesity was specifically highlighted as a key determinant (25). This encompassed an evaluation of the regularity of attendance in relation to breast and cervical cancer screening by 6182 women aged 54-65 years. Clear delineation was made between women who were neglecting to attend for regular gynaecological check-up, screening, and those who were infrequent in their uptake of breast screening services. There was a clear differential between women living with obesity and overweight in terms of the cancer screening they accessed, with greater levels of uptake of breast screening as opposed to cervical cancer screening. (25). What was apparent from this study was the correlational evidence that the higher a woman’s BMI was the statistically less likely she was to engage and uptake with cancer screening services.

In a parallel investigation, the specific determinants of cervical cancer screening uptake by women living with obesity were further explored. Factors precluding screening were identified, which included embarrassment, negative body image and imaging with medical equipment, which posed a barrier to screening in practice (28). There was a reciprocal correlation between patients and their healthcare providers, both of whom acknowledged difficulties associated with obesity and cancer screening. Healthcare providers specifically identified pragmatic issues of the physical difficulty of performing pelvic examination and the generalised reluctance of women living with obesity to engage with cervical cancer screening. Stigma was a core identifiable preventable issue in relation to the negative attitudes towards women living with obesity, particularly for those women with extant co-morbidities, which overshadow the need for regular and appropriate levels of preventative diagnostic screening.

**Issues specifically related to the population living with obesity**

Several issues, which were reported as barriers to all types of screening for people living with obesity were identified. It is acknowledged that some of these issues e.g. modesty, embarrassment have also been shown to exist in the general population who seek cancer screening interventions but may have context-specific properties related to weight and body size (see Table 4).

*Insert Table 4 here*

**Discussion**

This systematic review aimed to explore the impact of obesity and obesity stigma on the access and uptake of cancer screening services. None of the included studies referred to the concept stigma of obesity. The studies did however discuss situations and experiences, which are a result of the consequences of stigma, giving clear evidence that there is stigma present in cancer screening situations. The findings of this review show that excess weight is a barrier to accessing cancer screening services for both sexes. The review highlighted the importance of healthcare professionals to understand the concerns and fears of people living with obesity when attending for cancer screening, whether perceived or real e.g. feeling stigmatised and make every attempt to ensure that facilities are weight-friendly, from equipment, language used, and overall environment.

The review also identified that many healthcare professionals were not comfortable or experienced in undertaking screening procedures with people living with obesity, and that education on techniques for performing screening interventions with this population, along with learning how to deal with refusals and other barriers, and providing a supportive environment which is weight-friendly is needed.

The anatomical differences documented between those of a high BMI (kg/m2) versus their low or average BMI counterparts is another historically reported issue, particularly in relation to breast screening and processes of physical examination (29). This issue not only acts as an actual and potential barrier to the uptake of screening by patients with obesity but also influences the likelihood of healthcare professionals being able to achieve valid and reliable diagnostic imaging procedures and, in some cases, to be confident in carrying out physical examinations in people with a higher BMI. This review consolidates these findings and highlights the need to consider further training and education when screening people living with obesity.

The findings of this review draw together the corpus of literature as related to the concept of weight as a barrier to access and uptake of cancer screening services. Most concerning is the historical existence of research detailing this, which yet remains largely unaddressed in consequent research within the field (30). A 2008 review of cancer screening in women with obesity, including 32 studies (10 breast, 14 cervical, and 8 colorectal), showed a relationship between decreased cervical cancer screening and increased body size, with the association occurring more often in white than black women in breast screening (31). With colorectal cancer screening, some studies reported body size impacting on screening and others reporting no impact, with authors suggesting that efforts to address barriers to increase uptake in all three screening programmes for women with obesity are warranted (31).

Weight, obesity, and weight gain account for 20% of all cancers, with weight loss, especially in postmenopausal women, reducing risk for breast cancer, with a small body of evidence to suggest poor outcomes after breast cancer in women with obesity (32). A retrospective cohort study of 35 women showed that women with obesity were less likely to present for follow-up mammogram appointments and recommended strategies to reduce barriers related to weight to improve attendance (33). Franck et al. (37) highlighted the significant barriers perceived by women living with obesity and overweight and the need for a radical overhaul of healthcare infrastructures, which were supportive and empowering in their approach to the early identification, assessment, diagnosis and long-term management of cancer.

