The Health Improvement Profile (HIP) for people with Severe Mental Illness: Feasibility of a secondary analysis to make international comparisons

Dawn Bos, RN, PhD[1]

Richard Gray, RN, PhD[2]

Soontareeporn Meepring RN, PhD[3]

Jacquie White, RN, PhD[4]

Kay Foland, RN, PhD[5]

*Daniel Bressington, RN (MH), PhD[6] * Corresponding author

[1] School of Nursing, Winona State University, Rochester, MN, USA. Email: dvanruler@minnstate.edu

[2] School of Nursing and Midwifery, La Trobe University, Melbourne, Australia. Email: R.Gray@latrobe.edu.au

[3] Faculty of Nursing, Naresuan University, Phitsanulok, Thailand. Email: j_katesm@hotmail.com

[4] Faculty of Health Sciences, University of Hull, Hull, UK. Email: jacqueline.white@hull.ac.uk.

[5] School of Nursing, South Dakota State University, Brookings, SD, USA. Email: kfoland@sdstate.edu

[6] College of Nursing & Midwifery. Charles Darwin University, Darwin, Australia. Email: Daniel.bressington@cdu.edu.au

Data Availability Statement:

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of interest:

The authors declare no conflicts of interest.

Authors' contributions:

Study conceptualization: DB and DBr. Principle investigators of original studies: DB, RG, SM, JW, KF, DBr. Data analysis: DB and DBr. Initial draft of manuscript: DB and DBr. Manuscript editing: all authors.

This is the peer reviewed version of the following article: Bos, D., Gray, R., Meepring, S., White, J., Foland, K. and Bressington, D. (2021), The Health Improvement Profile (HIP) for people with Severe Mental Illness: Feasibility of a secondary analysis to make international comparisons. Journal of Psychiatric and Mental Health Nursing, which has been published in final form at https://doi.org/10.1111/jpm.12748.

PROFESSOR RICHARD GRAY (Orcid ID : 0000-0001-9694-4206)

PROFESSOR DANIEL BRESSINGTON (Orcid ID : 0000-0003-0951-2208)

Article type : Original Article

The Health Improvement Profile (HIP) for people with Severe Mental Illness: Feasibility of a secondary analysis to make international comparisons

Accessible Summary

What is already known about this topic:

- Individuals with severe mental illness (SMI) have elevated risks for physical health problems and low screening rates.
- No previous studies have compared the physical health promotion needs of people with SMI using the same screening tool across different international settings.

What this paper adds to existing knowledge:

- It appears feasible to use the HIP to profile and compare physical health related risks in people with SMI across different international settings.
- The HIP tool identified significant differences in areas of risk across the four countries.

What are the implications for practice?

- The HIP could be used to identify unique clusters of health promotion needs in different countries.

- Use of HIP health checks may support implementation of individualized interventions.

The Health Improvement Profile (HIP) for people with Severe Mental Illness: Feasibility of a secondary analysis to make international comparisons

Abstract

Introduction:

To date no studies have contrasted physical health profiles of people with Severe Mental Illness (SMI) in different countries.

Aim:

Evaluate feasibility of using the Health Improvement Profile (HIP) to compare and contrast physical health and health behaviours of people with SMI from four countries.

Method:

An observational feasibility study using secondary analysis of pooled health state and lifestyle data. Physical health checks using modified versions of HIP were administered in four countries.

Results:

Findings suggest feasibility of HIP screening to profile and compare physical health and health behaviours of people with SMI across international settings. High overall numbers of risk items (red-flags) were identified in all but the Thailand sample. Despite some commonalities, there were important differences in health profiles across countries.

Discussion:

This is the first study to demonstrate feasibility of the HIP to compare health risks in individuals with SMI across countries. Future multi-national HIP studies should recruit a fully-powered stratified random sample of people with SMI that is representative of each setting.

Implications for practice:

It appears feasible to utilize the HIP to identify specific areas of health risk in different countries, which may help to better focus nursing interventions and use of resources.

Key words:

Physical health, Schizophrenia, Risk Assessment, Public Health, Health Promotion.

Relevance Statement

The physical health disparities faced by people with severe mental illness are well documented, however physical health screening rates are generally low. This study established the feasibility of using the HIP screening tool to identify country-specific physical health profiles across different settings. High overall numbers of risk items (red-flags) were identified in all but the Thailand sample. Despite some commonalities, important differences exist in the health profiles across the countries. It appears feasible to utilize the HIP to identify specific areas of health risk in different countries, which may help to better focus nursing interventions and make effective use of scant resources.

The Health Improvement Profile (HIP) for people with Severe Mental Illness: Feasibility of a secondary analysis to make international comparisons

Background

People with Severe Mental Illness (SMI) have higher rates of physical illness and die at younger ages than those without SMI (Hjorthøj et al., 2017). SMI includes schizophrenia, and bipolar disorder (Nesvag et al., 2017; Substance Abuse and Mental Health Services Administration, 2020). Early mortality of individuals with SMI is a global concern (Liu et al., 2017b) and is due in part to elevated levels of cardiovascular disease, which is associated with conditions such as diabetes, dyslipidemia, and hypertension, (Chung et al., 2018; Razzano et al. 2015; Rekhi, et al., 2016; Vancampfort et al., 2014; Yang et al., 2016). Cardiovascular disease is a major health threat in general populations across the world, for example it accounts for 20% of mortality in China (World Health Organization, 2016) and results in high health-related costs in western countries such as the USA and UK (American Heart Association, 2016; Luengo-Fernandez et al., 2006).

Evidence suggests that people with SMI are disproportionally affected by CVD; authors of a recent meta-analysis reported a 53% increase in the odds of CVD in people with SMI compared to controls (Correll et al., 2017). There are also gender-related cardiovascular risk factors that can manifest in people with SMI, in that women experience higher waist circumference and obesity rates cross-culturally (Albrecht et al., 2015; Liu et al., 2017a). In addition to the physical health impacts of excess bodyweight, obesity is associated with increased levels of depression symptoms in women and therefore may compound an underlying depressive illness (Rajan & Menon, 2017).

In addition to experiencing higher rates of obesity, diabetes, dyslipidemia, and hypertension at least 20% of individuals with SMI demonstrate multiple unhealthy behaviours which raise cardiovascular risk (Vermeulen-Smit et al., 2015). It is therefore essential that physical health screening intervention programs for people with SMI incorporate an assessment of health behaviours in order to identify risk, direct interventions, and help patients adopt healthier lifestyle behaviours (Fernandez-San-Martin et al., 2014; Moore et al., 2015; Xiong et al., 2015). Health risk behaviors are defined as a lifestyle activity that places a person at increased risk of suffering a particular condition, illness or injury (Free Dictionary by Farlex, 2020). This is whether or not the person is aware of the link between the activity and risk of disease or injury,

Although physical health risk screening is recommended by health care consensus groups and is well accepted and valued by people with SMI, it is not implemented at adequate rates (Baller et al., 2015; Beebe & Harris, 2013; National Institute of Health and Care Excellence, 2018; Osborne et al., 2011). Rates of physical health risk screening reported in some studies are as low as 29% for Body Mass Index and 39% for lipid screening in persons with SMI (Kilbourne et al., 2011) and 20% for screening of cholesterol, BMI, Blood pressure and blood sugar in UK primary care patients with SMI (Hardy, Hinks, & Gray, 2013). Breast cancers are also screened at lower rates in people with SMI compared to the general population (Woodhead et al., 2016) and consequently cancers are identified at more advanced stages (Kisley, Crow, & Lawrence, 2013). Disproportionately fewer health risk behavior interventions and lifestyle advice sessions are also given to individuals with SMI as compared to people with diabetes (Hardy et al., 2013).

Unfortunately, when physical health screening is conducted in individuals with SMI it is often unstructured and non-systematic (Baller et al., 2015) which limits its effectiveness (Pitman et al., 2011; Tosh et al., 2014) and lowers screening rates (Mugisha et al., 2017; Xiong et al., 2015). The guideline driven approach (Mitchell et al., 2012; Yoemans, Dale, & Beedle, 2014) has been shown to improve rates of physical health screening and result in short-term increases in monitoring (Baller et al., 2015). Screening guideline recommendations vary among differing advisory groups, despite this, there is general agreement that physical health screening of individuals with mental illness should be completed at least yearly (NICE, 2015).

