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Prevalence and correlates of food insecurity in community-based individuals with severe mental illness receiving long-acting injectable antipsychotic treatment

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Abstract

People with severe mental illness (SMI) have numerous risk factors that may predispose them to food insecurity (FI); however, the prevalence of FI and its effects on health are under-researched in this population. The present study aimed to describe the prevalence of FI and its relationship to lifestyle factors in people with SMI. This cross-sectional study recruited people with SMI receiving long-acting injectable (LAI) antipsychotic medication from community services at three sites in Sydney, Australia. Assessments were completed on physical health and lifestyle factors. χ^2 Tests, independent-samples *t* tests and binary logistic regression analyses were calculated to examine relationships between lifestyle factors and FI. In total, 233 people completed the assessments: 154 were males (66 %), mean age 44·8 (SD 12·7) years, and the majority (70 %) had a diagnosis of schizophrenia. FI was present in 104 participants (45 %). People with FI were less likely to consume fruits (OR 0·42, 95 % CI 0·24, 0·74, $P = 0·003$), vegetables (OR 0·39, 95 % CI 0·22, 0·69, $P = 0·001$) and protein-based foods (OR 0·45, 95 % CI 0·25, 0·83, $P = 0·011$) at least once daily, engaged in less moderate to vigorous physical activity (min) (OR 0·997, 95 % CI 0·993, 1·000, $P = 0·044$), and were more likely to smoke (OR 1·89, 95 % CI 1·08, 3·32, $P = 0·026$). FI is highly prevalent among people with SMI receiving LAI antipsychotic medications. Food-insecure people with SMI engage in less healthy lifestyle behaviours, increasing the risk of future non-communicable disease.

Key words: **Food insecurity: Diet: Psychosis: Schizophrenia: Antipsychotic treatment**

Food security, described as the consistent and assured access to and availability of safe sufficient food to support nutritional adequacy and a healthy life, is deemed a right for all humans[1]. In 2018, the WHO estimated that 11 % of people worldwide were undernourished and 10 % of people worldwide were experiencing severe food insecurity (FI), resulting in a call for action[2]. In Australia, rates of FI are estimated to be between 5 and 13 %[3–5]. A range of factors influence the level of food security including income, employment, ethnicity and disability[6]. Furthermore, food supply is affected by location and food availability, as well as by price, quality and variety[7,8]. FI develops when ongoing access and availability to food are limited or uncertain, with the impaired ability to acquire and use nutritious food in socially acceptable and safe ways[8,9]. The rising cost of food, particularly nutritious foods, increased cost of living and lower household incomes all contribute to and perpetuate FI[8,10].

In Australia, socially disadvantaged groups have been shown to have a higher prevalence of FI[8,11]. Such population groups include low-income households, rural/remote areas, indigenous, homeless, disabled, aged and migrant populations[10–12]. As these groups are highly associated with a lower socioeconomic status, food purchasing is often perceived as a discretionary expense relative to other living necessities[7,12]. A reduction in diet quality commonly follows with the overconsumption of energy-dense, non-nutritious foods, and lower intake of core foods such as fruits and vegetables, and important nutrients including fibre[13,14]. This increases the risk for obesity and diet-related disease, such as type II diabetes, heart disease and stroke[7,9,10].

Abbreviations: FI, food insecurity; LAI, long-acting injectable; MVPA, moderate-to-vigorous physical activity; SMI, severe mental illness.

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FI is known to be associated with poorer mental health status and increased suicidality[15,16]; however, the prevalence and impact of FI in people living with a severe mental illness (SMI), including schizophrenia and other psychotic illnesses, are under-researched and potentially under-managed in clinical practice. A study from the USA of 111 people living with SMI found that the prevalence of FI was 71 %, considerably higher than the reported national prevalence of 15 %[17]. Within the present study, those who were severely food insecure had significantly higher odds (OR 5·06) of psychiatric emergency room visits within the previous year compared with those who were food secure[17].