A systematic review of 11 studies examining the association between obesity and cancer screening found that women with obesity were less likely to access cervical screening, but this was only seen in white women, and not in black women (34). This was also found in the study on race, obesity, and colorectal screening included in our systematic review (26), which revealed that women living with obesity have some of the lowest levels of detection and highest risks of cervical cancer, which was found in other studies (35). A retrospective review of 1080 cases of cervical screening in a single centre, with 29.5% (n=311) women living with obesity, and 10% (n=107) women living with severe and complex obesity, found a significant association between BMI and cytology screening was evidenced with the severe and complex cohort having the highest incorrect rate (64.4%), followed by women living with obesity (51.5%). Findings suggest that women living with obesity and severe and complex obesity have disproportionate inappropriate screening before cervical cancer diagnosis, and women living with severe and complex obesity have worse overall survival rates than normal weight counterparts (36), This raises important potential areas for future research in relation to the availability of cancer screening, which is context specific and situationally determined for many women.

A study from 2004 showed that after adjusting for variable such as age, insurance status, race and smoking status, men with overweight and obesity were more likely than men of normal weight to have undergone colorectal screening. Women with obesity were less likely to have been screened compared with women of a normal weight (30) demonstrating that the situation has largely remained the same. Similarly, having financial strain was identified as a barrier to screening uptake (40), and there was a clear disparity between White and African-American women in colorectal screening uptake, particularly with regards to colonoscopy uptake (38). The impact of race is an area for future exploration, as encouraging screening uptake across all populations is key to increasing early cancer detection, thus gaining an understanding of the underlying reasons behind this disparity will be imperative.

This systematic review was undertaken during the COVID-19 pandemic, and the studies included in the review were all undertaken prior to March 2020. During this time, screening services globally were adversely affected, with services postponed or decreased, with many patients worried about the risks of infection (37). During this time, evidence showed that overweight and obesity predispose to severe symptoms and negative prognosis of COVID-19 (38). Studies have found that people living with obesity who contract COVID-19 are likelier than people with normal weight to require intensive mechanical ventilation (39). The COVID-19 pandemic has also highlighted the need to examine how people living with obesity potentially face an exacerbation of those characteristics associated with weight stigma, such as how people’s coping mechanisms, the potential of binge eating and anxiety and mental health may be impacted upon by the need for social isolation (40). This study raises important implications for our own in terms of whether healthcare access for people living with obesity we focus upon is also further impacted and exacerbated by the global pandemic. With restart strategies now underway (41), the potential impact of the risks of obesity and COVID-19 may be a further barrier to screening uptake in a population where the actual uptake has been shown to be low.

The pandemic negatively disrupted routine clinical care, with cancer programmes such screening no exception. Many programmes were cancelled or postponed, especially in 2020, a period of isolation measures such as lockdowns put in place to contain the spread of the virus(42). These measures left people without access to recommended routine screening interventions, which were suggested to impact patients, healthcare professionals and healthcare systems (43). In the United States, men and black people were disproportionately affected by decreased colorectal cancer screening, and to redress this deficit, it is estimated that rates of colorectal cancer screening need to increase by 50%(42)

Although many screening programmes have resumed, the long-term impact of the pandemic on cancer screening and prevalence of cancer as a result is not yet known (44). A systematic review of the impact of the pandemic on colorectal cancer diagnosis and treatment, found a reduction in diagnosis and treatment, and that redressing the deficit requires strong and effective action to prevent negative consequences such as the number of people with advanced stages of cancer, potential increased treatment costs, quality of life and survival rates(45). At the time of writing this review, no studies examining the impact of the pandemic and screening for people living with obesity were identified.

The strengths of this review were the systematic and rigorous approach to the identification, screening, and selection of key literature to understand obesity and its impact on the access and uptake to cancer screening services.imitations of this review are that the studies included in this review were carried out prior to the COVID-19 pandemic, and the findings may not be applicable in the context of the current climate with factors such as social distancing and other infection-control mandated regulations in place in the majority of countries. As there is no consensus on infection control measures globally, we acknowledge there is variance in the impact of the pandemic with respect to screening programmes. This study was also limited by the exclusion of articles not available in English language, meaning that some key issues may have been missed if studies were published solely in another language.

The findings should be considered in the context of the healthcare systems in the countries in which the studies took place, as there are varying healthcare systems globally which may differ from the UK National Health System free at point of access care where this review was carried out.

