Obesity among adults aged 18-44 years in appalachian west virginia (wv)

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**Description of Health Disparity**

“Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health” (WHO, 2022). Body mass index (BMI), a gauge of obesity, is determined by dividing a person's weight in kilograms by their height in square meters (CDC, 2022). In 2020, CDC reported that obesity prevalence rates in the United States is greater than 40%. All of WV is within the Appalachian region (arc.gov, 2022). 34 out of a total 55 WV counties are rural, 13 counties are both urban and rural, and 8 counties are urban (WV.gov, 1999).  Furthermore, individuals living in rural counties (34.2%) have considerably higher obesity prevalence rates than adults living in urban counties (28.7%) (CDC, 2018). The prevalence of adult obesity rates in rural Appalachian WV is 34.1%, which is remarkably higher than the national average of 27.4% (arc.gov, 2022).

Obesity is a serious public health concern because, if left unattended, individuals develop several co-morbidities associated with it, such as cancers, cardiovascular diseases, endocrine disease (diabetes), gallstones, osteoarthritis e.tc. (CDC, 2022). I chose obesity in rural West Virginia due to its highest prevalence rate in the state, and if we can control obesity alone, we can prevent many of its comorbidities and lower the burden of disease consequences in the state. Excess consumption of calorie rich food, physical inactivity (CDC, 2022), and low income (Okobi et.al., 2021) are identified as major obesity predisposing factors among rural Americans.

**Burden of Rural Health Disparity on Rural residents**

With a total size of 24,078 square miles and a population of 1,782,959 in 2021, 666,086 of West Virginia's residents live in rural areas (RHIhub, 2022). According to the US census bureau and Office of Management and Budget, 64% i.e., two third of the West Virginians reside in rural areas which makes this state as a rural state of the nation (WV.gov,1999). 37.4% of West Virginian rural adults aged 18-44 years are diagnosed obese, which is much higher than the national average of 29.5% (America’s Health Rankings, 2022). Adult obesity prevalence in West Virginia Blacks is 45.4%, Whites is 39.6%, Hispanics is 31.8% (Statista, 2022).

Since 1989, the state's adult obesity prevalence on an average has surged by 4.6% per year (West Virginia Department of health and humans Services, 2011). From 1989 to 2008, the state's rate of morbid obesity (having a BMI of 40 or more) increased by an average yearly change of 10.5%, from 0.8% to 4.9% (West Virginia Department of health and humans Services, 2011). According to County Health Rankings and Roadmaps report (2022), adult obesity prevalence rate is significantly highest in rural Logan and Mac Dowell County of rural West Virginia.

**Social Determinants influencing Adult Obesity in rural West Virginia**

Social dimensions influence obesity greater than the genetic dimension (Min Zhou, 2021). Although obesity is not dispersed evenly throughout society, individual’s social determinants such as their socioeconomic status can influence how obesity is distributed (Min Zhou, 2021). The prevalence of obesity in rural America is 6.2 times greater than in its urban counterparts (Okobi et.al., 2021). Low income is the significant predisposing factor for high obesity prevalence rates in rural America (Okobi et.al., 2021). The USDA-Economic Research Service estimated that in 2020, the average per capita income in West Virginia was $44,994 with a per capita income of $40,872 in rural areas (RHIhub, 2022).

In rural West Virginia, the median household income is $39,741, which is $3,600 less than West Virginia state’s average and $5,880 less than the urban counterparts of the state (West Virginia Center on Budget and Policy, 2018). In comparison with national rates, the median household income is 25% less in rural West Virginia (arc.gov, 2022). Americans who live in impoverished or poverty dense counties are more likely to develop obesity (Levine, 2011). Counties with poverty rates greater than 35% have 145% higher obesity prevalence rates than wealthiest counties (Levin, 2011). Poverty rates are higher in rural areas than in urban areas. Economic Research Service estimates that in 2019 15.4% of rural residents had incomes below the federal poverty level, compared to only 11.9% of urban residents (RHIhub, 2022). Based on 2020 ACS data, the Economic Research Report stated that the poverty rate in rural West Virginia is 16.9%, which is higher than urban (15.1%) counterpart of the state (RHIhub, 2022).

The adult obesity prevalence rates among individuals unemployed for more than 52 weeks is estimated to be 32.7% and those individuals unemployed for less than two weeks is 22.8% (Steve Crabtree, 2014). These findings therefore point to a significant connection between adult obesity and unemployment. According to USDA-ERS 2021 repot, rural West Virginia unemployment rate is 5.6% which is higher than its urban counter part of 4.7% (RHIhub, 2022).