The physical health screening tool administered in the current study, the Health Improvement Profile (HIP), is based on guidelines for health screening in those with SMI and is intended to be used by nurses and other health professionals to produce an individualized physical health risk profile. The HIP was originally developed by White and colleagues in the UK, subsequently it has been adapted for use in Hong Kong (Bressington et al., 2014; 2016), Thailand (Meepring et al, 2018), Finland (Werkkala et al., 2020) and the USA (Bos, 2018). Screening is designed to increase the individuals' awareness of health problems and engage people with SMI in brief interventions to reduce health behavior related risk (Hardy, White & Gray, 2018). The HIP includes evidence based recommendations for follow-up that are given to participants to reinforce ongoing monitoring of health risks, and as impetus for adopting healthier lifestyle behaviours.

Given the insufficient physical health screening rates and poor medical outcomes in people with SMI (Reilly et al., 2013) it is important to clarify how a standardized approach may facilitate screening and help to directly compare physical health promotion needs (Doherty & Gaughran, 2014; Happell et al., 2015; Vasudev & Martindale, 2010) in a different international settings. However, to date there have been no studies that have contrasted physical health profiles of patients with SMI in different countries using the same screening tool. The use of an identical tool in different international settings would enable the direct comparison of physical health and health-behaviour related risks and therefore may aid in identifying typical country-specific profiles of health promotion needs to inform interventions/resource allocation. We addressed this gap in knowledge by conducting a secondary analysis of pooled data from four previous clinical studies of the HIP to demonstrate the potential feasibility of contrasting observations.

Study aims and objectives

The aim of this study was to evaluate the feasibility of using the HIP to profile and compare the physical health and health behaviours of people with SMI across different international settings. HIP data from clinical studies conducted with people with SMI in United States of America, Thailand, United Kingdom, and Hong Kong was combined. We were able to compare 18 risk parameters compared across countries: body mass index (BMI), waist circumference, hypertension, alcohol use, diet (vegetable intake), exercise, smoking, sleep, caffeine intake, drug use (cannabis), safe sex, bowels, fluid intake, feet checks, teeth checks, urine problems, eye checks and breast checks.

2.1 Design

This feasibility study used pooled data of individuals with SMI that completed the HIP in research studies conducted in four different countries. The USA data reported in this paper have not been previously reported. Additional data used in this analysis have been previously reported for Hong Kong (Bressington et al., 2018), Thailand (Meepring et al., 2018) and the UK (White et al., 2015).

Study settings, recruitment and data collection

Each of the four studies had a different approach to participant recruitment. These have been described in detail elsewhere for three of the four samples (White et al., 2015). In summary, in Hong Kong a random selection of participants with SMI were recruited (during July to September 2015) from the community psychiatric service of a large government psychiatric hospital in the New Territories for a pilot cluster RCT of the Chinese HIP intervention (Bressington et al., 2018). The Hong Kong data presented in this study are from the 69 patients (from total of 137 participants) that were randomized into the intervention group and hence completed the HIP. In Thailand, a convenience sampling technique was adopted where participants were recruited by their keyworkers (from May to June 2015) for a quasi-experimental study of the Thai HIP in an outpatient's department of a psychiatric hospital in the upper region of southern Thailand (Meepring et al., 2018). In the UK "first contact" HIP's were completed by mental health nurses between November 2007 and June 2010 for every patient with SMI who consented to a physical health assessment on admission (convenience sample) in two in-patient wards in one hospital. In the USA, participants were recruited from Sept 2015 to January 2016 by outpatient clinic staff and community recovery group keyworkers (convenience sample) in a rural area of the upper mid-western USA.

Procedure

The HIP was completed and coded according to the HIP administration manual in all countries. In each of the four countries the HIP tools were completed by trained mental health nurses in individual meetings with their clients during their routine clinical practice. Nurses administering and the HIP had received at least three hours of training in using the HIP with patients with SMI.

Training was delivered face-to-face or online (in the US) and included information about medical comorbidities in severe mental illness; procedures for administering and coding the HIP; and an overview of the manual, development of physical health care plans, and signposting to additional resources. Biological parameters, such as blood pressure and waist circumference were measured and recorded by the interviewer during the interview and documented in the HIP.

2.21 Measures

Health Improvement Profile (HIP)

The HIP, is a clinical tool to facilitate conversations with patients about their physical health and focus clinical intervention based on the best available evidence (White et al, 2009). Face validity and clinical utility has been demonstrated in the United Kingdom (White et al., 2009; Shuel et al., 2010). Testing in Hong Kong, China (Bressington et al., 2014; Bressington et al., 2016; Bressington et al., 2018), Thailand (Thongsai et al., 2016; Meepring et al., 2018), Finland (Werkkala et al., 2020) and the UK (Shuel et al., 2010) found that the tool had good clinical utility. Additionally, the HIP has been implemented as standard of care in health systems internationally including Australia (Brown et al 2020).

The original version of the HIP (White et al 2009) covers twenty-seven biological and behavioral parameters in gender specific formats, coded as red (risk, action required) or green (healthy, no current risk). Items coded red indicate the need for action in terms of manualized recommendations, consideration of an intervention as necessary, and recommendation of repeat physical health screening (White et al., 2009). Individualized recommendations given in risk areas were used to guide the completion of care plans that aimed to improve health behaviours (please see table 1 for details of the parameters and recommendations in accordance with the HIP manual; Hardy et al, 2018). Each country made some modifications to the original HIP format, primarily this involved researchers in each country discussing the clinical relevance of each item on the HIP with a panel of local patients and clinicians and deleting/adding items as required. Hong Kong and Thailand ethnicity-specific BMI and waist circumference risk cut-off points used were adopted according to the World Health Organization Global Data Base on Body Mass Index. The WHO recommends lower cut-off points for people of Asian descent (WHO, 2006). Table 2 shows the ethnicity-specific cut-off points used in each study. The Hong Kong and Thai

HIPs were also translated into the relevant local language using standard translation procedures. The final number of items included in the modified HIPs were 22 (Thailand) and 27 (UK, USA, and Hong Kong). In the current study we analyzed 18 individual HIP items that were consistent across each modified version of the tool (i.e. the unaltered items) and the total number of red flagged items. The HIP is published, along with the HIP Manual (Hardy et al, 2018) and is available from the authors of the current study upon request. The HIP can be used freely in clinical practice but should not be amended without permission of the original authors.

2.23 Participants and Data Collection Procedure

Demographic information collected included: age, gender, ethnicity, occupation, and employment status. Additionally, we collected psychiatric diagnosis, medical conditions, length of mental health symptoms, and current medications, particularly if taking an anti-psychotic medication.

Participants were included if they were:

- Aged 18 to 65 years
- Able to understand the accepted language of the country.
- With a diagnosis of a severe mental illness (clinical diagnosis of schizophrenia, schizoaffective disorder, bipolar disorder, or major depression).

Exclusion criteria were:

- Current unstable mental health symptoms, current pregnancy (USA).
- Inability to provide informed consent (all countries).
- Being treated for a primary substance misuse disorder (Thailand, Hong Kong, USA).

Ethical Considerations

Ethical approvals to conduct the study were obtained from the relevant institutional and clinical research ethical committees in each of the four countries (Hong Kong- The Hong Kong Polytechnic University Ethics Committee (reference: HSEARS20141202001) and the Hong

Kong Hospital Authority Cluster Clinical Research Ethics Committee (ref: NTWC/CREC/1500);; USA South Dakota State University, Brookings SD; Thailand- Research Ethical Committee at Suansaranrom Psychiatric Hospital (ref: 044/2557-2014). In the UK, the study did not meet the criteria of a research study as defined by the National Patient Safety Agency National Research Ethics National Health Service and was, therefore, approved as an audit and service evaluation by the Medical Director, including permission to publish anonymous data and results. In the UK GDPR legislation was upheld as personal data was not collected/reported, or if it was collected to manage the data collection phase and informed consent process this data was removed before analysis. In the US, Thailand and Hong Kong participant information sheets made it clear that taking part in the study was voluntary and that declining to take part or withdrawing from the study would not have any negative consequences on their subsequent treatment provided by the clinical services. Participants in US, Thailand and Hong Kong were also given adequate time to consider their participation, provided written informed consent and were asked to grant permission to access their medical notes.