People living with SMI often experience a lower standard of living, with poor functional outcomes, cognitive impairments, disability, and social and health inequalities[18,19]. This is frequently combined with socioeconomic barriers such as poverty, low income, unemployment, stigma, reduced independence and low self-efficacy[18–22]. It is therefore conceivable that FI may be highly prevalent in this population, further impacting on physical and mental health.

The high levels of physical morbidity and premature mortality among SMI populations are widely recognised, with a 15-year life expectancy reduction compared with people without SMI[23]. Recent studies documented the poor physical health of people with enduring SMI receiving clozapine[24] or long-acting injectable (LAI) antipsychotics[25].

The present study aimed to (i) assess the prevalence of FI in individuals with SMI receiving LAI antipsychotic medications and (ii) explore the relationship between FI and lifestyle factors in a sub-sample of people who were assessed for FI within the larger quality improvement project[25].

Methods

Study design and setting

This cross-sectional study was conducted between October 2016 and December 2017 across three community mental health sites within the South Eastern Sydney Local Health District Mental Health Service. The present study was deemed a quality improvement or quality assurance project by the South Eastern Sydney Local Health District Human Research Ethics Committee (17/298 (LNR/17/POWH/580)).

Participants

Participants were people experiencing SMI living in the community and receiving LAI treatment through the clinic service at one of the three community mental health sites. The present study aimed to include all people engaged with the LAI clinic; hence, there were no exclusion criteria within this cohort. Participants were invited to participate in the quality improvement project when attending the LAI clinic as part of routine care by clinicians within the clinic.

Outcome measures

A series of measures was completed with participants facilitated by a clinician based on-site. Measures were completed in a private consulting room co-located with the LAI service.

Sociodemographic and medication details. Participants' sociodemographic and medication details including sex, age, psychiatric diagnosis, psychotropic medication prescription and community treatment order status were obtained from medical records. Participants' country of origin (of birth) was categorised as (i) Australia, (ii) Asia or (iii) other. LAI antipsychotic prescriptions were converted to chlorpromazine equivalents, referred to as defined daily dose.

Anthropometry. Anthropometric data including height, weight, BMI, blood pressure and waist circumference were collected using standardised procedures. Participants were weighed without shoes and wearing light clothing on the OMRON HN-283 digital scale to the nearest 0·1 kg. Height was measured with shoes off, using a wall-mounted stadiometer to the nearest 0·1 cm. BMI was calculated as weight/height^2 with participants characterised as normal weight (18·5–24·9 kg/m^2), overweight (25·0–29·9 kg/m^2) and obese (≥30·0 kg/m^2) as per WHO cut-offs[26]. Blood pressure was measured on the left arm in a seated position using an OMRON automatic sphygmomanometer. Waist circumference was measured horizontally at the navel at the end of expiration to the nearest 0·1 cm. Waist circumference was categorised as 'at risk' according to ethnic specific values from the International Diabetes Foundation criteria: Europids (≥80 cm for females and ≥94 cm for males) and Asian people (≥80 cm for females and ≥90 cm for males)[27].

Food security. Participants completed the Radimer/Cornell Hunger and Food Insecurity questionnaire with assistance from a trained clinician. The Radimer/Cornell questionnaire has been validated for internal consistency, and construct and criterion-related validity, to assess hunger and FI at both a household and individual level[28]. The Radimer/Cornell questionnaire is a nine-question tool (children's section removed) consisting of food anxiety, food quality and food quantity components. Participants have three possible responses: (i) 'Not True', (ii) 'Sometimes True' or (iii) 'Often True'. Participants who answer either 'Sometimes True' or 'Often True' to any of the questions are considered food insecure.

Dietary intake. Diet was assessed through the use of a targeted ten-question, picture-guided, food intake questionnaire specifically developed to evaluate food patterns. The questionnaire evaluated intake of five 'healthy' and five 'unhealthy' food categories. Healthy food categories were fruits, vegetables, whole-grain foods, unsweetened dairy and alternatives and protein foods. Unhealthy food categories included unhealthy fats, sugary drinks, sweet foods, savoury discretionary foods and alcoholic beverages. Participants were asked to consider average frequency of intake over the last month and select from multiple choice responses: (i) less than once per week, (ii) multiple times per week, (iii) once per d and (iv) multiple times per d.