Based on the findings of this review, the following recommendations should be taken into consideration. The review identified a paucity of studies from both patients living with obesity and healthcare professional perspectives which would illuminate subjective individual experiences, and subsequently give context and meaning to inform development of future service development and professional education to support people living with obesity and cancer screening access and uptake. Further qualitative studies should be undertaken with both patients and healthcare professionals, to further understand barriers, enablers, and the lived experience of people who have potential to access cancer screening services, and healthcare professionals who carry out these services*.*

Training and education on obesity stigma and its consequences should be developed and carried out with healthcare professionals working in screening services. Screening information and other promotional materials (printed, website etc.) should be reviewed to ensure that the language is ‘people-first’ (46, 47) and that any potential concerns regarding weight stigma are identified and addressed prior to screening taking place. In addressing the excessive mortality of these women, raising awareness of the need to educate both healthcare providers and women living with obesity is fundamental to cultural and contextual change management interventions.

The wider impact of the pandemic on cancer screening services is currently in early stages of investigation. The risks associated with obesity and related comorbidities in the context of COVID-19 and social distancing rules may be a further contributing factor to an already low uptake of screening services in the population living with obesity. It is recommended that these risks and potential resultant fears be taken into consideration when planning and promoting screening, to put the risk in perspective, and reinforce the safety and social distancing regulations that are in place to minimise spread of infection, to allay concerns and demonstrate that it is safe to be screened.

**Conclusion**

The findings of this study reaffirm a paucity of research in relation to obesity stigma and the corresponding decrease in uptake of cancer screening opportunities. This has the direct implication that the early clinical interventions needed to assess, diagnose, and treat common cancers may be avoidably delayed with the consequential outcome of adverse outcomes and increased cancer mortality for those living with obesity. Existing literature provides a broad basis for the understanding of the physiological and anatomical impact of obesity in society but minimal insight into lives lived within a judgemental and value laden society. The integration of learning opportunities for those working with people living with obesity is essential if these assumptions and presuppositions are to be challenged in practice, where the desired outcome is to improve numbers of people engaging with the cancer screening opportunities afforded to them. The intersectional differences in perception of screening on behalf of patients living with obesity and healthcare professionals is profound and is reflective of wider societal stigma. Whilst actual anatomical and physiological difference impact upon healthcare professionals’ capacity and capability in relation to optimal screening, it is actually a shift in psychological perspectives for both those living with obesity and the professionals caring for them that lies at the heart of a service which ought to be equitable, compassionate and understanding of the need for optimal cancer screening provision.

**Conflicts of interest**

None of the authors have any conflict of interest to declare.

**Author contributions**

XX, XY, XT and XS designed the review. XX and XT carried out independent searches.

All authors were involved with the selection of studies included in the review, writing of the manuscript and approved the submission.

**Acknowledgements**

We wish to acknowledge the Northern Cancer Alliance, UK for funding this review, and to the Library staff at South Tyneside and Sunderland NHS Foundation Trust for assisting with the literature searches.

**References**

1. Basen-Engquist K, Chang M. Obesity and cancer risk: recent review and evidence. Curr Oncol Rep. 2011;13(1):71-6.

2. Calle EE, Thun MJ. Obesity and cancer. Oncogene. 2004;23(38):6365-78.

3. Stone TW, McPherson M, Gail Darlington L. Obesity and Cancer: Existing and New Hypotheses for a Causal Connection. EBioMedicine. 2018;30:14-28.

4. Heo JW, Kim SE, Sung MK. Sex Differences in the Incidence of Obesity-Related Gastrointestinal Cancer. Int J Mol Sci. 2021;22(3).

5. World Health Organization. Obesity and Overweight: World Health Organisation; 2021 [updated June 2021. Available from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>.

6. Lobstein T, Brinsden H, Neveux M. World Obesity Atlas 2022. London: World Obesity Federation; 2022.

7. Phelan SM, Burgess DJ, Yeazel MW, Hellerstedt WL, Griffin JM, van Ryn M. Impact of weight bias and stigma on quality of care and outcomes for patients with obesity. Obesity reviews : an official journal of the International Association for the Study of Obesity. 2015;16(4):319-26.

8. Bidstrup H, Brennan L, Kaufmann L, de la Piedad Garcia X. Internalised weight stigma as a mediator of the relationship between experienced/perceived weight stigma and biopsychosocial outcomes: a systematic review. International journal of obesity (2005). 2022;46(1):1-9.