2.34 Statistical Analysis

Standard descriptive statistics (means, standard deviations, frequencies and percentages) were used to describe the data (SPSS, 2020). Internal consistency of the HIP questionnaire for the four-country sample was calculated by the Kudar Richardson -20 procedure for binary variables using SPSS (Rudolph et al., 2019, SPSS, 2020). Potential reliability score for KR-20 is 0 to 1 with 1 being best consistency. Following this, we conducted Chi-square/Fisher's exact tests to determine the differences in frequencies of selected red-flagged (risk rated) individual health behaviours/areas of health risk across the four countries. Kruskal Wallis tests were used to determine significant differences in median number of total red-flagged health risk areas (items) across patients in the four countries. Given that multiple comparisons of individual HIP items were compared we applied a Bonferroni adjustment to the level of significance to avoid an increased risk of type one error (by dividing 0.05 by the number of individual comparisons), hence alpha was set at $p < 0.02$ for all tests (two-sided). All analysis was done using IBM SPSS software version 25 for windows.

3. Results

The HIP completion/response rates in Thailand, Hong Kong and US were 91%, 85% and 91% respectively. However, the UK sample was derived from clinical audit data, consequently a response rate cannot be calculated. The time taken to complete and code the HIP ranged from 20 to 45 minutes.

Demographics

Table 3 shows the demographic and clinical characteristics of study participants across all four countries. Age of participants across was similar between countries. The proportion of male participants varied between countries and was lowest in the USA (n=16/40, 40%) and highest in the U.K. (n=71/108, 66%). Educational level was lowest in the Thailand sample, with 71% (75/105) having only elementary school or below level of education. Most of the participants in Hong Kong and USA samples had high school diploma or college/university level of education. For UK participants the level of education was not reported.

Participants predominantly had psychotic disorders (schizophrenia or schizoaffective disorder). In Hong Kong and the UK two thirds and in Thailand all participants had a psychosis. In the USA sample the most prevalent diagnosis was major depression (impairing functioning). Antipsychotic medication was prescribed to the majority of participants in the Hong Kong, UK, and Thailand samples but to a third of those in the USA.

Internal consistency of the HIP

The internal consistency (reliability) score for data (all four countries) was 0.751 for the full scale (18 HIP items) and ranged from 0.716 to 0.763 for individual items. This indicates acceptable internal consistency, as 0.6 to 0.8 are desired for KR -20 (Rudolph et al., 2019; Statistical Program for Social Sciences (SPSS), 2019). We note that the KR-20 does not assure criterion homogeneity, only internal consistency in this instance of administration of the HIP in the different samples (SPSS, 2019).

Risk (red flagged) score results

Table 4 shows the prevalence of cardiometabolic health risk areas and problematic health-related behaviours—items flagged as red items on the HIP—by country. The most prevalent red flagged items were body mass index (BMI) and waist circumference. The proportion of participants that were overweight/obese (according to BMI) was highest in the American sample at 75% (30/40) and UK at 70% (76/108). Hong Kong had lower rates of risk in BMI items at 65% (45/69), and Thailand sample had the lowest risk at 46% (48/105). Waist circumference red-flagged items were also most common in the USA with 83% (33/40), followed by Hong Kong with 54% (38/69), then UK 43% (46/108), and lowest was Thailand 19% (20/105). Differences among the samples between the Thailand sample and UK and USA sample were significantly different for both BMI (χ^2 (3, N = 323) = 17.96, p < 0.001) and waist circumference, (χ^2 (3, N = 323) = 59.57, p < 0.001).

Further items of lifestyle behavior risk were diet, substance use and unsafe sexual practices. Diet risk (lack of fruits and vegetables) had the highest measured prevalence of risk (red flags) in the USA sample with 18% (10/40), followed by the UK sample with 66% (71/108). Alcohol, cannabis, and excess caffeine use were highest in the UK, with rates of 45%, 25% and 33% respectively.

The Chi-Square test showed significant difference between the UK and the other three countries on alcohol use (χ^2 (3, N=323) = = 92.45, p< 0.001), cannabis use (χ^2 (3, N=318) = 30.27, p< 0.001) and caffeine, (χ^2 (3, N=323) = 52.41, p< 0.001). Risk regarding safe sexual practices were highest in Thailand with 14% (14/105) and the UK with 16% (17/108), and these risks were significantly more frequent than the USA and Hong Kong (χ^2 (3, N=301) = = 7.92, p< 0.001).

Breast checks (either self-examination or screening) was an area of high risk across all four countries. More than one in five individuals had not completed recommended breast cancer screening (self-examination/mammogram). The percentages of red flags for breast checks were highest in the UK (82% n = 89/108) and lowest in Thailand with (23% n = 24/105). The proportion of participants undertaking breast checks (i.e. red flags) differed between the four countries (χ^2 (3, N = 321) = 78.18, p < 0.001).

The total number of red flagged items was highest in the UK with a mean of 7.54 (SD = 3.35) and next highest in the USA with a mean of 7.07 (SD = 2.07). The mean number of red flags was lowest in the Thailand sample (mean = 2.62 (SD = 2.26). There were significant differences in the median total HIP screen risk scores in the four countries as calculated by the Kruskal Wallis Test (χ^2 (3, N=323) = 120.37, p< 0.001).

4. Discussion

The aim of this study was to test the feasibility of using the HIP to profile and compare the physical health and health behaviours of patients with SMI across international settings. This was achieved by conducting a secondary analysis of HIP data from four countries. The acceptable levels of internal consistency, relatively low refusal rates and the observed statistically significant differences in types of risk observed across countries, suggest that is feasible to use the HIP tool across international settings to identify typical profiles of physical health promotion needs in each setting. These encouraging initial findings provide the foundations for future, appropriately powered multi-site epidemiological studies of the HIP, which may help to more establish clusters of physical health promotion need and inform policies and practice. Our findings build on those of previous HIP studies that have estsblished that culturally/contextually modified versions of the HIP have good acceptability and face validity in a variety of countries, for example, Finland (Werkkala et al., 2020), Thailand (Meepring et al., 2018), Australia (Jones et al., 2016; Brown et al., 2020) and Hong Kong (Bressington et al., 2016). However, the current study is the first to demonstrate that the 18 unmodified HIP items could be analyzed across countries to identify a country specific pattern of physical health risks.

In terms of the HIP results, the total number of red-flagged HIP health risk items were found to be significantly different across countries, with the highest in the UK and USA, followed by Hong Kong and Thailand. The differences in the frequencies of individual areas of health risk were also found to be statistically significant across countries for all items, except for fluid intake and bowel health. These findings demonstrate that it seems feasible to create a general profile of physical health related challenges for people with SMI in each country using the HIP.

Elevated BMI and waist circumference were found to be most common of all areas of risk in all four countries. This finding aligns with previous international studies in which central obesity and BMI are frequently elevated in people with SMI (Razzano et al., 2015; Vancampfort et al., 2014; Yang et al., 2016). Although indicators of obesity are relatively common across the four countries, the reported prevalence of central obesity and a high BMI differs across countries in the current study. However, the prevalence rates seem to be generally proportional to obesity rates in the corresponding general populations, with rates being around double of those of reported in the general population. For example, the current study noted rates of central obesity of 83% in the US, whereas the prevalence rates of central obesity in the US general population has been reported to be between 26 to 55% (Janssen et al., 2015). Similarly, 54% of the Hong Kong sample were found to have central obesity in the current study, compared to around 27% in the general Hong Kong population (Ko et al., 2010).

This secondary analysis of HIP screening results for BMI seem to support the findings of previous studies highlighting that Asians in the general population typically have lower BMI's than the general populations of many Western countries (Bajaj et al., 2014; Hong Kong Government, 2019), however some studies report that Asian obesity rates have been increasing over time, i.e. from 12.9% to 23.7% (Lao et al., 2015). Asian individuals tend to have lower BMI than individuals of other cultures, however cardiovascular risk occurs at lower body weight and lower BMI for these individuals compared to European populations (Misra, 2015; Narksawat et al., 2007). Thus, it follows that Thai individuals (Asian in background), despite having a lower BMI, have similar rates of cardiovascular risk (hypertension 50%, obesity 30%) as US, UK, and European populations (Calosia, Palencia, & Khan, 2013; De Hert et al., 2009). It also interesting to note that over 40% of Thai participants in the current study have an unhealthy BMI despite the fact that they reported relatively high levels of exercise and adequate fruit/vegetable intake. Previous analyses of these data (Thongsai et al., 2016) highlighted that an overweight BMI was more closely associated with the number of prescribed antipsychotics than lifestyle behaviours, which may suggest that interventions to reduce bodyweight need to incorporate a review of prescribed medication and place less emphasis on diet or exercise.