Physical activity. Previous 7-d physical activity was assessed using the International Physical Activity Questionnaire – Short Form[29]. The International Physical Activity Questionnaire – Short Form asks participants to recall time spent in vigorous- and moderate-intensity physical activity, time spent walking

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and time spent sitting. A continuous indicator of physical activity at each intensity was calculated as a sum of weekly minutes per week. The percentage of clients achieving the WHO guidelines[30] of 150 min of moderate-to-vigorous physical activity (MVPA) per week was included as a categorical variable. The International Physical Activity Questionnaire has demonstrated reliability as a surveillance tool to assess the levels of physical activity in people with schizophrenia[31].

Smoking. Nicotine dependence was measured using the Fagerström Test for Nicotine Dependence[32], a six-item questionnaire. Scores of 1–2 indicate low dependence, 3–4 low to moderate dependence, 5–7 moderate dependence and 8+ high dependence.

Statistical methods

Categorical descriptive statistics were calculated via cross-tabulation and reported as numbers and percentages (sex, diagnosis, country of birth, LAI medication, community treatment order status, number of antipsychotic medications prescribed, additional mood stabiliser, antidepressant and benzodiazepine medications prescribed, BMI risk category, International Diabetes Foundation waist circumference risk category, dietary factors, smoking status and number of cigarettes smoked). Data distribution for continuous variables was assessed through histograms, and skewness and kurtosis values. Continuous descriptive statistics (age, LAI defined daily dose, weight, BMI, waist circumference, minutes in physical activity and sedentary time) were reported as means and standard deviations due to normal distributions.

χ^2 Tests were calculated to test for differences associated with the presence of food security and categorical variables: sex, diagnosis, prescribed LAI medication, community treatment order status, dietary factors (categorised as consumed at least once per d), smoking status and number of cigarettes smoked. Independent-samples *t* tests were run on food security status and continuous variables: age, weight, BMI, waist circumference, MVPA and sedentary time. Statistical significance was set at $P < 0{\cdot}05$. For multiple comparisons of food security status against likely correlated dietary factors, a Bonferroni adjustment was implemented and statistical significance was modified to $P < 0{\cdot}006$. For multiple comparisons on likely correlated physical activity factors, a Bonferroni adjustment was implemented and statistical significance was modified to $P < 0{\cdot}017$. Binary logistic regression analyses were calculated adjusting for age and sex, and diagnosis and 'at risk' waist circumference ($P < 0{\cdot}1$ for univariate model) to determine OR for lifestyle variables associated with FI. All statistical analyses were calculated using SPSS version 24.

Results

In total, 233 participants (45 % of the total cohort receiving LAI) completed the food security questionnaire and other assessments (Table 1). Participants were able to decline to participate in any of the measures which resulted in lower sample sizes for certain measures. There were more people who completed the survey receiving mood stabiliser medication compared with those who did not complete the survey. There were no differences between the two groups in demographic details or other clinical variables.

Of the participants who completed the food security survey, 66 % (*n* 154) were males, and the median age was 44·8 (SD 12·7) years. The majority of participants (63 %) were born in Australia, and the remainder were born in an Asian country (18 %) or other countries (22 %) and had a primary diagnosis of schizophrenia (70 %). Participants were prescribed a range of LAI antipsychotic medications, and 34 % (*n* 79) were prescribed at least one additional oral antipsychotic. The frequency of additional oral psychotropic medications, other than antipsychotics, was as follows: mood stabiliser 21 % (*n* 50), antidepressant 9 % (*n* 20) and benzodiazepine 6 % (*n* 15). Participants were mostly in the at-risk BMI categories, with 48 % obese and 29 % overweight. Eighty percentage had an at-risk waist circumference.