9. Emmer C, Bosnjak M, Mata J. The association between weight stigma and mental health: A meta-analysis. Obesity reviews : an official journal of the International Association for the Study of Obesity. 2020;21(1):e12935.

10. Curll SL, Brown PM. Weight stigma and psychological distress: A moderated mediation model of social identification and internalised bias. Body Image. 2020;35:207-16.

11. The Lancet D, amp, Endocrinology. Obesity-related stigma;

hiding in plain sight. The Lancet Diabetes & Endocrinology. 2020;8(5):349.

12. Kaminsky J, Gadaleta D. A study of discrimination within the medical community as viewed by obese patients. Obes Surg. 2002;12(1):14-8.

13. Puhl RM, Luedicke J, Grilo CM. Obesity bias in training: attitudes, beliefs, and observations among advanced trainees in professional health disciplines. Obesity (Silver Spring). 2014;22(4):1008-15.

14. Tomiyama AJ, Finch LE, Belsky AC, Buss J, Finley C, Schwartz MB, et al. Weight bias in 2001 versus 2013: contradictory attitudes among obesity researchers and health professionals. Obesity (Silver Spring). 2015;23(1):46-53.

15. Mold F, Forbes A. Patients' and professionals' experiences and perspectives of obesity in health-care settings: a synthesis of current research. Health Expectations. 2013;16(2):119-42.

16. Graham Y, Hayes, C., Yemm, H., Cox, J.,Sengupta, P., Mahawar, K. A systematic review of obesity as a barrier to accessing cancer screening services York: PROSPERO: International Prospective Register of Systematic Reviews; 2021 [Available from: <https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=223378>.

17. Moher D, Liberati A, Tetzlaff J, Altman DG, The PG. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med. 2009;6(7):e1000097.

18. Friedman AM, Hemler JR, Rossetti E, Clemow LP, Ferrante JM. Obese Women's Barriers to Mammography and Pap Smear: The Possible Role of Personality. Obesity. 2012;20(8):1611-7.

19. McBride KA, Fleming CAK, George ES, Steiner GZ, MacMillan F. Double Discourse: Qualitative Perspectives on Breast Screening Participation among Obese Women and Their Health Care Providers. Int J Environ Res Public Health. 2019;16(4).

20. Seibert RG, Hanchate AD, Berz JP, Iiischroy PC, Schroy PC, 3rd. National Disparities in Colorectal Cancer Screening Among Obese Adults. American Journal of Preventive Medicine. 2017;53(2):e41-e9.

21. Charmaz K. Constructing grounded theory. 2nd edn. 2nd ed. London: Sage; 2014.

22. Ferrante JM, Fyffe DC, Vega ML, Piasecki AK, Ohman-Strickland PA, Crabtree BF. Family Physicians' Barriers to Cancer Screening in Extremely Obese Patients. Obesity. 2010;18(6):1153-9.

23. Messina CR, Lane DS, Anderson JC. Body mass index and screening for colorectal cancer: gender and attitudinal factors. Cancer Epidemiol. 2012;36(4):400-8.

24. Tekkel M, Veideman T, Rahu M. Use of mammography, Pap test and prostate examination by body mass index during the developmental period of cancer screening in Estonia. Public Health. 2011;125(10):697-703.

25. Franck JE, Ringa V, Rigal L, Sassenou J, Cœuret-Pellicer M, Chauvin P, et al. Patterns of gynaecological check-up and their association with body mass index within the CONSTANCES cohort. J Med Screen. 2020:969141320914323.

26. Leone LA, Campbell MK, Satia JA, Bowling JM, Pignone MP. Race moderates the relationship between obesity and colorectal cancer screening in women. Cancer Causes Control. 2010;21(3):373-85.

27. Hellmann SS, Njor SH, Lynge E, von Euler-Chelpin M, Olsen A, Tjønneland A, et al. Body mass index and participation in organized mammographic screening: a prospective cohort study. BMC Cancer. 2015;15(1):294.

28. Franck JE, Ringa V, Coeuret-Pellicer M, Chauvin P, Menvielle G. The determinants of cervical cancer screening uptake in women with obesity: application of the Andersen's behavioral model to the CONSTANCES survey. Cancer Causes Control. 2020;31(1):51-62.