Although the Thai participants reported relatively good heath behaviours, we observed high prevalence rates of unhealthy lifestyle behaviours associated with increased cardiovascular risk levels (i.e. tobacco smoking, poor diet and lack of exercise) in at least a third of all participants in the USA, UK and Hong Kong. Perhaps most concerning is the relatively high levels of smoking reported by participants (except those in Thailand) because smoking has been identified as the most important modifiable behavior associated with premature death in people with SMI (Gilbody et al., 2019). The high rates of smoking reported by non-Thai participants in the current study seem to concur with earlier studies suggesting that people with SMI are three times more likely to smoke than the general population (Szatkowski and McNeill, 2015) and highlight the need to provide resources and support in this important area of physical health promotion. Indeed, there is some evidence that smoking cessation programmes specifically designed and targeted at people with SMI can successfully support them to quit, although there is less evidence that this can be sustained over the long-term (Gilbody et al., 2019). However, it is of note that only 12% of the Thai study participants reporting smoking tobacco, whereas the rate in the general Thai population aged over 15 years was projected to be 19.8% in 2020 (WHO, 2019). Possible reasons for the low reported prevalence in the current study include that smoking status was self-reported by study participants and is thus is subject to social desirability bias, and also that the majority of Thai participants were unemployed and relied on family financial support, resulting in a lack of money to purchase cigarettes.

Similarly to prior research, the current feasibility study also found a lack of adequate breast examinations in individuals with SMI (Weinsten et al., 2015; Woodhead et al., 2016) despite there being an increased risk of mortality from cancers in people with SMI (Chang et al., 2014). Also, individuals taking anti-psychotic medications at higher risk for hyperprolactinemia, warrant mammogram screening (Gupta et al., 2018). The lack of screening for breast cancer was highest in the UK then Hong Kong, thus potentially suggesting UK and Hong Kong populations could especially benefit from approaches to improve breast screening rates. The use of HIP in routine practice could help to address a lack of cancer mammography screening by raising awareness of its importance to clinicians and service users with SMI (Kisley et al., 2013; Musuuza et al, 2013). This is particularly important because earlier studies show that cancer screening rates are lower in those with depression (Happell, Scott, & Platanian-Pung, 2012) and psychosis (Weinstein et al., 2016). In addition to breast checks, many participants in the four countries did not check their teeth, feet or eyes with adequate frequency, particularly those in Hong Kong, USA and UK. Therefore, countries need to raise personal awareness of the need to be more self-aware of own heath state, carry out appropriate self–checks and go for professional checkups regularly

Implications for mental health nursing

Although the clinical findings of this study should be treated with caution due to the non-representative samples, the results suggest that it is feasible to utilize the HIP to profile the physical health state of individuals and identify specific areas of health risk in different countries. The study findings may also indicate that interventions and resources in different countries could be tailored to address the most common lifestyle/health behaviour challenges in each setting. It also interesting to note that some of the areas of physical health risks and undesirable health behaviours seem interrelated, and therefore targeting individualized interventions on improving certain health behaviours may help to reduce or mitigate multiple observed health risks. The USA for example could address elevated risks of poor vegetable intake, central obesity, and hypertension through dietary interventions and improved physical activity (Naslund et al., 2016). Whereas, the UK could address substance misuse (including caffeine) and unsafe sexual practices (Paquette et al., 2017) through public health promotion programs in schools and communities (Pearson, 2012). Although effective reduction strategies for risky sexual behaviours in people with SMI are unclear, they could possibly be improved by targeted education (Hale, Fitzgerald-Yau, & Viner, 2014). Hong Kong may achieve most impact by targeting improving physical activity levels and Thailand by promoting adequate fluid intake and safe sexual practices.

The results of this feasibility study also show that health promotion challenges for people with SMI, are to some degree, country specific and therefore wider public health promotion/education campaigns may benefit from targeting countries according to specific clusters of health behaviours. However, health promotion among individuals with SMI is challenging cross-culturally, with most effective practice being comprehensive health risk screening to create an individualized profile of health risks and direct physical illness prevention practices that consider a range of important influences (Liu et al., 2017a). In this regard, the HIP may prove to be a clinically useful tool to promote the physical health of people with SMI because it includes consideration of mental health symptoms (Firth et al., 2016), lack of support (Firth et al., 2016), lack of knowledge (McKibbin et al., 2014), and health care system access (Coblentz et al., 2015). The HIP tool also targets prevention through standardized procedures (Naslund et al., 2017), one-on-one reinforcement (McKibbin et al., 2014), and use of behavior specific approaches (Lui et al, 2017b).

Implications for future research

The study findings highlight that it is feasible to use to the HIP to obtain a comprehensive assessment of the physical health state/health behaviours of people with SMI in different countries. Findings reinforce that physical health risks are high among individuals with SMI in several countries and warrant more intensive health risk screening and intervention approaches. The results also suggest that it is feasible to directly compare and contrast country-specific physical health promotion needs across different international settings using the same health check tool.

Therefore, future epidemiological studies utilizing the HIP may help to inform a better understanding of the interventions and health promotion resources required to address clusters of physical health risks in different international settings. Subsequent studies that utilize the HIP in multiple countries should consider adopting a probability sampling approach, specifically by including a stratified random sample of people with SMI that is representative of each setting (Tyrer and Heyman, 2016). Future studies should also collect data on potential confounding variables (i.e. medication types/doses) and ensure that the sample size provides adequate statistical power to conduct analyses using these potential confounders as covariates.

Study strengths and limitations

The study is the first to evaluate the feasibility of using the HIP to directly compare the physical health and health behaviour risks of people with SMI across four countries. Despite its innovative design and topic, the study has numerous limitations that require consideration. Although we have demonstrated the feasibility of the HIP, the data are not derived from representative samples because participants were recruited using different approaches and at different times in each country, which may have introduced selection bias that would influence the results. For example, although the mean age of the participants from each setting is around 40 years, the duration of illness, percentage of males and types of diagnoses vary significantly, and this negatively impacts upon the comparability of the samples and the generalizability of results. Because of the relatively small sample sizes the generalizability of the findings is further limited (especially those of the US findings). Another limitation is that health behaviours were self-reported by the participants and are thus potentially subject to recall bias and social desirability bias, particularly because clinical staff collected data and participants may have wished to present a positive view of their health behaviors to avoid being criticized or judged by nursing staff. In addition, the UK sample was drawn from in-patients who were more severely and acutely ill, thus it was likely that those individuals would have higher health risks. Similarly, it is also possible that individuals more interested and invested in healthy lifestyle behaviours participated in the studies. Finally, as this study is a secondary analysis there was limited ability to control for confounding factors and power analysis was not able to be applied or followed.

Conclusion

The results from this feasibility study suggest that the HIP has good utility for use cross-culturally in industrialized and less industrialized populations to profile physical health and lifestyle related risks. The use of HIP to screen individuals with SMI cross-culturally in larger numbers using epidemiological approaches could be feasible based on this study's findings. Screening with HIP in larger representative samples could facilitate identification of varying health risk prevalence so focused, effective screening and intervention can carried out cross-culturally. Although elevated BMI/waist circumference and lack of breast cancer screening were frequently recorded risk items among all four countries, it is apparent that there are unique physical health promotion challenges in each setting. These clusters of areas of risk could be targeted by health education and promotion campaigns in each individual setting. Targeting interventions and resources towards country-specific risk clusters may also help to focus nursing interventions and make effective use of scant resources.

Acknowledgements

We would like to thank all the participants and nursing staff who dedicated their valuable time to take part in this study.

Funding

The Hong Kong data collection was funded by central research grant funds from the Hong Kong Polytechnic University. The Thailand study was funded by Thailand Research Fund, Royal Thai Government. The United Kingdom sample obtained nurse training in the HIP by funds from the Bristol-Myers Squib and Otzuka Pharmaceuticals (UK) Ltd. using a train the trainer methodology. The study itself was not funded or supported by any public, commercial, or not-for-profit agency. The United States sample did not receive any specific grants from funding agencies.