FI was prevalent in 45 % (*n* 108) of participants. There was no difference between food security status and sex, LAI medication or number of participants on a community treatment order (all $\chi^2 < 1{\cdot}0$, all $P > 0{\cdot}30$; Table 2). There was a trend to statistical significance for difference in diagnoses between food security status ($\chi^2 = 5{\cdot}8$, all $P = 0{\cdot}056$), with 48 and 43 % of people with schizophrenia and schizoaffective disorder being food insecure, respectively, compared with 20 % of people with bipolar affective disorder being food insecure. There was no difference in food security status and age, weight, BMI or waist circumference (all $t < 1{\cdot}6$, all $P > 0{\cdot}11$).

Participants who were food insecure were less likely to consume fruits (OR 0·42, 95 % CI 0·24, 0·74, $P = 0{\cdot}003$), vegetables (OR 0·39, 95 % CI 0·22, 0·69, $P = 0{\cdot}001$) or lean meat, poultry, fish and other protein-based foods (OR 0·45, 95 % CI 0·25, 0·83, $P = 0{\cdot}011$) at least once per d (Table 3). People who were food insecure were more likely to smoke (OR 1·89, 95 % CI 1·08, 3·32, $P = 0{\cdot}026$); however, within those who were smokers there was no difference between food security status for the categories of number of cigarettes smoked ($\chi^2 = 0{\cdot}7$, $P = 0{\cdot}87$). Food insecure participants also reported lower levels of MVPA (min) (OR 0·997, 95 % CI 0·993, 1·000, $P = 0{\cdot}044$); however, there was no difference in sedentary time between food security status ($t(220) = 0{\cdot}2$, $P = 0{\cdot}8$).

Discussion

The present study found a prevalence of FI in people with SMI receiving LAI medication of 45 %. Further, those reporting FI reported less healthful lifestyle behaviours. People with FI consumed less vegetables, fruits and lean meat, poultry, fish and other protein-based foods and were more likely to be smokers. These lifestyle behaviours are well-known risks for future non-communicable disease and all-cause mortality[33–35], to which people with SMI are highly vulnerable[36]. The present study adds significantly to the evidence base for FI being a highly prevalent issue in this patient group. This is in line with findings from the limited number of studies that have to date explored the important question of FI in people with SMI[17]. The present study adds to this by additionally providing new insights into

Table 1. Demographic and clinical details of people who participated in the survey and those who did not (Numbers and percentages; mean values and standard deviations)

	Participated		Did not participate		
	n	%	*n*	%	Statistical test
Demographic					
Age (years)					
Mean	44·8		45·7		$t(514) = 0{\cdot}85$, $P = 0{\cdot}40$
SD	12·7		12·4		
Male	154	66	176	62	$\chi^2 = 0{\cdot}94$, $P = 0{\cdot}33$
Country of birth					
Australia	145	62	167	60	$\chi^2 = 2{\cdot}56$, $P = 0{\cdot}28$
Asia	37	16	36	13	
Other	51	22	77	27	
Diagnosis and treatment					
Diagnosis					
Schizophrenia	156	69	205	75	$\chi^2 = 2{\cdot}27$, $P = 0{\cdot}32$
Schizoaffective disorder	51	22	48	17	
Bipolar affective disorder	20	9	22	8	
LAI medication					
Paliperidone	64	27	85	30	$\chi^2 = 7{\cdot}38$, $P = 0{\cdot}39$
Zuclopenthixol	47	20	64	23	
Aripiprazole	42	18	46	16	
Respiridone	33	14	41	14	
Flupenthixol	33	14	28	10	
Haloperidol	11	5	19	7	
Fluphenazine	2	1	0	0	
Olanzapine	1	1	0	0	
LAI defined daily dose (mg)					
Mean	1·1		1·1		$t(510) = 0{\cdot}2$, $P = 0{\cdot}81$
SD	0·5		0·5		
Participants with CTO	119	51	138	49	$\chi^2 = 0{\cdot}32$, $P = 0{\cdot}57$
Additional oral psychotropic medications					
Antipsychotic					
No oral antipsychotic	157	67	181	63	
Olanzapine	27	12	39	14	
Quetiapine	27	12	36	13	
Clozapine	9	3	17	6	
Amisulpride	7	3	3	1	$\chi^2 = 8{\cdot}15$, $P = 0{\cdot}42$
Haloperidol	0	0	1	1	
Paliperidone	2	1	3	1	
Lurasidone	2	1	0	0	
Multiple oral antipsychotics	2	1	4	1	
Mood stabiliser	50	21	41	14	$\chi^2 = 4{\cdot}35$, $P = 0{\cdot}04$*
Antidepressant	20	9	34	12	$\chi^2 = 1{\cdot}57$, $P = 0{\cdot}21$
Benzodiazepine	15	6	18	6	$\chi^2 = 0{\cdot}00$, $P = 0{\cdot}96$