29. Elmore JG, Carney PA, Abraham LA, Barlow WE, Egger JR, Fosse JS, et al. The association between obesity and screening mammography accuracy. Archives of internal medicine. 2004;164(10):1140-7.

30. Heo M, Allison DB, Fontaine KR. Overweight, obesity, and colorectal cancer screening: disparity between men and women. BMC Public Health. 2004;4:53.

31. Cohen SS, Palmieri RT, Nyante SJ, Koralek DO, Kim S, Bradshaw P, et al. Obesity and screening for breast, cervical, and colorectal cancer in women: a review. Cancer. 2008;112(9):1892-904.

32. Wolin KY, Carson K, Colditz GA. Obesity and cancer. Oncologist. 2010;15(6):556-65.

33. Fair AM, Wujcik D, Lin JM, Grau A, Wilson V, Champion V, et al. Obesity, gynecological factors, and abnormal mammography follow-up in minority and medically underserved women. Journal of women's health (2002). 2009;18(7):1033-9.

34. Maruthur NM, Bolen SD, Brancati FL, Clark JM. The association of obesity and cervical cancer screening: a systematic review and meta-analysis. Obesity (Silver Spring). 2009;17(2):375-81.

35. Clarke MA, Fetterman B, Cheung LC, Wentzensen N, Gage JC, Katki HA, et al. Epidemiologic Evidence That Excess Body Weight Increases Risk of Cervical Cancer by Decreased Detection of Precancer. J Clin Oncol. 2018;36(12):1184-91.

36. Gnade CM, Hill EK, Botkin HE, Hefel AR, Hansen HE, Sheets KA, et al. Effect of Obesity on Cervical Cancer Screening and Outcomes. J Low Genit Tract Dis. 2020;24(4):358-62.

37. Richards M, Anderson M, Carter P, Ebert BL, Mossialos E. The impact of the COVID-19 pandemic on cancer care. Nature Cancer. 2020;1(6):565-7.

38. Caci G, Albini A, Malerba M, Noonan DM, Pochetti P, Polosa R. COVID-19 and Obesity: Dangerous Liaisons. J Clin Med. 2020;9(8).

39. Mohammad S, Aziz R, Al Mahri S, Malik SS, Haji E, Khan AH, et al. Obesity and COVID-19: what makes obese host so vulnerable? Immunity & Ageing. 2021;18(1):1.

40. Puhl RM, Himmelstein MS, Pearl RL. Weight stigma as a psychosocial contributor to obesity. Am Psychol. 2020;75(2):274-89.

41. Kregting LM, Kaljouw S, de Jonge L, Jansen EEL, Peterse EFP, Heijnsdijk EAM, et al. Effects of cancer screening restart strategies after COVID-19 disruption. British Journal of Cancer. 2021.

42. Kelkar AH, Zhao J, Wang S, Cogle CR. Impact of the COVID-19 Pandemic on Colorectal and Prostate Cancer Screening in a Large U.S. Health System. Healthcare (Basel, Switzerland). 2022;10(2):264.

43. Cancino RS, Su Z, Mesa R, Tomlinson GE, Wang J. The Impact of COVID-19 on Cancer Screening: Challenges and Opportunities. JMIR Cancer. 2020;6(2):e21697.

44. Alkatout I, Biebl M, Momenimovahed Z, Giovannucci E, Hadavandsiri F, Salehiniya H, et al. Has COVID-19 Affected Cancer Screening Programs? A Systematic Review. Front Oncol. 2021;11:675038-.

45. Mazidimoradi A, Hadavandsiri F, Momenimovahed Z, Salehiniya H. Impact of the COVID-19 Pandemic on Colorectal Cancer Diagnosis and Treatment: a Systematic Review. J Gastrointest Cancer. 2021:1-17.

46. Obesity Action Coalition. Weight bias resources and guides Tampa: Obesity Action Coalition; 2021 [Available from: <https://www.obesityaction.org/action-through-advocacy/weight-bias/weight-bias-resources/>.

47. University of Connecticut Rudd Center for Food Policy and Obesity. Weight Bias and Stigma Hartford: University of Connecticut Rudd Centre for Food Policy and Obesity; 2021 [Available from: [https://uconnruddcenter.org/research/weight-bias-stigma/#](https://uconnruddcenter.org/research/weight-bias-stigma/).