Prevalence of obesity decreases as individual educational level increases (aafp.org, 2022). Adults who did not complete high school had the greatest rate of obesity (35.5%), followed by adults with high school graduation (32.3%), adults who went to college (31%) and adults with college graduate degree (22.2 percent) (aafp.org, 2022). According to 2016-2020 ACS statistical data reported by Economic Research Service, 14.8% of rural West Virginia population does not have a high school diploma.

Therefore, low socioeconomic status such as unemployment, poverty, low income, poor median household income, poor education of are the major predisposing social determinants for high adult obesity prevalence in rural West Virginia.

**Behavioral Factors influencing Adult Obesity in rural West Virginia**

There are several predisposing behavioral risk factors such as consumption of energy dense or high calorie food, consumption of large portions of food, increased consumption of sugar sweetened beverages, irregular eating patterns, decreased physical activity, increased sedentary habits contribute to high obesity prevalence (Rennie et.al., 20005). 46.0% of the adults of this rural state reported fruit consumption less than one time per day and 24.2% adults reported vegetable consumption less than one time per day (CDC, 2016). Neighborhood availability of food has major impact on adult obesity, such as low obesity prevalence rates are observed in places with greater availability to nutritious meals and a higher concentration of full-service restaurants and grocery shops (healthy people.gov, 2020). Lack of neighborhood access to grocery store or supermarkets alone doesn’t contribute to high obesity prevalence but greater access to convenience or fast-food store in neighborhood also has an impact on adult obesity (Harvard T.H. CHAN, 2022). West Virginia stands 3rd in the nation for highest number of fast food or convenience stores i.e., in this rural state there are 5,3 fast food centers for every 10,000 population (Emily DiNuzzo, 2021).

One of the major causes of the obesity epidemic in the United States is physical inactivity (Gray et.al., 2018). According to BRFSS 2018 report (2018) this rural state is ranked 10th among the most physically inactive states of the nation. 28.2% of individuals in of this rural state, i.e., one fourth of the state population did not engage in any exercise or leisure-time physical activity (BRFSS, 2018). The physical inactivity prevalence is significantly higher in Logan, McDowell, Mingo, and Wyoming rural counties of the state (BRFSS, 2018). Furthermore, physical inactivity is highest among adults with incomplete high school diploma (BRFSS, 2018).

Moreover, recent research has demonstrated that alcohol drinking and cigarette smoking has significant impact on individual’s BMI, which in turn increases the risk of obesity (Liao, 2016). According to BRFSS, 2018 report more than one fourth of the adults i.e., 25.2% in this rural state reported every day or someday cigarette smoking. Additionally, rural West Virginia has highest percentage of adults who smoke in the United States (Statista, 2022). Heavy cigarette smoking is observed among adults aged 25-34 years, those with less or incomplete high school education and individuals with less than $15,000 of median household income (BRFSS, 2018). The prevalence of heavy alcohol drinking among this rural state residents is 4.2%, binge alcohol drinking is 12.1% and drinking is found to be highest among men aged 25-34 years and college graduates (BRFSS, 2018).

Epidemiological evidence indicate that decrease consumption of sugar sweetened beverage is directly related to decrease in weight status of an individua (Malik et.al., 2006). About 39.2% of West Virginian adults regularly consume a soda, pop, or another beverage with added sugar (Fast Facts, 2018). Moreover, higher consumption is observed among males aged 18-24 years and those with incomplete or less than high school diploma (Fast Facts, 2018). Nearly one in every 5 adults (19.1%) of this rural state consume sugar sweetened beverage on daily basis (Fast Facts, 2018).

**Public Health Efforts in Addressing the Rural Health Disparity**

**"Change the Future WV"**

According to the NIH, obesity is the second leading cause of preventable deaths in the US (WVdhhr.org, 2022).  The Communities Putting Prevention to Work (CPPW) program with a two-year grant, launched by the CDC in 2010 with the goal of reducing obesity associated comorbidities & tobacco use across the nation in 50 communities (WVU, 2013). CPPW funding was granted to the WV Bureau for PH to focus on the Mid-Ohio Valley (MOV), a six-county region that is primarily rural (WVU, 2013). The initiative, known locally as "Change the Future WV," aimed to decrease obesity by enhancing nutrition and boosting physical activity (WVU, 2013). "Change the Future WV" centered on altering policies, systems, and neighborhoods so that people of all ages could choose healthier options more easily (WVU, 2013). The project's objectives included expanding chances for physical activity as well as access to fresh fruits and vegetables (FFVs) in the community and at schools (WVU, 2013).