LAI, long-acting injectable medication; CTO, community treatment order.
* $P < 0{\cdot}05$.

associations of FI with other factors including BMI, cigarette smoking and physical activity.

The prevalence of FI in people with SMI receiving LAI medication appears significantly higher than both the national rates in the general Australian population (approximately 5 %)[5], rates in the Australian population using the Radimer/Cornell Hunger and Food Insecurity questionnaire (13 %)[3,4] and worldwide rates (11 % undernourished, 10 % severe FI)[2]. Several factors may contribute to the high prevalence of FI in SMI. First, financial constraints are a common barrier for people with persistent SMI, due to high rates of unemployment or partial employment requiring government support[37,38]. Second, people with SMI often have poorer culinary skills[39] and may have limited food storage and preparation options[40]. Third, more than 50 % of people with SMI do not drive and therefore rely on public transport or other family members or carers to access food stores[41]. Fourth, symptoms and characteristics of mental illness, such as social anxiety and persecutory ideas, can lead to people with SMI avoiding supermarkets[42]. In addition, we do not know whether people receiving LAI treatment are representative of other SMI cohorts and may in fact have higher rates of disadvantage, given this cohort has the highest rate of involuntary treatment and is often poorly engaged with health services.

It is well documented that people with SMI have less healthy dietary intake compared with those without mental illness, and they may fall short of national targets for healthy recommended dietary intake[43]. It is known that dietary interventions can improve physical health in people with SMI[44]. However, assessing for and providing strategies to manage FI may be a necessary addition to routine clinical care for this population. Future studies should evaluate the effectiveness of interventions to improve food security in people with SMI and FI, and its subsequent effect on nutritional intake and diet quality. The high prevalence of smokers in the food insecure group is a possible reflection of

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Table 2. Demographic and clinical details of participants
(Numbers and percentages; mean values and standard deviations)