References

Albrecht, S. S., Gordon-Larsen, P., Stern, D., & Popkin, B. M. (2015). Is waist circumference per body mass index rising differentially across the United States, England, China and Mexico? *European Journal of Clinical Nutrition*, *69*(12), 1306-1312. doi:10.1038/ejcn.2015.71

American Heart Association. (2016). Heart disease, stroke and research Statistics at-a-glance. Retrieved from http://my.americanheart.org/idc/groups/ahamah-public/@wcm/@sop/@smd/documents/downloadable/ucm_480086.pdf

Bajaj, H. S., Pereira, M. A., Anjana, R. M., Deepa, R., Mohan, V., Mueller, N. T., Rao, G. H., & Gross, M. D. (2014). Comparison of relative waist circumference between Asian Indian and US adults. *Journal of Obesity, 2014,* 1-10. 461956. doi:10.1155/2014/461956

Baller, J. B., McGinty, E. E., Azrin, S. T., Juliano-Bult, D., & Daumit, G. L. (2015). Screening for cardiovascular risk factors in adults with serious mental illness: A review of the evidence. *BMC Psychiatry*, *15,* 55. doi:10.1186/s12888-015-0416-y

Beebe, L. H., & Harris, R. F. (2013). Description of physical activity in outpatients with schizophrenia spectrum disorders. *International Journal of Mental Health Nursing*, *22*(5), 430-436. doi: 10.1111/inm.12008

Bos, D. M. (2018). Relationship of physical health risk screenings in seriously mentally ill with self-efficacy for health, perception of health risk, and intention to follow-up with care. Retrieved from https://openprairie.sdstate.edu/etd/2445/

Bressington, D., Chien, WT., Mui, J., Lam, KKC., Mahfoud, Z., White, J., Gray, R (2018). The Chinese Health Improvement Profile (CHIP) for people with severe mental illness: A Cluster Randomised Controlled Trial. *International Journal of Mental Health Nursing*, *27*, 841–85.

Bressington, D., Mui, J., Hulbert, S., Cheung, E., Bradford, S., & Gray, R. (2014). Enhanced physical health screening for people with severe mental illness in Hong Kong: Results from a one-year prospective case series study. *BMC Psychiatry, 14*(57), 1-10.

Bressington, D., Mui, J., Wells, H., Chien WT., Lam, C., White, J., Gray, R. (2016). Refocusing on physical health: Community psychiatric nurses' perceptions of using enhanced health checks for people with severe mental illness. *International Journal of Mental Health Nursing* 25, 214–224. doi: 10.1111/inm.12195

Brown, T., May, A., & Beverley-Stone, M. (2020). The adaptation and implementation of the Health Improvement Profile to Australian standards in public mental health settings. *Journal of Psychiatric and Mental Health Nursing*. 27:628–639. doi: 10.1111/jpm.12616

Chung, K. H., Kuo, C. J., S. Y., Juang, S. H., & Wu, W. C. (2018). Risk factors for early circulatory mortality in patient with schizophrenia. *Psychiatry Research, 267,* 7-11.

Colosia, A. D., Palencia, R., & Khan, S. (2013). Prevalence of hypertension and obesity in patients with type 2 diabetes mellitus in observational studies: A systematic literature review. *Diabetes Metabolic Syndromes and Obesity, 6,* 327-338. doi:10.2147/DMSO.S51325

Chang, C. K., Hayes, R. D., Broadbent, M. T., Hotopf, M., Davies, E., Moller, H., & Stewart, R. (2014). A cohort study on mental disorders, stage of cancer at diagnosis and subsequent survival. *BMJ Open, 4*(1), e004295. doi:10.1136/bmjopen-2013-004295

Chen, Y., Liu, L., Zhou, Q., Imam, M. U., Cai, J., Wang, Y., . . . Fu, X. (2017). Body mass index had different effects on premenopausal and postmenopausal breast cancer risks: a dose-response meta-analysis with 3,318,796 subjects from 31 cohort studies. (1), 936. doi:10.1186/s12889-017-4953-9

Coblentz, P., Leickly, E., Chwastiak, L., Cristofalo, M. A., Ries, R. K., & McDonell, M. G. (2015). Schizophrenia and metabolic syndrome in rural communities: Understanding barriers and improving care. *Journal of Rural Mental Health, 39*(1), 34-45. doi:10.1037/rmh0000025

Correll, C. U., Solmi, M., Veronese, N., Bortoloato, B., Rosson, S., Santonastaso, P., Thapa-Chhetri, N., Fornaro, M., Gallicchio, D., Callantoni, E., Pigato, G., Favaro, A., Monaco, F., Kohler, C., Vancampfort, D., Ward, D, Gaughran, F.,

Carvalho, A. F., & Stubbs, B. (2017). Prevalence, incidence and mortality from cardiovascular disease in patients with pooled and specific severe mental illness: a large-scale meta-analysis of 3,211,768 patients and 113,383,368 controls. *World Psychiatry, 16*, 163-180.

De Hert, M., Dekker, J. M., Wood, D., Kahl, K. G., Holt, R. I., & Moller, H. J. (2009). Cardiovascular disease and diabetes in people with severe mental illness position statement from the European Psychiatric Association (EPA), supported by the European Association for the Study of Diabetes (EASD) and the European Society of Cardiology (ESC). *European Psychiatry, 24*(6), 412-424. doi:10.1016/j.eurpsy.2009.01.005

Doherty, A. M., & Gaughran, F. (2014). The interface of physical and mental health. *Social Psychiatry Epidemiology, 49*(5), 673-682. doi:10.1007/s00127-014-0847-7

Firth, J., Rosenbaum, S., Stubbs, B., Gorczynski, P., Yung, A. R., & Vancampfort, D. (2016). Motivating factors and barriers towards exercise in severe mental illness: A systematic review and meta-analysis. *Psychological Medicine, 46*(14), 2869-2881. doi:10.1017/S0033291716001732.

Fernandez-San-Martin, M. I., Martin-Lopez, L. M., Masa-Font, R., Olona-Tabuena, N., Roman, Y., Martin-Royo, J., Oller-Canet, S., Gonzales- Tjon, S., Fan-Emeterio, L., Baroso-Garcia, A., Vinens-Cabrera, L., & Flores-Mateo, G. (2014). The effectiveness of lifestyle interventions to reduce cardiovascular risk in patients with severe mental disorders: meta-analysis of intervention studies. *Community Mental Health Journal*, *50*(1), 81-95. doi:10.1007/s10597-013-9614-6

Firth, J., Siddiqi, N., Koyanagi, A., Siskind, D., Rosenbaum, S., Galletly, C., .. & Chatterton, M. L. (2019). The Lancet Psychiatry Commission: a blueprint for protecting physical health in people with mental illness. *The Lancet Psychiatry*, 6(8), 675-712.

Free Dictionary by Farlex. (2020). Health risk behavior. Retrieved from https://medical-dictionary.thefreedictionary.com/High+Risk+Behavior

Gupta, S., Lakshmanan, D. A. M., Khastgir, U., & Nair, R. (2018). Management of antipsychotic-induced hyperprolactinaemia. *BJPsych Advances*, *23*(4), 278-286. doi:10.1192/apt.bp.115.014928

Hale, D. R., Fitzgerald-Yau, N., & Viner, R. M. (2014). A systematic review of effective interventions for reducing multiple health risk behaviours in adolescence. *American Journal of Public Health*, *104*(e19-e41). doi:10.2105/AJPH. 2014.301874

Happell, B., Galletly, C., Castle, D., Platania-Phung, C., Stanton, R., Scott, D., McKenna, B., Millar, F., Liu, D., Browne, M, Furness, T. (2015). Scoping review of research in Australia on the co-occurrence of physical and serious mental illness and integrated care. *International Journal of Mental Health Nursing*, *24*(5), 421-438. doi:10.1111/inm.12142

Hardy, S., Hinks, P., & Gray, R. (2013). Screening for cardiovascular risk in patients with severe mental illness in primary care: A comparison with patients with diabetes. *Journal of Mental Health*, *22*(1), 42-50. doi:10.3109/09638237.2012.759194

Hardy, S., White, J., Gray, R. (2018) *The Health Improvement Profile: A manual to promote physical wellbeing in people with severe mental illness*. 2nd Ed. M&K Publishing. Keswick

Happell, B., Scott, D., & Platania-Phung, C. (2012). Provision of preventive services for cancer and infectious diseases among individuals with serious mental illness. *Archives of Psychiatric Nursing*, *26*(3), 192-201. doi:10.1016/j.apnu.2011.09.002

Hjorthøj, C., Stürup, A. E., McGrath, J. J., & Nordentoft, M. (2017). Years of potential life lost and life expectancy in schizophrenia: A systematic review and meta-analysis. *Lancet Psychiatry*, 4(4), 295-301. doi: 10.1016/s2215-0366(17)30078-0

Jones, M., Kruger, M., & Walsh, S. M. (2016). Preparing non‐government organization workers to conduct health checks for people with serious mental illness in regional Australia. *Journal of psychiatric and mental health nursing*, 23(5), 247-254.