**Strengths:** "Change the Future WV" initiative increased youth exposure to a wide range of FFVs and increased access to nutritious diets (Conduent, 2022). This endeavor has reached more than 133,000 individuals through print, radio, tv, outdoor advertising through billboards (Conduent, 2022). Moreover, participating supermarkets like Walmart’s agreed to redesign at least one of their checkout lanes as a healthy checkout aisle with physical activity (PA) toys and healthy foods (Conduent, 2022). The number of farmers markets, their operating hours, and the number of vendors who accept debit cards/ EBT have all expanded (Conduent, 2022).

To increase PA, a plan was focused on enhancement of the current trails by the Mid-Ohio Valley Regional HD and WV Parks and Recreation Department (Conduent, 2022). In the surveys conducted it was found that over the past two years 47.1% reported having increased access to physical activity and FFVs access was claimed to have increased by 53.4% (WVU, 2013).

**Limitations:** This intervention was introduced only in six rural counties of WV leaving 34 completely rural counties behind, who would also have benefited from this intervention.

**“West Virginia Everyday: A Statewide Plan to Improve Physical Activity and Nutrition”:**

The CDC Guide to Community Preventive Services and other CDC-recommended initiatives are listed as intervention options that this state strategy seeks to highlight and support. The strategy offers many possibilities for WV of all ages in schools, workplaces, and communities to develop everyday healthy lifestyle behaviors (wv.gov, 2022). This state plan was developed over a three-year period by the WV Office of Healthy Lifestyles (OHL) in collaboration with key stakeholders from around the state (wv.gov, 2022). The WV Everyday..., serves as a framework for policymakers at local, state, and institutional level to collaborate in order to develop and support environments that make it simpler for WV residents to choose nutritious food and physical activity choices (wv.gov, 2022). The objectives of “WV Everyday” include increasing PA, promoting healthy eating, boosting infant breastfeeding, advancing healthy weight, expanding access to healthy food, and building systems capacity with an overarching goal to reduce the burden of obesity in WV (wv.gov, 2022).

**Strengths:** This statewide plan targets every rural county of the state of WV. It aims to provide suggestions that every West Virginian can use to make healthier decisions and maintain regular healthy lifestyle behaviors.

**Limitations:** The WV.gov websites do not include comprehensive information about the effectiveness of this program.

**Research Efforts:** Research Framework was implemented to identify barriers and facilitators to physical activity and weight loss in West Virginia. The Consolidated Framework for Implementation Research (CFIR) approach with five major domains was used to identify required barriers and facilitators (Turner et.al., 2022).  The purpose of this research is to understand the causes of obesity in WV and determine what motivates people to exercise and lose weight (Turner et.al., 2022).

**Results:** The barriers and facilitators under five domains of CFIR research intervention identified in the outer setting include infrastructure and their cultural norms, the inner setting include access to knowledge, individual characteristics, and implementation process (Turner et.al., 2022). It was identified that socioeconomic, environmental factors and cultural factors influenced rural West Virginians diet and exercise (Turner et.al., 2022). Participants frequently brought up issues of affordability, family traditions, and restricted access to resources such as nutritious foods, community-based exercise programs, and medical services (Turner et.al., 2022).

**Strengths:** The findings of this research study reveal how people in rural WV view lifestyle changes and the influencing factors that impact their healthy lifestyle behaviors. Future obesity interventions in rural WV or rural Appalachia must consider community characteristics to create a customized lifestyle intervention program that is both doable and successful.

**Limitations:** The limitation of this research study is possible bias in the responses by the participants or refusal of the participants to provide information to few questions that would have been useful in drawing the result of the research study.

**West Virginia Walks:** The WV University Department of Community Medicine created and implemented this program (wv.gov, 2022). The WV Walks Project is an eight-week marketing campaign with concurrent social-ecological community events (wv.gov, 2022).

**West Virginia Restaurant Survey:** This survey, which aims to gauge the proportion of restaurants in West Virginia that label menu items as "healthy choices," (wv.gov, 2022).