	Food secure (*n* 129)		Food insecure (*n* 104)		
	n	%	*n*	%	Statistical test
Demographic					
Age (years)					
Mean	45·6		43·7		$t(231) = 1·1$, $P = 0·26$
SD	13·2		12·1		
Male	82	64	72	69	$\chi^2 = 0·83$, $P = 0·36$
Country of birth					
Australia	84	65	61	59	
Asia	20	16	17	16	$\chi^2 = 1·24$, $P = 0·54$
Other	25	19	26	25	
Diagnosis and treatment					
Diagnosis					
Schizophrenia	84	65	78	75	
Schizoaffective disorder	29	22	22	21	$\chi^2 = 5·77$, $P = 0·06$
Bipolar affective disorder	16	13	4	4	
LAI medication (*n* 232)					
Paliperidone	42	33	22	21	
Zuclopenthixol	25	19	22	21	
Aripiprazole	20	15	22	21	
Respiridone	16	12	17	16	$\chi^2 = 7·33$, $P = 0·40$
Flupenthixol	18	14	15	15	
Haloperidol	6	5	5	5	
Fluphenazine	2	2	0	0	
Olanzapine	0	0	1	1	
LAI defined daily dose (mg) (*n* 231)					
Mean	1·1		1·1		$t(230) = 0·9$, $P = 0·38$
SD	0·5		0·5		
Participants with CTO	62	48	57	55	$\chi^2 = 1·05$, $P = 0·31$
Additional oral psychotropic medications					
Antipsychotic					
Not-oral antipsychotic	89	69	68	66	
Olanzapine	12	9	15	14	
Amisulpride	6	4	1	1	
Clozapine	5	4	4	4	
Paliperidone	2	2	0	0	$\chi^2 = 8·57$, $P = 0·29$
Quetiapine	12	9	15	14	
Lurasidone	2	2	0	0	
Multiple oral antipsychotics	1	1	1	1	
Mood stabiliser	27	21	23	22	$\chi^2 = 0·05$, $P = 0·83$
Antidepressant	12	9	8	8	$\chi^2 = 0·19$, $P = 0·66$
Benzodiazepine	8	6	7	7	$\chi^2 = 0·03$, $P = 0·87$
Anthropometry					
Weight (kg) (*n* 217)	92·2	30·7	87·2	23·9	$t(221) = 1·3$, $P = 0·19$
BMI (kg/m^2) (*n* 208)	31·2	8·8	29·4	7·4	$t(207) = 1·6$, $P = 0·11$
BMI category (*n* 208)					
Underweight	1	1	1	1	
Healthy	18	16	29	30	
Overweight	34	30	26	27	$\chi^2 = 7·9$, $P = 0·16$
Obese (class I)	34	30	19	20	
Obese (class II)	12	11	13	13	
Obese (class III)	13	12	8	9	
Waist circumference (cm) (*n* 222)	106·2	18·2	103·3	18·1	$t(221) = 1·2$, $P = 0·24$
Waist circumference risk category (*n* 222)					
At metabolic risk	17	14	27	26	$\chi^2 = 4·9$, $P = 0·026$*
Not at metabolic risk	102	86	76	74	

LAI, long-acting injectable medication; CTO, community treatment order.
* $P < 0·05$.

the significant costs associated with buying cigarettes and tobacco products. An Australian study of people with mental illness receiving a disability support pension found that smoking on average forty cigarettes per d equates to 37 % of their pension[45]. Given the high rates of smoking found in this sample (63 %), similar to the percentage of smokers among people with SMI more generally (approximately 66 %)[46], further research and development of targeted clinical interventions are suggested. Prospective studies that monitor monetary spending over time, particularly focussing on smoking and other substances, and the effect on food security are needed. Lower levels of physical activity for food insecure people are a consistent finding[47]; however, the potential relationship between FI and MVPA is unclear. A number of factors which correlate with lower

Table 3. Comparison of lifestyle characteristics by food security status*
(Numbers and percentages; mean values and standard deviations; odds ratios and 95 % confidence intervals)