Ko, G. T., Tang, J. S., & Chan, J. C. N. (2010). Worsening trend of central obesity despite stable or declining body mass index in Hong Kong Chinese between 1996 and 2005. *European journal of clinical nutrition*, 64(5), 549-552.

Hong Kong Government (2019). *Health Facts of Hong Kong 2019 Edition*. https://www.dh.gov.hk/english/statistics/statistics_hs/files/Health_Statistics_pamphlet_E.pdf . Accessed 27 August 2020.

Janssen, E. M., McGinty, E. E., Azrin, S. T., Juliano-Bult, D., & Daumit, G. L. (2015). Review of the evidence: prevalence of medical conditions in the United States population with serious mental illness. *General Hospital Psychiatry*, *37*(3), 199-222. doi:10.1016/j.genhosppsych.2015.03.004

Kilbourne, A. M., Zonghan, L,, Bowersox, N., Pirraglia, P., & Bauer, M. S. (2011). Does co-located care improve access to cardiometabolic screening for patients with serious mental illness? *General Hospital Psychiatry***,** *33*(6), 634-636. doi:10.1016/j.genhosppsych.2011.07.003

Kisley, S., Crowe, E., & Lawrence, D. (2013). Cancer related mortality in people with mental illness. *Journal of American Medical Association Psychiatry, 70*(2), 209-217.

Ko, G. T., Tang, J. S., & Chan, J. C. (2010). Worsening trend of central obesity despite stable or declining body mass index in Hong Kong Chinese between 1996 and 2005. *European Journal of Clinical Nutrition, 64*(5), 549-552. doi:10.1038/ejcn.2010.49

Lao, X. Q., Ma, W. J., Sobko, T., Zhang, Y. H., Xu, Y. J., Xu, X. J., ... & Thomas, G. N. (2015). Overall obesity is leveling-off while abdominal obesity continues to rise in a Chinese population experiencing rapid economic development: analysis of serial cross-sectional health survey data 2002–2010. *International journal of obesity*, 39(2), 288.

Liu, X., Chen, Y., Boucher, N. L., & Rothberg, A. E. (2017a). Prevalence and change of central obesity among US Asian adults: NHANES 2011-2014. *BMC Public Health, 17*(1), 678. doi:10.1186/s12889-017-4689-6

Liu, N. D., Duamit, T., Aquila, R., Charlson, F., Cuijper, P... Shekar, S. (2017b). Excess mortality in persons with severe mental disorders: a multilevel intervention framework and priorities for clinical practice, policy and research agendas. *World Psychiatry, 16,* 30-40.

Luengo-Fernandez, R., Leal, J., Gray, A., Petersen, S., & Rayner, M. (2006). Cost of cardiovascular diseases in the United Kingdom. *Heart, 92*(10), 1384-1389. doi:10.1136/hrt.2005.07217

McKibbin, C. L., Kitchen, K. A., Wykes, T. L., & Lee, A. A. (2014). Barriers and facilitators of a healthy lifestyle among persons with serious and persistent mental illness: Perspectives of community mental health providers. Community Mental Health Journal, 50(5), 566-576. doi:10.1007/s10597-013-9650-2

Meepring, S., Chien, WT., Gray, R., Bressington, D. (2018). The effects of the Thai Health Improvement Profile intervention (HIP-T) on the physical health and health behaviours of people with schizophrenia: A quasi experimental study. *International Journal of Mental Health Nursing, 27*, 126–137. doi: 10.1111/inm.12301

Misra, A. (2015). Ethnic-Specific Criteria for Classification of Body Mass Index: A Perspective for Asian Indians and American Diabetes Association Position Statement. *Diabetes Technologies and Therapeutic, 17*(9), 667-671. doi:10.1089/dia.2015.0007

Mugisha, J., De Hert, M., Stubbs, B., Basangwa, D., & Vancampfort, D. (2017). Physical health policies and metabolic screening in mental health care systems of sub-Saharan African countries: a systematic review. *International Journal of Mental Health Systems, 11,* 31. doi:10.1186/s13033-017-0141-7

Mitchell, A. J., Delaffon, V., Vancampfort, D., Correll, C. U., & De Hert, M. (2012). Guideline concordant monitoring of metabolic risk in people treated with antipsychotic medication: systematic review and meta-analysis of screening practices. *Psychological Medicine, 42*(1), 125-147. doi:10.1017/S003329171100105X

Moore, S., Shiers, D., Daly, B., Mitchell, A. J., & Gaughran, F. (2015). Promoting physical health for people with schizophrenia by reducing disparities in medical and dental care. *Acta Psychiatry of Scandanavia, 132*(2), 109-121. doi:10.1111/acps.12431

Musuuza, J. S., Sherman, M. E., Knudsen, K. J., Sweeney, H. A., Tyler, C. V., & Koroukian, S. M. (2013). Analyzing excess mortality from cancer among individuals with mental illness. *Cancer, 119(*13), 2469-2476. doi:10.1002/cncr.28091

Narksawat, K., Podang, J., Punharathabundu, P., & Podhipak, A. (2007). Waist circumference, body mass index and health risk factors among middle aged Thais. *Asian Pacific Journal of Public Health, 19*(3), 10-15.

Naslund, J. A., Aschbrenner, K. A., Scherer, E. A., Pratt, S. I., Wolfe, R. S., & Bartels, S. J. (2016). Lifestyle intervention for people with severe obesity and serious mental Illness.

American Journal of Preventive Medicine, 50(2), 145-153. doi:10.1016/j.amepre.2015.07.012

National Health Service. (2017). Research ethics service and research ethics committees. Retrieved from https://www.hra.nhs.uk/about-us/committees-and-services/res-and-recs/

National Institute of Health and Care Excellence. (2018). Improving physical health for people with serious mental illness (SMI), Retrieved from: https://www.nice.org.uk/sharedlearning/improving-physical-health-for-people-with-serious-mental-illness-smi

National Institute of Mental Health. (2016). *Serious mental illness among U. S. adults*. Retrieved from http://www.nimh.nih.gov/health/statistics/prevalence/serious-mental-illness-smi-among-us-adults.shtml

Nagrani, R., Mhatre, S., Rajaraman, P., Soerjomataram, I., Boffetta, P., Gupta, S., Parmar, V., Badwe, R., Dikshit, R. (2016). Central obesity increases risk of breast cancer irrespective of menopausal and hormonal receptor status in women of South Asian Ethnicity. *European Journal of Cancer, 66*, 153-161. doi:10.1016/j.ejca.2016.07.022

Nesvag, R., Jonsson, E. G., Bakken, I. J., Knudsen, G. P., Bjella, T. D., Reichborn-Kjennerud, T., Melle, I., Andreassen, O. A. (2017). The quality of severe mental disorder diagnoses in a national health registry as compared to research diagnoses based on structured interview. *BMC Psychiatry, 17*(1), 93. doi:10.1186/s12888-017-1256-8

Nguyen Ngoc, H., Kriengsinyos, W., Rojroongwasinkul, N., & Aekplakorn, W. (2019). Association of Adiposity Indices with Hypertension in Middle-Aged and Elderly Thai Population: National Health Examination Survey 2009 (NHES-IV). J Cardiovasc Dev Dis, 6(1). doi:10.3390/jcdd6010013

Osborn, D. P., Baio, G., Walters, K., Petersen, I., Limburg, H., Raine, R., & Nazareth, I. (2011). Inequalities in the provision of cardiovascular screening to people with severe mental illnesses in primary care: cohort study in the United Kingdom THIN Primary Care Database 2000-2007. *Schizophrenia Research*, *129*(2-3), 104-110. doi:10.1016/j.schres.2011.04.003

Paquette, R., Tanton, C., Burns, F., Prah, P., Shahmanesh, M., Field, N., . . . Mercer, C. H. (2017). Illicit drug use and its association with key sexual risk behaviours and outcomes: Findings from Britain's third National Survey of Sexual Attitudes and Lifestyles (Natsal-3). *PLoS One, 12*(5), e0177922. doi:10.1371/journal.pone.0177922

Pearson, G. S. (2012). Managing the metabolic side effects of atypical antipsychotics. *Journal of Child Adolescent Psychiatric Nursing, 25*(1), 54-55. doi:10.1111/j.1744-6171.2011.00316.x

Pitman, A. L., Osborn, D. P., Wright, C. A., Nazareth, I., & King, M. B. (2011). Cardiovascular screening of people with severe mental illness in England: Views of service users and providers. *Psychiatric Services*, *62*,1338–1345.