**Policy Recommendations for Employed individuals**

**Recommendation 01- Nutrition Policy:** The annual cost of obesity to the US healthcare system is close to $173 billion (CDC, 2022). US health care is spending nearly $79 to $132 per obese individual (CDC, 2022). 2015-2020 Dietary Guidelines of America recommends Americans to consume 2,000 calories per day which includes 2 cups of fruits and 2.5 cups of vegetables in their daily diet (Hayden & Jeffery, 2019). According to previous Economic Research Analysis conducted by USDA, it was found that 2 cups of fruits and 2.5 cups of vegetables can be purchased between $2.10 to $2.60 ((Hayden & Jeffery, 2019). If the federal government in collaboration with the state can develop and provide funds to small rural businesses it would cost approximately $3 per person, which is much lower than the cost associated with obesity treatment. Obesity prevention initiatives will reduce the economic burden on the US Healthcare system. Therefore, the federal government in collaboration with rural states should develop a separate budget for small rural employers or organizations to provide them with funds to feed their employees nutritious food during working hours.

Similar to the mandatory vaccination policy, every employer, regardless of size, should be held accountable for providing two servings of fruits and 2.5 servings of vegetables at the workplace. Employers can apply for a federal budget to get their monthly funds to provide their employees with nutritious food.

**Implication:** A person must consume fewer calories either to maintain weight or lose weight. Researchers' studies indicate people feel full by the amount of food they consume rather than how many calories they consume (CDC, 2022). Foods with low energy density have a higher volume per unit of calories, which may help consumers feel satisfied at a meal while consuming less calories (CDC, 2022). Fruits and vegetables are low in calories and energy density because they naturally include higher content of fiber and water, which makes them best substitutes for high energy dense foods (CDC, 2022). Therefore, serving fruits and vegetables to employees will make them consume fewer calories with a feeling of fullness and will help with weight reduction. This funding from federal to rural employers will aid in adults to consume regular fruits and vegetables which will ultimately help in reduction of obesity prevalence among WV adults.

**Recommendation 02- Leisure time Physical Activity Policy:** 2020 US Physical activity guidelines recommend adults to engage in two and half hours to 5 hours of moderate intensity physical activity or one hour 15 minutes to two hours thirty minutes of vigorous intensity of vigorous physical activity in a week (health.gov, 2019).  Every rural organization should be required by federal legislation to provide one hour of physical activity for staff members during working hours. Medium to large size organizations should have separate space allotted for yoga or physical activity equipment with access to free physical activity related tutorials. Smaller employers might provide their employees the option of taking a stroll for 30 minutes after lunch and another 30 minutes break during work. This will help the employee relax and get the necessary exercise.

**Implications:** Regular physical activity helps in maintaining and reducing individual weights (CDC, 2022), which will influence obesity prevalence rates in WV and improves organizational performance rates (Allan, 2019). For instance, if an organization mandates leisure time physical activity and provides nutritious diet, there is a lower risk that the employee will become ill or develop obesity associated comorbidities, reducing the need for frequent sick leaves and the expenditure of company funds on employee health care. Additionally, employees that lead healthy lifestyles perform better overall for the firm since they are more self-confident.

Furthermore, these organizational mandatory policy suggestions for Dietary and Physical activity will lower the prevalence of adult obesity and obesity-related chronic disorders in West Virginia and reduce the disease burden in the state of WV. These recommendations are essential because they will encourage fast food eaters to consume nutritious food and sedentary workers to become physically active.

**Recommendations for Unemployed individuals**

**`Recommendation 03: Community Engagement Interventions:** Public health organizations should hold responsibility in educating rural community members regarding obesity, its consequences, and preventable methods. Public health should collaborate with local community stakeholders, supermarkets, and gym to raise funds from federal, state, national and local nonprofit organizations and hold responsibility in organizing monthly gatherings at local public places such as schools, parks, churches to educate individuals and give unemployed members coupons which can be redeemed at local supermarkets and local gyms. These coupons can be redeemed only for fruits and vegetables.

These gatherings will be advertised through social media accounts, local news channels, billboards, pamphlets, at grocery stores, churches, malls, restaurants, and gyms. This will encourage unemployed adults to have nutritious food and engage in regular physical activity. Additionally, each unemployed participant in this program who reduced weight should receive a health-related reward to motivate them and others to maintain healthy weights or continue working toward weight loss if they are obese.

**Implications:** Since the majority of rural residents are unemployed, WV's adult obesity prevalence cannot be controlled by employment policy changes alone, but public health should develop and implement interventions that engage unemployed community members towards behavioral changes. Making sure that coupons can only be used at farmers markets and must be used to purchase only fruits and vegetables would drive people to eat them, which can significantly affect long-term behavioral change. Physical activity coupons encourage them to visit the gym regularly and have one hour of physical activity per day. By engaging unemployed individuals in behavioral change interventions will help them develop healthy lifestyle behaviors which aids in reducing overall prevalence of obesity and obesity related chronic disease prevalence in West Virginia.

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