	Food secure		Food insecure			Binary logistic regression		
	n	%	*n*	%	χ^2/*t* test‡	OR	95 % CI	*P*
Dietary intake (consumed at least once per d, *n* 220)								
Vegetables	60	50	25	25	$\chi^2 = 13{\cdot}6$, $P < 0{\cdot}001$†	0·39	0·22, 0·69	0·001†
Fruits	58	48	25	25	$\chi^2 = 11{\cdot}9$, $P = 0{\cdot}001$†	0·42	0·24, 0·74	0·003†
Whole grains	54	44	43	43	$\chi^2 = 0{\cdot}8$, $P = 0{\cdot}77$			
Plain dairy and dairy alternatives	84	69	69	70	$\chi^2 = 0{\cdot}5$, $P = 0{\cdot}82$			
Lean meat, poultry, fish and other protein-based foods	55	45	25	25	$\chi^2 = 9{\cdot}3$, $P = 0{\cdot}002$†	0·45	0·25, 0·83	0·011*
Sugary drinks	45	37	46	47	$\chi^2 = 2{\cdot}1$, $P = 0{\cdot}15$			
Savoury discretionary foods	16	13	18	18	$\chi^2 = 1{\cdot}0$, $P = 0{\cdot}31$			
Sweet discretionary foods	25	21	23	23	$\chi^2 = 2{\cdot}1$, $P = 0{\cdot}34$			
Physical activtiy (min/d) (*n* 222)								
Sedentary time								
Mean	433		440		$t(220) = 0{\cdot}2$, $P = 0{\cdot}81$			
SD	211		220					
Walking								
Mean	311		226		$t(200) = 1{\cdot}7$, $P = 0{\cdot}09$			
SD	464		266					
Moderate and vigorous physical activity								
Mean	59		22		$t(173) = 2{\cdot}4$, $P = 0{\cdot}017$*	0·997	0·993, 1·000	0·044*
SD	152		66					
Currrent smoker (*n* 219)	69	58	71	72	$\chi^2 = 4{\cdot}8$, $P = 0{\cdot}029$*	1·89	1·08, 3·32	0·026*
Nicotine dependence (within smoking cohort, *n* 145)								
High	14	21	12	18				
Moderate	25	36	32	48	$\chi^2 = 2{\cdot}4$, $P = 0{\cdot}49$			
Low-moderate	18	26	16	24				
Low	12	17	7	10				

* $P < 0{\cdot}05$.
† $P < 0{\cdot}01$.
‡ χ^2 Statistical significance was adjusted to $P < 0{\cdot}006$ for dietary components, and independent-samples *t* test statistical significance was adjusted to $P < 0{\cdot}017$ for physical activity factors. Binary logistic regression analyses were adjusted for age, sex, diagnosis and 'at risk waist circumference' to determine OR for people who were food insecure.

physical activity in people with SMI, such as low socioeconomic status, physical co-morbidities and smoking status, appear to correlate with FI in the general population, questioning a causative relationship[48,49]. Prospective studies of FI and its relationship to MVPA levels in people with SMI are needed to help understand this relationship.

Limitations

The limitations of the present study are as follows. First, a number of subjective measures were utilised in the present study potentially reducing the accuracy when compared with objective measures. The food intake questionnaire has not yet been validated in SMI population. Given the high prevalence of cognitive and memory deficits along people with SMI, a simplified, picture-guided tool was developed to give an overall indication of frequency of categorised food choices. Second, the cross-sectional design prevents causal conclusions being made and, however, does provide evidence to support future prospective observational and intervention studies. Third, there is potential for selection bias given that only 45 % of the total available cohort completed the survey. However, comparisons of available demographic and clinical data revealed minimal differences between those who completed the survey and those did not, indicating that there was otherwise no evidence to suggest any systematic bias. No obvious explanation was identified for the difference in mood stabiliser prescription rates between the two groups. Fourth, the questionnaire utilised in the study did not distinguish whether the FI identified in the present study was acute or chronic. Lastly, the relationship between socioeconomic status and FI was not explored.

Despite these limitations, the present study provided insight into understanding the prevalence of FI and its relationship to other health behaviours in this highly vulnerable group. The following gaps remain: (i) validation studies are required of both dietary assessment methods and food security measures specifically for people with SMI to determine optimal assessment methods, (ii) future studies should explore the relationship of additional demographic and treatment elements with food security status including socioeconomic status, and duration of illness and exposure to antipsychotic medication, and alcohol and substance use and (iii) prospective studies are needed to observe participants' budgetary spending in relation to food, housing, smoking and substance use and other factors to identify impacts on food security. Given the increasing number of dietitians working in mental health services, evaluating food security status could become an important component of routine care to include in initial assessments in order to guide optimal interventions.

Conclusion

FI is highly prevalent in people with SMI receiving LAI antipsychotic medications. People who were food insecure engaged in less healthy lifestyle behaviours, increasing the risk of future non-communicable diseases. Future studies which explore causal pathways will help to target interventions for FI for mental health teams.

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