Rajan, T. M., & Menon, V. (2017). Psychiatric disorders and obesity: A review of association studies. *Journal of Postgraduate Medicine, 63*(3), 182–190. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5525483/

Razzano, L. A., Cook, J. A., Yost, C., Jonikas, J. A., Swarbrick, M. A., Carter, T. M., & Santos, A. (2015). Factors associated with co-occurring medical conditions among adults with serious mental disorders. *Schizophrenia Research, 161*(2-3), 458-464. doi:10.1016/j.schres.2014.11.021

Reilly S, P. C., Gask L, Hann M, Knowles S, Druss B, & Lester, H. (2013). Collaborative care approaches for people with severe mental illness. *Cochrane Reviews*, 1-60.

Robson, D., & Gray, R. (2007). Serious mental illness and physical health problems: a discussion paper. *International Journal of Nursing Studies*, *44*(3), 457-466. doi:10.1016/j.ijnurstu.2006.07.013

Rekhi, G., Khyne, T. T., & Lee, J. (2016). Estimating 10-year cardiovascular disease risk in Asian patients with schizophrenia. *General Hospital Psychiatry*, *43*, 46-50. doi: https://doi.org/10.1016/j.genhosppsych.2016.09.005

Rudolph, M. J., Daugherty, K. K., Ray, M. Shuford, V. P., Lebovitz, L., & DiVall, M. V. (2019). Best practices related to examination item construction and post-hoc review. *American Journal of Pharmaceutical Education*, 83 (7), 1492- 1503.

Schober, P., P & Vetter, T. R. (2019). Chi-Square tests in medical research. *Anesthesia Research Society*, 129(5) 1193.

Shuel, F., White, J., Jones, M., & Gray, R. (2010). Using the serious mental illness health improvement profile [HIP] to identify physical problems in a cohort of community patients: a pragmatic case series evaluation. *International Journal of Nursing Studies, 47*(2), 136-145. doi:10.1016/j.ijnurstu.2009.06.003

Song, P., Li, X., Bu, Y., Ding, S., Zhai, D., Wang, E., & Yu, Z. (2019). Temporal trends in normal weight central obesity and its associations with cardiometabolic risk among Chinese adults. *Science Reports, 9*(1), 5411. doi:10.1038/s41598-019-41986-5

Substance Abuse and Mental Health Services Administration. (2020). Serious mental illness and serious emotional disturbance. Retrieved from: https://www.samhsa.gov/dbhis-collections/smi

Thongsai, S., Gray, R., & Bressington, D. (2016). The physical health of people with schizophrenia in Asia: Baseline findings from a physical health check programme. *Journal of Psychiatric Mental Health Nursing*, *23*(5), 255-266. doi:10.1111/jpm.12300

Tosh, G., Clifton, A. V,, Xia, J., & White, M. M,. (2014). Physical health care monitoring for people with serious mental illness, *Cochrane Database of Systematic Reviews*, *1*, 1361-6137.

Tyrer, S., & Heyman, B. (2016). Sampling in epidemiological research: issues, hazards and pitfalls. *British Journal of Psychiatry bulletin*, 40(2), 57-60.

Vancampfort, D., Correll, C. U., Wampers, M., Sienaert, P., Mitchell, A. J., De Herdt, A., Probst, M., Scheewe, T. W. De Hert, M. (2014). Metabolic syndrome and metabolic abnormalities in patients with major depressive disorder: a meta-analysis of prevalences and moderating variables. *Psychological Medicine, 44*(10), 2017-2028. doi:10.1017/S0033291713002778

Vasudev, K., & Martindale, T., D. (2010). Physical healthcare of people with severe mental illness: everybody's business! *Mental Health in Family Medicine*, *7*, 115-122.

Vermeulen-Smit, E., Ten Have, M., Van Laar, M., & De Graaf, R. (2015). Clustering of health risk behaviours and the relationship with mental disorders. *Journal of Affective Disorders*, *171*, 111-119. doi:10.1016/j.jad.2014.09.031

Weinstein, L., Stenfancic, A., Cummingham, A. T., Hurley, K. E., Cabassa, L., & Wender, R. . (2016). Cancer screening, prevention, and treatment in people with mental illness. *CA Cancer Journal Clinics, 66*(2), 133-151. doi:10.3322/caac.21334

Werkkala, C., Välimäki, M., Anttila, M., Pekurinen, V., Bressington, D. (2020) Validation of the Finnish Health Improvement Profile (HIP) with patients with Severe Mental Illness. *BMC Psychiatry*, 20:112. Doi: 10.1186/s12888-020-02511-5

White, J., Gray, R., & Jones, M. (2009). The development of the serious mental illness physical Health Improvement Profile. *Journal of Psychiatric and Mental Health Nursing, 16*(5), 493-498. doi:10.1111/j.1365-2850.2009.01375.x

White, J. (2015) *Physical Health checks in serious mental illness: A programme of research in secondary care* Doctoral Thesis, University of East Anglia. Retrieved from https://ueaeprints.uea.ac.uk/56777/

Woodhead, C., Cunningham, R., Ashworth, M., Barley, E., Stewart, R. J., & Henderson, M. J. (2016). Cervical and breast cancer screening uptake among women with serious mental illness: a data linkage study. *BMC Cancer, 16*(1), 819. doi:10.1186/s12885-016-2842-8

World Health Organization. (2006). Global data base on body mass index. Retrieved from http://www.assessmentpsychology.com/icbmi.htm

World Health Organization Western Pacific Region. (2016). *Who representative office China: Cardiovascular diseases.* Retrieved from http://www.wpro.who.int/china/mediacentre/factsheets/cvd/en/

World Health Organization (2020). *WHO global report on trends in prevalence of tobacco use 2000-2025, third edition*. Retrieved from: https://www.who.int/docs/default-source/searo/tobacco/country-fact-sheets/thailand-who-tobacco-prevalence-trend-estimates-2019.pdf?sfvrsn=4030f0b3_2

Wu, C. Y., Chen, S. P., & Grossman, J. (2008). Facilitating Intrinsic Motivation in Clients with Mental Illness. *Occupational Therapy in Mental Health, 16*(1), 1-14. doi:10.1300/J004v16n01_01

Xiong, G. L., Iosif, A. M., Suo, S., McCarron, R. M., Koike, A., Onate, J., & Carter, C. S. (2015). Understanding preventive health screening services use in persons with serious mental illness: how does integrated behavioral health primary care compare? *International Journal of Psychiatry Medicine*, *48*(4), 279-298. doi:10.2190/PM.48.4.d

Yang, C. Y., Yo, S. C., & Peng, Y. C. (2016) Prevalence and predictors of metabolic syndrome in people with schizophrenia in I patient rehabilitation wards. *Biological Research for Nursing*, *18*(5), 558-566 doi: 10.1177/1099800416653184

Yeomans, D., Dale, K., & Beedle, K. (2014). Systematic computerised cardiovascular health screening for people with severe mental illness. *Psychiatric Bulletin*, *38*(6), 280-284. doi:10.1192/pb.bp.113.045955

Table 1

Risk Cut off and Evidence Based Recommendations Given to Participants for Red (Risk) Items According to the HIP Administration Manual

HIP Item	Risk Determination for RED flag	Recommendations (According to HIP Administration Manual)
BMI	< 18.50 ≥ 25.00	Treatment or information exchange about weight loss should be offered to patients with: A BMI ≥ 30 A BMI ≥ 28 with co-morbidities (eg coronary heart disease, diabetes).
Waist circumference	≥80cm (women) ≥94cm (men)	Support and exchange information on diet (ie meal planning) and exercise Referral to a local weight/exercise management programme may be required Consider medication review.
Hypertension	≥140/90	For patients with blood pressure > 140/90 mmHg, exchange information on weight loss/exercise (if overweight), improved diet and reduction in alcohol and salt intake and refer to the GP for further investigation.
Alcohol use	>3 units/day	Offer recommendations on sensible daily alcohol intake: Adult women should not regularly drink > 2–3 units of alcohol a day, Adult men not regularly drink > 3–4 units a day (Department of Health 2007b). Refer to local Alcohol Support Agency.
Diet (veg)	Unable to cook or shop No access to cooking facilities	Explain- five portions of fruit/vegetables daily and reducing fat intake, reduces risk of cancer, heart disease, and other chronic illnesses. Address barriers, health benefits of buying, preparing and eating fruit/vegetables). Agree, implement diet plan
Exercise	None (needed 30 minutes a day)	Recommend 30 minutes of activity five days a week (DH 2004). Follow up at appropriate intervals over three to six-month period. Refer to exercise scheme (DH 2004). Check what local council offers.
Smoking	Passive smoking/ smoking	Advise about health risks of smoking. Ask about respiratory symptoms; refer for chest examination if appropriate. If wish to quit smoke refer to Stop Smoking Services (DH 2007a) or local GP practice. If change in smoking medication review re: antipsychotic levels.
Sleep	< 3 hours > 8 hours	Clarify any patient sleep problems. Educate about good sleep hygiene and benefits of sleep diary. Consider medication review – refer to 'Risk and Relapse Plan' if relapse suspected.

Caffeine	≥ 600mg/day	Give information on reducing caffeine intake (gradually to avoid withdrawal). Check for symptoms of caffeinism or caffeine toxicity (> 1000 mg/day), can worsen anxiety.
Drug use (cannabis)	Occasional/ Regular	Ask about other non-prescribed drug use. Implement health behaviour interventions and evaluate systematically using a drug-use scale. Consider gaining support of dual diagnosis worker/service to enhance evaluation/access, interventions.
Safe sex	Inconsistent/Never	Identify if the patient is engaging in behaviours that increase the risk of STIs Provide sexual health advice If STI is suspected, refer to the Genito-Urinary Medicine Clinic.
Bowels	Diarrhea, constipation, excessive urgency, straining, laxative use	GIve information on increasing physical activity, lowering alcohol and a healthy diet. Check for any bowel frequency/incontinence issues. Refer to GP who can make a rapid referral for endoscopy if symptoms are suspicious.
Fluid intake	< 1liter/day > 3 liters/day	If low Check for signs of dehydration (FSA) Encourage 1-2 liters (6–8 glasses) of fluid daily (more during hot weather, physical exertion). Info to increase intake. If high intake: Implement fluid balance chart. Electrolyte assessment.
Feet check	Never Check	Give information on keeping feet healthy, eg washing daily, trimming nails, treatment for burns, cuts and breaks in skin. If problems or at risk: elderly, diabetes, arthritis refer to chiropodist.
Teeth check	≥ 2 years	Dental check-ups should be every 12 months to two years to the community dentist (NICE 2004a). Provision of dentistry can be limited in some areas patients may need support to find and access one.
Urine problems	< 1litre/day > 2litres/day	Assess for signs of dehydration, encourage fluids, implement fluid balance chart. Assess for symptoms of polyuria. Check for urine frequency/incontinence issues Dip test urine.
Eye checks	> 2 years	Prompt patients to self-refer, or refer, to an optometrist if no eye examination in the last two years. Consider always sight aids (eg glasses, contact lenses).
Breast checks check (male & female)	Never	Women: Check risk factors for breast cancer (eg previous history, family history, age) (Patient UK 2007). Advise of abnormal changes. If abnormalities, refer for investigations. Check for increased serum prolactin. Men: same as women. Plus --Check for symptoms (painless lump, nipple discharge, ulceration or swelling). Refer to primary care if symptoms reported or observed.

Table 2. HIP Items with Different Cut-off Points for Red (Risk) Rating by Country

	UK (108) **Rating for Risk**	**Hong Kong (69)** **Rating for Risk**	**Thailand (105)** **Rating for Risk**	**USA (40)** **Rating for Risk**
HIP Item				
BMI	obesity from BMI > 25	obesity from BMI > 23	obesity from BMI > 23	obesity from BMI > 25
Waist Circumference	≥ 80 cm (female) ≥ 94 cm (male)	≥ 80 cm (female) ≥ 90 cm (male)	≥ 80 cm (female) ≥ 90 cm (male)	≥ 80 cm (female) ≥ 94 cm (male)

Key: cm – centimeters, BMI- body mass index, HIP- health improvement profile,

Table 3: Demographics of Sample by Country

Country	**UK (108)** **N (valid %)**	**Hong Kong (69)** **n (valid %)**	**Thailand (105)** **n (valid %)**	**USA (40)** **n (valid %)**
Age in years (mean, SD)	43 (11)	48 (9)	41 (10)	40 (13)
Male gender	71 (66)	29 (42)	56 (53)	16 (40)
Ethnicity	White: 106 (98) Indian: 1(1) Black: 1 (1)	Chinese: 69 (100)	Thai: 105 (100)	White: 34 (85) Hispanic: 2 (5) Black: 4 (10)
Education level None Primary Secondary College/University	 Not reported	 5 (7(20 (27) 37 (54) 7 (10)	 42 (40) 33 (31) 19 (18) 11 (10)	 0 5 (13) 10 (25) 25 (63)
Duration of illness months (median, interquartile range)	Not reported	68 (98.6)* (144.5, 181.5)	48 (45.7)* (35.6, 18)	18 (45)* (139.4, 168)
Diagnosis (primary) Schizophrenia (or schizoaffective disorder)	72 (67)	39 (57)	70 (100)	1 (3)
Bipolar disorder	14 (13)	9 (13)	0	8 (20)
Major (Clinical/Chronic) Depression	Not reported	21 (30)	Not reported	31 (77)
Other (e.g. borderline personality disorder, substance and/or alcohol use disorder, depression unspecifed)	22 (20)	18 (27)	0	0
Psychiatric Medication Prescribed medication	98 (96)	68(97)	105 (100)	39 (97)
Prescribed antipsychotic medication	91 (84)	58 (83)	105 (100)	12(33)
Prescribed no medication	4 (4)	2 (3)	0	1 (3)

*duration of mental illness in months- median, interquartile range are shown.

Table 4: Comparison of Health Risk Areas in Four Countries

Red flagged HIP item	Hong Kong (69) n (valid %)	Thailand (105) n (valid %)	UK (108) n (valid %)	USA (40) n (valid %)	? Chi-square test, p-value
BMI overweight	45 (65)	48 (46)	76 (70)	**30 (75)**	17.96, P<0.001*
Waist circumference	38 (54)	20 (19)	46 (43)	**33 (83)**	59.57, p<0.001*
Hypertension	6 (9)	3 (3)	19 (18)	**10 (25)**	18.99, P<0.001*
Alcohol use	2 (3)	2 (2)	**49 (45)**	2 (5)	92.45, p<0.001*
Diet (veg)	22 (31)	1 (1)	71 (66)	**32 (80)**	126.29, p<0.001*
Exercise	**57 (81)**	11 (11)	41 (38)	24 (60)	93.99, p<0.001*
Smoking	24 (35)	13 (12)	58 (54)	**23 (58)**	47.97, p<0.001*
Sleep	30 (43)	22 (21)	16 (15)	**21 (52)**	29.78, P<0.001*
Caffeine	0	4 (4)	**36 (33)**	9 (23)	52.41, p<0.001*
Drug use (cannabis)	1 (1)	7 (7)	**27 (25)**	3 (8)	30.27, p<0.001*
Safe sex	7 (10)	15 (14)	**17 (16)**	1 (3)	7.92, p<0.001*
Bowels	11 (16)	16 (15)	29 (27)	**13 (33)**	8.57, p=0.036
Fluid intake	**20 (29)**	17 (16)	25 (23)	4 (10)	7.18, p=0.066
Feet check	**31 (44)**	20 (19)	**48 (44)**	10 (25)	20.25, p<0.001*
Teeth check	25 (36)	12 (11.4)	44 (41)	**17 (43)**	27.05, p<0.001*

Urine problems	5 (7)	31 (29)	**43 (40)**	7 (18)	25.78, p<0.001*
Eye checks	18 (26)	10 (10)	32 (30)	**19 (48)**	25.77, p<0.001*
Breast checks (male and female)	43 (62)	24 (23)	**89 (82)**	22 (55)	78.18, p<0.001*
Red flags for 18 items Mean (SD), Median (IQR)	5.44 (2.39), 5.0 (3.0)	2.62 (2.26), 2.0 (3.0)	**7.54 (3.35),** **7.0 (5.0)**	7.07 (2.07), 7.0 (2.75)	#120.37, p<0.001*

highest percentage across the countries

*Significant at p<0.002

□ Fishers exact test was used when more than 20% of cells had expected frequencies < 5.

Kruskal Wallis test.